

Mabopane Cemetery Expansion
Mabopane Ecological Overview
City of Tshwane

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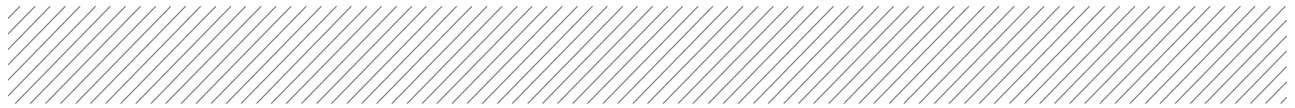


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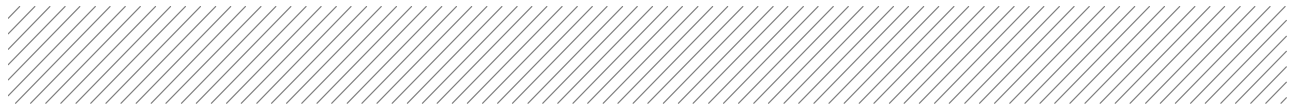
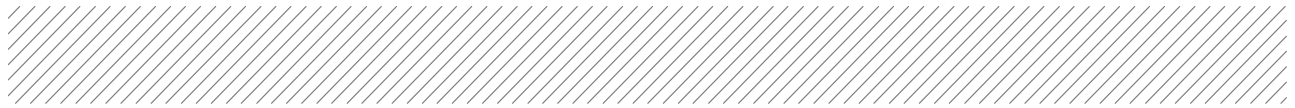


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Acronyms



Acronym	Meaning
ADU	Animal Demography Unit
AGIS	Agricultural Geo-Referenced Information System
BGIS	Biodiversity Geographic Information System
CBA	Critical Biodiversity Area
CoT	City of Tshwane
DEM	Digital Elevation Model
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EMP	Environmental Management Plan
ESA	Ecological Support Area or
GDARD	Gauteng Department of Agriculture and Rural Development
GG	Government Gazette
GIS	Geographic Information System
GN	Government Notice
GPS	Global Positioning System
IUCN	International Union for Conservation of Nature
MASL	Metres Above Sea Level
NBA	National Biodiversity Assessment
NEMBA	National Environmental Management: Biodiversity Act
NFEPA	National Freshwater Ecosystem Priority Area
PRECIS	National Herbarium Pretoria Computerised Information System
QDS	Quarter Degree Square
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
SRTM	shuttle radar topography mission
TPI	Topographic Position Index
TWI	Topographic Wetness Index
UCT	University of Cape Town
WMA	Water Management Area

1 Introduction

The City of Tshwane is proposing to expand the existing cemetery site on the Remaining Extent of Portion 33 of the farm Mabopane 702 JR. This report aims to provide information regarding the ecological characteristics of the proposed site aimed for expansion.

1.1 Report details

The table below highlights the details of this report in accordance with Appendix 6 of GN No. R. 982 of 4 December 2014 and provides hyperlinks to the relevant sections within the report.

Table 1: Report details

Item	Description
Details of specialist	General details
Declaration of independence	Declaration of independence
Scope of report and purpose of report	Introduction
Date and season of site visit	Field survey
Methodology	Methods
Site sensitivity	Ecosystem
“No go” areas and buffers	Ecosystem
Environmental sensitivity map	Site context
Assumptions and information gaps	Knowledge gaps
Findings and implications	Results
Mitigation measures (EMP)	Recommendations
Conditions for the EA	Recommendations
Monitoring requirements	N/A
Opinion on authorisation of activity	Conclusion
Consultation process	N/A
Comments and responses	N/A
Any other information	N/A

1.2 Knowledge gaps

This assessment was limited to two brief site visits towards the end of the flowering season. A medium level of confidence for the presence or absence assessment of Species of Conservation Concern (SCC) potentially occurring within the study area is therefore given. The likelihood of occurrence for SCC was largely based on previous records for the Quarter Degree Square (QDS) as well as the presence of suitable habitat.

2 Study area context

2.1 Regional biodiversity context

The study area is located in the City of Tshwane Municipality of the Gauteng Province. The municipality is approximately 217 457 ha in size of which approximately 41.7% is regarded as remaining natural areas. The municipality contains 8 formally land-based protected areas which covers 4.8% of the municipal area. The bulk of the municipality is situated within the Savanna (75.15%) biome with the Grassland biome represented by the remainder of the municipal area. There are 12 nationally classified vegetation types and nine threatened ecosystems within the municipality.

The Crocodile (West) and Marico Water Management Area (WMA) contributes all of the drainage within the municipality. The seven main rivers transecting the municipality are Apies, Crocodile, Hennops, Jukskei, Pienaars, Sand and Tolwane River. A mere 1% of the municipality consist of formally classified freshwater wetland areas. Biodiversity features associated with the study area are indicated in **Figure 1** below.

