

September 2021

BIODIVERSITY AND TERRESTRIAL FAUNAL COMPLIANCE STATEMENT

for the

Proposed development of 82 Furrow Road in Equestria,
City of Tshwane Metropolitan Municipality, Pretoria.



Compiled for
Bastion Development Group

Compiled by



TABLE OF CONTENTS

1.	INTRODUCTION.....	9
2.	DETAILS OF THE SPECIALISTS.....	9
3.	Project Description.....	10
4.	PROJECT LOCATION.....	10
5.	ASSUMPTIONS.....	11
6.	receiving ENVIRONMENT.....	12
6.1.	Climate.....	12
6.2.	Geology topography and soils.....	12
6.3.	Hydrology.....	12
6.4.	Vegetation.....	13
7.	Methodology.....	16
7.1.	Desktop site verification.....	16
7.2.	Vegetation.....	19
7.3.	Calculating the Project Area Of Influence (PAOI).....	20
7.4.	Evaluation of Site Ecological Importance.....	20
7.5.	Conservation Importance.....	20
7.6.	Functional Integrity.....	22
7.7.	Biodiversity Importance.....	23
7.8.	Receptor Resilience.....	23
7.1.	Desktop Site Verification for species of conservation concern.....	25
8.	SITE VERIFICATION AND RESULTS FOR BIODIVERSITY ASSESSMENT.....	26
8.1.	Site Verification Method.....	26
8.2.	Site Verification result.....	26
8.3.	Terrestrial ecosystems and Ecological processes within the PAOI.....	29
8.4.	Expected Ecological Condition.....	33
8.5.	Biodiversity Priority areas.....	33
9.	PROPOSED IMPACT MANAGEMENT ACTIONS.....	34
9.1.	Project Impact Assessment.....	36
10.	Results OF FAUNA AND FLORA ASSESSMENT.....	43
10.1.	Site Sensitivity Verification – Vegetation Assessment.....	43
10.2.	Species of Provincial concern.....	43

10.3. Species of Special Concern and Red data Species	46
11. PROPOSED IMPACT MANAGEMENT ACTIONS.....	52
11.1. Site Area.....	52
12. RESULTS OF THE ENVIRONMENTAL SCREENING TOOL.....	58
12.1. Animal species theme sensitivity	58
13. CONCLUSION	58
14. REFERENCES.....	59

Appendix A: CV of specialist

LIST OF TABLES

Table 2-1. Specialist details	9
Table 4-1. Centre point coordinates of the proposed development.	10
Table 4-2. 21-digit Surveyor General code for the property affected by the proposed property.....	11
Table 6-1. The key vegetation type present in the study area based on Mucina and Rutherford.	14
Table 6-2. Dominant species representative from different stratum of the Marikana Thornveld type (Mucina & Rutherford, 2006).....	15
Table 7-1. Summary of environmental sensitivities in the project area.	19
Table 7-2. Conservation Importance Criteria	21
Table 7-3. Functional Integrity Criteria	22
Table 7-4. Receptor Resilience Criteria	23
Table 7-5. Interpretation of Site Ecological Importance	24
Table 8-1. Area calculations for the PAOI (82 Furrow Road).....	29
Table 8-2. Combined SEI for the Coastal Infrastructure Assessment in 82 Furrow Road	33
Table 9-1. Impact on Terrestrial Critical Biodiversity Areas (CBAs).....	37
Table 9-2. Impact on ecosystem threat status	38
Table 9-3. Impact on explicit subtypes in the vegetation.....	38
Table 9-4. Impact on overall ecosystem diversity of the site.....	39
Table 9-5. Direct, Indirect and cumulative impacts: Construction	39
Table 9-6. Direct, Indirect and cumulative impacts: Operation.....	41
Table 10-1. Species of special concern.	46
Table 11-1. Impacts on Critical Biodiversity Areas.....	53
Table 11-2. Impact on the extent and integrity of the Marikana Thornveld.	54
Table 11-3 Impacts on the Species of Conservation Concern.	55

LIST OF FIGURES

Figure 4-1. Locality of the proposed development area.....	11
Figure 7-1. City of Tshwane Spatial Development Framework Region 5 (2018) map for the area.	17
Figure 8-1. Land-uses and impacts along the proposed development site: a-c) The site represents garden type species; d-f) Illegal dumping on site; Bare soil; g-j) Encroachment of Alien species; k-l) Bare soil.....	28
Figure 8-2. Existing Land use within the Area of Influence.	29
Figure 8-3 Biome of the study area (VEGMAP, 2018).	30
Figure 8-4 Vegetation of the study area (VEGMAP, 2018).	30
Figure 8-5. Gauteng Conservation Plan V3.3 (Gauteng C-plan, 2011).....	31
Figure 8-6. Threat Status of the study area (VEGMAP, 2018).....	31
Figure 8-7. Landcover of the study area (SANBI, 2009).	32
Figure 8-8. Protected Areas (Protected Areas Register, 2021).....	32
Figure 8-9. Ridges/ Koppies/ Mountains (Ridges Guideline, 2001).	33
Figure 10-1. BODATSA search area (shaded square).....	45

List of Acronyms

BGIS SANBI	South African National Biodiversity Institute: Biodiversity Geographic Information System
BI	Biodiversity Importance
BODATSA	Botanical Database of Southern Africa
BPA	Biodiversity Priority Area
C-plan	Conservation Plan
CBA	Critical Biodiversity Areas
CI	Conservation Importance
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CR	Critically Endangered
CREW	Custodians of Rare and Endangered Wildflowers
CSIR	Council for Scientific and Industrial Research
DD	Data Deficient
EN	Endangered
ESA	Ecological Support Areas
FI	Functional Integrity
GG	Government Gazette
GN	Government Notice
IUCN	International Union for Conservation of Nature and Natural Resources
KBA	Key Biodiversity Areas
LC	Least Concern
MAP	Mean Annual Precipitation
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystems Priority Areas
NSBA	National Spatial Biodiversity Assessment
NT	Near Threatened Species
PA	Protected Areas
PAOI	Project Area Of Influence
PRECIS	Pretoria (PRE) Computerised Information System
RR	Receptor Resilience
SAIIAE	South African Inventory of Inland Aquatic Ecosystems

List of Acronyms (cont.)

SCC	Species of Conservation Concern
SDF	Spatial Development Framework
SEI	Site Ecological Importance
SG	Surveyor General
SIBIS	Integrated Biodiversity Information System
SOSC	Species of Special Concern
SWSA-sw	Strategic WSAs for surface water
TOPS	Threatened or Protected Species
TSP	Threatened plant species
VU	Vulnerable
WMA	Water Management Area
WSAs	Water Source Areas
WWF-SA	World Wide Fund for Nature – South Africa
WRC	Water Research Commission

DECLARATION OF INDEPENDENCE

I, Jacolette Adam (Exigent Engineering Consultants CC) declare that:

General declaration:

- I act as the independent specialist in this application;
- do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014, as amended;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I am aware that a person is guilty of an offence in terms of Regulation 48 (1) of the EIA Regulations, 2014, as amended, if that person provides incorrect or misleading information. A person who is convicted of an offence in terms of sub-regulation 48(1) (a)-(e) is liable to the penalties as contemplated in section 49B(1) of the National Environmental Management Act, 1998 (Act 107 of 1998).

J Adam

Date: 21 September 2021

DATE	REVISION	STATUS	PREPARED BY	CHECKED AND APPROVED BY
21 September 2021	0	Approved for submission	Salona Reddy	Jacolette Adam (Pr. Sci. Nat., Reg number: 400088/02)
			<i>Reddy</i>	<i>J Adam</i>

1. INTRODUCTION

Exigent Engineering Consultants CC (hereafter referred to as Exigent) has been appointed by Bastion Development Group Pty) Ltd to conduct the biodiversity and faunal assessment for the proposed development of the 82 Furrow Street housing development, on portion 2 of Holding 49 of Willowglen A/H and portion 708 (a portion of portion 81) of the Farm The Willows No. 340-JR, in Equestria, City of Tshwane Metropolitan Municipality, Gauteng.

According to Government Notice (GN) No. 960 which was published in Government Gazette (GG) No. 42561 of 05 July 2019, it is a requirement to submit a report generated by the national web-based environmental screening tool in terms of section 24(5)(h) of the National Environmental Management Act (NEMA), 1998 (Act No 107 of 1998) and regulation 16(1)(b)(v) of the Environmental Impact Assessment (EIA) Regulations, 2014, as amended. This GN came into effect from 4 October 2019. According to the results from the environmental screening assessment, the site falls within a very high Terrestrial Biodiversity theme, high palaeontology and medium animal species theme.

The Terrestrial Biodiversity theme was classified as a very high because the theme classified the study area as a Vulnerable (VU) Ecosystem. The palaeontology theme was classified as high because the theme classified the study area with features with a high palaeontological sensitivity. The animal theme was classified as medium as the theme indicated that there are three (3) sensitive species which may occur onsite. These species include Invertebrate-*Clonia uvarovi*, Mammalia-*Neamblysomus julianae* and Sensitive Species 7.

GN No. 648 of 10 May 2019 prescribed procedures to be followed for the assessment and the minimum criteria for reporting of identified environmental themes in terms of Section 24(5)(a) and (h) of NEMA, when applying for Environmental Authorisation. In line with GN No. 1150 of 30 October 2020, Section 2.3, a terrestrial Animal Species Compliance Statement report will be submitted together with a Terrestrial Biodiversity Compliance Statement report in line with the Draft Ecosystem Environmental Assessment Guideline of July 2021.

2. DETAILS OF THE SPECIALISTS

Exigent was established in 1998 providing multidisciplinary engineering and environmental services. The Exigent Environmental Business Unit provides sustainable answers within an environmental developmental framework. Our foundations are built upon ecological principles with wide ranging expertise in environmental management and assessment processes. The qualifications and experience of the primary specialists and report compilers are listed in Table 2-1. The specialists' Curriculum Vitae are attached as Appendix A.

Table 2-1. Specialist details

Specialist and contact details	Qualifications	SACNASP Registration	Experience
Jacolette Adam Email: jacolette@exigent.co.za Mobile: 082 852 6417	M.Sc. LLM (Environmental Law)	No: 400088/02	21 years of professional experience in the environmental sector and has been a certified Pr. Sci. Nat since 2002. She is also a Fellow member of the Water Institute of South Africa, Environmental Law Association of SA, the International Association for Impact Assessment South Africa and has successfully completed numerous specialist assessments throughout South Africa for a wide range of clients.
Salona Reddy Email: salona@exigent.co.za Mobile: 076 340 6234	B.Sc. Hons	Not registered	Salona has 4 years of work experience in the field of environmental management and ecological assessments. She obtained her BSc Hons in 2015 and is in the process of completing her MSc. She has been responsible for compilation of numerous EIA and EMPs for a wide range of clients.

3. PROJECT DESCRIPTION

The proposed project includes the construction of a housing development in Equestria located on portion 2 of Holding 49, Willow Glen A/H and portion 708 (a portion of portion 81) of the Farm The Willows No. 340-JR, within the jurisdiction of the City of Tshwane Metropolitan Municipality, Gauteng. The proposed development includes a new housing development and associated services:

- The proposed housing development will be high density comprising of 7 phases;
 - Phase 1 will include 25 units (5659 m²);
 - Phase 2, will include 7 units(1730 m²);
 - Phase 3 will include 8 units (2218 m²);
 - Phase 4 will include 14 units (3004 m²);
 - Phase 5 will include 13 units (3779 m²);
 - Phase 6 will include 18 units (3592 m²) and
 - Phase 7 will include 13 units (1524 m²)
- Numerous visitors and open parking areas;
- A refuse area and
- A park (450 m²);

Engineering services will be installed as per the specification of the Council. The development will see to the separation of potentially contaminated stormwater. This will form part of stormwater management plan to be approved.

4. PROJECT LOCATION

The proposed site to be extended is located on portion 2 of Holding 49, Willow Glen A/H and portion 708 (a portion of portion 81) of the Farm The Willows No. 340-JR, within the jurisdiction of the City of Tshwane Metropolitan Municipality, Gauteng (Figure 4-1). The study area is calculated to be 22 000 m² (2.20 ha).

The development is proposed within the quarter degree grid cell 2528CD, quaternary catchment A23A, with the centre point geographical coordinates of the proposed development site situated at: (Table 4-1).

Table 4-1. Centre point coordinates of the proposed development.

LATITUDE/LONGITUDE	DEGREES	DECIMAL MINUTES
South	25	45.326
East	28	19.848

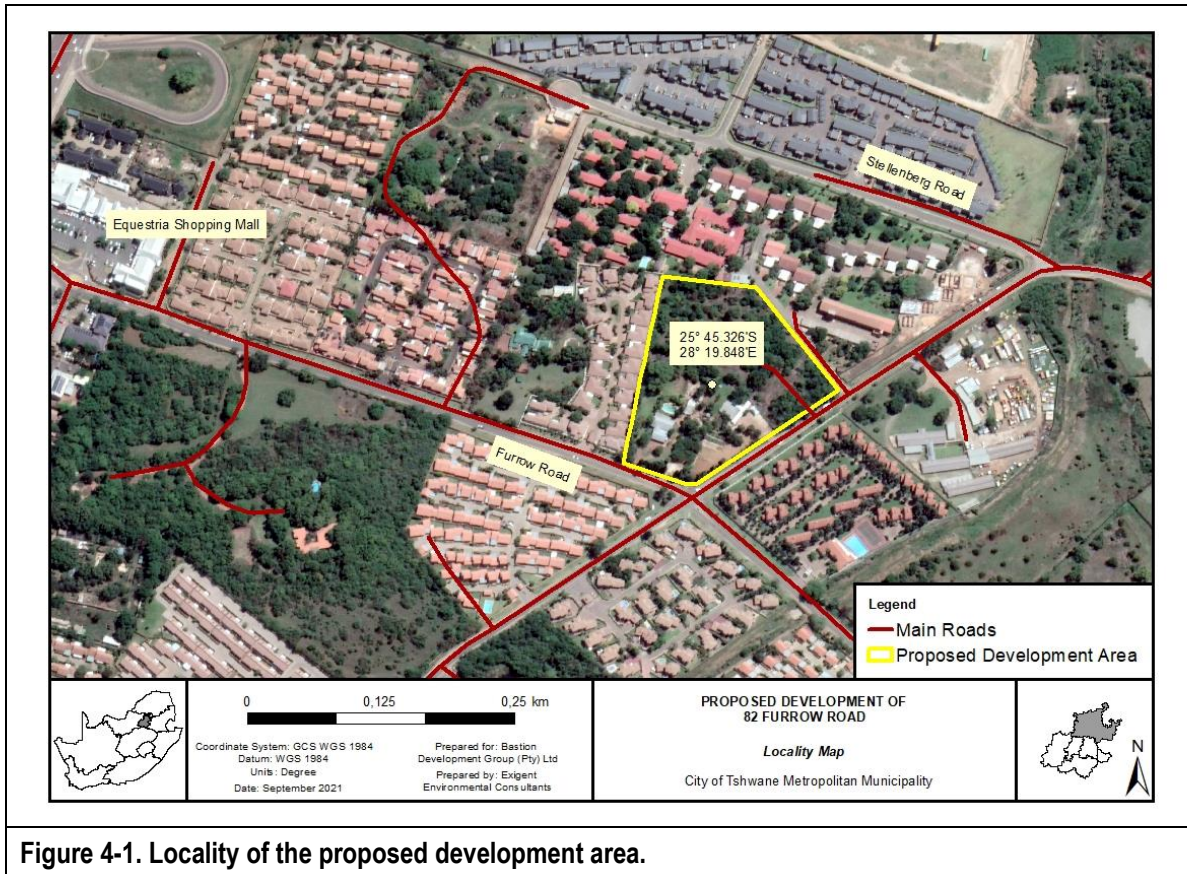


Figure 4-1. Locality of the proposed development area.

The 21-digit surveyor general (SG) code for the property is provided in Table 4-2 below:

Table 4-2. 21-digit Surveyor General code for the property affected by the proposed property.

Surveyor-general 21-digit site for the parent farm																				
T	0	J	R	0	2	8	9	0	0	0	0	4	9	0	0	0	0	0	0	
T	0	J	R	0	0	0	0	0	0	0	0	3	4	0	0	0	7	0	8	

5. ASSUMPTIONS

It is assumed that all third-party information used was correct at the time of the compilation of the report. The survey was restricted to a single season (Winter), and it was not necessary to perform an additional survey in Spring.

In order to obtain a comprehensive understanding of the dynamics of the study area, as well as the status of endemic, rare or threatened species in any area, assessments should always consider investigations at different time scales (across seasons/years) and replication. However, due to time constraints, such long-term studies are not always feasible, and all conclusions represented herein will be based on a single field survey that was undertaken on 22 July 2021. Given the nature of the area of the site 22 000 m² (2.20 ha) the mentioned Species of Conservation Concern (SCC) are unlikely to occur within the study area.

