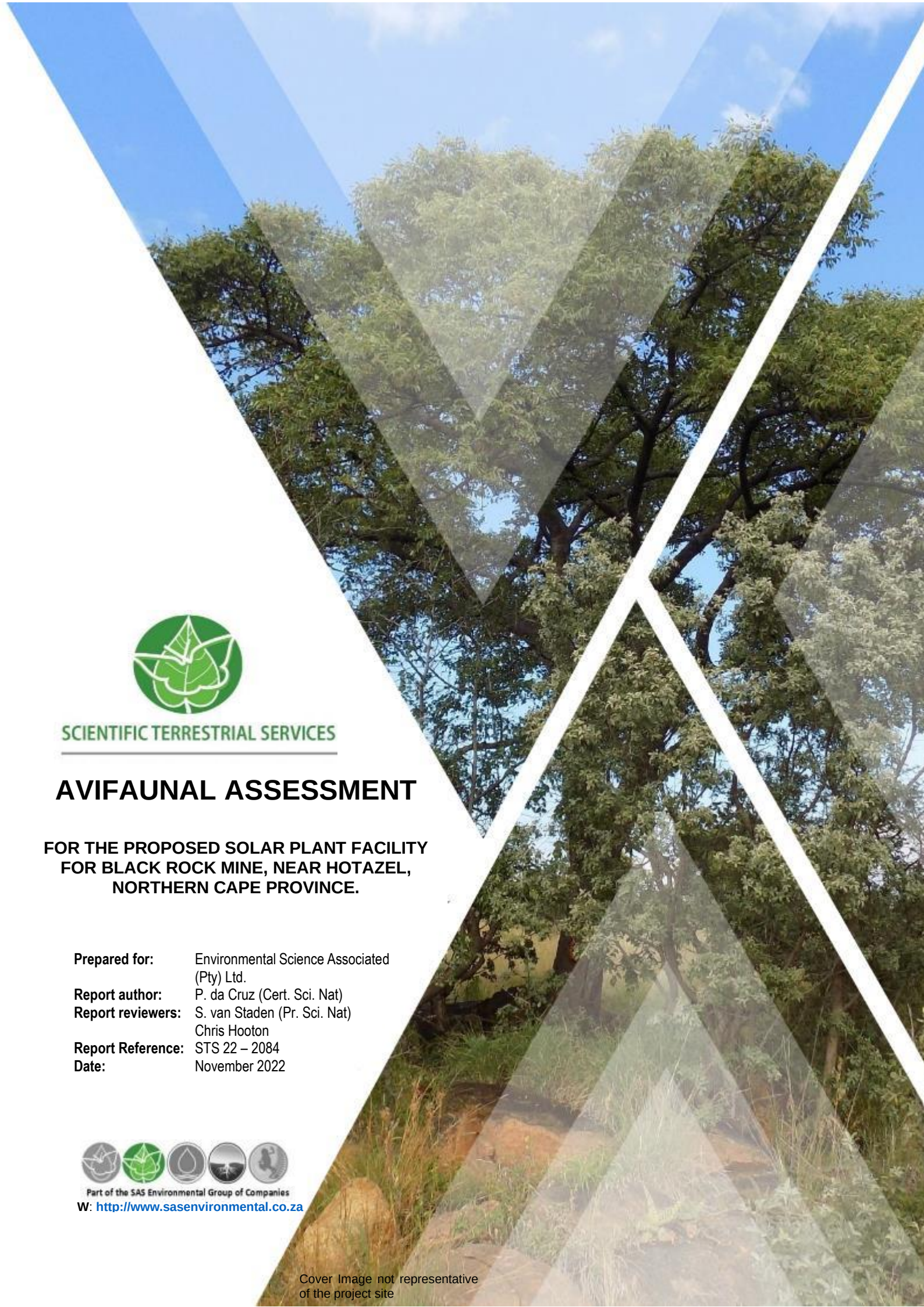

SCIENTIFIC TERRESTRIAL SERVICES

AVIFAUNAL ASSESSMENT

FOR THE PROPOSED SOLAR PLANT FACILITY FOR BLACK ROCK MINE, NEAR HOTAZEL, NORTHERN CAPE PROVINCE.

Prepared for:	Environmental Science Associated (Pty) Ltd.
Report author:	P. da Cruz (Cert. Sci. Nat)
Report reviewers:	S. van Staden (Pr. Sci. Nat) Chris Hooton
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Cover Image not representative of the project site

EXECUTIVE SUMMARY

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. The major impact anticipated to occur is the alteration of areas of natural habitat, reducing avian abundance and diversity within the study area, especially within the solar array footprint. Impact scores are reduced as no sensitive habitat is proposed to be developed (due mainly to the high anthropogenic disturbance factor), and as there is a very low likelihood of the occurrence of sensitive species beyond very intermittent ranging and foraging onto the project area. Further impacts that may result from the proposed project are as a result of potential collisions and electrocutions with the proposed PV facilities and the proposed powerline. It is anticipated that should the proposed mitigation measures be implemented the risk of collisions and electrocutions can be reduced to acceptable levels. Due to the low potential of occurrence of Species of Conservation Concern, 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.

Scientific Terrestrial Services CC (STS) was appointed to conduct an avifaunal assessment as part of the environmental authorisation process for the proposed Black Rock Solar Plant Facility, near Hotazel, Northern Cape Province. The Black Rock Solar Project consists of a proposed overhead power line (OHPL), proposed access road, proposed substation and two solar project areas (e.g., western and eastern).

Specific outcomes required from this report include the following:

- To determine the sensitivity of the habitat for avifauna and avifaunal SCC, as well as the likelihood of the presence of SCC on the development site and its surrounds.
- To determine the environmental impacts that the proposed development may have on the ecology associated with the study area, with emphasis on avifaunal SCC and to develop mitigation and management measures in terms of avifaunal SCC for all phases of the development.

AVIFAUNAL ASSESSMENT

- During the field investigation 4 broad habitats were identified in close proximity to the development footprint, they include Open Thornveld, Semi-closed Thornveld, freshwater habitat and degraded habitat.
- Several SCC have broad distributions that encompass the study area; however due to the fragmentation of natural habitat and high level of human activity on the site and in the study area, only one species – *Ardeotis kori* (Kori Bustard) has been confirmed to occur on the site and certain other SCC have a possibility of occurring / ranging onto the site, with potential for occurrence of these other species assessed to be low.
- Despite habitat disturbance and fragmentation, the development site and its surrounds contain habitat for avifauna, with the avifaunal assemblage on the site considered to be broadly representative of the typical species assemblage for arid savannah in the wider area. The absence perennial / permanently inundated freshwater habitats, and rocky, mountainous habitats on the project site however limits avifaunal diversity;
- The proposed activities, i.e. the development of solar arrays, will lead to the transformation of woodland (thornveld) habitat in the development footprint to an extent that it will no longer be suitable for most avifauna. Minor migrations to adjacent habitat will likely occur decreasing species richness within the study area and increasing competition for resources in the surrounding habitat reducing avian abundances.; and

- The proposed development is not deemed likely to pose a threat to avifaunal SCC within the study area, and no regional impacts are anticipated. However mitigation measures set out within this report must be adhered to due to the potential for avian collisions with power line or PV infrastructure.

AVIFAUNAL IMPACT ASSESSMENT:

It is assumed that a high level of mitigation will take place. From the impact tables it is evident that prior to mitigation, the impacts on avifauna and avifauna habitat and diversity as well as SCC are of minor to medium-lower significance as a result of the establishment of the proposed PV facility and associated infrastructure. This activity will likely result in a decrease in avian richness and abundance within the study area, while SCC diversity on a regional scale is highly unlikely to be reduced. If effective mitigation takes place, impacts may be reduced to lower significance impacts.

Sensitivity

From an avifaunal ecological perspective, the study area is considered to be of low sensitivity. In the context of the development site, no high or medium sensitivity criteria are met, Accordingly, considering the low level of possibility of the occurrence of SCC and very low potential for a regional impact on SCC to be created, the avifaunal sensitivity of the study area is considered to be low.

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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].

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".
Baseline information (IEM Series)	Information derived from data that: • records the existing elements and trends in the environment; and • records the characteristics of a given project proposal.
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[1] 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.

[1] 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.
Earthing Wire	Wire at the top of power line towers not connected to the conductors.
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.
Granivores	Birds that feed 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.
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.
Protected	Species of high conservation value or national importance that require protection, according to TOPS 2007 and NEMBA.
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.
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.
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.

Weeds	A plant is a weed '*if, in any specified geographical area, its populations grow entirely or predominantly in situations markedly disturbed by man (without, of course, being deliberately cultivated plants*)' (Baker 1965); in cultural terms, weeds are plants (**not necessarily alien**) that grow in sites where they are not wanted and that have detectable economic or environmental impacts (Pyšek et al. 2004).

LIST OF ACRONYMS

BARESG	Birds and Renewable Energy Specialist Group BARESG
BGIS	Biodiversity Geographic Information Systems
CARA	Conservation of Agricultural Resources Act, 1983 [Act No. 43 of 1983]
CBA	Critical Biodiversity Area
CR	Critically Endangered
DFFE	Department of Forestry, Fisheries and the Environment
DMRE	Department of Mineral Resources and Energy
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
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
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
O&M	Operations and Maintenance
OHL	Overhead line
PGMs	Platinum Group Metals
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
SWSA	Strategic Water Source Areas
TOPS	Threatened or Protected Species
VEGMAP	Vegetation Map Project
VU	Vulnerable
WM	Waste Management
WMP	Waste Management Plan

WSA	Water Source Area
WUL	Water Use Licence
WWTP	Wastewater Treatment Plant

1 INTRODUCTION

Scientific Terrestrial Services (Pty) Ltd (STS) was appointed to conduct a terrestrial biodiversity assessment as part of the environmental authorisation process for the proposed Black Rock Solar Plant Facility, near Hotazel, Northern Cape Province. The Black Rock Solar Project consists of the Overhead Powerline (OHPL), Access Road, Proposed Substation and two solar project areas (e.g., western and eastern) collectively the layout will be referred to as the "study area".

The study area is located on the Remaining Extent of Farm Klipling 271, approximately 1.5 km north west from the nearest Hotazel infrastructure, and approximately 2.5km from centre to centre from the Hotazel town. The study area falls within the jurisdiction of the John Taolo Gaetsewe District Municipality, and the Joe Morolong Local Municipality. The extent and layout of the study area is illustrated in Figures 1 - 2.

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

1.1 Project Background

BRMO proposes to construct and operate a solar power generation facility to supply its operations, with the primary aims of:

- Offsetting electricity grid supply risks and escalating costs;
- Reducing BRMO's carbon footprint with a long-term view to net carbon neutrality;

The project will be built in phases with the first phase being 44MW, which will include:

- A solar PV plant;
- substations and electrical distribution infrastructure;
- Battery storage facilities;

Future phases will be scheduled as applicable after completion and commissioning of the first phase. The total generation capacity applied for is 100MW.

The proposed solar facility is to be located on the Remaining Extent of Farm Klipling 271 and will have a development footprint of approximately 450ha in extent, with additional infrastructure for distributing the electricity to the BRMO's operations. This infrastructure will tie in to BRMO's existing electrical distribution infrastructure.

The project will include the following:

- Surveying and assessment of the proposed footprint;
- Vegetation clearance and establishment of access roads;
- Site establishment and laydown areas;
- Erection of fencing and access control;
- Stripping of topsoil to be stockpiled where necessary;
- Transporting of materials to site;
- Excavations and erection of the proposed infrastructure;
- Establishment and connection of overhead distribution lines substations;
- Establishment of Battery Energy Storage System (BESS):

Construction Phase

The construction phase will broadly consist of:

- Erection of fences and access control;
- Clearing of vegetation and establishment of roads, contractor laydown areas and project service facilities;
- Stripping and stockpiling of topsoil where required;
- Excavations of foundations for support where required;
- Erection of solar PV generation and distribution facilities (including panels and collector substations);
- Erection of overhead lines;
- Establishment of a new substation to tie in overhead lines and existing distribution infrastructure;
- Establishment of a battery storage facility; and
- Removal of construction facilities and rehabilitation of disturbed areas, where applicable, at the end of construction phase.

Operational Phase

The operational phase will consist of:

- Operation of the facilities;
- Security and access control;

- Periodic maintenance and inspection of the panels;
- Cleaning of panels; and
- Administrative functions.

Closure and Decommissioning Phase

The current life of mine is expected to exceed 25 years. The PV installations are anticipated to have an operational life of at least 25 years before panels may need to be replaced. Replacement of the PV panels, after 25 years or more of operational life, will entail:

- Removal of the panels and replacement; and
- Transporting of the panels to a recycling facility where the recyclable components can be recycled, and disposal of those components which are not recyclable.

Decommissioning of the facilities at end of life of the mine will entail:

- Removal of the panels and replacement;
- Transporting of the panels to a recycling facility where the recyclable components can be recycled, and disposal of those components which are not recyclable;
- Disassembly of supporting infrastructure and recycling of the recyclable components (e.g. steel and electrical cabling);
- Following the removal of all onsite components, the site will need to be rehabilitated.
- Removal of foundations and disposal or recuse of rubble;
- Ripping and scarifying of roads, and other compacted footprints;
- Depositing of subsoil and topsoil, on the exposed surfaces; and
- Rehabilitation and aftercare.

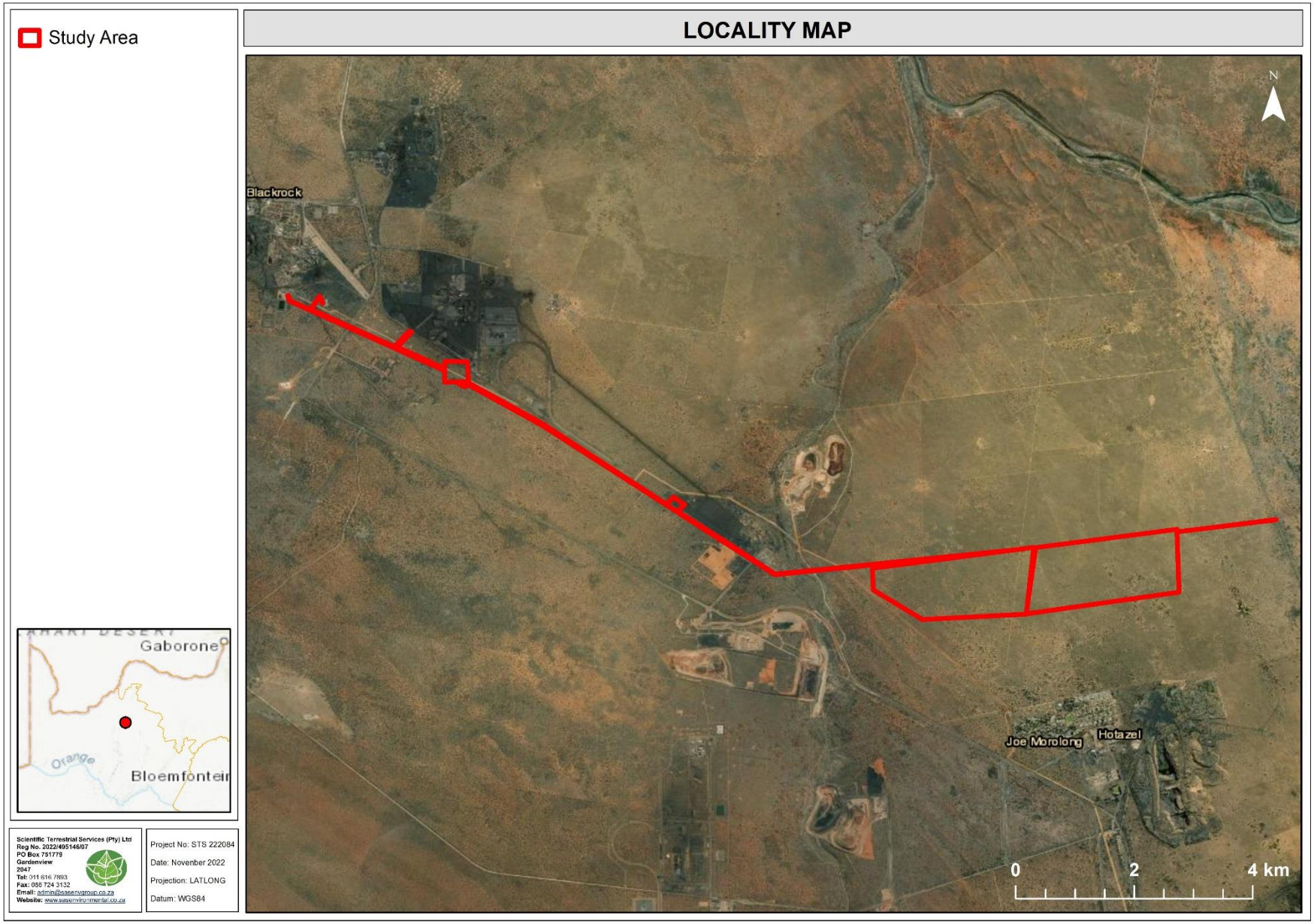

Figure 1: Digital satellite image depicting the study area in relation to surrounding area.

