

May 2021

**AN ECOLOGICAL REPORT ON THE FLORA &
FAUNA:**

**Remainder of Portion 23, Portion, 162,
Remainder of Portion 196, Lanseria, Gauteng**

A report commissioned
by

**COSMOPOLITAN
PROJECTS
JOHANNESBURG
(PTY) LTD**

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CONDITIONS RELATING TO THIS REPORT

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- Have no vested interest in the property studied nor is it affiliated with any other person/body involved with the property and/or proposed development.
- Is not a subsidiary, legally or financially of the proponent.
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- Declare that remuneration for services provided by Enviroguard Ecological Services cc and its members/co-workers is not subjected to or based on approval of the proposed project by the relevant authorities responsible for authorising this proposed project.
- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA.
- Reserve the right to modify aspects pertaining to the present investigation should additional information become available through ongoing research and/or further work in this field.
- Is committed to biodiversity conservation but concomitantly recognize the need for economic development. We reserve the right to form and hold our own opinions within the constraints of our specialities and experience, and therefore will not submit willingly to the interests of other parties or change our statements to appease them.

The study was undertaken by Prof. LR Brown (PhD UP) & Mr C Cook (MSc UP). Both are registered as a Professional Natural Scientists with the following details:

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Mr T O' Donoghue Reg. No. 010184 (Ecological Science)

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	Soil Classification and Wetland Delineation Short Course – TERRASOIL Science Wetland Legislation Course - Wetrest
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Factors limiting the quality of this study

Flora: A once off survey was conducted while the study was done on 27 April 2021. Thus, only those flowering plants that flowered at the time of the visit could be identified with high levels of confidence. Some of the more rare and cryptic species may have been overlooked due to their inconspicuous growth forms. Many of the rare and endangered succulent species can only be distinguished (in the veld) from their very similar relatives on the basis of their reproductive parts. These plants flower during different times of the year. Multiple visits to any site during the different seasons of the year could therefore increase the chances to record a larger portion of the total species complex associated with the area. The survey of the study site is however considered as successful with a correct identification of the different vegetation units.

Fauna: It must be stressed that no actual faunal surveys of mammal, bird, reptile and amphibian species occurring on the site were conducted but merely an assessment of available and specialised habitat. By surveying the site for specialised habitats, as well as

the remaining vegetation and specific habitats, one can make an assumption of the possible presence or absence of threatened faunal species. In order to ascertain actual species lists more intensive surveys are required over several seasons.

Limitation to a faunal screening exercise based on a single site visitation (8 hours) conducted during the late summer early autumnal months on 27th of April 2021. All animals (mammals, reptiles and amphibians) seen or heard; were recorded. Use was also made of indirect evidence such as nests, feathers and animal tracks (footprints, droppings) to identify animals. The majority of threatened species are extremely secretive and difficult to observe even during intensive field surveys conducted over several years this is especially pertinent to the highly elusive and secretive South African hedgehog, Rough-haired Golden Mole, Serval, White-tailed Rat, Swamp Musk Shrew, Coppery Grass Lizard, Striped Harlequin Snake and Giant Bullfrog. There is a limitation of historic data and available databases for the majority of threatened species especially the Striped Harlequin Snake where only 80 records exist for Southern Africa, Swaziland and Lesotho and only 2 records of Coppery Grass Lizard during an intensive reptile survey of Gauteng (Whittington-Jones et al. 2008). The presence of threatened species on site is assessed mainly on habitat availability and suitability as well as desk research (literature, personal records and previous surveys conducted in the similar habitats within the Muldersdrift, Cosmo City, Zandspruit, Nooitgedacht and Lanseria areas between 2000 and 2021.

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- The results of the project;
- The technology described in any report;
- Recommendations delivered to the Client.

Approach

Conclusions reached, and recommendations made are based not only on occurrence of individual species, but more appropriately on habitats and ecosystem processes. Planning must therefore allow for the maintenance of species, habitats and ecosystem processes, even if Red Data or endemic plant or animal species are absent.



**Prof LR Brown *Pri.SciNat*; MGSSA
Enviroguard Ecological Services cc**

INTRODUCTION

The natural resources of South Africa, with its highly complex and diversified society, are continually under threat from development especially in and close to areas richly endowed with natural resources. The natural environment and assets such as soil, water, indigenous vegetation, biodiversity, endemic and rare species and indigenous wildlife should be part of planning any new developments. New development plans should be based on scientific, ecological principles to prevent destruction or the deterioration of the environment and consequently the loss of valuable natural assets - also the loss of plant and animal species (biodiversity) and natural open spaces within the urban environment. This does not only have economic consequences, but from a conservation viewpoint, may have enormous advantages to the natural ecosystems. Development should, therefore, be planned to make the best possible use of natural resources and to avoid degradation, and therefore attention must be paid to environmental factors in the decision-making process. During the last years development became complicated and sophisticated, scientifically based, enterprises where environmental and nature systems are (or should be) accounted for in the planning stages. Modern development planning is intended to improve the way in which South African environmental resources are utilised. This provides a cost-effective procedure for ensuring that environmental concerns are carefully considered in the project development process. This procedure aims at guiding and facilitating the development process of a project. **An ecological evaluation of any area to be developed is presently considered a necessity.**

Vegetation it is the most physical representation of the environment on which all animals are ultimately dependent. As primary producers it is a major component in the environment and as such it is of immense practical importance that it be conserved. Not only does it play a major role in humankind's existence as primary producers, but it also forms a protecting layer covering the soil thereby protecting it against the onslaught of wind and water. When the vegetation is damaged or removed, there is no more protection, thus enhancing erosion and negatively affecting the faunal communities present on the area.

AIMS OF THE STUDY

This report aims to present ecological report on the flora and fauna of the Remainder of Portion 23, Portion, 162, Remainder of Portion 196, Lanseria, Gauteng Province (hereafter referred to as the study area).

The objectives of this study were to:

- Identify, describe and delineate the different vegetation units present on the study site.
- Provide a description of the fauna (**mammals, avifauna (birds), reptiles, amphibians**) occurring within the study area.
- Identify species of conservation importance that could possibly occur on the proposed site.
- To provide a sensitivity map of the study area (where applicable).
- To provide management recommendations to mitigate negative and enhance positive impacts of the proposed development.

STUDY AREA

Location

The study site is located north and south of the N14 Highway with Malibongwe Drive forming the eastern boundary. The western boundary is formed by a perennial tributary in the Northern section with agricultural holdings along the entire western and southern boundaries. The northern boundary borders onto industrial developments.

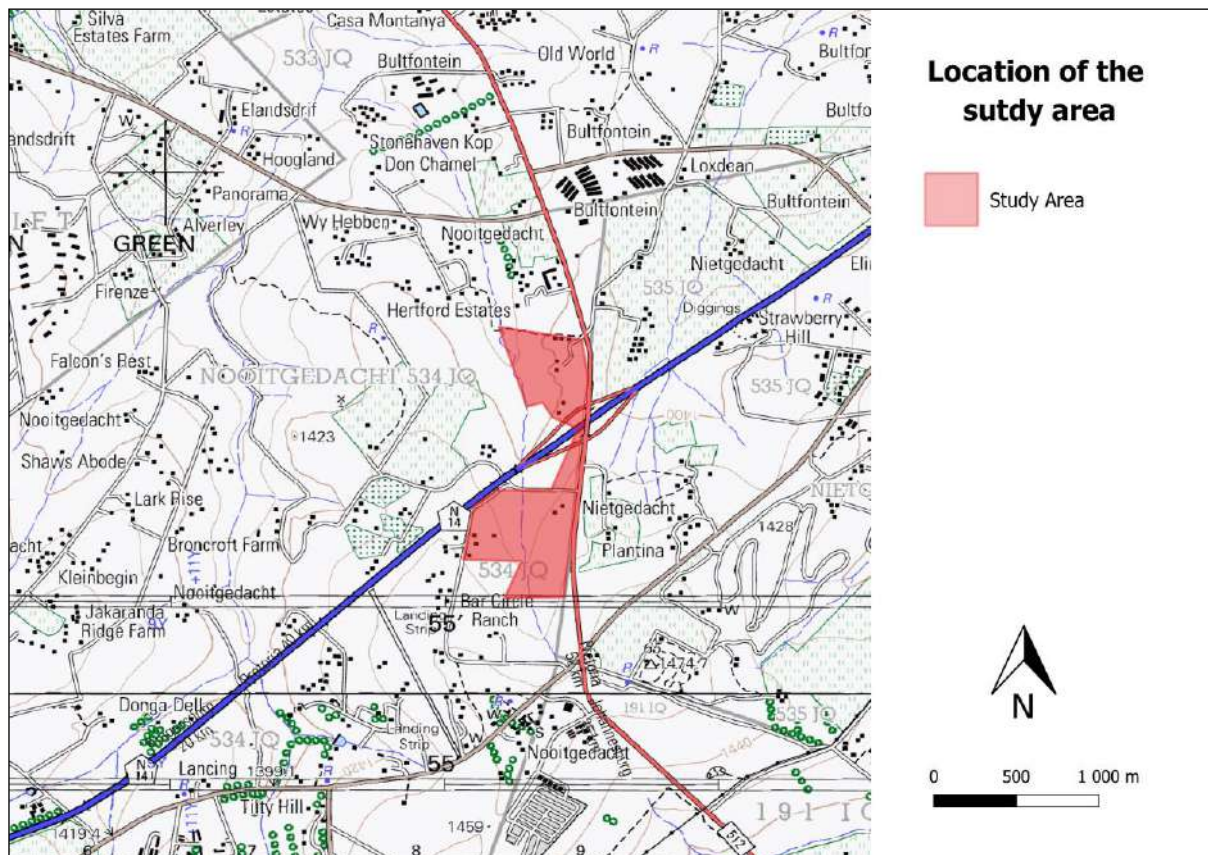


Figure 1. Locality the study area.

Existing impacts

- The site is not fenced and is located between various agricultural holdings and commercial/residential developments.
- Communal cattle graze the area throughout the year

METHODS

VEGETATION

The Braun-Blanquet survey principles to survey and describe plant communities as ecological units were used for this study. This vegetation survey method has been used as the basis of a national vegetation survey of South Africa (Mucina et al. 2000) and is considered to be an efficient method of classifying and describing vegetation (Brown *et al.* 2013). The study is based on the floristic composition of the different vegetation units. An overview of the vegetation was first obtained from relevant literature. The vegetation was stratified into relative homogeneous units using Google Earth images and topographic maps. All these units were verified on foot and vegetation sample plots placed in each. The different vegetation units (ecosystems) are not only described in terms of their plant species composition, but also evaluated in terms of the potential habitat for sensitive/red data plant species. Ecological sensitivity and conservation value of the plant communities were assessed and categorised according to habitat and plant species assemblages (even though red data species or suitable habitat for such species could be absent an area could still have pristine habitat comprising a high diversity of climax species giving it a high conservation value).

Data recorded included:

Data pertaining to the vegetation physiognomy and floristic composition (species richness and canopy cover of each species) was gathered. A list of all plant species present, including trees, shrubs, grasses, forbs, geophytes and succulents were compiled. All identifiable plant species were listed. Notes were additionally made of any other features that might have an ecological influence.

Red data species

An investigation was also carried out on rare and protected plants that might possibly occur in the region. For this investigation the National Red List of Threatened Plants of South Africa, Lesotho & Swaziland, compiled by the Threatened Species Programme, South African National Biodiversity Institute (SANBI) was used. GDARD supplied a list of red data plant species that have been noted within the QDG. Internet sources were also consulted on the distribution and habitat of these species in the area as well as available literature.

Other information used included:

- The IUCN conservation status categories on which the Threatened Species Programme, Red List of South African Plants (2013) is based, was also obtained.

The presence of rare and protected species or suitable habitat was recorded during the field visit.

QDG data as well as other red data lists are used as guidelines to assist when conducting the field work. Unless a specific species was recorded previously on the specific site under investigation, the QDG lists cannot be used as meaning that the species listed do occur on the site. These lists are not comprehensive and continually change as people find and record new habitats and red data species. It could therefore mean that a red data species found in an adjacent QDG or one even further away, could potentially occur in another QDG. However, since no study has been done in that grid it will result in it not being listed for that QDG. The fact that it is not listed does however, not mean that the species or suitable habitat is not present. It is therefore imperative that a **physical site visit is conducted** to determine firstly, the presence of the listed red data species or suitable habitat on the site, and secondly, and most importantly the suitability of the site for the presence other red data species also.

Data processing

A classification of vegetation data was done to identify, describe and map vegetation types. The descriptions of the vegetation units include the tree, shrub and herbaceous layers. The conservation priority of each vegetation unit was assessed by evaluating the plant species composition in terms of the present knowledge of the vegetation of the Grassland and Savanna biomes of South Africa. The following four conservation priority categories were used for each vegetation unit:

High: Area with natural vegetation with a high species richness and habitat diversity; presence of viable populations of red data plant species OR suitable habitat for such species; presence of unique habitats; less than 5% pioneer/alien plant species present. These areas are ecologically valuable and important for ecosystem functioning. This land should be conserved and managed and is not suitable for development purposes.

Medium-high: Natural area with a relatively high species richness and diversity; not a threatened or unique ecosystem; moderate habitat diversity; between 5-10% pioneer/alien plant species present; that would need low financial input and management to improve its current condition; and where low-density development could be considered with limited impact on the vegetation / ecosystem. It is recommended that larger sections of the vegetation are maintained.

Medium: An area with a relatively natural species composition; not a threatened or unique ecosystem; moderate species diversity; between 11-20% pioneer/alien plant species present; that would need moderate to major financial input to rehabilitate to an improved condition; and where medium density development could be considered with limited impact on the vegetation / ecosystem. Where possible certain sections of the vegetation could be maintained.

Low-medium: Area with relatively natural vegetation, though a common vegetation type; moderate to low species and habitat diversity; previously or currently degraded or in secondary successional phase; between 20-40% pioneer and/or alien plant species; low ecosystem functioning; low rehabilitation potential.

Low: A totally degraded and transformed area with a low habitat diversity and ecosystem functioning; no viable populations of natural plants; >40% pioneer and/or alien plant species present; very low habitat uniqueness; whose recovery potential is extremely low; and on which development could be supported with little to no impact on the natural vegetation / ecosystem.

Impact analysis

An **impact analysis** was done for the vegetation units identified. This was achieved by evaluating the different vegetation units against a set of habitat criteria. For impact assessment the **potential impacts** on the vegetation was assessed by using the NEMA 2014 guidelines and criteria. To further quantify the severity of each impact, values were assigned to criteria ratings (Table 1).

Table 1: Criteria, criteria ratings and values (in brackets) used in this study to assess possible impacts on vegetation during the proposed development

Criteria	Rating (value)
Extent of impact	Site (1), Region (2), National (3), International (4)
Duration of impact	Short term (1), Medium term (3), Long term (4), Permanent (5)
Magnitude of impact	Low (2), Moderate (6), High (8)
Probability of impact	Improbable (1), Probable (2), Highly probable (4), Definite (5)

Sensitivity analysis

A sensitivity analysis was done for the vegetation units to determine their ecological sensitivity in terms of the vegetation and its associated ecosystem. The different units were scored against set vegetation criteria. A score between 80 and 100 means the area has a high vegetation ecological sensitivity; 50-79 a medium vegetation ecological sensitivity; 30-49 a low-medium vegetation ecological sensitivity; and 0-29 a low vegetation ecological sensitivity.

FAUNA

This faunal survey focused mainly on mammals, birds, reptiles and amphibians within the proposed Nooitgedacht/Lanseria site. The survey focused on the current status of threatened animal species occurring, or likely to occur within the study area, describing the available and sensitive habitats on the site, identifying potential impacts and providing mitigation measures for the identified impacts of the proposed project.

Predictive methods

Satellite imagery of the area was obtained from Google Earth™ was studied in order to get a three-dimensional impression of the topography and current land use.

Literature Survey

A detailed literature search was undertaken to assess the current status of threatened fauna that have been historically known to occur within the 2527 DD Quarter Degree Grid Cell (QDGC) in which the site is situated. The literature search was undertaken utilising *The Vegetation of South Africa, Lesotho and Swaziland* (Mucina & Rutherford 2006) for the vegetation description as well as *National Red List of Threatened Plants of South Africa* (Raimondo *et al.*, 2009), *The Mammals of the Southern African Subregion* (Skinner & Chimimba 2005) and *The Red List of Mammals of South Africa, Swaziland and Lesotho* (Taylor *et al.* 2016) as well as ADU's MammalMAP (http://vmus.adu.org.za/vm_sp_list.php) for mammals. Hockey, P.A.R., Dean, W.R.J., Ryan, P.G. (eds). 2005. *Roberts- Birds of Southern Africa VIIth ed.* And BARNES, K.N. (ed.) (2000) *The 2014/2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland* (Taylor *et al.* 2015) for avifauna (birds) as well as the internet SABAP2 (<http://sabap2.adu.org.za>). *A Complete Guide to the Frogs of Southern Africa* (du Preez & Carruthers 2009) and *The Atlas and Red Data Book of the frogs of South Africa, Lesotho and Swaziland* (Minter *et al.* 2004) and *Ensuring a future for South Africa's frogs: a strategy for conservation research. SANBI Biodiversity Series 19* (Measey *et al.* 2010) for amphibians as well as SAFAP FrogMAP (<http://vmus.adu.org.za>). *The Field Guide to the Snakes and other Reptiles of Southern Africa* (Branch 2001) and *Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland* (Bates *et al.* 2014) as well as SARCA (<http://sarca.adu.org.za>) for reptiles.

Site Investigation Methodology

A preliminary faunal habitat assessment of the status, spatial requirements and habitat preferences of all priority faunal species (mammals, birds, reptiles and amphibians) likely to occur within or surrounding the Nooitgedacht site was undertaken. For certain species, an estimate of the expected or historical distribution for the area could be extrapolated from published information and unpublished reports, while habitat and spatial requirements were generally derived from the literature. For other species such as the Striped Harlequin Snake and Coppery Grass Lizard little of this information was readily available and conservation targets remain speculative. Species assessments will be updated when additional data becomes available and where appropriate, proposed conservation targets will be revised.

A survey of the proposed Nooitgedacht site was carried out on foot during daylight hours on the 27th of April 2021. The temperature was overcast and mild with temperatures ranging between 16-22°C. The survey was heavily augmented with previous faunal surveys conducted in the adjacent Muldersdrift, Cosmo City, Zandspruit, Nooitgedacht, Lanseria area between 2000 and 2021. The field verification for the site was restricted to a single day (8 hours) during the late summer early autumnal months. No specialist faunal survey techniques; including camera trapping, pit-fall and funnel trapping were used during the brief field verification of the mammals, reptiles and amphibians on the site. No nocturnal surveys were undertaken.

RESULTS OF THE VEGETATION SURVEY

Vegetation units

The study area comprises five vegetation units (Figure 2) namely:

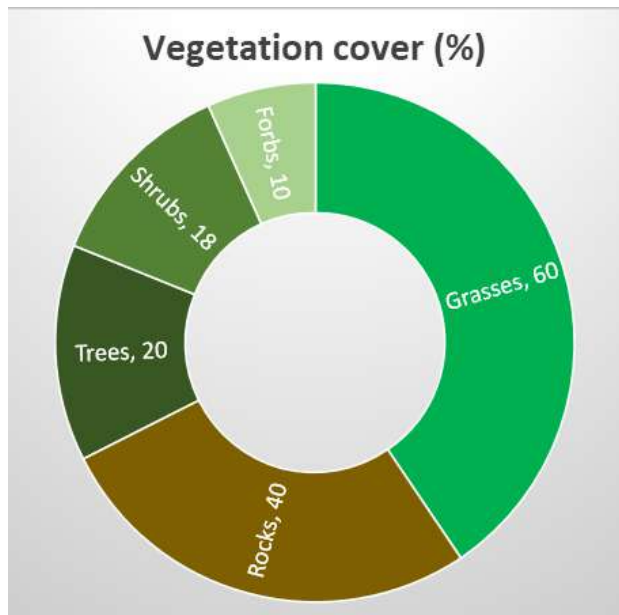
1. Rocky ridge
2. Old fields
3. Developed area
4. Wetland
5. Degraded area

1. Rocky ridge



Vegetation structure:	Medium tall open-closed woodland		
Topography:	Western slope (5-8°)	Soil	Shallow loamy
Unit size	5 ha		
Need for rehabilitation	Medium-high		
Conservation Priority	High		

This vegetation unit is located in the northern section of the study area along the northern boundary of the property. The area consists of a moderately steep rocky granite hill that has a western slope. The largest section consists of medium to tall open to closed woody vegetation with a moderate canopy cover and a relatively well-developed herbaceous layer for a rocky ridge (see figure right). Along footslopes the woody vegetation is less dense with more open grass patches. The area is very rocky and has large to medium-sized rocks that cover approximately 40% of the area. The soil is shallow loamy.



The vegetation of this unit is characterised by the prominence of various woody species with *Vachellia karroo*, *Vachellia robusta*, *Searsia lancea*, *Euclea crispa* and *Ehretia rigida* prominent in the woody layer and the grasses *Eragrostis curvula*, *Aristida congesta* subsp. *Barbicollis* and *Setaria sphacelata* prominent in the grass layer. Other species present include the forbs *Ipomoea crassipes*, *Solanum panduriforme*, *Pellaea calomelanos* and *Dicoma anomala*.

Red data species

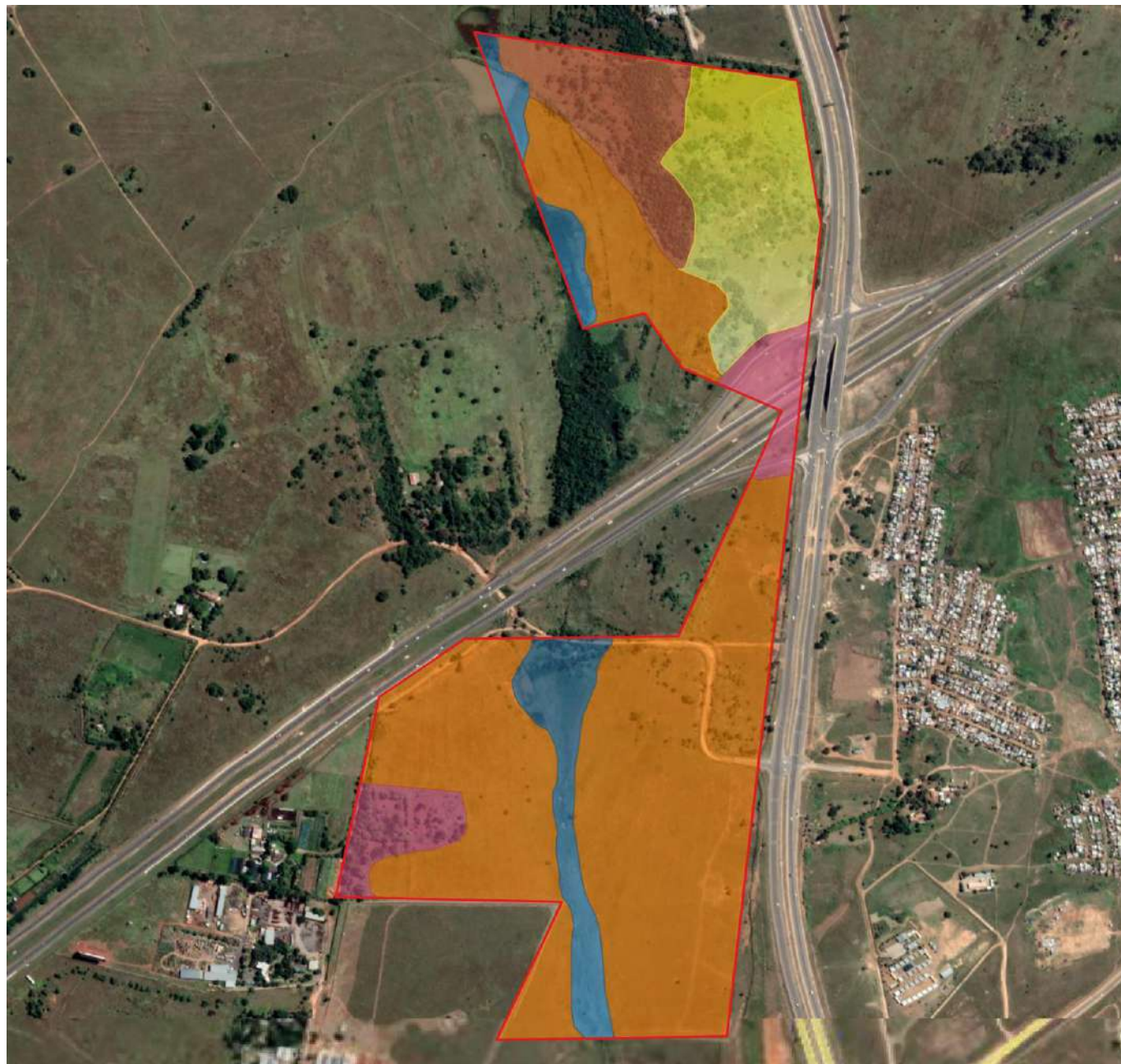
No red data species were found to be present in this unit though suitable habitat exists (see Annexure A).

Alien plant species

Cereus jamacaru; *Opuntia ficus-indica*; *Melia azedarach*; *Solanum mauritianum*.