6. RECEIVING ENVIRONMENT

6.1. Climate

The climate of the study area can be described as warm and temperate with summer rainfall and very dry winters. The summers are long and warm, and the winters are short, cool, dry and clear. Pretoria has been categorised as a Cwa zone which includes humid to subtropical climates according to the Köppen-Geiger climate classification system (Climate-Data.Org, 2019). The Mean Annual Precipitation (MAP) of the area is between 600 and 700 mm a year with frequent occurrences of frost in winter (Mucina & Rutherford, 2006). The average maximum temperature is 35.3°C and the minimum temperature is -3.3 °C for January and June respectively. Corresponding values are 32.8°C and -1.0°C for January and July.

The rainy period of the year lasts for 5.5 months, from October 17 to April 1, with a sliding 31-day rainfall of at least 13 mm. The most rain falls during the 31 days centred around January 17, with an average total accumulation of 97 mm. The rainless period of the year lasts for 3.9 months, from May 11 to September 8. The least rain falls around July 14, with an average total accumulation of 3 millimetres (www.weatherspark.com).

6.2. Geology topography and soils

The proposed development is located within the mafic intrusive rocks of the Rustenberg Layered Suite of the Bushveld Igneous Complex. Rocks include gabbro, norite, pyroxenite and anorthosite. The shales and quartzites of the Pretoria Group (Transvaal Supergroup) also contribute. Mainly vertic melanic clays with some dystrophic or mesotrophic plinthic catenas and some freely drained, deep soils. The area is dominated by the Black and Red Clay Soils (Ea), Ba indicates land in which red and or yellow brown apedal soils (Hutton, Bainsvlei, Avalon, Glencoe and Pinedene soil forms) that are dystrophic and or mesotrophic, dominate over red and or yellow brown eutrophic soils and lastly Apedal Eutrophic Soils (Ae) described as freely drained, red, eutrophic, apedal soils comprise >40% of the land type (yellow soils comprise <10%).

6.3. Hydrology

The National Freshwater Ecosystems Priority Areas (NFEPA) used Water Source Areas (WSAs) to create a database that present various water and water related layers, including wetland delineation and vegetation data, catchment data, area of high groundwater recharge and water management areas using the criterion of the production of relatively large volumes of runoff which sustain lowland areas downstream. This work was then taken further in a study by the World Wide Fund for Nature – South Africa (WWF-SA) and the Council for Scientific and Industrial Research (CSIR) who identified 21 Strategic WSAs for surface water (SWSA-sw) which covered 8% of South Africa and supplied 50% of the mean annual runoff. More recently, the Water Research Commission (WRC) funded a study which identified water source areas for both ground and surface water resources (BGIS SANBI 2017). Strategic Water Source Areas (SWSAs) are now defined as areas of land that either:

- (a) supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size and so are considered nationally important; or
- (b) have high groundwater recharge and where the groundwater forms a nationally important resource; or
- (c) areas that meet both criteria (a) and (b). They include transboundary Water Source Areas that extend into Lesotho and Swaziland.

Based on the South African National Biodiversity Institute: Biodiversity Geographic Information System (BGIS SANBI) SWSAs database (2017) the study area is not strategically important for the water and economic security for South Africa.

6.3.1. Surface Water

The study area falls along the Apies-Piensaars tertiary catchment (A23) is highly developed and is comprised of eight quaternary catchments which cover an area of 4,446,504 km² (As Gazetted on 16 September 2016). The study area lies within the Apies River / Piensaars River sub-management area of the Crocodile (West) and Marico Water Management Area (WMA), which includes the Apies, Pienaar, Moretele and Tlholwe Rivers and their tributaries of the quaternary catchment A23A. The Apies River is located approximately 5 km east of the site, while the Moretele River is located about 5km west of the site. Rivers are an important habitat for birds in that they act as corridors of microhabitat for waterbirds, while the riparian vegetation on the banks provide cover for skulking species such as African Finfoot. The project does not impact directly on the river, as the riverine vegetation is located largely outside the study area. The site was however flagged as a river corridor because of this reason.

6.3.2. Ground Water

The groundwater recharge of South Africa has been mapped and distributed as part of the NFEPAs in 2011. This data aimed to provide the sub-quaternary catchments where the groundwater recharge was three-times higher than the average recharge ratio. Areas of high groundwater recharge are not necessarily classified as FEPAs, however they can be perceived as the 'recharge hotspots' of a region. It is critical to maintain the natural habitat in these areas of high groundwater recharge as to protect the functioning of the groundwater dependent ecosystems. Areas of groundwater recharge values higher than 300 indicate high groundwater recharge areas.

The Apies-Piensaars tertiary catchment has been highly developed. Groundwater resources in the catchment have been extensively utilised, by extensive livestock grazing by rural communities and possibly over-exploited by the dominating irrigation sector.

The study area falls within Crocodile (West) Marico Water Management Area (WMA). Groundwater forms an important feature with regard to water resources in the Crocodile River (West) Catchment. According to DWS (2009) a large dolomitic aquifer stretches along the southern parts of the catchment. Hence a significant volume of water is drawn for irrigation and other purposes from this aquifer, including a significant portion of the water supply to the City of Tshwane. The aquifer extends across the boundaries of the various WMAs in this area. The sandy aquifers occur along the Lower Crocodile River, from which large quantities of water are abstracted for irrigation. These aquifers are recharged from rainfall as well as river flow. The remainder of the catchment is mostly underlain by fractured rock aquifers, which are well utilised for rural community water supplies (DWA, 2009).

The study area has a groundwater recharge ratio of 28.30 Mm³/a. The aquifer classification map of South Africa has indicated that the study area has been identified as a minor aquifer system. The water source in this area is a combination of ground and surface water. According to the groundwater quality component in Table 6.1 of the National Water Act no. 36 of 1998 (Government Gazette no. 1050, 2 October 2020) the electrical conductivity of the groundwater in the Quaternary catchment A23A ranges between 47-51.70 mS/m.

6.4. Vegetation

According to the National Vegetation Map (SANBI, 2018), the proposed project lies within the Marikana Thornveld vegetation type of the Central Bushveld Bioregion and the Savana Biome which expands from Rustenburg in the west, to Marikana and Brits in the north, to Pretoria in the east, ranging in altitude from 1050m – 1450m above mean sea level (Mucina & Rutherford, 2006). Open to dense, low thorn savanna dominated by *Acacia* species or shrubby grassland with a very low shrub layer. Another defining characteristic of this thornveld are the heavy black turf and clay soils. The ecosystem occurs on flat to slightly undulating plains. The National Biodiversity Assessment (NBA,2018) lists the Ecosystem Threat status of the Marikana Thornveld is rated as Vulnerable (V) (Figure 8-3 and Figure 8-4) (Table 6-1).

Table 6-1. The key vegetation type present in the study area based on Mucina and Rutherford.

Vegetation type	Status (NSBA)*	Description
Marikana Thornveld	Vulnerable	Approximately 1% of the 19% conservation target currently being statutorily conserved, in reserves such as the Magaliesberg Nature Area and De Onderstepoort Nature Reserve. This vegetation type has been considerably impacted, with 48% being transformed predominantly via cultivation, urban or built up areas. Nearer Pretoria, industrial development is the greatest threat of land transformation, with agriculture being the dominant threat in the more rural regions where this vegetation type occurs. Erosion potential within this vegetation type is low to moderate, with localised, high densities of invasive species.

*National Spatial Biodiversity Assessment

The greatest threat to the conservation of this vegetation type is seen by agricultural development and industrial development.

Table 6-2 lists the species representative from the Marikana Thornveld.

Table 6-2. Dominant species representative from different stratum of the Marikana Thornveld type (Mucina & Rutherford, 2006).

Herbs	Graminoids
<i>Hermannia depressa</i>	<i>Elionurus muticus</i>
<i>Ipomoea obscura</i>	<i>Eragrostis lehmanniana</i>
<i>Barleria macrostegia</i>	<i>Setaria sphacelata</i>
<i>Dianthus mooiensis</i> subsp. <i>Mooiensis</i>	<i>Themeda triandra</i>
<i>Ipomoea oblongata</i>	<i>Aristida scabrivalvis</i> subsp. <i>Scabrivalvis</i>
<i>Vernonia oligocephala</i>	<i>Fingerhuthia Africana</i>
<i>Ledebouria revoluta</i>	<i>Heteropogon contortus</i>
<i>Ornithogalum tenuifolium</i>	<i>Hyperthelia dissoluta</i>
<i>Sansevieria aethiopica</i>	<i>Melinis nerviglumis</i>
	<i>Pogonarthria squarrosa</i>
Small Trees	Tall shrubs
<i>Acacia caffra</i>	<i>Euclea crispa</i> subsp. <i>Crispa</i>
<i>Gerrardii</i>	<i>Olea europea</i> subsp. <i>Africana</i>
<i>Acacia karroo</i>	<i>Rhus pyroides</i> var. <i>pyroides</i>
<i>Combretum molle</i>	<i>Diospyros lycioides</i> subsp. <i>Gueerkei</i>
<i>Rhus lancea</i>	<i>Ehretia rigida</i> subsp. <i>Rigida</i>
<i>Ziziphus mucronate</i>	<i>Euclea undulata</i>
<i>Acacia nilotica</i>	<i>Grewia flava</i>
<i>A. Tortilis</i> subsp. <i>Heteracantha</i>	<i>Pavetta gardeniifolia</i>
<i>A. Celtis Africana</i>	
<i>Dombeya rotundifolia</i>	
<i>Pappea capensis</i>	
<i>Peltophorum africanum</i>	
<i>Terminalia sericea</i>	
Tall tree	Woody climbers
<i>Acacia burkei</i>	<i>Clematis brachiata</i>
	<i>Helinus integrifolius</i>
Herbaceous Climbers	
<i>Pentarrhinum insipidum</i>	
<i>Cyphostemma cirrhosum</i>	
Low Shrubs	Geophytic Herbs
<i>Asparagus cooperi</i>	<i>Ledebouria revoluta</i>
<i>Rhynchosia nitens</i>	<i>Ornithogalum tenuifolium</i>
<i>Indigofera zeyheri</i>	<i>Sansevieria aethiopica</i>
<i>Justicia flava</i>	

7. METHODOLOGY

7.1. Desktop site verification

Prior to conducting the physical study area visit, an initial level 1 (desktop) survey was done using Google Earth's map timeline function to detect changes in visible vegetation gradients. Maps are available from 2004-2021. Possible sensitive features were identified, and GPS coordinates were noted to assist with the study area visit.

7.1.1. Literature and database survey

A literature survey was conducted to assist with the study. The full reference to resources used is listed in Section 14.

Relevant resources included:

- VEGMAP (2018);
- National Spatial Biodiversity Assessment (2018);
- Red Data Animal Lists; and
- Various field guides and books.

7.1.2. Local databases

As per the zoning allocation of the City of Tshwane Metropolitan Municipality, the area of the proposed project has been earmarked in the Spatial Development Framework (SDF, 2013) for Region 5 as a strategic area for residential densification in support of a proposed new regional node on the northwestern corner of the intersection of the N4 highway and Hans Strydom Drive (Solomon Mahlangu). As seen in Figure 7-1 the area is zoned by the Municipality as Suburban density. According to the Spatial Development Framework Region 5 (SDF, 2018) Equestria has been zoned as Densification & mixed use.

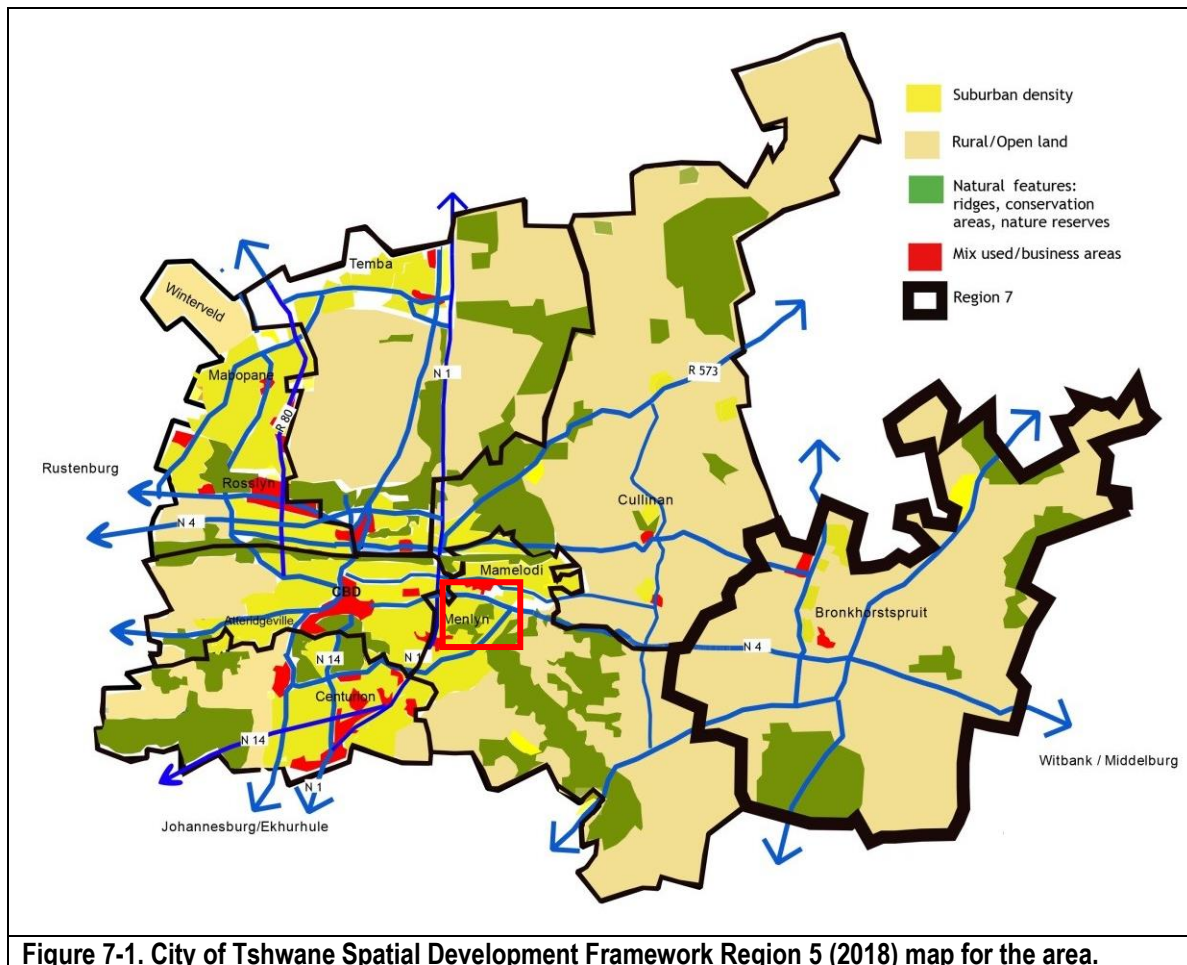


Figure 7-1. City of Tshwane Spatial Development Framework Region 5 (2018) map for the area.

7.1.3. Provincial databases

The Gauteng Conservation Plan (C-plan) Version 3.3 (2011) focuses on three key areas:

- Species requirements: The persistence requirements for each of the threatened species included in the plan were identified and incorporated into the plan. For instance, range sizes and habitat requirements, as well as buffers around known species locations, were built into the plan.
- Climate change: The plan identifies and includes (a) corridors, (b) areas that represent the full range of bioclimatic variables (altitude, aspect, geology), and (c) intact ridges, which represent important environmental gradients and linkages.
- Hydrological processes: Key wetland and river systems are included in the plan. In addition, targets were set for identified priority freshwater catchments and dolomite systems.

The Gauteng Conservation Plan (C-plan) Version 3.3 (2011) focuses on three key areas:

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- Hydrological processes: Key wetland and river systems are included in the plan. In addition, targets were set for identified priority freshwater catchments and dolomite systems.

The C-Plan includes three main purposes

- to serve as the primary decision support tool for the biodiversity component of the Environmental Impact Assessment (EIA) process;
- to inform protected area expansion and biodiversity stewardship programmes in the province; and
- to serve as a basis for development of Bioregional Plans in municipalities within the province.

The Gauteng C-Plan was used during a Geographic Information System (GIS) based assessment of the study area. The Gauteng C-Plan V3.3 (2011) delineates (at approximately 1:50 000 scale) biodiversity priority areas called Critical Biodiversity Areas (CBA), Ecological Support Areas (ESA) and Protected Areas (PA). The Gauteng C-Plan was consulted for the compilation of this report. Results indicate that the study area is not within a CBA, ESA or PA (as can be seen on the aerial image) (Figure 8-5).

The province of Gauteng includes four categories for the National Protected Area Expansion Strategy (NPAES) such as Protected Areas (Pas), Negotiated Areas, Priority Focus Areas (PFAs) and Remains severely under-protected (DEA, 2016). The study area has no classification mostly due to the transformation already occurring in the area. The main biodiversity features include wetlands, rivers and their buffers, important ridges, dolomite areas and climate change corridors. These areas are often pressured by urban areas for a range of residential, commercial and industrial reasons. Mining is also an important pressure, though less so than urban pressures. Arable commercial agriculture and subsistence agriculture are important in particular areas such as the far north (DEA, 2016). The surrounding area provides no corridor for species movement nor any suitable habitat for important or threatened species.

