Ecological Assessment for the proposed development on Portion 58 of the Farm Vaalbank 289 JS, Middelburg

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Executive Summary

Introduction

Kyllinga Consulting, in association with Pachnoda Consulting, has been appointed by AdiEnvironmental to conduct an ecological assessment for the proposed light industrial development on Portion 58 of the Farm Vaalbank 289 JS, Middelburg, Mpumalanga.

Methods

The vegetation in each of the habitat units on site was recorded along random transect walks during the site visits on 6 March 2020. The assessment focused on the vegetation in each of the vegetation units on site, but the vegetation immediately adjacent to the site was also recorded. The vegetation units were delineation of Google Earth aerial photographs of the site.

The attributes of the faunal community on the study site were investigated during 6 March 2020 with the objective to evaluate the structure and conservation value of the faunal habitat on the study site.

Results

The site can be divided into three basic units, with sub-divisions:

- Bare areas and buildings: The bare areas and building are almost completely devoid of vegetation and therefore does not have any significance to this assessment. This area is of very low sensitivity.
- Transformed: The transformed area consists of an old garden and weedy areas. Although these areas are vegetated the vegetation is dominated by alien and invasive species. This includes a number of fruit trees, extensive kikuyu (*Pennisetum clandestinum*) and a large clump of Spanish Reed (*Arundo donax*). This area is highly transformed and is of low sensitivity.
- Planted pasture: The old field on the western portion of the site has been cultivated in the past and the grassland is secondary grassland in the early stages of succession. The species diversity in this unit is higher than those on the remaining three units, which is dominated by *Paspalum* or *Digitaria*. The species diversity in all units is however very low.
- No threatened species were observed on site or is expected to be present on site. The orchid species *Habenaria epipactidea* is present in the areas dominated by *Paspalum* or *Digitaria.* This species is a protected species under the Mpumalanga Nature Conservation Act but is also fairly common. This species can be relocated to secondary grassland in the area. Do not relocate the species to primary grassland. These areas have a moderate sensitivity due to the remaining indigenous vegetation and the presence of a single protected species.
- No wetland areas are present on site. Shallow canals are present on site to direct runoff away from the development and excavations are present in the weedy areas. Some ponding is taking place in these areas but does not represent wetland conditions. In addition, no hydromorphic soils are present on site.
- The Spanish Reed (*Arundo donax*) is present on site. This species is often confused with indigenous reed species including *Phragmites australis*. Although *Phragmites* species are obligate wetland species, *Arundo donax* is not. *Arundo donax* is an indicator of disturbance.

The following conclusions were reached during the fauna assessment:

- No habitat with a high conservation value was identified on the study site. The habitat types were either of moderate conservation value (represented by planted pastures) to low conservation value (represented by old fields, areas covered in weeds and old gardens).
- The overall faunal richness on the study site was low and provided habitat for a few widespread and generalist species. The poor faunal richness was the result of past disturbance regimes (e.g. tilling and ploughing) which resulted in modified and secondary grassland seres.
- The ecological connectivity of all regenerating and natural habitat types on the study site were severely constrained by nearby road networks and adjacent mining and agricultural activities, thereby limiting the dispersal of fauna species.
- The study site hosts a low richness of mammal species with 24 species likely to occur, of which 13 species have high probability of occurrence. Widespread species (e.g. Highveld Mole-rat *Cryptomys cf. pretoriae,* Highveld Gerbil *Gerbilliscus brantsii* and African Savanna Hare *Lepus cf. victoriae*) that are generally common (thereby having a high frequency of occurrence) in similar habitat types were virtually absent on the study site.
- Wetland features were absent on the study site, which thereby contributed towards the low species richness and absence of facultative wetland mammal species
- The probability for threatened and near threatened mammal species to occur on the study site is low.
- Fifteen (15) amphibian and 48 reptile species are known to be present in the study region, although only three frog species and 10 reptile species have a high probability of occurrence due to the availability of suitable habitat.
- Bird species richness was low with approximately 94 bird species that could occur on the study site and immediate surroundings. The typical bird composition comprised of widespread taxa (mainly granivores) which were predominantly eurytopic and occurs in both untransformed as well as transformed habitat.
- The only bird species of conservation concern observed on the study site is the Vulnerable Lanner Falcon (*Falco biarmicus*). It was observed flying over the study site in a south-easterly direction towards the Vaalbank Private Nature Reserve. It was considered as an occasional foraging visitor to the site.

Conclusion and Recommendations

Nearly the entire site was occupied by habitat types that were either modified or at an early successional stage, while untransformed habitat on the study site was virtually absent. The natural habitat on the study site consisted of secondary vegetation units represented by regenerating old fields (4.7ha) and planted pastures (5.2ha). The remainder of the study area was represented by land consisting of infrastructure (6.32ha), recently cleared areas of bare ground (4.4ha) or covered in weeds (0.3ha) and old relict gardens (1.2ha). Therefore, approximately 45 % (c. 10ha) of the study site was historically ploughed and are currently represented by secondary grassland or grassland that is at an early successional stage. Some of these modified areas (23% of the study site) were

subsequently converted to pastures consisting of *Digitaria eriantha* or *Paspalum notatum*. The secondary and early successional age of the natural grassland units on the site was responsible for an extremely low and depauperate faunal richness represented by only a few species with generalist life histories. In addition, specialised and K-selected (e.g. long-lived species often requiring large home ranges) fauna taxa, as well as small to medium bodied facultative wetland fauna were ominously absent from the study site owing to the absence of topographical and spatial habitat heterogeneity (e.g. presence of surface rock and outcrops) and wetland features.

In addition, the study site represented an ecological "cul-de-sac", meaning that ecological connectivity and the ability for animals to disperse across the site into adjacent habitat was severely compromised by road networks (N4 Highway and the access road to the Pienaardam Leisure Resort), mining activities and agricultural activities. Based on these habitat attributes, the general fauna conservation value of the site is low.

Given the degraded nature of the vegetation and the low species diversity of the remaining habitat the proposed development is not anticipated to have a significant impact on the biodiversity.

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1 Introduction

Kyllinga Consulting, in association with Pachnoda Consulting, has been appointed by AdiEnvironmental to conduct an ecological assessment for the proposed light industrial development on Portion 58 of the Farm Vaalbank 289 JS, Middelburg, Mpumalanga. The following is included in the assessment:

- Vegetation and plant species assessment – determining the plant communities and species of conservation importance on site, as well as invasive species.
- Fauna assessment – determining potential species of conservation importance and sensitive habitat on site.
- Impact assessment.

1.1 Limitations

The vegetation and fauna on site were assessed during a single site visit conducted late in the growing season. The assessment therefore reflects a "snap-shot" in time and does not include a complete fauna or flora species list for the entire site. The aim is rather to identify habitats of conservation importance that may support species of concern.

It is assumed that all attempts will be made to limit the impact of the proposed project on the environment and that the mitigation measures included in this report will be adhered to. Should this not be the case, the impact / risk assessments and buffer requirements will be influenced.

1.2 Details of the Authors

Ina Venter has an M.Sc in Botany from the University of Pretoria, focusing on wetland vegetation. She is a registered professional natural scientist (Pr.Sci.Nat) in the fields of Botanical Science and Ecological Science (400048/08). She has working experience in South Africa, Lesotho and Mozambique, and has been involved in several projects in the Gauteng, North-West, Limpopo, Mpumalanga, KwaZulu-Natal and Free State Provinces. Experience includes wetland and vegetation assessments.

Lukas Niemand has an M.Sc in Zoology from the University of Pretoria, focusing on avifaunal indicators during ecological restoration. He is a registered professional natural scientist (Pr.Sci.Nat) in the fields of Ecological and Zoological Science (400095/06). He has working experience in South Africa, Lesotho, Mozambique, Burundi, Congo-Brazzaville, Malawi, Liberia, Zambia, Guinea, Tanzania and Ethiopia, and has been involved in several projects in the Gauteng, North-West, Limpopo, Mpumalanga, KwaZulu-Natal, Free State, Eastern Cape, Northern Cape and Western Cape Provinces. Experience includes a broad range of faunal assessment, with particular emphasis on avifaunal and entomological assessments.

2 Site

2.1 Location and site description

The site is located to the south of Middelburg in Mpumalanga. The site is on the south-east corner of the intersection between the N4 and the R35 (Figure 1). A bulk diesel depot and truck stop is present on a portion of the site. The Black Wattle Colliery is present to the west of the site, opposite the R35. Mining activities to the south of the site has recently been rehabilitated.

3 Desktop information

3.1 Water resources and topographical maps

The site is located in quaternary catchment B12D. The Pienaars Dam is located in the Vaalbankspruit to the east of the site. The site slopes towards the south-east, towards a tributary feeding into the Pienaars Dam. The Vaalbankspruit drains towards the north, to the Klein Olifants River.

No wetland areas are indicated on site in the NFEPA database or the latest NBA (2018) database (Figure 2 and Figure 3). According to the NBA wetland probability database a drainage line is present to from the Black Wattle Colliery to the north-east. The drainage line is mainly located opposite the N4.

3.2 Mpumalanga Biodiversity Sector Plan

According to the Mpumalanga Biodiversity Sector Plan (MBSP) freshwater database the majority of the site is Heavily Modified with a few areas designated as Other Natural Areas (Figure 4). No areas of concern are therefore indicated in the freshwater database.

According to the MBSP terrestrial database the site is located adjacent to a Protected Area and falls within the Ecological Support buffer area for the protected area (Figure 5). Although the site is considered to be Heavily to Moderately Modified, the site is considered to be of conservation concern due to its location within the buffer zone of the protected area. The Vaalbank Private Nature Reserve is located around the Pienaars Dam and protect the immediate catchment areas of the dam. Although this area has been proclaimed as a private nature reserve in the 1960's, the area is not managed as such and consist of the Pienaarsdam Leisure Resort as well as several small holdings. The Pienaarsdam Leisure Resort is managed as a recreational area are include various recreational activities.

3.3 Vegetation

The site falls within the Rand Highveld Grassland vegetation type, which is classified as Endangered in Mucina & Rutherford (2006) and as Vulnerable in the Threatened Ecosystems regulations of the National Environmental Management: Biodiversity Act.

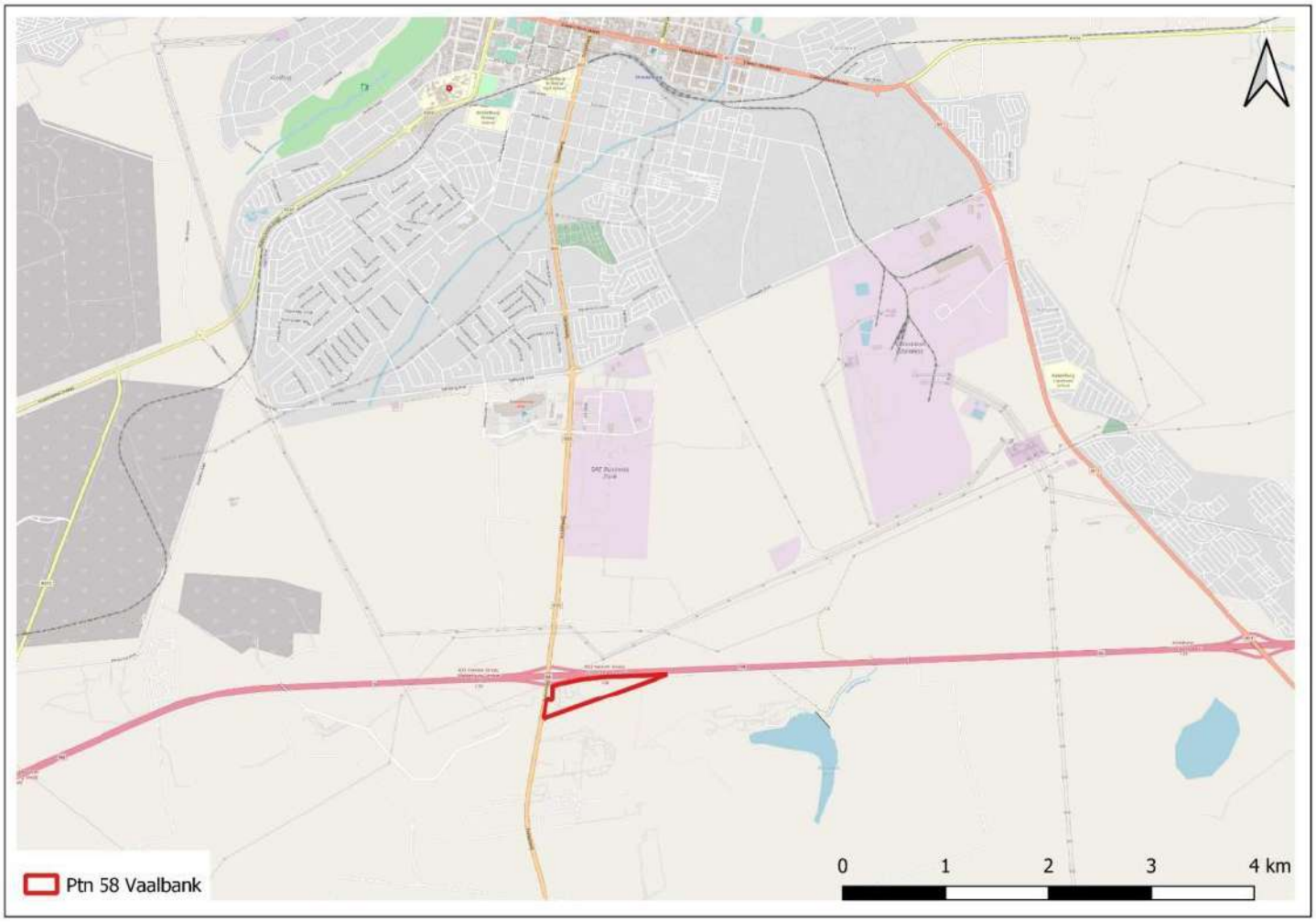

Figure 1: Location of the site is relation to Middelburg and the N4.

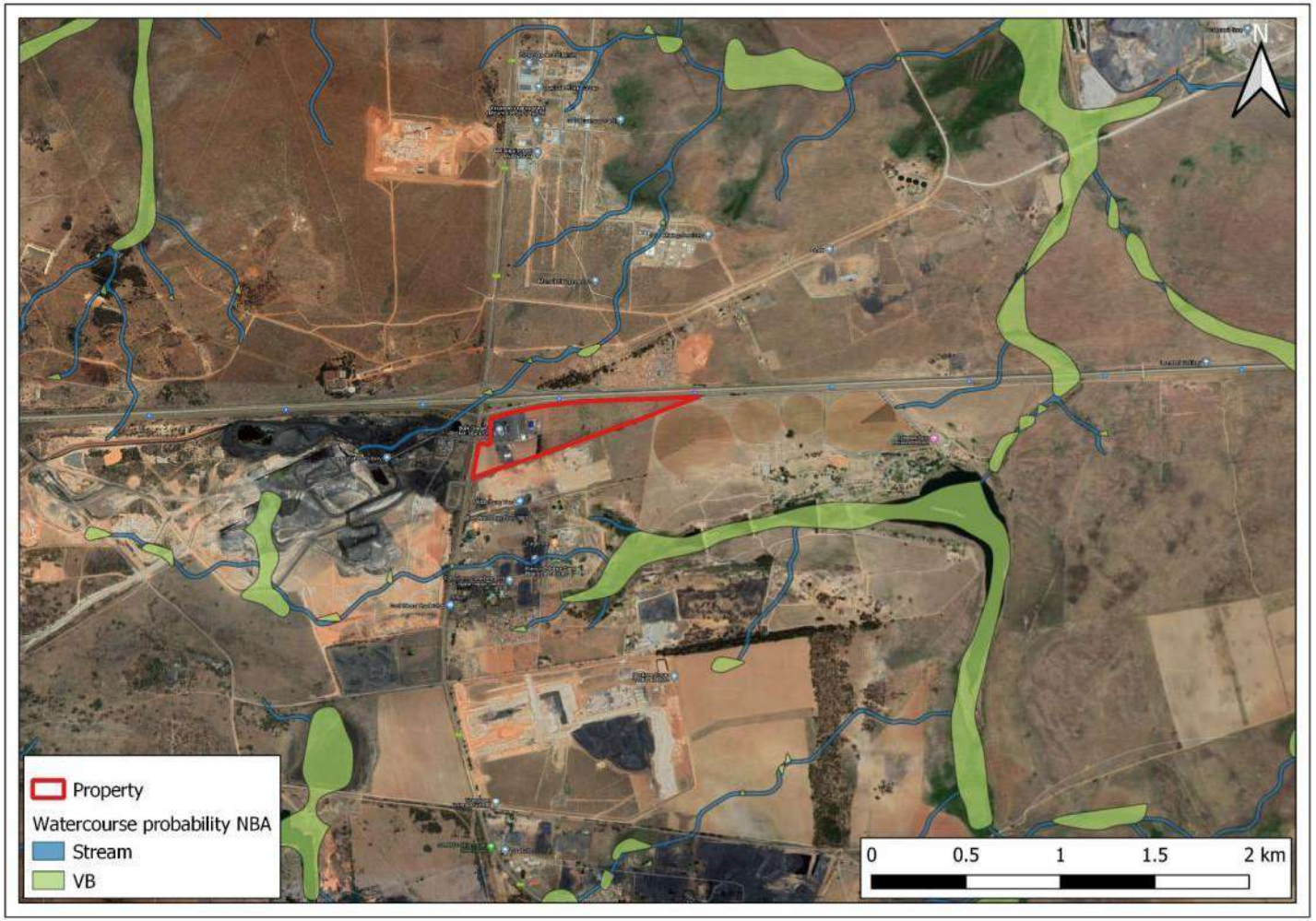

Figure 2: Watercourse probability according to the NBA (2018) database.

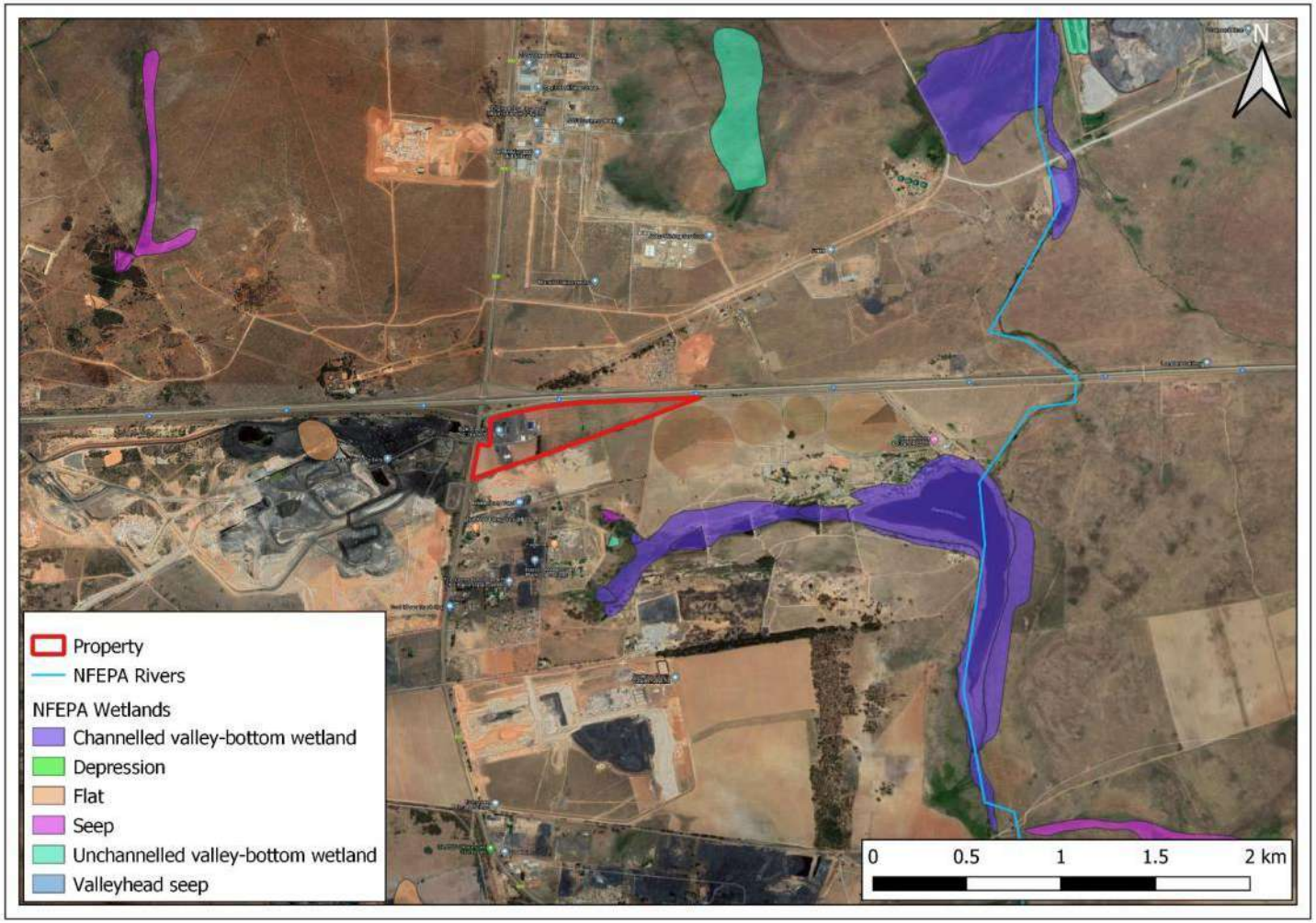

Figure 3: Wetland areas identified in the NFEPA database on site and around the site.