The following is a list of plant species identified in unit 1a during the survey (❤️=alien invasive species; +=medicinal value; 👁️=Protected species; 🌿=Garden hybrid) (W=woody; G=grass; F=forb):

Cat	Species	Class
	<i>Achyranthes sicula</i> (L.) All.	F
+	<i>Aloe greatheadii</i> Sch'nland	F
	<i>Aristida barbicollis</i> Trin. & Rupr.	G
	<i>Asparagus larycinus</i> Burch.	W



Vegetation Units

-  Study area
-  1. Rocky Ridge
-  2. Old fields
-  3. Developed area
-  4. Wetland
-  5. Degraded area

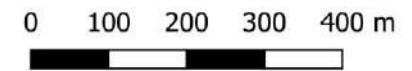


Figure 2. Vegetation units of the study area (Image obtained from Google Earth 2021).

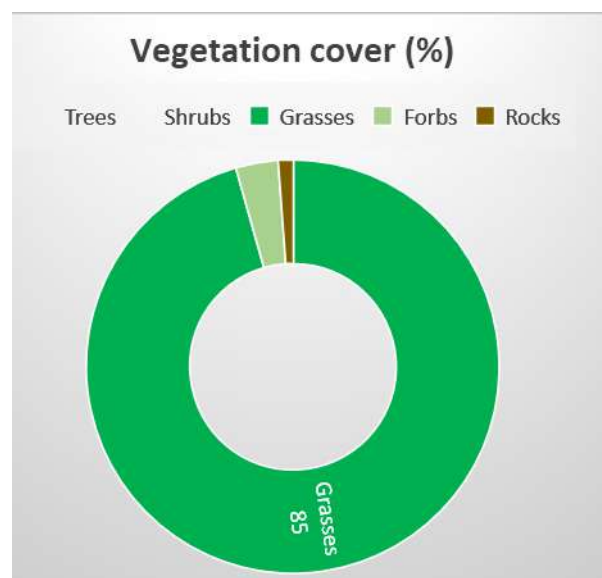
Cat	Species	Class
	<i>Bidens pilosa</i> L.	
	<i>Celtis africana</i> Burm.f.	
☠	<i>Cereus jamacaru</i> DC.	
	<i>Clematis brachiata</i> Thunb.	
	<i>Cymbopogon pospischilii</i>	
	<i>Dicoma anomala</i> Sond.	
	<i>Ehretia rigida</i> (Thunb.) Druce	
	<i>Eragrostis curvula</i> (Schrad.) Nees	
	<i>Euclea crispa</i> (Thunb.) Gürke	
	<i>Gymnosporia buxifolia</i> (L.) Szyszyl	
	<i>Hermannia depressa</i> N.E.Br.	
	<i>Ipomoea crassipes</i> Hook.	
	<i>Lanena discolor</i> (Sond.) Engl.	
☠	<i>Melia azedarach</i> L.	
	<i>Nidorella hottentotica</i> DC.	
☠	<i>Opuntia ficus-indica</i> (L.) Mill.	
+	<i>Pellaea calomelanos</i> (Sw.) Link	
	<i>Searsia lancea</i> L.f.	
	<i>Searsia pyroides</i> Burch.	
	<i>Senegalia caffra</i> Willd.	
	<i>Setaria sphacelata</i> (Schumach.) Moss	
☠	<i>Solanum mauritianum</i> Scop.	
	<i>Solanum panduriforme</i> E.Mey.	
	<i>Vachellia robusta</i>	

2. Old fields



Status	Degraded		
Vegetation structure:	Medium-tall grassland		
Topography:	Eastern slope (2-3°)	Soil	Loam
Unit size:	40 ha		
Need for rehabilitation	High		
Conservation Priority	Low		

This vegetation unit comprises the largest part of the study area. The soil is loamy with few rocks covering less than 1% of the area. The area is located on an eastern and western slope ranging between 2° and 3°. Except for a single alien invasive tree and a few scattered *Senegalia caffra* and *Searsia lancea* individuals, there are no woody species present and the vegetation is dominated by the herbaceous layer with the



grasses having the highest canopy cover (see figure previous page) and forbs covering less than 3%.

The vegetation is dominated by the anthropogenic grass *Hyparrhenia hirta* while the grasses *Aristida congesta* subsp. *barbicollis* and *Cynodon dactylon* are prominent. Other species include the grasses *Eragrostis curvula*, *Cymbopogon caesius*, *Eragrostis gummiflua* and the forbs *Crabbea angustifolia*, *Polygala hottentotica* and *Tagetes minuta*.

Red data species

No red data species or suitable habitat were found to be present within this unit.

Alien plant species

Pinus pinaster.

The following is a list of plant species identified in unit 1a during the survey (🔴=alien invasive species; 🟢=medicinal value; 👁️=Protected species; 🌿=Garden hybrid) (W=woody; G=grass; F=forb):

Cat	Species	Class
🟢	<i>Aloe greatheadii</i> Sch'nland	F
	<i>Aristida barbicollis</i> Trin. & Rupr.	G
	<i>Asparagus laricinus</i> Burch.	W
	<i>Bidens pilosa</i> L.	F
	<i>Crabbea angustifolia</i> Nees	F
🔴	<i>Crotalaria agatiflora</i>	W
	<i>Cymbopogon caesius</i>	G
	<i>Cynodon dactylon</i> (L.) Pers.	G
	<i>Eragrostis curvula</i> (Schrad.) Nees	G
	<i>Eragrostis gummiflua</i> Nees	G
🟢	<i>Gomphocarpus fruticosus</i> (L.) Aiton f.	F
	<i>Helichrysum miconiifolium</i> DC.	F
	<i>Hyparrhenia hirta</i> (L.) Stapf	G
	<i>Melinis repens</i> (Willd.) Zizka	G
🔴	<i>Pinus pinaster</i> Aiton	W
	<i>Pogonarthria squarrosa</i> (Roem. & Schult.) Pilg.	G
	<i>Polygala hottentotta</i> C.Presl	F
	<i>Pseudognaphalium luteo-album</i> (L.) Hilliard & B.L.Burt	F
	<i>Searsia pyroides</i> Burch.	W
	<i>Senegalia caffra</i>	W
	<i>Schkuhria pinnata</i> (Lam.) Cabrera	F
	<i>Sporobolus africanus</i> (Poir.) Robyns & Tournay	G
	<i>Tagetes minuta</i> L.	F
	<i>Verbena tenuisecta</i> Briq.	F

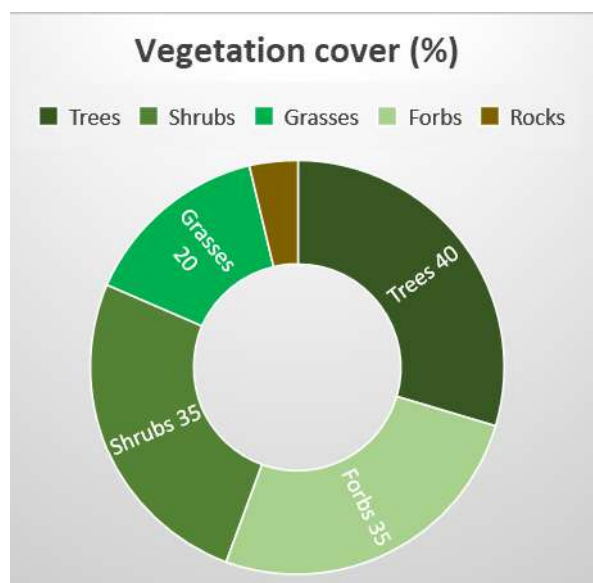
3. Developed areas



Vegetation structure:	Planted woodland & roads		
Topography:	Mostly level	Soil	Loam
Unit size	4.4 ha		
Need for rehabilitation	High		
Conservation Priority	Low		

This vegetation unit occurs in the south-western section of the study site and also included the N14 highway in the central part of the site. The area used to be an old homestead with landscaped gardens and planted trees. The woody layer is dominant with the highest cover (see figure right).

The vegetation consists of a mixture of ornamental, alien invasive and indigenous tree species. These include *Vachellia karroo*, *Acacia podalyriifolia*, *Eucalyptus camaldulensis*, *Jacaranda mimosifolia*, *Melia azedarach* and *Pinus pinaster*. The herbaceous layer consists of pioneer and secondary successional grasses and forbs such



as *Eragrostis curvula*, *Cynodon dactylon*, *Pennisetum clandestinum*, *Bidens pilosa*, *Schkuhria pinnata* and *Tagetes minuta*.

Red data species

No red data species were found to be present in this unit due to the transformed condition thereof.

Alien plant species

Acacia podalyriifolia; *Agave americana*; *Canna indica*; *Cereus jamacaru*; *Eucalyptus camaldulensis*; *Gleditsia spp*; *Jacaranda mimosifolia*; *Lantana camara*; *Melia azedarach*; *Morus alba*; *Pennisetum clandestinum*; *Pinus pinaster*.

The following is a list of plant species identified in unit 1a during the survey (🔴=alien invasive species; 🟢=medicinal value; 👁️=Protected species; 🌿=Garden hybrid) (W=woody; G=grass; F=forb):

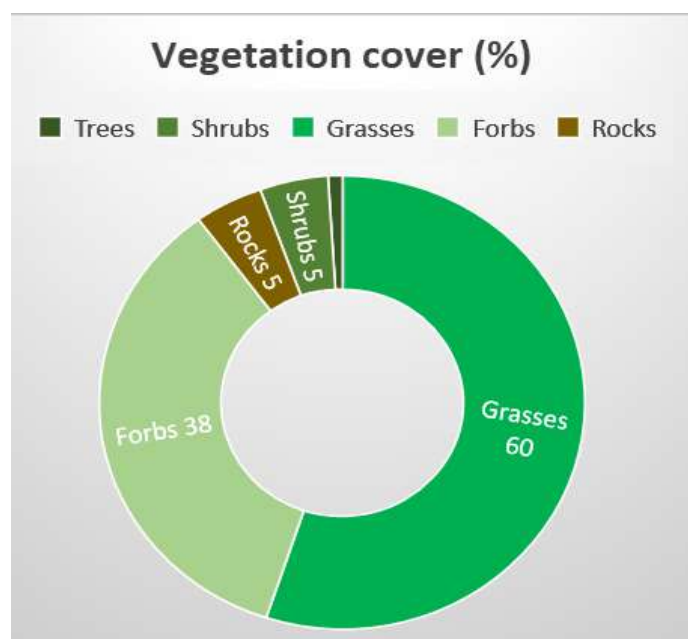
Cat	Species	Class
🔴	<i>Acacia podalyriifolia</i> A.Cunn. ex G.Don	
🔴	<i>Agave americana</i> L.	
	<i>Bidens pilosa</i>	
🌿	<i>Bougainvillea glabra</i> Choisy	
🔴	<i>Canna indica</i> L.	
🔴	<i>Cereus jamacaru</i> DC.	
	<i>Cynodon dactylon</i>	
	<i>Eragrostis curvula</i>	
🔴	<i>Eucalyptus camaldulensis</i> Dehnh.	
🔴	<i>Gleditsia triacanthos</i>	
	<i>Hyparrhenia hirta</i>	
🔴	<i>Jacaranda mimosifolia</i> D.Don	
🔴	<i>Lantana camara</i> L.	
🟢	<i>Lippia javanica</i> (Burm.f.) Spreng.	
🔴	<i>Melia azedarach</i> L.	
🔴	<i>Morus alba</i>	
🔴	<i>Pennisetum clandestinum</i>	
🔴	<i>Pinus pinaster</i> Aiton	
	<i>Rosa species</i>	
	<i>Schkuhria pinnata</i>	
	<i>Tagetes minuta</i>	

4. Wetland



Vegetation structure:	Variable: short grassland to scattered woodland areas		
Topography:	N/A	Soil	Loamy to clayey
Unit size	5.7 ha		
Need for rehabilitation	High-medium		
Conservation Priority	High		

The wetland area forms the western boundary of the northern section and is located in the central part of the southern section. In the northern section it comprises two artificial dams, while the southern section forms a mostly narrow stream with an old but broken farm dam with dense poplar trees in the north. The herbaceous vegetation is dominant with the highest canopy cover (see figure right).



The vegetation is dominated by the grasses *Paspalum dilatatum* and *Paspalum urvillei*, while the forbs *Schoenoplectus corymbosus* and *Cyperus textilis* are prominent. The woody species vary from a high canopy cover of 40% locally to 5% overall and is characterised by the declared alien invader trees *Populus alba* and *Sesbania punicea*. Other species present include the grasses *Sporobolus africana*, *Hyparrhenia hirta* and the forbs *Verbena bonariensis*, *Schkuhria pinnata*, *Typha capensis* and *Berkheya setifera*.

Red data species

No red data species were found to be present in this unit due to the transformed condition thereof.

Alien plant species

Eucalyptus Camaldulensis; *Populus alba*; *Sesbania punicea*; *Verbena bonariensis*

The following is a list of plant species identified in unit 1a during the survey (☠=alien invasive species; +=medicinal value; 👁=Protected species; 🌿=Garden hybrid) (W=woody; G=grass; F=forb):

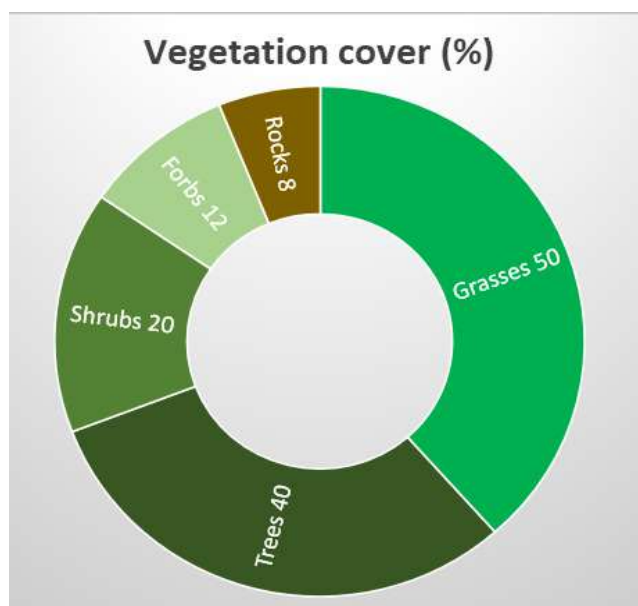
Cat	Species	Class
	<i>Asparagus larycinus</i> Burch.	W
	<i>Berkheya setifera</i> DC.	F
	<i>Cynodon dactylon</i> (L.) Pers.	G
	<i>Cyperus textilis</i> Thunb.	F
	<i>Ehretia rigida</i> (Thunb.) Druce	W
☠	<i>Eucalyptus camaldulensis</i> Dehnh.	W
	<i>Hyparrhenia hirta</i> (L.) Stapf	G
	<i>Paspalum dilatatum</i> Poir.	G
	<i>Paspalum urvillei</i> Steud.	G
☠	<i>Populus alba</i> L.	W
	<i>Searsia lancea</i> L.f.	W
	<i>Schkuhria pinnata</i> (Lam.) Cabrera	F
	<i>Schoenoplectus corymbosus</i> J.Raynal	F
☠	<i>Sesbania punicea</i> (Cav.) Benth.	W
	<i>Sporobolus africanus</i> (Poir.) Robyns & Tournay	G
	<i>Stoebe vulgaris</i> Levyns	W
	<i>Themeda triandra</i> Forssk.	G
+	<i>Typha capensis</i> (Rohrb.) N.E.Br.	F
☠	<i>Verbena bonariensis</i> L.	F
+	<i>Vernonia oligocephala</i> (DC.) Sch.Bip. ex Walp.	F

5. Degraded area



Vegetation structure:	Open woodland		
Topography:	Slight western slope (2°)	Soil	Loam
Unit size	9.1 ha		
Need for rehabilitation	High		
Conservation Priority	Low		

This vegetation unit is a small section in the northern-eastern part of the study site. The area is openly accessible to people and many vagrants and people using the area for informal purposes were noted. The vegetation is dominated by the woody species with a 60% cover followed by the grasses (see figure right). There are some rocks present, and the soil is loamy and shallow to medium deep.



The vegetation is characterised by the prominence of various woody and grass species and include the woody species *Vachellia karroo*, *Acacia mearnsii*, *Melia azedarach*, the grasses *Eragrostis curvula*, *Cymbopogon validus*, *Hyparrhenia hirta* and the forbs *Opuntia ficus-indica*, *Tagetes minuta* and *Richardia brasiliensis*.

Red data species

No red data species were found to be present in this unit due to the transformed condition thereof.

Alien plant species

Acacia mearnsii; *Arundo donax*; *Casuarina cunninghamiana*; *Jacaranda mimosifolia*; *Opuntia ficus-indica*; *Pinus pinaster*; *Solanum mauritianum*; *Tecoma stans*.

The following is a list of plant species identified in unit 1a during the survey (🔴=alien invasive species; 🟢=medicinal value; 👁️=Protected species; 🌿=Garden hybrid) (W=woody; G=grass; F=forb):

Cat	Species	Class
🔴	<i>Acacia mearnsii</i> De Wild.	W
🔴	<i>Arundo donax</i> L.	F
	<i>Bidens pilosa</i>	F
🔴	<i>Casuarina cunninghamiana</i>	W
	<i>Chloris gayana</i> Kunth	G
	<i>Cymbopogon validus</i> (Stapf) Stapf ex Burtt Davy	G
	<i>Digitaria eriantha</i> Steud.	G
	<i>Eragrostis curvula</i> (Schrud.) Nees	G
	<i>Hyparrhenia hirta</i> (L.) Stapf	G
🔴	<i>Jacaranda mimosifolia</i> D.Don	W
🔴	<i>Melia azedarach</i> L.	W
	<i>Melinis repens</i> (Willd.) Zizka	G
🔴	<i>Opuntia ficus-indica</i> (L.) Mill.	F
🔴	<i>Pinus pinaster</i> Aiton	W
	<i>Richardia brasiliensis</i>	F
🔴	<i>Solanum mauritianum</i> Scop.	W
	<i>Tagetes minuta</i> L.	F
🔴	<i>Tecoma stans</i> Juss.	W
🟢	<i>Vachellia karroo</i>	W

RESULTS OF THE FAUNAL SURVEY

The vegetation unit on which the site is situated is **Egoli Granite Grassland (Gm 10)** in various stages of transformation and degradation. The southern portion of the site comprises of homogenous *Hyparrhenia hirta* degraded secondary grassland vegetation has been previously ploughed or utilised for livestock grazing and annual grass harvesting activities. The southern portion is dominated by old agricultural lands dominated by the anthropogenic grass *Hyparrhenia hirta* while the grasses *Aristida congesta* subsp. *barbicollis* and *Cynodon dactylon* are prominent. Other species include the grasses *Eragrostis curvula*, *Cymbopogon caesius*, *Eragrostis gummiflua* and the forbs *Crabbea angustifolia*, *Polygala hottentotica* and *Tagetes minuta*. Several *Aloe greatheadii* individuals occur above a heavily degraded mainly channelled valley bottom wetland. The southern section of the valley bottom wetland has been heavily degraded due on-going livestock (cattle) drinking and grazing activities. An old farm dam occurs on the valley bottom wetland. The N14 bisects the site and the valley bottom wetland. The northern section comprises a heavily degraded mainly un-channelled valley bottom wetland which has been artificially embanked into two permanent dams. A rocky granitic hill or ridge; with a western slope occurs on the central northern portion of the site. The largest section consists of medium to tall open to closed woody vegetation with a moderate canopy cover and a relatively well-developed herbaceous layer for a rocky ridge. The lower-lying footslopes have more open grassland areas with scattered trees. Tree species recorded included *Vachellia karroo*, *Vachellia robusta*, *Searsia lancea*, *Euclea crispa* and *Ehretia rigida* prominent in the woody layer and the grasses *Eragrostis curvula*, *Aristida congesta* subsp. *barbicollis* and *Setaria sphacelata* prominent in the grass layer. The area is very rocky and has large to medium-sized rocks that cover approximately 40% of the area. The soil is shallow loamy. Previously developed areas occur on the south-western portion of the site as well as the entire N14 area. Heavily degraded grasslands occur above the rocky ridge adjacent to the R512. The faunal habitat assessment focused on the remaining natural habitats including the valley bottom wetland and rocky ridge and hill. Limited surveys were conducted in the previous residential or developed areas, degraded grasslands as well as transformed secondary *Hyparrhenia hirta* grasslands due to time constraints.

EXISTING IMPACTS ON FAUNA AND VEGETATION ON THE SITE INCLUDE:

- Change in land use: natural grasslands containing a diversity of vertebrate and invertebrate fauna are converted into agricultural areas; leading to considerable loss of faunal biodiversity.

- Small tracts of indigenous grassland become surrounded by homogenous transformed and degraded grasslands or high-density residential and commercial developments causing fragmentation of previously intact natural habitats.
- The remaining remnants of natural grassland are more susceptible to exotic invasion and degradation due to increased edge effects.
- Habitat fragmentation also eliminates corridors between similar undisturbed habitats.
- The fragmentation of interconnected valley bottom wetlands, hillslope seepage wetlands and drainage lines from each other and their surrounding terrestrial environment threatens species that move between palustrine wetlands and those that require intact terrestrial habitats in close proximity to valley bottom wetlands or streams (e.g. Giant Bullfrog, Cook 2003).
- High density (Cosmo City) and Informal settlements (Zandspruit) occur to the south of the site which results in the over utilization of remaining open grasslands for medicinal plants as well as increased human presence and human disturbances such as illegal dumping, hunting and poaching. The majority of the site is currently un-fenced with several vagrants observed on the property.
- Numerous paths and formal and informal road transverse the areas around the site. Major road networks (N14, R114, R512) can be considered as migratory or dispersal barriers for numerous faunal species including Giant Bullfrogs, Hedgehogs and Owls. The site is bisected by the N14 and bordered by R512
- Fences and walls restrict the natural dispersal movements of several animal species (Giant Bullfrog, South African Hedgehog). A concrete barrier occurs on the eastern boundary adjacent to the R512.
- The valley bottom wetland has been artificially embanked into two permanently inundated dams which has altered the natural hydrological patterns of the seasonally inundated valley bottom wetland. Un-controlled livestock drinking and grazing has resulted in the overgrazing of the hygrophilous grasses and sedges, trampling of the vegetation and compaction of the hydric soils within the valley bottom wetland. Extensive White Polar (*Populus alba*) occurs within the degraded valley bottom wetland and results in stream-flow reduction, narrowing of channel as well as restricting dispersal of certain wetland associated fauna (frogs). The embankments and walls of the dams have been planted with the alien invasive Kikuyu (*Pennisetum clandestinum*).
- The degraded and transformed grassland areas as well as the rocky ridge have become colonised by alien invasive vegetation including Cluster Pine (*Pinus pinaster*, Red River Gum (*Eucalyptus camaldulensis*), Lantana (*Lantana camara*), Kikuyu (*Pennisetum clandestinum**); Tall Fleabane (*Conyza albida*), Khaki Bush (*Tagetes*

minuta), Syringa (*Melia azedarach**), Pom-pom Weed (*Campuloclinium macrocephalum*), and Purple Top (*Verbena bonariensis*).

Amphibians

Amphibians are an important component of South Africa's exceptional biodiversity (Siegfried 1989) and are such worthy of both research and conservation effort. This is made additionally relevant by international concern over globally declining amphibian populations, a phenomenon currently undergoing intensive investigation but as yet is poorly understood (Wyman 1990; Wake 1991). Frog populations throughout the world have crashed dramatically in the last twenty years. Deforestation, wetland draining, and pollution are immediately obvious causes. But other, more fundamental, man-made impacts are causing population declines in 'pristine' habitats such as national parks and remote rainforests. Reductions in atmospheric ozone levels are allowing increased UV-radiation, pollutants are accumulating in natural systems and bacterial and virus distribution is accelerating across the globe (Carruthers 2001). Most frogs have a biphasic life cycle, where eggs laid in water develop into tadpoles and these live in the water until they metamorphose into juvenile frogs living on the land. This fact coupled with being covered by a semi-permeable skin makes frogs particularly vulnerable to pollutants and other environmental stresses. Consequently, frogs are useful environmental bio-monitors (bio-indicators) and may act as an early warning system for the quality of the environment. The Giant Bullfrog (*Pyxicephalus adspersus*) has been chosen as a flagship species for the grassland ecoregion (Cook in le Roux 2002)

Breeding in African frogs is strongly dependent on rain, especially in the drier parts of the country where surface water only remains for a short duration. The majority of frog species in Gauteng Province can be classified as explosive breeders. Explosive breeding frogs utilise ephemeral pans or inundated grasslands for their short duration reproductive cycles.

As the survey was undertaken during daylight hours during the late summer months (April 2021), only a few species of frogs were recorded. Ideally, a herpetological survey should be undertaken throughout the duration of the wet season (November-March). It is only during this period accurate frog lists can be compiled. During this survey; fieldwork was augmented with species lists compiled from personal records; data from the South African Frog Atlas Project (SAFAP) and published data, and the list provided in Table below is therefore regarded as likely to be fairly comprehensive.