7.1.4. National databases

The Integrated Biodiversity Information System (SIBIS) database from the South African National Biodiversity Institute (SANBI) contains information from several SANBI databases, namely:

- Acocks (plant species observations);
- Custodians of Rare and Endangered Wildflowers (CREW) (threatened plant species localities);
- DNA laboratories (plant and reptile DNA accessions);
- Garden Accessions (plant collection records);
- MSB (plant seed collection records);
- National Herbarium Pretoria (PRE) Computerised Information System (PRECIS) (taxonomy and herbarium specimens);
- Species Status (NEMBA-listed species);
- TSP (threatened plant species); National Freshwater Ecosystems Priority Areas (NFEPAs) – (Nel *et al.*, 2011). This mapping product highlights potential rivers and wetlands that should be earmarked for conservation on a national basis; and
- National Spatial Biodiversity Assessment.

The SIBIS database provides information of the IUCN Red List status, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix listing or TOPS status of the study area, on an

interactive map. The NFEPA database includes various water and water related layers, including wetland delineation and vegetation data, catchment data, area of high groundwater recharge and water management areas. Based on National Biodiversity Assessment classification, the entire study area falls within a **NEMBA listed vulnerable ecosystem** known as the **Marikana Thornveld** as per the TSHThreatenedEcosystems layer (SANBI, 2006). The NEMBA Ecosystem list indicates that the Marikana Thornveld is classified as Vulnerable (NEMBA, 2011) this list is promulgated and will be used to describe the vegetation threat status hereof. Although the study area is classified as a vulnerable ecosystem the study site is highly transformed not clearly indicating an vulnerable ecosystem. The study site is classified as poorly protected within the terrestrial threat status.

7.2. Vegetation

Prior to the site investigation, the development site was stratified into relatively homogeneous vegetation/habitat units based on the morphology of the terrain and the growth-form of the vegetation. This was done with the help of 1:50 000 topographical maps and Google earth aerial photos of the development site. The physical site survey was conducted on 22 July 2021, as required for species identification. Species lists were compiled during the site visits to ensure that representative species observed were captured. The species listed within the findings of the screening tool were also searched for during the site visit.

Fauna distribution data were obtained from various available databases, publications and field guides to ascertain the historical occurrence of species within 2528CD.

7.2.1. Vegetation Sensitivity Summary

A summary of environmental sensitivity information provided above is listed in Table 7 1 below.

Table 7-1. Summary of environmental sensitivities in the project area.

Database	Importance	Criteria	82 Furrow Road
National vegetation types	Savanna	Least concern	A common vegetation unit
	Central Bushveld	Least concern	A common vegetation unit
Provincial vegetation types	Marikana Thornveld	Vulnerable	Not in study site
NFEPA	N/A	N/A	Not in study site
PA Expansion Focus area	N/A	N/A	Not in study site
IBA	N/A	N/A	None close to site
Provincial CBA	N/A	N/A	Not in study site
	N/A	N/A	Not in study site
Provincial ESA	N/A	N/A	None close to site
Threatened Ecosystems	Marikana Thornveld	Vulnerable	N/A
Gauteng C Plan	Marikana Thornveld	Vulnerable	Not in study site
NEMBA List 2011	Marikana Thornveld	Vulnerable	Not in study site
Landscape corridors	N/A	N/A	None close to site

7.3. Calculating the Project Area Of Influence (PAOI)

The following steps were followed in calculating the Project Area of Influence (PAOI):

1. The project activities interaction with the flora of the region assessed based on the following sources:
 - a. SA National Land Cover (BGIS 2014);
 - b. National Spatial Biodiversity Assessment (2018);
 - c. National Freshwater Ecosystems Priority Areas (NFEPA) – (Nel *et al.*, 2011);
 - d. South African Inventory of Inland Aquatic Ecosystems (SAIIAE, 2018); and
 - e. Previous specialist assessments for the project area.
2. Calculate how far the project activities could influence on the vegetation communities.

7.4. Evaluation of Site Ecological Importance

SANBI (2020) defines Site Ecological Importance (SEI) as a function of the *Biodiversity Importance (BI)* of the receptor, which is either defined as the species of conservation concern, or for instance a faunal community or habitat type present on the site), and its resilience to impacts, *Receptor Resilience (RR)*, and is then calculated as follows:

$$SEI = BI + RR$$

BI is the function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor and is calculated as follows:

$$BI = CI + FI$$

7.5. Conservation Importance

CI is evaluated in line with the various internationally accepted principles and criteria for the determination of biodiversity-related value, including the IUCN Red List species, Red list of Ecosystems and the Key Biodiversity Areas (KBA) of the IUCN (IUCN 2016).

This CI evaluation is based on the following criteria:

1. **IUCN Threatened and Near Threatened Species** (CR, EN, VU & NT) on a national or global scale as per the IUCN criteria (www.iucnredlist.org). The Guideline states that should the national and global assessment status differ for the same taxon, the most recent evaluation of status should be used in the SEI calculation.
2. **Rare species** as included on the South African National Red List as Rare of Critically Rare or Extremely Rare. These species are highly restricted even though not currently declining. Should a proposed development impact on a population of these species they will qualify under an IUCN category of threat.
3. **Range-restricted species** – the presence of terrestrial fauna, flora with a global population Extent of Occurrence (EOO) of 10 000km² or less.
4. **Globally significant populations of congregatory species** - a roughly estimated proportion (%) of the global population of a fauna species that congregate for breeding/feeding/hibernation/ other reasons;

5. **Significant areas of threatened vegetation types** – function of both the size being considered in relation to the total extent of that vegetation type (i.e. proportion) and how threatened (CR, EN, VU) the vegetation types are;
6. **Natural processes** – natural unmanaged areas with low levels of ecological disturbance have largely intact natural processes such as pollination, seed dispersal and migration, and thus have greater intrinsic conservation importance than those modified through ecological disturbance.

In calculating the CI, the criteria as set out below in

Table 7-2 has been implemented.

Table 7-2. Conservation Importance Criteria

Conservation Importance	Fulfilling Criteria
Very High	Confirmed or highly likely occurrence of CR, EN, VU, extremely rare ¹ , critically rare ² , species that have a global EOO <10km ² Any area of natural habitat or a CR ecosystem or large area (>0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type Globally significant populations of congregatory species (>10% of the global population)
High	Confirmed or highly likely occurrence of CR, EN, VU, extremely rare, critically rare, species that have a global EOO >10km ² IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed only under Criterion A, include if there are less than 10 locations or <10 000 mature individuals remaining. Small area (>0,01% but smaller than (>0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (>0,01%) of natural habitat of VY ecosystem type Presence of Rare species Globally significant populations of congregatory species (>1% but <10% of the global population)
Medium	Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystem type with status of VU Presence of range-restricted species >50% of receptor contains natural habitat with potential to support SCC
Low	No confirmed or highly likely populations of SCC No confirmed or highly likely populations of range-restricted species <50% of receptor contains natural habitat with limited potential to support SCC
Very low	No confirmed and highly unlikely populations of SCC

¹ Applicable to butterflies (as per Mecenero *et al* 2013)

² Applicable to plants (as per Raimondo *et al* 2009)

Conservation Importance	Fulfilling Criteria
	No confirmed and highly unlikely populations of range-restricted species No natural habitat remaining

7.6. Functional Integrity

Functional Integrity (FI) of the receptor³, used as the vegetation/faunal community or habitat type) is defined as the receptor's ability to maintain the structure and functions that define it, compared to its known or predicted state under ideal conditions. In calculating the FI, the criteria as set out below in Table 7-3 has been implemented.

Table 7-3. Functional Integrity Criteria

Functional Integrity	Fulfilling Criteria
Very High	Very large (>100ha) intact area for any conservation status of ecosystem type or >5ha for CR ecosystem types High connectivity serving as functional ecological corridors, limited road network between intact habitat patches No or minimal criteria negative ecological impacts with no signs of major past disturbances
High	Large (>20ha, but <100ha) intact area for any conservation status of ecosystem type or >10ha for EN ecosystem types Good habitat connectivity with potential functional ecological corridors and a regularly used road network between habitat intact patches Only minor current negative ecological impacts with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential
Medium	Medium (>5ha but <20ha) semi-intact area for any conservation status of ecosystem type or >20ha for VU ecosystem types Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of past disturbance with moderate rehabilitation potential
Low	Small (>1ha but <5ha) area Almost no habitat connectivity but migrations still possible across some transformed or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential. Several minor and major current negative ecological impacts.
Very low	Very small <1ha area No habitat connectivity except for flying species or flora with wind dispersed seeds. Several major current negative ecological impacts.

³ Defined as the measure of ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts.

7.7. Biodiversity Importance

Based on the above criteria, the BI is then calculated as per the matrix below.

Biodiversity Importance		Conservation Importance				
		Very High	High	Medium	Low	Very Low
Functional Integrity	Very high	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very low
	Low	Medium	Medium	Low	Low	Very low
	Very low	Medium	Low	Very low	Very low	Very low

7.8. Receptor Resilience

The Receptor Resilience (RR)⁴ is based on the estimated recovery time to restore an appreciable portion of the functionality of the receptor. These resilience aspects should be evaluated based on the specific conditions, such as large birds of prey having different resilience levels to noise disturbances based on the breeding cycle.

The RR is calculated based on the criteria as set out in Table 7-4.

Table 7-4. Receptor Resilience Criteria

Receptor Resilience Criteria	Fulfilling Criteria
Very High	Habitat that can recover rapidly (less than 5 years) to restore >70% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that might have a very high likelihood of returning to a site once the disturbance has been removed.
High	Habitat that can recover relatively quickly (5 -10 years) to restore >70% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that might have a high likelihood of returning to a site once the disturbance has been removed.

⁴ Intrinsic capacity of the receptor to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention

Receptor Resilience Criteria	Fulfilling Criteria
Medium	Will recover slowly (more than 10 years) to restore >70% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that might have a moderate likelihood of returning to a site once the disturbance has been removed.
Low	Habitat that is unlikely to be able to recover fully after a long period: >15 years required to restore less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that might have a low likelihood of returning to a site once the disturbance has been removed.
Very low	Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are likely to return to a site once a disturbance or impact has been removed.

Based on the above criteria, the SEI is then calculated as per the matrix below.

Site Ecological Importance		Biodiversity Importance				
		Very High	High	Medium	Low	Very Low
Receptor resilience	Very high	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very low
	Low	Medium	Medium	Low	Low	Very low
	Very low	Medium	Low	Very low	Very low	Very low

The SEI is then interpreted based on the guideline as set out in Table 7-5.

Table 7-5. Interpretation of Site Ecological Importance

Site Ecological Importance	Fulfilling Criteria
Very High	Avoidance mitigation - No destructive development activities should be considered. Offset mitigation not possible as this would be the last remaining species/good patches of habitat/unique species assemblages. Destructive impacts for species/ecosystems where persistence target remains.

Site Ecological Importance	Fulfilling Criteria
High	Avoidance mitigation whenever possible - Minimization mitigation. Changes to project infrastructure design to limit the amount of habitat impacted. Limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimization and restoration mitigation - Development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimization and restoration mitigation - Development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very low	Minimization mitigation - Development activities of medium to high impact acceptable and restoration activities may not be required.

The combination of SEI for various taxon into a single SEI for the PAOI can be done by means of ad hoc combining the maximum SEI for each receptor, or via an evaluation of the SEI once per receptor for all necessary taxon, but in these instances the highest CI, FI and lowest RR ratings across all taxon should be applied.

7.1. Desktop Site Verification for species of conservation concern

7.1.1. TOP species Desktop Lists for the Development Area

In addition to the species identified in the DEA screening tool and those identified by the Gauteng Department: Agriculture and Rural Development (GDARD), the National Environmental Management: Biodiversity Act (Act No. 10 of 2004, NEMBA) Threatened or Protected Species (TOPS) species were also considered for the proposed development. TOP species were identified in terms of the threatened and protected species lists as published under the NEMBA GN 151 of 2007 (GN151, 2007). The International Union for Conservation of Nature and Natural Resources (IUCN) Red-list species for South Africa were also consulted for the distribution and status for mammals, reptiles, and invertebrates. Where variation occurred, this was indicated on the list.

7.1.2. Species of special concern

The available habitat on the development site was compared to the habitat requirements of Species of Special Concern (SOSC) potentially occurring in the study area as determined from the literature review. Based on this assessment, SOSC with a probability of occurring on the development site were identified.

7.1.3. Red data listed species

South Africa is a signatory to the United Nations Convention on Biological Diversity (1992) and, as such, needs to conserve biological diversity, promote the sustainable use of biological diversity, and ensure the fair and equitable sharing of benefits arising out of the utilisation of genetic resources. Principle 4(a) of the NEMA states that disturbance to ecosystems and loss of biodiversity should be avoided, minimised and remedied.

To promote the conservation of biodiversity, species of concern have been identified by the World Conservation Organisation (IUCN) Red Data lists which they feel require protection (Hilton-Taylor, 1996; IUCN 2002). The World Conservation Organisation (IUCN) has three threatened categories, namely Critically Endangered, Endangered and Vulnerable. Species that have been evaluated according to the IUCN criteria and do not fall into one of the threatened categories can be classified as Least Concern, Near Threatened or Data Deficient (Minter *et al.*, 2004; Hilton-Taylor, 1996):

Extinct: The species are presumed extinct when extensive surveys have failed to record an individual. Surveys should be in known and expected habitat, at appropriate times and throughout its historic range.

Extinct in the Wild: Exhaustive surveys in known and expected habitat, at appropriate times and throughout its historic range have failed to record an individual. Populations occur well outside the past range, in cultivation or in captivity.

Critically Endangered (CR): Species facing an extremely high risk of extinction in the wild.

Endangered (EN): These taxa are in danger of extinction and are unlikely to survive if the current situation continues.

Vulnerable (VU): Vulnerable species are facing a high risk of extinction in the wild. Vulnerable species are taxa that are likely to move into the Endangered category in the near future if the factors causing the decline to continue to be present.

Near Threatened (NT): Species are classified as Near Threatened when they do not meet the criteria for the threatened categories but are close to classifying as Threatened or will likely classify as Threatened in the near future.

Data Deficient (DD): A species is classified as a Data Deficient when there is a lack of appropriate data on the distribution and/or population status of the species. The species may be well studied, and the biology known, but data on the abundance and/or distribution are not available. The category indicates that more data are required and that there is a possibility that the species may be classified into one of the threat categories in the future.

Least Concern (LC): Species that are widespread and abundant are normally included in this category.

Not Listed (NL): Species that are not listed in terms of the various databases used.

8. SITE VERIFICATION AND RESULTS FOR BIODIVERSITY ASSESSMENT

8.1. Site Verification Method

A single field survey that was undertaken on 22 July 2021 for a duration of 8 hours. The season that the field survey was conducted was in Winter. Due to the highly transformed nature of the PAOI, seasonality of the survey is not considered to be an essential factor for the detection of terrestrial Biodiversity Priority Areas (BPAs).

The specialist investigated the study area on foot during the 8 hours. The entire site of 2.20 ha was surveyed on foot to locate and characterise habitats. Photographs were taken and the assessment of the likelihood of any terrestrial ecosystems and BPAs being present was conducted. The terrestrial ecosystems observed on site were captured using a Samsung Galaxy A70. Habitat characteristics and the likelihood of terrestrial ecosystem BPAs found on site is provided in Figure 8-1 and Figure 8-2.

