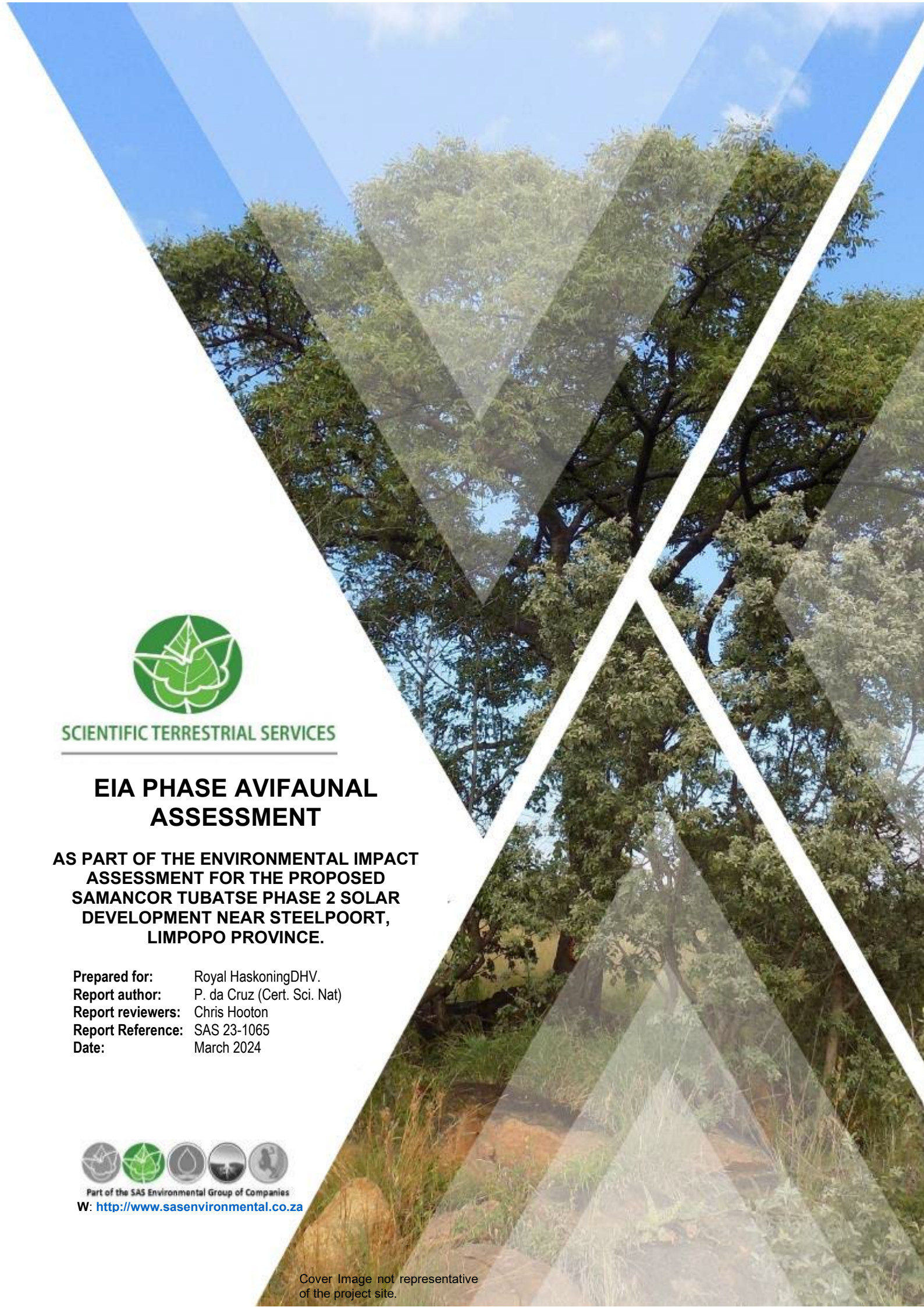


SCIENTIFIC TERRESTRIAL SERVICES

EIA PHASE AVIFAUNAL ASSESSMENT

AS PART OF THE ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED SAMANCOR TUBATSE PHASE 2 SOLAR DEVELOPMENT NEAR STEELPOORT, LIMPOPO PROVINCE.

Prepared for: Royal HaskoningDHV.
Report author: P. da Cruz (Cert. Sci. Nat)
Report reviewers: Chris Hooton
Report Reference: SAS 23-1065
Date: March 2024

Part of the SAS Environmental Group of Companies
W: http://www.sasenvironmental.co.za

Cover Image not representative of the project site.

EXECUTIVE SUMMARY

Scientific Aquatic Services (SAS) (Pty) Ltd was appointed to conduct an EIA-phase avifaunal assessment as part of the Environmental Impact Assessment (EIA) process for the proposed 40MW Solar PV Plant (Samancor Tubatse Phase 2 Solar Development) on the Farm Goudmyn 337 KT near Steelpoort in the Limpopo Province. The area of assessment consists of five (5) separate development sites for the phase 2 solar project (i.e. Site 2B (Site 2 extension), Sites 3B, 3C, 4B and 5B) (collectively known as the 'study area').

The wider study area is comprised of various habitat units, most of which is woodland vegetation occurring within residual patches of remnant natural habitat in varying states of degradation. The freshwater (aquatic) habitat associated with a number of natural drainage features is also present, including the Steelpoort River and its associated riparian zone. The remnant of the study area is comprised of modified habitats. The Steelpoort River and the non-perennial drainage line that bisects sites 4C and 3B/C have been identified as important local bird movement corridors. The various habitat units and sub-units have been assigned differing levels of avifaunal sensitivity, with the highest sensitivity being the freshwater habitat (aquatic habitats associated with the Steelpoort River and associated riparian zones) and residual areas of relatively untransformed woodland. The study area has been assigned an overall medium level of avifaunal sensitivity.

The study area supports a relatively diverse assemblage of avifaunal species, with the natural diversity of species in woodland habitat being enhanced by the presence of freshwater habitat. A number of species of conservation concern (SCC) have been recorded, or could potentially occur within the study area. A list of priority species has been identified for the study area – i.e. SCC which are sensitive and thus most at risk of impacts emanating from the proposed development.

All potential issues and impacts associated with the proposed development have been identified. The impact assessment matrix as provided by the EAP has been used to assess the potential impacts of the proposed development on avifauna, with impacts of moderate to low significance being identified. A set of mitigation and control measures to reduce the intensity of identified impacts have been identified and must be adhered to by the applicant. Should these mitigation measures be implemented it is the professional opinion of the ecologist that the development would be acceptable in an avifaunal context and can be granted environmental authorisation.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

DOCUMENT GUIDE

The table below provides a guide to the reporting of biodiversity impacts as they relate to 1) Government Notice No. 1150 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on **Animal Species Theme** as published in Government Gazette 43855 dated 30 October 2020 (as amended in Government Notice 3717 of 2023).

Theme-Specific Requirements as per Government Notice No. 1150 Animal Biodiversity Theme – Medium Sensitivity Rating as per Screening Tool Output		
No.	**SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS**	**Section in report/Notes**
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.	Avifaunal 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 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.	Section 4.3
1.3	The Terrestrial Animal Species Specialist Assessment and the Terrestrial Animal Species Compliance Statement must be undertaken within the study area.	Avifaunal Assessment
1.4	Where the nature of the activity is expected to have an impact on species of conservation concern beyond boundary of the preferred site, the project areas of influence must be determined by the specialist in accordance with Species Environmental Assessment Guideline, and the study area must include the project areas of influence, as determined.	Avifaunal Assessment
2	**Animal Species Specialist Assessment**	
2.1	The assessment must be prepared 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.	Cover Page Appendix E
2.2	**The assessment must be undertaken in accordance with the Species Environmental Assessment Guideline[1] and must:**	
2.2.1	Identify the Species of Conservation Concern which were found, observed or are likely to occur within the study area;	Section 3,4
2.2.2	Provide evidence (photographs or sound recordings) 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);	Section 4
2.2.3	Identify the distribution, location, viability[2] and detailed description of population size of the Species of Conservation Concern identified within the study area;	Section 4
2.2.4	Identify the nature and the extent of the potential impact of the proposed development on the population of the Species of Conservation Concern located within the study area;	Section 5.5
2.2.5	Determine the importance of the conservation of the population of the Species of Conservation Concern 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;	Section 4
2.2.6	Determine the potential impact of the proposed development on the habitat of the Species of Conservation Concern located within the study area;	Section 5.5
2.2.7	Include a review of relevant literature on the population size of the Species of Conservation Concern, the conservation interventions as well as any national or provincial species management plans for the Species of Conservation Concern. This review must provide information on the need to conserve the Species of Conservation Concern and indicate whether the development is compliant with the applicable species management plans and if not, a motivation for the deviation;	Section 3
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 Species of Conservation Concern, for example, fires in fire-prone systems;	Section 3,4,5
2.2.9	Identify any potential impact on ecological connectivity within the broader landscape, and resulting impacts on the identified Species of Conservation Concern and its long-term viability;	Section 5.2
2.2.10	Determine buffer distances as per the Species Environmental Assessment Guidelines used for the population of each Species of Conservation Concern	**Not Applicable to this report**

[1] Available at https://bgis.sanbi.org/
[2] the ability to survive and reproduce in the long term

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.	Section 4
2.2.12	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	Section 4.3
2.3	The findings of the assessment must be written up in a Terrestrial Animal Species Specialist Assessment Report.	Avifaunal assessment
3.	**Animal Species Specialist Assessment Report. This report must include as a minimum the following information:**	
3.1.1	Contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the assessment including a curriculum vitae;	Cover page Appendix E
3.1.2	A signed statement of independence by the specialist;	Appendix E
3.1.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Section 2
3.1.4	A description of the methodology used to undertake the site sensitivity verification and impact assessment and site inspection, including equipment and modelling used where relevant;	Section 2,4.3
3.1.5	A description of the mean density of observations/number of sample sites per unit area and the site inspection observations;	**Not applicable to this report.**
3.1.6	A description of the assumptions made and any uncertainties or gaps in knowledge or data	Section 1.2
3.1.7	Details of all Species of Conservation Concern found or suspected to occur on site, ensuring sensitive species are appropriately reported;	Section 3,4
3.1.8	The online database name, hyperlink and record accession numbers for disseminated evidence of Species of Conservation Concern found within the study area	**Not Applicable to this report**
3.1.9	The location of areas not suitable for development and to be avoided during construction where relevant;	Section 4.3, 5
3.1.10	A discussion on the cumulative impacts;	Section 5.9
3.1.11	Impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr)	Section 5.7
3.1.12	A reasoned opinion, based on the findings of the specialist assessment, regarding the acceptability or not, of the development related to the specific theme considered, and if the development should receive approval or not, related to the specific theme being considered, and any conditions to which the opinion is subjected if relevant.	Executive Summary, Section 6
3.1.13	A motivation must be provided if there were any development footprints identified as per paragraph 2.3.12 above that were identified as having "low" or "medium" terrestrial animal species sensitivity and were not considered appropriate.	Section 4.3
3.2	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	Avifaunal Assessment
4	**Medium Sensitivity Species of Conservation Concern Confirmation**	
4.1	Medium sensitivity data represents suspected habitat for SCC based on occurrence records for these species collected prior to 2002 or is based on habitat suitability modelling.	Avifaunal Assessment
4.2	The presence or likely presence of the Species of Conservation Concern identified by the screening tool, must be confirmed through a site inspection by a specialist registered with the South African Council for Natural Scientific Professions in a field of practice relevant to the taxonomic group ("taxa") for which the assessment is being undertaken.	Cover Page Section 4
4.3	The assessment must be undertaken within the study area.	Section 2.1
4.4	The site inspection to determine the presence or likely presence of Species of Conservation Concern must be undertaken in accordance with the Species Environmental Assessment Guideline.	Section 3,4
4.5	The site inspection is to confirm the presence, likely presence or confirmed absence of a Species of Conservation Concern within the site identified as "medium" sensitivity by the screening tool.	Section 4
4.6	Where Species of Conservation Concern are found on site or have been confirmed to be likely present, a Terrestrial Animal Species Specialist Assessment must be submitted in accordance with the requirements specified for "very high" and "high" sensitivity in this protocol.	Avifaunal Report
4.7	Similarly, where no Species of Conservation Concern are found on site during the investigation or if the presence is confirmed to be unlikely, a Terrestrial Animal Species Compliance Statement must be submitted.	N/A

GLOSSARY OF TERMS

Most definitions are based on terms and concepts elaborated by Richardson *et al*. (2011), Hui and Richardson (2017) and Wilson *et al*. (2017), with consideration to their applicability in the South African context, especially South African legislation [notably the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), and the associated Alien and Invasive Plant (AIP) Species Regulations, 2020].

Accipiter	Family of raptors, including goshawks and sparrowhawks.
Alien species (syn. exotic species; non-native species)	A species that is present in a region outside its natural range due to human actions (intentional or accidental) that have enabled it to overcome biogeographic barriers.
Avifauna	The birds of a particular region, habitat, or geological period.
Baseline (IEM Series)	Conditions that currently exist. Also called "existing conditions".
Biological diversity or Biodiversity (as per the definition in NEMBA)	The variability among living organisms from all sources including, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part and includes diversity within species, between species, and of ecosystems.
Biodiversity priority areas	Features in the landscape or seascape that are important for conserving a representative sample of ecosystems and species, for maintaining ecological processes, or for the provision of ecosystem services. They include the following categories, most of which are identified based on systematic biodiversity planning principles and methods: Protected Areas, Critically Endangered and Endangered ecosystems, Critical Biodiversity Areas and Ecological Support Areas, Freshwater Ecosystem Priority Areas, high water yield areas, flagship free-flowing rivers, priority estuaries, Priority Areas for land-based protected area expansion, and Study Areas for offshore protection. Marine ecosystem priority areas and coastal ecosystem priority areas have yet to be identified but will be included in future. The different categories *are not mutually exclusive* and, in some cases, overlap, often because a particular area or site is important for more than one reason. They should be *complementary*, with overlaps *reinforcing the importance* of an area.
Biome - as per Mucina and Rutherford (2006)	A broad ecological spatial unit representing major life zones of large natural areas – defined mainly by vegetation structure, climate, and major large-scale disturbance factors (such as fires).
Bioregion (as per the definition in NEMBA)	A geographic region which has in terms of section 40(1) been determined as a bioregion for the purposes of this Act.
Corridor	A dispersal route or a physical connection of suitable habitats linking previously unconnected regions.
Critical Biodiversity Area (CBA)	A CBA is an area considered important for the survival of threatened species and includes valuable ecosystems such as wetlands, untransformed vegetation, and ridges.
Critically Endangered (CR) (IUCN[3] Red List category)	**Applied to both species/taxa and ecosystems**: A species is CR when the best available evidence indicates that it meets at least one of the five IUCN criteria for CR, indicating that the species is facing an extremely high risk of extinction. CR ecosystem types are at an extremely high risk of collapse. Most of the ecosystem type has been severely or moderately modified from its natural state. The ecosystem type is likely to have lost much of its natural structure and functioning, and species associated with the ecosystem may have been lost. CR species are those considered to be at extremely high risk of extinction.

[3] International Union for Conservation of Nature (IUCN)

Development footprint (as per the NEMA definition)	"In respect of land, means any evidence of its physical transformation as a result of the undertaking of any activity".
Degradation	The many human-caused processes that drive the decline or loss in biodiversity, ecosystem functions or ecosystem services in any terrestrial and associated aquatic ecosystems.
Disturbance	A temporal change, either regular or irregular (uncertain), in the environmental conditions that can trigger population fluctuations and secondary succession. Disturbance is an important driver of biological invasions.
Driver (ecological)	A driver is any natural or human-induced factor that directly or indirectly causes a change in ecosystem. A direct driver clearly influences ecosystem processes, where indirect driver influences ecosystem processes through altering one or more direct drivers.
Ecological Condition	"Ecological condition" means the extent to which the composition, structure and function of an area or biodiversity feature has been modified from a reference condition of "natural". Various terminology can be used for precision of language: ➢ Fair ecological condition: Areas that are moderately modified, semi-natural. An ecological condition class in which ecological function is maintained even though composition and structure have been compromised. Can apply to a site or an ecosystem. ➢ Good ecological condition: Areas that are natural or near-natural. An ecological condition class in which composition, structure and function are still intact or largely intact. Can apply to a site or an ecosystem. ➢ Poor ecological condition: Areas that are severely or irreversibly modified. An ecological condition class in which ecological function has been compromised in addition to structure and composition. Can apply to a site or an ecosystem.
Ecological processes	The functions and processes that operate to maintain and generate biodiversity. In order to include ecological processes in a biodiversity plan, their spatial components need to be identified and mapped.
Ecological Support Area (ESA)	An ESA provides connectivity and important ecological processes between CBAs and is therefore important in terms of habitat conservation.
Ecoregion	An ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region."
Endangered (EN) (IUCN Red List category)	**Applied to both species/taxa and ecosystems**: A species is EN when the best available evidence indicates that it meets at least one of the five IUCN criteria for EN, indicating that the species is facing a very high risk of extinction. EN ecosystem types are at a very high risk of collapse. EN species are those considered to be at very high risk of extinction.
Endemic species	Species that are only found within a pre-defined area. There can therefore be sub-continental (e.g., southern Africa), national (South Africa), provincial, regional, or even within a particular mountain range.
Fatal flaw (IEM Series)	Any problem, issue or conflict (real or perceived) that could result in proposals being rejected or stopped.
Faunal Class	In biological classification, class (Latin: classis) is a taxonomic rank, as well as a taxonomic unit. Class specifically refers to major groups, namely: mammals, avifauna (birds), reptiles and invertebrates.
Frugivore	A bird that primarily feeds on fruit.
Granivore	A bird species that predominantly feeds on grains and seeds.
Ground-truth	Ground truth is a term used in various fields to refer to information provided by direct observation (i.e., empirical evidence) as opposed to information provided by inference.
Habitat (As per the definition in NEMBA)	A place where a species or ecological community naturally occurs.

Habitat loss	Conversion of natural habitat in an ecosystem to a land use or land cover class that results in irreversible change in the composition, structure and functional characteristics of the ecosystem concerned.
Impact **(IEM Series, draft Offset policy, and NEMA)**	The positive or negative effects on human well-being and/or on the environment. Impact-related terminology: ➢ Cumulative impact: Past, current and reasonably foreseeable future impacts of an activity, considered together with the impact of the proposed activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities. ➢ Impact Significant/significance: Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e., intensity, duration, and likelihood). Impact significance is the value placed on the change by different affected parties (i.e., level of significance and acceptability). It is an anthropocentric concept, which makes use of value judgements and science-based criteria (i.e., biophysical, social and economic). Such judgement reflects the political reality of impact assessment in which significance is translated into public acceptability of impacts. ➢ Residual negative impacts: Negative impacts that remain after the proponent has made all reasonable and practicable changes to the location, siting, scale, layout, technology and design of the proposed development, in consultation with the environmental assessment practitioner and specialists (including a biodiversity specialist), in order to avoid and minimise negative impacts, and/or rehabilitate and/or restore impacted areas within 30 years (*It is acknowledged that the time it takes for full restoration differs from ecosystem type to ecosystem type, as well as the local conditions. Given that there is no readily accessible information on the recovery times of the different ecosystem types in South Africa, a general timeframe had to be used. The 30-year general timeframe in the definition of "residual impact" reflects that the difficulty in restoring South African ecosystems once they have been disturbed. It is based on the risk-averse and cautious approach*). ➢ Significant impact: An impact that may have a notable effect on one or more aspects of the environment or may result in non-compliance with accepted environmental quality standards, thresholds, or targets.
Important Bird and Biodiversity Area (IBA)	The IBA Programme identifies and works to conserve a network of sites critical for the long-term survival of bird species that: are globally threatened, have a restricted range, are restricted to specific biomes/vegetation types or sites that have significant populations.
Indigenous vegetation **(As per the definition in NEMA)**	Vegetation occurring naturally within a defined area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.
Integrity (ecological)	The integrity of an ecosystem refers to its functional completeness, including its components (species) its patterns (distribution) and its processes.
Intra African	A migrant that visits southern Africa from other parts of Africa.
Invasive species	Alien species that sustain self-replacing populations over several life cycles, produce reproductive offspring, often in very large numbers at considerable distances from the parent and/or site of introduction, and have the potential to spread over long distances.
Listed invasive species	All alien species that are regulated in South Africa under the NEMBA, Alien and Invasive Species Regulations, 2020.

Least Threatened	Least threatened ecosystems are still largely intact.
Microphyllous	Referring to plants and trees with small leaves, as opposed to broad-leafed plants. A microphyll is termed as a leaf 25-75mm long.
Migrant	In a southern African avifaunal context, birds that typically visit the subcontinent, usually in the summer months, spending the southern hemisphere winter in other parts of Africa (Intra-African migrant) or the Palaearctic.
Native species (syn. indigenous species)	Species that are found within their natural range where they have evolved without human intervention (intentional or accidental). Also includes species that have expanded their range as a result of human modification of the environment that does not directly impact dispersal (e.g., species are still native if they increase their range as a result of watered gardens but are alien if they increase their range as a result of spread along human-created corridors linking previously separate biogeographic regions).
Near Threatened (according to IUCN)	Close to being at high risk of extinction in the near future.
Niche (ecological)	The role and position a species have in its environment; how it meets its needs for food and shelter, how it survives, and how it reproduces. A species' niche includes all of its interactions with the biotic and abiotic factors of its environment.
Palaearctic	Zoogeographical region that incorporates Europe, northern Asia and northern Africa.
Passerine	Largest order of birds, which are characterised by feet adapted for perching (three toes forward-facing and 1 backward facing)
Protected	Species of high conservation value or national importance that require protection, according to TOPS 2007 and NEMBA.
Raptor	A bird of prey, e.g., eagles, buzzards, falcons, etc.
Red Data Listed (RDL) species	According to the Red List of South African plants (http://redlist.sanbi.org/) and the International Union for Conservation of Nature (IUCN), organisms that fall into the Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
Refugia (ecological)	Refugium (plural: refugia) is a location which supports an isolated or relict population of a once more widespread species. This isolation can be caused by climatic changes, geography, or human activities such as deforestation and overhunting.
Resource (ecological)	A resource is a substance or object in the environment required by an organism for normal growth, maintenance, and reproduction. Resources can be consumed by one organism and, as a result, become unavailable to another organism.
Riparian Zone	The physical structure and associated vegetation of the areas associated with a fluvial freshwater ecosystem which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.
Species of Conservation Concern (SCC)	The term SCC in the context of this report refers to all RDL and IUCN listed threatened species as well as provincially and nationally protected species of relevance to the project.
Threatened ecosystem	An ecosystem that has been classified as CR, EN or VU, based on an analysis of ecosystem threat status. A threatened ecosystem has lost or is losing vital aspects of its structure, function, or composition. The NEMBA allows the Minister of Environmental Affairs or a provincial MEC for Environmental Affairs to publish a list of threatened ecosystems. To date, threatened ecosystems have been listed only in the terrestrial environment. In cases where no list has yet been published by the Minister, such as for all aquatic ecosystems, the ecosystem threat status assessment in the National Biodiversity Assessment (NBA) can be used as an interim list in planning and decision making.

Threatened species	A species that has been classified as CR, EN or VU, based on a conservation assessment (Red List), using a standard set of criteria developed by the IUCN for determining the likelihood of a species becoming extinct. A threatened species faces a high risk of extinction in the near future.
Understorey	The part of the forest / woodland which grows at the lowest height level below the canopy.
Vulnerable (VU) (Red List category)	**Applied to both species/taxa and ecosystems**: A species is VU when the best available evidence indicates that it meets at least one of the five IUCN criteria for VU, indicating that the species is facing a high risk of extinction. An ecosystem type is VU when the best available evidence indicates that it meets any of the criteria A to E for VU and is then considered to be at a high risk of collapse.

LIST OF ACRONYMS

BARESG	Birds and Renewable Energy Specialist Group BARESG
BGIS	Biodiversity Geographic Information Systems
CAR	Coordinated Avifaunal Roadcounts Project
CBA	Critical Biodiversity Area
CR	Critically Endangered
CWAC	Coordinated Waterbird Counts Project
DFFE	Department of Forestry, Fisheries and the Environment
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
E-GIS	Environmental Geographical Information Systems
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EN	Endangered
ESA	Ecological Support Area
EW	Extinct in the Wild
EWT	Endangered Wildlife Trust
GIS	Geographic Information Systems
GN	Government Notice
Ha	Hectares
IBA	Important Bird and Biodiversity Area
IEM	Integrated Environmental Management
IUCN	International Union for Conservation of Nature
kV	Kilovolt
LC	Least Concern
MAP	Mean annual precipitation
MAPE	Mean Annual Potential Evaporation
masl	Meters Above Mean Sea Level
MASMS	Mean Annual Soil Moisture Stress
MAT	Mean Annual Temperature
MFD	Mean Frost Days
MW	Megawatt
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act, 1998 [Act No. 107 of 1998]
NEMBA	National Environmental Management: Biodiversity Act, 2004 [Act No. 10 of 2004]
NPAES	National Protected Area Expansion Strategy
PP	Poorly Protected
PV	Photovoltaic
QDS	Quarter Degree Squares
RDL	Red Data listed
SABAP 2	South African Bird Atlas Project 2
SACAD	South African Conservation Areas Database
SACNASP	South African Council for Natural Scientific Professions
SANBI	South African National Biodiversity Institute
SAPAD	South African Protected Areas Database
SCC	Species of Conservation Concern
STS	Scientific Terrestrial Services
TOPS	Threatened or Protected Species
VEGMAP	Vegetation Map Project
VU	Vulnerable

1 INTRODUCTION

Scientific Terrestrial Services (STS) (Pty) Ltd was appointed to conduct an EIA phase avifaunal assessment as part of the Environmental Impact Assessment (EIA) process for the proposed 40MW Solar PV Plant (Samancor Tubatse Phase 2 Solar Development) on the Farm Goudmyn 337 KT near Steelpoort in the Limpopo Province. The area of assessment consists of five (5) separate development sites for the Phase 2 solar project (i.e. Site 2B (the Site 2 extension), Sites 3B, 3C, 4C and 5B), collectively known as the 'study area'. The study area is located within the Greater Tubatse Local Municipality located within the Sekhukhune District Municipality within the Limpopo Province. See Figures 1 & 2 for an indication of the extent and location of the study area in relation to surrounding areas.

This report, after consideration of the description of the ecological integrity of the study area from an avifaunal perspective must guide the Environmental Assessment Practitioner (EAP), the regulatory authorities and the applicant, by means of the presentation of results and recommendations as to the viability of the proposed development activities from an avifaunal perspective.

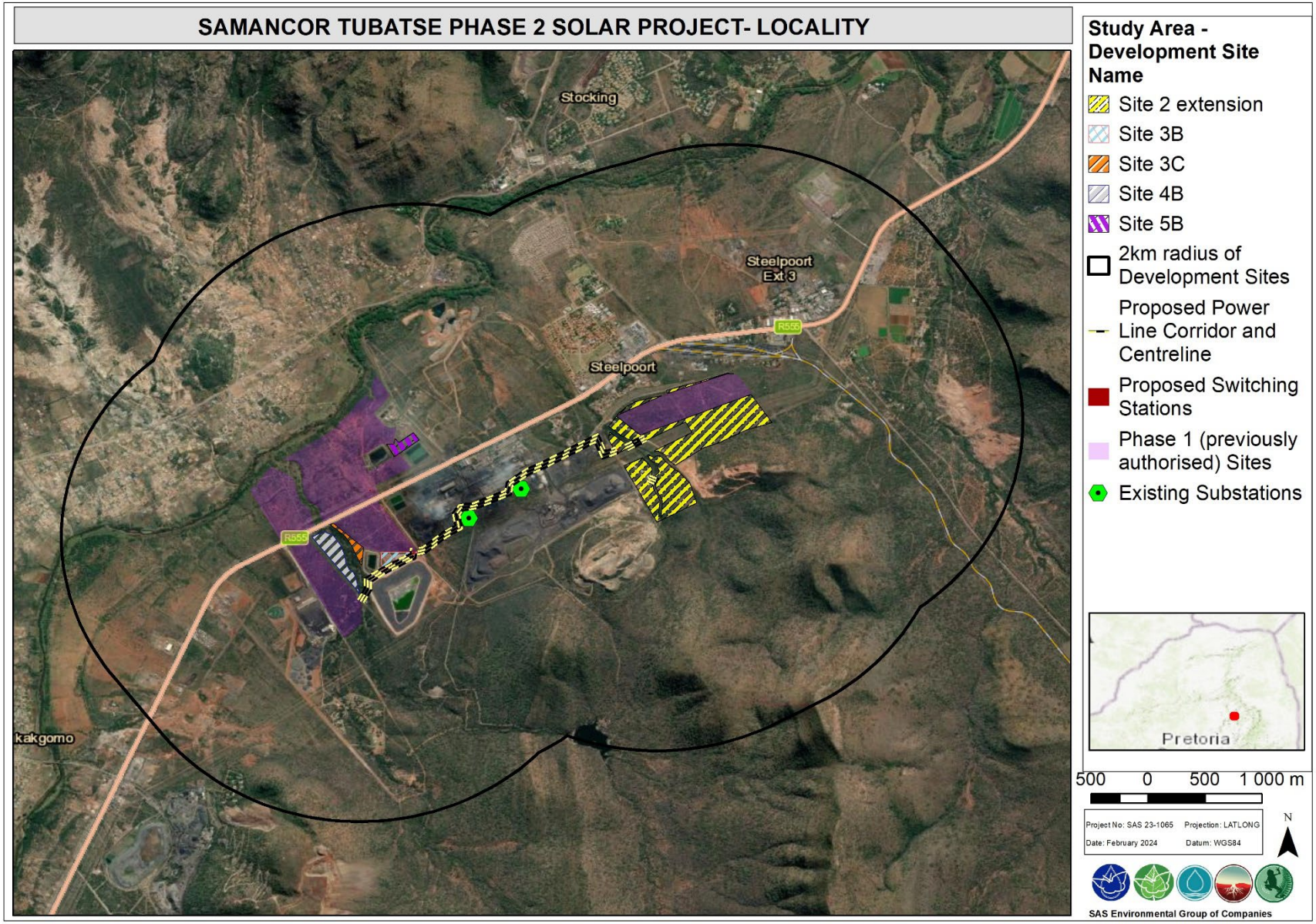


Figure 1: Digital satellite image depicting the study area in relation to surrounding area.