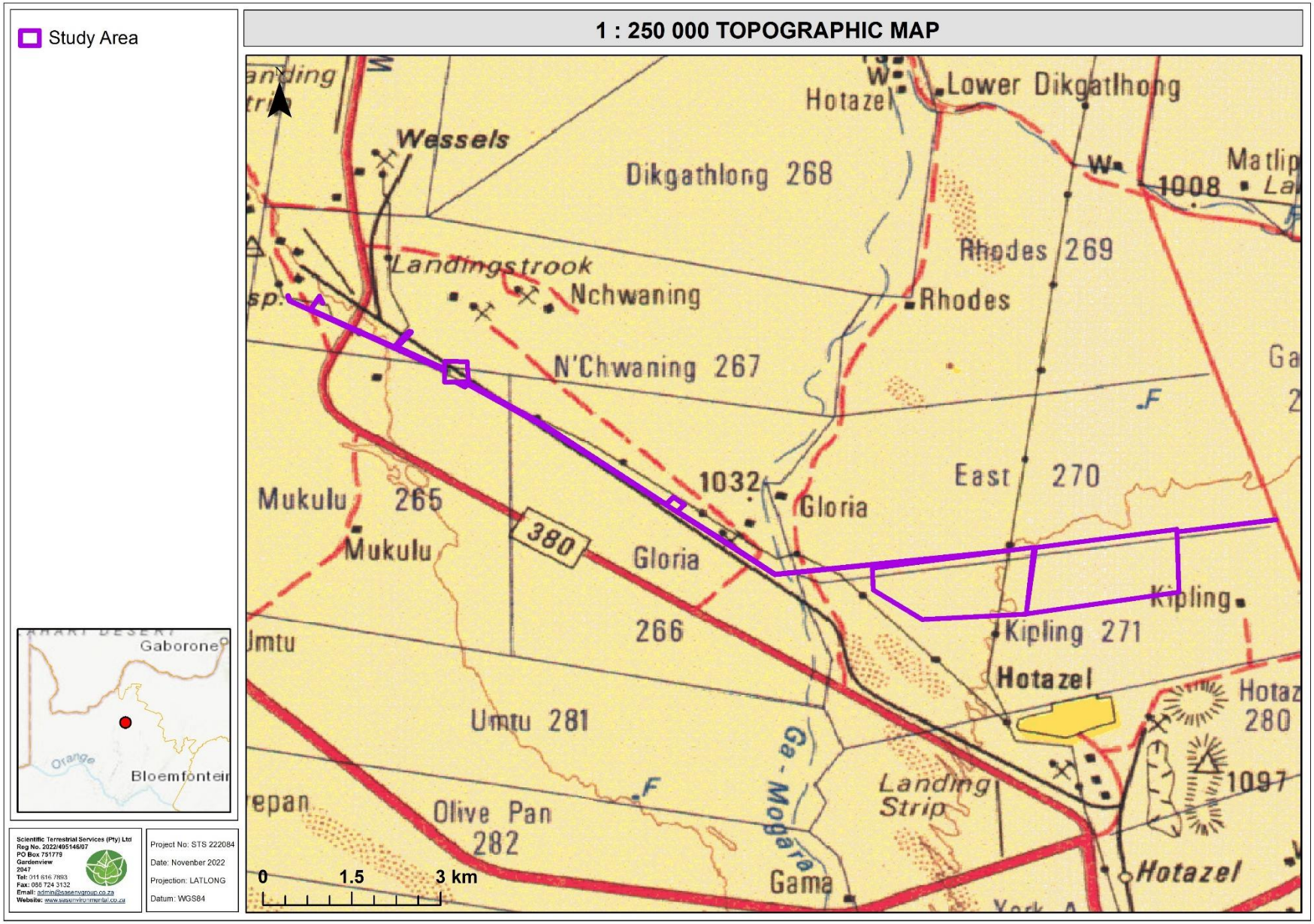

Figure 2: The study area depicted on a 1:250 000 topographical map in relation to the surrounding area.

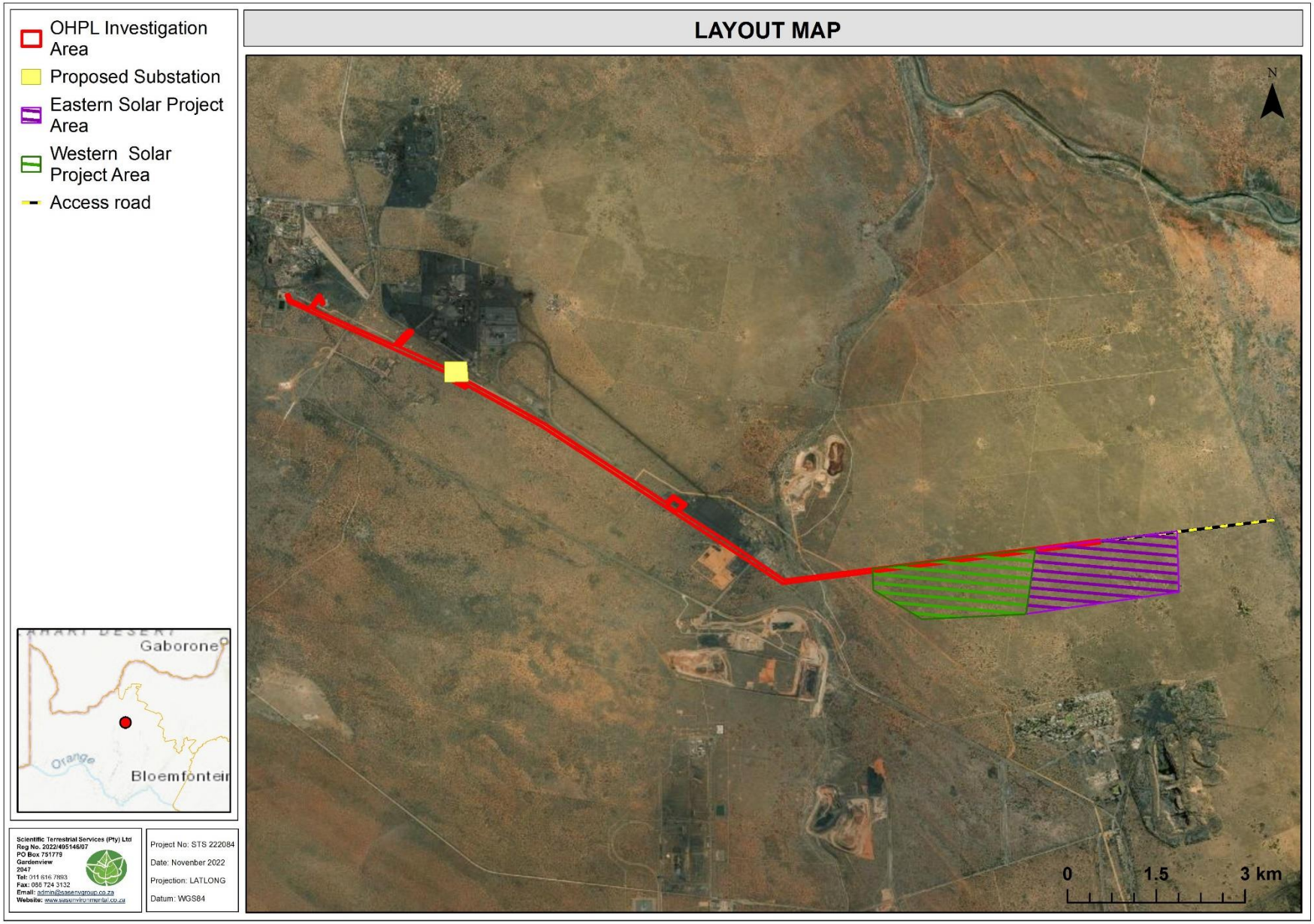

Figure 3: The proposed project layout.

1.2 Project Scope

Specific outcomes in terms of this report are outlined below:

- To update previously undertaken desktop studies on the site with 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/). 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, was utilised to gain background information on the physical habitat and potential floral and faunal ecology associated with the study area;
- To identify and consider all sensitive landscapes and possible habitat for such species; and
- To determine the environmental impacts that the proposed development may have on the ecology associated with the study area, with emphasis on avifauna species of conservation concern (SCC) and to develop mitigation and management measures in terms of avifaunal SCC for all phases of the development.

1.3 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- The avifaunal assessment was limited to the study area only and did not assess in detail the surrounding properties. The surrounding properties were noted on an *ad hoc* basis whilst moving to and from the study area however, with data extrapolated to these areas through the use of satellite imagery as and where necessary;
- 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;
- Due to the nature and habits of most avifaunal species and their often-wide ranging habits or migration patterns, it is unlikely that all species would have been observed during a site assessment of limited duration. Therefore, site observations were

compared with literature studies and existing avifaunal databases for the site where necessary;

- The field assessment was undertaken during summer (31st October – 4th of November 2022). The field assessment aimed to determine the ecological status of the habitat associated with the Study Area, and to "ground-truth" the results of previously undertaken assessments. Previous field assessments were conducted by STS for previous projects (September 2020; STS 200051, 2020), (September 2019, STS 19004, 2019) and (July 2021, STS 210052) in the region. The data for these projects were used to further inform this report; and
- This avifaunal assessment has complied with the BirdLife South Africa Birds and Solar Energy Guidelines as far as possible (refer to Section 2.3). Due to EIA timeframe restrictions, a mid to late summertime (rainy season) assessment could not be undertaken – i.e. the peak season of bird occurrence on the site. However, assessments undertaken in previous years by STS were undertaken in spring to early summer (September) in which bird occurrence was recorded and assessed, and accordingly these allowed a more representative seasonal assessment of bird occurrence on the sites to be acquired. The field assessment for this project was undertaken between the 31st of October to the 4th of November 2022. The inability to undertake a mid- to late-summer assessment is a partial limitation, but it is not anticipated to be a significant limiting factor in the ability of the assessment to assess avifaunal impacts associated with the proposed development.

1.4 Indemnity and Terms of use of this Report

The findings, results, observations, 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 survey and 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.

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2 ASSESSMENT APPROACH

2.1 General Approach

A field assessment was undertaken during early summer (31st of October 2022 to the 04th of November 2022), in order to determine the potential presence of SCC and general habitat characteristics within the study area. A reconnaissance 'walkabout' was undertaken in the footprint of the solar field, as well as along the alignments of the power line. The field assessment was focussed in these areas as previous assessments had established the habitats on the site. The assessed areas were then walked on foot and all observed avifauna were recorded. A detailed explanation of the method of assessment is provided in **Appendix B** of this report.

2.2 Sensitivity Mapping

All the ecological features of the study area were considered, and sensitive areas were assessed. In addition, identified locations of protected species were marked by means of Global Positioning System (GPS). A Geographic Information System (GIS) was used to project these features onto aerial photographs and topographic maps. The sensitivity map should guide the design and layout of the proposed construction and operational activities.

2.3 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 Figure 4). The assessment and monitoring regime adopted is dependent on the level of sensitivity of the study area, as determined through the preliminary avifaunal assessment.

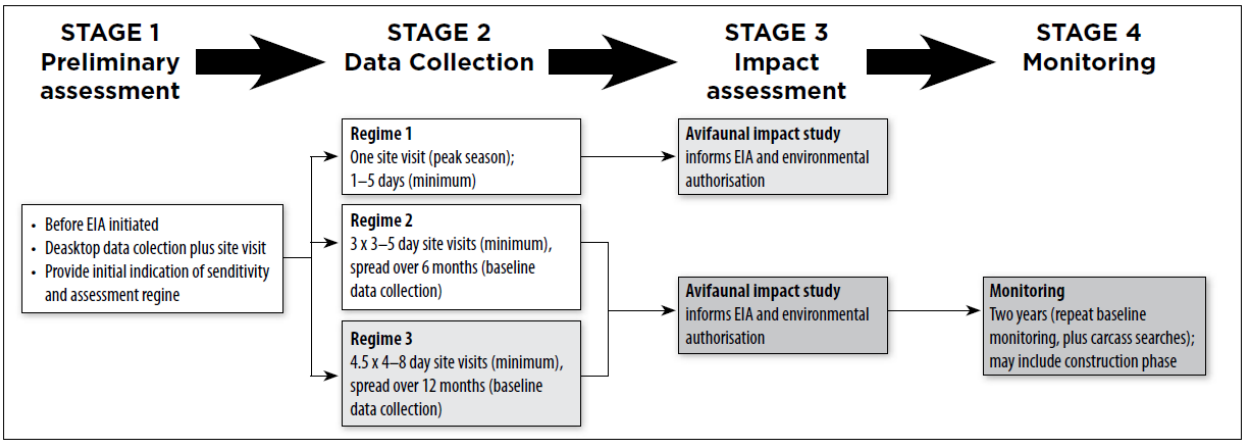

Figure 4: Recommended multi-tier process for assessing the potential and realised impacts of proposed solar energy developments in South Africa (Jenkins *et al*, 2017).

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 for solar development sites of >150ha are large size, thus the proposed development is a large-sized development. The guidelines do however make an allowance for large site, where Regime 1 can be applied, provided there is sufficient information already available in which to support a low sensitivity. The level of avifaunal sensitivity is can however, be dependent on a number of factors, detailed in Table 2.

Table 1: Criteria determining avifaunal sensitivity on the development site.

Sensitivity Criterion	Applicability to the Development Site
Number of priority species present or potentially present	Low
Regional, national, or global importance of the affected area for these species (both individually and collectively)	Low – (The site is not located in an IBA)
Perceived susceptibility of these species (both individually and collectively) to the anticipated impacts of development	Moderate – loss of habitat and collision potential associated with the proposed development could have an impact on certain larger collision-prone SCC due to their confirmed occurrence in the study area
Avifaunal habitat (e.g. wetlands, nesting or roost sites) of regional or national significance	Not Present
Population of a priority species that is of regional or national significance	No - occurrence of an SCC confirmed (Kori Bustard – *Ardeotis kori*) confirmed, but the site is part of a much larger range
A bird movement corridor that of regional or national significance	Not present
A protected area and/or Important Bird and Biodiversity Area	Not Present
Avifaunal habitat (e.g., a wetland, nesting or roost sites) of local significance	Present – locally important habitat for Kori Bustard present

A locally significant population of a priority species	Present – confirmed presence of Kori Bustard, but site forms part of a much wider local and regional range of the species.
A locally significant bird movement corridor	Not present

An area would be considered to be of low avifaunal sensitivity if it does not meet any of the above criteria. In the context of the development site, certain medium sensitivity criteria are met, with the confirmed presence of Kori Bustard (*Ardeotis kori*) on the development. Due to the very wide range and low density of occurrence of this species the site is considered locally important for this species, but less important in a regional or national context, and accordingly the site is considered to have a medium avifaunal importance.

Where the avifaunal sensitivity is medium for large-sized sites, a regime 2 assessment process can be undertaken. For assessment regime 2 at least 2 (2-3) site assessment visits should be undertaken, with at least one of the site visits conducted during the peak time of bird occurrence in the area, as per the BLSA guidelines. The BLSA guidelines recommend that during the site visits time should be spent to obtain first-hand knowledge of the avian habitats present, in order to predict the affected avifauna, the nature and scale of possible impacts and the best mitigation options available. This assessment should be informed substantially by the specialist's previous experience of similar habitats and bird taxa, supplemented by the existing data describing the birds likely to be present (e.g. SABAP 1 and 2 data). If there is an obvious and predictable seasonal peak in avian abundance or activity in the general area of the proposed development, one of the site visits must be timed to coincide with this peak time (e.g. soon after rain which prompts influxes of birds into dry areas, or in summer when the majority of migratory birds would be present). In the context of the study area, this peak time would be late summer once summer rains have occurred.

Only a single early summer site visit was undertaken due to EIA-related time constraints. However, assessments undertaken in previous years by STS were undertaken in spring (September) in which bird occurrence was recorded and assessed, and accordingly these allowed a more representative seasonal assessment of bird occurrence on the sites to be acquired. Accordingly the inability to undertake a late-summer assessment is a partial limitation, but it is not anticipated to be a significant limiting factor in the ability of the assessment to assess avifaunal impacts associated with the proposed development.

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 2: Summary of the conservation characteristics for the study area (Quarter Degree Square (QDS) 2722BB).

DETAILS OF THE STUDY AREA IN TERMS OF MUCINA & RUTHERFORD (2006) AND THE NATIONAL VEGETATION MAP PROJECT (SANBI, 2018A) - ORIGINAL EXTENT OF MAPPED VEGETATION TYPE			
BIOME		The study area is situated within the **Savanna Biome**.	
BIOREGION		The study area is located within the **Eastern Kalahari Bushveld Bioregion** and the **Kalahari Duneveld Bioregion.**	
VEGETATION TYPES		**Kathu Bushveld (SVk 12) –the western and eastern portions of the study area.**	**Gordonia Duneveld (SVkd1) - in the middle of the study area**
ALTITUDE (M)		960 – 1 300	800 -1 200
CLIMATE		Summer and autumn rainfall with very dry winters	Summer and autumn rainfall with very dry winters
CLIMATE	**MAP (mm)**	300	182
	MAT (°C)	18.5	18.6
	MFD (Days)	27	21
	MAPE (mm)	2883	2912
	MASMS (%)	85	86
DISTRIBUTION		Northern Cape Province	Northern Cape Province
GEOLOGY AND SOILS		Aeolian red sand and surface calcrete, deep (>1.2 m) sandy soils of Hutton and Clovelly soil forms. Land types of mainly Ah and Ae, with some Ag.	Aeolian sand underlain by superficial silcretes and calcretes of the Cenozoic Kalahari Group. Fixed parallel sand dunes, with Af land type almost exclusively.
CONSERVATION		Least threatened. Target 16%. None conserved in statutory conservation areas. More than 1% already transformed, including the iron ore mining locality at Sishen, one of the biggest open-cast mines in the world. Erosion is very low.	Least threatened. Target 16%. Some 14% statutorily conserved in the Kgalagadi Transfrontier Park. Very little transformed. Generally low erosion, but some areas with spectacular destabilisation of normally vegetated dunes (through local overstocking) favoured by photographers. Erosion is normally very low.
VEGETATION AND LANDSCAPE FEATURES		Shrub layer generally most important with, for example, *Senegalia mellifera*, *Diospyros lycioides* and *Lycium hirsutum*. Grass layer is variable in cover.	Parallel dunes about 3–8 m above the plains. Open shrubland with ridges of grassland dominated by *Stipagrostis amabilis* on the dune crests and *Vachellia haematoxylon* on the dune slopes, also with *Senegalia mellifera* on lower slopes and *Rhigozum trichotomum* in the interdune strata.
DETAILS OF THE STUDY AREA IN TERMS OF THE 2018 NATIONAL BIODIVERSITY ASSESSMENT - REMAINING EXTENT OF MAPPED VEGETATION TYPE			
NBA (2018): ECOSYSTEM PROTECTION LEVEL AND ECOSYSTEM THREAT STATUS **FIGURE 4**		The NBA indicates the perceived remaining extent of vegetation types. The study area is within the Kathu Bushveld (in the western and eastern sections of the study area) which is considered **Least Concerned** (LC) and **Poorly Protected (PP)** and the Gordonia Duneveld (in the middle on the study area) which is considered **LC** and **Moderately Protected (MP)**. 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**. 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. 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 NEMPAA.	