8.2. Site Verification result

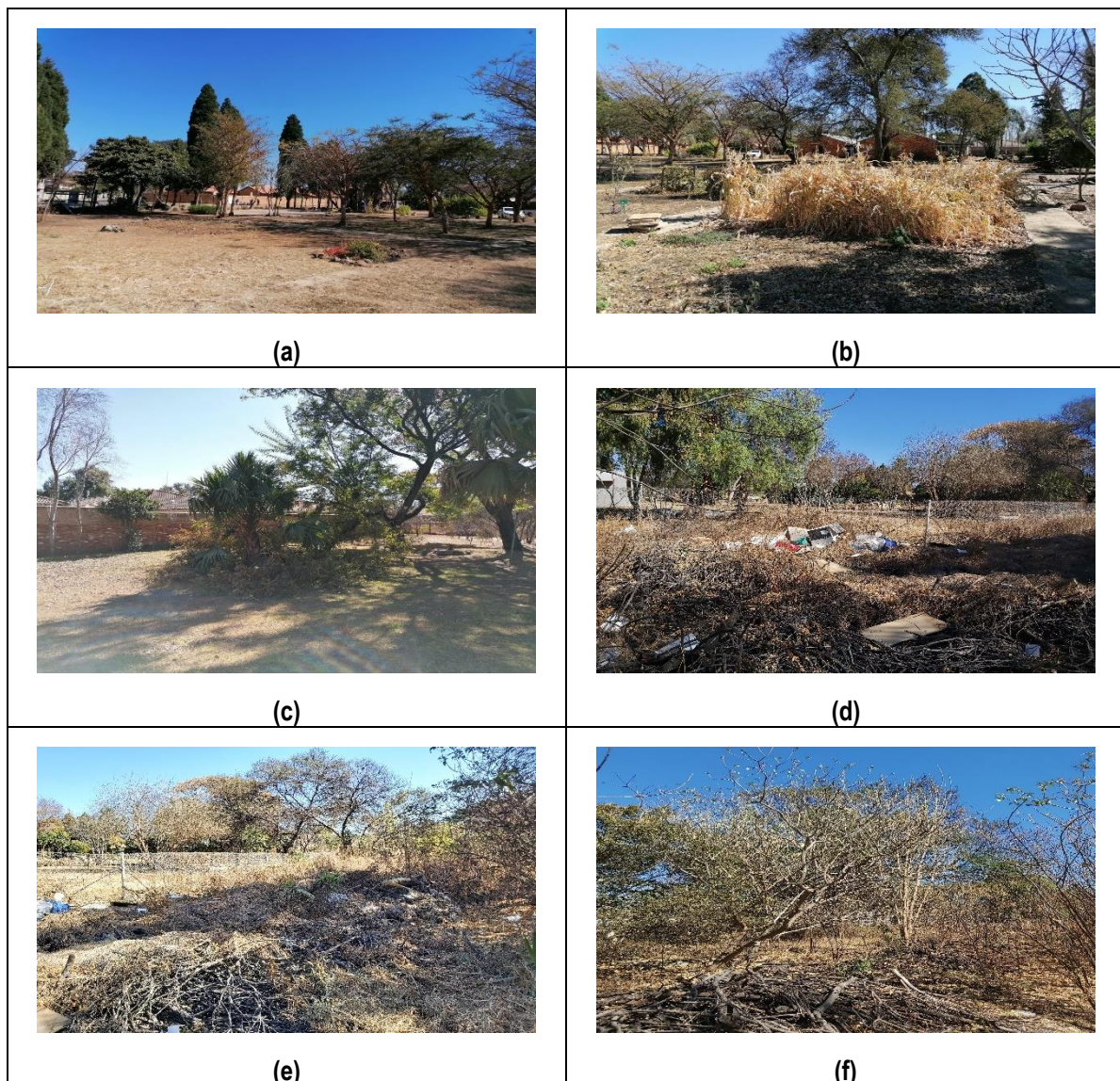
The land uses surrounding the development footprint includes high density residential housing, main roads (Furrow Road and Ouklipmuur Ave) and a great deal of transformation and development. As seen in Figure 4-1 above, significant areas of interest include the gated community of Furrow Falls, Scubaworx (Pty), Willow Country Lodge, the Equestria Shopping Center along with multiple housing estates.

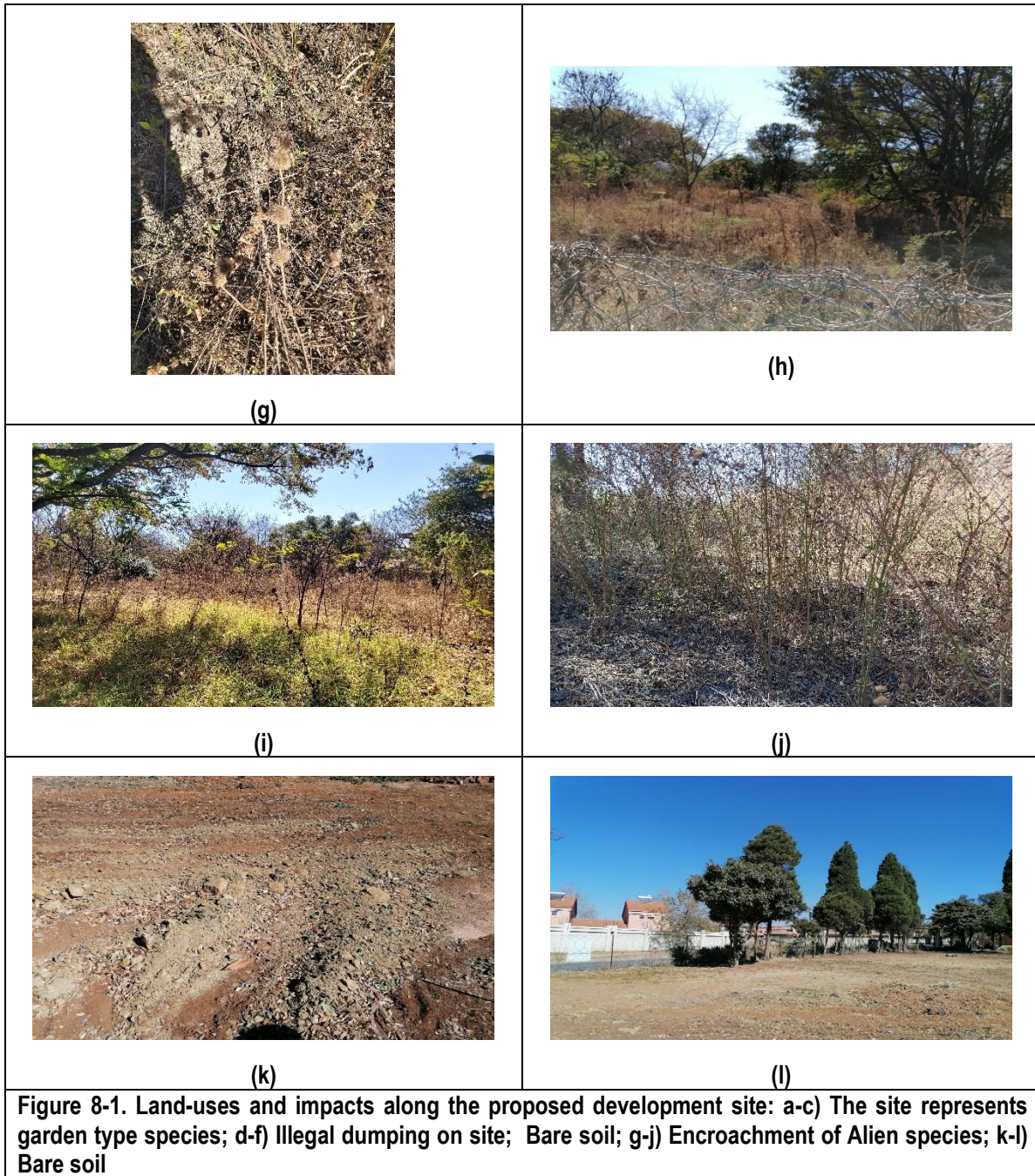
The study area is currently being utilized as a housing residence. The pre-existing impacts within the development area includes, main roads bordering the site and the development of houses and structures. Various forms of clearing has already taken place on site leading to the encroachment of alien invasive species.

The site is made up of the encroachment of various common garden grass and tree species along with the associated alien species due to the severe transformation and disturbance which is directly a result of anthropogenic impacts surrounding the project area. Illegal dumping is seen in areas of the study site along with areas which display erosion. The area throughout the google earth historical imagery indicates transformation, development and vegetation clearing. The vegetation throughout the google earth historical imagery (Accessed on 16 September 2021) indicates changes due to preferred landscaping styles. The vegetation was cleared in 2001 and the area was utilized. Regrowth appeared from 2005, by 2011 the area had immense regrowth and was cleared again in 2015.

Current impact on the site includes encroachment of various common garden grass and tree species, alien species and various forms of transformation in the form of buildings, gardens, dumping, fencing (Figure 8-1 and Figure 8-2). The project footprint or PAOI is calculated to be 22 000 m² (2.20 ha) as the entire site will be utilized for construction either in the form of development or landscaping.

The vegetation of the study area is mostly made up of garden type species as the study area is utilized as a housing residence. The vegetation areas classified in Figure 8-1 depicts the site's status quo as a typical garden.





The site indicated species which represent garden type species and alien species because of severe transformation and development across the 2.20 ha area. The dominant species located within the PAOI is described in Section 10.1. Within the study area 10 420 m² of the property is classified as developed and 11 580 m² is classified as a garden in terms of the land use existing on site. Of the total site, 10 420 m² (47%) presents existing construction and transformation. This leaves the remaining 11 580 m² (53%) classified as a garden.

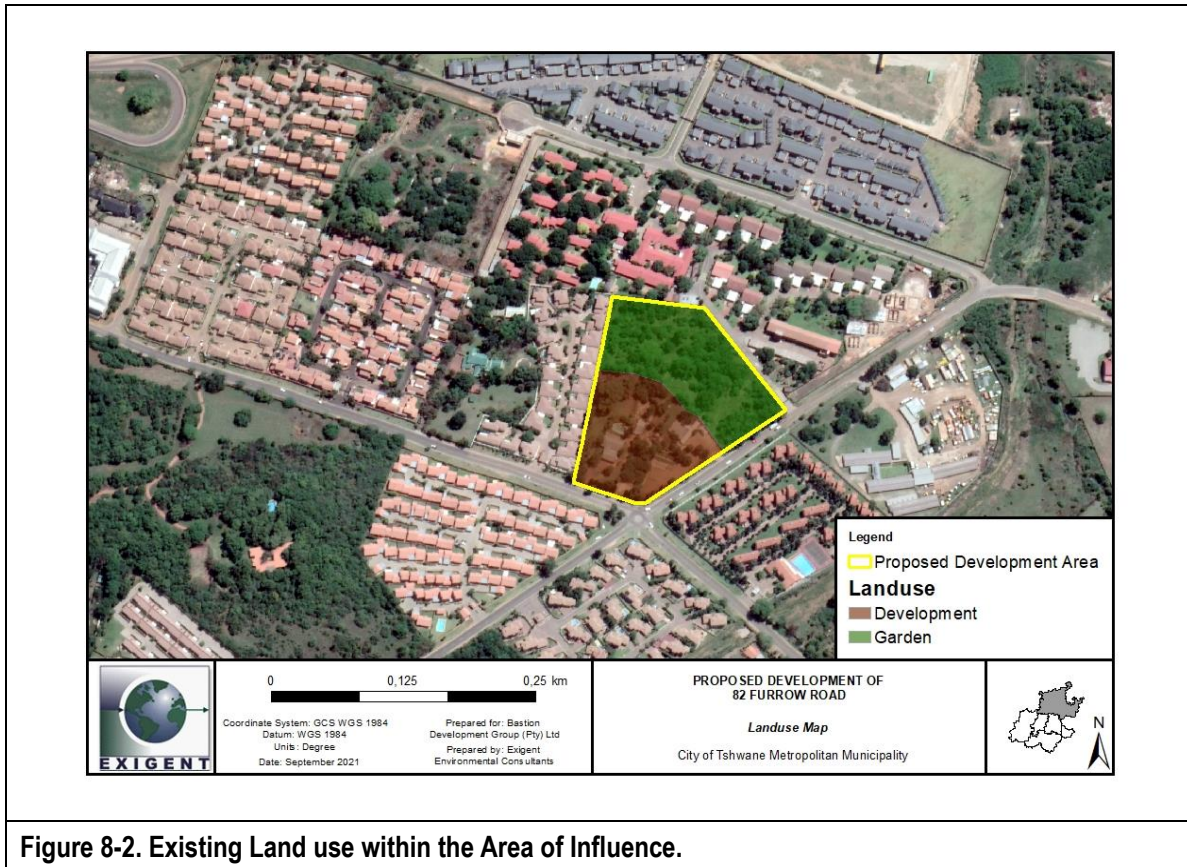


Figure 8-2. Existing Land use within the Area of Influence.

8.3. Terrestrial ecosystems and Ecological processes within the PAOI

The PAOI was calculated as per Table 8-1 below. The PAOI was calculated as the actual footprint of the proposed activities including the construction footprint.

Table 8-1. Area calculations for the PAOI (82 Furrow Road)

PAOI	Area (ha)	Description	Probability
Primary	2.20	Actual infrastructure footprint including the proposed construction footprint area.	Definite
TOTAL	2.20		

The PAOI has been studied using various key references and resources. The PAOI is located within the Savanna Biome (Figure 8-3) within the Marikana Thornveld (Figure 8-4) (VEGMAP, 2018). The Marikana Thornveld is classified as vulnerable (Figure 8-6) (NEMBA, 2011).

The PAOI does not fall within a Critical Biodiversity Area (CBA) category (Figure 8-5).

Land Cover Maps and Protected Areas was also consulted to determine if the PAOI was located with an area of concern however the results indicate that the PAOI does not fall in a protected area and falls within the cultivated and natural land use (Figure 8-7 and Figure 8-8). No ridges were located within the PAOI (Figure 8-9).

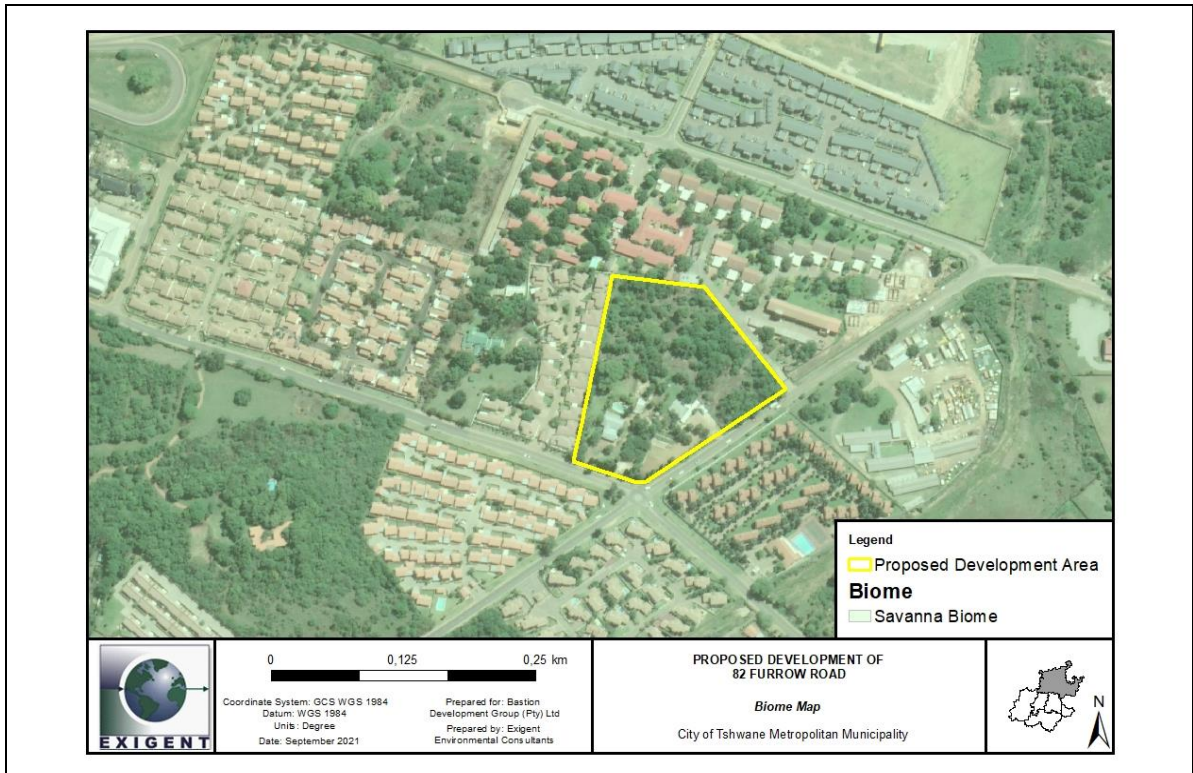


Figure 8-3 Biome of the study area (VEGMAP, 2018).

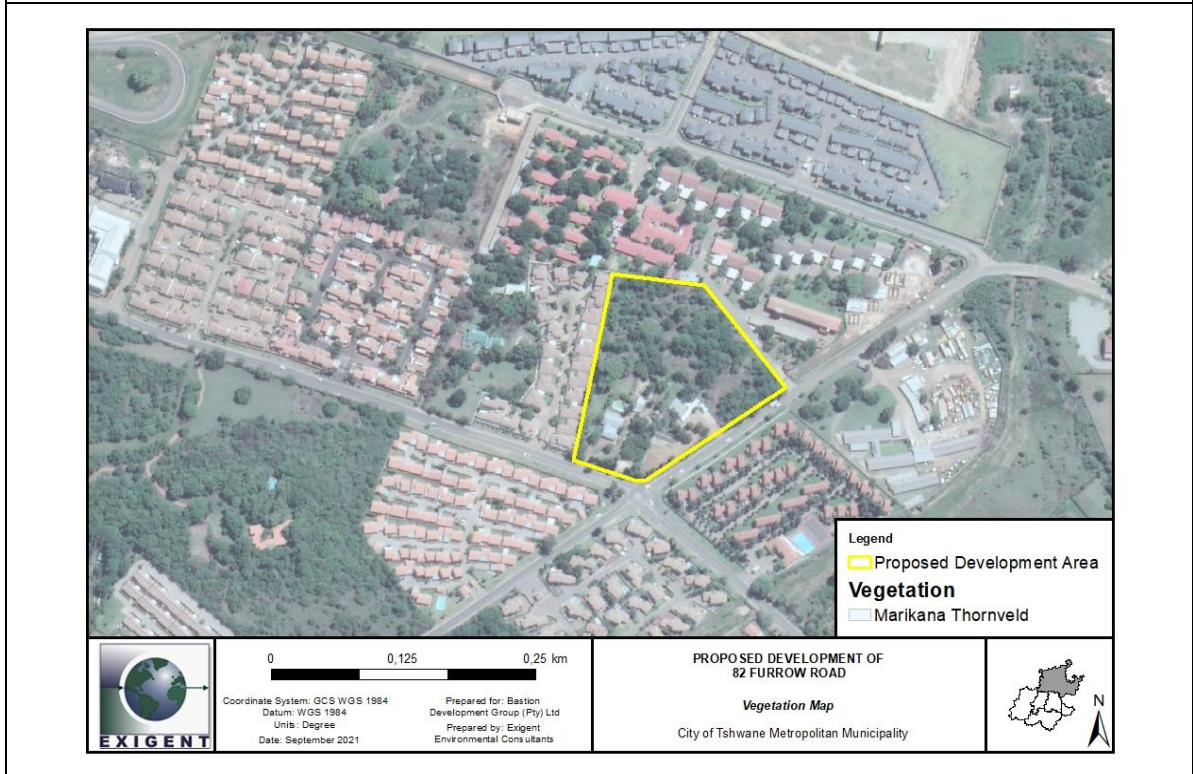


Figure 8-4 Vegetation of the study area (VEGMAP, 2018).

