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HYDRA-KRONOS 2ND 400KV POWER LINE

SPECIALIST IMPACT ASSESSMENT (AVIFAUNA)

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PROFESSIONAL EXPERIENCE

Ms. Megan Diamond completed a Bachelor of Science degree in Environmental Management from the University of South Africa and has been involved in conservation for 20 years. She has 17 years' worth of experience in the field of bird interactions with electrical infrastructure and during this time has completed impact assessments for over 160 projects. During her tenure at the Endangered Wildlife Trust's Wildlife & Energy Programme and the Programme's primary project (i.e. the Eskom-EWT Strategic Partnership) from 2006 to 2013, Megan was responsible for assisting the energy industry and the national utility in minimising the negative impacts, associated with the construction and operation of electrical infrastructure, on wildlife through the provision of strategic guidance, risk and impact assessments, training and research. Megan (SACNASP Environmental Science Registration number 300022/14) currently owns and manages *Feathers Environmental Services* and is tasked with providing guidance to industry through the development of best practice procedures and avifaunal specialist studies for various developments including renewable energy facilities, power lines, power stations and substation infrastructure in addition to railway infrastructure and residential developments within South Africa and elsewhere within Africa. Megan has attended and presented at several conferences and facilitated workshops, as a subject expert, since 2007. Megan has authored and co-authored several academic papers, research reports and energy industry related guidelines, including the *BirdLife South Africa/ Endangered Wildlife Trust best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa* and the *Avian Wind Farm Sensitivity Map for South Africa* (2015), and played an instrumental role in facilitating the endorsement of these two products by the South African Wind Energy Association (SAWEA), IAIAsa (International Association for Impact Assessment South Africa) and Eskom. She chaired the Birds and Wind Energy Specialist Group in South Africa (2011/2012) and the IUCN/SSC Crane Specialist Group's Crane and Power line Network (2013-2015), a working group comprised of subject matter experts from across the world, working in partnership to share lessons, develop capacity, pool resources, and accelerate collective learning towards finding innovative solutions to mitigate this impact on threatened crane populations. She is currently a member of the IUCN Stork, Ibis and Spoonbill Specialist Group and the Eskom-EWT Strategic Partnership Ludwig's Bustard Working Group.

DECLARATION OF INDEPENDENCE

I, Megan Diamond, in my capacity as a specialist consultant, hereby declare that I:

- Act as an independent specialist to *DIGES Group* for this project.
- Do not have any personal or financial interest in the project except for financial compensation for specialist investigations completed in a professional capacity as specified by the Amendment to Environmental Impact Assessment Regulations, 2017.
- Will not be affected by the outcome of the environmental process, of which this report forms part of.
- Do not have any influence over the decisions made by the governing authorities.
- Do not object to or endorse the proposed development, but aim to present facts and our best scientific and professional opinion with regard to the impacts of the development.
- Undertake to disclose to the relevant authorities any information that has or may have the potential to influence its decision or the objectivity of any report, plan, or document required in terms of the Amendment to Environmental Impact Assessment Regulations, 2017.

INDEMNITY

- This report is based on a desktop investigation using the available information and data related to the site to be affected and a four-day, single season site visit to the project area on 5-8 June 2023. No long-term investigation or monitoring has been conducted.
- The Precautionary Principle has been applied throughout this assessment.
- 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 at the time of study.
- Additional information may become known or available during a later stage of the process for which no allowance could have been made at the time of this report.
- The specialist investigator reserves the right to modify this report, recommendations and conclusions at any stage should additional information become available.
- Information, recommendations and conclusions in this report cannot be applied to any other area without proper investigation.
- This report, in its entirety or any portion thereof, may not be altered in any manner or form or for any purpose without the specific and written consent of the specialist investigator as specified above.
- Acceptance of this report, in any physical or digital form, serves to confirm acknowledgment of these terms and liabilities.

[redacted]

27 June 2023

EXECUTIVE SUMMARY

The Northern Cape province is home to the highest number of renewable energy projects in South Africa. In order to evacuate the existing and expected renewable power out of the Northern Cape province, to other load centres in the country, *Eskom Holdings SOC Limited* (hereinafter referred to as *Eskom*) needs to strengthen its Transmission (TX) infrastructure network. The Aries-Kronos-Hydra 400kV corridor is one of three major backbone corridors, that move power to and from the Northern Cape. Furthermore, with the current generation allocation, the existing Hydra-Kronos 400kV power line will experience thermal overload, thus requiring the need for a second Hydra-Kronos 400kV power line.

The proposed *Hydra-Kronos 2nd 400kV power line* extends from the existing Hydra Main Transmission Substation (MTS) approximately 7km southeast of De Aar to the existing Kronos MTS, near Copperton. It is located in the Siyathemba, Kareeberg and Emthanjeni Local Municipalities, within the Pixely ka Semme District Municipality, Northern Cape Province.

A screening report for the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* was generated on 3 April 2023. The project site and immediate environment is classified as MEDIUM and HIGH sensitivity for terrestrial animals according to the Terrestrial Animal Species Theme. These classifications are linked to the potential occurrence of Ludwig's Bustard *Neotis ludwigii*, Lanner Falcon *Falco biarmicus,* Verreaux's Eagle *Aquila verreauxii* and Tawny Eagle *Aquila rapax*. In addition, the study area contains confirmed habitat for SCC as defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020). The presence of Ludwig's Bustard and Verreaux's Eagle were confirmed during the site verification and field survey of the PAOI. In addition the author has conducted several assessments and research projects in the PAOI and has previously observed Lanner Falcon and Tawny Eagle. Based on these observations, the classification of HIGH sensitivity for avifauna in the screening tool is therefore confirmed.

A total of 184 bird species have been recorded across the two pentads, within which the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* project is located, during the SABAP2 atlassing period to date. The presence of these species in the broader area provides an indication of the diversity of species that could potentially occur along the proposed power line corridor. Of the 184 species, 48 species are classified as priority species of which 14 are regional SCC, one Endemic and two Near Endemic species. Relevant to this power line development, of the power line sensitive species, almost half (n=22) are likely to occur frequently within the PAOI. With the exception of Ludwig's Bustard, Blue Crane, Verreaux's Eagle and Karoo Korhaan, the majority of SCC have been recorded in very low numbers, with between one and ten individual birds of each species being recorded over the fourteen-year survey period. The SABAP2 data is an accurate reflection of the diversity and abundance of SCC that are likely to be found within the areas surrounding the proposed *Hydra-Kronos 2nd 400kV power line and MTS infrastructure*. Although this report focuses on SCC, since the impacts associated

with the construction and operation of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* are likely to be more biologically significant for these species, the impact on non-SCC power line priority species is also assessed. Furthermore, SCC can often be used as surrogate species for the others in terms of impacts and the necessary mitigation.

A single winter survey was conducted on 5-8 June 2023, with a focused effort on the areas along the proposed *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* alignment and footprint, respectively. In order to describe the avifaunal community present, a concerted effort was made to sample the avifauna in all of the primary habitats that were available within the PAOI and broader surrounds, associated with the power line and MTS developments. All species encountered (observed and heard) during the site survey were noted.

The site visit produced a combined list of 75 species. The majority of observations were of passerine species that are common to this area. Each of these species has the potential to be displaced by the construction and operation of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* as a result of habitat transformation and/or disturbance. However, suitable habitat is available within the broader area, so the displacement impact will not be of regional or national significance. Sixteen priority species were recorded and during the survey and are highly susceptible to the collision impact associated with transmission power line infrastructure. This premise is confirmed with the observation of two collision mortalities on the 1Hydra-Kronos 400kV power line. Ludwig's Bustard, Karoo Korhaan and a nesting Verreaux's Eagle were the SCC recorded during the field survey.

Poorly sited or designed facilities and infrastructure can negatively impact not only vulnerable species and habitats, but also entire ecological processes. The effects of any development on birds are highly variable and depend on a wide range of factors, including the specification of the development, the topography of the surrounding land, the habitats affected and the number and diversity of species present. With so many variables involved, the impacts of each development must be assessed individually. Negative impacts on avifauna by electricity infrastructure generally take two (2) main forms, namely electrocution and collisions. Displacement due to habitat destruction and disturbance associated with the construction of the electricity infrastructure and other associated infrastructure is another impact that could potentially impact on avifauna.

The principal areas of concern for SCC and non-SCC power line-sensitive species are:

- Displacement as a result of habitat loss or transformation
- Displacement as a result of disturbance
- Direct mortality as a result of construction activities
- Mortality due to collisions with the 400kV power line conductors and/or earthwires
- Mortality due to electrocutions on the MTS infrastructure

Cumulative Impact in relation to an activity means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may

not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities. The proposed 400kV power line equates to a maximum of 187km. There are approximately several transmission and distribution powerlines totalling hundreds of kilometres of existing medium and high voltage lines within the 35km radius around the proposed project area. An intensive internet search was conducted to source information on the grid connections of the abovementioned projects available within the public domain, but in some instances no information could be obtained. The proposed development will thus increase the total number of existing high voltage lines by a fairly significant percentage. The contribution of the proposed 400kV to the cumulative impact of all the high voltage lines is thus MODERATE. However, the combined cumulative impact of the existing and proposed powerlines on avifauna within a 35km radius is considered to be HIGH. The cumulative impact of displacement due to disturbance and habitat transformation at the Hydra MTS and Kronos MTS is considered to be LOW, due to the small size of the footprint and the fact that construction of the bays are within the confines of the existing MTS. The cumulative impact of potential electrocutions within the MTS yards is also likely to be LOW as it is expected to be a rare event.

In conclusion, the habitat within which the PAOI is located is considered to have a MODERATE – HIGH sensitivity. The construction of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* will result in impacts of MODERATE to MODERATE-LOW significance to birds occurring in the vicinity of the new infrastructure, which can be reduced further through the application of mitigation measures. It is anticipated that the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* can be constructed with acceptable levels of impact on the resident avifauna, subject to the following recommendations:

* Conduct a pre-construction inspection (avifaunal walk-through) of the final power line alignment to identify priority species that may be breeding within the final footprint. If a SSC nest is occupied, the avifaunal specialist must consult with the contractor to find ways of minimizing the potential disturbance to the breeding birds during the construction period. This could include measures such as delaying some of the activities until after the breeding season.
* Conduct a pre-construction inspection (avifaunal walk-through) of the final power line alignment to identify power line spans that will require the installation of bird flight diverters.
* The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint (especially the removal of natural vegetation) and rehabilitation of disturbed areas is concerned.
* Construction activities (i.e. all staff, vehicle and machinery) should be restricted to the immediate footprint of the infrastructure.
* Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of avifaunal species.
* Maximum use should be made of existing roads and the construction of new roads must be kept to a minimum.

* If collision or electrocution impacts are recorded once the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* are operational, it is recommended that a representative from the Eskom-Endangered Wildlife Trust Strategic Partnership investigate the mortalities and provide recommendations for site-specific mitigation to be applied reactively.

In addition to this, the normal suite of environmental good practices should be applied, such as ensuring strict control of staff, vehicles and machinery on site and limiting the creation of new roads as far as possible.

TABLE OF CONTENTS

PROFESSIONAL EXPERIENCE 2
DECLARATION OF INDEPENDENCE 3
INDEMNITY 3
EXECUTIVE SUMMARY 4
1. INTRODUCTION 10
2. PROJECT LOCATION 10
3. PROJECT DESCRIPTION 11
4. THIS REPORT 11
4.1 Scope of Work 11
4.2 Terms of Reference 11
4.3 Structure of this report 12
5. APPROACH AND METHODOLOGY 15
5.1 Methodology 15
5.2 Data sources used 16
6. APPLICABLE LEGISLATION, POLICIES AND GUIDELINES 19
6.1 Agreements and Conventions 19
6.2 National & Provincial Legislation 20
7. DESCRIPTION OF THE BASELINE CONDITIONS 22
7.1 Site Sensitivity Verification 22
7.2 Relevant Bird Populations 22
7.2.1. Protected Areas 22
7.2.2. Important Bird & Biodiversity Areas (IBAs) 22
7.2.3. Coordinated Avifaunal Roadcount (CAR) Routes 23
7.2.4. Coordinated Waterbird Count (CWAC) Sites 24
7.2.5 South African Bird Atlas Project 2 Data (SABAP2) 25
7.2.6. Primary Data Collection 28
7.3 Avifaunal Habitats 29
7.3.1. Nama Karoo 29
7.3.2. Surface Water 29
7.3.3. Wetlands 29

7.3.4. Mountains & Rocky Ridges 30
7.3.5. Agriculture 30
7.3.6. Exotic/Alien Tree Stands 30
7.3.7. High Voltage Power Lines 30
8. IDENTIFICATION OF IMPACTS 31
8.1 Construction Phase 31
8.1.1. Displacement as a result of habitat loss or transformation 31
8.1.2. Displacement as a result of disturbance 32
8.1.3. Direct mortality as a result of construction activities 32
8.2 Operational Phase 32
8.2.1. Mortality due to collisions with the 400kV power line conductors and/or earthwires 32
8.2.2. Mortality due to electrocutions within the Hydra and Kronos MTS 34
8.3 Decommissioning & Closure Phases 35
8.3.1. Displacement as a result of disturbance 35
8.4 Impact Significance 35
8.5 Cumulative Impact 36
9. PROPOSED IMPACT MITIGATION ACTIONS 37
10. PROPOSED MONITORING ACTIONS 40
11. ENVIRONMENTAL IMPACT STATEMENT 40
11.1 Conditions to be included in the Environmental Authorisation 40
11.2 Specialist Opinion 41
12. ASSUMPTIONS, UNCERTAINTIES & GAPS IN KNOWLEDGE 42
13. REFERENCES 43
APPENDIX 1: SOUTH AFRICAN BIRD ATLAS PROJECT DATA (SABAP2) FOR THE HYDRA-KRONOS 2ND 400KV POWER LINE & MTS INFRASTRUCTURE PROJECT 46
APPENDIX 2: AVIFAUNAL HABITAT OBSERVED WITHIN THE HYDRA-KRONOS 2ND 400KV POWER LINE & MTS INFRASTRUCTURE PAOI 50
APPENDIX 3: METHOD OF ASSESSING THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS 56
APPENDIX 4: CURRICULUM VITAE 57

1. INTRODUCTION

With robust solar and wind energy resources, the Northern Cape province is home to the highest number of renewable energy projects in South Africa. In order to evacuate the existing and expected renewable power out of the Northern Cape province, to other load centres in the country, *Eskom Holdings SOC Limited* (hereinafter referred to as *Eskom*) needs to strengthen its Transmission (TX) infrastructure network. The Aries-Kronos-Hydra 400kV corridor is one of three major backbone corridors that move power to and from the Northern Cape. Furthermore, with the current generation allocation, the existing Hydra-Kronos 400kV power line will experience thermal overload, thus requiring the need for a second Hydra-Kronos 400kV power line.

2. PROJECT LOCATION

The proposed *Hydra-Kronos 2nd 400kV power line* extends from the existing Hydra Main Transmission Substation (MTS) approximately 7km south east of De Aar to the existing Kronos MTS, near Copperton. It is located in the Siyathemba, Kareeberg and Emthanjeni Local Municipalities within the Pixely ka Semme District Municipality, Northern Cape Province (FIGURE 1).