<table>
<tr><th colspan="4">NATIONAL THREATENED ECOSYSTEMS ASSOCIATED WITH THE STUDY AREA (2011 AND PROPOSED 2021)</th></tr>
<tr><td>NATIONAL THREATENED ECOSYSTEMS (2011 AND DRAFT 2021)</td><td colspan="3">According to the National Threatened Ecosystems dataset (2011), the study area is not within a threatened ecosystem. This is in agreement with the 2021 Red List of Ecosystems which also indicates that the study area is within LC ecosystems, namely the Kathu Bushveld and Gordonia Duneveld.

The purpose of listing protected ecosystems is primarily to preserve witness sites of exceptionally high conservation value. The first national list of threatened terrestrial ecosystems for South Africa was gazetted on 9 December 2011 (NEMBA: National List of Ecosystems that are Threatened and in need of protection, (G 34809, GN 1002), 9 December 2011).

Note: The National list of threatened terrestrial ecosystems published in terms of the NEMBA in 2011 remains in legal force. The 2021 Red List of Ecosystems was published in the government gazette on November 5th, 2021, for public comment (Gazette Notice no. 1476) and is not yet in force.</td></tr>
<tr><th colspan="2">CONSERVATION DETAILS PERTAINING TO THE AREA OF INTEREST (VARIOUS DATABASES)</th><th colspan="2">NATIONAL WEB BASED ENVIRONMENTAL SCREENING TOOL (accessed 2022)</th></tr>
<tr><td>IMPORTANT BIRD AREAS (IBA) (2015)</td><td>The study area is not located within a 10 km radius of an IBA (IBA, 2015).</td><td colspan="2">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</td></tr>
<tr><td rowspan="3">SAPAD (2022, Q2); SACAD (2022, Q2); NPAES (2018); AND SWSA (2017)</td><td rowspan="3">The various datasets associated with nationally protected areas (i.e., SAPAD and NPAES) do not indicate any protected areas or focus areas within 10 km of the study area.

The various national conservation areas checked for the study area (i.e., SACAD, SWSA) did not indicate the study area to be within 10 km of any conservation areas. For the SWSA, only the surface water was checked for the terrestrial biodiversity assessment. Refer to the Freshwater compliance statement (SASg) for details on underground SWSA.</td><td>Animal Species Theme[2]
Figure 5</td><td>The Animal Species Theme for the study area was identified to be of medium sensitivity. However, the majority of the site was identified as low sensitivity areas with only a portion of the most western section identified as medium faunal sensitivity.

The trigger species identified by the Screening tool include Aves-Aquila rapax (Tawny Eagle; EN).</td></tr>
<tr><td>Terrestrial Biodiversity Theme
Figure 6</td><td>For the Terrestrial Biodiversity Theme, the study area has an overall very high sensitivity due to the middle section of the study area being classed as an ESA and the presence of a FEPA Sub-catchment present within the study area.</td></tr>
<tr><td>Plant Species Theme
Figure 7</td><td>The Plant Species Theme for the study area was identified to be of low sensitivity.</td></tr>
<tr><th colspan="4">NORTHERN CAPE PROVINCIAL SPATIAL DEVELOPMENT FRAMEWORK (NCPSDF, 2019) - FIGURE 8</th></tr>
<tr><td colspan="4">The NCPSDF is to function as an innovative strategy that will apply sustainability principles to all forms of land use management throughout the northern cape as well as to facilitate practical results, as it relates to the eradication of poverty and inequality and the protection of the integrity of the environment.</td></tr>
<tr><td colspan="4">The study area also falls within the Gamagara corridor. The Gamagara corridor comprises the mining belt of the john Taolo Gaetsewe and Siyanda districts and runs from lime acres and Danielskuil to Hotazel in the north. The corridor focuses on the mining of iron and manganese.</td></tr>
<tr><th colspan="4">GRIQUALAND WEST CENTRE OF ENDEMISM (VAN STADEN ET AL., 2020) - FIGURE 9</th></tr>
<tr><td colspan="4">The study area occurs outside of the refined boundary of the Griqualand West Centre of Endemism (GWC) as updated by van Staden et al. (2020).</td></tr>
</table>

[2] Data Conservation status is from the Global Biodiversity Information Facility (GBIF) which provides free and open access to biodiversity data.

NORTHERN CAPE CRITICAL BIODIVERSITY AREAS (2016) - FIGURE 10	
Ecological Support Area (ESA)	The middle section of the study area is located within an **ESA**. ESAs are areas which must retain their ecological processes to meet biodiversity targets for ecological processes that have not been met in CBAs or protected areas. Similarly, ESAs are required to meet biodiversity targets for representation of ecosystem types or species of special concern when it is not possible to meet them in CBAs. These areas support ecological functioning of protected areas or CBAs or a combination of these (SANBI, 2017).
Other Natural Areas (ONA)	The study area, particularly the western and eastern portions of the study area, are located within an area is classified as **ONAs.** According to the Technical Guidelines for Critical Biodiversity Area (CBA) Maps document ONA consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs (SANBI, 2017).
CBA Reasons Layer	The Northern Cape CBAs (2016) database also includes the "reasons" layer, which is based on the planning units used in the spatial analysis and provides a list of biodiversity and ecological features found in each planning unit, which contribute to the biodiversity target (CBA Map Reason Metadata). According to this Northern Cape CBA Reasons layer, the triggering feature for the ESA associated with the study area is the presence of the Ga-Mogara River.

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

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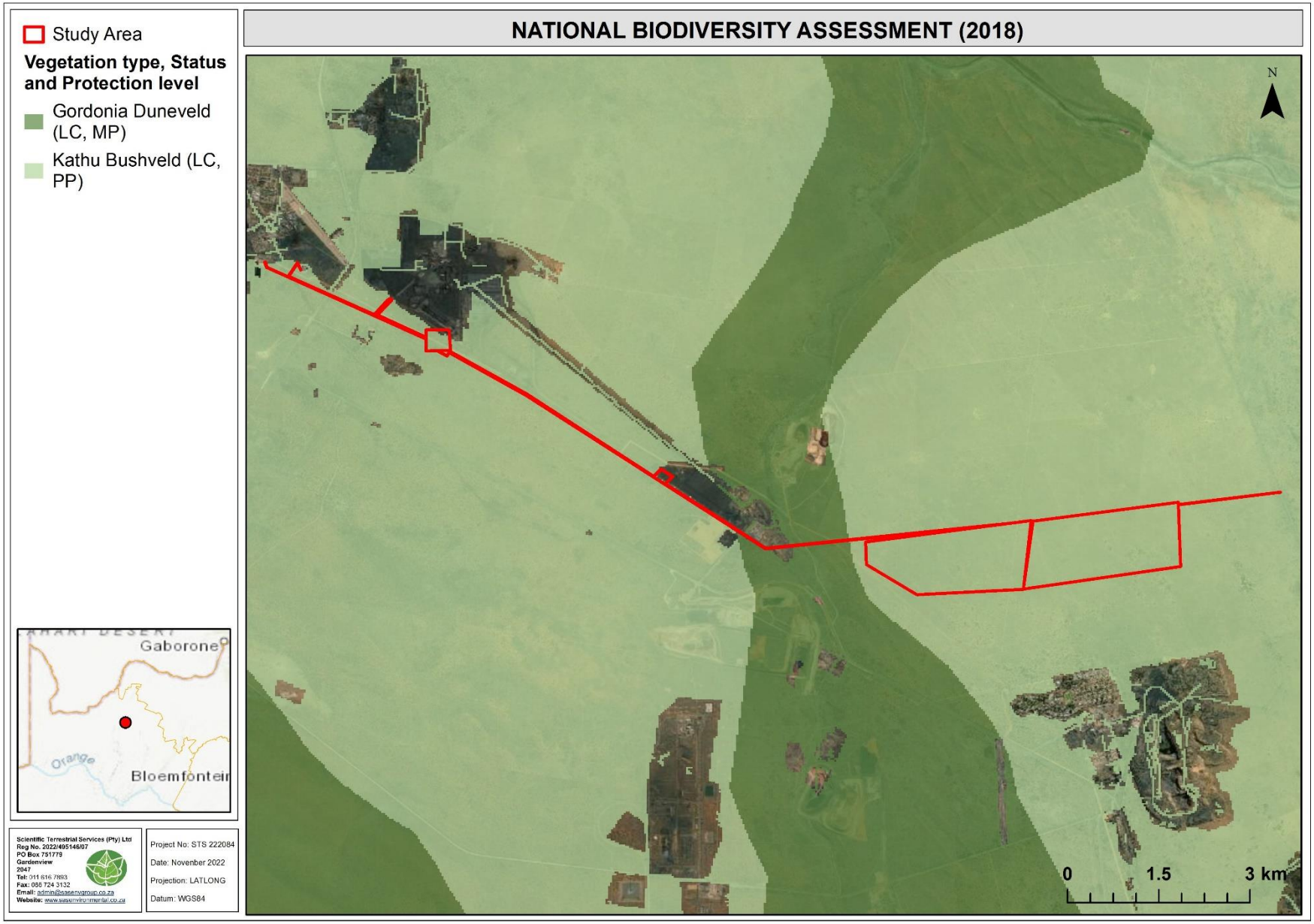

Figure 5: Vegetation types associated with the study area as identified by the National Biodiversity Assessment (NBA; 2018).

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Screening Report Map - Animal Species Theme

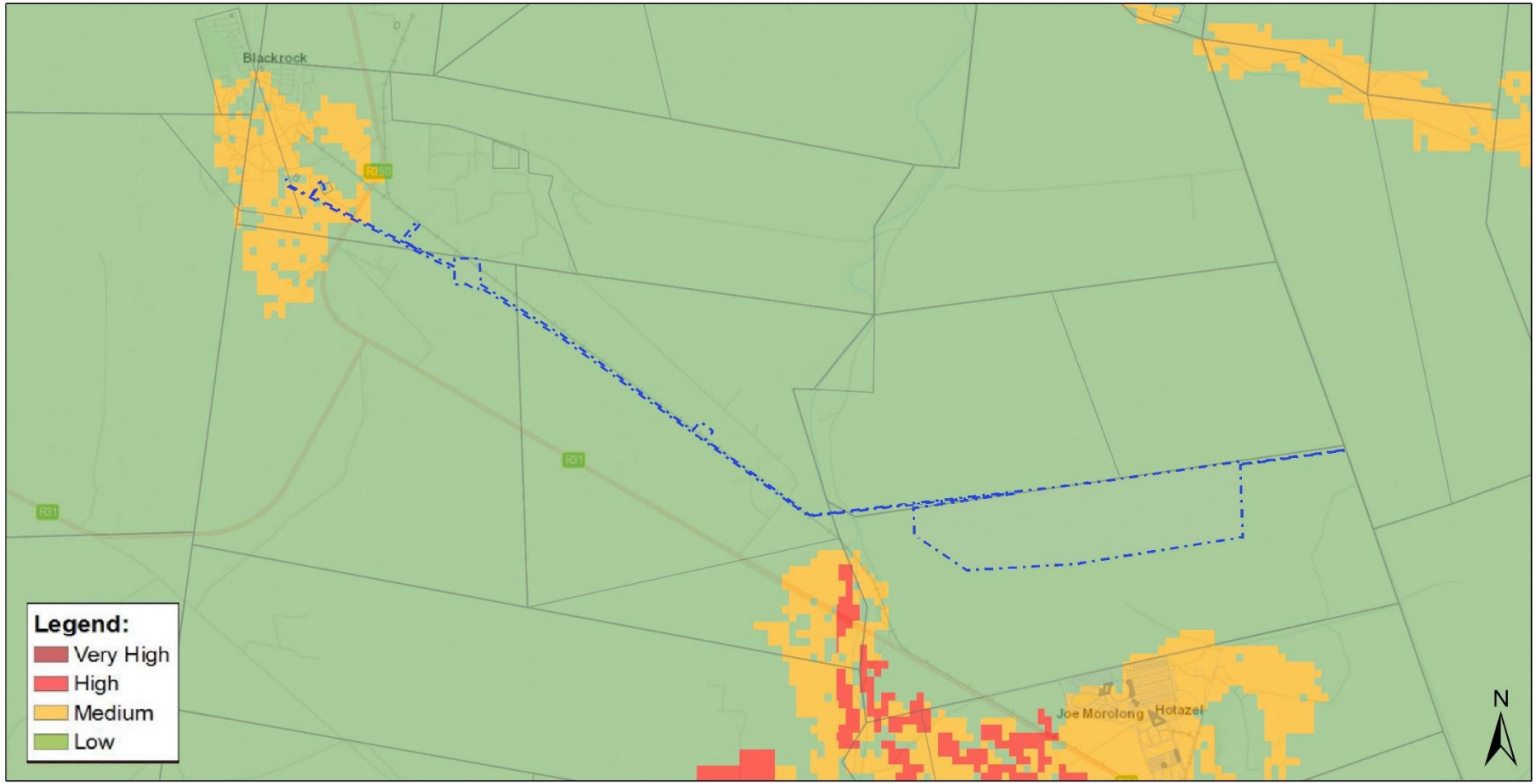

Figure 6: The Animal Species Theme outcome for the study area.

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Screening Report Map - Terrestrial Biodiversity Theme

Figure 7: The Terrestrial Biodiversity Theme outcome for the study area.

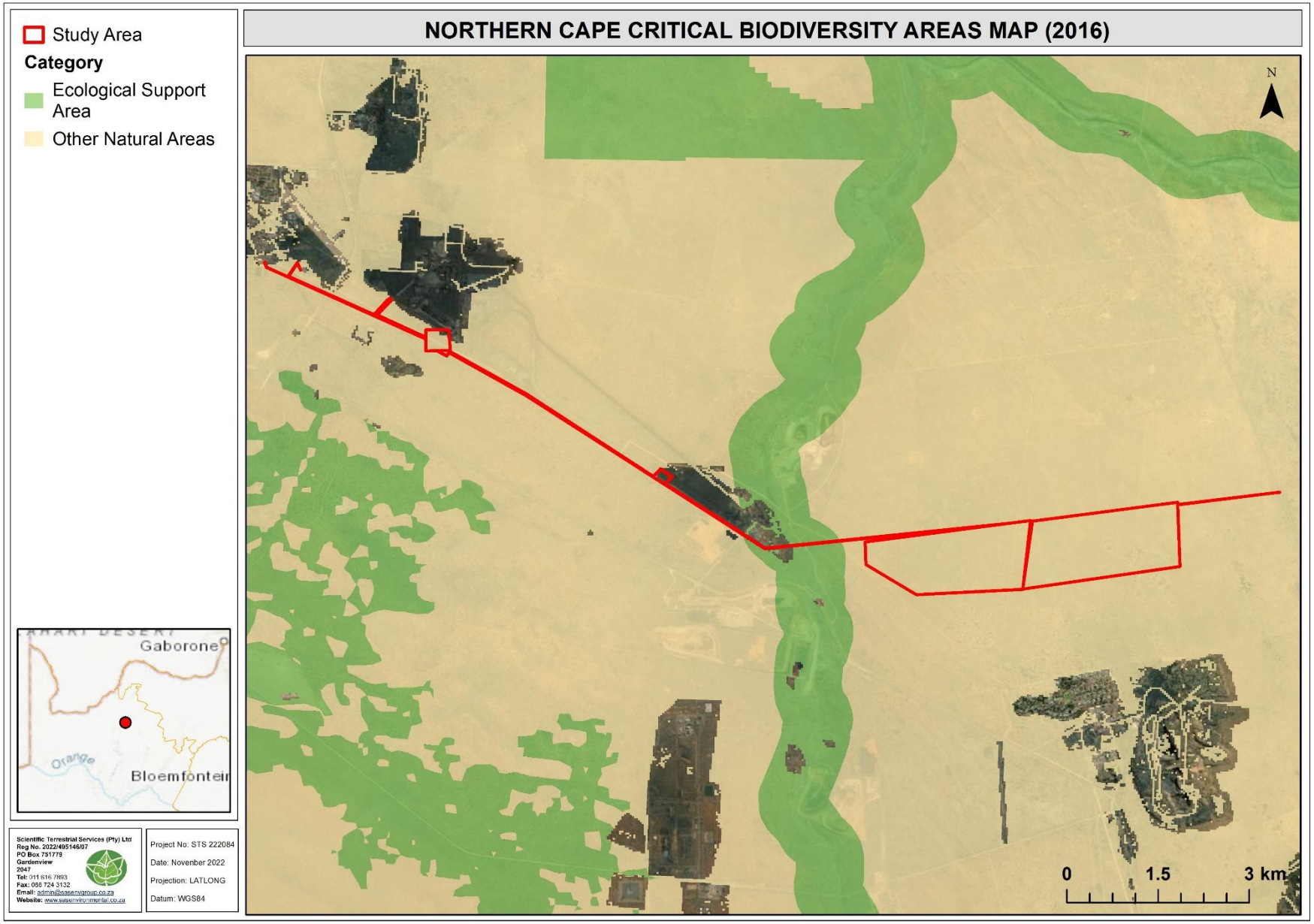

Figure 8: Importance of the study area in relation to the Northern Cape Critical Biodiversity Areas Database (2016).

