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ECOLOGICAL CONSULTANTS

**FAUNA SURVEY AND IMPACT ASSESSMENT FOR
FOR CHANGES TO INFRASTRUCTURE AT BAKUBUNG PLATINUM
MINE, LEDIG, NORTH WEST PROVINCE
(Frischgewaagd & Mimosa, North-West Province)**

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EIA REGULATIONS SPECIALISTS REPORT CHECKLIST

(1) A specialist report prepared in terms of the 2014 Environmental Impact Assessment Regulations must contain-

(a) details of-		
✓	(i) the specialist who prepared the report; and	page 52
✓	(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	page 52
✓	(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	page 53
✓	(c) an indication of the scope of, and the purpose for which, the report was prepared;	page 5
✓	(d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	page 5
✓	(e) a description of the methodology adopted in preparing the report or carrying out the specialised process;	page 9
✓	(f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	page 28
✓	(g) an identification of any areas to be avoided, including buffers;	page 29
✓	(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;	pages 13&14
✓	(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	page 5
✓	(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	page 16
✓	(k) any mitigation measures for inclusion in the EMPr;	page 46
X	(l) any conditions for inclusion in the environmental authorisation;	n/a
✓	(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	page 47
(n) a reasoned opinion-		
✓	(i) as to whether the proposed activity or portions thereof should be authorised; and	page 29
✓	(ii) if the opinion is that the proposed activity 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;	page 46
X	(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	No specific consultation was undertaken or deemed necessary as part of this study. Comments received by SLR as part of the EIA were considered in the undertaking of this study
X	(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	n/a
X	(q) any other information requested by the competent authority.	none

ABBREVIATIONS

IBA	Important Bird Area
mamsl	Metres Above Mean Sea Level
NEMBA ToPS	National Environmental Management: Biodiversity Act Threatened or Protected Species (No. 10 of 2004)
SABAP2	Southern African Bird Atlas Project 2

TERMINOLOGY

Alien	Introduced from elsewhere: neither endemic nor indigenous.
Biodiversity	The structural, functional and compositional attributes of an area, ranging from genes to landscapes.
Nectarivore	Animal obtaining its energy and nutrient requirements primarily from plant nectar.
Transformed	Transformed ecosystems are no longer natural and contain little or no indigenous flora. Examples include agricultural lands, plantations, urban areas, etc.

INTRODUCTION

Chiara Kotze of SLR Consulting approached De Castro and Brits Ecological Consultants to conduct a vertebrate fauna survey of the proposed infrastructure areas for the changes to infrastructure at Bakubung Platinum Mine, Ledig, North West Province.

The study area is situated in the North-West Province, centred on the Bakubung Platinum Mine, approximately 2 km to the west of the Sun City Resort. It covers portions of the farm Frischgewaagd 96 JQ and Mimosa 81 JQ. This report presents the findings of the walk-through faunal survey, and provides recommendations for the mitigation of potential impacts to fauna species.

TERMS OF REFERENCE

In accordance with the approved proposal for this study, the following aspects pertaining to the faunal ecology of the study area are included in this report:

- Determination of the occurrence, or possible occurrence, of threatened and / or sensitive vertebrate fauna (mammals, birds, reptiles and amphibians), based on data from the second Southern African Bird Atlas Project (<http://sabap2.adu.org.za>) and the current South African Reptile Conservation Assessment (<http://vmus.adu.org.za>), Friedmann & Daly (2004), Minter *et.al* (2004), and limited field surveys which will be conducted as follows:
 - While all species seen and heard will be recorded, the approach will be to search specifically for conservation-important species and to provide an accurate assessment of habitat quality for potentially occurring ‘species of conservation concern’.
 - Mammals will be recorded along the same transects and at the same points at which birds are sampled. Visual sightings will be supplemented with indirect evidence such as spoor or dung, as well as limited audio confirmation.
 - Birds will be surveyed by slowly walking through each of the vegetation types at each development site. Birds will be surveyed using the MacKinnon list method as recommended by O’Dea *et al.* (2004). Species heard calling only will also be included.
 - Reptiles and frogs will be searched for during the day by visual scanning of likely habitat, investigating potential refuges such as under logs, beneath old bark on dead trees, leaf litter, etc. Frogs will also be sampled through recording calls at acoustical monitoring points. No trapping exercises will be undertaken.
- Completion of an Impact Assessment to assess the potential impacts of the proposed developments on the fauna of the study area.

APPROACH AND LIMITATIONS

- The fieldwork component of the current survey was conducted in summer on the 18th and 19th November 2015. The single-season survey is deemed adequate for this survey as faunal activity levels are highest during spring / summer and due to the disturbance levels on site eliminating most of the potentially occurring Red Data species.
- After the completion of the fieldwork, a final pipeline alignment was provided in December 2015 and an updated Tailings Storage Facility (TSF) layout was provided in February 2016. As the November 2015 site visit entailed an assessment within a corridor surrounding the original design and much of the December 2015 pipeline layout falls within this corridor or its immediate surrounds, the findings of the November 2015 site visit are still deemed relevant. The changes in the TSF layout do not impact the findings of this report either and thus the mapping has been kept with the previous TSF layout.
- Emphasis was placed on searching for threatened species and compiling species lists at each of the proposed development sites so as to best compare the sensitivity of each site.
- Surveys occurred during daylight hours and no nocturnal surveys took place.
- No trapping of species was performed for sampling

PROJECT DESCRIPTION

Wesizwe Platinum Limited (Wesizwe) is the owner of Bakubung Platinum Mine, currently shaft sinking on the farm Frischgewaagd 96JQ (Portions 3, 4 and 11). The mine is located near Ledig, just south of the Pilanesberg Game Reserve and Sun City in the North West Province. Two reefs will be mined for Platinum Group Elements - platinum, palladium, rhodium and gold, with copper and nickel as by-products. The project area falls within the Rustenburg and Moses Kotane Local Municipalities of the Bojanala District Municipality. A locality map is provided in Figure 1.

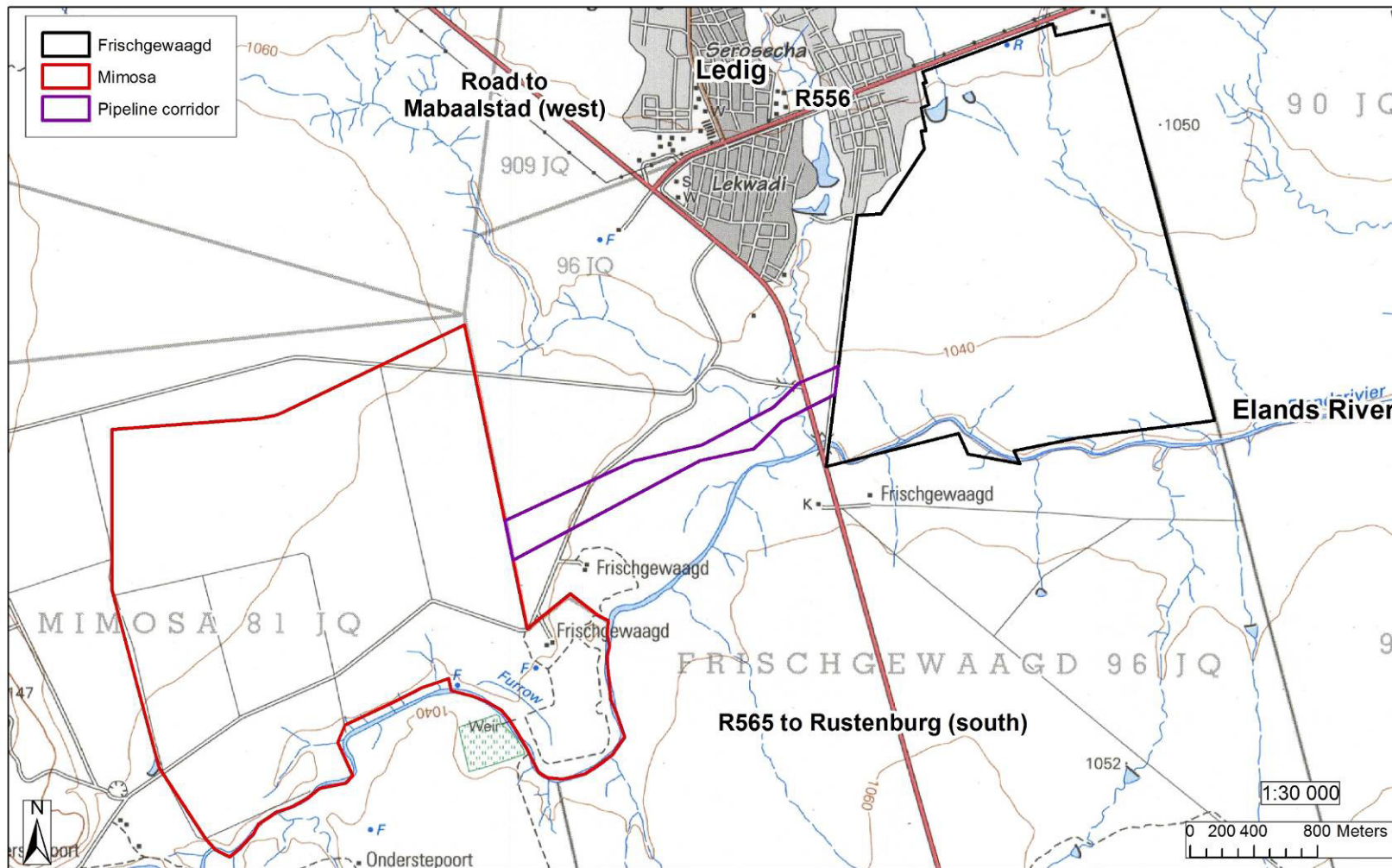
In 2008, Wesizwe conducted an Environmental Impact Assessment (EIA) process for the development of the Bakubung Platinum Mine. The Bakubung Platinum Mine received Environmental Authorisation in 2009, in terms of both the National Environmental Management Act (Act 107 of 1998) (NEMA) and Mineral and Petroleum Resources Development Act (Act 28 of 2002) (MPRDA). A Water Use Licence (WUL) was issued in terms of the National Water Act (Act 36 of 1998) (NWA) in 2010.

While construction at the Bakubung Platinum Mine has commenced, not all facilities have yet been constructed. Mining has not yet commenced. Wesizwe is now proposing to make several changes to the approved mine. The changes are required in order to cater for an increase in ore processing capacity, as well as additional support infrastructure which will require additional Environmental Authorisations, a Waste Management Licence (WML) and additional water uses requiring an amendment to their existing WUL.

The following changes are proposed to the Bakubung Platinum Mine, as per the approved proposal for this study and on the basis of subsequent communication with SLR, (infrastructure components addressed in the current specialist report are shaded):

- The construction of a Tailings Storage Facility (TSF) of approximately 235.3ha on the farm Mimosa 81JQ. The height will be approximately 44m.
- An approximately 3.83km long Tailings Pipeline linking the Concentrator to TSF. The alignment will be situated on the Farms Frischgewaagd and Mimosa and the intervening area to the north of the Elands River between these farms. The pipeline will be 300mm in diameter and will be raised above ground level on plinths, and the construction servitude will be 30m wide.
- The construction of a Concentrator Plant on a footprint of approximately 6.3ha.
- The construction of a Product Stockpiles and Ore Crusher on a footprint of approximately 25.2ha adjacent to the Concentrator Plant.
- The construction of a Waste Rock Dump on a footprint of approximately 5.8ha.
- The construction of a Pollution Control Dam's for the Concentrator on a footprint of approximately 5.1 ha on the farm Frischgewaagd.
- The construction of a Return Water Dam with a footprint of approximately 1.2ha on the farm Mimosa.
- The construction of a Storm Water Dam with a footprint of approximately 14.9ha on the farm Mimosa.
- Relocation of the ore crusher circuit from underground to the surface.
- Inclusion of the minerals in the waste rock into the mining licence, as the waste rock may potentially be crushed and sold as aggregate.
- Construction of erosion control measures along watercourses within the mine.
- Storage and handling of dangerous goods such as diesel and reagents on site.
- Various pipeline and road crossings over watercourses, including a bridge crossing.
- New sewage and water pipelines.
- Settling and return water dams.
- New internal mine roads (some of which will cross watercourses).
- Ventilation shafts and raise boreholes.
- Generators or possibly a solar power plant on site, for back-up power.
- A salvage yard for temporary storage of general and hazardous waste.
- The construction of Phase 1 of the mine housing on a footprint of approximately 19.8ha on the farm Frischgewaagd (approved).
- The construction of Phase 1a of the mine housing on a footprint of approximately 25.2ha on the farm Frischgewaagd.
- The construction of the Eskom Ledig substation on a footprint of approximately 5.1ha adjacent to the Phase 1a mine housing.