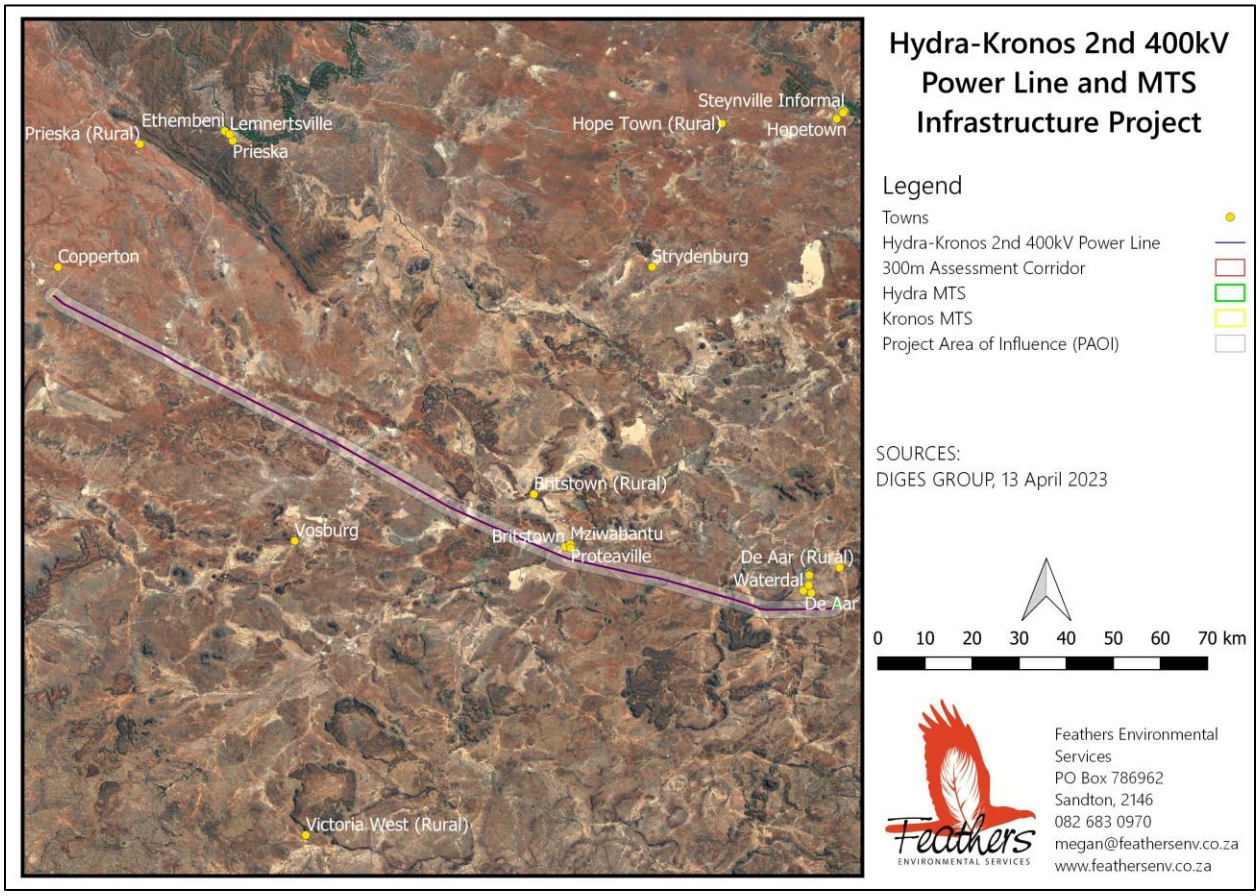

FIGURE 1: Regional map detailing the location of the proposed Hydra-Kronos 2nd 400kV power line alignment and the existing Hydra and Kronos Main Transmission Substations in the Pixely ka Semme District Municipality, Northern Cape Province

3. PROJECT DESCRIPTION

The proposed works to be undertaken by Eskom Holdings SOC Ltd are:

Hydra – Kronos 2nd 400 kV line

- Construct a second ±187 km 400 kV line from Hydra to Kronos Substation.
- Bypass series compensation on the 1st Hydra – Kronos 400 kV line.
- The power line corridor assessed is 300m wide.

Kronos Substation

- Extend 400 kV busbar at Kronos Substation.
- Establish and equip a new 400 kV feeder bay at Kronos Substation.

Hydra Substation

- Equip existing 400 kV feeder bay at Hydra Substation.

4. THIS REPORT

4.1 Scope of Work

*Feathers Environmental Services CC (*hereafter referred to as *Feathers)* was appointed by *DIGES Group* (hereafter referred to as *DIGES*) to assess the impacts associated with the aforementioned scope of works from an avifaunal perspective and compile a specialist avifaunal impact assessment report, that will inform the Basic Assessment Report required for the Environmental Authorisation. This report is based on a desktop review and a single winter season field survey. The survey was conducted over a four-day period from 5-8 June 2023 and used a set methodology and various data sets to determine which avian species regularly occur within the proposed study area, the availability of bird micro habitats (i.e. avifaunal sensitive areas), the possible impacts of the proposed 400kV power line and MTS infrastructure and their significance, in addition to the provision of recommendations for the mitigation of the anticipated impacts.

4.2 Terms of Reference

Feathers has conducted this avifaunal impact assessment according to the following terms of reference in accordance with the minimum report requirements listed in the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species (Government Gazette No 43855, 30 October 2020):

- Conduct a site sensitivity verification through the use of a desk top analysis, using satellite imagery and other available and relevant information, in addition to an on-site field inspection;

- Assess various avifaunal datasets, including but not limited to Important Bird Areas (IBAs) and describe the avifaunal communities (particularly with reference to Species of Conservation Concern (SCC) most likely to impacted on by the 400kV power line and the associated MTS infrastructure;
- Identify and confirm avifaunal micro habitats along the 400kV power line alignment and within the MTS yards for their suitability to support SCC and non-SCC priority (power line-sensitive) species, in terms of breeding, roosting and foraging;
- Describe the avifaunal communities (both SCC and non-SCC priority species) most likely to be impacted, based on primary occurrence data collected during the site survey;
- Provide a detailed description of the impacts associated with the construction and operation of the 400kV power line and the associated MTS infrastructure;
- Assess the significance (rated according to a pre-determined set of criteria of the identified direct, indirect and cumulative impacts during the construction and operation phases of the 400kV power line and the associated MTS infrastructure;
- Consider the 400kV power line alignment and the area earmarked within Kronos MTS for the establishment of the 400kV yard and advise possible changes (if necessary);
- Recommend practical mitigation measures for the management of the identified impacts at each stage of the development process for inclusion in the draft Environmental Management Programme (EMPr);
- Propose a monitoring programme for the sensitive areas, species or receptors (if necessary); and
- Describe the gaps in baseline data and an indication of the confidence levels.

4.3 Structure of this report

In terms of the NEMA 2014 EIA Regulations contained in GN R982 of 04 December 2014 (as amended) all specialist studies must comply with Appendix 6 of the NEMA 2014 EIA Regulations GN R982 of 04 December 2014 (TABLE 1) and in accordance with the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species (Government Gazette No 43855, 30 October 2020) (TABLE 2).

TABLE 1: Information to be included in specialist reports

Legal Requirement		Relevant Section in Specialist study
(1)	A specialist report prepared in terms of these Regulations must contain-	
(a)	details of-	
	(i) the specialist who prepared the report; and	Professional Experience and Appendix 4
	(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae	Professional Experience and Appendix 4

Legal Requirement		Relevant Section in Specialist study
(b)	a declaration that the specialist is independent in a form as may be specified by the competent authority;	Declaration of Independence
(c)	an indication of the scope of, and the purpose for which, the report was prepared;	Section 4
(cA)	an indication of the quality and age of base data used for the specialist report;	Section 5
(cB)	a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 7
(d)	the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 5
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 5
(f)	details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 7 & 8
(g)	an identification of any areas to be avoided, including buffers;	N/A
(h)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	N/A
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 12
(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 7 & 8
(k)	any mitigation measures for inclusion in the EMPr;	Section 9, 10 and 11
(l)	any conditions for inclusion in the environmental authorisation;	Section 9, 10 and 11
(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 10
(n)	a reasoned opinion	Section 11
	whether the proposed activity, activities or portions thereof should be authorised;	Section 11
	regarding the acceptability of the proposed activity or activities; and	Section 11
	if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 11
(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	Not Applicable
(p)	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Not Applicable
(q)	any other information requested by the competent authority.	Not Applicable
(2)	Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Section 4, Table 2, Section 5 and Section 6, Section 7,

Legal Requirement		Relevant Section in Specialist study
		Section 8, Section 9, Section 10

TABLE 2: Minimum report requirements listed in the protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020)

HIGH SENSITIVITY RATING FOR TERRESTRIAL ANIMAL SPECIES	
SITE SENSITIVITY VERIFICATION	
The site sensitivity verification must be undertaken by an environmental assessment practitioner or specialist.	Professional Experience and Appendix 4
The site sensitivity verification must be undertaken through the use of: (a) a desk top analysis, using satellite imagery; (b) a preliminary on-site inspection; and (c) any other available and relevant information.	Section 7
The outcome of the site sensitivity verification must be recorded in the form of a report that: (a) confirms or disputes the current use of the land and environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.; (b) contains a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity; and (c) is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations	Section 7
SPECIALIST ASSESSMENT & MINIMUM REPORT CONTENT REQUIREMENTS	
Contact details and relevant experience as well as the SACNASP Registration number of the specialist preparing the assessment including a curriculum vitae;	Professional Experience and Appendix 4
A signed statement of independence by the specialist;	Declaration of Independence
A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Section 5
A description of the methodology used to undertake the site sensitivity verification, impact assessment and site inspection, including equipment and modelling used where relevant;	Section 5
A description of the mean density of observations/number of sample sites per unit area and the site inspection observations;	Section 7
A description of the assumptions made and any uncertainties or gaps in knowledge or data;	Section 12
details of all SCC found or suspected to occur on site, ensuring sensitive species are appropriately reported;	Section 7

the online database name, hyperlink and record accession numbers for disseminated evidence of SCC found within the PAOI;	N/A
The location of areas not suitable for development and to be avoided during construction where relevant;	N/A
a discussion on the cumulative impacts;	Section 8
Impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	Section 9
A reasoned opinion, based on the findings of the specialist assessment, regarding the acceptability or not of the development and if the development should receive approval or not, related to the specific theme being considered, and any conditions to which the opinion is subjected if relevant; and	Section 11
A motivation must be provided if there were any development footprints identified as per paragraph 2.2.12 above that were identified as having "low" or "medium" terrestrial animal species sensitivity and were not considered. appropriate.	N/A

5. APPROACH AND METHODOLOGY

5.1 Methodology

The following methods were employed to compile this avifaunal impact assessment report:

- The focus of this assessment is primarily on the potential impacts of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* on priority species. Priority species are defined as those species which could potentially be impacted by displacement through habitat transformation and/or disturbance as well as collision and electrocution based on specific morphological and/or behavioural characteristics. These include both Species of Conservation Concern (SCC) as defined by the *Species Environmental Assessment Guideline: Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa (2020)* i.e. those species listed on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered, Vulnerable, Near Threatened and Data Deficient, as well as certain other impact susceptible species.
- By virtue of their mobility, the identification of bird presence and abundance cannot be confined to the *Hydra-Kronos 2nd 400kV power line* alignment and MTS infrastructure footprints therefore the Project Area of Influence (PAOI) is defined as a 2km zone around the proposed power line alignment. And MTS footprints. Avifaunal sensitivity has been defined for this PAOI.
- The proposed *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* are located across 31 South African Bird Atlas Project 2 (SABAP2) pentad grid cells (FIGURE 2). A total of 160 full protocol lists and 222 ad hoc protocol lists have been completed, which provides an accurate snapshot of the avifauna in the study area;

- Collected and examined various avifaunal data sets (detailed in section 5.2) at a desktop level to determine the presence of species, that may be vulnerable to the impacts associated with the construction and operation of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure*;
- Suitable avifaunal habitats and potential sensitive areas along the proposed *Hydra-Kronos 2nd 400kV power line and MTS infrastructure*, where impacts are likely to occur, were identified using various Geographic Information System (GIS) layers and Google Earth imagery and confirmed based on personal observations made during the site verification and field survey;
- Primary avifaunal diversity and occurrence data collected during a single winter season, four-day site verification and field survey to the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* project area, conducted on 5-8 June 2023. Data was collected by means of incidental counts to ground truth the information gleaned from secondary data sources and to collect primary bird occurrence data along the proposed 400kV power line alignment, MTS footprints and the immediate surrounds (FIGURE 3);
- The potential impacts, associated with the construction and operation of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* on the avifaunal community and their significance were predicted and assessed according to quantitative criteria (APPENDIX 3); and
- Practical recommendations for the management and mitigation of impacts, related to the construction and operation of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* are provided in Section 10 for inclusion in the draft EMPr.

5.2 Data sources used

The following data sources and reports were used in varying levels of detail for this study:

- Procedures for the Assessment and Minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of NEMA when applying for Environmental Authorisation (Gazetted October 2020);
- Guidelines for the Implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for EIAs in South Africa produced by the South African National Biodiversity Institute on behalf of the Department of Environment, Forestry and Fisheries (2020) were consulted to determine the applicable protocol to be used;
- Screening Reports for an Environmental Authorisation as required by the 2014 EIA Regulations - Proposed Development Footprint Environmental Sensitivity Hydra-Kronos 2nd 400kV power line alignment and MTS Infrastructure, compiled by *Feathers* on 2 June 2023;
- Bird distribution data of the South African Bird Atlas 2 (SABAP 2) (Animal Demography Unit, 2 June 2023)
- The Important Bird & Biodiversity Areas (IBAs) report (Marnewick et al. 2015);
- Co-ordinated Waterbird Count Database (CWAC – Taylor et al. 1999);
- Coordinated Avifaunal Roadcount project database (CAR – Young et al, 2003);
- The global and regional conservation status and endemism information of all bird species (Taylor et al. 2015) and the latest (2022-2) IUCN Red List of Threatened Species (http://www.iucnredlist.org);

* The power line - bird mortality incident database of the Eskom/Endangered Wildlife Trust Strategic Partnership (1996 to 2013) was consulted to determine which of the species occurring in the PAOI are typically impacted upon by power lines, and the extent of the impact;
* The latest vegetation classification described in the Vegetation Map of South Africa (South African National Biodiversity Institute, 2012 and Mucina & Rutherford, 2006);
* High-resolution Google Earth ©2023 imagery was used to examine the micro habitats within the PAOI;
* KMZ. shapefiles detailing the location of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure*, provided by *DIGES* on 13 April 2023; and
* A four-day site verification and field survey of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* and the broader PAOI conducted on 5-8 June 2023 (winter survey) to form a first-hand impression of avifaunal species presence and micro habitat occurring within the larger PAOI surrounding the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure*. This information, together with the SABAP2 data was used to compile a comprehensive list of species that could occur in the PAOI (FIGURE 3).