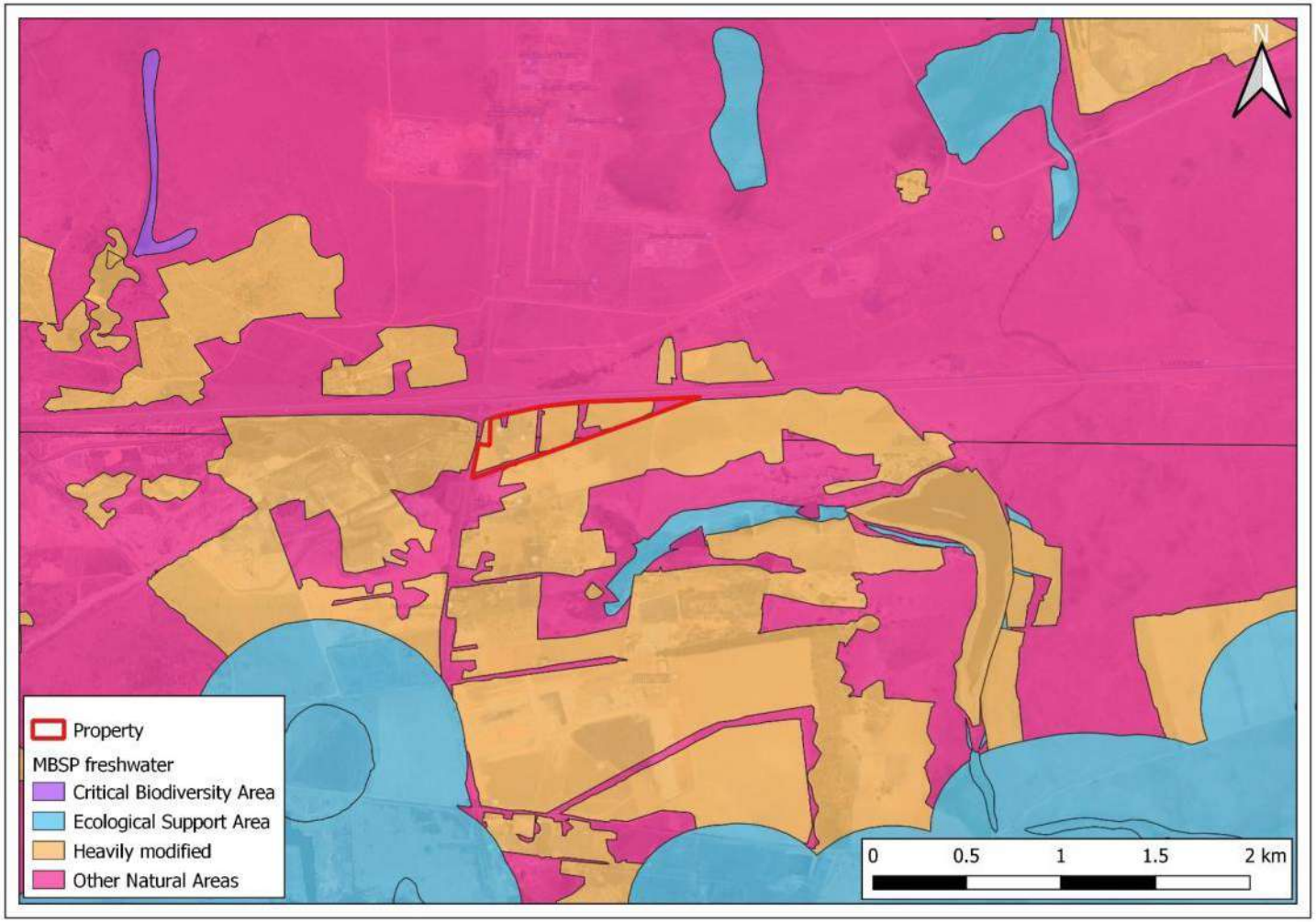

Figure 4: Catchment areas and the MBSP freshwater database of the site.

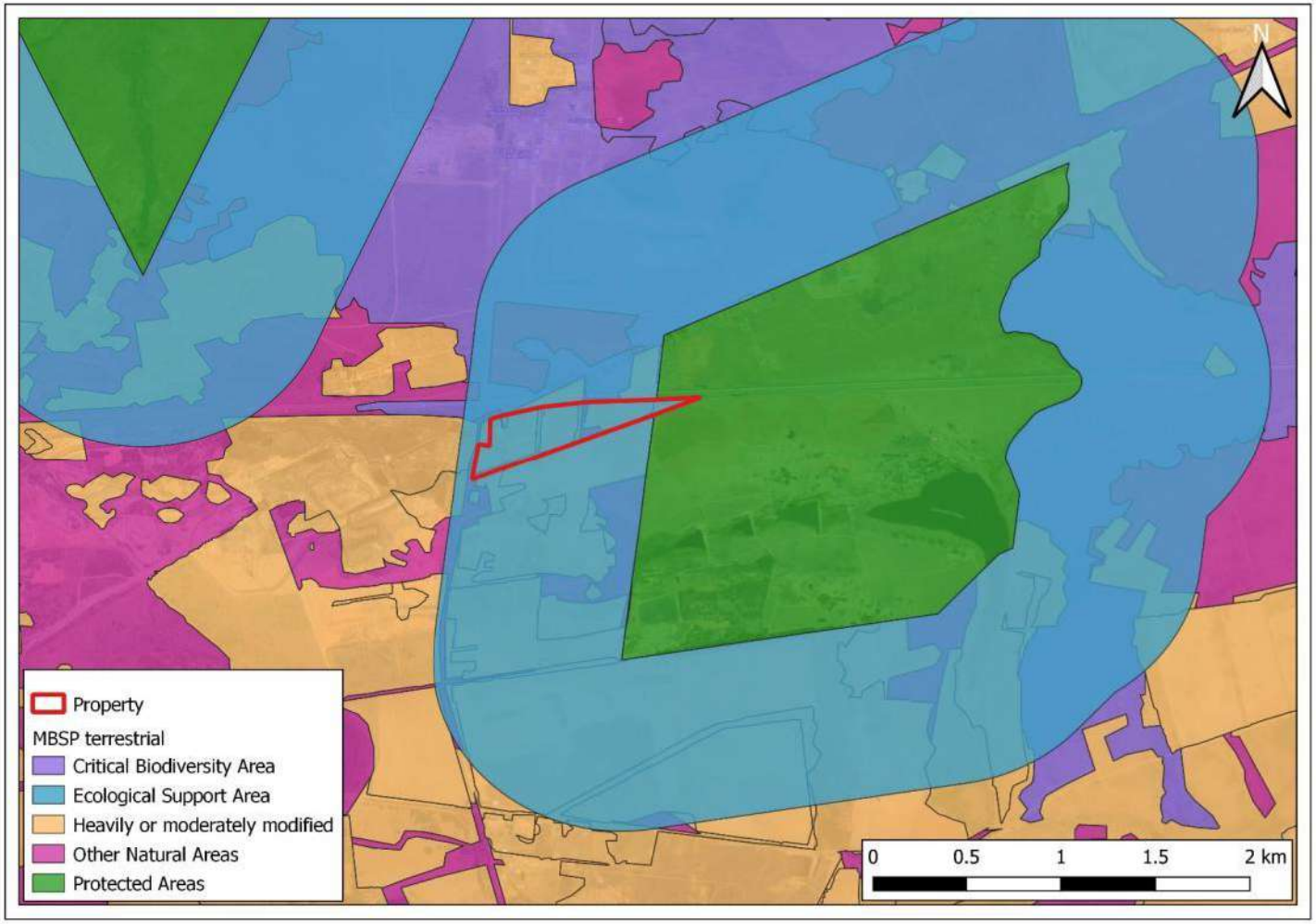

Figure 5: Important areas according to the MBSP terrestrial database.

4 Methods

4.1 Vegetation Assessment

Aerial photographs of the site were investigated, and habitat units identified. The site visit took place on 6 March 2020. The vegetation in each of the habitat unit was recorded along random transect walks. The assessment focused on the vegetation on site, but the vegetation immediately adjacent to the site was also recorded.

4.2 Fauna Assessment

The attributes of the vertebrate faunal community on the study site were investigated during 6 March 2020 with the objective to evaluate expected and observed faunal composition and conservation value of faunal habitat. However, due to the proposed promulgation of the general requirements for undertaking a site sensitivity verification and identifying protocols for the assessment and report content requirements of environmental impacts, it was noted during the outcome of the Environmental Screening Tool that an invertebrate and a reptile species of concern are listed for the area - the occurrence of these species will also be discussed.

4.2.1 Literature review and database acquisition

Mammals

- The potential occurrence and conservation status of mammal taxa were based on the IUCN Red List (2020) and the revised national Red Data Book by Child *et al*. (2016), while mammalian nomenclature was informed by Child *et al*. (2016), Stuart and Stuart (2015) and MammalMap, unless otherwise indicated.
- The historical and extant (contemporary) distribution ranges of mammal taxa sympatric to the study area were sourced from MammalMap (c. 2529CD, including adjacent 2529DC) and applicable field guides, in particular Stuart & Stuart (2015), Skinner & Chimimba (2005) and Friedmann & Daly (2004).
- A list of threatened and near threatened mammal species for 2529CD were also obtained from the Mpumalanga Parks and Tourism Authority (MPTA).

Birds

- Hockey *et al.* (2005), Del Hoyo *et al.* (1992-2011) and Harrison *et al*. (1997) were consulted for general information on the life history attributes of the relevant bird species. These datasets also provide small scale distributional information.
- The conservation status of bird species was categorised according to the global IUCN Red List of threatened species (IUCN, 2020) and a recent regional conservation assessment by Taylor et al. (2015).
- The biogeographic affinities of bird species were based on the Important Bird and Biodiversity Areas of Marnewick et al. (2015).
- Distributional data pertaining to species of conservation concern was sourced from the first South African Bird Atlas Project (SABAP1) and verified against Harrison et al. (1997) for species corresponding to the quarter-degree grid cell 2529CD (Middelburg). The SABAP1 data provides a “snapshot” of the abundance and composition of species recorded within a

quarter degree grid cell (QDGC) which was the sampling unit chosen (corresponding to an area of approximately 15 min lat x 15 min long). It should be noted that the atlas data makes use of reporting rates that were calculated from observer cards submitted by the public as well as citizen scientists. It provides an indication of the thoroughness of which the QDGCs were surveyed between 1987 and 1991.

- Additional distributional data was sourced from the second South African Bird Atlas Project (SABAP2; www.sabap2.adu.org.za). Since bird distributions are dynamic (based on landscape changes such as fragmentation and climate change), SABAP2 was born (and launched on 1 July 2007) from SABAP1 with the main difference being that all sampling is done at a finer scale known as pentad grids (5 min lat x 5 min long, equating to 9 pentads within a QDGC). Therefore, the data is more site-specific, recent and more comparable with observations made during the site visit (due to increased standardisation of data collection). The pentad grids relevant to the current project include 2545_2925 and 2550_2925 (although adjacent pentad grids to were also investigated).
- The choice of scientific nomenclature, taxonomy and common names were recommended by the International Ornithological Committee (the IOC World Bird Names, v.10.1; Gill & Donsker, 2020).
- A list of threatened and near threatened bird species for QDS 2529CD were also obtained from the MPTA.

Herpetofauna

- Red List categories for potential occurring reptile species were chosen according to the conservation assessment conducted by Bates *et al.* (2014).
- Red List categories and listings of potential occurring amphibian taxa follow Minter et al (2004) and the online dataset FrogMap (administered by the Animal Demography Unit, Cape Town).
- The distribution of reptile and amphibian species were verified against the Animal Demography's (ADU) database consisting of ReptileMap and FrogMap.
- A list of threatened and near threatened reptile and frog species for QDS 2529CD were also obtained from the MPTA.

4.2.2 Field surveys

Mammals

- Mammals were identified by visual sightings during *ad hoc* transect walks. In addition, mammals were also identified by means of spoor, droppings, roosting sites or likely habitat types.

Avifauna

- Birds were identified by means of *ad hoc* random transect walks while covering as much of the study site as possible. Species, where necessary, were verified using Roberts Birds of Southern Africa, VIIth ed. (Hockey *et a*l., 2005).
- Dominant species and avifaunal compositions were verified by means of four point counts (see Buckland *et al*., 1993; Figure 6). Points were approximately 200 m apart to ensure independence of observations, and due to the small surface area of the study site the

number of counts were limited to four. Each count lasted approximately 10 minutes. Data from the point counts were analysed to determine typical or dominant species according to Clarke & Warwick (1994).

- Birds were also identified by means of their calls and other signs such as nests, discarded egg shells (Tarboton, 2001) and feathers. Particular attention was paid to suitable roosting, foraging and nesting habitat for species of conservation concern.

Herpetofauna

- Possible burrows, or likely reptile habitat (termitaria, stumps or rocks) were inspected for any inhabitants. Amphibians were also identified by their vocalisations (if any) and through the presence of likely habitat types (e.g. water features, drainage lines, etc.). However, the herpetofaunal assessment focussed largely on a desktop review and was informed by *ad hoc* observations.

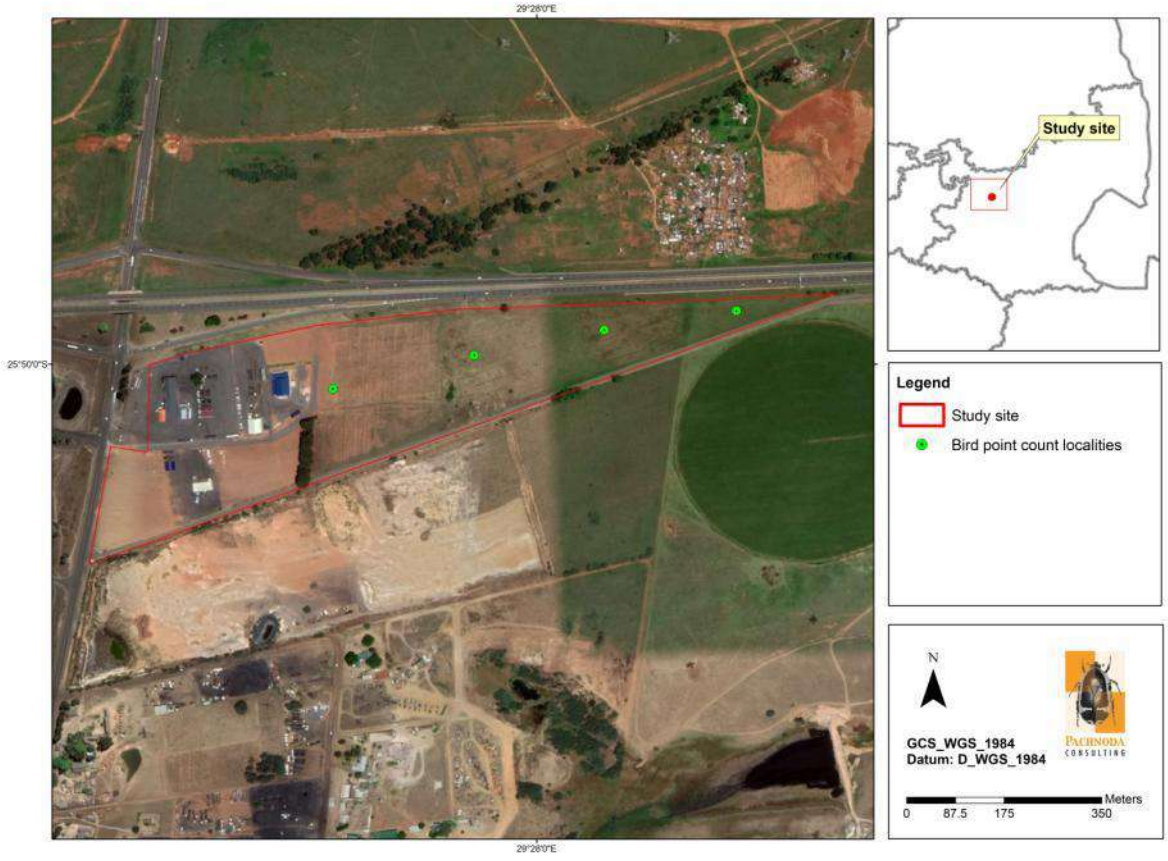

Figure 6: A satellite image of the study site illustrating the spatial localities of four bird point counts.

4.3 Impact Assessment

The Impact Assessment took the nature, extent, intensity, duration and probability of the impacts into consideration to determine the significance of the impact. Scores were allocated as follows:

Extent:

- Footprint: 1
- Site: 2
- Local: 3
- Regional: 4
- National: 5

Intensity:

- Low: 2
- Low-Medium: 4
- Medium: 6
- Medium-High: 8
- High: 10

Duration:

- Short term: 1
- Short to Medium term: 2
- Medium term: 3
- Long term: 4
- Permanent: 5

Probability:

- Improbable: 1
- Possible: 2
- Likely: 3
- Highly likely: 4
- Definite: 5

Significance:

The significance is calculated using the following formula: Significance = (Extent + Duration + Intensity) x Probability. The scoring indicates the significance of the impact as follows:

- 0-9: No Impact
- 10-24: Low
- 25-49: Medium
- 50-74: Medium to High
- 75-89: High
- 90-100: Extreme

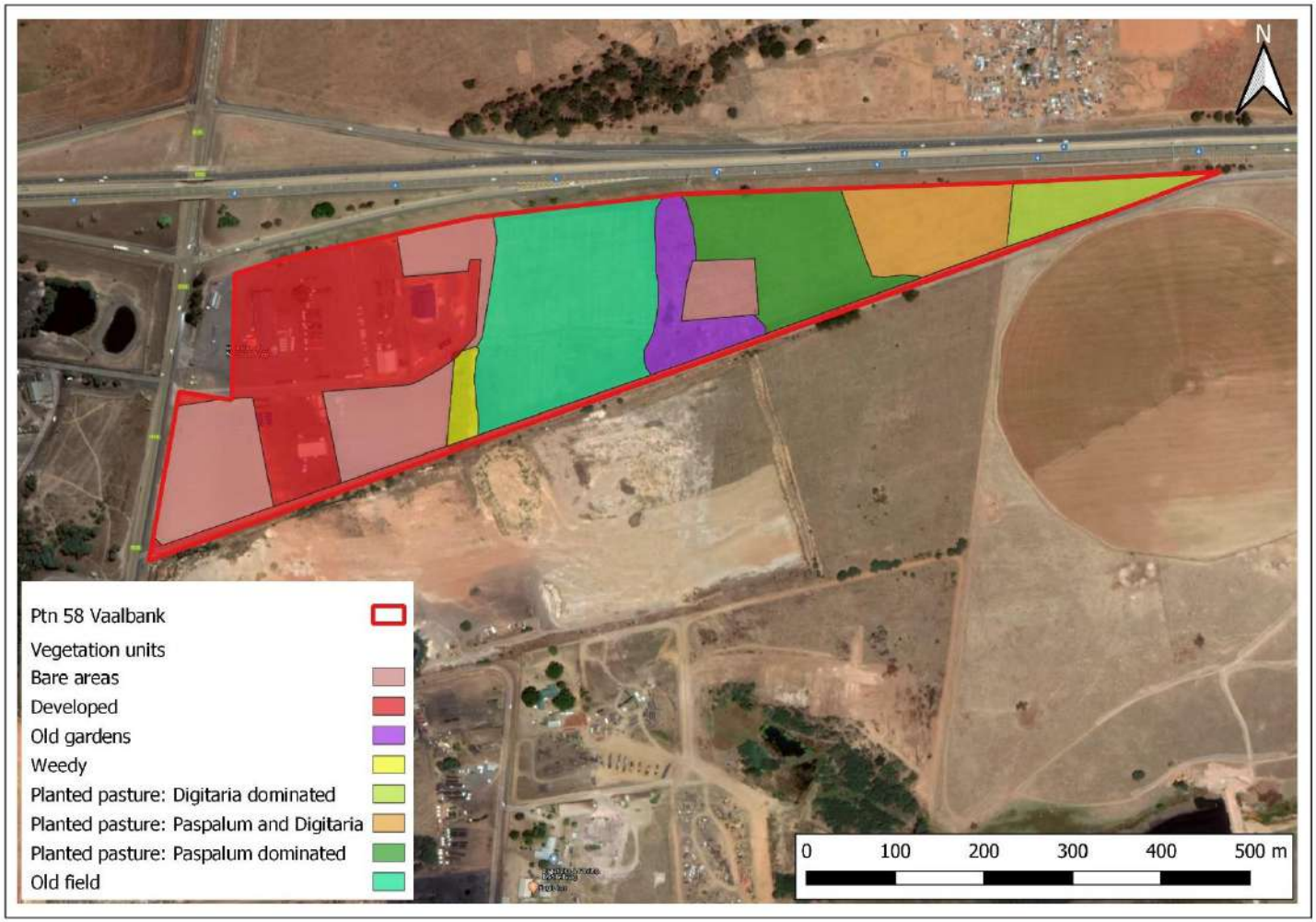

Figure 7: Vegetation unit identified on site during the site visit.

5 Results

5.1 Vegetation

5.1.1 Description

The site can be divided into three basic units, with sub-divisions:

- Bare areas and buildings
- Transformed
  - Old garden
  - Weedy areas
- Planted pasture
  - Old field
  - *Paspalum* dominated
  - *Digitaria* dominated
  - *Paspalum* and *Digitaria* dominated

Table 1: Vegetation units on site with their applicable sizes.

Vegetation unit	Size (ha)	Sub-units	Size (ha)	%
Bare areas and buildings	10.72	Bare areas	4.43	20
		Development	6.29	28
Transformed	1.48	Old gardens	1.16	5
		Weedy	0.32	1
Planted pasture	9.95	Old field	4.68	21
		Digitaria dominated	0.96	4
		Paspalum and *Digitaria* dominated	1.78	8
		Paspalum dominated	2.53	11

Figure 8: Cleared area adjacent to the old garden (left) and bare areas and buildings on the western portion of the site (right).

The bare areas and building are almost completely devoid of vegetation and therefore does not have any significance to this assessment (Figure 8). A small area of approximately 0.6ha has recently been

cleared on site. This area has largely been part of the *Paspalum* dominated pasture, but a small portion were in the Old Gardens vegetation sub-unit.