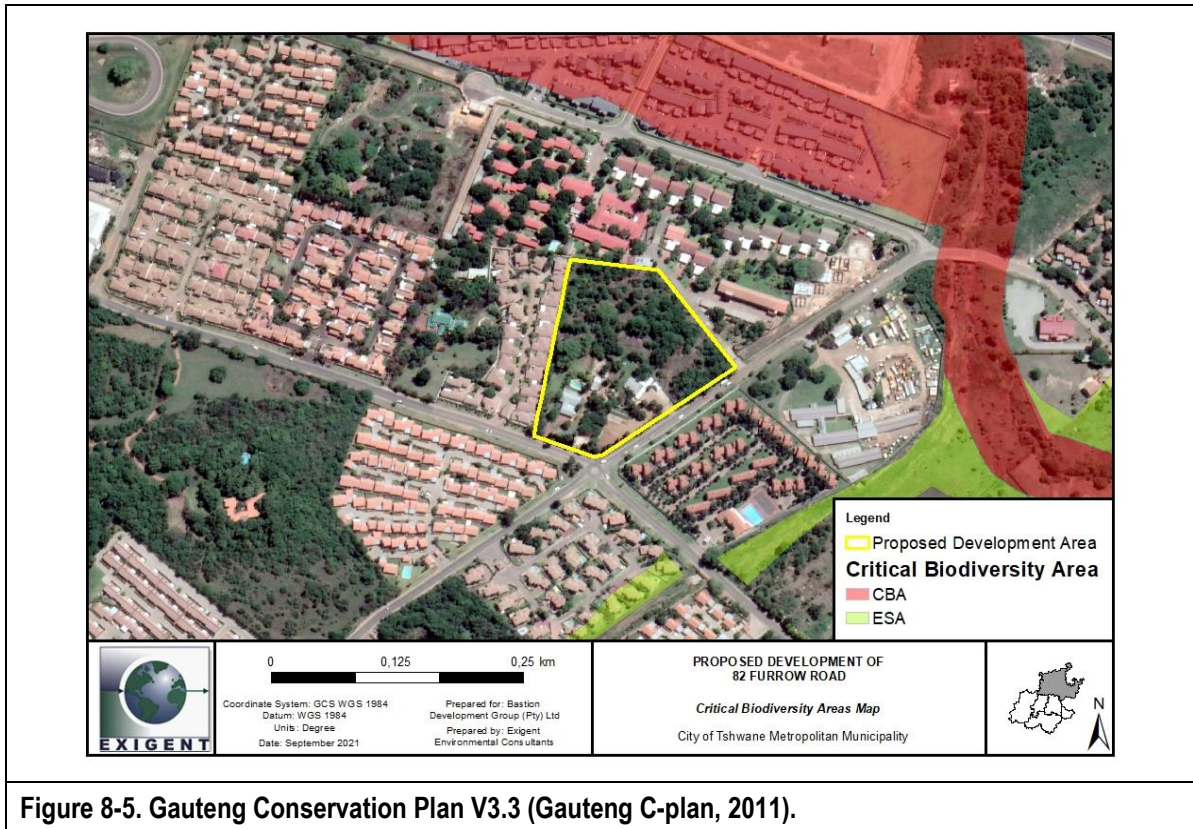


Figure 8-5. Gauteng Conservation Plan V3.3 (Gauteng C-plan, 2011).

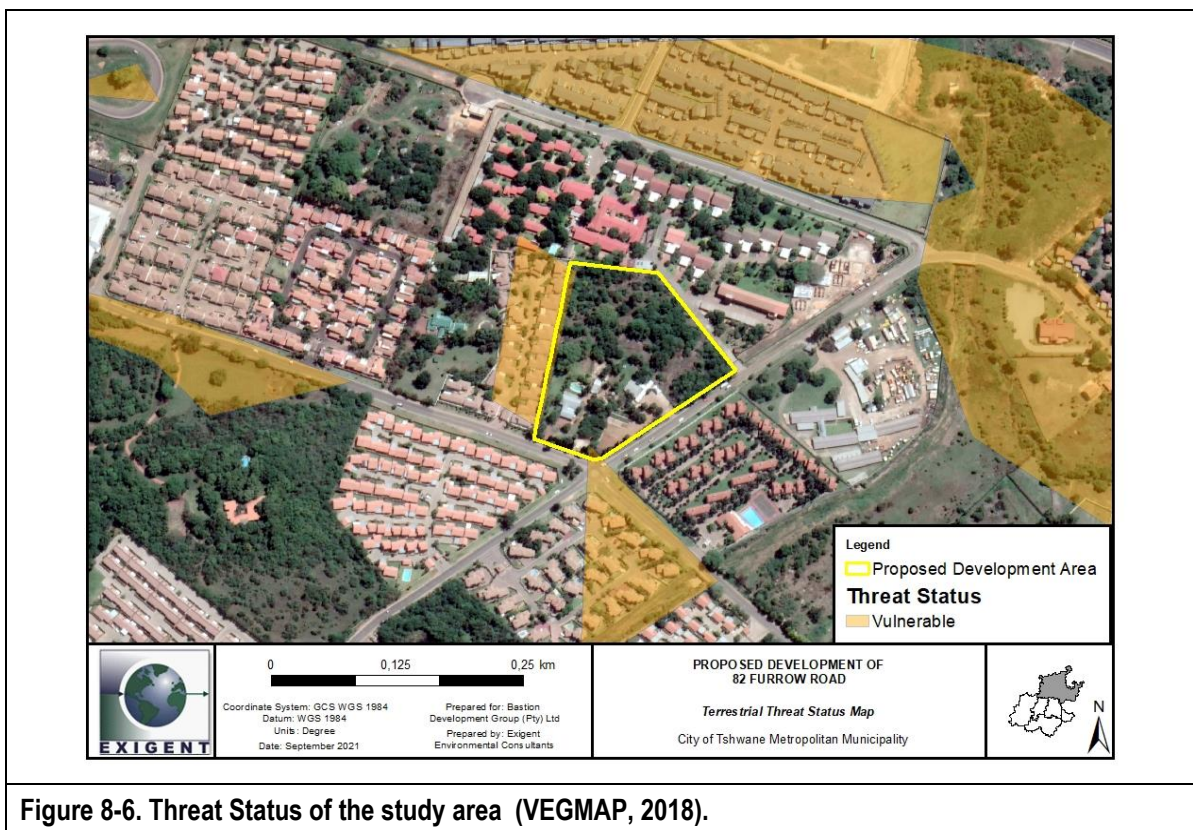


Figure 8-6. Threat Status of the study area (VEGMAP, 2018).

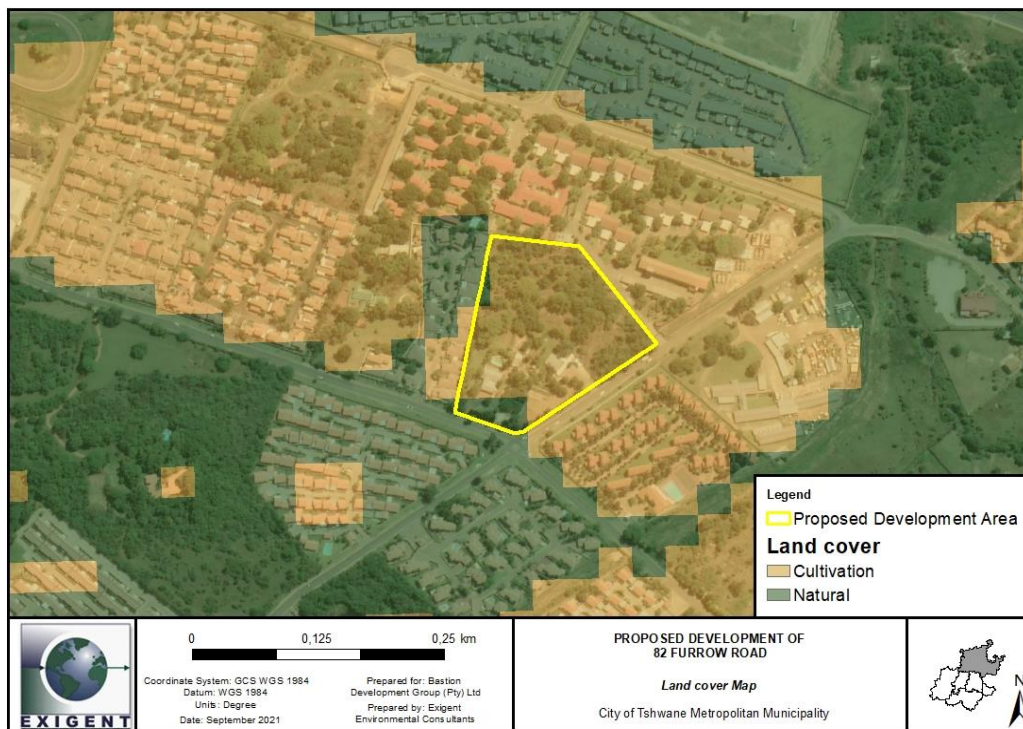


Figure 8-7. Landcover of the study area (SANBI, 2009).

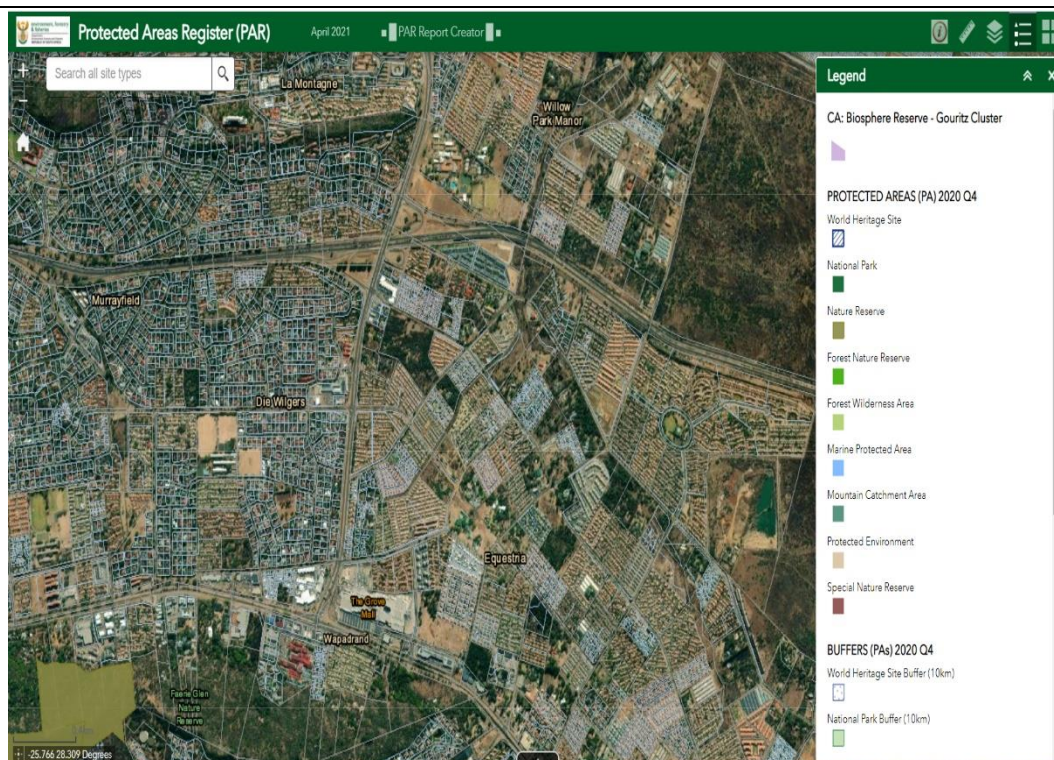


Figure 8-8. Protected Areas (Protected Areas Register, 2021).

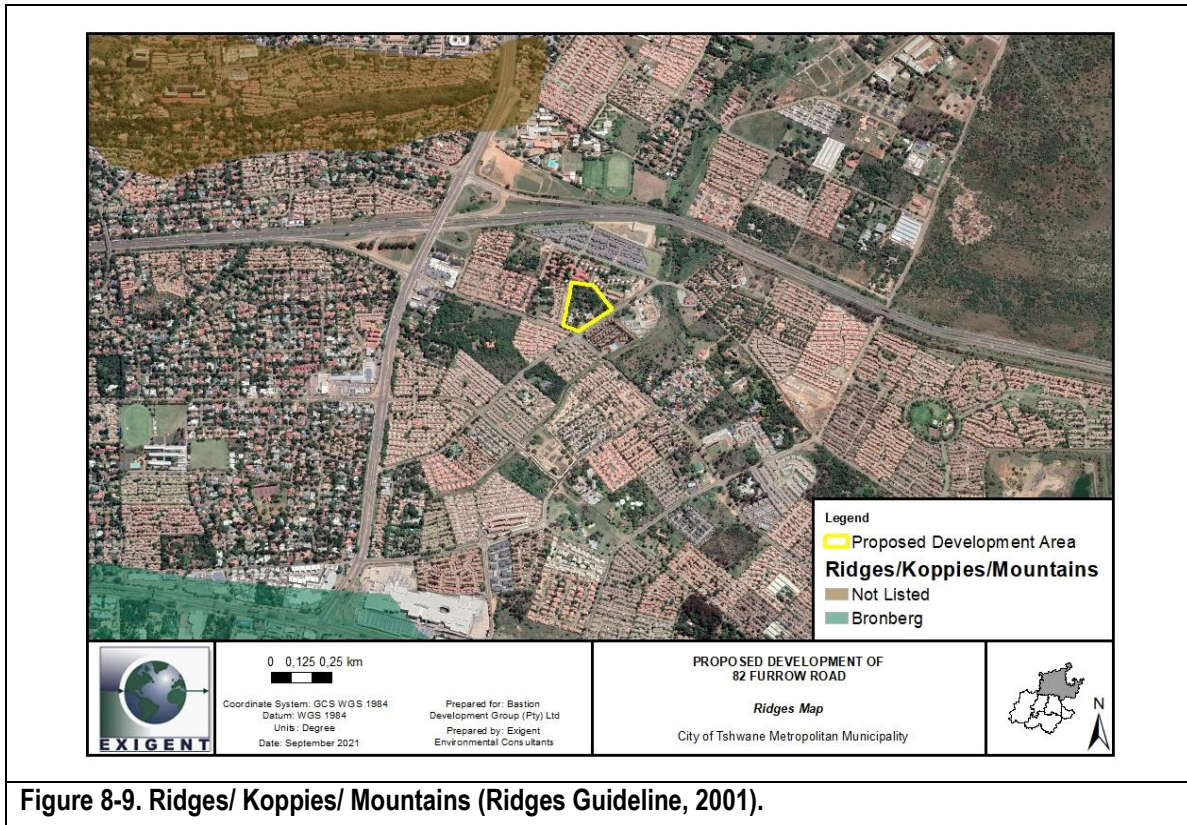


Figure 8-9. Ridges/ Koppies/ Mountains (Ridges Guideline, 2001).

8.4. Expected Ecological Condition

Table 8-2. Combined SEI for the Coastal Infrastructure Assessment in 82 Furrow Road

Habitat	Conservation Importance	Functional Importance	Receptor Resilience	Biodiversity importance	Site Ecological Importance
Garden	Very Low	Low	Very Low	Low	Very Low

The expected ecological condition was determined using a coalition of desktop ecological conditions and level of degradation of ecosystems within the PAOI. From the observation at a desktop level, it is important to note the various surrounding impacts which already exist and have existed through time. This included the SA Vegetation Map, Provincial Spatial Biodiversity Plans, Bioregional Plans, Land cover maps, Topographical Maps, recent historical aerial photography, Google Earth, Satellite imagery and Contour lines.

Based on the various databases it can be seen that the PAOI has been transformed and disturbed over time. The expected ecological condition from a desktop level was determined to be low when considering the various surrounding impacts and where the PAOI is placed.

