

December 2021

AN ECOLOGICAL REPORT ON THE FLORA & FAUNA:

**Proposed residential township development on
Portion 183 of the Farm Zandfontein 317-JR,
City of Tshwane Metropolitan Municipality**

A report commissioned
by

**COSMOPOLITAN
PROJECTS
JOHANNESBURG
(PTY) LTD**

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CONDITIONS RELATING TO THIS REPORT

Declaration of interest

Enviroguard Ecological Services cc and its members/co-workers:

- 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.
- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA).
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- 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 C Cook: Reg. No. 400084/08 (Zoological Science)

They have the following qualifications:

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Factors limiting the quality of this study

Flora: The site was visited for a preliminary survey on 9 August while the full survey was conducted 6 November 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 summer rainfall season on the 6th of November 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 Pretoria North (Tshwane) areas; between 2000 and 2021.

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- 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 Proposed residential township development on Portion 183 of the Farm Zandfontein 317-JR, City of Tshwane Metropolitan Municipality (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 approximately 7 ha in size and is located to the north of Erma Street and to the west of Erma and Mulder Street, within the City of Tshwane Metropolitan Municipality, Gauteng. The area is a small holding surrounded by residential/township developments in the east and west, and industrial area in the south and open land in the north.

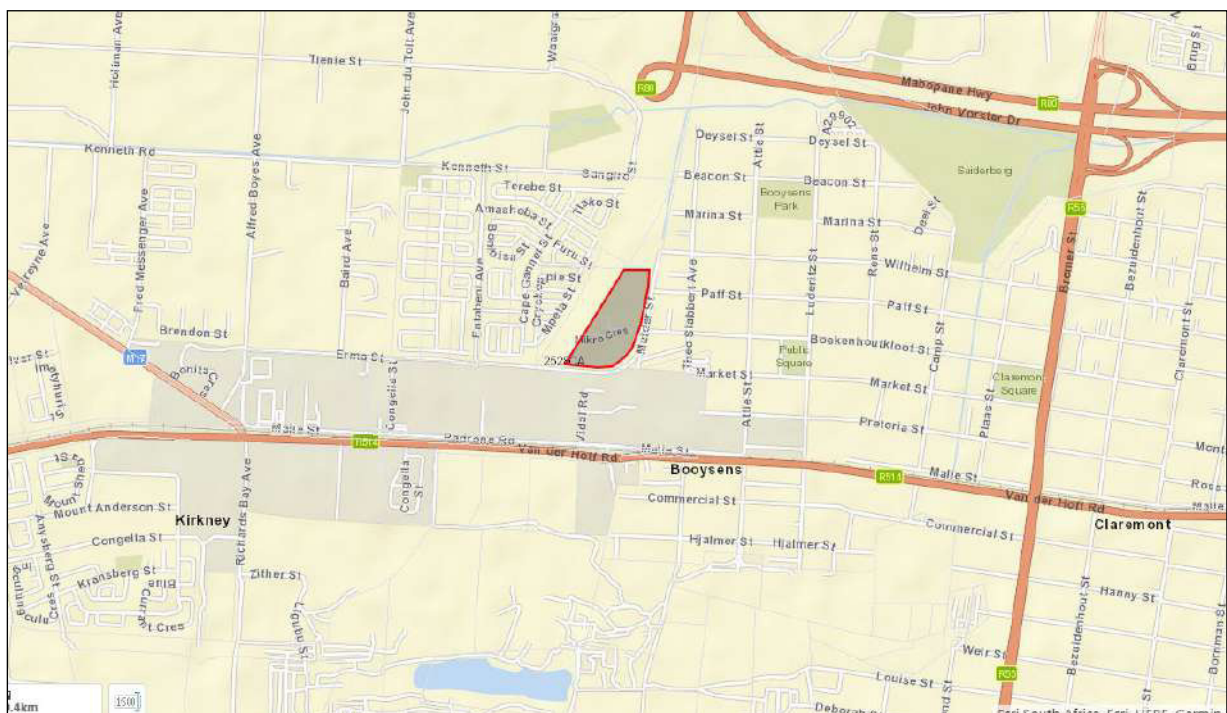


Figure 1. Locality the study area.

Existing impacts

- Sections of the site are developed with houses and outbuildings and a kraal area.
- The area is used for grazing at times.

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 Westview 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 Pretoria-West 2528 CA 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 Westview 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 Westview site was carried out on foot during daylight hours on the 6th of November 2021. The temperature was hot with temperatures ranging between 18-32°C. The survey was heavily augmented with previous faunal surveys conducted in the Tshwane area between 2000 and 2021. The field verification for the site was restricted to a single day (8 hours) during the summer months. No specialist faunal survey techniques; including camera trapping, acoustic monitoring, 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 three vegetation units (Figure 2) namely:

1. *Eragrostis curvula* grassland
2. *Hyparrhenia hirta* grassland
3. Developed area

1. *Eragrostis curvula* grassland



Status	Degraded		
Vegetation structure:	Grassland with scattered trees		
Topography:	Level with slight southern slope (1-3°)	Soil	Clay
Unit size	2.3 ha		
Need for rehabilitation	High		
Conservation Priority	Low		

This unit is located along the south-eastern boundary of the study area on dark to brown clay soil. There are few rocks present, however rocks and building rubble are present in some

areas covering up to 5% of the area. The grasses and forbs have the highest cover (see table below):

TREES	SHRUBS	GRASSES	FORBS	ROCKS
3%	5%	65%	20%	5%

The vegetation of this unit is characterised by the dominance of the grasses *Eragrostis curvula* and *Hyparrhenia hirta*, with *Eragrostis chloromelas*, *Setaria sphacelata*, and the forbs *Nidorella anomala*, *Pachycarpus schinzii* and *Verbena tenuisecta* being prominent. Other species present include the grasses *Themeda triandra*, *Cynodon dactylon* and the forbs *Verbena brasiliensis*, *Verbena bonariensis*, *Campuloclinium macrocephalum*, *Pollichia campestris*, *Gomphocarpus fruticosus* and *Conyza bonariensis*.