5.1.1.1 Transformed vegetation

The entire site was affected by farming activities in the past. The transformed areas are the areas with several impacts, but with a vegetation cover. The dominant vegetation is alien and weedy (Figure 9). Portions of this site included in this vegetation unit is the old garden area in the centre of the site, with associated disturbances to the north and south, as well as the weedy vegetation located adjacent to the row of pines adjacent to the cleared areas and the storm water channel located in this area. Both of these sub-units contain a variety of alien and weedy species, with some features resembling wetness.

The weedy patch adjacent to the bare and developed areas consist of a row of *Pinus patula* (Pine) with a stormwater canal directing the water to the south, off the site. Although an artificial canal is present in this area, this is not a wetland area. The plant species present in this area is mainly alien species, with a few weedy indigenous species and some invasive plant species present as well.

Figure 9: Images of (a), (b) and (c) the old garden area and (d) the weedy area.

The old garden is located around a recently cleared area that may have been the location of an old farmhouse sometime in the past. No ruins are visible in the area on historical images of the site. The species in this area is however typical of an old farm garden and include kikuyu (*Pennisetum clandestinum*), various fruit trees, as well as *Melia azedarach* (Seringa). The soil to the north of the cleared area is very disturbed and include several depressions. This northern area was likely used as

a household dumping site in the past. A clump of *Arundo donax* (Spanish Reed) is present adjacent to the road, where some water may accumulate. This is however not a wetland area and Spanish Reed is not an indicator of wetland conditions, but of disturbance. This species is present in this area due to the historical disturbances on site. The northern portion, where the soil disturbances occurred, also have a number of sedges, mostly *Cyperus esculentus*, an indicator of disturbances but a few individuals of another *Cyperus* species is also present in the excavations. Due to the low density of this species and the lack of hydromorphic indicators in the top 0.5m of the soil this is not considered an artificial wetland area, but a disturbed area where occasional ponding takes place.

Both sub-units of this vegetation unit are highly disturbed and no longer resembles the Rand Highveld Grassland vegetation type in any way and is almost completely transformed to weedy and invasive species. In addition, due to the location of the site and the unit in the site the vegetation is unlikely to contribute to connectivity and ecological corridors. The N4 to the north and road and Black Wattle Colliery to the west serve as very effective barriers to species and water movement.

5.1.1.2 Planted pasture

This vegetation unit has four sub-units and includes all vegetation units that were cultivated in the past and is now dominated grass species, but exclude the areas dominated by *Pennisetum clandestinum* (kikuyu) (Figure 10). All of these vegetation units represent secondary grassland in the very early successional stages. Although no fences remain, the dominant vegetation were clearly determined by the historical location of cultivated fields. The delineation of the sub-units is therefore blocky.

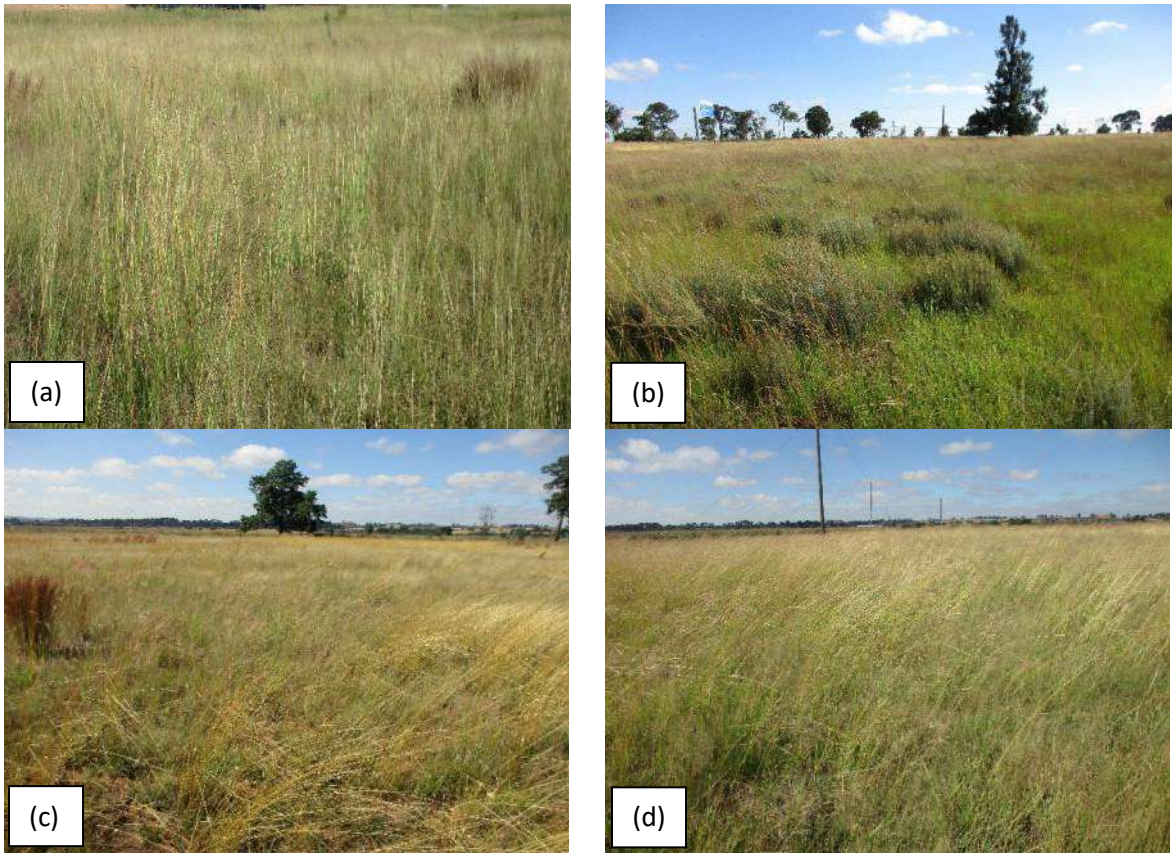

Figure 10: Similarities in the four sub-units of this vegetation type including (a) the old field, (b) the Paspalum *dominated vegetation, (c)* Paspalum *and* Digitaria *dominated vegetation and (d)* Digitaria *dominated vegetation.*

The sub-units located to the east of the old garden consists of planted pasture, with one or two dominant grass species. Other species are present in much lower densities. Based on the species composition of these three sub-units and the clear, straight boundaries between them, these areas were planted with grazing grasses for pasturage. The species composition of these sub-units differs markedly from the species composition expected in the Rand Highveld Grassland vegetation unit and the vegetation can no longer be considered a remnant of this threatened vegetation type. The orchid species *Habenaria epipactidea* is present in all three of these sub-units but is most numerous in the *Paspalum* dominated planted pasture. This species is not a threatened species.

The old field located between the old garden and bare areas consists of a mix of vegetation which resembles vegetation that typically gets established on a cultivated area that has been left fallow for several years, likely more than 20 years. The species composition consists of a mix of common grass species, with a very low diversity of forb species. This is typical of secondary grassland in the early successional stages. Although some superficial similarity to the Rand Highveld Grassland vegetation type exists, this vegetation type lacks the high species diversity, especially of forbs and geophytes, that are typically associated with primary Rand Highveld Grassland.

Table 2: Plant species observed on site during the site visit.

Species	Growth form	Alien / Invasive	Planted pasture				Transformed	
			Old field	Paspalum dominant	Paspalum and Digitaria dominant	Digitaria dominant	Old garden	Weedy
Albuca species	Forb		x					
Amaranthus hybridus	Forb	Alien						x
Aristida adscensionis	Grass		x			x	x	
Arundo donax	Grass	Class 1b					x	
Bidens bipinnata	Forb	Alien					x	
Bidens pilosa	Forb	Alien	x				x	x
Bulbostylis burchellii	Sedge				x			
Chamaecrista mimosoides	Forb		x		x			
Chenopodium ambrosioides	Forb	Alien					x	
Cleome maculata	Forb			x	x			
Commelina species	Forb		x			x		x
Conyza bonariensis	Forb	Alien	x				x	
Conyza canadensis	Forb	Alien					x	
Cosmos bipinnata	Forb	Alien					x	
Cucumis zeyheri	Forb		x					x
Cyanotis speciosa	Forb				x			
Cyperus esculentus	Sedge	Alien	x					
Cyperus sp	Sedge		x				x	
Datura ferox	Shrub	Class 1b	x				x	x

Species	Growth form	Alien / Invasive	Planted pasture				Transformed	
			Old field	Paspalum dominant	Paspalum and Digitaria dominant	Digitaria dominant	Old garden	Weedy
Datura stramonium	Shrub	Class 1b					x	
Digitaria eriantha	Grass		x	x	x	x		
Eragrostis curvula	Grass		x	x		x		
Eragrostis gummiflua	Grass		x	x	x			
Eragrostis pseudosclerantha	Grass					x		
Eragrostis plana	Grass				x		x	
Eragrostis rigida	Grass		x					
Eragrostis tef	Grass						x	
Gomphocarpus physocarpus	Shrub						x	
Gomphrena celosioides	Forb		x					
Habenaria epipactidea	Forb			x	x	x		
Helichrysum nudifolium	Forb		x	x				
Helichrysum rugulosum	Forb		x	x		x	x	
Helichrysum species	Forb			x				
Heteropogon contortus	Grass		x					
Hyparrhenia hirta	Grass		x		x	x	x	x
Hyparrhenia tamba	Grass						x	
Lagerstroemia indica	Tree	Alien					x	
Lippia javanica	Shrub		x					
Lopholaena coriifolia	Shrub		x					
Malus sylvestris	Tree	Alien					x	
Melia azedarach	Tree	Alien					x	
Melinis repens	Grass		x		x	x	x	
Monocymbium ceresiiforme	Grass			x				
Morus alba	Tree	Class 3					x	
Oxalis corniculata	Forb						x	
Paspalum dilatatum	Grass						x	
Paspalum notatum	Grass		x			x	x	
Pelargonium luridum	Forb		x					
Pennisetum clandestinum	Grass						x	
Perotis patens	Grass		x	x	x	x		
Physalis viscosa	Forb	Alien					x	
Pinus patula	Tree	Class 2						x
Prunus armeniaca	Tree	Alien					x	
Prunus persica	Tree	Alien					x	
Pogonarthria squarrosa	Grass		x		x	x	x	
Pollichia campestris	Forb		x					

Species	Growth form	Alien / Invasive	Planted pasture				Transformed	
			Old field	Paspalum dominant	Paspalum and Digitaria dominant	Digitaria dominant	Old garden	Weedy
Pseudognaphalium luteo-alba	Forb	Alien	x					
Punica granatum	Tree	Alien					x	
Pyrus communis	Tree	Alien					x	
Richardia braziliensis	Forb	Alien	x		x	x	x	
Schizachyrium jeffreysii	Grass		x		x			
Schizachyrium sanguineum	Grass		x		x			
Selaginella species	Fern				x			
Senecio erubescens	Forb			x				
Senecio inaequidens	Forb		x		x			
Senecio species	Forb		x			x		
Seriphium plumosum	Shrub		x	x	x	x		
Sida dregei	Forb						x	
Sonchus nanus	Forb						x	
Sporobolus africanus	Grass		x	x	x		x	
Tagetes minuta	Forb	Alien	x				x	x
Themeda triandra	Grass		x					
Trichoneura grandiglumis	Grass		x					
Urochloa mosambicensis	Grass		x					x
Verbena bonariensis	Forb	Class 1b					x	
Verbena braziliensis	Forb	Class 1b					x	
Vigna species	Forb		x				x	
Vitis vinifera	Climber	Alien					x	
Walafrida densiflora	Forb		x	x	x			
Zaluzianskya species	Forb				x	x		
Total	**80**		**41**	**14**	**21**	**16**	**41**	**9**
Trees	9		0	0	0	0	8	1
Shrubs	6		4	1	1	1	3	1
Grasses	25		17	6	10	9	12	2
Sedges	3		2	0	1	0	1	0
Climbers	1		0	0	0	0	1	0
Ferns	1		0	0	1	0	0	0
Forbs	35		18	7	8	6	16	5
Alien (exclude invasives)	20		6	0	1	1	17	3
Invasive class 1b	5		1	0	0	0	5	1
Invasive class 2	1		0	0	0	0	0	1
Invasive class 3	1		0	0	0	0	1	0

5.1.2 Invasive species

A list of alien and invasive species has been published in the Government Gazette of 1 August 2014 in the Alien and Invasive Species Regulations (AIS) under the National Environmental Management Biodiversity Act (Act 10 of 2004). Invasive species are divided into the following four categories:

- "Category 1a: Invasive species which must be combatted and eradicated. Any form of trade or planting is strictly prohibited.
- Category 1b: Invasive species which must be controlled and wherever possible, removed and destroyed. Any form of trade or planting is strictly prohibited.
- Category 2: Invasive species, or species deemed to be potentially invasive, in that a permit is required to carry out a restricted activity. Category 2 species include commercially important species such as pine, wattle and gum trees. Plants in riparian areas are Category 1b.
- Category 3: Invasive species which may remain in prescribed areas or provinces. Further planting, propagation or trade, is however prohibited. Plants in riparian areas are Category 1b."

Seven invasive species were recorded on site during the site visit (Table 3). These species will have to be controlled on site during the construction and operational phases. Additional disturbances on site may result in additional species encroaching into the site.

Table 3: Invasive species recorded in on site during the site visit.

Species	Growth form	Alien / Invasive	Old field	Transformed	
				Old garden	Weedy
Arundo donax	Grass	Class 1b		x	
Datura ferox	Shrub	Class 1b	x	x	x
Datura stramonium	Shrub	Class 1b		x	
Morus alba	Tree	Class 3		x	
Pinus patula	Tree	Class 2			x
Verbena bonariensis	Forb	Class 1b		x	
Verbena braziliensis	Forb	Class 1b		x	

Figure 11: Invasive species present on site.

5.1.3 Species of conservation importance

No threatened plant species were observed on site during the site visit and none are expected. Species indicated to potentially occur in the area are included in Table 4 below. No habitat is present for these species on site and the habitat has further been transformed by the historical cultivation. It is highly unlikely that any of these species will be present on site or can utilise the site as an ecological corridor.

Table 4: Species of conservation importance expected in the greater area.

Species	Status	Habitat	Habitat on site
Anacampseros subnuda subsp. lubbersii	VU	Rand Highveld Grassland and Loskop Mountain Bushveld in Middelburg and Witbank area. On rhyolite boulders.	No habitat on site.
Brachycorythis conica subsp. transvaalensis	CR	Short, open grassland or wooded grassland, on sandy gravel overlying dolomite or quartzite. Altitude of 1 000-1 705 m.	No habitat on site.
Dioscorea sylvatica	VU	Wooded and relatively mesic places. Coastal bush, moister bushveld areas and wooded mountain kloofs.	No habitat on site.
Frithia humilis	EN	Very shallow soils derived from coarse materials from the Irrigasie formation, Ecca group.	No habitat on site.
Nerine gracilis	VU	Damp areas in undulating grassland.	No habitat on site.

Numerous individuals of the orchid species *Habenaria epipactidea* is present in the eastern portion of the site. Although species is common and widespread all orchid species are protected under the Mpumalanga Nature Conservation Act. Since the species is common, the relocation of the species on site is recommended rather than excluding development from the site. The species must be searched for and relocated in the growing season prior to construction. The species must be relocated to disturbed veld in the area, not to natural vegetation.


Figure 12: Habenaria epipactidea *present on site.*

5.2 Fauna

5.2.1 Mammals

Regional Overview and taxonomic diversity

A total of 45 mammal species have been recorded in the study area (2529CD and 2529DC; *sensu* MammalMap) (Table 5). When considering the poor ecological condition and past agricultural activities that have occurred on the site, only approximately nine (20 %) of these species have a high probability of occurrence on the study site. Another seven mammal species have a moderate probability of occurrence, since under natural conditions (when habitat types are untransformed), these species are widespread in the area but peripheral and uncommon in secondary habitat. These latter species are hence regarded as occasional visitors on the study site (Table 5). In addition, approximately 29 (64 %) of the 45 species that occur in the region have a low probability of occurrence on the study site and are either absent (due to the absence of suitable habitat) or are highly irregular visitors owing to absence of optimal habitat (Table 5). Most of these species are present on the nearby Vaalbank Private Nature Reserve, which also include a number of introduced game species (mainly bovids). The nearby Vaalbank Private Nature Reserve is also fenced off and will thereby restrict the dispersal of game and large carnivore species into adjacent areas. Some of the species listed in Table 8 are probably no longer natural to the area, and were introduced as game species (mainly large bovine species such as Blesbok Damaliscus pygargus phillipsi), while one species, the House Mouse (*Mus musculus*) is alien (exotic) to the area and could also occur on the developed units on the study site.

Mammal Richness on the Study Site

Approximately 24 mammal species could occur on the study site. These include 16 of the 45 mammal species that have been recorded in the region (*sensu* MammalMap, and an additional eight species not recorded by MammalMap) (Table 6). Of the 24 expected species, only 13 (54% of the expected richness) have a high likelihood of occurrence, of which only the Black-backed Jackal (Canis

mesomelas) was observed (based on spoor) on the study site during the site visit. Widespread species (e.g. Highveld Mole-rat *Cryptomys cf. pretoriae,* Highveld Gerbil *Gerbilliscus brantsii* and African Savanna Hare *Lepus cf. victoriae*) that are generally common (thereby having a high frequency of occurrence) in similar habitat types were virtually absent on the study site during the site visit. It emphasises the general poor ecological condition of the habitat units on the site.

Table 5: An inventory of mammalian taxa recorded on the study area (2529CD and 2529DC) and the probability of each species to occur on the study site.

Family	Scientific name	Common name	Conservation Status	Probability of occurrence
Bathyergidae	*Cryptomys pretoriae (=hottentotus)*	Highveld Mole-rat	Least Concern	High
Bovidae	*Antidorcas marsupialis*	Springbok	Least Concern	Low
Bovidae	*Connochaetes gnou*	Black Wildebeest	Least Concern	Low
Bovidae	*Damaliscus pygargus phillipsi*	Blesbok	Least Concern	Low
Bovidae	*Kobus ellipsiprymnus*	Waterbuck	Least Concern	Low
Bovidae	*Oryx gazella*	Gemsbok	Least Concern	Low
Bovidae	*Ourebia ourebi*	Oribi	Endangered	Low
Bovidae	*Sylvicapra grimmia*	Common Duiker	Least Concern	Moderate
Bovidae	*Tragelaphus scriptus*	Bushbuck	Least Concern	Low
Bovidae	*Tragelaphus strepsiceros*	Greater Kudu	Least Concern	Low
Canidae	*Canis mesomelas*	Black-backed Jackal	Least Concern	High
Canidae	*Otocyon megalotis*	Bat-eared Fox	Least Concern	Low
Canidae	*Vulpes chama*	Cape Fox	Least Concern	Moderate
Cercopithecidae	*Chlorocebus pygerythrus*	Vervet Monkey	Least Concern	Low
Cercopithecidae	*Papio ursinus*	Chacma Baboon	Least Concern	Low
Erinaceidae	*Atelerix frontalis*	Southern African Hedgehog	Near Threatened	Low
Felidae	*Caracal caracal*	Caracal	Least Concern	Low
Felidae	*Felis silvestris*	African Wild Cat	Least Concern	Moderate
Felidae	*Leptailurus serval*	Serval	Near Threatened	Low
Felidae	*Panthera pardus*	Leopard	Vulnerable	Low

Herpestidae	*Cynictis penicillata*	Yellow Mongoose	Least Concern	High
Herpestidae	*Herpestes sanguineus*	Slender Mongoose	Least Concern	High
Herpestidae	*Suricata suricatta*	Suri ate	Least Concern	Low
Hyaenidae	*Parahyaena brunnea*	Brown Hyena	Near Threatened	Low
Leporidae	*Lepus capensis*	Cape Hare	Least Concern	Low
Leporidae	*Lepus victoriae (=saxatilis)*	African Savanna Hare	Least Concern	High
Leporidae	*Pronolagus randensis*	Jameson's Red Rock Hare	Least Concern	Low
Macroscelididae	*Elephantulus myurus*	Eastern Rock Elephant Shrew	Least Concern	Low
Muridae	*Gerbilliscus brantsii*	Highveld Gerbil	Least Concern	High
Muridae	*Mastomys cf. natalensis*	Natal Multimammate Mouse	Least Concern	High
Muridae	*Micaelamys namaquensis*	Namaqua Rock Mouse	Least Concern	Low
Muridae	*Rhabdomys pumilio*	Four-striped Grass Mouse	Least Concern	High
Mustelidae	*Aonyx capensis*	Cape Clawless Otter	Near Threatened	Low
Mustelidae	*Ictonyx striatus*	Striped Polecat	Least Concern	Moderate
Mustelidae	*Poecilogale albinucha*	African Striped Weasel	Near Threatened	Low
Nesomyidae	*Dendromus melanotis*	Grey Climbing Mouse	Least Concern	Moderate
Orycteropodidae	*Orycteropus afer*	Aardvark	Least Concern	Low
Procaviidae	*Procavia capensis*	Cape Rock Hyrax	Least Concern	Low
Rhinolophidae	*Rhinolophus clivosus*	Geoffroy's Horseshoe Bat	Least Concern	Low
Sciuridae	*Paraxerus cepapi*	Bush Squirrel	Least Concern	Low
Suidae	*Potamochoerus larvatus koiropotamus*	Bushpig	Least Concern	Low
Vespertilionidae	*Miniopterus natalensis*	Natal Long-fingered Bat	Least Concern	Moderate
Vespertilionidae	*Scotophilus dinganii*	Yellow House Bat	Least Concern	High
Viverridae	*Genetta genetta*	Small-spotted Genet	Least Concern	Low
Viverridae	*Genetta maculata*	Common Large-spotted Genet	Least Concern	Moderate

Table 6: An inventory of mammalian taxa that could occur on the study site (with a moderate to high probability of occurrence).