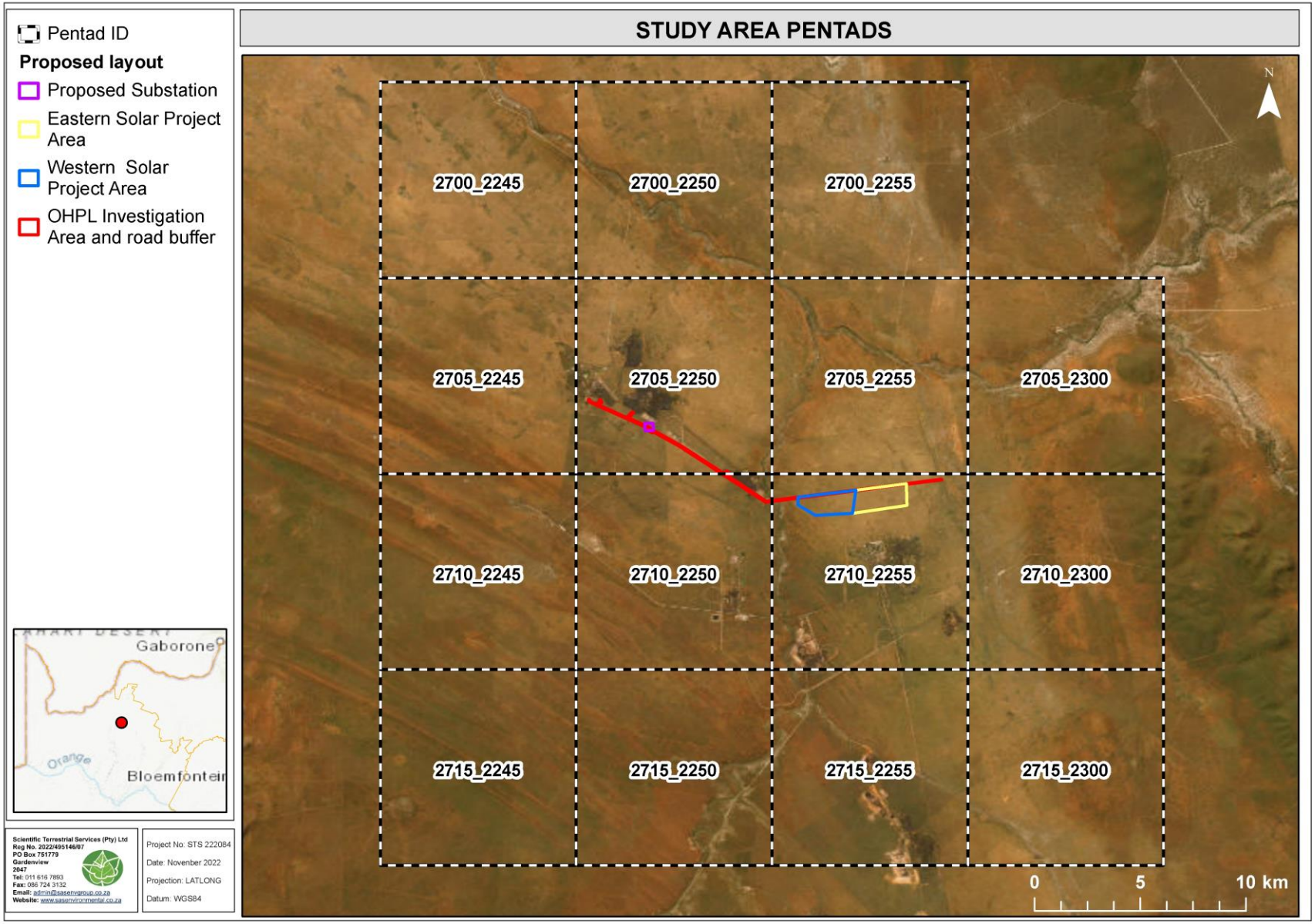

Figure 9: The study area in relation to the pentads located in the wider area.

3.2 Results of Desktop Avifaunal SCC Assessment

The following table of avifaunal SCC include threatened/ sensitive bird species whose distribution ranges (as presented in Taylor *et al*, 2015) include the area in which the proposed development is located. Records from SABAP 2 were obtained to determine if these species were recorded in SABAP 2 in the pentads 2705_2250, 2710_2250 and 2710_22255 and the relative reporting rate for each species in these pentads. Due to the low coverage of atlas cards in the area, records from the adjacent pentads have also been checked for the occurrence of SCC. The table below provides a brief summary of the data.

Table 3: A summary of historic and current data for SCC obtained from SABAP2 pentads 2705_2250, 2710_2250 and 2710_2255, as well as from adjacent pentads.

Common Name	Scientific Name	Regional Status (Taylor *et al*, 2015)	Reporting Rate (%)			Recorded in Neighbouring Pentads
			SABAP 2 2705_2250 (26 cards)	SABAP 2 2710_2250 (6 cards)	SABAP 2 2710_2255 (4 cards)	
Kori Bustard	*Ardeotis kori*	NT	-	-	-	X (2705_2300 2715_2250)
Ludwig's Bustard	*Neotis ludwigii*	EN	-	-	-	-
Secretarybird	*Sagittarius serpentarius*	VU	-	-	-	-
Lappet-faced Vulture	*Torgos tracheliotos*	EN	-	-	-	-
White-backed Vulture	*Gyps africanus*	EN	-	16.7	-	X (2710_2300 2705_2245)
Verreauxs' Eagle	*Aquila verreauxii*	VU	-	-	25	-
Martial Eagle	*Polemaetus bellicosus*	EN		16.7	-	X (2715_2300 2710_2245 2705_2245 2700_2245)
Tawny Eagle	*Aquila rapax*	EN	-	-	-	-
Black Harrier	*Circus maurus*	EN	-	-	-	-
Lanner Falcon	*Falco biarmicus*	VU		-	25	X (2710_2300 2715_2300)
Double-banded Courser	*Rhinoptilus africanus*	NT	-	16.7	-	-
Burchell's Courser	*Cursorius rufus*	VU	-	-	-	-

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

4 AVIFAUNAL ASSESSMENT RESULTS

Based on the results of the field investigations undertaken between the 31st of October and the 04th of November 2022, three broad habitat units with two sub-units were distinguished within the study area:

- **Transformed Habitat:** This include areas where vegetation communities are degraded or cleared and have significantly shifted away from their reference states due to exposure to anthropogenically-related disturbances (ranging in significance).
- **Thornveld Habitat:** Natural vegetation communities where species composition and vegetation structure have not deviated significantly from the reference states, and in which only restricted disturbances were noted on site. The Thornveld Habitat unit includes three sub-units that vary in vegetation structure, soil type and/or habitat integrity. The recorded species composition invariably differed between these habitat sub-units, but most species are, however, shared among them. The two sub-units include:
  - Open Thornveld; and
  - Semi-closed Thornveld.
- **Freshwater Habitat:** The powerline route traverses the Ga-mogara River habitat. The Ga-mogara Habitat encompasses the Ga-mogara River[3] and its flood lines[4] (flood lines provided by the client). From a floral perspective, the sections of the Ga-mogara Habitat within the study area are regarded to be degraded and species-poor. The habitat is densely encroached by the invasive *Prosopis glandulosa* and the vegetation has taken on a **short-to-tall, closed woodland** structure.

For a further breakdown of the floral communities and habitat and conservation sensitivities associated with them, refer to the floral report (STS 222039: Part B).

Section 4.1 summarises the field observations that were made during the site visit in October/November 2022, with regards to overall avifaunal diversity, food availability, habitat

[3] The Freshwater Habitat meets the definition of a **watercourse** in terms of the definition contained within the National Water Act, 1998 (Act No. 36 of 1998) (NWA):

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

and a reference to a watercourse includes, where relevant, its bed and banks.

[4] Government Notice (GN) 509 of 2016 (i.e., General authorisation in terms of Section 39 of the NWA for water uses as defined in section 21(c) or section 21(i)) defines a flood lines in terms of a watercourse as follows: **"extent of a watercourse" means:**

a) The outer edge of the 1 in 100 year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;

integrity, habitat availability, general comments and business case and conclusion. Figures 10-14 below provides a visual representation of the above-mentioned habitat units.

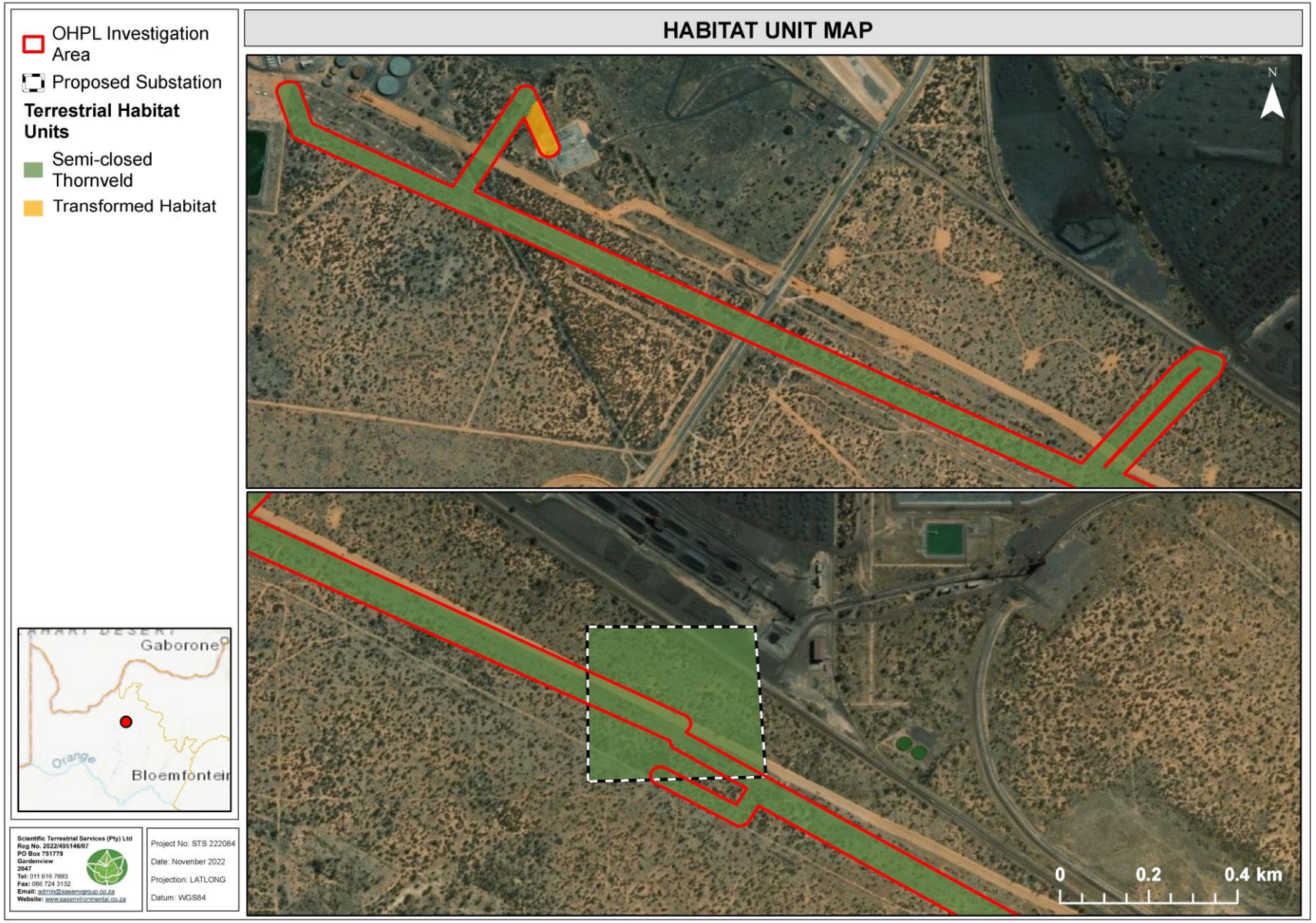

Figure 10: Habitat units encountered within the western part of the study area (power line western extent).

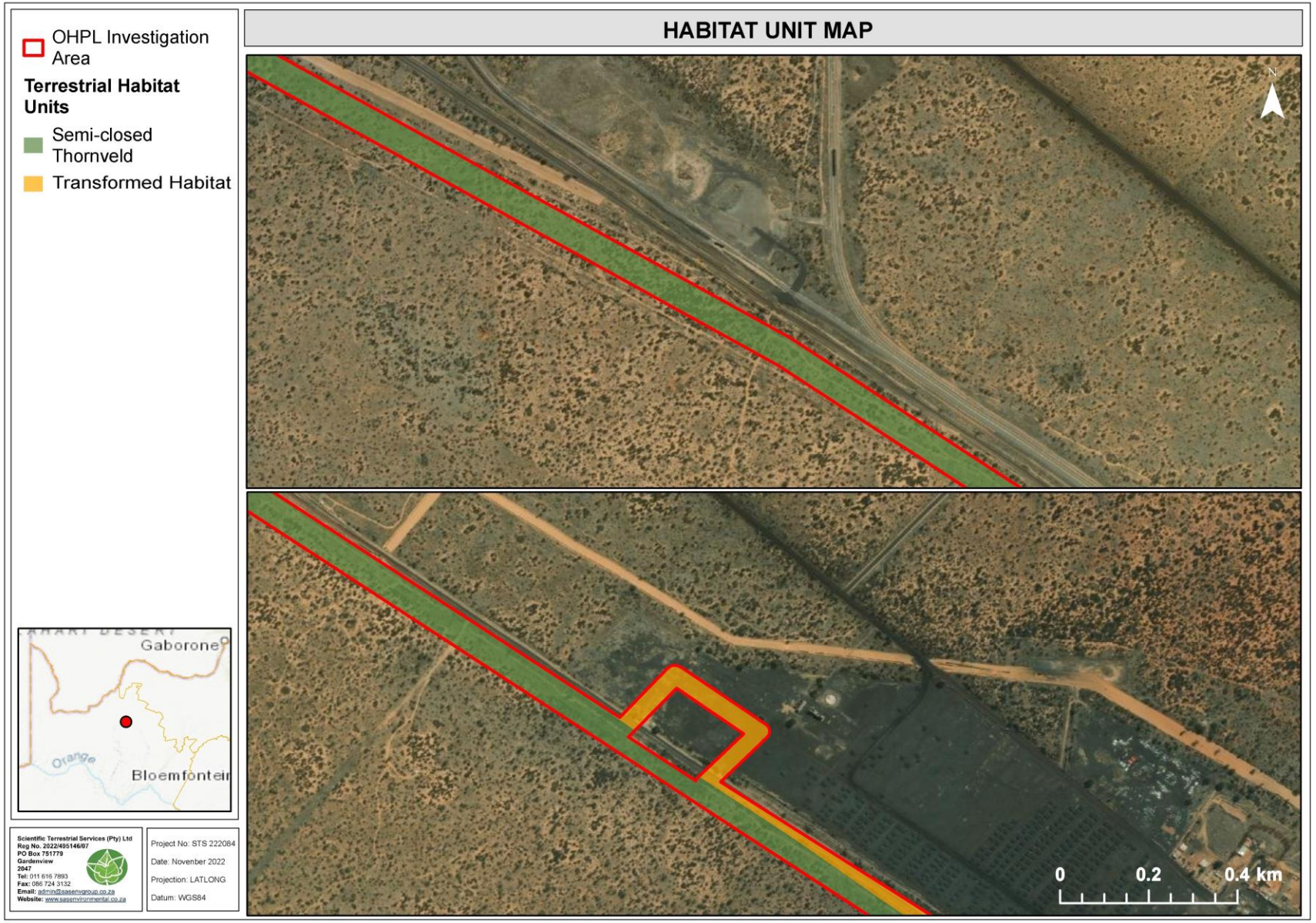

Figure 11 Habitat units encountered within the western part of the study area (power line central extent).

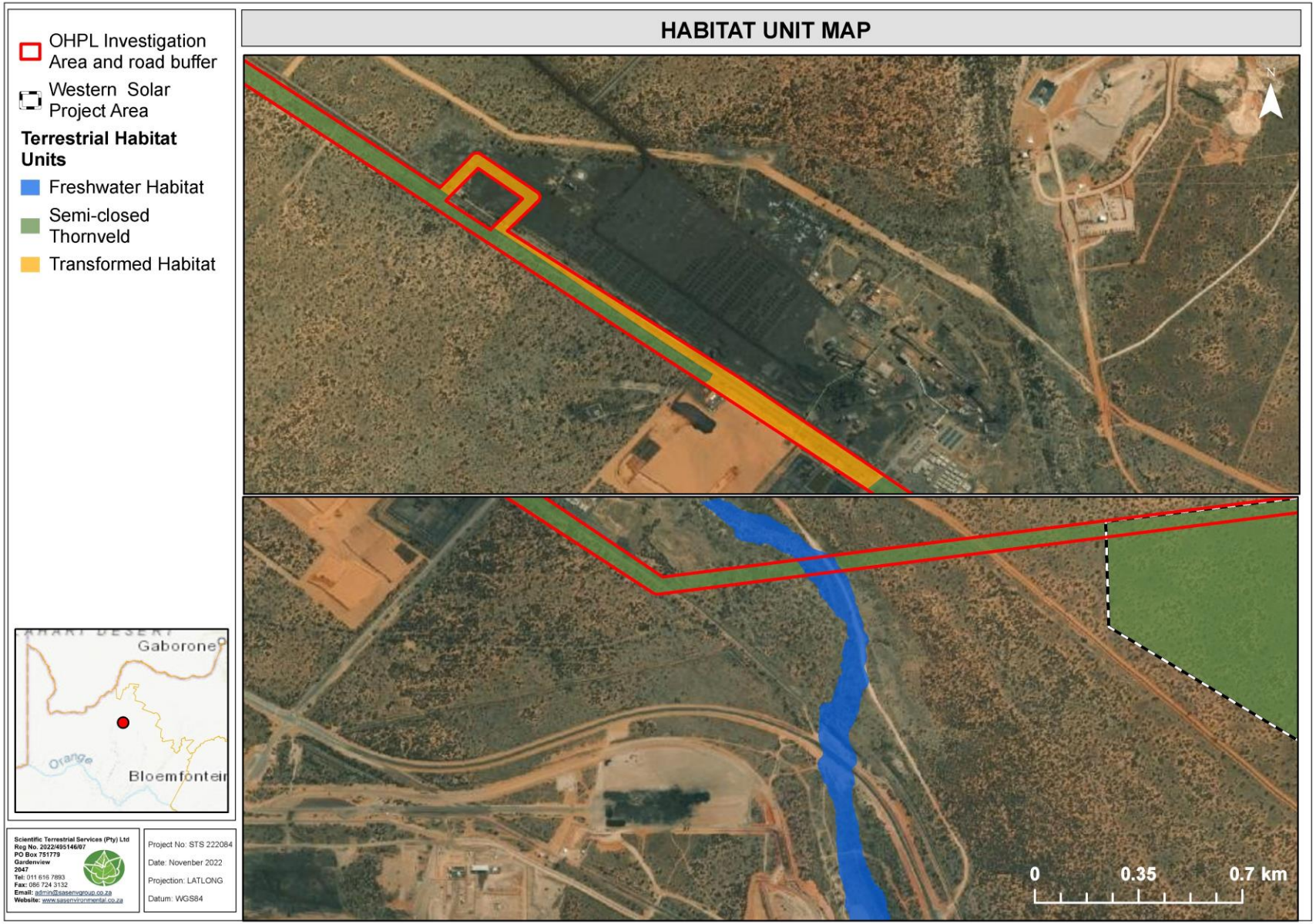

Figure 12: Habitat units encountered within the western part of the study area (power line eastern extent).