The footprints of all infrastructure components assessed in the current report are shown on the vegetation and land cover map provided in Figure 1.



Locality map for WeSizwe study area
(1:50 000 Topographical map 2527AC Sun City)

January 2016
Created by:



Figure 1. Location of the study area

METHODOLOGY

Fieldwork

Mammals, reptiles and frogs were surveyed simultaneously during the two days in the field in mid-November 2015 and observations were incidental, with no intensive quantitative sampling or trapping taking place. Most mammal species occurring in the study area are nocturnal or cryptic, resulting in heavy reliance on indirect evidence, such as spoor or scats. Reptiles were surveyed through active searching of likely habitat, such as under rocks or logs, exposed positions on rocky outcrops, etc. Frogs were surveyed audially or through visual observations, but no nocturnal surveys took place. Birds were surveyed using the MacKinnon list method as recommended by O’Dea *et al.* (2004). This is a rapid assessment technique in which all species seen or heard are grouped into consecutive lists of equal length and a species accumulation curve is generated by plotting cumulative species totals against number of lists. We used 10-species lists, which Herzog *et al.* (2002) considered to be the best compromise between stable richness estimation curves and robust sample size. Birds were searched for by walking slowly through vegetation, preferably along paths or tracks, and recording all species seen or heard. Care was taken to remain at any point of bird activity and record all the species present, particularly mixed species flocks. Thus, rate of observer movement was inversely proportional to level of bird activity. Birds were viewed through Bushnell Legend 10x42 binoculars. Similarity between different bird assemblages was determined using the Sørensen Coefficient of Similarity (Kent & Coker, 1992), defined as:

$$S_s = \frac{2a}{2a + b + c}$$

where S_s = Sørensen Coefficient of Similarity
a = number of species common to both communities
b = number of species in community 1
c = number of species in community 2

Lists of conservation-important mammals, birds, reptiles and frogs potentially occurring within the project area were prepared using data from the Friedmann & Daly (2004), the Southern African Bird Atlas Project 2 <http://sabap2.adu.org.za/>, Taylor *et al.* (2015), Minter *et al.* (2004) and Bates *et al.* (2014). The above data were captured mostly at a quarter-degree spatial resolution, but were refined by excluding species unlikely to occur within the study area, due to unsuitable habitat characteristics (e.g. altitude and land-use). Bat species thought to only fly over the site and not actually utilize vegetation communities (i.e. mostly cave-roosting species) were not included in the assessment. Potential occurrence of fauna in the study area was predicted based on knowledge of known habitat requirements of each species, and in some cases this predicted occurrence was confirmed during fieldwork. Limited additional information was obtained from previous faunal studies performed at Wesizwe.

Impact Assessment

The proposed method for the assessment of environmental issues is set out in the Table 1. This assessment methodology enables the assessment of environmental issues including: cumulative impacts, the severity of impacts (including the nature of impacts and the degree to which impacts may cause irreplaceable loss of resources), the extent of the impacts, the

duration and reversibility of impacts, the probability of the impact occurring, and the degree to which the impacts can be mitigated.

Table 1. Criteria for Assessing Impacts

PART A: DEFINITION AND CRITERIA*					
Definition of SIGNIFICANCE		Significance = consequence x probability			
Definition of CONSEQUENCE		Consequence is a function of severity, spatial extent and duration			
Criteria for ranking of the SEVERITY of environmental impacts	H	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.			
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.			
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.			
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.			
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.			
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.			
Criteria for ranking the DURATION of impacts	L	Quickly reversible. Less than the project life. Short term			
	M	Reversible over time. Life of the project. Medium term			
	H	Permanent. Beyond closure. Long term.			
Criteria for ranking the SPATIAL SCALE of impacts	L	Localised - Within the site boundary.			
	M	Fairly widespread – Beyond the site boundary. Local			
	H	Widespread – Far beyond site boundary. Regional/ national			
PART B: DETERMINING CONSEQUENCE					
SEVERITY = L					
DURATION	Long term	H	Medium	Medium	Medium
	Medium term	M	Low	Low	Medium
	Short term	L	Low	Low	Medium
SEVERITY = M					
DURATION	Long term	H	Medium	High	High
	Medium term	M	Medium	Medium	High
	Short term	L	Low	Medium	Medium
SEVERITY = H					
DURATION	Long term	H	High	High	High
	Medium term	M	Medium	Medium	High
	Short term	L	Medium	Medium	High
			L	M	H
			Localised Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional/ national
SPATIAL SCALE					
PART C: DETERMINING SIGNIFICANCE					
PROBABILITY (of exposure to impacts)	Definite/ Continuous	H	Medium	Medium	High
	Possible/ frequent	M	Medium	Medium	High
	Unlikely/ seldom	L	Low	Low	Medium
			L	M	H
CONSEQUENCE					

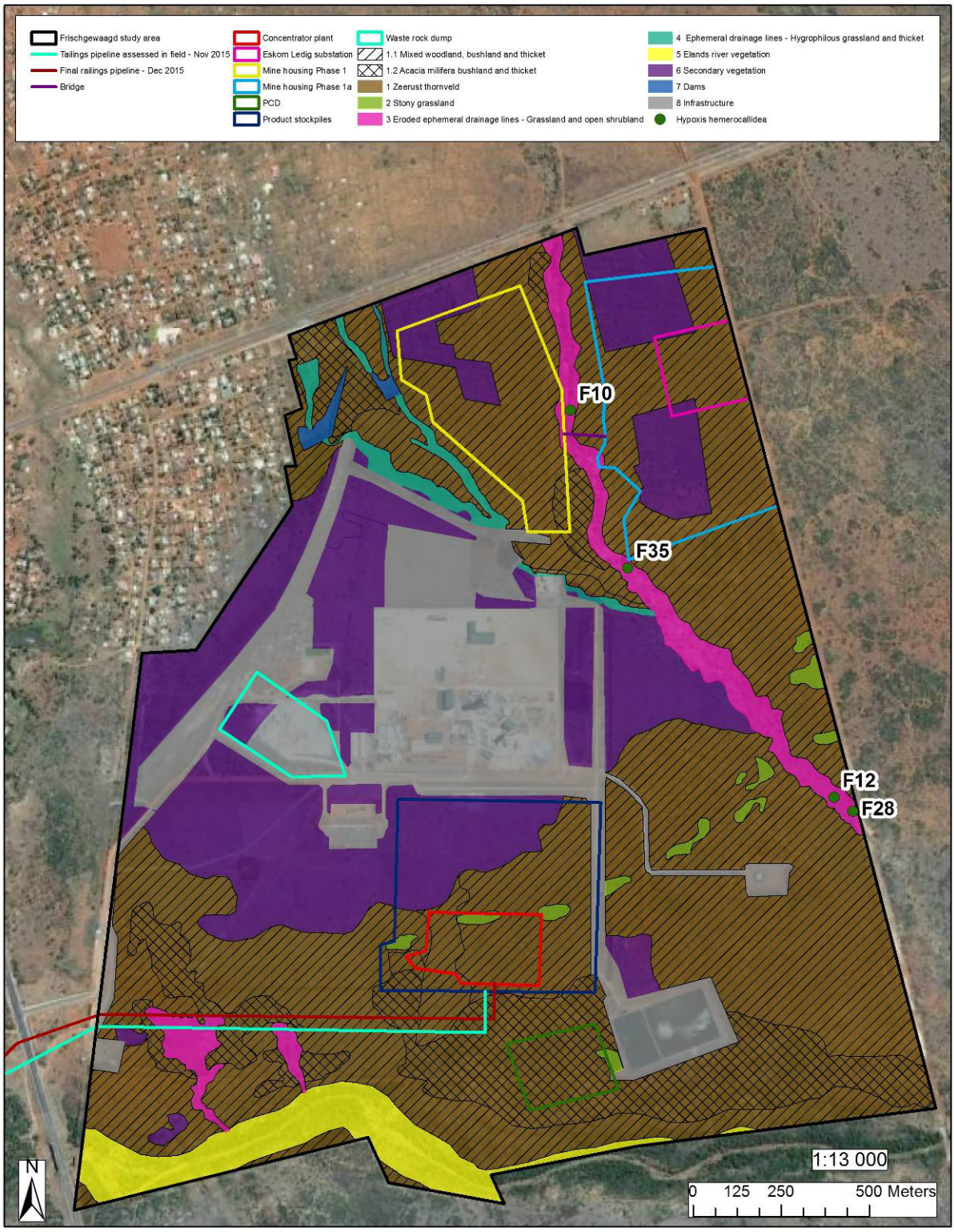
PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	Decision guideline
High	It would influence the decision regardless of any possible mitigation.
Medium	It should have an influence on the decision unless it is mitigated.
Low	It will not have an influence on the decision.

***H = high, M= medium and L= low and + denotes a positive impact.**

DESCRIPTION OF THE STUDY AREA AND ITS IMMEDIATE SURROUNDS

Locality and land-use

The changes to infrastructure at Bakubung Platinum Mine project (Bakubung Project) consists of a total of 11 proposed infrastructure developments with eight situated on the farm Frischgewaagd 96 JQ, three on Mimosa 81 JQ and one linking the two (Figures 2 & 3). The combined area of these infrastructure footprints is approximately 290 hectares. The study area is located south and east of the township of Ledig around the Bakubung Platinum Mine, Bojanala Platinum District Municipality, North-West Province. The centre of the study area is situated approximately 2.5 km west of the Sun City Resort and falls entirely within the quarter degree grid 2527AC. The major land-use activities within the study area and its immediate surrounds are residential, mining and agriculture (mostly livestock and game farming). The Pilanesberg National Park is situated approximately 2km to the north of the study area. Large tracts of undeveloped land occur to the east of the site and within the Pilanesberg National Park to the north.

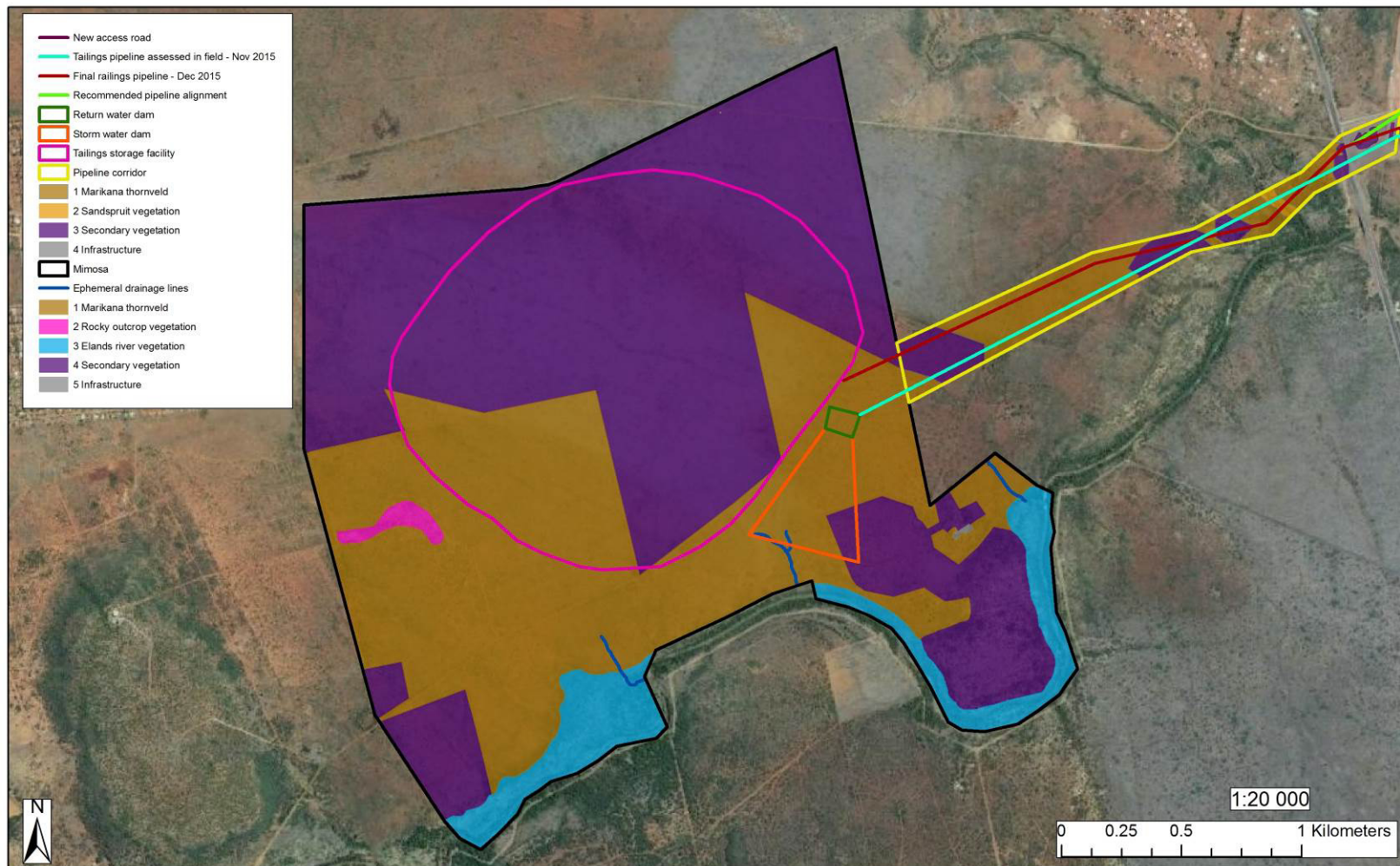


Vegetation map for Frischgewaagd

January 2016
Created by:



