

APPENDIX 15
AVIFAUNAL IMPACT ASSESSMENT

DECEMBER 2021



**TAWANA HOTAZEL MINING (PTY) LTD: MINE & SURFACE INFRASTRUCTURE DEVELOPMENT
AVIFAUNAL IMPACT ASSESSMENT REPORT**

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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 the environmental sector for 20 years. She has 15 years' worth of experience in the field of bird interactions with electrical infrastructure and during this time has completed impact assessments for over 140 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 properties 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 Powerline 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 Ecology International (Pty) Ltd 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 developments, 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 survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken.
- * This report is based on a desktop investigation using the available information and data related to the site to be affected and a single season site visit to the study area conducted on 10 May 2021. No long-term investigation or monitoring has been conducted.
- * The Precautionary Principle has been applied throughout this investigation.
- * 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.


19 December 2021

EXECUTIVE SUMMARY

The Department of Mineral Resources and Energy (DMRE) has accepted an application for a Mining Right for the proposed Hotazel Project made by *Tawana Hotazel Mining (Pty) Ltd.* The overall area is approximately 154ha in extent (inclusive of the mining right application area and access road) and is located approximately 1km south-east of the town of Hotazel within the Joe Morolong Local Municipality in the Northern Cape Province.

A screening report for the proposed mine development area was generated on 29 December 2020. The proposed development area is considered to have a LOW Animal Species Theme and Terrestrial Biodiversity Theme sensitivity. A preliminary desktop assessment of the available avifaunal data, specifically with regards anecdotal records of breeding Verreaux's Eagle and the presence of two nest locations, suggest that the site sensitivity is likely to be HIGH. The single season site visit confirmed the location of one inactive Verreaux's Eagle nest, as well as breeding habitat for a variety of water dependent species. Given the existing disturbance and habitat transformation within the immediate area, the site sensitivity is considered to be MEDIUM.

An assessment of the current SABAP2 data yielded a total of 142 bird species have been recorded within the nine-pentad broader study area during the SABAP2 atlassing period to date. The presence of these species in the broader study area provides an indication of the diversity of species that could potentially occur in areas where pockets of natural vegetation/habitats persist. Of the 142 species, six of these are considered to be of conservation concern. Each of the Red List species have been recorded in low numbers, with between one and three individuals being recorded over the twelve-year survey period. The low report rates may possibly be attributed to the fact that the pentad grid cells have not been surveyed extensively and may not be an accurate reflection of the true densities within the proposed development area. However, it is also important to note that the proposed development area has been significantly transformed during previous mining operations and the establishment of the town of Hotazel. The low report rates can also possibly be attributed to the fact fairly high levels of disturbance exist within the broader study area, caused by the mining and urban land use practices as well as fragmented natural habitat. While this report focuses on Red List species, since the impacts associated with the proposed mine development project are likely to be more biologically significant for these species, the impact on non-Red List species is also assessed, albeit in less detail. The non-Red List species that have been considered for this assessment include kestrels, kites, owls and various waterfowl species.

Verreaux's Eagle *Aquila verreauxii* is a large, territorial bird of prey with a distribution inextricably linked to mountainous habitat and its main prey of rock hyraxes, a prey base that features prevalently in the study area. Verreaux's Eagle has recently been classified as *Vulnerable* in southern Africa due to a decrease in its range and abundance. Verreaux's Eagles are habitat specific and typically occur in hilly and mountainous areas with cliffs, rocks ledges and caves. They are also known to occur in dry savannah, woodland where rocky outcrops,

gorges, mountain ranges and quarries provide suitable nesting platforms and prey. Typically, their affinity for nesting on steep cliffs renders the species less susceptible to human disturbance. However, with a contraction in their range and a reduction in prey availability, due to increasing human pressures, the birds are forced to exploit areas that although offer suitable nesting sites are often subject to significant disturbance. The proposed study area is an example of this. Despite the relatively disturbed nature of the proposed development site, the historical open-cast pit has provided suitable nesting platforms and prey base for this species to thrive over the last 11 years. Two nest locations have been observed within the proposed development area. Both the site visit conducted by the vegetation specialist in November 2020 and the more recent rapid field survey conducted as part of this avifaunal assessment in May 2021, confirmed the location of one of the two nests previously observed. The nest at the second location no longer exists. The nest may have been washed away during a heavy rainfall episode in November 2021. Observations of the nest at the first location yielded an inactive nest and no observations of Verreaux's Eagle. Reports from mine staff and contractors suggest that Verreaux's Eagle still utilise the project area extensively, but they have not observed that eagles on the nest this season (at the time of the field survey). It is important to note that prospecting (i.e. drilling) was underway, within 300m of the Verreaux's Eagle nest, during the November 2020 and May 2021 surveys. It is likely the disturbance associated with the noise of the drilling equipment and the vehicle and pedestrian traffic at the prospecting site, may have temporarily displaced the eagles from the nest and the immediate area.

While this species is relatively tolerant of human disturbance, the reopening of the proposed mine development and its associated activities are going to be a significant cause of disturbance to the resident pair and its progeny and it is very likely that the birds will be displaced from this location. A pre-construction inspection prior to the removal of the water within the open void and the construction of the mine to confirm Verreaux's Eagle nest status must be conducted to ensure the appropriate measures are taken to incubate and/or relocate the chick should the nest be active.

In order to describe the avifaunal community present, a rapid field survey was conducted in May 2021 to sample the avifauna in all of the primary habitats that were available within the study area. All species encountered (observed and heard) during the site visit were noted and are indicated in grey in APPENDIX 2. The site visit produced a list of 35 species that are common to this area, 32 of which have been previously recorded by SABAP2. The water contained within the open pit and the island in the centre of the water-filled pit have created an ideal **breeding habitat** for various water dependent species i.e. herons, cormorants, ibis, grebes, moorhens and coots - species that have not been previously recorded by SABAP2 given the absence of water habitats within the broader study area. Each of these species has the potential to be displaced by proposed mine project, as a result of disturbance and to a lesser degree habitat transformation. Although, many of these species, particularly passerine species, have persisted despite high levels of existing disturbance within the study area, the loss of the breeding habitat contained within the existing pit is likely to be permanent,

since similar habitat is not available on this property. The water dependent species observed utilising this key habitat, may move to the adjacent mine (south east of the *THM* development) where surface water habitat occurs. However an opportunity exists to create similar surface water habitats at each of the stormwater ponds by keeping the tall trees in each of these areas and creating an island that will provide an adequate breeding substrate.

The proposed development area is located within a single primary vegetation division namely the Savanna Biome. The savanna/woodland biome contains a large variety of bird species (it is the most species-rich community in southern Africa) but very few bird species are restricted to this biome. Savanna is particularly rich in raptors and forms the stronghold for priority species (recorded in the broader project area by SABAP2) such as White-backed Vulture *Gyps africanus*, Martial Eagle *Polemaetus bellicosus* and a multitude of medium-sized raptors, for example the Black-chested Snake Eagle *Circaetus pectoralis*. Apart from raptors, woodland in its undisturbed state is suitable for a wide range of other, non-raptorial sensitive species i.e., Kori Bustard *Ardeotis kori*. The SABAP2 reporting rates of Red List birds potentially occurring in woodland habitat in the project area are low, indicating that human activity has impacted on the avifaunal community and that levels of disturbance are high. However, these areas will provide foraging and roosting habitat for the large diversity of passerine species recorded in the area.

The habitat within which the proposed study area is located is moderate to highly sensitive from a potential bird impact perspective. The establishment of the proposed mine development and construction of its associated surface infrastructure will result in impacts of MODERATE significance to birds occurring in the vicinity of the new infrastructure, which can be reduced to through the application of mitigation measures. It is anticipated that the proposed mine development and its associated surface infrastructure can be constructed within the study area with acceptable levels of impact on the resident avifauna, subject to the following recommendations:

- * A pre-construction inspection prior to the removal of the water within the open void and the construction of the mine to confirm Verreaux's Eagle nest status must be conducted. Should the nest be active it is recommended that the Endangered Wildlife Trust: Birds of Prey Programme be contacted to ensure the appropriate measures are taken to incubate and/or relocate the chick.
- * The removal of the water within the open void and underground workings to be done between April and June outside of the waterfowl breeding season.
- * The construction of an island within the proposed stormwater ponds, utilising the existing vegetation (i.e. do not remove large trees in these areas) will provide alternative nesting habitat for the resident waterfowl species.
- * The overhead 11kV power line connecting the mine office and weighbridge to the on-site mini substation must be constructed using a bird friendly structure (Inverted Delta-T).

- * Additional mitigation in the form of insulating sleeves on *jumpers* present on strain poles, terminal poles and box transformers must also be considered.
- * If collision or electrocution impacts are recorded once the 11kV power line and on-site substation are operational, it is recommended that the Endangered Wildlife Trust: Wildlife & Energy Programme investigate the mortalities and provide recommendations for site-specific mitigation to be applied reactively.
- * Vehicles must utilise existing roads only.
- * Speed restrictions to be enforced for all vehicles to limit avifaunal collisions.
- * Awareness initiatives to educate road users about the presence of avifaunal species utilising the roads.
- * Should collisions persist mitigation recommendations to be sought from Endangered Wildlife Trust's Wildlife & Transport Programme.
- * Construction activities (i.e. all staff, vehicle and machinery) should be restricted to the immediate footprint of the infrastructure. The recommendations of the botanical study must be strictly implemented.
- * 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. New roads are to be located in areas of existing high disturbance, and not encroach upon sensitive habitats.
- * 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. THIS REPORT	10
2.1 Scope of Work	10
2.2 Structure of this report	11
3. PROJECT LOCATION	13
4. PROJECT OVERVIEW	14
5. APPROACH AND METHODOLOGY	15
5.1 Methodology	15
5.2 Data sources used	16
6. APPLICABLE LEGISLATION, POLICIES AND GUIDELINES	18
6.1 The Convention on Biological Diversity	18
6.2 The Convention on the Conservation of Migratory Species of Wild Animals	19
6.3 The Agreement on the Conservation of African-Eurasian Migratory Water Birds	19
6.4 The National Environmental Management Act 107 of 1998 (NEMA)	20
6.5 The National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA) and the Threatened or Protected Species Regulations, February 2007 (TOPS Regulations)	20
6.6 The National Environmental Management: Protected Areas Act 57 of 2003	20
6.7 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	21
7. DESCRIPTION OF THE BASELINE CONDITIONS	21
7.1 Site Sensitivity Verification	21
7.2 Relevant Bird Populations	21
7.2.1 South African Bird Atlas Project 2 Data (SABAP2)	21
7.2.2 Verreaux's Eagle	23
7.2.3 Primary Data Collection	24

7.3	Avifaunal Habitats.....	25
7.3.1.	<i>Savanna (Bushveld)</i>	25
7.3.2.	<i>Surface Water</i>	26
7.3.3.	<i>Built-up Areas</i>	27
8.	IMPACT ASSESSMENT	27
8.1	Construction Phase	27
8.1.1.	<i>Displacement as a result of habitat loss or transformation</i>	27
8.1.2.	<i>Displacement as a result of disturbance</i>	28
8.1.3.	<i>Direct mortality as a result of construction activities</i>	28
8.2	Operational Phase	28
8.2.1.	<i>Mortality due to collisions with the proposed 11kV power line conductors</i>	28
8.2.2.	<i>Mortality due to electrocutions on the 11kV power line infrastructure</i>	30
8.2.3.	<i>Mortality due to electrocutions within the on-site substation</i>	31
8.2.4.	<i>Collisions with motor vehicles</i>	31
8.2.5.	<i>Impact on the quality of electrical supply of the power line, substation and mine infrastructure</i> ...	31
8.2.6.	<i>Nesting</i>	31
9.	PROPOSED IMPACT MITIGATION ACTIONS	38
10.	PROPOSED MONITORING ACTIONS	41
11.	ENVIRONMENTAL IMPACT STATEMENT	41
11.1	Conditions to be included in the Environmental Authorisation	41
11.2	Specialist Opinion	42
12.	ASSUMPTIONS, UNCERTAINTIES & GAPS IN KNOWLEDGE.....	43
13.	REFERENCES.....	45
	APPENDIX 1: POTENTIAL AVIFAUNAL HABITAT OBSERVED WITHIN THE DEVELOPMENT AREA.....	47
	APPENDIX 2: SOUTH AFRICAN BIRD ATLAS PROJECT DATA (SABAP2) RECORDED IN THE BROADER STUDY AREA	49
	APPENDIX 3: METHOD OF ASSESSING THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS	53
	APPENDIX 4: CURRICULUM VITAE.....	56

1. INTRODUCTION

The Department of Mineral Resources and Energy (DMRE) has accepted an application for a Mining Right for Iron and Iron bearing minerals including hematite, goethite, specularite and limonite and Manganese and manganese bearing minerals for the proposed Hotazel Project made by *Tawana Hotazel Mining (Pty) Ltd* (hereinafter referred to as *THM*). The overall area is approximately 154ha in extent (inclusive of the mining right application area and access road).

The National Environmental Management Act (NEMA) (Act 107 of 1998) requires that an impact assessment be conducted for any development which could have a significant effect on the environment, with the objective to identify, predict and evaluate the actual and potential impacts of these activities on ecological systems; identify alternatives; and provide recommendations for mitigation to minimize the negative impacts. In order to meet the Impact Assessment requirements as outlined in the 2014 National Environmental Management Act (No 107 of 1998) as amended in 2017, *THM* require detailed specialist studies that will document any potential fatal flaws, the impacts of the project and recommend measures to manage (i.e. maximise positive and minimise negative) and monitor those impacts.

2. THIS REPORT

2.1 Scope of Work

THM appointed *Prime Resources Environmental Consultants* (hereinafter referred to as *Prime Resources*) as independent Environmental Assessment Practitioners (EAP) to manage the Impact Assessment process for the proposed mine development. *Prime Resources* appointed *Ecology International (Pty) Ltd* (hereinafter referred to as *Ecology International*) to conduct the required biodiversity assessments. *Feathers Environmental Services CC* is subcontracted to *Ecology International*, in the role of Avifaunal Specialist, to compile the avifaunal component of the biodiversity studies

This report is based on a desktop investigation of the proposed mine development and a site visit conducted over a one-day period, using a set methodology and various data sets (discussed elsewhere) to determine which avian species regularly occur within the study area, the availability of avifaunal micro habitats (i.e. avifaunal sensitive areas) and the possible impacts of the proposed mine development and their significance on the resident avifaunal community, with specific emphasis on the pair of Verreaux's Eagle that are reported to be resident within the proposed mining area, as well as recommendations for the mitigation of the anticipated impacts. *Feathers* has conducted this avifaunal impact assessment according to the following terms of reference:

- * 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 a single season site visit;
- * Assess various avifaunal datasets, including but not limited to Important Bird Areas (IBAs) and describe the avifaunal communities (particularly with reference to Red List species) most likely to be impacted on by the proposed mine development;
- * Identify and confirm avifaunal microhabitats within the proposed mine development study area and assess these for their suitability to support Red List and non-Red List priority species, in terms of breeding, roosting and foraging;
- * Describe the avifaunal communities (both Red List and non-Red List priority species) most likely to be impacted, based on primary data collected during the site visit;
- * Provide a detailed description of the impacts associated with the establishment (construction) and operation of the proposed mine development;
- * Assess the significance (rated according to a pre-determined set of criteria, as supplied by *Ecology International*) of the identified direct, indirect and cumulative impacts, during the establishment (construction) and operation phases of the proposed mine development, based on data collected in-field;
- * Consider the proposed layout plans for mine development and advise possible changes to these layouts;
- * 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. The best available data sources will be used to predict the impacts.

2.2 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) as detailed in TABLE 1 below.

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-	

Legal Requirement		Relevant Section in Specialist study
	(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
(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 2
(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 8
(g)	an identification of any areas to be avoided, including buffers;	Section 8
(h)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 8
(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
(k)	any mitigation measures for inclusion in the EMPr;	Section 9
(l)	any conditions for inclusion in the environmental authorisation;	Section 10 Section 11

Legal Requirement		Relevant Section in Specialist study
(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 9 Section 10 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 <i>gazetted</i> 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.	Not Applicable

3. PROJECT LOCATION

The proposed mine development is located approximately 1km south-east of the town of Hotazel, across two land portions (Hotazel 280 and York 279) within the Joe Morolong Local Municipality in the Northern Cape Province (FIGURE 1). *THM* largely incorporates the historical Hotazel Manganese Mine (HMM), and the mining right area includes the residual opencast void and surface dumps of low-grade material. The mothballed processing plant and rail loadout facility fall outside the mining right area. The final mine development layout and project description was provided by *Prime Resources* on 29 October 2021.

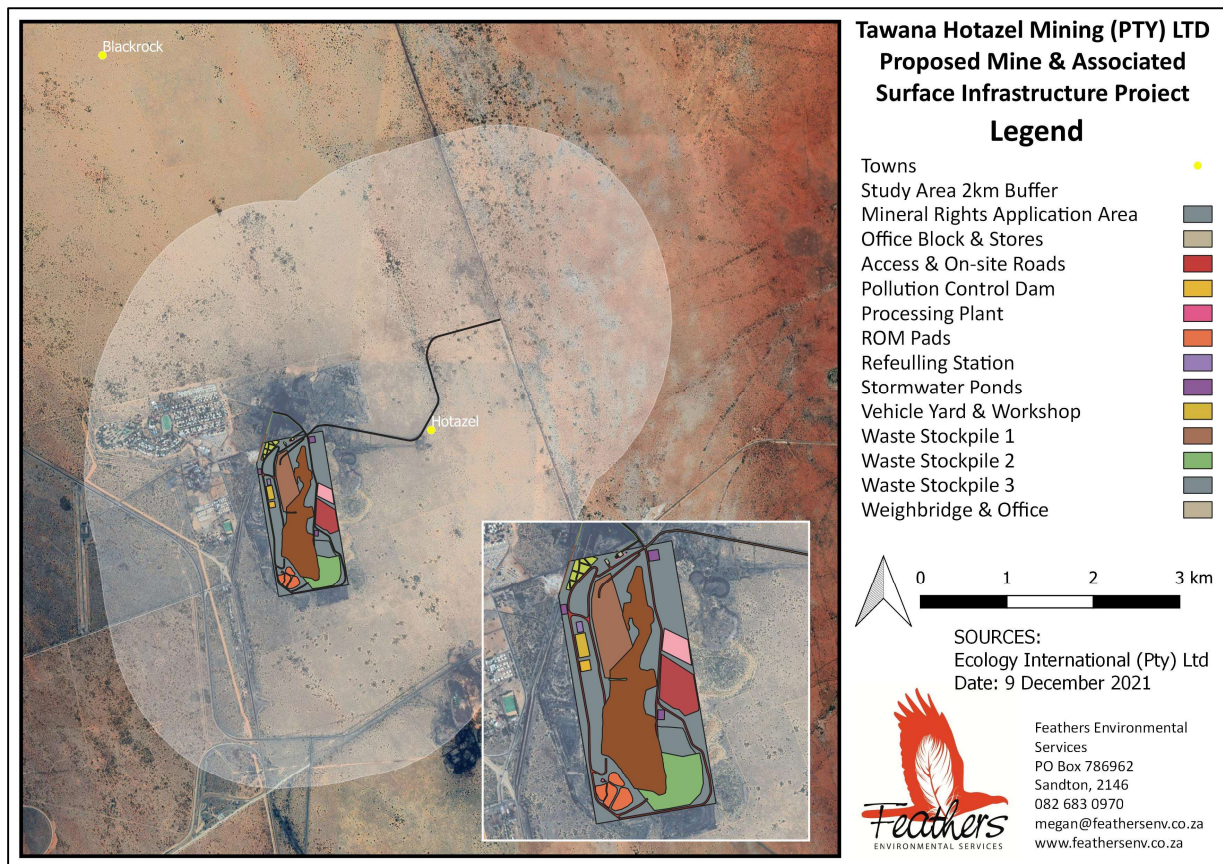


FIGURE 1: Regional map detailing the location of the proposed *THM* development area located within the Joe Morolong Local Municipality, Northern Cape Province.

4. PROJECT OVERVIEW

The project consists of the following project components as provided by *Prime Resources* dated October 2021:

Surface infrastructure includes:

- * opencast pit (incorporating the historical Hotazel Manganese Mine void and further expansion of the opencast footprint) to be mined at a maximum depth of 95m;
- * run of mine pad;
- * run of mine ore stockpile area;
- * processing plant, comprised of crushing and screening infrastructure;
- * in-pit waste dumps (residue material);
- * mine entrance and on site access roads comprised of two main access roads for heavy vehicles and light delivery vehicles respectively (with a minimum road width of 10m);
- * weighbridge facility;

- * offices and parking;
- * plant yard/workshop;
- * refuelling station;
- * water management infrastructure comprised of pollution control dams and stormwater ponds;
- * on-site mini substation; and
- * 11kV overhead power line infrastructure connecting the mine office and weighbridge to the on-site mini substation.

5. APPROACH AND METHODOLOGY

5.1 Methodology

The following methodology was employed to compile this avifaunal impact assessment report:

- * Collect and examine various avifaunal data sets (detailed in section 5.2) at a desktop level to determine the presence of sensitive Red List, as well as non-Red List priority species, that may be vulnerable to the impacts associated with the proposed mine development;
- * Suitable avifaunal habitats and potential sensitive areas within the immediate surrounds of the proposed mine development, 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 visit on 10 May 2021 (FIGURE 2);
- * Primary bird data was collected by means of a rapid field survey to ground truth the information gleaned from secondary data sources and to collect primary bird occurrence data at the project site and its immediate surrounds;
- * The potential impacts, associated with the construction and operation of the proposed mine development on the avifaunal community, with specific emphasis on Verreaux's Eagle, and the significance were predicted and assessed according to quantitative criteria provided by *Ecology International* on 9 December 2021 (APPENDIX 3); and
- * Practical recommendations for the management and mitigation of potentially significant impacts, related to the construction and operation of the mine development are provided in Section 9 for inclusion in the draft EMPr.