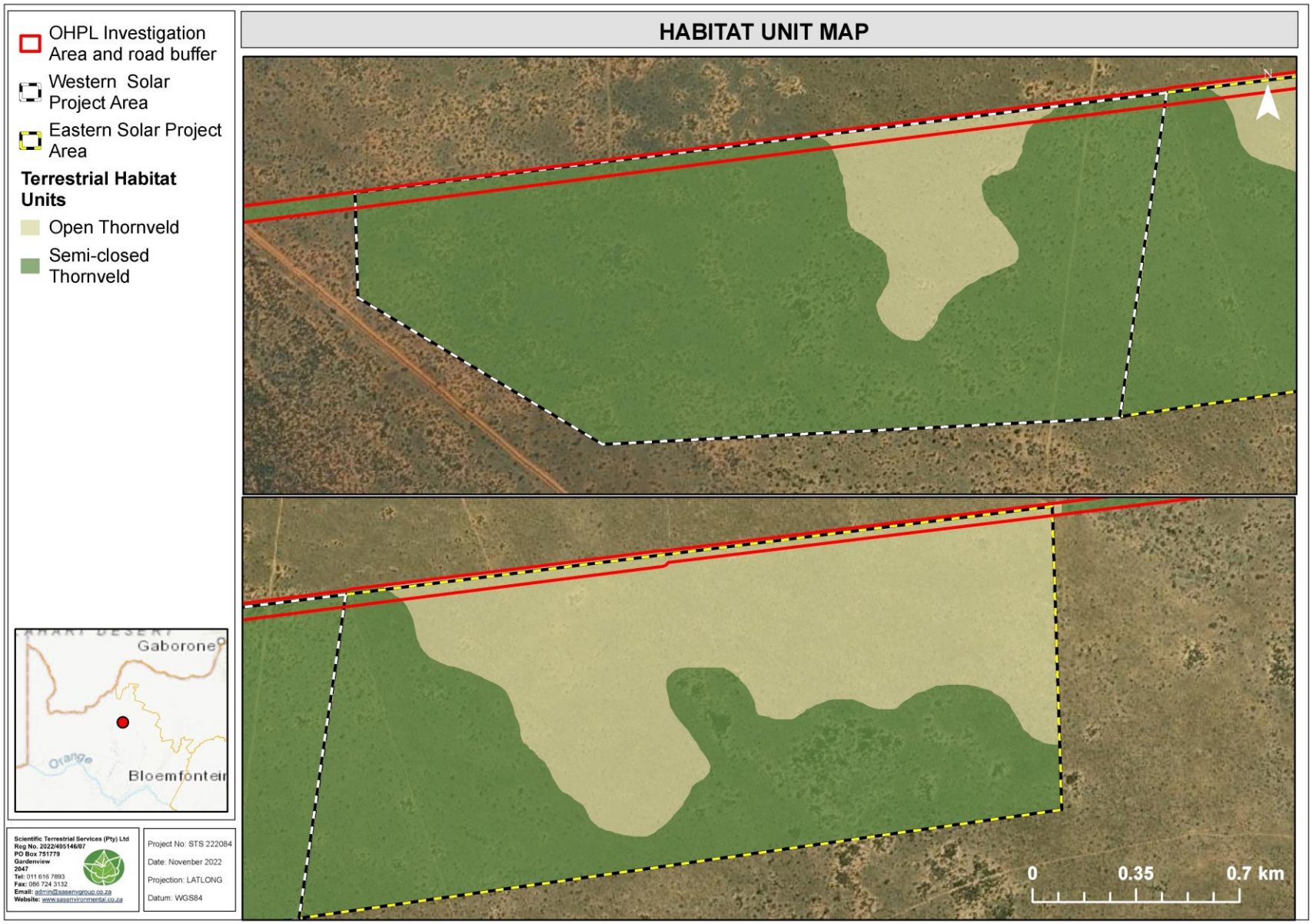

Figure 13: Habitat units encountered within the western part of the study area (Solar Project Areas).

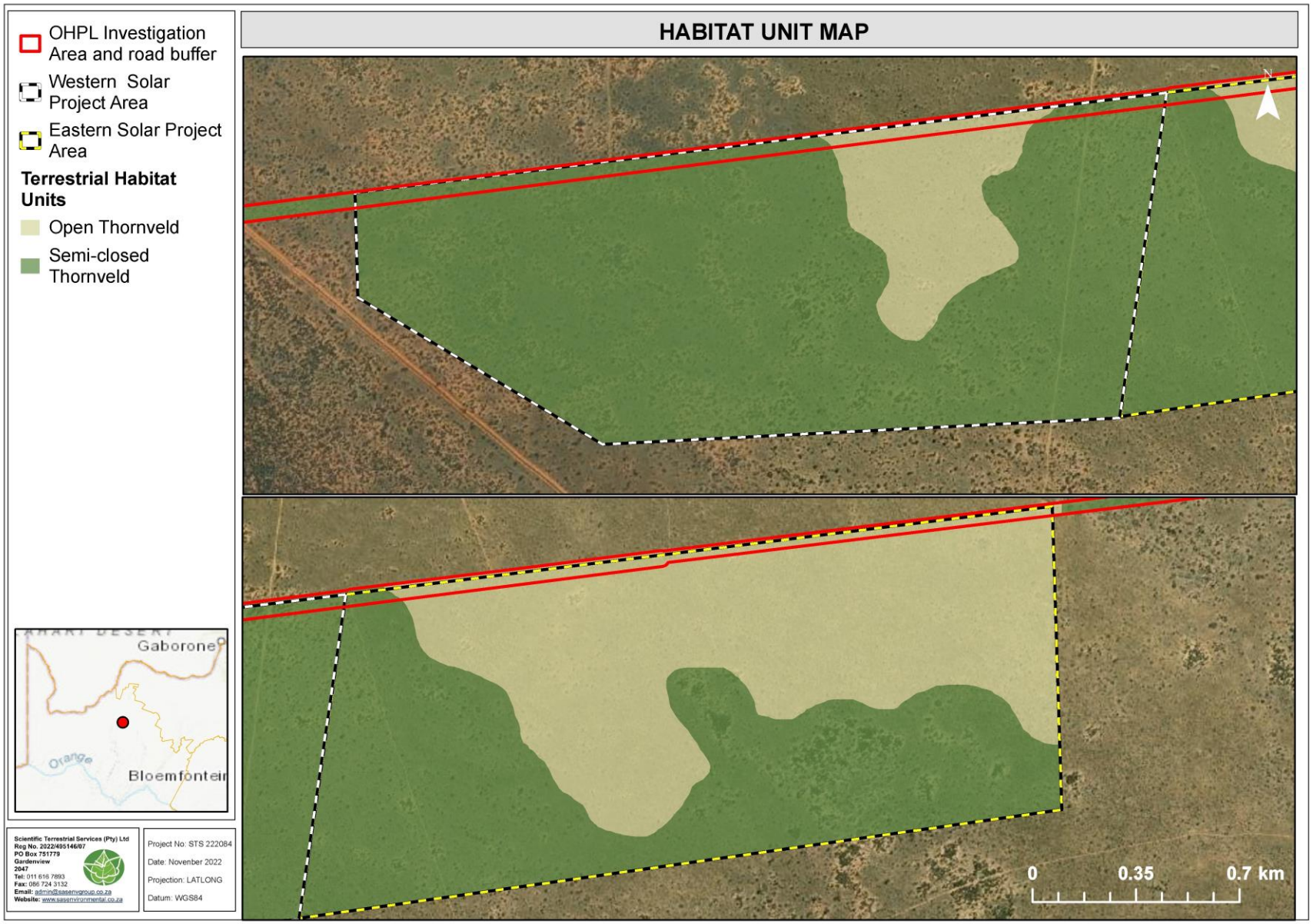

Figure 14 Habitat units encountered within the western part of the study area (access road east of the Solar Project areas)

4.1 Summary of results for avifaunal species

Photograph Notes:

Left Top Left – Nest discovered on the solar project site **Left Top Right** Kori Bustard in flight, recorded on the project site. **Left Bottom Left** –Kalahari Scrub-Robin (*Cercotrichas paena*); **Left Bottom Right** – Swallow-tailed Bee-eater (*Merops hirundineus*).

Right Top: Left – Open thornveld in the solar array footprint; **Right Top Right** – grassy area in open thornveld in the solar array footprint. **Right Bottom Left** – Semi-closed thornveld along the proposed power line alignment; **Right Bottom Right –** Example of transformed habitat on the project site.




Photographs:




<table>
<tr><td>Avifaunal Species of Conservation Concern (SCC)</td><td colspan="2">The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland indicates that several SCC have a distribution which encompasses the study area; SABAP2 data for the study areas and surrounding pentads was consulted and indicates that certain of these and certain other SCC have been recorded in the wider area. During the field assessment the only SCC observed within the study area was the Kori Bustard (Ardeotis kori NT). This bustard species prefers wooded habitats and is likely to range anywhere within the Open and Semi-closed Thornveld that dominates the study area. The related Ludwig's Bustard (Neotis ludwigii EN) prefers more open karroid scrubveld habitat and is likely to occur very marginally in the study area, if at all.
Based on this desktop assessment and assessment of on-site habitat characteristics, it is evident that the Martial Eagle (Polemaetus bellicosus EN) occurs occasionally, albeit widely over the wider area. The White-backed Vulture (Gyps africanus EN) and Lanner Falcon (Falco biarmicus VU) have also been recorded in more than one pentad in the wider area and are likely to range widely over the study area. Although falling within its range, the Lappet-faced Vulture (Torgos tracheliotos EN) and Tawny Eagle (Aquilla rapax EN) are only likely to be an extremely uncommon visitors to the study area. The Verreauxs' Eagle (Aquila verreauxii, VU) is likely to be largely restricted to hilly areas to the east and south-east of the site where its primary prey (Rock Hyrax - Procavia capensis) will be encountered, and as such is also likely to be an extremely occasional visitor to the area. The Black Harrier is highly unlikely to occur within the study area due to lack of suitable habitat. Secretarybirds (Sagittarius serpentarius, VU) may occasionally range in the open thornveld habitat unit in the study area.</td></tr>
<tr><td>General Avian Discussion</td><td>Avifaunal diversity is considered intermediate to low within the study area. The habitat units within the study area provide a few alternative landscape structures, which is often considered a primary determinant of bird assemblages, and the absence of natural rocky and freshwater habitat on the site limits the avifaunal diversity on the site. The actual diversity noted within the study area was intermediate with mostly commonly occurring species typical of the semi-arid western parts of the country being observed.
The study area is likely to experience seasonal variation in bird species densities, primarily related to food sources that are related to the growing and rainy seasons. During the summer months the overall food resource production of the herbaceous layer increases, especially for granivorous and nectivorous species, and a higher abundance of avifauna can be supported. The summer months will see an increase in insect abundance which provide an energy rich source of food for many avifaunal species. This increase is likely mimicked by small mammals as well as lizards and skinks which are an important food resource for raptors and some smaller bird species. Understandable reductions in insect abundance will likely occur during the winter months, and many avifaunal species will likely become more nomadic in their behaviour.

The integrity of the many parts of the study area with regards to avifaunal species is considered low, especially where mining operations and linear impacts such as roads and railways have occurred. In other parts of the study area located away from areas of disturbance, habitat integrity is higher, although agricultural practices (livestock rearing) and associated landuse-related factors have resulted in partial degradation Where significant degradation, transformation and fragmentation has occurred, this has significantly lowered the possibility for many of the potentially occurring SCC to range within the area.</td><td>Conclusion
The avifaunal habitat sensitivity for the study area is considered to be intermediate to low. The possibility of SCC ranging into / occurring within the area on a regular basis is low and it is considered highly unlikely that any of the SCC will breed within the study area. The strong human disturbance factor over much of the landscape of the study area is considered a very strong limiting factor for the occurrence of SCC.

Clearing of vegetation for the proposed solar arrays and ancillary infrastructure will have a direct impact on habitat availability in the development footprint, leading to localised migration of many avifaunal species to adjacent habitats. The retention of relict habitat in the immediate surrounds of the proposed development will partially offset this by providing areas into which affected bird species can move. Avifaunal abundances within the footprint will however dramatically decrease. Species that relocate into the surrounding areas will be subject to higher levels of competition for food resources and space. Impacts to avifaunal species within the study area will result in the localised loss of habitat, diversity and avian abundance, whilst edge effects such as noise, dust and footprint creep will impact on avifaunal species in the immediate vicinity of the proposed development.

The power line associated with the development could pose a threat to certain avifaunal species that are vulnerable to collisions, especially certain larger, less mobile birds, although the fragmentation of habitat and high human presence is likely to greatly limit the potential for such species (e.g. bustards / korhaans and larger raptors). Collision-related mitigation measures should thus be considered for this project.</td></tr>
</table>

4.2 Avifaunal SCC Assessment

During field assessments, it is not always feasible to identify or observe all species within an area, largely due to the secretive nature of many avian species, possible low population numbers or varying habits of species, as well as the wide range of many species that entail that such species may only intermittently inhabit different parts of their range / territory. As such, and to specifically assess an area for faunal SCC, a Probability of Occurrence (POC) matrix is used, utilising a number of factors to determine the probability of faunal SCC occurrence within the study area. Species listed regional listings, whose known distribution ranges and habitat preferences include the study area were taken into consideration. Table 4 lists the SCC for the project. Of these species only Kori Bustard (*Ardeotis kori*) was recorded on the site. Of the remainder of the potentially-occurring SCC several species have been recorded in the pentads in which the study area occurs; The following species – White-backed Vulture (*Gyps africanus*, EN), Martial Eagle (*Polemaetus bellicosus;* EN), Lanner Falcon (*Falco biarmicus*, VU), Secretarybird (*Sagittarius serpentarius*, VU), Double-banded Courser (*Rhinoptilus africanus*, NT) and Burchell's Courser (*Cursorius rufus*, VU), are likely to occasionally range onto the site

Should the nests of any avifaunal SCC as listed above and in Appendix D of this report, be encountered during the course of the proposed development activities, all operations must be stopped immediately, and an avifaunal specialist must be consulted in order to advise on the best way forward. For mitigation on how to appropriately manage and treat potential SCC present in the study area refer to Section 6.2.

Table 4: Avifaunal SCC that have been recorded to and which may occur within the study area

SCIENTIFIC AND COMMON NAME	HABITAT DESCRIPTION	REGIONAL STATUS	POC (%)
Ardeotis kori (Kori Bustard)	**Range**: Resident; occurring widely but rarely across the northern parts of southern Africa and into Eastern Africa. **Major habitats**: Arid wooded savannah; Nama Karroo. **Description**: Forages by pecking on the ground, singly or in small groups. Very slow and heavy flight. **Food:** Feeds primarily on invertebrates and small vertebrates, but also roots, berries, etc.. **Available habitat within the study area*:*** Open and Semi-closed thornveld.	**NT**	**C**
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 within the study area:** Open and Semi-closed Thornveld; Freshwater Habitat (Ga-Mogara River riparian).		**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:** Open Thornveld; Freshwater Habitat (Ga-Mogara River riparian).	**VU**	**L**
Polemaetus bellicosus (Martial Eagle)	**Range**: Breeding resident, occurring widely across southern Africa and into sub-Saharan Africa. **Major habitats**: Various types of open woodland; farmland with scattered trees and shrubland with wooded drainage lines. Often occurs in association with power lines. **Description**: Powerful raptor, usually hunting on the wing; moving across large areas in search of prey. **Food:** Feeds primarily on a mix of small mammals, reptiles and larger birds. **Available habitat with the study area:** Open and Semi-closed Thornveld; Freshwater Habitat (Ga-Mogara River riparian).	**VU**	**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:** Degraded grassland and open woodland.	**VU**	**L**

NT=Near Threatened.

5 SENSITIVITY MAPPING

Figure 14 below conceptually illustrates the areas considered to be of increased ecological sensitivity. The areas are depicted according to their sensitivity in terms of the presence or potential for avifaunal SCC, habitat integrity and levels of disturbance, threat status of the habitat type, the presence of unique landscapes and overall levels of diversity. The table below presents the sensitivity of each identified habitat unit along with an associated conservation objective and implications for development.

Table 5: A summary of sensitivity of each habitat unit and implications for development.

Sensitivity	Habitat Unit	Development Implications
Low Sensitivity	➢ **Transformed Habitat** Conservation Objective for areas of Low Sensitivity**:** Optimise development potential.	These habitats are deemed to be of low sensitivity for avifauna due to their altered state, absence of vegetation lack of heterogeneity and intensive anthropogenic presence – presence of mining activities and linear development. Development within these areas is unlikely to lead to any measurable lead to high impacts to avifaunal habitat or species diversity provided mitigation measures are implemented.
Moderately Low	➢ **Semi-closed Thornveld** ➢ **Open Thornveld** Conservation Objective for areas of Moderately-Low Sensitivity**:** Optimise development potential while improving biodiversity intactness of surrounding natural habitat and managing edge effects.	The habitat sensitivity of this unit is considered moderately low as it has been partly degraded as a result of historic and current agricultural activities and associated land use practices (e.g. veld burning). The units comprise of relatively homogenous thornveld vegetation with average forging and breeding opportunities for most avifauna and these habitats are not considered important for any SCC. Development within these habitat units is not expected to have a significant negative impact on the local or regional ecology of the area, provided mitigation measures are adhered to.
Moderately High	➢ **Freshwater Habitat** Conservation Objective: Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance.	The Ga-Mogara River is the only freshwater habitat in the wider area and is such is an important avifaunal movement corridor. The presence of moisture, in the form of surface water flows on an episodic basis only, but permanently in the form of groundwater that can be accessed by riparian vegetation ensures that the river displays a structure and vegetative composition that is distinct from surrounding vegetation communities. Due to the increased availability of moisture, the productivity of this habitat for avifauna is greatly increased, and the presence of larger trees improves the roosting and nesting value of this habitat unit. It should be noted that the riparian corridor of the river has been degraded by mining activities in the vicinity of the proposed crossing point, hence this reach of the river has only been assessed to be of moderately high sensitivity.