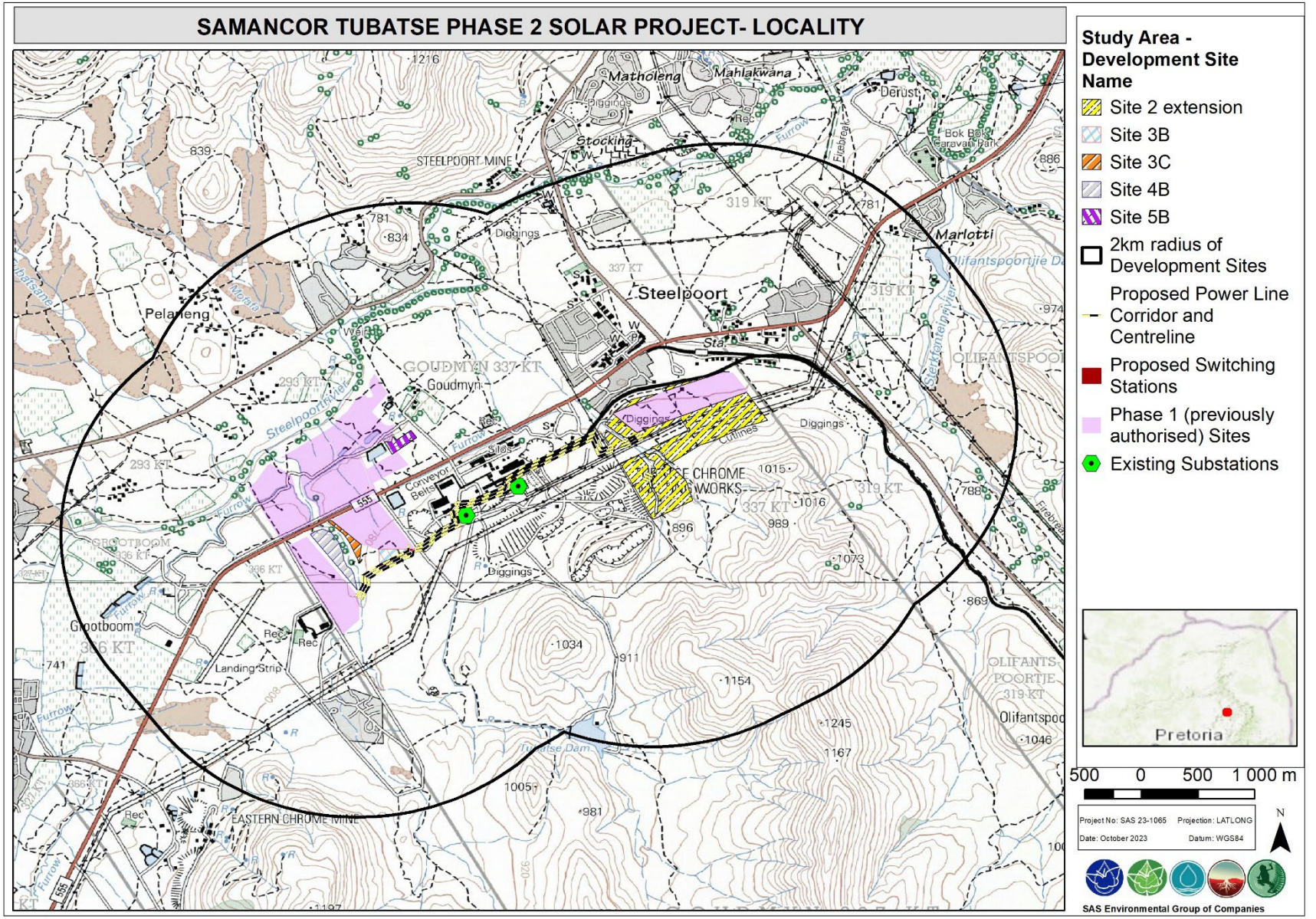


Figure 2: The study area depicted on a 1:50 000 topographical map in relation to the surrounding area.

1.1 Project Scope

Specific outcomes in terms of this report are outlined below:

- To incorporate and consider all relevant information as presented by South African National Biodiversity Institute's (SANBI's) Biodiversity Geographic Information Systems (BGIS) website (http://bgis.sanbi.org), including the National Threatened Ecosystem Database (2011), and data from the Environmental Geographical Information Systems (E-GIS) databases (https://egis.environment.gov.za/) into the assessment. Sources such as the National Environmental Management: Biodiversity Act (Act No.10 of 2004) (NEMBA) Threatened or Protected Species (TOPS) list (NEMBA, Notice 389 of 2013), The International Union for Conservation of Nature (IUCN) Red List of Threatened Species; and The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland, to gain background information on the physical habitat and potential and avifaunal ecology associated with the study area;
- To identify and consider all sensitive landscapes and possible habitat for such species;
- To assign avifaunal sensitivity associated with different habitat units in the study area and surrounds; and
- To assess all identified impacts in detail and to identify a requisite set of mitigation measures.

1.2 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- No site assessments were undertaken as part of the Phase 2 Solar development avifaunal assessment. The Phase 1 development sites are located in close proximity to the Phase 2 study area and both projects occur in the same overall area (refer to Figures 1 and 2). The assessments conducted to date for the (Phase 1) Tubatse Solar Development (a late summer site assessment in the Scoping phase and two spring assessments in the EIR phase), as well as two summer assessments in the area associated with the monitoring of Wahlberg's Eagle (*Hieraaetus wahlbergi*) nesting activity are considered sufficient to gain a thorough understanding of the avifaunal diversity and sensitivity of the wider area that includes the Phase 2 development areas;
- The layout provided by the applicant indicates that new power line alignments would be developed. Following guidance from the EAP, the proposed power line alignments have been assessed as part of the scope of the Phase 2 project, with the exception of a certain alignment located to the north of the R555 road in the vicinity of the Phase

Site 5 development area, which is considered a Phase 1 power line. The layout and technical project description indicates that proposed electrical crossings of certain of the drainage lines could be via overhead lines or via underground cabling, however at the guidance of the EAP it has been assumed that all electrical crossings of the drainage lines will be via overhead lines and that no cabling will be installed through / across the drainage lines;

- The layout provided by the proponent shows a few arrays were designed out of the designated footprint. In consultation with the EAP and the Client, the arrays that were out of the assessed footprint were removed;
- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most avifaunal communities have been accurately assessed and considered; and
- This avifaunal assessment has complied with the BirdLife South Africa Birds and Solar Energy Guidelines as far as possible (refer to Section 2.5).

1.3 Indemnity and Terms of use of this Report

The findings, results, conclusions, and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and STS and its staff reserve the right to, at their sole discretion, modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

Although STS (Pty) Ltd exercises due care and diligence in rendering services and preparing documents, STS (Pty) Ltd accepts no liability and the client, by receiving this document, indemnifies STS (Pty) Ltd and its directors, managers, agents and employees against all actions, claims, demands, losses, liabilities, costs, damages, and expenses arising from, or in connection with, services rendered, directly or indirectly by STS (Pty) Ltd and by the use of the information contained in this document.

This report must not be altered or added to or used for any other purpose other than that for which it was produced without the prior written consent of the author(s). This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

1.4 Project Technical Description

The rising electricity tariffs in South Africa, combined with the increasingly severe load shedding patterns experienced across the country, has a negative impact on the production and revenue of Samancor Chrome business. Climate change is also a concern for Samancor Chrome referring to the emissions of greenhouse gases (GHG) in the use of fossil fuel electricity. This has motivated Samancor Chrome to consider renewable energy generation at their smelter plants. Implementing solar PV generation will result in improved availability of supply and reduced utility bills as well as going 'green' in terms of environmental considerations.

In 2021, a Special Purpose Vehicle (SPV), TFC Solar (Pty) Ltd, proposed the development of a Solar PV facility of up to 100-Megawatt (MW) generation capacity over five (5) sites: 1, 2, 3, 4 and 5. These five (5) sites were subject to an EIA and an Environmental Authorisation was granted on 25 April 2022 from the Department of Forestry, Fisheries and the Environment (DFFE) (DFFE Ref: 14/12/16/3/3/2/2079). A General Authorisation was received from the Department of Water and Sanitation on 28 March 2022. Site 1 is no longer considered for the Solar PV development.

A total of 60MW output can be achieved from the previously authorised Sites 2 – 5. Additionally, TFC Solar (Pty) Ltd, propose the development of a 40MW Solar PV facility to be developed on Site 2B, 3B, 3C, 4B and 5B – refer to Figure 1. All previously authorised Sites 2, 3, 4 and 5 as well as new Sites 2B, 3B, 3C, 4B and 5B would achieve a total of 100MW.

The PV plant will consist of the following infrastructure presented below. Note that the below may be revised at a later stage when the engineering design process continues, and there will be sharing of infrastructure with the first phase i.e. previously authorised Sites 2, 3,4 and 5.

- Solar PV panels that will be able to deliver the required 40MW output to the Samancor grid;
- Inverters that convert direct current (DC) generated by the PV modules into alternating current (AC) to be exported to the Samancor electrical grid;
- Transformer/ s that raises the system AC low voltage to medium voltage. The transformer converts the voltage of the electricity generated by the PV panels to the correct voltage for delivery to the TFC Plant;
- Transformer substation; and
- Instrumentation and Control consisting of hardware and software for remote plant monitoring and operation of the facility.

Associated infrastructure includes:

- Mounting structures for the solar panels in a fixed tilt of rotating tracking configuration;
- Cabling between the structures, to be lain underground where practical;
- New 33kV overhead powerlines between the various sites and the Tubatse East and -West substation buildings;
- Local substation and transformer yard at each PV site;
- Containerized switchgear substation at Tubatse East and -West MV substations for connecting to the Tubatse substation busbars;
- Water provision infrastructure (i.e. pipeline/ s, storage tank/ s, etc.) for PV panel cleaning;
- Battery Energy Storage System (BESS); and
- Internal access roads (typically 6m) roads will be constructed, but existing roads will be used as far as possible), fencing (approximately 3m in height), gates and access control.

2 ASSESSMENT APPROACH

The methodology for conducting the study is detailed below.

2.1 Defining the Area of Assessment / Investigation

As the first step of the assessment, the area of assessment / investigation was defined. Five development sites located in the vicinity of the Tubatse Ferrochrome plant and in the vicinity of the (Phase 1) Tubatse Solar development sites have been presented by the applicant for assessment (Figures 1 and 2). However due to the mobility of bird species, the area of assessment needs to be conducted for a wider area, and a 2km buffer from the immediate study area has been generated (Figure 1 and 2). The bird habitat assessment and sensitivity assessment has been completed for this larger area. It should be noted however that the assessment of the occurrence of birds has been based on an even larger area that encompasses all of the pentads surrounding the two pentads into which the study area and its immediate surrounds falls- refer to Section 3 and Figure 12.

2.2 Identification of Avifaunal Assemblage in the Study Area

The next stage of the study was the compilation of a list of bird species for the study area. The bird species list was based primarily on the data collected as part of the Southern African Bird Atlas (SABAP 2) (refer to Section 3) but was also based on the observations of the author during the (Phase 1) Tubatse Solar and Wahlberg's Eagle nesting site assessments. Due to the mobility of birds and due to the relatively low number of full protocol field lists collected for the study area pentads, SABAP 2 data from a wider area encompassing all pentads adjoining the two study area pentads (representing a radius of approximately 11-15km), was also utilised, with a habitat filter applied (i.e. bird species recorded for the surrounding pentads which are restricted to specific habitat types -e.g. higher altitude grassland – not found within the study area were excluded from the study area species list) to the potential occurrence of species as recorded in a wider radius.

It should be noted that no data was relevant to the development location from either the Coordinated Avifaunal Roadcounts (CAR) Project[4] or the Coordinated Waterbird Counts (CWAC) Project (no registered CWAC sites are located close to the study area).

[4] The closest CAR routes to the study area are located 45km to the south in the area between Dullstroom and Mashishing (Lydenburg), an area of very different altitude, habitat composition and resultant bird species composition to the study area.

As part of the assessment of avifaunal species occurrence, species of conservation concern (SCC) (i.e. threatened (Red Data)) and endemic species confirmed to occur and potentially occurring in the study area) were flagged.

Based on the study area bird species list, and the habitat-based sensitivity assessment, a list of 'priority' bird species, for further assessment in the EIA phase, has been compiled.

2.3 Assessment of Sensitivity

In order to identify the sensitivity of the study area from an avifaunal perspective, a number of spatial data sources and tools were utilised. The following spatial databases were interrogated:

- Important Bird Areas (IBAs);
- Limpopo Province Conservation Plan V2 (2018); and
- The Department of Forestry, Fisheries and the Environment (DFFE), Web-based Environmental Screening Tool.

The last component of the assessment of avifaunal sensitivity on the site was the mapping of habitat units in the study area and surrounds, and the assigning of avifaunal sensitivity classes to these habitat types, with the outcome presented in a study area avifaunal sensitivity map. The habitat unit-based assessment of sensitivity was used as part of the basis on which to confirm or dispute the avian and animal species theme sensitivities as assigned by the DFFE web-based environmental screening tool.

2.4 Assessment of Impacts

All potential issues relating to the proposed development of the solar power facility and impacts on avifauna have been assessed through the application of the impact assessment methodology provided by the EAP. Such identification has taken into consideration the location of the study area in relation to sensitive habitats / locations within the wider area and has considered the impacts on avifauna that are associated with solar power plants (PV arrays).

2.5 Conformance to the BirdLife South Africa Birds and Solar Energy - Best Practice Guideline

The solar energy industry as a renewable power generation source is expanding rapidly in southern Africa, however experiences in other parts of the world suggest that, like many other energy sources, solar power may affect birds in different ways, through the alteration of habitat, the displacement of populations from preferred habitat, collision and burn mortality associated with elements of the solar hardware and ancillary infrastructure. It is important to note, however that the nature and implications of these effects are poorly understood.

In order to fully understand and successfully avoid and minimise the possible negative impacts of solar energy on the region's birds, it is essential that sufficient, project- and site-specific data are gathered to both inform the avifaunal impact assessment process and build the scientific birding community's understanding of the impacts and potential mitigation measures (Jenkins *et al*, 2017).

Accordingly, the Birds and Renewable Energy Specialist Group (BARESG), convened by BirdLife South Africa and the Endangered Wildlife Trust (EWT) has developed a set of guidelines and monitoring protocols for evaluating utility-scale solar energy development proposals. The guidelines are aimed at environmental assessment practitioners, avifaunal specialists, developers and regulators and propose a tiered assessment process, including a number of different tiers of assessment and monitoring (Jenkins *et al*, 2017):

- Preliminary avifaunal assessment;
- Data collection;
- Impact Assessment; and
- Monitoring.

The guidelines detail the recommended means and standards required to achieve the following aims:

- To inform the current environmental impact assessment processes;
- To develop the collective understanding of the effects of solar energy plants on southern African birds; and
- To identify the most effective means to mitigate these impacts.

A gradient of survey and monitoring requirements for avifaunal studies is recommended by the guidelines based on the proposed technology, size of footprint, the amount of available data, and the estimated sensitivity of the receiving environment (refer to Figure 3). The

assessment and monitoring regime adopted is dependent on the level of sensitivity of the study area, as determined through the preliminary avifaunal assessment.

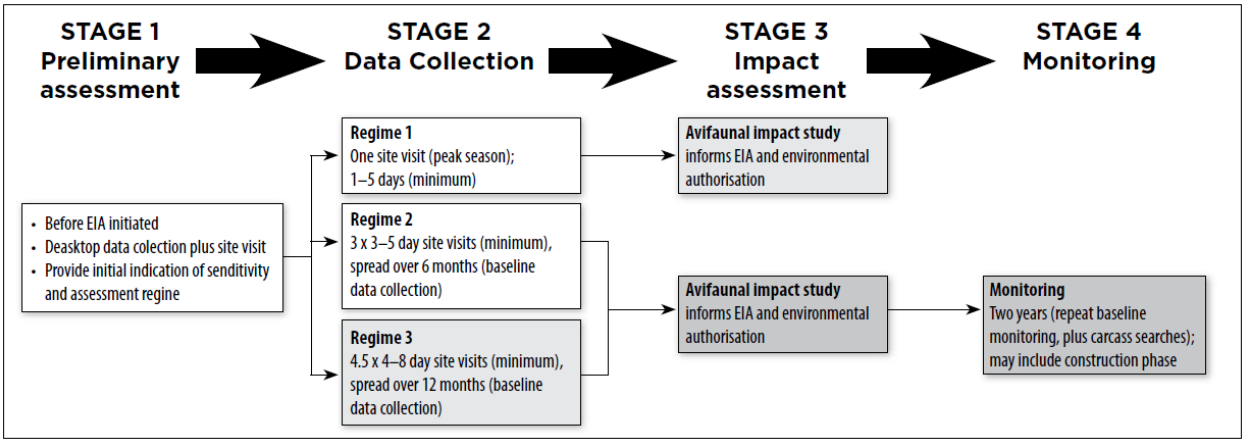


Figure 3: Recommended multi-tier process for assessing the potential and realised impacts of proposed solar energy developments in South Africa (Jenkins *et al*, 2017).

In the determination of what type of avifaunal assessment regime should be utilised for the proposed development, the size of the site and the avifaunal sensitivity of the study areas needs to be considered, as stipulated by the BLSA guidelines. The guidelines stipulate that solar development sites between 30ha and 150ha are of medium size – the size of the combined development site areas is approximately 59ha and thus of medium size. For such medium sites where non-CSP-type solar developments are proposed a Regime 2-level assessment is recommended to be applied unless the site has been assessed to be of low avifaunal sensitivity. The study area was assessed to be most closely associated with the definition of medium sensitivity in the BLSA Solar Guidelines and accordingly a Regime 2 approach was undertaken. Under the Regime 2 assessment approach, at least two site visits of 2-3 day duration must be undertaken. For the (Phase 1) Tubatse Solar avifaunal assessment, two site brief site visits were conducted in the scoping phase of the project and two site assessments were undertaken in the EIA phase. In addition two further site assessments conducted as part of the Wahlberg's Eagle nesting activities on part of the Phase 1 study area. Certain of these were conducted in the early and late summer, and accordingly the stipulation of the guidelines that one of the assessments conducted in the peak season of avifaunal occurrence in the study area was accordingly met.

3 RESULTS OF THE DESKTOP ANALYSIS

3.1 Conservation Characteristics of the Study area

The following table contains data accessed as part of the desktop assessment. It is important to note, that although all data sources used provide useful and often verifiable high-quality data, the various databases do not always provide an entirely accurate indication of the study area's actual biodiversity characteristics.

Table 1: Summary of the conservation characteristics for the study area (Quarter Degree Square (QDS) 2430CA).

DETAILS OF THE STUDY AREA IN TERMS OF THE 2018 FINAL VEGETATION MAP OF SOUTH AFRICA, LESOTHO, AND SWAZILAND										
BIOME	The study area is situated within the **Savanna Biome**									
BIOREGION	The study area is located within the **Central Bushveld Bioregion**									
VEGETATION TYPE	**Sekhukhune Plains Bushveld** (SVcb 27); **Sekhukhune Mountain Bushveld** (SVcb28) – small part of the study area in the southern parts of the Site 2B.									
DESCRIPTION OF THE VEGETATION TYPES ASSOCIATED WITH THE STUDY AREA ACCORDING TO MUCINA & RUTHERFORD (2006)										
	Sekhukhune Plains Bushveld					**Sekhukhune Mountain Bushveld**				
ALTITUDE (m)	700–1 100					900–1 600 m				
CLIMATE	Summer rainfall with very dry winters.									
	MAP (mm)	**MAT (°C)**	**MFD (Days)**	**MAPE (mm)**	**MASMS (%)**	**MAP (mm)**	**MAT (°C)**	**MFD (days)**	**MAPE (mm)**	**MASMS (%)**
	518	19	4	2084	79	609	17.5	5	2043	77
DISTRIBUTION	Limpopo and Mpumalanga Provinces									
GEOLOGY & SOILS	Complex geology, with rocks mainly mafic and ultramafic intrusive rocks of the main to lower zones of the Rustenburg Layered Suite on the eastern lobe of the Bushveld Igneous Complex (Vaalian). The zones (subsuites) are dominated by concentric belts of norite, gabbro, anorthosite and pyroxenite, with localised protrusions of magnetite, chromatite, serpentinised harzburgite, olivine diorite, shale, dolomite, and quartzite. Most of the area consists of red apedal soils. Deep, loamy Valsrivier soils are characteristic of the plains and shallow Glenrosa soils are found on the low-lying, rocky hills. Patches of erodible black, melanic structured horizons are common around small mountains. Some Steendal soils are underlain by gypsum. Land types[5] mainly Ae, Ib, Ea and Ia.					Rocks mainly ultramafic intrusive of the lower, critical and main zones of the eastern Rustenburg Layered Suite of the Bushveld Igneous Complex (Vaalian). Three subsuites (zones), namely Croydon, Dwars River and Dsjate consist mainly of norite, pyroxenite, anorthosite and gabbro, and are characterised by localised intrusions of magnetite, diorite, dunite, bronzitite and harzburgite. Soils are predominantly shallow, rocky and clayey. Glenrosa and Mispah soil forms are common, with lime present in low-lying areas. Rocky areas without soil are common on steep slopes. The Dwars River Valley is characterised by prismacutanic horizons with melanic structured diagnostic horizons. Around Steelpoort red apedal, freely drained soils occur, and these deeper soils include Hutton, Bonheim and Steendal soil forms.					
CONSERVATION	**Vulnerable (VU).** Target 19%. Nearly 2% statutorily conserved in Potlake, Bewaarkloof and Wolkberg Caves Nature Reserves. Approximately 25% of this area has been transformed and is mainly under dry-land subsistence cultivation. A small area is under pressure from chrome and platinum mining activities and the associated urbanisation. Depending on commodities, this threat could increase in the future. There is a high level of degradation of much of the remaining vegetation by unsustainable harvesting and utilisation. Erosion widespread at usually high to very high levels with donga formation. Alien *Agave* species, *Caesalpinia decapetala*, *Lantana camara*, *Melia azedarach*, *Nicotiana glauca*, *Opuntia* species, *Verbesina encelioides* and *Xanthium strumarium* are widespread but scattered.					**Least threatened (LT)**. Target 24%. None conserved in statutory conservation areas.				

[5] Land types refer to a class of land with specified characteristics. In South Africa it has been used as a unit denoting land at 1:250 000 scale, over which there is a marked uniformity of climate, terrain form and soil pattern. Land type Ae refers to Red (yellow soils <10%) that are more eutrophic than dystrophic/mesotrophic, Land type Ib refers to soil that consists largely of rock (60-80%), usually with shallow and/or rocky soils on steep slopes, Land type Fb refers to Shallow, and/or rocky, often steep, moderately leached (some lime, mainly in valleys) soils, and Land type Ea refers to dark, blocky clay topsoil (often swelling clays) and/or red, structured clays (ARC: Land Type Survey Staff. 1972 – 2006).

VEGETATION & LANDSCAPE FEATURES	Mainly semi-arid plains and open valleys between chains of hills and small mountains running parallel to the escarpment. Predominantly short, open to closed thornveld with an abundance of *Aloe* species and other succulents. Heavily degraded in places and overexploited by man for cultivation, mining, and urbanisation. Both man-made and natural erosion dongas occur in areas containing clays rich in heavy metals. Encroachment by indigenous microphyllous[6] trees and invasion by alien species is common throughout the area.	Dry, open to closed microphyllous and broad-leaved savanna on hills and mountain slopes that form concentric belts parallel to the north-eastern escarpment. Open bushveld often associated with ultramafic soils on southern aspects. Bushveld on ultramafic soils contain a high diversity of edaphic specialists. Bushveld of mountain slopes generally taller than in the valleys, with a well-developed herb layer. Bushveld of valleys and dry northern aspects usually dense, like thicket, with an herb layer comprising many short-lived perennials. Dry habitats contain several species with xerophytic adaptations, such as succulence and underground storage organs. Both man-made and natural erosion dongas occur on foot slopes of clays rich in heavy metals.
CONSERVATION DETAILS PERTAINING TO THE AREA OF INTEREST (VARIOUS DATABASES)		
NATIONAL BIODIVERSITY ASSESSMENT (2018) (FIGURE 4)	As mentioned previously, two vegetation types are associated with the study area. Most of the study area are located within the remaining extent of the Sekhukhune Plains Bushveld, which is currently **endangered (EN)** and considered to be **poorly protected**. Small parts of the study area fall within the Sekhukhune Mountain Bushveld, which is currently LC and **Poorly Protected.** The NBA is the primary tool for monitoring and reporting on the state of biodiversity in South Africa. Two headline indicators that are applied to both ecosystems and species are used in the NBA: threat status and protection level: i. Ecosystem threat status tells us about the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function, and composition, on which their ability to provide ecosystem services ultimately depends. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or LC, based on the proportion of each ecosystem type that remains in good ecological condition relative to a series of thresholds. ii. Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Not Protected, Poorly Protected, Moderately Protected or Well Protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) (NEMPAA).	
RED LIST OF ECOSYSTEMS (2022) (FIGURE 5)	According to the 2022 Red List of Ecosystems, the study area is located within the remaining extent of a threatened ecosystem, namely the EN Sekhukhune Plains Bushveld ecosystem. This ecosystem is classified as a B1(i) ecosystem; B1(i) ecosystems have been classified as such because they have a restricted distribution and high rate of loss (in terms of habitat). The purpose of listing protected ecosystems is primarily to preserve witness sites of exceptionally high conservation value. The revised list (known as the Red List of Ecosystems 2022) 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 (Mucina and Rutherford 2006; with updates described in Dayaram et al., 2019). The revised list identifies 120 threatened terrestrial ecosystem types (55 CR, 51 EN and 14 VU types). Following a series of consultations with conservation authorities and the public in 2020/21 the Revised list of terrestrial ecosystems that are threatened and in need of protection was the approved by the Minister for implementation in August 2022. The revised list was published in the Government Gazette (Gazette Number 47526, Notice Number 2747) and came into effect on 18 November 2022.	

[6] Microphyllous - having very small leaves. From *micro* meaning small and *phyllous* referring to leaves.