8.5. Biodiversity Priority areas

The site does not fall within a CBA, PA or ESA classification the PAOI existing landuse has been classified initially at a desktop level and later verified by a site inspection. The PAOI is made up of a garden vegetation type and alien species which is observed to have been transformed over time through anthropogenic and existing infrastructure like landscaping, houses and roads. The vegetation throughout the site is represents common garden species, alien species and does not present much change across the area in terms of habitat composition.

The BPAs (SANBI), Landcover Maps (SANBI), various topographic maps, recent and historical imagery, Google Earth, Satellite imagery and contour lines were consulted in determining if the PAOI and surrounding landscape

represents any biodiversity priority areas. After consultation of these various datasets, it was determined that no biodiversity priority areas exist within the PAOI.

9. PROPOSED IMPACT MANAGEMENT ACTIONS

The methodologies as stipulated by the Draft Ecosystem Environmental Assessment Guideline (July 2021) are described below. These methodologies have been applied to assess the impacts for the proposed housing development and services.

The impact assessment will focus on the direct and indirect impacts associated with the project. All impacts will be analysed with regards to their extent, intensity, duration, probability, and significance.

The significance of potential impacts that may result from the proposed project will be determined to assist decision-makers (typically by a designated authority or state agency, but in some instances, the proponent).

The significance of an impact is defined as a combination of the consequence of the impact occurring and the probability that the impact will occur.

The criteria used to determine impact consequence are presented in the table below.

Rating	Definition of Rating	Score
Extent – Physical extent or spatial scale of the impact		
Local	Confined to project or study area or part thereof (e.g. the development site and immediate surrounds)	1
Regional	The region (District Municipality or Quaternary catchment)	2
National	Nationally or beyond	3
Intensity – Impact would be destructive or benign		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered	3
Duration – Timeframe in which the impact would occur		
Short Term	Up to 2 years and reversible	1
Medium Term	2 to 15 years and reversible	2
Long Term	More than 15 years and irreversible	3

The combined score of these three criteria corresponds to a Consequence Rating, as follows:

Combined Score	3-4	5	6	7	8-9
Consequence Rating	Very Low	Low	Medium	High	Very High

Once the consequence is derived, the probability of the impact occurring is considered, using the probability classifications presented in the table below.

Probability – Likelihood of the impact occurring	
Improbable	< 40% chance of occurring
Possible	40% – 70% chance of occurring
Probable	>70% – 90% chance of occurring
Definite	> 90% chance of occurring

The overall significance of impacts is determined by considering consequence and probability using the rating system prescribed in the table below:

		Probability			
		Improbable	Possible	Probable	Definite
Consequence	Very low	Insignificant	Insignificant	Very low	Very low
	Low	Very low	Very low	Low	Low
	Medium	Low	Low	Medium	Medium
	High	Medium	Medium	High	High
	Very high	High	High	Very high	Very high

Finally, the impacts are also considered in terms of their status (positive or negative impact) and the confidence in the ascribed impact significance rating. The prescribed system for considering impacts status and confidence (in assessment) is laid out in the table below:

Status of impact	
Indication of whether the impact is adverse (negative) or beneficial (positive)	+ ve (positive – a 'benefit')
	- ve (negative – a 'cost')
Confidence of assessment	
The degree of confidence in predictions based on available information, Hatch's judgment and / or specialist knowledge	Low
	Medium
	High

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **Insignificant:** Potential impact is negligible and will not have an influence on the decision regarding the proposed activity / development.
- **Very low:** Potential impact is very small and should not have any meaningful influence on the decision regarding the proposed activity / development.
- **Low:** Potential impact may not have any meaningful influence on the decision regarding the proposed activity / development.
- **Medium:** Potential impact should influence the decision regarding the proposed activity / development.
- **High:** Potential impact will affect the decision regarding the proposed activity / development.
- **Very high:** Proposed activity should only be approved under special circumstances.

Practicable mitigation and optimisation measures are recommended and impacts are rated in the prescribed way, both without and with the assumed effective implementation of mitigation and optimisation measures.

Mitigation and optimisation measures are either:

- **Essential:** Measures that must be implemented and are non-negotiable
- **Best Practice:** Recommended to comply with best practice, with adoption dependent on the proponent's risk profile and commitment to adhere to best practice, and which must be shown to have been considered and sound reasons provided by the proponent if not implemented.

The assessment of impacts adheres to the minimum requirements in the EIA Regulations and takes into account applicable official guidelines.

9.1. Project Impact Assessment

The following key issues have been identified and assessed during this biodiversity impact assessment:

- Impact on CBAs with specific reference to species composition, diversity and structure, ecosystem status and species of special concern;
- Impact on ESAs in terms of ecological processes, functionality and loss of corridors;
- Impact on PAs and quality of SWSA; and
- Impact on the extent and integrity of indigenous forests with reference to potential loss.

It should be noted that the proposed layout of infrastructure has been amended after discussions with key stakeholders and interested parties, as well as specialists to minimise the impacts. This impact assessment is therefore based on the preferred alternative layout option which minimises the impacts on the ecological features of the study area.

9.1.1. Impact on Terrestrial Critical Biodiversity Areas (CBAs)

The PAOI was not identified as CBA, ESA or PA likely because use of the following reasons:

- The potential that species of conservational concerns may not be located within the area.
- The PAOI is not located in an area within 5 km of FEPA and in the same catchment.
- The PAOI is not classified as a corridor.
- Although the PAOI habitat type is classified as Marikana Thornveld which has a threat status of vulnerable the SDF and zoning classified this area as residential.
- The POAI does not have any ridges within 200 m.

The impact of the activities associated with the project is seen as low. The reasons are because the housing development and associated infrastructure will be constructed and ultimately fenced making it a definite footprint not altering any surrounding potential corridors. As mentioned in Section 10.3; Table 10-1 which discusses species of special concern and the unlikelihood of occurrence within the PAOI. The PAOI does not display any aquatic functions and does not display any biodiversity or landscape corridors.

The proposed activities will largely be located within areas with a species dominated by garden species. The PAOI hence does not display typical Marikana Thornveld dominant species as the PAOI is highly disturbed and transformed. The PAOI presents high anthropogenic impacts and is located within the suburb of Equestria and is surrounded by a built up environment.

Table 9-1. Impact on Terrestrial Critical Biodiversity Areas (CBAs)

Impact	Status	Extent	Duration	Severity	Frequency	Probability of occurrence	Significance without mitigation		Significance with mitigation
Terrestrial Critical Biodiversity Areas (CBAs)	Negative	1	5	3	1	1	18	Low	Low
Mitigation: <ul style="list-style-type: none"> • Strict management during construction phase to limit the extent of the footprint of the impact. • No areas outside the final footprint may be cleared. Management of construction related impacts such as eating areas, concrete mixing areas, storage yard should only be allowed in designated areas.									

9.1.2. Impact of Proposed development on maintaining the CBA in a natural or near natural state or after achieving rehabilitation

The proposed development will not maintain the CBA in a natural or near natural state as the site does not display CBA properties. The proposed development will alter the PAOI in terms of the existing vegetation which is described as a garden and severely transformed. The species present within this vegetation area is not of conservation concern and is not considered non-endemic. Section 10.3; Table 10-1 indicates the unlikelihood of these SCC occurring within the PAOI. Considering that area does not fall within CBA, ESA or PA classification and does not display properties of these priority areas therefore after rehabilitation the PAOI may not be restored to display CBA, ESA or PA properties.

9.1.3. Impact on species composition and structure of vegetation

Within the PAOI the vegetation structure is described as a garden. The site is calculated to be 2.20 ha and an area of 11 580 m² (1.15 ha) requires the clearing of vegetation. The site is severely transformed and displays high anthropogenic activities hence clearing the area classified as garden will not cause a high impact to the existing vegetation. Within the site 100% of the garden area will be lost to transformation either due to concreting or landscaping to accommodate the layout plan. This impact will therefore not be assessed.

9.1.4. Impact on ecosystem threat status

The ecosystem threat status is considered vulnerable according to the TSH Threatened Ecosystems (SANBI, 2006) and the NEMBA Protected ecosystems list. The PAOI is also classified as vulnerable according to the NBA, 2011. The footprint area with regard to the entire site is used to determine the loss of habitat. This site does not present any CBA, ESA or PA properties and neither the Marikana Thornveld vegetation hence leaving room for the re-evaluation of the threat status. The garden habitat will experience a loss of 11 580 m² (1.15 ha) (51%). Upon consulting the IUCN, red data list and TOPs list the habitat lost does not provide sufficient habitat for the mentioned species (Please refer to Section 10.3; Table 10-1).

Table 9-2. Impact on ecosystem threat status

Impact	Status	Extent	Duration	Severity	Frequency	Probability of occurrence	Significance without mitigation		Significance with mitigation
Ecosystem threat Status	Negative	1	5	2	1	1	16	Low	Low
Mitigation: <ul style="list-style-type: none"> • Strict management during construction phase to limit the extent of the footprint of the impact. • No areas outside the final footprint may be cleared. Management of construction related impacts such as eating areas, concrete mixing areas, storage yard should only be allowed in designated areas.									

9.1.5. Impact on explicit subtypes in the vegetation

As per the databases, the vegetation within the PAOI is classified as the Marikana Thornveld (Figure 8-4). However upon site inspection the composition of vegetation on the site is dominated by garden type species and not the expected Marikana Thornveld vegetation. Within the study area 11 580 m² (1.15 ha) consists of garden type species which will be impacted and presents no characteristics to any subtypes of the Savanna biome or the Marikana Thornveld vegetation .

Table 9-3. Impact on explicit subtypes in the vegetation.

Impact	Status	Extent	Duration	Severity	Frequency	Probability of occurrence	Significance without mitigation		Significance with mitigation
Explicit subtypes in the vegetation	Negative	1	5	3	1	1	18	Low	Low
Mitigation: <ul style="list-style-type: none"> • Natural open spaces outside the development footprint should be left in their undeveloped state. • Any existing or new exotic vegetation within the proposed development site must be eradicated. • A monitoring program should be put in place to remove exotic vegetation and maintain areas free from exotic invasions during the construction and operational phase. • Indigenous veg to be used for landscaping purposes 									

9.1.6. Impact on overall ecosystem diversity of the site

The extent of loss within the Marikana Thornveld is not calculated as the site represents no characteristics of this vegetation type. The full extent of the gardens vegetation type, 11 580 m² (1.15 ha) will be impacted. This site presents no ecological processes as it is surrounded by developments such as a main road, housing residences and associated infrastructure. The PAOI is not flagged as a corridor and presents no aquatic features on site.

Table 9-4. Impact on overall ecosystem diversity of the site.

Impact	Status	Extent	Duration	Severity	Frequency	Probability of occurrence	Significance without mitigation		Significance with mitigation
Ecosystem diversity	Negative	1	5	2	1	1	16	Low	Low
<p>Mitigation:</p> <ul style="list-style-type: none"> • Strict management during construction phase to limit the extent of the footprint of the impact. • No areas outside the final footprint may be cleared. • Indigenous veg to be used for landscaping purposes <p>Management of construction related impacts such as eating areas, concrete mixing areas, storage yard should only be allowed in designated areas.</p>									

9.1.7. Impact on any changes to the threat status of ecosystems in the CBA

The ecosystem threat status is considered vulnerable according to the TSH Threatened Ecosystems (SANBI, 2006) and the NEMBA Protected ecosystems list. The PAOI is also classified as vulnerable according to the NBA, 2011. The footprint area with regard to the entire site is used to determine the loss of habitat. This site does not present any CBA, ESA or PA properties and neither the Marikana Thornveld vegetation hence leaving room for the re-evaluation of the threat status. The garden habitat will experience a loss of 11 580 m² (1.15 ha) (51%). Upon consulting the IUCN, red data list and TOPs list the habitat lost does not provide sufficient habitat for the mentioned species (Please refer to Section 10.3; Table 10-1). The site does not reflect CBA properties therefore the PAOI has not been incorrectly identified therefore no added loss was indicated as part of the CBA. This impact will therefore not be assessed.

9.1.8. Direct, Indirect and cumulative impacts Construction

These impacts are described as impacts that generally impact the site at a construction phase. These impacts include, the natural environment in terms of the flora, fauna, hydrology, pollution of groundwater, alien vegetation and erosion.

Table 9-5. Direct, Indirect and cumulative impacts: Construction

Impact	Status	Extent	Duration	Severity	Frequency	Probability of occurrence	Significance without mitigation		Significance with mitigation
Infestation of alien invasive species during construction	Negative	1	3	5	1	5	54	Medium	Low
<p>The disturbance of the open veld vegetation by the proposed activities may increase the spread of exotic species. Alien and invasive species are already a problem in the project area and utmost care should be taken not to disperse and increase the colonisation of these species.</p>									
<p>Mitigation:</p> <ul style="list-style-type: none"> • Natural open spaces outside the development footprint should be left in their undeveloped state. • Any existing or new exotic vegetation within the proposed development site must be eradicated. • A monitoring program should be put in place to remove exotic vegetation and maintain areas free from exotic invasions during the construction and operational phase. <p>Indigenous veg to be used for landscaping purposes</p>									

Impact	Status	Extent	Duration	Severity	Frequency	Probability of occurrence	Significance without mitigation		Significance with mitigation
Hydrological Impacts	Negative	2	5	5	2	1	36	Low	Low
<p>Although no watercourses are located on site, it is important to make sure no spills take place to prevent the contamination into groundwater</p> <p>Mitigation:</p> <ul style="list-style-type: none"> Silt traps must be installed on the development site boundary during construction; Small-scale diversion berms should be constructed, to reduce the risk of the earthworks becoming a preferred surface flow path leading to erosion; “Trench-breakers”, which are in-trench barriers, should be installed within any trench excavations to intercept and minimise the accumulation of surface runoff water from upslope areas running down the trenches; Erosion control structures must be put in place where soil may be prone to erosion; Engineering structures (such as gabions or reno mattresses) for large discharge points must be used to dissipate and control energy of stormwater runoff; Regular evaluation of the effectiveness of the engineering structures and discharge points should occur during construction and operational phase. Bare areas where vegetation has been removed pose a risk of becoming a sediment load during heavy rainfall, this must be managed by placing it on the upslope side of the development site; Temporary stormwater management structures must be used during construction. Any areas damaged as a result of stormwater runoff from the construction site must be rehabilitated immediately; and <p>During rehabilitation, prompt and progressive reinstatement of bare areas is required. During reinstatement, the topsoil layer is to be replaced last, to simulate the pre-construction soil conditions.</p>									
Pollution of surface and groundwater due to chemical, oil and fuel spills	Negative	2	2	5	1	5	54	Medium	Low
<p>Contaminants such as hydrocarbons, solids and pathogens will be generated from several potential sources (examples include petrol/diesel, oil/grease and other hazardous substances). These contaminants have the capacity to negatively affect ecosystems including sensitive or intolerant species of flora and fauna.</p> <p>Mitigation:</p> <ul style="list-style-type: none"> Extra care must be taken to prevent any potentially hazardous substances from entering the groundwater during heavy rainfall events by implementing mitigation plans, such as the Stormwater Management Plan; The use and handling of all chemicals and potentially hazardous substances must take place on an impermeable surface and banded areas to prevent chemicals and potentially hazardous substances from infiltrating the soil; All rubble and other types of waste must be appropriately stored and disposed of at a licensed waste disposal site; Contingency plans must be compiled for possible spillages of dangerous goods and include details for decontamination and process to be followed; <p>Spill kits must be available in the event of a hydrocarbon or chemical spill.</p>									
Erosion	Negative	1	5	3	3	3	54	Medium	Low
<p>Vegetation clearance may result in sheet erosion. The clearance of vegetation will further reduce the capacity of the land surface to retard the flow of surface water, thus, decreasing infiltration, and increasing both the quantity and velocity of surface water runoff and erosion.</p> <p>Mitigation:</p> <ul style="list-style-type: none"> Topsoil and subsoil should be stockpiled separately, to not impact on areas outside the servitude; Topsoil storage should not exceed a height of 2 m. During rehabilitation, prompt and progressive reinstatement of bare areas is required. The topsoil layer is to be replaced on top during reinstatement. Checks must be carried out at regular intervals to identify areas where erosion is occurring; 									

Impact	Status	Extent	Duration	Severity	Frequency	Probability of occurrence	Significance without mitigation	Significance with mitigation
<ul style="list-style-type: none"> The control of soil erosion and siltation associated with construction is important at all locations on site, and particularly adjacent to riparian area. Both temporary and permanent soil erosion control measures must be used during the construction phase. Any earth-worked areas, which may lay bare for extended periods, should be temporarily grassed. <p>Remedial action, including the rehabilitation of eroded areas and, where necessary, the relocation of the paths causing erosion, is to be undertaken</p>								

9.1.9. Direct, Indirect and cumulative impacts during Operation

These impacts are described as impacts that generally impact the site in the operation phase. These impacts include, the natural environment in terms of the hydrology, pollution of groundwater, alien vegetation and erosion.

The disturbance of the natural vegetation by the proposed activities may increase the spread of exotic species. Alien and invasive species are already a problem in the project area and utmost care should be taken not to disperse and increase the colonisation of these species.