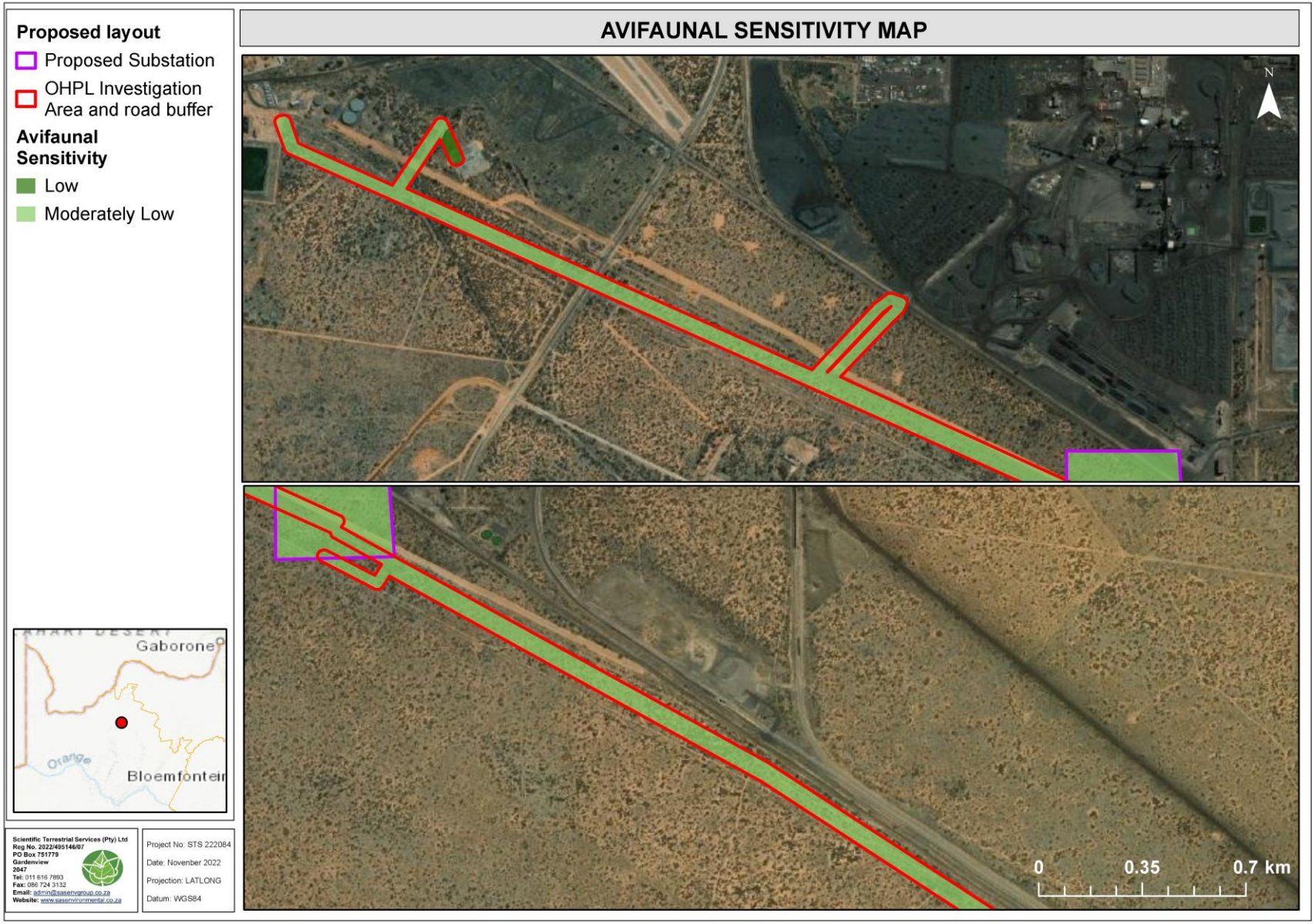

Figure 15: Avifaunal sensitivity map for the Study Area – northern extent of the OHPL investigation area.

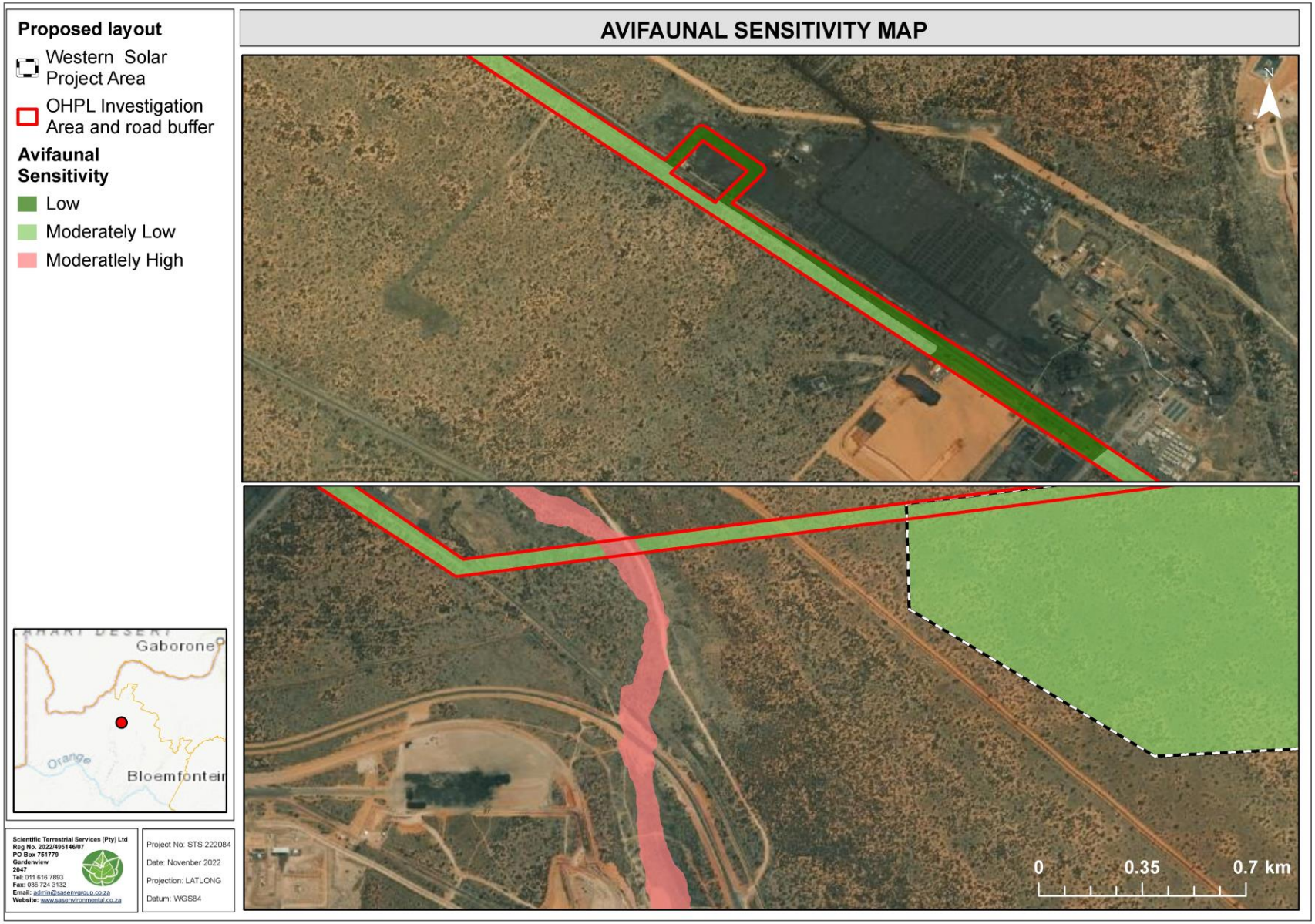

Figure 16: Avifaunal sensitivity map for the Study Area – southern extent of the OHPL investigation area.

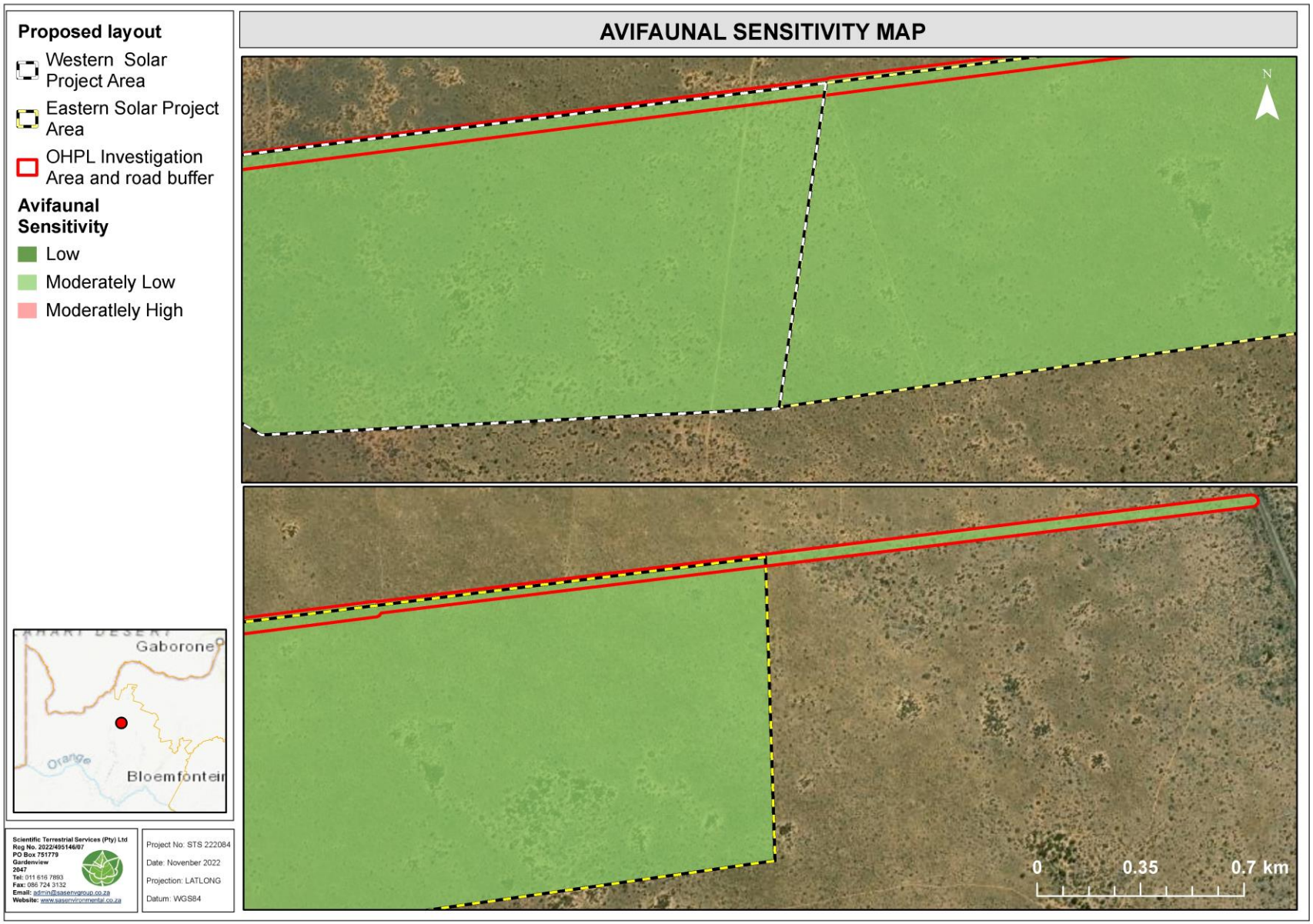

Figure 17: Avifaunal sensitivity map for the Study Area – Solar Power Project Areas.

6 IMPACT ASSESSMENT

The sections below provide the significance of perceived impacts arising from the proposed development for the study area as described in Section 1.1. The impact assessment was undertaken on all aspects of avifaunal ecology deemed likely to be affected by the proposed activities (as per the layout in Figure 3).

The impact assessment and discussion of all impacts arising from all phases of the proposed mining development are provided in Section 6.2 and 6.3. All mitigatory measures required to minimise the perceived impacts are presented in the impact assessment tables of Section 6.2

Proposed Activity Description: Development of a Solar PV Facility and OHL lines (Options 1 and 2 assessed in the impact assessment).

6.1 Activities and Aspect Register

The table below indicates the perceived risks to avifaunal species associated with the activities pertaining to the proposed infrastructure developments listed in Section 6 above.

Table 6: 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:
  • Potential failure to have a Rehabilitation Plan developed before the commencement of the development of the powerline.
  • Potential failure to obtain the necessary permits for the removal of protected avifaunal species should they be needed resulting in delays to the construction activities.
- **Impact**: Long-term or permanent degradation and modification of the receiving environment, loss of SCC and fauna habitat.

- Potential inadequate design of PV infrastructure, electricity pylons and powerlines increasing the possibility of birds being electrocuted or colliding with infrastructure. - **Impact:** Long-term collision and electrocution risks to SCC species leading to a reduction in SCC diversity.
Construction Phase
- Inadequate layout optimisation, resulting in extensive (non-phased) site clearing and the removal of indigenous vegetation. - **Impact:** Loss of important avifaunal habitat and the potential loss of potential avifaunal SCC.
- Uncontrolled and unplanned site clearing and the removal of vegetation and destruction of avifaunal habitat and forage. - **Impact:** Loss of sensitive avifaunal habitat and avifaunal species reliant on this specific habitat for survival.
- Proliferation of AIP species that colonise areas of increased disturbances and 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. - **Impact:** Loss of avifaunal habitat, diversity, and potential SCC.
- Potential failure to implement a rehabilitation and an alien floral control plan after the construction phase. - **Impact:** Potentially leading to permanent transformation of avifaunal habitat and long-term degradation of important avifaunal habitat within the region.
- Increased risk of avian collisions with construction vehicles. - **Impact:** Local loss of potential avifaunal SCC abundance and diversity.
- 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 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.
Operational and Maintenance Phase
- Loss of indigenous vegetation and thus avifaunal habitat, in particular woodland vegetation and less disturbed grassland vegetation within the solar array footprint and within power line servitudes that are 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.
- 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, diversity and potential SCC, 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, diversity and potential SCC.
- Poorly implemented and monitored AIP Management programme leading to the reintroduction and proliferation of AIP species. - **Impact:** Permanent loss of surrounding avifaunal niche habitat, diversity and SCC.
- Increased risk of collisions with the project infrastructure and/or electrocution while perching on the pylons or powerlines. - **Impact:** Local loss of potential avifaunal SCC abundance and diversity.
- Potential overexploitation through the removal and/or collection of important or sensitive avifaunal SCC on the property. - **Impact:** Local loss of potential avifaunal SCC abundance and diversity.
- Potentially poorly managed edge effects: - Clearing of all vegetation from the entire width of the power line servitude. - Ineffective rehabilitation of compacted areas, bare soils, or eroded areas leading to a continual proliferation of AIP species in disturbed areas and subsequent spread to surrounding natural areas altering the avifaunal habitat; and - Potential erosion stemming from soil left bare leading to sedimentation of downslope avifaunal habitat. - **Impact:** Loss of avifaunal habitat, diversity and potential SCC within the direct expansion development footprint of the mine. Loss of surrounding avifaunal diversity and potential avifaunal SCC through the displacement of indigenous flora by AIP species - especially in response to disturbance in natural areas.

6.2 Avifaunal Impact Assessment Results

The below table indicates the perceived risks to the avian ecology associated with all phases of the proposed development within the study area. The table also provides the findings of the impact assessment undertaken with reference to the perceived impacts prior to the implementation of mitigation measures and following the implementation of mitigation measures. The mitigated results of the impact assessment have been calculated on the premise that all mitigation measures as stipulated in this report are adhered to and implemented. Should such actions not be adhered to, it is highly likely that post-mitigation impact scores will increase.

Table 7: Planning Phase impacts on the faunal habitat, diversity, and SCC from the proposed development activities. Required mitigation measures are presented at the bottom of the table.