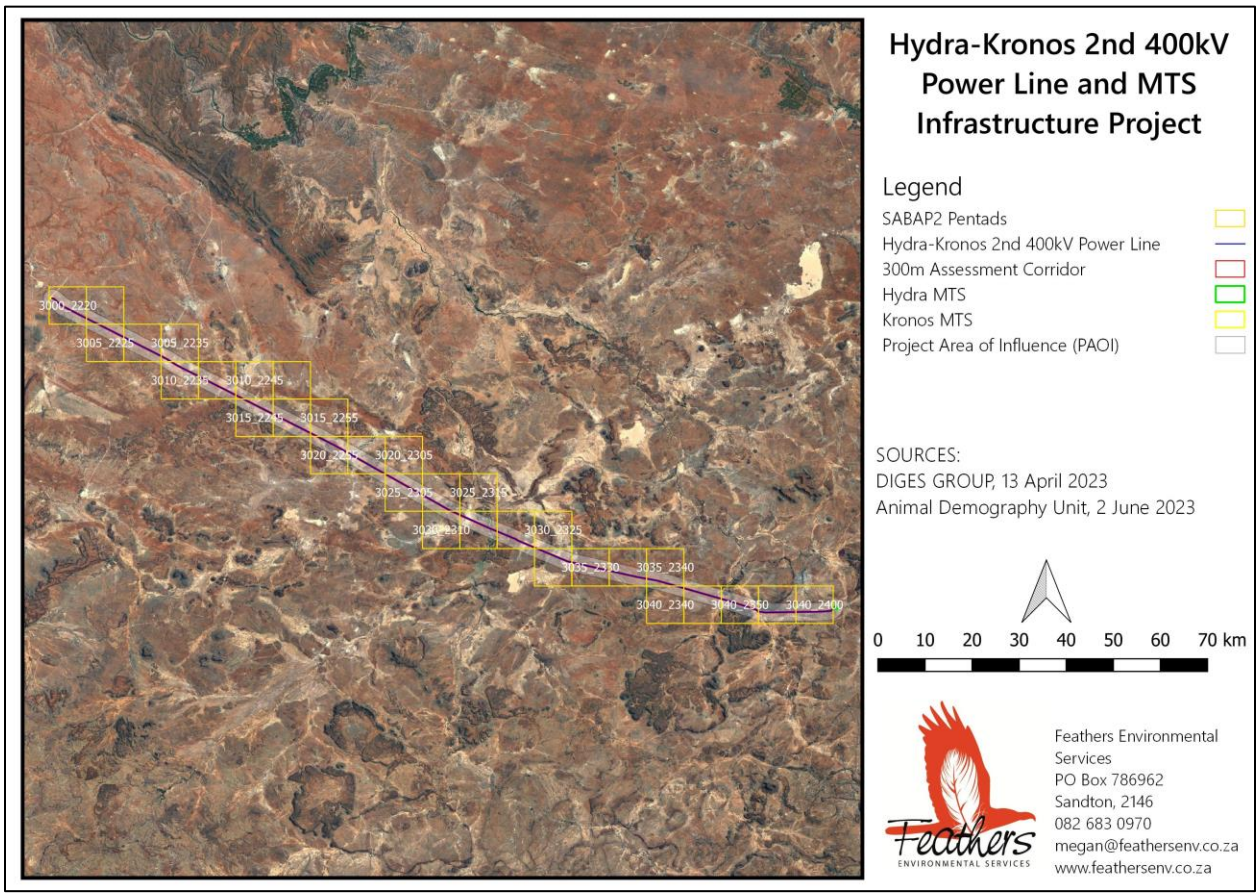

FIGURE 2: Location of the four South African Bird Atlas Project 2 (SABAP2) pentad grid cells that were considered for the Hydra-Kronos 2nd 400kV power line alignment and MTS Infrastructure project

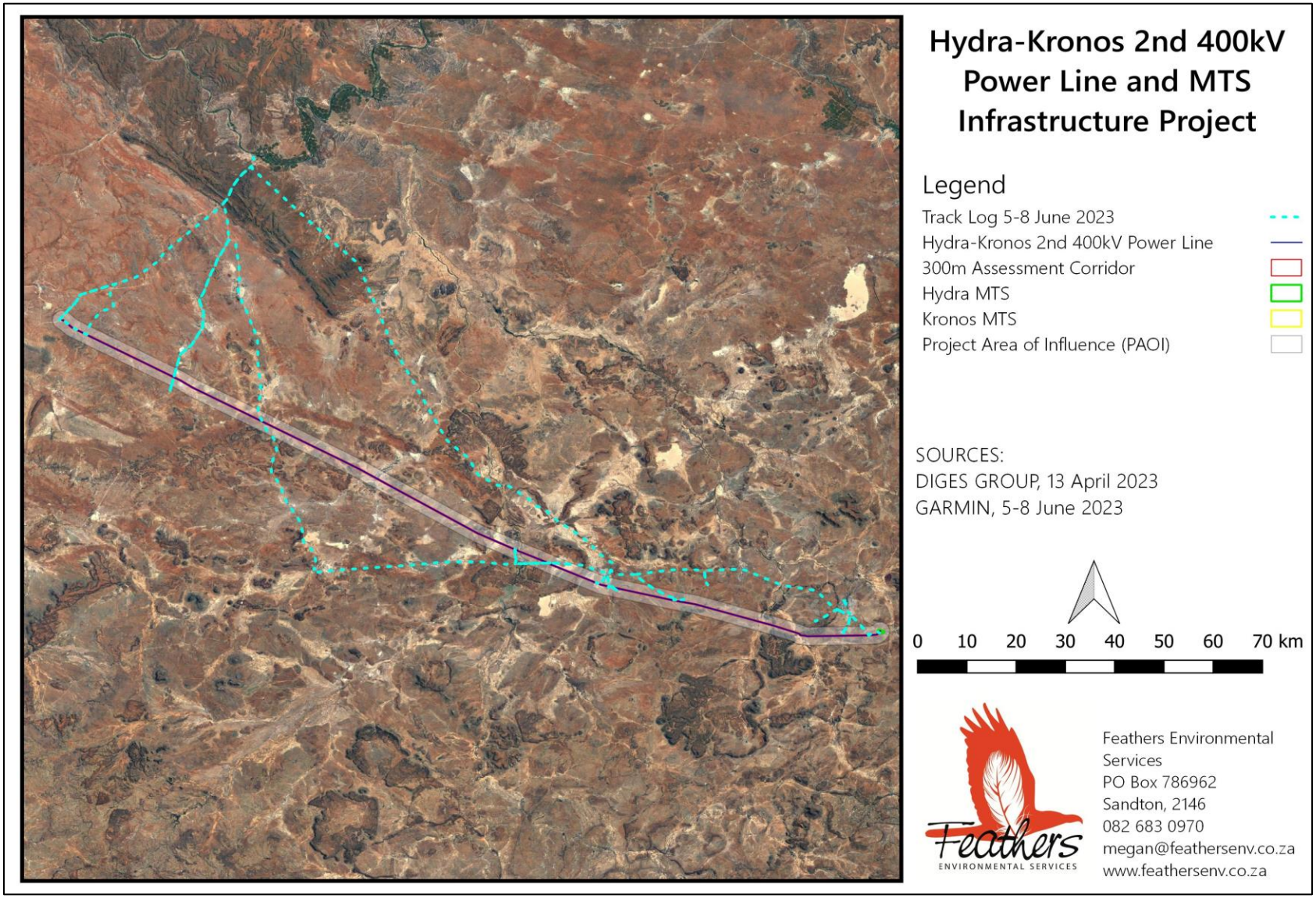

FIGURE 3: Regional map detailing the areas surveyed during the site verification and field survey of the Hydra-Kronos 2nd 400kV power line alignment and MTS Infrastructure PAOI, conducted on 5-8 June 2023

6. APPLICABLE LEGISLATION, POLICIES AND GUIDELINES

The following pieces of legislation are applicable to this assessment:

6.1 Agreements and Conventions

South Africa is party to various agreements and conventions (TABLE 3) which are relevant to the conservation of avifauna (BirdLife International, 2022).

TABLE 3: Agreements and conventions which South Africa is party to and which is relevant to the conservation of avifauna.

Convention Name	Description	Geographic Scope
African-Eurasian Waterbird Agreement (AEWA)	The Agreement on the Conservation of African-Eurasian Migratory Water birds (AEWA) is an intergovernmental treaty dedicated to the conservation of migratory waterbirds and their habitats across Africa, Europe, the Middle East, Central Asia, Greenland and the Canadian Archipelago. The AEWA covers 255 species of birds ecologically dependent on wetlands for at least part of their annual cycle, including many species of divers, grebes, pelicans, cormorants, herons, storks, rails, ibises, spoonbills, flamingos, ducks, swans, geese, cranes, waders, gulls, terns, tropic birds, auks, frigate birds and even the South African penguin. The core activities carried out under AEWA are described in its Action Plan, which is legally binding for all countries that have joined the Agreement. The AEWA Action Plan details the various measures to be undertaken by Contracting Parties to guarantee the conservation of migratory waterbirds within their national boundaries. These include species and habitat protection, and the management of human activities, as well as legal and emergency measures.	Regional
Convention on Biological Diversity (CBD), Nairobi, 1992	The CBD represents a commitment to sustainable development. The Convention has three main objectives: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources. The convention makes provision (in a general policy guideline) for keeping and restoring biodiversity. In addition to this the CBD is an ardent supporter of thorough assessment procedures (Strategic Environmental Assessments (SEAs) and Environmental Impact Assessments (EIAs)) and requires that Parties apply these processes when planning activities that will have a biodiversity impact. An important principle encompassed by the CBD is the precautionary principle which essentially states that where serious threats to the environment exist, lack of full scientific certainty should not be used as a reason for delaying management of these risks. The burden of proof that the impact will *not* occur lies with the proponent of the activity posing the threat. In addition, the Aichi Biodiversity Targets (CBD 2011) address several priority issues i.e. the loss of biodiversity and its causes; reducing direct pressure on biodiversity; safeguarding ecosystems, species and genetic diversity and participatory planning to enhance implementation of biodiversity conservation. Each of these is relevant to a project of this nature and bird conservation through all project phases from planning to the implementation of mitigation measures for all developments.	Global
Convention on the Conservation of Migratory Species of Wild Animals, (CMS), Bonn, 1979	The most appropriate instrument to deal with the conservation of terrestrial, aquatic and avian migratory species. The convention includes policy and guidelines with regards to the impacts associated with man-made infrastructure. CMS requires that Parties take measures to avoid migratory species from becoming endangered (Art II,	Global

	par. 1 and 2) and to make every effort to prevent the adverse effects of activities and obstacles that seriously impede or prevent the migration of migratory species (Art III, par. 4b and 4c). At CMS/CoP7 (2002) Res. 7.2 on Impact Assessment and Migratory Species was accepted, requesting Parties to apply appropriate SEA and EIA procedures for all proposed developments. An agreement developed in the framework of CMS, in force since November 1999, brings the 119 Range States of the Africa Eurasian Waterbird Agreement (AEWA) region together in a common policy to protect migratory waterbirds that use the flyway from the Arctic to southern Africa. The agreement contains a number of obligations that are relevant to migratory waterbirds and infrastructure development.	
Convention on the International Trade in Endangered Species of Wild Flora and Fauna, (CITES), Washington DC, 1973	CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	Global
Ramsar Convention on Wetlands of International Importance, Ramsar, 1971	The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.	Global
Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia	The Signatories will aim to take coordinated measures to achieve and maintain the favourable conservation status of birds of prey throughout their range and to reverse their decline when and where appropriate.	Regional

6.2 National & Provincial Legislation

The following pieces of national legislation, provincial legislation and best practice guidelines (TABLE 4) are applicable to this assessment:

TABLE 4: National and provincial legislation which is relevant to the conservation of avifauna.

Legislation	Description	Geographic Scope
The National Environmental Management Act 107 of 1998 (NEMA)	The National Environmental Management Act 107 of 1998 (NEMA) creates the legislative framework for environmental protection in South Africa and is aimed at giving effect to the environmental right in the Constitution. It sets out a number of guiding principles that apply to the actions of all organs of state that may significantly affect the environment. Sustainable development (socially, environmentally and economically) is one of the key principles, and internationally accepted principles of environmental management, such as the precautionary principle and the polluter pays principle, are also incorporated. NEMA also provides that a wide variety of listed developmental activities, which may significantly affect the environment, may be performed only after an environmental impact assessment has been done and authorization has been obtained from the relevant authority. Many of these listed activities can potentially have negative impacts on bird populations in a variety of ways. The clearance of natural vegetation, for instance, can lead to a loss of habitat and may depress prey populations, while erecting structures needed for generating and distributing energy, communication, and so forth can cause mortalities by collision or electrocution.	National
The National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA) and	The National Environmental Management: Biodiversity Act (No. 10 of 2004), (NEMBA) regulations on Threatened and Protected Species (TOPS) provides for the consolidation of biodiversity legislation through establishing national norms and	National

the Threatened or Protected Species Regulations, February 2007 (TOPS Regulations)	standards for the management of biodiversity across all sectors and by different management authorities. The national Act provides for among other things, the management and conservation of South Africa's biodiversity; protection of species and ecosystems that necessitate national protection and the sustainable use of indigenous biological resources.	
The National Environmental Management: Protected Areas Act 57 of 2003	The National Environmental Management: Protected Areas Act (No. 57 of 2003), as amended in 2014, provides for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. The Act also provides for the establishment of a national register of all national, provincial and local protected areas that are managed in accordance with national norms and standards; and to endure intergovernmental co-operation and public consultation in matters concerning protected areas. Protected areas are declared in order to regulate the area as a buffer zone for protection of a special nature reserve, world heritage site or nature reserve; to enable owners of land to take collective action to conserve biodiversity on their land and to seek legal recognition therefor; to protect the area if the area is sensitive to development due to its- (i) biological diversity; (ii) natural characteristics; (iii) scientific, cultural, historical, archaeological or geological value; (iv) scenic and landscape value; or (v) provision of environmental goods and services; to protect a specific ecosystem outside of a special nature reserve, world heritage site or nature reserve; to ensure that the use of natural resources in the area is sustainable. This Act explicitly states that no development, construction or farming may be permitted in a nature reserve or world heritage site without the prior written approval of the management authority.	National
The National Environmental Management Act 107 of 1998 (NEMA) Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal and or Avifaunal Species	This protocol provides the criteria for the specialist assessment and minimum report content requirements for impacts on terrestrial animal and/or avifaunal species for activities requiring environmental authorisation. This protocol replaces the requirements of Appendix 6 of the Environmental Impact Assessment Regulations. The assessment and reporting requirements of this protocol are associated with a level of environmental sensitivity identified by the national web based environmental screening tool (screening tool) for terrestrial animal species. The relevant terrestrial animal species data in the screening tool has been provided by the South African National Biodiversity Institute (SANBI).	National
Species Environmental Assessment Guideline: Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for environmental impact assessments in South Africa.	The *Species Environmental Assessment Guideline* provides background and context to the assessment and minimum reporting criteria contained within the Terrestrial Animal and Plant Species Protocols; as well as to provide guidance on sampling and data collection methodologies for the different taxonomic groups that are represented in the respective protocols. This guideline is intended for specialist studies undertaken for activities that have triggered a listed and specified activity in terms of the National Environmental Management Act, 1998 (No. 107 of 1998) (NEMA), as identified by the EIA Regulations, 2014 (as amended) and Listing Notices 1-3.	National
Northern Cape Nature Conservation Act No 9 of 2009	This act provides for the sustainable utilisation of wild animals, aquatic biota and plants; the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; describes offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; provides for the issuing of permits and other authorisations; and provides for matters connected therewith.	Provincial

7. DESCRIPTION OF THE BASELINE CONDITIONS

7.1 Site Sensitivity Verification

A screening report for the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* was generated on 3 April 2023. The project site and immediate environment is classified as MEDIUM and HIGH sensitivity for terrestrial animals according to the Terrestrial Animal Species Theme. These classifications are linked to the potential occurrence of Ludwig's Bustard *Neotis ludwigii*, Lanner Falcon *Falco biarmicus*, Verreaux's Eagle *Aquila verreauxii* and Tawny Eagle *Aquila rapax*. In addition, the study area contains confirmed habitat for SCC as defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020). The presence of Ludwig's Bustard and Verreaux's Eagle were confirmed during the site verification and field survey of the PAOI. In addition the author has conducted several assessments and research projects in the PAOI and has previously observed Lanner Falcon and Tawny Eagle. Based on these observations, the classification of HIGH sensitivity for avifauna in the screening tool is therefore confirmed.

7.2 Relevant Bird Populations

7.2.1. Protected Areas

These areas are protected by law and managed for biodiversity conservation, providing much needed habitat that can potentially support a diversity and abundance of avifaunal species. The proposed *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* are not located within a protected area. The De Aar Nature Reserve (FIGURE 4) occurs approximately 6km north of the proposed 400kV power line, but not within the areas proposed to be developed. No information could be obtained for the De Aar Nature Reserve, but it is assumed that the composition and abundance of avifauna in the reserve will be similar to the surrounding area. The presence of protected areas is not used as a criterion to assess the sensitivity and anticipated impacts within the PAOI.