2.2 Geology and soils

The area is characterised by undifferentiated shallow soils with minimal development on hard or weathering rock (AGIS, Dominant Soil Classes, 2003). Runoff from the associated underlying rock contributes to the soil formation and is therefore favourably regarded as areas of water intake. These soils however are limited in land use options. Soils with minimal development, usually shallow, on hard or weathering rock, with or without intermittent diverse soils. Lime is rare or mostly absent in the landscape (AGIS, General Soils, 1996).

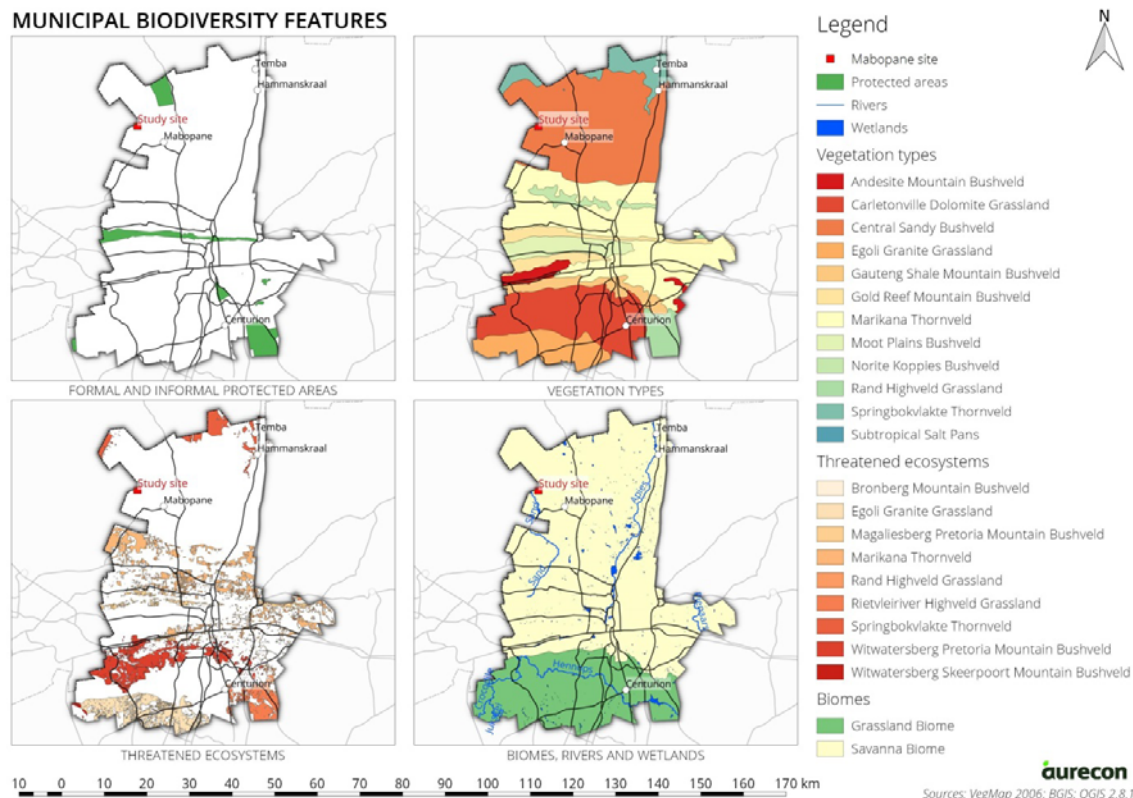


Figure 1: Municipal biodiversity features



3 Methods

3.1 Field survey

A brief site visit was conducted on the 20th of February 2015 by an ecologist, an Environmental Assessment Practitioner (EAP), officials from Gauteng Department of Agriculture and Rural Development (GDARD) and the representatives of Tshwane Municipality. A supplementary field survey was performed on the 3rd of March 2015 by an ecologist in order to gain some insight into the general ecological characteristics of the areas affected by the proposed activity. During each field visit the site area was covered on foot and recorded with a handheld Global Positioning System (GPS), with which a series of geo-referenced photographs were also taken (refer to Appendix B for geo-referenced photographs).

The focus of the survey was to gather information on habitat attributes that might potentially foster Red Data species and / or nationally protected species within the proposed construction footprint of the project. These SCC are species either listed under the International Union for Conservation of Nature (IUCN) database (2014) or National Environmental Management: Biodiversity Act (NEMBA) (No. 10 of 2004), and protected trees listed under the National Forests Act 1998 (Act No 84 of 1998). The diversity and high level ecological integrity of the habitats on site was also assessed.

3.2 Desktop survey

3.2.1 Literature assessment

A large component of the assessment was conducted based on information gathered from the South African National Biodiversity Institute (SANBI) and its affiliated links. Intensive sampling was beyond the scope and level of this assessment and the assessment therefore focussed on combining information gathered from the literature and the field survey to formulate a matrix that could shed light on the ecological integrity of the site.