	UNMANAGED								MANAGED							
Habitat Unit/ Proposed Alternative	**Probability**	**Sensitivity**	**Severity**	**Spatial Scale**	**Duration**	**Likelihood**	**Consequence**	**Significance**	**Probability**	**Sensitivity**	**Severity**	**Spatial Scale**	**Duration**	**Likelihood**	**Consequence**	**Significance**
IMPACT ON HABITAT AND DIVERSITY																
Western and Eastern Solar Project Area																
Thornveld	3	2	2	3	1	5	6	**30 Low**	2	2	1	3	1	4	5	**20 Low**
OHPL Investigation Area, Substation and Road Buffer Investigation Area																
Thornveld	3	2	2	3	1	5	6	**30 Low**	2	2	1	3	1	4	5	**20 Low**
Freshwater Habitat	3	3	2	3	1	6	6	**36 Low**	2	3	1	3	1	5	5	**25 Low**
Transformed Habitat	3	1	2	3	1	4	6	**24 Low**	2	1	1	3	1	3	5	**15 Low**
Mitigation Measures for Planning phase impacts on habitat and species diversity																
- Footprint areas should be kept as small as possible in the facility design and layout; - Planning of the OHPL must ensure that no power line towers are placed in the riparian corridor of the Ga-Mogara River. - Design of infrastructure and layouts must be environmentally sound; - Where possible, and feasible, design of all access roads should be to utilise existing roads so to reduce fragmentation of existing natural habitat; - At all times, ensure that sound environmental management is in place during the planning phase; - Minimise loss of indigenous vegetation where possible through planning and adherence to suitable layouts; - It is recommended that prior to the commencement of construction activities the entire construction footprint be clearly demarcated to limit footprint creep and edge effects; - Prior to the commencement of construction activities, an authorised AIP Management/Control Plan should be compiled for implementation; and - Planning for construction should ensure that construction preferably occur in the drier winter months. - Bird diverter devices (flappers) must be included in the planning of the line to be fitted along each span.																
IMPACT ON SCC																
Western and Eastern Solar Project Area																
Thornveld	3	2	2	3	1	5	6	**30 Low**	1	2	2	3	1	3	6	**18 Low**
OHPL Investigation Area, Substation and Road Buffer Investigation Area																
Thornveld	3	2	2	3	1	5	6	**30 Low**	1	2	2	3	1	3	6	**18 Low**
Freshwater Habitat	3	3	2	3	1	6	6	**36 Low**	1	3	2	3	1	4	6	**24 Low**

	UNMANAGED								MANAGED							
Habitat Unit/ Proposed Alternative	**Probability**	**Sensitivity**	**Severity**	**Spatial Scale**	**Duration**	**Likelihood**	**Consequence**	**Significance**	**Probability**	**Sensitivity**	**Severity**	**Spatial Scale**	**Duration**	**Likelihood**	**Consequence**	**Significance**
Transformed Habitat	3	1	1	3	1	4	5	**20 Low**	1	1	1	3	1	2	5	**10 Low**
Mitigation Measures for Planning Phase Impacts on SCC																
- An authorised rescue and relocation plan must be compiled prior to commencement of construction and mining activities so all personnel are aware of the requirements should a SCC be encountered; - Planning for vegetation clearing must include the phased clearing of the solar array footprint and not complete clearing of the footprint at the start of construction; - Where possible, and feasible, design of all access roads should be to utilise existing roads so to reduce fragmentation of existing natural habitat; - At all times, ensure that sound environmental management is in place during the planning phase; - Minimise loss of indigenous vegetation where possible through planning and adherence to suitable layouts; - It is recommended that prior to the commencement of construction activities the entire construction footprint be clearly demarcated to limit footprint creep and edge effects; - Prior to the commencement of construction, the ECO, and EO must be educated about the presence of potential avifaunal SCC and informed of procedures should any SCC be encountered. The services of an avifaunal specialist must be used for such training; - Bird diverter devices (flappers) must be included in the planning of the line to be fitted along each span.															

Table 8: Construction Phase impacts on the faunal habitat, diversity, and SCC from the proposed development activities. Required mitigation measures are presented at the bottom of the table.

	UNMANAGED								MANAGED							
Habitat Unit/ Proposed Alternative	**Probability**	**Sensitivity**	**Severity**	**Spatial Scale**	**Duration**	**Likelihood**	**Consequence**	**Significance**	**Probability**	**Sensitivity**	**Severity**	**Spatial Scale**	**Duration**	**Likelihood**	**Consequence**	**Significance**
IMPACT ON HABITAT AND DIVERSITY																
Western and Eastern Solar Project Area																
Thornveld	5	2	4	2	2	7	8	**56 Medium Low**	5	2	4	2	2	7	8	**56 Medium Low**
OHPL Investigation Area, Substation and Road Buffer Investigation Area																
Thornveld	4	2	2	3	2	6	7	**42 Low**	3	2	2	3	2	5	7	**35 Low**
Freshwater Habitat	4	3	3	3	1	7	7	**49 Low**	3	3	2	3	1	6	6	**36 Low**
Transformed Habitat	4	1	1	3	1	5	5	**25 Low**	3	1	1	3	1	4	5	**20 Low**
Mitigation Measures for Construction-phase impacts on habitat and species diversity																
- Construction should preferably 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; - No unauthorised fires are to be allowed on the site; - An effective dust management plan must be designed and implemented in order to mitigate the impact of dust on flora and therefore fauna habitat throughout the construction phase; - Edge effect control must be implemented to ensure no further degradation and potential loss of faunal SCC 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; - No additional habitat must be disturbed outside of the approved footprints areas. Weekly (recommended) to monthly (minimum requirement) monitoring and recording of the footprint areas must be done during the construction phase by the ECO and photographic records kept – special attention must also be paid to potential increase and spread of AIPs; - Existing roads should as far as possible be used for access purposes to the construction site. - An AIP Management/Control Plan must be implemented by a qualified professional; and - In the construction of the OHL, only the required clearing of woody vegetation within a strip under the lines, and not across the entire width of the power line servitude. Clearing of vegetation must be restricted to woody vegetation above the minimum height clearance, and not clearing of all vegetation. - Bird diverter devices (flappers) must be fitted along each span as soon as the line is strung.															
IMPACT ON SCC																
Western and Eastern Solar Project Area																
Thornveld	2	2	3	2	2	4	7	**28 Low**	2	2	2	2	2	4	6	**24 Low**
OHPL Investigation Area, Substation and Road Buffer Investigation Area																
Thornveld	2	2	2	3	2	4	7	**28 Low**	2	2	2	3	2	4	7	**28 Low**

	UNMANAGED								MANAGED							
Habitat Unit/ Proposed Alternative	**Probability**	**Sensitivity**	**Severity**	**Spatial Scale**	**Duration**	**Likelihood**	**Consequence**	**Significance**	**Probability**	**Sensitivity**	**Severity**	**Spatial Scale**	**Duration**	**Likelihood**	**Consequence**	**Significance**
Freshwater Habitat	2	3	3	3	1	5	7	**35 Low**	2	3	2	3	1	5	6	**30 Low**
Transformed Habitat	1	1	1	3	1	2	5	**10 Low**	1	1	1	3	1	2	5	**10 Low**
Mitigation Measures for Construction Phase Impacts on SCC																
- . 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); - The construction footprint must be carefully managed and no encroachment beyond the authorised footprint must be permitted to occur; and - A strict policy of no fires on the construction site and surrounds must be maintained - Bird diverter devices (flappers) must be fitted along each span as soon as the line is strung.																

Table 9: Operation and Maintenance Phase impacts on the faunal habitat, diversity, and SCC from the proposed development activities. Required mitigation measures are presented at the bottom of the table.

	UNMANAGED								MANAGED							
Habitat Unit/ Proposed Alternative	**Probability**	**Sensitivity**	**Severity**	**Spatial Scale**	**Duration**	**Likelihood**	**Consequence**	**Significance**	**Probability**	**Sensitivity**	**Severity**	**Spatial Scale**	**Duration**	**Likelihood**	**Consequence**	**Significance**
IMPACT ON HABITAT AND DIVERSITY																
Western and Eastern Solar Project Area																
Thornveld	2	2	2	2	4	4	8	**32 Low**	2	2	2	2	4	4	8	**32 Low**
OHPL Investigation Area, Substation and Road Buffer Investigation Area																
Thornveld	2	2	2	3	4	4	9	**36 Low**	2	2	2	3	4	4	9	**36 Low**
Freshwater Habitat	2	3	2	3	4	5	9	**45 Low**	2	3	2	3	4	5	9	**45 Low**
Transformed Habitat	1	1	1	3	4	2	8	**16 Low**	1	1	1	3	4	2	8	**16 Low**
Mitigation Measures for Operational Phase impacts on habitat and species diversity																
- . Ongoing alien and invasive vegetation monitoring and control must 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; - Monitoring of the solar arrays and power line alignment 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. - The power line servitude must not be indiscriminately cleared of woody vegetation, rather woody vegetation above the minimum clearance height must be pruned. - Anti roosing spikes / diverters should be fitted to the solar panels, if required.															
IMPACT ON SCC																
Western and Eastern Solar Project Area																
Thornveld	2	2	2	2	4	4	8	**32 Low**	2	2	2	2	4	4	8	**32 Low**
OHPL Investigation Area, Substation and Road Buffer Investigation Area																
Thornveld	2	2	2	3	4	4	9	**36 Low**	2	2	2	3	4	4	9	**36 Low**
Freshwater Habitat	3	3	2	3	4	6	9	**54 Medium Low**	3	3	2	3	4	6	9	**54 Medium Low**
Transformed Habitat	1	1	1	3	4	2	8	**16 Low**	1	1	1	3	4	2	8	**16 Low**
Mitigation Measures for Operational Phase Impacts on SCC																

Habitat Unit/ Proposed Alternative	UNMANAGED								MANAGED							
	Probability	Sensitivity	Severity	Spatial Scale	Duration	Likelihood	Consequence	Significance	Probability	Sensitivity	Severity	Spatial Scale	Duration	Likelihood	Consequence	Significance
- . Monitoring of the solar arrays and power line alignment 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. - The power line servitude must not be indiscriminately cleared of woody vegetation, rather woody vegetation above the minimum clearance height must be pruned																

6.3 Impact discussion

The impact significance of the proposed development (prior to mitigation) on avifaunal habitat, diversity and SCC range from medium low to low (negative). Potential regional-scale impacts are highly unlikely, and if recommended mitigation measures as stipulated in the tables above below are adhered to, impacts on avifaunal diversity and habitat are likely to be localised. If effective mitigation takes place at all stages of the proposed project, most of the impacts may be reduced to lower significance ratings, minor to negligible (negative).

Construction phase impacts resulting in the destruction of habitat and operational phase impacts resulting from possible avifaunal collisions with infrastructure are expected to be the highest in their severity with impact that are anticipated to be minor and moderate (negative) without mitigation. Impact mitigation is however expected to reduce the severity of these impacts to lower significance levels. Impacts to SCC will be minor (negative) if mitigations measures are ignored during the construction and operational phases. Mitigation, if implemented correctly, will reduce the impact significance to very levels for SCC.

6.3.1 Impact on avifaunal Diversity and Habitat

One of the primary impacts associated with the development of a PV-based solar power generation facility is its physical transformation of large areas of natural vegetation – in many cases PV facilities involve the complete removal of vegetation from the inclusive footprint of the installed PV panels, although a pioneer grass layer may subsequently develop under the panels. It is understood that such an approach would be adopted for the proposed development.

The habitat transformation associated with the clearing of all vegetation could result in a number of impacts on birds, including:

- direct habitat loss which would be particularly significant for species with restricted ranges or very specific habitat requirements;
- habitat fragmentation and/or modification; and
- disturbance / displacement of species (e.g. through construction / maintenance activities).

In this context, and at the scale of the development site, the development of the arrays will have a significant impact on the bird assemblage (abundance and species density), and most birds that currently occur on the grassland and woodland on the site will no longer be able to inhabit the site once construction (vegetation clearing) has commenced.

Only a very small number of birds (most likely to be granivores – seed eaters) such as weavers, widows, waxbills, and some gamebirds such as Helmeted Guineafowl (*Numida meleagris*) etc. would be likely to forage within the arrays if a pioneer grass layer is allowed to become established under the arrays. It is important to note that none of the affected species have restricted ranges or very specific habitat requirements; all of the commonly occurring woodland species that have been commonly recorded on the development site and more widely in the surrounds are very well-represented in the wider surrounding area where woodland habitat has been retained and will be present once the development becomes operational. As such, none of the affected species have limited distributions and the loss of habitat at the scale of the proposed development will not have a population-level impact.

At a wider study area scale (i.e. a 2km radius of the development site), the habitat transformation impact will be less significant, as parts of the study area will still be characterised by residual woodland habitat, and certain ecological linkages will be retained on the property on which the development is proposed and its immediate surrounds if vegetation clearing is limited to the development footprint. The retention of such linkages is significant, as habitat loss impacts are heightened when the site of a proposed development will directly affect important areas of ecological connectivity, or in habitat for threatened species.

6.3.2 Construction-related Disturbance and Displacement Impacts

The construction of the solar panel arrays over a relatively large area may potentially be a significant civil engineering undertaking that will involve bulk earthworks and the removal of vegetation. Construction will thus be 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 current surrounding mining operations provide a significant source of noise to the ambient noise levels in the area. The baseline is thus altered from a natural setting, although the noise from the operations decreases noticeably in the vicinity of the proposed solar arrays. 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 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.

The proposed power line is proposed to cross the Ga-Mogara River. This is the only freshwater feature in the wider area and is ecologically important due to foraging, roosting and nesting opportunities associated with increased levels of moisture availability and the presence of larger trees in the riparian corridor of the river. However the riparian corridor of the reach proposed to be crossed by the overhead power line has been significantly altered by mining-related activities, and accordingly the habitat integrity of the riparian corridor has been significantly lowered. Nonetheless the riparian corridor is sensitive and certain of the construction-related impacts, if not properly mitigated could have a moderate negative impact on the riparian habitat of the river. Accordingly it is important that mitigation measures be implemented to reduce the potential impact on the river's riparian zone, including placing towers outside of the riparian zone and limiting vegetation clearing to only the necessary clearing of woody vegetation above the minimum clearance zone.

6.3.3 Potential Operational Impacts associated with the development of Solar Arrays

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). No evaporation ponds are proposed to be developed in association with the solar power development, and the proposed arrays are not located in close proximity to any natural or artificial waterbodies that exist in the vicinity of the development footprint. This means that there are no exacerbating factors that would be likely to attract waterbirds to the vicinity of the solar arrays. The solar development site is not located along major avian flyways (which would exist along a major river, for example, and 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 as part of the proposed operational monitoring of bird-related impacts on the development site, the solar arrays must be monitored for collision-related impacts, as discussed further in Section 7.

6.3.4 Power Line-related Impacts

A single power line is proposed to be developed as part of the development of the solar power facility. Importantly from an avifaunal impact perspective, much of the length of the alignment is alongside existing linear infrastructure, thus the area is already disturbed by a higher human presence. From a bird habitat perspective, power lines can be associated with clearing of vegetation within the power line servitude. Depending on the size of the power line, woody vegetation under the lines and conductors above a certain height needs to be cleared and maintained to be below the minimum height. The risk of flashovers from fire sometimes also necessitates the mowing and removal of vegetation under the lines in a linear strip. Accordingly power lines can be associated with a certain level of habitat modification, but the impact would be limited and highly localised, although fragmentary and likely to be associated with edge effects. This impact is mitigated if only the required strip of land under the lines within the servitude is cleared of woody vegetation and mowed, rather than the entire width of a power line servitude that is typically proclaimed in association with the power line.

Of greater importance is the risk posed to avifauna by the proposed power line related to mortality due to collisions. The proposed power line is aligned adjacent an existing power line for much of its length. This factor is a mitigating factor in the context of potential collisions, as birds will be aware of the presence of a power line. However the risk of collisions with the new power line still needs to be considered. The overall sensitivity of the area is intermediate at best and the potential for the regular occurrence of SCC is considered relatively low, but the confirmed presence of certain SCC that are large and thus less mobile in flight poses the risk that these and other species could suffer from collisions with the proposed power line. Accordingly mitigation in the form of anti-collision devices is required to be installed along the length of the proposed power line.

6.3.5 Impact on avifaunal SCC

A number of avifaunal SCC have distribution ranges which encompass the study area and may utilize it for foraging on an irregular basis. Of these species only *Ardeotis kori* (Kori Bustard) has been confirmed to occur on the site. *Gyps africanus* (White-backed Vulture),

Falco biarmicus (Lanner Falcon), *Polemaetus bellicosus* (Martial Eagle) and *Sagittarius serpentarius* (Secretarybird), are anticipated to have potential of occurring within the study area. For these species there is a low potential of occurrence on the site, primarily due the very high human activity presence in the area, twinned with the very large ranges of most of these species. There is thus a limited chance of SCC being adversely impacted by the proposed development at a regional or population level, and the area is not considered to be a regionally important breeding, roosting or foraging habitat for any of the abovementioned species and thus no impacts on their respective populations breeding productivity are likely to occur. Mitigation measures (most importantly in the context of the anti-collision devices on the proposed power line) will further reduce the impact on SCC, in particular the Kori Bustard which was confirmed to occur on the development site.

6.3.6 Probable 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:

- 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.

6.3.7 Cumulative Impacts

The development, in particular of solar arrays that will result in large-scale transformation of natural (albeit disturbed) 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 and undeveloped land that is used for livestock grazing. As such the development, in particular the transformation of habitat associated with the solar arrays is considered part of a wider cumulative impact on avifauna in the wider area that is associated with increasing loss of habitat and resultant loss on avian diversity and abundance in the area.

7 RECOMMENDED MONITORING REGIME

The mitigation measures for each stage of the project are detailed in the Impact Tables in Section 6 above. Monitoring is a critical component of the mitigation measures for solar power

plants. 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:

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 or employee of the proponent. Searches must be undertaken at the solar arrays and along the new power line alignment. The methods detailed in the BLSA Birds and Solar Guidelines must be applied.

8 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 development of the Black Rock Solar Plant Facility, near Hotazel, Northern Cape Province.

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. The major impact anticipated to occur is the alteration of areas of natural habitat, reducing avian abundance and diversity within the study area. Impact scores are reduced as no sensitive habitat is proposed to be developed, and as there is a very low likelihood of the occurrence of sensitive species beyond intermittent ranging and foraging into the development area. Further impacts that may result from the proposed project are as a result of potential collisions and electrocutions with the proposed PV facilities and power line. It is anticipated that should the proposed mitigation measures be implemented the risk of collisions and electrocutions can be drastically reduced. Due to the low potential of occurrence of Species of Conservation Concern, 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.

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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.

CONSERVATION OF AGRICULTURAL RESOURCES ACT (CARA, ACT 43 OF 1983)

Removal of the alien and weed species encountered in the application area must take place in order to comply with existing legislation (amendments to the regulations under the CARA, 1983 and Section 28 of the NEMA, 1998). Removal of species should take place throughout the construction and operation, phases.

APPENDIX B: Avifaunal Method of Assessment

Avifaunal Assessment Methodology

A reconnaissance 'walk through' on foot was undertaken to determine the general habitat types found throughout the study area. Special emphasis was placed on areas that may potentially support avifaunal SCC. Sites representative of habitat units or unique niche habitats were then marked and point counts were undertaken in order to identify the occurrence of the avifaunal communities, species and habitat diversities. The presence of any avifaunal inhabitants of the study area was assessed through direct visual observation or identifying such species through calls, nests and potentially pellets.