A few woody species occur as a clump in the southern part of the unit, with some as single individuals scattered through the unit, and include the woody species *Vachellia sieberiana*, *Gymnosporia buxifolia* and *Rhynchosia nitens*.

Red data species

No red data species were found to be present in this unit.

Alien plant species

Verbena bonariensis; *Verbena brasiliensis*, *Morus alba*, *Campuloclinium macrocephalum*, *Jacaranda mimosifolia*; *Melia azedarach*; *Tipuana tipu*.

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

Cat	Species	Class
	<i>Acrotome hispida</i>	F
🟡	<i>Amaranthus hybridus</i>	F
🔴	<i>Campuloclinium macrocephalum</i>	F
🟡	<i>Chenopodium album</i>	F
🟡	<i>Conyza bonariensis</i>	F
🟡	<i>Conyza podocephala</i>	F
	<i>Cucumis zeyheri</i>	F
🟡	<i>Cynodon dactylon</i>	G
	<i>Dipcadi viride</i>	F
	<i>Eragrostis chloromelas</i>	G
	<i>Eragrostis curvula</i>	G



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

	<i>Gladiolus ssp</i>	F
+	<i>Gomphocarpus fruticosus</i>	F
	<i>Gymnosporia buxifolia</i>	W
	<i>Hermannia depressa</i>	F
	<i>Hyparrhenia hirta</i>	G
☹	<i>Jacaranda mimosifolia</i>	W
☉	<i>Lepidium bonariense</i>	F
🧑	<i>Medicago sativa</i>	F
☹	<i>Melia azedarach</i>	W
☹	<i>Morus alba</i>	W
☉	<i>Nidorella anomala</i>	F
☉	<i>Nidorella hottentotica</i>	F
☉	<i>Oenothera rosea</i>	F
	<i>Pachycarpus schinzii</i>	F
☉	<i>Physalis viscosa</i>	F
☉	<i>Plantago lanceolata</i>	F
	<i>Pollichia campestris</i>	F
	<i>Rhynchosia nitens</i>	W
	<i>Searsia lancea</i>	W
☹	<i>Sesbania punicea</i>	W
	<i>Setaria sphacelata</i>	G
☉	<i>Solanum incanum</i>	F
	<i>Solanum panduriforme</i>	F
☉	<i>Sonchus nanus</i>	F
☉	<i>Tagetes minuta</i>	F
☹	<i>Tipuana tipu</i>	W
+	<i>Vachellia karroo</i>	W
	<i>Vachellia sieberiana</i>	W
☹	<i>Verbena bonariensis</i>	F
☹	<i>Verbena brasiliensis</i>	F
☉	<i>Ziziphus zeyheriana</i>	W

2. *Hyparrhenia hirta* grassland



Status	Degraded		
Vegetation structure:	Medium-tall grassland		
Topography:	Mostly level with slight southern slope (1-2°)	Soil	Loam
Unit size:	3.9 ha		
Need for rehabilitation	High		
Conservation Priority	Low		

This vegetation unit comprises the largest part of the study area and is in the northern section of the site. The soil varies from red loam to yellow gravelly. There are no woody species present, and the vegetation is dominated by the herbaceous layer with the grasses having the highest canopy cover (see table below) and forbs covering 10%.

TREES	SHRUBS	GRASSES	FORBS	ROCKS
1%	2%	85%	10%	1%

The vegetation is dominated by the anthropogenic grass *Hyparrhenia hirta* while the grass *Heteropogon contortus* and the forb *Hermannia depressa* are dominant locally. The declared alien invader forb *Campuloclinium macrocephalum* is prominent throughout this

unit. Other species include the grasses *Eragrostis chloromelas*, *Melinis repens*, *Cynodon dactylon*, *Themeda triandra* and the forbs *Physalis viscosa*, *Helichrysum miconiifolium*, *Verbena brasiliensis*, *Scabiosa columbaria* and *Tagetes minuta*. A few single individuals of the tree *Vachellia karroo* are present along the northern boundary of this unit.

Red data species

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

Alien plant species

Campuloclinium macrocephalum; *Sesbania punicea*; *Verbena brasiliensis*.

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

Cat	Species	Class
🔴	<i>Campuloclinium macrocephalum</i>	F
	<i>Cymbopogon caesius</i>	G
	<i>Cynodon dactylon</i>	G
🔴 🟢	<i>Datura stramonium</i>	F
	<i>Eragrostis chloromelas</i>	G
	<i>Felicia muricata</i>	F
	<i>Gymnosporia buxifolia</i>	W
	<i>Helichrysum krausii</i>	F
	<i>Helichrysum miconiifolium</i>	F
	<i>Hermannia depressa</i>	F
	<i>Heteropogon contortus</i>	G
	<i>Hyparrhenia hirta</i>	G
	<i>Medicago sativa</i>	F
	<i>Melinis repens</i>	G
	<i>Physalis viscosa</i>	F
🟢	<i>Scabiosa columbaria</i>	F
🔴	<i>Sesbania punicea</i>	W
	<i>Solanum incanum</i>	F
	<i>Tagetes minuta</i>	F
	<i>Themeda triandra</i>	G
	<i>Thesium ssp</i>	F
🟢	<i>Vachellia karroo</i>	W
🔴	<i>Verbena brasiliensis</i>	F
	<i>Verbena tenuisecta</i>	F
🟢	<i>Vernonia oligocephala</i>	F
	<i>Zornia milneana</i>	F

3. Developed area



Vegetation structure:	Various (gardens & bare patches)		
Topography:	Mostly level	Soil	Loam
Unit size	0.9 ha		
Need for rehabilitation	High		
Conservation Priority	Low		

This vegetation unit occurs in the south-western section of the study site and comprises a residential house, outbuildings and a kraal area.

The vegetation consists of a mixture of ornamental, alien invasive and indigenous tree species. These include *Vachellia karroo*, *Searsia lancea*, *Jacaranda mimosifolia*, *Melia azedarach* and various ornamental species. The herbaceous layer consists of pioneer and secondary 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

Jacaranda mimosifolia; *Melia azedarach*; *Morus alba*; *Pennisetum clandestinum*.