Although no watercourses are located on site, it is important to make sure no spills take place to prevent the contamination into groundwater during the operation phase.

During the operational phase of this project, there is a higher risk of fuel spills due to the possibility of infrastructure malfunction.

Vegetation clearance as part of the construction phase may result in sheet erosion. Where rehabilitation and bank stabilising has not taken place fully by the end of the construction activities, there is a risk of sedimentation and erosion taking place.

Table 9-6. Direct, Indirect and cumulative impacts: Operation

Impact	Status	Extent	Duration	Severity	Frequency	Probability of occurrence	Significance without mitigation	Significance with mitigation
Infestation of alien invasive species during construction	Negative	1	3	3	1	5	42 Low	Low
<p>The disturbance of the natural vegetation by the proposed activities may increase the spread of exotic species. Alien and invasive species are already a problem in the project area and utmost care should be taken not to disperse and increase the colonisation of these species.</p> <p>Mitigation:</p> <ul style="list-style-type: none"> Successful re-vegetation in all areas is crucial to stabilise soils and limit infestation by invasive alien plant species. Rehabilitation should be undertaken on a progressive basis in these areas. <p>A monitoring program should be put in place to remove exotic vegetation and maintain open space areas free from exotic invasions during operation.</p>								
Hydrological Impacts	Negative	2	5	5	2	1	36 Low	Low
<p>Although no watercourses are located on site, it is important to make sure no spills take place to prevent the contamination into groundwater during the operation phase.</p>								

Impact	Status	Extent	Duration	Severity	Frequency	Probability of occurrence	Significance without mitigation	Significance with mitigation	
<p>Mitigation:</p> <ul style="list-style-type: none"> Bare areas where vegetation has been removed pose a risk of becoming a sediment load into river during heavy rainfall or windy conditions. Bare areas which have not recovered from the construction phase, should therefore be covered during such events. Temporary stormwater management structures should be used during operational phase in areas which have not recovered fully from construction activities. <p>Any areas damaged as a result of stormwater runoff from the construction site must be rehabilitated.</p>									
Pollution of surface and groundwater due to chemical, oil and fuel spills	Negative	1	3	4	2	4	48	Low	Low
<p>During the operational phase of this project, there is a higher risk of fuel spills due to the possibility of infrastructure malfunction.</p>									
<p>Mitigation:</p> <ul style="list-style-type: none"> Preventive measure must be undertaken during the construction of the infrastructures, securing all joints for minimum spillage occurrences. Should a spillage occur, it must be reported to the relevant departments immediately. Where contamination occurs, soil must be immediately removed to prevent further contamination. Monthly monitoring for E-coli must be adhered to for the period of 6 months following the construction phase of the development as to ensure the sufficient functioning of the newly installed infrastructure. Should faulty infrastructure be identified, it must be replaced immediately after discovery. This must form part of a maintenance plan approved by the competent authority. Records must be kept of sewage spillages during both phases, construction and operational. An emergency preparedness plan must be in place for instances where spills occur that can be harmful to people or the receiving environment. 									
Erosion	Negative	1	2	2	3	3	30	Low	Low
<p>Vegetation clearance as part of the construction phase may result in sheet erosion. Where rehabilitation and bank stabilising has not taken place fully by the end of the construction activities, there is a risk of sedimentation and erosion taking place.</p>									
<p>Mitigation:</p> <ul style="list-style-type: none"> Checks must be carried out at regular intervals to identify areas where erosion is occurring. The control of soil erosion and siltation associated with operation is important at all locations on site, and particularly adjacent to riparian area. Both temporary and permanent soil erosion control measures must be used during the operation phase. Remedial action, including the rehabilitation of eroded areas and, where necessary, the relocation of the paths causing erosion, is to be undertaken. <p>During rehabilitation, prompt and progressive reinstatement of bare areas is required. The topsoil layer is to be replaced on top during reinstatement.</p>									

10. RESULTS OF FAUNA AND FLORA ASSESSMENT

10.1. Site Sensitivity Verification – Vegetation Assessment

Due to the high levels of disturbance in the surrounding area, the likelihood of the study area presenting a CBA, ESA or PA priority focus area and a vulnerable ecosystem is low. The likelihood of encountering small animals was incredibly low within the study area.

The study area presented a savanna type biome characteristic that is covered with garden type species and tree species. The transformation of the area is a direct result of the development of the housing residence within the city of Pretoria which is represented as the development of business infrastructure and residential townships. The study area presented *Strelitzia reginae*, *Cyperus alternifolius*, *Melaleuca viminalis*, *Bidens pilosa* L, *Campuloclinium macrocephalum*, *Taraxacum officinale*, *Lantana camara*, *Solanum mauritianum* a conifer (*Abies grandis*), *Acacia dealbata* and common lawn grass such as *Pennisetum clandestinum* Hochst. Ex Chiov within the garden areas.

During the site visit, no common bird species, small mammals, amphibians or reptiles were observed whilst walking the 22 000 m² (2.20 ha) study area. The study area did not provide sufficient habitat for species particularly of conservation concern because of the transformation and fragmentation of the site.

10.2. Species of Provincial concern

As per the Gauteng C-Plan V3.3, portions of the study area are located in areas that are not defined as CBAs. Hence no red listed flora species (among others) have the potential to occur. The Botanical Database of Southern Africa (BODATSA) site provided plant species for the area covered by the grey shaded square (Figure 10-1). The application area is indicated in grey. No species were identified in the BODATSA search area neither were any species of conservation concern recorded.

A search of the online Virtual Museum of African Mammals provided 89 records for mammal species, 253 records for aves species, 295 records for lepidoptera, 29 records for Dung beetle species, 17 records for frog species, 42 records for lacewing species, 54 records for odonata species, 62 records for reptile species, 25 records for a spider species, 6 records for scorpions and 55 records for mushrooms, 12 records for Orchids spotted in the 2528CD quaternary degree square. Of the records 3 bird, 11 mammal, 1 invertebrate, 1 amphibian and 4 reptile species was classified as vulnerable or near threatened no other species identified were of conservation concern (Table 10-1).

For the Mammals the occurrences of the SCC listed in Table 10-1 were checked for their potential occurrence utilizing the following databases along with a site visit to confirm if the SCC are present in the study area.

- iNaturalist
- Virtual Museum of African Mammals (MammalMAP, 2020)
- The African Chiroptera Report (for bats)

For the Avifauna the occurrences of the SCC listed in Table 10-1 were checked for their potential occurrence utilizing the following databases along with a site visit to confirm if the SCC are present in the study area.

- iNaturalist
- Southern African Bird Atlas Project 2 (SABAP2, 2020)
- Co-ordinated Wetland Counts
- Co-ordinated Avifaunal RoadCounts
- Birds in Nature Reserve Projects

For the Herpetofauna the occurrences of the SCC listed in Table 10-1 were checked for their potential occurrence utilizing the following databases along with a site visit to confirm if the SCC are present in the study area.

- iNaturalist
- Reptile Atlas of Southern Africa (Reptile Map, 2020)
- Frog Atlas of Southern Africa (FrogMap, 2020)

For the Terrestrial Invertebrates the occurrences of the SCC listed in Table 10-1 were checked for their potential occurrence utilizing the following databases along with a site visit to confirm if the SCC are present in the study area.

- iNaturalist
- Atlas of Lepidoptera (LepiMAP, 2020)
- Atlas of Dung Beetles in southern Africa (Dung BeetleMAP, 2020)
- Atlas of southern African Spiders (SpiderMAP, 2020)

For the plant theme the occurrences of the SCC listed in Table 10-1 were checked for their potential occurrence utilizing the following databases along with a site visit to confirm if the SCC are present in the study area.

- iNaturalist
- Botanical Database of Southern Africa (NEWPOSA)
- Global Biodiversity Information Facility (GBIF)
- Atlas of African Orchids (OrchidMap)

During the site visit, it was determined that the mammal, avifauna, Amphibians and reptiles (Herpetofauna), Terrestrial Invertebrates and plant SCC had a low to no potential for occurrence within the proposed development area. This area holds no suitable habitat for the listed species due to the transformation, fragmentation and placement of the study site.

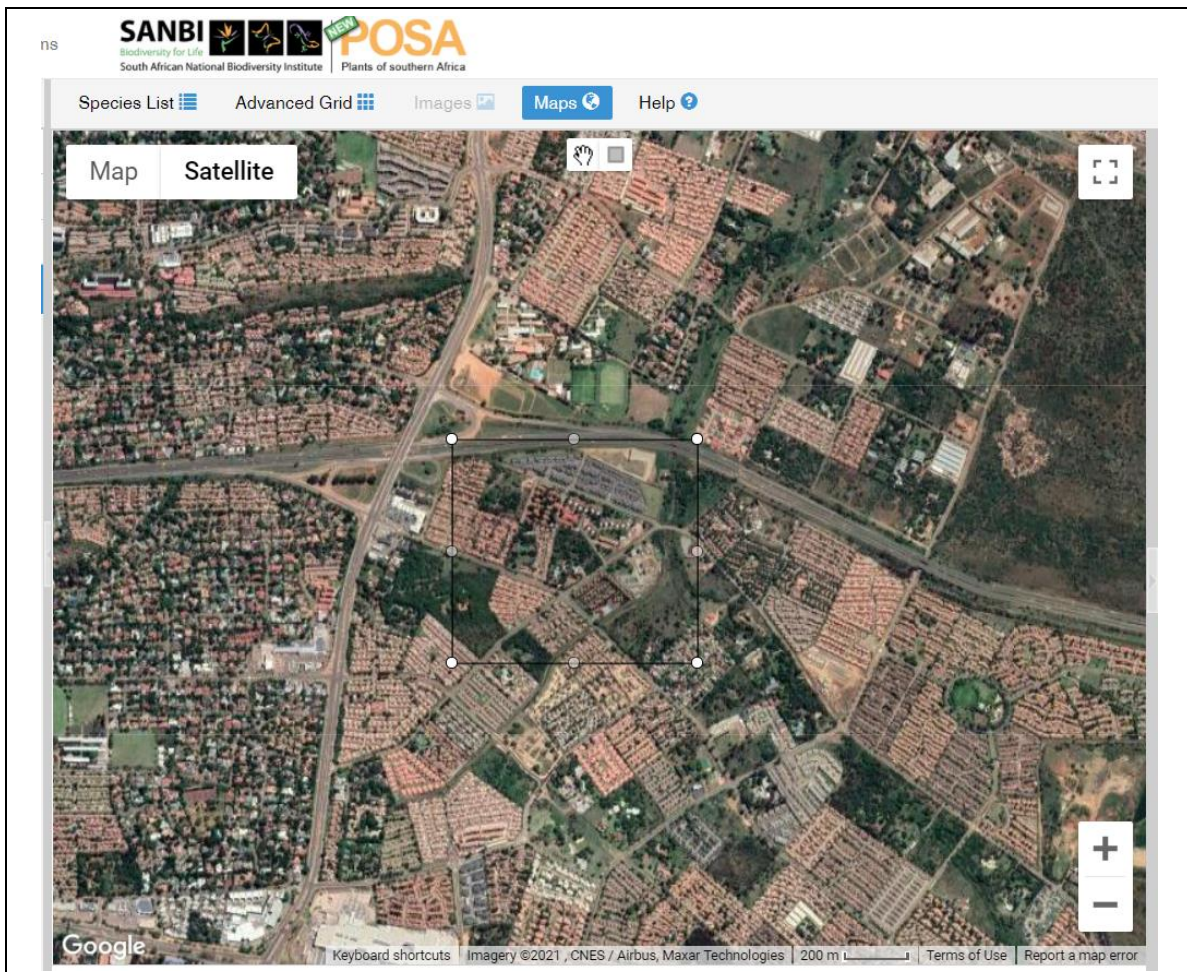


Figure 10-1. BODATSA search area (shaded square).

10.3. Species of Special Concern and Red data Species

Table 10-1. Species of special concern.

Family	Scientific Name	Common Name	TOPS Status	IUCN Status	Km ²	Likelihood of occurrence	Motivation
Mammals							
Chrysochloridae	Chrysospalax villosus	Rough-haired Golden Mole	CR	VU	(0.0226km ² /1.05km ²)x100= 0%	Low	Habitat type: sandy soils in grasslands, meadows and along edges of marshes in Savannah and Grassland biomes of South Africa. Due to the nature of the animal and the location of the project, it is unlikely that this species would be found in proximity to the study area roaming freely. The amount of anthropogenic activity in the area also makes it an undesirable area for the species to inhabit.
Chrysochloridae	*Neamblysomus julianae	Juliana's Golden Mole	VU	EN	(0.0226km ² /7.79km ²)x100= 0%	Low	Habitat type: tends to live underground in the sandy soil under grasslands with scattered trees and bushes (also known as bushveld). Due to the nature of the animal and the location of the project, it is unlikely that this species would be found in proximity to the study area roaming freely. The amount of anthropogenic activity in the area also makes it an undesirable area for the species to inhabit.
Bovidae	Damaliscus lunatus	(Southern African) Tsessebe	EN	LC		Low	Habitat type: floodplains, but they are sometimes found in dry areas of open savanna and park woodland, taking to the shade during the heat of the day. Due to the nature of the animal and the location of the project, it is unlikely that this species would be found in proximity to the study area roaming freely. The amount of anthropogenic activity in the area also makes it an undesirable area for the species to inhabit.
Erinaceidae	Atelerix frontalis	Southern African Hedgehog	P	LC		Low	Habitat type: floodplains, but they are sometimes found in dry areas of open savanna and park woodland, taking to the shade during the heat of the day.

Family	Scientific Name	Common Name	TOPS Status	IUCN Status	Km ²	Likelihood of occurrence	Motivation
							Due to the nature of the animal and the location of the project, it is unlikely that this species would be found in proximity to the study area roaming freely. The amount of anthropogenic activity in the area also makes it an undesirable area for the species to inhabit.
Felidae	Acinonyx jubatus	Cheetah	EN	VU	$(292.34\text{km}^2/12615.35\text{km}^2) \times 100 = 0\%$	Low	<p>Habitat type: Habitats that are favored by cheetahs include grasslands and deserts. Cheetahs are terrestrial but have been known to climb trees on occasion.</p> <p>Due to the nature of the animal and the location of the project, it is unlikely that this species would be found in proximity to the study area roaming freely. The amount of anthropogenic activity in the area also makes it an undesirable area for the species to inhabit.</p>
Hyaenidae	Parahyaena brunnea	Brown Hyena	P	NT		Low	<p>Habitat type: inhabits desert areas, semi-desert, and open woodland savannahs. It can survive close to urban areas by scavenging. The brown hyena favors rocky, mountainous areas, as they provide shade and it is not dependent on the ready availability of water sources for frequent drinking.</p> <p>Due to the nature of the animal and the location of the project, it is unlikely that this species would be found in proximity to the study area roaming freely. The amount of anthropogenic activity in the area also makes it an undesirable area for the species to inhabit.</p>
Muridae	Otomys auratus	Southern African Vlei Rat (Grassland type)		NT		Low	<p>Habitat type: This species is associated with mesic grasslands and wetlands within alpine, montane and sub-montane regions, typically occurring in dense vegetation in close proximity to water.</p> <p>Due to the nature of the animal and the location of the project, it is unlikely that this species would be found in proximity to the study area roaming freely. The amount of anthropogenic activity in the area also makes it an undesirable area for the species to inhabit.</p>

Family	Scientific Name	Common Name	TOPS Status	IUCN Status	Km ²	Likelihood of occurrence	Motivation
Mustelidae	<i>Aonyx capensis</i>	African Clawless Otter	P	NT		Low	Habitat type: It inhabits permanent water bodies in savannah and lowland forest areas through most of sub-Saharan Africa. Due to the nature of the animal and the location of the project, it is unlikely that this species would be found in proximity to the study area roaming freely. There are no water bodies located on site to provide a suitable habitat.
Mustelidae	<i>Poecilogale albinucha</i>	African Striped Weasel		LC		Low	Habitat type: This species is mainly found in savannah and grassland habitats, although it probably has a wide habitat tolerance and has been recorded from lowland rainforest, semi- desert grassland, fynbos (with dense grass) and pine. Due to the nature of the animal and the location of the project, it is unlikely that this species would be found in proximity to the study area roaming freely. The amount of anthropogenic activity in the area also makes it an undesirable area for the species to inhabit.
Soricidae	<i>Crocidura mariquensis</i>	Swamp Musk Shrew		LC	$(0.0226\text{km}^2/0.72\text{k m}^2)\times 100= 0\%$	Low	Habitat type: This species has highly specific habitat requirements, occurring only close to open water with intact riverine and semi-aquatic vegetation such as reedbeds, wetlands and the thick grass along riverbanks. Due to the nature of the animal and the location of the project, it is unlikely that this species would be found in proximity to the study area roaming freely. There are no water bodies located on site to provide a suitable habitat.
Vespertilionidae	<i>Miniopterus schreibersii</i>	Schreibers's Long-fingered Bat		VU		Low	Habitat type: This species seems to favor hard-wood forest-rich habitats and mainly roosts in colonies in karst caves, mines and cellars with other cave-dwelling species. Fast flight and maneuvers with its broad tail membrane allow the hunt for moths, beetles, Lepidoptera larvae and even spiders.