3.2.2 GIS

The Gauteng Conservation Plan (C-plan) v3.3 (Compaan, 2011) was used as a baseline in the evaluation of ecologically sensitive areas. In addition, all national biodiversity datasets were also used to provide background information for the site (i.e. NFEPA¹, NBA² etc.).

The wetland boundaries and surface water were mapped from aerial imagery (Google Earth and Bing maps) and were delineated conservatively during the desktop study, which was augmented during the site survey and as part of the habitat unit assessment. In addition, the Shuttle Radar Topography Mission (SRTM) Digital Elevation Model (DEM) was used to perform a basic terrain analysis that encompassed a slope and landforms analyses as well as Topographic Wetness Index (TWI) analysis. The TWI is used to assess the areas of potential soil moisture based on the assumption that the movement of water within the landscape is influenced by the topography (Schmidt & Persson, 2003). Wherever possible, all models were verified with field-collected data. The habitat units, used to determine fauna and flora probability of occurrence are subjectively delineated based on variances in vegetation composition and available satellite imagery.

¹ National Freshwater Ecosystem Priority Area

² National Biodiversity Assessment

4 Results

4.1 Site context

4.1.1 Local biodiversity features

The site is situated within the Central Sandy Bushveld vegetation type (Mucina & Rutherford, 2006). It has a conservation status of vulnerable according to Mucina & Rutherford (2006), but is not listed in the gazetted national list of threatened ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GoN 1002), 9 December 2011).

The site is not classified into one of the biodiversity categories (i.e. Critical Biodiversity Area, Ecological Support Area, Important Area and or Protected Area) of the Gauteng C-Plan. However, according to the Gauteng C-Plan, the study site does provide suitable habitat for the near threatened / Orange Listed floral species *Ceropegia turricula*.

The sub-quaternary catchment applicable to the study site is classified as a low priority / status unknown according to the NFEPA atlas. The Tolwane River is located approximately 1.2 kilometres south-west from the site and flows in a north-west direction. The Tolwane River's present ecological state is characterised as largely natural / Class B and a critically modified river condition (Nel & Driver, 2012). **Figure 2** below gives an overview of the local biodiversity within the immediate surroundings of the study site.

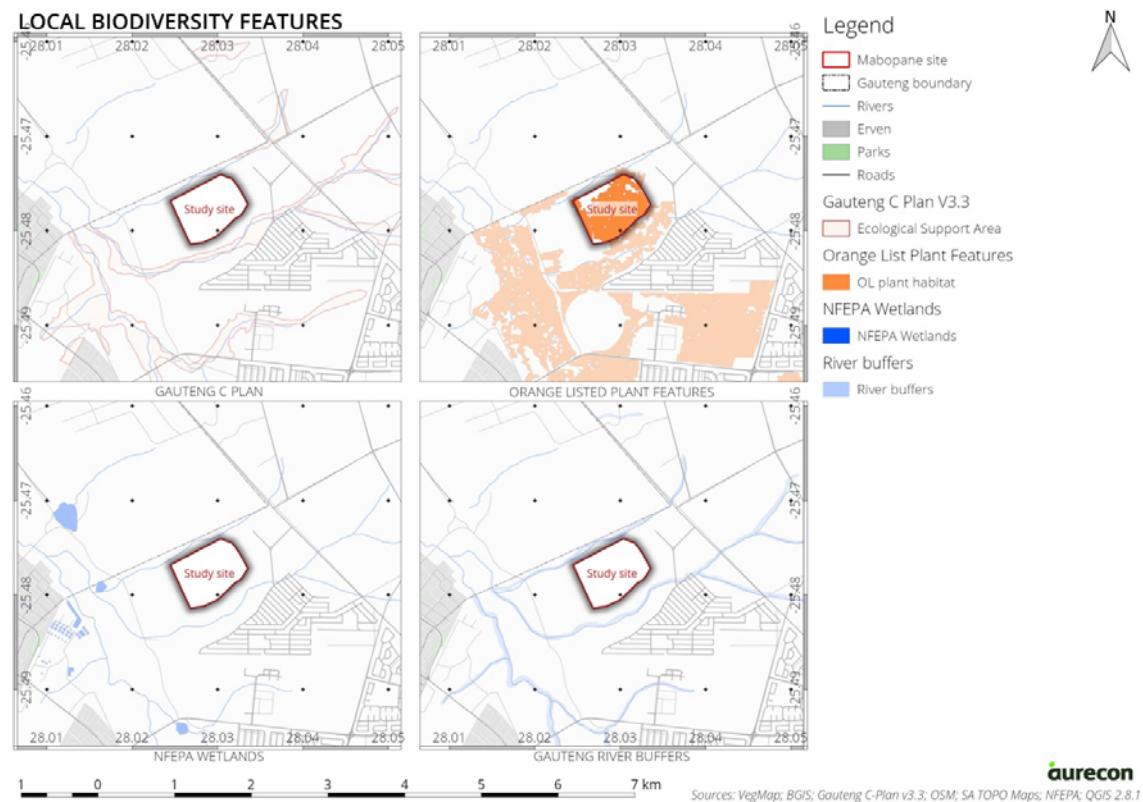


Figure 2: Local biodiversity features

4.1.2 Local terrain features

The local terrain elevation ranges between 1160 and 1130 metres above sea level (masl). The slope across the site area is relatively flat (between 0° and 5°). The slope increases to between 5° and 7° along the southern boundary of the site where the local topography slopes towards the wetland /river. The major landforms associated with the site are plains, midslope ridges (small hills in plains) and midslope drainages (shallow valleys). The local landforms provide some insight into the results of the topographic wetness index of the site. Local soil moisture tends to be higher within the shallow valleys between small hills / midslope ridges of the site. The terrain analysis results are indicated in **Figure 3** below.