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

Cat	Species	Class
	<i>Bidens pilosa</i>	F
	<i>Cynodon dactylon</i>	G
	<i>Eragrostis curvula</i>	G
	<i>Hyparrhenia hirta</i>	G
👹	<i>Jacaranda mimosifolia</i>	W
👹	<i>Melia azedarach</i>	W
👹	<i>Morus alba</i>	W
👹	<i>Pennisetum clandestinum</i>	G
	<i>Schkuhria pinnata</i>	F
	<i>Searsia lancea</i>	W
	<i>Tagetes minuta</i>	F
+	<i>Vachellia karroo</i>	W

RESULTS OF THE FAUNAL SURVEY

The vegetation unit on which the site is situated is Moots Plain Bushveld (SVcb 8). The vegetation of the study area is degraded and shows little resemblance with the original vegetation type due to various anthropogenic influences. The south-eastern portion of the site comprises of homogenous *Eragrostis curvula* and *Hyparrhenia hirta*, with *Eragrostis chloromelas*, *Setaria sphacelata* degraded secondary grassland vegetation has been previously ploughed or utilised for livestock grazing and annual grass harvesting activities. The northern portion is dominated by old agricultural lands dominated by the anthropogenic grass *Hyparrhenia hirta* and *Heteropogon contortus* and the forb *Hermannia depressa*. The Category 1b declared alien invader forb *Campuloclinium macrocephalum* is prominent throughout this unit. Other species include the grasses *Eragrostis chloromelas*, *Melinis repens*, *Cynodon dactylon*, *Themeda triandra* and the forbs *Physalis viscosa*, *Helichrysum miconiifolium*, *Verbena brasiliensis*, *Scabiosa columbaria* and *Tagetes minuta*. A few single individuals of the tree *Vachellia karroo* are present along the northern boundary of this unit. Situated on the south-western section of the study site comprises an existing residential house, outbuildings and a kraal area. No major rocky outcrops or extrusions were observed although scattered small to medium sized rocks as well as historic dumped building materials were observed within the south-eastern grasslands. The soil varies from dark brown clays, yellowish gravelly sands and red loams. The faunal habitat assessment focused on the remaining open grasslands. Limited surveys were conducted in the residential or developed areas.

EXISTING IMPACTS ON FAUNA AND VEGETATION ON THE SITE INCLUDE:

- Change in land use: natural Moots Plain Bushveld containing a diversity of vertebrate and invertebrate fauna are converted initially into agricultural areas and more recent urban sprawl; leading to considerable loss of faunal biodiversity.
- Small tracts of indigenous bushveld or secondary grasslands become surrounded by homogenous transformed high-density residential and industrial developments causing fragmentation of previously intact natural habitats.
- The remaining remnants of natural Moots Plain Bushveld 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 (Moots Plain Bushveld) threatens species that move between palustrine

wetlands and those that require intact terrestrial habitats in close proximity to valley bottom wetlands or pans (e.g. Giant Bullfrog, Cook 2003).

- High density (Andeon) residential areas occur to the west; Booysens to the east 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 fenced. Evidence of historic dumping activities.
- Major road networks (R80, R55, R513, R514, M17) can be considered as migratory or dispersal barriers for numerous faunal species including Giant Bullfrogs, Hedgehogs and Owls. The site is bordered by Erma Road to the south and east.
- Fences and walls restrict the natural dispersal movements of several animal species (Giant Bullfrog, South African Hedgehog). The current wire fences restrict the dispersal movements of several faunal species (Tortoises).
- The degraded and transformed grassland areas as well as the rocky ridge have become colonised by alien invasive vegetation including Kikuyu (*Pennisetum clandestinum**); Tall Fleabane (*Conyza albida*), Khaki Bush (*Tagetes minuta*), Syringa (*Melia azedarach**), White Mulberry (*Morus alba**), Jacaranda (*Jacaranda mimosifolia**), Red Sesbania (*Sesbania punicea**), 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 acts 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 early summer rainfall period (November 2021) only a few species of frogs had initiated their breeding activities. 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.