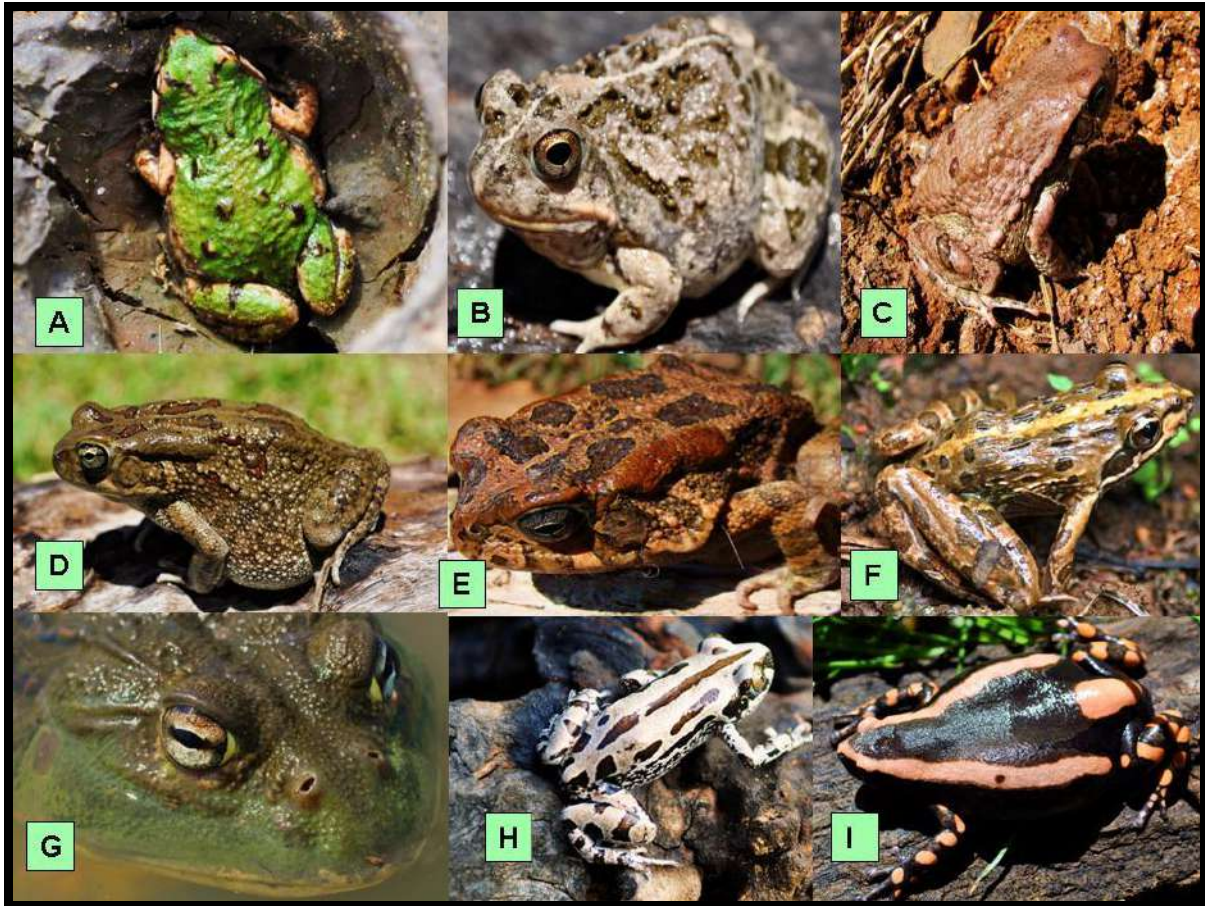


Figure 3. A conglomerate of photographs displaying the frog species recorded by the consultant within the 2727 DD QDGC. **A:** Boettger's Caco (*Cacosternum boettgeri*), **B:** Tremelo Sand Frog (*Tomopterna cryptotis*), **C:** Red Toad (*Schismaderma carens*), **D:** Olive Toad (*garmani*), **F:** Guttural Toad (*Sclerophrys gutturalis*), **G:** Giant Bullfrog (*Pyxicephalus adspersus*), **H:** Bubbling Kassina (*Kassina senegalensis*) and **I:** Banded Rubber Frog (*Phrynomerus bifasciatus*).

Table 2. Frog species recorded by the consultant in the area. Species highlighted in yellow were recorded during current survey. The list has been augmented from surveys conducted on the neighbouring property.

COMMON NAME	SCIENTIFIC NAME	BREEDING HABITAT
Olive Toad	<i>Sclerophrys garmani</i>	Seasonal and permanent wetlands and artificial dams
Guttural Toad	<i>Sclerophrys gutturalis</i>	Seasonal and permanent wetlands and artificial dams. Adult collected adjacent to dam.
Raucous Toad	<i>Sclerophrys capensis</i>	Seasonal and permanent pans, dams
Red Toad	<i>Schismaderma carens</i>	Deeper (>1m) <i>Typha capensis</i> - <i>Phragmites australis</i> seasonal and permanent dams. Juvenile recorded from <i>Cyperus textilis</i> clump in dam 2.
Common Platanna	<i>Xenopus laevis</i>	Seasonal and permanent pans and dams. Adult observed in

		dam1.
Boettger's or Common Caco	<i>Cacosternum boettgeri</i>	Seasonal pans and inundated grassland. Calling from seasonal depression adjacent to dams
Bubbling Kassina	<i>Kassina senegalensis</i>	Seasonal pans and inundated grassland
Tremelo Sand Frog	<i>Tomopterna cryptotis</i>	Seasonal pans and inundated grassland
Banded Rubber Frog	<i>Phrynomantis bifasciatus</i>	Seasonal pans and pools
Natal Sand Frog	<i>Tomopterna natalensis</i>	Seasonal pans and inundated grassland
Giant Bullfrog	<i>Pyxicephalus adspersus</i>	Seasonal pans and pools/ inundated grassland
Delalande's River Frog	<i>Amietia delalandii</i>	Seasonal and permanent wetlands

The site offers suitable foraging and dispersal habitat for three toad species namely Guttural Toad (*Sclerophrys gutturalis*), Olive Toad (*Sclerophrys garmani*) and Raucous Toad (*Sclerophrys capensis*) which could potentially breed in the farm dams on the north-western boundary of the site. Red Toads (*Schismaderma carens*) and calling males of Banded Rubber Frogs (*Phrynomantis bifasciatus*) favour rocky areas as found on the central northern portion of the site. The valley bottom wetland and small borrow-pit on the neighbouring property offers suitable breeding habitat for Tremelo Sand Frogs (*Tomopterna cryptotis*), Natal Sand Frogs (*Tomopterna natalensis*), Common Caco (*Cacosternum boettgeri*), Bubbling Kassina (*Kassina senegalensis*) and possibly Giant Bullfrog (*Pyxicephalus adspersus*). The majority of frog species in the area, including the threatened Giant Bullfrog breed in shallow seasonally inundated pools or depressions which are well vegetated with hygrophilous and hydrophilic grassland and sedge vegetation.

Reptiles

Most knowledge of the reptiles of Gauteng is based on the extensive survey done by N.H.G. Jacobsen (1989); providing a detailed account of all reptiles in the then Transvaal province. This survey resulted in descriptions of life histories, habitat requirements and conservation status and maps of the known distributions. More recent surveys have revealed that 92 reptile species (Whittington-Jones *et al.* 2008) occur in Gauteng Province and of these, 2 species are threatened mainly due to habitat destruction as well as habitat fragmentation.

Comprehensive reptile species lists are impossible to determine without extensive fieldwork over a number of months or even years. No pitfall or funnel trapping was conducted due to time constraints and the survey was based primarily on visual encounters.

This method entails active searching in suitable habitat components such as searching in the different vegetation communities, turning over objects such as logs and loosely embedded rocks, searching in crevices in rocks and bark and replacing all surface objects after examining the ground beneath. Logs, termite mounds and other substrates are not torn apart to minimize disturbance to important habitat elements in the sample unit. Observers note only presence of individuals or sign and identify the detection to the most specific taxonomic level possible. Specimens are only captured when necessary to confirm identification especially of difficult to distinguish species.

The majority reptile species are sensitive to severe habitat alteration and fragmentation. Due to previous agricultural activities in the area coupled with increased habitat destruction for urban expansion, degradation (alien plant invasion) and disturbances are all causal factors in the alteration of reptile species occurring in these areas. The indiscriminate killing of all snake species as well as the illegal collecting of certain species for private and the commercial pet industry reduces reptile populations especially snake populations drastically. The frequent burning of the grasslands on the site will have a high impact on remaining reptiles. Fires during the winter months will severely impact on the hibernating species, which are extremely sluggish. Fires during the early summer months destroy the emerging reptiles as well as refuge areas increasing predation risks.

Because of human presence in the area (vagrants) coupled with habitat destruction and disturbances with historic agricultural activities and more recent increased urban sprawl, alterations to the original reptilian fauna are expected to have already occurred within and adjacent to the Nooitgedacht/Lanseria site. The majority reptile species are sensitive to severe habitat alteration and fragmentation of the open Highveld grasslands as well as quartzite, andesite ridges and granitic and dolomitic rocky outcrops. Due to previous agricultural activities on the site and adjacent area coupled with increased habitat destruction for urban and commercial expansion, degradation (alien plant invasion) and disturbances are all causal factors in the alteration of reptile species occurring in these areas. Illegal collection of reptiles occurs throughout Gauteng Province. The consultant has personally observed the decline in several reptile species within the greater Lanseria study area especially along the Roodekrans Ridge, open Egoli Granite Grasslands and Carletonville Dolomite Grasslands to the north of the N14. These include Aurora House

Snake (*Lamprophis aurora*), Brown House Snake (*Boaedon capensis*), Rhombic Egg-Eater (*Dasypeltis scabra*), Black-headed Centipede Eater (*Aparallactus capensis*), Flap-necked Chamaeleon (*Chamaeleo dilepis*), Transvaal Gecko (*Pachydactylus affinis*), Cape Gecko (*Pachydactylus capensis*) and Leopard Tortoise (*Stigmochelys pardalis*).

Several active termite mounds as well as limited old moribund mounds were observed within the *Hyparrhenia hirta* grasslands and foot-slopes of the rocky ridge. Moribund (old abandoned or dead mounds) termite mounds offer important refuges for certain frog, lizard and snake species (Striped Harlequin Snake). Large number of species of mammal, birds, reptiles and amphibians feed on the emerging alates (winged termites). These mass emergences coincide with the first heavy summer rains and the emergence of the majority of herpetofauna. The granitic rocky hill or ridge situated within the central northern portion of the site offers suitable habitat for several rupicolous (living on or amongst rocks) reptile species. Reptile species recorded within the mostly embedded granitic rocks included Yellow-Throated Plated Lizard (*Gerrhosaurus flavigularis*), Speckled Rock Skink (*Trachylepis punctatissima*), Variable Skink (*Trachylepis (Mabuya) varia*), Southern Rock Agama (*Agama atra*) and Transvaal Thick-toed Gecko (*Pachydactylus affinis*). The wooded rocky ridge provides suitable habitat for the rupicolous Common Girdled Lizard (*Cordylus vittifer*), Lobatse Hinged Tortoise (*Kinixys lobatsiana*), Speke's Hinged Tortoise (*Kinixys spekii*), Rock Monitor (*Varanus albigularis*) as well as Cape Gecko (*Pachydactylus capensis*).

Snake species likely to occur on and around the site include Snouted Cobra (*Naja annulifera*), Mozambique Spitting Cobra (*Naja mossambica*), Black-headed Centipede Eater (*Aparallactus capensis*), Northern Boomslang (*Dispholidus typus viridis*), Spotted Bush Snake (*Philothamnus semivariatus*), Red-lipped Snake (*Crotaphopeltis hotamboeia*), Brown House Snake (*Boaedon capensis*), Brown Water Snake (*Lycodonomorphus rufulus*), Spotted Grass Snake (*Psammophylax rhombeatus*), Striped Grass Snake (*Psammophylax tritaeniatus*), Puff Adder (*Bitis arietans*), Rhombic Night Adder (*Causus rhombeatus*). Population sizes are expected to be low due to high levels of habitat transformation as well as high levels of anthropogenic disturbances. Illegal reptile collecting will have a high impact on the small populations of snake species. No snake species were observed during the site visitation.

Reptile species recorded within the woodland areas on the rocky hill or ridge included Speckled Rock Skink (*Trachylepis punctatissima*), Variable Skink (*Trachylepis varia*), Cape Skink (*Trachylepis capensis*) and Common Dwarf Gecko (*Lygodactylus capensis*). The

woodland patches on the rocky ridge provide suitable habitat for arboreal reptile species such as Flap-necked Chameleon (*Chamaeleo dilepis*), Southern Tree Agama (*Acanthocercus atricollis*), Northern Boomslang (*Dispholidus typus viridis*), Spotted Bush Snake (*Philothamnus semivariegatus*) and Rock Monitor (*Varanus albigularis*).

The degraded southern valley bottom wetland and old farm dam offers limited suitable habitat for any wetland/riverine associated reptiles. The perennial farm dams on the north-western boundary provide suitable habitat for Nile Monitor (*Varanus niloticus*) and South African or Marsh Terrapin (*Pelomedusa galeata*). None were observed during the brief field surveys.



Figure 4. A collage of photographs displaying reptile species recorded by the consultant within the 2527 DD QDGC. **A:** Common Night Adder (*Causus rhombeatus*) feeding on a Raucous Toad (*Sclerophrys capensis*), **B:** White-throated or Rock Monitor (*Varanus albigularis albigularis*) **C:** Black-headed Centipede Eater (*Aparallactus capensis*), **D:** Flap Necked-Chameleon (*Chamaeleo dilepis*), **E:** Transvaal or Thick-toed Gecko (*Pachydactylus affinis*), **F:** Leopard Tortoise (*Stigmochelys pardalis*), **G:** Herald or Red Lipped Snake (*Crotaphopeltis hotamboeia*), **H:** Water Monitor (*Varanus niloticus*) and **I:** Mole Snake (*Pseudaspis cana*).

Table 3. Reptile species recorded from the site (*) and within the Cosmo City, Muldersdrift, Nooitgedacht and Lanseria areas by the consultant during previous surveys (2000-2021). Actual species lists for the site will most likely contain far fewer species due to extensive habitat destruction and degradation and high levels of anthropogenic disturbances on and surrounding the site.

Common Name	Scientific Name	Habitat Requirements
Marsh or helmeted Terrapin	<i>Pelomedusa subrufa</i>	Artificially created dams.
Peter's Thread Snake	<i>Leptotyphlops scutifrons</i>	Fossorial found in soil under rocks or
Incognito Worm Snake	<i>Leptotyphlops incognitus</i>	Logs, in moribund termite mounds.
Jacobsen's Worm Snake	<i>Leptotyphlops jacobseni</i>	Fossorial found in soil under rocks
*Cape Skink	<i>Trachylepis capensis</i>	Terrestrial digging tunnels in loose sand at the base of bushes or boulders, also favours dead trees and fallen Aloes.
* Speckled Rock Skink	<i>Trachylepis punctatissima</i>	A mostly rock-living diurnal skink the Spotted Skink often occurs in association with man-made structures where it is able to find refuge and food and may be unwittingly translocated in boxes, firewood and other items where it has taken refuge
Wahlberg's Snake-eyed skink	<i>Panapsis wahlbergii</i>	Amongst grass roots under rotting logs and around stones and old termitaria (Moribund) on broken ground. Eats termites and other small insects.
Rainbow Skink	<i>Trachylepis margatifer</i>	Rupicolous species on exposed granite domes and other hard rock faces (quartzite and some diabase and slate). Very active and males are territorial.
*Variable Skink	<i>Trachylepis varia</i>	Another terrestrial and diurnal skink, the Variable Skink is widespread although not very frequently recorded from disturbed habitats. It occupies a wide variety of habitats where there is sufficient vegetative cover. It takes refuge in a wide range of shelters including under rocks on soil, in crevices, under building rubble and in the burrows of other animals.
Common Rough-scaled Lizard	<i>Ichnotropis squamulosa</i>	Active hunters on sandy flat clearings and dig branching burrows in soft sand, usually at the base of <i>Vachellia</i> and <i>Senegalia</i> trees as well as grass tussocks.
Spotted Sand Lizard	<i>Pedioplanis lineoocellata</i>	Prefer flat rocky veld. Shelter is small burrows dug underneath a flat rock.
*Transvaal Thick-toed gecko	<i>Pachydactylus affinis</i>	Rocky outcrops and old termite mounds.
Cape Thick-toed Gecko	<i>Pachydactylus capensis</i>	Rocky outcrops, under logs and old termite mounds as well as houses.

*Cape Dwarf Gecko	<i>Lygodactylus capensis</i>	Well-wooded savanna but also thrives in urban areas.
*Yellow-throated Plated Lizard	<i>Gerrhosaurus flavigularis</i>	A common and widespread terrestrial lizard, usually associated with a dense ground cover. They dig burrows at the base of bushes, under boulders and also under rubbish piles. They often take refuge in the burrows of other animals
Transvaal Girdled Lizard	<i>Cordylus vittifer</i>	The Transvaal Girdled Lizard is rupicolous and restricted to rocky outcrops, inhabiting fissures between rocks and under rocks.
Distant's Ground Agama	<i>Agama aculeata distanti</i>	Terrestrial but will often climb in a low shrub to bask. A short hole dug at the base of a bush or under a rock serves as a retreat.
Distant's Ground Agama	<i>Agama aculeata distanti</i>	Terrestrial but will often climb in a low shrub to bask. A short hole dug at the base of a bush or under a rock serves as a retreat.
Southern Rock Agama	<i>Agama atra</i>	Rupicolous living on rocky outcrops and even shelter under the bark of a tree.
Rock Monitor	<i>Varanus albigularis</i>	Terrestrial but will often climb trees and may spend a large proportion of their time on rocky outcrops. They usually have a retreat in a rock fissure, a hole in a tree, animal burrows or in a termitarium.
Water Monitor	<i>Varanus niloticus</i>	Terrestrial semi-aquatic lizards usually found close to water.
Flap-necked Chameleon	<i>Chamaeleo dilepis</i>	Arboreal species found in moist and dry savannah and woodlands
Southern Stiletto Snake or Bibron's Burrowing Asp	<i>Atractaspis bibronii</i>	A burrowing (fossorial) species usually found in deserted (moribund) termite mounds, under rotting logs or beneath sun-warmed rocks.
Herald or red-lipped Snake	<i>Crotaphopeltis hotamboeia</i>	A common and widespread nocturnal snake, the Herald Snake feeds on frogs and toads which it finds around houses and in moister areas. Takes refuge under rocks and in moribund termitaria and in building rubble but may rest up by day in a variety of cover.
Rinkhals	<i>Haemachatus Haemachatus</i>	The Rinkhals is a widespread snake primarily inhabiting moister areas in Highveld grassland. Although formerly common in parts of its range, its habitat has been depleted by urban expansion. It tends to inhabit the burrows of other animals and is mostly nocturnal although basking in the sun during the day. Feeds mostly on amphibians and rodents

Mole Snake	<i>Pseudopsis cana</i>	Adults may reach 2m in length but are mostly smaller in this area. A diurnal snake they feed on mice and rats and also African Molerats which are widespread. It takes refuge within the burrows of other animals.
Rhombic Night Adder	<i>Causus rhombeatus</i>	Favours damp environments in moist savanna where it seeks refuge in old termite mounds, under logs and large flat stones as well as amongst building rubble.
Common Egg Eater	<i>Dasypeltis scabra</i>	A common and widespread nocturnal snake, the Common Egg-eater is largely dependent on dead termitaria on the Highveld where little other cover is available. It will also shelter under rocks, in crevices, under building rubble and in a variety of other refuges when available. The snake is dependent on bird's eggs as a source of food which they locate by means of a fine sense of smell.
Brown House Snake	<i>Lamprophis fuliginosus</i>	Frequents human habitation as well as under loosely embedded rocks.
Aurora House Snake	<i>Lamprophis aurora</i>	Favours moist grassland habitat adjacent to wetlands/valley bottom; often use moribund termite mounds in grassland; loosely embedded rocks
Spotted Grass Snake/ Skaapsteker	<i>Psammophylax rhombeatus</i>	A common and widespread diurnal snake mostly in highveld grassland it feeds on lizards and small rodents. It is often seen foraging in rocky and moist areas but takes refuge under rocks, in dead termitaria, old building rubble and animal burrows sometimes in the company of other snakes. Feeds mostly on frogs, lizards and rodents
Striped Grass Snake/ Skaapsteker	<i>Psammophylax tritaeniatus</i>	A common and widespread diurnal snake mostly in highveld grassland it feeds on lizards and small rodents. It is often seen foraging in rocky and moist areas but takes refuge under rocks, in dead termitaria, old building rubble and animal burrows sometimes in the company of other snakes. Feeds mostly on frogs, lizards and rodents
Cape or Black-Headed Centipede Eater	<i>Aparallactus capensis</i>	A burrowing (fossorial) species usually found in deserted (moribund) termite mounds, under rotting logs or beneath sun-warmed rocks.
Spotted Bush-Snake	<i>Philothamnus</i>	Moist savannah, forests, urban

	<i>semivariegatus</i>	areas
Short-snouted Whip Snake	<i>Psammophis brevirostris</i>	Grassland and moist savanna that dashes for cover when disturbed. May also venture into low shrubs to bask.
Crossed Whip Snake	<i>Psammophis crucifer</i>	Moist savanna seeking refuge under stones or disused termitaria.
Common Brown Water Snake	<i>Lycodonomorphus rufulus</i>	A nocturnal, aquatic snake confined to damp localities near streams and rivers.
Sundevall's Shovel-snout	<i>Prosymna sundevalli</i>	Found in old termite mounds and under rocks
Common Slug-eater	<i>Duberria lutrix</i>	Grassland species that favours damp localities often found under rocks, logs, grass tufts and vegetation.
Common or Cape Wolf Snake	<i>Lycophidion capense</i>	Moist savanna and grassland and is fond of damp localities and is often found under stones, logs, piles of thatch grass, rubbish heaps or in deserted termite mounds.
Puff Adder	<i>Bitis arietans</i>	Rocky areas within grasslands/savanna.
Southern African Python	<i>Python natalensis</i>	Widespread in bushveld, savanna and forest. Some evidence suggests that the species has recently extended its range southwards in Gauteng and in the Northern Cape, possibly as a result of climatic warming (Alexander 2007).
Leopard Tortoise	<i>Stigmochelys pardalis</i>	Semi-arid savannas to grassland
Spekes' Hinged Tortoise	<i>Kinixys spekii</i>	Vachellia and Combretum woodlands as well as bushveld
Lobatse Hinged Tortoise	<i>Kinixys lobatsiana</i>	Savannahs and dry bush with rocky areas.

Avifauna/Birds

A comprehensive bird species list requires intensive surveys compiled over several years. Numbers of bird species in the Nooitgedacht-Lanseria-Cosmo-City-Lion Park areas have declined mainly due to increased levels of human disturbances; extensive habitat transformation due to increased urban sprawl and agricultural activities; as well as severe habitat degradation of the wetlands as well as rivers (especially the tributaries of the Crocodile River). Human activity has transformed grasslands in South Africa to a point where few pristine examples exist (Low & Rebelo 1996; Barnes 1998). Factors such as agricultural intensification, increased pasture management (overgrazing), decrease in grassland management due to frequent fires and extensive land-use alteration (urbanisation and land invasion).

Continuing pressure as well as high levels of anthropogenic disturbances on remaining fragmented open grasslands and sensitive wetlands are largely responsible for the decline of the threatened avifaunal species in the area.

Three-hundred and two (302) bird species have been recorded from the 2555_2750 pentad in which the Nooitgedacht/Lanseria site is situated. Seventy-two (72) bird species were recorded during the brief field survey (total 8 hours). The list for the site has been augmented from surveys conducted on the neighbouring property. Species recorded during the field survey are common, widespread and typical of fairly uniform degraded grassland, scattered bush clumps, rocky woodland and transformed and degraded river/wetland habitat.

Bird species observed within the open *Hyparrhenia hirta* grasslands on the southern portion of the site included Northern Black Korhaan, Zitting Cisticola, Black-chested Prinia, Rufous-naped Lark, Common Fiscal, Cattle Egret, Hadedah and granivores such as Cape Turtle Dove, Laughing Dove, Speckled Pigeon and Southern Masked Weaver.

Bird species recorded from the central, northern rocky hill and woodland included Black-backed Puffback, Arrow-marked Babbler, Dark-capped Bulbul, Go-away-bird, Black-collared Barbets, Crested Barbets, Red-faced Mousebirds, Speckled Mousebird, Green Wood-Hoopoe, Spotted Flycatcher, African Paradise Flycatcher, Greater and Lesser Honeyguides and Black-headed Oriole. The alien woodland include dense White Poplar (*Populus alba*) stands, *Syringa* (*Melia azedarach*) woodlands and several large scattered Red River Gums *Eucalyptus camaldulensis* provide suitable roosting habitat for Yellow-billed and Black Kites, European Bee-eaters as well as Helmeted Guineafowls. The artificially embanked dams on the north-western boundary provide suitable habitat for certain waterfowl. Bird species recorded included Malachite Kingfisher, Red-nobbed Coot, Reed Cormorant, Grey Heron, Sacred Ibis, and exotic geese (introduced). No significant reed beds occur for nesting and roosting for weavers and waxbills. No owls were flushed from the overgrazed and trampled hygrophilous grasses within the valley bottom wetland on the southern and northern portions of the site. No raptors were observed during the brief site visits.

Mammals

The mammal survey was based primarily from a desktop screening perspective and field verification (8 hours) assessing the habitat availability during daylight hours. No small mammal trapping or camera trapping was conducted during the site visitations. Fieldwork was augmented with previous surveys in similar habitats within the Cosmo City-Muldersdrift-Nooitgedacht-Lanseria area as well as published data. The area was initially traversed on foot to ascertain the presence of available refuges, spoor or droppings within the open secondary *Hyparrhenia hirta* grasslands, wooded rocky ridge and degraded valley bottom wetland and dams. For medium and large mammals, visual encounters of the actual animal as well as spoor or tracks, scat, foraging marks were noted and used for species identification.