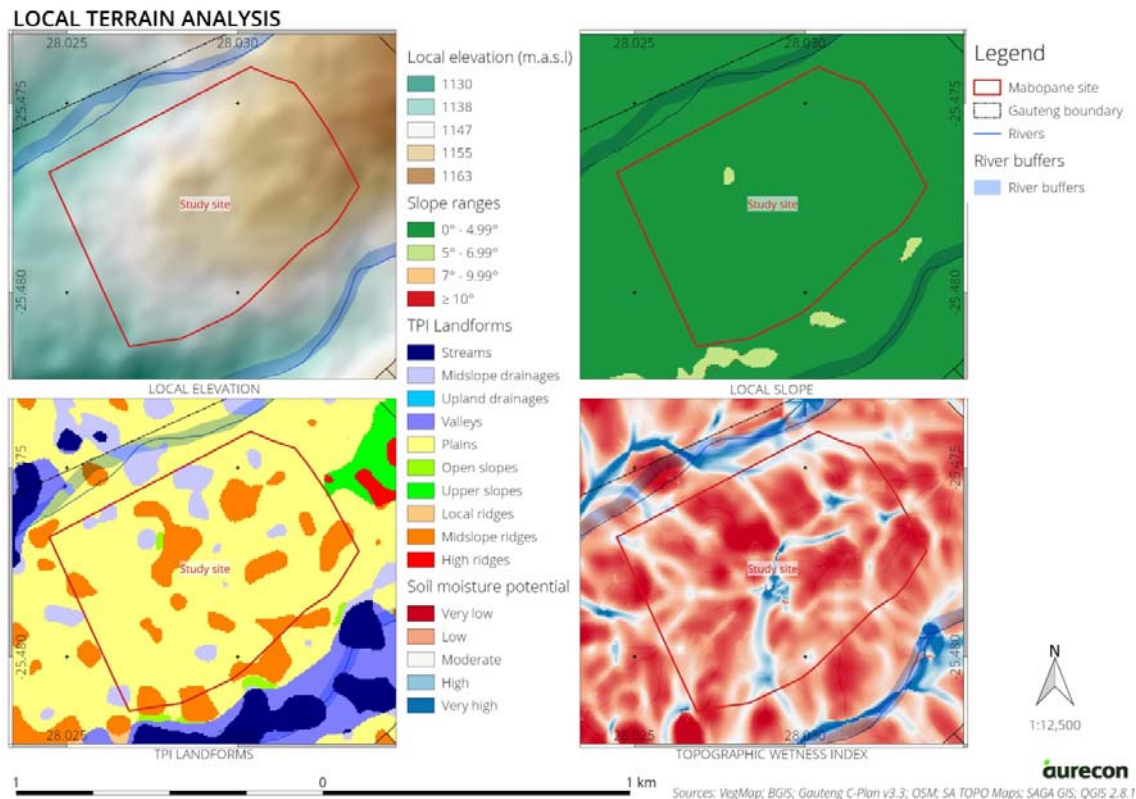


Figure 3: Local terrain analysis

4.2 Fauna and flora observed during the site visit

Photographs including some of the conspicuous fauna and flora species observed during the site visit are shown below. These species are characteristic for the study area.

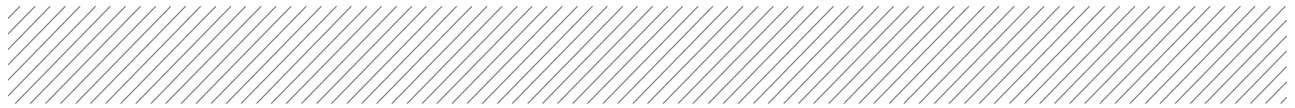


Figure 4: *Indigofera cf cymosa*



Figure 5: *Vitex zeyheri*



Figure 6: *Dicoma cf anomala*



Figure 7: *Crabbea angustifolia*



Figure 8: *Dicerocaryum eriocarpum*



Figure 9: *Gladiolus permeabilis*
subsp. *edulis*



Figure 10: *Nectarinia talatala*



Figure 11: *Circaetus pectoralis*



Figure 12: *Hirundo cf rustica*

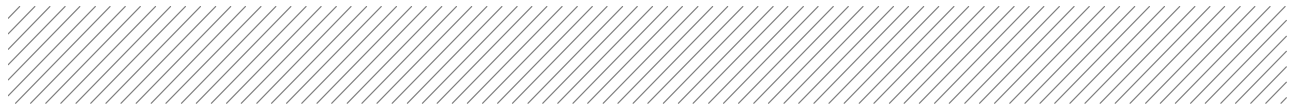


Figure 13: *Hirundo albigularis*



Figure 14: *Hirundo cf daurica*



Figure 15: *Melaenornis pammelaina*

4.3 Habitat units

Habitat units were initially delineated using an unsupervised clustering technique on the latest satellite imagery. The initial clusters were then subjectively grouped into broad units based on field observations and interpretation of available satellite imagery.