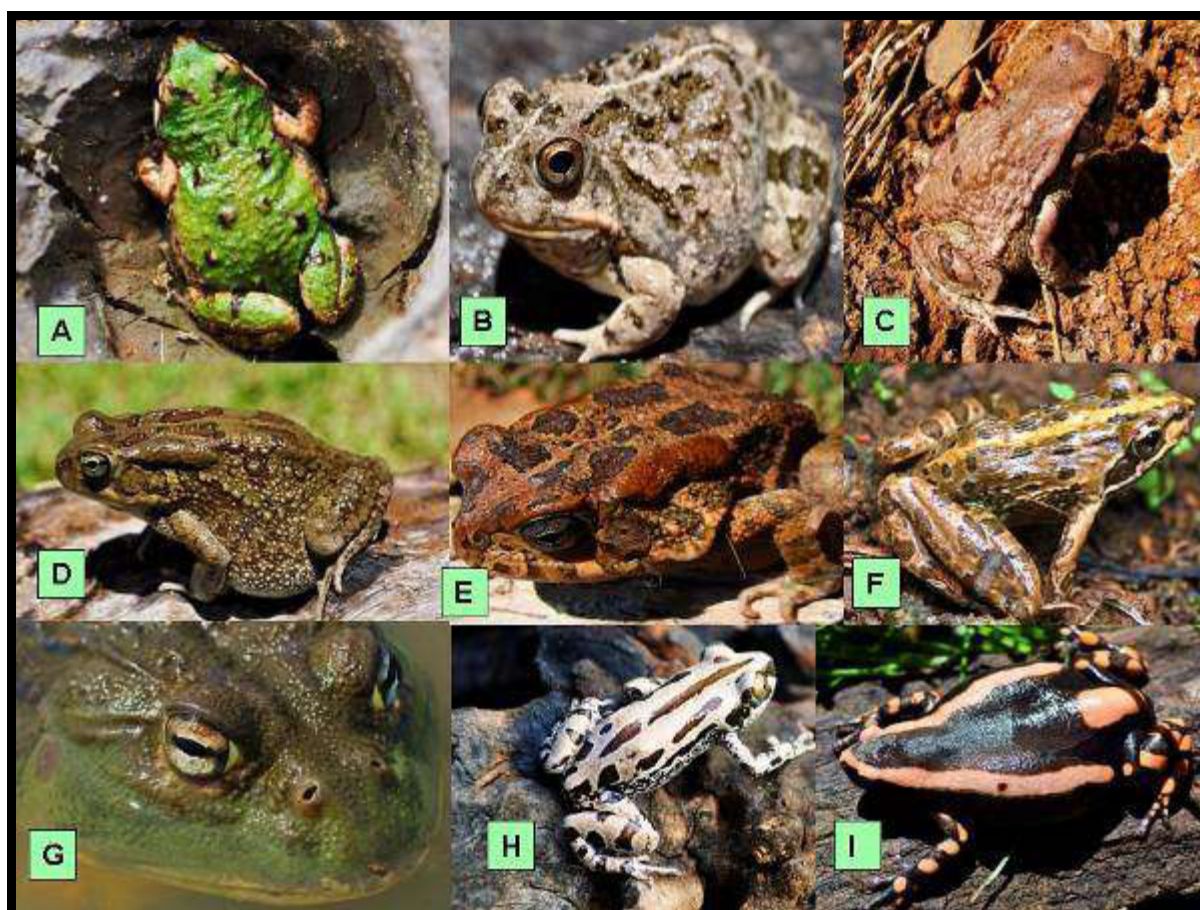


Figure 3. A conglomerate of photographs displaying the frog species recorded by the consultant within the 2528 CA QDGC. **A:** Boettger's Caco (*Cacosternum boettgeri*), **B:** Tremelo Sand Frog (*Tomopterna cryptotis*), **C:** Red Toad (*Schismaderma carens*), **D:** Olive Toad (*garmani*), **E:** Guttural 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 Pretoria North 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. Road fatality (Erma Road).
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.
Common Platanna	<i>Xenopus laevis</i>	Seasonal and permanent pans and dams.
Boettger's or Common Caco	<i>Cacosternum boettgeri</i>	Seasonal pans and inundated grassland.
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
African Bullfrog	<i>Pyxicephalus edulis</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 limited dispersal habitat (north) for three toad species namely Guttural Toad (*Sclerophrys gutturalis*), Olive Toad (*Sclerophrys garmani*) and Raucous Toad (*Sclerophrys capensis*) which could potentially breed in the valley bottom wetland approximately 540 m to the north of the site. Red Toads (*Schismaderma carens*) and calling males of Banded Rubber Frogs (*Phrynomantis bifasciatus*) favour rocky areas as found in the ridges to the north of the site. The valley bottom wetland to the north 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 harvesting of the grasslands on the site will have a high impact on remaining reptiles with the destruction of any termite mounds and removal of rock material. Limited vegetation cover during the early summer months restricts refuge areas and increasing the 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 Westview site. The majority reptile species are sensitive to severe habitat alteration and fragmentation of the open Moots Plain Bushveld as well as 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 rapid 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 Midrand-Pretoria. 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*), Common Girdled Lizard (*Cordylus vittifer*), Lobatse Hinged Tortoise (*Kinixys lobatsiana*), Speke's Hinged Tortoise (*Kinixys spekii*), Leopard Tortoise (*Stigmochelys pardalis*), Rock Monitor (*Varanus albigularis*) and Southern Tree Agama (*Acanthocercus atricollis*).

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 semivariegatus*), Red-lipped Snake (*Crotaphopeltis hotamboeia*), Brown House Snake (*Boaedon capensis*), Brown Water Snake (*Lycodonomorphus rufulus*), Spotted Grass Snake (*Psammophylax rhombeatus*), Striped Grass Snake (*Psammophylax tritaeniatatus*), 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 transformed and degraded grasslands included the ubiquitous commensals namely Speckled Rock Skink (*Trachylepis punctatissima*) and Common Dwarf Gecko (*Lygodactylus capensis*). Low reptile diversity is expected on the site due to extensive habitat transformation, degradation and fragmentation.