Figure 2. Location of the proposed infrastructure survey sites on Frischgewaagd



Vegetation map with proposed infrastructure for Mimosa and the Pipeline corridor

January 2016
Created by:



Figure 3. Location of the proposed infrastructure survey sites on Mimosa

Physical Habitat

The topography of the study area is very flat, with few small drainage lines (mostly non-perennial) situated in shallow valleys. The entire study area falls within the south-western parts of the Crocodile River catchment. The largest watercourse within the study area is a tributary of the Elandspruit which is bisected by the proposed pipeline route c. 300 meters west of the tarred R565. The elevation averages 1060 mamsl. The geology underlying the study area is dominated by clay soils from the Bushveld Complex as well as sediments of the Pretoria Group (Transvaal Supergroup), although the alkaline rocks of the nearby Pilanesberg Complex are probably influencing the soils in the site to some degree. Rainfall in the study area is approximately 550-600 mm per annum and occurs almost exclusively in the summer, with winters being very dry (Mucina & Rutherford, 2006). Fairly frequent frosts occur in winter.

Broad-scale vegetation and habitat patterns

The recently completed North West Biodiversity Sector Plan (2015) provides revised mapping of the national vegetation types (Mucina and Rutherford, 2006) within the North West Province. According to this revised mapping, six vegetation types occur within 3km of the study area and four vegetation types occur within the study area, indicating that the study area is situated within a zone of transition. The vast majority of the study area itself is mapped a Zeerust Thornveld, with a significant area of Western Sandy Bushveld indicated in the western parts of the Mimosa section and very small areas of Moot Plains Bushveld and Marikana Thornveld indicated along the southern boundaries of the Mimosa and Frischgewaagd sections respectively. Because of the scale at which the NWBSP was compiled, and considering that there are seldom distinct boundaries between vegetation types, but rather transition zones in which various vegetation types intergrade, it is not surprising that the vegetation of the study area does conform entirely with the NWBSP. While some vegetation shows some physiognomic, and to a lesser extent floristic, elements of Zeerust Thornveld, the vegetation does not show any significant similarities to Western Sandy Bushveld, and conforms far more closely to the description of Marikana Thornveld provided by Mucina & Rutherford (2006), particularly in terms of species composition and dominance. The only other Mucina & Rutherford (2006) vegetation type identified within the study area is Gold Reef Mountain Bushveld, which is represented by a very small (ca. 2.5ha) area at site M37 on a low quartzitic outcrop near the western boundary of the Mimosa section. This small portion of Gold Reef Mountain Bushveld is not large enough to comprise distinct faunal habitat, and is not dealt with any further here.

Marikana Thornveld is part of the Central Bushveld Bioregion of the Savanna Biome (Mucina and Rutherford, 2006). It occurs entirely within North-West Province and the northern parts of Gauteng to the north of the Magaliesburg from Pretoria westwards. According to Mucina and Rutherford (2006) Marikana Thornveld has a national conservation status of Endangered, but the more recent NWBSP 2015 categorises Marikana Thornveld as Vulnerable. The vegetation type originally covered approximately 165 663ha within the North West Province, of which 68 105ha (or 41.1%) remain untransformed (NWBSP 2015). Transformation is largely attributable to cultivation and to a lesser extent residential and industrial (e.g. mining) development. Less than 1% of this vegetation type is statutorily conserved and the Biodiversity conservation target is 19% (Mucina and Rutherford 2006).

VERTEBRATE FAUNA

The baseline assessment of the vertebrate fauna of the proposed Bakubung Project was conducted in March 2014 by de Castro & Brits. This area only contains the Mine Housing Phase 1, Mine Housing Phase 1a, Eskom Ledig Substation and the Bridge proposed development areas (de Castro & Brits, 2014). Selected data were extracted from this report to supplement the 2015 survey. Despite the generally untransformed nature of the study area, large portions to the west and south are intensively settled or mined and the fauna of the site is as a consequence depauperate. However, the 550km² Pilanesberg National Park, administered by the North West Parks and Tourism Board, is situated a mere 2km north of the site and this reserve contains large numbers of vertebrate fauna, including many Red Data listed species.

Mammals

Regional Overview

The study area is situated in the savanna biome, a region with high diversity of mammals, a low number of endemics and a high number of Red Data species. Much of the area surrounding the study area has been transformed and extensively disturbed through mining, agriculture and urban spread. This habitat transformation, together with elevated human presence and impacts such as disturbance, hunting and persecution, has negatively impacted on large mammal occurrence, particularly ungulates and predators. As a result, mammals remaining in the study area are mostly small, cryptic and often nocturnal species that are adapted to live in close proximity to transformed ecosystems such as cultivated fields or urban developments.

Local Setting

Ten mammal species were confirmed to occur within the development footprint during fieldwork (Appendix 2). However, more extensive fieldwork, including nocturnal surveys, would have produced a slightly longer list. One species of conservation concern was confirmed to occur: Serval (*Leptailurus serval*) is assessed as Near-threatened and is protected under the National Environmental Management: Biodiversity Act (No. 10 of 2004) Threatened or Protected Species Lists (GG Notice 256, March 2015) and scats of this species were located in grassland along the pipeline route on Frischgewaagd 96 JQ. All the remaining species located during fieldwork are common and widespread mammals of the savanna and grassland biomes of South Africa and include herbivores such as Steenbok (*Raphicerus campestris*), Grey Duiker (*Sylvicapra grimmia*), Springhare (*Pedetes capensis*) and Scrub Hare (*Lepus saxatilis*) and carnivores such as Caracal (*Caracal caracal*), Black-backed Jackal (*Canis mesomelas*) and Water Mongoose (*Atilax paludinosus*).

An estimated 23 conservation-important mammal species potentially occur within the general vicinity of the study area (Appendix 3). Several colonial cave-dwelling bat species are likely to occur overhead, but these species are obligate cave-dwellers and are thus only likely to feed over the site; they have therefore been excluded from the list.

A summary of the mammal species confirmed per site is presented in Table 2. The proposed Concentrator Plant and Stock Piles sites were grouped for convenience as this is a relatively homogenous and large area. The proposed development infrastructure site with the highest diversity of mammal species is the pipeline linking Frischgewaagd and Mimosa with five species recorded. This was followed by Mine Housing Phase 1 and the Tailings Storage

Facility with four each. The mammal species with the highest reporting rate is the Scrub Hare with records from nine sites, followed by the Grey Duiker with records from seven. Only one site produced a mammal of conservation concern: Serval was recorded on the pipeline route between Frischgewaagd and Mimosa (Table 2).

Table 2. Localities of confirmed mammal sightings per infrastructure site

Species	Infrastructure Footprints										TOTAL		
	Eskom Ledig Substation	Mine Housing Phase 1a	Mine Housing Phase 1	Bridge	Waste Rock Dump	Concentrator Plant and Stockpiles	Pollution Control Dam	Tailings Pipeline	Return Water Dam	Storm Water Dam		Tailings Storage Facility	
Marsh Mongoose				x								1	
Black-backed Jackal			x		x							2	
Cape Porcupine	x					x		x			x	4	
Caracal						x						1	
Grey Duiker	x	x		x		x		x		x	x	7	
Scrub Hare	x	x	x	x	x		x	x		x	x	9	
Serval								x				1	
Slender Mongoose								x	x			2	
Springhare			x		x							2	
Steenbok		x	x						x		x	4	
	10	3	3	4	3	3	3	1	5	2	2	4	11

Conservation-Important Species

Of the 23 potentially occurring conservation-important species, 21 have Red Data status (Appendix 3). Of these, 13 species are those that have been classified as Data-Deficient, meaning that not enough data were available in order to assess their Red Data status. It is very likely that at least a few Data-Deficient species do occur.

Seven of the remaining Red Data mammal species that potentially occur have been assessed as Near Threatened (Southern African Hedgehog, Spotted-necked Otter, African Clawless Otter, Serval, Honey Badger, Brown Hyaena and Rusty Bat), which means that they are close to or likely to soon qualify for the status of Vulnerable. One of these (Serval) was confirmed while the remaining species all have a Moderate chance of at least passing through or feeding in or over the study area, and are discussed in greater detail below. No Threatened species were confirmed during fieldwork. Each of the Near Threatened species likely to occur within the study area is discussed below:

Serval (*Leptailurus serval*)

This medium-sized carnivore is regularly reported during specialist surveys of grassland and wetland habitat (*pers.obs.*), with most evidence being in the form of scats. The preferred habitats in the savanna biome are open woodland and valley-bottom wetlands, but individuals

are sometimes recorded on the edges of towns in secondary grassland (*pers.obs.*). A single set of scats was located in grassland along the Tailings Pipeline Route at S25.38950° E27.07863°. It is likely that natural habitat in the study area supports at least a few individuals and thus highly likely to be affected by expanding township and mining construction activities.

Southern African Hedgehog (*Atelerix frontalis*)

This species has a wide habitat tolerance, from semi-arid to sub-temperate habitats, often tolerating proximity of high human density. It is thus possible to be present in any area of untransformed habitat within the study area.

Spotted-necked Otter (*Lutra maculicollis*)

This otter has been classified as Near Threatened by Friedman & Daly (2004). While this species is known as primarily an aquatic species which prefers large expanses of clear, relatively deep, open water such as large rivers, lakes and swamp areas, with plenty of cover along the edges (Skinner & Chimimba, 2005), it has been noted as adapting to small streams and rivers. Considering the small and non-perennial nature the streams in the study area, Spotted-necked otter is unlikely to be resident, although it may move into the area to forage from the nearby Elandspruit.

African Clawless Otter (*Aonyx capensis*)

This otter is also classified as Near Threatened (Friedman & Daly, 2004). It is likely to be resident along the Elandspruit and may occasionally forage within suitable habitat within the study area.

Honey Badger (*Mellivora capensis*)

This small carnivore utilises a wide range of habitats and in South Africa is most frequently observed in the savanna biome. These small carnivores occupy large territories (*c.* 50 km² range for a single pair, Friedman & Daly, 2006) and it is unlikely that they are resident in the study area but merely forage within occasionally.

Brown Hyaena (*Hyaena brunnea*)

This large carnivore occurs in the nearby Pilanesberg National Park and probably on many of the game/ livestock farms to the east of the study area. Brown Hyaena is a solitary forager which may travel between 30-50km in search of food and have home ranges ranging in size from approximately 19km² to 310km² (Skinner & Chimimba, 2005). This species is primarily a nocturnal scavenger, particularly in areas where it is persecuted. Recent records of Brown Hyaenas in the vicinity of Johannesburg and Pretoria indicate that this species can survive in close proximity to high numbers of people. However, given the size of their home ranges, it is unlikely that the study area will support a significant or viable sub-population and the proposed housing activities should have no significant impact on the individuals present, or on the overall conservation status of the species.

Rusty Bat (*Pipistrellus rusticus*)

This small insectivorous bat has declined in certain parts of its wide distribution range (Friedman & Daly, 2006) and has qualified as Near Threatened due to a lack of recent records. This bat roosts in crevices in trees and may at least forage over the study area.