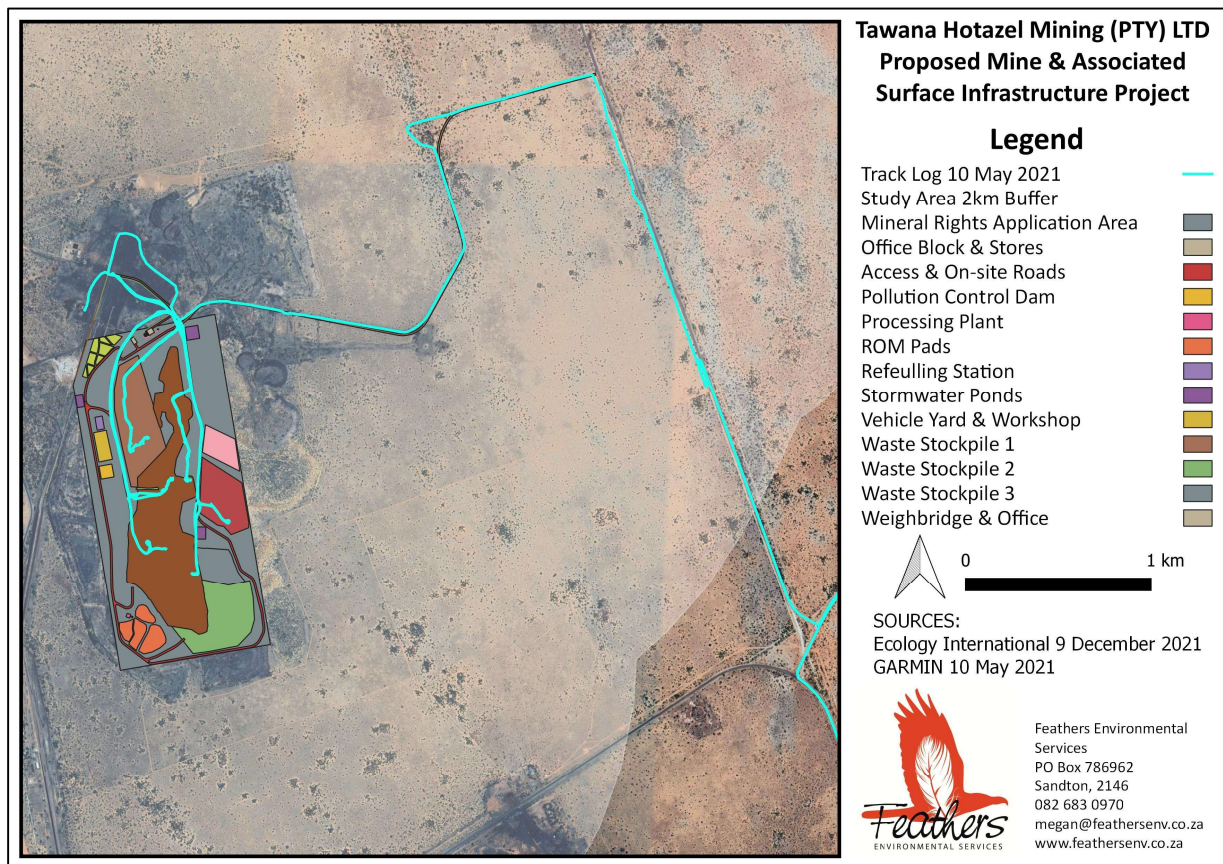


FIGURE 2: Regional map detailing the routes surveyed during the field survey to the study area conducted on 10 May 2021.

5.2 Data sources used

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

- * Screening Report for an Environmental Authorisation as required by the 2014 EIA Regulations - Proposed Site Environmental Sensitivity: Tawana Hotazel Mining (Pty) Ltd Mining Right Application compiled by *Feathers Environmental Services* on 29 December 2020;
- * Bird distribution data of the South African Bird Atlas 2 (SABAP 2) was obtained from the Animal Demography Unit of the University of Cape Town on 28 December 2020 and updated on 9 December 2021 as a means to ascertain which species occur within the **broader area**, based on nine pentad grid cells surrounding the proposed mine development envelope. Each pentad is approximately 8 × 7.6 km. Between 2007 and 2020, a total of 49 full protocol cards (i.e. 49 bird surveys lasting a minimum of two hours each) have been completed across the nine pentads. The relevant pentads within the study area include: 2705_2250; 2705_2255; 2705_2300; 2710_2250; 2710_2255; 2710_2300; 2715_2250; 2715_2255 and 2715_2300 (FIGURE 3);
- * The Important Bird Areas (IBAs) report (Marnewick et al. 2015) was consulted to determine the location of the nearest IBAs and their importance for this study. There are no IBAs within the confines of the

development and broader study area and therefore IBA data was not used as a criterion to assess the sensitivity and anticipated impacts within the project area;

- * The Co-ordinated Waterbird Count (CWAC – Taylor et al. 1999) data was consulted determine if large concentrations of water birds, associated with South African wetlands, may occur within the study area. There are no CWAC sites within the confines of the development and broader study area and therefore CWAC data was not used as a criterion to assess the sensitivity and anticipated impacts within the project area;
- * The Coordinated Avifaunal Roadcount project (CAR – Young et al, 2003) data was consulted to obtain relevant data on large terrestrial bird report rates in the area. There are no CAR routes located within the confines of the development and broader study area and therefore CAR data was not used as a criterion to assess the sensitivity and anticipated impacts within the project area;
- * The conservation status and endemism information of all bird species occurring in the aforementioned pentads was then determined with the use of the Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor et al. 2015) and the IUCN Red List of Threatened Species Version 2021-1 (<http://www.iucnredlist.org>) and the most recent and comprehensive summary of southern African bird biology (Hockey et al. 2005);
- * The latest vegetation classification described in the Vegetation Map of South Africa (South African National Biodiversity Institute, 2012 and Mucina & Rutherford, 2006) was consulted in order to determine which vegetation types occur within the proposed study areas;
- * High-resolution Google Earth ©2021 imagery was used to examine the microhabitats within the proposed study area;
- * KMZ/KML shapefile detailing the location and footprint of the proposed *THM* development was obtained from *Ecology International* on 20 November 2020, 22 April 2021 and 9 December 2021;
- * KMZ/KML shapefile detailing the approximate locations of two Verreaux's Eagle nests in addition to photographs detailing areas of potential avifaunal habitat were obtained from Michelle Pretorius (Vegetation Specialist) on 23 and 25 November 2020;
- * A single one-day field visit to the project area was conducted on 10 May 2021 (autumn survey) to form a first-hand impression of avifaunal species presence and micro-habitat occurring within the proposed development site (FIGURE 2). This information, together with the SABAP2 data was used to compile a comprehensive list of species that could occur in the study area; and
- * Personal observations made during the aforementioned site visit to the proposed mine development study area coupled with the author's experience gained from assessing various electrical infrastructure development projects in the Free State region have been used to formulate a professional opinion of the species likely to occur in the study area and the likely impacts that the proposed mine development may have on the resident avifaunal community.

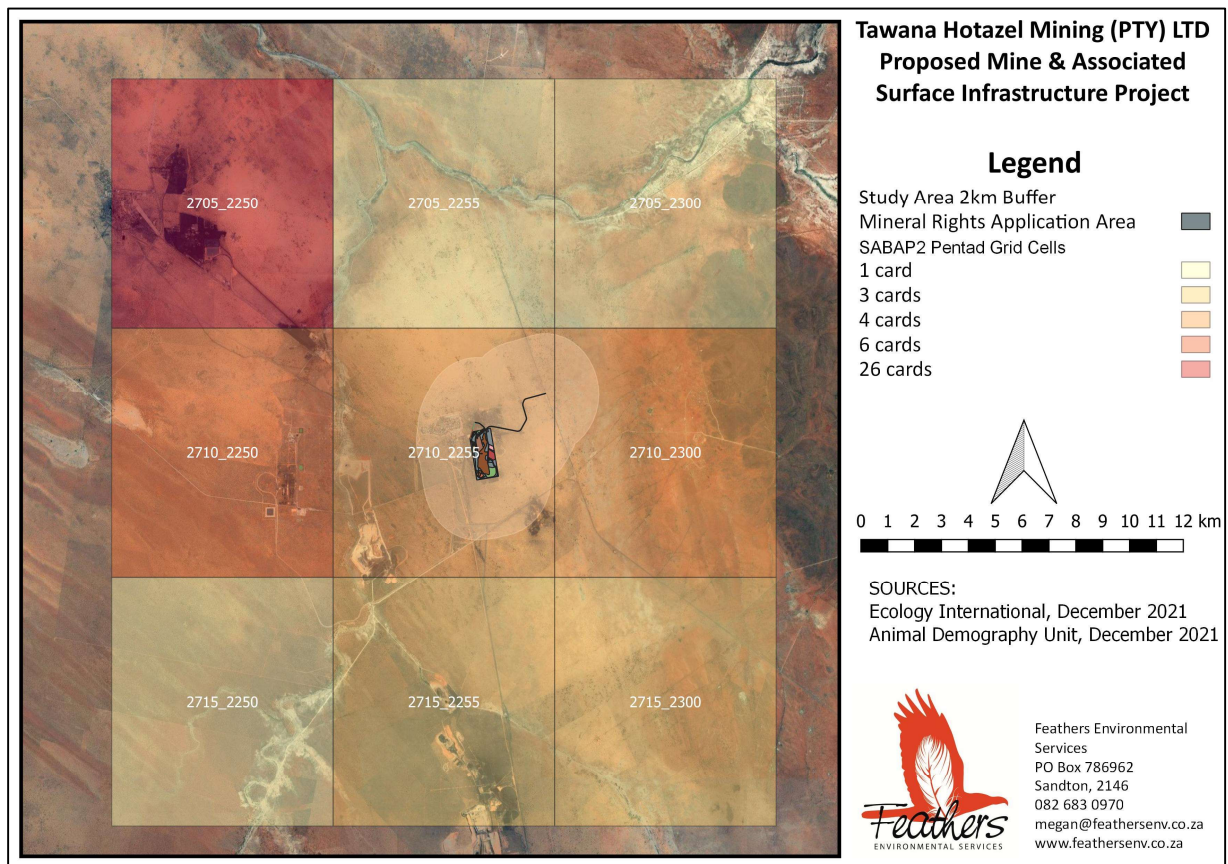


FIGURE 3: Location of the nine South African Bird Atlas Project 2 (SABAP2) pentad grid cells that were considered for the proposed mine development project.

6. APPLICABLE LEGISLATION, POLICIES AND GUIDELINES

The following pieces of legislation are applicable to this assessment:

6.1 The Convention on Biological Diversity

The Convention on Biological Diversity (CBD) is an international convention (to which South Africa is a signatory) and 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 (<http://www.cbd.int/convention/guide/>). 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 in the case of energy infrastructure and bird conservation through all project phases from planning to the implementation of mitigation measures for existing developments.

6.2 The Convention on the Conservation of Migratory Species of Wild Animals

The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or the Bonn Convention) is an intergovernmental treaty and is 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 (South Africa is a signatory) take measures to avoid migratory species from becoming endangered (Art II, 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 energy infrastructure. AEWA has also published a series of practical guidelines that enable Parties to effectively address conservation issues influencing the status of migratory waterbirds. The most relevant guideline for migratory birds and energy infrastructure is the *Guideline on how to avoid, minimise or mitigate impact of infrastructural developments and related disturbance affecting waterbirds* (Tucker & Treweek, 2008).

6.3 The Agreement on the Conservation of African-Eurasian Migratory Water Birds

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 (South Africa included) 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.

6.4 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.

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

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 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.

6.6 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, archeological 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.

6.7 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).

7. DESCRIPTION OF THE BASELINE CONDITIONS

7.1 Site Sensitivity Verification

A screening report for the proposed mine development area was generated on 29 December 2020. The proposed development area does not occur within applicable development incentive, restriction, exclusion or prohibition zones. The proposed development area is considered to have a LOW Animal Species Theme and Terrestrial Biodiversity Theme sensitivity. A preliminary desktop assessment of the available avifaunal data, specifically with regards anecdotal records of breeding Verreaux's Eagle and the presence of two nest locations, suggest that the site sensitivity is likely to be HIGH. The single season site visit confirmed the location of one inactive Verreaux's Eagle nest, as well as breeding habitat for a variety of water dependent species. Given the existing disturbance and habitat transformation within the immediate area, the site sensitivity is considered to be MEDIUM.

7.2 Relevant Bird Populations

7.2.1 South African Bird Atlas Project 2 Data (SABAP2)

A total of 142 bird species have been recorded within the nine-pentad broader study area (FIGURE 3) during the SABAP2 atlassing period to date (APPENDIX 2). The presence of these species in the broader study area provides an indication of the diversity of species that could potentially occur in areas where pockets of natural

vegetation/habitats persist. Of the 142 species, six of these are considered to be of conservation concern (TABLE 2) (Taylor et al, 2015). The Red List species have all been recorded in low numbers, with between one and three individuals being recorded over the fourteen-year survey period within the relevant pentads. The low report rates may possibly be attributed to the fact that the pentad grid cells have not been surveyed extensively and may not be an accurate reflection of the true densities within each of the pentads and the proposed development area. Pockets of suitable natural habitat, to support these species does exist within the study area, so it is likely that an increase in survey effort will yield a greater diversity and density of species. However, it is also important to note that the proposed development area has been significantly transformed during previous mining operations and the establishment of the town of Hotazel. The low report rates can also possibly be attributed to the fact fairly high levels of disturbance exist within the broader study area, caused by the mining and urban land use practices as well as fragmented natural habitat.

While this report focuses on Red List species, since the impacts associated with the proposed mine development project are likely to be more biologically significant for these species, the impact on non-Red List species is also assessed, albeit in less detail. Furthermore, much of the mitigation recommended for Red List species will also protect non-Red List species in the study area. The non-Red List species that have been considered for this assessment include kestrels, kites, owls and various waterfowl species. Each Red List species' potential for occurring in a specific habitat class is indicated in TABLE 2, in addition to the type of impact that could potentially affect each species.

TABLE 2 Annotated list of the Red List species recorded in the relevant pentads surrounding the proposed mine development area.

COMMON NAME	REGIONAL CONS. STATUS	GLOBAL CONS. STATUS	AV. REPORT RATE (No. of Records)	SAVANNA (BUSHVELD)	QUARRY	SURFACE WATER	DISPLACEMENT (HABITAT LOSS & DISTURBANCE)	POWER LINE COLLISION	POWER LINE ELECTROCUTION
Bustard, Kori <i>Ardeotis kori</i>	NT	NT	4.3 (2)	x	-	-	x	x	-
Eagle, Martial <i>Polemaetus bellicosus</i>	EN	VU	2.1 (1)	x	-	-	x		x
Eagle, Verreaux's <i>Aquila verreauxii</i>	VU	LC	2.1 (1)	foraging	x	-	x	-	x
Falcon, Lanner <i>Falco biarmicus</i>	VU	LC	6.4 (3)	x	x		x	x	-
Roller, European <i>Coracias garrulus</i>	NT	LC	2.1 (1)	x	-	-	x	-	-
Vulture, White-backed <i>Gyps africanus</i>	CR	CR	4.3 (2)	x	-	-	-	x	x
CR = Critically Endangered EN = Endangered VU = Vulnerable NT = Near-threatened LC = Least Concern									

7.2.2. Verreaux's Eagle

Verreaux's Eagle *Aquila verreauxii* is a large, territorial bird of prey. Its distribution is inextricably linked to mountainous habitat and its main prey of rock hyraxes, a prey base that features prevalently in the study area. Although this raptor is widely spread throughout Africa, Verreaux's Eagle has recently been classified as *Vulnerable* in southern Africa due to a decrease in its range and abundance (Murgatroyd et al, 2016). Verreaux's Eagles are habitat specific and typically occur in hilly and mountainous areas with cliffs, rocks ledges and caves. They are also known to occur in dry savannah, woodland where rocky outcrops, gorges, mountain ranges and quarries provide suitable nesting platforms and prey (Kondlo and Moeketsane, 2014). The birds are often found in pairs, perched on a prominent lookout or soaring and gliding around their territory. Typically, their affinity for nesting on steep cliffs renders the species less susceptible to human disturbance. However, with a contraction in their range and a reduction in prey availability, due to increasing human pressures (Murgatroyd et al, 2016), the birds are forced to exploit areas that although offer suitable nesting sites are often subject to significant disturbance. The proposed study area is an example of this. Despite the relatively disturbed nature of the proposed development site, the historical open-cast pit has provided suitable nesting platforms and prey base for this species to thrive over the last 11 years (pers coms Hennie Dempers). Two nest locations were reported to have been observed within the proposed development area - their approximate locations detailed in FIGURE 4.

Both the site visit conducted by the vegetation specialist in November 2020 and the more recent rapid field survey conducted as part of this avifaunal assessment in May 2021, confirmed the location of one of the two nests previously observed. The nest at the second location no longer exists. The nest may have been washed away during a heavy rainfall episode in November 2021. Observations of the nest at the first location yielded an inactive nest and no observations of Verreaux's Eagle. Reports from mine staff and contractors suggest that Verreaux's Eagle still utilise the project area extensively, but they have not observed that eagles on the nest this season (at the time of the field survey) .

It is important to note that prospecting (i.e. drilling) was underway, within 300m of the Verreaux's Eagle nest, during the November 2020 and May 2021 surveys. It is likely the disturbance associated with the noise of the drilling equipment and the vehicle and pedestrian traffic at the prospecting site, may have temporarily displaced the eagles from the nest and the immediate area.

While this species is relatively tolerant of human disturbance, the reopening of the proposed mine and its associated activities are going to be a significant cause of disturbance to the resident pair and its progeny and it is very likely that the birds will be displaced from this location. While suitable habitat and prey may be available in the broader area, there may be opportunities to encourage the birds to remain resident with the provision of an artificial nesting platform, outside of the development zone.

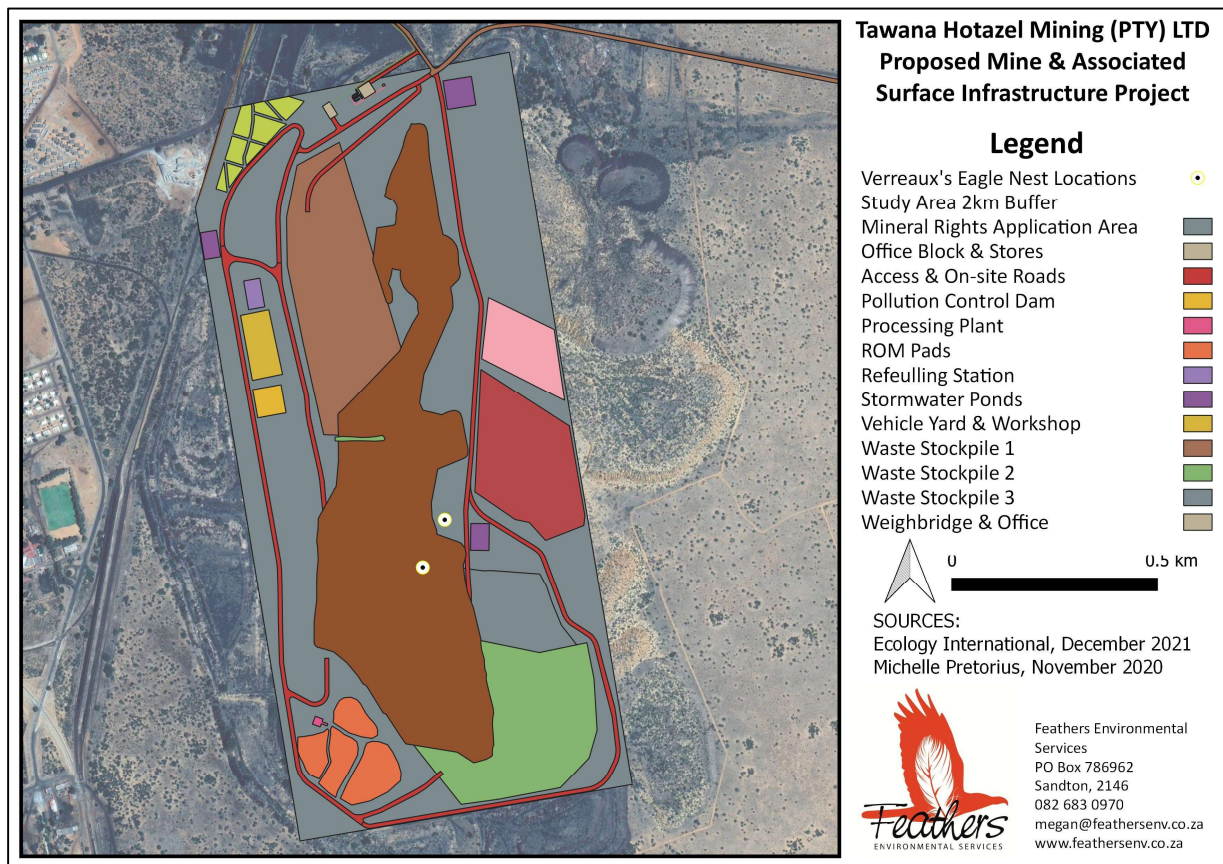


FIGURE 4: Location of the two historical nest locations within the proposed THM development area (Hennie Dempers).

7.2.3. Primary Data Collection

A single autumn survey was conducted on 10 May 2021. 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 study area. All species encountered (observed and heard) during the site visit were noted and are indicated in grey in APPENDIX 2. The site visit produced a list of 35 species that are common to this area, 32 of which have been previously recorded by SABAP2. The water contained within the open pit and the island in the centre of the water-filled pit have created an ideal **breeding habitat** for various water dependent species i.e. herons, cormorants, ibis, grebes, moorhens and coots - species that have not been previously recorded by SABAP2 given the absence of water habitats within the broader study area. Each of these species has the potential to be displaced by proposed mine project, as a result of disturbance and habitat transformation. Although, many of these species, particularly passerine species, have persisted despite high levels of existing disturbance within the study area, the loss of the breeding habitat contained within the existing pit is likely to be permanent, since similar habitat is not readily available on this property. The water dependent species observed utilising this

key habitat, may move to the adjacent mine (south east of the proposed mine development) where surface water habitat occurs.

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. The classification of vegetation types is from Mucina & Rutherford (2006 and 2012), while from an avifaunal perspective, the Atlas of southern African Birds (SABAP1) recognises six primary vegetation divisions or biomes within South Africa, namely (1) Fynbos (2) Succulent Karoo (3) Nama Karoo (4) Grassland (5) Savanna and (6) Forest (Harrison et al. 1997). 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 spatial scale habitats (micro habitats) that support the requirements of a particular bird species that need to be examined in greater detail. Micro habitats are shaped 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 and are critically important in mapping the site in terms of avifaunal sensitivity and ultimately informing mitigation requirements. Investigation of the proposed mine development envelope and its immediate surrounds revealed following bird micro habitats (FIGURE 5), with APPENDIX 1 providing a photographic record (Pretorius, November 2020) of these:

7.3.1 Savanna (Bushveld)

The study area is located within the Savanna Biome, defined by SABAP1 as having a grassy under-storey and a distinct woody upper-storey of trees and tall shrubs (Harrison et al, 1997). Any remaining natural woodland occurring at the development site and within the broader study area is comprised of the Kathu Bushveld vegetation type (FIGURE 5) which forms part of the Eastern Kalahari Bushveld Bioregion, which is characterised by sparse to dense shrubland or parkland woodland dominated by semi-deciduous *Acacia*, *Boscia albitrunca*, *Terminalia sericea* and *Lonchocarpus nelsii* trees and *Acacia* and *Grewia* shrubs on deep Kalahari sands. Tall trees are rare, mostly *Acacia erioloba* (Camelthorn), but large trees are found, mostly along river courses. Grass cover is variable dependent on rain, grazing and fires. There are no watercourses, but there are fossil river valleys and many pans on calcrete, which irregularly hold water (Mucina & Rutherford 2006).