Family	Scientific name	Common name	Conservation Status	Probability of occurrence
Bathyergidae	*Cryptomys pretoriae (=hottentotus)*	Highveld Mole-rat	Least Concern	High
Bovidae	*Raphicerus campestris*	Steenbok	Least Concern	Moderate
Bovidae	*Sylvicapra grimmia*	Common Duiker	Least Concern	Moderate
Canidae	*Canis mesomelas*	Black-backed Jackal	Least Concern	High
Canidae	*Vulpes chama*	Cape Fox	Least Concern	Moderate
Felidae	*Felis silvestris*	African Wild Cat	Least Concern	Moderate
Herpestidae	*Atilax paludinosus*	Marsh Mongoose	Least Concern	Moderate
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	Least Concern	High
Herpestidae	*Herpestes sanguineus*	Slender Mongoose	Least Concern	High
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	Least Concern	High
Leporidae	*Lepus victoriae (=saxatilis)*	African Savanna Hare	Least Concern	High
Molossidae	*Tadarida aegyptiaca*	Egyptian Free-tailed Bat	Least Concern	High
Muridae	*Dendromus mystacalis*	Chestnut Climbing Mouse	Least Concern	Moderate
Muridae	*Gerbilliscus brantsii*	Highveld Gerbil	Least Concern	High
Muridae	*Mastomys cf. natalensis*	Natal Mastomys	Least Concern	High
Muridae	*Mus musculus*	House Mouse	Least Concern	High
Muridae	*Rhabdomys pumilio*	Four-striped Grass Mouse	Least Concern	High
Muridae	*Saccostomus campestris*	Poached Mouse	Least Concern	Moderate
Mustelidae	*Ictonyx striatus*	Striped Polecat	Least Concern	Moderate
Nesomyidae	*Dendromus melanotis*	Grey Climbing Mouse	Least Concern	Moderate
Vespertilionidae	*Miniopterus natalensis*	Natal Long-fingered Bat	Least Concern	Moderate
Vespertilionidae	*Neoromicia capensis*	Cape Serotine Bat	Least Concern	High
Vespertilionidae	*Scotophilus dinganii*	Yellow House Bat	Least Concern	High
Viverridae	*Genetta maculata*	Common Large-spotted Genet	Least Concern	Moderate

Biodiversity value and ecological considerations

- The study site supported a low richness of mammal species. The low expected richness is a consequence of the poor ecological condition of the natural grassland units (mainly old secondary fields and planted pastures) on the study site and historical activities which included ploughing.
- The study site is poorly-connected to untransformed "late-successional" grassland that occurs to the south-east of the site, including the large patches of grassland which are which are associated with the Pienaarsdam Leisure Resort (and included in the Vaalbank Private Nature Reserve indicated in the MBSP, but not managed as such). The latter areas contain a

high richness of meso- and large carnivores as evidenced by the MammalMap data, although most of these species are absent on the study site.

- Wetland features are absent on the study site, which thereby contribute towards the low species richness and absence of facultative wetland mammal species.
- Many of the mammal species that are widespread and with a high frequency of occurrence on grassland on the Mpumalanga Highveld were ominously absent from the study site.

Mammal taxa of conservation concern

The study site has a low probability for Threatened and Near-threatened mammal species to be present, based on poor habitat suitability and structure. MammalMap lists seven mammal species of conservation concern which are known to be present in QDS 2529CD and 2529DC, all of which have a low probability of occurrence. These include two threatened (c. Oribi *Ourebia ourebi* and Leopard *Panthera pardalis*) and five near threatened mammal species (c. Brown Hyaena *Parahyaena brunnea*, South African Hedgehog *Atelerix frontalis*, Serval *Leptailurus serval*, Cape Clawless Otter *Aonyx capensis* and African Striped Weasel *Poecilogale albinucha*) (*sensu* Child *et al*., 2016). Table 7 provides an inventory of threatened and near threatened mammal species that are present in QDS 2529CD and 2529DC, and their probability of occurrence on the study site. In addition, the MPTA database holds zero records of threatened or near threatened mammal species for the Farm Vaalbank 289 JS.

Table 7: An inventory of mammal species of conservation concern that could occur on the study area (sensu MammalMap) ant their probability of occurrence on the study site.

Family	Scientific name	Common name	Red list	Preferred Habitat	Status on study site
Bovidae	*Ourebia ourebi*	Oribi	Endangered	Untransformed mixed grassland on undulating topographies. A selective grazer, preferring both short and tall grassland at a "climax" successional state	Unlikely to occur, suitable habitat absent. The nearest farms where this species is currently known from are: Elandspruit 291 JS (10.4 km NW of study sire and Kalbasfontein 284 JS (21km NW of study site).
Felidae	*Panthera pardus*	Leopard	Vulnerable	Varied, although preferring topographically complex habitat (e.g. mountains). Highly adaptable and catholic in diet (from insects to large bovines). Occupies large home ranges on Highveld.	Vagrant to the study site. Habitat on study site is considered to be marginal. The study region is peripheral to the core distribution of this species.

Family	Scientific name	Common name	Red list	Preferred Habitat	Status on study site
Hyaenidae	*Parahyaena brunnea*	Brown Hyena	Near Threatened	Varied, although preferring large and extensive land. A secretive scavenger occupying large home ranges.	Vagrant to the study site. Habitat on study site considered to be marginal. The nearest farm where this species is currently known from is: Mooifontein 285 JS (15km NW of study site).
Erinaceidae	*Atelerix frontalis*	Southern African Hedgehog	Near Threatened	Dry grassland and well maintained urban gardens where persecution by humans and feral animals is absent.	Low, probably absent. Historical tilling of the natural grassland units on the study site considered to have displaced this species. This species is currently known from Farm Zeekoeiwater 311 JS (19km WSW of study site) but is believed to be present on adjacent farms where suitable habitat occurs. The study region is also considered to be peripheral to the core distribution range of this species which is more numerous west of Emalahleni.
Felidae	*Leptailurus serval*	Serval	Near Threatened	Mainly moist tall grassland bordering wetland features with a high prey base (mainly rodents).	An irregular foraging visitor or vagrant to the study site. Habitat on study site considered to be marginal.
Mustelidae	*Aonyx capensis*	Cape Clawless Otter	Near Threatened	Pans, dams, rivers and streams, will also utilize storm water channels and man-made features during dispersal.	Unlikely to occur, suitable habitat absent
Mustelidae	*Poecilogale albinucha*	African Striped Weasel	Near Threatened	Varied, although strong bias to moist and montane grassland. High prey base (mainly rodents) required.	Status on study site uncertain, probably absent due to poor ecological condition of grassland units and low prey base.

5.2.2 Amphibians

Fifteen (15) frog species are known to be sympatric to the study area (according to QDC 2529CD and adjacent grid 2529DC; Table 8). Only three of these species have a high probability of occurrence on the study site based on their widespread distribution ranges and their ability to breed in temporary rain-filled depressions and roadside verges during high precipitation events. These include the

Common Caco (*Cacosternum boettgeri*), Guttural Toad (*Sclerophrys gutturalis*) and Bubbling Kassina (*Kassina senegalensis*). The remaining species include four species with a moderate probability of occurrence (habitat suitability is marginal), while eight species having a low probability of occurrence (owing to the absence of breeding habitat). The absence of prominent wetland features (e.g. dams, pans and seeps) explains the low expected amphibian diversity on the study site.

According to Minter et al. (2004), the amphibian richness on the study area is moderate (c. 11-20 species) with a very low prevalence of endemic species (c. 1 species, *Amietia delalandii*). Therefore, the study site is not considered as an important amphibian diversity hotspot.

Table 8: A list of amphibian/frog species known from recent observations (sensu FrogMap) and historical distributional records for the study site (2529CD and adjacent grid 2529DC).

Family	Scientific Name	Common Name	Conservation Status	Probability of occurrence on study site
Bufonidae	*Schismaderma carens*	Red Toad	Least Concern	Low (breeding habitat absent)
Bufonidae	*Sclerophrys capensis*	Raucous Toad	Least Concern	Moderate
Bufonidae	*Sclerophrys gutturalis*	Guttural Toad	Least Concern	High
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	Least Concern	High (during precipitation)
Hyperoliidae	*Semnodactylus wealii*	Rattling Frog	Least Concern	Low (probably absent)
Phrynobatrachidae	*Phrynobatrachus natalensis*	Snoring Puddle Frog	Least Concern	Low (probably absent)
Pipidae	*Xenopus laevis*	Common Platanna	Least Concern	Low (probably absent)
Ptychadenidae	*Ptychadena porosissima*	Striped Grass Frog	Least Concern	Low (probably absent)
Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	Least Concern	Moderate to low
Pyxicephalidae	*Cacosternum boettgeri*	Common Caco	Least Concern	High (during precipitation)
Pyxicephalidae	*Pyxicephalus adspersus*	Giant Bull Frog	Near Threatened	Low (probably absent)
Pyxicephalidae	*Strongylopus fasciatus*	Striped Stream Frog	Least Concern	Low (probably absent)
Pyxicephalidae	*Tomopterna cryptotis*	Tremelo Sand Frog	Least Concern	Moderate
Pyxicephalidae	*Tomopterna natalensis*	Natal Sand Frog	Least Concern	Moderate
Pyxicephalidae	*Tomopterna tandyi*	Tandy's Sand Frog	Least Concern	Low (status uncertain - cryptic species)

Amphibian taxa of conservation concern

The Giant Bullfrog (*Pyxicephalus adspersus*) is the only frog species of conservation concern which is known from QDS 2529CD and 2529DC in the region (Minter et al., 2004). Within QDS 2529CD (sympatric to the study site) it is known from a large pan on Farm Elandspruit 291 JS, which is located approximately 8.7 km west of the study site and also from Farm Riefontein 286 JS which is located 10.7 km north of the study site (the locality is on the northern outskirts of Middelburg) (*sensu* MPTA database).

The Giant Bullfrog is listed as least concern by the IUCN due to its wide distribution and broad habitat tolerance (Channing et. al., 2004). According to Channing et. al. (2004), its global population size is presumably large enough to buffer any rapid declines, which disqualifies this species for listing in any of the threatened categories. However, some fragmented populations have experienced rapid declines in South Africa due to urban development (especially in Gauteng) while also under pressure from mining activities as evidenced in the western limb of the Bushveld complex (gabbros) (e.g. Rustenburg). On a national level, this species is categorised as Near-threatened during a conservation assessment conducted by Minter et al. (2004). It is the largest frog species in South Africa and thus has a long life expectancy.

P. adspersus spend most of its live underground in a dormant state (called "aestivation"), and only emerge after heavy bouts of rainfall (*c*. 30 mm or more) (Channing, 2001) whereby they immediately start to breed. They are therefore easily overlooked during unfavourable conditions (e.g. dry spells or low rainfall events). After breeding the adults and juveniles will search for suitable "aestivation" sites and may travel up to 200 m - 1 km from breeding sites, whereby they burrow themselves, only to emerge during favourable conditions (Alexander, 2004). It is usually during this long dormancy period that they remain undetected and are thus vulnerable towards development (especially construction works) or changes in surface runoff. They are also threatened when their breeding habitat becomes degraded (e.g. pollution) or during the mass dispersal (e.g. road kills) of juveniles.

Typical Habitat Requirements

In order for Bullfrogs to successfully complete their life cycle, the following habitat requirements should be present (adopted from Alexander, 2004):

- Ephemeral pans, depressions or even small shallow artificial dams with enough capacity to store water for at least one month to facilitate breeding. These depressions should be shallow enough for breeding to take place.
- The pans and depressions should be easily accessible to Bullfrogs (marginal vegetation surrounding pans or depressions should not restrict accessibility).
- The soils surrounding the depressions and pans should be suitable for "aestivation" of Bullfrogs (normally grey clayey or deep sandy soils).
- Access to suitable foraging habitat (e.g. open grassland adjacent to breeding sites).

Occurrence of Giant Bullfrog on the study area

In general, the study site is not considered to be an important breeding habitat for this species owing to the absence of suitable breeding habitat. In addition, the occurrence of this species on the study site is considered to be low since a large section of natural habitat was historically ploughed which would have disrupted or even induce mortalities to "aestivating" individuals.

5.2.3 Reptiles

A total of 48 reptile taxa are known to be sympatric to the study area (according to QDC 2529CD and adjacent grid 2529DC; *sensu* Bates et al., 2014) (Table 9). According to the habitat types present (and also when acknowledging the degraded ecological condition of the grassland units), the reptile richness on the study site is low (Bates *et al.,* 2014). Only 10 (20 %) of these species show a high probability of occurrence, while 14 species have a medium probability of occurrence and are regarded as uncommon to rare on the site. The remaining 24 species have low probabilities of occurrence. Most of the species with low probabilities of occurrences are marginal to the study area and have their distribution ranges centred in the Central Bushveld Bioregion (as opposed to the Grassland Biome) or are associated with rocky grassland and wetland habitat types that were absent on the study site. The prominent species on the study site include the Rhombic Egg-eater (*Dasypeltis scabra*), Spotted Grass Snake (*Psammophylax rhombeatus*) and Speckled Rock Skink (*Trachylepis punctatissima*).

Table 9: A list of reptile species known from recent observations (sensu ReptileMap) and historical distributional records for the study area (2529CD and adjacent grid 2529DC) and their probability of occurrence on the study site.

Family	Scientific Name	Common name	Conservation Status	Probability of occurrence on study site
Agamidae	*Agama aculeata distanti*	Distant's Ground Agama	Least Concern	Moderate
Agamidae	*Agama atra*	Southern Rock Agama	Least Concern	Low
Chamaeleonidae	*Chamaeleo dilepis*	Common Flap-neck Chameleon	Least Concern	Low
Colubridae	*Crotaphopeltis hotamboeia*	Red-lipped Snake	Least Concern	High
Colubridae	*Dasypeltis scabra*	Rhombic Egg-eater	Least Concern	High
Colubridae	*Dispholidus typus typus*	Boomslang	Least Concern	Low
Colubridae	*Philothamnus occidentalis*	Western Natal Green Snake	Least Concern	Low
Colubridae	*Philothamnus semivariegatus*	Spotted Bush Snake	Least Concern	Moderate
Colubridae	*Telescopus semiannulatus semiannulatus*	Eastern Tiger Snake	Least Concern	Low
Cordylidae	*Chamaesaura aenea*	Coppery Grass Lizard	Near Threatened	Low
Cordylidae	*Cordylus vittifer*	Common Girdled Lizard	Least Concern	Low
Elapidae	*Aspidelaps scutatus scutatus*	Speckled Shield Cobra	Least Concern	Low
Elapidae	*Elapsoidea sundevallii media*	Highveld Garter Snake	Least Concern	Low
Elapidae	*Hemachatus haemachatus*	Rinkhals	Least Concern	High
Elapidae	*Naja annulifera*	Snouted Cobra	Least Concern	Moderate

Family	Scientific Name	Common name	Conservation Status	Probability of occurrence on study site
Elapidae	*Naja mossambica*	Mozambique Spitting Cobra	Least Concern	Low
Gekkonidae	*Hemidactylus mabouia*	Common Tropical House Gecko	Least Concern	Moderate
Gekkonidae	*Lygodactylus capensis capensis*	Common Dwarf Gecko	Least Concern	Low
Gekkonidae	*Lygodactylus ocellatus*	Spotted Dwarf Gecko	Least Concern	Low
Gekkonidae	*Pachydactylus affinis*	Transvaal Gecko	Least Concern	High
Gekkonidae	*Pachydactylus capensis*	Cape Gecko	Least Concern	Moderate
Gerrhosauridae	*Gerrhosaurus flavigularis*	Yellow-throated Plated Lizard	Least Concern	Low
Lamprophiidae	*Aparallactus capensis*	Black-headed Centipede-eater	Least Concern	Moderate
Lamprophiidae	*Atractaspis bibronii*	Bibron's Stiletto Snake	Least Concern	Moderate
Lamprophiidae	*Boaedon capensis*	Brown House Snake	Least Concern	High
Lamprophiidae	*Homoroselaps dorsalis*	Striped Harlequin Snake	Near Threatened	Low
Lamprophiidae	*Lamprophis aurora*	Aurora House Snake	Least Concern	Low
Lamprophiidae	*Lycodonomorphus rufulus*	Brown Water Snake	Least Concern	Moderate
Lamprophiidae	*Lycophidion capense capense*	Cape Wolf Snake	Least Concern	Moderate
Lamprophiidae	*Psammophis brevirostris*	Short-snouted Grass Snake	Least Concern	Low
Lamprophiidae	*Psammophis crucifer*	Cross-marked Grass Snake	Least Concern	Low
Lamprophiidae	*Psammophylax rhombeatus*	Spotted Grass Snake	Least Concern	High
Lamprophiidae	*Psammophylax tritaeniatus*	Striped Grass Snake	Least Concern	Moderate
Lamprophiidae	*Pseudaspis cana*	Mole Snake	Least Concern	Low
Leptotyphlopidae	*Leptotyphlops distanti*	Distant's Thread Snake	Least Concern	Moderate
Pythonidae	*Python natalensis*	Southern African Python	Least Concern	Low
Scincidae	*Acontias gracilicauda*	Thin-tailed Legless Skink	Least Concern	Low
Scincidae	*Acontias occidentalis*	Western Legless Skink	Least Concern	Low

Family	Scientific Name	Common name	Conservation Status	Probability of occurrence on study site
Scincidae	*Trachylepis capensis*	Cape Skink	Least Concern	High
Scincidae	*Trachylepis punctatissima*	Speckled Rock Skink	Least Concern	High
Scincidae	*Trachylepis sp. (Transvaal varia)*	Skink sp. 1	Least Concern	Low
Scincidae	*Trachylepis varia sensu lato*	Common Variable Skink Complex	Least Concern	High
Testudinidae	*Kinixys lobatsiana*	Lobatse Hinged-back Tortoise	Vulnerable	Low
Testudinidae	*Stigmochelys pardalis*	Leopard Tortoise	Least Concern	Moderate
Typhlopidae	*Afrotyphlops bibronii*	Bibron's Blind Snake	Least Concern	Moderate
Varanidae	*Varanus niloticus*	Water Monitor	Least Concern	Low
Viperidae	*Bitis arietans arietans*	Puff Adder	Least Concern	Moderate
Viperidae	*Causus rhombeatus*	Rhombic Night Adder	Least Concern	High

Reptile taxa of conservation concern

The near threatened Coppery Grass Lizard (*Chamaesaura aenea*) and Striped Harlequin Snake (*Homoroselaps dorsalis*) are known to be present in the study area. Both species are notoriously difficult to find and detect, which explains the low reporting rates obtained during the reptile atlas period (*sensu* ReptileMap). Both species have been recorded from QDS 2529CD although these records are old and were obtained during 1900 (probably from the Middelburg area; *sensu* MPTA database).

C. aenea occurs within fairly pristine grasslands and does not appear to tolerate any significant disturbances or habitat alterations. The national population of this species is scattered and appears to have experienced population declines over the last decade due to fragmentation and afforestation of its primary grassland habitat. It is also vulnerable towards veld fires and relies heavily on the presence of outcrops or rocky cover for protection against veld fires. However, it remains to be a very rare and unobtrusive species. For example, Whittington-Jones *et a*l. (2008) recorded only two specimens from Rietvlei Dam Nature Reserve in Gauteng over a period of ca. eight years. Based on the absence of suitable habitat on the study site, the probability that this species is present is low (it is probably absent).

Homoroselaps dorsalis is relatively widespread in South Africa but regarded to be rare in most parts of their geographic distribution. The population of *H. dorsalis* is highly fragmented and prone towards local extinction. Although not often encountered and mostly overlooked since it is often present underneath loose rocks and in termitaria. Based on the absence of suitable habitat on the study site, the probability that this species is present is low.

Please refer to section 5.2.6 of this document for more information regarding the occurrence of the Lobatse Hinged-back Tortoise (*Kinixys lobatsiana*) on the study site.

5.2.4 Avifauna (birds)

Species richness and composition

Approximately 94 bird species are expected to occur on the study site and immediate surroundings according to the available habitat units (Addendum B). The expected richness was inferred from the South African Bird Atlas Project (SABAP1 & SABAP2)[1] (Harrison et al., 1997; www.sabap2.org) and the presence of suitable habitat on the study area[2]. This equates to 9.6 % of the approximate 978[3] species listed for the southern African subregion[4] (and approximately 10.9 % of the 856 species recorded within South Africa[5]). According to the SABAP2 database, the average number of species observed per pentad grid (with a minimum observation time of 2 hours) is approximately 49.7 species, with 25 species observed during the site visit. Therefore, it is clear that the observed richness is more than 50% lower than the mean derived for each card submitted on a pentad grid scale, thereby emphasising the poor species richness and degraded ecological condition of the habitat units on the study site.

In addition, the study site was also poorly represented by biome-restricted bird species (the Southern Bald Ibis *Geronticus calvus* may represent a rare to irregular foraging visitor to the area).

Typical species and general composition

An analysis of bird data generated from the point counts showed that the typical composition (the species with the highest frequency of occurrence) consists widespread of taxa. The majority of the composition consists of cryptic members of the Cisticolidae (cisticolas), granivores pertaining to the genera *Euplectes* (widowbirds), Passer (sparrows) and *Streptopelia* (doves) (Table 10). The typical composition is predominantly eurytopic and occurs in both natural untransformed as well as transformed habitat.

The average bird richness per point count was low with 6.5 bird species recorded per count and rarely exceeding 10 species per count. The average number of individuals is also low with 15.75 birds recorded per count (range=4-22).

Table 10: The typical bird species (species with high frequency of occurrence) recorded on the study site.

Species	Average abundance	Consistency	% Contribution
Zitting Cisticola (*Cisticola juncidis*)	2.50	2.08	46.74
Cape Sparrow (*Passer melanurus*)	1.25	0.86	19.34
Red-eyed Dove (*Streptopelia semitorquata*)	1.00	0.89	15.56

[1] The expected richness statistic was derived from the QDS 2529CD (Middelburg) with a total of 262 bird species recorded (based on 256 cards submitted) AND the two pentad grids (pentad grid 2545_2925 and 2550_2925) totalling 264 species (based on 443 full protocol cards).