Three main habitat units were delineated. Habitat unit 1 consist of a mosaic between low open woodland and grassland savannah. Two sub-units are therefore indicated for habitat unit 1. Habitat units are indicated in **Figure 19** below.

4.3.1 Habitat unit 1 Broad-leaved woodland savannah

This habitat unit dominates the study area and consist of a mosaic of low, broad-leaved *Combretum* woodland and open savannah grassland, characteristic of Central Sandy Bushveld associated with shallow, rocky and / or gravelly soils. The open grassland areas are characterised by *Indigofera comosa*, *Xerophyta retinervis*, *Crabbea angustifolia*, *Diheteropogon amplexans*, *Bulbostylis burchelli*, *Heteropogon contortus* and *Dicoma anomala*. The wooded areas are characterised by *Gymnosporia polyacantha*, *Dombeya rotundifolia*, *Combretum zeyheri*, *Combretum apiculatum*, *Vitex zeyheri*, *Brachiaria nigropedata* and *Digitaria eriantha*. This unit also contains the less conspicuous *Gladiolus permeabilis* subsp. *edulis*.



Figure 16: Combretum woodland



Figure 17: Open savannah



Figure 18: Grassland savannah



HABITAT UNITS



Figure 19: Habitat units

4.3.2 Habitat unit 2 Thorny savannah

This habitat unit is characterised by a low, closed and characteristic shrubby thornveld. Typical species associated with this unit are *Dichrostachys cinerea* subsp. *africana*, *Acacia nilotica*, *Acacia tortillis*, *Peltophorum africanum*, *Euclea crispa*, *Schmidtia pappophoroides* and *Aristida congesta*.



Figure 20: Thornveld



Figure 21: Low shrubland



Figure 22: Closed veld

4.3.3 Habitat unit 3 Transformed

This habitat unit consist of areas that have been transformed by earthworks (borrow pits for sand) and illegal dumping. Weeds and alien floral species have invaded into these areas, but areas are mostly characterised by bare soils and limited ground cover. Conspicuous alien flora observed included *Zinnia peruviana*, *Ricinus communis*, *Datura* spp and *Solanum* spp.



Figure 23: Transformed area



Figure 24: Sand mining



Figure 25: Illegal dumping

5 Discussion

5.1 Ecosystem

Overall, the floral species composition is representative of the Central Sandy Bushveld vegetation type, specifically communities associated with shallow rocky or gravelly soils and shallow eutrophic sandy flats.

The ecosystem function is intact and provides habitat for generalist fauna and avi-fauna species and is relatively well connected to the remainder of the surrounding natural landscape. However, illegal dumping across the site and sand mining along the southern boundary and within the riparian zone results in the removal of natural vegetation and the introduction of alien invasive flora. Access to the site and the absence of control will only aggravate the situation in the future.

The sensitivity mapping rules for biodiversity assessments state that all good condition natural vegetation should be designated as sensitive. Taking into account that the site does not constitute a critical biodiversity or ecological support area, all natural vegetation areas were designated as being moderately sensitive (**Figure 26**).

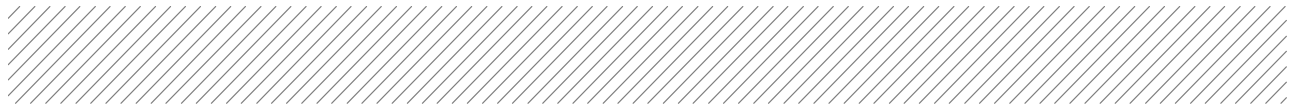
5.2 Fauna

The Virtual Museum (VM) database³ provides a platform to access distribution records for fauna species. The literature study focussed on querying the VM database to generate species lists for the 2528AC QDS. The initial literature study revealed six faunal SCC previously recorded within the 2528AC QDS. These results were cross referenced with data from the IUCN Red List of Threatened Species to extract information on the ecology and threats pertaining to the recorded SCC. These species are discussed below.

5.2.1 Marsh Sylph *Metisella meninx*

The marsh sylph is found in wetland and marshy areas between the altitudes of 1400 and 1700 masl. throughout the Grassland biome. Suitable habitat sites are sometimes only colonised during suitable years from core populations. Thick stands of *Leersia hexandra* grass are required as the larval host plant. Although wetland habitats exist adjacent to the property area, the presence of *Leersia hexandra* grass needs to be present within the system in order for marsh sylphs to successfully breed. No wetland habitats occur on the site and *Leersia hexandra* was not recorded during this survey. The likelihood of occurrence is therefore regarded as moderate.