One potentially occurring species has a national status of Vulnerable (Ground Pangolin, *Smutsia temminckii*). This species has disappeared from large parts of its former range and is

susceptible to habitat destruction, poisoning, electric fences and collection for the muthi trade (Friedmann & Daly 2004). It has a Low likelihood of occurring within the study area. No mammal potentially occurring within the study area is endemic to South Africa, i.e. occurring nowhere else (Appendix 4).

Five species potentially occurring are protected under the National Environmental Management: Biodiversity Act (No. 10 of 2004) Threatened and Protected Species Lists (GG Notice 256, 2015): Brown Hyaena, Serval, Black-footed Cat, Ground Pangolin and Cape Fox (Appendix 4). Deacon (2015) did not confirm any conservation-important mammal species during the specialist faunal survey in May 2015.

Birds

Regional Overview

The savanna regions of South Africa support the highest diversity of bird species but also the lowest number of endemics. The fynbos and grasslands found further south are isolated from other similar biomes in Africa and therefore support many endemics, but the savanna biome occurs unbroken over much of south-central and east Africa and most species are shared. The savanna biome can be further classified into various types, mostly based on climate, geology, vegetation or structure. The study area is situated within the Central Bushveld Bioregion of the savanna biome (Mucina & Rutherford, 2006), on the elevated central plateau of the sub-region. Bird assemblages contain species of both the moist savannahs of the eastern Lowveld and the more arid western Bushveld / Kalahari regions, while areas of grassland support some species normally associated with the Highveld. This overlap in assemblages has resulted in reasonably high species diversity in this corner of the North-West Province.

The quarter-degree grid 2527AC, within which the study area is located, has had a high total of 365 bird species recorded thus far in the ongoing second South African Bird Atlas (SABAP2). This is primarily due to high observer coverage in the Pilanesberg National Park, which is located within this grid. Each quarter-degree grid is divided into nine mapping units (pentads) for the purposes of this atlas. The pentad 2520_2700, in which most of the study area is situated, has had a total of 209 species recorded, or 57% of the species total for the entire grid 2527AC¹. One-hundred and twelve bird species were confirmed in the study area if the totals from the 2014 and 2015 surveys are combined. This includes eight waterbird species recorded in the existing Pollution Control Dam which is adjacent to the proposed Pollution Control Dam (Appendix 2).

Bird species recorded that are associated with the moister eastern savannas included White-browed Scrub-Robin (*Cercotrichas leucophrys*), Southern Boubou (*Laniarius ferrugineus*), Dark-capped Bulbul (*Pycnonotus tricolor*) and Black-headed Oriole (*Oriolus larvatus*). Birds more typical of the arid, western savannas included Kalahari Scrub-Robin (*Cercotrichas paeana*), Crimson-breasted Shrike (*Laniarius atrococcineus*), Chestnut-vented Tit-Babbler (*Parisoma subcaeruleum*) and Marico Flycatcher (*Bradornis mariquensis*). Some wetland birds were observed on the small dams adjacent to the Pollution Control Dam in the eastern portion of the study area, including Little Grebe (*Tachybaptus ruficollis*), Southern Pochard (*Netta erythrophthalma*), Red-billed Teal (*Anas erythrorhyncha*) and Fulvous Duck (*Dendrocygna bicolor*).

Important Bird Areas

The study area is situated within 2km of the Pilanesberg National Park Important Bird Area (Marnewick *et.al.* 2015). This Global IBA supports a number of threatened large raptors such as White-backed and Cape Vultures, Secretarybird, Verreaux's, Tawny and Martial Eagles, Bateleur and African Marsh Harrier. Additional wetland birds include White-backed Night Heron and African Finfoot. All of these birds are scarce outside protected areas in South Africa and no breeding habitat is present within the study area.

Local Setting

A total of 88 bird species were recorded from the 11 proposed infrastructure footprints as well as adjacent areas during the 2015 survey (Appendix 4). The proposed Concentrator Plant

¹ http://sabap2.adu.org.za/summary_pentad.php?pentad=2520_2700§ion=1&odr=rr

and Stock Piles sites were grouped for convenience as this is a relatively homogenous and large area. The footprint with the highest bird species diversity is the Eskom Ledig Substation with 44 species, followed by the Tailings Pipeline with 37 species and the Mine Housing Phase 1 with 33 species. Additional time in each proposed footprint will result in an increase in the number of species recorded, particularly in the largest footprint (Tailings Storage Facility) as this area was surveyed during a sub-optimal time of day for bird activity. No bird species with conservation-importance were recorded from any of the footprints and additional time spent surveying in each will most likely only better reflect species diversity rather than reveal Red Data or protected species. A summary of species totals for each footprint is presented in Table 3 and the full species list is presented in Appendix 4.

Table 3. Localities of confirmed bird species per infrastructure site

	Infrastructure Footprints											
	Eskom Ledig Substation	Mine Housing Phase 1a	Mine Housing Phase 1	Bridge	Waste Rock Dump	Concentrator Plant and Stockpiles	Pollution Control Dam	Tailings Pipeline	Return Water Dam	Storm Water Dam	Tailings Storage Facility	TOTAL
No. of Bird Species	44	10	33	11	13	28	18	37	18	18	14	88

A species accumulation curve using data for the 80 species that were recorded on 30 MacKinnon lists compiled within all 11 proposed development footprints indicates that the study area was adequately sampled for the period of fieldwork (Figure 1). Further surveys at other times of the year are likely to produce additional species.

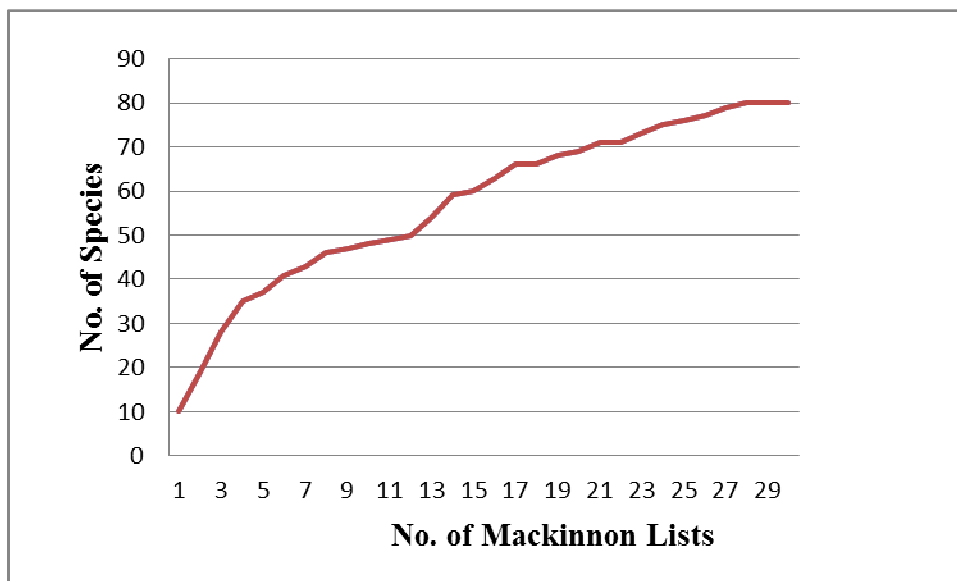


Figure 1. Species accumulation curve using MacKinnon list data for the Study Area

Species Assemblages in the Study Area

Encounter rates of species recorded in MacKinnon lists were used to determine the most frequently encountered species throughout the study area (Appendix 5). The 11 most frequently recorded species are indicated in Table 4. None of these species are habitat specialists and are commonly recorded throughout the savanna biome in South Africa. Interestingly, only two species are seedeaters (Black-throated Canary and Southern Masked Weaver) indicating that the area had not received much rainfall and grass seeds were possibly in short supply. One species is a specialist herbivore (Red-faced Mousebird), one species is a nectarivore (White-bellied Sunbird) and one is a generalist omnivore (Dark-capped Bulbul). The remaining six species are predominantly insectivorous which is understandable as much of the area is covered in shrubland or thicket which supports an abundance of insects.

Table 4. Most frequently encountered bird species in the Study Area

Species	Number of Encounters	Encounter Rate
Rattling Cisticola	17	0.057
Red-faced Mousebird	16	0.053
Black-chested Prinia	15	0.050
Sabota Lark	13	0.043
Dark-capped Bulbul	12	0.040
Black-throated Canary	10	0.033
Southern Masked Weaver	10	0.033
White-bellied Sunbird	10	0.033
Chestnut-vented Titbabbler	9	0.030
Long-billed Crombec	9	0.030
White-browed Scrub-robin	9	0.030

An analysis of Sørensen Co-efficients of Similarity between four bird assemblages was undertaken to quantify the affinity between the assemblages (Table 5). This is discussed in more detail under each assemblage description.

Table 5. Sørensen Co-efficient of Similarity Matrix for bird assemblages in the Study Area

	Thicket	Shrubland	Grassland	Secondary / Modified
Thicket	-	0.21	0.00	0.00
Shrubland	0.21	-	0.12	0.12
Grassland	0.00	0.12	-	0.07
Secondary / Modified	0.00	0.12	0.07	-

i. Thicket

This assemblage is restricted to the denser groves of particularly *Acacia mellifera*, *A. karoo* and *A. caffra* within the study area. Thicket patches were encountered in many of the proposed development footprints and seemed to be particularly evident in the red clay / loam soils across the study area (Appendix 1). The two birds most frequently encountered in Thicket are Crested Francolin and Kalahari Scrub-robin, with five records each, followed by Chestnut-vented Titbabbler, Southern Boubou and White-bellied Sunbird with four each (Table 6). Additional bird species restricted to this assemblage included Black Cuckoo, Crimson-breasted Shrike, Red-eyed Dove, Speckled Mousebird and Thick-billed Weaver. The closest affinity is with Shrubland ($S_s = 0.21$; Table 5), with 10 shared species. A total of 24 species were recorded from this assemblage, the third highest in the study area (Appendix 2).

Table 6. Reporting rate of the most frequently encountered bird species in Thicket

Thicket Assemblage	No. of Records	Reporting Rate
Crested Francolin	5	0.109
Kalahari Scrub-robin	5	0.109
Chestnut-vented Titbabbler	4	0.087
Southern Boubou	4	0.087
White-bellied Sunbird	4	0.087
Black Cuckoo	3	0.065
Dark-capped Bulbul	3	0.065
Red-faced Mousebird	3	0.065
Crimson-breasted Shrike	2	0.043
Red-eyed Dove	2	0.043

ii. Shrubland

Shrubland occurs over much of the study area, with dominant woody species including *Acacia karoo*, *A. caffra*, *Searsia lancea*, *Ziziphus mucronata* and *Grewia flava*. Trees seldom

exceed three meters in height and are often multi-stemmed (Appendix 1). This habitat supports the largest and most species-rich assemblage within the study area with 58 species recorded (Appendix 2). The most frequently recorded species is Rattling Cisticola with 17 records, followed by Sabota Lark, Black-chested Prinia and Red-faced Mousebird with 13 records each (Table 7). The closest affinity is with Thicket ($S_s = 0.21$; Table 5), with 10 shared species. Bird species restricted to this assemblage include Great Spotted Cuckoo, Cape Glossy Starling, Chinspot Batis, Fork-tailed Drongo, Golden-breasted Bunting and Red-backed Shrike, all common savanna species across South Africa.

Table 7. Reporting rate of the most frequently encountered bird species in Shrubland

Shrubland Assemblage	No. of Records	Reporting Rate
Rattling Cisticola	17	0.083
Sabota Lark	13	0.063
Black-chested Prinia	13	0.063
Red-faced Mousebird	13	0.063
Long-billed Crombec	9	0.044
White-browed Scrub-robin	9	0.044
Black-throated Canary	9	0.044
Southern Masked Weaver	9	0.044
Dark-capped Bulbul	9	0.044
Diderick Cuckoo	6	0.029

iii. Grassland

Grassland patches occur throughout the study area, particularly on black clay soils where the soil restricts the establishment of Shrubland (Appendix 1). Grasslands are best represented in the Mine Housing Phase 1, Product Stockpiles and Concentrator Plant and Tailings Storage Facility footprints. The most frequently recorded bird in this assemblage is Rufous-naped Lark with six records, followed by African Quailfinch with four and Cattle Egret with three (Table 8). Additional birds unique to this assemblage included Marsh Owl, Black-headed Heron, African Pipit and Common Waxbill (Appendix 2). The Shrubland assemblage showed the closest affinity with Grassland, with a Sørensen Co-efficients of Similarity of 0.12 (Table 5).