The relevance of this vegetation classification to the avifauna of the area, is that this habitat class is of importance for a variety of Red List species. The Eastern Kalahari Bushveld is particularly rich in large Red List raptors, such as White-backed Vulture *Gyps africanus*, Martial Eagle *Polemaetus bellicosus* recorded in the broader study area. All these species require large trees for breeding and roosting, and large *Acacia erioloba* trees are ideal for that purpose. Apart from Red List species, it also supports several non-Red Data large raptor species, such as the Black-chested Snake Eagle *Circaetus pectoralis*. A multitude of smaller raptor species also

occur in Eastern Kalahari Bushveld, as well as the large terrestrial Red List Kori Bustard *Ardeotis kori*. The SABAP2 reporting rates for the Red List birds potentially occurring in this bushveld habitat in the project area are low, indicating that human activity has impacted on the avifaunal community and that levels of disturbance are high (APPENDIX 1: FIGURES 1 and 2) however, these areas are likely to provide foraging and roosting habitat for the large diversity of passerine species recorded in the area.

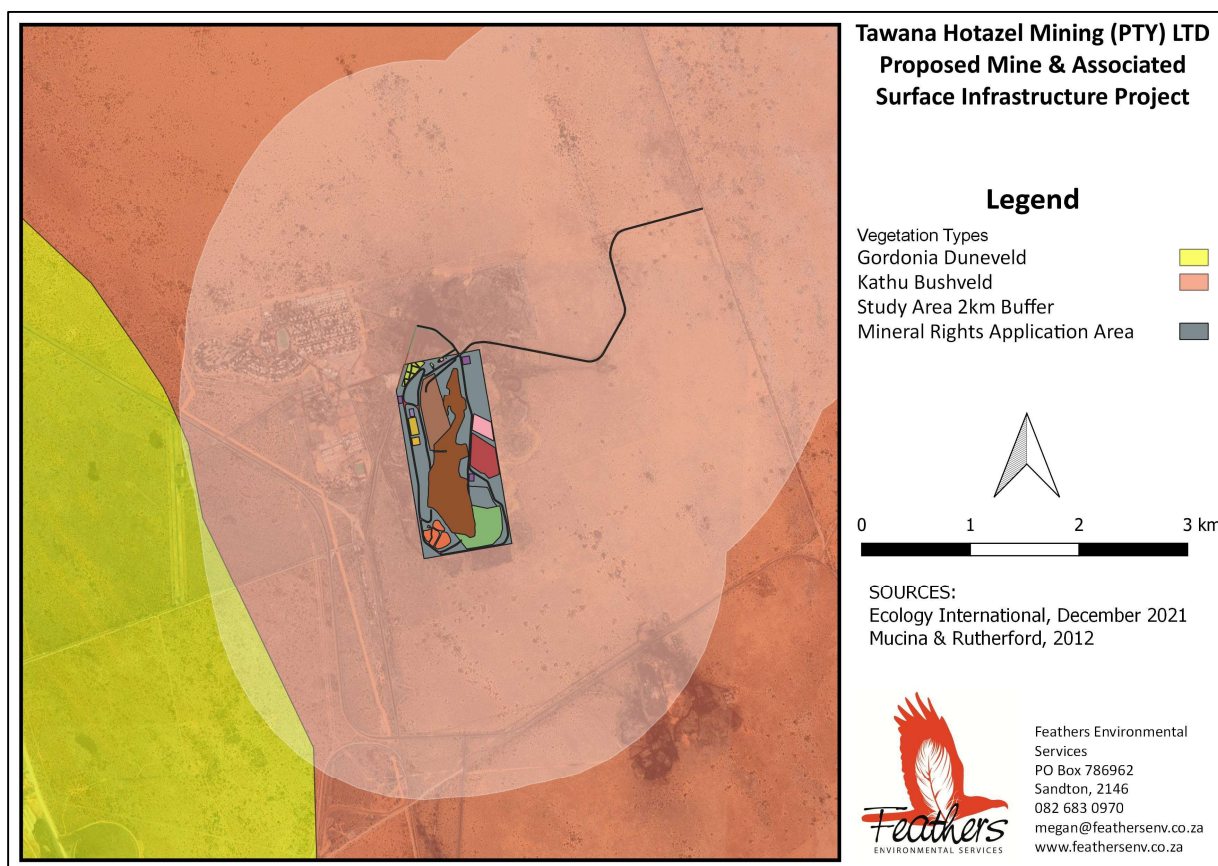


FIGURE 5: Vegetation map (Mucina & Rutherford 2006) indicating the location of the project area in relation to the surrounding vegetation types.

7.3.2. Surface Water

The old open-cast pit has filled up with water and created an aquatic environment. The water is surrounded by *Phragmites* and a small island is present in the centre of the waterbody (APPENDIX 1: FIGURE 3). Although artificial in nature, waterbird species benefit from areas like this at times resulting in a range expansion for many species, formerly restricted to areas of higher rainfall. Apart from the water quality, the structure of the waterbody and specifically the margins and the associated shoreline and vegetation, play a significant role in determining the species that will be attracted to the waterbody. As discussed above, this is a key habitat within the project area supporting a variety of water dependent species.

7.3.3. *Built-up Areas*

These areas include surface infrastructure such as industrial buildings/offices, existing mine infrastructure and roads (APPENDIX 2: FIGURE 8). Built-up areas generally are of little value to sensitive Red List bird species due to their degraded nature and the associated disturbance factor. They do however play an important role in providing safe refuge and foraging opportunities for small passerine species that have become common in these environments.

TABLE 2 details the micro habitats that each of the Red List bird species (recorded by SABAP2) will typically frequent in the study area. 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 2 represents each species' most preferred or normal 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. IMPACT ASSESSMENT

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. Each of these potential effects can interact, either increasing the overall impact on birds or, in some cases, reducing a particular impact. The principal areas of concern for Red List and non-Red List priority species related to the proposed mine development and its associated surface infrastructure include:

8.1 Construction Phase

8.1.1. *Displacement as a result of habitat loss or transformation*

This impact is dependent on the location and the scale of the facility. Relevant to this project avifaunal habitat may need to be cleared to accommodate the proposed mine and its associated surface infrastructure (including but not limited to access roads, electrical, infrastructure, offices and processing plant) reducing the amount of habitat available to birds for foraging, roosting and breeding. The effect of the vegetation clearing is always more marked in woodland areas, where construction necessitates the removal of woody plants, and especially large trees. Relevant to this assessment, although sections of the study area have already been intensively transformed through previous mining activities, pockets of natural bushveld vegetation and waterbody habitat do exist are likely to be transformed (or further transformed) during the course of the establishment and operation of the mine which could in turn impact on birds using these habitats

It is also important to note that the loss of habitat, associated with the construction of the mine and its surface infrastructure, may be more significant for the more common passerine species with small home ranges as entire territories could be removed.

8.1.2. Displacement as a result of disturbance

Excavation and construction activities are a source of significant disturbance particularly as a result of the machinery and construction personnel that are present on site for the duration of the construction of the facility. For most bird species, construction activities are likely to be a cause of temporary disturbance and may impact on foraging, breeding and roosting behaviours or in more extreme cases, result in displacement from the site entirely. The study area is already subjected to a fairly significant degree of disturbance due to the previous and existing mining activities within the proposed development area. However, a Verreaux's Eagle breeding site and waterbody habitat are present and remain areas of refuge for priority species. Development within these focal sites will be a significant source of disturbance and are likely to result in displacement.

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. No terrestrial bird species (ground) nest locations were observed during the site visit to the study area. The absence of Red List species nests may also be a result of the disturbance in the area and the resultant low report rates for large terrestrial species. Should nests or breeding locations, pertaining to Red List species, be identified during the avifaunal inspection prior to the construction phase of this project, site specific mitigation must be implemented to ensure that this impact is reduced to negligible levels.

8.2 Operational Phase

8.2.1. Mortality due to collisions with the proposed 11kV power line conductors

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. A potential impact of the proposed 11kV power line is collisions with the overhead conductors. 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. However, 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 line.

In a recent PhD study, Shaw (2013) provides a concise summary of the phenomenon of avian collisions with power lines:

"The collision risk posed by power lines is complex and problems are often localised. While any bird flying near a power line is at risk of collision, this risk varies greatly between different groups of birds, and depends on the interplay of a wide range of factors (APLIC 1994). Bevanger (1994) described these factors in four main groups – biological, topographical, meteorological and technical. Birds at highest risk are those that are both susceptible to collisions and frequently exposed to power lines, with waterbirds, gamebirds, rails, cranes and bustards usually the most numerous reported victims (Bevanger 1998, Rubolini et al. 2005, Jenkins et al. 2010).

The proliferation of man-made structures in the landscape is relatively recent, and birds are not evolved to avoid them. Body size and morphology are key predictive factors of collision risk, with large-bodied birds with high wing loadings (the ratio of body weight to wing area) most at risk (Bevanger 1998, Janss 2000). These birds must fly fast to remain airborne, and do not have sufficient manoeuvrability to avoid unexpected obstacles. Vision is another key biological factor, with many collision-prone birds principally using lateral vision to navigate in flight, when it is the low-resolution and often restricted, forward vision that is useful to detect obstacles (Martin & Shaw 2010, Martin 2011, Martin et al. 2012). Behaviour is important, with birds flying in flocks, at low levels and in crepuscular or nocturnal conditions at higher risk of collision (Bevanger 1994). Experience affects risk, with migratory and nomadic species that spend much of their time in unfamiliar locations also expected to collide more often (Anderson 1978, Anderson 2002). Juvenile birds have often been reported as being more collision-prone than adults (e.g. Brown et al. 1987, Henderson et al. 1996).

The technical aspects of power line design and siting also play a big part in collision risk. Grouping similar power lines on a common servitude, or locating them along other features such as tree lines, are both approaches thought to reduce risk (Bevanger 1994). In general, low lines with short span lengths (i.e. the distance between two adjacent pylons) and flat conductor configurations are thought to be the least dangerous (Bevanger 1994, Jenkins et al. 2010)."

Relevant to this development, collisions are likely to be linked to specific habitat types (i.e. open savanna and waterbodies) and/or specific sets of circumstances (i.e. roosts) potentially involving ibis, heron, egret and the various water dependent species that utilise the study area. The standard practice to mitigate for avian collision impact is the installation of anti-collision devices on the earth wires. This form of mitigation has proved to be reasonably successful in reducing collisions, with a reduction in mortality of up to 60% (see Jenkins et al. 2010). Eskom Distribution has approved two anti-collision devices, commonly referred to as bird flight diverters

(BFDs); the Bird Flapper (dynamic) and the Flight Diverter (static). Both have advantages and disadvantages. Dynamic devices are thought to be very effective in reducing collisions as the birds presumably see them very well because of the movement that attracts their attention. The disadvantage of dynamic devices is that they are subject to extensive wear and tear, inevitably limiting the lifespan of the device. This has obvious cost implications if a line needs to be re-marked every few years (Van Rooyen and Diamond, 2015). Static devices are mechanically more durable because they lack the element of wear and tear that moving parts predictably have. Flight diverters should be as large as possible and contrast with the background. Black and white/yellow intermixed patterns are likely to maximise the probability of detection (Martin *et al.* 2010).

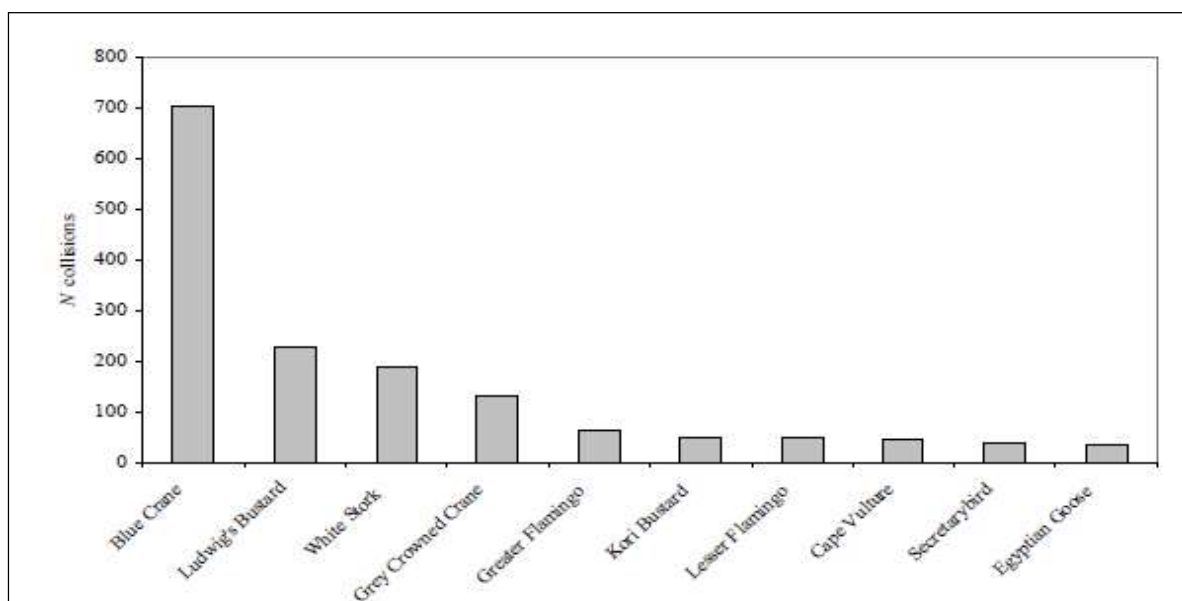


FIGURE 6: The top ten collision prone bird species in South Africa, in terms of reported incidents contained in the Eskom/EWT Strategic Partnership central incident register 1996 - 2007 (Jenkins *et al.* 2010)

8.2.2. Mortality due to electrocutions on the 11kV power line infrastructure

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 and design of the tower/pole structure and mainly affects larger, perching species that are capable of spanning the spaces between energized components. This is particularly likely when more than one bird attempts to sit on the same pole, a behaviour that is typical of gregarious species (i.e. White-backed Vulture) when perching or roosting. Relevant to this development, White-backed Vulture, Martial Eagle, Verreaux's Eagle, ibis and herons species are susceptible to electrocution on the power line infrastructure. The best possible mitigation is the construction of the power line using the Eskom approved bird-friendly structure (Inverted Delta-T) with a

minimum clearance distance of 1.8m between the phases and cross arms. Additional mitigation in the form of insulating sleeves on *jumpers* present on strain poles, terminal poles and box transformers is also required.

8.2.3. Mortality due to electrocutions within the on-site substation

Electrocutions within the proposed on-site substation are possible but should not affect the more sensitive Red List bird species as these species are unlikely to use the infrastructure within the yard for perching or roosting. Since it is difficult to predict with any certainty where birds are likely to nest within the substation, coupled with the costs associated with insulating the infrastructure, electrocutions will need to be mitigated using site-specific recommendations if and when they occur.

8.2.4. Collisions with motor vehicles

Roadside verges are an attractive habitat to a diversity of bird species (Kaseloo 2006; Pocock & Lawrence 2006; Roach & Kirkpatrick 1985). Vegetation is often dense and lush (when compared to surrounding areas, due to protection from grazing animals and an increased supply water from road surface runoff) supporting high densities of rodents that in turn attract predatory birds such as owls, raptors and herons. Swallows and swifts, are attracted to culverts and bridges because of the nesting opportunities they provide. For these species, that are attracted to roads, collisions with motor vehicles are a significant impact.

8.2.5. Impact on the quality of electrical supply of the power line, substation and mine infrastructure

Although this does not form part of the brief, it is important to mention that birds could have an impact on the proposed power line infrastructure, the hardware within the substation and possibly other related mine infrastructure. Both bird streamers and bird pollution occur as a result of birds perching and defecating on the pole tops and, often directly above live conductors causing electrical faults on power lines. The more faults that occur on a line, the poorer the quality of electrical supply to the end users (i.e. the mine). Site specific mitigation can be applied reactively should this impact occur.

8.2.6. Nesting

Bird nests may also cause faults through nest material, protruding into the air gap between live components on the power line and substation infrastructure. Crows in particular often incorporate wire and other conductive material into their nests. When nests cause flashovers, the nesting material may catch fire. This in turn can lead to equipment damage or a general veld fire. Apart from the cost of replacing damaged equipment, the resultant veld fire can lead to claims for damages from landowners. Power line poles/towers in turn provide nesting substrate for certain bird species, some of which might benefit through the increased availability of nesting substrates both on the power line and substation infrastructure as well as the mine offices and plant infrastructure. Site specific mitigation can be applied reactively should this impact occur.

8.3 Impact Assessment

A quantitative methodology was used to describe, evaluate and rate the significance of the aforementioned impacts associated with the construction and operation of the proposed mine development and its associated surface infrastructure. This assessment is presented in tabular format below (TABLE 3) for both pre- and post-mitigation according to set criteria described in APPENDIX 3.

TABLE 3: Impact assessment ratings for pre and post mitigation

Impact description	Extent	Duration	Magnitude	Probability	Significance (without mitigation)	Significance (with mitigation)	Reversibility	Mitigation	Confidence level
IMPACT 1: Displacement of Red List species as a result of habitat loss and/or transformation									
Displacement as a result of habitat loss or transformation associated with the construction of the proposed THM and its ancillary infrastructure particularly the surface water and cliff habitats within the open void resulting in a negative direct impact on the resident avifauna.	Local (2)	Long (4)	High (8)	Highly probable (4)	MODERATE (56)	LOW-MODERATE (36)	High	<ul style="list-style-type: none"> * A pre-construction inspection prior to the removal of the water within the open void and the construction of the mine to confirm Verreaux's Eagle nest inactive status. However should the nest be active it is recommended that the Endangered Wildlife Trust: Birds of Prey Programme be contacted to ensure the appropriate measures are taken to incubate and/or relocate the chick. * The removal of the water within the open void and underground workings to be done between April and June outside of the waterfowl breeding season. * The construction of an island within the proposed stormwater ponds, utilising the existing vegetation (i.e. do not remove large trees in these areas) will provide alternative nesting habitat for the resident waterfowl species. 	High

Impact description	Extent	Duration	Magnitude	Probability	Significance (without mitigation)	Significance (with mitigation)	Reversibility	Mitigation	Confidence level
IMPACT 2: Displacement of Red List species as a result of disturbance									
Displacement as a result of disturbance associated with the construction of the proposed THM and its ancillary infrastructure (i.e. noise and movement of construction and operational equipment and personnel) resulting in a negative direct impact on Verreaux's Eagle and the avifauna (particularly waterfowl) utilising the open void.	Local (2)	Long (4)	High (8)	Highly probable (4)	MODERATE (56)	LOW-MODERATE (36)	High	<ul style="list-style-type: none"> * A pre-construction inspection prior to the removal of the water within the open void and the construction of the mine to confirm Verreaux's Eagle nest inactive status. However should the nest be active it is recommended that the Endangered Wildlife Trust: Birds of Prey Programme be contacted to ensure the appropriate measures are taken to incubate and/or relocate the chick. * The removal of the water within the open void and underground workings to be done between April and June outside of the waterfowl breeding season. * The construction of an island within the proposed stormwater ponds, utilising the existing vegetation (i.e. do not remove large trees in these areas) will provide alternative nesting habitat for the resident waterfowl species. 	High

Impact description	Extent	Duration	Magnitude	Probability	Significance (without mitigation)	Significance (with mitigation)	Reversibility	Mitigation	Confidence level
IMPACT 3: Direct mortality of Red List species as a result of construction activities									
Mortality of Red List nestlings as a result of the construction of the proposed THM and its associated infrastructure resulting in a negative direct impact on the resident avifauna.	Site (1)	Short term (2)	High (8)	Unlikely (2)	LOW-MODERATE (22)	LOW (18)	High	The low significance of this impact does not warrant mitigation	High
OPERATIONAL PHASE									
IMPACT 1: Mortality of Red List species due to collision with the 11kV power line conductors									
Collisions of Red List avifauna with the conductors of the proposed 11kV power line, resulting in a negative direct mortality impact, particularly large terrestrial birds and to a lesser extent raptors.	Regional (3)	Long term (4)	High (8)	Unlikely (2)	LOW-MODERATE (30)	LOW (15)	High	<ul style="list-style-type: none"> * Power line & servitude manager/ECO is requested to report all bird collisions encountered during routine line patrols of 11kV power line to the Eskom-Endangered Wildlife Trust Strategic Partnership who will provide reactive mitigation recommendations, if necessary. * Bird flight diverters to be maintained on sections of power line during the operational life span of the 11kV power line. 	High
Impact description	Extent	Duration	Magnitude	Probability	Significance (without mitigation)	Significance (with mitigation)	Reversibility	Mitigation	Confidence level

IMPACT 2: Mortality of Red List species due to electrocution on the 11kV power line poles									
Electrocutions of Red List avifauna on the live and earthed components on the 11kV power line poles/towers, resulting in a negative direct mortality impact.	Regional (3)	Long term (4)	High (8)	Unlikely (2)	LOW-MODERATE (30)	LOW (15)	High	<ul style="list-style-type: none"> * The 11kV power line must be constructed using a bird friendly structure (inverted Delta-T). * Additional mitigation in the form of insulating sleeves on <i>jumpers</i> present on strain poles, terminal poles and box transformers must also be considered. * Insulating material to be maintained during the operational life span of the 11kV power line. * Power line & servitude manager/ECO must report all bird electrocutions encountered during routine line patrols of 11kV power line to the Endangered Wildlife Trust: Wildlife & Energy Programme for mitigation recommendations, if necessary. 	High
Impact description	Extent	Duration	Magnitude	Probability	Significance (without mitigation)	Significance (with mitigation)	Reversibility	Mitigation	Confidence level
IMPACT 3: Mortality of Red List species due to electrocution within the on-site substation									
Electrocutions of Red List avifauna on the live and earthed components within the on-site substation, resulting in a negative direct mortality impact.	Local (2)	Long term (4)	Moderate (6)	Improbable (2)	LOW (24)	LOW (12)	High	<ul style="list-style-type: none"> * Should electrocutions occur within the on-site substation yard, mitigation can be applied reactively using a range of insulation devices. Site-specific recommendations should be sought from the Endangered Wildlife 	High

								Trust's Wildlife & Energy Programme.	
IMPACT 4: Mortality of Red List species due to collisions with motor vehicles									
Collisions of Red List avifauna with the motor vehicles utilising both the proposed access and internal roads resulting in a negative direct mortality impact.	Local (2)	Long term (4)	High (6)	Probable (3)	MEDIUM (36)	LOW (24)	High	<ul style="list-style-type: none"> * Vehicles must utilise existing roads only. * Speed restrictions to be enforced for all vehicles to limit avifaunal collisions. * Awareness initiatives to educate road users about the presence of avifaunal species utilising the roads, * Should collisions persist mitigation recommendations to be sought from Endangered Wildlife Trust's Wildlife & Transport Programme. 	High

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).