³ Developed by the Animal Demography Unit (ADU) of the University of Cape Town (UCT)



BUFFERS AND SENSITIVITY

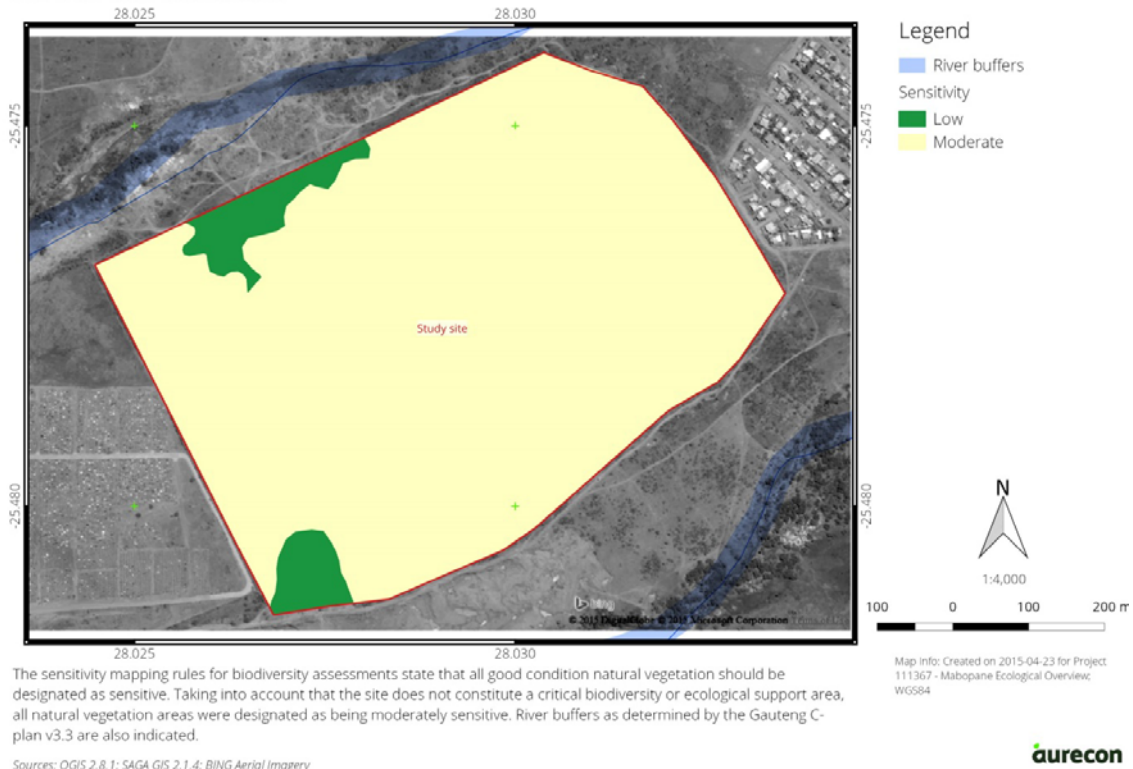


Figure 26: Sensitivity

5.2.2 Giant Bullfrog *Pyxicephalus adspersus*

The following excerpt is quoted regarding the Giant Bullfrog:


“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 (Prof. Louis du Preez, pers. comm.)” (Conservation, 2012). Suitable habitat exists for giant bullfrog within the wetlands adjacent to the site. The likelihood of occurrence is therefore regarded as moderate.

5.2.3 African White-tailed Rat *Mystromys albicaudatus*

This terrestrial rodent prefers black loam soil with a good vegetation cover within shrubland and grassland areas. No suitable habitat exist within the study area. The likelihood of occurrence is therefore regarded as low.

5.2.4 Geoffroy's Horseshoe Bat *Rhinolophus clivosus*

Records of this bat species range from savannah woodland, shrubland (Mediterranean-type), dry savannah, open grasslands, semi-desert and more arid environments. It therefore has a wide distribution range. Roosting takes place across a wide range of structures including caves, rock crevices, disused mines and rural and urban buildings. It is listed globally as least concern on the IUCN Red List of Threatened Species in view of its wide distribution and recognized large population



(Kock, Amr, Jacobs, Cotterill, Taylor, & Monadjem, 2008). However, in view of the local threats regarding this species, it is listed as near threatened according to the ADU. Although the species may forage within the study area, no suitable roosting sites exist. The likelihood of occurrence is therefore regarded as low.