The wooded rocky ridge or hill provides favourable habitat for rupicolous mammal species such as the Rock Elephant Shrew (*Elephantulus myurus*), Jameson's Red Rock Rabbit (*Pronolagus randensis*), Woodland Doormouse (*Graphiurus murinus*), Namaqua Rock Mouse (*Aethomys namaquensis*), Small-spotted Genet (*Genetta genetta*), Chacma Baboon (*Papio ursinus*) and Rock Hyrax (*Procavia capensis*). The scattered woodland patches and limited sections of the riparian zone of the non-perennial drainage line provide suitable habitat for Vervet Monkeys (*Cercopithecus aethiops*). The *Vachellia robusta* and *Vachellia karoo* woodlands on the eastern slopes of the rocky ridge provides suitable habitat for Lesser Bushbaby (*Galago moholi*). A scat of a Slender Mongoose (*Galerella sanguinea*) was observed within the mid-slopes of the rocky ridge to the west of the site.

Antelope species recorded from the area include Bush or Common Duiker (*Sylvicapra grimmia*) droppings within the wooded pockets and wooded rocky ridge on the central western boundary of the site. A Steenbok (*Raphicerus campestris*) was flushed from the open grasslands to the west of the site. The population sizes of larger mammal species will depend on the current levels of anthropogenic disturbances as well as illegal poaching within the site and neighbouring properties. High levels of anthropogenic disturbances are expected due to several vagrants living on or adjacent to the property. Several wire and nylon snares were observed during the site visits within the wooded rocky ridge. The illegal hunting with dogs cannot be eliminated as the site is unfenced. Presence of feral cats is also highly likely.

The open *Hyparrhenia hirta* grasslands on the southern portion of the site provide suitable habitat for smaller rodents including Striped mouse (*Rhabdomys pumilio*), Multimammate

Mouse (*Mastomys coucha*), Bushveld Gerbil (*Gerbilliscus leucogaster*), Highveld Gerbil (*Gerbilliscus brantsii*), Grey Climbing Mouse (*Dendromus melanotus*) and Fat Mouse (*Steatomys pratensis*). The scattered termite mounds within the open grasslands provide suitable habitat for Least Dwarf Shrew (*Suncus infinitesimus*). The old agricultural lands offer suitable habitat for Striped Polecats (*Ictonyx striatus*) and Black-backed Jackal (*Canis mesomelas*).

Mammal species observed within the secondary succession degraded *Hyparrhenia hirta* grasslands on the site included scattered African Molerat (*Cryptomys hottentotus*) mounds as well as possible burrows of Natal Multimammate Mouse (*Mastomys coucha*). A Scrub Hare (*Lepus saxatilis*) was flushed from the dense *Hyparrhenia hirta* grasslands. A Yellow Mongoose (*Cynictis penicillata*) was observed darting within the undulating *Hyparrhenia hirta*-*Melinis repens* grasslands on the neighbouring property to the west of the site.

The mesic or hydrophilic grasslands adjacent to the lower-lying seasonal drainage line on the southern as well as limited areas above the in-flow to the artificially embanked dams on the north-western boundary provides suitable habitat for Striped mouse (*Rhabdomys pumilio*), Veld Rat (*Aethomys chrysophilus*), Greater Canerat (*Thryonomys swinderianus*), Swamp Musk Shrew (*Crocidura mariquensis*), and Vlei Rat (*Otomys sp.*).

The site was also surveyed for the following wetland associated mammals:

Cape Clawless Otters (*Aonyx capensis*)

The permanent dams and White Poplar invaded valley bottom wetland upstream from the site provides suitable refuge and dispersal habitat for any remaining Cape Clawless Otters. The dams contain suitable prey items including crabs, frogs, fish and other aquatic life. High levels of anthropogenic disturbances as well as major road networks are immediate threat to remaining Cape Clawless Otters. No evidence (scats or spoor) of otters were observed within the southern and northern valley bottom wetland and artificially created dams.

Spotted-necked Otter (*Lutra maculicollis*)

Spotted-necked otters are adapted ideally to an aquatic life and are confined to the larger river systems, dams, lakes and swamps which have extensive areas of open water. No suitable habitat occurs for this species on the actual site or surrounding area.

Water or Marsh Mongoose (*Atilax paludinosus*)

The permanent dams and White Poplar invaded valley bottom wetland upstream from the site provides suitable for Water/ Marsh Mongoose. The dense reed beds offer suitable

refuge habitat for Water Mongooses. The dams contain suitable prey items including crabs, frogs, fish and other aquatic life. High levels of anthropogenic disturbances as well as major road networks are immediate threat to remaining Marsh Mongoose. No evidence (scats or spoor) of otters were observed along the southern or northern valley bottom wetland and artificially created dams.

Rough-haired Golden Mole (*Chrysothalax villosus*)

Limited suitable habitat occurs on the site in the form of the grassy margins and sandy soils above seasonally and temporary inundated wetland areas above the artificially created dams on the north-western boundary as well as the southern mainly channelled valley bottom wetland. Uncontrolled livestock drinking, grazing and trampling activities as well as previous agricultural activities restricts the suitability of the site.

African Marsh Rat or Water Rat (*Dasymys incomtus*)

Marginally suitable habitat occurs along the reed beds around permanent dams.

Vlei Rat (*Otomys irroratus*)

Suitable habitat exists on the site within the reed beds within the permanent dams as well as among the semi-aquatic grasses (*Paspalum* spp., *Sporobolus* sp.) within the valley bottom wetland and artificially created dams. No runs or saucer shaped nests were observed on higher lying ground or in clumps of grass. No feeding areas were noted (short discarded grass stems) on the site.

No evidence of any wetland associated mammals were observed within the degraded southern valley bottom wetland, northern valley bottom wetland and artificially created dams. .

Bat species recorded from the area include Egyptian Free-tailed Bat (*Tadarida aegyptiaca*), Rusty Bat (*Pipistrellus rusticus*), Cape serotine bat (*Eptesicus capensis*), Yellow House Bat (*Scotophilus dinganii*), Common Slit-faced Bat (*Nycteris thebaica*). No specialist mammal surveys were undertaken during the current faunal habitat assessment.



Figure 5. A collage of photographs* of smaller mammal species likely to occur on the site. **A:** Highveld Gerbil (*Gerbilliscus brantsii*) are likely to occur within the open grasslands adjacent to the seasonal drainage line to the south and east of the site; **B:** Yellow Mongoose (*Cynictis pencilata*) was recorded from the grasslands to the east of the site. **C:** Suitable habitat for Striped Mouse (*Rhabdomys pumilio*) occurs within the grasslands and low-lying rocky ridge. **D:** Scrub Hares (*Lepus saxatilis*) was flushed from the rank *Hyparrhenia hirta* grassland on the site.

* photographs courtesy of Prof. G.D. Engelbrecht

Table 4. Mammal species recorded, or likely to occur, on site and surrounding area using alternative habitats as indicators of possible species present. Actual species lists will most likely contain far fewer species due to extensive habitat destruction and degradation as well as current high levels of anthropogenic activities on and surrounding the site.

COMMON NAME	SCIENTIFIC NAME
Tomb Bat	<i>Taphozous mauritanus</i>
Transvaal free-tailed Bat	<i>Tadarida ventralis</i>
Egyptian free-tailed Bat	<i>Tadarida aegyptiaca</i>
Cape Serotine Bat	<i>Eptesicus capensis</i>
Yellow House Bat	<i>Scotophilus dinganii</i>
Lesser Yellow House Bat	<i>Scotophilus borbonicus</i>
Reddish-grey Musk Shrew	<i>Crocidura cyanea</i>
Tiny Musk Shrew	<i>Crocidura fuscomurina</i>
Swamp Musk Shrew	<i>Crocidura mariquensis</i>
Least Dwarf Shrew	<i>Suncus infinitesimus</i>
South African Hedgehog	<i>Atelerix frontalis</i>
*Scrub Hare	<i>Lepus saxatilis</i>
*House Mouse	<i>Mus musculus</i>
*Common Molerat	<i>Cryptomys hottentotus</i>
Angoni Vlei Rat	<i>Otomys angoniensis</i>
Vlei Rat	<i>Otomys irroratus</i>
Striped Mouse	<i>Rhabdomys pumilio</i>
Water Rat	<i>Dasymys incomtus</i>
Pygmy Mouse	<i>Mus minutoides</i>
*Multimammate Mouse	<i>Mastomys coucha</i>
Namaqua Rock Mouse	<i>Aethomys namaquensis</i>
Red Veld Rat	<i>Aethomys chrysophilus</i>
**House Rat	<i>Rattus rattus</i>
Highveld Gerbil	<i>Gerbilliscus brantsii</i>
Grey Climbing Mouse	<i>Dendromus melanotis</i>
Brant's Climbing Mouse	<i>Dendromus mesomelas</i>
Chestnut Climbing Mouse	<i>Dendromus mystacalis</i>

Fat Mouse	<i>Steatomys pratensis</i>
Porcupine	<i>Hystrix africaeaustralis</i>
African Weasel	<i>Poecilogale albinucha</i>
Striped Polecat	<i>Ictonyx striatus</i>
Large-spotted Genet	<i>Genetta tigrina</i>
*Yellow Mongoose	<i>Cynictis penicillata</i>
*Slender Mongoose	<i>Galerella sanguinea</i>
Water or Marsh Mongoose	<i>Atilax paludinosus</i>
Black-backed Jackal	<i>Canis mesomelas</i>
Common Duiker	<i>Sylvicapra grimmia</i>

* Field observations of mammal species recorded on the site and surrounding vicinity during the brief site visit (27th of April 2021). Identification was determined by visual observation and animal tracks (footprints and droppings).

** **introduced species**

DISCUSSION

VEGETATION

Vegetation type

The vegetation of the study is classified as belonging to the endangered Egoli Granite vegetation type (Gm10) (Mucina & Rutherford 2006). Egoli Granite Grasslands in the Gauteng Province are highly threatened and are listed as Endangered. Only a small fraction (3%) of this vital habitat has been formerly conserved within Gauteng. These grassland areas form vital habitats for numerous animal and plant species. The vegetation of this endangered ecosystem is characterized by the dominance of the grass *Hyparrhenia hirta* but has a high species richness and diversity with some rocky outcrops in-between (Bredenkamp, Brown & Phab 2006; Mucina & Rutherford 2006). Species common for this vegetation type include *Aristida canescens*, *Digitaria monodactyla*, *Themeda triandra*, *Setaria sphacelata*, *Eragrostis curvula*, *Eragrostis chloromelas*, *Heteropogon contortus*, *Melinis repens*, *Monocymbium cerasiiforme*, *Becium obovatum*, *Helichrysum rugulosum*, *Nidorella hottentotica*, *Berkheya insignis*, *Crabbea hirsuta*, *Cyanotis speciosa* and *Kohautia amatymbica*.

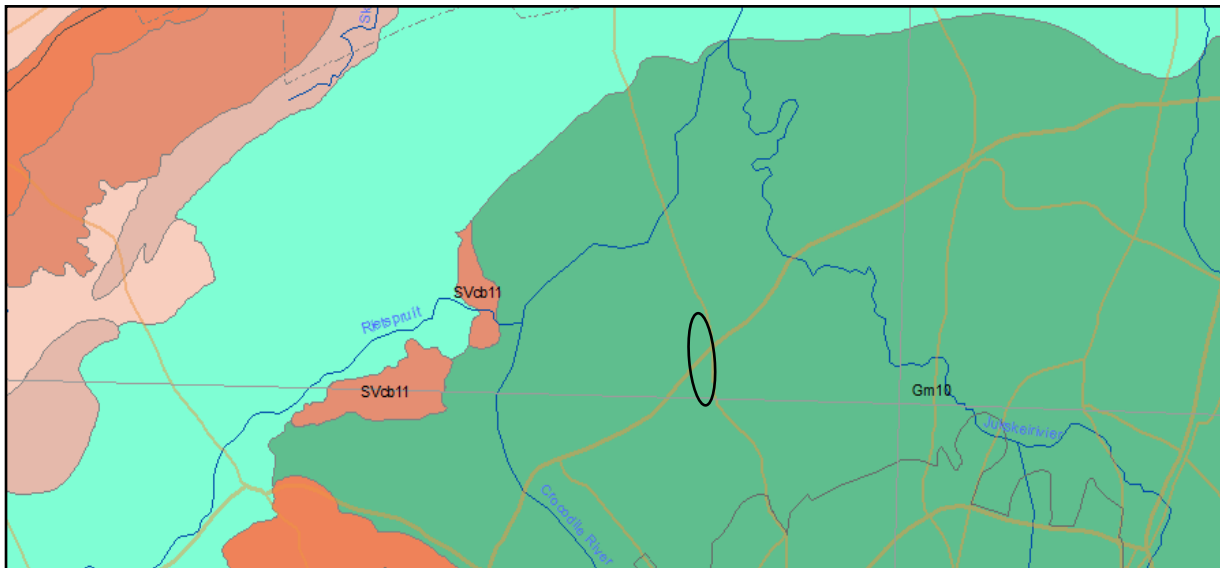


Figure 6. Approximate location (black circle) of the study area within the Egoli Granite Grassland (Gm10) vegetation type (image obtained Mucina & Rutherford, 2006).

Of the target of 24% to be conserved only 3% is statutorily conserved. Several private conservation areas and the Walter Sisulu Botanical Garden contribute to the protection of

this vegetation type. It is estimated that more than two thirds of this unit have been transformed by urbanization, cultivation and roads.

The vegetation of the study area is degraded and shows little resemblance with the original vegetation type due to various anthropogenic influences.

Vegetation units

The **Rocky Ridge (vegetation unit 1)**, is located in the northern section of the study area with shallow soil and medium sized granite boulders. The area is somewhat isolated with industrial developments in the north, a degraded area in the east with old fields in the south and west, though the wetland area is close to a section of it in the west. Various vagrants were found to be present within the ridge and plant harvesting was observed during the site visit. At the bottom section of this unit close to the wetland/dam area old graves were also noted. The vegetation is dominated by the tree *Vachellia robusta* with various other woody species present. The herbaceous layer is well-developed in the open areas between the trees with various grass and forb species present. Due to the various anthropogenic influences, there area a number of declared alien invader species present that are scattered throughout the area. Old graves were also noted in the area next to the dam along the western boundary (see photo right). The area has a moderate slope and the rock cover is high throughout this vegetation unit protecting the woody species against fire which has resulted in the woody vegetation establishing on this ridge. Rocky ridges are important ecosystems in that they provide a diverse array of habitats for both plants and animals with various micro habitats as well as climatic conditions present. The degraded sections within this



unit should be rehabilitated and the alien plant species removed. From a plant ecological and ecosystem functioning point of view this unit has a **high conservation value and ecosystem functioning**.

The **Old fields (vegetation unit 2)** comprises the largest area of the study site and is located in the southern and northwestern sections of the site. These areas have been ploughed and planted in the past and actively cultivated. These old fields have been left fallow for many years and as a result the anthropogenic grass became dominant and will remain like that for more than 50 years unless rehabilitation activities involving high financial input are implemented. The area is also grazed by cattle from the local community which has resulted in the establishment of small grazing lawns dominated by the grass *Cynodon dactylon* (see photo right). This vegetation unit has a low species richness, with almost 90% of the species being pioneer/secondary successional species indicating the degraded condition of the vegetation. This vegetation unit has no resemblance to the original natural vegetation and is therefore from a plant ecological and ecosystem functioning point of view as having a **low conservation value and ecosystem functioning**.



The **Developed areas (vegetation unit 3)** consists of an old homestead area that was planted with trees and shrubs many years ago. Many of these woody species are declared alien invader trees while a few indigenous woody species are present. The herbaceous layer is degraded and comprises pioneer weedy species and secondary successional grasses. This area also includes the N14 highway and off ramp that are transformed. These areas have no resemblance to any natural vegetation and has a **low conservation value and ecosystem functioning**.

The **Wetland area (vegetation unit 4)** is located along the western boundary of the study area and comprises three artificial farm dams. The dam areas have in the past been planted with the invasive kikuyu grass (*Pennisetum clandestinum*) to stabilise the dam walls. These areas are permanently wet and provide habitat for various aquatic and insect species. The area is grazed by cattle that roam freely along the dams and adjacent grassland areas. The vegetation is typical of wetland areas though various alien species are also present. The wetland area in the southern section of the study site is located in the centre of the site. In the northern section there is an old broken dam wall as well as an old borrow pit that are seasonally wet with a dense *Populus alba* stand (see photo next page). The wetland forms a narrow to medium wide (2-3 m) section in the rest of the site. The area is freely grazed by cattle that have trampled large sections laying the clay soil bare. The

wetland areas do not have a high plant species richness and many areas are degraded. Although the vegetation is degraded, these systems play an important role in channelling and storing water hence it is regarded as having a **high conservation value and ecosystem functioning**.



Vegetation unit 5 (Degraded area) is located in the north-eastern section of the study site. The area is an open site that is easily accessible by people and as a result there is some rubble and litter as well as various informal roads. A number of vagrants were observed in this section as well as old ruins of buildings that existed on this area. The vegetation is characterised by the prominence of a large number of alien invasive plants as well as pioneer and secondary successional grass and forb species. The unit has a low species richness and most species are either declared alien invader species or pioneer/secondary successional species. From a plant ecological and ecosystem functioning point of view this unit has a **low conservation value and ecosystem functioning**.

Topography and drainage

With the wetland in the central part of the study site, the area slopes from both east to west and west to east towards the wetland (average slope 1.7°). Surface water drains towards the wetland with perennial stream in central part of the site. Water is channelled in a northerly direction by the wetland/stream. The terrain is relatively flat along the slopes though old ploughing furrows in sections give it an undulating appearance in sections.



Figure 7. Topography and drainage of the study site (Image obtained from SANBI 2021).

Connectivity

The study site is surrounded by industrial and residential developments towards the north, east, and west (Figure 8) and agricultural areas and degraded areas in the west and south with little connectivity to any natural vegetation (Figure 8).



Figure 8. Connectivity of the study site (Yellow = Developments; Purple = agricultural areas) (Source: Google Earth 2021).

Ecosystem classification

According to GDARD C-Plan ver 3.3 the south-western part of the study area is classified as a Critical Biodiversity Area (CBA important) and a large section of the western part as an Ecological Support Area (ESA) (Figure 9). A CBA is regarded as an area that need to be maintained in as natural condition as possible to meet the region's biodiversity target. An ESA is an area that has been subjected to some degradation and although no longer intact, it is largely natural and important to support CBA's and to maintain landscape connectivity (Desmond *et al.*, 2013). Both the CBA and ESA areas are degraded and dominated by the anthropogenic grass *Hyparrhenia hirta* of vegetation unit 2 which is regarded as degraded.



Figure 9. Ecosystem classification according to GDARD C-Plan ver 3.3 (Light Green = ESA; Dark Green = CBA) (Source: SANBI GIS, 2021).

According to LUDS (2021) the site is classified as follows:

Table 5: Land Use Decision Support (SANBIGIS, 2019) classification of the site.

Description	Result
Vegetation type	Egoli Granite Grassland (Gm 10)
National Soil Class	Undifferentiated structureless soils. Soil Class: S17
Sub-quaternary catchments	(2) 1162; 1167 Upstream
Wetland Units	None
River units	None
Formal Protected areas	None
Informal protected areas	None
CBA & ESA units	6

Red data species

The presence of a subpopulation of a species of conservation concern on a site is used as an indicator amongst other, of the sensitivity of the vegetation ecosystem. If such a species is found to be present, the competent authority may refuse authorisation for the proposed

activity or require mitigation measures to be implemented. Lists of red data species are normally acquired via various resources and if no specific recording was made/confirmed on the site, lists obtained from Quarter Degree Grids (QDSG) are used as a broad guideline. At this broad scale, the list will include species that may not necessarily be found on the proposed site since no suitable habitat exists. These lists therefore provide broad guidelines only but are nonetheless useful tools to assess the habitat suitability of the site for these species.

According to the lists supplied by GDARD as well as that obtained from literature there is no red data species recorded within a 5km radius from the site although a total of 18 red data plant species that were recorded in the QDG for the study area. The confidential list of GDARD is included as Annexure 1. No listed species were found to be present within study area (Annexure 1).

Previous land use

The study area has been subjected to various agricultural and anthropogenic practices in the past. All the grassland areas have been ploughed and / or mowed and grazed while the degraded area (vegetation unit 5) has been used for dumping and informal settlements (Figure 10).

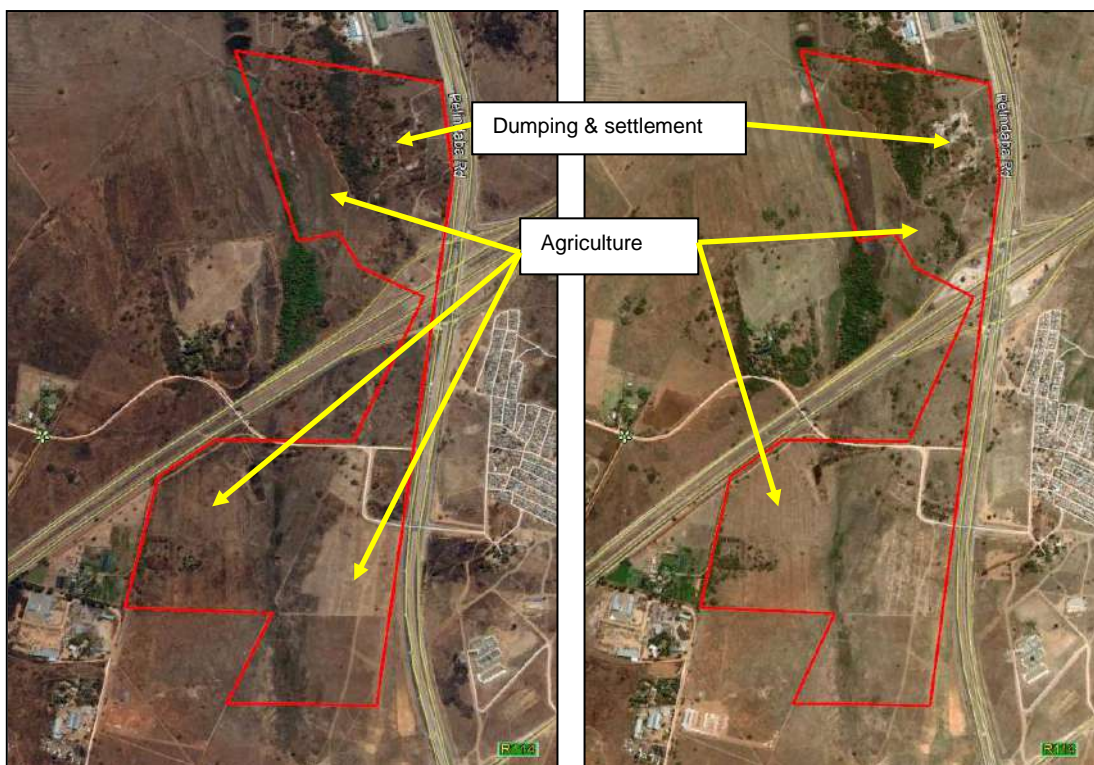


Figure 10. Various anthropogenic influences on the study area over the years indicating ploughing/mowing and dumping (Source: Google Earth).

Alien plant species

A large number of declared alien invasive species were noted throughout the area and are listed below:

Species	CARA	NEMBA	Vegetation units				
			1	2	3	4	5
<i>Acacia mearnsii</i> De Wild.	2	2					●
<i>Acacia podalyriifolia</i> A.Cunn. ex G.Don	3	1b			●		
<i>Agave americana</i>	2	Not listed			●		
<i>Arundo donax</i> L.	1	1b					●
<i>Canna indica</i>	1	1b			●		
<i>Casuarina cunninghamiana</i> Miq.	2	1b / 2					●
<i>Cereus jamacaru</i> DC.	1	1b	●		●		
<i>Crotalaria agatiflora</i> Scheinf.		1b		●			
<i>Eucalyptus camaldulensis</i> Dehnh.	1	2			●	●	
<i>Gleditsia triacanthos</i>	2	1b			●		
<i>Jacaranda mimosifolia</i> D.Don	3	1b natural areas; not listed urban			●		●
<i>Lantana camara</i> L.	1	1b			●		
<i>Melia azedarach</i> L.	1b	3	●		●		●
<i>Morus alba</i> L.	3	3			●		
<i>Opuntia ficus-indica</i>	1b	1	●				●
<i>Pennisetum clandestinum</i> Chiov.	1b	not listed			●		
<i>Pinus pinaster</i> Schltld. & Cham.	1b	2		●	●		●
<i>Populus alba</i> L.		2				●	
<i>Sesbania punicea</i> (Cav.) Benth.	1	1b				●	
<i>Solanum mauritianum</i> Scop.	1b	1	●				●
<i>Tecoma stans</i>	1	1b					●
<i>Verbena bonariensis</i> L.		1b				●	

Vegetation units 3 and 5 have the most declared alien invader species and pose a risk to the surrounding environments, while the large *Populus alba* stands in vegetation unit 4 is reason for concern since it is slowly taking over the entire wetland system.

Medicinal plants

Only seven (7) medicinal plant species were recorded on the study site and are listed in the table below.