IBA (2015) (FIGURE 6)	The Important Bird Areas Programme is one of BirdLife International's most important conservation initiatives that identifies and works to conserve a network of sites critical for the long-term survival of bird species that are threatened, have a restricted range, or which are habitat specific. Lastly IBAs have also been designated based on significant bird populations that inhabit a certain area. The purpose of the IBA Programme is to identify and protect a network of sites, at a biogeographical scale, critical for the long-term viability of naturally occurring bird populations. The IBA Programme helps BirdLife South Africa's partners prioritise conservation action amongst sites. South Africa has 101 Global IBAs and an additional 21 Regional IBAs . There are no IBAs within or in the immediate vicinity of the study area. Three IBAs are located roughly equidistant from the study area – the Wolkberg Forest Belt to the north and north-west, the Blyde River Canyon to the east and north-east and the Steenkamp Berg IBA to the south (Figure 6). The closest IBA to the proposed study area is approximately 37km to the north-east – the Blyde River Canyon IBA. ..
SAPAD (2023, Q1)[7], SACAD (2023, Q1)[8], & NPAES (2018) (FIGURE 7)	According to the SAPAD (2023_Q1), there are three protected areas within a 10 km radius of the study area, namely the Apiesboom Private Nature Reserve (PNR; ~ 6 km), Glen Ora PNR (~ 9 km), and Luiperdhoek PNR (~ 7 km), NR: According to the SACAD (2022_Q3), the study area is not located within a 10 km radius of a conservation areas. According to NPAES database (2018), the same protected areas as indicated in the SAPAD database are indicated.
DETAIL OF THE AREA OF INTEREST IN TERMS OF THE LIMPOPO CONSERVATION PLAN V2 (2018) (FIGURE 8)	
ECOLOGICAL SUPPORT AREA 1 (ESA 1)	Most of the study area is located within a **Category 1 ESA**. These are natural, near natural and/or degraded areas that are selected to support CBAs by maintaining ecological processes. **Land Management Recommendations:** Implement appropriate zoning and land management guidelines to avoid impacting on ecological processes. Avoid intensification of land use and fragmentation of natural landscapes. **Incompatible Land-Use**: Urban land-uses including Residential (including golf estates, rural residential, resorts), Business, Mining & Industrial; Infrastructure (roads, power lines, pipelines). **Note**: Certain elements of these activities could be allowed subject to detailed impact assessment to ensure that developments were designed to maintain the overall ecological functioning of ESAs.
NO NATURAL HABITAT REMAINING	Scattered sections throughout the study area are located within an area considered to have **No Natural Remaining (NNR) Habitat.** These are areas with no significant direct biodiversity value. These are either not natural areas or degraded natural areas that are not required as ESA. These areas include intensive agriculture, urban, industry, and human infrastructure. **Land Management Recommendations:** No management objectives, land management recommendations or land-use guidelines are prescribed. These areas are nevertheless subject to all applicable town and regional planning guidelines and policy. Where possible existing "Not Natural" areas should be favoured for development before "Other natural areas".
NATIONAL WEB-BASED SCREENING TOOL	
The Screening Tool is intended to allow for pre-screening of sensitivities in the landscape to be assessed within the EA process. This assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed development footprint to avoid sensitive areas. The different sensitivity ratings pertaining to the Plant [and Animal] Protocols are described below: ➢ Very high: Habitat for species that are endemic to South Africa, where all the known occurrences of that species are within an area of 10 square kilometres (km^2) are considered critical habitat, as all remaining habitat is irreplaceable. Typically, these include species that qualify under CR, EN, or VU criteria of the IUCN or species listed as critically/ extremely rare under South Africa's national red list criteria. For each species reliant on a critical habitat, all remaining suitable habitat has been manually mapped at a fine scale. ➢ High: Recent occurrence records for all threatened (CR, EN, VU) and/or rare endemic species are included in the high sensitivity level.	

[7] **SAPAD (2023):** The definition of protected areas follows the definition of a protected area as defined in the National Environmental Management: Protected Areas Act, (Act No. 57 of 2003) (NEMPAA). Chapter 2 of the National Environmental Management: Protected Areas Act, 2003 sets out the "System of Protected Areas", which consists of the following kinds of protected areas - 1. Special nature reserves; 2. National parks; 3. Nature reserves; 4. Protected environments (1-4 declared in terms of the National Environmental Management: Protected Areas Act, 2003); 5. World heritage sites declared in terms of the World Heritage Convention

[8] **SACAD (2023):** The types of conservation areas that are currently included in the database are the following: 1. Biosphere reserves, 2. Ramsar sites, 3. Stewardship agreements (other than nature reserves and protected environments), 4. Botanical gardens, 5. Transfrontier conservation areas, 6. Transfrontier parks, 7. Military conservation areas and 8. Conservancies.

➢ Medium: Model-derived suitable habitat areas for threatened and/or rare species are included in the medium sensitivity level. ➢ Low: Areas where no threatened species are known or expected to occur.	
AVIAN SPECIES THEME (FIGURE 11)	The entirety of the wider study area is deemed to be a low sensitivity.
ANIMAL SPECIES THEME (FIGURE 9)	For the animal species theme, the study area is located within area of **high and medium sensitivity.** Triggering Bird species include*:* » **High***: Falco biarmicus* (Lanner Falcon (EN)); » **Medium:** *Podica senegalensis* (African Finfoot) (VU)); » **Medium:** *Hydroprogne caspia* (Caspian Tern) (VU)); » **Medium:** *Sagittarius serpentarius* (Secretarybird) (VU)); » **Medium:** *Geronticus calvus* (Southern Bald Ibis) (VU)); and » **Medium:** *Aquila rapax* (Tawny Eagle) (EN)).
TERRESTRIAL BIODIVERSITY THEME (FIGURE 10)	For the terrestrial biodiversity theme, the study area has a **low** and a **very high sensitivity.** Triggering features of the very high sensitivity included the presence of **Category 1 ESA** and ESA 1 the **Sekhukhune Plains Bushveld (EN)** threatened terrestrial ecosystem**.**
RENEWABLE ENERGY: STRATEGIC TRANSMISSION CORRIDORS	
POWER CORRIDORS (FIGURE 11)	Although the study area is not located within a strategic transmission corridor, it is located ~ 3 km east of the International Power Corridor.
RENEWABLE ENERGY DEVELOPMENT ZONES (REDZ)	The study area is not located within a REDZ.

Areas Database; SAPAD = South African Protected Areas Database; IBA = Important Bird Area; MAP – Mean annual precipitation; MAT – Mean annual temperature; MAPE – Mean annual potential evaporation; MFD = Mean Frost Days; MASMS – Mean annual soil moisture stress (% of days when evaporative demand was more than double the soil moisture supply

.

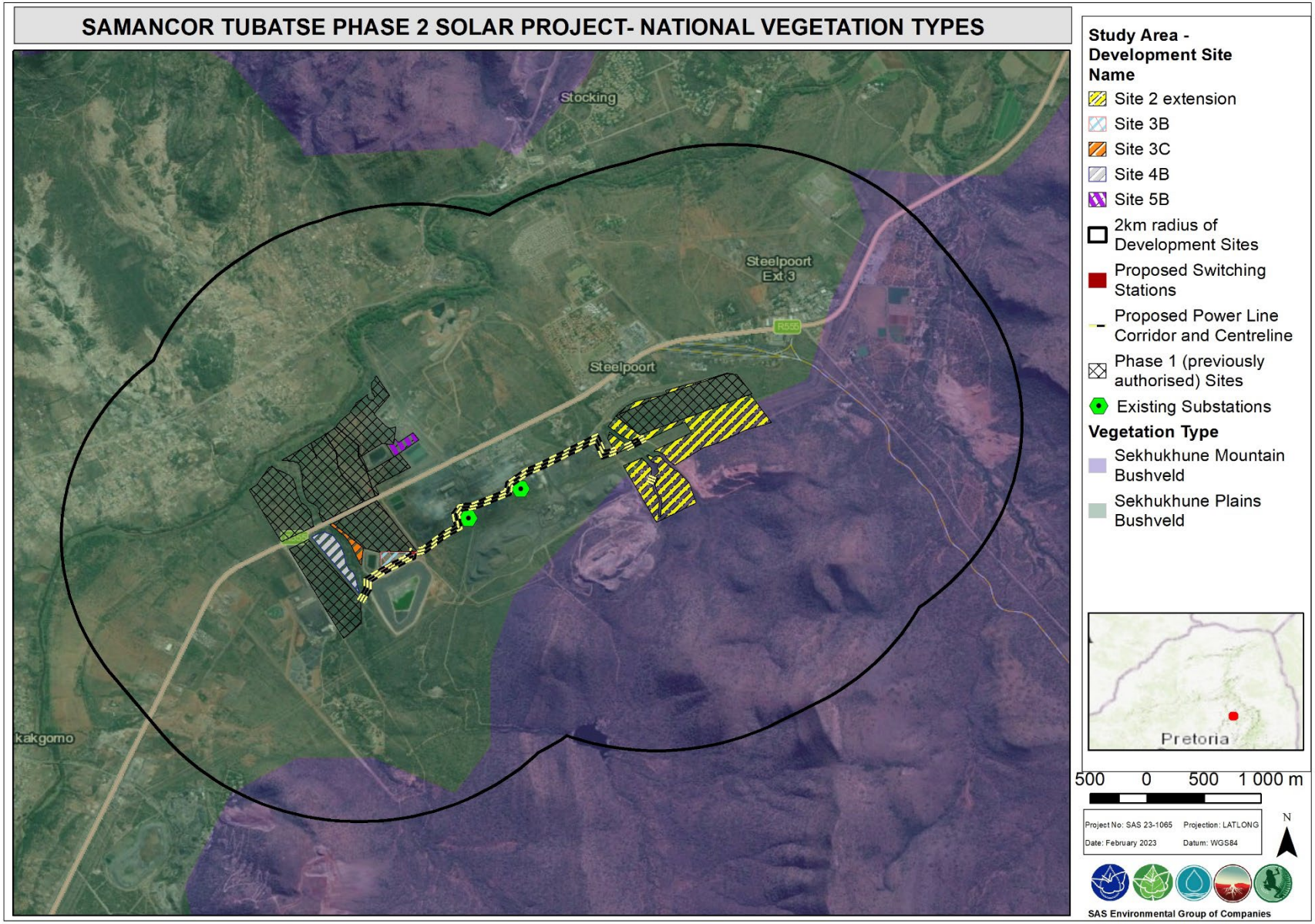


Figure 4: The terrestrial vegetation types associated with the study area according to the National Biodiversity Assessment (2018).

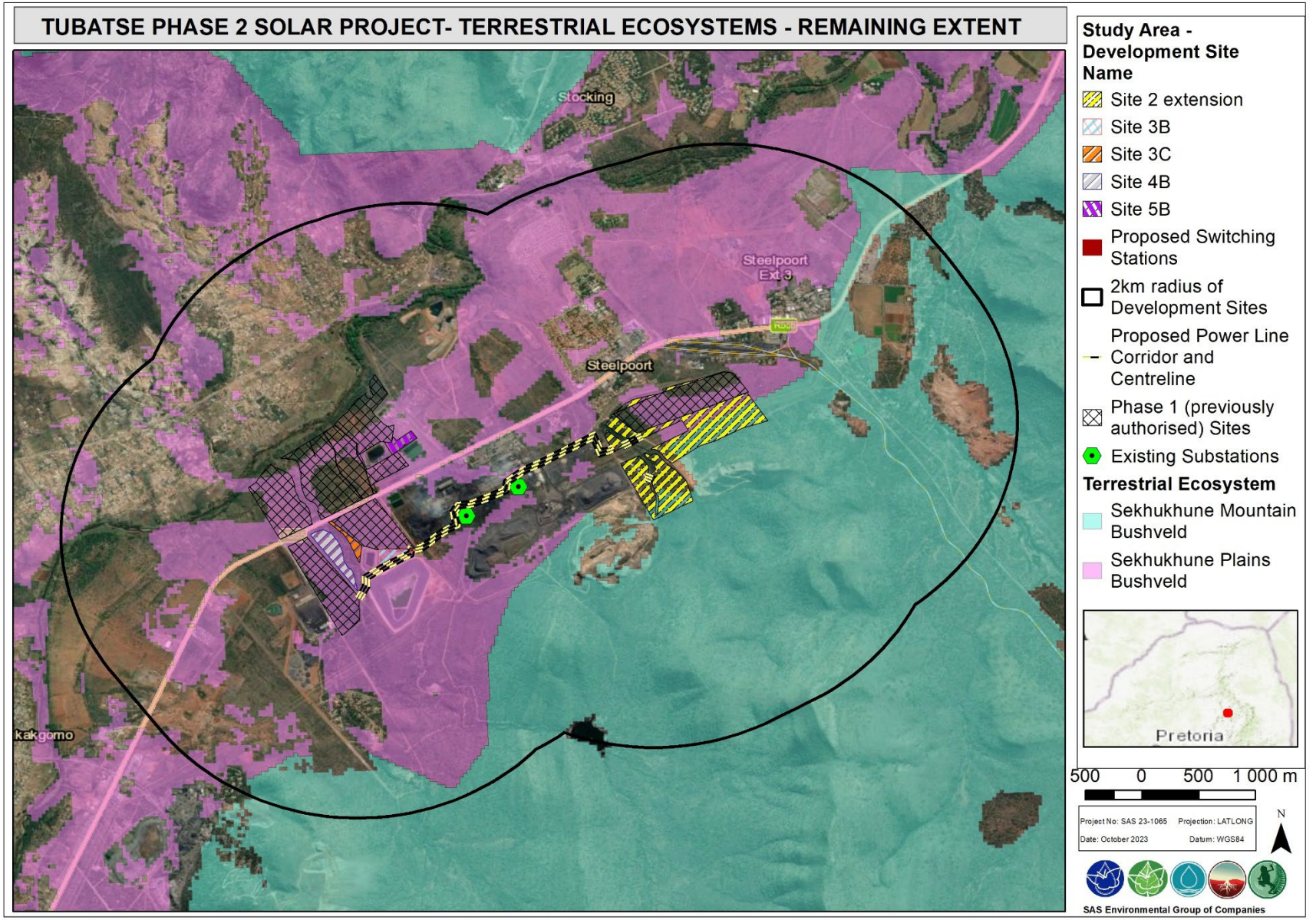


Figure 5: The remaining extent of the endangered ecosystem associated with the study area according to the 2022 Red List of Ecosystems.

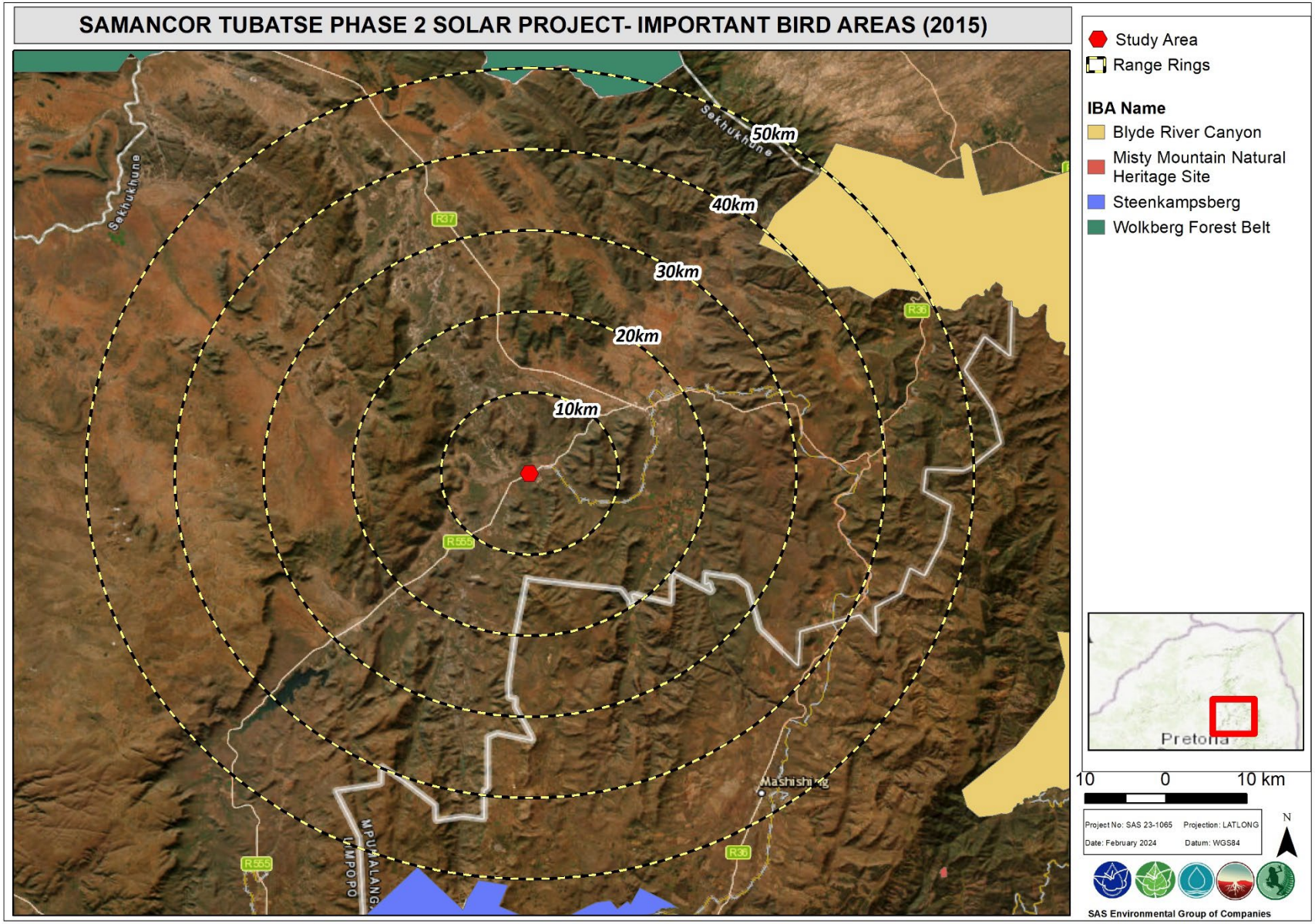


Figure 6: The study area in relation to Important Bird Areas (2015).

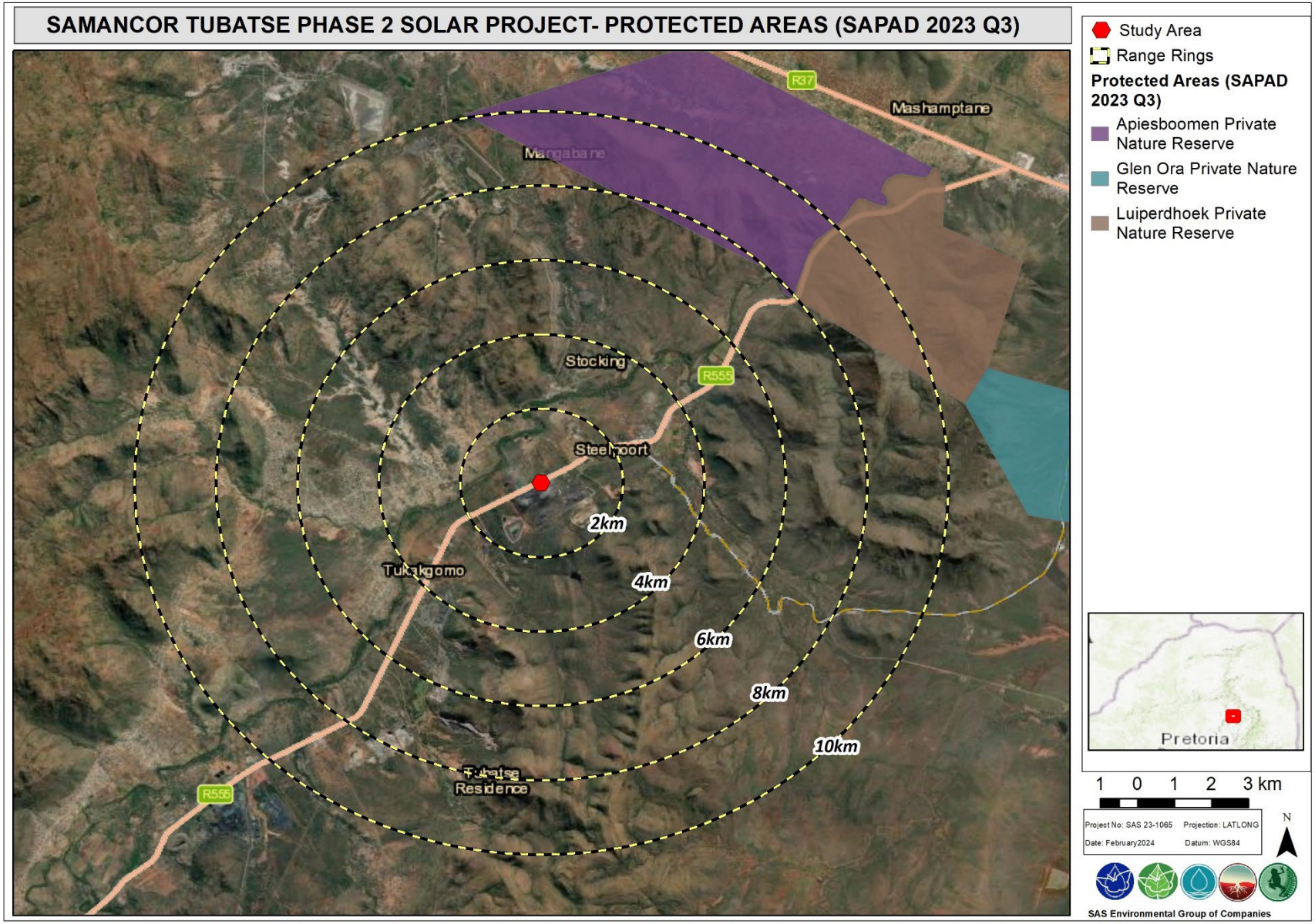


Figure 7: The study area in relation to national protected and conservation areas as per the SAPAD (2023, Q1) and the SACAD (2023, Q1).

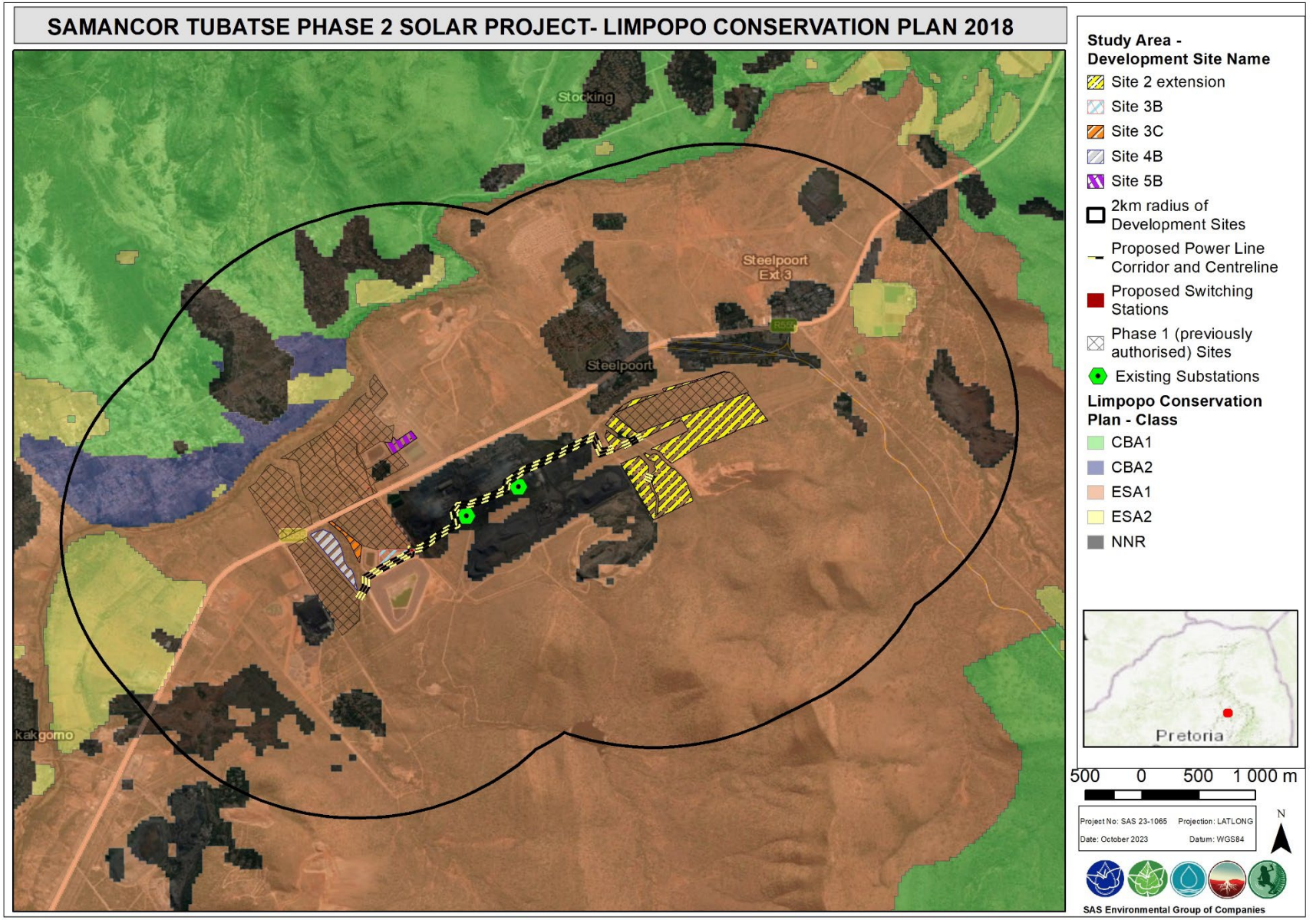


Figure 8: The study area in relation to the C-Plan categories as indicated in the Limpopo Biodiversity Conservation Plan (C-Plan; 2018).

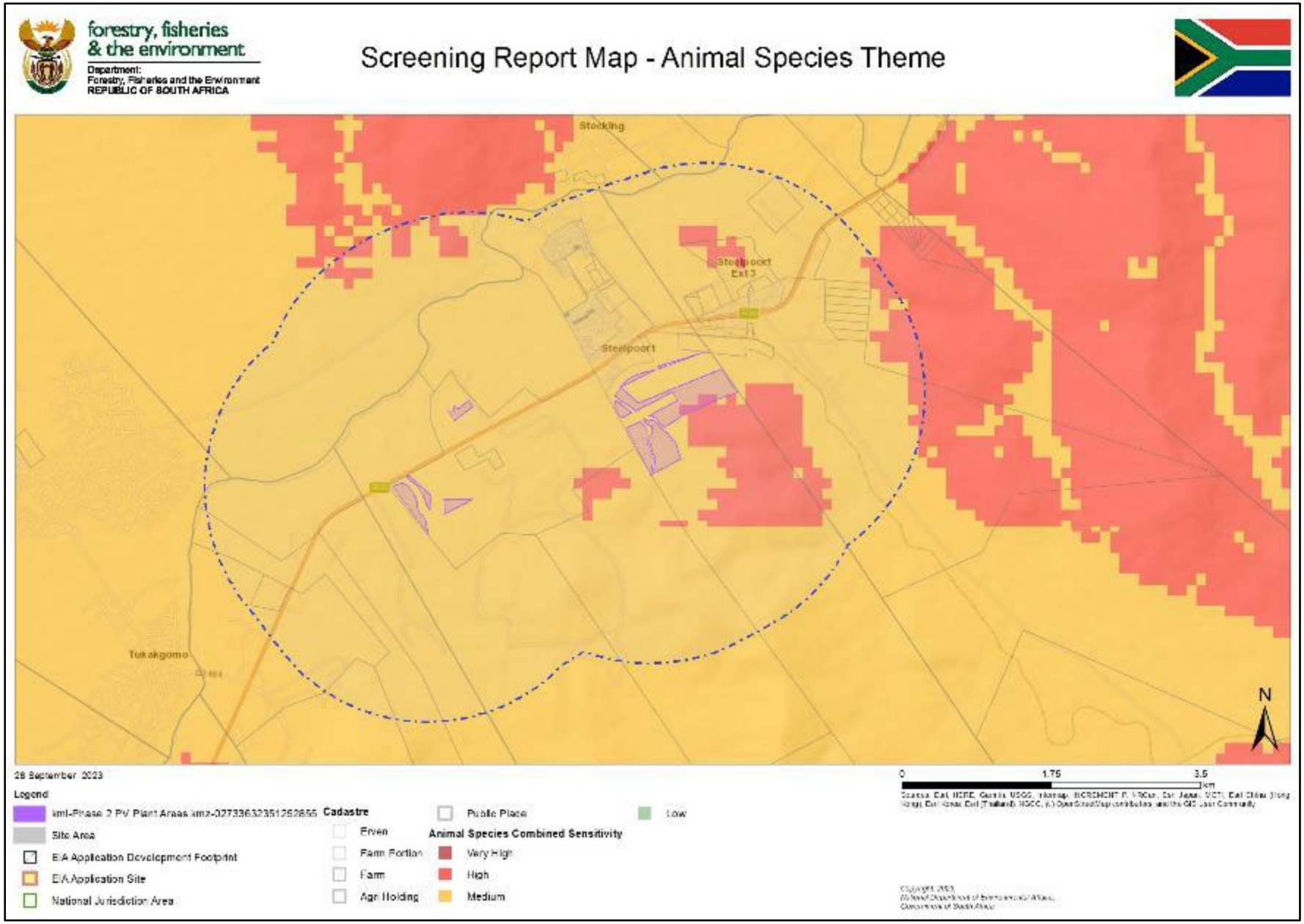


Figure 9: The Animal Species Theme sensitivity of study area as identified by the screening tool.