5.2.5 Schreibers's Long-fingered Bat *Miniopterus schreibersii*

This terrestrial migrating bat species forages across a variety of open to semi-open natural and artificial habitats, even suburban areas. Colonies roost mainly in caves and mines, but they have been found in man-made structures including tunnels, ruins and buildings. Roost sites are changed several times throughout the year and are probably linked to changes between seasonal climates. It is listed globally as near threatened on the IUCN Red List of Threatened Species in view of significant population declines across the northern parts (European countries) of its range (Hutson, Aulagnier, benda, Karatas, Palmeirim, & Paunović, 2008). In addition, it is listed locally as near threatened according to the ADU. Although the species may forage within the study area, no suitable roosting sites exist. The likelihood of occurrence is therefore regarded as low.

5.2.6 Rusty Pipistrelle *Pipistrellus rusticus*

Records of this terrestrial bat species indicate ranges throughout much of sub-Saharan Africa and specifically from savannah woodland, and both dry and moist savannah habitats. Roosting records indicate tree crevices, under bark and derelict buildings. It is listed globally as least concern on the IUCN Red List of Threatened Species in view of its wide distribution and recognized large population (Jacobs, Cotterill, Taylor, & Monadjem, 2008). However, in view of the local threats regarding this species, it is listed as near threatened according to the ADU. Suitable habitat and roosting sites exist within the study area. The likelihood of occurrence is therefore regarded as moderate.

5.3 Flora

The National Herbarium Pretoria Computerised Information System (PRECIS)⁴ provides an electronic database system to access distribution records on southern African plants. The literature study focussed on querying the PRECIS database to generate species lists for the 2528AC quarter degree square (QDS) as well as querying the latest Gauteng C-Plan for suitable habitat regarding SCC.

The initial literature study (limited to the PRECIS database and Gauteng C-Plan) revealed two SCC previously recorded within the 2528AC QDS and a separate SCC for which suitable habitat exist. The initial results were cross referenced with data from the Red List of South African Plants to extract information on the ecology and threats pertaining to the recorded SCC. All SCC previously recorded within the QDS are discussed below in **5.3.1**. In addition, protected tree species previously recorded within the 2528AC QDS, as well as species that was identified within the study area is discussed below in **5.3.2**.

5.3.1 IUCN listed floral species

Brachystelma discoideum

This terrestrial succulent from the dogbane family has experienced significant declines as a result of habitat destruction associated with crop cultivation and urban expansion. It is known from less than five locations within South Africa and is associated with alluvial pans. It is currently listed as endangered according to the Red List of South African Plants (Victor & Peckover, *Brachystelma discoideum* R.A.Dyer., 2007). This species was not located during the site visit, and suitable habitat is limited to the adjacent streams / wetland habitats. The likelihood of occurrence is therefore regarded as low.

⁴ Developed and maintained by the National Herbarium in Pretoria



Wild Daisy *Callilepis leptophylla*

This widespread terrestrial flora species from the daisy family has experienced declines as a result of over exploitation for the medicinal plant trade. It is mainly associated with grassland and or open woodland, preferring rocky outcrops and rocky hill slopes. It is currently listed as declining according to the Red List of South African Plants (Victor, 2009). Although not located during the site visit, suitable habitat exists for this species. Likelihood of occurrence is therefore regarded as high.

Ceropegia turricola

This terrestrial succulent from the dogbane family experienced significant declines as a result of habitat destruction associated with mining and urban expansion. It is associated with grassland slopes within savannah habitats. It is currently listed as near threatened according to the Red List of South African Plants (Peckover & Victor, 2004). Although not located during the site visit, suitable habitat exists for this species. Likelihood of occurrence is therefore regarded as high.

5.3.2 National Forestry Act

Section 12(1) and Section 15(1) of the National Forests Act 1998 (Act No 84 of 1998) allows for the declaration of a tree, a group of trees, woodland or a species of trees as protected. A list of species was published under Government Notice (GN) 716 in Government Gazette (GG) 35648 of 7 September 2012. Under the published list the following species are relevant to this study based on their confirmed presence or previous records within the study area:

- *Combretum imberbe* Leadwood National Tree # 539
- *Sclerocarya birrea* subsp. *caffra* National Tree # 360

Under Section 15(1) of the National Forests Act (Act No 84 of 1998) the following restricted activities are applicable to protected trees:

1. No person may -
 - a) cut, disturb, damage or destroy any protected tree; or
 - b) possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, or any forest product derived from a protected tree,

except –

- (i) under a licence granted by the Minister; or

in terms of an exemption from the provisions of this subsection published by the Minister in the Gazette on the advice of the Council.