Plant name	Plant part used	Medicinal use	Vegetation unit
<i>Aloe greatheadii</i>	Leaf sap	Treat skin irritations, bruises and burns.	1; 2
<i>Gomphocarpus fruticosus</i>	Leaves, sometimes roots	Headache, stomach pain, tuberculosis.	2
<i>Lippia javanica</i>	Leaves & twigs	Coughs, cold, stomach	3

		problems, bronchitis, headaches	
<i>Pellaea calomelanos</i>	Leaves and rhizomes	Smoked for olds, asthma. Also used for coughs and kidney problems	1
<i>Typha capensis</i>	Fleshy rhizomes	Diarrhea, dysentery, male potency enhancer, blood circulation improvement	4
<i>Vachellia karroo</i>	Leaves, bark and gum	Diarrhoea & dysentery Gum: colds, oral thrush & haemorrhage.	5
<i>Vernonia oligocephala</i>	Leaves and twigs, rarely roots.	Stomach bitters, rheumatism Treat abdominal pain, colic, dysentery and diabetes. Roots treat ulcerative colitis.	4

None of the medicinal plant species present are threatened and occur abundantly within the Province, while some are regarded as encroachers and indicators of degraded conditions.

Sensitivity analysis

A vegetation ecological sensitivity analysis was done for the vegetation units and is indicated in table 6 below.

Table 6. Sensitivity analysis for the vegetation units of the study area.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Criteria	Rocky ridge	Old fields	Developed area	Wetland	Degraded area
Presence of protected / red data species	6	1	1	5	3
Species richness and composition	8	2	1	5	4
Dominant/prominent species ecological status	9	5	1	8	2
Sensitivity to disturbance	8	3	2	8	3
Conservation status and ecological functioning	9	3	2	8	2
Area fragmentation	4	3	2	8	2
Medicinal plants	7	3	1	5	2
Important topographical features (steep slopes, cliffs etc.)	9	1	1	9	1
TOTAL SCORE	76	29	14	73	24
Sensitivity rating	High/med	Low	Low	High/med	Low

According to table 6 vegetation units 1 and 4 have a high/medium ecological sensitivity from a plant ecological point of view and taking into consideration their conservation value, both are regarded as having a high ecological sensitivity.

FAUNA

Amphibians



Figure 11. The Giant Bullfrog (*Pyxicephalus adspersus*) has been recorded by the consultant within the Cosmo City, Muldersdrift, Diepsloot and Lanseria areas. Remaining populations are threatened due to extensive habitat transformation due to increased urban sprawl and degradation to the breeding habitats (endorheic pans) within the area. Large numbers are killed annually after heavy summer downpours migrating towards suitable breeding habitats on the adjacent major road networks (R114, R511, N14).

Threatened species

The Giant Bullfrog (*Pyxicephalus adspersus*) is a protected frog species whose conservation status has been revised and was previously included as a Red Data Species under the category 'Lower Risk near threatened' (Minter *et al.* 2004). The Giant Bullfrog has been down-graded to 'Least-Concern' (Measey *et al.* 2010). Giant Bullfrogs historically occurred throughout the Diepsloot, Nooitgedacht, Lanseria, Honeydew, Krugersdorp, Muldersdrift areas. A major causal factor in the decline in Giant Bullfrog populations in this area is massive habitat destruction by previous agricultural activities (draining wetlands, ploughing of grasslands) and within the past twenty-five years by extensive urban sprawl due to residential and commercial developments.

Major (R511, R114, R540, N14) and adjacent road networks bisect suitable breeding and foraging areas resulting in mass road fatalities of migrating adult and juvenile bullfrogs. The consultant has observed several road fatalities (adult males) along the R511, N14, M47, R540, R114, R512 and M5.

Fences and walls also prevent the natural migration of adult and juveniles from foraging areas and suitable breeding sites (habitat fragmentation). This has become especially prevalent within the small-holdings and plots due to high levels of crime; especially within the Muldersdrift-Nooitgedacht area. Habitat deterioration due to changes in the seasonality of wetland sites (damming), deterioration of water quality due to surface water contamination with pesticides and pollutants and weed and reed invasion lead to the disappearance of bullfrog populations. Human predation of adult bullfrogs is another causal factor in population declines. This is especially prevalent in the rural parts of Southern Africa (Hammanskraal, Seshego) as well as around larger informal settlements such as Diepsloot (*pers.obs.* 2008, 2009) as well as Zandspruit (*pers. obs.* 2005). Bullfrogs are also caught illegally for the local and international pet industry. Removal of large adult males has a detrimental effect on the reproductive success of the small relic populations. The recent increase in the exotic pet trade; especially snakes; results in juvenile bullfrogs been captured for feeding captive snakes.

Bullfrog populations have declined dramatically over the past twenty years especially in the Fourways, Diepsloot, Dainfern, Chartwell AH, Nietgedacht, Nooitgedacht, Muldersdrift and Krugersdorp area. Continual destruction of the open Egoli Granite and secondary *Hyparrhenia hirta* grasslands for increased urban development and deterioration of suitable breeding and foraging areas (illegal dumping and alien vegetation invasion) have resulted in the disappearance of several smaller Giant Bullfrog populations. The majority of records (post 2000) of Giant Bullfrogs from the area are of migrating adult males usually found dead on the major road networks. There are several smaller breeding populations (<50 adults) within the Old Diepsloot Nature Reserve, Dainfern, Chartwell AH, Nooitgedacht, Muldersdrift and Krugersdorp area. A large population (>500) occurs in Diepsloot.

The open grasslands within the southern portion and north-western portion of the site and adjacent grasslands to the west with deeper sandy areas or Glenrosa soil Form offer favourable aestivation or burrowing areas for remaining Giant Bullfrogs as well as the seasonally inundated hydric clays within the valley bottom wetland. The adjacent grasslands are currently used for agriculture or proposed for development and thus will severely restrict suitable foraging, burrowing/aestivation and dispersal habitat. The site is bisected by the

N14 and the R512 (Malibongwe) on the eastern boundary. These can be considered as migratory or dispersal barriers for all remaining frog species including the Giant Bullfrog.

The degraded upper section (cattle grazing and trampling) of the mostly channelled valley bottom wetland offers no suitable breeding habitat for Giant Bullfrogs and frogs in general. The seasonal artificially excavated borrow pit above the lower-lying valley bottom wetland on the north-western boundary offers marginally suitable breeding habitat for any remaining Giant Bullfrogs. This seasonally inundated depression is on the neighbouring property. The artificially embanked dams offer suitable breeding habitat for certain urban exploiters such as Guttural Toad, Red Toad and Common Platanna

GDARD's Minimum Requirements for Biodiversity Studies: Amphibians

Under C-Plan version 3 (latest version i.e. version 3.3), no specialist studies for any species of amphibian are requested for consideration in the review of a development application. The Giant Bullfrog (*Pyxicephalus adspersus*) has been removed following re-assessment of the species' status in South Africa. The species is not truly Near-Threatened in South Africa (no quantitative analysis of the Giant Bullfrog distribution against the IUCN criteria can consider them as such) and the most recent evaluation of the status of the Giant Bullfrog in December 2009 did not consider the species sufficiently threatened to be listed as Near Threatened (G. Masterson pers. comm. with Prof. Louis du Preez)*. Given the current objectives of Gauteng's C-plan i.e. to be used to protect representative habitat and generate specialist studies for threatened faunal species, the Giant Bullfrog does not qualify for inclusion as a species-specific layer requiring specialist assessments. Records of *P. adspersus* are known for five of the six provincial protected areas, but the best habitat for *P. adspersus* is found in Abe Bailey Nature Reserve, Merafong City Municipality and Leeuwfontein Collaborative Nature Reserve, Nokeng tsa Taemane Local Municipality (Masterson 2011).

As per the C-Plan approach, the conservation of the Giant Bullfrog and of amphibians in general will be met by the protected area network as well as the designation of priority habitats i.e., pans or quaternary catchments, with associated restrictions on land use.

* It is the opinion of the specialist consultant that dramatic population declines have occurred within Gauteng Province over the past 30 years and Giant Bullfrogs are worthy of conservation efforts and listing of 'near-threatened'.

The wetland and a protective buffer zone, beginning from the outer edge of the wetland temporary zone, must be designated as sensitive (GDARD Requirements for Biodiversity Assessments: Version 2; 2012).

It is therefore considered the study site contains suitable foraging and migratory/dispersal and burrowing habitat of **medium-low** conservation importance, and **no suitable breeding habitat** for Giant Bullfrogs. Due to high levels of anthropogenic disturbances on the site and adjacent areas it is highly unlikely that significant Giant Bullfrog populations remain on the site and adjacent *Hyparrhenia hirta* grasslands. The adjacent grasslands are either currently being developed or are planned for future development.

Reptiles

Threatened species

Continual destruction of suitable habitats has resulted in the disappearance of numerous reptile species on the Highveld. No snake species was recorded during the brief field survey. One threatened reptile species have been recorded within the 2527 DDQDGC according to ReptiMAP. A historic record (1922) of the Striped Harlequin Snake (*Homoroselaps dorsalis*), which is categorised as Rare in the out-dated Red Data List (Branch 1988) and is currently listed as Near-Threatened (NT) (Bates et al. 2014) has been recorded from the QDGC. Prefers grassland and are endemic to the highveld of the Free State, Kwazulu-Natal, Swaziland, Limpopo and Gauteng. These snakes are very secretive and are only known from a few specimens. They burrow in loose soil and forage underground in tunnels and cracks, and are usually exposed in abandoned termitaria or under stones. They feed exclusively on thread snakes (*Leptotyphlops*) which they catch underground (Branch 1998).



The low-lying slopes of the rocky ridge and scattered moribund termite mounds on the southern p[ortion above the valley bottom

wetland offers marginally suitable habitat for Striped Harlequin Snakes. The proposed

development of the secondary succession degraded grassland with relatively few termite mounds should not significantly impact on any remaining Striped Harlequin Snakes if the mitigatory measures are implemented throughout all stages of the proposed development. The conservation of the rocky ridge, valley bottom wetland and grassland buffer zones should conserve suitable habitat for any remaining Striped Harlequin Snakes.

Gauteng represents approximately 10% of the total extent of occurrence for the species, meaning 10 % of 11 populations need to be protected in Gauteng in order to prevent *H. dorsalis* from becoming listed as ‘Vulnerable’, which is effectively 1 population. *Homoroselaps dorsalis* occurs in close proximity to the Egoli Granite Grassland (EGG) Nature Reserve, and if it is found there during surveys or by chance encounters, the local population should also be protected but the recommended minimum target is the protection and conservation of the Suikerbosrand Nature Reserve population. In the literature, Alexander & Marais (2007), Broadley (1983) and Branch (1998) all indicate that the current knowledge of *H. dorsalis* habits and habitat is based on the assumption that it is similar to the more widely distributed and better-known Spotted Harlequin Snake (*H. lacteus*). The model of suitable habitat for *H. dorsalis* within Suikerbosrand Nature Reserve is based on the observations of *H. dorsalis* and the Spotted Harlequin Snake (*H. lacteus*) within the reserve. Four Harlequin Snakes (2 *H. dorsalis* and 2 *H. lacteus*) have been recorded in Suikerbosrand since 2006. All of the records have occurred on land type Ib43 (Land Type Survey Staff,2006) and all records were associated with ridges or ridge slopes with a soil-rock mix and low clay content (< 35 %).The protection of *H. dorsalis* in Suikerbosrand Nature Reserve, Sedibeng District Municipality will meet the conservation targets for the species in Gauteng (Masterson 2011). Under C-Plan version 3.3, no specialist studies for any species of reptile are requested for consideration in the review of a development application within Gauteng Province (GDARD Requirements for Biodiversity Assessments: Version 3.3).

Avifauna

Table 7. Red Data List bird species previously recorded from the 2555_2755 pentad within which the study area is situated, and that occur or could possibly within or in the vicinity of the study area due to the presence of suitable habitat.

Species	Conservation status (Taylor 2014/15)	Reporting rate SABAP2 %	Habitat requirements (Chittenden 2005; Hockey <i>et al</i> 2005)	Likelihood of occurrence
Martial Eagle	Endangered	0.0		Low: Marginally suitable habitat for occasional foraging arrays
African Marsh-harrier <i>Circus ranivorus</i>	Endangered	0.7	Large permanent wetlands with dense reed beds. Sometimes forages over smaller wetlands and grassland.	Low: Marginally suitable habitat for occasional foraging arrays within the seasonal wetland system on the north-western portion of the site. No suitable breeding habitat within the valley bottom wetland.
Cape Vulture <i>Gyps coprotheres</i>	Endangered	0.9	Linked to cliff breeding sites in mountainous areas but ranges widely in surrounding areas.	Low: Breeding colonies are situated in the Magaliesberg. Recorded throughout the area most likely as vagrants flying over.
Yellow-Billed Stork	Endangered	0.2	Shoreline of most inland freshwater bodies.	Low: Nomadic and the dams on the north-western boundary offers marginally suitable habitat for occasional foraging arrays but no suitable breeding habitat.
Black Stork <i>Ciconia nigra</i>	Vulnerable	0.1	Associated with mountainous areas but not restricted to them. Nomadic during the non-breeding season.	Low: Nomadic and the open grasslands and wetland north-western boundary offers marginally suitable habitat for occasional foraging arrays but no suitable breeding

				habitat.
White-Bellied Korhaan <i>Eupodotis sengalensis</i>	Vulnerable	No records from SABAP2.	Open grassland with scattered trees, numerous termite mounds and rocky ground. Forages in burned areas.	Low: Marginally suitable habitat occurs within the open undulating grasslands to the west. The high levels of anthropogenic disturbances restricts the likelihood of any extended periods on the site. Most suitable habitat north-east towards the Skurweberge and Magaliesberg.
Secretarybird <i>Sagittarius serpentarius</i>	Vulnerable	0.1	Favours open habitat and breeds within <i>Vachellia</i> trees.	Low: Limited records based mainly on single observations within the open grasslands to the north and north-west of the N14. The open <i>Hyparrhenia hirta</i> grasslands offer marginally suitable foraging habitat but the high levels of anthropogenic disturbances restricts the likelihood of any extended periods on the site.
African Grass-Owl <i>Tyto capensis</i>	Vulnerable	1.2	Normally associated with pristine, well managed grasslands usually in close proximity of water, but also in alien vegetation structurally resembling tall or	Medium-Low: Suitable habitat for foraging arrays within the mesic grasslands adjacent to the palustrine wetland system on the southern and north-western

			rank grassland, and hydrophilic sedges.	portions of the site. High levels of anthropogenic disturbances restricts the likelihood of any extended periods or breeding on the heavily degraded valley bottom wetland on the site.
Lanner Flacon <i>Flacon biarmicus</i>	Vulnerable	2.1	Favours open grasslands and woodlands near rocky cliffs or electricity poles for nesting.	Medium-High: Suitable habitat for occasional foraging arrays within the rocky hill/ ridge on the northern central portions. Recorded throughout the open grasslands, Roodekrans Ridge, Andesite Bushveld mountains within the adjacent areas to the north and west.
Verraux's Eagle <i>Aquila verreauxi</i>	Near-Threatened	0.4	Mountainous and rocky areas with large cliffs.	Low: Resident breeding pair at Walter Sisulu Botanical gardens. Forages in the adjacent open grasslands, alien woodlands and Andesite Mountain Bushveld.
Greater Flamingo <i>Phoenicopterus ruber</i>	Near-Threatened	0.2	Greater and Lesser Flamingos are only non-breeding visitors to the former Transvaal (Tarboton <i>et al.</i> 1987), but flocks may spend extended periods on the Highveld where they utilize shallow, eutrophic wetlands and	Low: The permanent dams on the NW boundary offers limited suitable habitat for occasional foraging arrays (good rainfall years) as well as dispersal habitat but the high levels of anthropogenic

			temporary pans.	disturbances restricts the likelihood of any extended periods.
Abdim's Stork	Near-Threatened	0.5	Non-breeding intra-African migrant. Occurs in large flocks in grasslands, savanna, woodland and cultivated lands.	Medium-Low: The open grasslands offer suitable habitat for occasional foraging arrays. The high levels of anthropogenic disturbances restricts the likelihood of any extended periods on the site.
African Finfoot <i>Podica senegalensis</i>	Vulnerable	0.1	Mostly along well-vegetated, perennial rivers and dams	None: The permanent dams and seasonal valley bottom wetland offers no suitable habitat.
Red Footed Falcon <i>Falco vespertinus</i>	Near-Threatened	1.4	Open semi arid and arid savanna	Medium-High: Suitable habitat for occasional foraging arrays (grasshoppers and termites) within the southern and north-western grasslands.
Half-collared Kingfisher <i>Alcedo semitorquata</i>	Near-Threatened	2.4	Mostly along clean, well-vegetated, fast-flowing streams. Recorded around dams.	Low- The permanent dams and seasonal valley bottom wetland offers no suitable breeding habitat but occasional foraging arrays within the dams.
European Roller	Near-Threatened	0.4	Non-breeding migrants. Open woodland perching on open dead branches, telephone and powerlines	Medium-Low: Suitable habitat for occasional foraging arrays (grasshoppers and termites) within the wooded rocky hill/ridge on the central northern portions of the site.

The site offers marginally suitable habitat for occasional foraging arrays for the larger raptors such as Cape Vulture and Verreaux's Eagle as well as the smaller raptors such as Lanner Falcon and Red-footed Falcon. No actual evidence of any threatened avifaunal species were observed during the brief field survey. The high levels of anthropogenic disturbances on the site and adjacent open grasslands, rocky ridges and valley bottom wetland significantly reduces the likelihood of any secretive bird species remaining on the site for any extended periods. The annual harvesting of grass on the site will impact on the secretive bird species. These include Blue Crane, Secretarybird, White-bellied Korhaan and African Grass Owls. The un-controlled cattle drinking and grazing significantly reduces the likelihood of African Grass Owls utilising the valley bottom wetland for roosting and nesting activities. The wetland and adjacent open grasslands offer suitable foraging areas but proximity to the N14 and R512 increases risks of road fatalities. More intensive specialist avifaunal surveys are required over extended periods in order to ascertain the current conservation status of these threatened bird species on the site and adjacent properties. The conservation and adequate rehabilitation of the valley bottom wetland and artificially embanked dams and adequate grassland buffer zones could potentially improve the habitat quality on the site for certain wetland associated bird species. The conservation of the rocky hill/ridge will conserve the majority of savanna or woodland associated bird species on the site.

Mammals

Threatened species

Table 8 Red Data List mammal species with confirmed records from the QDGC and for which suitable habitat is present, and which may therefore occur within the study area

TAXONOMIC INFORMATION				RED LISTING INFORMATION				
Order	Family	Scientific name	Common name	2016 Regional Listing	2016 Regional Listing Criteria	Current global listing	Global listing criteria	IUCN 2007
Artiodactyla	Bovidae	<i>Pelea capreolus</i>	Grey Rhebok	Near Threatened	A2bd	Least Concern	None	None
Artiodactyla	Bovidae	<i>Redunca fulvorufula fulvorufula</i>	Mountain Reedbuck	Endangered	A2b	Least Concern	None	None
Carnivora	Felidae	<i>Leptailurus serval</i>	Serval	Near Threatened	A2c; C2a(i)	Least Concern	None	Protected
Carnivora	Felidae	<i>Panthera pardus</i>	Leopard	Vulnerable	C1	Vulnerable	A2cd	Vulnerable
Carnivora	Hyaenidae	<i>Parahyaena brunnea</i>	Brown Hyaena	Near Threatened	C2a(i) +D1	Near Threatened	C1	Protected
Carnivora	Mustelidae	<i>Aonyx capensis</i>	Cape Clawless Otter	Near Threatened	C2a(i)	Near Threatened	A2cde+3 cde	Protected
Chiroptera	Vespertilionidae	<i>Pipistrellus rusticus</i>	Rusty Pipistrelle	Near-threatened	Not Given	Least Concern	None	None
Erinaceomorpha	Erinaceidae	<i>Atelerix frontalis</i>	South African Hedgehog	Near Threatened	A4cde	Least Concern	None	Protected

Several red listed mammal species have been recorded from the Walter Sisulu National Botanical Gardens and Roodekrans Ridge to the west of the site including the 'Endangered' Mountain Reed Buck (*Redunca fulvorufula fulvorufula*), "Vulnerable" Leopard (*Panthera pardus*), Near-Threatened Serval (*Leptailurus serval*), Brown Hyaena (*Parahyaena brunnea*), Cape Clawless Otter (*Aonyx capensis*), Grey Rhebok (*Pelea capreolus*), Rusty Pipistrelle (*Pipistrellus rusticus*) and South African Hedgehog (*Atelerix frontalis*).

No evidence of any threatened mammal species was recorded during the brief single day site visitation (8 hours) of the site. This can be expected due to the short-duration of the

field work as well as secretive nature of the threatened mammal species, including Servals, White-tailed Rats, Veli Rats and Swamp Musk Shrews. The majority of threatened mammal species occurring in the area are extremely difficult to observe even during intensive field surveys conducted for extended periods.

Mountain Reed Buck (*Redunca fulvorufula fulvorufula*)

Formerly widespread in South Africa, they occur in suitable habitat in Limpopo Province, the eastern North-West Province, Gauteng, parts of Mpumalanga, central and southern Free State, western Kwazulu-Natal, the Eastern Cape and narrowly into the Western Cape. Mountain Reedbuck inhabit the dry, grass-covered, stony slopes of hills and mountains, where these provide cover in the form of bushes or scattered trees. They are found infrequently on more open mountainous grassland and tend avoid the bleak open conditions associated with summits of mountainous areas, preferring the lower slopes and occurring in many areas on low stony hills. They move onto flats adjacent to their stony habitat to feed and drink, the availability of water being an essential habitat requirements (Skinner & Chimimba 2005). Mountain Reed Buck have been recorded in the Walter Sisulu National Botanical Gardens and Roodekrans ridge system. The population size within the Walter Sisulu National Botanical Gardens is estimated between 20-30 individuals (pers. comm. T. De Castro 2017). The secondary *Hyparrhenia hirta* grasslands on the southern and north-western portions of the site as well as grasslands to the west provide limited suitable foraging or dispersal habitat due to high levels of anthropogenic disturbances surrounding the site. It is highly unlikely that Mountain Reed Buck will occur on the site or adjacent grasslands. Major road networks (N14, R512) border the site which severely restricts dispersal movements.

Leopard (*Panthera pardalis*)

In Kwazulu-Natal they occur primarily in the north-east and are sparsely distributed elsewhere in the central and western parts of the province. They are found throughout Limpopo Province, Mpumalanga, North West and Gauteng, except on the highveld grassland areas in the southern parts of these provinces. They occur sporadically in the Free State. In the Eastern Cape they occur in the mountainous areas along the south coast from about King William's Town district westwards into the Western Cape and then in the northern and north-eastern parts of the Northern Cape. Leopards have a wide habitat tolerance and are generally associated with areas of rocky Koppies and hills, mountain ranges and forest. While they are independent on water supplies, relying on their prey for their moisture requirements, they drink regularly when water is available. Cover to lie up in safety during the daylight hours and from which to hunt is an important requirement. They

manage to persist in areas of concentrated development provided they have adequate cover in rocky hills and forest (Skinner & Chimimba 2005). Personal communication with local ecologist Mr Tony De Castro confirmed that a female leopard and two cubs were photographed in 2015 during a camera trapping survey within the Walter Sisulu National Botanical Garden. The secondary succession grasslands as well as granitic rocky ridge/hill and woodland offers marginally suitable habitat for foraging arrays as well as exploratory/dispersal activities for the highly secretive and elusive Leopard. The high levels of anthropogenic activities on and surrounding the site significantly reduces the likelihood. Major road networks (N14, R512) border the site which severely restricts dispersal movements.

Brown Hyaena (*Parahyaena brunnea*)

They are widely, though discontinuously and sparsely, distributed in Limpopo Province, North West Province, Mpumalanga and Gauteng especially in small nature reserves. Brown Hyaena are associated particularly with the Nama-Karoo and Succulent Karoo Biomes and the drier parts of the Grassland and Savanna biomes. In Gauteng they prefer rocky mountainous areas with bush cover. Cover to lie up during the day is an essential requirement. Water is not a requirement, although they drink when its available. Brown Hyaena have been recorded within the Walter Sisulu National Botanical Garden as well as within Mogale's Gate (pers. obs.) and Magaliesberg to the north and north-west of the study area. The secondary succession grasslands, wooded rocky hill/ridge as well as alien invaded woodlands offers marginally suitable habitat for foraging arrays as well as exploratory/dispersal activities for the highly secretive and elusive Brown Hyaena. The high levels of anthropogenic activities on and surrounding the site significantly reduces the likelihood. Major road networks (N14, R512) border the site which severely restricts dispersal movements.

Serval (*Leptailurus serval*)

Serval occur in dense, well watered grassland and reed beds and are always associated with water. In South Africa they occur from the Eastern Cape northwards into Mpumalanga lowveld and Limpopo Valley. Servals have been recorded in the Drakensberg highlands and inland mountain highlands (Magaliesberg, Soutpansberg, Waterberg). Servals are predominantly nocturnal; with limited activity during the early morning and late afternoon. Diurnal activity is unusual and adequate cover is required during periods of inactivity. Servals have been displaced mainly due to habitat loss through agricultural and forestry activities. Populations are secure within protected areas. A local ecologist Mr Tony De Castro has recorded serval in camera traps within the Walter Sisulu National Botanical

Garden. The secondary succession grasslands as well as lower-lying wetland on the southern portion offers extremely limited suitable habitat (no rank grassland due to cattle overgrazing) for foraging arrays as well as exploratory/dispersal activities for the highly secretive and elusive Serval. The high levels of anthropogenic activities on and surrounding the site significantly reduces the likelihood. Major road networks (N14, R512) border the site which severely restricts dispersal movements.