7.2.2. Important Bird & Biodiversity Areas (IBAs)

Some sites are exceptionally important for maintaining the taxa dependent upon the habitats and ecosystems in which they occur. Vigorous protection of the most critical sites is one important approach to conservation. Many species may be effectively conserved by this means. Patterns of bird distribution are such that, in most cases, it is possible to select sites that support many species. These sites, carefully identified on the basis of the bird numbers and species complements they hold (i.e. globally threatened, range restricted and or migratory or congregatory species), are termed Important Bird Areas (IBAs). IBAs are selected such that, taken together, they form a network throughout the species' biogeographic distributions. IBAs are key sites for conservation – small enough to be conserved in their entirety and often already part of a protected-area network. The south

eastern portion of the proposed 400kV power line, close to Hydra MTS, occurs within the Platberg-Karoo Conservancy IBA - SA037 (FIGURE 4).

The landscape consists of extensive flat to gently undulating plains that are broken by dolerite hills and flat-topped inselbergs. The ephemeral Brak River flows in an arc from south-east to north-west, eventually feeding into the Orange River basin. Other ephemeral rivers include the Hondeblaf, Seekoei, Elandsfontein and Ongers rivers, with a network of tributaries. This IBA contributes significantly to the conservation of large terrestrial birds and raptors. These include Blue Crane *Grus paradiseus*, Ludwig's Bustard *Neotis ludwigii*, Kori Bustard *Ardeotis kori,* Blue Korhaan *Eupodotis caerulescens*, Black Stork *Ciconia nigra*, Secretarybird *Sagittarius serpentarius*, Martial Eagle *Polemaetus bellicosus*, Verreauxs' Eagle *Aquila verreauxii* and Tawny Eagle *Aquila rapax*.

A total of 289 bird species are known to occur here. In summer, close to 10% of the global population of Lesser Kestrel *Falco naumanni* congregate and roost in this IBA. Amur Falcons *Falco amurensis* are also abundant and forage and roost with Lesser Kestrels. This IBA is seasonally important for White Stork *Ciconia ciconia*, and Coordinated Avifaunal Roadcounts indicate high numbers of this species during outbreaks of brown locusts and armoured ground crickets. The IBA also supports the following biome-restricted species: Karoo Lark *Calendulauda albescens*, Karoo Long-billed Lark *Certhilauda subcoronata,* Karoo Chat *Cercomela schlegelii*, Tractrac Chat *Cercomela tractrac*, Sickle-winged Chat *Cercomela sinuata,* Namaqua Warbler *Phragmacia substriata*, Layard's Tit-Babbler *Sylvia layardi*, Pale-winged Starling *Onychognathus nabouroup* and Black-headed Canary *Serinus alario*.

With the exception of Karoo Lark, Karoo Chat, and Namaqua Warbler, each of the remaining aforementioned species have been observed in the relevant SABAP2 pentads. It is therefore likely that the impacts associated with the construction and operation of the proposed *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* project, will negatively affect these species if the necessary avoidance and mitigation measures are not implemented.

7.2.3. Coordinated Avifaunal Roadcount (CAR) Routes

Cranes, bustards, storks and other large birds that spend most of their time on the ground, need wide, open spaces and are certainly not restricted to protected areas. Agricultural habitats are used extensively for feeding, roosting and breeding, often because no natural, pristine habitats are available, and sometimes because the agricultural habitats are especially attractive to birds. The Coordinated Avifaunal Roadcounts (CAR) project monitors the populations of 36 species of large terrestrial birds in agricultural habitats, in addition to gamebirds, raptors and corvids along 350 fixed routes covering over 19 000km (http://car.adu.org.za/). Although CAR road counts do not give an absolute count of all the individuals in a population, they do provide a measure of relative abundance in a particular area. There are six CAR routes located within the 15km of the

Hydra-Kronos 2nd 400kV power line and MTS infrastructure project area. These include routes NK031, NK033, NK041, NK113 NK131 and NK203 (FIGURE 4). Routes NK031, NK033 and NK041 were surveyed regularly between 2011 and 2015 yielding observations of Kori Bustard, Ludwigs Bustard, Denham's Bustard *Neotis denhami*, Blue Crane, Karoo Korhaan *Eupodotis vigorsii*, Northern Black Korhaan *Afrotis afraoides*, Secretarybird, Spur-winged Goose *Plectropterus gambensis*, White Stork, Black Stork *Ciconia nigra*, Black-headed Heron *Ardea melanocephala*, and Pied Crow *Corvus albus*. These species feature prominently throughout the PAOI and are highly susceptible to the collision impact associated with transmission power line infrastructure.

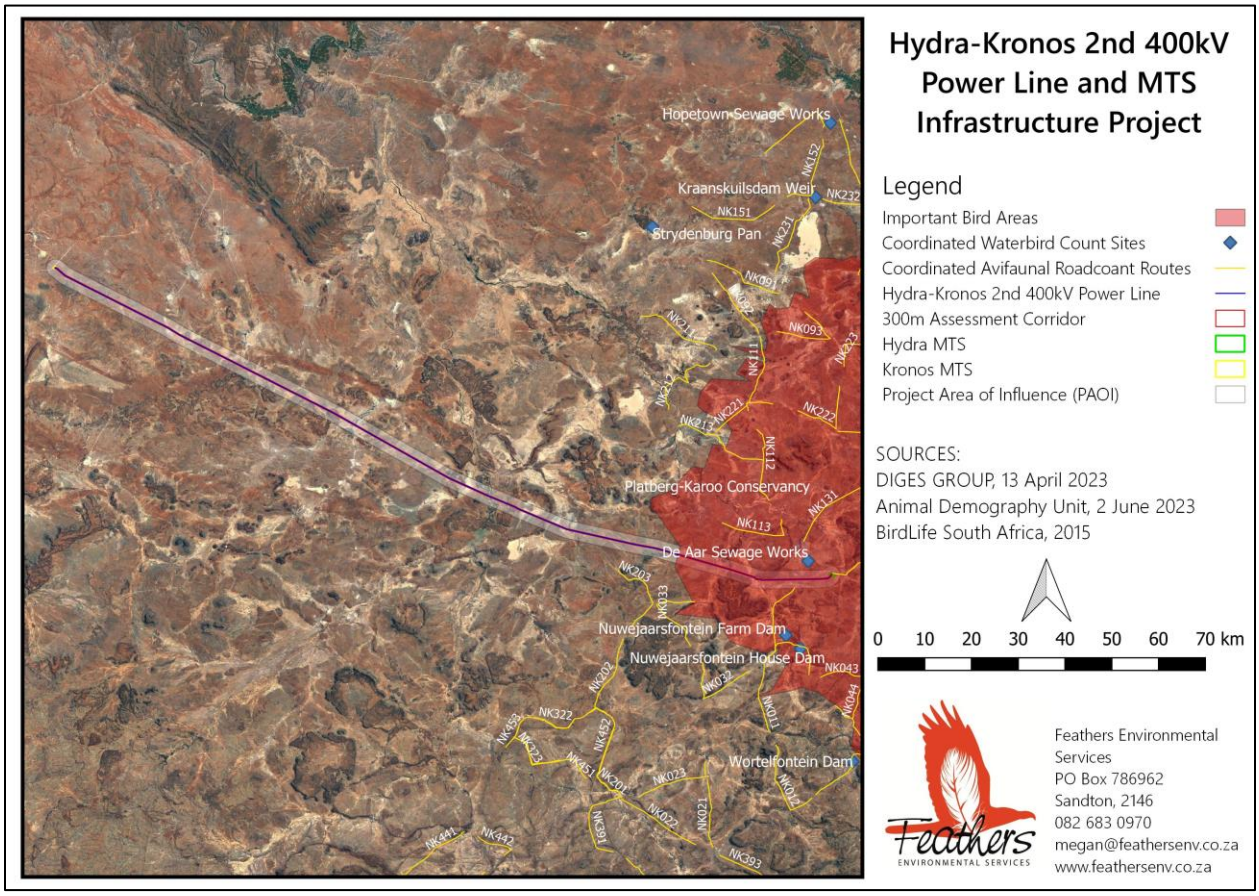

FIGURE 4: Protected Areas, Important Bird Areas (IBAs) , Coordinated Avifaunal Roadcount (CAR) routes, Coordinated Waterbird Count (CWAC) sites in relation to the Hydra-Kronos 2nd 400kV power line alignment and MTS Infrastructure PAOI

7.2.4. Coordinated Waterbird Count (CWAC) Sites

A CWAC site is any body of water, other than the oceans, which supports a significant number (set at approximately 500 individual water birds, irrespective of the number of species) of birds which use the site for feeding, and/or breeding and roosting (Harrison et al, 2004). This definition includes natural pans, vleis, marshes, lakes, rivers, as well as a range of manmade impoundments (i.e. sewage works). There are no CWAC sites located within the PAOI. The closest CWAC sites, located within a 20km radius of the *Hydra-Kronos 2nd*

400kV power line and MTS infrastructure project area include the De Aar Sewage Works, Nuwejaarsfontein Farm Dam and the Nuwejaarsfontein House Dam (FIGURE 4). Greater Flamingo (n=4) is the only Red List species that has been recorded at the De Aar Sewage Works. Species recorded in relatively larger numbers include Red-knobbed Coot *Fulica cristata*, Yellow-billed Duck *Anas undulata*, Spur-winged Goose, Hadeda Ibis *Bostrychia hagedash*, Blacksmith Lapwing *Vanellus armatus*, Black-winged Stilt *Himantopus himantopus* and Cape Teal *Anas capensis*. The Nuwejaarsfontein House Dam site is counted regularly and has recorded Greater Flamingo (n=6). The more common duck, grebe, ibis, cormorant, avocet, goose and wader species are regularly observed at both Nuwejaarsfontein sites.

These CWAC sites provide an indication of the waterbird species that could be supported by similar natural and artificial impoundments located along or in close proximity to the proposed *Hydra-Kronos 2nd 400kV power line and MTS infrastructure*. However, it is important to note that with the exception of Blacksmith Lapwing, the remaining species are considered priority species that are susceptible to collisions with power line infrastructure.

7.2.5 South African Bird Atlas Project 2 Data (SABAP2)

A total of 184 bird species have been recorded across the two pentads, within which the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* project is located, during the SABAP2 atlassing period to date (APPENDIX 1). The presence of these species in the broader area provides an indication of the diversity of species that could potentially occur at the along the proposed power line corridor. Of the 184 species, 48 species are classified as priority species (see definition in section 5) of which 14 are regional SCC (Taylor et al, 2015), one Endemic and two Near Endemic species. Relevant to this power line development, of the power line sensitive species, almost half (n=22) are likely to occur frequently within the PAOI. APPENDIX 1 provides a comprehensive list of all the species recorded by SABAP2. With the exception of Ludwig's Bustard, Blue Crane, Verreaux's Eagle and Karoo Korhaan, the majority of SCC have been recorded in very low numbers with between one and ten individual birds of each species being recorded over the fourteen-year survey period. The SABAP2 data is an accurate reflection of the diversity and abundance of SCC that are likely to be found within the areas surrounding the proposed *Hydra-Kronos 2nd 400kV power line and MTS infrastructure*. Although this report focuses on SCC, since the impacts associated with the construction and operation of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* are likely to be more biologically significant for these species, the impact on non-SCC power line priority species is also assessed. Furthermore, SCC can often be used as surrogate species for the others in terms of impacts and the necessary mitigation. Each priority species' potential for occurring in a specific habitat class is indicated in TABLE 5, in addition to the type of impact that could potentially affect each species, specific to the location of this project.

The following abbreviations are used: EN (Endangered), VU (Vulnerable), NT (Near Threatened), H (High), M (Medium) and L (Low).

TABLE 5: Annotated list of power line priority species that have been recorded in the relevant SABAP2 pentads, with a high and medium likelihood of occurrence in the PAOI

Species Name	Scientific Name	Full Protocol	Ad hoc Protocol	Red List Global	Red List Regional	Power line Priority	Recorded during surveys	Likelihood of Occurrence	Nama Karoo	Surface Water	Wetlands	Rocky Ridges	Agriculture	Exotic Tree Stands	High Voltage Power Lines	Mortality Electrocution (MTS)	Mortality Collision	Displacement Habitat Transformation	Habitat Disturbance
Abdim's Stork	Ciconia abdimii	1.3	0.9	-	NT	x		L	x				x				x	x	
African Sacred Ibis	Threskiornis aethiopicus	10.1	0.9	-	-	x		H		x	x				x	x	x		x
African Spoonbill	Platalea alba	3.8	0.0	-	-	x		L		x							x		
Amur Falcon	Falco amurensis	3.8	0.0	-	-	x		H	x				x		x	x		x	
Black Harrier	Circus maurus	0.0	0.9	EN	EN	x		L			x					x			
Black Stork	Ciconia nigra	2.5	0.0	-	VU	x		L		x	x			x	x		x		
Black-chested Snake Eagle	Circaetus pectoralis	2.5	0.0	-	-	x		L	x	x				x	x	x		x	
Black-headed Heron	Ardea melanocephala	1.3	0.0	-	-	x	x	L	x	x	x			x	x	x	x	x	x
Black-winged Kite	Elanus caeruleus	5.1	0.9	-	-	x	x	M	x					x	x	x		x	x
Blue Crane	Grus paradisea	22.8	0.0	VU	NT	x		H	x	x	x		x				x	x	x
Blue Korhaan	Eupodotis caerulescens	1.3	0.0	NT	LC	x		L	x								x	x	x
Booted Eagle	Hieraaetus pennatus	8.9	0.0	-	-	x		H	x	x				x	x	x		x	
Cape Crow	Corvus capensis	1.3	2.7	-	-	x		M	x					x	x	x		x	x
Cape Eagle-Owl	Bubo capensis	2.5	0.0	-	-	x		M	x				x	x		x	x	x	
Common Buzzard	Buteo buteo	1.3	0.9	-	-	x		M	x	x			x	x	x	x		x	
Egyptian Goose	Alopochen aegyptiaca	29.1	4.5	-	-	x	x	H		x	x		x				x	x	x
Gabar Goshawk	Micronisus gabar	1.3	0.0	-	-	x		M		x				x		x		x	
Greater Flamingo	Phoenicopterus roseus	1.3	0.0	-	NT	x		L		x							x		
Greater Kestrel	Falco rupicoloides	17.7	7.2	-	-	x	x	H	x					x	x	x		x	x
Hadada Ibis	Bostrychia hagedash	36.7	1.8	-	-	x	x	H	x	x	x		x	x	x	x	x	x	x
Helmeted Guineafowl	Numida meleagris	20.3	2.7	-	-	x	x	H	x				x	x	x		x	x	x
Jackal Buzzard	Buteo rufofuscus	34.2	4.5	-	-	x	x	H	x	x				x	x	x		x	x
Karoo Korhaan	Eupodotis vigorsii	24.1	0.9	-	NT	x	x	H	x								x	x	x
Kori Bustard	Ardeotis kori	2.5	0.9	NT	NT	x		H	x								x	x	x