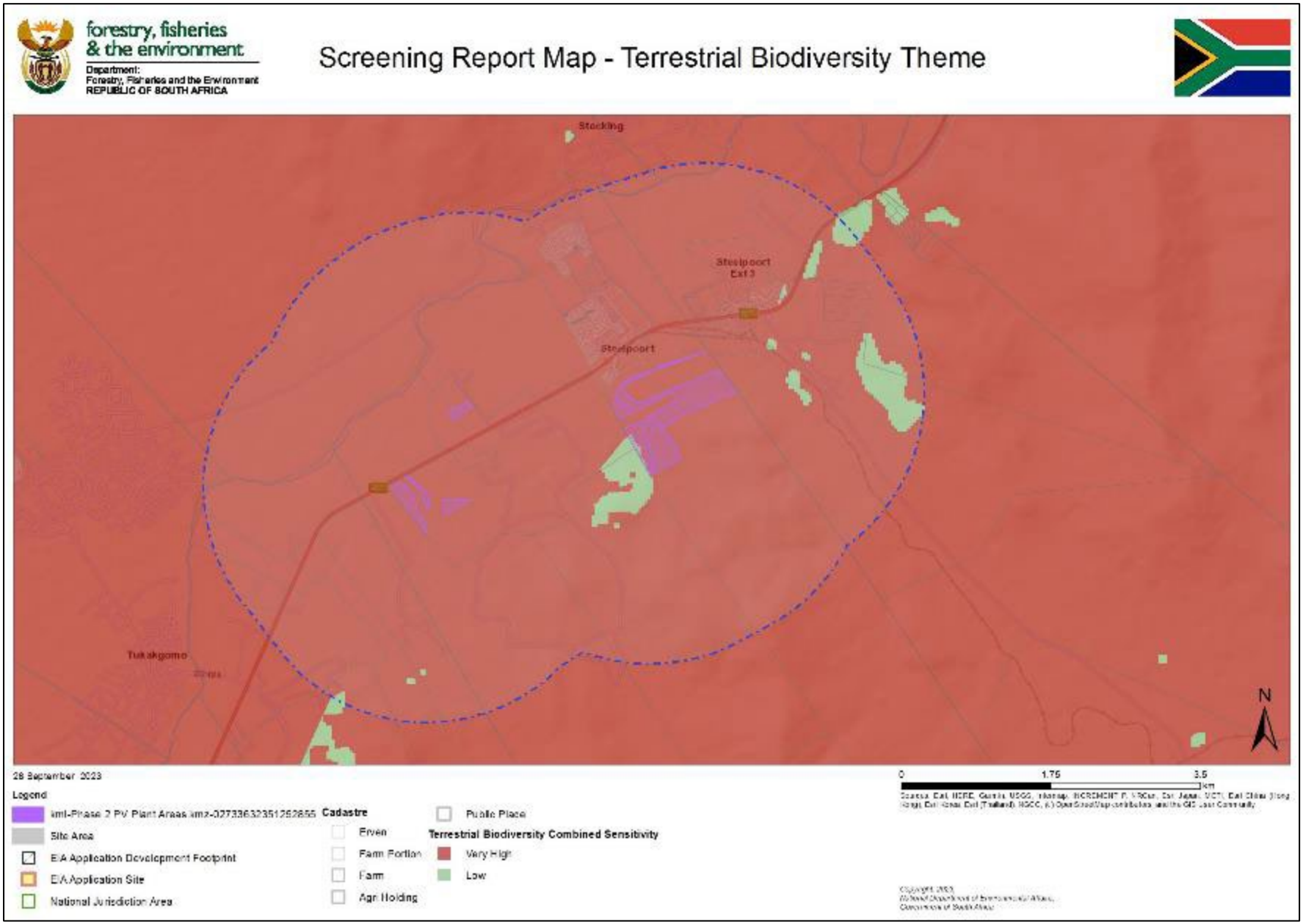


Figure 10: The Terrestrial Biodiversity Theme sensitivity of study area as identified by the screening tool.

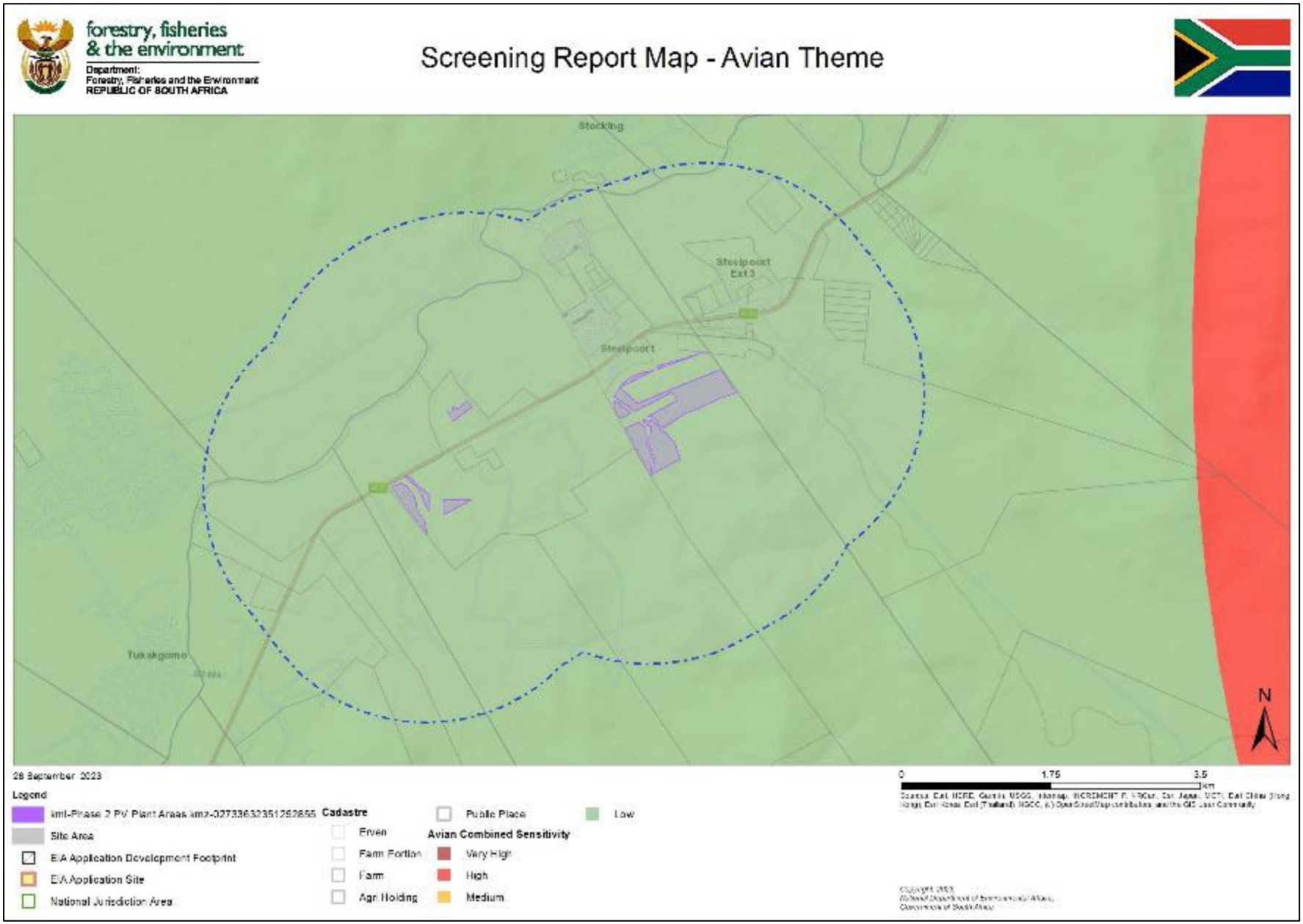


Figure 11: The Avian Theme sensitivity of study area as identified by the screening tool.

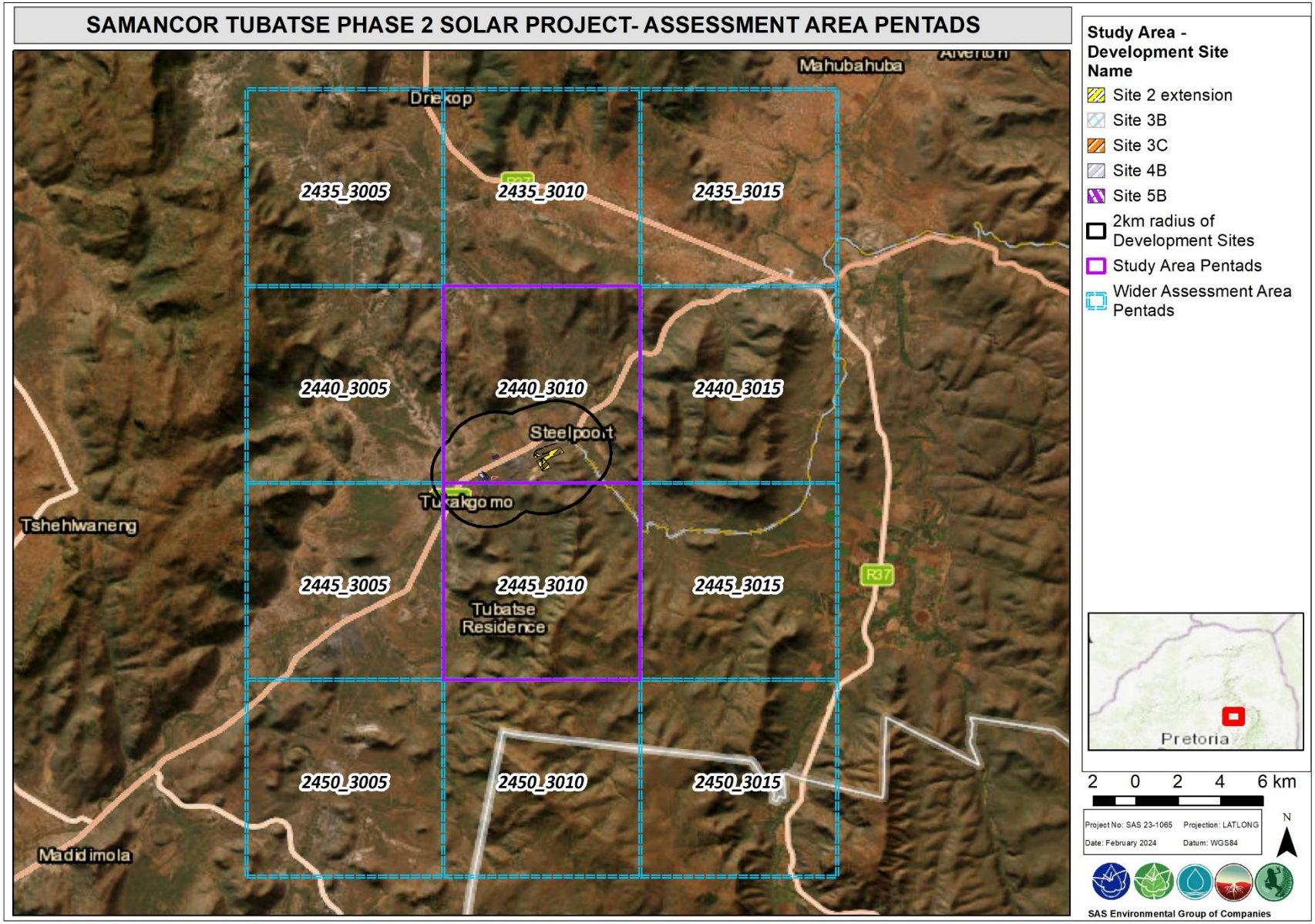


Figure 12: Pentads associated with the study area.

3.2 Results of Desktop Avifaunal Assessment

A bird species list for the study area was compiled in the Scoping-phase of the Phase 1 project and was updated based on the outcomes of the Phase 1 EIA field assessments and the two Wahlberg's Eagle nest monitoring site assessments(Appendix C). The bird species list was also supplemented by data from the SABAP2 project[9] as well.

The species composition of the Phase 1 study area is representative of the habitats present in the Phase 2 study area due to the overlap of the two study areas. The majority of bird species present are typical of savannah (woodland or bushveld), the predominant habitat type within the study area. A relatively small number of species are associated with aquatic habitats, representing the presence of a perennial river and small number of artificial waterbodies (dams) within the wider area. A small number of species more typically associated with grassland habitats do occur in the study area and have taken advantage of the modification of woodland habitat through clearing of woody vegetation.

The study area species list contains a number of larger bird species, including certain raptor and stork species. These species are significant as species from these groups of birds are often threatened (see Section 3.2.1 below).

3.2.1 Occurrence of Species of Conservation Concern

A number of Species of Conservation Concern (SCC) / Red Data species have either been recorded or could potentially occur within the study area. The latest list of Red Data List bird species is contained within the 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor *et al*, 2015). Table 2 lists the bird species in the study area species list that are designated as SCC. SCC species are very important in the context of the proposed development, as any impacts on these threatened species could be potentially significant at the population level. In addition certain of these species are large birds that are vulnerable to collisions with infrastructure.

[9] The SABAP2 project is a citizen science project that utilises the inputs of several hundred volunteers to map the distribution of birds across several southern African countries. SABAP2 is the follow-up project to the Southern African Bird Atlas Project (SABAP1), which took place from 1987-1991. The second bird atlas project started on 1 July 2007 and thus represents nearly fourteen years of data. The project aims to map the distribution and relative abundance of birds in southern Africa. To gather data, volunteers select a geographical 'pentad' on a map and record all the bird species seen within a set time frame, in order of species seen. This information is uploaded to the SABAP2 database and is used for research and analysis by several different agencies, including the SANBI, BLSA, as well as academics and students at various universities. http://sabap2.birdmap.africa

Table 2 – Avifaunal SCC recorded, potentially occurring within the study area, or flagged by the DFFE Screening Tool.

Scientific Name	Common Name	Regional Threat Category
Ciconia abdimii	Abdim's Stork	Near Threatened
Ciconia nigra	Black Stork	Vulnerable
Podica senegalensis	African Finfoot	Vulnerable
Geronticus calvus	Southern Bald Ibis	Vulnerable
Sagittarius serpentarius	Secretarybird	Vulnerable
Gyps coprotheres	Cape Vulture	Endangered
Gyps africanus	White-backed Vulture	Endangered
Aquila rapax	Tawny eagle	Endangered
Polemaetus bellicosus	Martial Eagle	Endangered
Falco biarmicus	Lanner Falcon	Vulnerable
Hydroprogne caspia	Caspian Tern	Vulnerable
Alcedo semitorquata	Half-collared Kingfisher	Near threatened
Coracias garrulus	European Roller	Near threatened

3.2.2 Occurrence of Endemic Species

Table 3 lists the endemic species have been recorded, or could occur within the study area. Endemic species are of importance due to their limited distribution and impacts on their populations (especially at cumulative level) could be significant It should be noted that species endemic to the southern African sub-region have been listed. A distinction has been drawn between birds completely endemic to the sub-region, as well as those species whose distributions mostly fall within the sub-region (near endemic).

Table 3 - Endemic or Near Endemic species recorded or potentially occurring within the study area.

Scientific Name	Common Name	Endemism Status
Geronticus calvus	Southern Bald Ibis	Endemic
Gyps coprotheres	Cape Vulture	Endemic
Buteo rufofuscus	Jackal Buzzard	Endemic
Pternisits natalensis	Natal Spurfowl	Near Endemic
Lophotis ruficrista	Red-crested Korhaan	Near Endemic
Pterocles bicinctus	Double-banded Sandgrouse	Near Endemic
Centropus burchellii	Burchell's Coucal	Near Endemic
Tockus leucomelas	Southern Yellow-billed Hornbill	Near Endemic
Tricholaema leucomelas	Acacia Pied Barbet	Near Endemic

Scientific Name	Common Name	Endemism Status
Mirafra sabota	Sabota Lark	Near Endemic
Anthoscopus minutus	Cape Penduline-Tit	Near Endemic
Monticola rupestris	Cape Rock Thrush	Endemic
Cossypha humeralis	White-throated Robin-Chat	Endemic
Cercotrichas paena	Kalahari Scrub-Robin	Near Endemic
Parisoma subcaeruleum	Chestnut-vented Tit-Babbler	Near Endemic
Bradornis mariquensis	Marico Flycatcher	Near Endemic
Sigelus silens	Fiscal Flycatcher	Endemic
Laniarius ferrugineus	Southern Boubou	Endemic
Laniarius atrococcineus	Crimson-breasted Shrike	Near Endemic
Cinnyris afer	Greater Double-collared Sunbird	Endemic
Cinnyris chalybeus	Southern Double-collared Sunbird	Endemic
Passer melanurus	Cape Sparrow	Near Endemic
Passer motitensis	Great Sparrow	Near Endemic
Sporopipes squamifrons	Scaly-feathered Finch	Near Endemic
Amadina erythrocephala	Red-headed Finch	Near Endemic
Uraeginthus granatinus	Violet-eared Waxbill	Near Endemic
Vidua regia	Shaft-tailed Whydah	Near Endemic
Emberiza impetuana	Lark-like Bunting	Near Endemic
Emberiza capensis	Cape Bunting	Near Endemic
Zosterops virens	Cape White-eye	Endemic

LC= Least Concern, NA= Not Assessed, NT= Near Threatened, VU= Vulnerable, EN= Endangered, CR= Critically Endangered, SI=Species Interest and P=Protected in Provincial or National Legislation; FP = Full Protocol

4 AVIFAUNAL ASSESSMENT RESULTS

4.1 Identification and Occurrence of Priority Bird Species

Based on the species list compiled for the study area and the sensitivity analysis, a number of 'priority species' with respect to the proposed development have been identified. The identification of priority species has also considered the conservation or endemism status of the species, whether the species would be vulnerable to being impacted by PV-based solar power development, or whether the species is an important component of the avian ecology of the study area. Species recorded in the wider area have been included as these could easily move into the study area. The priority species are:

- Black Stork (*Ciconia nigra*) **VU**;
- Secretarybird (*Sagittarius serpentarius*) **VU**;
- Cape Vulture (*Gyps coprotheres*) **EN**;
- White-backed Vulture (*Gyps africanus*) **EN**;
- Verreaux's Eagle (*Aquilla verreauxii*) **VU**;
- Tawny Eagle (*Aquila rapax*) **EN**;
- Wahlberg's Eagle (*Hieraaetus wahlbergi*) **LC**; and
- Lanner Falcon (*Falco biarmicus*) **VU**.

Table 4 below provides detail on these priority species.

Table 4 – Priority Species characteristics and potential impact associated with the proposed development.

SCIENTIFIC AND COMMON NAME	HABITAT DESCRIPTION	REGIONAL STATUS	POC (%)
Ciconia nigra (Black Stork)	**Range**: Widely distributed within southern Africa but with likely complex seasonal movements. SABAP2 data suggests it is a species in decline in the sub-region. **Major habitats**: Freshwater habitats (foraging) and mountainous areas characterised by cliffs. **Description**: Strongly piscivorous, foraging at dams, rivers and floodplains where fish are present. Nests in winter on cliff faces. **Food:** Fish. **Available habitat with the study area and surrounds:** The Steelpoort River and the Tubatse Dam. **Nature of potential impact related to the proposed development:** .The species may occasionally visit the study area to forage in the Steelpoort River or in larger dams such as the Tubatse Dam. The species could fly over and be attracted to investigate the natural freshwater features or the artificial waterbodies in the vicinity of the PV arrays, thus potentially making it at risk of collision with the PV arrays.	**VU**	**L**
Gyps africanus (White-backed Vulture)	**Range**: Resident; occurring across sub-Saharan Africa with the exception of forests in west and central Africa; in southern Africa is restricted to the northern parts of the subcontinent. **Major habitats**: Wooded Savannah **Description**: Scavenger, being the most commonly-occurring scavenger at carcasses within its range. Searches aerially for food, following other scavengers and predators. **Food:** Feeds primarily on large ungulate carcasses. **Available habitat with the study area and surrounds:** Residual areas of natural woodland; **Nature of potential impact related to the proposed development:** Transformation of habitat may indirectly affect this species through cumulative loss of natural habitat. Individuals ranging into the area may perch on power lines in the area, thus being at risk of collisions with overhead wires.	**EN**	**L**
Gyps coprotheres (Cape Vulture)	**Range**: Resident and far ranging over much of South Africa but has disappeared from much of its former range. Now largely restricted to mountainous terrain where it breeds, ranging into surrounding areas. **Major habitats**: Wooded Savannah, grassland, mountainous terrain. **Description**: Scavenger. Searches aerially for food, following other scavengers and predators. **Food:** Feeds primarily on large ungulate carcasses. **Available habitat with the study area and surrounds:** Residual areas of natural woodland. **Nature of potential impact related to the proposed development:** Transformation of habitat may indirectly affect this species through cumulative loss of natural habitat Individuals ranging into the area may perch on power lines in the area, thus being at risk of collisions with overhead wires.	**EN**	**L**
Sagittarius serpentarius (Secretarybird)	**Range**: Breeding resident, occurring widely across southern Africa and into sub-Saharan Africa. **Major habitats**: Short grassland, scrub, open woodland. **Description**: Terrestrial feeder, moving across large areas in search of prey. **Food:** Feeds primarily on reptiles (snakes) and small mammals. **Available habitat with the study area and surrounds:** Degraded grassland and open woodland. **Nature of potential impact related to the proposed development:** The transformation of habitat may exert a local impact on birds foraging in the local the area.	**VU**	**L**
Falco biarmicus (Lanner Falcon)	**Range**: Breeding resident ranging widely across southern Africa and occurring across Africa, Arabia, and the western Palaearctic. **Major habitats**: Grassland, cultivated fields, cleared woodland. **Description**: Aerial hunter of avian prey, with birds caught on the wing in an aerial chase. **Food:** Feeds primarily on small birds. **Available habitat within the study area and surrounds:** Cleared areas within degraded bushveld habitat especially along power lines.	**VU**	**C**

SCIENTIFIC AND COMMON NAME	HABITAT DESCRIPTION	REGIONAL STATUS	POC (%)
	Nature of potential impact related to the proposed development: The transformation of habitat may exert a local impact on birds foraging in the local the area. This may be mitigated somewhat if a grassy understorey is retained under the panels, thereby still attracting small passerines to the site. The panels could pose a collision risk for such birds engaging in high speed aerial pursuits.		
Aquila verreauxii (Verreaux's Eagle)	**Range**: Breeding resident, occurring widely across southern Africa and into sub-Saharan Africa as far north as Ethiopia. **Major habitats**: Mountainous / hilly terrain, especially where its primary prey item *Procavia capensis* occurs. **Description**: Powerful raptor, often hunting in pairs, preferring to hunt along steep slopes or ridge tops, ambushing unsuspecting prey **Food:** Feeds primarily on *Procavia capensis* but is an opportunistic feeder taking smaller prey up to the size of small antelope and goats. **Available habitat with the study area and surrounds:** Birds may occasionally forage over the hilly terrain immediately south of the study area. **Nature of potential impact related to the proposed development:** Limited potential impact- birds may overfly the study area or may occasionally range in the vicinity of the site to search for prey in the hilly terrain on the southern edge of the study area.	**VU**	**L**
Aquila rapax (Tawny Eagle)	**Range**: Breeding resident, but largely restricted to large protected areas.in the central and north-eastern parts of the sub-region. **Major habitats**: Mesic woodland / savannah to semi-desert. **Description**: Powerful raptor, maintaining large territory. Hunts prey on the wing, but adept at scavenging and piracy. **Food:** Feeds on a variety of prey including small mammals, game birds, reptiles, etc. . **Available habitat with the study area and surrounds:** Birds may occasionally forage over residual woodland in the study area. **Nature of potential impact related to the proposed development:** Transformation of habitat is the largest potential impact associated with this and other transformative developments in the area.	**EN**	**L**
Hieraaetus wahlbergi (Wahlberg's Eagle)	**Range**: North-eastern parts of South Africa.-. **Major habitats**: Various types of woodland. **Description**: Breeding intra-African migrant, present in southern Africa August to April. Birds commence with breeding-and nesting activities as soon as they arrive and maintain territories while present. **Food:** Feeds on small prey. **Available habitat with the study area and surrounds:** Residual patches of woodland. **Nature of potential impact related to the proposed development:** This species, and the breeding pair are most likely to be impacted by the cumulative loss of natural habitat within their territory.	**LC**	**C**

Although the likelihood of the occurrence of certain of these species is likely to be low, their threat status, twinned with their ability to range extensively over large territories or areas of occurrence entails that they could occur in the study area and should be considered.

One species that is not threatened (SCC) has been included in the list of priority species – Wahlberg's Eagle (*Hieraaetus wahlbergi*). This is due to the confirmed occurrence of this species in the area surrounding the study area, the confirmed breeding of the species in the wider area, with a nest site close to the (Phase 1) Tubatse Solar Site 4 (located south of the Phase 2 Site 4B) and its ecological importance in a study area context. The pair of Wahlberg's Eagles is thus resident in the study area while present in the southern African summer (being Intra-African migrants) and while present in the summer months are the apex avian predator

in the study area. The impact of the proposed development thus needs to be further assessed in the EIA phase.

Certain SCC which could occur in the wider study area have not been included in the list of priority species. This is either due to their very low potential for occurrence in the study area, lack of available habitat, or in the case of the two species which are highly dependent on aquatic habitats in the form of rivers, inhabit habitats (i.e. the aquatic habitat of the Steelpoort river) which will be unlikely to be directly or even indirectly affected by the proposed Phase 2 solar development.

The avifaunal assessment in the EIAR-phase will focus on the assessment of these priority species as the species that are most at risk from the proposed development.