OBJECTIVE: Mitigate the displacement and direct mortality impacts caused by the construction and operation of the proposed mine development and its associated surface infrastructure .		
Project component/s	Tawana Hotazel Mine and its associated surface infrastructure, including the 11kV overhead power line	
Potential Impact	Permanent displacement and mortality of local populations of Red List and non-Red List species caused by habitat loss, disturbance, collisions with the overhead conductors and electrocutions on the power line and substation infrastructure.	
Activity/risk source	<ul style="list-style-type: none"> * Construction of the proposed mine development and its associated surface infrastructure, including the 11kV overhead power line within sensitive avifaunal habitat. * Unmitigated construction and operational activities. 	
Mitigation: Target/Objective	Limit avifaunal mortality and displacement as far as practically possible for the duration of the operational life span of the proposed mine development and its associated surface infrastructure.	
Mitigation: Action/control	Responsibility	Timeframe
CONSTRUCTION PHASE		
<p><i>Displacement as a result of habitat loss:</i></p> <ul style="list-style-type: none"> * A pre-construction inspection prior to the removal of the water within the open void and the construction of the mine to confirm Verreaux's Eagle nest status. Should the nest be active it is recommended that the Endangered Wildlife Trust: Birds of Prey Programme be contacted to ensure the appropriate measures are taken to incubate and/or relocate the chick. * The removal of the water within the open void and underground workings to be done between April and June outside of the waterfowl breeding season. * The construction of an island within the proposed stormwater ponds, utilising the existing vegetation (i.e. do not remove large trees in these areas) will provide alternative 	Construction Manager, Environmental Control Officer and Avifaunal Specialist.	Prior to the commencement of construction (inclusive of all project components to the completion of construction.

<p>nesting habitat for the resident waterfowl species.</p>		
<p><i>Displacement as a result of disturbance:</i></p> <ul style="list-style-type: none"> * A pre-construction inspection prior to the removal of the water within the open void and the construction of the mine to confirm Verreaux's Eagle nest status. Should the nest be active it is recommended that the Endangered Wildlife Trust: Birds of Prey Programme be contacted to ensure the appropriate measures are taken to incubate and/or relocate the chick. * The removal of the water within the open void and underground workings to be done between April and June outside of the waterfowl breeding season. * The construction of an island within the proposed stormwater ponds, utilising the existing vegetation (i.e. do not remove large trees in these areas) will provide alternative nesting habitat for the resident waterfowl species. 	<p>Construction Manager, Environmental Control Officer and Avifaunal Specialist.</p>	<p>Prior to the commencement of construction (inclusive of all project components to the completion of construction.</p>
<p>OPERATIONAL PHASE</p>		
<p><i>Mortality as a result of electrocutions on the 11kV power line infrastructure:</i></p> <ul style="list-style-type: none"> * The 11kV power line connecting the mine office and weighbridge to the on-site mini substation must be constructed using a bird friendly structure (Inverted Delta-T). * Additional mitigation in the form of insulating sleeves on <i>jumpers</i> present on strain poles, terminal poles and box transformers must also be considered. * Insulating material to be maintained during the operational life span of the 11kV power line. * Power line & servitude manager/ECO must report all bird electrocutions encountered during routine line patrols of 11kV power line to the Endangered Wildlife Trust: Wildlife & 	<p>Environmental Manager, Line and Servitude Manager, Environmental Control Officer and Endangered Wildlife Trust: Wildlife & Energy Programme</p>	<p>For the duration of the operational life-span of the 11kV power line infrastructure</p>

Energy Programme for mitigation recommendations, if necessary.		
<p><i>Mortality as a result of electrocutions within the on-site substation:</i></p> <p>Should electrocutions occur within the on-site substation yard, mitigation can be applied reactively using a range of insulation devices. Site-specific recommendations should be sought from the Endangered Wildlife Trust's Wildlife & Energy Programme.</p>	Environmental Manager, Line and Servitude Manager, Environmental Control Officer and Endangered Wildlife Trust: Wildlife & Energy Programme	For the duration of the operational life-span of the on-site substation.
<p><i>Mortality as a result of collisions with the 11kV power line earthwires and/or conductors:</i></p> <ul style="list-style-type: none"> * Power line & servitude manager/ECO is requested to report all bird collisions encountered during routine line patrols of 11kV power line to the Eskom-Endangered Wildlife Trust Strategic Partnership who will provide reactive mitigation recommendations, if necessary. * Bird flight diverters to be maintained on sections of power line during the operational life span of the 11kV power line. 	Environmental Manager, Line and Servitude Manager, Environmental Control Officer and Endangered Wildlife Trust: Wildlife & Energy Programme	For the duration of the operational life-span of the 11kV power line infrastructure
<p><i>Collisions of avifauna with the motor vehicles:</i></p> <ul style="list-style-type: none"> * Vehicles must utilise existing roads only. * Speed restrictions to be enforced for all vehicles to limit avifaunal collisions. * Awareness initiatives to educate road users about the presence of avifaunal species utilising the roads. <p>Should collisions persist mitigation recommendations to be sought from Endangered Wildlife Trust's Wildlife & Transport Programme.</p>	Environmental Manager, Road Servitude Manager, Environmental Control Officer and Endangered Wildlife Trust: Wildlife & Transport Programme	For the duration of the operational life-span of the mine development and its associated road infrastructure
<p><i>Nest building on the 11kV power line, within the on-site substation and other surface infrastructure:</i></p> <p>If on-going impacts are recorded once the mine development, 11kV power line and on-site substation are operational, it is recommended that these impacts be assessed by Endangered Wildlife Trust:</p>	Environmental Manager, Line and Servitude Manager, Environmental Control Officer and Endangered Wildlife Trust: Wildlife & Energy Programme.	For the duration of the operational life-span of the mine development and its associated surface infrastructure.

<p>Wildlife & Energy Programme and site-specific mitigation be applied reactively.</p> <p>While it is not illegal to remove an unoccupied nest that is posing a quality of supply risk, the removal of nests that contain eggs or chicks will require a permit to do so. Nest management strategies to be identified and implemented reactively, if required.</p>		
<p>Performance Indicator</p>	<ul style="list-style-type: none"> * Alternative nesting/breeding habitat is established. * Sustainable levels of mortalities are reported on a monthly basis and the necessary mitigation measures are implemented timeously. 	

10. PROPOSED MONITORING ACTIONS

A pre-construction inspection prior to the removal of the water within the open void and the construction of the mine to confirm Verreaux’s Eagle nest status and to provide appropriate measures to incubate and/or relocate the chick should the nest be active.

The Environmental Manager and/or Environmental Control Officer to conduct regular inspections of surface infrastructure associated with the mine development power lines to 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 proposed study area is located is moderate to highly sensitive from a potential bird impact perspective. The establishment of the proposed mine development and construction of its associated surface infrastructure will result in impacts of MODERATE significance to birds occurring in the vicinity of the new infrastructure, which can be reduced to through the application of mitigation measures. It is anticipated that the proposed mine development and its associated surface infrastructure can be constructed within the study area with acceptable levels of impact on the resident avifauna, subject to the following recommendations:

- * A pre-construction inspection prior to the removal of the water within the open void and the construction of the mine to confirm Verreaux’s Eagle nest status must be conducted. Should the nest be active it is recommended that the Endangered Wildlife Trust: Birds of Prey Programme be contacted to ensure the appropriate measures are taken to incubate and/or relocate the chick.

- * The removal of the water within the open void and underground workings to be done between April and June outside of the waterfowl breeding season.
- * The construction of an island within the proposed stormwater ponds, utilising the existing vegetation (i.e. do not remove large trees in these areas) will provide alternative nesting habitat for the resident waterfowl species.
- * The 11kV power line must be constructed using a bird friendly structure (Inverted Delta-T).
- * Additional mitigation in the form of insulating sleeves on *jumpers* present on strain poles, terminal poles and box transformers must also be considered.
- * If collision or electrocution impacts are recorded once the 11kV power line and on-site substation are operational, it is recommended that the Endangered Wildlife Trust: Wildlife & Energy Programme investigate the mortalities and provide recommendations for site-specific mitigation to be applied reactively.
- * Vehicles must utilise existing roads only.
- * Speed restrictions to be enforced for all vehicles to limit avifaunal collisions.
- * Awareness initiatives to educate road users about the presence of avifaunal species utilising the roads.
- * Should collisions persist mitigation recommendations to be sought from Endangered Wildlife Trust's Wildlife & Transport Programme.
- * Construction activities (i.e. all staff, vehicle and machinery) should be restricted to the immediate footprint of the infrastructure. The recommendations of the botanical study must be strictly implemented.
- * 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. New roads are to be located in areas of existing high disturbance, and not encroach upon sensitive habitats.
- * 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 outcomes of the impact assessment detailed in Section 8, in conjunction with the baseline conditions as presented in Section 7 and the impact management measures in Section 9, the proposed mine development is not deemed to present significant negative environmental issues or impacts. It is this specialist's opinion that the proposed *THM* development can be constructed within the delineated area with acceptable levels of impact on the resident avifauna subject to the aforementioned mitigation and management measures.

12. ASSUMPTIONS, UNCERTAINTIES & GAPS IN KNOWLEDGE

The author assumed that the sources of information used 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 single one-day site visit to the proposed development area. 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. This 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 proposed development area. Based on these findings, the specialist was able to identify and assess the anticipated impacts
- * By virtue of their mobility, the assessment of bird presence and abundance cannot be confined to the proposed mine development project site, therefore the **study area was defined as a 2km zone** around the proposed development area (FIGURE 1).
- * Although the proposed mine development is located within a single pentad grid cell (2710_2255), a larger area is necessary to obtain a dataset that is large enough (encompassing nine pentad grid cells) to ensure that reasonable conclusions about species diversity and densities, in a particular habitat type, can be drawn. Coverage by SABAP2 is adequate with a total of 49 full protocol data cards being completed across the nine pentads (FIGURE 3). The SABAP2 data is regarded as a reliable record of the avifauna likely to occur within the project area.
- * The focus of this avifaunal impact assessment is primarily on the potential impacts on Red List and priority non-Red List species i.e. species that are vulnerable to the displacement impacts associated with the surface infrastructure construction and operation of the proposed mine. The impact on the common species is also considered, albeit in less detail.
- * 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.

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 avifaunal impact assessment report and subsequent recommendations for this project.**

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APPENDIX 1: POTENTIAL AVIFAUNAL HABITAT OBSERVED WITHIN THE DEVELOPMENT AREA



FIGURE 1: Pockets of natural Kathu Bushveld



FIGURE 2: Transformed and degraded Kathu Bushveld located within the historical pit.



FIGURE 3: Waterbody within the historical pit.

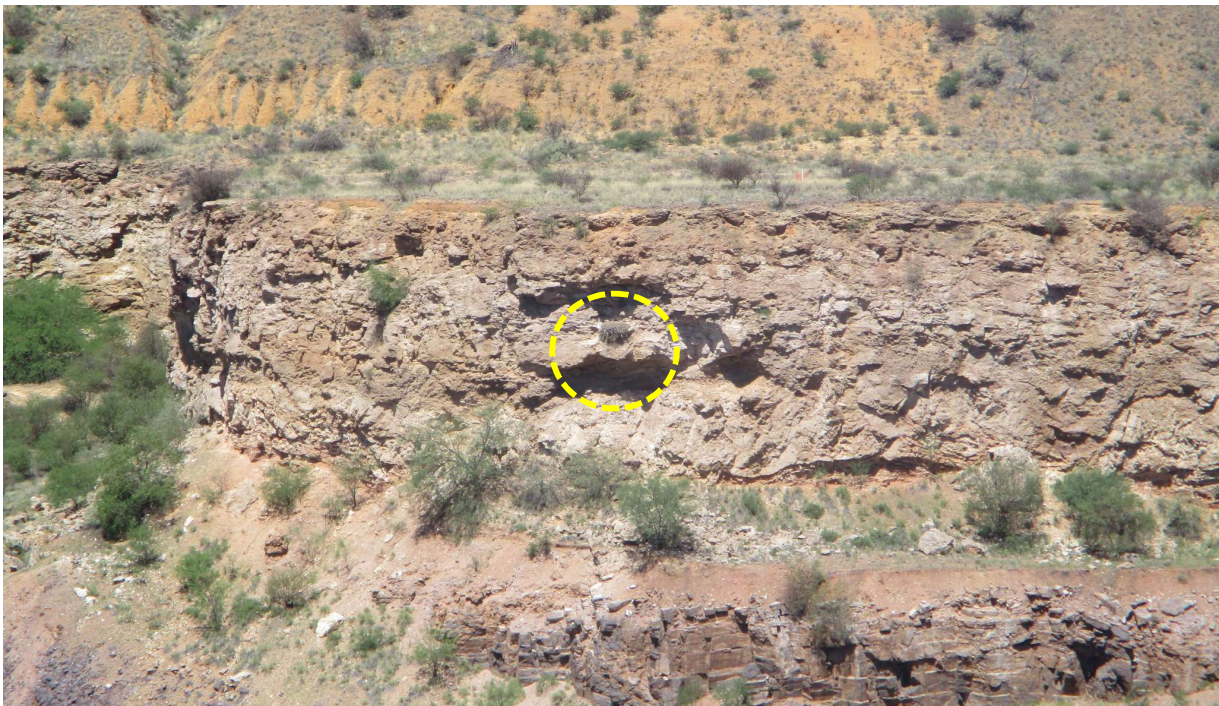


FIGURE 4: One of two Verreaux's Eagle nest locations that occur within the proposed development area

APPENDIX 2: SOUTH AFRICAN BIRD ATLAS PROJECT DATA (SABAP2) RECORDED IN THE BROADER STUDY AREA

Family name	Scientific name	Red List Global	Red List Regional	Endemicity South Africa	Endemicity Southern Africa	Report Rate	Number
Barbet, Acacia Pied	<i>Tricholaema leucomelas</i>				Near-endemic	76.6	36
Barbet, Crested	<i>Trachyphonus vaillantii</i>					8.5	4
Batis, Pirit	<i>Batis pririt</i>				Near-endemic	27.7	13
Bee-eater, European	<i>Merops apiaster</i>					38.3	18
Bee-eater, Swallow-tailed	<i>Merops hirundineus</i>					31.9	15
Bishop, Southern Red	<i>Euplectes orix</i>					2.1	1
Bokmakierie	<i>Telophorus zeylonus</i>				Near-endemic	6.4	3
Brubru	<i>Nilus afer</i>					27.7	13
Buffalo-weaver, Red-billed	<i>Bubalornis niger</i>					8.5	4
Bulbul, African Red-eyed	<i>Pycnonotus nigricans</i>				Near-endemic	74.5	35
Bunting, Cinnamon-breasted	<i>Emberiza tahapisi</i>					4.3	2
Bunting, Golden-breasted	<i>Emberiza flaviventris</i>					23.4	11
Bunting, Lark-like	<i>Emberiza impetuani</i>				Near-endemic	10.6	5
Bustard, Kori	<i>Ardeotis kori</i>	NT	NT			4.3	2
Canary, Black-throated	<i>Crithagra atrogularis</i>					19.1	9
Canary, Yellow	<i>Crithagra flaviventris</i>				Near-endemic	70.2	33
Chat, Anteating	<i>Myrmecocichla formicivora</i>				Endemic	21.3	10
Chat, Familiar	<i>Cercomela familiaris</i>					63.8	30
Cisticola, Desert	<i>Cisticola aridulus</i>					17.0	8
Cisticola, Tinkling	<i>Cisticola rufilatus</i>					2.1	1
Coot, Red-knobbed	<i>Fulica cristata</i>					2.1	1
Courseer, Double-banded	<i>Rhinoptilus africanus</i>					2.1	1
Crombec, Long-billed	<i>Sylvietta rufescens</i>					14.9	7
Crow, Pied	<i>Corvus albus</i>					17.0	8
Cuckoo, Black	<i>Cuculus clamosus</i>					2.1	1
Cuckoo, Diderick	<i>Chrysococcyx caprius</i>					10.6	5
Cuckoo, Great Spotted	<i>Clamator glandarius</i>					4.3	2
Cuckoo, Jacobin	<i>Clamator jacobinus</i>					12.8	6
Dove, Laughing	<i>Streptopelia senegalensis</i>					83.0	39
Dove, Namaqua	<i>Oena capensis</i>					29.8	14
Dove, Red-eyed	<i>Streptopelia semitorquata</i>					48.9	23
Dove, Rock	<i>Columba livia</i>					2.1	1
Drongo, Fork-tailed	<i>Dicrurus adsimilis</i>					57.4	27
Eagle, Martial	<i>Polemaetus bellicosus</i>	VU	EN			2.1	1

Family name	Scientific name	Red List Global	Red List Regional	Endemicity South Africa	Endemicity Southern Africa	Report Rate	Number
Eagle, Verreaux's	<i>Aquila verreauxii</i>	LC	VU			2.1	1
Eagle-owl, Spotted	<i>Bubo africanus</i>					2.1	1
Eremomela, Yellow-bellied	<i>Eremomela icteropygialis</i>					19.1	9
Falcon, Lanner	<i>Falco biarmicus</i>	LC	VU			6.4	3
Falcon, Pygmy	<i>Polihierax semitorquatus</i>					4.3	2
Finch, Red-headed	<i>Amadina erythrocephala</i>				Near-endemic	29.8	14
Finch, Scaly-feathered	<i>Sporopipes squamifrons</i>				Near-endemic	72.3	34
Firefinch, Red-billed	<i>Lagonosticta senegala</i>					4.3	2
Fiscal, Common	<i>Lanius collaris</i>					17.0	8
Flycatcher, Chat	<i>Bradornis infuscatus</i>				Near-endemic	21.3	10
Flycatcher, Fairy	<i>Stenostira scita</i>			Near endemic	Endemic	4.3	2
Flycatcher, Fiscal	<i>Sigelus silens</i>			Near endemic	Endemic	40.4	19
Flycatcher, Marico	<i>Bradornis mariquensis</i>				Near-endemic	63.8	30
Flycatcher, Spotted	<i>Muscicapa striata</i>					14.9	7
Go-away-bird, Grey	<i>Corythaixoides concolor</i>					2.1	1
Goshawk, Gabar	<i>Melierax gabar</i>					23.4	11
Goshawk, Southern Pale Chanting	<i>Melierax canorus</i>				Near-endemic	19.1	9
Guineafowl, Helmeted	<i>Numida meleagris</i>					42.6	20
Hoopoe, African	<i>Upupa africana</i>					29.8	14
Hornbill, African Grey	<i>Tockus nasutus</i>					40.4	19
Hornbill, Southern Yellow-billed	<i>Tockus leucomelas</i>				Near-endemic	42.6	20
Ibis, Hageda	<i>Bostrychia hagedash</i>					6.4	3
Kestrel, Greater	<i>Falco rupicoloides</i>					10.6	5
Kestrel, Rock	<i>Falco rupicolus</i>					8.5	4
Kite, Black-shouldered	<i>Elanus caeruleus</i>					8.5	4
Korhaan, Northern Black	<i>Afrotis afraoides</i>				Endemic	21.3	10
Korhaan, Red-crested	<i>Lophotis ruficrista</i>				Near-endemic	27.7	13
Lapwing, Blacksmith	<i>Vanellus armatus</i>					40.4	19
Lapwing, Crowned	<i>Vanellus coronatus</i>					40.4	19
Lark, Eastern Clapper	<i>Mirafra fasciolata</i>				Near-endemic	8.5	4
Lark, Fawn-coloured	<i>Calendulauda africanoides</i>					31.9	15
Lark, Red-capped	<i>Calandrella cinerea</i>					6.4	3
Lark, Sabota	<i>Calendulauda sabota</i>				Near-endemic	6.4	3
Lark, Spike-heeled	<i>Chersomanes albofasciata</i>				Near-endemic	2.1	1
Martin, Brown-throated	<i>Riparia paludicola</i>					6.4	3
Martin, Rock	<i>Hirundo fuligula</i>					61.7	29

Family name	Scientific name	Red List Global	Red List Regional	Endemicity South Africa	Endemicity Southern Africa	Report Rate	Number
Masked-weaver, Southern	<i>Ploceus velatus</i>					83.0	39
Mousebird, Red-faced	<i>Urocolius indicus</i>					36.2	17
Mousebird, White-backed	<i>Colius colius</i>				Endemic	61.7	29
Myna, Common	<i>Acridotheres tristis</i>					46.8	22
Neddicky, Neddicky	<i>Cisticola fulvicapilla</i>					4.3	2
Ostrich, Common	<i>Struthio camelus</i>					2.1	1
Owlet, Pearl-spotted	<i>Glaucidium perlatum</i>					21.3	10
Palm-swift, African	<i>Cypsiurus parvus</i>					25.5	12
Penduline-tit, Cape	<i>Anthoscopus minutus</i>				Near-endemic	6.4	3
Pigeon, Speckled	<i>Columba guinea</i>					51.1	24
Pipit, African	<i>Anthus cinnamomeus</i>					6.4	3
Pipit, Buffy	<i>Anthus vaalensis</i>					2.1	1
Prinia, Black-chested	<i>Prinia flavicans</i>				Near-endemic	85.1	40
Pytilia, Green-winged	<i>Pytilia melba</i>					14.9	7
Quelea, Red-billed	<i>Quelea quelea</i>					29.8	14
Reed-warbler, African	<i>Acrocephalus baeticatus</i>					2.1	1
Robin-chat, Cape	<i>Cossypha caffra</i>					2.1	1
Rock-thrush, Short-toed	<i>Monticola brevipes</i>				Near-endemic	4.3	2
Roller, European	<i>Coracias garrulus</i>	LC	NT			2.1	1
Roller, Lilac-breasted	<i>Coracias caudatus</i>					27.7	13
Roller, Purple	<i>Coracias naevius</i>					12.8	6
Sandgrouse, Burchell's	<i>Pterocles burchelli</i>				Near-endemic	14.9	7
Sandgrouse, Namaqua	<i>Pterocles namaqua</i>				Near-endemic	17.0	8
Scimitarbill, Common	<i>Rhinopomastus cyanomelas</i>					21.3	10
Scrub-robin, Kalahari	<i>Erythropygia paena</i>				Near-endemic	72.3	34
Shelduck, South African	<i>Tadorna cana</i>				Endemic	4.3	2
Shrike, Crimson-breasted	<i>Laniarius atrococcineus</i>				Near-endemic	29.8	14
Shrike, Lesser Grey	<i>Lanius minor</i>					10.6	5
Shrike, Red-backed	<i>Lanius collurio</i>					14.9	7
Snake-eagle, Black-chested	<i>Circaetus pectoralis</i>					4.3	2
Sparrow, Cape	<i>Passer melanurus</i>				Near-endemic	36.2	17
Sparrow, House	<i>Passer domesticus</i>					51.1	24
Sparrow, Southern Grey-headed	<i>Passer diffusus</i>					34.0	16
Sparrowlark, Grey-backed	<i>Eremopterix verticalis</i>				Near-endemic	6.4	3
Sparrow-weaver, White-browed	<i>Plocepasser mahali</i>					42.6	20
Spurfowl, Red-billed	<i>Pternistis adspersus</i>				Near-endemic	27.7	13