Species Name	Scientific Name	Full Protocol	Ad hoc Protocol	Red List Global	Red List Regional	Power line Priority	Recorded during surveys	Likelihood of Occurrence	Nama Karoo	Surface Water	Wetlands	Rocky Ridges	Agriculture	Exotic Tree Stands	High Voltage Power Lines	Mortality Electrocution (MTS)	Mortality Collision	Displacement Habitat Transformation	Habitat Disturbance
Lanner Falcon	Falco biarmicus	6.3	0.9	-	VU	x		H	x	x			x	x	x	x		x	x
Lesser Flamingo	Phoeniconaias minor	1.3	0.0	NT	NT	x		L		x							x		
Lesser Kestrel	Falco naumanni	20.3	3.6	-	-	x		H	x				x		x	x		x	
Little Grebe	Tachybaptus ruficollis	1.3	0.0	-	-	x		L		x							x		
Ludwig's Bustard	Neotis ludwigii	15.2	1.8	EN	EN	x	x	H	x				x				x	x	x
Martial Eagle	Polemaetus bellicosus	2.5	1.8	EN	EN	x		M	x	x					x	x		x	x
Northern Black Korhaan	Afrotis afraoides	70.9	8.1	-	-	x	x	H	x								x	x	x
Pale Chanting Goshawk	Melierax canorus	64.6	13.5	-	-	x	x	H	x	x				x	x	x		x	x
Pied Crow	Corvus albus	84.8	38.7	-	-	x	x	H	x					x	x	x		x	x
Red-billed Teal	Anas erythrorhyncha	3.8	0.0	-	-	x		L		x							x		
Red-knobbed Coot	Fulica cristata	2.5	0.0	-	-	x	x	H		x							x		
Rock Kestrel	Falco rupicolus	17.7	9.0	-	-	x		H	x			x	x	x	x	x		x	x
Secretarybird	Sagittarius serpentarius	1.3	2.7	EN	VU	x		L	x	x							x	x	x
South African Shelduck	Tadorna cana	12.7	4.5	-	-	x	x	H		x							x		
Spotted Eagle-Owl	Bubo africanus	1.3	0.0	-	-	x		M	x			x		x	x		x	x	x
Spur-winged Goose	Plectropterus gambensis	13.9	0.0	-	-	x		M		x	x		x				x		x
Tawny Eagle	Aquila rapax	2.5	0.0	VU	EN	x		M	x	x				x	x	x		x	x
Verreaux's Eagle	Aquila verreauxii	26.6	8.1	-	VU	x	x	H	x			x		x	x	x		x	x
Western Barn Owl	Tyto alba	1.3	0.0	-	-	x		M	x				x	x		x	x	x	x
Western Cattle Egret	Bubulcus ibis	2.5	0.0	-	-	x		M	x	x	x			x			x	x	x
White Stork	Ciconia ciconia	0.0	3.6	-	-	x		M	x	x	x			x	x		x	x	
White-faced Whistling Duck	Dendrocygna viduata	1.3	0.0	-	-	x		L		x							x		
White-necked Raven	Corvus albicollis	22.8	4.5	-	-	x	x	H	x					x	x	x		x	x
Yellow-billed Duck	Anas undulata	5.1	0.0	-	-	x		M		x							x		

7.2.6. Primary Data Collection

A single winter survey was conducted on 5-8 June 2023, with a focused effort on the areas along the proposed *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* alignment and footprint, respectively. In order to describe the avifaunal community present, a concerted effort was made to sample the avifauna in all of the primary habitats that were available within the PAOI and broader surrounds associated with the power line and MTS developments. All species encountered (observed and heard) during the site survey were noted and are indicated (highlighted in grey) in APPENDIX 1.

The site visit produced a combined list of 75 species. The majority of observations were of passerine species that are common to this area. Each of these species has the potential to be displaced by the construction and operation of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* as a result of habitat transformation and/or disturbance. However, suitable habitat is available within the broader area, so the displacement impact will not be of regional or national significance. Sixteen priority species were recorded during the survey and are highly susceptible to the collision impact associated with transmission power line infrastructure. This premise is confirmed with the observation of two collision mortalities on the 1st Hydra-Kronos 400kV power line (FIGURE 5). Ludwig's Bustard, Karoo Korhaan and a nesting Verreaux's Eagle were the SCC recorded during the field survey (FIGURE 5).

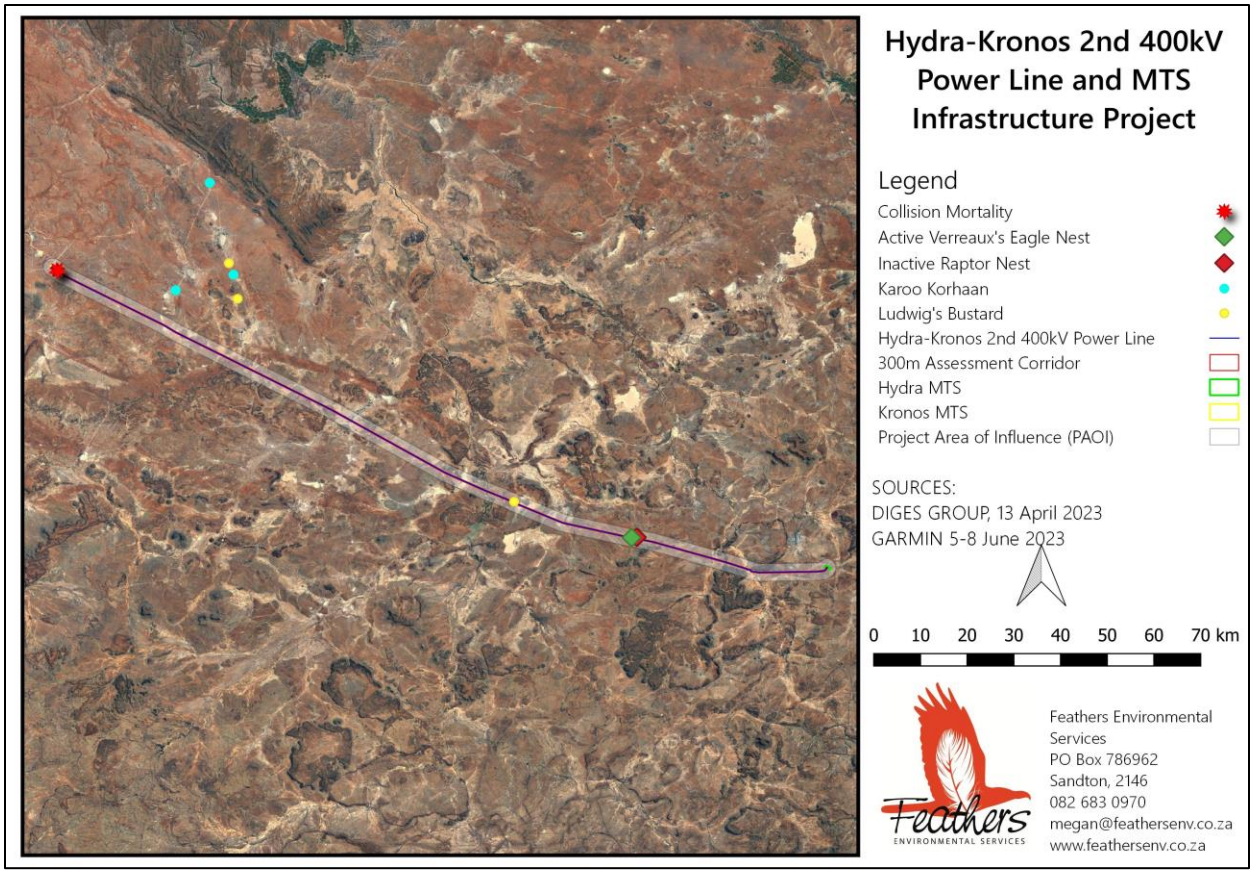

FIGURE 5: Notable field observations of SCC and collision mortalities made during the field survey on 5-8 June 2023

7.3 Avifaunal Habitats

Vegetation is one of the primary factors determining bird species distribution and abundance in an area. It is widely accepted within ornithological circles that vegetation structure is more important in determining which bird species will occur there. Whilst much of the distribution and abundance of bird species can be attributed to the broad vegetation types present in an area, it is the smaller micro habitats that are determined by factors other than vegetation, such as topography, land use, food availability, and various anthropogenic factors all of which will either attract or deter birds. Micro habitats are critically important in mapping the site in terms of avifaunal sensitivity and ultimately informing mitigation requirements. Assessment of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* PAOI revealed seven broadly described avifaunal micro habitats i.e. karoo, surface waterbodies, wetlands, rocky ridges, agriculture, exotic/alien tree stands and high voltage power line infrastructure. APPENDIX 2 provides a photographic record of the bird habitats.

7.3.1. Nama Karoo

The vegetation at the development area consists of Karoo shrub vegetation punctuated by rugged relief. Although not remarkably rich in species or endemism, the flora and fauna of the region are remarkably adapted to the region's climatic extremes. The major threats to biodiversity are posed by pastoralism, exotic plants, mining and agriculture. Trees and taller woody shrubs are restricted mostly to watercourses and include *Acacia karroo, Diospyros lycioides, Grewia robusta, Rhus lancea,* and *Tamarix usneoides* (Palmer and Hoffman 1997). This habitat type will typically support Secretarybird, Ludwig's Bustard, Common Buzzard *Buteo buteo*, Jackal Buzzard *Buteo rufofuscus*, Blue Crane, Booted Eagle *Hieraaetus pennatus*, Martial Eagle, Tawny Eagle, Amur Falcon, Lanner Falcon, Pale Chanting Goshawk *Melierax canorus*, Greater Kestrel *F*, Lesser Kestrel, Blue Korhaan, Northern Black Korhaan and White Stork

7.3.2. Surface Water

The study area contains sources of both permanent (i.e. water troughs) and ephemeral (i.e. dams) surface waterbodies. When filled with water, the dams typically attract flocks of Blue Crane and Greater Flamingo *Phoenicopterus roseus*, Secretarybird, Booted Eagle, Martial Eagle, Tawny Eagle, Verreaux's Eagle, Lanner Falcon, Gabar Goshawk *Micronisus gabar*, Pale Chanting Goshawk, Helmeted Guineafowl *Numida meleagris*,, Black Stork, White Stork, various waterfowl, ibis, heron and goose species that utilise this habitat type in which to roost and forage.

7.3.3. Wetlands

Wetlands are characterized by slow flowing seasonal water (or permanently wet) and tall emergent vegetation (rooted or floating) and provide habitat for many water birds. The conservation status of many of the bird species that are dependent on wetlands reflects the critical status of wetlands worldwide, with many having

already been destroyed. There are examples of localized wetlands within the PAOI. These wetland areas when inundated with water are likely to attract sensitive species such as Blue Crane, Black Stork and White Stork (Young 2003) that are usually attracted to habitats like this. Various common species i.e. korhaan, ibis, herons and geese will also utilise this wetland for their foraging needs.

7.3.4. Mountains & Rocky Ridges

The PAOI contains mountainous areas and exposed rocky ridges that are likely to support the foraging and breeding needs of Verreaux's Eagle, Rock Kestrel and Spotted Eagle-Owl.

7.3.5. Agriculture

Relevant to this project, cultivation is limited to a few agricultural lands within the PAOI. Arable or cultivated land represents a significant feeding area for many bird species in any landscape, but perhaps more so in arid environments. The opening up of the soil surface, and land preparation makes many insects, seeds, bulbs and other food sources suddenly accessible to birds and other predators; the crop or pasture plants cultivated are often eaten by birds or attract insects which are in turn eaten by birds. Ludwig's Bustard, Common Buzzard Blue Crane, Amur Falcon, Lanner Falcon, Lesser Kestrel, Rock Kestrel, Egyptian Goose, Spur-winged Goose, Helmeted Guineafowl and Hadeda Ibis are likely to frequent this microhabitat. Although the cultivated lands are not located within the proposed power line corridor, we must account for the potential movement birds across the power line alignment, as and when food resources become available within the cultivated areas, thereby increasing the risk of collision with the overhead power line conductors and/or earthwires.

7.3.6. Exotic/Alien Tree Stands

The development area is largely devoid of trees, except for alien trees which have been planted in homestead areas. Although stands of *Eucalyptus* are strictly speaking invader species, they have become important refuges for certain species of raptors, particularly Amur Falcon, a Palearctic migrant, which will commonly roost in small stands of *Eucalyptus* in suburbs of small towns. Relevant to this project Amur Falcon, Lanner Falcon, Lesser Kestrel, Greater Kestrel, Tawny Eagle and Martial Eagle may utilise this habitat type occasionally.

7.3.7. High Voltage Power Lines

The existing 1 Hydra-Kronos 400kV power line is located directly adjacent to the proposed *Hydra-Kronos 2nd 400kV power line*. Transmission lines are an important breeding and roosting substrate for raptors in the Karoo, due to the lack of large trees (Jenkins *et al.* 2013).

TABLE 5 details the micro habitats that each of the power line sensitive bird species (recorded by SABAP2) will typically frequent in the PAOI. It must be stressed that birds can and will, by virtue of their mobility, utilise almost any areas in a landscape from time to time. However, the analysis in TABLE 5 represents each species' most preferred habitats. These locations are where most of the birds of that species will spend most of their time which in turn provides an indication of where impacts on those species will be most significant.

8. IDENTIFICATION OF IMPACTS

Poorly sited or designed facilities and infrastructure can negatively impact not only vulnerable species and habitats, but also entire ecological processes. The effects of any development on birds are highly variable and depend on a wide range of factors including the specification of the development, the topography of the surrounding land, the habitats affected and the number and diversity of species present. With so many variables involved, the impacts of each development must be assessed individually.

Negative impacts on avifauna by electricity infrastructure generally take two (2) main forms, namely electrocution and collisions (Ledger & Annegarn, 1981; Ledger 1983; Ledger, 1984; Hobbs and Ledger, 1986a; Hobbs & Ledger, 1986b; Ledger, Hobbs & Smith, 1992; Verdoorn, 1996; Kruger & Van Rooyen, 1998; Van Rooyen, 1998; Kruger, 1999; Van Rooyen, 1999; Van Rooyen, 2000; Van Rooyen, 2004; Jenkins *et al.*, 2010). Displacement due to habitat destruction and disturbance associated with the construction of the electricity infrastructure and other associated infrastructure is another impact that could potentially impact on avifauna. Each of these potential effects can interact, either increasing the overall impact on birds or, in some cases, reducing a particular impact (for example where habitat loss and disturbance causes a reduction in birds using an area which may then reduce the risk of collision).

The principal areas of concern for SCC and non-SCC power line priority species are:

8.1 Construction Phase

8.1.1. Displacement as a result of habitat loss or transformation

During the construction of power lines, service roads (jeep tracks), substations and other associated infrastructure, habitat destruction/transformation inevitably takes place. The construction activities will constitute the following:

- Site clearance and preparation;
- Excavations for infrastructure;
- Construction of the infrastructure (i.e. the additional bay within the Kronos MTS, access roads and 400kV power line); and

* Transportation of personnel, construction material and equipment to and from the site.

These activities could impact on birds breeding, foraging and roosting in or in close proximity of the existing Kronos and Hydra MTS, and *Hydra-Kronos 2nd 400kV power line* through transformation of habitat, which could result in temporary or permanent displacement. Unfortunately, very little mitigation can be applied to reduce the significance of this impact as the total permanent transformation of the natural habitat within the construction footprint of the central collector substation is unavoidable. In the case of the *Hydra-Kronos 2nd 400kV power line*, the direct habitat transformation is limited to the tower footprints and the narrow access road/track under the power line. The habitat in the study area is highly uniform from a bird impact perspective. The loss of habitat due to direct habitat transformation associated with the construction of the proposed 400kV power line is likely to be fairly minimal.

8.1.2. Displacement as a result of disturbance

Excavation and construction activities are a source of significant disturbance. For most bird species, construction activities are likely to be a cause of temporary disturbance impacting on foraging, and roosting behaviours but in more extreme cases, construction may impact on the breeding success of certain species particularly if the disturbance happens during a critical part of the breeding cycle, resulting in temporary breeding failure or permanent nest abandonment. Terrestrial species and raptors potentially breeding on the existing power line infrastructure (i.e. the nesting Verreaux's Eagle observed during the field survey) within the PAOI are most likely to be affected by displacement due to disturbance. A potential mitigation measure is the timeous identification of nests and the timing of the construction activities to avoid disturbance during a critical phase of the breeding cycle.