Grey Rhebok (*Pelea capreolus*)

Grey Rhebok are endemic to the sub region and as they only occur where there is suitable habitat their distribution is discontinuous and patchy. They occur in southern North West Province, Gauteng, southern Limpopo Province, western Mpumalanga, the eastern Free State, western and central Kwazulu-Natal, the western Northern Cape, the Western Cape and the Eastern Cape. Throughout the greater part of their distributional range Grey Rhebok are associated with Rocky Hills, rocky mountainous slopes and mountain plateau grassland with good grass cover. Short, burnt veld is favoured for feeding and long grass for cover. They are independent of a water supply, but drink in the dry winter months if water is available (Skinner & Chimimba 2005.). Grey Rhebok occur within the Walter Sisulu National Botanical Gardens. The rocky ridge and adjacent secondary grasslands offers marginally suitable habitat for foraging arrays as well as exploratory/dispersal activities for Grey Rhebok. The high levels of anthropogenic activities on and surrounding the site significantly reduces the likelihood. Major road networks (N14, R512) border the site which severely restricts dispersal movements.

African Clawless Otter (*Aonyx capensis*)

The African or Cape Clawless Otter is distributed widely in sub-Saharan Africa where there is suitable aquatic habitat. They occur in Limpopo, Mpumalanga, Gauteng, North West, Kwazulu-Natal, Eastern Cape, Western Cape and Northern Cape provinces. Being predominantly aquatic they don't wander widely from water and throughout their range they occur in rivers, lakes, swamps and dams and up the tributaries of rivers into small streams. The otters feed on crabs, fish, frogs and other aquatic life. As the small streams dry up they move down to more permanent water. If they wander away from water they invariably return to it as it is an essential requirement. The association in which the terrestrial aquatic habitat occurs can range from forest to woodland to open grassland and otters occurrence bears no relation to surrounding terrain provided that the aquatic conditions are suitable and there is adequate cover which to rest. African Clawless Otters have been recorded within the Walter Sisulu National Botanical garden; especially at the Sasol's artificially created wetland and bird hide (pers. obs.). The degraded valley bottom wetland on the southern portions of

the site provides limited suitable habitat but the north-western valley bottom wetland and dams offers suitable habitat for occasional foraging arrays during the wet summer months and dispersal areas for African Clawless Otters within the study area. The suitability is reduced due to the high levels of anthropogenic disturbances on and surrounding the site as well as proximity of N14 and R512.



Figure12. The South African Hedgehog has been recorded by the consultant in the open Egoli Granite during previous surveys. They have also been recorded from Fourways-Dainfern area, Old Diepsloot Nature Reserve, Walter Sisulu National Botanical Gardens, Muldersdrift-Krugersdorp areas. They still persist in some well-established suburban gardens and residential plots.

South African Hedgehog (*Atelerix frontalis*)

South African Hedgehogs occur in such a wide variety of habitats that it is difficult to assess its habitat requirements. The one factor that is common to all the habitats in which they occur is dry cover, which they require for resting places and breeding purposes. Habitat must provide a plentiful supply of insects and other foods. Suburban gardens provide these requirements and this may explain their occurrence in this type of habitat. South African Hedgehogs are predominantly nocturnal, becoming active after sundown, although, after light rains at the commencement of the wet season, they may be active during daylight hours (Skinner and Smithers, 1991). South African Hedgehogs have been recorded within the Walter Sisulu National Botanical Gardens, Muldersdrift, Fourways, North-riding, Dainfern, Krugersdorp, Diepsloot areas. Marginally suitable habitat exists within the

secondary grasslands on the southern and north-western portions of the site and the mesic grasslands along the valley bottom wetland for South African Hedgehogs. Major road networks (N14, R512) border the site which severely restricts dispersal movements.

Southern African Vlei Rat *Otomys auratus*

Where *Otomys auratus* and *O. angoniensis* co-occur at the same site, the former is associated with sedges and grasses adapted to densely vegetated wetlands with wet soils, while the latter is associated with plant species that typically grow in the drier margins of wetlands (Davis 1973). Vlei rats are exclusively herbivorous, with a diet mainly comprised of grasses. The degraded valley bottom wetland on the southern portion of the site offers limited suitable habitat due to extensive trampling and grazing by cattle. The valley bottom wetland on the north-western boundary and adjacent moist or mesic grasslands offers suitable habitat for Vlei Rats (Wetland type) within the mesic grasslands and wetlands, typically occurring in dense vegetation in close proximity to the waters edge.

Two near- threatened bat species have previously been recorded from the study area namely the Rusty Pipistrelle (*Pipistrellus rusticus*) and Shreiber's Long-fingered Bat (*Miniopterus schreibersii*).

Rusty Pipistrelle (*Pipistrellus rusticus*)

Rusty Pipistrelle occurs in parts of Gauteng, Limpopo Province and Mpumalanga Province. They occur in savanna woodland and often with riverine associations. The Rusty Pipistrelle has been recorded at the Walter Sisulu Botanical Gardens and Roodekrans Ridge. Marginally suitable habitat occurs within the rocky ridge for occasional foraging arrays within the study area.

Shreiber's or Natal Long-fingered Bat (*Miniopterus schreibersii*)

Shreiber's or Natal Long-fingered Bat occurs in parts of Gauteng, North West, eastern half of Kwazulu-Natal, Mpumalanga and Free State Province. Shreiber's Long-fingered Bats are cave-dwellers and the availability of caves or other similar substantial shelter, such as mine audits is an essential habitat requirement. Annual migrations take place between the caves situated on the southern Highveld of Gauteng and in the Limpopo Province Bushveld (Van Der Merwe 1975). No major caves of mine audits occur within the study area.

More intensive specialist mammal surveys (including bat surveys) will be required in order to ascertain the current conservation status of the above-mentioned threatened mammal species on the site and adjacent grasslands. The surrounding grasslands are all currently

being developed or have been approved for development which will significantly reduce the likelihood of any threatened mammal species occurring on the site. Development of the transformed and degraded vegetation units will most likely have a medium-low, short to long term negative impact on remaining faunal species occurring on the site. The conservation of the rocky ridge/hill as well as the valley bottom wetland and implementation of an alien vegetation removal programme could potentially result in improved habitat quality for remaining mammal species.

SENSITIVE FAUNAL HABITATS

EGOLI GRANITE GRASSLAND (GM10)

Egoli Granite Grasslands in the Gauteng Province are highly threatened and are listed as **Endangered**. More than two thirds of this vegetation unit have already undergone transformation mainly due to urbanization, road construction, industrialisation and agricultural activities (cultivation). Only a small fraction (3%) of this vital habitat has been formerly conserved. Conservation targets are the proposed conservation of 24%. These grassland areas form vital habitats for numerous animal species. The majority of suitable grassland habitat is usually severely fragmented resulting in road fatalities of species migrating between habitats. The secondary succession *Hyparrhenia hirta* grasslands on the southern and north-western portions of the site are considered as **Medium Sensitivity** and **Conservation Value**. The degraded grasslands on the north-eastern portion adjacent to the rocky ridge and the previous developed areas are considered as **Low Sensitivity** and **Conservation Value**.

ROCKY RIDGE

Rocky hills and ridges are characterized by high spatial heterogeneity due to the range of differing aspects (north, south, east, west and variations thereof), slopes and altitudes all resulting in differing soil (e.g. depth, moisture, temperature, drainage, nutrient content), light and hydrological conditions. The temperature and humidity regimes of microsites vary on both a seasonal and daily basis (Samways & Hatton, 2000). Moist cool aspects are more conducive to leaching of nutrients than warmer drier slopes (Lowrey & Wright, 1987). Variation in aspect, soil drainage (Burnett *et al.*, 1998) and elevation/altitude (Primack, 1995) have been found to be especially important predictors of biodiversity. It follows that ridges will be characterized by a particularly high biodiversity, as such their protection will contribute significantly to the conservation of biodiversity in the area as well as the rest of Gauteng Province. For example, a wide variety of bird groups utilize ridges, koppies and

hills for feeding, roosting and breeding. These groups include some owls, falcons, nightjars, swifts, swallows, martins, larks, chats, thrushes, cisticolas, pipits, shrikes, starlings, sunbirds, firefinches, waxbills, buntings, canaries, eagles and vultures. Ridges provide important habitat for sensitive species such as bats (roosting sites) and the eastern rock elephant shrew. Ridges and kloofs also form caves, an important habitat for highly specialized animals, e.g. bats as well as African Rock Python. Variable microclimate conditions have resulted in a vast array of invertebrate communities associated with the high plant diversity characterizing ridges. Hills and koppies generally have more insects (both in terms of individuals and species) than the immediate surroundings (Samways & Hatton, 2000). No construction activities must be allowed in the wooded rocky ridge areas or the rocky outcrops on the central western boundary. These areas must be considered “no-go” areas throughout all stages of the development. The wooded rocky ridge on the central northern portions of the site is considered as **High Sensitivity** and **Conservation value**. It is imperative that connectivity between the central wooded rocky hill and lower-lying valley bottom wetland and dams on the north-western boundary are maintained. This could potentially form a biological or dispersal corridor for remaining faunal species.

VALLEY BOTTOM WETLAND

All remaining wetlands and their associated indigenous grassland and sedge dominated vegetation must be considered as a sensitive habitat. All wetland habitats including seasonal seepage wetlands are considered to be **Sensitive** and of **High conservation importance** for the following reasons:

- Wetlands are characterized by hydric soils and slow flowing water and tall emergent vegetation and provide habitat for many faunal species. The conservation status of many of the faunal species that are dependent on wetlands reflects the critical status of wetland nationally, with many having already been destroyed. In this study area wetlands, including seasonal pans are important habitats for species such as Giant Bullfrogs, African Grass Owl, African Marsh Harrier, Blue Crane, Serval and Rough-haired Golden Mole.
- Several mammal species including Vlei Rats and Marsh Mongoose may occur along the reed margins of the valley bottom wetland for foraging and refuge habitat. Waterbirds, which were formerly restricted to high rainfall areas with natural wetland habitat, make use of man-made dams, and surrounding areas, for feeding, roosting and breeding. Certain amphibian species will utilize the shallow seasonal depressions and pans for breeding purposes including Giant Bullfrog, Striped Stream Frog, Guttural Toad,

Delalande's River Frog, Common Caco, Bubbling Kassina. Reptile species such as the Brown water Snake are associated with wetland habitats including permanent dams.

The adjacent homogenous secondary grasslands (old lands) to the south and west are all proposed for current and future developments which will result in alteration of the faunal composition on the site and adjacent areas. It is imperative that the lower-lying valley bottom wetland and grassland buffer zone and central northern rocky ridge/hill are adequately managed with a natural fire regime determined by a suitably qualified botanist or grassland ecologist. Activities in all adjacent open grasslands to the west and south must be restricted. Access to surrounding open grassland must be strictly managed to prevent possible poaching, harvesting of medicinal plants and disturbances to remaining fauna. No driving of vehicles through open grassland. No new linear infrastructure including roads, pipelines and powerlines within the lower-lying valley bottom wetland and rocky ridge.

POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT ON THE ASSOCIATED FLORA

The following assessment of impacts was done and was guided by the requirements of the NEMA EIA Regulations (2014) and is presented in the tables below:

Loss of habitat

Any development will have an impact on the natural vegetation. The vegetation of all the vegetation units except that of the rocky ridge (unit 1) are degraded and characterised by the dominance of pioneer weedy, secondary successional or declared alien invasive species, thus any development of these units should have a **short-medium term negative impact** on the total ecosystem. Since these areas are degraded it is thought that the loss of species would not be significant in terms of overall habitat and biodiversity with few climax species that would be lost. Although degraded, the wetland area (vegetation unit 4) is a sensitive area and any development within it will result in a loss of ecosystem functioning, while the rocky ridge area (vegetation unit 1) is part of a sensitive ecosystem where development will result in a loss of biodiversity. Development in these two units will have **long-term negative impact** on the environment.

Mitigation and recommendations

No development should be allowed in vegetation units 1 and 4. These areas should be fenced off prior to construction and zoned as no-go areas. Only people involved in the

HIGH CONSERVATION UNIT: 1 & 4

Activity	Potential impact	Environmental significance									Reversibility	Cumulative impact	Irreplaceable loss	Mitigation measures
		Nature	Extent	Duration	Magnitude	Probability	Rating before mitigation	Rating after mitigation						

Environmental Component: Vegetation, Fauna

Clearing of vegetation for construction	Loss of plant species	-	3	5	8	4	64	High	15	Negligible	Irreversible	High	High	See potential impacts and recommended mitigation measures in report
	Loss of rare/medicinal species	-	1	4	8	2	26	Low	10	Negligible	Irreversible	Moderate	Medium	
	Loss of animal species	-	3	4	8	4	60	High	14	Negligible	Irreversible	Moderate	High	
	Loss of biodiversity	-	3	5	8	4	64	High	15	Negligible	Irreversible	High	High	
	Increased soil erosion	-	3	4	8	2	30	Low	6	Negligible	Reversible	Low	Low	
	Alien plant invasion	+	3	5	8	4	64	High	12	Negligible	Reversible	Low	Low	

LOW CONSERVATION UNIT: 2, 3 & 5

Activity	Potential impact	Environmental significance									Reversibility	Cumulative impact	Irreplaceable loss	Mitigation measures
		Nature	Extent	Duration	Magnitude	Probability	Rating before mitigation	Rating after mitigation						

Environmental Component: Vegetation, Fauna

Clearing of vegetation for construction	Loss of plant species	-	1	5	2	1	8	Negligible	8	Negligible	Irreversible	Low	Low	See potential impacts and recommended mitigation measures in report
	Loss of rare/medicinal species	-	1	1	2	1	4	Negligible	4	Negligible	Irreversible	Low	Low	
	Loss of animal species	-	1	1	2	1	4	Negligible	4	Negligible	Irreversible	Low	Low	
	Loss of biodiversity	-	1	5	2	1	8	Negligible	6	Negligible	Irreversible	Low	Low	
	Increased soil erosion	-	2	3	2	2	14	Negligible	10	Negligible	Reversible	Low	Low	
	Alien plant invasion	+	1	4	6	1	11	Negligible	4	Negligible	Reversible	Low	Low	

removal of alien plants in these areas should be allowed to enter these vegetation units. During the **CONSTRUCTION** phase for areas approved by development by the authorities, the following is recommended: To minimise the effect on the vegetation it is recommended that the construction be done within the winter period when most plants are dormant and when little rain is expected that could potentially cause erosion.

Where vegetation needs to be “opened” to gain access it is recommended that the herbaceous species are cut short rather than removing them. That will ensure that they regrow during the growing season. If possible “soil saver blankets” could be placed over the vegetation to prevent erosion and unnecessary trampling. These blankets must be removed after construction.

All temporary stockpile areas, litter and dumped material and rubble must be removed during and on completion construction activities. Vegetation clearance should be restricted to the approved development areas allowing remaining animals opportunity to move away from the disturbance. No animals should be intentionally killed or destroyed and poaching and hunting should not be permitted on the site. No hunting with firearms (shotguns, air rifles or pellet guns) or catapults should be permitted on the property as well as neighbouring areas.

A Re-vegetation and Rehabilitation Manual should be prepared for the use of contractors, landscape architects and groundsmen to rehabilitate areas that became degraded due to construction activities.

Alien vegetation

Alien species poses a huge threat to the natural environment due to their competitive nature that leads to the displacement of natural indigenous species (plants and animals), and also due to their excessive use of soil water. The large number of alien plants in the different vegetation units of the study area are of concern.

Alien and invasive plant species are grouped according to the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA) into three categories:

- Category 1 plants are weeds that serve no useful economic purpose and possess characteristics that are harmful to humans, animals or the environment. These plants need to be eradicated using the control methods stipulated in Regulation 15.D of the CARA.

- Category 2 plants are plants that are useful for commercial plant production purposes but are proven plant invaders under uncontrolled conditions outside demarcated areas.
- Category 3 plants are mainly used for ornamental purposes in demarcated areas but are proven plant invaders under uncontrolled conditions outside demarcated areas.

The following categories have been listed by the National Environmental Management:

Biodiversity Act (10/2004) (NEMBA):

- Category 1a plants are high-priority emerging species requiring compulsory control. All breeding, growing, moving and selling are banned.
- Category 1b plants are widespread invasive species controlled by a management programme.
- Category 2 plants are invasive species controlled by area. Can be grown under permit conditions in demarcated areas. All breeding, growing, moving, and selling are banned without a permit.
- Category 3 plants are ornamental and other species that are permitted on a property but may no longer be planted or sold.

Mitigation and recommendations

All alien vegetation should be eradicated within the study site and invasive species as listed in this report should be given the highest priority. The use of herbicides shall only be allowed after a proper investigation into the necessity, the type to be used, the long-term effects and the effectiveness of the agent. Application shall be under the direct supervision of a qualified technician. All surplus herbicides shall be disposed of in accordance with the supplier's specifications and not close to or near the wetland/river areas. Exotic and invasive plant species were categorised according to the framework laid out by The Conservation of Agricultural Resources Act (CARA) (Act 43 of 1983) and National Environmental Management: Biodiversity Act (10/2004) (NEMBA). These acts define weeds as alien plants, with no known useful economic purpose that should be eradicated. Where herbicides are used to clear vegetation, selective and biodegradable herbicides registered for the specific species should be applied to individual plants only. General spraying and the use of non-selective herbicides (e.g. Roundup, Mamba etc.) should be prohibited at all times.

Waste Management

Adequate waste management measures must be implemented preventing possible illegal dumping and littering of adjacent sensitive areas especially the watercourse areas of the study site.

- Adequate toilet facilities must be provided for all staff to prevent pollution of the environment.
- The excavation and use of rubbish pits is forbidden.
- Burning of waste is forbidden.
- A fenced area must be allocated for waste sorting and disposal.
- Individual skips for different types of waste (e.g. 'household' type refuse, building rubble, etc.) should be provided.

Stormwater Management and pollution of water system

All stormwater and runoff generated by the development activities must be appropriately managed.

- The stormwater drainage network system must be kept separate from the wastewater (water containing waste) system.
- The storm water system must be designed such that no large amount of water is released at one point into the wetland area.
- The release of water must be designed such that the force of the water is reduced to prevent unnecessary erosion.
- The old borrow pit that is part of the wetland system could be used as an attenuation dam.

Prior to construction commencement

- It is vitally important that storm water management is properly managed on site both during and after construction.
- Drainage must be controlled to ensure that runoff from the site will not culminate in off-site pollution or result in rill and gully erosion or any erosion of the watercourses.

Erosion and Surface runoff

Most development activities are characterised by large areas of sealed surfaces such as roads, footpaths, houses etc. As a result, water infiltration is considerably reduced with an increase in surface run-off. Run-off is generally discharged to surface water systems and often contains pollutants. Pollutants range from organic matter, including sediments, plant materials and sewage, to toxic substances such as heavy metals, oils and hydrocarbons. Construction activities associated with development can lead to massive short-term erosion unless adequate measures are implemented to control surface run-off. Sheet erosion occurs when run-off surface water carries away successive thin layers of soil over large patches of bare earth. This type of erosion is most severe on sloping soils as is the study area, which has low infiltration if all vegetation is removed, which promotes rapid run-off. Continual erosion in sheet-eroded slopes is a common cause of gully erosion. Gully erosion results from increased flow along a drainage area, especially where protective vegetation has been removed and soils are readily transported. Gully erosion can be associated with salting as the saline sub-soils are readily eroded.

Mitigation and recommendations

The timing of clearing activities is of vital importance. Clearing activities and earth scraping should preferably be restricted to the dry season to prevent erosion. The dry months are also the period when most of the plant and animal species are either dormant or finished with their propagation/breeding activities. Soil stockpiling areas must follow environmentally sensitive practices and be situated a sufficient distance away from the watercourse area. Sufficient measures must be implemented to prevent the possible contamination of the surface water and groundwater. It is recommended that sandbags/ hay/straw bales/blocks are placed all along the watercourse areas during the wet season to prevent soil erosion into these areas.

Loss of Faunal Habitats

Alteration of the vegetation of the proposed site will directly, and indirectly, impact on the smaller sedentary species (insects, arachnids, reptiles, amphibians and mammals) adapted to their ground dwelling habitats. Larger, more agile species (birds and mammals) will try and re-locate in suitable habitats away from the construction activities. The impacts will be significantly reduced if the entire rocky ridge/ hill and lower-lying valley-bottom wetland as well as grassland buffer zones are conserved and adequately managed. The rocky ridge and north-western valley bottom wetland could form a potential biological or dispersal corridor.

Mitigation and recommendations

Any animals encountered in the areas could be relocated away from the development site. During the construction phase, workers must be limited to areas under construction and access to natural undeveloped areas must be strictly regulated, preventing uncontrolled hunting, poaching and gathering of firewood and medicinal plants. Increased pressure on the environment could result in major environmental degradation if environmentally sensitive practices are not followed and maintained. During the construction activities; wherever possible, work should be restricted to one area at a time. This will give smaller birds, mammals, reptiles and amphibians an opportunity to move into undisturbed areas close to their natural habitat.

The Site Manager and ECO must ensure that no faunal species are disturbed, trapped, hunted or killed during the construction phase. All animals unearthed or disturbed should ideally be released in appropriate habitat away from the development. Construction activities should be limited to the daylight hours preventing disturbances to the nocturnal activities of certain species and nearby human populations. This will also minimise disturbances to sensitive and secretive species.

Migratory Routes (Fencing)

The migratory movements of several animal (frog, reptile and mammal) species are completely disrupted by numerous walls, fences and road networks, which restrict natural movements between suitable foraging and breeding areas. This is especially prevalent for highly mobile species, such as Giant Bullfrogs, which can migrate up to six kilometres from suitable foraging areas (open grassland) to favourable breeding areas (seasonal pans or ponds). Fencing off of residential areas and private property also plays a critical role in impeding the natural migration of the majority of animal species. A trade off thus exists between safety and security on the one hand and movement of animal species on the other.

Mitigation and recommendations

The preservation, maintenance and creation of tracts of natural vegetation (biological corridors) in all stages of ecological succession, interconnected by corridors or green belts for escape, foraging, breeding and exploratory movements between the seasonal wetland and adjacent open Egoli Granite Grasslands to the south and west needs to be considered. The rocky ridge and north-western valley bottom wetland could form a potential biological or dispersal corridor.

Area of the proposed development should be fenced off, and remain fenced off after the completion of construction. Fencing during construction phase or any other barrier should be low impact, preventing further disturbance of the neighbouring vegetation and disruption of the natural migratory movements of remaining animals towards the lower-lying valley bottom wetland. Fences may also be used during the operational phase to prevent the migration of certain animals out of the conserved areas along the wetland onto the construction site. Reverse curbing of approximately 50-70cm should be placed around the housing areas preventing reptiles and amphibians entering into these high-risk areas. The fence or barrier should, however, limit people, livestock and dogs entering the sensitive sites around the pans. A non-migratory brick wall approximately 70cm high with palisade fencing above is recommended.

Artificial Lighting

Numerous species will be attracted towards the light sources and this will result in the disruption of natural cycles, such as the reproductive cycle and foraging behaviour. The lights may destabilise insect populations, which may alter the prey base, diet and ultimately the wellbeing of nocturnal insectivorous fauna. The lights may attract certain nocturnal species to the area, which would not normally occur there, leading to competition between sensitive and the more common species.

Mitigation and recommendations

Artificial lighting should be directed away from the endorheic pans in order to minimize the potential negative effects of the lights on the natural nocturnal activities of certain animals. Where lighting is required for safety or security reasons, this should be targeted at the areas requiring attention. Yellow sodium lights should be prescribed as they do not attract invertebrates at night and will not disturb the existing wildlife. Sodium lamps require a third less energy than conventional light bulbs.

Environmental Control Officer (ECO)

A suitably qualified ECO should be appointed to monitor all activities and to report any actions that could or potentially could have a negative effect on the environment. It is recommended that photographic records are kept before, during and after construction of the various activities.

CONCLUSION & RECOMMENDATIONS

The study site is surrounded by various agricultural holdings and residential/informal settlement areas. The area is not fenced, and access is easily obtained. Large sections of the site have been previously ploughed and planted with pastures while other have been grazed and harvested for fodder with the furrows that were ploughed still visible in some areas. There are various roads and footpaths that transect the area. Herders from the nearby informal settlement east of the site use the area for grazing throughout the year. The cattle graze and trample the area and as a result the wetland area is trampled in some places, but not with large-scale degradation, though the grass layer is degraded with mostly secondary successional species. Based on their plant species composition, conservation value and sensitivity analysis the different vegetation units in the study area has the following ecological sensitivities (Figure 13):

Vegetation unit 1 (Rocky ridge) is characterised by dense to open woody vegetation with a moderate herbaceous layer. The area has some degraded sections due to vagrants utilising the area for meetings, wood harvesting etc., but overall, the largest part of the ridge is in a good condition from a vegetation ecological perspective. Many species are climax species with some secondary successional and pioneer species present. As expected, the area has a high rock cover and overall good vegetation cover. Although a few alien invasive species are present they could easily be removed and eradicated. Rocky ridges are important ecological features and play an important role in overall ecosystem functioning. This vegetation unit is regarded as having a **high ecological sensitivity**.