Table 8. Reporting rate of the most frequently encountered bird species in Grassland

Grassland Assemblage	No. of Records	Reporting Rate
Rufous-naped Lark	6	0.154
African Quailfinch	4	0.103
Cattle Egret	3	0.077
Black-headed Heron	2	0.051
Crowned Lapwing	2	0.051
Desert Cisticola	2	0.051
Red-breasted Swallow	2	0.051

Southern Red Bishop	2	0.051
Swainson's Spurfowl	2	0.051
Cape Turtle-dove	2	0.051

iv. Secondary / Modified

Small sections of Secondary / Modified areas exist within the study area, the largest of which is in the eastern portion of the Tailings Pipeline Route adjacent to the tarred R565 road (Appendix 1). Birds recorded within this assemblage are familiar species that are often or almost always commensal with man. These include Common Myna, Cattle Egret, Pied Crow and House Sparrow (Appendix 2).

Conservation-Important Species

Four Red Data species were confirmed in the pentad during SABAP2, all with a reporting rate of under 15%: Marabou Stork (*Leptoptilos crumeniferus*), Tawny Eagle (*Aquila rapax*), Secretarybird (*Sagittarius serpentarius*) and Yellow-throated Sandgrouse (*Pterocles gutturalis*). No species of conservation concern were located during fieldwork. However, Black Stork was confirmed on an adjacent property in May 2015 (Deacon, 2015). Some suitable habitat does occur within the project area for this species, but only as an occasional visitor. An additional 22 Red Data species have been recorded from other pentads within 2527AC (Appendix 4). Due to the disturbed nature of the study area and its location adjacent to a mine and residential area, most species have a low likelihood of utilising the habitat within the study area. Human disturbance cannot be tolerated by many of the larger birds such as Martial Eagle (*Polemaetus bellicosus*) and Kori Bustard (*Ardeotis kori*). The lack of suitable natural wetlands also results in a low likelihood for aquatic species, and the absence of breeding sites (cliffs, large trees and large wetlands) exclude most species from settling. Of the potentially occurring Red Data species, six have a moderate chance of occurring within the study area (Appendix 3). Each of these is discussed below:

Lanner Falcon (*Falco biarmicus*)

This large falcon is listed as Vulnerable in the latest Red Data List due to habitat loss, poisoning and persecution (Taylor *et. al.* 2015). No suitable breeding habitat (ledges on cliffs) is present within the study area but birds may occasionally forage over it.

European Roller (*Coracias garrulous*)

This non-breeding migrant is listed as Near Threatened in the latest conservation assessment due to habitat loss and disturbance over much of its breeding range in Europe and western Asia (Taylor *et. al.* 2015). It is likely to forage over suitable open habitat of the study area during the summer months.

Half-collared Kingfisher (*Alcedo semitorquata*)

Half-collared Kingfisher is listed as Near Threatened due to continuous degradation of streams and rivers across South Africa, including habitat destruction, agriculture and a reduction in water quality (Taylor *et. al.*, 2015). It is likely to be resident only along permanent streams such as the nearby Elandspruit but could occasionally forage over smaller waterways within the study area.

Abdim's Stork (*Ciconia abdimii*)

A decreasing population trend and a reduction of habitat and habitat quality have led to this species being assessed as Near Threatened (Taylor *et. al.*, 2015). This species breeds in a broad band across the African savannas north of the equator and birds may only occasionally forage over the study area.

Black Stork (*Ciconia nigra*)

Black Stork is listed as Vulnerable due to loss of wetland habitat in the region as well as having a small local population (Taylor *et. al.*, 2015). This species was confirmed from an adjacent property (Zwartkoppies) in May 2015 (Deacon, 2015) and may occasionally forage in the streams and dams within the study area. None are known to breed within the adjacent Pilanesberg IBA (Taylor *et. al.*, 2015).

Yellow-throated Sandgrouse (*Pterocles gutturalis*)

A small local population and reliance on prevailing farming practices has resulted in this species being assessed as Near Threatened (Taylor *et. al.*, 2015). The study area is situated well within the range of this bird and, despite little or no cultivation taking place within the study area; birds may occasionally forage over the areas with clay soils.

Apart from Lanner Falcon and Black Stork which are listed as Vulnerable, all the potentially occurring Red Data birds are classified as Near Threatened in the Red Data list (Taylor *et. al.*, 2015, Appendix 3). Eight potentially occurring species are protected under the National Environmental Management: Biodiversity Act (No. 10 of 2004) Threatened and Protected Species Lists (GG Notice 256, 2015, Appendix 3).

Effect of Proposed Solar Power Plant on Birds

BirdLife South Africa states that its main concern about the two most prevalent types of solar power generation in South Africa – photovoltaic and concentrated solar power – is that they can potentially cause the displacement or exclusion from important habitats of nationally and/or globally threatened, rare, endemic or range-restricted bird species (file:///C:/Users/user/Downloads/Solar%20guidelines_version2.pdf.) If the development of a solar plant could have a significant and detrimental impact on biodiversity then additional surveys are recommended. If sufficient data are available for the specific area and no nationally or globally threatened, rare, endemic or range-restricted species are likely to occur, then this survey can be performed as a desktop review. It is suggested that if a solar power plant is approved by the mine, an avifaunal specialist be approached to determine the most suitable site for such a development and suggest the most suitable mitigation measures.

Reptiles & Frogs

Reptiles and frogs were recorded incidentally during the survey and no trapping was performed. Four reptile and four frog species are confirmed from the study area, all being common and widespread in the savanna biome in South Africa and not species of conservation-concern (Appendix 2). The North-West Province does not have high numbers of threatened or near threatened reptiles, and no Red Data reptile species potentially occur. The only additional frog species of conservation concern that potentially occurs in the study area is Giant Bullfrog (*Pyxicephalus adspersus*, Appendix 3), which has been assessed as Near Threatened (Minter *et al.*, 2004) and is protected under the National Environmental Management: Biodiversity Act (No. 10 of 2004) Threatened and Protected Species Lists (GG Notice 256, 2015). There are no seasonal pan-wetlands in the study area which may provide suitable breeding sites for the Giant Bullfrog and its presence within the study area is unlikely. No conservation-important reptiles or frogs were recorded by Deacon (2015).

CONCLUSION

Nine mammal species were recorded during fieldwork. One additional species was recorded during the 2014 survey. The most frequently recorded mammals include Scrub Hare, Grey Duiker, Cape Porcupine and Steenbok – all common and widespread species in South Africa. Populations of these smaller mammals are especially evident where areas had been fenced off from the surrounding developments (for example the Eskom Ledig Substation and Mine Housing Phase 1 areas). Species diversity and abundance appeared less evident on the heavily grazed and unfenced Mimosa property, where people had unrestricted access.

No threatened mammals were located during fieldwork, although one Near Threatened species (Serval) was recorded from Shrubland on the Tailings Pipeline route. This carnivore is sensitive to human disturbances such as mining and township infrastructure development as it may succumb to snaring, hunting with dogs or habitat loss. Only one set of scats was located in two days of fieldwork indicating that this species is a scarce resident at best, and is probably losing habitat as much to bush encroachment as it is to mining and housing projects. It is unlikely that the proposed developments will have a serious impact on its wider population as much habitat is present in the area, including in the nearby Pilanesberg National Park. Serval is also listed as Protected under the National Environmental Management: Biodiversity Act (No. 10 of 2004) Threatened and Protected Species Lists (GG Notice 256, 2015).

Of the potentially occurring mammals of conservation-importance, seven have been assessed as Near Threatened (Southern African Hedgehog, Spotted-necked Otter, African Clawless Otter, Serval, Honey Badger, Brown Hyaena and Rusty Bat) and all have a moderate likelihood of occurring at least as foraging species, although only in low density as no evidence of their presence was found. One species is listed as Vulnerable (Ground Pangolin) but this species has a low likelihood of occurring due to regional scarcity and human disturbance. The mammal sensitivity within the study area is Low.

Eighty-eight bird species were recorded during fieldwork. This figure increases to 112 if data from the 2014 survey as well as species recorded from adjacent habitats are included. Four main bird assemblages exist within the development footprints and these are Thicket, Shrubland, Grassland and Secondary / Modified. The most frequently recorded bird species are all habitat generalists, being found throughout the savanna biome of South Africa. Twenty-six Red Data birds potentially occur within the general vicinity of the study area although only six have a moderate chance of occurring within the study area: Lanner Falcon, Black Stork, European Roller, Half-collared Kingfisher, Abdim's Stork and Yellow-throated Sandgrouse. Apart from Lanner Falcon which is listed as Vulnerable, all the potentially occurring Red Data birds are classified as Near Threatened in the Red Data list. Most of these species have a low likelihood of actually breeding within the site and most species would only occasionally forage within the study area. The avian sensitivity within the study area is Low.

Four reptiles and four amphibians were recorded within the study area, none with conservation status. Two potentially occurring species are protected under the National Environmental Management: Biodiversity Act (No. 10 of 2004) Threatened and Protected Species Lists (GG Notice 256, 2015): Southern African Python and Giant Bullfrog and one species is listed as Near Threatened: Giant Bullfrog. No suitable breeding habitat occurs

within any of the proposed development footprints for this species. The reptile and frog sensitivity within the study area is Low.

Provided the recommendations suggested in this report are followed, there is no objection to the proposed development in terms of the fauna of the study area.

General mitigation and management measures aimed at avoiding or reducing related impacts on fauna are listed in the full Impact Assessment which is presented in Appendix 6:

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APPENDIX 1. PHOTOGRAPHS OF THE FAUNAL ASSEMBLAGES PRESENT WITHIN THE STUDY AREA

	
<p>Thicket</p>	<p>Shrubland</p>
	
<p>Grassland</p>	<p>Grassland</p>
	
<p>Secondary / Modified</p>	<p>Artificial wetland on existing Pollution Control Dam</p>

APPENDIX 2. CHECKLIST OF FAUNA RECORDED DURING FIELDWORK

Species	Family	Protected	Red Data	Assemblages				2014 Survey Only
				Thicket	Shrubland	Grassland	Secondary / Modified	
Mammals								
Marsh Mongoose	<i>Atilax paludinosus</i>							x
Black-backed Jackal	<i>Canis mesomelas</i>				x			
Caracal	<i>Caracal caracal</i>				x			
Slender Mongoose	<i>Herpestes sanguineus</i>				x			
Cape Porcupine	<i>Hystrix africaeaustralis</i>			x	x	x		
Serval	<i>Leptailurus serval</i>	NEMBA (PR)	NT			x		
Scrub Hare	<i>Lepus saxatilis</i>			x	x	x		
Springhare	<i>Pedetes capensis</i>					x		
Steenbok	<i>Raphicerus campestris</i>				x	x		
Grey Duiker	<i>Sylvicapra grimmia</i>			x				
Subtotal	10	1	1	3	6	5	0	1
Birds								
Common Myna	<i>Acridotheres tristis</i>						x	
Egyptian Goose *	<i>Alopochen aegyptiacus</i>							
Thick-billed Weaver	<i>Amblyospiza albifrons</i>			x				
Red-billed Teal *	<i>Anas erythrorhyncha</i>							
African Darter	<i>Anhinga rufa</i>							x
African Pipit	<i>Anthus cinnamomeus</i>					x		
Little Swift	<i>Apus affinis</i>			over	over	over	over	

White-rumped Swift	<i>Apus caffer</i>			over	over	over	over	
Black-headed Heron	<i>Ardea melanocephala</i>					x		
Marsh Owl	<i>Asio capensis</i>					x		
Chinspot Batis	<i>Batis molitor</i>				x			
Marico Flycatcher	<i>Bradornis mariquensis</i>				x			
Cattle Egret	<i>Bubulcus ibis</i>				x	x	x	
Steppe Buzzard	<i>Buteo vulpinus</i>							x
Barred Wren-Warbler	<i>Calamonastes fasciolatus</i>							x
Sabota Lark	<i>Calendulauda sabota</i>				x			
Fiery-necked Nightjar	<i>Caprimulgus pectoralis</i>				x			
Familiar Chat	<i>Cercomela familiaris</i>				x		x	
White-browed Scrub-Robin	<i>Cercotrichas leucophrys</i>				x			
Kalahari Scrub-Robin	<i>Cercotrichas paena</i>			x				
Dideric Cuckoo	<i>Chrysococcyx caprius</i>				x			
Klaas's Cuckoo	<i>Chrysococcyx klaas</i>			x	x			
Marico Sunbird	<i>Cinnyris mariquensis</i>				x			
White-bellied Sunbird	<i>Cinnyris talatala</i>			x	x			
Desert Cisticola	<i>Cisticola aridulus</i>					x		
Rattling Cisticola	<i>Cisticola chiniana</i>				x			
Neddicky	<i>Cisticola fulvicapilla</i>				x			
Zitting Cisticola	<i>Cisticola juncidis</i>							x
Great Spotted Cuckoo	<i>Clamator glandarius</i>				x			
Jacobin Cuckoo	<i>Clamator jacobinus</i>				x			
White-backed Mousebird	<i>Colius colius</i>				x			
Speckled Mousebird	<i>Colius striatus</i>			x				
Speckled Pigeon	<i>Columba guinea</i>							x
Pied Crow	<i>Corvus albus</i>				x		x	
Grey Go-away-bird	<i>Corythaixoides concolor</i>				x			
Black-throated Canary	<i>Crithagra atrogularis</i>				x	x		