8.1.3. Direct mortality as a result of construction activities

Bird mortality as a result of construction activities is improbable because birds are incredibly mobile and able to move out of harm's way. If mortality does occur, it is likely to be confined to a localised area and restricted to immobile species e.g. nestlings.

8.2 Operational Phase

8.2.1. Mortality due to collisions with the 400kV power line conductors and/or earthwires

Collisions are the biggest single threat posed by power lines to birds in southern Africa (van Rooyen 2004). Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds. These species are mostly heavy-bodied birds with limited maneuverability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines (van Rooyen 2004, Anderson 2001). Unfortunately, many of the collision sensitive species are considered threatened in southern Africa. Quantifying this impact in terms of the likely number of birds that will be impacted, is very difficult because a number of variables play a role in

determining the risk, for example weather, rainfall, wind, age, flocking behaviour, power line height, light conditions, topography, population density and so forth. Recent research provides the first evidence that birds can render themselves blind in the direction of travel during flight through voluntary head movements (Martin & Shaw 2010). Visual fields were determined in three bird species representative of families known to be subject to high levels of mortality associated with power lines i.e. Kori Bustards, Blue Cranes and White Storks. In all species the frontal visual fields showed narrow and vertically long binocular fields typical of birds that take food items directly in the bill under visual guidance. However, these species differed markedly in the vertical extent of their binocular fields and in the extent of the blind areas which project above and below the binocular fields in the forward-facing hemisphere. The importance of these blind areas is that when in flight, head movements in the vertical plane (pitching the head to look downwards) will render the bird blind in the direction of travel. Such movements may frequently occur when birds are scanning below them (for foraging or roost sites, or for conspecifics). In bustards and cranes pitch movements of only 25° and 35°, respectively, are sufficient to render the birds blind in the direction of travel; in storks, head movements of 55° are necessary. That flying birds can render themselves blind in the direction of travel has not been previously recognised and has important implications for the effective mitigation of collisions with human artefacts including wind turbines and power lines. These findings have applicability to species outside of these families especially raptors (A*ccipitridae*) which are known to have small binocular fields and large blind areas similar to those of bustards and cranes, and are also known to be vulnerable to power line collisions.

Power line collisions are generally accepted as a key threat to bustards (Raab *et al*. 2009; Raab *et al*. 2010; Jenkins & Smallie 2009; Barrientos *et al*. 2012, Shaw 2013). In a recent study, carcass surveys were performed under high voltage transmission lines in the Karoo for two years, and low voltage distribution lines for one year (Shaw 2013). Ludwig's Bustard was the most common collision victim (69% of carcasses), with bustards generally comprising 87% of mortalities recovered. Total annual mortality was estimated at 41% of the Ludwig's Bustard population, with Kori Bustards also dying in large numbers (at least 14% of the South African population killed in the Karoo alone). Karoo Korhaan was also recorded, but to a much lesser extent than Ludwig's Bustard. The reasons for the relatively low collision risk of this species probably include their smaller size (and hence greater agility in flight) as well as their more sedentary lifestyles, as local birds are familiar with their territory and are less likely to collide with power lines (Shaw 2013).

From incidental record keeping by the Endangered Wildlife Trust: Wildlife & Energy Programme it is possible to give a measure of what species are likely to be impacted upon (see FIGURE 6 below - Jenkins et al. 2010). This only gives a measure of the general susceptibility of the species to power line collisions, and not an absolute measurement for any specific power line.

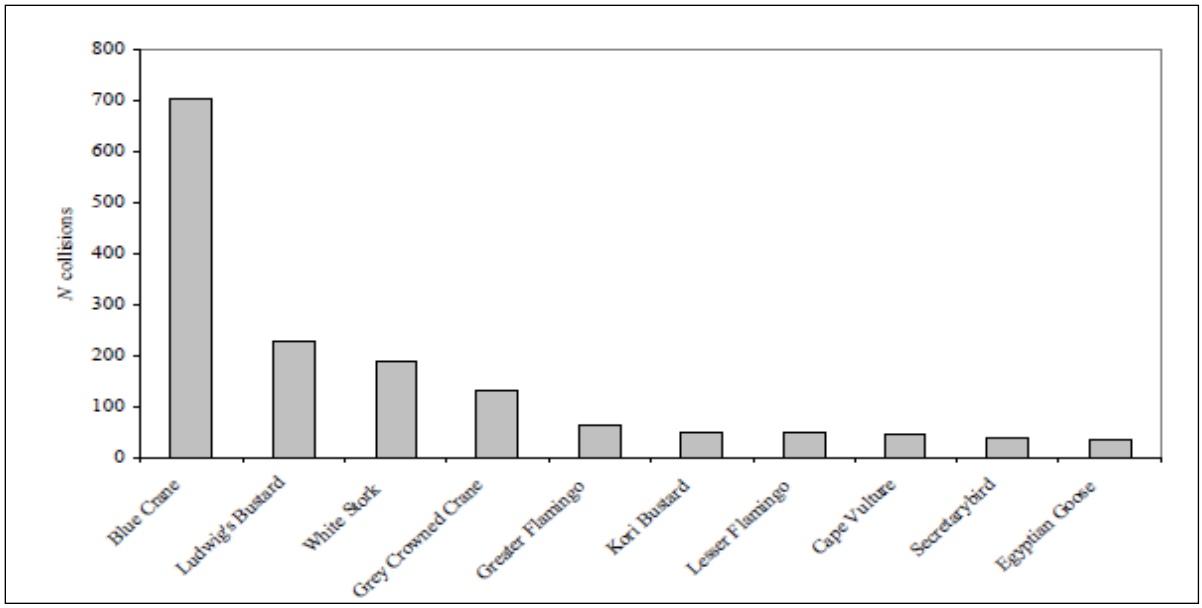

FIGURE 6 :The top ten collision prone bird species in South Africa, in terms of reported incidents contained in the Eskom/EWT Strategic Partnership central incident register 1996 - 2007 (Jenkins et al. 2010)

Despite doubts about the efficacy of line marking to reduce the collision risk for bustards (Jenkins *et al*. 2010; Martin *et al.* 2010), there are numerous studies which prove that marking a line with PVC spiral type Bird Flight Diverters (BFDs) generally reduce mortality rates (e.g. Bernardino *et al.* 2018; Sporer *et al.* 2013, Barrientos *et al*. 2011; Jenkins *et al*. 2010; Alonso & Alonso 1999; Koops & De Jong 1982), including to some extent for bustards (Barrientos *et al*. 2012; Hoogstad 2015 pers.comm). Power line markers should be as large as possible, and highly contrasting with the background. Colour is probably less important as during the day the background will be brighter than the obstacle with the reverse true at lower light levels (e.g. at twilight, or during overcast conditions). Black and white interspersed patterns are likely to maximise the probability of detection (Martin *et al*. 2010).

Using a controlled experiment spanning a period of nearly eight years (2008 to 2016), the Endangered Wildlife Trust (EWT) and Eskom tested the effectiveness of two types of line markers in reducing powerline collision mortalities of large birds on three 400kV transmission lines near Hydra substation in the Karoo. Marking was highly effective for Blue Cranes, with a 92% reduction in mortality, and large birds in general with a 56% reduction in mortality, but not for bustards, including the endangered Ludwig's Bustard. The two different marking devices were approximately equally effective, namely spirals and bird flappers, they found no evidence supporting the preferential use of one type of marker over the other (Shaw *et al*. 2017).

8.2.2. Mortality due to electrocutions within the Hydra and Kronos MTS

Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and

earthed components (van Rooyen 2004). Electrocution risk is strongly influenced by the power line voltage of the and design of the pole structure and mainly affects larger, perching species, such as vultures, eagles and storks, easily capable of spanning the spaces between energized components. Due to the large size of the clearances on most overhead lines of above 132kV, electrocutions are generally ruled out as even the largest birds cannot physically bridge the gap between dangerous components. It can be concluded that electrocutions on the proposed *Hydra-Kronos 2nd 400kV power line* will not be possible through conventional mechanisms will therefore not be assessed in terms of its significance

Electrocutions on the proposed electrical infrastructure to be constructed within the existing Hydra MTS and Kronos MTS are possible, however the likelihood of this impact on the more sensitive SCC priority species is remote, as these species are unlikely to regularly utilise the infrastructure within the switching station for perching or roosting. Species that are more vulnerable to this impact are medium-sized raptors, corvids, owls and certain species of waterbirds.

8.3 Decommissioning & Closure Phases

8.3.1. Displacement as a result of disturbance

Similarly to the disturbance impact associated with the construction of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure*, the decommissioning of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* will undoubtedly displace some species. Again, terrestrial species and raptors potentially breeding on the existing power line infrastructure within the PAOI are most likely to be affected by displacement due to disturbance.

8.4 Impact Significance

A quantitative methodology was used to describe, evaluate and rate the significance of the aforementioned impacts associated with the construction and operation of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure*. This assessment is presented in tabular format below (TABLES 6 - 9) for both pre- and post-mitigation according to set criteria described in APPENDIX 3.

TABLE 6: Assessment of the displacement impact associated with habitat loss and/or transformation caused by the construction of the proposed Hydra-Kronos 2nd 400kV power line and MTS infrastructure.

Activity:	Construction of the 400kV power line & MTS Infrastructure					
Impact:	Displacement of SCC and non-SCC priority species as a result of habitat loss & transformation					
Status	Negative					
Significance rating:	Duration	Extent	Reversibility	Magnitude	Probability	Significance
Pre-Mitigation	3	1	3	3	4	40 Moderate - Low
Post-Mitigation	3	1	3	2	3	27 Moderate - Low

TABLE 7: Assessment of the displacement impact associated with disturbance caused by the construction of the proposed Hydra-Kronos 2nd 400kV power line and MTS infrastructure

Activity:	Construction of the 400kV power line & MTS Infrastructure					
Impact:	Displacement of SCC and non-SCC priority species as a result disturbance					
Status	Negative					
Significance rating:	Duration	Extent	Reversibility	Magnitude	Probability	Significance
Pre-Mitigation	2	2	3	4	4	44 Moderate
Post-Mitigation	2	2	1	2	3	21 Moderate - Low

TABLE 8: Assessment of mortality due to collision with the 400kV power line conductors/earthwires

Activity:	Operation of the 400kV power line					
Impact:	Mortality of SCC and non-SCC priority species due to collision with the 400kV power line conductors/earthwires					
Status	Negative					
Significance rating:	Duration	Extent	Reversibility	Magnitude	Probability	Significance
Pre-Mitigation	3	4	3	5	4	60 Moderate
Post-Mitigation	3	3	1	3	2	20 Low

TABLE 9: Assessment of mortality due to electrocution on the proposed infrastructure within the Hydra & Kronos MTS

Activity:	Operation of the Hydra & Kronos MTS					
Impact:	Mortality of SCC and non-SCC priority species as a result of electrocution on the infrastructure within the Hydra & Kronos MTS					
Status	Negative					
Significance rating:	Duration	Extent	Reversibility	Magnitude	Probability	Significance
Pre-Mitigation	3	3	3	3	3	36 Moderate - Low
Post-Mitigation	2	2	1	2	1	7 Low

8.5 Cumulative Impact

"Cumulative Impact", in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities .

The role of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e. whether the addition of the proposed project in the area will increase the impact). This section addresses whether the construction of the proposed development will result in:

* Unacceptable risk
* Unacceptable loss
* Complete or whole-scale changes to the environment
* Unacceptable increase in impact

The proposed 400kV power line equates to a maximum of 187km. There are approximately several transmission powerlines and distribution powerlines totalling hundreds of kilometres of existing medium and high voltage lines within the 35km radius around the proposed project area. An intensive internet search was conducted to source information on the grid connections of the abovementioned projects available within the public domain, but in some instances no information could be obtained. The proposed development will thus increase the total number of existing high voltage lines by a fairly significant percentage. The contribution of the proposed 400kV to the cumulative impact of all the high voltage lines is thus MODERATE. However, the combined cumulative impact of the existing and proposed powerlines on avifauna within a 35km radius is considered to be HIGH.

The cumulative impact of displacement due to disturbance and habitat transformation at the Hydra MTS and Kronos MTS is considered to be LOW, due to the small size of the footprint and the fact that construction of the bays are within the confines of the existing MTS. The cumulative impact of potential electrocutions within the MTS yards is also likely to be LOW as it is expected to be a rare event.

9. PROPOSED IMPACT MITIGATION ACTIONS

Based on the anticipated impacts described above, the following recommendations are provided regarding practical mitigation measures for potentially significant impacts to be included in the Environmental Management Programme (EMPr) detailed in TABLE 10 below.

TABLE 10: Recommendations for the anticipated impacts associated with the construction and operation of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure*

OBJECTIVE: Mitigate the displacement and direct mortality impacts caused by the construction and operation of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure*.		
Project component/s	*Hydra-Kronos 2nd 400kV power line and MTS infrastructure*.	
Potential Impact	Permanent displacement and mortality of local populations of SCC and non-SCC power line sensitive species caused by habitat loss, disturbance, collisions with the overhead conductors and electrocutions on the MTS infrastructure.	
Activity/risk source	* Construction of the 400kV power line within sensitive avifaunal habitat. * Unmitigated construction, operational and decommissioning activities.	
Mitigation: Target/Objective	Limit avifaunal mortality and displacement as far as practically possible for the duration of the operational life span of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure*.	
Mitigation: Action/control	Responsibility	Timeframe
CONSTRUCTION PHASE		
Displacement as a result of habitat loss: * Avoid removal of sensitive vegetation types. The recommendations of the botanical study must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of disturbed areas is concerned. * Construction activity should be restricted to the immediate footprint of the infrastructure. * All construction activities should be strictly managed according to generally accepted environmental best practice standards, so as to avoid any unnecessary impact on the receiving environment. * All temporary disturbed areas should be rehabilitated according to the site's rehabilitation plan, following construction. * Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.	Construction Manager and Environmental Control Officer	From the commencement of construction (inclusive of all project components to the completion of construction.
Displacement as a result of disturbance: * Conduct a pre-construction inspection (avifaunal walk-through) of the final power line alignment to identify priority species that may be breeding within the final footprint. If a SSC nest is occupied, the avifaunal specialist must consult with the contractor to find ways of minimizing the	Avifaunal Specialist Construction Manager and Environmental Control Officer	Prior to the commencement of construction

potential disturbance to the breeding birds during the construction period. This could include measures such as delaying some of the activities until after the breeding season. * A site-specific CEMPr must be implemented, which gives appropriate and detailed description of how construction activities must be conducted. All contractors are to adhere to the CEMPr and should apply good environmental practice during construction. The CEMPr must specifically include the following: • No off-road driving; • Maximum use of existing roads, where possible; • Measures to control noise and dust according latest best practice; • Restricted access to the rest of the property; • Strict application of all recommendations in the biodiversity specialist report pertaining to the limitation of the footprint. • Inclusion of operational measures to be followed with Environmental Awareness Training.		
Mortality as a result of collision with the overhead conductors and/or earthwires of the 400kV power line * Conduct a pre-construction inspection (avifaunal walk-through) of the final power line alignment to identify power line spans that will require the installation of bird flight diverters according to Eskom guidelines.	Avifaunal Specialist Construction Manager and Environmental Control Officer	Prior to the commencement of construction
OPERATIONAL PHASE		
Mortality as a result of electrocutions on the MTS infrastructure * Eskom line and servitude managers are requested to report all bird electrocutions encountered during routine inspections of the Hydra MTS and Kronos MTS to the Eskom-Endangered Wildlife Trust Strategic Partnership.	Eskom Environmental Manager, Line and Servitude Manager, Environmental Control Officer, and Eskom-Endangered Wildlife Trust Strategic Partnership	For the duration of the operational life-span of the Hydra MTS and Kronos MTS

* Insulating material (if applied) to be maintained during the operational life span Hydra MTS and Kronos MTS		
Mortality as a result of collision with the overhead conductors and/or earthwires of the 400kV power line * Eskom line and servitude managers are requested to report all bird collisions encountered during routine line patrols of the 400kV power line to the Eskom-Endangered Wildlife Trust Strategic Partnership. * Bird flight diverters to be maintained on sections of the power line during the operational life span of the 400kV power line	Eskom Environmental Manager, Line and Servitude Manager, Environmental Control Officer and Eskom-Endangered Wildlife Trust Strategic Partnership.	For the duration of the operational life-span of the 400kV power line
Performance Indicator	* The size and extent of sensitive habitat present at the start of construction remains intact at end of construction phase. * Sustainable levels of mortalities are reported on a monthly basis and the necessary mitigation measures are implemented timeously.	