4.2 Study Area and Surrounds Habitat Units

Due to a mix of land use and land cover, combined with terrain present in the study area and its surrounds, there are a mix of habitats that occur in the wider area. The spatial distribution of habitat types is shown in Figure 13. The habitat types are:

Table 5: Study Area and surrounds avifaunal habitat units – woodland (bushveld)

WOODLAND (BUSHVELD)	
   **Photograph Notes:** **Left**: Open woodland habitat in the area to the east of the Steelpoort commercial area; **Centre**: Denser thicket-type woodland on the (Phase 1) Site 4; **Right**: Dense microphyllous thickets in the area beyond the Steelpoort riparian zone boundary.	
Habitat Unit Description	Woodland (Bushveld) is the predominant natural habitat type in the wider area. This habitat is distinguished from grassland in that it is characterised by woody vegetation of variable density, and forms part of the savannah biome. Of the different types of savannahs as defined by Bourlière and Hadley (1983), two typically occur in the study area; savannah 'woodland' with trees and shrubs forming a light canopy and 'tree savannah' with scattered trees and shrubs. Savannahs in Africa are strongly characterised by marked wet and dry seasons. Woodland micro-habitats differ across the wider area and across the study area. Much of the study area, including large parts of Site 2B, and large parts of Site 3C & 4B are characterised by thicket-type woodland in rocky ('rugged') terrain. These areas are characterised by outcropping of bedrock to form rocky ground with the most predominant shrubs being *Terminalia prunoides* and *Dichrostachys cinerea*, with succulent species, in particular aloes being very common and limited grass cover. Such habitat on Site 2B forms dense thickets in places. Other parts of the wider area are characterised by more open woodland on sandy soils. This particular woodland micro-habitat is more open and as such is characterised by a grassy understorey, with the presence of larger shrubs and small trees with species such as *Senegalia nigrescens, D. cinerea, Euclea crispa* and *Commiphora mollis*. Tall woodland on hillsides is present close to the southern extent of the Site 2B and is characterised by the presence of larger trees such as *Kirkia wilmsii, Sclerocarya birrea* and other tree species such as *Combretum apiculatum* and *C. mole*. Dense microphyllous thickets are limited to the far northern parts of the area surrounding the study area close to the Steelpoort River and occur directly adjacent to the outer edge of its riparian zone. This woodland consists of dense thickets of *Vachellia tortilis, V. nilotica* and *D. cinerea* with a closed canopy. Parts of the study area, including Site 2B extension area are unfenced and as such these sites are heavily grazed by cattle, with the removal of woody vegetation for firewood being evident in certain areas. Woodland habitat to the north of the R555 road appears to be more degraded than areas that are fenced in the

	southern part of the study area, with the proximity of the area between the Steelpoort River and the R555 to the communal areas to the north of the river being an important factor. In a site sensitivity context, woodland habitat has been divided into two sub-units – degraded woodland and untransformed woodland.
Avifaunal Assemblage	Savannah (Woodland) as a habitat supports a high diversity of avifauna. The high diversity of avifauna within the savannah biome is indicated by the fact that only tropical rainforest has more birds per unit hectare than savannahs, however savannahs have a higher morphological diversity of birds due to their variable nature (Fry, 1983). Importantly, savannahs and woodlands support both seedeaters (granivores) as well as insectivorous species. The opportunities for foraging in savannahs is reflected by the significant degree of radiation of these granivores into the African savannahs, with significant representation of major seed-eating families including Columbidae (pigeons and doves), Ploceidae (Weavers), Viduidae (widowbirds), Estrilididae (waxbills), Fringilidae (finches), as well as partial granivores such as Phasianidae (especially francolins) and Alaudidae (larks) (Maclean, 1990). Insectivorous species also occur in high densities in African savannahs (Maclean, 1990), and these species typically forage within the canopy of the woodland, with a number of species often foraging in a loose collective fashion in what are termed 'bird parties', the advantage of which is thought to be protective awareness of predators and a 'beating function' to disturb insect prey that would otherwise go unnoticed (Maclean, 1990). Accordingly woodland habitat in the wider area is expected to be characterised by a relatively high density of bird species and a relatively high abundance of overall avian biomass. Due to the seasonality of savannahs, many species are nomadic or migratory (especially seedeaters) (Maclean, 1990), and the numbers of birds within savannahs increase greatly with the arrival of Intra-African and Palaearctic migrants in the summer months. This is expected to be true for the study area during the summer period following rains when the resident species are joined by large numbers of migratory and nomadic species. The importance for of this habitat unit for avifaunal assemblages in a wider area context in enhanced by residual land parcels containing woodland vegetation acting as areas of ecological connectivity in the landscape. Due to the high density of small mammals, reptiles, and smaller birds in this habitat type, this habitat generally supports a large number of raptors, in particular accipiters as well as other birds of prey such as eagles and buzzards. A number of raptor (and other smaller insectivorous bird species) species are migratory and will typically occur within this habitat in the summer during and after rainfall when certain types of prey species, especially non-invertebrates tend to increase in abundance. Raptors represent the most important species present within savannah / woodland – a number of which have been designated as priority species. In the context of the proposed development, the development of power lines - a component of the proposed development – could be significant as certain of species are collision prone and often interact with power lines by perching or nesting on them.
SCC Occurrence and assemblage	As described above, woodland habitat represents the largest component of natural habitat in the wider study area. Such habitat is present in varying states of disturbance, but areas of relatively intact woodland habitat are still present. Most of the SCC and identified priority species for the study area are raptors and accordingly these species, if ranging into the study area, are likely to be strongly dependent on the areas of residual woodland habitat for foraging, perching and roosting. Where observed in the study area and its surrounds, Lanner Falcons (*Falco biarmicus)* were observed hunting in woodland areas in the vicinity of transformed habitats, close to the Steelpoort riparian corridor, or in the vicinity of power lines. The abundance of certain species in the vicinity of transformed habitats (e.g. doves and certain other small passerines) is likely to attract Lanner Falcons to this part of the study area, whilst power lines provide excellent vantage points. Although avifaunal SCC are likely to range into and utilise woodland habitat for hunting / foraging, it is deemed unlikely that any SCC species would breed in the study area.

Table 6: Study Area and surrounds avifaunal habitat units – Freshwater Habitat (Aquatic-Riparian Corridors and Dams)

FRESHWATER HABITAT (AQUATIC-RIPARIAN CORRIDORS AND DAMS)	
   **Photograph Notes:** **Left**: The channel of the Steelpoort River; note the removal of vegetation and dumping of soil on the northern (left) bank; **Centre**: *Phragmites mauritianus* reedbeds in the riparian corridor of the Steelpoort River; **Right**: – The episodic drainage line that drains between Sites 3C and 4B.	
Habitat Unit Description	The Steelpoort River is the primary drainage feature in the wider area. It is a perennial river, rising in the area to the north of Middelburg. The river in the study area surrounds is characterised by a primary channel, with a flanking riparian zone. During the Phase 1 site assessments, the aquatic habitat of the Steelpoort River in the area appeared to be polluted, with a high silt load visible in the channel of the river. The riparian zone of the reaches of the Steelpoort River in the study area surrounds has been significantly impacted, especially the riparian zone on the northern side of the river, which has been physically altered by the removal of vegetation (in particular mature trees) along with excavation and dumping of sand along the banks of the river in certain locations. Certain reaches on the southern side of the river within the wider area, however, are less impacted. The riparian zone on the southern bank of the river adjacent to the boundary of the (Phase 1) Tubatse Solar Site 5 is characterised by some large trees (primarily *Combretum erythrophyllum*) and some areas of *Phragmites mauritianum* reedbeds, especially in the area where the drainage line draining from the hilly area to the east, drains into the Steelpoort River. The river and its riparian zone do not fall into the Phase 2 development area. As mentioned above, a drainage line drains into the Steelpoort Valley from the hilly terrain to the east, draining to the east of Site 4B and west of Sites 3B and 3C and draining across the (Phase 1) Site 5. Although being a non-perennial drainage line, it is characterised by a distinct, but narrow riparian zone characterised by larger trees than the surrounding woodland. Although not as distinct and significant as the riparian zone of the Steelpoort River, this drainage line's riparian zone acts as an important movement corridor for birds, linking the Steelpoort River and the hilly terrain to the east in a context of fragmentation of the woodland habitat in the area. Other drainage lines are present close to the study area, including two smaller drainage lines to the north of the R555 road and two drainage lines, rising in the hilly ground to the south of Site 2B and draining between the Site 2B land parcels. In a sensitivity context, this habitat unit has been divided into two sub-units – aquatic riparian corridors and dams. The only dam in the wider area is the Tubatse Dam, which is an impoundment along the above-mentioned drainage line to the south of Sites 3B, 3C and 4B. The dam is fed by water abstracted from the Steelpoort River which is periodically released from the dam into the downstream drainage line.

Avifaunal Assemblage	The Steelpoort River as the primary river (drainage feature) in the wider area is likely to be a locally important bird movement corridor, especially as it occurs within an enclosed valley. The movement corridor is likely to be a flyway for certain species (especially waterfowl) and for smaller passerines that will move along its riparian corridor. Despite the observed polluted state of the Steelpoort River, the river channel supports a number of aquatic specialists, including cormorants, certain kingfishers, wagtails, herons and certain species of duck. The riparian habitat of the river, though degraded, is (naturally) wooded and accordingly supports a greater diversity of bird species akin to the woodland habitat unit and thus supports a similar species assemblage and abundance. However the 'forested' riparian habitat of the river provide habitat for a number of bird species that are not found in other habitats in the area, that would typically occur in forest or dense thicket habitat such as Red-capped Robin Chat (*Cossypha natalensis*), Sombre Greenbul (*Andropadus importunus*), Tambourine Dove (*Turtur tympanistria*) and certain raptor species such as the African Goshawk (*Accipiter tachiro*). Riparian corridors of larger rivers in the wider area are also important as they contain a relatively high density of fruiting trees such as the Sycamore Fig (*Ficus sycomorus*) that provides foraging opportunities for frugivores such as the African Green-Pigeon (*Treron calvus*) and Purple-crested Turaco (*Gallirex porphyreolophus*). Certain parts of the riparian zone of the river are characterised by large riparian trees (primarily *Senegalia burkei*) forming a closed canopy. Such riparian woodland, akin to riparian forest, is an important habitat for a number of bird species, in particular certain raptors, especially accipiters, and certain owl species.
SCC Occurrence and assemblage	As with woodland habitat, freshwater habitat (especially riparian habitat) is likely to be significant for most of the SCC that range into the development area. For SCC raptors, the riparian habitat of the Steelpoort River and the riparian corridor associated with the drainage line located between sites 3B/C and 4B provides cover and ample hunting opportunities due to the year-round increased abundance of birds in this habitat due to elevated water and food supply. The Steelpoort River has been flagged for the potential occurrence of African Finfoot (*Podica senegalensis*). Whilst the species could nominally occur within the Steelpoort River, as it favours rivers with slow flowing reaches characterised by overhanging riparian vegetation, the increasing degradation of the channel and riparian zone of the reaches of the river in the wider area are unlikely to present suitable habitat for this species, or another SCC that has been recorded in less degraded upstream reaches of the river closer to the Lion Smelter, the Half-collared Kingfisher (*Alcedo semitorquata*), which favours fast flowing clear unpolluted stetches of river.

Table 7: Study Area and surrounds avifaunal habitat units – Modified Surface Water Habitat (Artificial Water Bodies)

MODIFIED SURFACE WATER HABITAT - ARTIFICIAL WATER BODIES	
  **Photograph Notes:** **Left**: One of the brine dams to the north of the smelter and to the south of Site 5C; **Right:** A settling dam at to the smelter's WTW works.	
Habitat Unit Description	Apart from the aquatic habitat associated with the Steelpoort River, there are other surface water features in the study area surrounds, all of which are artificial. A number of such features are associated with the Tubatse Ferrochrome Plant, including two brine dams located to the south of the R555 road in the plant footprint, further brine dams located to the north of the road and the plant, along with a stormwater dam and other settling plants associated with a water treatment plant located in the same area. Site 5C is located in immediate proximity to the two brine dams to the north of the R555. To the south-west of the plant and to the south of the Phase 1 Site 3 a large waste disposal pond is present, along with a (currently dry) leachate pond.
Avifaunal Assemblage	The artificial water bodies are unlikely to hold significant numbers of waterbirds, as their structure is not attractive to birds inhabiting or feeding / roosting in aquatic habitats such as reedbeds and mudflats. Only certain species attracted to open water (e.g. Egyptian Geese – *Alopochen aegyptiaca* and Blacksmith Lapwing – *Vanellus armatus*) are likely to be regularly encountered at these habitats. The design of mist of these water bodies – having steep lined sides with no shallow water or marginal vegetation greatly reduces the likelihood of the occurrence of a significant array of waterbirds It is important to note that artificial waterbodies do however have the potential to attract waterbirds, including those flyovers at higher altitudes and thus these artificial waterbodies have been flagged as having a moderate avifaunal sensitivity. The potential proximity of settling ponds to certain of the sites (i.e. Site 5C) and therefore the solar panel arrays development is potentially an issue in the context of collision risks.
SCC Occurrence and assemblage	Due to the general absence of suitable habitat (i.e. wading habitat and marginal vegetation) artificial water bodies are unlikely to attract any avifaunal SCC. The Caspian Tern (*Hydroprogne caspia*) has been flagged by the DFFE Screening Tool for the study area. In an inland setting this species occurs on large open water bodies such as large instream dams, however the artificial waterbodies in the wider area (and the Tubatse Dam) are considered too small to be utilised by this species.

Table 8 - Study Area and surrounds avifaunal habitat units – Modified Terrestrial Habitats

MODIFIED TERRESTRIAL HABITATS	
   **Photograph Notes:** **Left**: An area cleared of woody vegetation in the vicinity of one of the brine dams to south of Site 5C; **Centre**: The Tubatse Smelter , with a Wahlberg's Eagle in the Foreground; **Right**: –Power line servitudes located to the south of Sites 3B/C and 4B.	
Habitat Unit Description	Modified habitats have been grouped due to their shared characteristics. To the north and west of the Steelpoort River in the wider area in areas of communal land tenure, and to the south of the river in the area to the west of the Tubatse Ferrochrome Plant a number of plots of land which appear to have been formerly cultivated, are present. These areas are no longer actively cultivated but having been historically cleared of woody vegetation have been colonised by pioneer grass and weed species and a process of succession of woody vegetation has started to occur. Certain areas in the vicinity of the Tubatse Ferrochrome Plant have been similarly cleared of their woody vegetation, and are currently characterised by either unvegetated ground, or similar pioneer grass species. The area surrounding the HH Waste Disposal Pond, located to the south of Site 3C and to the south-east of Site 4B is an example of such habitat. There is a relatively high density of power lines in the study area surrounds. The servitudes of all such power lines are cleared and maintained clear of all woody vegetation and as such typically consist of similar modified grassland habitat, albeit in linear strips. The nature of landuse in the area entails that there are significant areas of anthropogenically-transformed habitat, of generally low attractiveness to birds. This habitat includes large areas comprising the smelter footprint, that are actively mined, or on which slag or other waste material is deposited to create mine dumps. Residential areas of Steelpoort are steadily increasing in size and certain areas of commercial landuse and infrastructural landuse (e.g. large railway yards) are also present in the vicinity of certain parts of the study area. From an avifaunal sensitivity context this habitat unit has been divided into a number of sub-units including cleared land / old cultivation / eroded, industrial infrastructure; and urban development.
Avifaunal Assemblage	Due to the nature of the vegetation cover, areas that have been formerly cultivated tend to attract bird species associated with modified grassland habitats, including certain pipit and lapwing species, and other granivores including various finch, waxbill, whydah and other similar species. The large buildings and structures of the Tubatse Ferrochrome Plant as well as the commercial areas of Steelpoort provide habitat for limited species such as certain dove, swift and swallow species.

	The residential areas associated with Steelpoort although transformed provide suitable habitat for certain woodland bird species adapted to surviving in suburban habitat due to the presence of gardens. Although not a natural habitat gardens represent a productive habitat for a number of bird species due to the human infrastructure availability of water, cover, foraging and nesting areas. In many ways the gardens are similar to woodland habitats and have been colonised by a number of species that would occur within woodland or thickets.
SCC Occurrence and assemblage	Most modified terrestrial habitats are considered unlikely to be of high significance to avifaunal SCC. As detailed above Lanner Falcons have been observed hunting in the study area surrounds within degraded habitat close to anthropogenically transformed areas and on infrastructure – i.e. power lines. Though occasionally utilised, transformed areas are unlikely to be used exclusively by any SCC. The high number of power lines in the study area surrounds could be utilised by SCC on which to perch and roost, but no nesting of any SCC was noted in the study area.

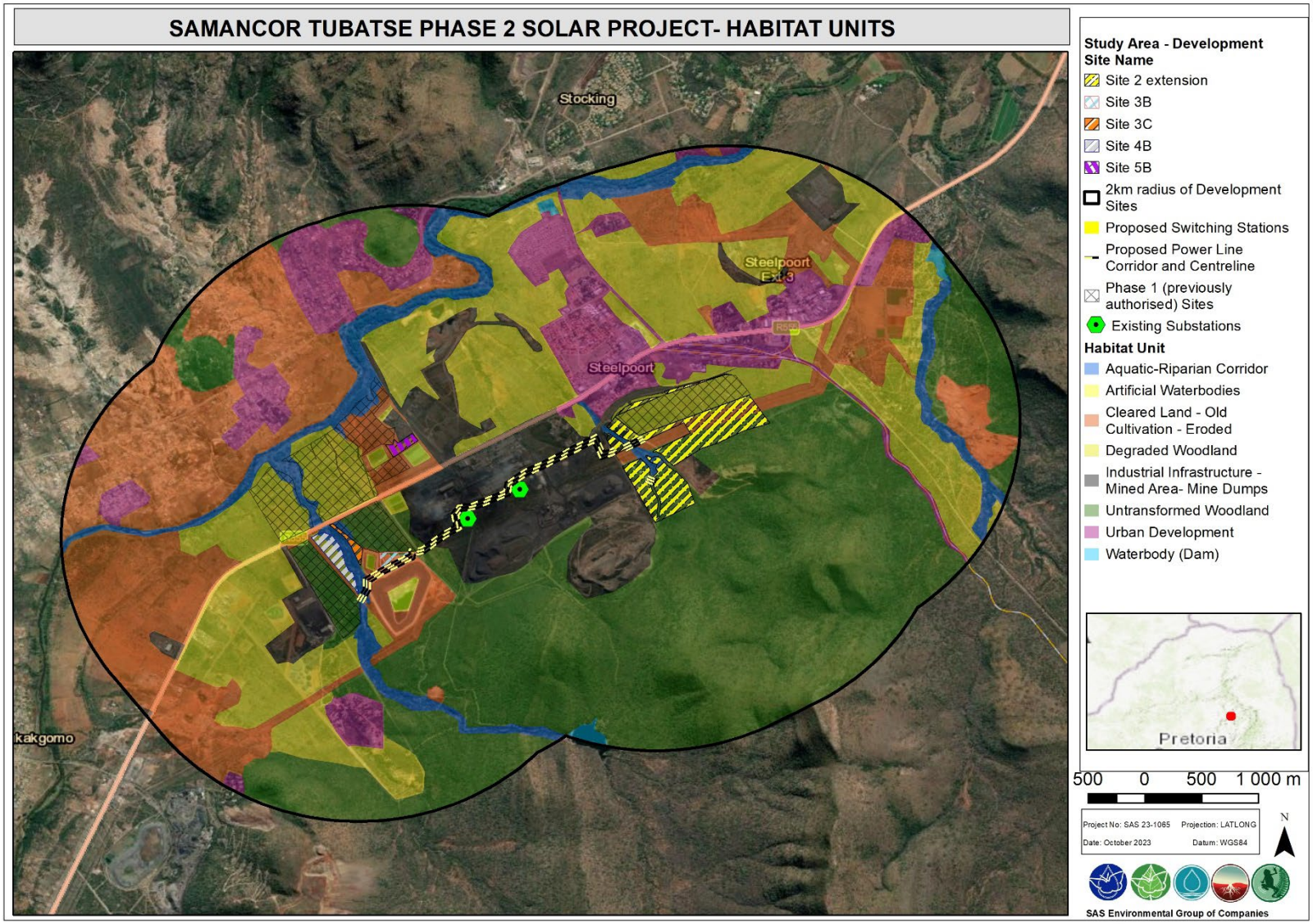


Figure 13: Habitat units and sub-units within the study area and surrounds.

4.3 Study Area Sensitivity Confirmation

The habitat units and sub-units described in Section 4.2 above have been mapped across the study area and surrounds utilising GIS software (Figure 14). A sensitivity class has been assigned to each habitat type (unit / sub-unit) based on the relative abundance and species composition associated with each habitat type. The highest level of sensitivity has been assigned to riparian corridors and natural water bodies (including dams) and untransformed woodland, with the lowest level of sensitivity being assigned to highly transformed habitats. Woodland habitat has been divided into untransformed woodland (i.e. in hilly terrain where there is very limited human activity, or within certain fenced areas (including some parts of the study area to which there is no public / open access) which has been assigned a high degree habitat-based of sensitivity, and 'degraded' woodland where human impacts as described in Section 4.2 are apparent. Such less intact woodland has been assigned a moderate degree of habitat-based sensitivity.

The assigning of sensitivity need to be assessed in the context of sensitivity assigned to the study area by the relevant themes of the DFFE's web-based screening tool. Two environmental themes – the avian theme and the animal species theme – are directly relevant to avifauna. The avian theme has assigned the entire study area a "low" degree of sensitivity (Figure 11) and the animal species theme has listed one bird species as being of "high" sensitivity and four others as being of "medium" sensitivity (refer to Table 1 and Figure 9). In the context of the habitat unit-based sensitivity designation, the avian theme is partially disputed as certain parts of the study area have been assigned "high" and "medium" levels of sensitivity. The animal species theme shows certain parts of the study area being high sensitivity – i.e. the hilly ground to the south-east of the town of Steelpoort – with the remainder of the study area being assigned a medium degree of sensitivity. This mostly corresponds with the habitat-unit based designation of sensitivity with the exception of the transformed habitat units which have been assigned a low level of sensitivity. The designation of animal species theme is largely supported, although disputed for certain habitat units. It is important to note that in reality, species deemed as priority species in the study area would not necessarily be restricted to high sensitivity habitat units and that certain such species could range across the entire study area; an example being individual Lanner Falcons which were observed hunting in undeveloped areas close to the Steelpoort built-up area that are highly degraded. This factor has been taken into account in the assessment of avifaunal impacts.

The maps indicating habitats and their associated levels of sensitivity are presented in Figure 14 and the Site Sensitivity Report appears in Appendix D.

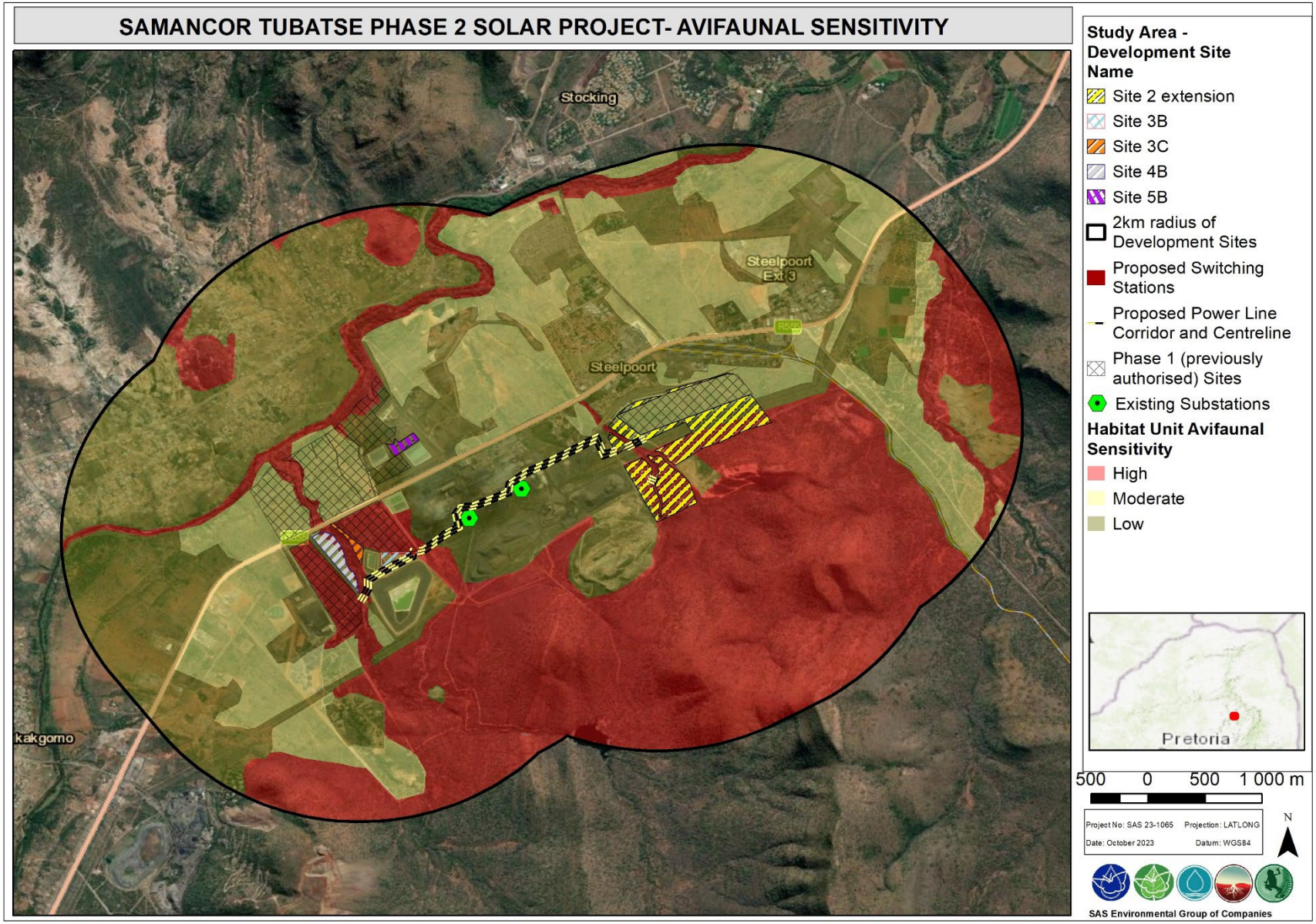


Figure 14: Habitat unit / sub-unit-based avifaunal sensitivity map for the Study Area and surrounds.

5 ASSESSMENT OF IMPACTS

There are a number of potential impacts of the proposed development on avifauna, as detailed below.

Table 9 below serves to summarise the nature of potential impacts on the avifaunal ecology of the study area, and Tables 10-11 have assessed these impacts in detail according to the method described in Appendix C (as provided by the EAP).

An assessment of all potential i) Construction Phase, and ii) Operational & Maintenance Phase impacts is provided in the ensuing sub-sections. All mitigatory measures required to minimise the perceived impacts are presented in Tables 10 and 11.

5.1 Activities and Aspect Register

The table below indicates the perceived risks to avifaunal species associated with the activities pertaining to the proposed solar development.

Table 9: Aspects and activities register considering avifaunal resources during all phases of development.

ACTIVITIES AND ASPECTS REGISTER
Planning (Pre-construction) Phase
- Potential failure to implement the required mitigation measures before and at the commencement of construction activities, in particular with respect to exclusion of freshwater ecosystems and associated buffers from the developable area: - **Impact:** Long-term or permanent degradation and modification of the receiving environment, loss of SCC and avifauna habitat.
- Potential inadequate design of PV infrastructure increasing the possibility of colliding with infrastructure. - **Impact:** Long-term collision and risks to SCC species leading to a reduction in SCC diversity.
Construction Phase
- Loss of indigenous vegetation and thus avifaunal habitat within the solar array footprint that is permanently cleared of woody vegetation. - **Impact:** Permanent loss of avifaunal habitat at a local scale affecting the typical species assemblage and thus reducing avifaunal habitat and diversity in the wider area. Further reduction of available habitat in the long-term, compounding the limiting factors to avifaunal assemblages.
- Inadequate layout optimisation, resulting in extensive (non-phased / indiscriminate) site clearing and the removal of indigenous vegetation. - **Impact:** Loss of avifaunal habitat with local impacts on avifaunal communities.
- Uncontrolled and unplanned site clearing and the removal of vegetation and destruction of avifaunal habitat and forage. - **Impact:** Loss of avifaunal habitat for species reliant on this specific habitat for survival.
- Proliferation of AIP species that colonise areas of increased disturbances and which may outcompete indigenous plant species, including further transformation of adjacent, undeveloped habitat.