Vegetation unit 2 (Old fields) comprises the largest parts of the study area. This area has been actively ploughed and grazed in the past and has been left fallow for many years. This has resulted in the anthropogenic grass *Hyparrhenia hirta* establishing and becoming dominant which is typical for highveld grassland once disturbed. The secondary successional grass *Eragrostis chloromelas* and the grass *Cymbopogon caesius* (that can also indicate degraded conditions) are prominent in sections. Small grazing lawns are present throughout this unit due to continuous grazing practices. These “lawns” are dominated by the pioneer grass *Cynodon dactylon* and will increase in size as the grazing continues over the years. This grassland has a low species richness and also a **low ecological sensitivity**.

The Developed area and the Degraded area (vegetation units 3 & 5) have been developed in the past with some sections landscaped (unit 3), while illegal dumping and settlement has taken place in others (unit 6). As a result, these areas are dominated by a large number of alien invasive trees and shrubs with a degraded herbaceous layer consisting of secondary successional and pioneer grass and forb species. These areas have a low species richness and is regarded as having a **low ecological sensitivity**.

The Wetland unit (4) occurs in the central part of the study area in the south and forms the western boundary of the study site in the northern section. Whereas the northern section comprises three artificial dams, a channel, an old borrow pit and a large *Populus alba* woodland, the southern section comprises a longer channel, and old broken dam wall and an old borrow pit. These areas are grazed by cattle that also use it for drinking purposes. The vegetation in the wet areas and dams are mostly obligate wetland species while a mixture of hydrophilic and terrestrial species occurs along the edges of the system. Trampling by cattle is evident throughout the wetland area. As a result of the degraded condition of the vegetation, the sensitivity analysis resulted in a medium sensitivity, however watercourses are extremely important and threatened ecosystems that have an important ecological function. Not only do they channel surface water to larger water systems, but they play a role on filtering water, water retention and also provide habitat to a variety of insects and aquatic species. This area can be rehabilitated by removing the alien invasive vegetation and preventing the overgrazing taking place. The wetland area also provides habitat for various aquatic species and insects increasing the biodiversity of the unit. This vegetation unit is therefore regarded as having a **high ecological sensitivity**.




No threatened species were found to be present on the site while the medicinal plants identified are not threatened and occur abundantly throughout the Province. The wetland falls within the area zoned by GDARD as a CBA area, however, although indicated as a CBA area vegetation unit 2 is degraded and has limited connectivity with natural areas or areas resembling native vegetation.

The large number of alien plant species present throughout the area especially units 3 & 5, are a cause for concern since these species are not only spreading into the adjacent vegetation units, but also spread their seeds via the wetland system during high rainfall events. It is therefore important that these species are eradicated from the property as a high priority especially in vegetation units 1 and 4.

It is not thought that development of the degraded areas with low ecological sensitivities on the study site should have a negative impact on the environment provided that the mitigation measures as indicated in this report is incorporated into the management plan and adhered to.



Conservation Value

-  Study area
-  Low conservation value
-  High conservation value

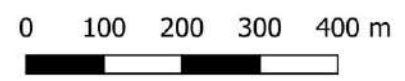


Figure 13. Sensitivity map of the different vegetation units of the study area.

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ANNEXURE 1 Red data plant species previously recorded in the QDG

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Species	Family	Found	Comments
CRITICALLY ENDANGERED			
<i>Lotononis adpressa subsp. leptantha</i>	FABACEAE	✘	Unit 1 marginal
NEAR THREATENED			
<i>Cleome conrathii</i>	CAPPARACEAE	✘	No suitable habitat
<i>Delosperma leendertziae</i>	MESMBRYANTHEMACEAE	✘	No suitable habitat
<i>Habenaria barbertoni</i>	ORCHIDACEAE	✘	No suitable habitat
<i>Habenaria kraenzliniana</i>	ORCHIDACEAE	✘	No suitable habitat
<i>Holothrix randii</i>	ORCHIDACEAE	✘	No suitable habitat
<i>Pearsonia bracteata</i>	FABACEAE	✘	No suitable habitat
<i>Drimia sanguinea</i>	HYACINTHACEAE	✘	No suitable habitat
ENDANGERED			
<i>Habenaria mossii</i>		✘	No suitable habitat
DECLINING			
<i>Boophone disticha</i>	AMARYLLIDACEAE	✘	Unit 1 marginal
<i>Callilepis leptophylla</i>	ASTERACEAE	✘	No suitable habitat
<i>Drima altissima</i>	LILIACEAE	✘	No suitable habitat
<i>Gunnera perpensa</i>	GUNNERACEAE	✘	No suitable habitat
<i>Hypoxis hemerocallidea</i>	HYPOXIDAE	✘	Unit 1 marginal
<i>Ilex mitis (L.) Radlk.</i>	AQUIFOLIACEAE	✘	No suitable habitat
VULNERABLE			
<i>Bowiea volubilis</i>	HYACINTHACEAE	✘	Not found, marginal
<i>Cheilanthes deltoidea subsp. silicola</i>	PTERIDACEAE	✘	No suitable habitat
<i>Melolobium subspicatum</i>	FABACEAE	✘	No suitable habitat
<i>Prunus africana</i>	ROSACEAE	✘	No suitable habitat
<i>Xerophyta adendorffii</i>	VELLOZIACEAE	✘	No suitable habitat

ANNEXURE 2 Bird species recorded within the 2555_2750 pentad (adjacent to site pentad) according to SABAP2

The birds highlighted in yellow were observed during current field survey of the site and neighbouring property to the west. Species highlighted in red are threatened bird species.

	Common group	Common species	Genus	Species	FP (RR%)	FP (n)	Latest FP	Adhoc (RR%)	Adhoc (n)	Latest Adhoc
1	Apalis	Bar-throated	<i>Apalis</i>	<i>thoracica</i>	2.4	7	2020-02-26	0.9	3	2020-09-24
2	Babbler	Arrow-marked	<i>Turdoides</i>	<i>jardineii</i>	18.0	53	2021-04-24	11.1	35	2021-03-30
3	Barbet	Acacia Pied	<i>Tricholaema</i>	<i>leucomelas</i>	1.0	3	2018-08-17	1.3	4	2021-02-19
4	Barbet	Black-collared	<i>Lybius</i>	<i>torquatus</i>	55.6	164	2021-04-24	16.1	51	2021-03-30
5	Barbet	Crested	<i>Trachyphonus</i>	<i>vaillantii</i>	62.7	185	2021-04-24	20.3	64	2021-03-23
6	Batis	Chinspot	<i>Batis</i>	<i>molitor</i>	8.5	25	2021-04-24	1.6	5	2020-10-17
7	Bee-eater	European	<i>Merops</i>	<i>apiaster</i>	29.8	88	2021-03-27	13.0	41	2021-03-23
8	Bee-eater	Little	<i>Merops</i>	<i>pusillus</i>	0.7	2	2020-03-07	0.9	3	2021-03-23
9	Bee-eater	Swallow-tailed	<i>Merops</i>	<i>hirundineus</i>	0.3	1	2021-04-24	0.0	0	-
10	Bee-eater	White-fronted	<i>Merops</i>	<i>bullockoides</i>	14.9	44	2021-04-24	6.0	19	2021-01-26
11	Bishop	Southern Red	<i>Euplectes</i>	<i>orix</i>	70.5	208	2021-04-24	26.3	83	2021-02-12
12	Bishop	Yellow	<i>Euplectes</i>	<i>capensis</i>	0.7	2	2013-12-08	0.0	0	-
13	Bishop	Yellow-crowned	<i>Euplectes</i>	<i>afer</i>	11.9	35	2019-02-03	1.9	6	2019-02-02
14	Bittern	Little	<i>Ixobrychus</i>	<i>minutus</i>	6.1	18	2019-12-18	0.0	0	-
15	Bokmakerie	Bokmakerie	<i>Telophorus</i>	<i>zeylonus</i>	13.9	41	2021-03-27	1.9	6	2021-01-26
16	Boubou	Southern	<i>Laniarius</i>	<i>ferrugineus</i>	50.8	150	2021-04-24	19.0	60	2021-03-30
17	Brubru	Brubru	<i>Nilaus</i>	<i>afer</i>	0.3	1	2020-09-13	0.0	0	-
18	Bulbul	Dark-capped	<i>Pycnonotus</i>	<i>tricolor</i>	90.8	268	2021-04-24	45.3	143	2021-03-30
19	Bunting	Cinnamon-breasted	<i>Emberiza</i>	<i>tahapisi</i>	8.1	24	2020-03-07	0.9	3	2021-03-23
20	Bunting	Golden-breasted	<i>Emberiza</i>	<i>flaviventris</i>	1.7	5	2020-09-19	0.6	2	2021-03-23
21	Bush-shrike	Grey-headed	<i>Malaconotus</i>	<i>blanchoti</i>	1.0	3	2019-12-07	0.0	0	-
22	Bush-shrike	Orange-breasted	<i>Telophorus</i>	<i>sulfureopectus</i>	0.3	1	2021-04-24	0.0	0	-
23	Buttonquail	Kurrichane	<i>Turnix</i>	<i>sylvaticus</i>	2.4	7	2020-02-26	0.9	3	2019-01-18
24	Buzzard	Jackal	<i>Buteo</i>	<i>rufofuscus</i>	0.3	1	2014-12-07	0.0	0	-
25	Buzzard	Lizard	<i>Kaupifalco</i>	<i>monogrammicus</i>	0.0	0	-	0.3	1	2020-06-12
26	Buzzard	Steppe	<i>Buteo</i>	<i>vulpinus</i>	10.2	30	2021-02-12	3.2	10	2021-02-12

27	Cameroptera	Grey-backed	<i>Cameroptera</i>	<i>brevicaudata</i>	0.7	2	2019-12-31	0.0	0	-
28	Canary	Black-throated	<i>Crithagra</i>	<i>atrogularis</i>	33.2	98	2021-04-24	11.1	35	2021-03-06
29	Canary	Yellow-fronted	<i>Crithagra</i>	<i>mozambicus</i>	33.9	100	2021-02-26	11.1	35	2021-03-30
30	Chat	Anteating	<i>Myrmecocichla</i>	<i>formicivora</i>	1.4	4	2020-09-13	1.3	4	2021-03-23
31	Chat	Familiar	<i>Cercomela</i>	<i>familiaris</i>	6.8	20	2021-04-24	3.8	12	2021-03-23
32	Cisticola	Cloud	<i>Cisticola</i>	<i>textrix</i>	10.2	30	2021-01-10	2.2	7	2021-01-29
33	Cisticola	Desert	<i>Cisticola</i>	<i>aridulus</i>	5.8	17	2020-12-16	0.6	2	2020-11-18
34	Cisticola	Lazy	<i>Cisticola</i>	<i>aberrans</i>	2.7	8	2020-09-19	1.6	5	2020-08-01
35	Cisticola	Levaillant's	<i>Cisticola</i>	<i>tinniens</i>	44.1	130	2021-04-24	14.2	45	2021-02-04
36	Cisticola	Rattling	<i>Cisticola</i>	<i>chiniana</i>	0.7	2	2019-11-18	0.3	1	2018-12-02
37	Cisticola	Wailing	<i>Cisticola</i>	<i>lais</i>	1.4	4	2017-11-21	0.3	1	2021-01-07
38	Cisticola	Wing-snapping	<i>Cisticola</i>	<i>ayresii</i>	14.2	42	2021-01-08	3.5	11	2021-01-31
39	Cisticola	Zitting	<i>Cisticola</i>	<i>juncidis</i>	47.1	139	2021-04-24	13.9	44	2021-04-24
40	Cliff-chat	Mocking	<i>Thamnotlaea</i>	<i>cinnamomeiventris</i>	0.7	2	2021-04-24	0.9	3	2018-09-23
41	Cliff-swallow	South African	<i>Hirundo</i>	<i>spilodera</i>	3.7	11	2020-12-10	0.9	3	2021-02-20
42	Coot	Red-knobbed	<i>Fulica</i>	<i>cristata</i>	60.7	179	2021-04-24	25.0	79	2021-02-12
43	Cormorant	Reed	<i>Phalacrocorax</i>	<i>africanus</i>	54.2	160	2021-04-24	13.6	43	2021-03-06
44	Cormorant	White-breasted	<i>Phalacrocorax</i>	<i>carbo</i>	12.2	36	2021-04-24	1.6	5	2020-11-21
45	Coucal	Burchell's	<i>Centropus</i>	<i>burchellii</i>	8.1	24	2020-09-14	0.9	3	2019-11-26
46	Cursorer	Temminck's	<i>Cursorius</i>	<i>temminckii</i>	0.3	1	2019-10-02	0.0	0	-
47	Crake	African	<i>Crecopsis</i>	<i>egregia</i>	0.7	2	2019-01-13	0.0	0	-
48	Crake	Black	<i>Amauornis</i>	<i>flavirostris</i>	6.8	20	2021-04-24	0.9	3	2018-12-02
49	Crane	Blue	<i>Anthropoides</i>	<i>paradiseus</i>	1.0	3	2020-01-31	0.9	3	2019-11-09
50	Crombec	Long-billed	<i>Sylvietta</i>	<i>rufescens</i>	3.1	9	2021-04-24	1.3	4	2020-02-14
51	Crow	Pied	<i>Corvus</i>	<i>albus</i>	78.0	230	2021-04-24	33.2	105	2021-03-30
52	Cuckoo	African	<i>Cuculus</i>	<i>gularis</i>	0.3	1	2020-12-10	0.3	1	2018-01-27
53	Cuckoo	Black	<i>Cuculus</i>	<i>clamosus</i>	3.1	9	2019-12-15	0.0	0	-
54	Cuckoo	Diderick	<i>Chrysococcyx</i>	<i>caprius</i>	24.4	72	2021-02-05	5.4	17	2021-01-31
55	Cuckoo	Jacobin	<i>Clamator</i>	<i>jacobinus</i>	0.7	2	2019-12-31	0.3	1	2017-12-30
56	Cuckoo	Klaas's	<i>Chrysococcyx</i>	<i>klaas</i>	0.7	2	2019-12-19	0.3	1	2020-12-06
57	Cuckoo	Levaillant's	<i>Clamator</i>	<i>levaillantii</i>	0.0	0	-	0.3	1	2018-11-06
58	Cuckoo	Red-chested	<i>Cuculus</i>	<i>solitarius</i>	9.5	28	2020-10-10	3.2	10	2020-11-28

59	Cuckoo-shrike	Black	<i>Campephaga</i>	<i>flava</i>	3.7	11	2020-11-07	1.9	6	2021-01-21
60	Darter	African	<i>Anhinga</i>	<i>rufa</i>	29.5	87	2021-04-24	5.4	17	2021-01-26
61	Dove	Laughing	<i>Streptopelia</i>	<i>senegalensis</i>	74.6	220	2021-04-24	31.0	98	2021-03-06
62	Dove	Namaqua	<i>Oena</i>	<i>capensis</i>	0.7	2	2019-07-16	0.0	0	-
63	Dove	Red-eyed	<i>Streptopelia</i>	<i>semitorquata</i>	73.2	216	2021-04-24	25.6	81	2021-03-06
64	Dove	Rock	<i>Columba</i>	<i>livia</i>	17.3	51	2021-04-24	4.1	13	2020-11-21
65	Drongo	Fork-tailed	<i>Dicrurus</i>	<i>adsimilis</i>	16.3	48	2021-04-24	6.6	21	2021-03-23
66	Duck	African Black	<i>Anas</i>	<i>sparsa</i>	13.6	40	2021-04-24	1.6	5	2021-01-21
67	Duck	Maccoa	<i>Oxyura</i>	<i>maccoa</i>	0.3	1	2016-06-03	0.0	0	-
68	Duck	Mallard	<i>Anas</i>	<i>platyrhynchos</i>	1.0	3	2019-04-16	2.2	7	2019-02-07
69	Duck	White-backed	<i>Thalassornis</i>	<i>leuconotus</i>	1.0	3	2018-09-30	0.0	0	-
70	Duck	White-faced	<i>Dendrocygna</i>	<i>viduata</i>	17.6	52	2021-01-08	4.1	13	2021-01-31
71	Duck	Yellow-billed	<i>Anas</i>	<i>undulata</i>	50.5	149	2021-04-24	16.8	53	2021-03-30
72	Eagle	Long-crested	<i>Lophaetus</i>	<i>occipitalis</i>	4.4	13	2020-11-07	0.6	2	2020-01-12
73	Eagle	Verreaux's	<i>Aquila</i>	<i>verreauxii</i>	1.7	5	2020-11-07	0.0	0	-
74	Eagle-owl	Spotted	<i>Bubo</i>	<i>africanus</i>	1.0	3	2021-01-01	0.9	3	2021-03-23
75	Eagle-owl	Verreaux's	<i>Bubo</i>	<i>lacteus</i>	0.7	2	2011-12-01	0.0	0	-
76	Egret	Cattle	<i>Bubulcus</i>	<i>ibis</i>	56.9	168	2021-04-24	19.3	61	2021-03-06
77	Egret	Great	<i>Egretta</i>	<i>alba</i>	1.0	3	2016-10-22	0.3	1	2017-05-09
78	Egret	Little	<i>Egretta</i>	<i>garzetta</i>	5.4	16	2020-12-10	0.0	0	-
79	Egret	Slaty	<i>Egretta</i>	<i>vinaceigula</i>	14.2	42	2020-01-12	5.4	17	2019-05-30
80	Egret	Yellow-billed	<i>Egretta</i>	<i>intermedia</i>	1.7	5	2019-11-02	0.3	1	2017-09-15
81	Falcon	Amur	<i>Falco</i>	<i>amurensis</i>	7.5	22	2021-01-10	2.5	8	2021-01-21
82	Falcon	Lanner	<i>Falco</i>	<i>biarmicus</i>	0.3	1	2008-12-06	0.9	3	2020-02-02
83	Falcon	Peregrine	<i>Falco</i>	<i>peregrinus</i>	1.0	3	2021-03-27	0.0	0	-
84	Finch	Cuckoo	<i>Anomalospiza</i>	<i>imberbis</i>	0.3	1	2018-12-21	0.0	0	-
85	Finch	Red-headed	<i>Amadina</i>	<i>erythrocephala</i>	1.4	4	2020-06-16	0.3	1	2015-03-08
86	Firefinch	African	<i>Lagonosticta</i>	<i>rubricata</i>	3.7	11	2020-08-11	1.9	6	2021-04-24
87	Firefinch	Jameson's	<i>Lagonosticta</i>	<i>rhodopareia</i>	8.1	24	2020-10-10	3.2	10	2021-02-12
88	Firefinch	Red-billed	<i>Lagonosticta</i>	<i>senegala</i>	0.3	1	2009-08-02	0.3	1	2019-05-30
89	Fiscal	Common (Southern)	<i>Lanius</i>	<i>collaris</i>	77.6	229	2021-04-24	31.6	100	2021-04-04
90	Fish-eagle	African	<i>Haliaeetus</i>	<i>vocifer</i>	14.2	42	2021-04-24	2.5	8	2021-03-24

91	Flamingo	Greater	<i>Phoenicopterus</i>	<i>ruber</i>	0.3	1	2016-06-03	0.0	0	-
92	Flufftail	Red-chested	<i>Sarothrura</i>	<i>rufa</i>	1.4	4	2019-11-02	0.6	2	2021-02-12
93	Flycatcher	Fairy	<i>Stenostira</i>	<i>scita</i>	0.3	1	2015-05-02	0.0	0	-
94	Flycatcher	Fiscal	<i>Sigelus</i>	<i>silens</i>	14.6	43	2021-04-24	3.2	10	2021-03-30
95	Flycatcher	Marico	<i>Bradornis</i>	<i>mariquensis</i>	0.3	1	2015-03-10	0.0	0	-
96	Flycatcher	Southern Black	<i>Melaenornis</i>	<i>pammelaina</i>	5.4	16	2021-04-24	2.2	7	2021-03-23
97	Flycatcher	Spotted	<i>Muscicapa</i>	<i>striata</i>	8.8	26	2021-01-01	1.6	5	2021-03-06
98	Francolin	Coqui	<i>Peliperdix</i>	<i>coqui</i>	8.5	25	2020-09-19	5.1	16	2021-03-30
99	Francolin	Orange River	<i>Scleroptila</i>	<i>levallantoide</i>	1.0	3	2020-09-16	0.0	0	-
100	Francolin	Red-winged	<i>Scleroptila</i>	<i>levallantii</i>	1.7	5	2020-07-03	0.0	0	-
101	Go-away-bird	Grey	<i>Corythaixoides</i>	<i>concolor</i>	66.8	197	2021-04-24	22.8	72	2021-03-06
102	Goose	Domestic	<i>Anser</i>	<i>anser</i>	1.0	3	2018-09-25	0.3	1	2017-09-30
103	Goose	Egyptian	<i>Alopochen</i>	<i>aegyptiacus</i>	62.7	185	2021-04-24	24.1	76	2021-03-06
104	Goose	Spur-winged	<i>Plectropterus</i>	<i>gambensis</i>	5.8	17	2020-12-10	2.8	9	2020-11-28
105	Goshawk	Gabar	<i>Melierax</i>	<i>gabar</i>	2.4	7	2020-08-13	1.3	4	2021-03-30
106	Grass-owl	African	<i>Tyto</i>	<i>capensis</i>	1.4	4	2015-06-22	0.0	0	-
107	Grassbird	Cape	<i>Sphenoecus</i>	<i>afer</i>	24.4	72	2021-04-24	5.4	17	2021-03-06
108	Grebe	Great Crested	<i>Podiceps</i>	<i>cristatus</i>	0.3	1	2015-05-17	0.0	0	-
109	Grebe	Little	<i>Tachybaptus</i>	<i>ruficollis</i>	15.9	47	2021-03-27	2.8	9	2020-12-06
110	Greenshank	Common	<i>Tringa</i>	<i>nebularia</i>	0.3	1	2015-06-22	0.0	0	-
111	Guineafowl	Helmeted	<i>Numida</i>	<i>meleagris</i>	74.2	219	2021-04-24	29.7	94	2021-03-30
112	Gull	Grey-headed	<i>Larus</i>	<i>cirrocephalus</i>	1.0	3	2018-07-14	0.9	3	2017-12-30
113	Hamerkop	Hamerkop	<i>Scopus</i>	<i>umbretta</i>	8.5	25	2021-01-10	2.5	8	2020-08-01
114	Harrier-Hawk	African	<i>Polyboroides</i>	<i>typus</i>	1.7	5	2019-12-27	0.3	1	2020-09-24
115	Hawk	African Cuckoo	<i>Aviceda</i>	<i>cuculoides</i>	0.3	1	2018-09-30	0.6	2	2018-12-26

5										
1 1 6	Hawk-eagle	African	<i>Aquila</i>	<i>spilogaster</i>	0.3	1	2015-12-23	0.0	0	-
1 1 7	Helmet-shrike	White-crested	<i>Prionops</i>	<i>plumatus</i>	0.3	1	2012-06-20	0.0	0	-
1 1 8	Heron	Black	<i>Egretta</i>	<i>ardesiaca</i>	6.1	18	2020-11-14	1.9	6	2020-02-20
1 1 9	Heron	Black-headed	<i>Ardea</i>	<i>melanocephala</i>	34.9	103	2021-04-24	12.0	38	2021-03-06
1 2 0	Heron	Goliath	<i>Ardea</i>	<i>goliath</i>	2.0	6	2019-12-22	0.3	1	2017-09-07
1 2 1	Heron	Green-backed	<i>Butorides</i>	<i>striata</i>	4.7	14	2020-08-13	0.9	3	2020-02-02
1 2 2	Heron	Grey	<i>Ardea</i>	<i>cinerea</i>	11.5	34	2020-09-14	1.9	6	2019-12-22
1 2 3	Heron	Purple	<i>Ardea</i>	<i>purpurea</i>	14.6	43	2021-02-05	2.8	9	2021-03-30
1 2 4	Heron	Squacco	<i>Ardeola</i>	<i>ralloides</i>	4.7	14	2017-09-18	0.9	3	2019-11-02
1 2 5	Honey-buzzard	European	<i>Pernis</i>	<i>apivorus</i>	1.7	5	2021-02-12	0.0	0	-
1 2 6	Honeybird	Brown-backed	<i>Prodotiscus</i>	<i>regulus</i>	0.3	1	2020-10-10	0.0	0	-
1 2 7	Honeyguide	Greater	<i>Indicator</i>	<i>indicator</i>	3.1	9	2020-07-19	0.3	1	2018-10-20
1 2 8	Honeyguide	Lesser	<i>Indicator</i>	<i>minor</i>	4.1	12	2020-12-10	1.3	4	2020-11-07
1 2 9	Hoopoe	African	<i>Upupa</i>	<i>africana</i>	22.7	67	2021-04-24	6.3	20	2021-02-04
1 3 0	Hornbill	African Grey	<i>Tockus</i>	<i>nasutus</i>	29.8	88	2020-12-10	12.7	40	2021-01-21
1 3 1	House-martin	Common	<i>Delichon</i>	<i>urbicum</i>	3.4	10	2020-09-16	0.9	3	2021-01-22
1 3 2	Ibis	African Sacred	<i>Threskiornis</i>	<i>aethiopicus</i>	57.6	170	2021-04-24	18.7	59	2021-03-06
1 3 3	Ibis	Glossy	<i>Plegadis</i>	<i>falcinellus</i>	9.8	29	2021-02-05	1.9	6	2019-11-30
1 3 4	Ibis	Hadeda	<i>Bostrychia</i>	<i>hagedash</i>	86.4	255	2021-04-24	38.9	123	2021-03-06
1 3 5	Indigobird	Village	<i>Vidua</i>	<i>chalybeata</i>	0.0	0	-	0.3	1	2020-03-14
1 3 6	Jacana	African	<i>Actophilornis</i>	<i>africanus</i>	4.4	13	2015-12-23	0.3	1	2015-05-17
1	Kestrel	Greater	<i>Falco</i>	<i>rupicoloides</i>	1.4	4	2020-03-	0.0	0	-