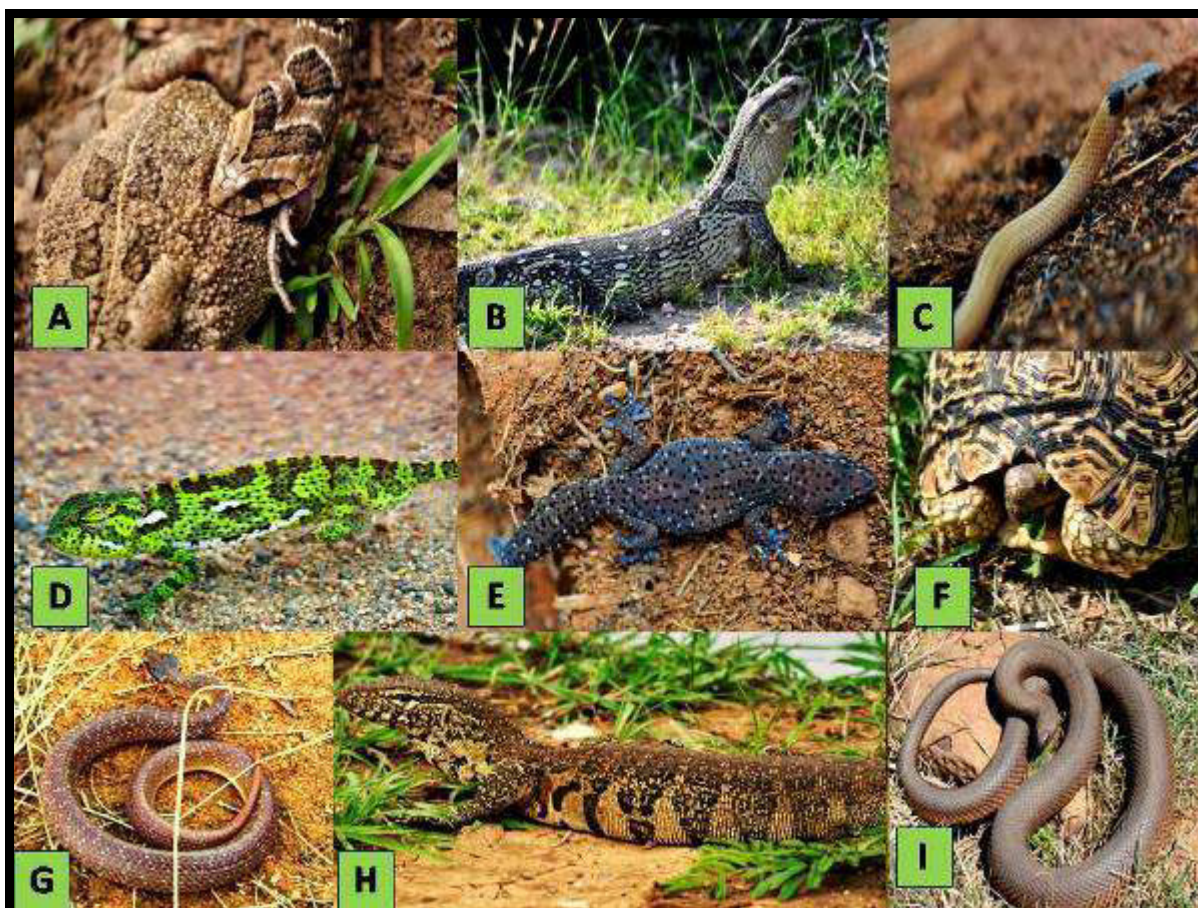


Figure 4. A collage of photographs displaying reptile species recorded by the consultant within the 2528 CA QDGC. **A:** Common Night Adder (*Causus rhombeatus*) feeding on a Raucous Toad (*Sclerophrys capensis*), **B:** White-throated or Rock Monitor (*Varanus albigularis albigularis*) **C:** Black-headed 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 Tshwane area 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. The 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 distantii</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.
Mole Snake	<i>Pseudaspis 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/ Skaapstekker	<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 semivariegatus</i>	Moist savannah, forests, urban 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 Westview 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. 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 Moots Plain Bushveld and sensitive wetlands are largely responsible for the decline of the threatened avifaunal species in the area.

Two-hundred and forty-three (243) bird species have been recorded from the 2540_2805 pentad in which the Westview site is situated. Twenty-two (22) bird species were recorded during the brief field survey (total 4 hours). Species recorded during the field survey are common, widespread and typical of fairly uniform degraded grassland habitat.

Bird species observed within the open *Hyparrhenia hirta-Eragrostis curvula* grasslands included Crowned Lapwing, Zitting Cisticola, Black-chested Prinia, Rufous-naped Lark, Common Fiscal, Cattle Egret, Hadada and granivores such as Cape Turtle Dove, Laughing Dove, Speckled Pigeon, Helmeted Guineafowl and Southern Masked Weaver.

Bird species recorded from the residential area included Black-backed Puffback, Dark-capped Bulbul, Cape Wagtail, Common Myna, House Sparrow and Cape Robin Chat. 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 Tshwane area as well as published data. The area was initially traversed on foot to ascertain the presence of available refuges, spoors or droppings within the *Hyparrhenia hirta-Eragrostis curvula*

grasslands. 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 open *Hyparrhenia hirta-Eragrostis curvula* grasslands 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 *Hyparrhenia hirta* grasslands.

Bat species recorded from the Tshwane 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; **B:** Yellow Mongoose (*Cynictis pencilata*) was recorded from the grasslands to the north of the site. **C:** Suitable habitat for Striped Mouse (*Rhabdomys pumilio*) occurs within the grasslands. **D:** Scrub Hares (*Lepus saxatilis*) was flushed from the rank *Hyparrhenia hirta* grassland on the site.

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>

* photographs courtesy of Prof. G.D. Engelbrecht

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>Dasyomys 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>Gerbiliscus 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 6th of November 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 located in the savanna biome and is classified as belonging to the vulnerable Moot Plains Bushveld vegetation type (SVcb 8) (Mucina & Rutherford 2006). It occurs at altitudes ranging between 1050 and 140 m.a.s.l. It is describes as an open to closed thorny savanna that is characterised by the dominance of various *Vachellia* and *Senegalia* species. The soil varies from clay-loam to red-yellow stony and gravelly. In some areas vertic and melanic clays occur. Frost is a frequent occurrence during the winter period, while an average summer and winter temperatures are 34°C and -3°C respectively.

The vegetation of this vegetation type is characterised by the prominence of woody species such as *Vachellia nilotica*, *Senegalia tortilis*, *Searsia lancea*, *Olea europaea* subsp. *cuspidata*, *Buddleja saligna*, *Grewia occidentalis*, *Gymnosporia polyacantha*, the grasses *Heteropogon contortus*, *Themeda triandra*, *Setaria sphacelata* and the forbs *Helichrysum nudifolium*, *Hermannia depressa*, *Corchorus asplenifolius*, *Osteospermum muricatum*, *Phyllanthus maderaspatensis* and *Evolvulus alsinoides*.