Yellow Canary	<i>Crithagra flaviventris</i>				x			
Yellow-fronted Canary	<i>Crithagra mozambica</i>			x	x			
Black Cuckoo	<i>Cuculus clamosus</i>			x				
African Palm-Swift	<i>Cypsiurus parvus</i>			over	over	over	over	
Fulvous Duck *	<i>Dendrocygna bicolor</i>							
Crested Francolin	<i>Dendroperdix sephaena</i>			x	x			
Fork-tailed Drongo	<i>Dicrurus adsimilis</i>				x			
Black-shouldered Kite	<i>Elanus caeruleus</i>					x		
Golden-breasted Bunting	<i>Emberiza flaviventris</i>				x			
Cinnamon-breasted Bunting	<i>Emberiza tahapisi</i>				x			
Chestnut-backed Sparrowlark	<i>Eremopterix leucotis</i>							x
Common Waxbill	<i>Estrilda astrild</i>					x		
Yellow-crowned Bishop	<i>Euplectes afer</i>							x
White-winged Widowbird	<i>Euplectes albonotatus</i>					x		
Southern Red Bishop	<i>Euplectes orix</i>					x		
Red-knobbed Coot *	<i>Fulica cristata</i>							
Violet-eared Waxbill	<i>Granatina granatina</i>							x
Woodland Kingfisher	<i>Halcyon senegalensis</i>				x			
Wahlberg's Eagle	<i>Hieraaetus wahlbergi</i>				x			
Lesser Striped-Swallow	<i>Hirundo abyssinica</i>				x			
White-throated Swallow *	<i>Hirundo albigularis</i>							
Greater Striped-Swallow	<i>Hirundo cucullata</i>					x		
Rock Martin	<i>Hirundo fuligula</i>							x
Barn Swallow	<i>Hirundo rustica</i>			over	over	over	over	
Red-breasted Swallow	<i>Hirundo semirufa</i>					x		
Red-billed Firefinch	<i>Lagonosticta senegala</i>				x			
Cape Glossy Starling	<i>Lamprotornis nitens</i>				x			
Crimson-breasted Shrike	<i>Laniarius atrococcineus</i>			x				
Southern Boubou	<i>Laniarius ferrugineus</i>			x				

Common Fiscal	<i>Lanius collaris</i>							X
Red-backed Shrike	<i>Lanius collurio</i>				X			
Lesser Grey Shrike	<i>Lanius minor</i>							X
Red-crested Korhaan	<i>Lophotis ruficrista</i>			X	X			
Black-collared Barbet	<i>Lybius torquatus</i>			X				
Pale-chanting Goshawk	<i>Melierax canorus</i>					X		
European Bee-eater	<i>Merops apiaster</i>				X			
Little Bee-eater	<i>Merops pusillus</i>				X			
Rufous-naped Lark	<i>Mirafra africana</i>					X		
Cape Wagtail	<i>Motacilla capensis</i>				X			
Spotted Flycatcher	<i>Muscicapa striata</i>			X				
Southern Pochard *	<i>Netta erythrophthalma</i>							
Helmeted Guineafowl	<i>Numida meleagris</i>				X			
Namaqua Dove	<i>Oena capensis</i>							X
Red-winged Starling	<i>Onychognathus morio</i>						X	
Black-headed Oriole	<i>Oriolus larvatus</i>							X
African Quailfinch	<i>Ortygospiza atricollis</i>					X		
Chestnut-vented Tit-Babbler	<i>Parisoma subcaeruleum</i>			X	X			
Southern Greyheaded Sparrow	<i>Passer diffusus</i>				X			
House Sparrow	<i>Passer domesticus</i>						X	
Cape Sparrow	<i>Passer melanurus</i>				X			
White-browed Sparrow-Weaver	<i>Plocepasser mahali</i>							X
Southern Masked-Weaver	<i>Ploceus velatus</i>			X	X			
Black-chested Prinia	<i>Prinia flavicans</i>				X	X		
Tawny-flanked Prinia	<i>Prinia subflava</i>				X			
Swainson's Spurfowl	<i>Pternistis swainsonii</i>					X		
Dark-capped Bulbul	<i>Pycnonotus tricolor</i>			X	X			
Green-winged Pytilia	<i>Pytilia melba</i>				X			
Red-billed Quelea	<i>Quelea quelea</i>					X		

Scaly-feathered Finch	<i>Sporopipes squamifrons</i>				x			
Cape Turtle Dove	<i>Streptopelia capicola</i>				x	x		
Red-eyed Dove	<i>Streptopelia semitorquata</i>			x				
Laughing Dove	<i>Streptopelia senegalensis</i>				x			
Common Whitethroat	<i>Sylvia communis</i>							x
Long-billed Crombec	<i>Sylvietta rufescens</i>				x			
Little Grebe *	<i>Tachybaptus ruficollis</i>							
Brown-crowned Tchagra	<i>Tchagra australis</i>			x	x			
African Grey Hornbill	<i>Tockus nasutus</i>				x			
Acacia Pied Barbet	<i>Tricholaema leucomelas</i>				x			
Blue Waxbill	<i>Uraeginthus angolensis</i>				x	x		
Red-faced Mousebird	<i>Urocolius indicus</i>			x	x			
Blacksmith Lapwing *	<i>Vanellus armatus</i>							
Crowned Lapwing	<i>Vanellus coronatus</i>					x		
Pin-tailed Whydah	<i>Vidua macroura</i>				x		x	
Long-tailed Paradise-Whydah	<i>Vidua paradisaea</i>							x
Shaft-tailed Whydah	<i>Vidua regia</i>							x
Cape White-eye	<i>Zosterops virens</i>			x				
Subtotal	112	0	0	24	58	25	11	17
Reptiles								
Puffadder	<i>Bitis arietans</i>				x			
Mozambique Spitting Cobra	<i>Naja mossambica</i>				x			
Striped Skink	<i>Trachylepis striata</i>				x			
Variable Skink	<i>Trachylepis varia</i>				x	x		
Subtotal	4	0	0	0	4	1	0	0
Amphibians								
Common River Frog	<i>Amietia angolensis</i>				x			
Gutteral Toad	<i>Amietophrynus gutteralis</i>							x
Raucous Toad	<i>Amietophrynus rangeri</i>				x			

African Bullfrog	<i>Pyxicephalis edulis</i>							x
Subtotal	4	0	0	0	2	0	0	2
TOTAL	130	1	1	27	70	31	11	20

* = Recorded from adjacent habitat in 2015

NT = Near-threatened

PR = Protected

NEMBA = National Environmental Management: Biodiversity Act Threatened or Protected Species (No. 10 of 2004)

APPENDIX 3. POTENTIALLY OCCURRING FAUNA

Species	Scientific Name	Red Data	Protected	Habitat	Likelihood	Reason
Mammals						
African Clawless Otter	<i>Aonyx capensis</i>	NT*		Rivers and streams	Moderate	Suitable habitat present along the pipeline route
Southern African Hedgehog	<i>Atelerix frontalis</i>	NT		Grassland and savanna	Moderate	Suitable habitat present
Reddish-grey Musk Shrew	<i>Crocidura cyanea</i>	DD		Wide variety of habitats	Moderate	Suitable habitat present
Swamp Musk Shrew	<i>Crocidura mariquensis</i>	DD		Wide variety of habitats	Moderate	Suitable habitat present
Tiny Musk Shrew	<i>Crocidura fuscomurina</i>	DD		Wide variety of habitats	Moderate	Suitable habitat present
Lesser Red Musk Shrew	<i>Crocidura hirta</i>	DD		Wide variety of habitats	Moderate	Suitable habitat present
Peters' Musk Shrew	<i>Crocidura silacea</i>	DD		Wide variety of habitats	Moderate	Suitable habitat present
Short-snouted Elephant-shrew	<i>Elephantulus brachyrhynchus</i>	DD		Grassland and shrubland	Moderate	Suitable habitat present
Black-footed Cat	<i>Felis nigripes</i>		NEMBA (PR)	Grassland and shrubland	Low	Edge of range, disturbance
Spotted-necked Otter	<i>Hydricotis maculicollis</i>	NT		Rivers and streams	Moderate	Suitable habitat present along the pipeline route
Single-striped Grass-Mouse	<i>Lemniscomys rosalia</i>	DD		Woodland with tall grass	Moderate	Suitable habitat present
Serval	<i>Leptailurus serval</i>	NT	NEMBA (PR)	Grassland, wetlands	Confirmed	
Honey Badger	<i>Mellivora capensis</i>	NT		Wide variety of habitats	Moderate	Suitable habitat present
Forest Shrew	<i>Myosorex varius</i>	DD		Wide variety of habitats	Moderate	Suitable habitat present
Brown Hyaena	<i>Hyaena brunnea</i>	NT	NEMBA (PR)	Wide variety of habitats	Moderate	Suitable habitat present
Rusty Bat	<i>Pipistrellus rusticus</i>	NT		Savanna, riparian forest, tree dwelling	Moderate	Suitable habitat present
African Weasel	<i>Poecilogale albinucha</i>	DD		Wide variety of habitats	Moderate	Suitable habitat present
Ground Pangolin	<i>Smutsia temminckii</i>	VU	NEMBA (VU)	Wide variety of habitats	Low	Disturbance, rare species
Least Dwarf Shrew	<i>Suncus infinitesimus</i>	DD		Wide variety of habitats	Moderate	Suitable habitat present

Greater Dwarf Shrew	<i>Suncus lixus</i>	DD		Wide variety of habitats	Moderate	Suitable habitat present
Lesser Dwarf Shrew	<i>Suncus varilla</i>	DD		Wide variety of habitats	Moderate	Suitable habitat present
Cape Fox	<i>Vulpes chama</i>		NEMBA (PR)	Open areas	Low	Natural habitat very fragmented
Bushveld Gerbil	<i>Tatera leucogaster</i>	DD		Woodland, thicket	Moderate	Suitable habitat present
Subtotal	23	21	5			
Birds						
Half-collared Kingfisher	<i>Alcedo semitorquata</i>	NT		Riverine forest	Moderate	Suitable habitat present along the pipeline route
Kori Bustard	<i>Ardeotis kori</i>	NT	NEMBA (PR)	Arid grassland and shrubland	Low	Disturbance, limited habitat present
Pallid Harrier	<i>Circus macrourus</i>	NT		Arid grassland and shrubland	Low	Limited habitat present
Abdim's Stork	<i>Ciconia abdimii</i>	NT		Wide variety of habitats	Moderate	Foraging habitat present
African Marsh-Harrier	<i>Circus ranivorus</i>	EN		Grassland and wetland	Low	Limited habitat present
Black-winged Pratincole	<i>Glareola nordmanni</i>	NT		Grassland and wetland	Low	Limited habitat present
Black Stork	<i>Ciconia nigra</i>	VU		Rivers and streams, breeds on cliffs	Moderate	Confirmed on adjacent property, no breeding habitat present
European Roller	<i>Coracias garrulus</i>	NT		Savannah	Moderate	Suitable habitat present
Lanner Falcon	<i>Falco biarmicus</i>	VU		Wide variety of habitats	Moderate	Suitable foraging habitat present only
White-backed Vulture	<i>Gyps africanus</i>	EN	NEMBA (EN)	Savanna	Low	Disturbance
Cape Vulture	<i>Gyps coprotheres</i>	EN	NEMBA (EN)	Savanna, grassland	Low	Disturbance
Marabou Stork	<i>Leptoptilos crumeniferus</i>	NT		Wide variety of habitats	Low	Rare in area
Yellow-billed Stork	<i>Mycteria ibis</i>	EN		Wetlands	Low	No suitable habitat present
Pink-backed Pelican	<i>Pelecanus rufescens</i>	VU		Wetlands	Low	No suitable habitat present
Lesser Flamingo	<i>Phoenicopterus minor</i>	NT		Wetlands	Low	No suitable habitat present
Greater Flamingo	<i>Phoenicopterus ruber</i>	NT		Wetlands	Low	No suitable habitat present
Verreaux's Eagle	<i>Aquila verreauxii</i>	VU		Mountainous areas	Low	No suitable habitat present
Martial Eagle	<i>Polemaetus bellicosus</i>	EN	NEMBA (EN)	Wide variety of habitats	Low	Vagrant, restricted mostly to large conservation areas