10. PROPOSED MONITORING ACTIONS

Eskom Environmental officials and/or line servitude staff to include avifaunal monitoring during routine inspections of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* and record the number of mortalities, nesting activity and determine the effectiveness of the mitigation actions taken.

11. ENVIRONMENTAL IMPACT STATEMENT

11.1 Conditions to be included in the Environmental Authorisation

In conclusion, the habitat within which the PAOI is located is considered to have a MODERATE – HIGH sensitivity. The construction of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* will result in impacts of MODERATE to MODERATE-LOW significance to birds occurring in the vicinity of the new infrastructure, which can be reduced further through the application of mitigation measures. It is anticipated that the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* can be constructed with acceptable levels of impact on the resident avifauna, subject to the following recommendations:

* Conduct a pre-construction inspection (avifaunal walk-through) of the final power line alignment to identify priority species that may be breeding within the final footprint. If a SSC nest is occupied, the avifaunal specialist must consult with the contractor to find ways of minimizing the potential disturbance to the breeding birds during the construction period. This could include measures such as delaying some of the activities until after the breeding season.
* Conduct a pre-construction inspection (avifaunal walk-through) of the final power line alignment to identify power line spans that will require the installation of bird flight diverters.
* The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint (especially the removal of natural vegetation) and rehabilitation of disturbed areas is concerned.
* Construction activities (i.e. all staff, vehicle and machinery) should be restricted to the immediate footprint of the infrastructure.
* Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of avifaunal species.
* Maximum use should be made of existing roads and the construction of new roads must be kept to a minimum.
* If collision or electrocution impacts are recorded once the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* are operational, it is recommended that a representative from the Eskom-Endangered Wildlife Trust Strategic Partnership investigate the mortalities and provide recommendations for site-specific mitigation to be applied reactively.
* In addition to this, the normal suite of environmental good practices should be applied, such as ensuring strict control of staff, vehicles and machinery on site and limiting the creation of new roads as far as possible.

11.2 Specialist Opinion

In accordance with the baseline conditions as presented in Section 7 and the outcomes of the impact assessment detailed in Section 8, the construction and operation of the proposed *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* is not deemed to present unmitigable negative environmental issues or impacts. It is this specialist's opinion that the construction of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure* will result in acceptable levels of impact on the resident avifauna subject to the aforementioned mitigation and management measures.

12. ASSUMPTIONS, UNCERTAINTIES & GAPS IN KNOWLEDGE

The avifaunal specialist assumed that the sources of information used for this assessment are reliable. However, it must be noted that there are limiting factors and these may potentially detract from the accuracy of the predicted results.

- The report is the result of a short-term study and is based on a four-day field survey of the PAOI. No long-term, seasonal monitoring was conducted by the avifaunal specialist. This assessment relies upon secondary data sources with regards to bird occurrence and abundance such as the SABAP2 project. These comprehensive datasets provide a valuable baseline against which any changes in species presence, abundance, and distribution can be monitored. However, primary information on bird habitat and avifaunal species occurrence collected during the site visit and together with professional judgement, based on extensive field experience since 2006, was used directly in determining which species of conservation importance are likely to occur within suitable avifaunal habitat types within the PAOI. Based on these findings, the specialist was able to identify and assess the anticipated impacts and provide recommendations for mitigation; and
- Predictions in this study are based on experience of these and similar species in different parts of South Africa, through the authors' experience working in the avifaunal specialist field since 2006. However, bird behaviour can't be reduced to formulas that will hold true under all circumstances. It must also be noted that, it is often not possible to entirely eliminate the risk of the disturbance and displacement impacts associated with the construction and operational activities. Our best possible efforts can probably not ensure zero impact on birds. Assessments such as this attempt to minimise the risk as far as possible, and although the displacement and collision impacts, associated with the construction and operation of the *Hydra-Kronos 2nd 400kV power line and MTS infrastructure*, will be unavoidable, they are likely to be temporary and of moderate significance.

The above limitations need to be stated as part of this assessment so that the reader fully understands the complexities. However, they do not detract from the confidence that this author has in the findings of this impact assessment report and subsequent recommendations for this project.

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APPENDIX 1: SOUTH AFRICAN BIRD ATLAS PROJECT DATA (SABAP2) FOR THE HYDRA-KRONOS 2ND 400KV POWER LINE & MTS INFRASTRUCTURE PROJECT

Species Name	Scientific Name	Full Protocol	Ad hoc Protocol	Red List Global	Red List Regional	Endemic	Endemic Detail
Abdim's Stork	Ciconia abdimii	1.3	0.9	-	NT		
Acacia Pied Barbet	Tricholaema leucomelas	39.2	4.5	-	-		
African Black Swift	Apus barbatus	7.6	0.0	-	-		
African Hoopoe	Upupa africana	7.6	1.8	-	-		
African Palm Swift	Cypsiurus parvus	3.8	1.8	-	-		
African Pipit	Anthus cinnamomeus	29.1	4.5	-	-		
African Red-eyed Bulbul	Pycnonotus nigricans	30.4	9.9	-	-		
African Reed Warbler	Acrocephalus baeticatus	1.3	0.9	-	-		
African Rock Pipit	Anthus crenatus	22.8	6.3	NT	NT	x	Endemic
African Sacred Ibis	Threskiornis aethiopicus	10.1	0.9	-	-		
African Spoonbill	Platalea alba	3.8	0.0	-	-		
African Stonechat	Saxicola torquatus	8.9	0.0	-	-		
Alpine Swift	Tachymarptis melba	5.1	0.9	-	-		
Amur Falcon	Falco amurensis	3.8	0.0	-	-		
Ant-eating Chat	Myrmecocichla formicivora	70.9	12.6	-	-		
Barn Swallow	Hirundo rustica	39.2	8.1	-	-		
Black Harrier	Circus maurus	0.0	0.9	EN	EN	x	Near endemic
Black Stork	Ciconia nigra	2.5	0.0	-	VU		
Black-chested Prinia	Prinia flavicans	45.6	1.8	-	-		
Black-chested Snake Eagle	Circaetus pectoralis	2.5	0.0	-	-		
Black-eared Sparrow-Lark	Eremopterix australis	2.5	0.9	-	-	x	Near endemic
Black-faced Waxbill	Brunhilda erythronotos	1.3	0.0	-	-		
Black-headed Canary	Serinus alario	19.0	3.6	-	-	x	Near endemic
Black-headed Heron	Ardea melanocephala	1.3	0.0	-	-		
Blacksmith Lapwing	Vanellus armatus	25.3	1.8	-	-		
Black-throated Canary	Crithagra atrogularis	25.3	2.7	-	-		
Black-winged Kite	Elanus caeruleus	5.1	0.9	-	-		
Black-winged Stilt	Himantopus himantopus	6.3	1.8	-	-		
Blue Crane	Grus paradisea	22.8	0.0	VU	NT		
Blue Korhaan	Eupodotis caerulescens	1.3	0.0	NT	LC	x	Endemic
Bokmakierie	Telophorus zeylonus	59.5	7.2	-	-		
Booted Eagle	Hieraaetus pennatus	8.9	0.0	-	-		
Bradfield's Swift	Apus bradfieldi	2.5	0.0	-	-		
Brown-throated Martin	Riparia paludicola	3.8	1.8	-	-		
Buffy Pipit	Anthus vaalensis	1.3	0.0	-	-		
Cape Bunting	Emberiza capensis	27.8	10.8	-	-		
Cape Crow	Corvus capensis	1.3	2.7	-	-		
Cape Eagle-Owl	Bubo capensis	2.5	0.0	-	-		
Cape Penduline Tit	Anthoscopus minutus	12.7	1.8	-	-		
Cape Robin-Chat	Cossypha caffra	13.9	1.8	-	-		
Cape Sparrow	Passer melanurus	82.3	10.8	-	-		
Cape Starling	Lamprotornis nitens	1.3	0.9	-	-		
Cape Turtle Dove	Streptopelia capicola	49.4	9.9	-	-		
Cape Wagtail	Motacilla capensis	24.1	5.4	-	-		
Cape Weaver	Ploceus capensis	0.0	0.9	-	-	x	Near endemic
Cape White-eye	Zosterops virens	1.3	0.0	-	-	x	Near endemic
Capped Wheatear	Oenanthe pileata	36.7	3.6	-	-		
Chat Flycatcher	Melaenornis infuscatus	38.0	6.3	-	-		

Species Name	Scientific Name	Full Protocol	Ad hoc Protocol	Red List Global	Red List Regional	Endemic	Endemic Detail
Chestnut-vented Warbler	Curruca subcoerulea	22.8	0.0	-	-		
Cinnamon-breasted Bunting	Emberiza tahapisi	3.8	2.7	-	-		
Cinnamon-breasted Warbler	Euryptila subcinnamomea	8.9	0.0	-	-	x	Near endemic
Common Buzzard	Buteo buteo	1.3	0.9	-	-		
Common Greenshank	Tringa nebularia	2.5	0.0	-	-		
Common Quail	Coturnix coturnix	0.0	0.9	-	-		
Common Starling	Sturnus vulgaris	0.0	0.9	-	-		
Common Swift	Apus apus	13.9	0.9	-	-		
Common Waxbill	Estrilda astrild	2.5	0.0	-	-		
Crowned Lapwing	Vanellus coronatus	6.3	0.0	-	-		
Curlew Sandpiper	Calidris ferruginea	1.3	0.0	NT	LC		
Desert Cisticola	Cisticola aridulus	26.6	5.4	-	-		
Diederik Cuckoo	Chrysococcyx caprius	3.8	0.0	-	-		
Double-banded Courser	Rhinoptilus africanus	3.8	0.9	-	-		
Dusky Sunbird	Cinnyris fuscus	20.3	0.9	-	-		
Eastern Clapper Lark	Mirafra fasciolata	48.1	7.2	-	-		
Egyptian Goose	Alopochen aegyptiaca	29.1	4.5	-	-		
European Bee-eater	Merops apiaster	7.6	0.9	-	-		
Fairy Flycatcher	Stenostira scita	22.8	0.9	-	-	x	Near endemic
Familiar Chat	Oenanthe familiaris	58.2	10.8	-	-		
Fawn-colored Lark	Calendulauda africanoides	11.4	0.0	-	-		
Fiscal Flycatcher	Melaenornis silens	17.7	0.0	-	-	x	Near endemic
Gabar Goshawk	Micronisus gabar	1.3	0.0	-	-		
Greater Flamingo	Phoenicopterus roseus	1.3	0.0	-	NT		
Greater Kestrel	Falco rupicoloides	17.7	7.2	-	-		
Greater Striped Swallow	Cecropis cucullata	24.1	4.5	-	-		
Grey Tit	Melaniparus afer	13.9	0.9	-	-	x	Near endemic
Grey-backed Cisticola	Cisticola subruficapilla	50.6	3.6	-	-		
Grey-backed Sparrow-Lark	Eremopterix verticalis	21.5	0.0	-	-		
Grey-headed Gull	Chroicocephalus cirrocephalus	1.3	0.9	-	-		
Grey-winged Francolin	Scleroptila afra	3.8	3.6	-	-	x	Endemic
Hadada Ibis	Bostrychia hagedash	36.7	1.8	-	-		
Helmeted Guineafowl	Numida meleagris	20.3	2.7	-	-		
House Sparrow	Passer domesticus	32.9	13.5	-	-		
Jackal Buzzard	Buteo rufofuscus	34.2	4.5	-	-	x	Near endemic
Kalahari Scrub Robin	Cercotrichas paena	13.9	0.0	-	-		
Karoo Chat	Emarginata schlegelii	7.6	0.9	-	-		
Karoo Eremomela	Eremomela gregalis	1.3	0.0	-	-	x	Near endemic
Karoo Korhaan	Eupodotis vigorsii	24.1	0.9	-	NT		
Karoo Long-billed Lark	Certhilauda subcoronata	35.4	11.7	-	-		
Karoo Prinia	Prinia maculosa	11.4	4.5	-	-	x	Near endemic
Karoo Scrub Robin	Cercotrichas coryphoeus	74.7	10.8	-	-		
Karoo Thrush	Turdus smithi	15.2	3.6	-	-	x	Near endemic
Kittlitz's Plover	Charadrius pecuarius	2.5	0.0	-	-		
Kori Bustard	Ardeotis kori	2.5	0.9	NT	NT		
Lanner Falcon	Falco biarmicus	6.3	0.9	-	VU		
Large-billed Lark	Galerida magnirostris	40.5	7.2	-	-	x	Near endemic
Lark-like Bunting	Emberiza impetuani	63.3	14.4	-	-		
Laughing Dove	Spilopelia senegalensis	41.8	9.0	-	-		
Layard's Warbler	Curruca layardi	31.6	9.0	-	-	x	Near endemic
Lesser Flamingo	Phoeniconaias minor	1.3	0.0	NT	NT		