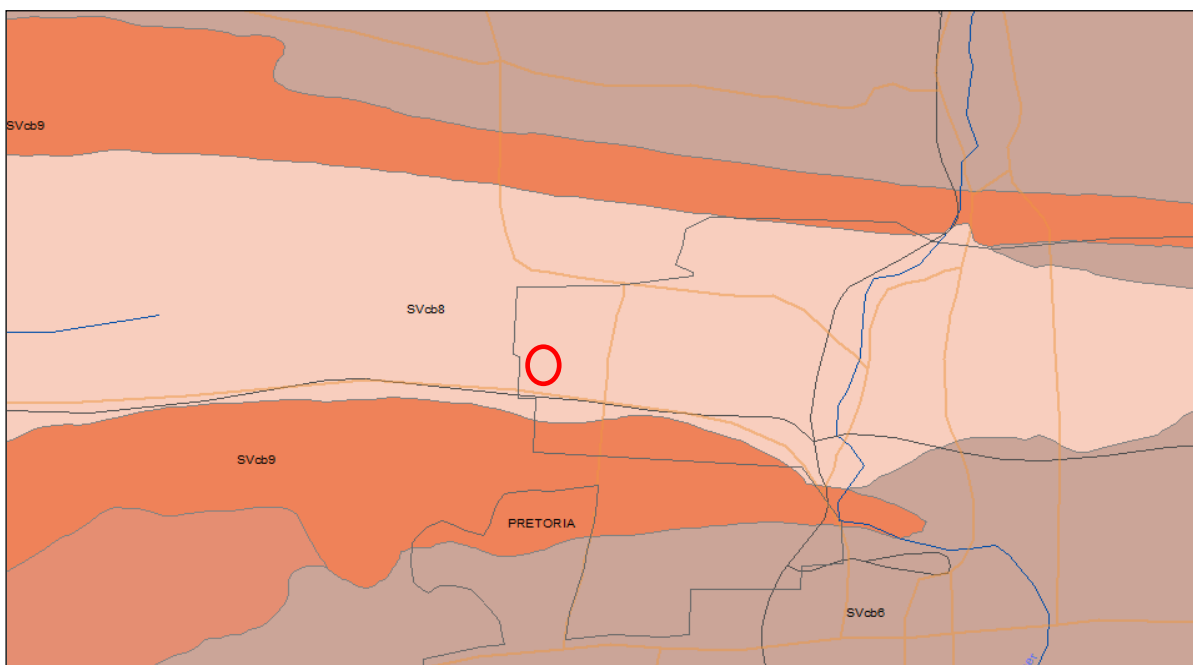


Figure 6. Approximate location (red circle) of the study area within the Moot Plains Bushveld vegetation type (image obtained Mucina & Rutherford, 2006).

It is estimated that approximately 19% of the target of 24% of this vegetation type is statutorily conserved with approximately 28% that has been transformed due to urban developments and agriculture.

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

Ecosystem classification

The study site is zoned as an Ecologically Support (ESA) area according to GDARD's C-Plan 3.3. Ecologically Support Areas are regarded as areas that are not essential for meeting biodiversity targets, but they can play a role in supporting ecosystem functioning of pristine and protected natural areas. They are also thought to be important for delivering ecosystem services.

There are no wetlands on the site though a large drainage channel with wetland properties is located approximately 540 m north of the site



Figure 7. Ecosystem classification of the study area according to GDARD'S C-Plan 3.3 (Red lines = boundary of study site; Light green = ESA) (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	Moot Plains Bushveld (SVcb 8)
National Soil Class	Undifferentiated structureless soils. Soil Class: S17
Sub-quaternary catchments	1
Wetland Units	None
River units	None
Formal Protected areas	None
Informal protected areas	None
CBA & ESA units	1

Vegetation units

The *Eragrostis curvula* grassland (vegetation unit 1) occurs along the southwestern boundary of the study site. The area is mostly grassland with scattered woody individuals (mainly in two small clumps) present. The area consists of dark to brown clay soil that has a higher moisture content than surrounding areas, with few rocks present and has been subjected to various anthropogenic influences in the past that include grazing and dumping of litter and rubble (see top photo right). Where bare soil patches remained the forb layer dominates. In the southern section where the soil has been disturbed many seedlings of the tree *Vachellia karroo* has established and is causing bush densification (see bottom photo right). Most of the species are categorised as pioneer weedy and secondary successional although some climax



grass and woody species are also prominent. Due to the dark clay soil having a higher water retention capacity some species that prefer such conditions, typical of turf areas dominated by *Vachellia* spp., are present in small patches. The presence of various declared alien invader plants, especially the forb *Campuloclinium macrocephalum* (pom-pom weed) poses a threat to the environment although the area is mostly isolated from other natural areas. The area has a moderate species richness although more than 60% of all species present are either pioneer weedy species or declared alien invader species. The area is degraded due to past anthropogenic actions and has no resemblance to any natural ecosystem. From a plant ecological and ecosystem functioning point of view this degraded area has a **low conservation value and ecosystem functioning**.

Vegetation unit 2 (*Hyparrhenia hirta* grassland)

comprises the largest part of the study area. This area (as well as the areas in the west and north outside the study area) has been extensively ploughed in the past with the ploughing furrows still visible in terms of the grasses broadly growing along these old lines (see top photo right). Typical of the Highveld grassland areas the vegetation has become dominated by the anthropogenic grass *Hyparrhenia hirta* after being left fallow for so many years. This grassland, although having a good vegetation cover, is homogeneous and has a low species richness. Most of the plants are secondary successional species. A concerning factor is the prominence of the highly invasive alien forb *Campuloclinium macrocephalum* throughout this grassland. This species



poses a huge threat to the natural grasslands within the Gauteng province where it displaces all natural vegetation on a large scale. This grassland will not change in structure or composition unless human intervention in the form of rehabilitation takes place with a large financial input. In some areas overgrazing has taken place while bare soil patches are also visible in places. This grassland unit has no resemblance with the original natural

vegetation that occurred in these areas and from a plant ecological and ecosystem functioning point of view is regarded as having a **low conservation value and ecosystem functioning**.

The **Developed area (vegetation unit 3)** occurs in the south-western part of the study site. This area has been variously developed with a house, outbuildings and a kraal area. The vegetation around the house and outbuildings has been landscaped in the past and is maintained as gardens consisting of various ornamental trees and forbs as well as some indigenous woody species. This area has a low species richness and is from a plant ecological and ecosystem functioning point of view regarded as being transformed with a **low conservation value and ecosystem functioning**.

Topography and drainage

The area is mostly level with a slight northern slope with the south of the study site being at an altitude of 1288m and the north at 1285 (average slope 1‰). Surface water drains mostly into the soil though during high rainfall events it could drain surface water towards the north. The terrain is relatively flat along the slopes though old ploughing furrows in sections give it a slight undulating appearance in sections.



Figure 8. Topography and drainage of the study site (Image obtained from Google Earth, 2021).

Connectivity

The study site is surrounded by industrial and residential developments towards the east, south and west (Figure 9) while old agricultural fields (similar to that of vegetation unit 2) is located directly north of the study site resulting in little connectivity to any natural vegetation (Figure 9).