[2] Please note that most of the expected species was based on taxa with a moderate to high probability of occurrence (>50 %) owing to the presence of suitable habitat and distribution ranges sympatric to the study site and immediate surroundings. However, it is highly possible that many of these species occur at low abundances, are uncommon or are spatially "rare" on the site.

[3] *sensu* www.zestforbirds.co.za (Hardaker, 2019).

[4] A geographical area south of the Cunene and Zambezi Rivers (includes Namibia, Botswana, Zimbabwe, southern Mozambique, South Africa, Swaziland and Lesotho).

[5] With reference to South Africa (including Lesotho and Swaziland (BirdLife South Africa, 2018).

Species	Average abundance	Consistency	% Contribution
Southern Red Bishop (*Euplectes progne*)	3.00	0.41	8.03
Cape Turtle dove (*S. capicola*)	0.75	0.41	5.37

Biodiversity value and ecological considerations

- The study area provides habitat for a very low richness of bird species with the majority of the composition being widespread and eurytopic species that are present on both transformed and untransformed natural habitat unit.
- The low observed richness is a product of the poor ecological condition of the vegetation units (mainly pioneer and secondary grassland) in combination with poor habitat heterogeneity.
- The bird composition was poorly represented by endemic, near-endemic and biome-restricted bird species.

Important Bird and Biodiversity Areas (IBAs)[6]

The study site does not overlap with any Important Bird and Biodiversity Area as defined by Marnewick et al. (2015).

Bird species of conservation concern

Table 11 provides an overview of bird species of 'conservation concern' recorded in the study region, as well as those previously recorded in the area based on their known distribution range and the presence of suitable habitat (sensu SABAP1 and SABAP2). According to Table 11, 19 threatened and near-threatened species are present on the study region according to recent (SABAP2) and historical (SABAP1) distribution records. The majority of these species are unlikely to be present on the study site owing to the absence of suitable habitat or the habitat on the study site does not meet their ecological requirements (e.g. the habitat on the study site is of poor ecological condition).

Of these 19 species, only the Lanner Falcon (*Falco biarmicus* - Vulnerable) was observed flying over the study site in a south-easterly direction towards the Vaalbank Private Nature Reserve (Figure 13. This species is not breeding on the site and is regarded as an occasional foraging visitor. It is unlikely that the proposed development will have a negative impact on this species, with specific reference to the poor habitat quality of the habitat units on the study site. It is worth mentioning that the Southern Bald Ibis (*Geronticus calvus*) could also utilise the site during foraging bouts. However, this species is a widespread foraging visitor to the grassland patches in the area and is unlikely to roost or breed on the site (it roosts and breed colonially).

Table 11: Bird species of 'conservation concern' that have been recorded in the study area based on their known distribution range (sensu SABAP1 & SABAP2) and the presence of suitable habitat and there potential likelihood of occurrence on the study site. Red list categories according to the IUCN (2020) and Taylor et al. (2015)**. The reporting rates were derived from QDS 2529CD and from the mean for pentad grids 2545_2925 and 2550_2925. Species highlighted in grey were confirmed on the study site during 06 March 2020.*

[6] An IBA is a geographic area that support globally significant populations of (1) threatened bird species and/or (2) biome-restricted species and/or (3) restricted-range species and/or (4) significant congregations of birds species, mainly referring to waterbirds or shorebirds.

Species	Global Conservation Status*	National Conservation Status**	SABAP1 reporting rate	SABAP2 reporting rate	Preferred Habitat	Potential Likelihood of Occurrence
Grus paradisea (Blue Crane)	Vulnerable	Near-threatened	1.0	0.33	Prefers open grasslands. Also forages in wetlands, pastures and agricultural land.	Vagrant and probably absent. Not observed in the study area since 2007.
Alcedo semitorquata (Half-collared Kingfisher)	-	Near-threatened	2.0	0.49	Prefers clear fast-flowing streams with overhanging vegetation earth banks that provide breeding habitat.	Unlikely to be present owing to absence of suitable habitat
Aquila verreauxii (Verreaux's' Eagle)	-	Vulnerable	1.0	0,24	Mountain ranges, koppies and exposed cliff faces.	Unlikely to be present owing to absence of suitable habitat.
Circus ranivorus (African Marsh Harrier)	-	Endangered	1.40	1.67	Restricted to permanent wetlands with extensive reedbeds.	Unlikely to be present owing to absence of suitable habitat
Ciconia abdimii (Abdim's Stork)	-	Near-threatened	3.0	0.24	A non-breeding summer visitor to open grassland and recently tilled agricultural land.	An uncommon to highly irregular summer foraging visitor to the grassland units.
Ciconia nigra (Black Stork)	-	Vulnerable	<0	-	Breeds on steep cliffs within mountain ranges; forages on ephemeral wetlands.	Vagrant, probably absent on study site. Not observed in study area since 2007 (historical records from Middelburg area).
Eupodotis senegalensis (White-bellied Korhaan)	-	Vulnerable	<0	1.22	Prefers transitional habitat between grassland and savanna (e.g. Bankenveld).	Unlikely to be present owing to absence of suitable habitat on the study site.
Falco vespertinus (Red-footed Falcon)	Near threatened	Near threatened	-	0,24	Varied, but prefers open dry to arid grassland. Often joins Amur Falcon (*F. amurensis*) flocks.	An irregular foraging visitor to the study site.
Falco biarmicus (Lanner Falcon)	-	Vulnerable	-	New record for pentad grid (06 March 2020)	Varied, but prefers to breed in mountainous areas.	An occasional foraging visitor to the study site. It is not breeding on the site. (It has also been recorded from Farm Doornpoort 312 JS, approx. 16.3km west of the study site).
Geronticus calvus (Southern Bald Ibis)	Vulnerable	Vulnerable	<0	15.24	A species restricted to montane grassland (especially when burned) and breed/nest on steep	An irregular to uncommon foraging visitor to the grasslands. Unlikely to use the site for

Species	Global Conservation Status*	National Conservation Status**	SABAP1 reporting rate	SABAP2 reporting rate	Preferred Habitat	Potential Likelihood of Occurrence
					cliffs.	breeding or roosting purposes.
Neotis denhami (Denham's Bustard)	Near-threatened	Vulnerable	<0	-	Primary upland grassland, particularly on hilly terrain.	Unlikely to be present on the study site. Not recently observed in study area since 2007.
Oxyura maccoa (Maccoa Duck)	Vulnerable	Near-threatened	3.0	2.86	Large saline pans and shallow impoundments.	Unlikely to be present on the study site.
Mycteria ibis (Yellow-billed Stork)	-	Endangered	2.0	-	Wetlands, pans and flooded grassland.	Unlikely to be present on the study site.
Phoeniconaias minor (Lesser Flamingo)	Near-threatened	Near-threatened	2.0	3.22	Restricted to large saline pans and other inland water bodies containing cyanobacteria.	Unlikely to be present on the study site.
Phoenicopterus roseus (Greater Flamingo)	-	Near-threatened	7.0	8.57)	Restricted to large saline pans and other inland water bodies.	Unlikely to be present on the study site.
Podica senegalensis (African Finfoot)	-	Vulnerable	<0	-	Well-vegetated perennial stream and rivers with overhanging vegetation.	Unlikely to be present on study site.
Sagittarius serpentarius (Secretarybird)	Vulnerable	Vulnerable	3.0	8.3 (ad hoc observations)	Prefers open grassland or lightly wooded habitat.	Vagrant and probably absent due to displacement from human activities. (It has been recorded from Farm Doornpoort 312 JS, approx. 16.3km west of the study site).
Sterna caspia (Caspian Tern)	-	Vulnerable	6.0	0.24	Prefers large inland water bodies (dams and pans) as well as large estuaries	Unlikely to occur.
Tyto capensis (African Grass-owl)	-	Vulnerable	<0	0.49	Prefers rank moist grassland that borders drainage lines or wetlands.	Rare foraging visitor, probably absent owing to the absence of optimal breeding and roosting habitat. It does occur on the nearby Farm Goedehoop 315 JS (approx 2km south

Species	Global Conservation Status*	National Conservation Status**	SABAP1 reporting rate	SABAP2 reporting rate	Preferred Habitat	Potential Likelihood of Occurrence
						of the study site), as well on moist grassland near Middelburg. It is also present on suitable habitat on Farm Naauwpoort (approx. 21km southwest of study site) and Farm Rietfontein 314 JS (approx. 4km southwest of study site).

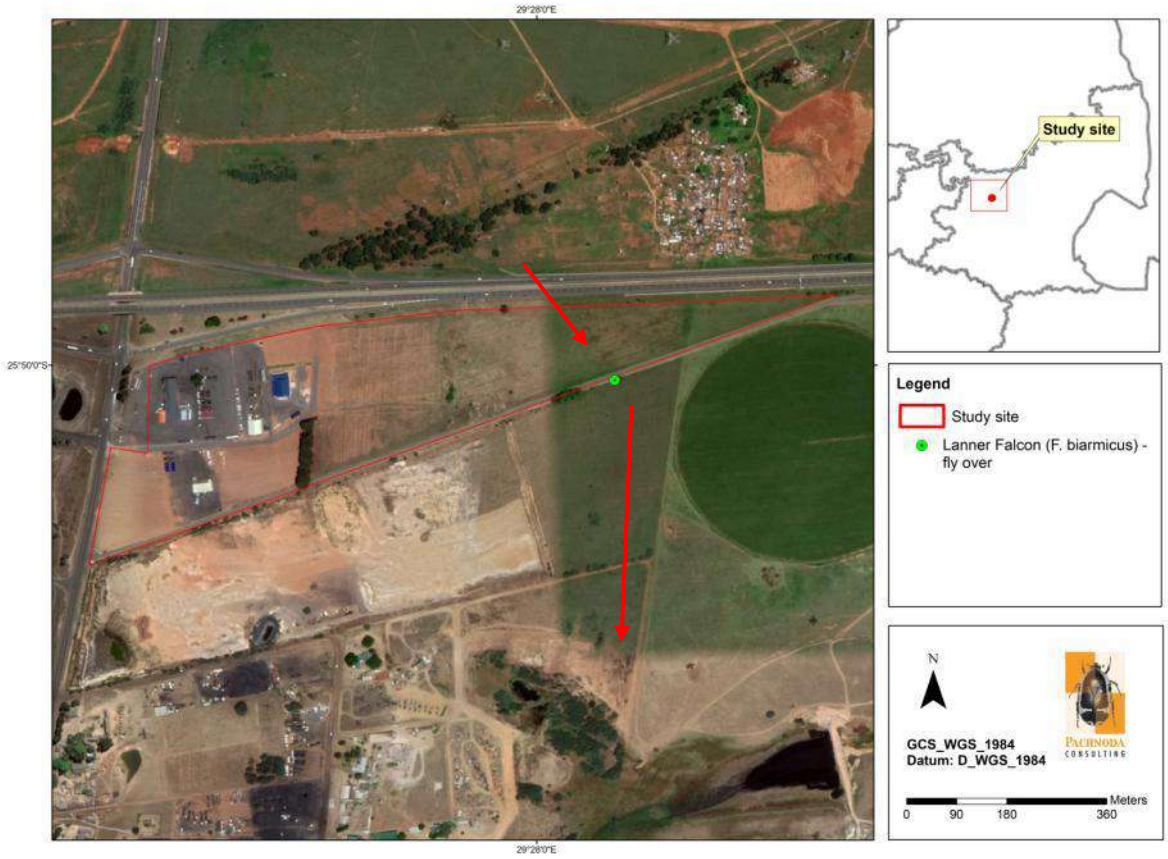

Figure 13: A satellite image of the study site illustrating the position of a Lanner Falcon (Falco biarmicus) which was flying over the site.

6 Results of the Environmental Screening Tool

According to the screening tool for environmental impact assessments the site has the following sensitivities:

- Plant species theme: Medium sensitivity due to the possible presence of five species.
- Animal species theme: Medium sensitivity due to the possible presence of two species.
- Terrestrial biodiversity theme: Very high sensitivity
    - Vulnerable ecosystem
    - Focus area for land-based protected areas expansion
    - Vaalbank Private Nature Reserve
- Aquatic biodiversity theme: Low sensitivity

6.1.1 Plant species theme

The site is modified to transformed, with a very low species diversity. None of the threatened or protected species that may occur in the area were observed on the site and no habitat is present for these species on site (please refer to Section 5.1.3 of this report). Due to the highly modified state of the site vegetation, the low species diversity and the absence of habitat for the threatened species, site sensitivity for plant species is considered to be low.

6.1.2 Animal species theme

The results of a screening report as per the outcome of the Environmental Screening Tool (based on the 2014 EIA regulations) produced a medium sensitivity for the animal theme on the study site. The potential occurrence of two fauna species is relevant: Rossouw's Copper (*Aloeides rossouwi*) and Sensitive Species 13 which is the Lobatse Hinged-back Tortoise (*Kinixys lobatsiana*).

Rossouw's Copper is an Endangered butterfly (*sensu* Mecenero et al., 2013) and currently only known from two to five localities corresponding to two QDSs, namely 2529BB and 2529BD where it occurs on high altitude sandy grassland (also invariably interspersed with rocky gullies - a feature that is absent on the study site) in the Stoffberg mountain range, especially the southern parts of Stoffberg (Figure 14). At both these QDSs, its habitat corresponds to the Sekhukhune Montane Grassland vegetation Type (not Rand Highveld Grassland). There are also three other QDSs where this species possibly occurs although some of these remain questionable. These include De Berg and Verloren Valei areas near Dullstroom (2530AC), the area above Waterval Boven (2530CB) and a questionable record from Limpopo Province in the Wolkberg - Strydompoort mountain range (2429BB) (Figure 14). When considering that this species occurs in untransformed high-altitude grassland, and that the nearest known population is more than 50 km from the study site, it is highly doubtful that this species will be present on the study site. In addition, the current ecological condition of the grassland patches on the study site is in a post-disturbed and secondary state, which also explained the poor representation of butterfly taxa on the site during the site visit when only two widespread species were observed (namely *Danaus chrysippus orientis* and *Eurema brigitta brigitta*). Therefore, based on the extant distribution range of *A. rossouwi* along with the degraded habitat quality of grassland on the study site, it is of the opinion that the probability for *A. rossouwi* to occur on the study site is very low.

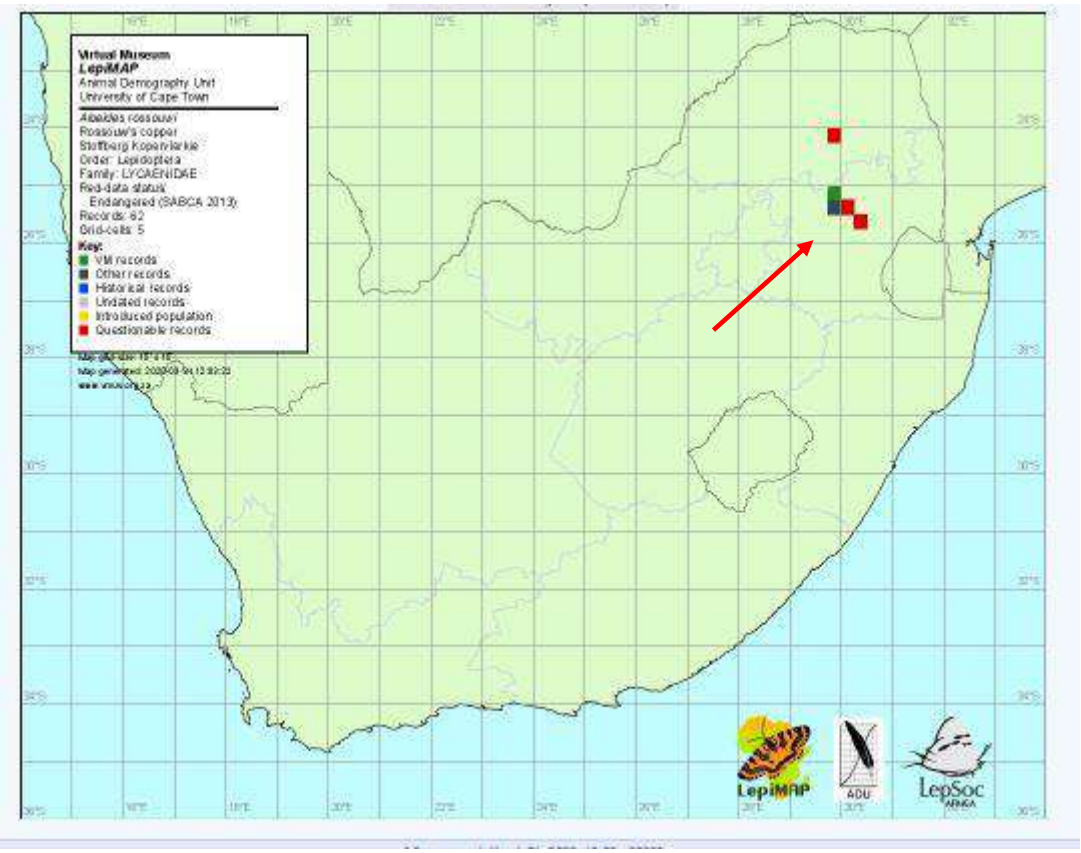

Figure 14: The distribution range of Rossouw's Copper (Aloeides rossouwi) in relation to the study site (see red arrow). (Map courtesy and copyright of the ADU, LepiMap and LepSoc).

The Lobatse Hinged-back Tortoise (*Kinixys lobatsiana*) is Vulnerable (Hofmeyr & Boycott, 2018) and is near-endemic to South Africa and Botswana where it mainly occurs in bushveld areas in the Limpopo, Gauteng and marginally also northern Mpumalanga Provinces. It also occurs in the extreme south-eastern Botswana (e.g. at Lobatse, the type locality). In South Africa its distribution range include three primary clusters, of which the largest is located in the bushveld regions of the Waterberg and associated mountain ranges, the Bankenveld areas of Gauteng from Midrand and Centurion to Pretoria, the Magaliesberg and eastern Mpumalanga, as well as bushveld near Zeerust (Figure 15a). It occurs primarily in rocky hills consisting of mixed thornveld (*Vachellia* and *Senegalia* Bushveld) and *Combretum* woodland. The presence of surface rock is a critical habitat feature for this species to survive fires and to "hibernate" during the austral winter. Its distribution does not appear to go further south than Emalahleni and Middelburg where bushveld habitat is replaced by grassland. Therefore, the probability for this species to occur on the study site is regarded as low, especially since the study site is mainly confined to grassland (in the absence of surface outcrops) which is also modified and of secondary ecological condition. However, a very old record of this species exists for QDS 2529CD and dates back to 1900 (Figure 15b). However, none was observed post-1900 from 2529CD, which provides motivation that this species is of low significance for the proposed project.

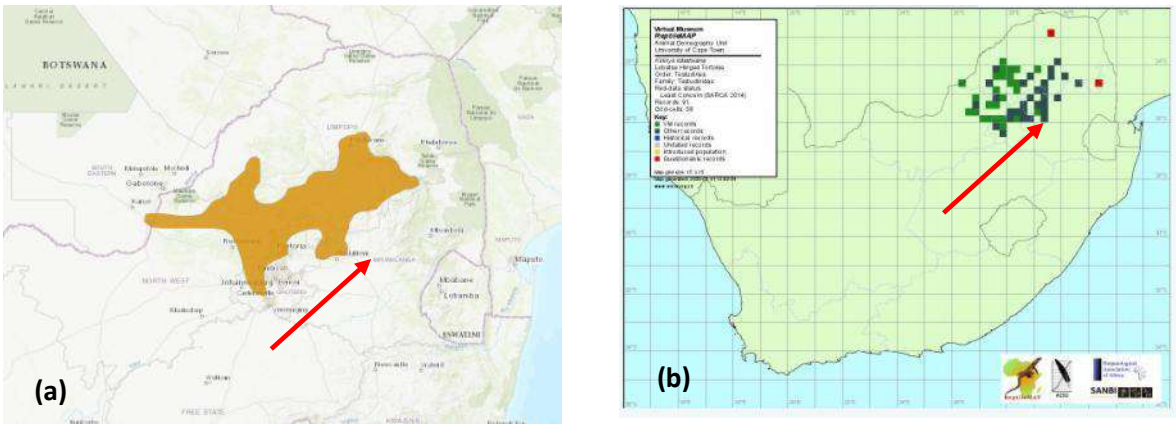

Figure 15: The distribution range of the Lobatse Hinged-back Tortoise (Kinixys lobatsiana) in relation to the study site (see red arrow). (Maps courtesy and copyright of the IUCN, ADU, ReptileMap and SANBI).

6.1.3 Terrestrial biodiversity theme

The site falls within the Rand Highveld Grassland vegetation type, which is a Vulnerable vegetation type. All portion of primary Rand Highveld Grassland, including areas affected by high grazing pressure, should therefore be considered to be of high conservation importance. The site has been cultivated in the past and the vegetation no longer represents the Rand Highveld Grassland vegetation type (refer to Section 5.1.1 of this report). The species diversity in the vegetation unit is very low. The Rand Highveld Grassland vegetation unit has a high species diversity, especially of forbs and geophytes. The diversity of species across all units are very low, including grass and forb species and no geophytes were observed on site. The normal ecological drivers needed to sustain heathy grassland is absent from this portion, likely as a result of the small size of the grassland and the isolation from other grassland areas. An appropriate grazing and fire regime will result in improvement of the grassland, but this is highly impractical on this portion, especially given the poor ecological connectivity of the site. With appropriate grazing and fire the grassland on site is still unlikely to return to a status representing primary Rand Highveld Grassland. Due to the modification on site the remaining vegetation in the Planted Pasture vegetation unit is of moderate sensitivity. The other units, including the existing development and bare soil, as well as the transformed vegetation is of low sensitivity.