Species Name	Scientific Name	Full Protocol	Ad hoc Protocol	Red List Global	Red List Regional	Endemic	Endemic Detail
Lesser Kestrel	Falco naumanni	20.3	3.6	-	-		
Lesser Swamp Warbler	Acrocephalus gracilirostris	1.3	0.0	-	-		
Levaillant's Cisticola	Cisticola tinniens	1.3	0.0	-	-		
Little Grebe	Tachybaptus ruficollis	1.3	0.0	-	-		
Little Stint	Calidris minuta	1.3	0.0	-	-		
Little Swift	Apus affinis	44.3	13.5	-	-		
Long-billed Crombec	Sylvietta rufescens	13.9	0.9	-	-		
Long-billed Pipit	Anthus similis	3.8	0.0	-	-		
Ludwig's Bustard	Neotis ludwigii	15.2	1.8	EN	EN		
Malachite Sunbird	Nectarinia famosa	2.5	0.0	-	-		
Marsh Sandpiper	Tringa stagnatilis	1.3	0.0	-	-		
Martial Eagle	Polemaetus bellicosus	2.5	1.8	EN	EN		
Mountain Wheatear	Myrmecocichla monticola	40.5	15.3	-	-		
Namaqua Dove	Oena capensis	29.1	3.6	-	-		
Namaqua Sandgrouse	Pterocles namaqua	15.2	0.9	-	-		
Neddicky	Cisticola fulvicapilla	2.5	0.9	-	-		
Nicholson's Pipit	Anthus nicholsoni	8.9	0.9	-	-		
Northern Black Korhaan	Afrotis afraoides	70.9	8.1	-	-		
Orange River White-eye	Zosterops pallidus	7.6	0.9	-	-		
Pale Chanting Goshawk	Melierax canorus	64.6	13.5	-	-		
Pale-winged Starling	Onychognathus nabouroup	17.7	3.6	-	-		
Pearl-breasted Swallow	Hirundo dimidiata	1.3	0.0	-	-		
Pied Avocet	Recurvirostra avosetta	1.3	0.9	-	-		
Pied Crow	Corvus albus	84.8	38.7	-	-		
Pied Starling	Lamprotornis bicolor	31.6	3.6	-	-	x	Endemic
Pink-billed Lark	Spizocorys conirostris	1.3	0.0	-	-		
Pin-tailed Whydah	Vidua macroura	3.8	0.0	-	-		
Plain-backed Pipit	Anthus leucophrys	5.1	0.0	-	-		
Pririt Batis	Batis pririt	15.2	0.0	-	-		
Quailfinch	Ortygospiza atricollis	10.1	0.9	-	-		
Red-billed Quelea	Quelea quelea	16.5	0.9	-	-		
Red-billed Teal	Anas erythrorhyncha	3.8	0.0	-	-		
Red-capped Lark	Calandrella cinerea	17.7	1.8	-	-		
Red-eyed Dove	Streptopelia semitorquata	15.2	2.7	-	-		
Red-faced Mousebird	Urocolius indicus	19.0	1.8	-	-		
Red-headed Finch	Amadina erythrocephala	22.8	0.0	-	-		
Red-knobbed Coot	Fulica cristata	2.5	0.0	-	-		
Red-winged Starling	Onychognathus morio	1.3	0.0	-	-		
Rock Dove	Columba livia	7.6	0.9	-	-		
Rock Kestrel	Falco rupicolus	17.7	9.0	-	-		
Rock Martin	Ptyonoprogne fuligula	40.5	9.9	-	-		
Ruff	Calidris pugnax	1.3	0.0	-	-		
Rufous-cheeked Nightjar	Caprimulgus rufigena	2.5	0.0	-	-		
Rufous-eared Warbler	Malcorus pectoralis	77.2	12.6	-	-		
Rufous-naped Lark	Mirafra africana	1.3	0.0	-	-		
Sabota Lark	Calendulauda sabota	65.8	5.4	-	-		
Scaly-feathered Weaver	Sporopipes squamifrons	20.3	0.0	-	-		
Sclater's Lark	Spizocorys sclateri	1.3	0.0	NT	NT	x	Near endemic
Secretarybird	Sagittarius serpentarius	1.3	2.7	EN	VU		
Short-toed Rock Thrush	Monticola brevipes	19.0	3.6	-	-		
Sickle-winged Chat	Emarginata sinuata	13.9	4.5	-	-	x	Near endemic

Species Name	Scientific Name	Full Protocol	Ad hoc Protocol	Red List Global	Red List Regional	Endemic	Endemic Detail
Sociable Weaver	Philetairus socius	1.3	0.0	-	-		
South African Cliff Swallow	Petrochelidon spilodera	13.9	0.9	-	-	x	Endemic Breeding
South African Shelduck	Tadorna cana	12.7	4.5	-	-		
Southern Boubou	Laniarius ferrugineus	1.3	0.0	-	-		
Southern Fiscal	Lanius collaris	48.1	6.3	-	-		
Southern Grey-headed Sparrow	Passer diffusus	11.4	1.8	-	-		
Southern Masked Weaver	Ploceus velatus	55.7	6.3	-	-		
Southern Red Bishop	Euplectes orix	11.4	0.9	-	-		
Speckled Pigeon	Columba guinea	41.8	9.9	-	-		
Spike-heeled Lark	Chersomanes albofasciata	59.5	8.1	-	-		
Spotted Eagle-Owl	Bubo africanus	1.3	0.0	-	-		
Spotted Flycatcher	Muscicapa striata	1.3	0.0	-	-		
Spotted Thick-knee	Burhinus capensis	3.8	0.0	-	-		
Spur-winged Goose	Plectropterus gambensis	13.9	0.0	-	-		
Stark's Lark	Spizocorys starki	3.8	0.0	-	-		
Tawny Eagle	Aquila rapax	2.5	0.0	VU	EN		
Three-banded Plover	Charadrius tricollaris	12.7	0.9	-	-		
Tractrac Chat	Emarginata tractrac	8.9	0.0	-	-		
Verreaux's Eagle	Aquila verreauxii	26.6	8.1	-	VU		
Wattled Starling	Creatophora cinerea	12.7	1.8	-	-		
Western Barn Owl	Tyto alba	1.3	0.0	-	-		
Western Cattle Egret	Bubulcus ibis	2.5	0.0	-	-		
White Stork	Ciconia ciconia	0.0	3.6	-	-		
White-backed Mousebird	Colius colius	36.7	4.5	-	-		
White-browed Sparrow-Weaver	Plocepasser mahali	19.0	3.6	-	-		
White-faced Whistling Duck	Dendrocygna viduata	1.3	0.0	-	-		
White-necked Raven	Corvus albicollis	22.8	4.5	-	-		
White-rumped Swift	Apus caffer	15.2	2.7	-	-		
White-throated Canary	Crithagra albogularis	68.4	9.9	-	-		
White-throated Swallow	Hirundo albigularis	8.9	0.9	-	-		
Yellow Canary	Crithagra flaviventris	17.7	6.3	-	-		
Yellow-bellied Eremomela	Eremomela icteropygialis	41.8	3.6	-	-		
Yellow-billed Duck	Anas undulata	5.1	0.0	-	-		
Zitting Cisticola	Cisticola juncidis	2.5	0.9	-	-		

APPENDIX 2: AVIFAUNAL HABITAT OBSERVED WITHIN THE HYDRA-KRONOS 2ND 400KV POWER LINE & MTS INFRASTRUCTURE PAOI

FIGURE 1: Typical Nama Karoo habitat within the PAOI

FIGURE 2: Grassy Karoo habitat

FIGURE 3: Ephemeral river/ drainage line (riparian vegetation)

FIGURE 4: Ephemeral pan

FIGURE 5: Farm Dam

FIGURE 6: Mountainous area

FIGURE 7: Rocky ridges

FIGURE 8: Agricultural lands

FIGURE 9: Exotic/Alien Trees

FIGURE 10: Water trough

FIGURE 11: Active Verreaux's Eagle nest

APPENDIX 3: METHOD OF ASSESSING THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS

Impacts are described and then evaluated in terms of the criteria given below.

The status of the impact	
Status	Description
Positive:	a benefit to the holistic environment
Negative:	a cost to the holistic environment
Neutral:	no cost or benefit

The duration of the impact		
Score	Duration	Description
1	Short term	Immediate/ short term (less than 3 months)
2	Medium term	Construction or decommissioning period
3	Long term	For the life of the operation
5	Permanent	Permanent
The extent of the impact		
Score	Extent	Description
1	Footprint	Within the site boundary
2	Site	Affects immediate surrounding areas
3	Local	Local area / district (neighbouring properties, transport routes and adjacent towns) is affected
4	Regional	Extends to almost entire province or larger region
5	National	Affects the country.
The reversibility of the impact		
Score	Reversibility	Description
1	Completely reversible	Reverses with minimal rehabilitation & negligible residual affects
3	Reversible	Requires mitigation and rehabilitation to ensure reversibility
5	Irreversible	Cannot be rehabilitated completely/rehabilitation not viable
The magnitude (severe or beneficial) of the impact		
Score	Severe/beneficial effect	Description
1	Zero	Natural and/or social functions and/or processes remain unaltered.
2	Very Low	Natural and/or social functions and/or processes are negligibly altered.
3	Low	Natural and/or social functions and/or processes are slightly altered and are reversible with time.
4	Moderate	Natural and/or social functions and/or processes are notably altered and are reversible with rehabilitation.
5	High	Natural and/or social functions and/or processes are permanently altered.
The probability of the impact		
Score	Rating	Description
1	Unlikely	The chance of this impact occurring is zero (0%).
2	Possible	May occur. The chances of this impact occurring is defined as 25%.
3	Probable	Likely to occur. The chances of this impact occurring is defined as 50%.
4	Highly Probable	The chances of this impact occurring is defined as 75%.
5	Definite	Will certainly occur. The chance of this impact occurring is defined as 100%.
The Consequence		= Magnitude + Extent + Duration + Reversibility.
The Significance		= Consequence x Probability.

Score	Significance
1 to 20	Low
21 to 40	Moderate to Low
41 to 60	Moderate
61 to 80	Moderate to high
81 to 100	High

APPENDIX 4: CURRICULUM VITAE

MEGAN DIAMOND

PERSONAL DETAILS

Date of Birth | *7 December 1978*
Driver's License | *Code A and B*
Home Language | *English*
Other Languages | *Afrikaans*

EDUCATION

BSc Environmental Management | *University of South Africa (UNISA)* 2002 – 2009

ACCREDITATION

South African Council for Natural Scientific Professions | *Environmental Science*
Registration Number: 300022/14

EXPERIENCE

Owner & Avifaunal Specialist | *Feathers Environmental Services*
July 2013 – Present

- Perform specialist avifaunal assessment studies to minimise the impact of industrial infrastructure on birds and their habitats;
- Provide strategic guidance to industry through the development of best practice procedures and guidelines;
- Review and comment on methodologies, specialist studies and EIA reports for Renewable Energy projects;
- Provide input into renewable energy and power line developments elsewhere in Africa and across the globe;
- Manage the collection and collation of relevant and complete desktop and/or field datasets;
- Manage pre- and post-construction avifaunal monitoring data collected at wind and solar energy facilities;
- Site assessments, either as part of the project team or independently;
- Preparation of reports according to project deadlines, including the use of Geographic Information Systems (GIS) to portray data;
- Attendance of specialist integration meetings; and
- Liaison with stakeholders where necessary.

Wildlife & Energy Programme Manager | *Endangered Wildlife Trust*
October 2006 – June 2013

Programme management

- Annually review the programme's conservation and research strategic objectives and update in accordance with the EWT's and programme's vision and mission including work plans for staff etc.;

- Ensure timeous, professional delivery on all aspects of Wildlife & Energy Programme activities;
- Formulate, prioritise and approve relevant research and conservation projects;
- Ensure acceptable quality of all research projects and their outputs;
- Participate in international network liaison as and when required;
- Produce regular popular articles & media releases on the Wildlife & Energy Programme projects and outputs & contribute to the EWT publications;
- Establish & maintain a network with relevant national & international stakeholders;
- Deliver presentations at relevant meetings, functions, workshops & conferences on behalf of the programme;
- Assist with compilation of newsletters, updating of webpage, compilation of press articles, any advocacy issues;
- Identify & establish partnerships to achieve Wildlife & Energy Programme conservation goals.

Eskom –EWT Strategic Partnership

- Ensure that this partnership is managed effectively and sustainably against its goals. Manage staff in this division;
- Develop and maintain relationships with Eskom;
- Negotiate the terms of reference for the annual service level agreements between EWT and Eskom, to ensure the sustainability of the relationship;
- Compile annual report to Eskom Corporate Environment and Sustainability;
- Produce monthly reports to Eskom's regional grids on the status of incident follow-up;
- Attend applicable forums to interact with Eskom stakeholders;
- Participate in international network liaison as and when required;
- Maintain a network with all relevant local and regional level stakeholders (meetings, forums, workshops, etc.);
- Identify research needs relating to the management of wildlife interaction with power lines;
- Conduct research projects on wildlife and power line interaction and present the results at national and international conferences and workshops;
- Development and implementation of training for Eskom field services staff (at various levels) in the management of wildlife interactions; and
- Conduct special investigations on power lines relating to wildlife induced faulting.

Environmental Impact Assessment Division

- Ensure that this division operates effectively and efficiently at all times and manage staff in this division; and
- Conduct specialist avifaunal studies for new power lines developments including: tendering/quoting for the projects, conducting field work, preparing reports, presenting results & negotiating the acceptance of recommendations, final "walk through" as part of Environmental Management Plans; general project management, all liaison with clients, Eskom, authorities, Interested and Affected Parties etc.

Management and administration

- Ensure all programme staff have relevant terms of reference;
- Ensure that all programme staff are performance appraised against their terms of reference;
- Compile and manage programme budgets, monthly reports, work plans and strategy;
- Monitor expenditure and take corrective action if necessary; and
- Ensure timely delivery on all projects to all stakeholders.

CONFERENCE ATTENDANCE

- *Society for Conservation Biology 21st Annual Meeting (1-5 July 2007)*
- *The 6th TAWIRI Scientific Conference (3 – 6 December 2007) Presented a paper titled "*Co-operative management of wildlife and power line conflicts: an African solution"
- Pan-African Ornithological Congress (7-12 September 2008)
- International Conference on Overhead Lines, Design, Construction, Inspection & Maintenance, Fort Collins Colorado USA. (29 March – 1 April 2010) Presented a paper titled "Bird's eye view: how birds see is key to avoiding power line collision"
- Windaba 2011 – Implementing South African Wind Energy (27-29 September 2011)
- Pan African Vulture Summit (16-20 April 2012) Presented a paper titled "Electrification in Africa – Are our vultures being strung along"
- 4th Wind Power Africa Conference & Renewable Energy Exhibition (28-30 May 2012) Presented a paper titled "Wind Energy in Africa – what does this really mean for our continent's birds"
- 13th Pan-African Ornithological Congress (14-21 October 2012) Presented a paper titled "Stringing South Africa's Terrestrial Birds Along - Monitoring of Bird Interactions with Power Line and Experimental Testing of Bird Collision Mitigation at the Karoo Long Term Monitoring Site"
- AEWA Single Species Action-Planning Workshop for the Conservation of the Grey Crowned Crane (10-13 September 2013) Presented and participated in the workshop as a subject expert (energy and bird interactions)

AUTHORED & CO-AUTHORED PAPERS

Jenkins, A.R., Smallie, J. & Diamond, M. 2009. Balls, flashers, flappers and coils: South African perspectives on a global search for ways to prevent avian collisions with overhead lines. In: Harebottle, D.M., Craig, A.J.F.K., Anderson, M.D., Rakatomonana, H. & Muchai, M. (eds). Proceedings of the 12th Pan-African Ornithological Congress, 2008. Cape Town, Animal Demography Unit.

Smallie, J., Diamond, M. & Jenkins, A. 2009. Lighting up the African continent – what does it mean for our birds? pp. 38–43. In: Harebottle, D.M., Craig, A.J.F.K., Anderson, M.D., Rakotomanana, H. & Muchai. (eds). *Proceedings of the 12th Pan-African Ornithological Congress, 2008.* Cape Town, Animal Demography Unit.

Jenkins, A. R., Smallie, J.J and Diamond, M. 2010 Avian collisions with power lines: a global review of causes and mitigation with a South African perspective. Bird Conservation International, page1 of16.

Retief, E.F., Diamond, M., Anderson, M.D., Smit, H.A., Jenkins, A.R., Brooks, M. 2011. Avian Wind Farm Sensitivity Map for South Africa.

Jenkins, A.R., Van Rooyen, C.S., Smallie, J.J., Harrison, J.A., Diamond, M. And Smit, H.A. 2012. BirdLife South Africa / Endangered Wildlife Trust best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa.

Jenkins, A.R., De Goede, K.H., Sebele, L. and Diamond, M. 2013. Brokering a settlement between eagles and industry: sustainable management of large raptors nesting on power infrastructure. Bird Conservation International (2013) 23:232 – 246.

Diamond, M., Harris, J., Mirande, C. and Austin, J. 2014. People of a feather flock together: A global initiative to address crane and power line interactions. 13th North American Crane Workshop Summary. Lafayette, Louisiana.

Page-Nicholson, S., Tate, G., Hoogstad, C., Murison, M., Diamond, M., Blofield, A., Pretorius, M., Michael, M.D. 2018. Mitigating the Impact of Large Mammals on Wooden Electrical Distribution Poles in the Kruger National Park, South Africa. African Journal of Wildlife Research.

Diamond, M. and Hoogstad, C. (in press) Collisions and habitat loss associated with utility lines and wind turbines. IUCN SSC Crane Specialist Group – Crane Conservation Strategy.