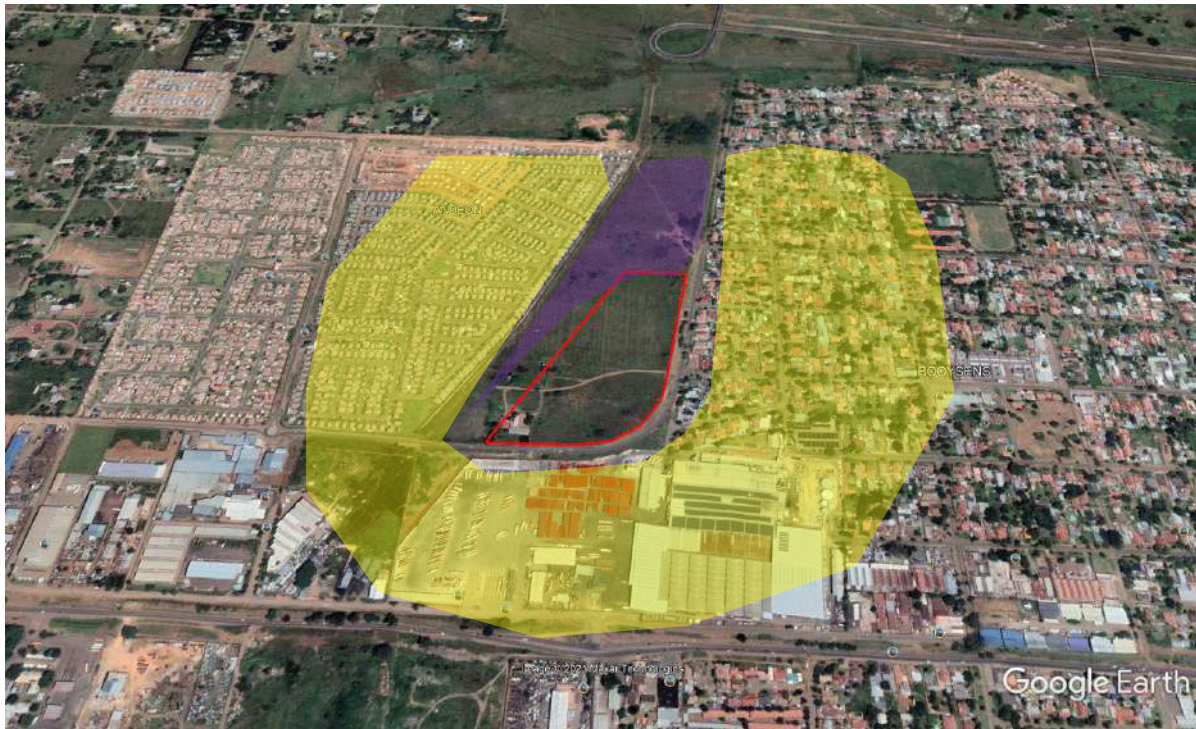


Figure 9. Connectivity of the study site (Yellow = Developments; Purple = agricultural areas) (Source: Google Earth 2021).

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 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).

Alien plant species

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

Species	CARA	NEMBA	Vegetation units		
			1	2	3
<i>Campuloclinium macrocephalum</i> (Less.) DC.	1	1	●	●	
<i>Datura stramonium</i> L.	1	1b		●	
<i>Jacaranda mimosifolia</i> D. Don	3	1b natural areas; not listed urban	●		●
<i>Melia azedarach</i> L.	1b	3	●		
<i>Morus alba</i> L.	3	3	●		●
<i>Pennisetum clandestinum</i> Chiov.	1b	not listed			●
<i>Sesbania punicea</i> (Cav.) Benth.	1	1b	●	●	
<i>Tipuana tipu</i> (Benth.) Kuntze	3	3	●		
<i>Verbena bonariensis</i> L.		1b	●		
<i>Verbena brasiliensis</i> Vell.		1b	●	●	

Vegetation units 1 and 2 have the most declared alien invader species and pose a risk to the surrounding environments.

Medicinal plants

Only five (5) 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>Datura stramonium</i>	Leaves & green fruit	Asthma, rheumatism, abscesses, bronchitis, tonsillitis	2
<i>Gomphocarpus fruticosus</i>	Leaves, sometimes roots	Headache, stomach pain, tuberculosis.	1
<i>Scabiosa columbaria</i>	Leaves & fleshy roots	Heartburn; wound-healing	2
<i>Vachellia karroo</i>	Leaves, bark and gum	Diarrhoea & dysentery Gum: colds, oral thrush & haemorrhage.	1; 2; 3
<i>Vernonia oligocephala</i>	Leaves and twigs, rarely roots.	Stomach bitters, rheumatism Treat abdominal pain, colic, dysentery and diabetes. Roots treat ulcerative colitis.	2

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, with *Datura stramonium* a declared category 1 alien invasive weed.

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
Criteria	<i>Eragrostis curvula</i> grassland	<i>Hyparrhenia hirta</i> grassland	Developed area
Presence of protected / red data species	1	1	1
Species richness and composition	3	1	1
Dominant/prominent species ecological status	3	5	3
Sensitivity to disturbance	3	3	1
Conservation status and ecological functioning	3	3	2
Area fragmentation	2	2	2
Medicinal plants	4	5	2
Important topographical features (steep slopes, cliffs etc.)	1	1	1
TOTAL SCORE	26	28	17
Sensitivity rating	Low	Low	Low

According to table 6 all the vegetation units have a low ecological sensitivity.

FAUNA

Amphibians



Figure 10. The Giant Bullfrog (*Pyxicephalus adspersus*) has been recorded by the consultant within the Pretoria North and Hammanskraal 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.

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 Thswane. 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 (R513, R514, M17, R80 and R55) and adjacent road networks bisect suitable breeding and foraging areas resulting in mass road fatalities of migrating adult and juvenile bullfrogs.

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 the current high levels of crime. 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 Midrand-Benoni 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, Westview, Onderstepoort, Muldersdrift and Krugersdorp area. A large population (>500) occurs in Diepsloot.

The open grasslands within the site and adjacent grasslands to the north 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 to the north. The adjacent high-density residential developments severely restrict suitable dispersal onto the site from adjacent areas to the south, east and west. These can be considered as migratory or dispersal barriers for all remaining frog species including the Giant Bullfrog.