Secretarybird	<i>Sagittarius serpentarius</i>	VU		Open woodland, grassland	Low	Suitable habitat present but rare in the area
Yellow-throated Sandgrouse	<i>Pterocles gutturalis</i>	NT		Clay savanna	Moderate	Suitable habitat present
Greater Painted-Snipe	<i>Rostratula benghalensis</i>	VU		Wetlands	Low	No suitable habitat present
Bateleur	<i>Terathopius ecaudatus</i>	EN	NEMBA (EN)	Savanna	Low	Vagrant, restricted mostly to large conservation areas
Lappet-faced Vulture	<i>Torgos tracheliotus</i>	EN	NEMBA (EN)	Wide variety of habitats	Low	Vagrant, restricted mostly to large conservation areas
African Grass Owl	<i>Tyto capensis</i>	VU		Grass-dominated wetlands	Low	Suitable habitat present but rare in the area
Tawny Eagle	<i>Aquila rapax</i>	EN	NEMBA (EN)	Savanna	Low	Human disturbance, no breeding habitat present
Bateleur	<i>Terathopius ecaudatus</i>	VU	NEMBA (EN)	Savanna	Low	Human disturbance, no breeding habitat present
Subtotal	26	26	8			
Reptiles						
Southern African Python	<i>Python natalensis</i>		NEMBA (PR)		Moderate	Suitable habitat present
Subtotal	1	0	1			
Frogs						
Giant Bullfrog	<i>Pyxicephalus adspersus</i>	NT			Low	No suitable habitat present
Subtotal	1	1	0			
TOTAL	51	48	14			

* = IUCN classification
DD = Data Deficient
NT = Near-threatened
VU = Vulnerable
EN = Endangered
National Environmental Management: Biodiversity Act (No. 10 of 2004) Threatened and Protected Species Lists (GG Notice 256, 2015)

APPENDIX 4. BIRD SPECIES RECORDED PER PROPOSED DEVELOPMENT FOOTPRINT

Species	Infrastructure Footprints										TOTAL	
	Eskom Ledig Substation	Mine Housing Phase 1a	Mine Housing Phase 1	Bridge	Waste Rock Dump	Concentrator Plant and Stockpiles	Pollution Control Dam	Tailings Pipeline	Return Water Dam	Storm Water Dam		Tailings Storage Facility
Acacia Pied Barbet	x		x									2
African Grey Hornbill								x				1
African Palm Swift							x					1
African Pipit	x											1
African Quailfinch						x		x			x	3
Barn Swallow	x											1
Black Cuckoo	x			x								2
Black-chested Prinia	x	x	x	x	x	x	x	x	x	x	x	11
Black-collared Barbet									x			1
Black-headed Heron	x					x						2
Black-shouldered Kite						x						1
Black-throated Canary	x		x		x	x		x		x	x	7
Blue Waxbill			x			x		x		x	x	5
Brown-crowned Tchagra	x		x	x		x		x				5
Cape Glossy Starling			x									1
Cape Sparrow					x							1
Cape Turtle-dove				x				x	x	x		4
Cape Wagtail					x							1
Cape White-eye								x				1
Cattle Egret	x				x		x	x			x	5
Chestnut-vented Titbabbler	x	x	x					x	x		x	6
Chinspot Batis	x			x								2
Cinnamon-breasted Bunting						x						1
Common Myna	x							x				2
Common Waxbill								x				1
Crested Francolin	x		x			x		x	x		x	6
Crimson-breasted Shrike			x			x						2
Crowned Lapwing										x	x	2
Dark-capped Bulbul	x		x	x		x	x	x	x	x		8
Desert Cisticola	x										x	2
Diderick Cuckoo	x	x	x		x	x			x			6
European Bee-eater								x				1
Familiar Chat	x				x							2
Fiery-necked Nightjar								x				1
Fork-tailed Drongo	x			x						x		3
Golden-breasted Bunting			x			x	x	x		x	x	6
Great Spotted Cuckoo						x						1

Greater Striped Swallow	x												1
Green-winged Pytilia								x					1
Grey Go-away-bird							x		x		x		3
Helmeted Guineafowl		x					x						2
House Sparrow	x												1
Jacobin Cuckoo	x												1
Kalahari Scrub-robin			x					x	x				3
Klaas's Cuckoo	x								x				2
Laughing Dove			x					x	x				3
Lesser Striped Swallow	x								x				2
Little Bee-eater	x												1
Little Swift	x												1
Long-billed Crombec	x	x	x				x	x	x				6
Marico Flycatcher									x				1
Marico Sunbird										x			1
Marsh Owl							x						1
Neddicky	x	x					x	x		x	x		6
Pale-chanting Goshawk										x			1
Pied Crow	x		x					x		x			4
Pin-tailed Whydah	x					x							2
Rattling Cisticola	x		x	x				x	x	x	x	x	8
Red-backed Shrike		x	x										2
Red-billed Firefinch									x				1
Red-billed Quelea									x				1
Red-breasted Swallow	x					x							2
Red-crested Korhaan	x		x	x					x		x		5
Red-eyed Dove	x		x										2
Red-faced Mousebird	x	x	x			x	x	x	x	x			8
Red-winged Starling	x												1
Rufous-naped Lark	x		x				x		x				4
Sabota Lark	x	x	x				x	x	x	x	x	x	9
Scaly-feathered Finch			x										1
Southern Boubou	x						x						2
Southern Grey-headed Sparrow			x						x	x			3
Southern Masked Weaver	x	x	x			x	x	x	x		x		8
Southern Red Bishop	x					x							2
Speckled Mousebird	x												1
Spotted Flycatcher				x									1
Swainson's Spurfowl										x	x		2
Tawny-flanked Prinia			x						x				2
Thick-billed Weaver			x										1
Wahlberg's Eagle							x						1
White-backed Mousebird	x												1
White-bellied Sunbird	x		x				x		x	x	x	x	7
White-browed Scrub-robin	x		x				x	x	x		x	x	7
White-fronted Bee-eater											x		1
White-rumped Swift								x					1
White-winged Widowbird			x			x							2
Woodland Kingfisher							x						1
Yellow Canary			x										1
Yellow-fronted Canary			x	x				x	x	x			5
	88	44	10	33	11	13	28	18	37	18	18	14	

APPENDIX 5. REPORTING RATES FOR BIRD SPECIES PER ASSEMBLAGE

Species	Assemblages				Total	Reporting Rate
	Thicket	Shrubland	Grassland	Secondary / Modified		
Rattling Cisticola		17			17	0.057
Red-faced Mousebird	3	13			16	0.053
Black-chested Prinia		13	2		15	0.050
Sabota Lark		13			13	0.043
Dark-capped Bulbul	3	9			12	0.040
Black-throated Canary		9	1		10	0.033
Southern Masked Weaver	1	9			10	0.033
White-bellied Sunbird	4	6			10	0.033
Chestnut-vented Titbabbler	4	5			9	0.030
Long-billed Crombec		9			9	0.030
White-browed Scrub-robin		9			9	0.030
Crested Francolin	5	2			7	0.023
Red-crested Korhaan	1	6			7	0.023
Brown-crowned Tchagra	2	4			6	0.020
Diderick Cuckoo		6			6	0.020
Golden-breasted Bunting		6			6	0.020
Laughing Dove		6			6	0.020
Neddicky		6			6	0.020
Rufous-naped Lark			6		6	0.020
Blue Waxbill		4	1		5	0.017
Cattle Egret		1	3	1	5	0.017
Kalahari Scrub-robin	5				5	0.017
Yellow-fronted Canary	1	4			5	0.017
African Quailfinch			4		4	0.013
Cape Turtle-dove		2	2		4	0.013
Southern Boubou	4				4	0.013
Black Cuckoo	3				3	0.010
Chinspot Batis		3			3	0.010
Common Myna				3	3	0.010
Fork-tailed Drongo		3			3	0.010
Grey Go-away-bird		3			3	0.010
Pied Crow		2		1	3	0.010
Southern Grey-headed Sparrow		3			3	0.010
Acacia Pied Barbet		2			2	0.007
Black-headed Heron			2		2	0.007
Crimson-breasted Shrike	2				2	0.007
Crowned Lapwing			2		2	0.007
Desert Cisticola			2		2	0.007
European Bee-eater		2			2	0.007
Familiar Chat		1		1	2	0.007
Helmeted Guineafowl		2			2	0.007
Klaas's Cuckoo	1	1			2	0.007

Lesser Striped Swallow		2			2	0.007	
Pin-tailed Whydah		1		1	2	0.007	
Red-backed Shrike		2			2	0.007	
Red-breasted Swallow			2		2	0.007	
Red-eyed Dove	2				2	0.007	
Southern Red Bishop			2		2	0.007	
Swainson's Spurfowl			2		2	0.007	
Tawny-flanked Prinia		2			2	0.007	
African Grey Hornbill		1			1	0.003	
African Pipit			1		1	0.003	
Black-collared Barbet	1				1	0.003	
Black-shouldered Kite			1		1	0.003	
Cape Glossy Starling		1			1	0.003	
Cape Sparrow		1			1	0.003	
Cape Wagtail		1			1	0.003	
Cape White-eye	1				1	0.003	
Cinnamon-breasted Bunting		1			1	0.003	
Common Waxbill			1		1	0.003	
Fiery-necked Nightjar		1			1	0.003	
Great Spotted Cuckoo		1			1	0.003	
Greater Striped Swallow			1		1	0.003	
Green-winged Pytilia		1			1	0.003	
House Sparrow				1	1	0.003	
Jacobin Cuckoo		1			1	0.003	
Little Bee-eater		1			1	0.003	
Marico Flycatcher		1			1	0.003	
Marico Sunbird		1			1	0.003	
Marsh Owl			1		1	0.003	
Pale-chanting Goshawk			1		1	0.003	
Red-billed Firefinch		1			1	0.003	
Red-billed Quelea			1		1	0.003	
Red-winged Starling				1	1	0.003	
Scaly-feathered Finch		1			1	0.003	
Speckled Mousebird	1				1	0.003	
Spotted Flycatcher	1				1	0.003	
Thick-billed Weaver	1				1	0.003	
Wahlberg's Eagle		1			1	0.003	
White-backed Mousebird		1			1	0.003	
White-winged Widowbird			1		1	0.003	
Woodland Kingfisher		1			1	0.003	
Yellow Canary		1			1	0.003	
	80	20	54	21	7	300	83

APPENDIX 6. IMPACT ASSESSMENT

IMPACT TYPE: LOSS OF HABITAT FOR FAUNA

Description of Impact: An estimated 344 hectares of untransformed vegetation, including woodland, riverbanks, streambeds etc., will be destroyed during mine and housing construction activities based on the current infrastructure footprint. This vegetation provides habitat for fauna species which will be displaced through this impact.

Rating of Impact

Severity

Some permanent loss of natural faunal habitat is expected which results in a High severity assessment. After mitigation, this impact could be reduced to Medium.

Duration

While infrastructure such as mine housing areas, bridges and substations are likely to permanently transform natural vegetation (High rating), some infrastructure such as stockpiles, dumps and tailings could be suitably rehabilitated after project completion to allow for at least some additional secondary habitat for fauna. Successful restoration of such habitat could reduce the duration of the impact to Medium.

Spatial scale

In both the mitigated and unmitigated scenarios the spatial scale is unlikely to extend beyond the project boundaries and development will most likely be restricted to the 11 project footprints. The rating would be Low for both scenarios.

Consequence

The consequence of the impacts (Consequence being a function of severity, spatial extent and duration) is High and while the mitigation measures listed below will reduce the potential duration of the impact, it is unlikely that it would reduce the Consequence to a rating of Low.

Probability

There is a definite and continuous probability of the impact, which leads to a High assessment.

Significance

Within the spatial scale of the project the significance is Medium although this would be rated High if representative vegetation was not widespread beyond the boundaries of the project. Large areas of untransformed vegetation exist to the east and the north of the study area, including in the Pilanesberg National Park.