ACTIVITIES AND ASPECTS REGISTER
- **Impact:** Degradation of favourable avifaunal habitat outside of the direct construction footprint, leading to a decrease in avifaunal diversity at a localised scale and loss of land to meet biodiversity targets.
- Potential dumping of excavated and construction material outside of designated areas, promoting the establishment of AIPs and destroying residual natural habitat. - **Impact:** Loss of avifaunal habitat and diversity.
- Potential failure to implement stormwater controls on the construction site. - **Impact:** Potential increased erosion within vulnerable soils, especially within the ephemeral drainage lines that could lead to degradation of riparian habitat that would negatively affect is productivity for avifaunal usage.
- Additional pressure on avifaunal habitat as a result of an increased human presence associated with the proposed development, contributing to: • Potential hunting/trapping/removal/collection of avifaunal species or potential SCC; and • Increased human activity, especially loud noise associated with construction activities will lead to the displacement and/or loss of potential avifaunal SCC. - **Impact:** Loss of sensitive avifaunal habitat and the potential loss of potential avifaunal SCC.
- Potential failure to concurrently rehabilitate bare or disturbed sites as soon as the construction activities have occurred will potentially result in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs. - **Impact:** Long-term loss of favourable habitat for historically recorded avifaunal species. Loss of avifaunal diversity and potential SCC which will disperse into the surrounding area in search of favourable habitat. Knock-on effects on adjacent / downgradient freshwater ecosystems through increased sedimentation, and / or increased erosion of riparian zones through increased runoff velocities, thereby further degrading avifaunal habitat within adjacent freshwater ecosystems.
Operational and Maintenance Phase
- Potential failure to implement an alien floral control plan after the construction phase. - **Impact:** Potential permanent transformation of avifaunal habitat and long-term degradation of avifaunal habitat adjacent to the development site due to potential proliferation of AIPs.
- Ineffective rehabilitation of exposed and impacted areas potentially leading to vegetation succession and a possible reduction of avifaunal diversity and occurrence of potential avifaunal SCC over the long-term. - **Impact:** Permanent loss of avifaunal habitat and diversity, and a higher likelihood of edge effect impacts on adjacent and nearby natural avifaunal habitat of increased sensitivity. Further reduction of available habitat in the long-term, compounding the limiting factors to avifaunal assemblages.
- Potential poor management and failure to monitor rehabilitation efforts, leading to: • Landscapes being left fragmented, resulting in reduced migration capabilities of avifaunal species, isolation of avifaunal populations and a decrease in avifaunal diversity; • Compacted soils limiting the re-establishment of natural vegetation; and • Increased risk of erosion in areas left disturbed. - **Impact:** Long-term (or permanent) loss of avifaunal habitat and diversity.
- Increased risk of collisions with the project infrastructure. - **Impact:** Local loss of potential avifaunal SCC abundance and diversity.
Decommissioning Phase
- Non-removal of solar array and associated infrastructure (e.g. overhead lines) - **Impact:** Residual impact related to Local loss of potential avifaunal SCC abundance and diversity.
- Potential dumping and incorrect disposal of decommissioned infrastructure in the development footprint, promoting the establishment of AIPs and destroying residual natural habitat. - **Impact:** Loss of avifaunal habitat and diversity.
- Potential to inappropriately rehabilitate disturbed areas - **Impact:** Loss of avifaunal habitat and diversity

5.2 Study Area-specific Issues

The habitat-based sensitivity assessment has identified certain areas of more intact habitat located on, or in close proximity to certain parts of the Phase 2 study area. This relates particularly to the presence of riparian habitat associated with certain drainage lines, in particular the drainage line that drains from the hilly area to the east of the south-east of the

study area and which drains between Sites 3B/C and Site 4B, as well as the drainage lines that are located between the Site 2B development parcels. In a landscape setting of large-scale fragmentation of woody vegetation habitat (especially within the Steelpoort valley), these drainage lines are likely to represent important landscape and altitudinal corridor linking the valley floor (and the Steelpoort riparian corridor) with the hilly areas to the east and south-east. The importance of these drainage lines and associated riparian corridors is even more locally significant given the authorisation of transformation of much of the residual woodland in the Phase 1 development footprint. The development of Sites 3B and 4C, as well as the development of Site 2B would exacerbate the loss of natural woodland habitat within the catchments of the respective drainage lines. It is however important to note that the solar array layout as presented by the applicant does not physically encroach on the riparian zones of these drainage lines, or on a 20m-wide development exclusion buffer that has been recommended as a development exclusion zone in the Freshwater Assessment (SAS, 2024). In this context the drainage lines and a small flanking area of natural woodland vegetation will be retained and will likely continue to enable the function of the drainage lines as ecological movement corridors. All such riparian corridors must be considered as highly sensitive habitats that comprise development exclusion areas for solar panel arrays from an avifaunal perspective, and the key mitigation measure as stipulated in the freshwater report that the integrity of the buffer areas surrounding the drainage lines through all development phases is supported in an avifaunal context.

5.3 Collision-related Impacts

One of the other significant direct impacts relating to the development and operation of solar panel arrays is bird trauma or mortality that is caused by collisions with PV panels, with the possible reasons for collisions being polarised light pollution and/or relating to waterbirds mistaking large arrays of PV panels as wetlands or waterbodies – the so-called “lake effect” (Walston *et al*, 2016). Although no evaporation ponds are proposed to be developed in association with the solar power development, certain of the arrays on Site 5B are located in close proximity to a number of artificial waterbodies (brine dams) that exist in the vicinity of the Smelter.

A certain assemblage of waterbird species inhabits these artificial waterbodies and the waterbodies are utilised as roosting sites by a number of species that are resident in the area, and accordingly these birds will move to and from the waterbodies, often in low light conditions at the start and end of the day. However it is important to consider that a relatively small overall number of birds and species diversity inhabit and utilise these water bodies. Incidental

observations are suggestive that the waterbodies may occasionally be utilised by species that would not regularly occur in the wider area to rest / roost.

As solar arrays are proposed to effectively surround the brine dams (with the development of Site 5B, in addition to the Phase 1 Site 5 arrays), the panels in the vicinity of the brine dams could also pose a collision risk for waterbirds, especially during low light conditions as discussed above. The relatively low number of birds visiting these artificial waterbodies would render the potential impacts less significant that a scenario in which large numbers of waterbirds were frequenting the waterbodies, and the potential impact is not considered highly significant. Furthermore, when considered in a wider (regional) context, the Sekhukhuneland-Lydenburg area is not associated with significant water bodies or wetlands, primarily due to the nature of the terrain which is often highly mountainous and rocky and thus does not typically attract a wide range of waterbirds that would be attracted to large natural wetlands, floodplains, pans or dams. The presence of large number of over-flying waterbirds that could be attracted to the panels in the manner of the 'lake effect' would thus be highly unlikely in the study area. This potential impact is thus not considered to be significant and the potential for large numbers of waterbirds or threatened species to be attracted to the solar arrays through the lake effect is expected to be low. Nonetheless certain mitigation measures have, and operational monitoring of collisions has been recommended at these waterbodies.

5.4 Construction-related Disturbance and Displacement Impacts

The construction of the solar panel arrays over a large area will be a massive undertaking that will involve bulk earthworks, the removal of vegetation, and in some cases the removal of outcropping or underlying bedrock. Construction will thus be very noisy, will at times generate large volumes of dust, and will involve the use and co-ordination of large numbers of plant and other vehicles. Sources of loud noise are likely to have varied, but definite impacts on birds; Noise from human activities (in particular from infrastructure and construction sites) has a strong impact on the physiology and behaviour of birds. This impact related to the masking of signals used for communication, breeding and for hunting (Bottalico *et al*, 2015). The presence of a noise source in an area implies a decrease in bird density. The decrease happens because birds tend to leave the areas where their signals are masked by the noise source (Bottalico et al, 2015).

In the context of the study area, it is important to note however that the Smelter provides a significant source of noise to the ambient noise levels in the area. The baseline is thus altered from a natural setting, especially for parts of certain of the development sites that are located

closest to the Smelter (in the context of the Phase 2 development Sites 3B & 5B). Nonetheless, construction activities, in particular the above-mentioned high noise generating activities would be likely to lead to the displacement and disturbance of birds, even in areas not being developed that are located adjacent to the development site. This is a temporary impact that will last for the duration of the construction in that particular development site/s but may lead to the temporary displacement of birds and the abandonment of breeding efforts. This would be particularly significant for larger species of birds which occur in lower densities due to the occurrence of large territories. The presence of a suspected Wahlberg's Eagle nest has been discussed in Section 5.5.1. The undertaking of construction when such species are not breeding is important. The majority of bird species breed in the summer months, and accordingly it is thus recommended that construction activities, in particular earth moving, rock removal and vegetation clearing occur in the winter months when most bird species are not breeding and there is a lower number and species diversity on the site due to the absence of migratory species.

5.5 Species-specific Impacts – priority species

None of the species identified as priority species in the Scoping-phase avifaunal assessment were recorded in the study area, with the exception of the Lanner Falcon which was recorded on numerous occasions on certain of the development site in both the Phase 1 avifaunal assessment Scoping and EIA-phase field visits. There were a number of Lanner Falcon sightings, mostly in the eastern part of the study area, close to the town of Steelpoort and its surrounds and in the vicinity of the Steelpoort River riparian zone. Sightings occurred during both the Scoping-phase (April 2021) and EIA-phase site visits (September and October 2021). This suggests that at least one bird is resident in the area. The species appears to favour the Steelpoort riparian zone (where there is a high density of prey species) and the vacant areas surrounding the built up areas of Steelpoort, being associated with the various power lines to hunt its avian prey. The proposed transformation of habitat on the Phase 1 and 2 development footprints (especially relating to the Sites 2 and 5 for both Phases) could lessen the available area in which the species often hunts. The development of the Phase 2 solar development would exacerbate the Phase 1 impacts identified, but the Phase 1 impacts were identified to be able to be mitigated by the non-development of the Steelpoort riparian corridor in which the species' arguably most productive hunting area would remain undisturbed. Additionally the Phase 1 Site 1 site is now not proposed for development and the Phase 1 avifaunal assessment assessed the Phase 1 development to be associated with a low level of impact on this species. The relatively small overall area of the transformation of the Phase 2 sites

would be unlikely to elevate the intensity and overall significance of the development's likely impact on this species.

The Verreaux's Eagle was recorded out of the study area, but in sufficiently close proximity to suggest that a resident pair(s) are likely to range into the study area. Birds ranging over the development site are highly unlikely to hunt over the development sites as their primary prey (Rock Hyraxes – *Procavia capensis*) are not present on the development sites. This species may hunt other prey such as goats, but no goats are present on any of the development sites. The likelihood of Verreaux's Eagles occurring in the immediate vicinity of the Phase 2 development sites and interacting with the proposed infrastructure is thus deemed to be very low.

Of the other priority species, all were likely to be very occasional visitors to the site, in many cases ranging high above the sites, or very unlikely to visit the study area due to absence of suitable habitat or high human presence in the area. The likelihood of the Phase 2 development impacting the priority species (other than the Lanner Falcon) has thus been assessed to be very low.

5.5.1 Wahlberg's Eagle Breeding Impacts

A Wahlberg's Eagle nest site was located in close proximity to the southern part of the Phase 1 Site 4 along the non-perennial drainage line that drains from the south. Nesting at the site was confirmed by monitoring of the nest undertaken during late 2022 (STS, 2023). The potential significance of the Phase 1 development-related impacts on the nest site examined the overall conservation status context of the species. The species is not listed as threatened in the latest (2015) assessment of Red Data bird species in South Africa, Lesotho and Swaziland (Taylor *et al*. 2015). The species is also not listed in the Eskom Red Data Book (Taylor *et al*, 2015) in any of the appendices as a special interest species or as a previously assessed species or an additional species that requires monitoring. The species text in Roberts states that certain regional populations are decreasing however, and notes that in north-eastern South Africa an approximate 40% population decrease was observed over 10 years. Globally the species is listed as Least Concern. This species has an extremely large range, and hence does not approach the thresholds for Vulnerable under the range size criterion (extent of occurrence <20,000 km^2 combined with a declining or fluctuating range size, habitat extent/quality, or population size and a small number of locations or severe fragmentation). The population trend appears to be stable, and hence the species does not approach the thresholds for Vulnerable under the population trend criterion (>30% decline

over ten years or three generations). The population size is very large, and hence does not approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure) (Birdlife International, 2021). Being one of the apex avian predators in the study area does however make this a significant species in a local context and the impacts on the development on a potentially breeding pair needs to be assessed.

The Phase 1 avifaunal assessment identified that the construction of the solar arrays in particular could cause breeding at the nest site to be abandoned due to the high level of noise associated with construction activities, especially vegetation clearing and site levelling and the erection of the arrays. The sensitivity of this species to disturbance in the vicinity of the nest site is unknown, however it must be assumed that as eagles, the pair would be sensitive to such disturbance to a certain degree, although during one of the monitoring visits to the nest site in late 2022, active construction and earthworks which were generating large volumes of dust were occurring at the site of the Samancor HH waste disposal dam to the north-east of the nest site. The context of disturbance and transformation around the nest site was also considered – the nest is not located in an entirely undisturbed area – in addition to the presence of the Smelter which adds a constant level of ambient noise to this area, the nest is located in relatively close proximity to a truck depot (330m to the boundary of the depot) to the north-west, and around 770m to the northern HH waste disposal dam. The area is thus characterised by a relatively high degree of human activity, noise and existing habitat transformation, and in this context the eagle pair thus can be assumed to have a reasonable degree of tolerance to disturbance in the context of the surrounding activities.

The Phase 1 avifaunal assessment concluded that the transformation of woodland on the Phase 1 Sites 3 and 4 would lessen the area available for foraging of the pair but may not cause breeding to be abandoned if noisy activities do not occur at the arrays during operation. In the context of the Phase 2 development, the transformation of vegetation associated with Sites 4B and 3B/C would cumulatively add to the loss of woodland and hunting territory in the vicinity of the nest site.

Operation of PV solar arrays is not typically associated with high levels of noise, and the presence of solar arrays on the Phase 1 Site 4 and the Phase 2 Site 4B would arguably not deleteriously affect breeding, provided the riparian zone of the drainage line in which the nest is located remains an area in which human activity is restricted. Along with other raptors that frequent the study area, the loss of foraging habitat may affect the occurrence of this species

in the study area, although suitable habitat would remain in the surrounding area. The closest point of the Phase 2 Site 4B solar arrays to the nest is 600m (refer to Figure 15), and Site 4B is not located within the buffer area of the nest which was recommended for exclusion of construction of arrays during the Wahlberg's Eagle nesting period. Mitigation measures in this regard are specified in Tables 10 and 11 below.

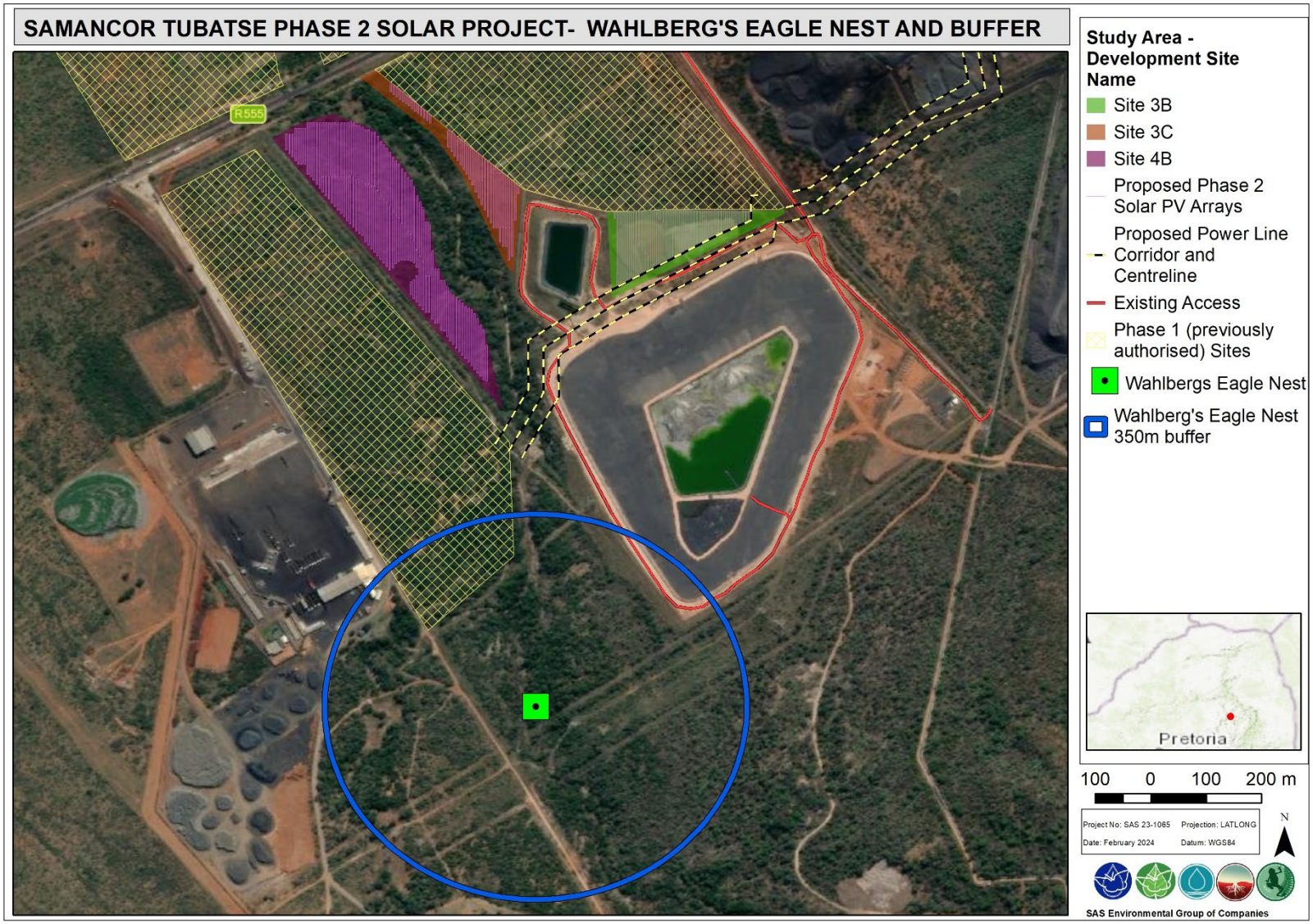


Figure 15 – Location of the Wahlberg's Eagle nest and associated 350m buffer in relation to the Phase 2 development sites.

5.6 Impacts associated with Power Lines

Power lines have been dealt with separately as they constitute a significant component of the proposed development and can be associated with significant impacts on birds. Power lines were assessed as part of the Phase 1 EIA and avifaunal assessment, but a similar set of alignments has been presented for assessment as part of the Phase 2 scope of works (refer to Figures 1 and 2). Power lines are large structures and can have significant negative, as well as some positive impacts on birds. The primary power line-related impacts on birds are listed below:

- Electrocutions, leading to bird mortalities;
- Collisions with overhead wires, leading to bird mortalities;
- Habitat Destruction;
- Disturbance;
- New nesting and roosting opportunities (positive impact); and
- Impacts by birds on the electrical infrastructure (streamers causing shorts on the line).

The power lines are proposed to link to the two existing substations located to the south of the Smelter (Figures 1 and 2). As the substations are located in very close proximity to the Smelter and its associated operations, much of the length of the power line alignments would run in close proximity to the area in which the Smelter operations take place. This area is highly transformed with the presence of the smelter and slag dumps and due to the absence of any vegetation along with the high disturbance factor associated with the plant and its operations has a very low degree of bird species occurrence. Such alignments include the portion of the power line corridors from Site 2B that are located between the Smelter and the truck loading area, and the portion of the Site 3, 4 & 5 power line that is located between the Smelter and the access road to the HH Waste Disposal Facility and Leachate Pond. These sections of the power lines pose a very low potential for bird-related, and collision impacts due to the transformation and disturbance factors.

The proposed power line alignment crosses the drainage line between Site 3B/C and 4B as well as the drainage line and a tributary located between the Site 2B development parcels (i.e. in two locations). It is in these riparian corridors where the greatest potential risk to avifauna related to the proposed power line has been identified. The power line alignment portion that links to the Phase 1 Site 4 is proposed to cross the drainage line close to the existing HH waste dam. No existing power lines or other linear infrastructure are located at this location and a certain area of woody vegetation clearing would thus need to occur. The power line

would be a new feature to which any birds flying along the drainage line would not be accustomed, thus presenting a potential collision risk. Of the two power line crossings of the drainage lines at Site 2B, one is located immediately parallel to the existing Eskom power line servitudes, and a shorter crossing is proposed to cross the tributary to the south. The location of the primary crossing adjacent to the existing power line servitudes is a mitigating factor as birds will be aware of the power lines in this location. These crossings would also potentially be located with loss of riparian and adjacent woodland habitat and collision risks and mitigation measures have been specified in the impact tables in Tables 10 and 11 below.

5.7 Impact Assessment Tables

Table 10: Impact Rating Matrix Table for Habitat Loss and Disturbance of Avifauna associated with the development of solar arrays and associated infrastructure (as applicable to general avifaunal assemblage and SCC)

Phase	Potential Aspect and/or Impact	Mitigation	Scale (S)	Duration (D)	Magnitude (M)	Probability (P)	Significance Points (M+D+S)xP	
Construction	**Aspect:** Construction of the solar power facility (including all associated infrastructure) utilising the current layout; Construction of the proposed power lines. **Impact:** Direct transformative impact on natural habitat related to construction of solar panel arrays cable trenching and internal access roads, as well as other construction-related activities including uncontrolled movement of vehicles and other construction machinery. The impact would relate to the loss of habitat for the current bird species inhabiting / visiting the development site and surrounding area, in particular in the context of priority species / SCC.	**Without**	2	4	6	5	60	**Moderate Significance**
		With	1	4	6	5	55	**Moderate Significance**
		Key mitigation measures: ➢ Clearing of vegetation to be completed in a phased manner. ➢ No unauthorised fires are to be allowed on the site. ➢ During the establishment (construction) of the power line servitudes in areas of residual natural vegetation, especially within riparian corridors, clearing of vegetation must be limited to what is technically required and woody vegetation within drainage lines that is below the minimum clearance distance to the lines must not be indiscriminately felled. ➢ With the exception of Site 4C (and Phase 1 Site 4) – see below in which a narrower construction window in the winter is specified - the bulk of construction should be timed to occur in the drier winter months when most bird species are not breeding, and when many granivores tend to become nomadic in nature and less territorial. ➢ Construction activities must not encroach beyond the development footprint. ➢ Construction staff must not enter any areas of residual woodland or other natural habitat outside of the development footprint. ➢ In the context of construction phase environmental management, edge effect control must be implemented to ensure no further degradation and potential loss of avifaunal habitat outside of the proposed project footprint area. An on-site Environmental Control Officer (ECO) must monitor and mitigate any edge effects throughout the construction phase. Special attention must also be paid to potential increase and spread of AIPs. ➢ Existing roads must as far as possible be used for access purposes to the construction sites. ➢ An AIP Management/Control Plan must be implemented by a qualified professional. ➢ No collection or hunting of any fauna species is to be allowed by personnel during the construction phase, especially with regards to avifaunal SCC (if encountered and not part of a rescue/relocation plan). ➢ No commencement of construction (especially vegetation clearing and bulk earthworks) for the solar power site on Phase 1 Site 4 and Phase 2 Site 4C and its surrounds must occur within the designated 350m buffer around the Wahlberg's Eagle						

Phase	Potential Aspect and/or Impact	Mitigation	Scale (S)	Duration (D)	Magnitude (M)	Probability (P)	Significance Points (M+D+S)xP	
		nest until such time as the Wahlberg's Eagles have left the area on their northward migration in April and before their arrival in August, as stipulated in the EA Amendment for the Phase 1 Solar Development. ➢ It is also important that vehicular access into the buffer area along the new access road to Site 4 continue to be restricted to authorised personnel (e.g. security) only and that no general construction personnel / construction vehicle access into the buffer area be permitted. Access to the parts of Site 4 and 4C outside of the buffer must be along the newly created access road, and no access routes must be created from the areas to the south and east of Site 4 / 4C.						
Operation	**Aspect:** Operation of the solar power facility utilising the current layout. **Impact:** Permanent transformative impact on natural vegetation that would lead to the relate to the loss of habitat for the current bird species inhabiting / visiting the development site and surrounding area.	**Without**	1	4	6	5	55	**Moderate Significance**
		With	1	4	6	5	55	**Moderate Significance**
		Key mitigation measures: ➢ Retention of residual natural vegetation on the parts of the Phase 2 (and Phase 1) development sites that do not fall within the solar array or other infrastructure footprint. ➢ Active protection of sensitive habitats through fencing off from public access – in the context of Phase 2 this would include the riparian zones of the drainage lines located between sites 3B/C and 4C and drainage lines located between the Site 2B development compartments and the fringing non-development buffer areas. ➢ It is recommended that low vegetation be retained or allowed to become re-established under the arrays to protect the underlying soil from erosion and to aid in the control of stormwater management to prevent edge effects on residual areas of avifaunal habitat adjacent to the development site boundaries from materialising. Such retention of a low / grassy vegetation layer will also provide some form of residual, albeit highly modified habitat for avifauna, providing foraging opportunities for a limited array of mainly granivorous species. It is recognised however that such vegetation retention in the operational phase of the development may be deemed to be technically non-feasible. ➢ Power line servitudes must not be cleared of all woody vegetation and only woody vegetation infringing on the required clearance area around the lines must be felled. ➢ Ongoing alien and invasive vegetation monitoring and control should take place for a period after the end of construction; ➢ The Alien and Invasive Plant Management and Control Plan designed and implemented as part of the operational phase must include for control and eradication for a period of at least 5 years after the end of construction. ➢ Maintenance of the integrity of the 350m Wahlberg's Eagle nest buffer throughout the lifespan of the proposed development and the restriction of access (other than security personnel access) into this buffer area.						

Table 11: Impact Rating Matrix Table for Power line related and collision-related impacts (as applicable to general avifaunal assemblage and SCC)

Phase	Potential Aspect and/or Impact	Mitigation	Scale (S)	Duration (D)	Magnitude (M)	Probability (P)	Significance Points (M+D+S)xP	
Operation	**Aspect:** Development (operation) of the solar PV arrays utilising the current layout, as well as the development of power lines. **Impact:** Bird fatalities due to collisions with overhead power lines or with PV panels.	**Without**	2	4	8	3	42	**Moderate Significance**
		With	2	4	6	2	24	**Low Significance**
		Key mitigation measures: ➢ Monitoring of the solar arrays for bird fatalities must occur at regular intervals during the operational phase of the development, in line with the BLSA Birds and Solar Energy Guideline. ➢ Anti roosing spikes / diverters should be fitted to the solar panels, if required. ➢ Placing of bird flight diverters along the spans of the power line crossing the drainage lines, or located within 100m each side of the drainage line riparian zones. ➢ Operational lighting at the solar facility must be limited to low level security lighting and no floodlighting must be utilised.					

5.8 Residual Impacts

Even with extensive mitigation, residual impacts on the receiving avifaunal ecological environment are deemed likely. The following points highlight the key latent impacts that have been identified ***at a local scale***:

- Reduction in potential avifaunal presence and in the surrounding habitats through edge effects, and potential collisions;
- Loss of and altered avifaunal species diversity;
- Reduction of avifaunal abundance; and
- Disturbed areas are highly unlikely to be rehabilitated to baseline levels of ecological functioning and loss of avifaunal habitat and species diversity may be permanent if mitigation measures are not implemented.

5.9 Cumulative Impacts

The development, in particular of solar arrays that will result in large-scale transformation of residual natural vegetation and habitats forms part of a wider trend of transformation of natural habitat in the wider area. The wider area is characterised by mining operations, human settlements and undeveloped land that is used for livestock grazing. The Phase 1 Tubatse Solar development has been authorised and as such transformation of large areas of residual woodland habitat has been permitted to occur in the near future. As such the Phase 2 development, in particular the transformation of untransformed woodland habitat associated with the Phase 2 solar arrays is considered a cumulative impact on avifauna in the wider area at a local level. Both development phases viewed together would also constitute a cumulative impact through which increasing loss of habitat and resultant loss on avian diversity and abundance is occurring in the area.

In a cumulative impact context specific to solar power developments, the approval, or application for solar developments within a 30km radius of the development site. As indicated in Figure 16 below, no approved or proposed solar developments are located within a 30km radius, thus the development will not be responsible for a cumulative impact in this context.

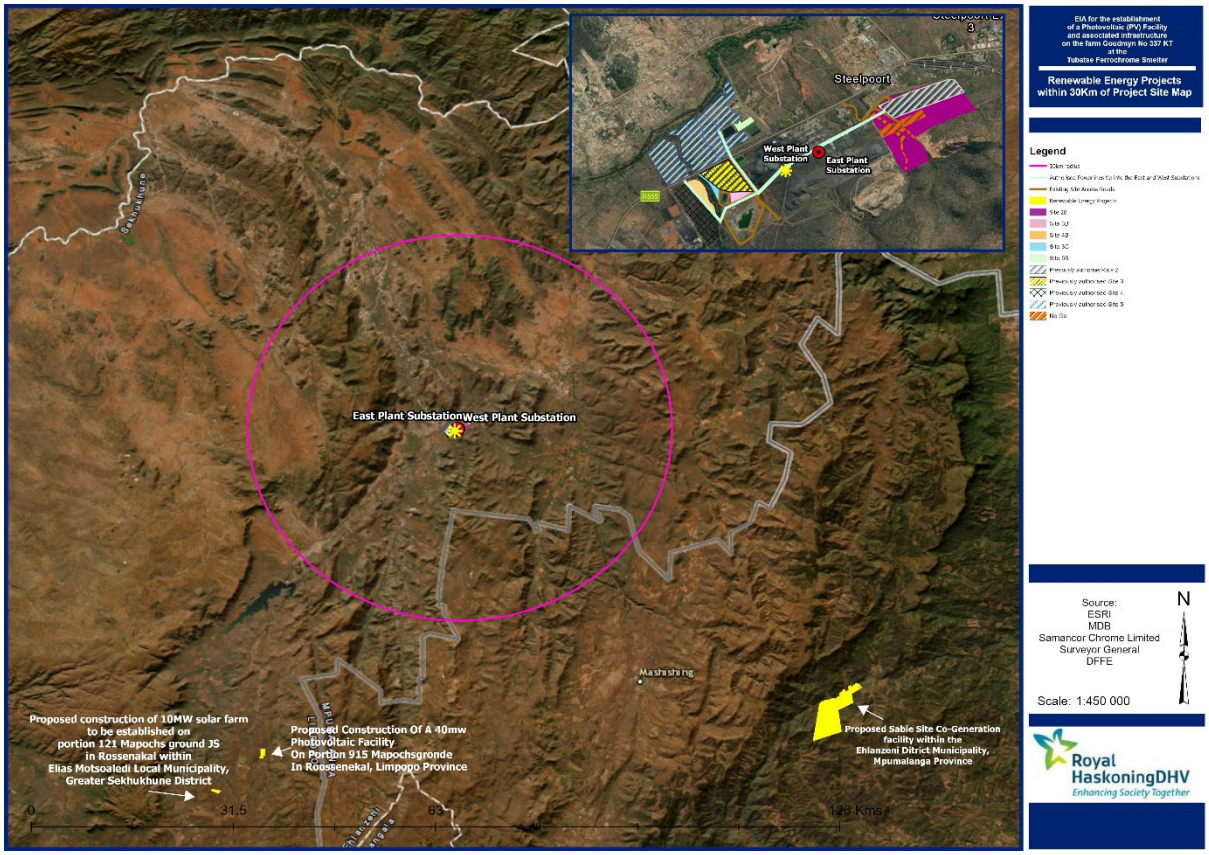


Figure 16: Map showing the development site in relation to other solar power projects in a 30km radius

5.10 Recommended Pre-Construction and Operational Avifaunal Monitoring Regime

The development of solar power generation facilities is a relatively recent phenomenon in South Africa, and such facilities have only been in place for the last decade, concentrated in certain parts of the country. The localised impacts of such facilities are still poorly understood.