6 Recommendations

- Prior to the commencement of any vegetation clearance for the cemetery, the final site area earmarked for development should be searched by a specialist registered as a Professional Natural Scientist in accordance with the Natural Scientific Professions Act (No.27 of 2003) within the field of Zoology for:
 - Potential roosting sites for *Pipistrellus rusticus* Rusty Pipistrelle
- Prior to the commencement of any vegetation clearance for the cemetery, the final site area earmarked for development should be searched by a specialist registered as a Professional Natural Scientist in accordance with the Natural Scientific Professions Act (No.27 of 2003) within the field of Ecology or Botany for:
 - The two Orange List floral species namely *Callilepis leptophylla* and *Ceropegia turricula*
 - The two protected tree species
- If any such species (and any additional SCC) are found, appropriate ex situ and/or in situ conservation measures should be developed and implemented with the approval of the Gauteng Department of Agriculture and Rural Development.
- Protected species and other SCC should be rescued and placed in a nursery managed by City of Tshwane for the benefit of local communities (many of these species have value as medicinal plants) or donated to a research institute (e.g. SANBI or botanical garden) prior to conversion into a cemetery, rather than simply being destroyed upon receipt of a permit.
- Where feasible, viable populations of SCC can also be translocated to degraded or untransformed areas within the broader study area which provide potentially suitable habitats. However such translocations should ensure that no ecological degradation of the host habitat occurs as a result of the translocation or the introduced species, and will have to be evaluated by a botanist for each species and each potential translocation area.
- According to the Conservation of Agricultural Resources Act (Act No. 43 of 1983), all declared alien weeds must be effectively controlled by the landowner. City of Tshwane should implement an alien plant control program for the control of weeds and aliens throughout the cemetery as well as the adjacent riparian and wetland habitats
- No development should occur within the 1 : 100 year flood line of any drainage line. This includes perennial and non-perennial streams and rivers and is in accordance with the National Water Act (no. 36 of 1998), except where the necessary legal authorisation in terms of a water use license is obtained.
- Should the necessary legal authorisation be obtained it is advised that no development should take place within the buffers as indicated by the Gauteng C-Plan v3.3.



7 Conclusion

The terrestrial habitats within habitat units 1 and 2 within the site provides suitable habitat for Red List and Orange List fauna and flora species. The site has good ecological functionality and contributes to the local ecology of the area by means of habitat provision and natural terrestrial buffer for the dispersal and movement of fauna and flora to and from the surrounding aquatic habitats.

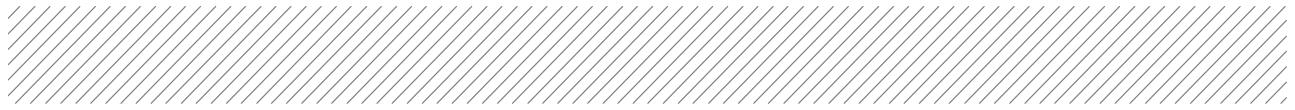
However, rapid rural expansion within the area results in large scale sand mining and illegal dumping within and adjacent to the study site. In the absence of access control to the site and control of illegal activities, the study site will rapidly fragment into a small patch of natural vegetation that will likely be disconnected from any remaining surrounding terrestrial habitats.

Based on the adherence to recommendations outlined above and the observations and outcomes of this assessment outlined below, there appears to be limited objection towards the authorisation of the proposed activity. Any objection would be motivated by the confirmed presence of any of the Red and / or Orange List fauna and flora species mentioned in this report. However, the following national and provincial attributes of the site based on published data should also be taken into account:

- The site is not located within an ecological support (ESA) or critical biodiversity (CBA) area
- The surrounding land cover could be classified as heavily modified
- The surrounding land use could be classified as rural development gradually transitioning into semi-urban development
- It is located within the urban edge as indicated by the Gauteng C-plan v3.3
- The site is situated within the Central Sandy Bushveld vegetation type and holds a conservation status of least threatened.

8 References

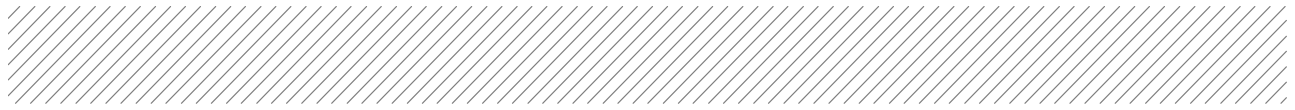
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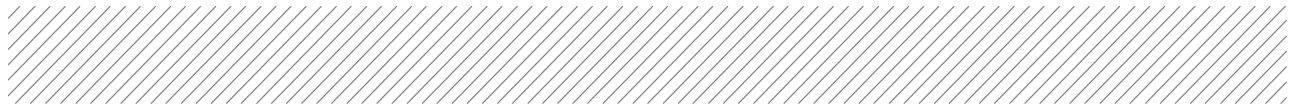
Appendix A

Specialist details

General details



Declaration of independence



Appendix B

Geo-photos



Pic. 01



Pic. 02



Pic. 03



Pic. 04



Pic. 05



Pic. 06



Pic. 07



Pic. 08



Pic. 09



Pic. 10



Pic. 11



Pic. 12



Pic. 13



Pic. 14



Pic. 15



Pic. 16



Pic. 17



Pic. 18



Pic. 19



Pic. 20



Pic. 21



Pic. 22



Pic. 23



Pic. 24



Pic. 25



Pic. 26



Pic. 27



Pic. 28



Pic. 29



Pic. 30



Pic. 31



Pic. 32



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