Family	Scientific Name	Common Name	TOPS Status	IUCN Status	Km ²	Likelihood of occurrence	Motivation
							Due to the nature of the animal and the location of the project, it is unlikely that this species would be found in proximity to the study area roaming freely. The amount of anthropogenic activity in the area also makes it an undesirable area for the species to inhabit.
Aves							
<i>Accipitridae</i>	<i>Circus ranivorus</i>	African marsh harrier	P	LC	$(0.0226\text{km}^2/12615.35\text{km}^2)\times 100=0\%$	Low	Habitat type: Commonly located in Reed beds, floodplains, lake margins. No reed beds, floodplains, lake margins areas were identified within close proximity to the proposed development. The study site does not present a suitable habitat. These birds are sighted in the area during mid to end summer (December-April). The survey was conducted in summer to support the unlikelihood of occurrence.
Glareolidae	Glareola nordmanni	Black-winged Pratincole		NT		Low	Habitat type: saline and alkaline steppes , grassland, ploughed and arable land, in river valleys and along shorelines. Due to the nature of the animal and the location of the project, it is unlikely that this species would be found in proximity to the study area roaming freely. There are no water courses located on site to provide a suitable habitat.
Gruidae	Anthropoides paradiseus	Blue Crane	EN	VU		Low	Habitat type: Primarily dry upland natural grassland dominated by grasses and sedges. Also roosts and nests in wetlands. Due to the nature of the animal and the location of the project, it is unlikely that this species would be found in proximity to the study area roaming freely. There are no wetlands located on site to provide a suitable habitat.
Invertebrate							

Family	Scientific Name	Common Name	TOPS Status	IUCN Status	Km ²	Likelihood of occurrence	Motivation
*Tettigoniidae	Clonia uvarovi	Bush cricket		VU		Low	<p>Habitat type: occurs in tall, woodland savannah in areas which are under intensive grazing pressure by livestock and wildlife, cultivation with non-timber crops, urban development, and invasion by alien plant species such as Lantana spp., bugweed and other non-native weed species.</p> <p>Due to the nature of the animal and the location of the project, it is unlikely that this species would be found in proximity to the study area. Although this species is found in urban development the project area presents a patchy area that is highly built up to provide adequate habitat for this species.</p>
Reptiles							
	*Sensitive species 7		VU	LC		Low	<p>Habitat type: This species is a savanna species that inhabits rocky hillsides in habitats of mixed Acacia and Combretum woodland, tropical Bushveld and Thornveld where vegetation ranges from dense, short shrubland to open tree savanna</p> <p>Due to the nature of the animal and the location of the project, it is unlikely that this species would be found in proximity to the study area roaming freely. The amount of anthropogenic activity in the area also makes it an undesirable area for the species to inhabit.</p>
Cordylidae	Chamaesaura aenea	Coppery Grass Lizard		LC		Low	Habitat type: Restricted to the Grassland Biome. Found on the grassy slopes and plateau of the eastern escarpment and Highveld
Crocodylidae	Crocodylus niloticus	Nile Crocodile	P	LC		Low	Habitat type: This species relies on open water for survival. Large aquatic habitats (ponds, rivers, dams etc.) No open water bodies are located within proximity to the study area, therefore the potential occurrence of this species on this site is low.

Family	Scientific Name	Common Name	TOPS Status	IUCN Status	Km ²	Likelihood of occurrence	Motivation
							Due to the nature of the animal and the location of the project, it is unlikely that this species would be found in proximity to the study area roaming freely. The amount of anthropogenic activity in the area also makes it an undesirable area for the species to inhabit.
Lamprophiidae	Homoroselaps dorsalis	Striped Harlequin Snake		LC		Low	Habitat type: This species favours habitats that are moist savanna and grasslands. Due to the nature of the animal and the location of the project, it is unlikely that this species would be found in proximity to the study area roaming freely. The amount of anthropogenic activity in the area also makes it an undesirable area for the species to inhabit.
Amphibians							
Pyxicephalidae	Pyxicephalus adspersus	Giant Bull Frog	P	LC		Low	Habitat type: The species has an affinity toward water. No wetland or waterlogged areas were identified within close proximity to the proposed development., therefore the potential occurrence of this species on this site is low.

* These species were identified as species of concern by the DEA Screening tool

11. PROPOSED IMPACT MANAGEMENT ACTIONS

The following key issues have been identified and assessed during this Fauna Assessment:

- Impact on Critical Biodiversity Areas with specific reference to species composition, diversity and structure, ecosystem status and species of special concern;
- Impact on Ecological Support Areas in terms of ecological processes, functionality and loss of corridors;
- Impact on Protected Areas extent and potential loss of expansion areas;
- Impact on habitat, water quantity and quality of Strategic Water Source Areas; and
- Impact on the extent and integrity of Marikana Thornveld with reference to potential loss.

It should be noted that the proposed layout of infrastructure has been amended after discussions with key stakeholders and interested parties, as well as specialists to minimise the impacts. This impact assessment is therefore based on the preferred alternative layout option which minimises the impacts on the ecological features of the study area.

11.1. Site Area

Due to the footprint of the proposed infrastructure, the habitat disturbance is likely to occur, however disturbed and exposed soil and exposed could lead to erosion and alien species encroachment. Standard management measures will be applicable during construction in terms of minimising the footprint, management of hazardous substances and clearance of limited footprint.

11.1.1. Impact on Critical Biodiversity Areas

The PAOI was not identified as CBA, ESA or PA likely because use of the following reasons:

- The potential that species of conservational concerns may not be located within the area.
- The PAOI is not located in an area within 5 km of FEPA and in the same catchment.
- The PAOI is not classified as a corridor.
- Although the PAOI habitat type is classified as Marikana Thornveld which has a threat status of vulnerable the SDF and zoning classified this area as residential.

The impact of the activities associated with the project is seen as low. The reasons are because the housing development and associated infrastructure will be constructed and ultimately fenced making it a definite footprint not altering any surrounding potential corridors. As mentioned in Section 10.3; Table 10-1 which discusses species of special concern and the unlikelihood of occurrence within the PAOI. The PAOI does not display any aquatic functions and does not display any biodiversity or landscape corridors.

The proposed activities will largely be located within areas with a species dominated by garden species. The PAOI hence does not display typical Marikana Thornveld dominant species as the PAOI is highly disturbed and transformed. The PAOI presents high anthropogenic impacts and is located within the suburb of Equestria and is surrounded by a built up environment.

As mentioned in Section 10.3; Table 10-1 which discusses species of special concern and the unlikelihood of occurrence within the PAOI. The PAOI does not display any aquatic functions and does not display any river corridors.

Table 11-1. Impacts on Critical Biodiversity Areas.

Impact	Status	Extent	Duration	Severity	Frequency	Probability of occurrence	Significance without mitigation		Significance with mitigation
Terrestrial Critical Biodiversity Areas (CBAs)	Negative	1	5	3	1	1	18	Low	Low
Mitigation: <ul style="list-style-type: none"> • Strict management during construction phase to limit the extent of the footprint of the impact. • No areas outside the final footprint may be cleared. Management of construction related impacts such as eating areas, concrete mixing areas, storage yard should only be allowed in designated areas.									

11.1.2. Impact on Ecological Support Areas

Ecological Support Areas protect the critical conservation areas from edge effects, as well as provide ecological support at the same time through forage areas and movement corridors. Based on the CPlanV33_1110_ge (2011) no ESAs occur within the terrestrial study area. This impact will therefore not be assessed.

11.1.3. Impact on Protected Areas and Expansion Areas

Protected Area Expansion allow for improved ecosystem representation, ecological sustainability and resilience to climate change (DEA, 2016). Based on the NPAES database (SANBI, 2010) no protected and expansion areas occur within the terrestrial study area. This impact will therefore not be assessed.

11.1.4. Strategic Water Source Areas

Based on the SWSA_all_v3_Nov2017 database (SANBI, 2017) no Strategic Water Source Areas occur within the terrestrial study area. This impact will therefore not be assessed.

11.1.5. Impact on the extent and integrity of Marikana Thornveld

The vegetation within the area is classified as the Marikana Thornveld (Figure 5-1). The development will impact 11 580 m² (1.15 ha) of this vegetation. However, upon site inspection the composition of vegetation on the site is dominated by alien vegetation and not the expected Marikana Thornveld vegetation. Hence the site has been incorrectly classified as vulnerable. Please refer to Section 9.1.4 and 9.1.7.

Table 11-2. Impact on the extent and integrity of the Marikana Thornveld.

Impact	Status	Extent	Duration	Severity	Frequency	Probability of occurrence	Significance without mitigation		Significance with mitigation
Explicit subtypes in the vegetation	Negative	1	5	3	1	3	36	Low	Low
Mitigation: <ul style="list-style-type: none"> • Natural open spaces outside the development footprint should be left in their undeveloped state. • Any existing or new exotic vegetation within the proposed development site must be eradicated. • A monitoring program should be put in place to remove exotic vegetation and maintain areas free from exotic invasions during the construction and operational phase. • Indigenous veg to be used for landscaping purposes 									

11.1.6. Impacts on the Species of Conservation Concern

The nature and extent of the potential impact of the proposed development on the population of the SCC located within the study area is low as the habitat of these species are not located within the study area.

There is no conservation concern of these species within the study area as these species are not located within this area. Neither their habitats nor their surrounding landscape and ecological processes will be impacted during this proposed construction.

Table 11-3 Impacts on the Species of Conservation Concern.

Family	Scientific Name	Common Name	Geographical scale or spatial scope	Duration temporal scope	Frequency or re-occurrence	Magnitude severity	or	Justification for magnitude/severity
Mammals								
<i>Felidae</i>	<i>Leptailurus serval</i>	Serval	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance as species does not occur within the study area.
<i>Felidae</i>	<i>Panthera pardus</i>	Leopard	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance as species does not occur within the study area.
<i>Chrysochloridae</i>	<i>Chrysospalax villosus</i>	Rough-haired Golden Mole	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance of surrounding habitat and breeding from possible noise of vehicles
* <i>Chrysochloridae</i>	<i>Neamblysomus julianae</i>	Juliana's Golden Mole	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance of surrounding habitat and breeding from possible noise of vehicles
<i>Bovidae</i>	<i>Damaliscus lunatus</i>	(Southern African) Tsessebe	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance of surrounding habitat and breeding from possible noise of vehicles
<i>Erinaceidae</i>	<i>Atelerix frontalis</i>	Southern African Hedgehog	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance of surrounding habitat and breeding from possible noise of vehicles
<i>Felidae</i>	<i>Acinonyx jubatus</i>	Cheetah	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance of surrounding habitat and breeding from possible noise of vehicles
<i>Hyaenidae</i>	<i>Parahyaena brunnea</i>	Brown Hyena	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance of surrounding habitat and breeding from possible noise of vehicles
<i>Muridae</i>	<i>Otomys auratus</i>	Southern African Vlei Rat (Grassland type)	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance of surrounding habitat and breeding from possible noise of vehicles
<i>Mustelidae</i>	<i>Aonyx capensis</i>	African Clawless Otter	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance of surrounding habitat and breeding from possible noise of vehicles
<i>Mustelidae</i>	<i>Poecilogale albinucha</i>	African Striped Weasel	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance of surrounding habitat and breeding from possible noise of vehicles

Family	Scientific Name	Common Name	Geographical scale or spatial scope	Duration temporal scope	Frequency or re-occurrence	Magnitude severity	or	Justification for magnitude/severity
<i>Soricidae</i>	<i>Crocidura mariquensis</i>	Swamp Musk Shrew	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance of surrounding habitat and breeding from possible noise of vehicles
<i>Vespertilionidae</i>	<i>Miniopterus schreibersii</i>	Schreibers's Long-fingered Bat	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance of surrounding habitat and breeding from possible noise of vehicles
Aves								
<i>Accipitridae</i>	<i>Circus ranivorus</i>	African marsh harrier	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance of surrounding habitat and breeding from possible noise of vehicles
<i>Glareolidae</i>	<i>Glareola nordmanni</i>	Black-winged Pratincole	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance of surrounding habitat and breeding from possible noise of vehicles
<i>Gruidae</i>	<i>Anthropoides paradiseus</i>	Blue Crane	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance of surrounding habitat and breeding from possible noise of vehicles
Invertebrates								
<i>*Tettigoniidae</i>	<i>Clonia uvarovi</i>	Bush cricket	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance of surrounding habitat and breeding from possible noise of vehicles
Reptiles								
	<i>*Sensitive species 7</i>		Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance as species does not occur within the study area.
<i>Cordylidae</i>	<i>Chamaesaura aenea</i>	Coppery Grass Lizard	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance of surrounding habitat and breeding from possible noise of vehicles
<i>Crocodylidae</i>	<i>Crocodylus niloticus</i>	Nile Crocodile	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance of surrounding habitat and breeding from possible noise of vehicles
<i>Lamprophiidae</i>	<i>Homoroselaps dorsalis</i>	Striped Harlequin Snake	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low		Low intensity disturbance of surrounding habitat and breeding from possible noise of vehicles
Amphibians								

Family	Scientific Name	Common Name	Geographical scale or spatial scope	Duration temporal scope	Frequency or re-occurrence	Magnitude or severity	Justification for magnitude/severity
<i>Pyxicephalidae</i>	<i>Pyxicephalus adspersus</i>	Giant Bull Frog	Local or project footprint	Long term (>20 year)	Highly irregular	Very Low	Low intensity disturbance as species does not occur within the study area.

12. RESULTS OF THE ENVIRONMENTAL SCREENING TOOL

12.1. Animal species theme sensitivity

The screening tool identified *Clonia uvarovi* (Uvarov's Clonia), *Neamblysomus julianae* (Juliana's Golden Mole) and Sensitive species 7 as an Animal feature. On the IUCN red data list *Clonia uvarovi* (Uvarov's Clonia) is classified as VU, *Neamblysomus julianae* (Juliana's Golden Mole) as EN and Sensitive species 7 as LC. In the TOPS list *Neamblysomus julianae* (Juliana's Golden Mole) and Sensitive species 7 is classified as VU. However, this site does not possess a suitable habitat for this species to occur. No further threatened animal species is present on site and none are expected due to lack of suitable habitat. The proposed development will therefore not affect any threatened animal species or its habitat.

13. CONCLUSION

According to GN.No. 960 which was published in GG No. 42561 of 05 July 2019, it is a requirement to submit a report generated by the national web-based environmental screening tool in terms of section 24(5)(h) of the NEMA, 1998 (Act No 107 of 1998) and regulation 16(1)(b)(v) of the EIA regulations, 2014, as amended. According to the results from the environmental screening assessment, the site falls within very high Terrestrial Biodiversity theme, high palaeontology and medium animal species theme..

It is clear from aerial imagery, literature review and ground truthing that large portions of the study area have been impacted by been transformation either by vegetation clearing, landscaping or built environment. As discussed in the vegetation description, the dominant vegetation within the study area is dominated by garden type species indicating transformation. The vegetation on site does not provide suitable habitat for SCC, and limited habitat for any species, except a few common species birds and invertebrates.

The current use of the land and environmental sensitivity as identified by the national web based environmental screening tool is herewith disputed. The site has been transformed and contains no species representative of the natural vegetation of the area. The specialist is of the opinion that this specialist study was conducted independently and based on our expertise, sufficient evidence is provided in support of the **low** environmental sensitivity of the proposed development site.

14. REFERENCES

- Hilton-Taylor, C. 1996. *Red Data list of southern African Plants*. Strelitzia 4. National Botanical Institute. Pretoria.
- IUCN 2002. *IUCN Red List categories*. Prepared by the IUCN Species Survival Commission, Gland, Switzerland.
- Mucina, L. & Rutherford, M.C. 2006. The vegetation of South Africa, Lesotho and Swaziland. Strelitzia, 2006
- South African National Biodiversity Institute (2006-2018). *The Vegetation Map of South Africa, Lesotho and Swaziland*, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Online, <http://bgis.sanbi.org/Projects/Detail/186>, Version 2018.
- South African National Biodiversity Institute (2020). Species Environmental Assessment Guideline. Guidelines for the Implementation of the Terrestrial Fauna and Flora Species Protocols for the environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 1.
- South African National Biodiversity Institute (2021). Ecosystem Environmental Assessment Guideline: Draft. Guidelines for the implementation of the Terrestrial and Aquatic Ecosystem Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria.
- AWARD. 2018. Biodiversity Sector Plan Handbook for the Maruleng Municipality. Supporting land use planning and decision-making in Critical Biodiversity Areas and Ecological Support Areas for sustainable development. Report compiled by Deborah Vromans, Stephen Holness, Derick du Toit and William Mponwana for the RESILIMO Project. AWARD. Hoedspruit. South Africa.
- South African National Biodiversity Institute (2018) National Biodiversity Assessment. The status of South Africa's ecosystems and biodiversity: Synthesis Report.

Annexure A: Curriculum Vitae of Specialists