Mainly channelled valley bottom wetland to the north offers extremely limited suitable breeding habitat for Giant Bullfrogs; and frogs in general. The seasonal artificially excavated borrow pits within the lower-lying valley bottom wetland offers marginally suitable breeding habitat for any remaining Giant Bullfrogs.

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.

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 **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 to the north 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. No threatened reptile species have been recorded within the 2528 CA QDGC according to ReptiMAP. 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 2540_2805 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
Cape Vulture <i>Gyps coprotheres</i>	Endangered	1.8	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.
Lanner Flacon <i>Flacon biarmicus</i>	Vulnerable	Not recorded during SABAP2	Favours open grasslands and woodlands near rocky cliffs or electricity poles for nesting.	Low: Suitable habitat for occasional foraging arrays.
Verraux's Eagle <i>Aquila verreauxi</i>	Near-Threatened	4.0	Mountainous and rocky areas with large cliffs.	Low: Forages in the adjacent open grasslands, alien

* 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'.

				woodlands and Andesite Mountain Bushveld.
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 restrict the likelihood of any extended periods on the site.
Red Footed Falcon <i>Falco vespertinus</i>	Near-Threatened	Not recorded during SABAP2	Open semi arid and arid savanna	Medium-low: Suitable habitat for occasional foraging arrays (grasshoppers and termites) within the southern and northern grasslands.

The site offers marginally suitable habitat for occasional foraging arrays for the larger raptors such as Cape Vulture and Verraux'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 and valley bottom wetland to the north; 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 open grasslands for roosting and nesting activities. The wetland and adjacent open grasslands to the north offer suitable foraging areas but proximity to the R80 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.

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	TOPS 2007
Carnivora	Felidae	<i>Leptailurus serval</i>	Serval	Near Threatened	A2c; C2a(i)	Least Concern	None	Protected
Carnivora	Hyaenidae	<i>Parahyaena brunnea</i>	Brown Hyaena	Near Threatened	C2a(i) +D1	Near Threatened	C1	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

A historic record (2004) of the 'Endangered' African wild-dog (*Lycaon pictus*) has been recorded from the 2528CA QDGC according to MammalMAP. No suitable habitat on the site for African Wild-Dogs.

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, South African Hedgehogs. The majority of threatened mammal species occurring in the area are extremely difficult to observe even during intensive field surveys conducted for extended periods.

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. The grasslands as well as lower-lying wetland to the north offers extremely limited suitable habitat 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 reduce the likelihood. Major road networks (R514, R80, R55, R512) encircle 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. The grasslands offer no suitable habitat for foraging arrays as well as exploratory/dispersal activities for the highly secretive and elusive Brown Hyaena due to the current wire fences and high-security walls. The high levels of anthropogenic activities on and surrounding the site significantly reduce the likelihood further. Major road networks (R514, R80, R55, R512) encircle the site which severely restricts dispersal movements.

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Figure 11. The South African Hedgehog has been recorded by the consultant in the Midrand-Tshwane areas during previous surveys. 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). Marginally suitable habitat exists within the secondary grasslands on the southern and northern portions of the site. Major road networks (R514, R80, R55, R512) encircle the site which severely restricts dispersal movements.

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. No

suitable habitat occurs within the degraded and transformed grasslands within the study area.

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 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.

Mitigation and recommendations

All alien plants should be removed from the property as a high priority. 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 (as far as practically possible) when most plants are dormant and when little rain is expected that could potentially cause erosion.

Where vegetation areas (that are not going to be developed) need 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

LOW CONSERVATION UNIT: 1, 2 & 3														
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	

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 plant 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. It is especially important that the highly invasive forb *Campuloclinium macrocephalum* is removed before it produces seeds. If it has produced seeds, the flower heads will have to be covered with plastic bags and cut before removing the plant. The flower heads with the seeds should be buried in the soil at a minimum depth of 1.5 m. 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 namely the watercourse area more than 600m north 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 release of water must be designed such that the force of the water is reduced to prevent unnecessary erosion.

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 area.

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 study site is mostly level, thus large-scale erosion should not be a problem if all other activities are managed correctly. 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 any watercourse area. Sufficient measures must be implemented to prevent the possible contamination of the surface water and groundwater.

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 to the north of the site.

Mitigation and recommendations

Any animals encountered in the areas could be relocated away from the development site. This is especially pertinent in the highly unlikely event that a South African Hedgehog is discovered during the vegetation clearance of the 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

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 to the north of the site.

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 residential and industrial developments while an old agricultural field borders onto its northern section. The area is fenced, and access has to be arranged. Large sections of the site have been previously ploughed and planted with pastures while others have been grazed and harvested for fodder with the furrows that were ploughed still visible in some areas. 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 12):

Vegetation unit 1 (*Eragrostis curvula* grassland) has some degraded sections due to various anthropogenic influences such as dumping of rubble, grazing and vegetation removal in the past. As a result, various alien invasive species have become established together with many pioneer weedy and secondary successional species. Vegetation unit 2 (*Hyparrhenia hirta* grassland) has previously been planted with (most probably) pasture grasses and was used for grazing. After being left fallow, it become dominated by the anthropogenic grass *Hyparrhenia hirta* and other secondary successional grasses. The Developed area (vegetation unit 3) has become transformed due to development of buildings and kraal areas.

None of the vegetation units identified on the property resembles the original natural vegetation that occurred in the area due to more than 40 years of anthropogenic activities. The site is classified as an ESA according to GDARD but has no natural species indicating stable resilient conditions and furthermore it has, except for the old agricultural fields in the north no connectivity to open vegetation and no natural vegetation areas. The site occurs as an isolated patch between various developments and is degraded from a plant ecological perspective. There were no red data species found to be present on the site while the medicinal plants present are not threatened species. Based on the various assessments and results of this study the area is regarded as having a **low ecological sensitivity**.

The plant species present throughout the area should be eradicated from the property as a high priority. It is not thought that development of 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.



Figure 12. Sensitivity map of the different vegetation units of the study area.

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