As such it is advised that monitoring be conducted in the pre-construction and post construction phases of the project as detailed below. It should be noted that as the Phase 1 and Phase 2 projects will in effect likely be developed as one project the below monitoring regime is applicable to both Phase 1 and Phase 2 as one effective development:

- Monitoring of the Wahlberg's Eagle nest site must continue (as part of the general recommended pre-, during- and post-construction (operational) avifaunal monitoring on the development sites and wider study area) on a yearly basis in the period prior to

the start of construction, through the construction phase, and for five (5) subsequent years after the end of construction.

- Assessment of habitat loss on bird species richness and relative abundance must be undertaken through the application of the same data collection and observation techniques as were applied in the EIAR-phase field assessments. Surveys conducted twice a year in the first two years of operation must be conducted as a minimum.
- Quantifying bird mortalities – Regular searches for carcasses of any bird fatalities associated with the operational solar facility must be undertaken, by an avifaunal specialist or a suitably qualified ECO. Search focus must be directed at the areas / components of the development highlighted as high risk for collisions, including all new power line alignments, the arrays in the vicinity of the existing water bodies on the site, and the arrays located closest to the Steelpoort riparian corridor. The methods detailed in the BLSA Guidelines must be applied. .

6 CONCLUSION AND RECOMMENDATIONS

Scientific Terrestrial Services (STS) was appointed to conduct an Avifaunal Assessment as part of the Environmental Assessment and Authorisation process for the proposed Tubatse Solar Phase 2 development at the Tubatse Ferrochrome Smelter near Steelpoort, Limpopo Province.

Areas of residual natural habitat in the wider study area have been identified, of which certain habitat units, in particular freshwater habitat and residual non-impacted woodland vegetation have been designated as sensitive habitat from an avifaunal perspective. A number of priority species were identified as part of the characterisation of the avifaunal assemblage of the study area and the assessment of impacts of the proposed development on avifauna.

The impact of greatest significance that is anticipated to occur is the alteration of areas of natural habitat in the development area footprint, reducing avian abundance and diversity within the study area and potentially impacting the priority species, most of which are avifaunal SCC. Further impacts that may result from the proposed project are as a result of potential collisions with the proposed PV facilities.

On its own the Phase 2 development would impact relatively small land parcels and areas of residual natural habitat, however the Phase 2 development needs to be viewed in the context of the larger Phase 1 development with the Phase 2 development sites being located

immediately adjacent to Phase 1 development sites (which have been authorised to be developed). The Phase 2 development would thus constitute a cumulative impact in the context of the Phase 1 development. In certain areas , the Phase 2 development sites would result in further transformation of areas earmarked in the Phase 1 avifaunal study as areas of residual natural habitat that should be kept free of development. Despite this cumulative impact, the riparian corridors of drainage lines in the vicinity of the Phase 2 development sites and a 20m development exclusion buffer have been left as non-developable areas. A set of mitigation measures have been stipulated to reduce the impacts of habitat loss in the development footprints.

The solar arrays and proposed power lines are potential sources of collision impacts. It is anticipated that should the proposed mitigation measures be implemented the risk of collisions can be drastically reduced. Due to the low potential of occurrence of SCCs in the study, impacts to these priority species are not anticipated to be regionally significant.

It is important that all essential mitigation measures and recommendations presented in this report should be adhered to as to ensure the ecology within the proposed construction areas as well as surrounding zone of influence is protected or adequately rehabilitated in order to minimise the deviations from the Present Ecological State as much as possible.

Based on the findings of the avifaunal assessment it is the opinion of the ecologists that from an avifaunal perspective, the proposed components of the development can be considered acceptable and can be granted environmental authorisation.

REFERENCES

Bourlière, F. & Hadley, M. , 1983. Present-day savannas – an overview. In Bourlière, F. (Ed.) Ecosystems of the World, 13: Tropical Savannas, 1-17. Amsterdam. Elsevier.

Fry, C.H., 1983. Birds in savanna ecosystems. In Bourlière, F. (Ed.) Ecosystems of the World, 13: Tropical Savannas, 337-357. Amsterdam. Elsevier.

IBA: Marnewick M.D., Retief E.F., Theron N.T., Wright D.R. & Anderson T.A. (2015). Important Bird and Biodiversity Areas of South Africa. Johannesburg: BirdLife South Africa. Online available: http://bgis.sanbi.org/IBA/project.asp

IUCN (2016). http://www.iucnredlist.org/.

Jenkins. A.R., Ralston-Paton. S and Smit-Robinson. H, 2017. Birds & Solar Energy – Best Practice Guidelines - Guidelines for assessing and monitoring the impact of solar power generating facilities on birds in southern Africa. BirdLife South Africa. Johannesburg

Maclean, G.L., 1990. Ornithology for Africa. Pietermaritzburg: University of Natal Press

Mucina, L. & Rutherford, M.C. (Eds). (2006). *The Vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria, RSA.

SABAP2, 2016. *The South Africa Bird Atlas Project 2 database.* http://sabap2.adu.org.za/index.php

Scientific Terrestrial Services, 2023. Monitoring Assessment of a Wahlberg's Eagle (Hieraaetus Wahlbergi) nest close to the site of the proposed Tubatse 100MW Solar Power Generation Facility near Steelpoort, Limpopo Province – Finding of the 2nd Monitoring Site Assessment.

Taylor M.R., Peacock F. Wanless R.W. (eds) (2015). The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Johannesburg, South Africa.

Walston LJ, Rollins KE, Kirk E, LaGory KE, Smith KP and Meyers SP. 2016. A preliminary assessment of avian mortality at utility-scale solar energy facilities in the United States. Renewable Energy 92:405-414

APPENDIX A: Legislative Requirements

NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998

The National Environmental Management Act (NEMA; Act 107 of 1998) and the associated Environmental Impact Assessment (EIA) Regulations (GN R982 of 2014) and well as listing notices 1, 2 and 3 (GN R983, R984 and R985 of 2014), state that prior to any development taking place which triggers any activity as listed within the abovementioned regulations, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment process or the EIA process depending on the nature of the activity and scale of the impact.

NATIONAL ENVIRONMENTAL MANAGEMENT BIODIVERSITY ACT (NEMBA, ACT NO. 10 OF 2004)

The objectives of this act are (within the framework of NEMA) to provide for:

- The management and conservation of biological diversity within the Republic of South Africa and of the components of such diversity;
- The use of indigenous biological resources in a sustainable manner;
- The fair and equitable sharing among stakeholders of the benefits arising from bio prospecting involving indigenous biological resources;
- To give effect to ratify international agreements relating to biodiversity which are binding to the Republic;
- To provide for cooperative governance in biodiversity management and conservation; and
- To provide for a South African National Biodiversity Institute to assist in achieving the objectives of this Act.

This act alludes to the fact that management of biodiversity must take place to ensure that the biodiversity of the surrounding areas is not negatively impacted upon, by any activity being undertaken, in order to ensure the fair and equitable sharing among stakeholders of the benefits arising from indigenous biological resources.
Furthermore, a person may not carry out a restricted activity involving either:

a) A specimen of a listed threatened or protected species;
b) Specimens of an alien species; or
c) A specimen of a listed invasive species without a permit.

APPENDIX B: Impact Assessment Methodology

In order for the EAP to allow for sufficient consideration of all environmental impacts, impacts were assessed using a common, defensible method of assessing significance that will enable comparisons to be made between risks/impacts and will enable authorities, stakeholders and the client to understand the process and rationale upon which risks/impacts have been assessed. The method to be used for assessing risks/impacts is outlined in the sections below.

The first stage of the risk/impact assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of receptors and resources, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. The definitions used in the impact assessment are presented below.

- An **activity** is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructure that is possessed by an organisation;
- An **environmental aspect** is an 'element of an organizations activities, products and services which can interact with the environment'[10]. The interaction of an aspect with the environment may result in an impact;
- **Environmental risks/impacts** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is;
- **Receptors** can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as wetlands, flora and riverine systems;
    - **Resources** include components of the biophysical environment; **Extent** refers to the spatial extent, i.e. the geographical scale of the impact;
    - **Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.
    - **Intensity** refers to the degree to which the impact affects the receiving environment, as well as natural, cultural and social functions and processes.
    - **Probability** of occurrence is the likelihood that any given impact will occur.
    - **Significance** is determined by the sum of the ratings assigned to Extent, Duration and Intensity and Probability **(Significance = E + I + D + P)**.

The significance of the impact is then assessed by rating each variable numerically **(Significance = E + I + D + P)** according to the defined criteria (refer to the table below). The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The values for significance of the impact are then read off a significance rating matrix and are used to determine whether mitigation is necessary[11].

The model outcome of the impacts was then assessed in terms of impact certainty and consideration of available information. The Precautionary Principle is applied in line with South Africa's National Environmental Management Act (No. 108 of 1997) in instances of uncertainty or lack of information, by increasing assigned ratings or adjusting final model outcomes. In certain instances, where a variable or outcome requires rational adjustment due to model limitations, the model outcomes have been adjusted.

Table F1: Descriptive criteria for the rating of impacts and significance of impacts (Royal HaskoningDHV DHV Pty Ltd, 2018).

Descriptive criteria

[10] The definition has been aligned with that used in the ISO 14001 Standard.

[11] Some risks/impacts that have low significance will however still require mitigation

Nature	Category	
Extent (E)	Categories 1 – 4	
	1	Footprint / site
	2	Local (within a radius of 2 kms of site)
	3	Regional
	4	National
Duration (D)	Categories 1 – 4	
	1	Short (less than five years)
	2	Medium term (5-15 years)
	3	Long term (15-30 years)
	4	Permanent
Intensity (I)	Categories 1 – 4	
	1	Low
	2	Moderate
	3	High
	4	Very High
Probability (P)	Categories 1 – 4	
	1	Improbable
	2	Probable
	3	Highly Probable
	4	Definite
IMPACT : Cumulative		
Extent (E)		
Duration (D)		
Intensity (I)		
Probability (P)		
Significance	**Significance = E + D + I + P**	
	Minimum value of 4, maximum of 16	
	Status determines if positive / negative	
	Neg (13 - 16 points) NEGATIVE VERY HIGH	Permanent and important impacts. The design of the site may be affected. Intensive remediation is needed during construction and/or operational phases. Any activity which results in a "very high impact" is likely to be a fatal flaw.
	Neg (10 - 12 points) NEGATIVE HIGH	These are impacts which individually or combined pose a significantly high negative risk to the environment. These impacts pose a high risk to the quality of the receiving environment. The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment.
	Neg (7 - 9 points) NEGATIVE MODERATE	These are impacts which individually or combined pose a moderate negative risk to the quality of health of the receiving environment. These systems would not generally require immediate action but the deficiencies should be rectified to avoid future problems and associated cost to rectify once in HIGH risk. Aesthetically and/or physically non-compliance can be expected over a medium term. In this case the impact is medium term, moderate in extent, mildly intense in its effect and probable. Mitigation is possible with additional design and construction inputs.

	Neg (4 - 6 points) **NEGATIVE LOW**	These are impacts which individually or combined pose a deleterious or adverse impact and low negative risk to the quality of the receiving environment, and may lead to potential health, safety and environmental concerns. Aesthetically and/or physical non-compliance can be expected for short periods. In this case the impact is short term, local in extent, not intense in its effect and may not be likely to occur. A low impact has no permanent impact of significance. Mitigation measures are feasible and are readily instituted as part of a standing design, construction or operating procedure.
	0 **Neutral**	Impact is neither beneficial nor adverse. These are impacts which cannot be classified as either positive or negative or classified as null and void in the case of a negative impact being adequately mitigated to a state where it no longer renders a risk.
	Pos (4 - 6 points) **POSITIVE LOW**	These are impacts which individually or combined pose a low positive impact to the quality of the receiving environment and health, and may lead to potential health, safety and environmental benefits. In this case the impact is short term, local in extent, not intense in its effect and may not be likely to occur. A low impact has no permanent impact of significance.
	Pos (7 - 9 points) **POSITIVE MODERATE**	These are impacts which individually or combined pose a moderate positive effect to the quality of health of the receiving environment. In this case the impact is medium term, moderate in extent, mildly intense in its effect and probable.
	Pos (10 - 12 points) **POSITIVE HIGH**	These are impacts which individually or combined pose a significantly high positive impact on the environment. These impacts pose a high benefit to the quality of the receiving environment and health, and may lead to potential health, safety and environmental benefits. In this case the impact is longer term, greater in extent, intense in its effect and highly likely to occur. The effects of the impact may affect the broader environment.
	Pos (13 - 16 points) **POSITIVE VERY HIGH**	These are permanent and important beneficial impacts which may arise. Individually or combined, these pose a significantly high positive impact on the environment. These impacts pose a very high benefit to the quality of the receiving environment and health, and may lead to potential health, safety and environmental benefits. In this case the impact is long term, greater in extent, intense in its effect and highly likely or definite to occur. The effects of the impact may affect the broader environment.

.

APPENDIX C: Study Area Bird Species List

Table D1: Avifaunal species list

Count	SABAP Ref	Common Name	Common Name	*Genus*	*Species*	Endemic	Threat Status	Site Record	Transect and FP Monitoring Record	SABAP 2 Record (Site Pentads)	Additional SABAP 2 Record (surrounding pentads)	Priority Species
1	6	Grebe	Little	*Tachybaptus*	*ruficollis*			X		X		
2	47	Cormorant	White-breasted	*Phalacrocorax*	*lucidus*			X		X		
3	50	Cormorant	Reed	*Microcarbo*	*africanus*			X	X	X		
4	52	Darter	African	*Anhinga*	*rufa*			X		X		
5	54	Heron	Grey	*Ardea*	*cinerea*			X		X		
6	55	Heron	Black-headed	*Ardea*	*melanocephala*			X		X		
7	57	Heron	Purple	*Ardea*	*purpurea*						X	
8	59	Egret	Little	*Egretta*	*garzetta*						X	
9	61	Egret	Western Cattle	*Bubulcus*	*ibis*			X		X		
10	62	Heron	Squacco	*Ardeola*	*ralloides*						X	
11	63	Heron	Striated (Green-backed)	*Butorides*	*striata*			X		X		
12	69	Night Heron	Black-crowned	*Nycticorax*	*nycticorax*			X		X		
13	72	Hamerkop	Hamerkop	*Scopus*	*umbretta*			X		X		
14	78	Stork	Abdim's	*Ciconia*	*abdimii*		**NT**				X	**X**
15	79	Stork	Black	*Ciconia*	*nigra*		**VU**					**X**
16	80	Stork	White	*Ciconia*	*ciconia*					X	X	
17	82	Ibis	Southern Bald	*Geronticus*	*calvus*	**E**	**VU**				X	**X**
18	83	Ibis	Glossy	*Plegadis*	*falcinellus*			X	X	X		
19	84	Ibis	Hadeda	*Bostrychia*	*hagedash*			X	X	X		
20	88	Goose	Spur-winged	*Plectropterus*	*gambensis*					X	X	

Count	SABAP Ref	Common Name	Common Name	*Genus*	*Species*	Endemic	Threat Status	Site Record	Transect and FP Monitoring Record	SABAP 2 Record (Site Pentads)	Additional SABAP 2 Record (surrounding pentads)	Priority Species
21	89	Goose	Egyptian	*Alopochen*	*aegyptiacus*			X	X	X		
22	91	Duck	Knob-billed	*Sarkidiornis*	*melanotos*						X	
23	95	Duck	African Black	*Anas*	*sparsa*			X		X		
24	96	Duck	Yellow-billed	*Anas*	*undulata*			X		X		
25	97	Teal	Red-billed	*Anas*	*erythrorhyncha*					X		
26	98	Teal	Cape	*Anas*	*capensis*			X		X		
27	100	Duck	White-faced	*Dendrocygna*	*viduata*						X	
28	105	Secretarybird	Secretarybird	*Saggitarius*	*serpentarius*		**VU**					**X**
29	106	Vulture	Cape	*Gyps*	*coprotheres*	**E**	**EN**				X	**X**
30	107	Vulture	White-backed	*Gyps*	*africanus*		**EN**			X	X	**X**
31	113	Falcon	Peregrine	*Falco*	*peregrinus*					X		**X**
32	114	Falcon	Lanner	*Falco*	*biarmicus*		**VU**	X	X	X		**X**
33	119	Falcon	Amur	*Falco*	*amurensis*						X	
34	123	Kestrel	Rock	*Falco*	*rupicolus*			X	X	X		
35	129	Kite	Yellow-billed	*Milvus*	*aegyptius*					X		
36	130	Kite	Black-winged	*Elanus*	*caeruleus*			X	X	X		
37	133	Eagle	Verreaux's	*Aquila*	*verreauxii*		**VU**				X	**X**
38	134	Eagle	Tawny	*Aquila*	*rapax*		**EN**				X	**X**
39	137	Eagle	Wahlberg's	*Hireaaetus*	*wahlbergi*			X	X	X	X	
40	138	Eagle	Long-crested	*Lophaetus*	*occipitalis*					X		
41	142	Eagle	Martial	*Polemaetus*	*bellicosus*		**EN**					**X**
42	144	Buzzard	Lizard	*Kaupifalco*	*monogrammicus*						X	
43	145	Snake-eagle	Brown	*Circaetus*	*cinereus*						X	
44	146	Snake-eagle	Black-chested	*Circaetus*	*pectoralis*			X	X	X		

Count	SABAP Ref	Common Name	Common Name	*Genus*	*Species*	Endemic	Threat Status	Site Record	Transect and FP Monitoring Record	SABAP 2 Record (Site Pentads)	Additional SABAP 2 Record (surrounding pentads)	Priority Species
45	149	Fish-eagle	African	*Haliaeetus*	*vocifer*			X	X	X		
46	152	Buzzard	Jackal	*Buteo*	*rufofuscus*	**E**					X	
47	154	Buzzard	Steppe	*Buteo*	*vulpinus*						X	
48	158	Sparrowhawk	Little	*Accipiter*	*minulus*			X	X	X		
49	160	Goshawk	African	*Accipiter*	*tachiro*					X		
50	171	Harrier-Hawk	African	*Polyboroides*	*typus*						X	
51	174	Francolin	Crested	*Dendroperdix*	*sephaena*			X	X	X		
52	177	Francolin	Shelley's	*Scleroptila*	*shelleyi*						X	
53	183	Spurfowl	Natal	*Pternistis*	*natalensis*	**NE**		X		X		
54	185	Spurfowl	Swainson's	*Pternistis*	*swainsonii*			X	X	X		
55	192	Guineafowl	Helmeted	*Numida*	*meleagris*			X	X	X		
56	196	Buttonquail	Kurrichane	*Turnix*	*sylvaticus*					X		
57	203	Crake	Black	*Zapornia*	*flavirostra*			X		X	X	
58	212	Coot	Red-knobbed	*Fulica*	*cristata*						X	
59	224	Korhaan	Red-crested	*Lophotis*	*ruficristata*	**NE**					X	
60	228	Jacana	African	*Actophilornis*	*africanus*						X	
61	238	Plover	Three-banded	*Charadrius*	*tricollaris*			X		X		
62	242	Lapwing	Crowned	*Vanellus*	*coronatus*			X		X		
63	245	Lapwing	Blacksmith	*Vanellus*	*armatus*			X	X	X		
64	247	Lapwing	African Wattled	*Vanellus*	*senegallus*			X	X	X		
65	258	Sandpiper	Common	*Actitis*	*hypoleucos*			X		X		
66	275	Thick-knee	Spotted	*Burhinus*	*capensis*			X	X	X		
67	310	Sandgrouse	Double-banded	*Pterocles*	*bicinctus*	**NE**		X	X	X	X	
68	311	Pigeon	Speckled	*Columba*	*guinea*			X	X	X		

Count	SABAP Ref	Common Name	Common Name	*Genus*	*Species*	Endemic	Threat Status	Site Record	Transect and FP Monitoring Record	SABAP 2 Record (Site Pentads)	Additional SABAP 2 Record (surrounding pentads)	Priority Species
69	314	Dove	Red-eyed	*Streptopelia*	*semitorquata*			X	X	X		
70	316	Turtle-dove	Cape	*Streptopelia*	*capicola*			X	X	X		
71	317	Dove	Laughing	*Streptopelia*	*senegalensis*			X	X	X		
72	318	Dove	Namaqua	*Oena*	*capensis*			X		X		
73	319	Dove	Tambourine	*Turtur*	*tympanistria*						X	
74	321	Wood-dove	Emerald-spotted	*Turtur*	*chalcospilos*			X	X	X		
75	323	Green-pigeon	African	*Treron*	*calvus*						X	
76	940	Dove	Rock	*Columba*	*livia*					X		
77	337	Turaco	Purple-crested	*Gallirex*	*porphyreolophus*			X		X		
78	339	Go-away-bird	Grey	*Crinifer*	*concolor*			X	X	X		
79	343	Cuckoo	Red-chested	*Cuculus*	*solitarius*					X		
80	344	Cuckoo	Black	*Cuculus*	*clamosus*						X	
81	347	Cuckoo	Levaillant's	*Clamator*	*levaillantii*						X	
82	348	Cuckoo	Jacobin	*Clamator*	*jacobinus*					X		
83	351	Cuckoo	Klaas's	*Chrysococcyx*	*klaas*			X	X	X		
84	352	Cuckoo	Diderick	*Chrysococcyx*	*caprius*					X		
85	359	Owl	Western Barn	*Tyto*	*alba*					X		
86	365	Owlett	Pearl-spotted	*Glaucidium*	*perlatum*					X	X	
87	368	Eagle-owl	Spotted	*Bubo*	*africanus*						X	
88	372	Nightjar	Rufous-cheeked	*Caprimulgus*	*rufigena*			X		X	X	
89	373	Nightjar	Fiery-necked	*Caprimulgus*	*pectoralis*			X		X		
90	380	Swift	African Black	*Apus*	*barbatus*					X		
91	383	Swift	White-rumped	*Apus*	*caffer*			X	X	X	X	
92	384	Swift	Horus	*Apus*	*horus*						X	

Count	SABAP Ref	Common Name	Common Name	*Genus*	*Species*	Endemic	Threat Status	Site Record	Transect and FP Monitoring Record	SABAP 2 Record (Site Pentads)	Additional SABAP 2 Record (surrounding pentads)	Priority Species
93	385	Swift	Little	*Apus*	*affinis*			X	X	X		
94	386	Swift	Alpine	*Tachymarptis*	*melba*			X	X	X	X	
95	387	Palm-swift	African	*Cypsiurus*	*parvus*			X	X	X		
96	390	Mousebird	Speckled	*Colius*	*striatus*			X	X	X		
97	392	Mousebird	Red-faced	*Urocolius*	*indicus*			X	X	X		
98	394	Kingfisher	Pied	*Ceryle*	*rudis*			X		X	X	
99	395	Kingfisher	Giant	*Megaceryle*	*maxima*			X		X		
100	396	Kingfisher	Half-collared	*Alcedo*	*semitorquata*		**NT**				X	
102	399	Kingfisher	Woodland	*Halcyon*	*senegalensis*						X	
103	401	Kingfisher	Grey-headed	*Halcyon*	*leucocephala*						X	
104	402	Kingfisher	Brown-hooded	*Halcyon*	*albiventris*			X	X	X		
105	403	Kingfisher	Striped	*Halcyon*	*chelicuti*						X	
106	404	Bee-eater	European	*Merops*	*apiaster*			X		X		
107	409	Bee-eater	White-fronted	*Merops*	*bullockoides*			X		X		
108	410	Bee-eater	Little	*Merops*	*pusillus*			X	X	X		
109	412	Roller	European	*Coracias*	*garrulus*		**NT**				X	
110	418	Hoopoe	African	*Upupa*	*africana*			X	X	X		
111	419	Wood Hoope	Green	*Phoeniculus*	*purpureus*			X		X		
112	421	Scimitarbill	Common	*Rhinopomastus*	*cyanomelas*			X	X	X		
113	424	Hornbill	African Grey	*Lophoceros*	*nasutus*			X	X	X		
114	426	Hornbill	Southern Yellow-billed	*Tockus*	*leucomelas*	**NE**		X	X	X		
115	4129	Hornbill	Southern Red-billed	*Tockus*	*rufirsotrs*					X		
116	431	Barbet	Black-collared	*Lybius*	*torquatus*			X	X	X		
117	432	Barbet	Acacia Pied	*Tricholaema*	*leucomelas*	**NE**		X	X	X		

Count	SABAP Ref	Common Name	Common Name	*Genus*	*Species*	Endemic	Threat Status	Site Record	Transect and FP Monitoring Record	SABAP 2 Record (Site Pentads)	Additional SABAP 2 Record (surrounding pentads)	Priority Species
118	437	Tinkerbird	Yellow-fronted	*Pogoniulus*	*chrysoconus*			X		X		
119	439	Barbet	Crested	*Trachyphonus*	*vaillantii*			X	X	X		
120	440	Honeyguide	Greater	*Indicator*	*indicator*			X		X		
121	441	Honeyguide	Scaly-throated	*Indicator*	*variegatus*						X	
122	442	Honeyguide	Lesser	*Indicator*	*minor*					X		
123	447	Woodpecker	Golden-tailed	*Campethera*	*abingoni*			X	X	X		
124	450	Woodpecker	Cardinal	*Dendropicos*	*fuscescens*			X	X	X		
125	451	Woodpecker	Bearded	*Chloropicos*	*namaquus*			X		X	X	
126	458	Lark	Rufous-naped	*Mirafra*	*africana*						X	
127	460	Lark	Sabota	*Calendulauda*	*sabota*	**NE**		X	X	X		
128	464	Lark	Dusky	*Pinarocorys*	*nigricans*			X		X		
129	484	Sparrowlark	Chestnut-backed	*Eremopterix*	*leucotis*					X	X	
130	493	Swallow	Barn	*Hirundo*	*rustica*			X		X		
131	495	Swallow	White-throated	*Hirundo*	*albogularis*			X		X	X	
132	496	Swallow	Wire-tailed	*Hirundo*	*smithii*			X	X	X		
133	498	Swallow	Pearl-breasted	*Hirundo*	*dimidiata*					X	X	
134	501	Swallow	Red-breasted	*Hirundo*	*semirufa*						X	
135	502	Swallow	Greater Striped	*Cecropis*	*cucullata*			X	X	X		
136	503	Swallow	Lesser Striped	*Cecropis*	*abyssinica*			X	X	X		
137	506	Martin	Rock	*Ptyonoprogne*	*fuligula*			X	X	X		
138	507	House-Martin	Common	*Delichon*	*urbicum*			X		X		
139	509	Martin	Brown-throated	*Riparia*	*paludicola*			X		X		
140	511	Saw-wing	Black	*Psalidoprocne*	*holomelaena*						X	
141	513	Cuckooshrike	Black	*Campephaga*	*flava*			X		X	X	