Overall mitigation objectives for each assessed impact or group of impacts:

- Protect untransformed vegetation
- Limit transformation / disturbance to development footprints

Mitigation measures:

1. Limit transformation only to development footprints;
2. Fence off surrounding untransformed vegetation (applicable to all footprints except the pipeline);
3. Maintain untransformed vegetation in a natural state;
4. Mine infrastructure to be adequately rehabilitated after mining ceases. This includes stockpiles, tailings, rock dumps etc.;
5. Construction teams to be housed off-site to reduce human presence on site;
6. Limit damage and access to riparian vegetation during bridge construction;

7. Monthly perimeter inspections to assess state of fence and determine if it is being breached by poachers;
8. Additional surveys to be performed if expansion of infrastructure is planned in the future.

Mitigation type:

These measures are all Control types except point 4 which would qualify as Remedy.

The degree to which the impact can –

be reversed: Partially

cause irreplaceable loss of resource: Possible

be avoided, managed or mitigated: Partial Mitigated to acceptable levels

Monitoring recommendations:

- Regular (monthly) inspections of all untransformed areas to assess whether habitat is being disturbed or damaged through illegal operations;
- Regular (monthly) inspections of fenceline to assess breaches / deterioration of the perimeter.

Summary of assessment:

<u>Management</u>	<u>Severity</u>	<u>Duration</u>	<u>Spatial scale</u>	<u>Consequence</u>	<u>Probability</u>	<u>Significance</u>
All phases						
Unmitigated	H	H	L	H	H	H
Mitigated	M	H	L	M	H	M

IMPACT TYPE: LOSS OF FAUNAL DIVERSITY

Description of Impact: Construction activities and resultant habitat transformation and persecution will potentially displace some of the 130 confirmed terrestrial vertebrates and many more potentially occurring species. This includes the potential impact of a suggested solar power plant.

Rating of Impact

Severity

Reasonable faunal diversity is currently present within the study area and development will result in a loss of this diversity due to disturbance, habitat transformation / modification and indirect persecution. The severity is assessed as Medium. A number of mitigation measures listed below could reduce the severity of this impact through limiting the amount of disturbance in untransformed vegetation. Implementation of these measures could reduce the severity to Low.

Duration

While some fauna species may be permanently displaced during the construction phase, it is possible that these may return to adjacent untransformed habitat once the project is in operational phase and disturbance levels are lower. Restoration of stockpiles, waste rock dumps and tailings facilities to functional secondary habitat may result in these areas being utilised by generalist fauna species. Without mitigation this will be a permanent impact (High), but implementation of mitigation measures suggested below could reduce the duration to Medium-term (Medium).

Spatial scale

In both the mitigated and unmitigated scenarios the spatial scale will extend beyond the project boundaries and impact adjacent properties as well, particularly factors such as noise disturbance. The spatial scale of this impact is therefore Local, which is rated as Medium.

Consequence

The consequence of the impacts (Consequence being a function of severity, spatial extent and duration) is High prior to mitigation and Medium after.

Probability

There is a definite and continuous probability of the impact where habitat is being transformed, which is rated as High, while the probability of the impact in the adjacent untransformed areas where fauna are disturbed and displaced is Possible, which is rated as Medium. Implementation of mitigation measures listed below may reduce the probability of the impact in areas outside of the infrastructure footprint, but not enough to be rated as Low.

Significance

The significance of this impact is rated as High in untransformed vegetation within the infrastructure footprint, as a result of Medium Consequence and High Probability. Adjacent untransformed areas where habitat will not be lost, but disturbance could still result in fauna displacement, have a Significance of Medium (Low Consequence and Medium Probability). Implementation of mitigation measures listed below may reduce the significance of the impact in areas outside of the infrastructure footprint, but not enough to be rated as Low.

Overall mitigation objectives for each assessed impact or group of impacts:

- Protect untransformed vegetation
- Limit transformation / disturbance to development footprints

Mitigation measures:

1. Limit transformation only to development footprints;
2. Fence off surrounding untransformed vegetation (applicable to all footprints except the pipeline);
3. Maintain untransformed vegetation in a natural state;
4. Construction teams to be housed off-site to reduce human presence on site;
5. Limit damage and access to riparian vegetation during bridge construction;
6. Apply sound veld management principles to ensure maximum biodiversity. This would include sound fire management and grazing techniques. Refer to mitigation measures in the Flora and Vegetation Report;
7. Additional surveys to be performed if expansion of infrastructure is planned in the future.
8. If the mine approves construction of a solar power plant, an avifaunal specialist should be consulted to determine the exact impact and recommend suitable construction sites and mitigation measures.

Mitigation type:

These measures are all Control types except point 6 which would qualify as Modify.

The degree to which the impact can –

be reversed: Partially

cause irreplaceable loss of resource: Possible

be avoided, managed or mitigated: Mitigated to acceptable levels

Monitoring recommendations:

- Regular (monthly) inspections of all untransformed areas to assess whether habitat is being disturbed or damaged through illegal operations;
- Regular (monthly) inspections of fenceline to assess breaches / deterioration of the perimeter;
- Implementation of suitable veld management principles, including burning, grazing and resting techniques. Protecting the vegetation is key to biodiversity conservation.

Summary of assessment:

<u>Management</u>	<u>Severity</u>	<u>Duration</u>	<u>Spatial scale</u>	<u>Consequence</u>	<u>Probability</u>	<u>Significance</u>
All phases						
Unmitigated	M	H	M	H	H	H
Mitigated	L	M	M	L	M	M

IMPACT TYPE: LOSS OF FAUNA SPECIES OF CONSERVATION-CONCERN

Description of Impact: One Near-threatened mammal was confirmed to occur within the property boundaries (Serval). Black Stork (Vulnerable) was confirmed from an adjacent property. A further 44 species of mammal, bird, reptile and frog with Red data status potentially occur within untransformed natural habitat in the study area.

Rating of Impact

Severity

A Medium rating for loss of species of conservation-concern is expected during all phases, with a mitigation scenario reducing this to a Low.

Duration

Much of the project infrastructure will permanently transform natural vegetation, potentially resulting in a reduction of the number of conservation-important species such as Serval on the properties. This has a High rating. Areas such as stockpiles, dumps and tailings could be suitably rehabilitated after project completion to allow for at least some additional secondary habitat for fauna. Some species, such as Serval, will utilise secondary grasslands and open woodlands, and this could reduce the duration to Medium-term.

Spatial scale

In both the mitigated and unmitigated scenarios the spatial scale of this impact is unlikely to extend beyond the project boundaries. The rating would be Low for both scenarios.

Consequence

The consequence of the impacts is High prior to mitigation and Low if mitigation measures are successfully implemented.

Probability

There is a definite and continuous probability of the impact, which leads to a High assessment. This is likely to remain High as no mitigation measures can be suggested to reduce this impact. The probability of the impact in the adjacent untransformed areas where fauna are disturbed and displaced is Possible, which is rated as Medium. Implementation of mitigation measures listed below may reduce the probability of the impact in areas outside of the infrastructure footprint, but not enough to be rated as Low.

Significance

The High Consequence and High Probability of this impact without mitigation measures being implemented has resulted in a High Significance in untransformed vegetation within the infrastructure footprint. Adjacent untransformed areas where habitat will not be lost, but disturbance could still result in fauna of conservation concern being displaced, have a Significance of Medium (Low Consequence and Medium Probability). Implementation of mitigation measures listed below may reduce the significance of the impact in areas outside of the infrastructure footprint, but not enough to be rated as Low.

Overall mitigation objectives for each assessed impact or group of impacts:

- Protect untransformed vegetation
- Limit transformation / disturbance to development footprints

Mitigation measures:

1. Limit transformation only to development footprints;

2. Fence off surrounding untransformed vegetation (applicable to all footprints except the pipeline);
3. Maintain untransformed vegetation in a natural state;
4. Mine infrastructure to be adequately rehabilitated after mining ceases. This includes stockpiles, tailings, rock dumps etc.;
5. Construction teams to be housed off-site to reduce human presence on site;
6. Limit damage and access to riparian vegetation during bridge construction;
7. Report and monitor species of conservation-concern;
8. Monthly perimeter inspections to assess state of fence and determine if it is being breached by poachers;
9. Additional surveys to be performed if expansion of infrastructure is planned in the future.

Mitigation type:

These measures are all Control types except point 4 which would qualify as Remedy.

The degree to which the impact can –

be reversed: Partially

cause irreplaceable loss of resource: Possible

be avoided, managed or mitigated: Mitigated to acceptable levels

Monitoring recommendations:

- Regular (monthly) inspections of all untransformed areas to assess whether habitat is being disturbed or damaged through illegal operations;
- Regular (monthly) inspections of fenceline to assess breaches / deterioration of the perimeter.
- Reporting of species of conservation-concern and implementing a monitoring programme.

<u>Management</u>	<u>Severity</u>	<u>Duration</u>	<u>Spatial scale</u>	<u>Consequence</u>	<u>Probability</u>	<u>Significance</u>
All phases						
Unmitigated	M	H	L	H	H	H
Mitigated	L	M	L	L	M	M

APPENDIX 7. DUNCAN MCKENZIE CV

Name: Duncan Robert McKenzie



Profession: Terrestrial Ecologist

Date of Birth: 9 Nov 1977

Name of Firm: ECOREX Consulting Ecologists cc

Position in Firm: Ecologist

Years with firm: 8

Nationality: South African

Qualifications :

- | | | |
|--------------------------------|-----------------------|------|
| • N.Dip. [Nature Conservation] | UNISA, RSA | 2007 |
| • N.Cert. [Nature Guiding] | Drumbeat Academy, RSA | 2004 |

Membership in Professional Societies:

- BirdLife South Africa
- Animal Demography Unit, University of Cape Town
- Botanical Society of South Africa

Languages :

	<u>Speaking</u>	<u>Reading</u>	<u>Writing</u>
English (home):	Excellent	Excellent	Excellent
Afrikaans:	Good	Good	Good
isiZulu:	Good	Fair	Fair
Spanish:	Fair	Fair	Fair

Countries of Work Experience: Botswana, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zimbabwe (Guiding). South Africa, Mozambique, DRC, Mali, Lesotho, Tanzania, Swaziland, Sierra Leone (Consulting Ecologist)

OVERVIEW OF EXPERIENCE

- 8 years' experience in specialist species identification, conducting baseline surveys, data analysis and report writing in various biomes in southern Africa, particularly savannah, forest and grassland biomes
- 2 years' experience game reserve management (KwaZulu-Natal)
- 5 years' experience (part time) of wetland delineation and management
- 2 years' experience of plant propagation and use for rehabilitation
- Specialist knowledge of identification of vascular plants
- Specialist knowledge of identification of mammals, birds, reptiles and amphibians
- SABAP2 Regional Co-ordinator: Mpumalanga
- Member of the Kwa-Zulu-Natal Bird Rarities Committee

Employment Record:

2007 - present	ECOREX	Ecologist
2005 - 2006	Iglu (London, UK)	Specialist Travel Agent
1997 - 2005	Duncan McKenzie Bird Tours	Owner, Specialist Guide
2001	KZN Wildlife	District Conservation Officer, Reserve Manager
1999 - 2001	Institute of Natural Resources	Part-time Horticulturalist and Rehabilitation Officer
1997-2001	Mondi Wetlands Project	Part-time Field Assistant and Regional Co-ordinator
1996-1997	Natal Parks Board	Ranger

APPENDIX 8. SPECIALIST DECLARATION FORM

10.4 The Specialist

Note: Duplicate this section where there is more than one specialist.

Duncan McKenzie, as the appointed specialist hereby declare/affirm the correctness of the information provided as part of the application, and that I:

- in terms of the general requirement to be independent (tick which is applicable):

<input checked="" type="checkbox"/>	other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
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<input type="checkbox"/>	am not independent, but another EAP that is independent and meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);
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- have expertise in conducting specialist work as required, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- will ensure compliance with the EIA Regulations 2014;
- 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 application;
- will take into account, to the extent possible, the matters listed in regulation 18 of the regulations when preparing the application and any report, plan or document relating to the application;
- will disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority or the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority (unless access to that information is protected by law, in which case I will indicate that such protected information exists and is only provided to the competent authority);
- declare that all the particulars furnished by me in this form are true and correct;
- am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B(2) of the National Environmental Management Act, 1998 (Act 107 of 1998).



Signature of the specialist

Ecorex Consulting Ecologists cc

Name of company

02/02/2016

Date