The eastern portion of the site is located in the 500m buffer zone of the Vaalbank Private Nature Reserve indicated in the Mpumalanga Biodiversity Sector Plan (Figure 5). This is likely why it is the focus are for land based protected area expansion. Due to the level of disturbance on site, poor ecological connectivity (refer to Section 7 below) of the site and the existing light industrial developments on site, this site is not considered the best choice for expansion of the Vaalbank Private Nature Reserve. As previously stated, this areas is also not currently managed as a protected area, but consist of the Pienaars Dam Leisure Resort and various smallholdings. The site is therefore considered to be of low biodiversity sensitivity.

6.1.4 Aquatic biodiversity theme

The indicated low sensitivity of the aquatic theme is considered to be correct. No wetland areas are present on site. Although stormwater systems and ponding result in occasional wetness in the site there are no hydromorphic indicators of the soil and the vegetation does not reflect wetland conditions.

7 Connectivity, Ecological Support and Sensitivity

7.1 Vegetation

The vegetation units on site are all modified or transformed by past disturbances and represent secondary grassland in the very early successional stages. The species present in these units are common and widespread and of little conservation importance. The only protected plant species present on site is the orchid species *Habenaria epipactidea*, which is one of the common orchid species. This species can be transplanted to similar modified habitat in the areas without resulting a significant loss in diversity. The site is therefore not very sensitive.

Disturbed areas may however occasionally serve as ecological corridors for plants species and therefore help to sustain biodiversity in surrounding areas. The site is located at the intersection between the N4 and R35 and the Black Wattle Colliery is located opposite the R35. These serve as effective barriers to the movement of plant and small fauna species. In addition, the portion to the south is a rehabilitated mine and has very poor vegetation cover. The areas to the south-east are used for cultivation of crops, mainly corn, and is poor in biodiversity. The site is therefore not considered to serve as an ecological corridor and contribute very little to biodiversity in surrounding areas.

7.2 Fauna

The prominent habitat units on the study site, apart from those that are developed or consist of bare ground, have all been modified at some stage and represent units that are at early successional stages or represent planted pastures. All of these habitat units comprise of poor faunal richness which consist of generalist and eurytopic species which are regarded as widespread species in the region, while specialists and species with small and localised distribution ranges appear to be absent or already displaced by the transformed state of the grassland units.

Nevertheless, the natural units appear to be fragmented and isolated from adjacent natural habitat by road networks, existing infrastructure and active agricultural activities, which have compromised the ecological connectivity of these units, thereby rendering the study site as an ecological "cul-de-sac" for medium to large terrestrial fauna species. In fact, some widespread mammal species (e.g. African Savanna Hare *Lepus cf. victoriae*, Highveld Gerbil *Gerbilliscus brantsii* and Highveld Mole-rat *Cryptomys cf. pretoriae*) that are in general present on modified habitat units were virtually absent from the study site.

From a sensitivity perspective, all developed, bare and weedy areas, including old fields and gardens are regarded to have a low conservation value due to the low fauna richness observed from these areas (c. old fields and gardens) and many also have no intact natural habitat left (c. developed and bare ground). The planted pastures have a moderate conservation value, since some widespread and generalist fauna species persist in the secondary grassland occupying these units, although the richness remains low.

8 Impact assessment and mitigation recommendations

No site development plan is available for the site at present. The impact assessment is therefore based on the assumption that the entire site will be developed for light industry, similar to the western portion of the site. This impact assessment will have to be revised once a final layout plan is available.

Table 12: Impact assessment table for the impacts on site.

Nature	Extent	Duration	Intensity	Probability	Status	Significance without mitigation	Significance with mitigation
Loss of primary / untransformed grassland / habitat	Site	Permanent	Low	Improbably	Negative	No Impact	No Impact
Loss of habitat for plant species of conservation importance	Site	Permanent	Low	Highly likely	Negative	Medium	Low
Loss of protected plant species	Footprint	Permanent	Low	Highly likely	Negative	Medium	Low
Loss of habitat for fauna species, including species of conservation importance	Site	Permanent	Low-medium	Improbable	Negative	Low	No Impact
Loss of Ecological corridors and connectivity	Site	Permanent	Low	Possible	Negative	Low	Low
Infestation by invasive plant species	Local	Long term	High	Likely	Negative	Medium to High	Low
Erosion and Sedimentation	Local	Medium term	Medium	Possible	Negative	Low	No Impact

Loss of habitat for plant species of conservation importance and loss of protected species

The site has been cultivated and has a very low diversity of plant species especially forb species. No threatened plant species were observed on site or is expected to occur on site. The orchid species *Habenaria epipactidea* is however present on site. All orchid species are protected under the Mpumalanga Nature Conservation Act. The species is however fairly widespread and not currently threatened.

- Relocate individuals of *Habenaria epipactidea* to modified grassland in the area. The individuals can be transplanted to any secondary grassland area with similar soil. Do not transplant to primary grassland or grassland that represent the Rand Highveld Grassland vegetation type. The translocations will have to be carried out in a way to ensure that no ecological degradation occur on the target habitat (where the plant will be planted), and it is recommended that this area be evaluated by an ecologist. Where relocation is not possible, the orchids can be rescued and donated to appropriate conservation and research institutions such as SANBI's Walter Sisulu National Botanical Garden or the Pretoria National Botanical Garden.
- Do not remove individuals emerging on site after construction activities were completed. Keep any remaining vegetation intact.
- Plant species indigenous to the area should be used in the landscaping of the communal areas, if applicable.
- Trees indigenous to the area should be used if planting is required.

Loss of habitat for fauna species, including species of conservation importance

The majority of all remaining habitat natural on the study site has been modified or represent grassland seres at an early or secondary successional stage and support a fauna composition that is of low richness. Although a number of threatened and near threatened animal species have been recorded in the study region, the probability for these to occur on the study site is low, with many regarded to be absent. Those species that could occur (e.g. Lanner Falcon *Falco biarmicus*) are regarded as occasional and/ or irregular foraging visitors to the site and based on the modified ecological condition of the habitat units, and the frequency of occurrence of these will remain low. It is not possible to mitigate against the loss of habitat since it is assumed that the entire area will be cleared of vegetation during the construction phase.

- The only sensible mitigation will be to commence with clearing activities on the western area and progressively continue in an easterly direction to provide larger and more mobile fauna (e.g. birds and bovids, when present) the opportunity to leave the site without becoming isolated or threatened (e.g. mortalities) by earthmoving equipment.
- If any subterranean/fossorial animal (e.g. reptile, scorpion, amphibian or mammal species) is recovered during the construction phase, this species must be relocated to the nearest area or natural open space with suitable habitat for the particular species to continue its life history.
- Killing or poaching of any animal species during the construction and operation phase (except for alien and pest species) should be prohibited. Any person found deliberately harassing any animal species in any way should face disciplinary measures, following the possible dismissal from the site.
- Plant species indigenous to the area should be used in the landscaping of the communal areas, if applicable.
- Trees indigenous to the area should be used if planting is required.

Loss of Ecological corridors and connectivity

The site has very poor ecological connectivity and faunal dispersal ability os severely limited by the presence of road networks, mining activities and active agricultural activities (e.g. commercial and

irrigation pivots). The N4 on the northern boundary of the site and the R35 on the western boundary with the Black Wattle Colliery are barriers to species movement. Development on site is therefore unlikely to have a significant negative effect on the ecological connectivity in the area.

Infestation by invasive plant species

Invasive plant species tend to establish in and around disturbed areas. A few alien and invasive species were observed on site during the site visit. These species may become established in disturbed areas on site and may spread from the site.

Mitigation:

- Compile an alien and invasive species control and monitoring plan as required in the Alien and Invasive Species Regulations under the National Environmental Management Biodiversity Act (Act 10 of 2004).
- Populations of invasive species on site must be controlled.
- The spread of invasive and weedy species from the site must be prevented.
- Several alien and invasive species resemble indigenous species, especially as seedlings. Care must be taken not to control indigenous species during the control of invasive species.
- No vehicles should drive through clumps of invasive species, since seeds get stuck in the tires and radiators of the vehicles. The vehicles can spread the seeds along all routes taken by the vehicles. If vehicles are used for the removal of invasive vegetation, the tires etc. must be cleaned of all seeds when leaving the site and before driving around the area.
- Erosion and sediment control measures must be in place at all areas cleared of invasive species. Areas bare of vegetation must be revegetated with indigenous vegetation as soon as possible.

Erosion & sedimentation

Clearing of vegetation from the site and increased runoff on site may result in erosion on site. This may potentially cause damage to downslope area. An increased sediment load in the water on site may result in excess sedimentation in downstream areas, which will result in a change in the vegetation composition. Erosion may take place at any areas cleared of vegetation for any reason, including around storm water infrastructure and areas cleared of invasive plant species.

Mitigation:

- Stabilise and re-vegetate all areas bare of vegetation as soon as possible.
- Monitor the entire site for signs of erosion throughout the construction and operational phases of the project.
- All erosion features must be rehabilitated as soon as possible.
- Implement erosion control measures where necessary.
- Stabilise any bare soil not used for cultivation as soon as possible.
- Implement sediment fences around erosion prone areas.
- Implement a sufficient storm water management plan.

9 Conclusion & Recommendation

Nearly the entire site was occupied by habitat types that were either modified or at an early successional stage, while untransformed habitat on the study site was virtually absent. The natural habitat on the study site consisted of secondary vegetation units represented by regenerating old fields (4.7ha) and planted pastures (5.2ha). The remainder of the study area was represented by land consisting of infrastructure (6.32ha), recently cleared areas of bare ground (4.4ha) or covered in weeds (0.3ha) and old relict gardens (1.2ha). Therefore, approximately 45 % (c. 10ha) of the study site was historically ploughed and are currently represented by secondary grassland or grassland that is at an early successional stage. Some of these modified areas (23% of the study site) were subsequently converted in pastures consisting of *Digitaria eriantha* or *Paspalum notatum*. The secondary and early successional age of the natural grassland units on the site was responsible for an extremely low and depauperate faunal richness represented by only a few species with generalist life histories. In addition, specialised and K-selected (e.g. long-lived species often requiring large home ranges) fauna taxa, as well as small to medium bodied facultative wetland fauna were ominously absent from the study site owing to the absence of topographical and spatial habitat heterogeneity (e.g. presence of surface rock and outcrops) and wetland features.

In addition, the study site represented an ecological "cul-de-sac", meaning that ecological connectivity and the ability for animals to disperse across the site into adjacent habitat was severely compromised by road networks (N4 Highway and the access road to the Pienaar Dam resort), mining activities and agricultural activities. Based on these habitat attributes, the general fauna conservation value of the site is low.

Given the degraded nature of the vegetation and the low species diversity of the remaining habitat the proposed development is not anticipated to have a significant impact on the biodiversity.

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10.2 Fauna assessment

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Addendum A – CV

CURRICULUM VITAE

Name:	**Catharina Elizabeth Venter** trading as Kyllinga Consulting
Position:	Senior Ecologist and Wetland Scientist
Date of Birth:	29 December 1979
Nationality:	South African
Languages:	Afrikaans, English

EDUCATIONAL QUALIFICATIONS

- M.Sc (Botany), University of Pretoria (2003)
- B.Sc Hons (Botany), University of Pretoria (2001)
- B.Sc (Environmental Sciences), University of Pretoria (2000). Majored in Geography and Botany
- Matriculated, Sasolburg High School (1997)

Additional

- Introduction to ArcGIS 1 (2006)
- Bringing your data into ArcGIS (2006)
- Introduction to ArcView 3.x (2003).

FIELDS OF EXPERTISE

- **Ecological Assessment:**
  Ecological Assessments as part of the Environmental Impact Assessment Process
- **Wetland Assessment:**
  Wetland Assessments as part of the Environmental Impact Assessment Process and Water Use Applications, as well as rehabilitation plans for wetlands, including planning or the Working for Wetlands programme. Large scale wetland assessments (catchment scale).
- **GIS:**
  Compilation of maps for submission as part of Environmental Impact Assessment Process. Creating spatial databases and large scale wetland maps (catchment scale). Projection conversions and matching/overlaying different format GIS maps.
- **Environmental Impact Assessment**
  Undertaken numerous Environmental Scoping Reports, as required by the Environment Conservation Act, 1989 (Act 73 of 1989), the National Environmental Management Act, 1998 (Act 107 of 1998), as amended and the Development Facilitation Act, 1995 (Act 67 of 1995). Project experience includes the establishment of various housing typologies, golf courses, commercial and industrial projects, infrastructure development (roads), resorts and/or game lodges as well as filling stations.
- **Public Participation:**
  Undertaken numerous public participation processes, ranging from basic to extensive, as required by relevant environmental legislation.

MEMBERSHIP IN PROFESSIONAL SOCIETIES

- Professional Natural Scientist (Pr.Sci.Nat) in the fields of Botanical and Ecological Science (Reg no. 400048/08)

- Member of the Botanical Society of South Africa

EMPLOYMENT HISTORY EXPERIENCE

Kyllinga Consulting (July 2015 - present)

Senior Ecologist responsible for wetland and ecological specialist assessments.

Spatial Ecological Consulting (February 2010 – June 2015)

Senior Ecologist responsible for wetland and ecological specialist assessments.

- Wetland Related Assessments

More than 40 wetland assessments conducted between 2010 and 2015.

- Vegetation Assessments

Approximately 16 vegetation assessments between 2010 and 2015.

- Management Plans

Completed two ecological management plans.

MSA Group Services (previously Exigent Environmental CC) (August 2004 – January 2010)

Environmental Scientist responsible for ecological and wetland assessments and the compilation of maps. Also conducted various scoping and EIA applications and EMPRs.

- Ecological Assessments

In excess of 50 ecological assessments conducted between 2004 and 2010, including managing the inclusion of the fauna specialist assessments.

- Wetland Assessments

More than 60 wetland verification projects, wetland delineations and wetland assessments, completed between 2004 and 2010.

- As well as:

Rehabilitation Projects; Fatal Flaw / Screening Assessments; National Department of Agriculture Authorisations; Mining Related Assessments; Private, Public Partnership Projects; Resource Management Plans (RMP); Environmental Management Plans; Environmental Management Programme; Environmental Exemption Processes; Basic Assessments; Environmental Impact Assessments

Part-time employment (2002-2004)

Tutor for botany practicals; Assisting Wildlife management students with Braun-Blanquette analysis; Researcher for a project on the vegetation communities and ecology of the Kruger National Park; Research assistant for the analysis of street trees in Tshwane urban forest; Various part time projects related to vegetation and wetlands

COUNTRIES OF WORK EXPERIENCE

- South Africa
- Lesotho
- Botswana
- Mozambique

PAPERS AND PUBLICATIONS

Co-author and data contributor to: SIEBEN, E. *et al*. The vegetation of inland wetlands with salt-tolerant vegetation in South Africa: description, classification and explanatory environmental factors, submitted to the South African Journal of Botany for review in Feb 2015.

Co-author and data contributor to: SIEBEN, E. *et al*. The herbaceous vegetation of subtropical freshwater wetlands in South Africa: description, classification and explanatory environmental factors, submitted to the South African Journal of Botany for review in Feb 2015.

Co-author and data contributor to: SIEBEN, E. *et al*. The vegetation of grass lawn wetlands of floodplains and pans in semi-arid regions of South Africa: description, classification and explanatory environmental factors, submitted to the South African Journal of Botany for review in Jan 2015.

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Company:	Pachnoda Consulting cc (Director)
Date of Birth:	1974-03-12
Nationality:	South African
Languages:	English and Afrikaans

EDUCATIONAL QUALIFICATIONS

1992	Hoërskool Hartbeespoort, Hartbeespoort - Senior Certificate.
1996	University of Pretoria, Pretoria - B.Sc. (Zoology and Entomology).
1997	University of Pretoria, Pretoria - B.Sc. (Hons) (Entomology).
2001	University of Pretoria, Pretoria - M.Sc. (Restoration Ecology/Zoology).

MEMBERSHIP IN PROFESSIONAL SOCIETY

- Professional Natural Scientist (Pr. Sci. Nat.) (Reg. no. 400095/06)
- BirdLife South Africa
- Hartbeespoort Natural Heritage Society

EXPERIENCE

A. Work conducted in South Africa

1. General Ecological Assessments (Fauna, Flora and Red Data Scans, including both functional and compositional aspects):

- Belvedere Trust, Proposed retirement village on Amorosa Agricultural Holdings, Roodepoort, Gauteng (2004);
- City of Joburg Property Development Company, Proposed upgrade and development of the Orlando Dam Intersection, Soweto, Gauteng (2004);
- PDNA, Proposed NASREC development, Johannesburg, Gauteng (2004);
- 17 Shaft Conference and Education Centre, Proposed establishment of the Veteran's Heritage Education Centre, Crown Mines, Gauteng (2004);
- GAUTRANS, Proposed re-alignment of Road D781 and construction of a road bridge over the Rietvleispruit, Kempton Park, Gauteng (2004);
- Mr. N. Lang, Ecological Opinion on the proposed establishment of a township, Muldersdrift, Gauteng (2004);
- AGES, Proposed Equestrian Centre, Leeufontein 299 IR, Gauteng (2004);
- PDNA, Proposed new bridge and re-alignment of a portion of provincial road P101-2 (R51), Laversburg, Gauteng (2004);
- Blenneerville Investment (Pty) Ltd, Proposed construction of a residential and commercial development on of Paradiso Estate, Tweefontein 372 JR, Gauteng (2004);
- Les Roches (Pty) Ltd, Proposed zoning of holdings 1, 2 & 3 of Hyde Park Agricultural Holdings, Gauteng (2004);
- Transnet Limited, Terrestrial Faunal Ecological Opinion: Phase 1B expansion of the Sishen-Saldanha Iron ore export corridor, Saldanha Bay, Western Cape (2005);
- Celebration North Riding (Pty) Ltd, Proposed mixed land-use development, North Riding, Gauteng (2005);
- Wilderness Safaris, Proposed upgrade of the Manzengwenya Dive Camp, Greater St. Lucia Wetlands Park, KwaZulu-Natal (2005);
- Wilderness Safaris, Proposed upgrade of the Rocktail Bay Camp, Greater St. Lucia Wetlands Park, KwaZulu-Natal (2005);
- GAEA Projects, Corridor Assessment for the proposed Sibaya Precinct, KwaZulu-Natal (2005);
- Computer Domain Holdings (Pty) Ltd, Red Data Floral Scan on portion 3 of the farm Elandshoek, portions 12 & 27 of the farm Groot Suikerboschkop, and portions 5 & 10 of the farm Palmietfontein, Dullstroom (2005);
- Zong's Property Investments, Proposed establishment of a residential development on a portion of Pomona Estates Agricultural Holdings, Pomona, Gauteng (2005);
- GJ van Zyl Trust, Proposed development of a resort on the Farm Witpoort 216 JS, Mpumalanga (2005);
- Mr. Howard Walker, Proposed subdivision of the Farm Lunsklip 105 JT, and the Farm Morgenzon 122 JT, for the establishment of a private resort, Dullstroom, Mpumalanga (2005);
- Lavender Manor cc, Proposed establishment of a retail, commercial and Lavender Manor Township on part of farm Rietfontein 189 IQ, Muldersdrift, Gauteng (2005);
- Geo Pollution Technologies, Proposed establishment of a residential development: Noordwyk Ext 65 & 80 on Erand Agricultural Holdings, Midrand, Gauteng (2005);
- Mr. A. Le Roux, Proposed Cradle View Country Estate, Muldersdrift, Gauteng (2006);
- Viking Bay Development Company (Pty) Ltd, Proposed Viking Bay freshwater marina and hotel development, Vaal Dam, Gauteng (2006);
- Land for Africa (Pty) Ltd, Ecological Opinion for the proposed establishment of a residential township on holding 122 Erand Agricultural Holding Extension 1, Halfway House, Midrand, Gauteng (2006);
- Brickot Developments cc, Ecological opinion for the proposed Bethal Retirement Village on the remainder of portion 3 of the farm Mooifontein 108 IS, Bethal, Mpumalanga (2006);

- Brawild (Pty) Ltd, Red Data Scan for the proposed Annlin Ex 117, Pretoria, Gauteng (2006);
- Mbombela Local Municipality, Ecological Opinion for the proposed extension of the Lowveld Botanical Gardens, Nelspruit, Mpumalanga (2006);
- Natural Scientific Services cc, Botanical survey for the SASOL Mafutha coal project near Lephalale, Limpopo Province, RSA (2008);
- SRK Consulting, Ecological assessment on Vlakfontein area, NW of Ogies, Mpumalanga. Report compiled in association with EkoInfo (2009); and
- Aurecon, Desktop biodiversity assessment and wetland scan: upgrade of the River View waste water treatment works, eMalahleni, Mpumalanga province. Report compiled in association with Imperata Consulting (2009).

2. Mining and Industrial related projects (ecological):

- Lonmin Platinum (Western Platinum Limited), Ecological Assessment for the proposed MK3 Shaft Complex on the farm Wonderkop 400 JQ, Rustenburg, North West Province (2004);
- Impala Platinum Limited, Ecological Assessment for prospecting SEMPs on the farms Buffelshoek 386 KT, Kalkfontein 367 KT, Spitskop 333 KT, Steelpoortpark 366 Kt and Tweefontein 360 KT and Hackney 116 KT (all Sekhukhuneland), Mpumalanga and Limpopo Province (2004);
- Trans-Caledon Tunnel Authority (TCTA), Ecological Assessment for borrow pit SEMPs on the TCTA pipeline, Vaal Marina to Secunda (2005);
- Boynton Platinum (Pty) Ltd, Ecological Assessment for the proposed establishment of platinum mines on the farms Tuschenkomst 135 JP, Witkleifontein 136 JP and Ruighoek 169 JP, North West Province (2005);
- Impala Platinum Holdings, Ecological Assessment for prospecting SEMPs on the Impala Platinum Bafokeng Mining Complex, North West Province (2005);
- Ceramic Industries Limited, Ecological Assessment of the Rietspruit Clay Quarries, Vanderbijlpark, Gauteng (2005);
- Ekurhuleni Metropolitan Municipality, Ecological Assessment Report for the proposed GLB Landfill Site on the farm Zesfontein 27 IR, Benoni, Gauteng (peer reviewed, 2006);
- Ceramic Industries Limited, Ecological Assessment of the Leeukuil Clay Quarries, Vanderbijlpark, Gauteng (2006);
- Council for Geoscience, Habitat sensitivity assessment scoping report for Bon Accord quarry on a portion of the farm de Onderstepoort 300-JR, Tshwane, Gauteng (2007);
- Fraser Alexander, Biodiversity action plan for Lonmin Limpopo & Platinum, North West & Limpopo Province, RSA (2008-2009);
- Envirolution Consulting (Pty) Ltd., Ecological screening report and site selection process for an Eskom general landfill and hazardous waste storage facility near Lephalale, Limpopo Province, RSA (2009);
- Envirolution Consulting (Pty) Ltd., Ecological assessment for the proposed construction of an Eskom general landfill and hazardous waste storage facility at the Matimba Power Station, Limpopo Province, RSA (2009);
- Shangoni/Vergenoeg Mining Company, Ecological assessment for the proposed construction of a slurry pipeline and waste rock dump at the Vergenoeg Mine, Gauteng (2011);
- ENVASS, An ecological evaluation (vertebrate & avifaunal component) for the proposed alternative energy plant on Portion 3, 4 & 5 of the Farm Groenwater 453, Northern cape (2012); and
- ENVASS, Ecological evaluation (vertebrate & avifaunal component) for the proposed alternative energy plant on !xun & khwe, Northern cape (2012).