Count	SABAP Ref	Common Name	Common Name	*Genus*	*Species*	Endemic	Threat Status	Site Record	Transect and FP Monitoring Record	SABAP 2 Record (Site Pentads)	Additional SABAP 2 Record (surrounding pentads)	Priority Species
142	517	Drongo	Fork-tailed	*Dicrurus*	*adsimilis*			X	X	X		
143	521	Oriole	Black-headed	*Oriolus*	*larvatus*			X	X	X		
144	522	Crow	Pied	*Corvus*	*albus*			X	X	X		
145	523	Crow	Cape	*Corvus*	*capensis*					X		
146	524	Raven	White-necked	*Corvus*	*albicollis*					X	X	
147	527	Tit	Southern Black	*Melaniparus*	*niger*			X	X	X		
148	531	Penduline-tit	Cape	*Anthoscopus*	*minutus*	**NE**					X	
149	533	Babbler	Arrow-marked	*Turdoides*	*jardinei*			X	X	X		
150	545	Bulbul	Dark-capped	*Pycnonotus*	*tricolor*			X	X	X		
151	546	Brownbul	Terrestrial	*Phyllastrephus*	*terrestris*					X		
152	550	Greenbul	Yellow-bellied	*Chlorocichla*	*flaviventris*					X	X	
153	551	Greenbul	Sombre	*Andropadus*	*importunus*					X		
154	552	Thrush	Kurrichane	*Turdus*	*libonyanus*			X	X	X		
155	557	Thrush	Groundscraper	*Turdus*	*litsipsirupa*			X	X	X		
156	1105	Thrush	Olive	*Turdus*	*olivaceus*						X	
157	559	Rock-thrush	Cape	*Monticola*	*rupestris*	**E**					X	
158	568	Wheatear	Capped	*Oenanthe*	*pileata*						X	
159	570	Chat	Familiar	*Cercomela*	*familiaris*			X		X		
160	573	Cliff-chat	Mocking	*Thamnolaea*	*cinnamomeiventris*						X	
161	576	Stonechat	African	*Saxicola*	*torquatus*					X		
162	579	Robin-chat	Red-capped	*Cossypha*	*natalensis*			X		X		
163	581	Robin-chat	Cape	*Cossypha*	*caffra*			X		X	X	
164	582	Robin-chat	White-throated	*Cossypha*	*humeralis*	**E**		X	X	X		
165	586	Scrub-robin	Kalahari	*Cercotrichas*	*paena*	**NE**		X	X	X		

Count	SABAP Ref	Common Name	Common Name	*Genus*	*Species*	Endemic	Threat Status	Site Record	Transect and FP Monitoring Record	SABAP 2 Record (Site Pentads)	Additional SABAP 2 Record (surrounding pentads)	Priority Species
166	588	Scrub-robin	White-browed	*Cercotrichas*	*leucophrys*			X	X	X		
167	594	Whitethroat	Common	*Sylvia*	*communis*					X	X	
168	596	Warbler	Icterine	*Hippolais*	*icterina*						X	
169	599	Warbler	Willow	*Phylloscopus*	*trochilus*						X	
170	600	Eremomela	Yellow-bellied	*Eremomela*	*icteropygialis*						X	
172	604	Swamp-warbler	Lesser	*Acrocephalus*	*gracilirostris*					X		
173	607	Warbler	Marsh	*Acrocephalus*	*palustris*			X		X		
174	609	Rush-warbler	Little	*Bradypterus*	*baboecala*						X	
175	621	Crombec	Long-billed	*Sylvietta*	*rufescens*			X	X	X		
176	622	Apalis	Bar-throated	*Apalis*	*thoracica*						X	
177	625	Apalis	Yellow-breasted	*Apalis*	*flavida*			X	X	X		
178	627	Camaroptera	Green-backed	*Camaroptera*	*brachyura*			X	X	X		
179	628	Camaroptera	Grey-backed	*Camaroptera*	*brevicaudata*					X		
180	629	Cisticola	Zitting	*Cisticola*	*juncidis*					X		
181	630	Cisticola	Desert	*Cisticola*	*aridulus*					X		
182	637	Neddicky	Neddicky	*Cisticola*	*fulvicapilla*			X	X	X		
183	642	Cisticola	Rattling	*Cisticola*	*chiniana*			X	X	X		
184	644	Cisticola	Red-faced	*Cisticola*	*erythrops*			X	X	X		
185	648	Cisticola	Lazy	*Cisticola*	*aberrans*			X		X	X	
186	649	Prinia	Tawny-flanked	*Prinia*	*subflava*			X	X	X		
187	650	Prinia	Black-chested	*Prinia*	*flavicans*			X	X	X		
188	654	Flycatcher	Spotted	*Muscicapa*	*striata*						X	
189	655	Flycatcher	African Dusky	*Muscicapa*	*adusta*						X	
190	656	Flycatcher	Ashy	*Muscicapa*	*caerulescens*			X		X		

Count	SABAP Ref	Common Name	Common Name	*Genus*	*Species*	Endemic	Threat Status	Site Record	Transect and FP Monitoring Record	SABAP 2 Record (Site Pentads)	Additional SABAP 2 Record (surrounding pentads)	Priority Species
191	657	Tit-flycatcher	Grey	*Myioparus*	*plumbeus*			X	X	X		
192	658	Warbler	Chestnut-vented	*Curruca*	*subcoerulea*	**NE**		X	X	X		
193	661	Flycatcher	Marico	*Melaenornis*	*mariquensis*	**NE**		X	X	X		
194	662	Flycatcher	Pale	*Melaenornis*	*pallidus*					X		
195	664	Flycatcher	Southern Black	*Melaenornis*	*pammelaina*					X		
196	665	Flycatcher	Fiscal	*Melaenornis*	*silens*	**E**		X		X		
197	673	Batis	Chinspot	*Batis*	*molitor*			X	X	X		
198	682	Paradise-flycatcher	African	*Terpsiphone*	*viridis*			X	X	X		
199	685	Wagtail	African Pied	*Motacilla*	*aguimp*			X		X		
201	688	Wagtail	Mountain	*Motacilla*	*clara*					X	X	
202	692	Pipit	African	*Anthus*	*cinnamomeus*			X		X		
203	694	Pipit	Plain-backed	*Anthus*	*leucophrys*						X	
204	696	Pipit	Striped	*Anthus*	*lineiventris*			X		X		
205	699	Pipit	Bushveld	*Anthus*	*caffer*						X	
206	707	Fiscal	Southern	*Lanius*	*collaris*			X	X	X		
207	708	Shrike	Red-backed	*Lanius*	*collurio*						X	
208	706	Shrike	Lesser Grey	*Lanius*	*minor*						X	
209	709	Boubou	Southern	*Laniarius*	*ferrugineus*	**E**		X	X	X		
210	711	Shrike	Crimson-breasted	*Laniarius*	*atrococcineus*	**NE**		X		X		
211	712	Puffback	Black-backed	*Dryoscopus*	*cubla*			X	X	X		
212	714	Tchagra	Brown-crowned	*Tchagra*	*australis*			X	X	X		
213	715	Tchagra	Black-crowned	*Tchagra*	*senegalus*					X		
214	719	Bush-shrike	Orange-breasted	*Chlorophoneus*	*sulfureopectus*			X	X	X		
215	721	Bush-shrike	Gorgeous	*Telophorus*	*viridis*						X	

Count	SABAP Ref	Common Name	Common Name	*Genus*	*Species*	Endemic	Threat Status	Site Record	Transect and FP Monitoring Record	SABAP 2 Record (Site Pentads)	Additional SABAP 2 Record (surrounding pentads)	Priority Species
216	723	Bush-shrike	Grey-headed	*Malaconotus*	*blanchoti*			X		X		
217	724	Shrike	Magpie	*Urolestes*	*melanoleucus*						X	
218	727	Helmet-shrike	White-crested	*Prionops*	*plumatus*					X		
219	728	Helmet-shrike	Retz's	*Prionops*	*retzii*			X		X		
220	731	Brubru	Brubru	*Nilaus*	*afer*			X		X		
221	734	Myna	Common	*Acridotheres*	*tristis*			X	X	X		
222	736	Starling	Violet-backed	*Cinnyricinclus*	*leucogaster*					X		
223	737	Starling	Cape	*Lamprotornis*	*nitens*			X	X	X		
224	745	Starling	Red-winged	*Onychognathus*	*morio*			X	X	X		
225	748	Oxpecker	Red-billed	*Buphagus*	*erythrorynchus*			X	X	X		
226	755	Sunbird	Marico	*Cinnyris*	*mariquensis*			X		X		
227	758	Sunbird	Greater Double-collared	*Cinnyris*	*afer*	**E**					X	
228	760	Sunbird	Southern Double-collared	*Cinnyris*	*chalybeus*	**E**					X	
229	763	Sunbird	White-bellied	*Cinnyris*	*talatala*			X	X	X		
230	771	Sunbird	Collared	*Hedydipna*	*collaris*					X		
231	772	Sunbird	Amethyst	*Chalcomitra*	*amethystina*			X	X	X		
232	774	Sunbird	Scarlet-chested	*Chalcomitra*	*senegalensis*			X		X		
233	780	Sparrow-weaver	White-browed	*Plocepasser*	*mahali*			X	X	X		
234	784	Sparrow	House	*Passer*	*domesticus*			X		X		
235	785	Sparrow	Great	*Passer*	*motitensis*	**NE**					X	
236	786	Sparrow	Cape	*Passer*	*melanurus*	**NE**		X		X		
237	788	Bush Sparrow	Yellow-throated	*Gymnoris*	*superciliaris*						X	
238	789	Weaver	Scaly-feathered	*Sporopipes*	*squamifrons*	**NE**		X	X	X		
239	791	Weaver	Spectacled	*Ploceus*	*ocularis*			X	X	X		

Count	SABAP Ref	Common Name	Common Name	*Genus*	*Species*	Endemic	Threat Status	Site Record	Transect and FP Monitoring Record	SABAP 2 Record (Site Pentads)	Additional SABAP 2 Record (surrounding pentads)	Priority Species
240	792	Masked-weaver	Lesser	*Ploceus*	*intermedius*			X		X		
241	793	Weaver	Red-headed	*Anaplectes*	*rubriceps*			X		X		
242	797	Weaver	Village	*Ploceus*	*cucullatus*			X	X	X		
243	799	Weaver	Cape	*Ploceus*	*capensis*					X		
244	801	Weaver	Golden	*Ploceus*	*xanthops*						X	
245	803	Masked-weaver	Southern	*Ploceus*	*velatus*			X	X	X		
246	804	Weaver	Thick-billed	*Amblyospiza*	*albifrons*			X		X		
247	805	Quelea	Red-billed	*Quelea*	*quelea*			X		X		
248	808	Bishop	Southern Red	*Euplectes*	*orix*			X		X		
249	812	Bishop	Yellow-crowned	*Euplectes*	*afer*						X	
250	813	Widowbird	Red-collared	*Euplectes*	*ardens*						X	
251	814	Widowbird	White-winged	*Euplectes*	*albonotatus*			X	X	X		
252	820	Finch	Red-headed	*Amadina*	*erythrocephala*	**NE**		X		X		
253	821	Finch	Cut-throat	*Amadina*	*fasciata*			X		X		
254	823	Mannikin	Bronze	*Spermestes*	*cucullatus*			X	X	X		
255	830	Pytilia	Green-winged	*Pytilia*	*melba*			X	X	X		
256	833	Firefinch	African	*Lagonosticta*	*rubricata*			X		X		
257	835	Firefinch	Jameson's	*Lagonosticta*	*rhodopareia*			X	X	X		
258	837	Firefinch	Red-billed	*Lagonosticta*	*senegala*			X		X		
259	838	Waxbill	Orange-breasted	*Amandava*	*subflava*			X		X		
260	839	Waxbill	Blue	*Uraeginthus*	*angolensis*			X	X	X		
261	840	Waxbill	Violet-eared	*Granatina*	*granatina*	**NE**		X		X		
262	841	Waxbill	Black-faced	*Estrilda*	*erythronotos*			X	X	X		
263	843	Waxbill	Common	*Estrilda*	*astrild*			X	X	X		

Count	SABAP Ref	Common Name	Common Name	*Genus*	*Species*	Endemic	Threat Status	Site Record	Transect and FP Monitoring Record	SABAP 2 Record (Site Pentads)	Additional SABAP 2 Record (surrounding pentads)	Priority Species
264	844	Quailfinch	African	*Ortygospiza*	*atricollis*			X		X		
265	846	Whydah	Pin-tailed	*Vidua*	*macroura*			X	X	X		
266	847	Whydah	Shaft-tailed	*Vidua*	*regia*	**NE**					X	
267	850	Indigobird	Purple	*Vidua*	*purpurascens*						X	
268	851	Indigobird	Village	*Vidua*	*chalybeata*					X		
269	852	Whydah	Long-tailed Paradise	*Vidua*	*paradisea*			X		X		
270	859	Canary	Yellow-fronted	*Crithagra*	*mozambica*			X	X	X		
271	860	Canary	Black-throated	*Crithagra*	*atrogularis*						X	
272	863	Canary	Brimstone	*Crithagra*	*sulphuratus*			X	X	X		
273	867	Seedeater	Streaky-headed	*Crithagra*	*gularis*			X	X	X	X	
274	871	Bunting	Lark-like	*Emberiza*	*impetuana*	**NE**					X	
275	872	Bunting	Cinnamon-breasted	*Emberiza*	*tahapisi*					X		
276	873	Bunting	Cape	*Emberiza*	*capensis*	**NE**					X	
277	874	Bunting	Golden-breasted	*Emberiza*	*flaviventris*			X	X	X		
278	1172	White-eye	Cape	*Zosterops*	*virens*	**E**		X		X		
279	4131	Coucal	Burchell's	*Centropus*	*burchelli*	**NE**					X	
280	4142	Sparrow	Southern Grey-headed	*Passer*	*diffusus*			X	X	X		

EN = Endemic. NE = Near Endemic
VU = Vulnerable

APPENDIX D: Site Sensitivity Verification Report

AVIFAUNAL (AVIAN THEME COMPOENT OF ANIMAL SPECIES AND TERRESTRIAL BIODIVERSITY THEMES) SITE SENSITIVITY VERIFICATION REPORT FOR THE PROPOSED SAMANCOR PHASE 2 SOLAR DEVELOPMENT NEAR STEELPOORT, LIMPOPO PROVINCE.

Introduction

According to the "Protocols for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes ("the Protocols") published in Government Gazette No. 43110 on 20 March 2020 and Government Gazette No. 43855 on 30 October 2020, the Environmental Assessment Practitioner (EAP) must verify the current use of the site in question and its environmental sensitivity as identified by the Screening Tool to determine the need for specialist inputs in relation to the themes included in the Protocols. The Protocols are allowed for in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA"). The Protocols must be complied with for every new application for Environmental Authorisation that is submitted after 9 May 2020.

This document serves as the Site Sensitivity Verification Report for the avian component of the terrestrial biodiversity and animal species themes for the proposed Samancor Phase 2 Solar Project near Steelpoort in the Limpopo Province. The proposed Samancor Phase 2 Solar Project requires environmental authorisation in terms of the NEMA EIA Regulations (2014), as amended and a Water Use Authorisation (WUA).

Study Area

The proposed Samancor Phase 2 Solar Project is located close to the Samancor Tubatse Ferrochrome Smelter, close to the town of Steelpoort in the Limpopo (Figure E1). The proposed Samancor Phase 2 Solar Project is located in close proximity to the R555 provincial road. The study area consists of various land parcels, including an additional Site 2 development area (Site 2B), Site 3B, 3C, 4B and 5C.

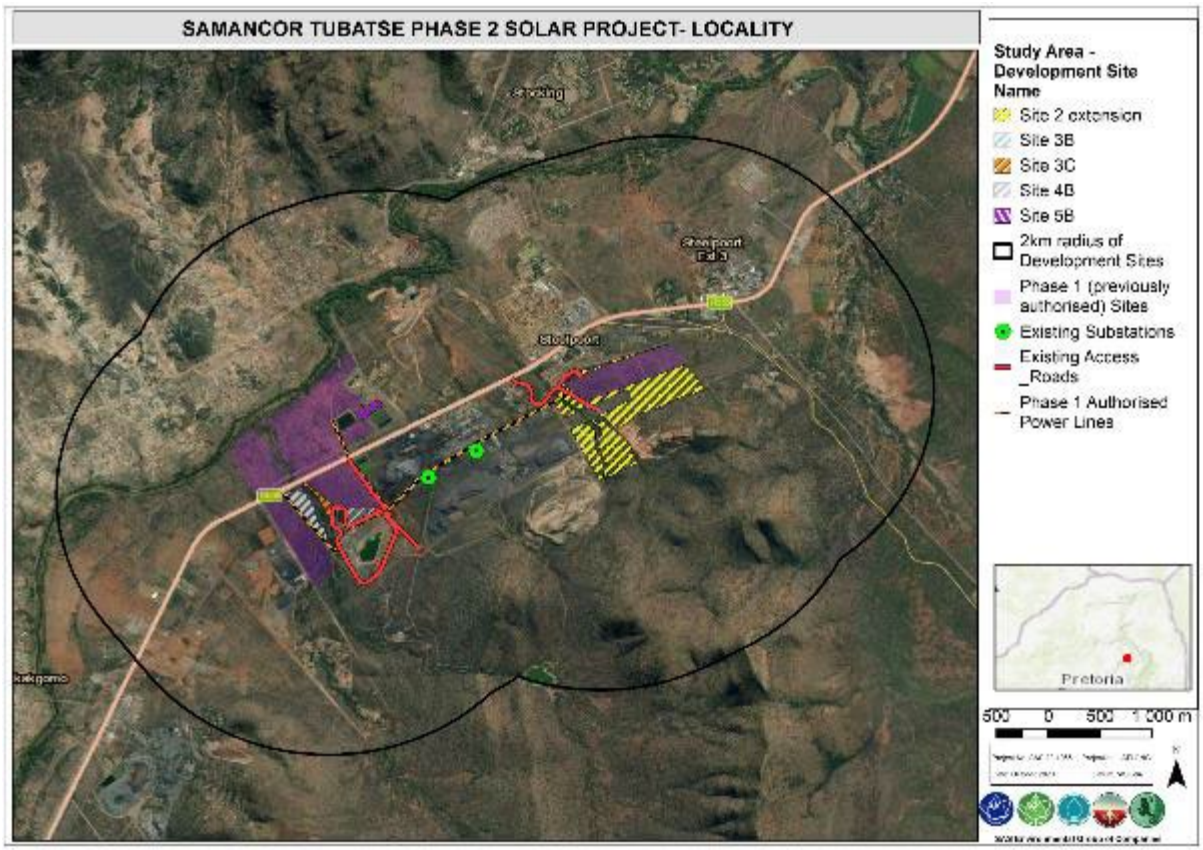


Figure D1: Digital satellite image depicting the location of the proposed Samancor Phase 2 Solar Project study area in relation to the surrounding area.

This site sensitivity verification report relates to a Screening Tool Report (STR) completed for the site in September 2023.

Site Verification Methodology

Information from the avifaunal assessment of in the study and investigation areas as part of the freshwater ecological assessment for the Tubatse Solar (Phase 1) development.

Avian Site Verification

The table below provides information regarding the outcome of the Screening Tool in terms of the terrestrial biodiversity and animal species themes sensitivity associated with the proposed project as well as a brief summary of the outcome of the avifaunal specialist report in response.

Table E1: Avian Sensitivity analysis for the proposed project.

Environmental Theme	Applicable Protocol	Response
Terrestrial Biodiversity Sensitivity Rating: The majority of the study area and 2km radius of the Samancor Tubatse Phase 2 Solar Development is located within areas of **very high terrestrial biodiversity** sensitivity due to the presence of ESAs and the location within a threatened terrestrial ecosystem. ***Animal Species*** Sensitivity Rating: The majority of the study area and 2km radius of the Samancor Tubatse Phase 2 Solar Development is located within areas of **medium animal species** sensitivity with small areas to the south east of Site 2B being located within **high animal species** sensitivity, with the presence of both high and medium sensitivity bird species flagged. *Requiring a Terrestrial Biodiversity Specialist Assessment / Terrestrial Animal Species Specialist Assessment.* **Verified Sensitivity**: the designation of very high terrestrial sensitivity to most of the wider area is partly disputed due to the fragmented and degraded nature of large parts of the wider area, areas of lower sensitivity (medium and low) have been identified. The designation of high and medium animal species theme sensitivity is supported.	-PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS ON TERRESTRIAL BIODIVERSITY (GN 320 OF MARCH 2020). -PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS ON TERRESTRIAL ANIMAL SPECIES (GN 1150 OF OCTOBER 2020).	Due to the confirmed presence of high sensitivity animal theme bird species in close proximity to the study area, an avifaunal assessment needs to be undertaken. This report has been compiled for the scoping phase and an EIA-phase report will be compiled.

APPENDIX E: Declaration and Specialists CV's

1. (a) (i) Details of the specialist who prepared the report

Christopher Hooton	BTech Nature Conservation (Tshwane University of Technology)
Paul da Cruz	BA(Hons) Geography and Environmental Studies (University of the Witwatersrand)
Stephen van Staden	MSc Environmental Management (University of Johannesburg)

1. (a). (ii) The expertise of that specialist to compile a specialist report including a curriculum vitae

Company of Specialist:	Scientific Terrestrial Services
Name / Contact person:	Chris Hooton
Postal address:	[redacted]
Postal code:	[redacted] Fax: [redacted]
Telephone:	[redacted]
E-mail:	[redacted]
Qualifications	BTech Nature Conservation (Tshwane University of Technology) National Diploma Nature Conservation (Tshwane University of Technology)

Company of Specialist:	Scientific Terrestrial Services
Name / Contact person:	Paul da Cruz
Postal address:	[redacted]
Postal code:	[redacted] Fax: [redacted]
Telephone:	[redacted]
E-mail:	[redacted]
Qualifications	BA (Hons) (Geography and Environmental Studies) (University of the Witwatersrand) BA (Geography) (University of the Witwatersrand)
Registration / Associations	Registered Certificated Scientist at South African Council for Natural Scientific Professions (SACNASP) Registered Environmental Assessment Practitioner (EAP) with the Environmental Assessment Practitioners Association of South Africa (EAPASA) Member of the South African Wetland Society (SAWS)

Company of Specialist:	Scientific Terrestrial Services
Name / Contact person:	Stephen van Staden
Postal address:	[redacted]
Postal code:	[redacted] Fax: [redacted]
Telephone:	[redacted]
E-mail:	[redacted]
Qualifications	MSc (Environmental Management) (University of Johannesburg) BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg) BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)
Registration / Associations	Registered Professional Natural Scientist at South African Council for Natural Scientific Professions (SACNASP) Accredited River Health Practitioner by the South African River Health Program (RHP) Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum

1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Paul da Cruz, 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 relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the 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

Signature of the Specialist

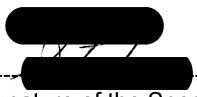
I, Christopher Hooton, declare that -

- I act as the **independent specialist (reviewer)** 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 relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the 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.

Specialist Signature

I, Stephen van Staden, declare that -

- I act as the **independent specialist (reviewer)** 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 relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the 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



Signature of the Specialist

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF CHRISTOPHER HOOTON

PERSONAL DETAILS

Position in Company	Senior Scientist, Member Biodiversity Specialist
Joined SAS Environmental Group of Companies	2013

EDUCATION

Qualifications

BTech Nature Conservation (Tshwane University of Technology)	2013
National Diploma Nature Conservation (Tshwane University of Technology)	2008

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Eastern Cape, Western Cape, Northern Cape, Free State
Africa - Zimbabwe, Sierra Leone, Zambia

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Floral Assessments
- Faunal Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Protected Tree and Floral Marking and Reporting
- Biodiversity Offset Plan

Freshwater Assessments

- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning

SAS ENVIRONMENTAL GROUP OF COMPANIES –
SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF PAUL DA CRUZ

PERSONAL DETAILS

Position in Company	Senior Ecologist
Joined SAS Environmental Group of Companies	2022

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Certificated Scientist at South African Council for Natural Scientific Professions (SACNASP)
Registered Environmental Assessment Practitioner (EAP) with the Environmental Assessment Practitioners Association of South Africa (EAPASA)
Member of the South African Wetland Society (SAWS)

EDUCATION

Qualifications

BA (Hons) (Geography and Environmental Studies) (University of the Witwatersrand)	1998
BA (Geography) (University of the Witwatersrand)	1997

Short Courses

Taxonomy of Wetland Plants (Water Research Commission)	2017
Advanced Grass Identification (Frits van Outshoorn)	2010
Grass Identification (Frits van Outshoorn),	2009
Soil Form Classification and Wetland Delineation; (TerraSoil Science)	2008

AREAS OF WORK EXPERIENCE

South Africa – All Provinces. **Southern Africa** – Lesotho, Botswana

DEVELOPMENT SECTORS OF EXPERIENCE

1. Renewable energy (Wind and solar)
2. Linear developments (energy transmission, telecommunication, pipelines, roads, border infrastructure)
3. Nature Conservation and Ecotourism Development
4. Commercial development
5. Residential development
6. Environmental and Development Planning and Strategic Assessment
7. Industrial/chemical; Non-renewable power Generation

KEY SPECIALIST DISCIPLINES

Legislative Requirements, Processes and Assessments

- EIA / BA Applications & Environmental Authorisation Amendments
- EMPr Compilation
- Environmental Compliance Monitoring (Environmental Auditing)
- Environmental Screening Assessments and Listing Notice 3 Trigger Identification / Mapping
- Strategic Environmental Assessments and Environmental Management Frameworks
- EIA / Specialist Study Peer Review

Freshwater Assessments

- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant Species and Landscape Plans
- Freshwater Assessments in support of Environmental Screening Assessments, Precinct Planning & SEA
- Wetland Construction (Compliance) Monitoring

Biodiversity Assessments

- Avifaunal Assessments and Strategic Biodiversity Assessment

Visual Impact Assessment

- Visual Impact Assessments

GIS / Spatial Analysis

- GIS Spatial Analysis and Listing Notice 3 mapping.

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF STEPHEN VAN STADEN

PERSONAL DETAILS

Position in Company	Group CEO, Water Resource Discipline Lead, Managing Member, Ecologist, Aquatic Ecologist
Joined SAS Environmental Group of Companies	2003 (year of establishment)

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)
Accredited River Health Practitioner by the South African River Health Program (RHP)
Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum
Member of the Gauteng Wetland Forum
Member of International Association of Impact Assessors (IAIA) South Africa;
Member of the Land Rehabilitation Society of South Africa (LaRSSA)

EDUCATION

Qualifications

MSc Environmental Management (University of Johannesburg)	2003
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2001
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	2000

Short Courses

Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs	2017
Tools for Wetland Assessment (Rhodes University)	2017
Legal liability training course (Legricon Pty Ltd)	2018
Hazard identification and risk assessment training course (Legricon Pty Ltd)	2018
Wetland Management: Introduction and Delineation (WLID1502S) (University of the Free State)	2018
Hydropedology and Wetland Functioning (TerraSoil Science and Water Business Academy)	2018

AREAS OF WORK EXPERIENCE

South Africa – All Provinces
Southern Africa – Lesotho, Botswana, Mozambique, Zimbabwe Zambia
Eastern Africa – Tanzania Mauritius
West Africa – Ghana, Liberia, Angola, Guinea Bissau, Nigeria, Sierra Leona
Central Africa – Democratic Republic of the Congo

DEVELOPMENT SECTORS OF EXPERIENCE

1. Mining: Coal, chrome, Platinum Group Metals (PGMs), mineral sands, gold, phosphate, river sand, clay, fluorspar
2. Linear developments (energy transmission, telecommunication, pipelines, roads)
3. Minerals beneficiation
4. Renewable energy (Hydro, wind and solar)
5. Commercial development
6. Residential development
7. Agriculture
8. Industrial/chemical

KEY SPECIALIST DISCIPLINES

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Environmental and Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions

Freshwater Assessments

- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning

- Maintenance and Management Plans
- Plant Species and Landscape Plans
- Freshwater Offset Plans
- Hydropedological Assessment
- Pit Closure Analysis

Aquatic Ecological Assessment and Water Quality Studies

- Habitat Assessment Indices (IHAS, HRC, IHIA & RHAM)
- Aquatic Macro-Invertebrates (SASS5 & MIRAI)
- Fish Assemblage Integrity Index (FRAI)
- Fish Health Assessments
- Riparian Vegetation Integrity (VEGRAI)
- Toxicological Analysis
- Water quality Monitoring
- Screening Test
- Riverine Rehabilitation Plans

Biodiversity Assessments

- Floral Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Terrestrial Monitoring
- Biodiversity Offset Plan

Soil and Land Capability Assessment

- Soil and Land Capability Assessment
- Hydropedological Assessment

Visual Impact Assessment

- Visual Baseline and Impact Assessments
- Visual Impact Peer Review Assessments