37							09			
138	Kestrel	Lesser	<i>Falco</i>	<i>naumanni</i>	0.3	1	2021-03-27	0.0	0	-
139	Kestrel	Rock	<i>Falco</i>	<i>rupicolus</i>	2.4	7	2019-12-15	1.3	4	2019-10-24
140	Kingfisher	Brown-hooded	<i>Halcyon</i>	<i>albiventris</i>	18.3	54	2021-04-24	4.1	13	2021-04-04
141	Kingfisher	Giant	<i>Megaceryle</i>	<i>maximus</i>	7.8	23	2020-08-13	1.3	4	2020-11-21
142	Kingfisher	Half-collared	<i>Alcedo</i>	<i>semitorquata</i>	1.4	4	2020-08-22	0.0	0	-
143	Kingfisher	Malachite	<i>Alcedo</i>	<i>crinata</i>	23.4	69	2021-04-24	4.7	15	2021-01-15
144	Kingfisher	Pied	<i>Ceryle</i>	<i>rudis</i>	35.9	106	2021-04-24	11.4	36	2021-02-12
145	Kingfisher	Woodland	<i>Halcyon</i>	<i>senegalensis</i>	4.4	13	2019-11-30	0.9	3	2020-02-02
146	Kite	Black-shouldered	<i>Elanus</i>	<i>caeruleus</i>	41.0	121	2021-04-24	16.1	51	2021-04-04
147	Kite	Yellow-billed	<i>Milvus</i>	<i>aegyptius</i>	5.8	17	2021-02-26	1.6	5	2020-02-22
148	Korhaan	Northern Black	<i>Afrotis</i>	<i>afraoides</i>	28.1	83	2021-03-27	9.8	31	2021-01-31
149	Korhaan	White-bellied	<i>Eupodotis</i>	<i>senegalensis</i>	0.7	2	2020-03-07	0.3	1	2018-09-23
150	Lapwing	African Wattled	<i>Vanellus</i>	<i>senegallus</i>	57.3	169	2021-04-24	18.0	57	2021-02-12
151	Lapwing	Blacksmith	<i>Vanellus</i>	<i>armatus</i>	78.6	232	2021-04-24	36.1	114	2021-03-06
152	Lapwing	Crowned	<i>Vanellus</i>	<i>coronatus</i>	80.0	236	2021-04-24	33.5	106	2021-03-06
153	Lark	Eastern Clapper	<i>Mirafra</i>	<i>fasciolata</i>	0.3	1	2020-01-25	0.6	2	2020-09-24
154	Lark	Eastern Long-billed	<i>Certhilauda</i>	<i>semitorquata</i>	0.3	1	2018-02-17	0.3	1	2018-05-09
155	Lark	Melodious	<i>Mirafra</i>	<i>cheniana</i>	0.3	1	2020-01-25	0.0	0	-
156	Lark	Red-capped	<i>Calandrella</i>	<i>cinerea</i>	1.4	4	2020-09-19	0.9	3	2021-03-23
157	Lark	Rufous-naped	<i>Mirafra</i>	<i>africana</i>	48.1	142	2021-03-27	19.0	60	2021-02-20
158	Lark	Sabota	<i>Calendulauda</i>	<i>sabota</i>	0.3	1	2009-12-13	0.0	0	-

159	Lark	Spike-heeled	<i>Chersomanes</i>	<i>albofasciata</i>	0.3	1	2017-04-08	0.0	0	-
160	Longclaw	Cape	<i>Macronyx</i>	<i>capensis</i>	47.1	139	2021-04-24	12.0	38	2021-03-06
161	Mannikin	Bronze	<i>Spermestes</i>	<i>cucullatus</i>	7.5	22	2021-04-24	0.9	3	2020-02-07
162	Martin	Banded	<i>Riparia</i>	<i>cincta</i>	3.4	10	2021-03-27	0.6	2	2020-11-28
163	Martin	Brown-throated	<i>Riparia</i>	<i>paludicola</i>	11.5	34	2021-04-24	2.8	9	2020-08-09
164	Martin	Rock	<i>Hirundo</i>	<i>fuligula</i>	12.2	36	2020-10-02	6.0	19	2020-06-26
165	Masked-weaver	Lesser	<i>Ploceus</i>	<i>intermedius</i>	0.7	2	2017-05-20	0.3	1	2019-12-19
166	Masked-weaver	Southern	<i>Ploceus</i>	<i>velatus</i>	90.2	266	2021-04-24	48.7	154	2021-03-23
167	Moorhen	Common	<i>Gallinula</i>	<i>chloropus</i>	53.2	157	2021-04-24	20.3	64	2021-03-06
168	Mousebird	Red-faced	<i>Urocolius</i>	<i>indicus</i>	35.3	104	2021-03-27	11.7	37	2021-01-29
169	Mousebird	Speckled	<i>Colius</i>	<i>striatus</i>	39.3	116	2021-04-24	12.7	40	2021-03-06
170	Mousebird	White-backed	<i>Colius</i>	<i>colius</i>	0.3	1	2014-12-07	0.0	0	-
171	Myna	Common	<i>Acridotheres</i>	<i>tristis</i>	83.7	247	2021-04-24	40.5	128	2021-03-30
172	Neddicky	Neddicky	<i>Cisticola</i>	<i>fulvicapilla</i>	40.7	120	2021-04-24	13.6	43	2021-03-23
173	Night-Heron	Black-crowned	<i>Nycticorax</i>	<i>nycticorax</i>	1.4	4	2019-10-31	0.3	1	2019-10-26
174	Nightjar	Fiery-necked	<i>Caprimulgus</i>	<i>pectoralis</i>	3.1	9	2020-10-10	4.4	14	2021-03-30
175	Nightjar	Freckled	<i>Caprimulgus</i>	<i>tristigma</i>	0.3	1	2011-12-01	0.0	0	-
176	Nightjar	Rufous-cheeked	<i>Caprimulgus</i>	<i>rufigena</i>	3.1	9	2021-01-01	1.9	6	2020-02-07
177	Olive-pigeon	African	<i>Columba</i>	<i>arquatrix</i>	1.4	4	2019-12-27	0.6	2	2017-11-11
178	Oriole	Black-headed	<i>Oriolus</i>	<i>larvatus</i>	8.1	24	2020-09-19	2.5	8	2020-09-24
179	Ostrich	Common	<i>Struthio</i>	<i>camelus</i>	11.5	34	2020-11-14	2.5	8	2020-09-04
18	Owl	Barn	<i>Tyto</i>	<i>alba</i>	0.7	2	2021-03-27	0.0	0	-

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181	Owl	Marsh	<i>Asio</i>	<i>capensis</i>	2.4	7	2019-07-11	2.5	8	2021-03-23
182	Owlet	Pearl-spotted	<i>Glaucidium</i>	<i>perlatum</i>	0.3	1	2020-09-19	0.0	0	-
183	Painted-snipe	Greater	<i>Rostratula</i>	<i>benghalensis</i>	0.3	1	2021-01-10	0.0	0	-
184	Palm-swift	African	<i>Cypsiurus</i>	<i>parvus</i>	61.4	181	2021-04-24	23.1	73	2021-03-06
185	Paradise-flycatcher	African	<i>Terpsiphone</i>	<i>viridis</i>	8.5	25	2021-01-08	1.9	6	2021-01-22
186	Paradise-whydah	Long-tailed	<i>Vidua</i>	<i>paradisaea</i>	0.3	1	2019-11-29	0.0	0	-
187	Peacock	Common	<i>Pavo</i>	<i>crystalatus</i>	6.1	18	2020-12-10	2.2	7	2020-11-21
188	Pigeon	Speckled	<i>Columba</i>	<i>guinea</i>	38.0	112	2021-04-24	8.2	26	2021-03-06
189	Pipit	African	<i>Anthus</i>	<i>cinnamomeus</i>	56.6	167	2021-04-24	20.9	66	2021-03-23
190	Pipit	Buffy	<i>Anthus</i>	<i>vaalensis</i>	4.1	12	2021-01-01	1.9	6	2021-04-04
191	Pipit	Bushveld	<i>Anthus</i>	<i>caffer</i>	0.3	1	2021-01-01	0.3	1	2020-12-25
192	Pipit	Nicholson's	<i>Anthus</i>	<i>nicholsoni</i>	1.0	3	2020-09-13	0.3	1	2020-09-24
193	Pipit	Plain-backed	<i>Anthus</i>	<i>leucophrys</i>	1.0	3	2020-01-31	0.9	3	2020-08-01
194	Pipit	Striped	<i>Anthus</i>	<i>lineiventris</i>	0.7	2	2021-01-01	1.6	5	2020-10-17
195	Plover	Three-banded	<i>Charadrius</i>	<i>tricoloris</i>	15.9	47	2021-01-10	3.2	10	2019-12-29
196	Pochard	Southern	<i>Netta</i>	<i>erythrophthalma</i>	0.0	0	-	0.3	1	2019-09-08
197	Prinia	Black-chested	<i>Prinia</i>	<i>flavicans</i>	12.2	36	2021-03-27	3.5	11	2021-02-12
198	Prinia	Tawny-flanked	<i>Prinia</i>	<i>subflava</i>	62.7	185	2021-04-24	18.7	59	2021-03-23
199	Puffback	Black-backed	<i>Dryoscopus</i>	<i>cubla</i>	12.5	37	2021-04-24	10.1	32	2021-03-23
200	Quail	Common	<i>Coturnix</i>	<i>coturnix</i>	1.4	4	2020-01-25	0.0	0	-
201	Quailfinch	African	<i>Ortygospiza</i>	<i>atricollis</i>	22.7	67	2021-04-24	9.8	31	2021-03-30
202	Quelea	Red-billed	<i>Quelea</i>	<i>quelea</i>	9.2	27	2020-08-	1.6	5	2020-06-

02							11			13
203	Reed-warbler	African	<i>Acrocephalus</i>	<i>baeticatus</i>	12.2	36	2021-01-10	3.8	12	2021-01-26
204	Reed-warbler	Great	<i>Acrocephalus</i>	<i>arundinaceus</i>	0.3	1	2015-01-15	0.3	1	2018-01-04
205	Robin-chat	Cape	<i>Cossypha</i>	<i>caffra</i>	43.4	128	2021-04-24	9.8	31	2020-11-28
206	Robin-chat	White-throated	<i>Cossypha</i>	<i>humeralis</i>	3.4	10	2020-09-13	1.9	6	2021-03-23
207	Rock-thrush	Cape	<i>Monticola</i>	<i>rupestris</i>	0.7	2	2009-09-04	0.0	0	-
208	Roller	European	<i>Coracias</i>	<i>garrulus</i>	0.3	1	2009-03-14	0.0	0	-
209	Roller	Lilac-breasted	<i>Coracias</i>	<i>caudatus</i>	0.3	1	2015-01-15	0.0	0	-
210	Rush-warbler	Little	<i>Bradypterus</i>	<i>baboecala</i>	26.1	77	2021-04-24	7.6	24	2021-02-12
211	Sandpiper	Common	<i>Actitis</i>	<i>hypoleucos</i>	0.3	1	2015-01-11	0.0	0	-
212	Scimitarbill	Common	<i>Rhinopomastus</i>	<i>cyanomelas</i>	0.3	1	2007-10-15	0.0	0	-
213	Scops-owl	Southern White-faced	<i>Ptilopsis</i>	<i>granti</i>	0.3	1	2019-01-02	0.0	0	-
214	Scrub-robin	Kalahari	<i>Cercotrichas</i>	<i>paena</i>	0.3	1	2015-12-26	0.0	0	-
215	Scrub-robin	White-browed	<i>Cercotrichas</i>	<i>leucophrys</i>	5.8	17	2021-03-27	3.5	11	2021-03-30
216	Secretarybird	Secretarybird	<i>Sagittarius</i>	<i>serpentarius</i>	0.3	1	2019-09-25	0.3	1	2020-09-04
217	Seedeater	Streaky-headed	<i>Crithagra</i>	<i>gularis</i>	4.7	14	2021-03-27	0.6	2	2019-02-02
218	Shelduck	South African	<i>Tadorna</i>	<i>cana</i>	0.3	1	2013-04-19	0.0	0	-
219	Shikra	Shikra	<i>Accipiter</i>	<i>badius</i>	1.7	5	2020-01-12	0.3	1	2020-02-22
220	Shoveler	Cape	<i>Anas</i>	<i>smithii</i>	0.3	1	2016-06-03	0.0	0	-
221	Shrike	Crimson-breasted	<i>Laniarius</i>	<i>atrococcineus</i>	1.0	3	2021-04-24	0.0	0	-
222	Shrike	Lesser Grey	<i>Lanius</i>	<i>minor</i>	1.4	4	2018-03-28	0.3	1	2018-04-02
223	Shrike	Red-backed	<i>Lanius</i>	<i>collurio</i>	5.4	16	2021-03-27	1.6	5	2021-03-23

2 2 4	Snake-eagle	Black-chested	<i>Circaetus</i>	<i>pectoralis</i>	6.1	18	2020-09-19	4.7	15	2021-03-23
2 2 5	Snake-eagle	Brown	<i>Circaetus</i>	<i>cinereus</i>	0.3	1	2020-09-13	0.0	0	-
2 2 6	Snipe	African	<i>Gallinago</i>	<i>nigripennis</i>	8.5	25	2021-01-10	2.5	8	2021-01-26
2 2 7	Sparrow	Cape	<i>Passer</i>	<i>melanurus</i>	37.6	111	2021-02-26	15.5	49	2021-03-06
2 2 8	Sparrow	House	<i>Passer</i>	<i>domesticus</i>	12.5	37	2021-04-24	1.6	5	2019-08-25
2 2 9	Sparrow	Southern Grey-headed	<i>Passer</i>	<i>diffusus</i>	47.1	139	2021-04-24	14.2	45	2021-02-20
2 3 0	Sparrow-weaver	White-browed	<i>Plocepasser</i>	<i>mahali</i>	16.3	48	2021-04-24	3.5	11	2020-11-21
2 3 1	Sparrowhawk	Black	<i>Accipiter</i>	<i>melanoleucus</i>	3.4	10	2021-04-24	0.6	2	2018-10-31
2 3 2	Sparrowhawk	Little	<i>Accipiter</i>	<i>minullus</i>	2.4	7	2019-12-07	0.9	3	2020-10-04
2 3 3	Sparrowhawk	Ovambo	<i>Accipiter</i>	<i>ovampensis</i>	5.8	17	2021-03-27	0.9	3	2019-04-07
2 3 4	Spoonbill	African	<i>Platalea</i>	<i>alba</i>	2.7	8	2019-11-20	1.3	4	2021-01-22
2 3 5	Spurfowl	Natal	<i>Pternistis</i>	<i>natalensis</i>	7.8	23	2021-04-24	4.4	14	2021-03-23
2 3 6	Spurfowl	Swainson's	<i>Pternistis</i>	<i>swainsonii</i>	20.3	60	2021-03-27	4.4	14	2021-02-12
2 3 7	Starling	Cape Glossy	<i>Lamprotornis</i>	<i>nitens</i>	66.8	197	2021-04-24	27.2	86	2021-03-30
2 3 8	Starling	Pied	<i>Spreo</i>	<i>bicolor</i>	35.3	104	2021-01-11	13.6	43	2021-03-06
2 3 9	Starling	Red-winged	<i>Onychognathus</i>	<i>morio</i>	27.8	82	2021-01-01	14.2	45	2021-03-30
2 4 0	Starling	Violet-backed	<i>Cinnyricinclus</i>	<i>leucogaster</i>	0.3	1	2019-12-15	0.0	0	-
2 4 1	Starling	Wattled	<i>Creatophora</i>	<i>cinerea</i>	1.4	4	2018-11-03	0.0	0	-
2 4 2	Stonechat	African	<i>Saxicola</i>	<i>torquatus</i>	63.1	186	2021-04-24	28.2	89	2021-03-23
2 4 3	Stork	Abdim's	<i>Ciconia</i>	<i>abdimii</i>	0.0	0	-	0.6	2	2018-01-21
2 4 4	Stork	Black	<i>Ciconia</i>	<i>nigra</i>	0.3	1	2018-02-17	0.0	0	-
2 4 4	Stork	White	<i>Ciconia</i>	<i>ciconia</i>	1.0	3	2021-01-15	0.3	1	2020-11-21

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2 4 6	Sunbird	Amethyst	<i>Chalcomitra</i>	<i>amethystina</i>	27.8	82	2021-03-27	12.0	38	2021-01-07
2 4 7	Sunbird	Greater Double-collared	<i>Cinnyris</i>	<i>afer</i>	0.3	1	2009-03-14	0.0	0	-
2 4 8	Sunbird	White-bellied	<i>Cinnyris</i>	<i>talatala</i>	26.1	77	2021-04-24	7.6	24	2020-11-21
2 4 9	Swallow	Barn	<i>Hirundo</i>	<i>rustica</i>	50.5	149	2021-03-27	19.3	61	2021-03-23
2 5 0	Swallow	Greater Striped	<i>Hirundo</i>	<i>cucullata</i>	59.3	175	2021-04-24	19.0	60	2021-03-06
2 5 1	Swallow	Lesser Striped	<i>Hirundo</i>	<i>abyssinica</i>	28.1	83	2021-04-24	9.2	29	2021-03-17
2 5 2	Swallow	Pearl-breasted	<i>Hirundo</i>	<i>dimidiata</i>	10.5	31	2021-04-24	6.3	20	2021-03-24
2 5 3	Swallow	Red-breasted	<i>Hirundo</i>	<i>semirufa</i>	3.1	9	2020-12-10	0.3	1	2020-02-22
2 5 4	Swallow	White-throated	<i>Hirundo</i>	<i>albigularis</i>	43.7	129	2021-04-24	16.1	51	2021-02-20
2 5 5	Swamp-warbler	Lesser	<i>Acrocephalus</i>	<i>gracilirostris</i>	29.5	87	2021-04-24	8.2	26	2021-01-26
2 5 6	Swamphen	African Purple	<i>Porphyrio</i>	<i>madagascariensis</i>	3.7	11	2021-01-10	2.8	9	2019-11-02
2 5 7	Swift	African Black	<i>Apus</i>	<i>barbatus</i>	2.0	6	2018-02-17	0.6	2	2020-11-21
2 5 8	Swift	Alpine	<i>Tachymarptis</i>	<i>melba</i>	1.4	4	2020-01-18	0.6	2	2019-04-09
2 5 9	Swift	Common	<i>Apus</i>	<i>apus</i>	1.4	4	2019-12-29	0.9	3	2019-04-09
2 6 0	Swift	Horus	<i>Apus</i>	<i>horus</i>	1.4	4	2021-01-08	0.6	2	2020-01-04
2 6 1	Swift	Little	<i>Apus</i>	<i>affinis</i>	32.2	95	2021-02-26	10.8	34	2021-03-06
2 6 2	Swift	White-rumped	<i>Apus</i>	<i>caffer</i>	41.4	122	2021-02-26	15.8	50	2021-03-24
2 6 3	Tchagra	Black-crowned	<i>Tchagra</i>	<i>senegalus</i>	12.5	37	2020-10-10	6.0	19	2021-03-30
2 6 4	Tchagra	Brown-crowned	<i>Tchagra</i>	<i>australis</i>	8.8	26	2021-04-24	4.7	15	2021-03-30
2 6 5	Teal	Hottentot	<i>Anas</i>	<i>hottentota</i>	0.3	1	2015-04-25	0.0	0	-
2 6 6	Teal	Red-billed	<i>Anas</i>	<i>erythrorhynchos</i>	2.7	8	2017-09-08	0.3	1	2018-01-11
2	Tern	Caspian	<i>Sterna</i>	<i>caspia</i>	0.3	1	2019-10-	0.3	1	2018-01-

6 7							31			04
2 6 8	Tern	Whiskered	<i>Chlidonias</i>	<i>hybrida</i>	14.9	44	2020-12-10	1.9	6	2020-02-20
2 6 9	Tern	White-winged	<i>Chlidonias</i>	<i>leucopterus</i>	3.7	11	2018-12-02	0.3	1	2015-10-31
2 7 0	Thick-knee	Spotted	<i>Burhinus</i>	<i>capensis</i>	24.7	73	2021-02-05	5.7	18	2021-03-23
2 7 1	Thrush	Groundscraper	<i>Psophocichla</i>	<i>litsipsirupa</i>	9.5	28	2021-01-08	5.1	16	2021-01-29
2 7 2	Thrush	Karoo	<i>Turdus</i>	<i>smithi</i>	27.8	82	2021-01-08	8.5	27	2021-02-19
2 7 3	Thrush	Kurrichane	<i>Turdus</i>	<i>libonyanus</i>	14.6	43	2021-01-01	4.7	15	2021-03-30
2 7 4	Tinkerbird	Yellow-fronted	<i>Pogoniulus</i>	<i>chrysoconus</i>	8.1	24	2021-04-24	5.1	16	2021-03-30
2 7 5	Tit	Southern Black	<i>Parus</i>	<i>niger</i>	0.0	0	-	0.3	1	2020-06-12
2 7 6	Tit-babbler	Chestnut-vented	<i>Parisoma</i>	<i>subcaeruleum</i>	1.0	3	2020-09-19	0.0	0	-
2 7 7	Turtle-dove	Cape	<i>Streptopelia</i>	<i>capicola</i>	54.9	162	2021-04-24	19.3	61	2021-03-23
2 7 8	Vulture	Cape	<i>Gyps</i>	<i>coprotheres</i>	11.2	33	2020-09-19	3.5	11	2021-01-31
2 7 9	Vulture	White-backed	<i>Gyps</i>	<i>africanus</i>	0.7	2	2020-11-14	0.0	0	-
2 8 0	Wagtail	Cape	<i>Motacilla</i>	<i>capensis</i>	42.4	125	2021-04-24	13.9	44	2021-03-06
2 8 1	Warbler	Garden	<i>Sylvia</i>	<i>borin</i>	0.3	1	2020-01-31	0.3	1	2018-01-11
2 8 2	Warbler	Marsh	<i>Acrocephalus</i>	<i>palustris</i>	2.7	8	2021-03-27	0.6	2	2019-11-26
2 8 3	Warbler	Willow	<i>Phylloscopus</i>	<i>trochilus</i>	8.8	26	2021-03-27	3.8	12	2021-02-20
2 8 4	Waxbill	Blue	<i>Uraeginthus</i>	<i>angolensis</i>	2.0	6	2020-08-22	0.0	0	-
2 8 5	Waxbill	Common	<i>Estrilda</i>	<i>astrild</i>	24.4	72	2021-04-24	4.4	14	2021-03-23
2 8 6	Waxbill	Orange-breasted	<i>Amandava</i>	<i>subflava</i>	1.7	5	2021-04-24	0.3	1	2019-11-15
2 8 7	Weaver	Cape	<i>Ploceus</i>	<i>capensis</i>	6.1	18	2020-01-01	1.9	6	2021-02-12
2 8 8	Weaver	Thick-billed	<i>Amblyospiza</i>	<i>albifrons</i>	38.6	114	2021-04-24	8.2	26	2021-03-06

289	Weaver	Village	<i>Ploceus</i>	<i>cucullatus</i>	0.3	1	2016-07-15	0.0	0	-
290	Wheatear	Capped	<i>Oenanthe</i>	<i>pileata</i>	5.1	15	2020-09-19	3.2	10	2020-11-07
291	Wheatear	Mountain	<i>Oenanthe</i>	<i>monticola</i>	0.7	2	2020-06-16	0.0	0	-
292	White-eye	Cape	<i>Zosterops</i>	<i>virens</i>	56.6	167	2021-04-24	21.8	69	2021-03-06
293	Whydah	Pin-tailed	<i>Vidua</i>	<i>macroura</i>	32.9	97	2021-02-12	12.0	38	2021-03-23
294	Widowbird	Fan-tailed	<i>Euplectes</i>	<i>axillaris</i>	0.7	2	2019-02-23	0.3	1	2019-02-03
295	Widowbird	Long-tailed	<i>Euplectes</i>	<i>progne</i>	27.5	81	2021-03-27	8.9	28	2021-03-06
296	Widowbird	Red-collared	<i>Euplectes</i>	<i>ardens</i>	37.3	110	2021-02-26	14.2	45	2021-03-06
297	Widowbird	White-winged	<i>Euplectes</i>	<i>albonotatus</i>	29.2	86	2021-01-08	7.9	25	2021-01-21
298	Wood-hoopoe	Green	<i>Phoeniculus</i>	<i>purpureus</i>	30.2	89	2021-04-24	8.2	26	2021-04-04
299	Woodpecker	Bearded	<i>Dendropicos</i>	<i>namaquus</i>	0.3	1	2011-12-01	0.3	1	2018-02-15
300	Woodpecker	Cardinal	<i>Dendropicos</i>	<i>fuscescens</i>	6.1	18	2021-04-24	1.9	6	2021-04-24
301	Woodpecker	Golden-tailed	<i>Campethera</i>	<i>abingoni</i>	4.1	12	2020-10-10	1.9	6	2021-02-04
302	Wryneck	Red-throated	<i>Jynx</i>	<i>ruficollis</i>	10.5	31	2021-02-05	5.1	16	2020-11-21