3. Avifaunal and Invertebrate Assessments:

- Lavender Manor cc, Red Data Bird Assessment for the proposed establishment of a retail, commercial and Lavender Manor Township on part of the farm Rietfontein 189 IQ, Muldersdrift, Gauteng (2004);
- Helga Schneider & Associates, Avifaunal & Invertebrate Red Data Assessment for the proposed rezoning & subdivision on Erf 6486 Orange Farm Ext 2, Johannesburg, Gauteng (2005);

- TOWNDEV, Avifaunal and Arachnid Assessment for the proposed subdivision of Grootfontein 349 JR, Rievlei Dam, Gauteng (2006);
- Prof. Van Rensburg, Red Data Invertebrate Scan for the proposed Rietvalleirand Extension 59, Gauteng (2006);
- Group Five Property Development, Invertebrate Assessment for the proposed Buccleuch Ex 1, Gauteng (2006);
- Zong's Property Investments, Avifaunal and *Metisella meninx* assessment for the establishment of a residential development on a portion of Pomona Estates Agricultural Holdings, Pomona, Gauteng (2006);
- Waterval Islamic Institute, Avifaunal and Invertebrate Assessment for the proposed Northern Golf Course Development, Midrand, Gauteng (2006);
- Ekurhuleni Metropolitan Municipality, Avifaunal & Invertebrate Red Data Assessment for the proposed low-cost housing development on Olifantsfontein 410 JR, Gauteng (2006);
- City of Tshwane Metropolitan Municipality, Invertebrate Red Data Scan for the proposed flood remediation and river upgrade at Soshanguve, Gauteng (2006);
- AGES, Invertebrate assessment for the proposed mining activities on the farm Thorncliffe 374 KT, Xstrata Eastern Mines, Mpumalanga (2007)
- AGES, Mammal and invertebrate assessment for the proposed Kalplats project, Stella, North West Province (2007)
- Exigent Engineering Consultants, Invertebrate assessment for the proposed Derdepoort X 11, Derdepoort, Gauteng (2007);
- Exigent Engineering Consultants, Invertebrate and Avifaunal scan for the proposed Cutty Sark hotel extension, Scottburgh, Kwazulu-Natal (2007);
- Strategic Environmental Focus, African Grass Owl assessment on the proposed Cradle View country estate on portion 60 of the farm Driefontein 179 IQ, Muldersdrift, Gauteng (2007);
- GEOLAB, Ecological assessment for the West Rand Gold Operations (WERGO) Witfontein tailings disposal facility, Mintails, Gauteng, RSA (2008);
- Coastal Environmental Services, Avifaunal Assessment for the proposed mining of heavy minerals at Port Durnford (Exxaro KZN-Sands), KwaZulu-Natal (2008);
- SRK & Natural Scientific Services cc, A feasibility study for the mining of coal north of the Limpopo Province. Avifaunal & invertebrate assessment, Rio Tinto Exploration, Limpopo Province, RSA (2009);
- Eskom/Baagi Environmental, An environmental management plan (avifaunal & faunal component) for the proposed Dinaledi - Spitskop 400 kV transmission line, North West Province (2010);
- Eskom/Baagi Environmental, An avifaunal impact report for the proposed 400 kV Ariadne-Venus transmission line between Estcourt and Pietermaritzburg, KwaZulu-Natal (2010);
- Eskom/Baagi Environmental, An avifaunal impact assessment report for a 275 kV power line between the substations of Glockner and Kookfontein, Vanderbijlpark, Gauteng (2010);
- Groundwater Consulting Services (Pty) Ltd/EkoInfo, An invertebrate and avifaunal specialist report for the proposed expansion of Exxaro's Glisa coal mine, Belfast, Mpumalanga (2010);
- Eskom/Baagi Environmental, An environmental management plan (avifauna component) for the proposed 400 kV Medupi-Massa transmission lines, Limpopo Province (2011);
- Eskom/Baagi Environmental, An avifaunal and fauna impact assessment report for the proposed 400 kV Arnott-Gumeni transmission line, Mpumalanga Province (2012);
- Eskom/Baagi Environmental, An environmental management plan (avifaunal component) for the proposed 400 kV Ngwedi transmission line and substation, North West Province (2012);
- Exxaro/EkoInfo, An avifaunal and invertebrate assessment (as part of a Biodiversity Assessment and action plan) for the Gravelotte MagVanTi Mining Area, Limpopo Province (2012);
- Groundwater Consulting Services (Pty) Ltd/EkoInfo, An invertebrate and avifaunal specialist report for the proposed Paardeplaats coal mine area, Belfast, Mpumalanga (2012);
- Groundwater Consulting Services (Pty) Ltd/EkoInfo, An invertebrate and avifaunal specialist report for the proposed Leeuwpan coal mine area, Belfast, Mpumalanga (2013);
- Eskom/Baagi Environmental, An environmental management plan (avifaunal component) for the proposed Medupi - Borutho 400 kV transmission line, Limpopo Province (2012);

- Eskom/Baagi Environmental, An environmental management plan (avifaunal component) for the proposed Gromis - Oranjemund 400 kV transmission line, Northern Cape (2013);

4. Other Assessments:

- Facilitation, project management and conduction of environmental scoping exercises, Environmental Impact Assessments, Environmental Management Plans, Feasibility Reports, for a range of projects and issues such as:
  - Housing Projects (West Rand Housing Projects) for the Gauteng Department of Housing;
  - Planning and facilitation of environmental awareness workshops (Winterveltd Workshops for the Department of Environmental Affairs and Tourism);
  - Compilation and evaluation of EIA reports and Environmental Management Plans (EMPs) for both the private and public sector (e.g. Scoping Report for the relocation of oxidation ponds for the Moqhaka Local Municipality and the installation of an underground additive tank for Sasol Oil (Pty) Ltd).
  - Urban Renewal Projects: Bekkersdal Urban Renewal Project and the Greater Evaton Urban Renewal Project for the Gauteng Department of Housing.
- Douglas Collieries (Inkwe Collieries), Biodiversity Assessment and database compilation of the Douglas Collieries (2005);
- Orion Group, Ecological Sensitivity Map for the proposed golf course and related facilities, Mont-Aux-Sources (2005);
- City of Joburg Property Development Company, Specialist *Lepidium mossii* assessment for the proposed upgrade and development of the Orlando Dam intersection, Soweto, Gauteng (2005);
- Johannesburg Roads Agency, Alien Eradication and Rehabilitation Programme for the proposed upgrade of 14th Avenue, Randburg, Gauteng (2006);
- City of Joburg Property Development Company, Ecological Management Plan for the Orlando Dam intersection, Soweto, Gauteng (2006);
- GJ van Zyl Trust, Alien Eradication Programme for the proposed development of a resort on the Farm Witpoort 216 JS, Mpumalanga (2006);
- GJ van Zyl Trust, Fire Management Plan for the proposed development of a resort on the Farm Witpoort 216 JS, Mpumalanga (2006); and
- Khutala Collieries (Inkwe Collieries), Biodiversity Assessment and database compilation (2006)

5. Linear Assessments:

- Johannesburg Roads Agency, Ecological Assessment for the Proposed upgrade of 14th Avenue, Randburg, Gauteng (2004).
- Trans-Caledon Tunnel Authority (TCTA), Proposed Vaal River Eastern Subsytem Augmentation (VRESAP) pipeline from Vaal Marina to Secunda (2005);
- PBA International (in association with Bathusi EC), Ecological Scoping Report for the proposed Eskom Delta-Epsilon 765 kV Transmission lines (2007);
- Bohlweki Environmental (in association with Bathusi EC), Ecological Scoping Report for the proposed Eskom Malelane-Boulders 132 kV Distribution line (2007);
- Bohlweki Environmental (in association with Bathusi EC), Ecological Scoping Report for the proposed Eskom Marathon-Delta 132 kV Distribution line (2007);
- Strategic Environmental Focus, Avifaunal EIA Report for the proposed Eskom Hendrina-Prairie-Marathon 400 kV Transmission line, Mpumalanga (2007);
- Natural Scientific Services cc, Botanical survey for the proposed upgrade of the Transnet railway line between Hotazel, Northern Cape and the Port of Ngqura, Eastern Cape, RSA (2008);
- Envirolution Consulting (Pty) Ltd, Ecological Report for the proposed Eskom Apollo-Lepini 400kV transmission line (2009);
- Arcus Gibb, An ecological investigation for the Tumelo 132 kV distribution line and power line near Kagiso, Gauteng (2010);

- Ekoinfo/SANRAL, Faunal investigation for the upgrade of the N3 highway (2011); and
- Aurecon (Pty) Ltd, Baseline vegetation survey for the Mokolo – Crocodile River Augmentation Project (MCWAP) pipeline from Mokolo Dam to Thabazimbi (2011).

B. Work conducted in other African countries:

- Rural Maintenance, Invertebrate study for four mini-hydroelectric generation plants, Northern Malawi, Africa (2010);
- Impacto, An avifaunal study (Phase 1) for the proposed Mpanda Nkwua Dam in the Zambezi River, Mozambique, Tete Province (2010);
- Conseil Régional des Pays de la Loire, An avifaunal investigation of the Rusizi and Ruvubu National Parks (Burundi), and the feasibility of establishing an avi-tourism network with specific emphasis on the protection of important flyways used by Palearctic birds - of - prey (2010);
- Impacto, An avifaunal study (Phase 2) for the proposed Mpanda Nkwua Dam in the Zambezi River, Mozambique, Tete Province (2011);
- Rural Maintenance, Invertebrate scan for the expansion of coal mining activities at Kayelekera, Northern Malawi, Africa (2011);
- Rural Maintenance, Invertebrate study for a mini-hydroelectric plant at the Chisanga Falls, Nyika National Park, Malawi (2011);
- Impacto/ERM/Enviro-Insight, Avifaunal investigation for the proposed Ncondezi Coal Mine, Tete Province, Mozambique (2011);
- Enviro-Insight, Avifaunal investigation for the Riversdale Coal Mine complex, Tete Province, Monzambique (2011);
- Anadarko Petroleum/ERM/Enviro-Insight, Avifaunal investigation for the proposed Anadarko Mozambique Area 1 Liquefied Natural Gas plant in northern Mozambique, Cabo Delgado Province, Mozambique (2012);
- Coffey Environments/EkoInfo, Avifaunal investigation for the mining of iron ore by Baobab Resources, Tete Province, Mozambique (a scoping-level assessment); and
- SRK/Flora, Fauna and Man Ecological Services, An avifaunal and invertebrate assessment for the establishment of a potash mine at Konkoati, Republic of the Congo (2012);
- China Union/ERM/Enviro-Insight, Avifaunal investigation for the proposed mining of iron ore in Bong County, Liberia (2012);
- SRK/Flora, Fauna and Man Ecological Services, An invertebrate assessment for the mining of iron ore by DMC Congo Mining/Exxaro at Mayoko, Republic of the Congo (2012);
- Western Cluster/ERM/Enviro-Insight, Avifaunal investigation for the proposed mining of iron ore at Bomi Hills, ,Bomi County, Liberia (2013);
- SRK/Flora, Fauna and Man Ecological Services, An invertebrate assessment for the establishment of an ecological offset for the DMC Congo Mining/Exxaro Iron Ore Mine at Mayoko, Republic of the Congo (2013);
- Western Cluster/ERM/Enviro-Insight, Avifaunal investigation for the proposed mining of iron ore at Bea Mountain, Grand Cape Mount County, Liberia (2013);
- Western Cluster/ERM/Enviro-Insight, Avifaunal investigation for the proposed mining of iron ore at Mano River, Grand Cape Mount County, Liberia (2013); and
- WSP/Flora, Fauna and Man Ecological Services, An invertebrate assessment for the establishment of a phosphate mine, Hinda Phosphate Project, Republic of the Congo (current); and
- Aureus Mine/Enviro-Insight, An avifaunal investigation for the proposed mining of gold at the New Liberty Gold Mine, Liberia (current)

C. Additional Experience:

- Monitoring and evaluation of the rehabilitation programme for the mining company Richards Bay Minerals (RBM) with special reference to vegetation, bird, small mammal and millipede assemblages.

- Other responsibilities include assessment of the ecological standard operating procedures (SOP) according to RBM's environmental management programme in compliance with ISO 14001 environmental standards accreditation process.
- Participated in the annual relief programme on the S.A Agulhas voyage to Subantarctic Marion Island (Prins Edward group). Took part in the research to estimate the population dynamics and demography of the alien house mouse (*Mus musculus*) on the island (under supervision of the University of Pretoria).
- Participated in the preparation of a conservation management plan for a game and trout farm in conjunction with Mpumalanga Parks Board (in charge of the bird section) for the farm Nu-Scotland Bavaria.
- Lead a successful professional bird tour (party of 12) to the Eastern Zimbabwean highlands and adjacent Mashonaland Plato (10 days).
- Lead a successful professional bird tour (party of 9) to the Cape Peninsula, Karoo and West Coast (10 days).
- Lead a successful professional bird tour (party of 12) to the Swaziland and Northern Zululand (10 days).
- Lead a successful professional bird tour (party of 15) to the Namibia (10 days).
- Lead a successful professional bird tour (party of 14) to the Eastern Drakensberg and Lesotho (10 days).

Employment History:

March 2007 – Current: of Director of Pachnoda Consulting cc

2004- January 2007: Strategic Environmental Focus (Pty) - Terrestrial Ecologist

2003 – 2004: Enviro-Afrik (Pty) Ltd– Environmental Consultant

2001 – 2003: University of Pretoria - Research Assistant

PUBLICATIONS:

- McEWAN, K.L., ALEXANDER, G.J., NIEMAND, L.J. & BREDIN, I.P. 2007. The effect of land transformation on diversity and abundance of reptiles. Paper presented at the 50th Anniversary Conference of the Zoological Society of Southern Africa.
- NIEMAND, L. 1997. Distribution and consumption of a rust fungus *Ravenelia macowaniana* by micro-lepidopteran larvae across an urban gradient: spatial autocorrelation and impact assessment. Hons publication, University of Pretoria, Pretoria
- NIEMAND, L. 2001. The contribution of the bird community of the regenerating coastal dunes at Richards Bay to regional diversity. MSc Thesis, University of Pretoria, Pretoria.
- VAN AARDE, R.J., WASSENAAR, T.D., NIEMAND, L., KNOWLES, T., FERREIRA, S. 2004. Coastal dune forest rehabilitation: a case study on small mammal and bird assemblages in northern KwaZulu-Natal, South Africa. In: Martínez, M.L. & Psuty, N. (Eds.) *Coastal sand dunes: Ecology and Restoration*. Springer-Verlag, Heidelberg.

- VAN AARDE, R., DELPORT, J. & NIEMAND, L. 1999. Of frogs and men. *Mechanical Technology,* June: 32-33.

- VAN AARDE, R., DELPORT, J. & NIEMAND, L. 1999. Gone Frogging. *Getaway,* January: 80-83.

PRESENTATIONS:

- Co-presenter at the Wetland Training Course (30 July – 3 August 2007) entitled: "Wetland-associated fauna". University of Pretoria, Pretoria.
- Co-presenter and lecturer of the pre-conference training course (entitled "Can rehabilitation contribute towards biodiversity?") at the 3rd Annual LaRSSA (Land Rehabilitation Society of Southern Africa) Conference (8-11 September 2015), Glenburn Lodge, Muldersdrift, Gauteng.

Addendum B – Expected Bird Species

A shortlist of bird species recorded from pentad grids 2545_2925 and 2550_2925 which are sympatric to the study site. Expected (with >50 % probability of occurrence) and observed species are also indicated. The list also provides an indication of the mean reporting rates.

Ref	Common Name		Genus	Species	Mean SABAP2 Reporting Rate		Expected on study site	Observed on study site (23 March 2020)
					Full Protocol	Ad Hoc		
1	Ostrich	Common	*Struthio*	*camelus*	33.59	0.00		
4	Grebe	Great Crested	*Podiceps*	*cristatus*	2.86	0.00		
6	Grebe	Little	*Tachybaptus*	*ruficollis*	24.81	0.68		
47	Cormorant	White-breasted	*Phalacrocorax*	*carbo*	16.27	0.68		
50	Cormorant	Reed	*Microcarbo*	*africanus*	81.40	10.25		
52	Darter	African	*Anhinga*	*rufa*	39.86	0.68		
54	Heron	Grey	*Ardea*	*cinerea*	29.46	0.00		
55	Heron	Black-headed	*Ardea*	*melanocephala*	49.51	2.03	1	
56	Heron	Goliath	*Ardea*	*goliath*	0.24	0.00		
57	Heron	Purple	*Ardea*	*purpurea*	29.70	1.35		
58	Egret	Great	*Ardea*	*alba*	6.89	0.00		
59	Egret	Little	*Egretta*	*garzetta*	22.35	1.35		
60	Egret	Yellow-billed	*Egretta*	*intermedia*	4.73	0.00		
61	Egret	Western Cattle	*Bubulcus*	*ibis*	81.33	21.17	1	
62	Heron	Squacco	*Ardeola*	*ralloides*	1.22	0.00		

Ref	Common Name		Genus	Species	Mean SABAP2 Reporting Rate		Expected on study	Observed on study
63	Heron	Green-backed	*Butorides*	*striata*	8.56	0.00		
64	Heron	Black	*Egretta*	*ardesiaca*	9.78	0.00		
67	Bittern	Little	*Ixobrychus*	*minutus*	0.98	0.00		
69	Night-Heron	Black-crowned	*Nycticorax*	*nycticorax*	0.98	0.00		
72	Hamerkop	Hamerkop	*Scopus*	*umbretta*	24.48	0.00		
74	Openbill	African	*Anastomus*	*lamelligerus*	2.86	0.00		
78	Stork	Abdim's	*Ciconia*	*abdimii*	0.24	0.00		
80	Stork	White	*Ciconia*	*ciconia*	2.20	0.00		
81	Ibis	African Sacred	*Threskiornis*	*aethiopicus*	37.06	2.03	1	
82	Ibis	Southern Bald	*Geronticus*	*calvus*	15.24	0.68		
83	Ibis	Glossy	*Plegadis*	*falcinellus*	7.67	8.33		
84	Ibis	Hadeda	*Bostrychia*	*hagedash*	95.23	27.25	1	
85	Spoonbill	African	*Platalea*	*alba*	15.17	0.00		
86	Flamingo	Greater	*Phoenicopterus*	*roseus*	8.57	8.33		
87	Flamingo	Lesser	*Phoeniconaias*	*minor*	3.22	0.00		
88	Goose	Spur-winged	*Plectropterus*	*gambensis*	43.82	9.68		
89	Goose	Egyptian	*Alopochen*	*aegyptiacus*	88.82	12.95	1	
91	Duck	Knob-billed	*Sarkidiornis*	*melanotos*	8.57	0.00		
94	Shoveler	Cape	*Anas*	*smithii*	7.27	0.00		
95	Duck	African Black	*Anas*	*sparsa*	12.11	0.00		
96	Duck	Yellow-billed	*Anas*	*undulata*	64.99	6.87		

Ref	Common Name		Genus	Species	Mean SABAP2 Reporting Rate		Expected on study	Observed on study
97	Teal	Red-billed	*Anas*	*erythrorhyncha*	23.10	1.35		
98	Teal	Cape	*Anas*	*capensis*	1.55	0.00		
100	Duck	White-faced	*Dendrocygna*	*viduata*	3.22	0.00		
101	Duck	Fulvous	*Dendrocygna*	*bicolor*	2.86	0.00		
102	Pochard	Southern	*Netta*	*erythrophthalma*	20.24	0.00		
103	Duck	Maccoa	*Oxyura*	*maccoa*	2.86	0.00		
104	Duck	White-backed	*Thalassornis*	*leuconotus*	5.71	0.00		
105	Secretarybird	Secretarybird	*Sagittarius*	*serpentarius*	0.00	8.33		
114	Falcon	Lanner	*Falco*	*biarmicus*	0.00	0.00	1	1
119	Falcon	Amur	*Falco*	*amurensis*	20.35	6.87	1	
120	Falcon	Red-footed	*Falco*	*vespertinus*	0.24	0.00		
122	Kestrel	Greater	*Falco*	*rupicoloides*	1.47	0.00		
123	Kestrel	Rock	*Falco*	*rupicolus*	5.38	1.35		
125	Kestrel	Lesser	*Falco*	*naumanni*	1.47	0.00	1	
129	Kite	Yellow-billed	*Milvus*	*aegyptius*	1.55	0.00		
130	Kite	Black-winged	*Elanus*	*caeruleus*	56.16	7.55	1	
132	Honey-buzzard	European	*Pernis*	*apivorus*	0.24	0.00		
133	Eagle	Verreaux's	*Aquila*	*verreauxii*	0.24	0.00		
145	Snake-eagle	Brown	*Circaetus*	*cinereus*	0.24	0.00		
146	Snake-eagle	Black-chested	*Circaetus*	*pectoralis*	0.24	0.00		
149	Fish-eagle	African	*Haliaeetus*	*vocifer*	0.49	0.00		