Family name	Scientific name	Red List Global	Red List Regional	Endemicity South Africa	Endemicity Southern Africa	Report Rate	Number
Starling, Cape Glossy	<i>Lamprotornis nitens</i>					83.0	39
Starling, Pale-winged	<i>Onychognathus nabouroup</i>				Near-endemic	8.5	4
Starling, Pied	<i>Lamprotornis bicolor</i>			Endemic	Endemic	2.1	1
Starling, Wattled	<i>Creatophora cinerea</i>					12.8	6
Sunbird, Dusky	<i>Cinnyris fuscus</i>				Near-endemic	4.3	2
Sunbird, Marico	<i>Cinnyris mariquensis</i>					44.7	21
Swallow, Barn	<i>Hirundo rustica</i>					10.6	5
Swallow, Greater Striped	<i>Cecropis cucullata</i>					44.7	21
Swallow, Red-breasted	<i>Cecropis semirufa</i>					4.3	2
Swift, Common	<i>Apus apus</i>					2.1	1
Swift, Little	<i>Apus affinis</i>					44.7	21
Swift, White-rumped	<i>Apus caffer</i>					14.9	7
Tchagra, Brown-crowned	<i>Tchagra australis</i>					17.0	8
Teal, Red-billed	<i>Anas erythrorhyncha</i>					2.1	1
Thick-knee, Spotted	<i>Burhinus capensis</i>					4.3	2
Thrush, Groundscraper	<i>Turdus litsitsirupa</i>					34.0	16
Thrush, Karoo	<i>Turdus smithi</i>			Near endemic	Endemic	27.7	13
Tit, Ashy	<i>Parus cinerascens</i>				Near-endemic	42.6	20
Tit-babbler, Chestnut-vented	<i>Sylvia subcaerulea</i>				Near-endemic	66.0	31
Turtle-dove, Cape	<i>Streptopelia capicola</i>					63.8	30
Vulture, White-backed	<i>Gyps africanus</i>	CR	CR			4.3	2
Wagtail, Cape	<i>Motacilla capensis</i>					8.5	4
Warbler, Rufous-eared	<i>Malcorus pectoralis</i>				Endemic	2.1	1
Warbler, Willow	<i>Phylloscopus trochilus</i>					2.1	1
Waxbill, Black-faced	<i>Estrilda erythronotos</i>					12.8	6
Waxbill, Violet-eared	<i>Uraeginthus granatinus</i>					51.1	24
Weaver, Sociable	<i>Philetairus socius</i>				Endemic	6.4	3
Wheatear, Capped	<i>Oenanthe pileata</i>					6.4	3
White-eye, Orange River	<i>Zosterops pallidus</i>				Endemic	17.0	8
Whydah, Shaft-tailed	<i>Vidua regia</i>				Near-endemic	14.9	7
Woodpecker, Cardinal	<i>Dendropicos fuscescens</i>					6.4	3
Woodpecker, Golden-tailed	<i>Campethera abingoni</i>					14.9	7

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

Potential impacts of the proposed activity on the environment were assessed in terms a formalised method, whereby a typical risk assessment process was undertaken to determine the significance of the potential impacts without the application of mitigation/management measures (WOMM). Once the significance of the impacts without the application of mitigation/management measures was known, the impacts were then re-evaluated, taking cognisance of the application of proposed mitigation/management measures provided to reduce the impact (WMM), thus enabling an understanding of the overall impact after the implementation of mitigation/management measures. The process that was undertaken is described in the section below.

It should be clearly understood that, in determining the significance of potential impacts for the present study, the assessment of impact significance post-mitigation assumes that all mitigation measures as proposed within this report are implemented. In the event that some mitigation measures are not deemed feasible by the client, re-evaluation of the significance of the potential impacts post-mitigation will be required which takes into consideration the application of mitigation measures deemed by the client as feasible.

The **EXTENT** refers to the impact footprint. What that means is that if a species were to be lost then the extent would be global because that species would be lost to the world. If human health is threatened, then the impact is likely to be no more than local and possibly (in the case of a nuclear power station) regional.

TABLE 2: Descriptors and scoring for the EXTENT of an impact

Descriptors	Definitions	Score
Site only	The impact remains within the footprint or cadastral boundary of the site.	1
Local	The impact extends beyond the footprint or cadastral boundary of the site, to include the immediately adjacent and surrounding areas.	2
Regional	The impact includes the greater surrounding area within which the site is located.	3
National	The scale/extent of the impact is applicable to the Republic of South Africa.	4
Global	The scale /extent of the impact is global (i.e., world-wide).	5

The **DURATION** is the period of time for which the impact would be manifest. Importantly, the concept of reversibility is taken into consideration in the scoring. In other words, the longer the impact endures, the less likely is the reversibility of the impact.

TABLE 2: Descriptors and scoring for the DURATION of an impact

Descriptors	Definitions	Score
Temporary	The impact endures for only a short period of time (0-1 years).	1
Short term	The impact continues to manifest for a period of between 1-5 years.	2
Medium term	The impact continues to manifest for a period of 5-15 years.	3
Long term	The impact will cease after the operational life of the activity.	4
Permanent	The impact will continue indefinitely.	5

The **MAGNITUDE** is the measure of the potential severity of the impact on the associated environment. As with duration, the concept of reversibility should be taken into account when considering the magnitude of the potential impact.

TABLE 3: Descriptors and scoring for the MAGNITUDE of an impact

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

The **LIKELIHOOD** is the likelihood of the impact manifesting. Although likelihood and probability may be considered interchangeable, the term likelihood is preferred as probability has a very specific mathematical and/ or statistical connotation. As such the expectation created by the term probability is that there will be an accurate empirically or mathematically defined expression of risk, which is not necessarily required.

TABLE 4: Descriptors and scoring for the LIKELIHOOD of an impact

Descriptors	Definitions	Score
Very improbable / Rare	Where it is highly unlikely that the impact will occur, either because of design or because of historic experience	1
Unlikely	Improbable – where the impact is unlikely to occur (some possibility), either because of design or historic experience.	2
Probable	there is a distinct probability that the impact will occur (< 50% chance of occurring)	3
Highly Probable	Most likely that the impact will occur (50 – 90% chance of occurring)	4
Definite	The impact will occur regardless of any prevention or mitigating measures (>90% chance of occurring).	5

The **SIGNIFICANCE** of impacts is derived through a synthesis of ratings of all criteria in the following calculation: **(Extent + Duration + Magnitude) x Likelihood = Significance**

TABLE 5: Descriptors for the SIGNIFICANCE score of an impact

Descriptors	Definitions	Score
Low	The perceived impact will not have a noticeable negative influence on the environment and is unlikely to require management intervention that would incur significant cost.	0 – 19
Low to Moderate	The perceived impact is considered acceptable, and application of recommended mitigation measures recommended.	20 – 39
Moderate	The perceived impact is likely to have a negative effect on the receiving ecosystem, and is likely to influence the decision to approve the activity. Implementation of mitigation measures is required, as is routine monitoring to ensure effectiveness of recommended mitigation measures.	40 – 59
Moderate to High	The perceived impact will have a significant impact on the receiving ecosystem, and will likely to have an influence on the decision-making process. Strict implementation of mitigation measures as provided is required, and strict monitoring and high levels of compliance and enforcement in respect of the impact in question are required.	60 – 79
High	The impact on the receiving ecosystem is considered of high significant and likely to be irreversible, and therefore highly likely to result in a fatal flaw for the project. Alternatives to the proposed activity are to be investigated as impact will have an influence on the decision-making process.	80 - 100

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.

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.

Declaration of Independence by Specialist

I, _____MEGAN DIAMOND_____, in my capacity as a specialist consultant, hereby declare that I –

- act as an independent specialist;

Where “**independent**” in relation a **specialist** means the following, as defined in GN982 of 2014 (as amended):

(a) that such EAP, **specialist** or person has no business, financial, personal or other interest in the activity or application in respect of which that EAP, specialist or person is appointed in terms of these Regulations; or

(b) that there are no circumstances that may compromise the objectivity of that EAP, specialist or person in performing such work;

excluding -

(i) normal remuneration for a specialist permanently employed by the EAP; or

(ii) fair remuneration for work performed in connection with that activity, application or environmental audit;

- will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- declare that there are no circumstances that may compromise my objectivity in performing such work;
- do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- have expertise in conducting the specialist report relevant to this application, including knowledge of the National Environmental Management Act, 1998 (Act No. 107 of 1998), regulations and any guidelines that have relevance to the proposed activity;
- based on information provided to me by the project proponent and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional ability; and
- undertake to have my work peer reviewed on a regular basis by a competent specialist in the field of study for which I am registered.



Signature of the Specialist

FEATHERS ENVIRONMENTAL SERVICES CC

Name of Company:

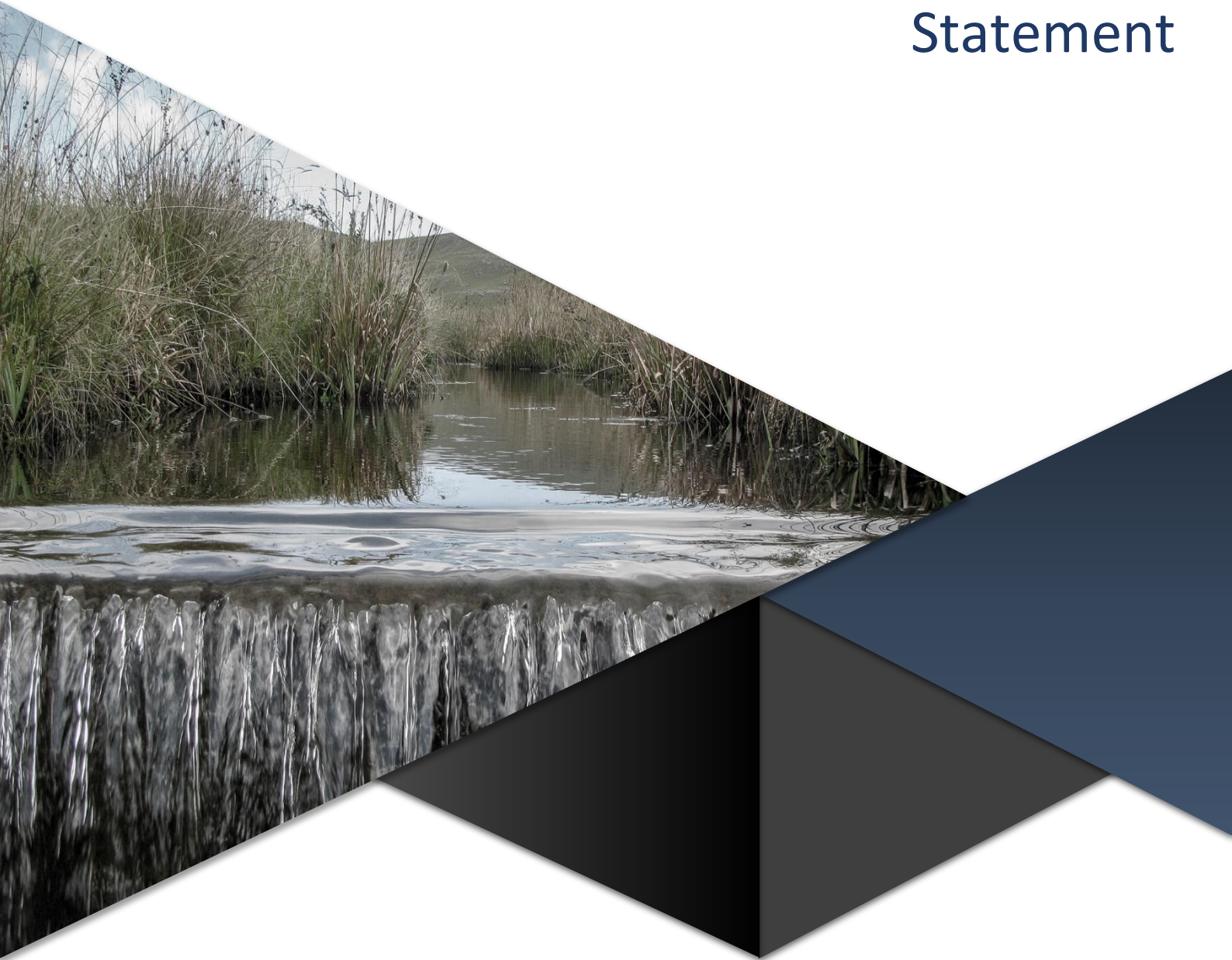
25 AUGUST 2021

Date

APPENDIX 16
AQUATIC BIODIVERSITY COMPLIANCE
STATEMENT

Hotazel Mine

Aquatic Biodiversity Compliance Statement



Ecology International

Sustainability through Collaboration

AQUATIC BIODIVERSITY COMPLIANCE STATEMENT

Hotazel Mine

Project Ref No. 200090

Prepared for:



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January 2021

Report developed by:



Kieren Bremner Pr.Sci.Nat.

Senior specialist

Ecology International (Pty) Ltd

SACNASP Reg. No. 119341 (Aquatic Science)

Report approved by:



Byron Grant Pr.Sci.Nat.

Director & Principal Specialist

Ecology International (Pty) Ltd

SACNASP Reg. No. 400275/08 (Aquatic Science,
Ecological Science & Zoological Science)

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Findings, recommendations and conclusions provided in this report are based on the authors' best scientific and professional knowledge and information available at the time of compilation. This report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and Ecology International (Pty.) Ltd. and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation

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Declaration of Independence by Specialist

I, **KIEREN BREMNER**, in my capacity as a specialist consultant, hereby declare that I -

- act as an independent consultant;
- will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- declare that there are no circumstances that may compromise my objectivity in performing such work;
- do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- have expertise in conducting the specialist report relevant to this application, including knowledge of the National Environmental Management Act, 1998 (Act No. 107 of 1998), regulations and any guidelines that have relevance to the proposed activity;
- based on information provided to me by the project proponent and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional ability;
- undertake to have my work peer reviewed on a regular basis by a competent specialist in the field of study for which I am registered; and
- as a registered member of the South African Council for Natural Scientific Professions, will undertake my profession in accordance with the Code of Conduct of the Council, as well as any other societies to which I am a member.



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(Aquatic Science)

25 January 2021

Date

EXECUTIVE SUMMARY

Prime Resources (Pty) Ltd appointed Ecology International (Pty) Ltd to provide a specialist aquatic biodiversity compliance statement for the proposed Hotazel Mine in the Northern Cape, South Africa. The purpose of the study was to determine the potential aquatic ecosystem sensitivity associated with the proposed Hotazel Project area.

Based on the results obtained during the present study, the closest aquatic systems to the proposed mining activities were determined to be the Ga-Mogara and Kuruman Rivers approximately 5 km and 9 km away, respectively. Accordingly, the area associated with the proposed mining activities is confirmed to have a low sensitivity from the perspective of natural surface water features. Further, the lack of natural surface water within the proximity of the proposed Hotazel Mine means that the impact of the proposed mining activity on the surrounding natural freshwater ecosystem is likely to be low.

Despite the above, cognisance must be given to the presence of an artificial, yet functional, aquatic ecosystem present within the void left by previous mining activities, and the presence of at least one provincially Protected fish species, *Tilapia sparrmanii*. Accordingly, the following recommendations pertaining to the way forward are proposed:

- Should the draining of the pit lake be required for future mining purposes, a detailed assessment of the fish species present within the lake will need to be conducted by an accredited aquatic specialist so as to advise on permit requirements. At present, it is known that at least one fish species identified within pit lake during the present study is listed as Protected under the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009), and as such, a permit will be required should translocations (or any other activity involving the fish species present) be undertaken. Further permits may be required depending on any additional species present;
- In the event that the pit lake is drained and depending on the number of fish species present (see previous comment), a suitably qualified and accredited aquatic specialist must be present so as to identify species for further actions (e.g. translocation, euthanasia, etc.)
- Under no circumstances are fish to be removed for the purpose of consumption due to potential metal accumulation within tissues of the fish and associated liabilities.

DOCUMENT GUIDE

The following table indicates the requirements for the Aquatic Biodiversity Compliance Statement Government Notice 320 of March 2020 as it relates to the National Environmental Management Act, 1998 (Act No. 107 of 1998).

No.	Requirement	Section in report
A)	Compliance statement to be prepared by a suitably qualified specialist registered with SACNASP, with expertise in the field of aquatic science.	Appendix A; Appendix B
B)	Statement must:	
(1)	Be applicable to the preferred site and the proposed development footprint	Section 1.1 and Section 2.1
(2)	Confirm that the site is of “low” sensitivity for aquatic biodiversity	Section 4
(3)	Indicate whether the proposed development will have an impact on the aquatic features	Section 5.1
C)	Statement must contain:	
(1)	Contact details of the specialist, their SACNASP registration number, their field of expertise, and a curriculum vitae	Appendix A
(2)	A signed statement of independence by the specialist	Page iii
(3)	Duration, date, and season of the site inspection and the relevance of the season to the outcome of the assessment	Section 4.1
(4)	A baseline profile description of biodiversity and ecosystems of the site	Section 4.1.1
(5)	Methodology used to verify the sensitivities of the aquatic biodiversity features on the site, including equipment and modelling used where relevant	Not applicable – artificial system
(6)	In the case of a linear activity, confirmation from the specialist that, in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase	Not applicable
(7)	Where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr	Section 5.1
(8)	Description of assumptions made as well as any uncertainties or gaps in the knowledge or data	Section 1.2.2
(9)	Any conditions to which this statement is subjected	Section 1.2.2; Section 6

TABLE OF CONTENTS

Executive Summary.....	iv
Document Guide.....	v
Table of Contents.....	vi
List of Figures.....	vii
List of Tables.....	vii
Acronyms.....	viii
1. Introduction.....	1
1.1 Project Description.....	1
1.2 Terms of Reference.....	1
1.3 Assumptions and Limitations.....	2
1.4 Legislative Framework.....	2
2. General Characteristics.....	3
2.1 Location.....	3
2.2 Climate.....	3
2.3 Geology & Soils.....	3
2.4 Regional Vegetation.....	3
3. Freshwater Ecosystem Characteristics.....	5
3.1 Freshwater Ecoregion.....	5
3.2 National Ecoregional Typing.....	5
3.3 Associated Water Resources.....	5
3.4 Strategic Water Source Areas.....	6
3.5 National Freshwater Ecosystem Priority Areas.....	6
3.6 Northern Cape Critical Biodiversity Areas.....	9
4. Results.....	11
4.1 Associated Freshwater Resources.....	11
4.1.1 Pit lake within the pit void.....	11
5. Risk Assessment.....	13
5.1 Identification of Potential Impacts.....	13
6. Conclusion and Recommendations.....	13
7. Bibliography.....	15
Appendix A: Curriculum Vitae of Authors.....	16
Appendix B: Proof of SACNASP Registration of Authors.....	28

LIST OF FIGURES

Figure 1: Location of the proposed Hotazel Project area.	4
Figure 2: Watercourses associated with the proposed Hotazel Project area.....	7
Figure 3: National Freshwater Ecosystem Priority Areas associated with the proposed Hotazel Project area	8
Figure 4: Northern Cape CBA Map outputs for the areas adjacent to and in the vicinity of the Hotazel Project area (Holness and Oosthuysen, 2016).....	10
Figure 5: Location of the pit void (lake) and potential cryptic wetlands in relation to the proposed Hotazel Project area.....	12
Figure 6: General view of the pit void (lake) and the associated aquatic habitat.	13

LIST OF TABLES

Table 1: Co-ordinates and descriptions of the freshwater resources observed during the study	11
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ACRONYMS

CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
DWS	Department of Water and Sanitation
FEPA	Freshwater Ecosystem Priority Area
NBA	National Biodiversity Assessment
NFEPA	National Freshwater Ecosystem Priority Areas project
NWRS	National Water Resource Strategy)
SAIAB	South African Institute for Aquatic Biodiversity
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
WMA	Water Management Areas
WRC	Water Research Commission
WWF	Worldwide Fund for Nature

1. INTRODUCTION

1.1 Project Description

Tawana Investment Holdings (Pty) Ltd (TIH) intends on submitting an application for a Mining Right (MR) to the Department of Mineral Resources and Energy (DMRE) for the proposed Hotazel Project. The MR Application area is 145.1026 Ha. The types of minerals applied for are: all (Code UN); Iron and Iron bearing minerals including hematite, goethite, specularite and limonite (Code (Fe) Type (B)) and Manganese and manganese bearing minerals (Code (Mn) Type (B)).

The Hotazel Project is situated on portions of two farms (Hotazel 280 and York 279) within the Joe Morolong Local Municipality and is located approximately 1 km south-east of the town of Hotazel. The Hotazel Project largely incorporates the historical Hotazel Manganese Mine (HMM), including the residual opencast void, surface dumps of low-grade material and the mothballed processing plant and rail loadout facility. HMM stopped production in 1989. The area was historically mined by both opencast and underground means and yielded high grade manganese ore.

Surface infrastructure is to be developed within the Surface Development Area (SDA; 113.4 ha) which is located within the MR area as well as in an area adjacent to the MR area. Infrastructure to be located within the MR Area (approximately 76.6 ha) includes the opencast pit (incorporating the historical void and further expansion of the opencast footprint), in-pit waste dumps (residue material), vehicle yard, and haul roads. Infrastructure to be located adjacent to the MR area (approximately 36.8 ha) includes the offices, rail line and loading stations, processing plant (re-development or refurbishment of the existing plant), product stockpile area, Run of Mine pad (RoM), and a Pollution Control Dam (PCD).

Prime Resources (Pty) Ltd was therefore appointed by TIH to facilitate the necessary environmental processes associated with the proposed project. Subsequently, Prime Resources appointed Ecology International (Pty) Ltd as independent environmental specialists to provide a specialist aquatic biodiversity compliance statement for the proposed Hotazel Mine in the Northern Cape, South Africa, so as to inform the necessary process.

1.2 Terms of Reference

The Terms of Reference for the development of an aquatic compliance statement for the proposed activity was noted to be as follows:

- Undertake a desktop review of available literature to describe the baseline environment;
- Define applicable legislative requirements;
- Undertake a site visit to verify baseline information and address any knowledge gaps;
- Address the potential for ecological impacts and risks to occur as a result of the proposed activities, including the following:
 - A detailed risk assessment in accordance with Department of Water and Sanitation Notice 509 of 2016 for activities being applied for and occurring with the regulated area;

- Identify both current and possible future negative future impacts on any identified watercourses as a result of the proposed activities; and
- Recommend mitigation, management and monitoring measures to avoid and/or lessen potential impacts on any aquatic resources present within the Hotazel Project area and the implementation of suitable rehabilitation measures, should this be required.

1.3 Assumptions and Limitations

To obtain a comprehensive understanding of the dynamics and diversity of the biota on a site, including species of conservation concern, studies should include investigations through the different seasons of the year, over a number of years, and extensive sampling of the area. This is particularly relevant where seasonal limitations to biodiversity assessments exist for the area of the proposed activity. Due to project time constraints inherent with Environmental Authorisation application processes, such long-term research is seldom feasible, and information contained within this report is based on a single field survey conducted during a single season.

Given the lack of naturally occurring surface water features within the general study area, a detailed aquatic assessment was not warranted. It was, however, understood that an artificial impoundment is located within the previous mine pit void which supports fish and other aquatic life forms. As such, the present study included a cursory site visit and development of the aquatic compliance statement, with general recommendations for the way forward on dealing with the fish species present within the void (i.e. visual assessment of aquatic ecosystem within the void with no collection of fish or macroinvertebrates for species identification).

1.4 Legislative Framework

In terms of biodiversity, South Africa has signed and ratified a number of international, national and provincial protocols, acts and planning tools. These are dedicated to ensure the continued conservation of biodiversity at all levels. The study was carried out in line with requirements and listings of the following legislation and policies published and promulgated up to the date of this study:

National

- The Constitution of the Republic of South Africa (Act 108 of 1996);
- The National Environmental Management Act (Act 107 of 1998) (NEMA) and all subsequent amendments;
- The National Water Act (Act 36 of 1998) (NWA), including:
 - Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998);
 - Government Notice 704 as published in the Government Gazette 20119 of 1999 as it relates to the National Water Act, 1998 (Act No. 36 of 1998);
- The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA), including:

- Alien and Invasive Species Lists, 2014 (GN R599 in GG 37886 of 1 August 2014, updated 2016);
- Lists of Critically Endangered, Endangered, Vulnerable and Protected Species (GG 29657 of 23 February 2007) to be read with an amendment to the list published on 14 December 2007 (GN R1187 in GG 30568, 14 December 2007);
- National Environmental Management: Protected Areas Act (Act 57 of 2003) (NEMPAA); and
- National Forests Act (Act 84 of 1998) and the relevant List of Protected Tree Species (GN 536, 07 September 2018).

Provincial

- The Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009).

2. GENERAL CHARACTERISTICS

2.1 Location

The proposed Hotazel Mine is situated approximately 1 km south-east of the town of Hotazel in the Northern Cape province, South Africa. The Hotazel Project is situated on the farms Hotazel 280 and York 279 within the Joe Morolong Local Municipality (Figure 1).

2.2 Climate

The area is characterised with mid to very late summer rainfall (predominantly late summer rainfall), receiving a mean annual rainfall of 0 – 500 mm/annum. Mean annual temperatures within the area range from 16°C to 22°C, and a mean annual surface runoff of approximately 5 – 40 mm/annum (Kleynhans et al., 2007).

2.3 Geology & Soils

The proposed Hotazel Project area is underlain by Tillite, a sedimentary rock that consists of consolidated masses of un-weathered blocks and glacial till (Menzies, 1978), overlain in turn, by aeolian red sand and surface calcrete (outcrops of Tertiary Kalahari beds comprised of surface limestone, silcrete and sandstone) in the riverbeds. Soils are generally deep (>1.2 m) red-yellow apedal, freely drained soils of the Hutton and Clovelly soil forms (Mucina and Rutherford, 2012; *Council for Geoscience*, 2021). Soils generally have a high base status with a clay composition usually <15%.

2.4 Regional Vegetation

The Hotazel Project area falls within the Kathu Bushveld vegetation type within the Savanna Biome. Vegetation consists of a medium-tall tree layer with *Acacia erioloba* in places, but mostly open and including *Boscia albitrunca* as the prominent trees. The shrub layer may be regarded as important, while the grass layer is variable in cover. The vegetation type is considered Least Threatened with a conservation target of only 16%. More than 1 % has been transformed, largely as a result of mining, and the incidence of erosion is very low (Mucina and Rutherford, 2012).

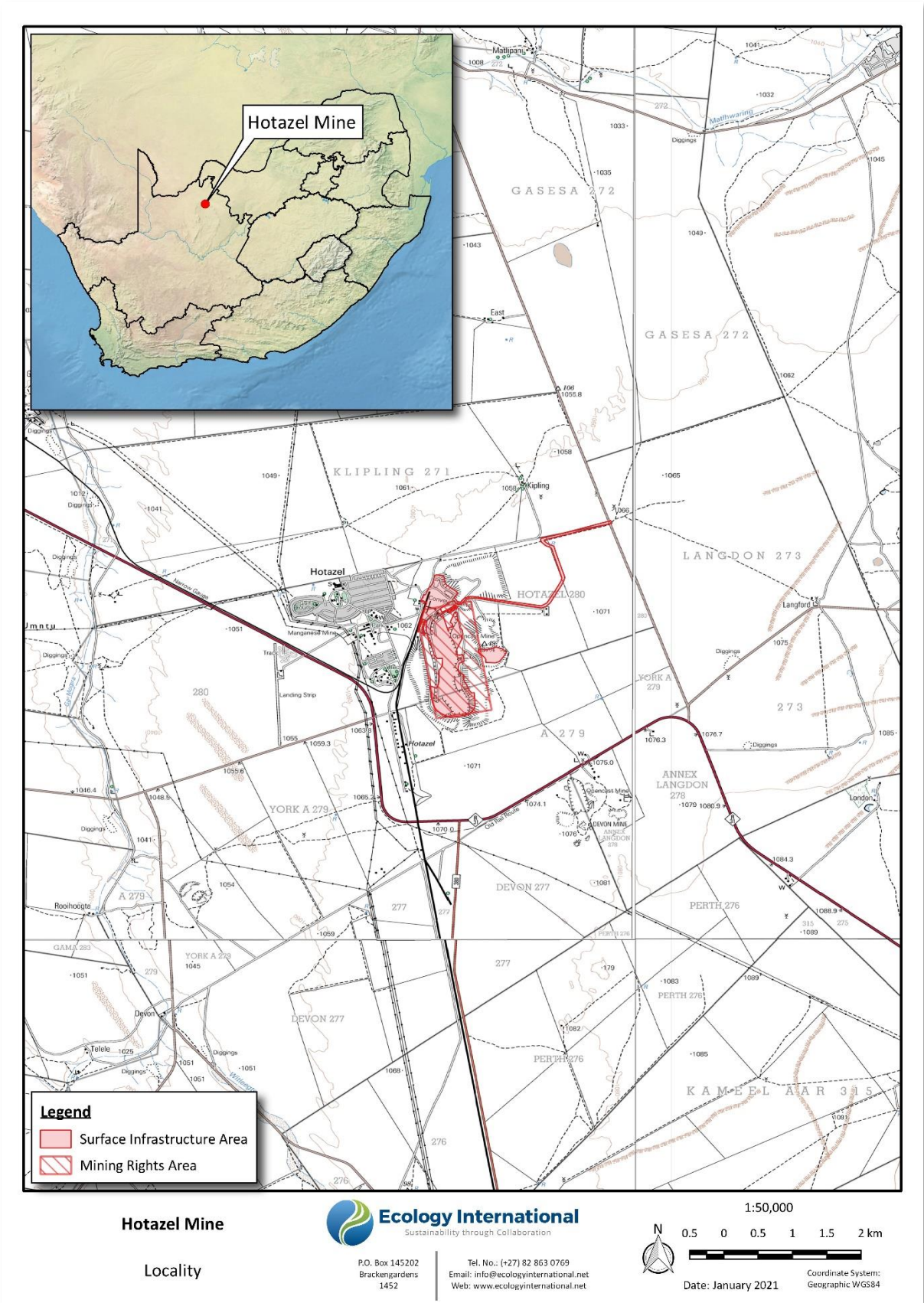


Figure 1: Location of the proposed Hotazel Project area.

3. FRESHWATER ECOSYSTEM CHARACTERISTICS

3.1 Freshwater Ecoregion

The proposed Hotazel Project area is located within the Southern Kalahari freshwater ecoregion, which stretches from the northern border of the Northern Cape province in South Africa, into the south-eastern portion of Namibia and the south-western parts of Botswana. The Southern Kalahari ecoregion includes the Kalahari Gemsbok National Park (South Africa) and the adjacent Gemsbok National Park (Botswana). Main habitat types in terms of watercourses are xeric freshwaters and endorheic (closed) basins, dominated by intermittent rivers and scattered seasonal pans, with rivers flowing only briefly after rainfall with rapid infiltrations into the sandy Kalahari soils. The pans within the area are generally underlain by lime with varying quantities of clay and retain standing water for only short periods of time. The role of the ephemeral rivers in the maintenance and functioning of the broader ecosystem is thus largely unknown. In addition, the level of taxonomic exploration for this ecoregion may be regarded as poor, with invertebrates in particular being poorly studied. The few aquatic species recorded retain affinities with both the southern temperate and Zambebian faunas (Scott, 2013).

3.2 National Ecoregional Typing

Ecoregional typing at a national level is based on spatially variable combinations of causal factors including physiography, climate, geology, soils and potential natural vegetation. Accordingly, the study area is located primarily within the Southern Kalahari Ecoregion, and more specifically within Level II Ecoregion 29.01.

3.3 Associated Water Resources

The NWRS-1 (National Water Resource Strategy, Version 1) originally established 19 Water Management Areas (WMAs) within South Africa and proposed the establishment of the 19 Catchment Management Agencies to correspond to these areas. In rethinking the management model, and based on viability assessments with respect to water resources management, available funding, capacity, skills and expertise in regulation and oversight, as well as to improve integrated water systems management, the original 19 designated WMAs have been consolidated into 9 WMAs.

As such, the proposed Hotazel Project area is located within the newly revised Vaal WMA. The study area is situated within Quaternary Catchment D41K between the Kuruman and the Ga-Mogara Rivers within the Molopo River catchment. The Ga-Mogara River confluences with the Kuruman River to the north of the study area, which eventually joins the Molopo River further downstream to the west. The Ga-Mogara River may be regarded as Largely Natural and non-perennial in nature, while the portion of the Kuruman River directly north of the study area may be regarded as Largely Natural and perennial due to its source, a natural spring known as the 'eye of Kuruman' further upstream. The Ga-Mogara River is classified as Critically Endangered and with the river signature not considered to be adequately protected, while the Kuruman River is classified as Critically Endangered with the river signature considered to be poorly protected according to the latest National Biodiversity Assessment (NBA, 2018; Van Deventer et al., 2019) (Figure 2).

3.4 Strategic Water Source Areas

Strategic Water Source Areas (SWSAs) are landscapes where a relatively large volume of runoff produces water for the majority of South Africa. Strategic water source areas can be regarded as natural 'water factories', supporting growth and development needs that are often a far distance away. Deterioration of water quality and quantity in these areas can have a disproportionately large negative effect on the functioning of downstream ecosystems and the overall sustainability of growth and development in the regions they support (Nel et al., 2013)

Based on available spatial data, the proposed Hotazel Project area is not within any identified SWSA. However, the Ghaap Plateau Groundwater SWSA is located approximately 12 km east of the Hotazel Project area, while the Sishen/ Kathu groundwater SWSA is located approximately 11 km south (Water Research Commission, 2017).

3.5 National Freshwater Ecosystem Priority Areas

The National Freshwater Ecosystem Priority Areas (NFEPA) project represents a multi-partner project between the Council for Scientific and Industrial Research (CSIR), South African National Biodiversity Institute (SANBI), Water Research Commission (WRC), Department of Water Affairs (DWA; now Department of Water and Sanitation, or DWS), Department of Environmental Affairs (DEA), WWF, South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks). More specifically, the NFEPA project aims to:

- Identify Freshwater Ecosystem Priority Areas (hereafter referred to as 'FEPAs') to meet national biodiversity goals for freshwater ecosystems; and
- Develop a basis for enabling effective implementation of measures to protect FEPAs, including free-flowing rivers.

The first aim uses systematic biodiversity planning to identify priorities for conserving South Africa's freshwater biodiversity, within the context of equitable social and economic development. The second aim comprises a national and sub-national component. The national component aims to align DWS and DEA policy mechanisms and tools for managing and conserving freshwater ecosystems. The sub-national component aims to use three case study areas to demonstrate how NFEPA products should be implemented to influence land and water resource decision-making processes at a sub-national level (Driver et al., 2011). The project further aims to maximize synergies and alignment with other national level initiatives such as the NBA (2018) and the Cross-Sector Policy Objectives for Inland Water Conservation.

Based on current outputs of the NFEPA project (Nel et al., 2011), the Hotazel Project area does not fall within a designated FEPA catchment, but is located within a listed Upstream Management Area. According to Driver et al. (2011), Upstream Management Areas are sub-quaternary catchments in which human activities need to be managed to prevent degradation of downstream river FEPAs and Fish Support Areas. Further, no FEPA-classified wetlands or wetland clusters were noted to be associated with the proposed Hotazel Project area (Figure 3).

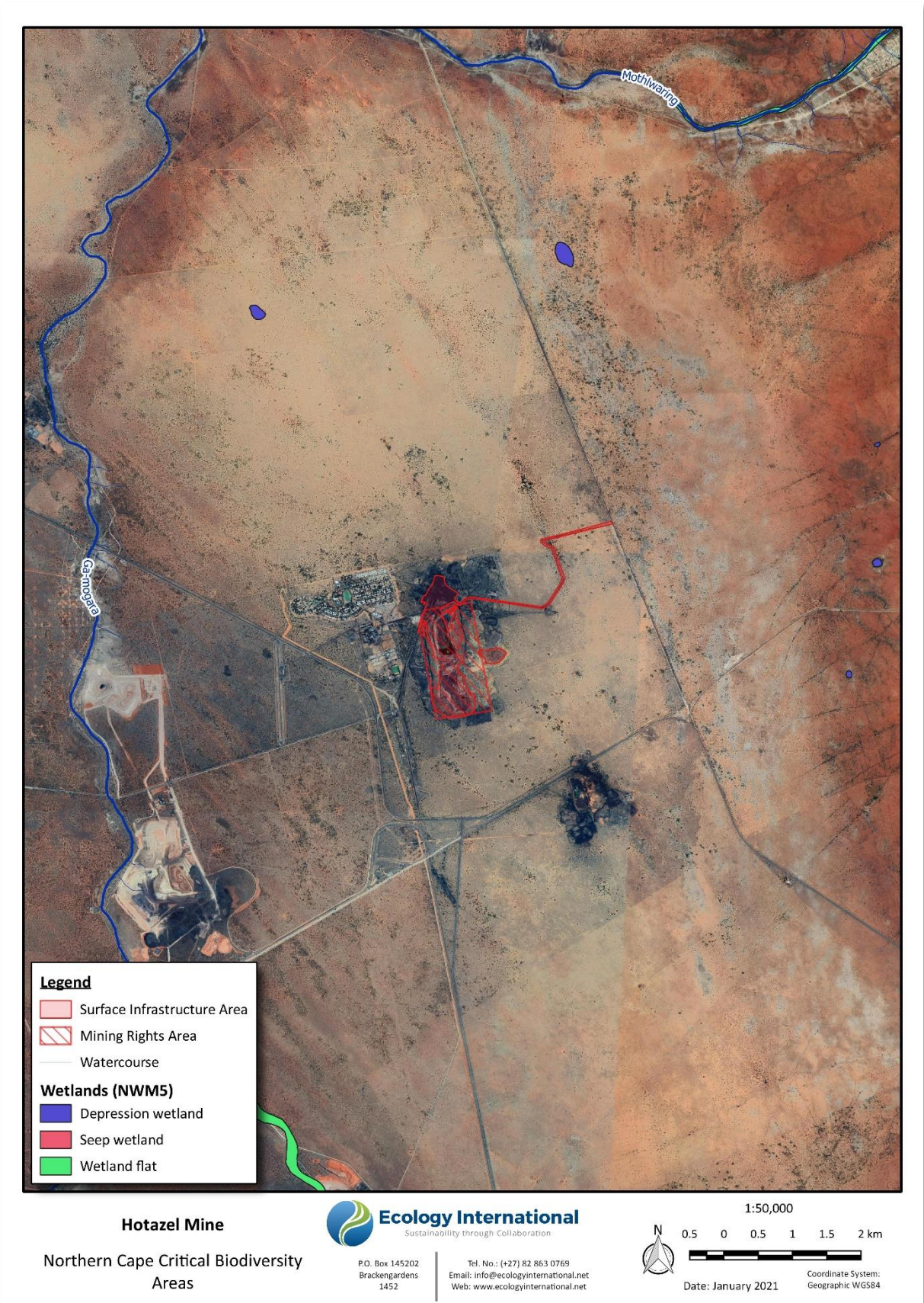


Figure 2: Watercourses associated with the proposed Hotazel Project area

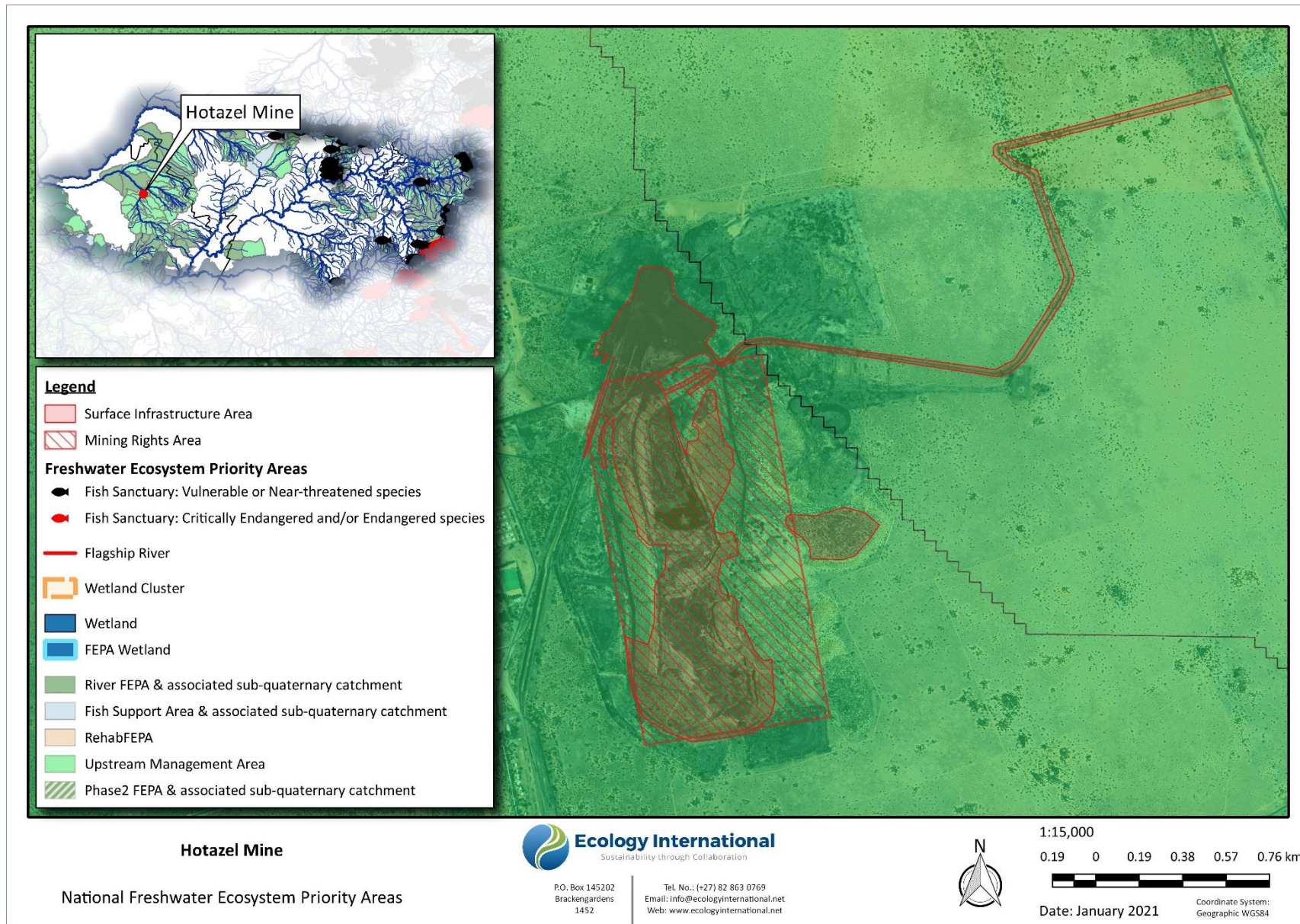


Figure 3: National Freshwater Ecosystem Priority Areas associated with the proposed Hotazel Project area

3.6 Northern Cape Critical Biodiversity Areas

The Northern Cape Critical Biodiversity Area (CBA) Map updates, revises and replaces all older systematic biodiversity plans and associated products for the province. The map includes a collation of all the available data on biodiversity features, their condition, current Protected Areas and Conservation Areas, and opportunities and constraints for effective conservation. The Northern Cape CBA maps the distribution of the province's biodiversity into several categories for both the terrestrial and inland aquatic realms (Holness & Oosthuysen, 2016). These are ranked according to ecological and biodiversity importance and their contribution to meeting the quantitative targets set for each biodiversity feature.

The Northern Cape CBA Map uses the following terms to categorise the various land use types according to their biodiversity and environmental importance:

- Critical Biodiversity Area – 1 (CBA 1: Irreplaceable);
- Critical Biodiversity Area – 2 (CBA 2: Optimal);
- Ecological Support Area;
- Other Natural Area; and
- Protected Area.

CBAs are terrestrial and aquatic areas of the landscape that are considered of high biodiversity value and that need to be maintained in a natural or near-natural state, with no further loss of habitat or species, to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses. Further, Ecological Support Areas (ESAs) are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of CBAs and/or in delivering ecosystem services, while areas designated as Other Natural Areas consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs.

According to the Northern Cape CBA Map, both the Ga-Mogara River (west of the study area) and the Kuruman River (north-east of the study area) are classified as ESAs, while a portion of the Kuruman River downstream of the Hotazel Project area and to the north, may be regarded as CBA 1. The areas immediately adjacent to the Hotazel Mining Rights Area are classified as Other Natural Areas (Figure 4).

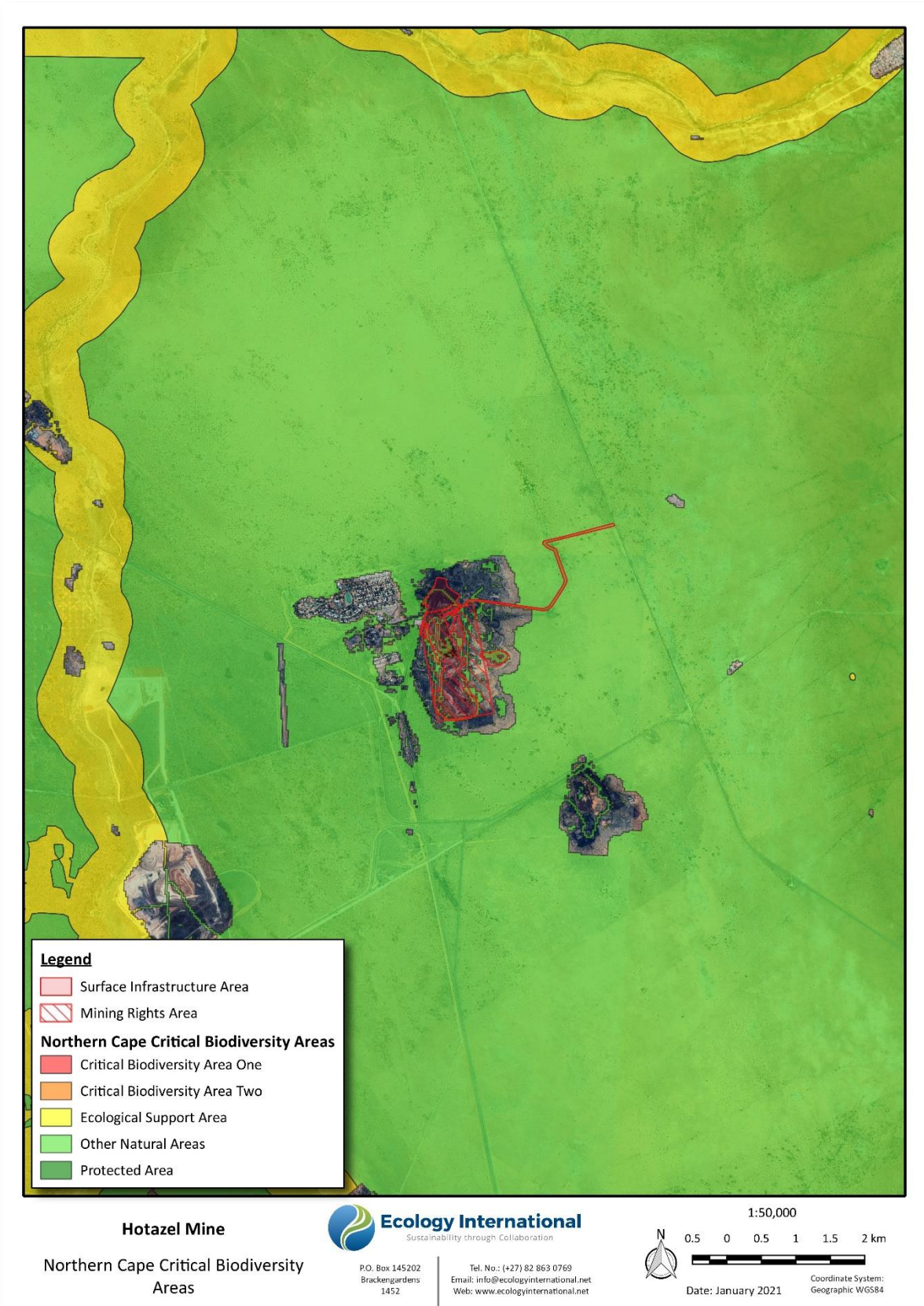


Figure 4: Northern Cape CBA Map outputs for the areas adjacent to and in the vicinity of the Hotazel Project area (Holness and Oosthuysen, 2016).

4. RESULTS

4.1 Associated Freshwater Resources

A cursory site visit was undertaken from the 23rd to the 25th November 2020 during late spring to identify the freshwater resources within and in the vicinity of the proposed Hotazel Mine area. Based on the site visit, the only surface water feature associated with proposed Hotazel Mine area was a pit lake within the existing pit void. Co-ordinates of the pit lake were recorded using a Garmin eTrex global positioning device and are listed in Table 1, and presented graphically in Figure 5. No natural aquatic or wetland systems were identified within the proposed project footprint areas or within the 500 m zone of regulation in accordance with Government Notice 509 as it relates to the National Water Act (Act N. 36 of 1998).

Table 1: Co-ordinates and descriptions of the freshwater resources observed during the study

Site	Coordinates	Elevation	Description
Pit lake	S27° 12' 25.9" E22° 58' 17.3"	1,021m	Site located within the proposed Hotazel Mining Rights Area within the historical mining void.

4.1.1 Pit lake within the pit void

The pit void (Figure 6) was comprised of a moderately sized, but relatively deep in some areas, artificial pit lake associated with the historical mine workings within the Hotazel Mining Rights Area. The pit lake appeared to support both aquatic vegetation that had established within the pit lake, as well as fauna that had been artificially translocated to the pit lake.

At the time of the assessment, the lake water was noted to be very clear with recharge likely mainly associated with seepage associated with interception of the water table. Substrate within the pit lake comprised mainly of coarse waste rock associated with the historical mine workings and isolated areas of fine sediments and detritus. In most areas, the pit lake was deep with steep high walls and rocky deposits of waste rock.

Dense stands of *Phragmites australis* were observed in shallower areas making access to the deeper water areas more difficult. Thick layers of detritus and sediment (likely rich in diatoms) were observed in the shallows, where what was recognised as *Tilapia sparrmanii* were feeding and taking refuge. This species is listed as Protected under the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009), however, it may be regarded as tolerant of still, low water quality environments. Further, numerous adult dragonflies and damselflies (order Odonata) were also observed. The lack of connectivity of this system to any surrounding natural aquatic resources and the presence of *Tilapia sparrmanii* strongly suggests the introduction of the species for recreation or angling purposes. However, the Hotazel Project area does occur within the natural distribution range of the species, having been recorded in the nearby Kuruman River.

In addition to the fish and adult Odonata observed, numerous birds were seen to be making use of the pit void habitat. For further information, please refer to the Avifaunal report.

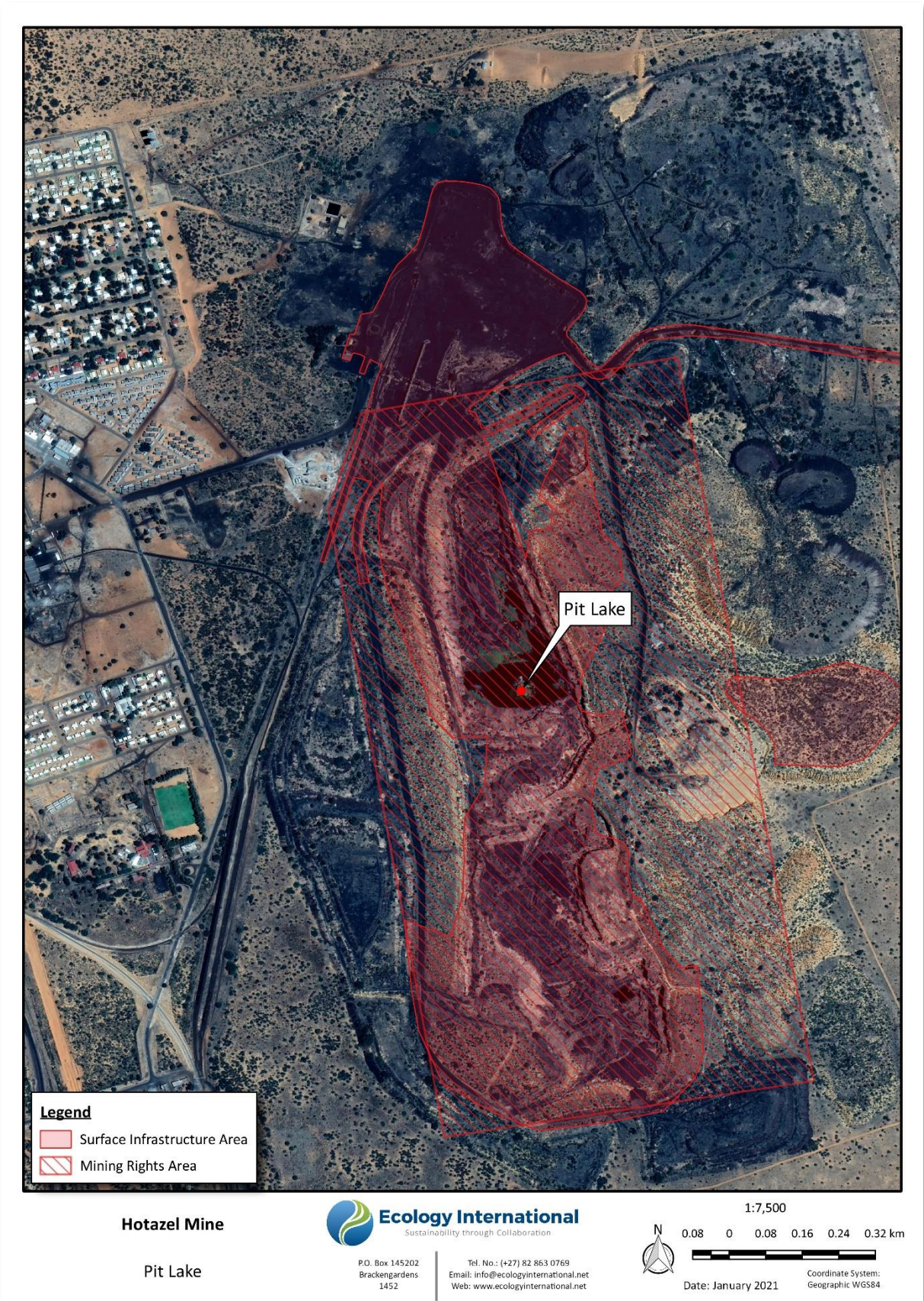


Figure 5: Location of the pit void (lake) and potential cryptic wetlands in relation to the proposed Hotazel Project area.



Figure 6: General view of the pit void (lake) and the associated aquatic habitat.

5. RISK ASSESSMENT

Any activities associated with a natural system, whether historic, current, or proposed, will impact on the surrounding environment, usually in a negative way. The purpose of this phase of the study was to identify and assess the significance of the potential impacts and to provide a description of the mitigation required to limit the perceived impacts on the natural environment, taking cognisance of the application of the mitigation hierarchy. In determining the impacts associated with the proposed activity, due consideration was given to previous impacting factors present. It must, however, be emphasised that the impacts as identified within this report pertain specifically to the aquatic biodiversity within an artificial system (i.e. the pit lake), as *no natural surface water features were identified to be associated with the proposed activity*. Further, the assessment of potential impacts associated with the proposed studies was done independent of consideration from other associated specialist investigations pertaining to the proposed activities (e.g. geohydrological, surface water, floral, avifaunal specialist assessments, etc.), the reports for which were not available at the time of writing. The author therefore reserves the right to amend the assessment of impact significance following review of the other associated specialist assessments.

5.1 Identification of Potential Impacts

The potential impacts anticipated as a result of the proposed activities have been identified in line with the nature of the proposed activities, the proximity of these activities to the aquatic resources within and in the vicinity of the Hotazel Project area, as well as according to the observations of the desktop and field assessments as presented in Section 3 and Section 4 of this report.

The absence of any naturally occurring surface water features within the proposed Hotazel Project area and its associated 500 m zone of regulation means that there will be no impact on such features as a result of the proposed activities.

6. CONCLUSION AND RECOMMENDATIONS

Based on the results obtained during the present study, the closest aquatic systems to the proposed mining activities were determined to be the Ga-Mogara and Kuruman Rivers approximately 5 km and 9 km away, respectively. Accordingly, the area associated with the proposed mining activities is

confirmed to have a low sensitivity from the perspective of natural surface water features. Further, the lack of natural surface water within the proximity of the proposed Hotazel Mine means that the impact of the proposed mining activity on the surrounding natural freshwater ecosystem is likely to be low.

Despite the above, cognisance must be given to the presence of an artificial, yet functional, aquatic ecosystem present within the void left by previous mining activities, and the presence of at least one provincially Protected fish species. Accordingly, the following recommendations pertaining to the way forward are proposed:

- Should the draining of the pit lake be required for future mining purposes, a detailed assessment of the fish species present within the lake will need to be conducted by an accredited aquatic specialist so as to advise on permit requirements. At present, it is known that at least one fish species identified within pit lake during the present study is listed as Protected under the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009), and as such, a permit will be required should translocations (or any other activity involving the fish species present) be undertaken. Further permits may be required depending on any additional species present;
- In the event that the pit lake is drained and depending on the number of fish species present (see previous comment), a suitably qualified and accredited aquatic specialist must be present so as to identify species for further actions (e.g. translocation, euthanasia, etc.)
- Under no circumstances are fish to be removed for the purpose of consumption due to potential metal accumulation within tissues of the fish and associated liabilities.

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- Nel, J.L., Maree, G., Roux, D., Moolman, J., Kleynhans, C.J., Sieberbauer, M. & Driver, A. (2004). *South African National Spatial Biodiversity Assessment 2004: Technical Report. Volume 2: River Component*. CSIR Report Number ENV-S-I-2004-063. Council for Scientific and Industrial Research, Stellenbosch
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- Water Research Commission. (2017). 2017 Surface and Groundwater SWSA.

Appendix A: Curriculum Vitae of Authors

Name: **Kieren Jayne Bremner Pr.Sci.Nat.**
Company: Ecology International (Pty) Ltd
Years of Experience: 12 years

Nationality: South African
Languages: English (fluent), Afrikaans (Fluent), French (Basic)
SACNASP Status: Professional Natural Scientist (Reg. No. 119341 [Active])
Email address: kieren@ecologyinternational.net
Contact Number: (+27) 72 262 4325

EDUCATIONAL QUALIFICATIONS AND TRAINING

-
- B.Sc. (Zoology and Biochemistry), Rand Afrikaans University (2004);
- B.Sc. Honours (Natural and Environmental Science), Rand Afrikaans University (2005);
- M.Sc. (Aquatic Health), University of Johannesburg (2011);
- Advanced 4x4 driving, Colt Driving School (2005);
- Environmental Auditing Workshop, University of Johannesburg (2006);
- First Aid Certificate (Level 1), Sharpminds (2008);
- Public Participation, Golder Associates (2008);
- SASS5 Field Assessment Accreditation in terms of the River Health Programme, Department of Water Affairs (2009 – present);
- RHAM (Rapid Habitat Assessment Model) Training Workshop, Department of Water and Sanitation – Resource Quality Information Services (2015);
- Wetland Plant Taxonomy, Water Research Commission (2017);
- Vegetation Response Assessment Index (VEGRAI), Mr. James MacKenzie (co-developer of index) (2018);
- Tools for Wetland Assessment – Rhodes University (2018);
- Fish Identification – South African Institute of Aquatic Biodiversity (2018);
- Wetland Soils, Agricultural Research Council in association with the University of the Free State (2018);
- Water Use Licence Applications: Section 21 (c) and (i) training workshop, Department of Water Affairs (2019);
- Grammar for Writers – South African Writers College (2019);
- Wetland Rehabilitation – presented by Piet-Loius Grundling (DEA) and Cilliers Blaauw (Aurecon) (2019)

- Editing and Copywriting – South African Writers College (2020).
-

KEY QUALIFICATIONS

▶ **Project Management:**

Project management and co-ordination of specialist-related projects, including:

- Aquatic assessments:
 - Design and implementation of monitoring programmes;
 - Baseline ecological assessments
 - Ecological impact and mitigation assessments;
- Wetland assessments:
 - Design and implementation of wetland monitoring programmes;
 - Wetland delineation studies;
 - Wetland Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) determination assessments;
 - Wetland management plans;
 - Wetland impact and mitigation assessments;
 - Wetland offset strategies and assessments;
- Water quality studies;
- Ecological Risk Assessments.

▶ **Specialist Assessments:**

Extensive experience in conducting specialist aquatic assessments and providing specialist ecological input, including:

- Baseline aquatic biodiversity assessments, including the determination of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) according to latest methodology;
- Aquatic impact and mitigation assessments;
- Design, management and implementation of biological monitoring programmes for the aquatic environment;
- Protocol development;
- Aquatic toxicity assessments;
- Bioaccumulation studies;
- Surface water quality studies;
- Application of various monitoring indices, including the South African Scoring System version 5 (SASS5), the Macro-Invertebrate Response Assessment Index (MIRAI), the Invertebrate Habitat Assessment System (IHAS), the Index for Habitat Integrity (IHI), the

Rapid Habitat Assessment Model (RHAM), the Fish Assemblage Integrity Index (FAII), the Fish Response Assessment Index (FRAI), Riparian Vegetation Response Index (VEGRAI), determination of EcoStatus, etc.

▶ **Specialist Review:**

Specialist and independent review of impact assessment and management reports for all sectors of government, civil society and the scientific and legal fraternity:

- Peer review of specialist reports.

PROFESSIONAL REGISTRATIONS

- South African Council for Natural Scientific Professions (SACNASP) – Professional Natural Scientist (Aquatic Science), Reg. No. 119341

Other Society Memberships

- South African Society of Aquatic Scientists
- South African Wetland Society

Other Memberships

- Gauteng Wetland Forum

COUNTRIES OF EXPERIENCE

- South Africa
- Botswana
- Mali
- Senegal
- Ghana
- Malawi
- Tanzania
- Democratic Republic of Congo

EMPLOYMENT EXPERIENCE

Ecology International September 2020 - Present

Role: Senior aquatic and wetland specialist

- Project management on various scales for environmental and biodiversity specialist-related services;
- Co-ordinating, implementing and conducting specialist studies for various aquatic and wetland projects, including:
 - Protocol development;
 - Monitoring programmes;
 - Baseline impact assessments;
 - Strategic-level assessments (e.g. Strategic Environmental Assessments, Environmental Management Frameworks, State of the Environment Reports, etc.);
- Acting as an information source concerning environmental legislation;
- Interfacing with clients in the consulting, mining, and government industries.

Scientific Aquatic Services, Johannesburg, Gauteng January 2020 – August 2020**Role: SAS Divisional Manager, Senior Aquatic and Wetland Ecologist**

- Co-ordinating and managing the wetland and aquatic specialist teams;
- Mentoring and training junior staff. In eight months, three of five members of my team submitted their SACNASP applications and were awaiting confirmation;
- Principle specialist on various aquatic and wetland baseline and ongoing biomonitoring assessments;
- Client liaison and project management. In eight months, I was actively involved in more than 20 projects and reviewed more than 90 reports.

Digby Wells Environmental, Johannesburg, Gauteng September 2017 – January 2020**Role: Unit Manager – Wetlands, Senior Aquatic and Wetland Ecologist**

- Co-ordinating and managing the wetland specialist team;
- Principle specialist on various aquatic and wetland related assessments throughout South Africa, DRC, Mali, Senegal, Tanzania, Malawi and Botswana.

Scientific Aquatic Services, Johannesburg, Gauteng August 2015 – August 2017**Role: Senior Aquatic and Wetland Ecologist**

- Initiated and/or actively involved in more than 24 ongoing seasonal biomonitoring and toxicological testing programmes employing monitoring indices such as IHAS, IHI, SASS5/MIRAI, FAII/FRAI, VEGRAI, RHAM, WET-Health and WET-Ecoservices
- Principle specialist and/or team member on more than 15 aquatic and wetland baseline assessments.

Estuary Care, Kenton-on-sea, Eastern Cape 2014 - 2015**Role: Ecologist**

- Water quality monitoring
- Trend analysis
- Reporting

Sustainable Seas Trust, Kenton-on-sea, Eastern Cape 2014

Role: Team Member

- Education and awareness: Mini-SASS days and clean up initiatives;
- Assisted with the compilation of the book: South African Coasts: A celebration of our seas and shores

Scientific Aquatic Services, Johannesburg, Gauteng April 2009 – April 2013

Role: Aquatic Ecologist

- Initiated and/or actively involved in more than 35 ongoing seasonal biomonitoring and toxicological testing programmes employing monitoring indices such as IHAS, IHI, SASS5/MIRAI, FAII/FRAI and VEGRAI
- Team member various aquatic and wetland baseline assessments throughout South Africa, the Democratic Republic of Congo and Ghana.

TWP Engineering, Johannesburg, Gauteng November 2007 – March 2009

Role: Junior Environmental Scientist

- Editing of documents
- Assist in compilation of documents
- Assist in public participation processes
- As a junior, took initiative and spear-headed the first two aquatic biomonitoring specialist assessments (specialist studies) at the company and sourced external resources to assist with expertise.

Rand Afrikaans University, Johannesburg, Gauteng 2006 - 2007

Role: Practical Demonstrator and Laboratory Assistant

- Assist in setting up practical sessions
- Provide assistance to students throughout practical sessions
- Assess students' preparation and progress
- Marking of papers and reports
- Assist in general laboratory maintenance and functioning

Rand Afrikaans University, Johannesburg, Gauteng 2005

Role: Research Assistant

- Doc.l. Pieterse in general research and laboratory tasks

Name: **Byron Grant** Pr.Sci.Nat.
Company: Ecology International (Pty) Ltd
Years of Experience: 16 years

Nationality: South African
Languages: English (mother tongue), Afrikaans
SACNASP Status: Professional Natural Scientist (Reg. No. 400275/08)
Email address: byron@ecologyinternational.net
Contact Number: (+27) 82 863 0769

EDUCATIONAL QUALIFICATIONS

- B. Sc. (Botany & Zoology), Rand Afrikaans University (1997 - 1999);
- B. Sc. (Honours) Zoology, Rand Afrikaans University (2000);
- M. Sc. (Aquatic Health) *cum laude*, Rand Afrikaans University (2001 – 2004);
- Introduction to quantitative research using sample surveys, Rand Afrikaans University (2004);
- SASS5 Field Assessment Accreditation in terms of the River Health Programme, Department of Water Affairs (2005 – present);
- Monitoring Contaminant Levels: Freshwater Fish (*awarded Best Practice*), University of Johannesburg (2005);
- EcoStatus Determination training workshop, Department of Water Affairs and Forestry (2006);
- Multi-disciplinary roles in defining EcoStatus and setting flow requirements during an ecological reserve study, Department of Water Affairs (2008);
- Water Use Licence Applications: Section 21 (c) and (i) training workshop, Department of Water Affairs (2009);
- Advanced Wetland Course, University of Pretoria (2010) (*awarded with Distinction*);
- Determination of the Present Ecological State within the EcoClassification process, University of the Free State (2011);
- River Health Programme Training Workshop, Department of Water and Sanitation – Resource Quality Information Services (2014);
- Tools for Wetland Assessments, Rhodes University (2015);
- RHAM (Rapid Habitat Assessment Model) Training Workshop, Department of Water and Sanitation – Resource Quality Information Services (2015);
- Wetland, River and Estuary Buffer Determination Training Workshop, Institute for Natural Resources (2015);
- Fish Invertebrate Flow Habitat Assessment Model (FIFHA), Department of Water and Sanitation – Resource Quality Information Services (2015);
- Wetland Plant Taxonomy, Water Research Commission (2017);
- Vegetation Response Assessment Index (VEGRAI), Mr. James MacKenzie (co-developer of index) (2018);
- Wetland Soils, Agricultural Research Council in association with the University of the Free State (2018);

- Hydropedology and Wetland Functioning (Short course), Terrasoil Science in association with the Water Business Academy (2018).
- HCV (High Conservation Value) Assessor Training Course, Astra-Academy (2019)

KEY QUALIFICATIONS

▶ **Project Management:**

Project management and co-ordination of specialist-related projects, including:

- Aquatic assessments (see below);
- Floral and Faunal assessments:
 - Design and implementation of monitoring programmes;
 - Baseline ecological assessments
 - Ecological impact and mitigation assessments;
 - Rescue and relocation assessments;
 - Alien and invasive vegetation management plans;
- Wetland assessments:
 - Design and implementation of wetland monitoring programmes;
 - Wetland delineation studies;
 - Wetland Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) determination assessments;
 - Wetland management plans;
 - Wetland impact and mitigation assessments;
 - Wetland offset strategies and assessments;
 - Wetland Reserve Determinations;
- Water quality studies;
- Dust monitoring studies;
- Ecological Risk Assessments;
- Biodiversity Action Plans (BAP);
- Biodiversity Management Strategies;
- Water Research Commission projects.

▶ **Specialist Assessments:**

Extensive experience in conducting specialist aquatic assessments and providing specialist ecological input, including:

- Baseline aquatic biodiversity assessments, including the determination of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) according to latest methodology;
- Aquatic impact and mitigation assessments;
- Design, management and implementation of biological monitoring programmes for the aquatic environment;
- Protocol development;
- Fish kill investigations;
- Ecological Flow Requirements;

- Reserve Determinations;
 - Aquatic toxicity assessments;
 - Bioaccumulation studies;
 - Human health risk assessments for the consumption of freshwater fish;
 - Surface water quality studies;
 - Application of various monitoring indices, including the South African Scoring System version 5 (SASS5), the Macro-Invertebrate Response Assessment Index (MIRAI), the Invertebrate Habitat Assessment System (IHAS), the Index for Habitat Integrity (IHI), the Rapid Habitat Assessment Model (RHAM), the Fish Assemblage Integrity Index (FAII), the Fish Response Assessment Index (FRAI), the Physico-chemical Assessment Index (PAI), Riparian Vegetation Response Index (VEGRAI), Fish Invertebrate Flow Habitat Assessment Model (FIFHA), determination of EcoStatus, etc.;
 - Eco-Conditional Requirement (Eco-0) assessments for Green Star Accreditation;
 - Watercourse Protection Plans relating to Eco-Conditional Requirement (Eco-0) for Green Star Accreditation.
- ▶ **Specialist Review:**
- Specialist and independent review of impact assessment and management reports for all sectors of government, civil society and the scientific and legal fraternity:
- Member of Technical Advisory Group for the Green Building Council of South Africa;
 - Member of Reference Groups for Water Research Commission;
 - Peer review of specialist biodiversity reports;
 - Peer reviewer for African Journal of Aquatic Science.

PROFESSIONAL REGISTRATIONS

- South African Council for Natural Scientific Professions (SACNASP) – Professional Natural Scientist (Aquatic Science, Ecological Science, Zoological Science), Reg. No. 400275/08

Other Society Memberships

- South African Society of Aquatic Scientists
- South African Wetland Society (Founding Member)
- Zoological Society of Southern Africa

Other Memberships

- Aquatox Forum
 - Gauteng Wetland Forum
 - Klipriviersberg Sustainability Association – Development Integration Team
 - Yellowfish Working Group
-

COUNTRIES OF EXPERIENCE

- South Africa
- Lesotho
- Swaziland
- Mozambique
- Ghana
- Namibia
- Cameroon

SPECIALIST WORKSHOP PARTICIPATION

- Wetland and Watercourse Buffers Determination workshop. Project for the Department of Water Affairs, Sub-directorate: Water Abstraction and Instream Use;
- NEMBA category 2 alien fish species mapping for Gauteng, Limpopo and Northwest Provinces and a national review workshop, South African Institute for Aquatic Biodiversity (SAIAB);
- National Freshwater Ecosystem Priority Areas project – Specialist Input Workshop, South African National Biodiversity Institute (SANBI);
- Biodiversity Offsets Strategy workshop, Gauteng Department of Agriculture, Conservation and Environment (GDACE);
- Minimum Requirements for Biodiversity Assessments (Version 2) workshop, Gauteng Department of Agriculture, Conservation and Environment (GDACE);
- Gauteng Nature Conservation Bill, Gauteng Department of Agriculture and Rural Development (GDARD);
- Mainstreaming Biodiversity in Mining Training Workshop, SANBI's Grasslands Programme (in partnership with the South African Mining and Biodiversity Forum and the Departments of Environmental Affairs and Mineral Resources);
- National Biodiversity Offset Workshop, Department of Environmental Affairs (DEA), Endangered Wildlife Trust (EWT);
- Accreditation/certification of Wetland Practitioners Workshop, South African Wetland Society.

PRESENTATIONS AND PUBLICATIONS

Brink, K., Gough, P., Royte, J.J., Schollema, P.P. & Wannings, H. (eds). (2018). From Sea to Source 2.0. Protection and restoration of fish migration in rivers worldwide. World Fish Migration Foundation. *Contributing author.*

Grant, B., Huchzermeyer, D. & Hohls, B. (2014). *A Manual for Fish Kill Investigations in South Africa.* WRC Report No. TT 589/14. Water Research Commission, Pretoria.

Grant, B., Hohls, B. & Huchzermeyer, D. (2013). Development of a Fish Kill Protocol for South Africa. South African Society for Aquatic Scientists - 2013 Conference, Arniston. Oral presentation.

Mlambo, S.S., van Vuren, J.H.J., Basson, R. & Grant, B. (2010). Accumulation of hepatic HSP70 and plasma cortisol in *Oreochromis mossambicus* following sub-lethal metal and DDT exposure. *African Journal of Aquatic Science* 35(1): 47-53.

Grant, B., van Vuren, J.H.J. & Cronjé, M.J. (2004). HSP 70 response of *Oreochromis mossambicus* to Cu²⁺ exposure in two different types of exposure media. South African Society for Aquatic Scientists – 2004 Conference, Cape Town. Poster presentation.

EMPLOYMENT EXPERIENCE

► **Ecology International: Date: June 2017 - Present**

Role: Director & Principal Biodiversity Specialist

- Management and co-ordination of staff members and specialists
- Project management on various scales for environmental and biodiversity specialist-related services;
- Co-ordinating, implementing and conducting specialist studies for various types of projects, including:
 - Protocol development;
 - Monitoring programmes;
 - Environmental Impact Assessments;
 - Strategic-level assessments (e.g. Strategic Environmental Assessments, Environmental Management Frameworks, State of the Environment Reports, etc.);
 - Biodiversity Management Plans, Biodiversity Action Plans, etc.;
- Acting as an information source concerning environmental legislation;
- Development of terms of reference and project proposals;
- Quality control of specialist reports; and
- Interfacing with clients in the consulting, mining, and government industries.

► **Independent Specialist: Date: February 2017 – May 2017**

Role: Principal Biodiversity Specialist

- Project management on various scales for biodiversity specialist-related services;
- Co-ordinating, implementing and conducting specialist studies for various types of projects, including:
 - Protocol development;
 - Monitoring programmes;
 - Environmental Impact Assessments;
 - Strategic-level assessments (e.g. Strategic Environmental Assessments, Environmental Management Frameworks, State of the Environment Reports, etc.);

- Biodiversity Management Plans, Biodiversity Action Plans, etc.;
 - Acting as an information source concerning environmental legislation;
 - Development of terms of reference and project proposals;
 - Quality control of specialist reports; and
 - Interfacing with clients in the consulting, mining, and government industries.

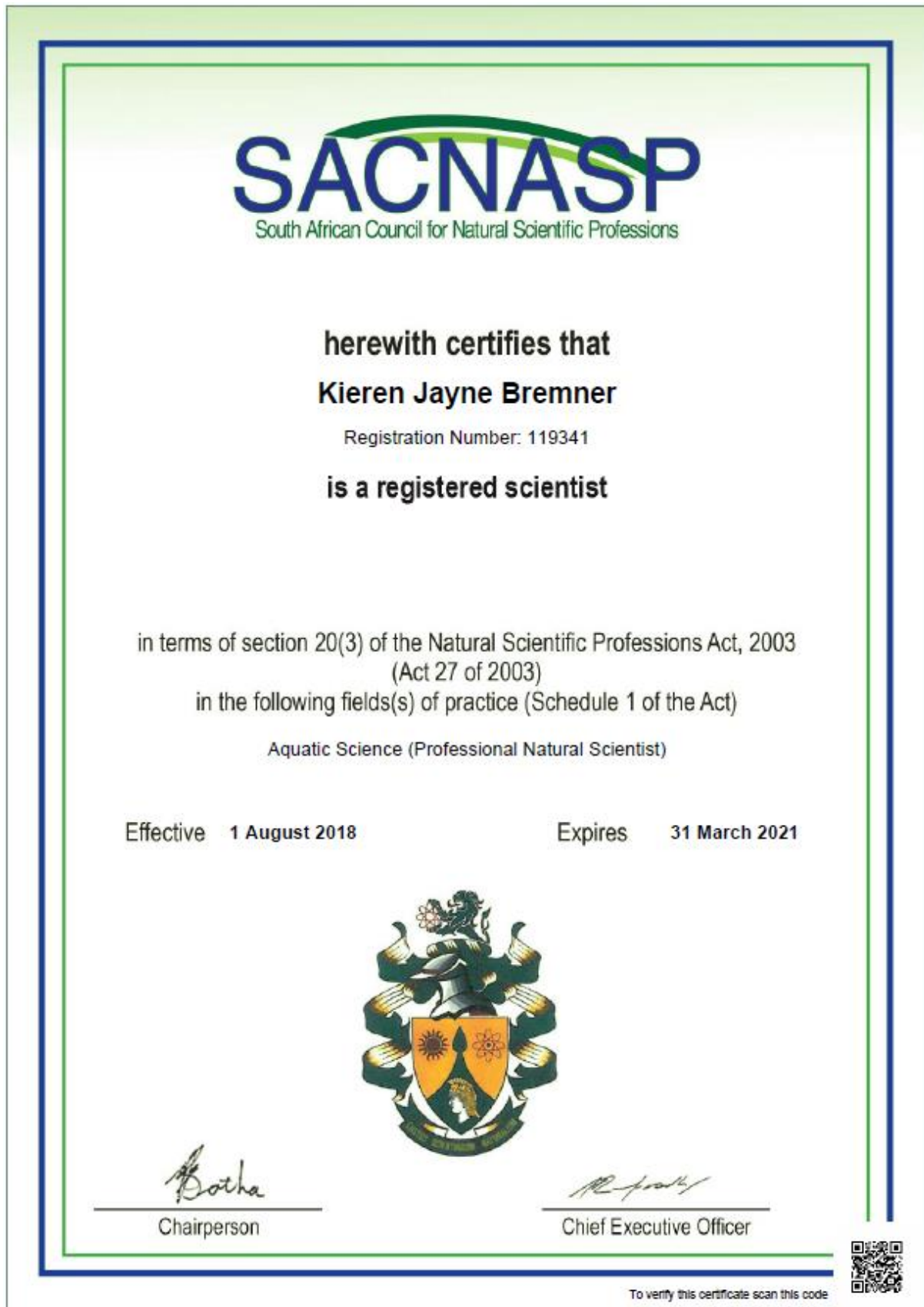
- ▶ **GIBB (June 2015 – January 2017)**
Role: Principal Specialist
 - Project management on various scales for specialist-related services;
 - Co-ordinating, implementing and conducting studies for various types of projects, including:
 - Monitoring programmes;
 - Environmental Impact Assessments;
 - Strategic-level assessments (e.g. Strategic Environmental Assessments, Environmental Management Frameworks, State of the Environment Reports, etc.);
 - Biodiversity Management Plans, Biodiversity Action Plans, etc.;
 - Acting as an information source concerning environmental legislation;
 - Development of terms of reference and project proposals;
 - Quality control of specialist reports; and
 - Interfacing with clients in the consulting, mining, and government industries.

- ▶ **Strategic Environmental Focus (August 2009 – June 2015)**
Role: Principal: Specialist Services
 - Management and co-ordination of staff members and specialists;
 - Project management on various scales for specialist-related services;
 - Co-ordinating, implementing and conducting studies for various types of projects, including:
 - Monitoring programmes;
 - Environmental Impact Assessments;
 - Strategic-level assessments (e.g. Strategic Environmental Assessments, Environmental Management Frameworks, State of the Environment Reports, etc.);
 - Biodiversity Management Plans, Biodiversity Action Plans, etc.;
 - Acting as an information source concerning environmental legislation;
 - Development of terms of reference and project proposals;
 - Quality control of specialist reports; and
 - Interfacing with clients in the consulting, mining, and government industries.

- ▶ **Strategic Environmental Focus (March 2009 – July 2009)**
Role: Senior Natural Scientist
 - Project management for water, aquatic and monitoring-related projects;
 - Management and co-ordination of specialists;

- Co-ordinating, implementing and conducting studies for various water and monitoring-related projects;
 - Acting as an information source concerning environmental legislation;
 - Development of terms of reference and project proposals;
 - Quality control of specialist reports; and
 - Interfacing with clients in the consulting, mining, and government industries.
- ▶ **Strategic Environmental Focus (July 2006 – February 2009)**
- Role: Aquatic Specialist**
- Conducting specialist assessments in the field of aquatic ecology and water science.
 - Acting as an information source concerning environmental legislation.
- ▶ **ECOSUN cc. (January 2005 – June 2006)**
- Role: Aquatic Scientist**
- Conducting specialist assessments in the field of aquatic ecology and water science.
 - Acting as an information source concerning environmental legislation.
- ▶ **Rand Afrikaans University (January 2003 – December 2004).**
- Role: Student Mentor / Post-Graduate Research Assistant**
- Validation of Antibodies for HSP70 Detection in the Freshwater Snail *Melanoides tuberculata* - B.Sc. (Honours) Student (January 2003 – December 2003);
 - The use of genotoxic and stress proteins in the active biomonitoring of the Rietvlei system, South Africa – M.Sc. Student (January 2003 – December 2003);
 - A comparison between Whole Effluent Toxicity (WET) testing and Active Biomonitoring (ABM) as indicators of in stream aquatic health – M.Sc. Student (January 2003 – December 2003);
 - The use of HSP70 and cortisol as biomarkers for heavy metal exposure - M.Sc. Student (January 2004 – December 2005).
- ▶ **Rand Afrikaans University (January 2000 – December 2004)**
- Role: Practical Demonstrator**
- Field supervisor for B.Sc. Honours (Zoology);
 - Aquatic Ecology (3rd year);
 - Human Physiology (2nd year); and
 - Ecology and Conservation (for Vista University)

Appendix B: Proof of SACNASP Registration of Authors





herewith certifies that

Byron Grant

Registration Number: 400275/08

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)

in the following field(s) of practice (Schedule 1 of the Act)

Ecological Science (Professional Natural Scientist)
Zoological Science (Professional Natural Scientist)
Aquatic Science (Professional Natural Scientist)

Effective 29 January 2014

Expires 31 March 2021

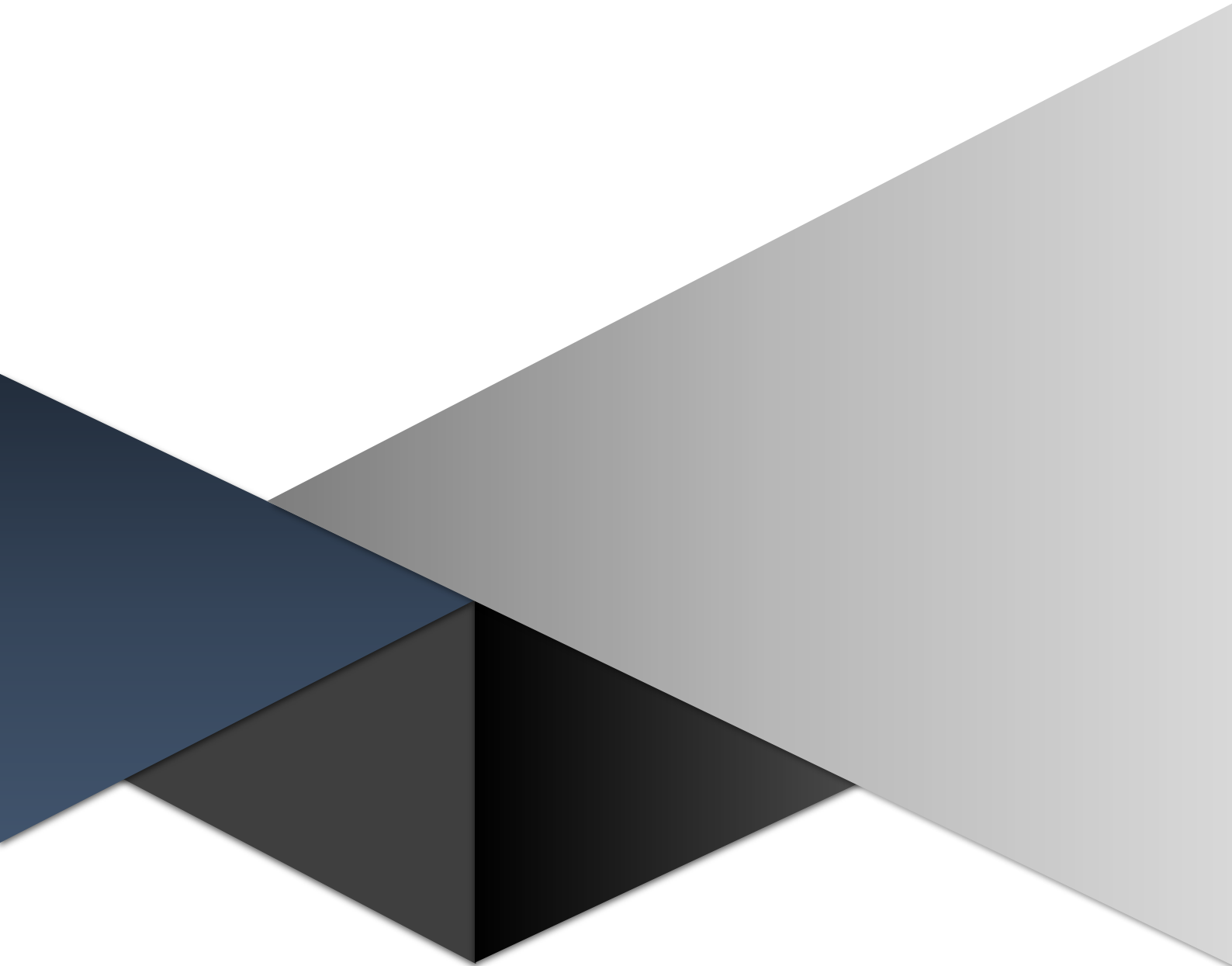


Chairperson

Chief Executive Officer



To verify this certificate scan this code



 (+27) 82 863 0769

 info@ecologyinternational.net

 www.ecologyinternational.net

Declaration of Independence by Specialist

I, Kieren Bremner Dunne, in my capacity as a specialist consultant, hereby declare that I –

- act as an independent specialist;

Where “**independent**” in relation a **specialist** means the following, as defined in GN982 of 2014 (as amended):

(a) that such EAP, **specialist** or person has no business, financial, personal or other interest in the activity or application in respect of which that EAP, specialist or person is appointed in terms of these Regulations;
or

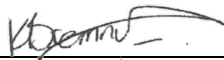
(b) that there are no circumstances that may compromise the objectivity of that EAP, specialist or person in performing such work;

excluding -

(i) normal remuneration for a specialist permanently employed by the EAP; or

(ii) fair remuneration for work performed in connection with that activity, application or environmental audit;

- will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- declare that there are no circumstances that may compromise my objectivity in performing such work;
- do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- have expertise in conducting the specialist report relevant to this application, including knowledge of the National Environmental Management Act, 1998 (Act No. 107 of 1998), regulations and any guidelines that have relevance to the proposed activity;
- based on information provided to me by the project proponent and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional ability; and
- undertake to have my work peer reviewed on a regular basis by a competent specialist in the field of study for which I am registered.



Signature of the Specialist

Ecology International (Pty) Ltd

Name of Company:

27-08-2021

Date

Declaration of Independence by Specialist

I, Kieren Bremner Dunne, in my capacity as a specialist consultant, hereby declare that I –

- act as an independent specialist;

Where “**independent**” in relation a **specialist** means the following, as defined in GN982 of 2014 (as amended):

(a) that such EAP, **specialist** or person has no business, financial, personal or other interest in the activity or application in respect of which that EAP, specialist or person is appointed in terms of these Regulations;
or

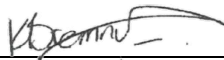
(b) that there are no circumstances that may compromise the objectivity of that EAP, specialist or person in performing such work;

excluding -

(i) normal remuneration for a specialist permanently employed by the EAP; or

(ii) fair remuneration for work performed in connection with that activity, application or environmental audit;

- will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- declare that there are no circumstances that may compromise my objectivity in performing such work;
- do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- have expertise in conducting the specialist report relevant to this application, including knowledge of the National Environmental Management Act, 1998 (Act No. 107 of 1998), regulations and any guidelines that have relevance to the proposed activity;
- based on information provided to me by the project proponent and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional ability; and
- undertake to have my work peer reviewed on a regular basis by a competent specialist in the field of study for which I am registered.



Signature of the Specialist

Ecology International (Pty) Ltd

Name of Company:

27-08-2021

Date