It is important to note that avifaunal species have varied breeding patterns and are subject to seasonal fluctuations. As such, it is unlikely that all avifaunal species will have been recorded during the site assessment. However, even though some avifaunal species may not have been identified during the sight assessment, the habitat units and degree of transformation can be used to establish an accurate understanding of avifaunal species most likely associated with the study area.

Avifaunal Species of Conservational Concern Assessment

Throughout the fauna assessment, special attention was paid to the identification of any of these SCC as well as the identification of suitable habitat that could potentially support these species. The **Probability of Occurrence (POC)** for each faunal SCC is described as:

- "**Confirmed'**: if observed during the survey.
- "**High**": if within the species' known distribution range and preferable habitat for foraging, roosting or breeding is available.
- "**Medium**": if either within the known distribution range of the species with marginal habitat that does not occur within the core of the species range or within an important foraging, roosting or breeding area; or
- "**Low**": if the habitat is not suitable and falls outside the distribution range of the species.

The accuracy of the POC is based on the available knowledge about the species in question, with many of the species lacking in-depth habitat research.

Avifaunal Habitat Sensitivity

The sensitivity of the study area for avifauna species was determined by calculating the mean of five different parameters which influence avifaunal species and provide an indication of the overall avifaunal ecological integrity, importance and sensitivity of the study area for each class. Each of the following parameters are subjectively rated on a scale of 1 to 5 (1 = lowest and 5 = highest):

- **Avifaunal SCC:** The confirmed presence or potential for avifaunal SCC or any other significant species, such as endemics, to occur within the habitat unit;
- **Habitat Availability:** The presence of suitable habitat for avifaunal species;
- **Food Availability:** The availability of food within the study area for avifaunal species;
- **Avifaunal Diversity:** The recorded avifaunal diversity compared to a suitable reference condition such as surrounding natural areas or available avifaunal databases; and
- **Habitat Integrity:** The degree to which the habitat is transformed based on observed disturbances which may affect habitat integrity.

Each of these values contribute equally to the mean score, which determines the suitability and sensitivity of the study area for avifaunal species. A conservation and land-use objective is also assigned to each sensitivity class which aims to guide the responsible and sustainable utilization of the study area in relation to avifaunal species. The different classes and land-use objectives are presented in the table below:

Table B1: Avifaunal habitat sensitivity rankings and associated land-use objectives.

SCORE	RATING SIGNIFICANCE	CONSERVATION OBJECTIVE
1> and <2	Low	Optimise development potential.
2> and <3	Moderately low	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.
3> and <4	Intermediate	Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential.
4> and <5	Moderately high	Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance.
5	High	Preserve and enhance the biodiversity of the habitat unit, no-go alternative must be considered.

APPENDIX C: Impact Assessment Methodology

Ecological Impact Assessment Method

In order for the Environmental Assessment Practitioner (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 applicant to understand the process and rationale upon which risks/impacts have been assessed. The method used for assessing risks/impacts is outlined in the sections below.
The first stage of 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'[5]. 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 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.
- **Frequency of activity** refers to how often the proposed activity will take place.
- **Frequency of impact** refers to the frequency with which a stressor (aspect) will impact on the receptor.
- **Severity** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.
- **Spatial extent** refers to 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.

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria. Refer to the Table C1. The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity and the frequency of the impact together comprise the likelihood of the impact occurring and can obtain a maximum value of 10. The values for likelihood and consequence of the impact are then read off a significance-rating matrix and are used to determine the level of mitigation that may be necessary[6].

The assessment of significance is undertaken twice. Initial significance is based on only natural and existing mitigation measures (including built-in engineering designs). The subsequent assessment considers the recommended management measures required to mitigate the impacts. Measures such as demolishing infrastructure, and reinstatement and rehabilitation of land, are considered post-mitigation.

[5] The definition has been aligned with that used in the ISO 14001 Standard.
[6] Some risks/impacts that have low significance will however still require mitigation.

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, 1998 (Act No. 107 of 1998) 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 C1: Criteria for assessing significance of impacts
LIKELIHOOD DESCRIPTORS

Probability of impact	**RATING**
Highly unlikely	1
Possible	2
Likely	3
Highly likely	4
Definite	5
Sensitivity of receiving environment	**RATING**
Ecology not sensitive/important	1
Ecology with limited sensitivity/importance	2
Ecology moderately sensitive/ /important	3
Ecology highly sensitive /important	4
Ecology critically sensitive /important	5

CONSEQUENCE DESCRIPTORS

Severity of impact	**RATING**
Insignificant / ecosystem structure and function unchanged	1
Small / ecosystem structure and function largely unchanged	2
Significant / ecosystem structure and function moderately altered	3
Great / harmful/ ecosystem structure and function largely altered	4
Disastrous / ecosystem structure and function seriously to critically altered	5
Spatial scope of impact	**RATING**
Activity specific/ < 5 ha impacted / Linear developments affected < 100m	1
Development specific/ within the site boundary / < 100ha impacted / Linear developments affected < 100m	2
Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear developments affected < 1000m	3
Regional within 5 km of the site boundary / < 2000ha impacted / Linear developments affected < 3000m	4
Entire habitat unit / Entire system/ > 2000ha impacted / Linear developments affected > 3000m	5
Duration of impact	**RATING**
One day to one month	1
One month to one year	2
One year to five years	3
Life of operation or less than 20 years	4
Permanent	5

Table C2: Significance Rating Matrix.

LIKELIHOOD (Frequency of activity + Frequency of impact)	CONSEQUENCE (Severity + Spatial Scope + Duration)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

Table C3: Positive/Negative Mitigation Ratings.

Significance Rating	Value	Negative Impact Management Recommendation	Positive Impact Management Recommendation
Very high	126-150	Critically consider the viability of proposed projects Improve current management of existing projects significantly and immediately	Maintain current management
High	101-125	Comprehensively consider the viability of proposed projects Improve current management of existing projects significantly	Maintain current management
Medium-high	76-100	Consider the viability of proposed projects Improve current management of existing projects	Maintain current management
Medium-low	51-75	Actively seek mechanisms to minimise impacts in line with the mitigation hierarchy	Maintain current management and/or proposed project criteria and strive for continuous improvement
Low	26-50	Where deemed necessary seek mechanisms to minimise impacts in line with the mitigation hierarchy	Maintain current management and/or proposed project criteria and strive for continuous improvement
Very low	1-25	Maintain current management and/or proposed project criteria and strive for continuous improvement	Maintain current management and/or proposed project criteria and strive for continuous improvement

The following points were considered when undertaking the assessment:

- Risks and impacts were analysed in the context of the *project's area of influence* encompassing:
  - Primary project site and related facilities that the proponent and their contractors develops or controls;
  - Areas potentially impacted by cumulative impacts for any existing project or condition and other project-related developments; and
  - Areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.
- Risks/Impacts were assessed for all stages of the project cycle including:
  - Pre-construction;
  - Construction;
  - Operation;
  - Closure and decommissioning.
- If applicable, transboundary or global effects were assessed.
- Individuals or groups who may be differentially or disproportionately affected by the project because of their *disadvantaged* or *vulnerable* status were assessed.
- Particular attention was paid to describing any residual impacts that will occur after rehabilitation.

Mitigation measure development

According to the DEA *et al.,* (2013) "Rich biodiversity underpins the diverse ecosystems that deliver ecosystem services that are of benefit to people, including the provision of basic services and goods such as clean air, water, food, medicine and fibre; as well as more complex services that regulate and mitigate our climate, protect people and other life forms from natural disaster and provide people with a rich heritage of nature-based cultural traditions. Intact ecological infrastructure contributes significant savings through, for example, the regulation of natural hazards such as storm surges and flooding which is attenuated by wetlands".

According to the DEA *et al.,* (2013) Ecosystem services can be divided into 4 main categories:

- Provisioning services are the harvestable goods or products obtained from ecosystems such as food, timber, fibre, medicine, and fresh water;
- Cultural services are the non-material benefits such as heritage landscapes and seascapes, recreation, ecotourism, spiritual values and aesthetic enjoyment;
- Regulating services are the benefits obtained from an ecosystem's control of natural processes, such as climate, disease, erosion, water flows, and pollination, as well as protection from natural hazards; and
- Supporting services are the natural processes such as nutrient cycling, soil formation and primary production that maintain the other services.

Loss of biodiversity puts aspects of the economy, wellbeing and quality of life at risk, and reduces socio-economic options for future generations. This is of particular concern for the poor in rural areas who have limited assets and are more dependent on common property resources for their livelihoods. The importance of maintaining biodiversity and intact ecosystems for ensuring on-going provision of ecosystem services, and the consequences of ecosystem change for human well-being, were detailed in a global assessment entitled the Millennium Ecosystem Assessment (MEA, 2005), which established a scientific basis for the need for action to enhance management and conservation of biodiversity.

Sustainable development is enshrined in South Africa's Constitution and laws. The need to sustain biodiversity is directly or indirectly referred to in a number of Acts, not least the National Environmental Management: Biodiversity Act, 2004 (No. 10 of 2004) (hereafter referred to as the Biodiversity Act) and is fundamental to the notion of sustainable development. In addition, International guidelines and commitments as well as national policies and strategies are important in creating a shared vision for sustainable development in South Africa (DEA *et al.,* 2013).

The primary environmental objective of the Minerals and Petroleum Resources Development Act, 2002 (Act No 28 of 2002) (MPRDA) is to give effect to the environmental right contained in the South African Constitution. Furthermore, Section 37(2) of the MPRDA states that "any prospecting or mining operation must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic and environmental factors into the planning and implementation of prospecting and mining projects in order to ensure that exploitation of mineral resources serves present and future generations".

Pressures on biodiversity are numerous and increasing. According to the DEA *et al.,* (2013) Loss of natural habitat is the single biggest cause of biodiversity loss in South Africa and much of the world. The most severe transformation of habitat arises from the direct conversion of natural habitat for human requirements, including[7]:

- Cultivation and grazing activities;
- Rural and urban development;
- Industrial and mining activities, and
- Infrastructure development.

Impacts on biodiversity can largely take place in four ways (DEA *et al.,* 2013):

- **Direct impacts:** are impacts directly related to the project including project aspects such as site clearing, water abstraction and discharge of water from riverine resources;

[7] Limpopo Province Environment Outlook. A Report on the State of the Environment, 2002. Chapter 4.

- **Indirect impacts:** are impacts associated with a project that may occur within the zone of influence in a project such as surrounding terrestrial areas and downstream areas on water courses;
- **Induced impacts:** are impacts directly attributable to the project but are expected to occur due to the activities of the project. Factors included here are urban sprawl and the development of associated industries; and
- **Cumulative impacts:** can be defined as the sum of the impact of a project as well as the impacts from past, existing and reasonably foreseeable future projects that would affect the same biodiversity resources. Examples include numerous mining operations within the same drainage catchment or numerous residential developments within the same habitat for faunal or floral species.

Given the limited resources available for biodiversity management and conservation, as well as the need for development, efforts to conserve biodiversity need to be strategic, focused and supportive of sustainable development. This is a fundamental principle underpinning South Africa's approach to the management and conservation of its biodiversity and has resulted the definition of a clear mitigation strategy for biodiversity impacts.

'Mitigation' is a broad term that covers all components of the 'mitigation hierarchy' defined hereunder. It involves selecting and implementing measures – amongst others – to conserve biodiversity and to protect the users of biodiversity and other affected stakeholders from potentially adverse impacts as a result of mining or any other land use. The aim is to prevent adverse impacts from occurring or, where this is unavoidable, to limit their significance to an acceptable level. Offsetting of impacts is considered to be the last option in the mitigation hierarchy for any project.

The mitigation hierarchy in general consists of the following in order of which impacts should be mitigated (DEA *et al.,* 2013):

- **Avoid/prevent impact:** can be done through utilising alternative sites, technology and scale of projects to prevent impacts. In some cases, if impacts are expected to be too high the "no project" option should also be considered, especially where it is expected that the lower levels of mitigation will not be adequate to limit environmental damage and eco-service provision to suitable levels;
- **Minimise impact:** can be done through utilisation of alternatives that will ensure that impacts on biodiversity and ecoservices provision are reduced. Impact minimisation is considered an essential part of any development project;
- **Rehabilitate impact:** is applicable to areas where impact avoidance and minimisation are unavoidable where an attempt to re-instate impacted areas and return them to conditions which are ecologically similar to the pre-project condition or an agreed post project land use, for example arable land. Rehabilitation can however not be considered as the primary mitigation tool as even with significant resources and effort rehabilitation usually does not lead to adequate replication of the diversity and complexity of the natural system. Rehabilitation often only restores ecological function to some degree to avoid ongoing negative impacts and to minimise aesthetic damage to the setting of a project. Practical rehabilitation should consist of the following phases in best practice:
    - **Structural rehabilitation** which includes physical rehabilitation of areas by means of earthworks, potential stabilisation of areas as well as any other activities required to develop a long terms sustainable ecological structure;
    - **Functional rehabilitation** which focuses on ensuring that the ecological functionality of the ecological resources on the focus area supports the intended post closure land use. In this regard special mention is made of the need to ensure the continued functioning and integrity of wetland and riverine areas throughout and after the rehabilitation phase;
    - **Biodiversity reinstatement** which focuses on ensuring that a reasonable level of biodiversity is re-instated to a level that supports the local post closure land uses. In this regard special mention is made of re-instating vegetation to levels which will allow the natural climax vegetation community or community suitable for supporting the intended post closure land use; and
    - **Species reinstatement** which focuses on the re-introduction of any ecologically important species which may be important for socio-cultural reasons, ecosystem functioning reasons

and for conservation reasons. Species re-instatement need only occur if deemed necessary.

- **Offset impact:** refers to compensating for latent or unavoidable negative impacts on biodiversity. Offsetting should take place to address any impacts deemed to be unacceptable which cannot be mitigated through the other mechanisms in the mitigation hierarchy. The objective of biodiversity offsets should be to ensure no net loss of biodiversity. Biodiversity offsets can be considered to be a last resort to compensate for residual negative impacts on biodiversity.

The significance of residual impacts should be identified on a regional as well as national scale when considering biodiversity conservation initiatives. If the residual impacts lead to irreversible loss or irreplaceable biodiversity the residual impacts should be considered to be of *very high significance* and when residual impacts are considered to be of *very high significance*, offset initiatives are not considered an appropriate way to deal with the magnitude and/or significance of the biodiversity loss. In the case of residual impacts determined to have *medium to high significance*, an offset initiative may be investigated. If the residual biodiversity impacts are considered of low significance no biodiversity offset is required.[8]

In light of the above discussion the following points present the key concepts considered in the development of mitigation measures for the proposed project.

- Mitigation and performance improvement measures and actions that address the risks and impacts[9] are identified and described in as much detail as possible.
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation or compensation where possible.
- Desired outcomes are defined and have been developed in such a way as to be measurable events with performance indicators, targets and acceptable criteria that can be tracked over defined periods, with estimates of the resources (including human resource and training requirements) and responsibilities for implementation wherever possible.

Recommendations

Recommendations were developed to address and mitigate impacts associated with the proposed projects. These recommendations also include general management measures which apply to the proposed projects as a whole. Mitigation measures have been developed to address issues in all phases throughout the life of the projects from planning, through to construction and operation.

[8] Provincial Guideline on Biodiversity Offsets, Western Cape, 2007.

[9] Mitigation measures should address both positive and negative impacts

APPENDIX D: Avifaunal SCC

Table E1: NEMBA: TOPS list (2007) of all avifaunal SCC that require a permit should they need to be relocated as a result of the proposed mining development and activities and its activities.

Scientific Name	Common Name
CRITICALLY ENDANGERED SPECIES	
AVIFAUNA	
Grus carunculatus	Wattled Crane
Hirundo atrocaerulea	Blue Swallow
Neophron percnopterus	Egyptian Vulture
Poicephalus robustus	Cape Parrot
ENDANGERED SPECIES	
AVIFAUNA	
Anthropoides paradiseus	Blue Crane
Balearica regulorum	Grey Crowned Crane
Ephippiorhynchus senegalensis	Saddle-billed Stork
Gypaetus barbatus	Bearded Vulture
Gyps africanus	White-backed Vulture
Gyps coprotheres	Cape Vulture
Necrosyrtes	Hooded Vulture
Pelecanus rufescens	Pink-backed Pelican
Scotopelia peli	Pel's Fishing Owl
Torgos tracheliotus	Lappet-faced Vulture
VULNERABLE SPECIES	
AVIFAUNA	
Trigonoceps occipitalis	White-headed Vulture
Aquila rapax	Tawny Eagle
Ardeotis kori	Kori Bustard
Ciconia nigra	Black Stork
Circaetus fasciolatus	Southern Banded Snake Eagle
Eupodotis caerulescens	Blue Korhaan
Falco fasciinucha	Falcon
Falco naumanni	Lesser Kestrel
Falco peregrinus	Peregrine Falcon
Geronticus calvus	Bald Ibis
Neotis ludwidii	Ludwig's Bustard
Polemaetus bellicosus	Martial Eagle
Terathopius ecaudatus	Bateleur
Tyto capensis	Grass Owl
PROTECTED SPECIES	
AVIFAUNA	
Bucowus leadeateri	Southern Ground-Hornbill
Circus ranivorus	African Marsh Harrier
Neotis denhami	Denham's Bustard
Spheniscus	Jackass Penguin

NL= Not Listed; EN= Endangered; CR= Critically Endangered; VU= Vulnerable; P = Protected (TOPS 2007); NT =

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:	29 Arterial rd. West, Oriel Bedfordview		
Postal code:	2007	Fax:	086 724 3132
Telephone:	011 616 7893		
E-mail:	chris@sasenvgroup.co.za		
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:	29 Arterial rd. West, Oriel Bedfordview		
Postal code:	2007	Fax:	086 724 3132
Telephone:	011 616 7893		
E-mail:	paul@sasenvgroup.co.za		
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:	29 Arterial Road West, Oriel, Bedfordview		
Postal code:	1401	Fax:	011 615 6240/ 086 724 3132
Telephone:	011 616 7893		
E-mail:	stephen@sasenvgroup.co.za		
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

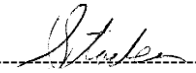
I, Christopher Hooton, declare that -

- 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