Ref	Common Name		Genus	Species	Mean SABAP2 Reporting Rate		Expected on study	Observed on study
152	Buzzard	Jackal	*Buteo*	*rufofuscus*	2.86	0.00		
154	Buzzard	Common (Steppe)	*Buteo*	*buteo vulpinus*	10.44	0.00	1	1
158	Sparrowhawk	Little	*Accipiter*	*minullus*	0.73	0.00		
159	Sparrowhawk	Black	*Accipiter*	*melanoleucus*	0.98	0.00		
162	Goshawk	Gabar	*Melierax*	*gabar*	0.24	0.00		
167	Marsh-harrier	African	*Circus*	*ranivorus*	1.67	0.00		
171	Harrier-Hawk	African	*Polyboroides*	*typus*	15.89	2.70	1	
172	Osprey	Osprey	*Pandion*	*haliaetus*	0.24	0.00		
183	Spurfowl	Natal	*Pternistis*	*natalensis*	3.22	0.00		
185	Spurfowl	Swainson's	*Pternistis*	*swainsonii*	12.69	4.17	1	
189	Quail	Common	*Coturnix*	*coturnix*	0.49	4.17	1	
192	Guineafowl	Helmeted	*Numida*	*meleagris*	87.73	10.25	1	
197	Rail	African	*Rallus*	*caerulescens*	3.18	1.35		
199	Crake	African	*Crecopsis*	*egregia*	0.24	0.00		
203	Crake	Black	*Amaurornis*	*flavirostris*	8.73	1.35		
205	Flufftail	Red-chested	*Sarothrura*	*rufa*	1.47	0.00		
208	Swamphen	African Purple	*Porphyrio*	*madagascariensis*	0.24	0.00		
210	Moorhen	Common	*Gallinula*	*chloropus*	59.15	6.19		
212	Coot	Red-knobbed	*Fulica*	*cristata*	89.76	17.12		
222	Korhaan	White-bellied	*Eupodotis*	*senegalensis*	1.22	0.00		
228	Jacana	African	*Actophilornis*	*africanus*	6.33	0.68		

Ref	Common Name		Genus	Species	Mean SABAP2 Reporting Rate		Expected on study	Observed on study
238	Plover	Three-banded	*Charadrius*	*tricollaris*	35.65	6.19		
242	Lapwing	Crowned	*Vanellus*	*coronatus*	86.13	12.84	1	
245	Lapwing	Blacksmith	*Vanellus*	*armatus*	95.80	23.87	1	
247	Lapwing	African Wattled	*Vanellus*	*senegallus*	38.99	9.68	1	
250	Snipe	African	*Gallinago*	*nigripennis*	21.87	6.19		
253	Stint	Little	*Calidris*	*minuta*	3.47	0.00		
256	Ruff	Ruff	*Philomachus*	*pugnax*	5.71	0.00		
258	Sandpiper	Common	*Actitis*	*hypoleucos*	16.57	0.00		
262	Sandpiper	Marsh	*Tringa*	*stagnatilis*	0.49	0.00		
263	Greenshank	Common	*Tringa*	*nebularia*	0.49	0.00		
264	Sandpiper	Wood	*Tringa*	*glareola*	4.90	0.68		
269	Avocet	Pied	*Recurvirostra*	*avosetta*	2.86	0.00		
270	Stilt	Black-winged	*Himantopus*	*himantopus*	4.77	0.00		
274	Thick-knee	Water	*Burhinus*	*vermiculatus*	0.49	0.00		
275	Thick-knee	Spotted	*Burhinus*	*capensis*	14.68	0.00	1	
277	Courser	Temminck's	*Cursorius*	*temminckii*	0.24	0.00		
288	Gull	Grey-headed	*Larus*	*cirrocephalus*	37.54	1.35		
290	Tern	Caspian	*Sterna*	*caspia*	0.24	0.00		
304	Tern	White-winged	*Chlidonias*	*leucopterus*	11.83	0.00		
305	Tern	Whiskered	*Chlidonias*	*hybrida*	27.46	2.70		
311	Pigeon	Speckled	*Columba*	*guinea*	92.82	21.62	1	1

Ref	Common Name		Genus	Species	Mean SABAP2 Reporting Rate		Expected on study	Observed on study
314	Dove	Red-eyed	*Streptopelia*	*semitorquata*	77.59	19.59	1	1
316	Turtle-dove	Cape	*Streptopelia*	*capicola*	93.92	27.93	1	1
317	Dove	Laughing	*Spilopelia*	*senegalensis*	95.68	32.77	1	1
318	Dove	Namaqua	*Oena*	*capensis*	1.67	0.00		
323	Green-pigeon	African	*Treron*	*calvus*	5.10	0.00		
343	Cuckoo	Red-chested	*Cuculus*	*solitarius*	13.49	2.70	1	
344	Cuckoo	Black	*Cuculus*	*clamosus*	0.49	0.00		
352	Cuckoo	Diderick	*Chrysococcyx*	*caprius*	27.53	4.73	1	
359	Owl	Western Barn	*Tyto*	*alba*	10.02	2.70	1	
360	Grass-owl	African	*Tyto*	*capensis*	0.49	0.00		
361	Owl	Marsh	*Asio*	*capensis*	2.53	0.00		
363	Scops-owl	African	*Otus*	*senegalensis*	0.00	1.35		
368	Eagle-owl	Spotted	*Bubo*	*africanus*	0.98	0.00	1	
371	Nightjar	European	*Caprimulgus*	*europaeus*	0.24	0.00		
378	Swift	Common	*Apus*	*apus*	0.98	0.00	1	
380	Swift	African Black	*Apus*	*barbatus*	0.73	2.70		
383	Swift	White-rumped	*Apus*	*caffer*	45.21	8.22	1	
384	Swift	Horus	*Apus*	*horus*	1.22	1.35		
385	Swift	Little	*Apus*	*affinis*	48.60	7.43	1	1
386	Swift	Alpine	*Tachymarptis*	*melba*	8.80	1.35		
387	Palm-swift	African	*Cypsiurus*	*parvus*	64.74	19.03	1	

Ref	Common Name		Genus	Species	Mean SABAP2 Reporting Rate		Expected on study	Observed on study
390	Mousebird	Speckled	*Colius*	*striatus*	55.16	16.33	1	
392	Mousebird	Red-faced	*Urocolius*	*indicus*	44.67	6.76	1	
394	Kingfisher	Pied	*Ceryle*	*rudis*	27.21	0.00		
395	Kingfisher	Giant	*Megaceryle*	*maximus*	17.13	0.00		
396	Kingfisher	Half-collared	*Alcedo*	*semitorquata*	0.49	0.00		
397	Kingfisher	Malachite	*Alcedo*	*cristata*	17.36	0.00		
399	Kingfisher	Woodland	*Halcyon*	*senegalensis*	13.37	0.00		
402	Kingfisher	Brown-hooded	*Halcyon*	*albiventris*	2.69	0.00		
404	Bee-eater	European	*Merops*	*apiaster*	14.31	10.25	1	
409	Bee-eater	White-fronted	*Merops*	*bullockoides*	24.37	2.03		
410	Bee-eater	Little	*Merops*	*pusillus*	0.24	0.00		
413	Roller	Lilac-breasted	*Coracias*	*caudatus*	0.24	0.00		
418	Hoopoe	African	*Upupa*	*africana*	48.38	9.46	1	
419	Wood-hoopoe	Green	*Phoeniculus*	*purpureus*	37.09	6.76		
431	Barbet	Black-collared	*Lybius*	*torquatus*	50.05	8.78		
432	Barbet	Acacia Pied	*Tricholaema*	*leucomelas*	5.71	0.00		
437	Tinkerbird	Yellow-fronted	*Pogoniulus*	*chrysoconus*	2.86	0.00		
439	Barbet	Crested	*Trachyphonus*	*vaillantii*	57.52	13.51	1	
440	Honeyguide	Greater	*Indicator*	*indicator*	0.49	0.00		
442	Honeyguide	Lesser	*Indicator*	*minor*	0.49	0.00		
447	Woodpecker	Golden-tailed	*Campethera*	*abingoni*	0.24	0.00		

Ref	Common Name		Genus	Species	Mean SABAP2 Reporting Rate		Expected on study	Observed on study
450	Woodpecker	Cardinal	*Dendropicos*	*fuscescens*	0.98	0.00		
453	Wryneck	Red-throated	*Jynx*	*ruficollis*	15.75	0.00	1	
458	Lark	Rufous-naped	*Mirafra*	*africana*	35.81	6.87	1	1
460	Lark	Sabota	*Calendulauda*	*sabota*	2.86	0.00		
474	Lark	Spike-heeled	*Chersomanes*	*albofasciata*	2.77	4.17		
484	Sparrowlark	Chestnut-backed	*Eremopterix*	*leucotis*	0.24	0.00		
488	Lark	Red-capped	*Calandrella*	*cinerea*	1.22	0.00	1	
493	Swallow	Barn	*Hirundo*	*rustica*	56.08	23.42	1	
495	Swallow	White-throated	*Hirundo*	*albigularis*	38.99	8.90		
499	Swallow	Grey-rumped	*Pseudhirundo*	*griseopyga*	0.24	0.00		
502	Swallow	Greater Striped	*Cecropis*	*cucullata*	59.99	17.12	1	1
503	Swallow	Lesser Striped	*Cecropis*	*abyssinica*	8.56	2.03		
504	Cliff-swallow	South African	*Pterochelidon*	*spilodera*	11.09	6.19	1	
506	Martin	Rock	*Ptyonoprogne*	*fuligula*	17.08	1.35		
507	House-martin	Common	*Delichon*	*urbicum*	4.16	0.00	1	
508	Martin	Sand	*Riparia*	*riparia*	0.24	0.00		
509	Martin	Brown-throated	*Riparia*	*paludicola*	42.94	4.05	1	
510	Martin	Banded	*Riparia*	*cincta*	6.24	0.00		
517	Drongo	Fork-tailed	*Dicrurus*	*adsimilis*	3.10	0.00	1	
521	Oriole	Black-headed	*Oriolus*	*larvatus*	21.72	0.00	1	
522	Crow	Pied	*Corvus*	*albus*	15.00	6.19	1	

Ref	Common Name		Genus	Species	Mean SABAP2 Reporting Rate		Expected on study	Observed on study
523	Crow	Cape	*Corvus*	*capensis*	0.24	0.00		
533	Babbler	Arrow-marked	*Turdoides*	*jardineii*	2.98	0.00		
545	Bulbul	Dark-capped	*Pycnonotus*	*tricolor*	64.41	9.46	1	
552	Thrush	Kurrichane	*Turdus*	*libonyanus*	0.73	1.35		
557	Thrush	Groundscraper	*Psophocichla*	*litsipsirupa*	14.10	1.35		
564	Wheatear	Mountain	*Oenanthe*	*monticola*	13.90	0.00		
568	Wheatear	Capped	*Oenanthe*	*pileata*	8.36	4.17	1	
570	Chat	Familiar	*Emarginata*	*familiaris*	2.86	0.00		
575	Chat	Anteating	*Myrmecocichla*	*formicivora*	25.53	6.19	1	
576	Stonechat	African	*Saxicola*	*torquatus*	38.54	11.71	1	
581	Robin-chat	Cape	*Cossypha*	*caffra*	57.52	8.11	1	
599	Warbler	Willow	*Phylloscopus*	*trochilus*	3.02	0.68		
603	Reed-warbler	Great	*Acrocephalus*	*arundinaceus*	1.96	0.00		
604	Swamp-warbler	Lesser	*Acrocephalus*	*gracilirostris*	10.11	2.70		
606	Reed-warbler	African	*Acrocephalus*	*baeticatus*	6.32	1.35	1	
609	Rush-warbler	Little	*Bradypterus*	*baboecala*	8.48	5.52		
618	Grassbird	Cape	*Sphenoeacus*	*afer*	3.67	0.00		
621	Crombec	Long-billed	*Sylvietta*	*rufescens*	2.86	0.00		
622	Apalis	Bar-throated	*Apalis*	*thoracica*	2.28	2.70		
629	Cisticola	Zitting	*Cisticola*	*juncidis*	27.53	6.87	1	1
630	Cisticola	Desert	*Cisticola*	*aridulus*	2.93	0.00		

Ref	Common Name		Genus	Species	Mean SABAP2 Reporting Rate		Expected on study	Observed on study
631	Cisticola	Cloud	*Cisticola*	*textrix*	4.12	0.00	1	
634	Cisticola	Wing-snapping	*Cisticola*	*ayresii*	7.26	0.00		
635	Cisticola	Pale-crowned	*Cisticola*	*cinnamomeus*	0.49	0.00		
637	Neddicky	Neddicky	*Cisticola*	*fulvicapilla*	8.53	1.35	1	
639	Cisticola	Wailing	*Cisticola*	*lais*	0.73	0.00		
642	Cisticola	Rattling	*Cisticola*	*chiniana*	0.24	0.00		
646	Cisticola	Levaillant's	*Cisticola*	*tinniens*	28.80	4.05	1	
648	Cisticola	Lazy	*Cisticola*	*aberrans*	2.86	0.00		
649	Prinia	Tawny-flanked	*Prinia*	*subflava*	15.25	2.03	1	
650	Prinia	Black-chested	*Prinia*	*flavicans*	7.95	0.00	1	1
654	Flycatcher	Spotted	*Muscicapa*	*striata*	6.98	0.68		
664	Flycatcher	Southern Black	*Melaenornis*	*pammelaina*	0.24	0.00		
665	Flycatcher	Fiscal	*Sigelus*	*silens*	9.83	0.00	1	
666	Warbler	Dark-capped Yellow	*Iduna*	*natalensis*	1.71	0.00		
673	Batis	Chinspot	*Batis*	*molitor*	2.86	0.00		
682	Paradise-flycatcher	African	*Terpsiphone*	*viridis*	8.15	2.03	1	
685	Wagtail	African Pied	*Motacilla*	*aguimp*	19.32	0.00		
686	Wagtail	Cape	*Motacilla*	*capensis*	89.07	19.14	1	
692	Pipit	African	*Anthus*	*cinnamomeus*	55.11	5.52	1	
694	Pipit	Plain-backed	*Anthus*	*leucophrys*	1.55	0.00		
695	Pipit	Buffy	*Anthus*	*vaalensis*	0.73	0.00		

Ref	Common Name		Genus	Species	Mean SABAP2 Reporting Rate		Expected on study	Observed on study
703	Longclaw	Cape	*Macronyx*	*capensis*	39.64	6.87	1	
706	Shrike	Lesser Grey	*Lanius*	*minor*	0.24	0.00	1	
707	Fiscal	Southern	*Lanius*	*collaris*	92.95	22.64	1	1
708	Shrike	Red-backed	*Lanius*	*collurio*	1.71	0.00		
709	Boubou	Southern	*Laniarius*	*ferrugineus*	1.92	0.00		
712	Puffback	Black-backed	*Dryoscopus*	*cubla*	3.02	0.00		
722	Bokmakierie	Bokmakierie	*Telophorus*	*zeylonus*	1.71	1.35	1	
723	Bush-shrike	Grey-headed	*Malaconotus*	*blanchoti*	1.96	0.00		
731	Brubru	Brubru	*Nilaus*	*afer*	0.24	0.00		
733	Starling	Common	*Sturnus*	*vulgaris*	0.24	0.00		
734	Myna	Common	*Acridotheres*	*tristis*	96.41	22.41	1	1
735	Starling	Wattled	*Creatophora*	*cinerea*	7.34	1.35		
736	Starling	Violet-backed	*Cinnyricinclus*	*leucogaster*	2.20	0.00		
737	Starling	Cape Glossy	*Lamprotornis*	*nitens*	56.19	2.03	1	
745	Starling	Red-winged	*Onychognathus*	*morio*	32.56	0.00		
746	Starling	Pied	*Lamprotornis*	*bicolor*	33.56	6.87	1	
763	Sunbird	White-bellied	*Cinnyris*	*talatala*	12.71	0.00		
772	Sunbird	Amethyst	*Chalcomitra*	*amethystina*	34.11	2.03	1	
780	Sparrow-weaver	White-browed	*Plocepasser*	*mahali*	11.67	0.00		
784	Sparrow	House	*Passer*	*domesticus*	83.03	12.84	1	1
786	Sparrow	Cape	*Passer*	*melanurus*	95.80	21.73	1	1

Ref	Common Name		Genus	Species	Mean SABAP2 Reporting Rate		Expected on study	Observed on study
797	Weaver	Village	*Ploceus*	*cucullatus*	20.38	1.35		
799	Weaver	Cape	*Ploceus*	*capensis*	33.56	2.70	1	
803	Masked-weaver	Southern	*Ploceus*	*velatus*	88.71	23.20	1	1
804	Weaver	Thick-billed	*Amblyospiza*	*albifrons*	29.30	2.03	1	
805	Quelea	Red-billed	*Quelea*	*quelea*	43.70	13.85	1	
808	Bishop	Southern Red	*Euplectes*	*orix*	65.34	21.17	1	1
810	Bishop	Yellow	*Euplectes*	*capensis*	1.55	0.00		
812	Bishop	Yellow-crowned	*Euplectes*	*afer*	26.96	0.00	1	1
813	Widowbird	Red-collared	*Euplectes*	*ardens*	2.28	0.00		
814	Widowbird	White-winged	*Euplectes*	*albonotatus*	7.38	0.00		
816	Widowbird	Fan-tailed	*Euplectes*	*axillaris*	23.57	4.84	1	
818	Widowbird	Long-tailed	*Euplectes*	*progne*	77.45	13.74	1	
820	Finch	Red-headed	*Amadina*	*erythrocephala*	29.91	10.81	1	
823	Mannikin	Bronze	*Spermestes*	*cucullatus*	28.12	10.81	1	
838	Waxbill	Orange-breasted	*Amandava*	*subflava*	4.57	0.68	1	
839	Waxbill	Blue	*Uraeginthus*	*angolensis*	5.71	0.00		
843	Waxbill	Common	*Estrilda*	*astrild*	24.64	4.84	1	1
844	Quailfinch	African	*Ortygospiza*	*atricollis*	1.92	0.00	1	
846	Whydah	Pin-tailed	*Vidua*	*macroura*	47.68	10.25	1	1
849	Indigobird	Dusky	*Vidua*	*funerea*	0.73	0.00		
857	Canary	Cape	*Serinus*	*canicollis*	0.49	5.52	1	1

Ref	Common Name		Genus	Species	Mean SABAP2 Reporting Rate		Expected on study	Observed on study
859	Canary	Yellow-fronted	*Crithagra*	*mozambicus*	4.20	0.68	1	1
860	Canary	Black-throated	*Crithagra*	*atrogularis*	18.68	10.25	1	1
866	Canary	Yellow	*Crithagra*	*flaviventris*	0.49	0.00		
867	Seedeater	Streaky-headed	*Crithagra*	*gularis*	3.71	0.00		
872	Bunting	Cinnamon-breasted	*Emberiza*	*tahapisi*	1.67	0.00		
873	Bunting	Cape	*Emberiza*	*capensis*	1.67	0.00		
874	Bunting	Golden-breasted	*Emberiza*	*flaviventris*	0.24	0.00		
940	Dove	Rock	*Columba*	*livia*	47.18	4.73	1	1
1016	Duck	Mallard	*Anas*	*platyrhynchos*	25.46	0.68		
1021	Peacock	Common	*Pavo*	*cristatus*	2.86	0.68		
1104	Thrush	Karoo	*Turdus*	*smithi*	56.49	15.54	1	
1105	Thrush	Olive	*Turdus*	*olivaceus*	0.49	0.00		
1172	White-eye	Cape	*Zosterops*	*virens*	49.69	10.81	1	1
1183	Lark	Eastern Clapper	*Mirafra*	*fasciolata*	1.47	0.00		
4126	Lark	Eastern Long-billed	*Certhilauda*	*semitorquata*	1.22	1.35		
4131	Coucal	Burchell's	*Centropus*	*burchellii*	13.45	1.35	1	
4142	Sparrow	Southern Grey-headed	*Passer*	*diffusus*	19.87	2.03	1	
10877	Pipit	Nicholson's	*Anthus*	*nicholsoni*	2.86	0.00		
						Total:	94	25

Addendum C – Declaration of Independence

Specialist:	Ina Venter, trading as Kyllinga Consulting		
Nature of specialist study compiled:	Vegetation and Wetland Assessment		
Contact person:	Ina Venter		
Postal address:	53 Oakley street, Rayton		
Postal code:	1001	**Cell:**	083 370 0850
Telephone:	012 734 5642	**Fax:**	
E-mail:	i.venter@telkomsa.net		
Qualifications & relevant experience:	M.Sc. Botany		
Professional affiliation(s) (if any)	South African National Association of Scientific Professions		

I, CE Venter (Ina) , declare that -

General declaration:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in Regulation 8;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Signature of specialist:

Ina Venter, trading as Kyllinga Consulting

Name of company:

12 March 2020

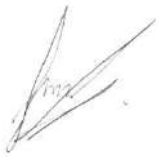
Date:

Specialist:	Pachnoda Consulting		
Nature of specialist study compiled:	Fauna & Terrestrial Ecology		
Contact person:	Lukas Niemand		
Postal address:	716 Lochiel Street, Faerie Glen		
Postal code:	0081	**Cell:**	083 798 0827
Telephone:	012 991 5141	**Fax:**	
E-mail:	lukas@pachnoda.co.za		
Qualifications & relevant experience:	M.Sc. Zoology		
Professional affiliation(s) (if any)	South African National Association of Scientific Professions		

I, Lukas Niemand , declare that -

General declaration:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in Regulation 8;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.



Signature of specialist:

Pachnoda Consulting

Name of company:

13 March 2020

Date: