BASELINE ECOLOGICAL HABITAT ASSESSMENT

GREENGATE EXT 98

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Hocom Properties Pty Ltd
Project Reference:
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Report Date:
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	Name	Signature	Date
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DECLARATION OF INDEPENDENCE

Specialist Name	Mr. A.E. van Wyk
Declaration of Independence	I declare, as a specialist appointed in terms of the National Environmental Management Act (Act No 108 of 1998) and the associated 2014 Environmental Impact Assessment (EIA) Regulations, that I: • I act as the independent specialist in this application; • I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant; • I declare that there are no circumstances that may compromise my objectivity in performing such work; • I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity; • I will comply with the Act, Regulations and all other applicable legislation; • I have no, and will not engage in, conflicting interests in the undertaking of the activity; • I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority; • All the particulars furnished by me in this form are true and correct; and • I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.
Signature	
Date	01/06/2020

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The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and Prism Environmental Management Services and its staff reserve the right to modify aspects of the report including the recommendations if and when new information becomes available from ongoing research or further work in this field, or pertaining to this investigation.

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EXECUTIVE SUMMARY

Prism Environmental Management Services was appointed by Hocom Properties (Pty) Ltd to undertake an Ecological Habitat Assessment to determine the impacts of proposed development of Portion 260 Rietfontein 189 IQ and associated services and roads on surrounding properties on the terrestrial ecology of the area linked to the. This is to specifically inform the Basic Asessment (BA) process and Water Use License Application (WULA) for the mentioned development.

Project Information provided by the EAP (Environmental Assessment Practitioner):

The proposed development of Portion 260 of the Farm Rietfontein 189 IQ involves a mix use development which includes a broad range of uses including Business 1 and Commercial Uses. This aims to serve growing residential areas around the area. The following primary rights are being applied for:

- Erf 1 – 4 | Business 1 (As per Scheme: Shops, Office use, Dwelling Units, Residential Use, Hotel and Restaurant)
- Erf 5 | Commercial (As per Scheme: - Warehousing and Distribution)
- Erf 6-7 | Business 1 As per Scheme: Shops, Office use, Dwelling Units, Residential Use, Hotel and Restaurant)

Necessary roads and services required for the development will also be put in place. These include:

- Water
  - An existing 110mm dia. municipal water pipeline traverses the proposed development parallel to Beyers Naude Drive. A new 160mm dia. municipal water pipeline will be installed in the new service road and will connect to this existing line.
  - The average daily demand for the proposed township is 307.2 kl/day.
- Sewer
  - No existing municipal sewer infrastructure is located adjacent to the proposed development. The nearest connection point is situated approximately 1.1 km west from the proposed township. A new 160mm dia. external sewer network will be constructed to connect to this existing line.
  - The new sewer line will be constructed along the natural drainage course and is planned 1.0m outside the 1:100 year flood line of the natural drainage course.
  - Dry Weather Flow (DWF) for the proposed township is 230.4 kl/day
- Stormwater
  - Stormwater attenuation will be provided for the 1:5 as well as the 1:25 year storm event such that the pre-development runoff is not exceeded. An industry guideline of 350 m^3/ha will be used for the sizing of the attenuation ponds.
  - The stormwater network will be designed in order to safely channel the runoff from a 1:10 year storm event, to the nearby natural drainage course.

- The internal roads will be provided with kerb inlets at strategic points to catch stormwater runoff from the development.
- The underground system will consist of “Interlocking Joint” concrete pipes with a minimum diameter of 450mm and discharged in the natural drainage course.

- Electricity
  - The proposed development will require approximately 3639 kVA electrical capacity.
  - Preliminary information suggests that the township will be supplied by Eskom from the existing 86 KV Dalkeith Substation from the 11kV Kromdraai feeder line which is adjacent to the property. The substation and line both have spare capacity.
  - Internal services will consist of an 11KV underground cable supplying miniature substations.
- Roads
  - A Traffic Impact Assessment has been undertaken to better understand the traffic impact of the development as well as to identify the necessary road upgrades required by the proposed development. Based on the development size, the expected trip generation of the application is ±965 vehicle trips during the weekday morning (AM) peak hour and ±2,293 vehicle trips during the weekday afternoon (PM) peak hour (based on COTO TMH 17, the South African Trip Data Manual). In order to cater for this, construction of the following roads will be required:
    - Road A The construction of a new Class 5a (commercial local) road – 7.4m wide in a 20m road reserve – from Ibis Lane in the east to the application site in the west.
    - Road B The construction of a new Class 4a (commercial collector) road – 7.4m wide in a 25m road reserve – on the eastern boundary of the application site from Beyers Naude Drive in the north to Planned K57 in the southwest
  - The following intersection improvements are required:
    - Intersection 4: Valley Road – Ibis Lane / Beyers Naude Drive- The construction of a second exclusive right-turn lane (90m) on the southern approach, and an additional through lane on the western and eastern approaches (90m). The additional through lane in a westbound direction will be constructed up to the planned marginal intersection (Intersection 9).
    - Intersection 7: Boland Road – Indaba Lane /Beyers Naude Drive - The implementation of traffic signals and the construction of exclusive turning lanes (60m) on the northern and southern approaches.
    - Intersection 8: Planned K56 / Beyers Naude Drive - The implementation of traffic signals and the construction of exclusive turning lanes (60m) on the northern and southern approaches.
    - Intersection 9: Road B / Beyers Naude Drive – The construction of a marginal intersection with an exclusive left-turn lane on the eastern approach.
    - Intersection 11: Road B / Road A - The construction of a two-lane roundabout (45m inscribed diameter).
  - Access to the application site will be obtained from Beyers Naude Drive in accordance with the Road Master Plan via the intersection with Valley Road – Ibis Lane and a new Class 5

road (i.e. Road A). Additional access is also proposed from Beyers Naude Drive via a proposed new marginal access (Class 4a road) with Beyers Naude Drive on the eastern boundary of the site (i.e. Road B) and from planned Route K56 in the south-west.

- An internal road will also be put in place and will be 16m in width.
- The proposed development occurs within 32m of a wetland. Further, a number of Roads and services (Road B and the sewer line) traverse the wetland

The proposed development is located at S26°02’52.36”: E27°53’16.85” in Portion 260 Rietfontein within the City of Johannesburg, Gauteng Province.

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1 INTRODUCTION

Prism Environmental Management Services was appointed by Hocom Properties (Pty) Ltd to undertake an Ecological Habitat Assessment to determine the impacts of proposed development of Portion 260 Rietfontein 189 IQ and associated services and roads on surrounding properties on the terrestrial ecology. This is to specifically inform the Basic Assessment (BA) process and Water Use License Application (WULA) for the mentioned development.

1.1 Project Description

Hocom Properties Pty Ltd is intending to develop a mixed-use township on Portion 260 (a Portion of Portion 114) of the Farm Rietfontein No. 189 I.Q.

In addition, the proposed development also involves the provision of all necessary services to the development including water, sanitation, stormwater and internal roads. Details of these services provided by the EAP:

- Water
  - An existing 110mm dia. municipal water pipeline traverses the proposed development parallel to Beyers Naude Drive. A new 160mm dia. municipal water pipeline will be installed in the new service road and will connect to this existing line.
  - The average daily demand for the proposed township is 307.2 kl/day.
- Sewer
  - No existing municipal sewer infrastructure is located adjacent to the proposed development. The nearest connection point is situated approximately 1.1 km west from the proposed township. A new 160mm dia. external sewer network will be constructed to connect to this existing line.
  - The new sewer line will be constructed along the natural drainage course and is planned 1.0m outside the 1:100 year flood line of the natural drainage course.
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- Stormwater
  - Stormwater attenuation will be provided for the 1:5 as well as the 1:25 year storm event such that the pre-development runoff is not exceeded. An industry guideline of 350 m³/ha will be used for the sizing of the attenuation ponds.
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  - The proposed development will require approximately 3639 kVA electrical capacity.
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  - Internal services will consist of an 11KV underground cable supplying miniature substations.
- Roads
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    - Road B The construction of a new Class 4a (commercial collector) road – 7.4m wide in a 25m road reserve – on the eastern boundary of the application site from Beyers Naude Drive in the north to Planned K57 in the southwest
  - The following intersection improvements are required:
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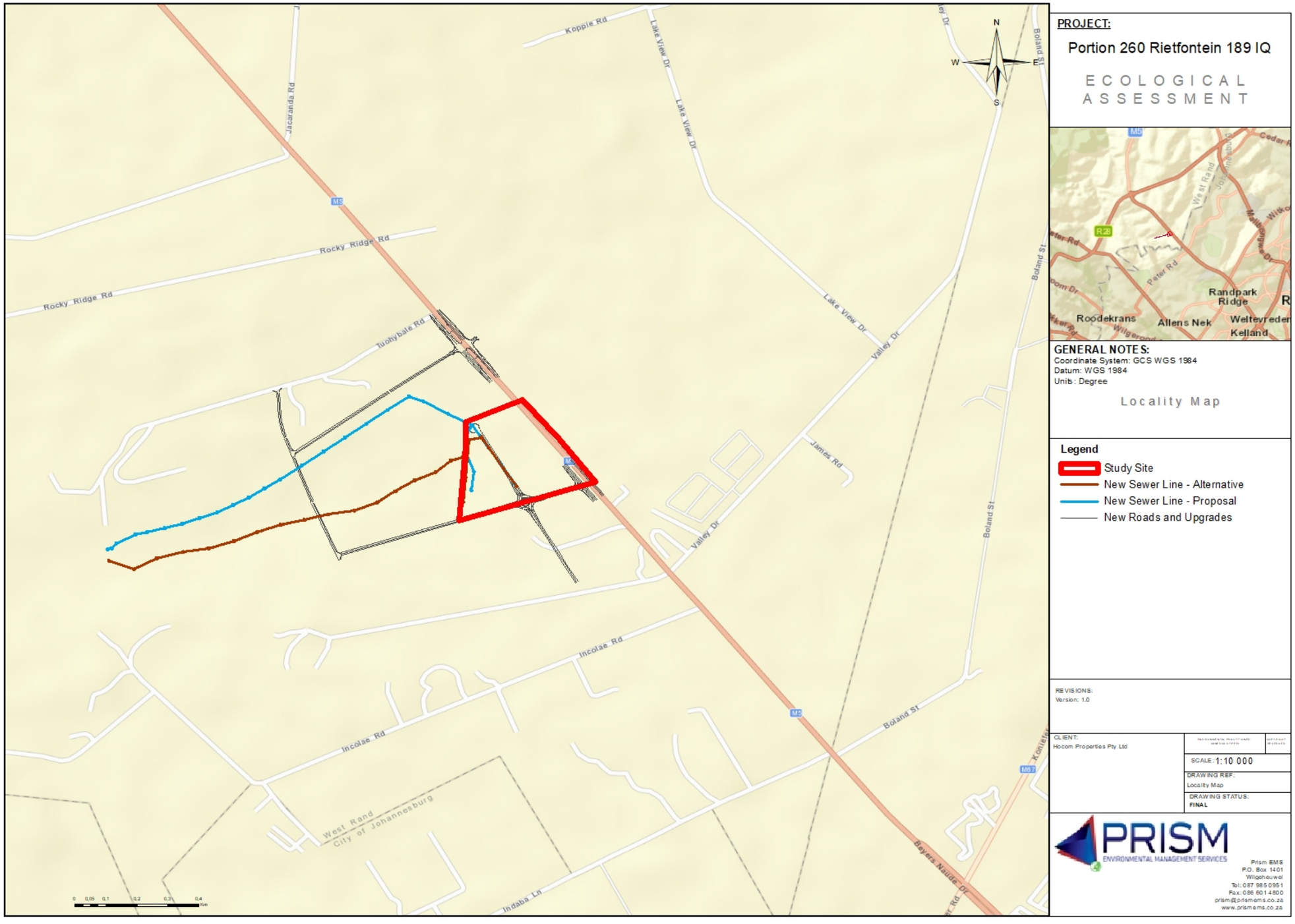
    - Intersection 8: Planned K56 / Beyers Naude Drive - The implementation of traffic signals and the construction of exclusive turning lanes (60m) on the northern and southern approaches.
    - Intersection 9: Road B / Beyers Naude Drive – The construction of a marginal intersection with an exclusive left-turn lane on the eastern approach.
    - Intersection 11: Road B / Road A - The construction of a two-lane roundabout (45m inscribed diameter).

- Access to the application site will be obtained from Beyers Naude Drive in accordance with the Road Master Plan via the intersection with Valley Road – Ibis Lane and a new Class 5 road (i.e. Road A). Additional access is also proposed from Beyers Naude Drive via a proposed new marginal access (Class 4a road) with Beyers Naude Drive on the eastern boundary of the site (i.e. Road B) and from planned Route K56 in the south-west.
- An internal road will also be put in place and will be 16m in width.
- The proposed development occurs within 32m of a wetland. Further, a number of Roads and services (Road B and the sewer line) traverse the wetland

1.2 Study Site Location

The proposed development is located at S26°02'52.36": E27°53'16.85" in Portion 260 of the Farm Rietfontein within the City of Johannesburg, Gauteng Province (*here after referred to as the study site/s*).

(*Figure 1-1: Locality Map of study area for the proposed development, Figure 1-2: Aerial Map of study area for the proposed development, Figure 1-3: Topography Map of the study area for the proposed development)*



PROJECT:

Portion 260 Rietfontein 189 IQ

ECOLOGICAL ASSESSMENT

GENERAL NOTES:
Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree

Locality Map

Legend
- Study Site
- New Sewer Line - Alternative
- New Sewer Line - Proposal
- New Roads and Upgrades

REVISIONS:
Version: 1.0

CLIENT:
Hocom Properties Pty Ltd

SCALE: 1:10 000

DRAWING REF:
Locality Map

DRAWING STATUS:
FINAL

PRISM ENVIRONMENTAL MANAGEMENT SERVICES

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Figure 1-1: Locality Map of study area for the proposed development

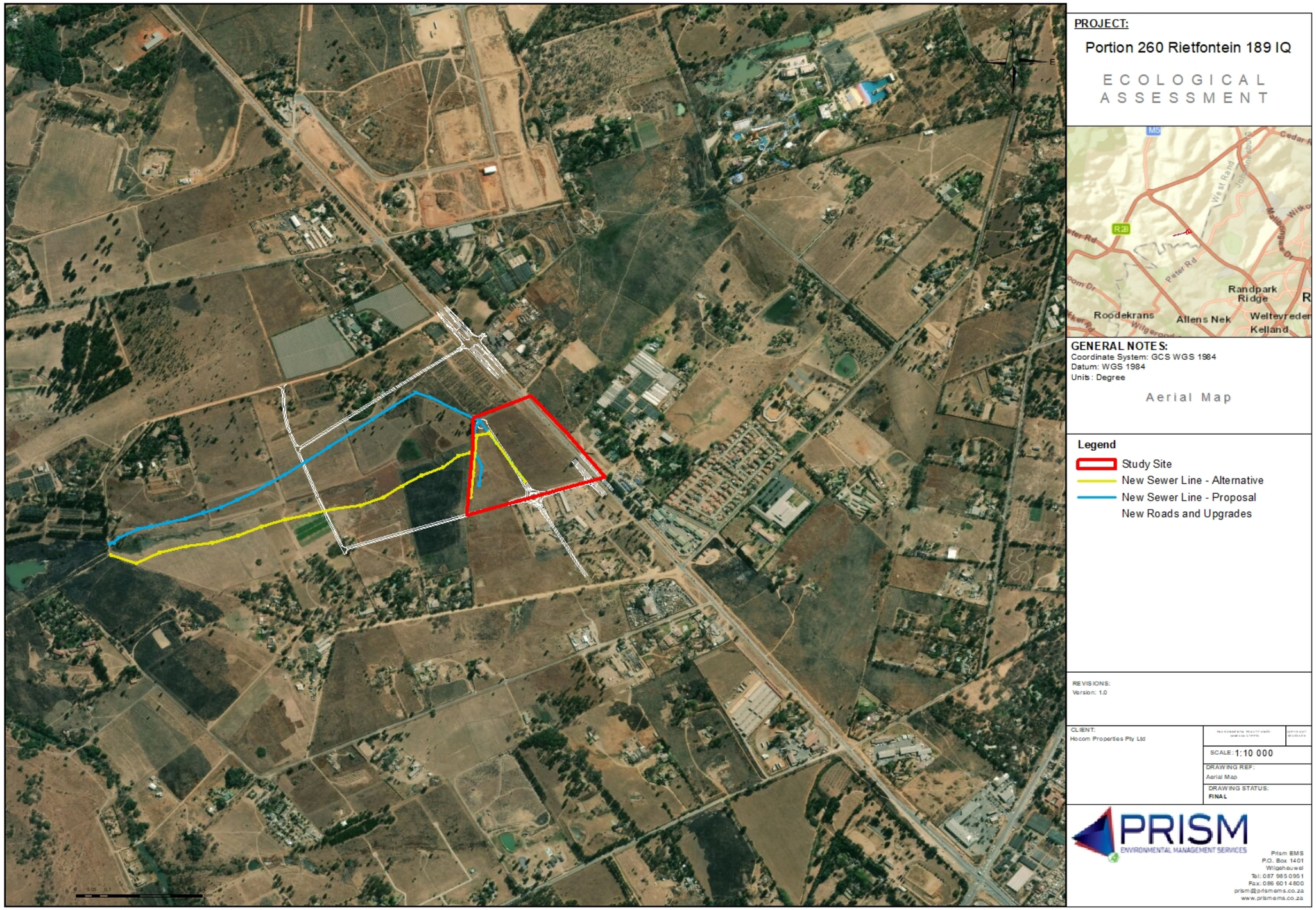

Figure 1-2: Aerial Map of study area for the proposed development

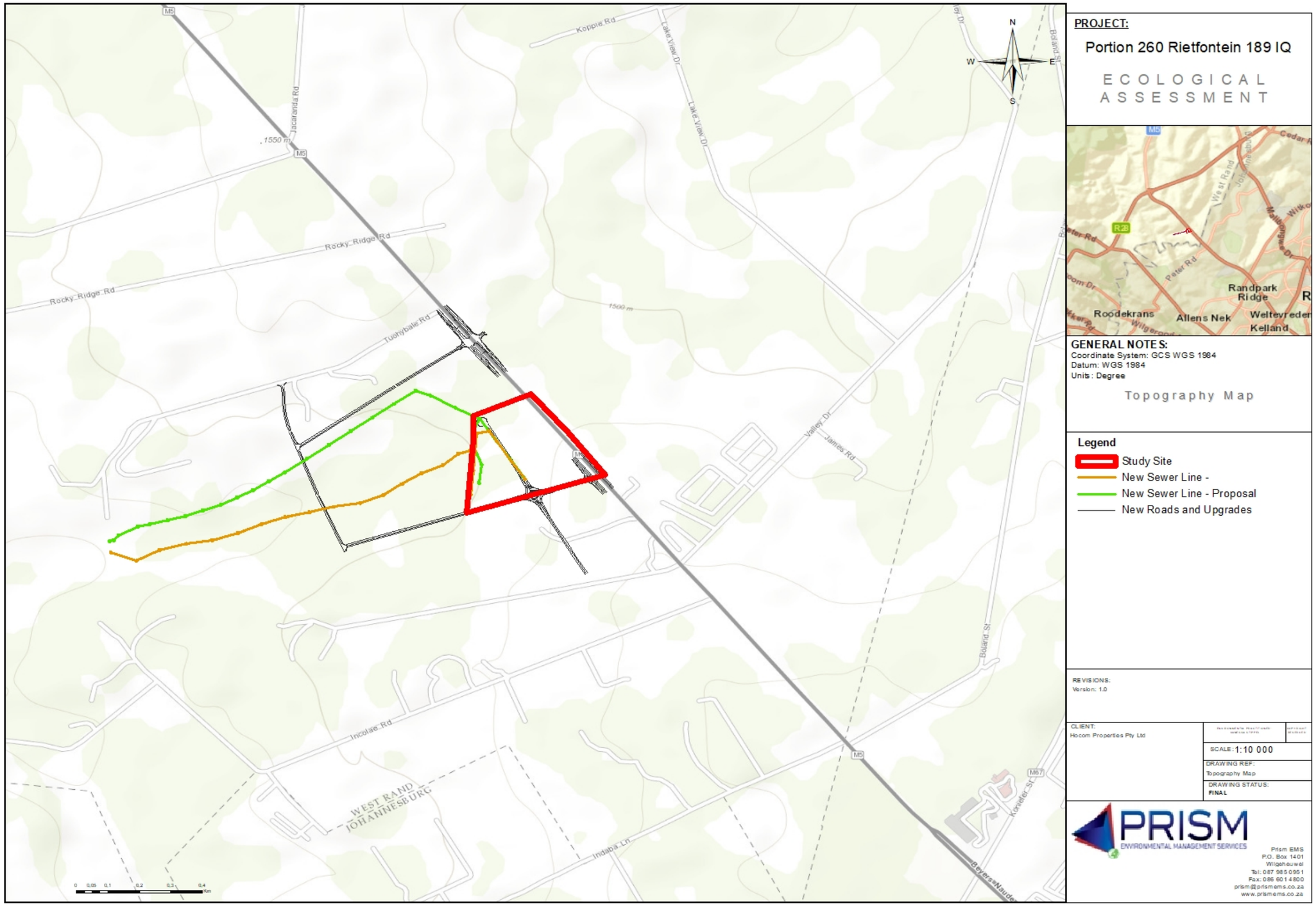

Figure 1-3: Topography Map of the study area for the proposed development

1.3 Study Limitations

All information acquired for the Ecological Habitat Assessment was assumed to be correct. This includes all GIS data and website information used to determine all previous recordings of Fauna and Flora species possible to be found on site. The study was limited to a snapshot view during one site visit and aimed only to confirm the desktop assessment. No detailed plant species lists, or faunal trapping was therefore undertaken as the site is disturbed, and alterations has impacted the site.

1.4 Scope and Purpose

The aim of this study was to undertake a desktop description of the baseline receiving environment to identify and potentially sensitive receptors from an ecological perspective. This was followed by a short site visit to confirm desktop information. This was to specifically inform the BA process and Water Use Registration for the proposed activities.

1.5 Overview of Specialist

Prism EMS has conducted the required ecological assessment report to inform the BA Process and Water Use Registration for the proposed activities. The team under lead of Mr D. Botha has conducted the assessment. The details of the team are tabularised in **Table 1-1**.

Table 1-1: Details of Specialist

Specialist	Mr. A.E. van Wyk - Ecologist
Company:	Prism Environmental Management Services
Qualifications:	B.Sc. Environmental & Biological Sciences
Experience:	5 years
Affiliation/ Registration	South African Council for Natural Scientific Professions (SACNASP) | Cand.Sci.Nat. (Pending)
Address:	12A Beacon Road, Poortview AH
Tel:	087 985 0951
Fax:	086 601 4800
Email:	a.e@prismems.co.za

Designation	**Name**	**Qualification**	**Professional Registration**	**Role**
Specialist Team				
Principle EAP and Biodiversity and Wetland Specialist	Mr. D. Botha	M.A. Environmental Management B.A. Hons. Geography & Environmental Management, B.A. Humanities Post Higher Education Diploma	Pr.Sci.Nat. (119979)	Field Assessment & Peer Review

		Wetland and Riparian Delineation (DWAF Accredited Short Course) Soil Classification and Wetland Delineation - Short Course – Terrasoil Science Tools for Wetland Assessment – Rhodes University SASS5 Aquatic Biomonitoring Training – *Department of Water Affairs, Ground Truth* Wetland Plant Taxonomy – *Water Research Commission* Hydropedology and Wetland Functioning – *Water Business Academy / Terra Soil Science* 17 Years' Experience		
Senior Environmental Practitioner	Ms. V Stippel	MSc. Animal, Plant and Environmental Sciences BSc. Honours. Ecology, Environment and Conservation BSc. Zoology and Archaeology South African Council for Natural Scientific Professions (SACNASP) registered Scientist | Pr.Sci.Nat. (116621) Registered Member of Environmental Assessment Practitioners Association of South Africa (EAPASA)(2019/175) Member of the International Association for Impact Assessors (IAIAsa) (1653) 9 years' experience	Pr.Sci.Nat. (116221)	Peer Reviewer

2 REPORT OUTLINE

Appendix 6 of GN 982 of 4 December 2014 provides the requirements for specialist reports undertaken as part of the environmental authorisation process. In line with this, Table 2-1 provides an overview of Appendix 6 together with information on how these requirements have been met.

Table 2-1: Specialist Report Requirements.

Requirement from Appendix 6 of GN 982 of 4 December 2014	Chapter
(a) Details of - (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report	Section 1.5
(b) Declaration that the specialist is independent in a form as may be specified by the competent authority	*Declaration of Independence*
(c) Indication of the scope of, and the purpose for which, the report was prepared	*Executive Summary*
(d) Date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 4.4
(e) Description of the methodology adopted in preparing the report or carrying out the specialised process	Section 4
(f) Specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 7
(g) Identification of any areas to be avoided, including buffers	Section 7
(h) Map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers	Section 1,6 and7
(I) Description of any assumptions made and any uncertainties or gaps in knowledge	Section 1.3
(j) Description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment	Section 6
(k) Mitigation measures for inclusion in the EMPr	Section 9
(I) Conditions for inclusion in the environmental authorisation	Section 9
(m) Monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 9
(n) Reasoned opinion - (i) as to whether the proposed activity or portions thereof should be authorised; and	Section 9

Requirement from Appendix 6 of GN 982 of 4 December 2014	Chapter
(ii)if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	
(o) Description of any consultation process that was undertaken during the course of preparing the specialist report	Section 4.5
(p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	(N/A)
(q) Any other information requested by the competent authority	(N/A)

3 LEGISLATION AND GUIDELINES

A summary of the applicable legislation and guidelines that have guided this ecological assessment are provided below. Please note that this list is not exhaustive but aims to provide a summary of the most pertinent legislative aspects.

- The National Environmental Management Act (NEMA) No. 107 of 1198): Environmental Impact Assessment Regulations, 2014. Specifically, the requirements of the specialist report as per the requirements of Appendix 6;
- The National Environmental Management: Biodiversity Act (NEM:BA) No. 10 of 2004: specifically, the management and conservation of biological diversity within the RSA and of the components of such biological diversity;
- Alien and Invasive Species Regulations, 2014 (GN.R. 598 of 1 August 2014)
- Alien and Invasive Species Lists, 2016 (GN 864 of 29 July 2016)
- National Environmental Management: Biodiversity Act, 2004: Threatened and Protected Species Regulations;
- National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003);
- National Protected Areas Expansion Strategy (NPAES);
- Environmental Conservation Act, 1989 (ECA), (Act no. 73 of 1989);
- National Forests Act, 1998 (Act 84 of 1998), specifically with reference to Protected Tree species.
- South Africa's National Biodiversity Strategy and Action Plan (NBSAP);
- National Spatial Biodiversity Assessment (NSBA); and
- National Biodiversity Assessment (NBA)
- National Biodiversity Framework (NBF, 2009)
- GDARD Conservation Plan (C-Plan) Version 3.3.
- GDARD Requirements for Biodiversity Assessments (Version 3, 2014a)
- Gauteng Department of Agriculture and Rural Development (GDARD): Checklist for Biodiversity Assessments.

4 METHODOLOGY

4.1 Geographic Information System

In order to determine the potential environmental sensitive's, a desktop GIS exercise was undertaken, and existing data layers were incorporated into a GIS for the study. All Mapping was performed using open source GIS software (Arc GIS).

4.2 Species of Conservation Concern

The current literature was utilised to gain an understanding of the environmental influences presently affecting the site. General information on the veld type, climate, geology and soils and current activity on the site was acquired prior to the field assessment of the property.

A literature review on the habitat of red data listed species with a potential distribution on site was conducted prior to the field assessment to gain a thorough understanding of the habitat type occupied for these species. In addition a list of potential sensitive species located on the site was requested by the GDARD Biodiversity section.

In addition, the National Screening Tool was also utilized to determine any potential sensitivities in the study site.

4.3 Literature Review

4.3.1 Flora Assessment

The South African National Biodiversity Institute (SANBI) provides a database, namely the Botanical Database of Southern Africa (BODATSA). The database is used to access distribution records on southern African plants. Relevant field guides were used for any other required information with regards to the Flora found on the study site.

The SANBI website (SANBI, 2017) was used to provide the current conservation status of each South African plant species.

4.3.2 Avifauna Assessment

A desktop study was undertaken to determine which bird species could potentially occur in the proposed study area, using data from the South African Bird Atlas Project (SABAP2). SABAP 2 maps the distribution and relative abundance of birds in Southern Africa which includes South Africa and other neighboring countries. Data of bird species are recorded based on records per geographical pentad (5-minute X 5 minute). A List of bird species potentially occurring within specific pentad (2600_2750) in

which the study area falls in was obtained from SABAP 2 data. This approach was used to ensure that all species potentially occurring on site are identified, whether, resident, vagrant or migratory.

4.3.3 Mammal Assessment

A list of mammal species potentially occurring on site was created using their known distributions and habitat suitability, sourced from online, literature sources and the Gauteng Department of Agriculture and Rural development (GDARD) Biodiversity section. The species list was generated for the 2627BB Quarter Degree Grid Cell (QDGC) and obtained from the Virtual Museum website

4.3.4 Herpetofauna Assessment

The online FitzPatrick Institute of African Ornithology - Virtual Museum website was used to determine potential reptiles and amphibian observations within the 2627BB QDGC.

4.3.5 Invertebrates (Butterflies – Lepidoptera) Assessment

The online FitzPatrick Institute of African Ornithology - Virtual Museum website was used to determine potential invertebrate observations within the 2627BB QDGC. The National Environmental Screening Tool (NEST) obtained and provided by the EAP, indicated that a Red Listed (Endangered) Invertebrate species has been previously recorded within the QDGS and therefor has the possibility of occurring within the study area.

4.4 Site Investigation

The details of the site investigation undertaken are provided in Table 4-1.

Table 4-1: Site Investigation Details

	Site Investigation
Date	January 2020
Season	Summer

4.5 Impact Assessment Methodology

As standardized impact assessment methodology was utilized to determine the impacts associated with the proposed development. A summary of this methodology is provided below.

The **significance** of an impact is defined as the combination of the **consequence** of the impact occurring and the **probability** that the impact will occur. The nature and type of impact may be direct or indirect and may also be positive or negative, refer to Table 4-2: below for the specific definitions.

Table 4-2: Nature and type of impact.

IMPACT	**Nature and Type of Impact:**	
	Direct	Impacts that are caused directly by the activity and generally occur at the same time and place as the activity
	Indirect	Indirect or induced changes that may occur as a result of the activity. These include all impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity
	Cumulative	Those impacts associated with the activity which add to, or interact synergistically with existing impacts of past or existing activities, and include direct or indirect impacts which accumulate over time and space
	Positive	Impacts affect the environment in such a way that natural, cultural and / or social functions and processes will benefit significantly, and includes neutral impacts (those that are not considered to be negative
	Negative	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes will be comprised

Table 4-3: presents the defined criteria used to determine the **consequence** of the impact occurring which incorporates the extent, duration and intensity (severity) of the impact.

Table 4-3: Consequence of the Impact occurring.

CONSEQUENCE	**Extent of Impact:**	
	Site	Impact is limited to the site and immediate surroundings, within the study site boundary or property (immobile impacts)
	Neighbouring	Impact extends across the site boundary to adjacent properties (mobile impacts)
	Local	Impact occurs within a 5km radius of the site
	Regional	Impact occurs within a provincial boundary
	National	Impact occurs across one or more provincial boundaries
	Duration of Impact:	
	Incidental	The impact will cease almost immediately (within weeks) if the activity is stopped, or may occur during isolated or sporadic incidences
	Short-term	The impact is limited to the construction phase, or the impact will cease within 1 - 2 years if the activity is stopped
	Medium-term	The impact will cease within 5 years if the activity is stopped
	Long-term	The impact will cease after the operational life of the activity, either by natural processes or by human intervention
	Permanent	Where mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient
	Intensity or Severity of Impact:	
	Low	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are not affected
	Low-Medium	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are modified insignificantly
	Medium	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are altered
	Medium-High	Impacts affect the environment in such a way that natural, cultural and / or social functions and processes are severely altered
	High	Impacts affect the environment in such a way that natural, cultural and / or social functions and processes will permanently cease

The probability of the impact occurring is the likelihood of the impacts actually occurring, and is determined based on the classification provided in Table 4-4.

Table 4-4: Probability and confidence of impact prediction.

	Probability of Potential Impact Occurrence:	
PROBABILITY	**Improbable**	The possibility of the impact materialising is very low either because of design or historic experience
	Possible	The possibility of the impact materialising is low either because of design or historic experience
	Likely	There is a possibility that the impact will occur
	Highly Likely	There is a distinct possibility that the impact will occur
	Definite	The impact will occur regardless of any prevention measures

The **significance** of the impact is determined by considering the consequence and probability without taking into account any mitigation or management measures and is then ranked according to the ratings listed in Table 4-5:

Table 4-5: Significance rating of the impact.

	Significance Ratings:	
SIGNIFICANCE	**Low**	Neither environmental nor social and cultural receptors will be adversely affected by the impact. Management measures are usually not provided for low impacts
	Low-Medium	Management measures are usually encouraged to ensure that the impacts remain of Low-Medium significance. Management measures may be proposed to ensure that the significance ranking remains low-medium
	Medium	Natural, cultural and/or social functions and processes are altered by the activities, and management measures must be provided to reduce the significance rating
	Medium-High	Natural, cultural and/or social functions and processes are altered significantly by the activities, although management measures may still be feasible
	High	Natural, cultural, and/or social functions and processes are adversely affected by the activities. The precautionary approach will be adopted for all high significant impacts and all possible measures must be taken to reduce the impact

The level of confidence associated with the impact prediction is also considered as low, medium or high (Table 4-6:).

Table 4-6: Level of confidence of the impact prediction.

	Level of Confidence in the Impact Prediction:	
CONFIDENCE	**Low**	Less than 40% sure of impact prediction due to gaps in specialist knowledge and/or availability of information
	Medium	Between 40 and 70% sure of impact prediction due to limited specialist knowledge and/or availability of information
	High	Greater than 70% sure of impact prediction due to outcome of specialist knowledge and/or availability of information

Once significance rating has been determined for each impact, management and mitigation measures must be determined for all impacts that have a significance ranking of Medium and higher in order to attempt to reduce the level of significance that the impact may reflect.

The EIA Regulations, 2014 specifically require a description is provided of the degree to which these impacts:

- can be reversed;
- may cause irreplaceable loss of resources; and
- can be avoided, managed or mitigated.

Based on the proposed mitigation measures, the mitigation efficiency is also determined (Table 4-7:) whereby the initial significance is re-evaluated and ranked again to effect a significance that incorporates the mitigation based on its effectiveness. The overall significance is then re-ranked, and a final significance rating is determined.

Table 4-7: Mitigation efficiency.

MITIGATION EFFICIENCY	**Mitigation Efficiency**	
	None	Not applicable
	Very Low	Where the significance rating stays the same, but where mitigation will reduce the intensity of the impact. Positive impacts will remain the same
	Low	Where the significance rating reduces by one level, after mitigation
	Medium	Where the significance rating reduces by two levels, after mitigation
	High	Where the significance rating reduces by three levels, after mitigation
	Very High	Where the significance rating reduces by more than three levels, after mitigation

The reversibility is directly proportional the "Loss of Resource" where no loss of resource is experienced, the impact is completely reversible; where a substantial "Loss of resource" is experienced there is a medium degree of reversibility; and an irreversible impact relates to a complete loss of resources, i.e. irreplaceable (Table 4-8:).

Table 4-8: Degree of reversibility and loss of resources.

DEGREE REVERSABILITY & LOSS OF RESOURCES	**Loss of Resources:**	
	No Loss	No loss of social, cultural and/or ecological resource(s) are experienced. Positive impacts will not experience resource loss
	Partial	The activity results in an insignificant or partial loss of social, cultural and/or ecological resource(s)
	Substantial	The activity results in a significant loss of social, cultural and/or ecological resource(s)
	Irreplaceable	The activity results in the complete and irreplaceable social, cultural and/or ecological loss of resource(s)
	Reversibility:	
	Irreversible	Impacts on natural, cultural and/or social functions and processes are irreversible to the pre-impacted state in such a way that the application of resources will not cause any degree of reversibility
	Medium Degree	Impacts on natural, cultural and/or social functions and processes are partially reversible to the pre-impacted state if less than 50% resources are applied
	High Degree	Impacts on natural, cultural and/or social functions and processes are partially reversible to the pre-impacted state if more than 50% resources are applied

	Reversible	Impacts on natural, cultural and/or social functions and processes are fully reversible to the pre-impacted state if adequate resources are applied

4.6 Consultation Process

Consultation is being undertaken by Prism EMS (EAP) as part of the overall environmental authorization process.In addition, as part of this study, the Ecological Specialist consulted with:

- The EAP;
- GDARD – Biodiversity Section ; and
- The Professional Team.

4.7 Field Survey

4.7.1 Flora Assessment

A site assessment was conducted on the 10th and 28th of January 2020 where the fauna and flora aspects were evaluated. As per GDARD minimum requirements for Biodiversity studies, survey was conducted during the summer (January 2020) which is between early November up and till end of April.

A site reconnaissance was done, and photos were taken of the current status of the study area in terms of vegetation and type of habitat. During the site assessment, a focus was placed on the presence or observations of species of conservation concern, threatened and protected species.

4.7.2 Avifauna

During the site assessment in January 2020, bird species were identified and recorded using observation, sound and signs such as nests, eggs and fallen off feathers.

4.7.3 Mammals

The method used to record possible sighting or presence of mammal species on site, was done by visual and indirect observations, such as footprints, droppings and sculls. Photographs were taken to identify any potential habitat suitable for certain mammal species.

4.7.4 Herpetofauna

As per the mammal survey, visual and indirect observations were used to determine potential species on site (such as shed skins). Photos were taken if anything was found. No species were caught and removed from the surveyed site. No trapping methods were used for reptile/amphibian records because of the limited timeframe for the specific survey.

4.7.5 Invertebrates (Butterflies – Lepidoptera) Assessment

As per the mammal and Herpetofauna survey, visual and indirect observations were used to determine potential species on site. Photos were taken if anything was found. No species were caught and removed from the surveyed site. No trapping methods were used for Invertebrate/butterfly records because of the limited timeframe for the specific survey.

5 SPECIES OF CONSERVATION CONCERN

The Red lists of threatened species are provided by the International Union for Conservation of Nature (IUCN), which provides the global conservation status of terrestrial fauna and flora. The regional conservation status is more recent than the global status; therefore different sources were used for each group study.

The conservation status categories defined by the IUCN are the "threatened" and “near-threatened” categories defined as follows:

- **Critically Endangered (CR)**:
  Critically Endangered refers to species facing an **extreme high** risk of extinction in the wild.

- **Endangered (EN)**
  Endangered species facing a **very high** risk of extinction in the wild.

- **Vulnerable (VU)**
  Vulnerable species facing a **high** risk of extinction in the wild.

- **Near Threatened (NT)**
  Near Threatened species close to qualify for or is likely to qualify for a threatened category in the near future.

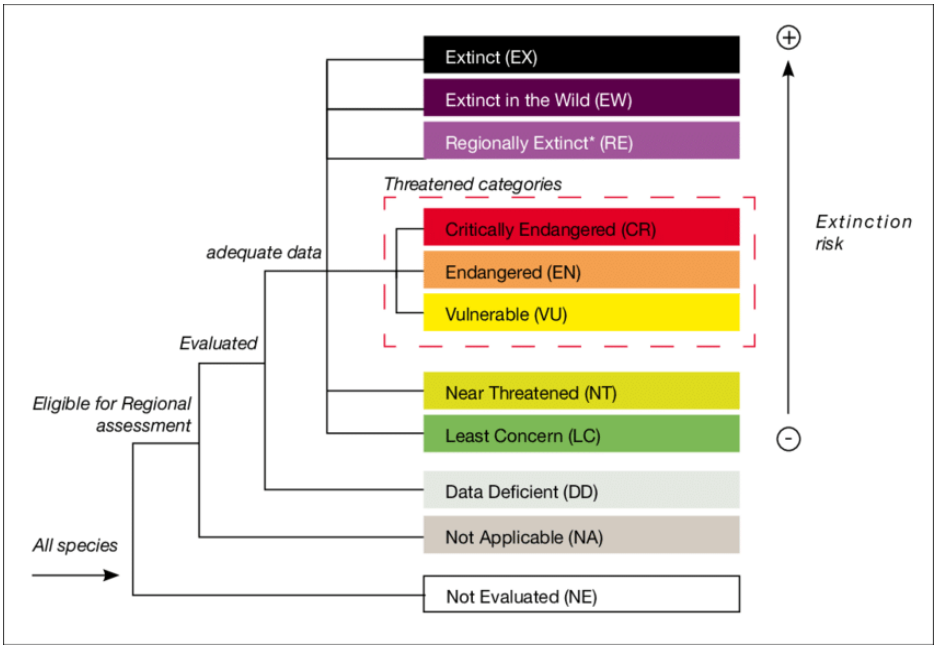

Figure 5-1: The IUCN Red List Categories and Criteria

5.1 Orange List Species

In addition, to the IUCN categories above, the concept of Orange List Species has also been utilised in this assessment.

Orange List species are those within the Red List that are categorized Rare, Data deficient, declining or near threatened. The aim of the Orange list is to provide for anticipatory conservation planning, to avoid future Red Listing.

It should be noted that communication with GDARD has been undertaken with regard to Orange List species and it was noted that whilst some species (such as *Hypoxis hemerocallidea* and *Boophane disticha*) have been down listed to least concern and therefore technically do not fall within the Orange List, the Department feels that these species continue to be protected until the policy is reviewed. This is due to the fact that Gauteng has a unique situation where habitats and species are being depleted rapidly due to urbanisation.

5.2 Species of Conservation Concern

Species of conservation concern are species that have a high conservation importance in terms of preserving South Africa's high floristic diversity and include not only threatened species, but also those classified in the categories Extinct in the Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically Rare, Rare, Declining and Data Deficient - Insufficient Information (DDD).

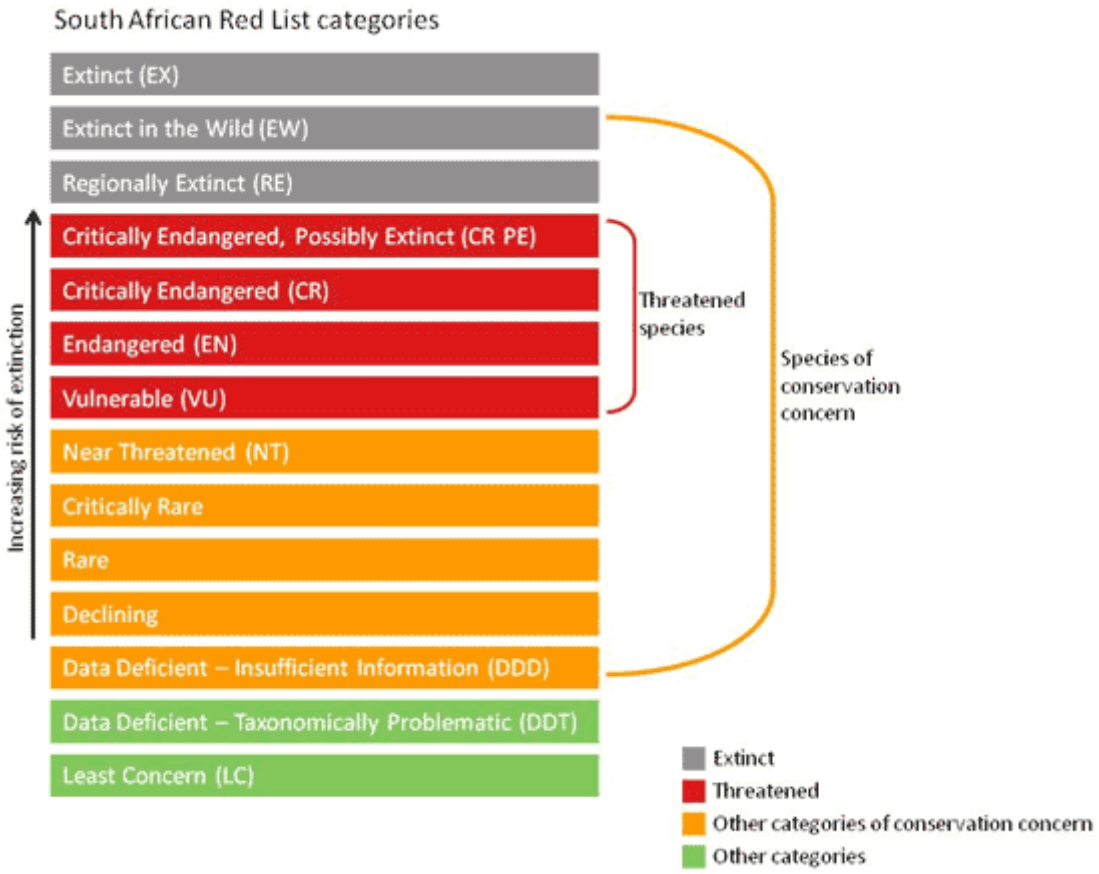

Figure 5-2: Species of Conservation Concern

6 RESULTS AND FINDINGS

6.1 Desktop Assessment

6.1.1 Geographical Information System

The potential environmental sensitive's, were determined using a desktop GIS, and existing data layers were incorporated into a GIS for the study. The following GIS Mapping was conducted as indicated in the Figures below.

6.1.1.1 Gauteng Conservation Plan (C-Plan) Version 3.3

The Gauteng C-Plan indicates the different conservation status with the province. The following categories are used to classify each area in terms of its biodiversity and environmental importance:

• Ecological Support Area;
• Important Area;

• Irreplaceable Area; and

• Protected Area.

As indicated in the Figure below (Figure 6-1: Gauteng C-Plan), the site falls within an Ecological Support Area (ESA). According to (GDARD, 2014) ESA plays an important role with regards to the ecological functioning of a specific area as it has the potential to be classified as a Critical Biodiversity Area (CBA). The reason for this is although ESA are classified as natural, near-natural or degraded it has the potential importance for supporting an ecological process.

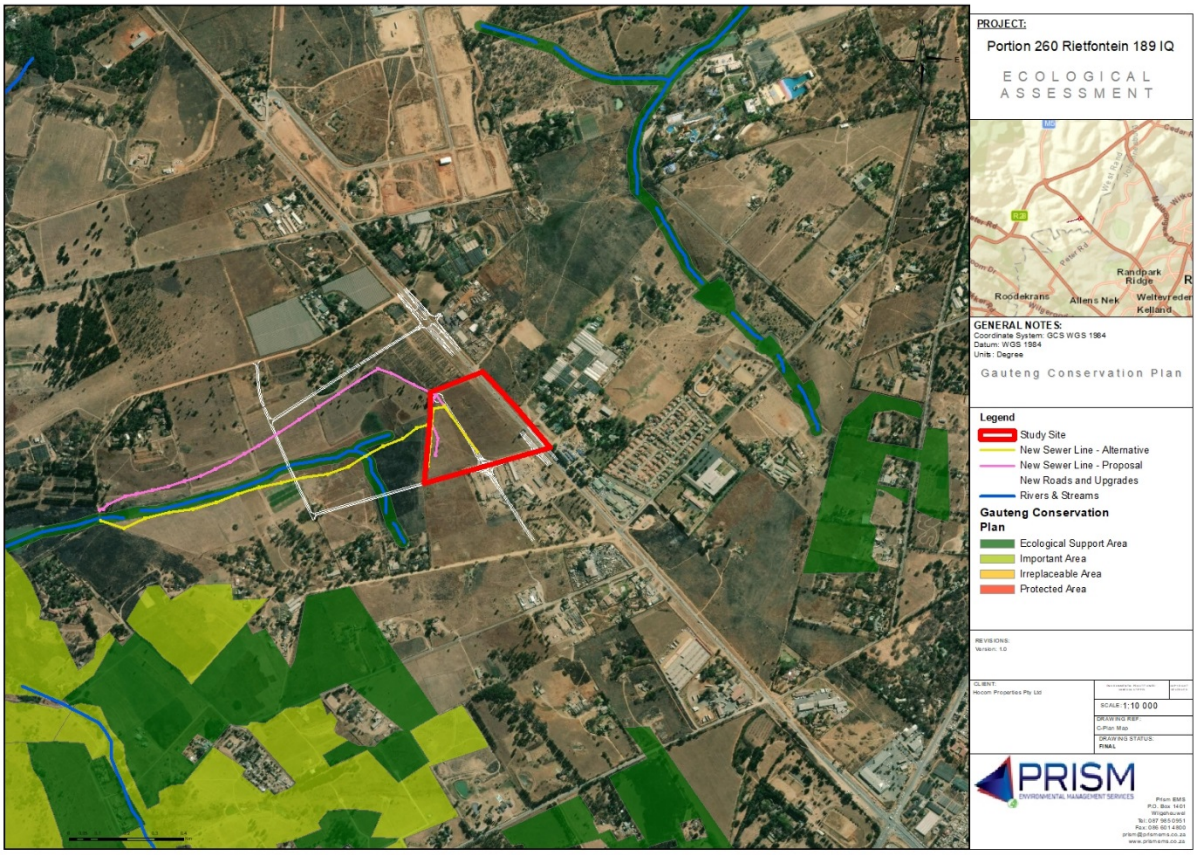

Figure 6-1: Gauteng C-Plan

6.1.1.2 Gauteng Protected Areas (GPA) and Important Bird Areas (IBA)

GSA (2010) explains the *National Protected Area Expansion Strategy for South Africa 2008* that protected areas are seen as areas of either land or sea that is protected by law mainly for the reason of biodiversity conservation. The National Environmental Management: Protected Areas Act (Act 57 of 2003) identified several categories that falls under protected areas. This include: special nature reserves, national parks, nature reserves, and protected environments. Other categories includes world heritage sites, marine protected areas, specially protected forest areas, and mountain areas.

IBA's are places not only of national but international significance for the conservation of biodiversity and more in particular the conservation of threatened and near-threatened bird species (Marnewick *et al*., 2015).

As per the figure below the site does not fall within any protected area (Figure 6-2: National Protected Areas Map). The figure indicates two (2) protected areas: The Magaliesberg - Important Bird Area and the Cradle of Humankind World heritage site.

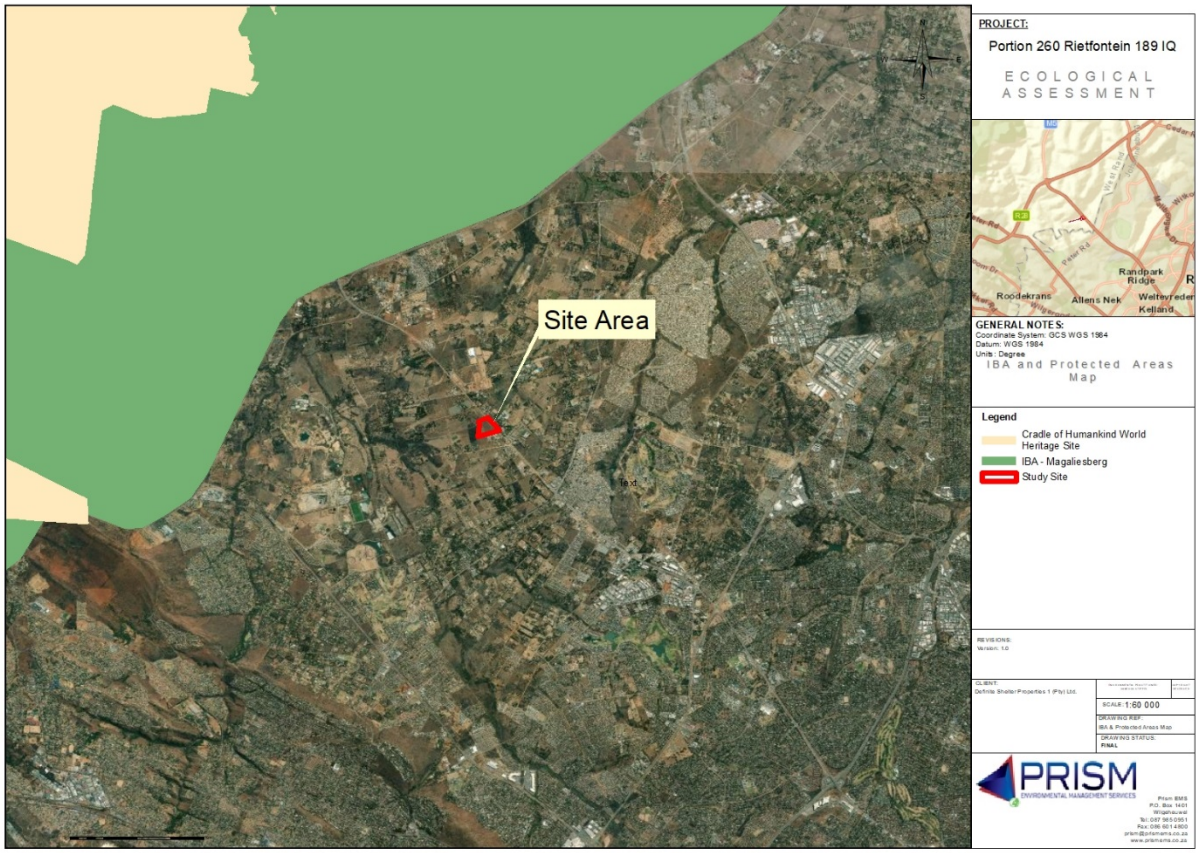

Figure 6-2: National Protected Areas Map

6.1.1.3 Vegetation

The Rietfontein project area is situated within a grassland biome, specifically the Egoli Granite Grassland as indicated in the figure below - Figure 6-3: Vegetation type - Egoli Granite Grassland) (Mucina & Rutherford, 2006).

The Egoli Granite Grassland is described as a moderate undulating landscape on the Highveld plateau supporting tall and usually dominated by species such as *Hyparrhenia hirta*. Some wood like species occurs on rocky outcrops areas which also includes a high diversity of other wood like species in the form of scattered shrubs and individual small trees (Musina & Rutherford, 2010).

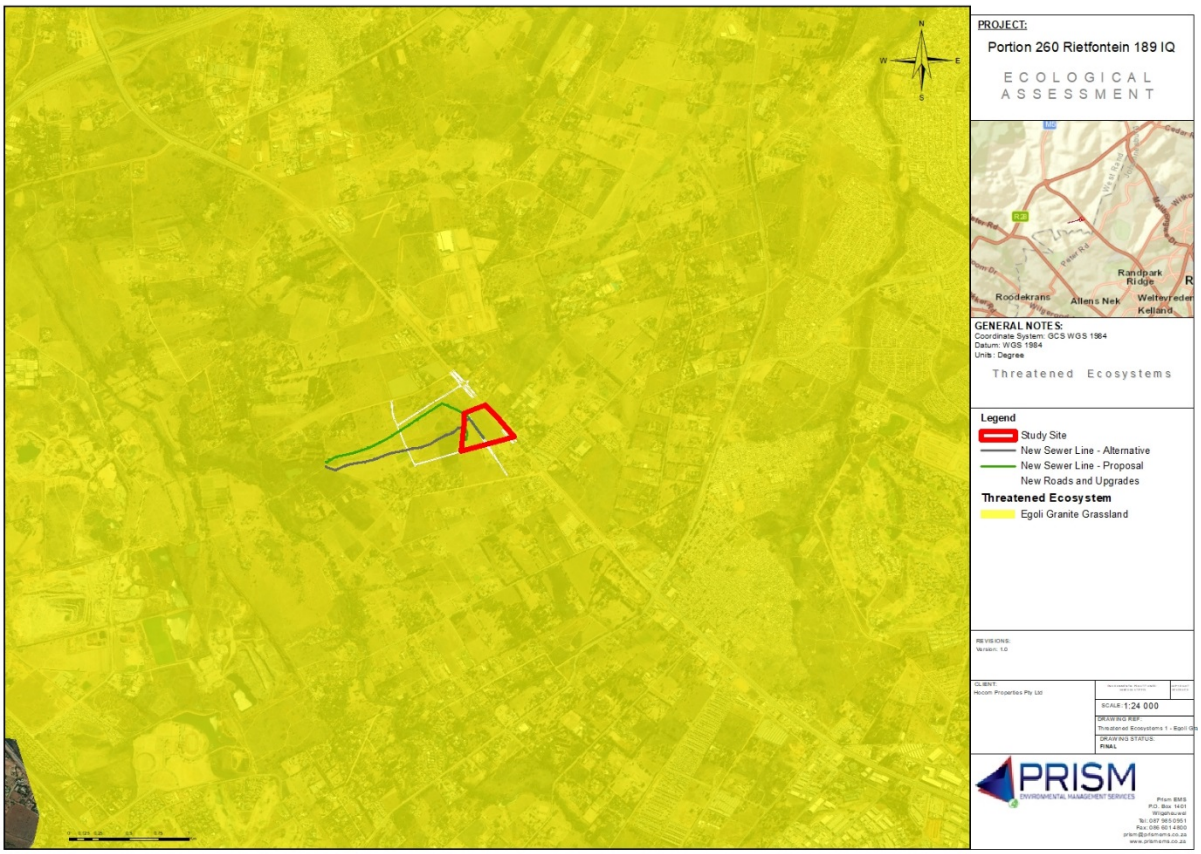

Figure 6-3: Vegetation type - Egoli Granite Grassland

6.1.2 Flora Assessment

A list of potential Red Data species that might occur on the site area was requested and provided from the GDARD Biodiversity section. In this regard, no Red/Orange list species are recorded with 5km of the study site. However, potential Red/Orange listed species found within the specific quarter degree are listed below. A list of potential occurrence of Flora Species of Conservation Concern is indicated in Table 6-1 below. Table 6-2: Attributes of the **Egoli Granite Grassland** regional vegetation unit and Table 6-3: Characteristic Plant Species of the Egoli Granite Grassland provides information on the vegetation type and a summaries the flora found within the Egoli Granite Grassland.

Table 6-1: Red data species to potentially occur on the site

Species	**Conservation Status** (²global status¹national status)	**Habitat**
Alepidea attenuate	Near Threatened[2]	Wetlands in grassland.
Aloe peglerae	Critically Endangered[1]	Grassland, in shallow, gravelly quartzitic soils on rocky north-facing slopes or summits of ridges.
Boophane disticha	**Declining[2]**	**Dry grassland and rocky areas.**

Bowiea volubilis subsp. *volubilis*	Vulnerable[2]	Shady places, steep rocky slopes and in open woodland, under large boulders in bush or low forest.
Brachycorythis conica subsp. *transvaalensis*	Critically Endangered[2]	Short grasslands, hillsides, on sandy gravel overlying dolomite, sometimes also on quartzites; occasionally open woodland; 1000 - 1705m.
Callilepis leptophylla	Declining[2]	Grassland or open woodland, often on rocky outcrops or rocky hill slopes.
Cineraria austrotransvaalensis	Near Threatened[1]	Amongst rocks on steep slopes of hills and ridges, as well as at the edge of thick bush or under trees; on all aspects and on a range of rock types: quartzite, dolomite and shale; 1400 – 1700 m.
Delosperma leendertziae	Near Threatened[1]	Rocky ridges; on rather steep south facing slopes of quartzite in mountain grassveld.
Eucomis autumnalis	Declining[2]	Damp, open grassland and sheltered places.
Habenaria barbertoni	Near Threatened[1]	In grassland on rocky hillsides.
Holothrix randii	Near Threatened[2]	Grassy slopes and rock ledges, usually southern aspects.
Hypoxis hemerocallidea	Declining[2]	Occurs in a wide range of habitats, from sandy hills on the margins of dune forests to open rocky grassland; also grows on dry, stony, grassy slopes, mountain slopes and plateaux; appears to be drought and fire tolerant.
Ilex mitis var. *mitis*	Declining[2]	Riverbanks, streambeds, evergreen forests.
Melolobium subspicatum	Vulnerable[1]	Grassland.
Pearsonia bracteata	Near Threatened[1]	Plants in Gauteng and North West occur in gently sloping Highveld grassland, while those in the Wolkberg were collected from steep wooded slopes and cliffs in river valleys.

Table 6-2: Attributes of the Egoli Granite Grassland regional vegetation unit

Name of vegetation type	Egoli Granite Grassland
Code as used in the Book (Mucina & Rutherford, 2010)	Gm10
Conservation Target (percent of area) from NSBA	24%
Protected/Conserved (percent of area) from NSBA	3%
Remaining Natural Area (percent of area) from NSBA	38%
Description of conservation status from NSBA	Endangered
Description of the Protection Status from NSBA	Hardly Protected
Area (km²) of the full extent of the Vegetation Type	1090
Name of the Biome	Grassland Biome

Table 6-3: Characteristic Plant Species of the Egoli Granite Grassland

Plant Form	Species
Graminoids	*Aristida canescens, A. congesta, Cynodon dactylon, Digitaria monodactyla, Eragrostis capensis, E. chloromelas, E. curvula, E. racemosa, Heteropogon contorus, Hyparrhenia hirta, Melinis repens* subsp*. repens, Monocymbium ceresiifrome, Setaria sphacelata, Themeda triandra, Tristachya leucothrix, Andropogon eucomus, Aristida aequiglumis, A.diffusa, A. scabrivalvis* subsp. *Borumensis, Bewsia biflora, Brachiaria serrate, Bulbostylis burchellii, Cymbopogon caesius, Digitaria tricholaenoides, Diheteropogon amplectens, Eragrostis gummiflua, E. sclerantha, Panicum natalense, Schizachyrium sanguineum, Setaria nigrirostris, Tristachya rehmannii, Urelytrum agropyroides.*
Herbs	*Acalypha angustata, A. peduncularis, Becium obovatum, Berkheya insignis, Crabbea hirsute, Cyanotis speciosa, Dicoma anomala, Helichrysum rugulosum, Justicia anagalloides, Kohautia amatymbica, Nidorella hottentotica, Pentanisia prunelloides* subsp. *latifolia, Pseudognaphallium luteo-album, Senecio venosus.*
Geophytic Herbs	*Cheilanthes deltoidea, C. hirta*
Small Tree	*Vangueria infausta*
Tall Shrub	*Rhus pyroides*
Low Shrub	*Anthospermum hispidulum, A. rigidum* subsp. *pumilum, Gnidia capitata, Helichrysum kraussii, Ziziphus zeyheriana*
Succulent Shrub	*Lopholaena coriifolia*

6.1.3 Avifauna Assessment

As per the desktop study done for bird species to potentially occur on site based on their previous sightings in the area (SABAP 2), 239 bird species are expected to occur within and around the study area (Pentad: 2600_2750). A complete list of potential bird species is provided in APPENDIX A: EXPECTED AVIFAUNA LIST.

Table 6-4: Avifauna SCC previously recorded in the pentad, provides an expected bird Species of Conservational Concern (SCC) list of which, seven (7) species (2.93%) are listed as SCC.

The SCC include the following:

• None of the species are listed as CR; and

• One (1) species is listed as EN on a regional basis; and

• Three (3) species are listed as VU on a regional basis; and

• Three (3) species are listed as NT on a regional basis.

Table 6-4: Avifauna SCC previously recorded in the pentad

Species	Common Name	Global Conservation Status	National Conservation Status	Preferred Habitat	Potential occurrence on study site	Latest Record
Aquila verreauzii	Verreaux Eagle	Least Concern	Vulnerable	Mountains and rocky areas with cliffs.	Lack of suitable habitat. Occurrence could be only due to fly buys.	March 2020
Falco biarmicus	Lanner Falcon	Least Concern	Near Threatened	Foraging in open grasslands and agricultural areas. Preferred habitat and roosting sites are mostly cliffs.	Lack of suitable habitat. Occurrence could be only due to fly buys and foraging purposes.	Feb 2019
Falco vespertinus	Red-footed Falcon	Near Threatened	Near Threatened	Roosts in small stands of trees *(Eucalyptys*). Breeds most commonly in open grassy, arid woodlands.	Lack of suitable habitat Occurrence could be only due to fly buys. Recorded five years ago.	Dec 2015
Phoenicopters ruber	Great Flamingo	Least Concern	Near Threatened	Primary open, eutrophic, shallow wetlands. Breeds on saline lakes and saltpans.	Lack of suitable habitat. Occurrence could be only due to fly buys	Nov 2017
Tyto capensis	African Grass-owl	Least Concern	Vulnerable	Treeless areas associated with damp substrata and tall grass	Recorded five years ago.	July 2015

				(*Stenotaphrum* sp and sedges (*Juncus* sp).	Occurrence could be only due to fly buys and foraging purposes mostly at sundown.	
Alcedo semitorquata	Half-collared Kingfisher	Least Concern	Endangered	Breeding within the vertical river banks, Prefers fast and clear flowing perennial streams and rivers for foraging purposes.	Lack of suitable habitat and breeding area. Occurrence could be only due to fly buys	Feb 2019
Ciconia abdimii	Abdim's Stork	Least Concern	Near Threatened	Grassland, cultivated lands and pan edges.	Extralimital Occurrence could be mostly due to foraging and fly buys.	Sept 2017

6.1.4 Mammal Assessment

As per the desktop study done for the mammal species to potentially occur on site based on their previous sightings in the area (Virtual Museum – Mammal Map), 53 bird species are expected to occur within and around the study area (QDGC-2627BB). A complete list of potential mammal species is provided in APPENDIX B: EXPECTED MAMMAL SPECIES LIST

Table 6-5: Mammal SCC previously recorded in the 2627BB QDGC, provides an expected mammal Species of Conservational Concern (SCC) list of which, seven (10) species (18.87%) are listed as SCC. The SCC include the following:

• None of the species are listed as CR; and
• One (1) species is listed as EN on a regional basis; and
• Three (1) species are listed as VU on a regional basis; and
• Three (8) species are listed as NT on a regional basis.

Table 6-5: Mammal SCC previously recorded in the 2627BB QDGC

#	Family	Science Name	Common Name	Conservation Status	# of Records	Last Recorded
1	Erinaceidae	Atelerix frontalis	Southern African Hedgehog	Near Threatened	2	2010
2	Felidae	Leptailurus serval	Serval	Near Threatened	2	2018
3	Hipposideridae	Cloeotis percivali	Percival's Short-eared Trident Bat	Endangered	4	2011
4	Muridae	Otomys auratus	Southern African Vlei Rat	Near Threatened	11	1959
5	Mustelidae	Aonyx capensis	African Clawless Otter	Near Threatened	2	2015
6	Mustelidae	Poecilogale albinucha	African Striped Weasel	Near Threatened	2	
7	Rhinolophidae	Rhinolophus blasii	Blasius's Horseshoe Bat	Near Threatened	38	1933
8	Soricidae	Crocidura maquassiensis	Makwassie Musk Shrew	Vulnerable	1	
9	Soricidae	Crocidura mariquensis	Swamp Musk Shrew	Near Threatened	1	1949
10	Vespertilionidae	Pipistrellus (Pipistrellus) rusticus	Rusty Pipistrelle	Near Threatened	2	2006

6.1.5 Herpetofauna (Reptile and Amphibian) Assessment

As per the desktop study done for the Herpetofauna species to potentially occur on site based on their previous sightings in the area (Virtual Museum – Reptile and Amphibian Map), 15 Amphibian and 48 Reptile species are expected to occur within and around the study area QDGC-2627BB. A complete list of potential Herpetofauna species is provided in APPENDIX C: EXPECTED HERPETOFAUNA LIST and APPENDIX D: EXPECTED AMPHIBIAN LIST.

Table 6-6: Herpetofauna SCC previously recorded in the 2627BB QDGC

#	Family	Scientific Name	Common Name	Conservation Status	# of Records	Last Recorded
1	Cordylidae	Chamaesaura aenea	Coppery Grass Lizard	Near Threatened (SARCA 2014)	1	1900

Table 6-6: Herpetofauna SCC previously recorded in the 2627BB QDGC, provides an expected Species of Conservational Concern (SCC) list of which, one (1) species (1.59%) are listed as SCC.

The SCC include the following:

• None of the species are listed as CR; and

• None of the species are listed as EN on a regional basis; and
• None of the species are listed as VU on a regional basis; and
• One (1) species is listed as NT on a regional basis.

6.1.6 Invertebrates (Butterflies – Lepidoptera) Assessment

The survey was included within the report because of the Red Listed butterfly species (*Aloeides dentatis*) that has the potential to occur in the study area based on the National Environmental Screen Tool (NEST) provided by the Environmental Assessment Practitioner (EAP). The butterfly species is listed as Endangered and was previously recorded within the 2627BB-QDGS. A complete list of potential Butterfly species is provided in APPENDIX E: EXPECTED INVERTEBRATE (LEPIDOPTERA-BUTTERFLIES).

6.2 Field Survey

The field survey which includes flora and fauna (mammals, avifauna, herpetofauna and invertebrates-butterflies) was conducted on the 10th and 29th of January 2020. The site area was survey on foot by means of visual sightings and photographs. Some of the photographs are indicated in the report and all other are available on request.

6.2.1 Flora Assessment

The site assessment undertaken indicated that whilst from a desktop perspective, the site falls within this endangered vegetation type. The vegetation found on site is not representative of the Egoli Granite Grassland and therefore does not hold any conservational value.

The site cannot be classified as the specific vegetation type for two reasons: 1.) there is a lack of similar vegetation to that described in the table above and 2.) The site is classified as secondary vegetation due to previous and ongoing agricultural and human activities on site. Secondary grassland regenerates through natural processes after significant removal or disturbance of the original/primary vegetation by humans or natural causes at a certain time in the past or over an extended period of time. Should secondary vegetation be undisturbed by regular factors such as grazing or fires, the secondary vegetation could slowly be overtaken by primary vegetation and restore itself to its original state. The site is therefor in its current condition due to the frequent disturbance and the availability of adult plant species reproducing seeds.

Whilst every effort was made to determine whether the species provided by GDARD Biodiversity section occurs on site, a total of two (2) species were recorded during the site visit. In species observed during the site visit is indicated in Orange in the Table below.

Table 6-7: Flora species observed during the site visit

Species	Conservation Status ([2]global Status [1]national Status)	Habitat	Present on site
Alepidea attenuate	Near Threatened[2]	Wetlands in grassland.	No – Not recorded during the site visit.
Aloe peglerae	Critically Endangered[1]	Grassland, in shallow, gravelly quartzitic soils on rocky north-facing slopes or summits of ridges.	No – Not recorded during the site visit.
Boophane disticha	**Declining[2]**	**Dry grassland and rocky areas.**	**Yes – One individual was recorded during the site visit.**
Bowiea volubilis subsp. *volubilis*	Vulnerable[2]	Shady places, steep rocky slopes and in open woodland, under large boulders in bush or low forest.	No – Not recorded during the site visit.
Brachycorythis conica subsp. *transvaalensis*	Critically Endangered[2]	Short grasslands, hillsides, on sandy gravel overlying dolomite, sometimes also on quartzites; occasionally open woodland; 1000 - 1705m.	No – Not recorded during the site visit.
Callilepis leptophylla	Declining[2]	Grassland or open woodland, often on rocky outcrops or rocky hillslopes.	No – Not recorded during the site visit.
Cineraria austrotransvaalensis	Near Threatened[1]	Amongst rocks on steep slopes of hills and ridges, as well as at the edge of thick bush or under trees; on all aspects and on a range of rock types: quartzite, dolomite and shale; 1400 – 1700 m.	No – Not recorded during the site visit.
Delosperma leendertziae	Near Threatened[1]	Rocky ridges; on rather steep south facing slopes of quartzite in mountain grassveld.	No – Not recorded during the site visit.
Eucomis autumnalis	Declining[2]	Damp, open grassland and sheltered places.	No – Not recorded during the site visit.
Habenaria barbertoni	Near Threatened[1]	In grassland on rocky hillsides.	No – Not recorded during the site visit.
Holothrix randii	Near Threatened[2]	Grassy slopes and rock ledges, usually southern aspects.	No – Not recorded during the site visit.
Hypoxis hemerocallidea	**Declining[2]**	**Occurs in a wide range of habitats, from sandy hills on the margins of dune forests to open rocky grassland; also grows on dry, stony, grassy slopes, mountain slopes and plateaux; appears to be drought and fire tolerant.**	**Yes – A high number of species were recorded during the site visit.**
Ilex mitis var. *mitis*	Declining[2]	Riverbanks, streambeds, evergreen forests.	No – Not recorded during the site visit.
Melolobium subspicatum	Vulnerable[1]	Grassland.	No – Not recorded during the site visit.
Pearsonia bracteata	Near Threatened[1]	Plants in Gauteng and North West occur in gently sloping Highveld grassland, while those in the Wolkberg were collected from steep wooded slopes and cliffs in river valleys.	No – Not recorded during the site visit.

Orange List Species found during the site visit

It should be noted however that two medicinal plant species, were observed in this habitat type during the site visit, namely *Hypoxis hemerocallidea*, (found in high numbers all around the study area), and one individual species of *Boophane disticha (*Figure 6-4: *Boophane diticha* and *Hypoxis hemerocallidea* found in the study area*).*

Figure 6-4: *Boophane diticha* and *Hypoxis hemerocallidea* found in the study area

These species are classified as “Least Concern” (but with population trend “decreasing”) on the SANBI Red List of South African Plants. Species classified as having a national status of ‘Least Concern’ are considered at low risk of extinction, as they are widespread and abundant (SANBI, 2017). However, GDARD has indicated these species must remain classified as Orange List species. This is due to the fact that Gauteng has a unique situation where habitats and species are being depleted rapidly due to urbanisation. Please refer to APPENDIX F: PROPOSED RESCUE AND RELOCATION PLAN FOR THE RED DATA LISTED PLANT SPECIES, *HYPOXIS HEMEROCALLIDEA* AND *BOOPHONE DISTICHA* FOUND ON THE PROPOSED DEVELOPMENT SITEfor the species relocation plan that is recommended.

The National Screening Tool provided by the Environmental Assessment Practitioner listed *Melolobium subspicatum (*Vulnerable) as a potential sensitive plant species to occur on the study area. This species of plant was not observed during the site visit.

When the vegetation assessment was conducted, throughout the entire project area as well as associated areas outside the study site, a habitat map was compiled on the basis of the findings (Figure 6-8: Habitat Assessment Map). A number of habitats were identified and are described in more detail in the subsections that follow. These include:

- Delineated wetland and 32m buffer; and
- Secondary vegetation with scattered alien invasive plant species.

6.2.1.1 Delineated Wetland and 32 m wetland buffer

A Wetland Assessment was conducted in January 2020 by Prism EMS (Botha, D. Report Ref: 21949 WPES 1). Figure 6-5 indicates the wetland and Figure 6-8: *Sensitivity Map* the 32m wetland buffer. As per the Wetland Assessment, typical wetland vegetation were observed during the site survey (Figure 6-5: Wetland vegetation features found and observed on the study site). In addition, a number of indicator species include species such as Pycreus, Paspalum, Andropogan, Fuirena, and Cyperus species to name a few as per the wetland delineation report.

Figure 6-5: Wetland vegetation features found and observed on the study site

6.2.1.2 Secondary Grassland Areas

The site area was classified during and after the site visit as secondary grassland. Secondary grasslands are those that have undergone extensive modification and a fundamental shift from their original state (e.g. to cultivated areas), but have then been allowed to return to a 'grassland' state (e.g. when old cultivated lands are re-colonised by a few grass species). Although secondary grasslands may superficially look like primary grasslands, they differ markedly with respect to species composition, vegetation structure, ecological functioning and the ecosystem services they deliver (Cadman *et al*., 2013).

Historical satellite images shows signs of burned vegetation and grass-cutting which may be used then for agricultural purposes. Furthermore. During one of the site visits in January 2020, a neighbouring landowner was using a tractor to mow the grassland area on site for livestock feeding purposes (Figure 6-6: Secondary Vegetation with some mowed areas)

Figure 6-6: Secondary Vegetation with some mowed areas

6.2.1.3 Scattered alien invasive species

The study area also had sections of scattered alien invasive species (These included species such as: *Cuscuta* campestris (Category 1b), *Striga asiatica, Populus x canescens* (Category 2) and *Campuloclinium macrocephalum* (Category 1b in Gauteng) (Figure 6-7: Alien Invasive species observed on the study area).

Figure 6-7: Alien Invasive species observed on the study area

Alien invasive species has the ability to spread and eventually dominate and replace the existing vegetation of a natural ecosystem. It is very important that all alien invasive species found and observed on the study area should be controlled and a remediated by means of a monitoring plan.

An alien invasive species list was published by the National Environmental Management: Biodiversity Act (Act 10 of 2004) on August 2014. The Act clearly states the importance in terms of controlling and the removing of alien invasive species – Category 1: Declared weeds (Bromilow, 2010).

According to the National Water Act, 1998 (Act No. 36 of 1998), no Category 2 (Declared invader plants with a commercial or utility value) or Category 3 (Mostly ornamental plants) (Bromilow, 2010) alien invasive species are allowed to grow within 30m of a 1:50 year flood line of river. This also includes other watercourses such as streams, springs, natural channels, lake, dam or wetland.

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides a brief explanation of the three (3) Categories of listed invasive species below:

- **Category 1a:** Alien invasive species that needs to be removed from a specific area immediately.

- **Category 1b:** Alien invasive species that needs to be controlled.

- **Category 2:** Alien invasive species listed within the notice as species which require a permit to carry out a restricted activity within a specified area.

- **Category 3:** Alien invasive species that are listed in the notice, as species which are subject to exemptions and prohibitions.

Category 1b and 2 invasive species were recorded within the project area and must therefore be removed and controlled before and during the construction phase. This can be done by implementing an alien invasive plant management programme in compliance of section 75 of the Act as stated above.

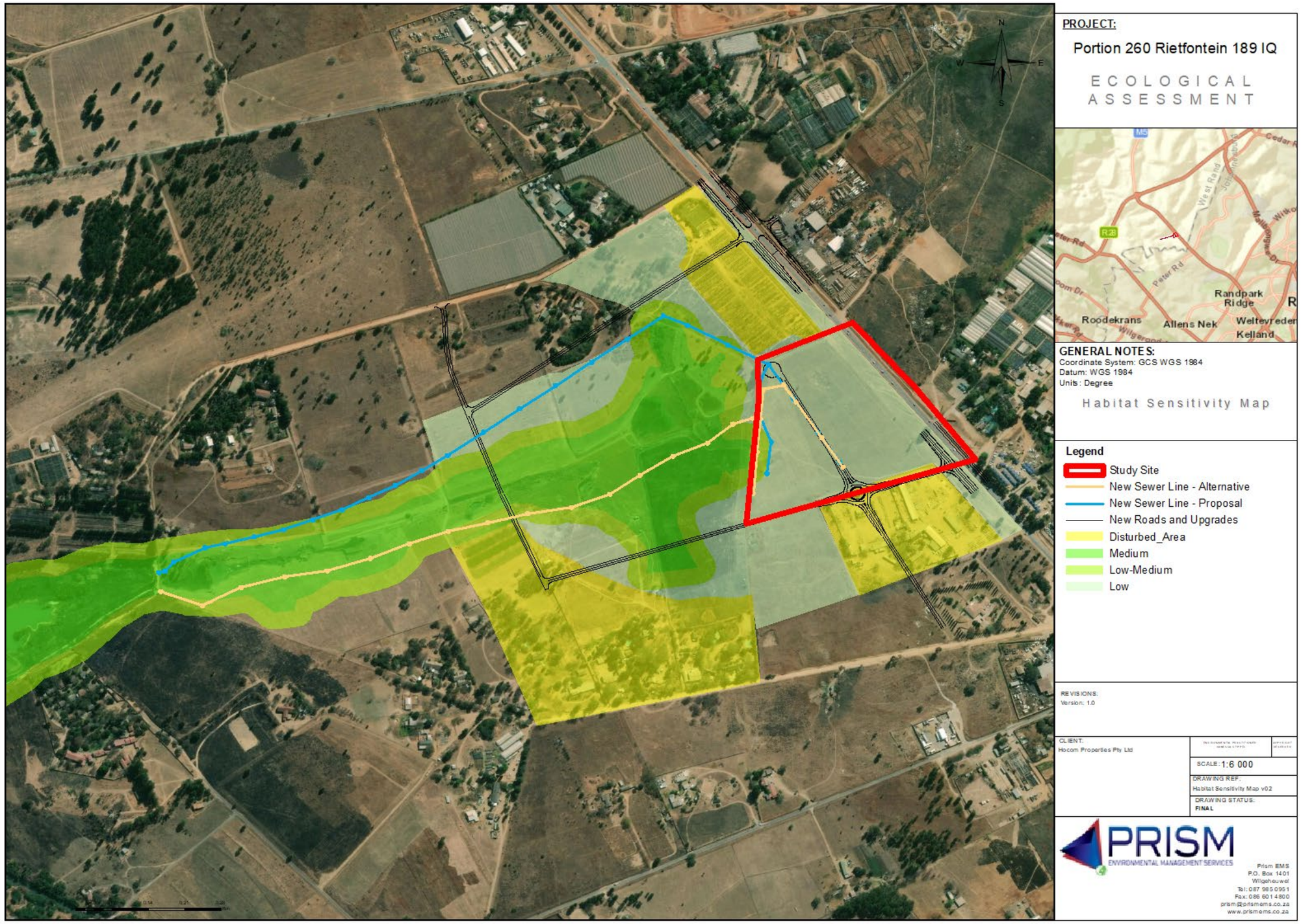

Figure 6-8: Habitat Sensitivity Map

6.2.2 Avifauna

During the site survey conducted in January 2020 only a total of twelve (12) were recorded as indicated in Table. This can probably be because of the human disturbance on site and lack of bird habitat. No SCC were recorded during the site visit. However, this does not mean the likeliness of them occurring on site is very small.

Table 6-8: Bird species observed during the site visit.

Species	Common Name	Conservation Status (IUCN,2017)
Cisticola juncidis	Zitting Cisticola	Least Concern
Psophocichla litsitsirupa	Groundscraper Thrush	Least Concern
Vanellus senegallus	African Wattled Lapwing	Least Concern
Vanellus coronatus	Crowned Lapwing	Least Concern
Anthus cinnamomeus	African Pipit	Least Concern
Macronyx capensis	Cape Longclaw	Least Concern
Ardea melanocephala	Black-headed Heron	Least Concern
Corvus albus	Pied Crow	Least Concern
Spilopelia senegalensis	Laughing Dove	Least Concern
Bubulus ibis	Western Cattle Egret	Least Concern
Elanus caeruleus	Black-shouldered Kite	Least Concern
Lanius collaris	Common Fiscal	Least Concern

6.2.3 Mammals

During the site visit that was based on visual sightings, tracks and other signs only one species was found. The only mammal species found on site and indicated in Table 6-9 and Figure 6-9 below was Blesbok.

Table 6-9: Mammal species observed during the site visit

Scientific Name	Common Name	Conservation Status (IUCN, 2017)
Damaliscus pygargus phillipsi	Blesbok	Least Concern

Figure 6-9: Blesbok observed during the site visit.

6.2.4 Herpetofauna

No species were observed during the site visit. However, this does not mean that the likelihood for species to occur on site is very low.

6.2.5 Invertebrates (Butterflies – Lepidoptera) Assessment

This survey was included within the report because of a Red Listed butterfly species (*Aloeides dentatis*). Listed as Endangered, that was previously recorded within this QDGS and was listed as an potential sensitive in the National Environmental Screening Tool. However, this SCC was not recording during the site visit. This could most probably be because of the Ruimsig Nature Reserve occurring within the same QDGC, which is there for conservational purposes for this species of butterfly in particular.

6.3 National Environmental Screening Tool

As per the requirements of GN 960 of 5 July 2019, a report was generated on the National Screening tool as part of the BA process. This report has been utilized to determine potential sensitivities these include:

- Insecta-*Aloeides dentatis dentatis;*
- *Melolobium subspicatum ;*
- Endangered ecosystem; and
- Aquatic CBAs

7 SITE SENSITIVITY

A desktop assessment of the site sensitivity has been undertaken (Figure 6-1: Gauteng C-Plan, Figure 6-2: National Protected Areas Map, Figure 6-3: Vegetation type - Egoli Granite Grassland and Figure 6-8: Habitat Sensitivity Map) together with site assessment and the following should be noted:

- The site does not fall within a Gauteng Conservation Plan Version 3.3. However, the proposed sewer line falls within an Ecological Support Area (ES) just west of the study area. The site assessment identified two main habitat types in the study site (wetland and secondary vegetation with scattered alien invasive species);
- The site does not fall within a National Protected Area Expansion Strategy Focus Area nor Gauteng Protected Area Expansion Priority Area;
- The site is not protected in terms of any international convention.
- The site is not declared as a nature reserve.
- The site is not zoned for conservation or public open space.
- The site does not fall within an Important Bird Area (IBA). The closest IBA is the Magaliesberg IBA which is about 3.5km northwest of the site.
- The study is affected by a wetland. A small section of the study site falls within the 32m buffer of the wetland. (Refer to Figure 6-8: Habitat Sensitivity Map)

From a desktop perspective, the site falls within Egoli Granite Grassland. However, the site visit confirmed that the site is not representative of these types due to historic disturbance.

Habitat sensitivity was determined through the observations found on site as well as the current status with regards to fauna and flora on site. The sensitivity was then rated using low to high. Low sensitivity is considered ideal for development were high sensitivity should be avoided were possible. Figure 7-10 indicates the areas on site with low to high sensitivity.

8 IMPACT ASSESSMENT

Table 8-1: Impacts and Mitigation Measures during the Construction and Operational Phase

	IMPACTS				CONSEQUENCE			PROBABILITY	SIGNIFICANCE (WOM)	CONFIDENCE	MANAGEMENT & MITIGATION MEASURES	MITIGATION EFFICIENCY	SIGNIFICANCE (WM)	DEGREE	
	TYPE	DESCRIPTION	CUMULATIVE	NATURE										LOSS RESOURCE	REVERSABILITY
					Extent (A)	Duration (B)	Intensity (C)	Probability (P)	Significance (A + B + C) X P						
CONSTRUCTION PHASE															
Impacts to Biodiversity	**Loss of Habitat due to loss of vegetation**														
	Direct	Clearing due to digging and laying foundations	Yes	Negative	*Site*	*Permanent*	*Low-Medium*	*Definite*	*Medium*	*High*	All construction activities must be outside of the wetland 32m buffer	*Low*	*Low-Medium*	*Partial*	*High Degree*
	Direct	Construction camps & lay down areas	Yes	Negative	*Site*	*Medium-term*	*Medium-High*	*Likely*	*Low-Medium*	*Medium*	Construction and laydown areas should be established outside of the wetland 32m buffer.	*Medium*	*Low*	*Partial*	*High Degree*
	Direct	Stochastic events such as fire	Yes	Negative	*Site*	*Incidental*	*Medium-High*	*Likely*	*Low*	*Medium*	Fires shall only be permitted in specially designated areas and under controlled circumstances.	*High*	*Low*	*Partial*	*High Degree*
	Direct mortality of fauna														
	Direct	Staff or construction workers poaching and hunting	No	Negative	*Site*	*Short-term*	*Low-Medium*	*Possible*	*Low*	*Medium*	Snaring and hunting of fauna by construction workers on or adjacent to the study area are strictly prohibited.	*High*	*Low*	*Partial*	*High Degree*
	Direct	Intentional killing of fauna	No	Negative	*Site*	*Incidental*	*Low-Medium*	*Likely*	*Low*	*Medium*	Killing of fauna on or adjacent to the study area are strictly prohibited. Should any fauna species be found on site, the ECO should be conducted asap to provide recommendation or mitigation measures.	*High*	*Low*	*Partial*	*High Degree*
	Direct	Vegetation and ground clearing resulting in loss of sensitive species	Yes	Negative	*Site*	*Long-term*	*Medium-High*	*Definite*	*Low-Medium*	*Medium*	Clearing of vegetation is not allowed within the 32m buffer of the wetland area other than for those activities authorised. It is recommended that all *Hypoxis hemerocallidea* and the one *Boophane disticha species* should be removed prior to construction activities and either relocated to a similar type of environment or implemented within the landscaping plan of the proposed development.	*Low*	*Low*	*Partial*	*High Degree*
		Disruption of ecological life cycles due to the restriction of species movement													
	Direct	Open trenches and other linear barriers	Yes	Negative	*Site*	*Short-term*	*Low-Medium*	*Highly Likely*	*Low*	*Medium*	Trenches and other linear barriers should not be kept open for too long, especially not staying open overnight.	*High*	*Low*	*No Loss*	*Reversible*
	Direct	Infrastructure	Yes	Negative	*Site*	*Permanent*	*Low-Medium*	*Definite*	*Medium*	*Medium*	Stormwater, sewer and road infrastructure should be designed in such a way that it will have minimal impact on the environmental, especially the wetland area.	*Medium*	*Low*	*No Loss*	*High Degree*
		Disruption of ecological life cycles due to noise and lighting													
	Direct	Noise during construction	No	Negative	*Site*	*Short-term*	*Low-Medium*	*Highly Likely*	*Low*	*Medium*	Construction must be restricted to hours of 07:00 and 17:00. Should construction activities need to continue over a weekend/pubic holiday or is expected to be excessively noisy, all Interested and Affected Parties and the ECO must be notified in advance.	*Medium*	*Low*	*No Loss*	*Reversible*

	Direct	Lighting during construction	Yes	Negative	*Site*	*Short-term*	*Medium-High*	*Highly Likely*	*Low-Medium*	*Medium*	Construction must be restricted to hours of 07:00 and 17:00. Should construction activities need to continue after hours is, all Interested and Affected Parties and the ECO must be notified in advance. Excessive lighting during construction should be avoided.	*Medium*	*Low*	*No Loss*	*Reversible*
		Introduction of alien flora affecting native faunal assemblages													
	Direct	Vehicles and machinery	Yes	Negative	*Site*	*Short-term*	*Medium*	*Likely*	*Low*	*Medium*	Alien, invasive species found within the construction area should be eradicated as far as possible and disposed of at a registered site. Measures to prevent siltation from entering the wetland area, should be implemented throughout the construction phase.	*High*	*Low*	*No Loss*	*Reversible*
	Direct	Soil Disturbance	Yes	Negative	*Site*	*Short-term*	*Medium-High*	*Highly Likely*	*Low-Medium*	*Medium*	Measures to prevent siltation from entering the wetland area, should be implemented throughout the construction phase.	*High*	*Low*	*No Loss*	*Reversible*
OPERATIONAL PHASE															
Impacts to Biodiversity		**Loss of existing habitat due to loss of vegetation**													
	Direct	Stochastic events such as fire	No	Negative	*Site*	*Incidental*	*Medium*	*Possible*	*Low*	*Medium*	Fire extinguishers must be placed on the property.	*High*	*Low*	*No Loss*	*Reversible*
		Direct mortality of fauna													
	Direct	Intentional killing of fauna	No	Negative	*Site*	*Incidental*	*Low*	*Improbable*	*Low*	*Medium*	It is not expected that any fauna will be found on site during operation. The Body Corporate must include the requirement in their rule book that should any be found that the relevant organisation be called to safely remove the species.	*High*	*Low*	*No Loss*	*Reversible*
		Disruption of ecological life cycles due to the restriction of species movement													
	Direct	Infrastructure	No	Negative	*Site*	*Permanent*	*Low*	*Highly Likely*	*Low-Medium*	*Medium*	Stormwater, sewer and road infrastructure should be designed in such a way that it will have minimal impact on the environmental, especially the wetland area. Maintenance should be undertaken as per the requirements of the stormwater management plan.	*High*	*Low*	*No Loss*	*Reversible*

9 REASONED OPINION AND RECOMMENDATIONS

From a desktop perspective, the proposed development occurs within the Egoli Granite Grassland (Endangered) vegetation type. According to the Gauteng Conservation Plan, the proposed development footprint traverses a small section of Ecological Support Area and Zone 3 of the GPEMF. As per the protected and conservation area map, the Cradle of Humankind is situated about 6 km northwest of the study area.

The site was actively surveyed to determine the current status of the habitats on site. Two main habitat types were identified within the study site, namely, Wetland with associated 32m buffer and secondary vegetation with scattered patches of alien invasive plant species. The development footprint falls within the disturbed area which is not representative of Egoli Granite Grassland.

Two SCC were identified on site, namely *Hypoxis hemerocallidea* and *Boophone disticha.* Whilst these species are classified as “Least Concern” in terms of Red Data List, GDARD has confirmed that they should be considered as “Orange List” species in Gauteng due to provincial level pressures. Therefore, in order to mitigate impacts to these species, a Search and Rescue and Relocation Plan has been devised and included in Appendix E. Impacts to these species are expected to be low with the implementation of the necessary mitigation.

Due to the ongoing anthropogenic activities in and around the study area, lack of habitat and breeding ground and presence of feral animals, the possibility for any of these species to be found on site is low.

Most of the impacts on flora and fauna are considered low to moderate. Most of the impacts on the fauna and flora can be mitigated, following the mitigation measures listed in the EMPr. These mitigation measures can lower the impacts to low and in some cases to very low. Direct impacts, such as habitat loss, cannot be fully mitigated.

9.1 MITIGATION AND MONITORING REQUIREMENTS

All mitigations and monitoring requirements must be adhered to as per the Impact Assessment in Section 8. It is of all importance that the wetland buffer should be barricaded and silt fenced before any construction activities commence on site. This will prevent any siltation and debris from entering the wetland area which has a sensitivity of medium. All alien invasive species should be removed from site and disposed of at a registered landfill site. Appendix E also provides a rescue and relocation plan for *Hypoxis* and *Boophone* species on site and should be implemented prior to construction.

9.2 CONCLUSION

The proposed development is unlikely to have a high impact on the study site due to low to medium sensitivity on site. Aspects such as human activities in and around the study site, presence of alien invasive species on site, lack of habitat for most fauna species and the presence of feral animals in the area have impacted on the existing sensitivity. All recommendations and mitigation measures, with regards to the fauna and flora on site, should be well managed pre -, during and post of the construction activities.

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11 APPENDICES

11.1 APPENDIX A: EXPECTED AVIFAUNA LIST

A list of avifauna species to potentially occur on the study area based on SABAP2 records. SCC has been highlighted in red and species observed during the site visit are highlighted in green.

#	Common Group	Common Species	Genus	Species	Conservation Status Taylor *et al.* (2015)
1	Apalis	Bar-throated	*Apalis*	*thoracica*	Least Concern
2	Babbler	Arrow-marked	*Turdoides*	*jardineii*	Least Concern
3	Barbet	Acacia Pied	*Tricholaema*	*leucomelas*	Least Concern
4	Barbet	Black-collared	*Lybius*	*torquatus*	Least Concern
5	Barbet	Crested	*Trachyphonus*	*vaillantii*	Least Concern
6	Batis	Chinspot	*Batis*	*molitor*	Least Concern
7	Bee-eater	European	*Merops*	*apiaster*	Least Concern
8	Bee-eater	White-fronted	*Merops*	*bullockoides*	Least Concern
9	Bishop	Southern Red	*Euplectes*	*orix*	Least Concern
10	Bishop	Yellow-crowned	*Euplectes*	*afer*	Least Concern
11	Bittern	Little	*Ixobrychus*	*minutus*	Least Concern
12	Bokmakierie	Bokmakierie	*Telophorus*	*zeylonus*	Least Concern
13	Boubou	Southern	*Laniarius*	*ferrugineus*	Least Concern
14	Bulbul	African Red-eyed	*Pycnonotus*	*nigricans*	Least Concern
15	Bulbul	Dark-capped	*Pycnonotus*	*tricolor*	Least Concern
16	Bunting	Cinnamon-breasted	*Emberiza*	*tahapisi*	Least Concern
17	Bunting	Golden-breasted	*Emberiza*	*flaviventris*	Least Concern
18	Bush-shrike	Grey-headed	*Malaconotus*	*blanchoti*	Least Concern
19	Bush-shrike	Orange-breasted	*Telophorus*	*sulfureopectus*	Least Concern
20	Buzzard	Steppe	*Buteo*	*vulpinus*	Least Concern

21	Camaroptera	Grey-backed	*Camaroptera*	*brevicaudata*	Least Concern
22	Canary	Black-throated	*Crithagra*	*atrogularis*	Least Concern
23	Canary	Yellow	*Crithagra*	*flaviventris*	Least Concern
24	Canary	Yellow-fronted	*Crithagra*	*mozambicus*	Least Concern
25	Chat	Anteating	*Myrmecocichla*	*formicivora*	Least Concern
26	Chat	Familiar	*Cercomela*	*familiaris*	Least Concern
27	Cisticola	Cloud	*Cisticola*	*textrix*	Least Concern
28	Cisticola	Desert	*Cisticola*	*aridulus*	Least Concern
29	Cisticola	Levaillant's	*Cisticola*	*tinniens*	Least Concern
30	Cisticola	Wailing	*Cisticola*	*lais*	Least Concern
31	Cisticola	Wing-snapping	*Cisticola*	*ayresii*	Least Concern
32	Cisticola	Zitting	*Cisticola*	*juncidis*	Least Concern
33	Cliff-chat	Mocking	*Thamnolaea*	*cinnamomeiventris*	Least Concern
34	Cliff-swallow	South African	*Hirundo*	*spilodera*	Least Concern
35	Coot	Red-knobbed	*Fulica*	*cristata*	Least Concern
36	Cormorant	Reed	*Phalacrocorax*	*africanus*	Least Concern
37	Cormorant	White-breasted	*Phalacrocorax*	*carbo*	Least Concern
38	Coucal	Burchell's	*Centropus*	*burchellii*	Least Concern
39	Crake	Black	*Amaurornis*	*flavirostris*	Least Concern
40	Crake	Spotted	*Porzana*	*porzana*	Least Concern
41	Crow	Pied	*Corvus*	*albus*	Least Concern
42	Cuckoo	African	*Cuculus*	*gularis*	Least Concern
43	Cuckoo	Black	*Cuculus*	*clamosus*	Least Concern
44	Cuckoo	Diderick	*Chrysococcyx*	*caprius*	Least Concern
45	Cuckoo	Klaas's	*Chrysococcyx*	*klaas*	Least Concern
46	Cuckoo	Levaillant's	*Clamator*	*levaillantii*	Least Concern
47	Cuckoo	Red-chested	*Cuculus*	*solitarius*	Least Concern

48	Cuckoo-shrike	Black	*Campephaga*	*flava*	Least Concern
49	Darter	African	*Anhinga*	*rufa*	Least Concern
50	Dove	Laughing	*Streptopelia*	*senegalensis*	Least Concern
51	Dove	Namaqua	*Oena*	*capensis*	Least Concern
52	Dove	Red-eyed	*Streptopelia*	*semitorquata*	Least Concern
53	Dove	Rock	*Columba*	*livia*	Least Concern
54	Drongo	Fork-tailed	*Dicrurus*	*adsimilis*	Least Concern
55	Duck	African Black	*Anas*	*sparsa*	Least Concern
56	Duck	Domestic	*Anas*	*platyrhynchos*	Least Concern
57	Duck	Mallard	*Anas*	*platyrhynchos*	Least Concern
58	Duck	White-faced	*Dendrocygna*	*viduata*	Least Concern
59	Duck	Yellow-billed	*Anas*	*undulata*	Least Concern
60	Eagle	Booted	*Aquila*	*pennatus*	Least Concern
61	Eagle	Long-crested	*Lophaetus*	*occipitalis*	Least Concern
62	Eagle	Verreaux's	*Aquila*	*verreauxii*	Vulnerable
63	Eagle-owl	Spotted	*Bubo*	*africanus*	Least Concern
64	Egret	Cattle	*Bubulcus*	*ibis*	Least Concern
65	Egret	Great	*Egretta*	*alba*	Least Concern
66	Egret	Little	*Egretta*	*garzetta*	Least Concern
67	Falcon	Amur	*Falco*	*amurensis*	Least Concern
68	Falcon	Lanner	*Falco*	*biarmicus*	Vulnerable
69	Falcon	Peregrine	*Falco*	*peregrinus*	Least Concern
70	Falcon	Red-footed	*Falco*	*vespertinus*	Near Threatened
71	Finch	Cut-throat	*Amadina*	*fasciata*	Least Concern
72	Finch	Red-headed	*Amadina*	*erythrocephala*	Least Concern
73	Finch	Scaly-feathered	*Sporopipes*	*squamifrons*	Least Concern
74	Firefinch	Jameson's	*Lagonosticta*	*rhodopareia*	Least Concern

75	Fiscal	Common (Southern)	*Lanius*	*collaris*	Least Concern
76	Fish-eagle	African	*Haliaeetus*	*vocifer*	Least Concern
77	Flamingo	Greater	*Phoenicopterus*	*ruber*	Near Threatened/ Least Concern
78	Flufftail	Red-chested	*Sarothrura*	*rufa*	Least Concern
79	Flycatcher	Fairy	*Stenostira*	*scita*	Least Concern
80	Flycatcher	Fiscal	*Sigelus*	*silens*	Least Concern
81	Flycatcher	Spotted	*Muscicapa*	*striata*	Least Concern
82	Francolin	Coqui	*Peliperdix*	*coqui*	Least Concern
83	Francolin	Orange River	*Scleroptila*	*levaillantoides*	Least Concern
84	Francolin	Red-winged	*Scleroptila*	*levaillantii*	Least Concern
85	Go-away-bird	Grey	*Corythaixoides*	*concolor*	Least Concern
86	Goose	Barnacle	*Branta*	*leucopsis*	Least Concern
87	Goose	Domestic	*Anser*	*anser*	Least Concern
88	Goose	Egyptian	*Alopochen*	*aegyptiacus*	Least Concern
89	Goshawk	Gabar	*Melierax*	*gabar*	Least Concern
90	Grass-owl	African	*Tyto*	*capensis*	Vulnerable/ Least Concern
91	Grassbird	Cape	*Sphenoeacus*	*afer*	Least Concern
92	Grebe	Little	*Tachybaptus*	*ruficollis*	Least Concern
93	Green-pigeon	African	*Treron*	*calvus*	Least Concern
94	Guineafowl	Helmeted	*Numida*	*meleagris*	Least Concern
95	Gull	Grey-headed	*Larus*	*cirrocephalus*	Least Concern
96	Hamerkop	Hamerkop	*Scopus*	*umbretta*	Least Concern
97	Harrier-Hawk	African	*Polyboroides*	*typus*	Least Concern
98	Heron	Black	*Egretta*	*ardesiaca*	Least Concern
99	Heron	Black-headed	*Ardea*	*melanocephala*	Least Concern
100	Heron	Green-backed	*Butorides*	*striata*	Least Concern
101	Heron	Grey	*Ardea*	*cinerea*	Least Concern

102	Heron	Purple	*Ardea*	*purpurea*	Least Concern
103	Heron	Squacco	*Ardeola*	*ralloides*	Least Concern
104	Honey-buzzard	European	*Pernis*	*apivorus*	Least Concern
105	Honeybird	Brown-backed	*Prodotiscus*	*regulus*	Least Concern
106	Honeyguide	Greater	*Indicator*	*indicator*	Least Concern
107	Honeyguide	Lesser	*Indicator*	*minor*	Least Concern
108	Hoopoe	African	*Upupa*	*africana*	Least Concern
109	Hornbill	African Grey	*Tockus*	*nasutus*	Least Concern
110	House-martin	Common	*Delichon*	*urbicum*	Least Concern
111	Ibis	African Sacred	*Threskiornis*	*aethiopicus*	Least Concern
112	Ibis	Glossy	*Plegadis*	*falcinellus*	Least Concern
113	Ibis	Hadeda	*Bostrychia*	*hagedash*	Least Concern
114	Indigobird	Purple	*Vidua*	*purpurascens*	Least Concern
115	Kestrel	Rock	*Falco*	*rupicolus*	Least Concern
116	Kingfisher	Brown-hooded	*Halcyon*	*albiventris*	Least Concern
117	Kingfisher	Giant	*Megaceryle*	*maximus*	Least Concern
118	Kingfisher	Half-collared	*Alcedo*	*semitorquata*	Endangered/ Least Concern
119	Kingfisher	Malachite	*Alcedo*	*cristata*	Least Concern
120	Kingfisher	Pied	*Ceryle*	*rudis*	Least Concern
121	Kingfisher	Woodland	*Halcyon*	*senegalensis*	Least Concern
122	Kite	Black-shouldered	*Elanus*	*caeruleus*	Least Concern
123	Kite	Yellow-billed	*Milvus*	*aegyptius*	Least Concern
124	Lapwing	African Wattled	*Vanellus*	*senegallus*	Least Concern
125	Lapwing	Blacksmith	*Vanellus*	*armatus*	Least Concern
126	Lapwing	Crowned	*Vanellus*	*coronatus*	Least Concern
127	Lark	Eastern Clapper	*Mirafra*	*fasciolata*	Least Concern
128	Lark	Rufous-naped	*Mirafra*	*africana*	Least Concern

129	Longclaw	Cape	*Macronyx*	*capensis*	Least Concern
130	Mannikin	Bronze	*Spermestes*	*cucullatus*	Least Concern
131	Martin	Brown-throated	*Riparia*	*paludicola*	Least Concern
132	Martin	Rock	*Hirundo*	*fuligula*	Least Concern
133	Masked-weaver	Southern	*Ploceus*	*velatus*	Least Concern
134	Moorhen	Common	*Gallinula*	*chloropus*	Least Concern
135	Mousebird	Red-faced	*Urocolius*	*indicus*	Least Concern
136	Mousebird	Speckled	*Colius*	*striatus*	Least Concern
137	Myna	Common	*Acridotheres*	*tristis*	Least Concern
138	Neddicky	Neddicky	*Cisticola*	*fulvicapilla*	Least Concern
139	Night-Heron	Black-crowned	*Nycticorax*	*nycticorax*	Least Concern
140	Nightjar	Fiery-necked	*Caprimulgus*	*pectoralis*	Least Concern
141	Nightjar	Freckled	*Caprimulgus*	*tristigma*	Least Concern
142	Nightjar	Rufous-cheeked	*Caprimulgus*	*rufigena*	Least Concern
143	Olive-pigeon	African	*Columba*	*arquatrix*	Least Concern
144	Oriole	Black-headed	*Oriolus*	*larvatus*	Least Concern
145	Ostrich	Common	*Struthio*	*camelus*	Least Concern
146	Owl	Barn	*Tyto*	*alba*	Least Concern
147	Owl	Marsh	*Asio*	*capensis*	Least Concern
148	Palm-swift	African	*Cypsiurus*	*parvus*	Least Concern
149	Paradise-flycatcher	African	*Terpsiphone*	*viridis*	Least Concern
150	Parakeet	Rose-ringed	*Psittacula*	*krameri*	Least Concern
151	Peacock	Common	*Pavo*	*cristatus*	Least Concern
152	Pigeon	Speckled	*Columba*	*guinea*	Least Concern
153	Pipit	African	*Anthus*	*cinnamomeus*	Least Concern
154	Plover	Three-banded	*Charadrius*	*tricollaris*	Least Concern
155	Pochard	Southern	*Netta*	*erythrophthalma*	Least Concern

156	Prinia	Black-chested	*Prinia*	*flavicans*	Least Concern
157	Prinia	Tawny-flanked	*Prinia*	*subflava*	Least Concern
158	Puffback	Black-backed	*Dryoscopus*	*cubla*	Least Concern
159	Quelea	Red-billed	*Quelea*	*quelea*	Least Concern
160	Rail	African	*Rallus*	*caerulescens*	Least Concern
161	Reed-warbler	African	*Acrocephalus*	*baeticatus*	Least Concern
162	Reed-warbler	Great	*Acrocephalus*	*arundinaceus*	Least Concern
163	Robin-chat	Cape	*Cossypha*	*caffra*	Least Concern
164	Rush-warbler	Little	*Bradypterus*	*baboecala*	Least Concern
165	Sandpiper	Wood	*Tringa*	*glareola*	Least Concern
166	Seedeater	Streaky-headed	*Crithagra*	*gularis*	Least Concern
167	Shikra	Shikra	*Accipiter*	*badius*	Least Concern
168	Shrike	Crimson-breasted	*Laniarius*	*atrococcineus*	Least Concern
169	Shrike	Red-backed	*Lanius*	*collurio*	Least Concern
170	Snake-eagle	Black-chested	*Circaetus*	*pectoralis*	Least Concern
171	Snipe	African	*Gallinago*	*nigripennis*	Least Concern
172	Sparrow	Cape	*Passer*	*melanurus*	Least Concern
173	Sparrow	House	*Passer*	*domesticus*	Least Concern
174	Sparrow	Southern Grey-headed	*Passer*	*diffusus*	Least Concern
175	Sparrow-weaver	White-browed	*Plocepasser*	*mahali*	Least Concern
176	Sparrowhawk	Black	*Accipiter*	*melanoleucus*	Least Concern
177	Sparrowhawk	Little	*Accipiter*	*minullus*	Least Concern
178	Sparrowhawk	Ovambo	*Accipiter*	*ovampensis*	Least Concern
179	Spoonbill	African	*Platalea*	*alba*	Least Concern
180	Spurfowl	Natal	*Pternistis*	*natalensis*	Least Concern
181	Spurfowl	Swainson's	*Pternistis*	*swainsonii*	Least Concern
182	Starling	Cape Glossy	*Lamprotornis*	*nitens*	Least Concern

183	Starling	Pied	*Spreo*	*bicolor*	Least Concern
184	Starling	Red-winged	*Onychognathus*	*morio*	Least Concern
185	Starling	Wattled	*Creatophora*	*cinerea*	Least Concern
186	Stonechat	African	*Saxicola*	*torquatus*	Least Concern
187	Stork	Abdim's	*Ciconia*	*abdimii*	Near Threatened/ Least Concern
188	Stork	White	*Ciconia*	*ciconia*	Least Concern
189	Sunbird	Amethyst	*Chalcomitra*	*amethystina*	Least Concern
190	Sunbird	Greater Double-collared	*Cinnyris*	*afer*	Least Concern
191	Sunbird	Malachite	*Nectarinia*	*famosa*	Least Concern
192	Sunbird	Marico	*Cinnyris*	*mariquensis*	Least Concern
193	Sunbird	White-bellied	*Cinnyris*	*talatala*	Least Concern
194	Swallow	Barn	*Hirundo*	*rustica*	Least Concern
195	Swallow	Greater Striped	*Hirundo*	*cucullata*	Least Concern
196	Swallow	Lesser Striped	*Hirundo*	*abyssinica*	Least Concern
197	Swallow	White-throated	*Hirundo*	*albigularis*	Least Concern
198	Swamp-warbler	Lesser	*Acrocephalus*	*gracilirostris*	Least Concern
199	Swamphen	African Purple	*Porphyrio*	*madagascariensis*	Least Concern
200	Swift	African Black	*Apus*	*barbatus*	Least Concern
201	Swift	Alpine	*Tachymarptis*	*melba*	Least Concern
202	Swift	Common	*Apus*	*apus*	Least Concern
203	Swift	Horus	*Apus*	*horus*	Least Concern
204	Swift	Little	*Apus*	*affinis*	Least Concern
205	Swift	White-rumped	*Apus*	*caffer*	Least Concern
206	Tchagra	Black-crowned	*Tchagra*	*senegalus*	Least Concern
207	Tchagra	Brown-crowned	*Tchagra*	*australis*	Least Concern
208	Teal	Red-billed	*Anas*	*erythrorhyncha*	Least Concern
209	Tern	Whiskered	*Chlidonias*	*hybrida*	Least Concern

210	Tern	White-winged	*Chlidonias*	*leucopterus*	Least Concern
211	Thick-knee	Spotted	*Burhinus*	*capensis*	Least Concern
212	Thrush	Groundscraper	*Psophocichla*	*litsipsirupa*	Least Concern
213	Thrush	Karoo	*Turdus*	*smithi*	Least Concern
214	Thrush	Kurrichane	*Turdus*	*libonyanus*	Least Concern
215	Tinkerbird	Yellow-fronted	*Pogoniulus*	*chrysoconus*	Least Concern
216	Tit-babbler	Chestnut-vented	*Parisoma*	*subcaeruleum*	Least Concern
217	Turtle-dove	Cape	*Streptopelia*	*capicola*	Least Concern
218	Wagtail	Cape	*Motacilla*	*capensis*	Least Concern
219	Warbler	Garden	*Sylvia*	*borin*	Least Concern
220	Warbler	Icterine	*Hippolais*	*icterina*	Least Concern
221	Warbler	Marsh	*Acrocephalus*	*palustris*	Least Concern
222	Warbler	Willow	*Phylloscopus*	*trochilus*	Least Concern
223	Waxbill	Blue	*Uraeginthus*	*angolensis*	Least Concern
224	Waxbill	Common	*Estrilda*	*astrild*	Least Concern
225	Waxbill	Orange-breasted	*Amandava*	*subflava*	Least Concern
226	Weaver	Cape	*Ploceus*	*capensis*	Least Concern
227	Weaver	Thick-billed	*Amblyospiza*	*albifrons*	Least Concern
228	Weaver	Village	*Ploceus*	*cucullatus*	Least Concern
229	Wheatear	Mountain	*Oenanthe*	*monticola*	Least Concern
230	White-eye	Cape	*Zosterops*	*virens*	Least Concern
231	Whydah	Pin-tailed	*Vidua*	*macroura*	Least Concern
232	Widowbird	Fan-tailed	*Euplectes*	*axillaris*	Least Concern
233	Widowbird	Long-tailed	*Euplectes*	*progne*	Least Concern
234	Widowbird	Red-collared	*Euplectes*	*ardens*	Least Concern
235	Widowbird	White-winged	*Euplectes*	*albonotatus*	Least Concern
236	Wood-hoopoe	Green	*Phoeniculus*	*purpureus*	Least Concern

237	Woodpecker	Cardinal	Dendropicos	fuscescens	Least Concern
238	Woodpecker	Golden-tailed	Campethera	abingoni	Least Concern
239	Wryneck	Red-throated	Jynx	ruficollis	Least Concern

11.2 APPENDIX B: EXPECTED MAMMAL SPECIES LIST

Mammal species to potentially occur within the study area based on Virtual Museum Mammal Map records. Please note that the list of mammal species are only based on previous recordings and do not include any other non-recording mammal species that might occur on sight. Species of conservation concern is highlighted in red.

#	Family	Science Name	Common Name	Red list Category	Number of Records	Last Recorded
1	Bathyergidae	*Cryptomys hottentotus*	Southern African Mole-rat	Least Concern (2016)	8	1989
2	Bovidae	*Raphicerus campestris*	Steenbok	Least Concern (2016)	1	2007
3	Bovidae	*Sylvicapra grimmia*	Bush Duiker	Least Concern (2016)	2	2013
4	Canidae	*Canis mesomelas*	Black-backed Jackal	Least Concern (2016)	33	2013
5	Canidae	*Otocyon megalotis*	Bat-eared Fox	Least Concern (2016)	18	1957
6	Cercopithecidae	*Chlorocebus pygerythrus pygerythrus*	Vervet Monkey (subspecies pygerythrus)	Least Concern (2008)	1	2012-12-10
7	Cercopithecidae	*Papio ursinus*	Chacma Baboon	Least Concern (2016)	29	1957
8	Erinaceidae	*Atelerix frontalis*	Southern African Hedgehog	Near Threatened (2016)	2	2010
9	Felidae	*Caracal caracal*	Caracal	Least Concern (2016)	23	2013
10	Felidae	*Felis catus*	Domestic Cat	Introduced	1	2014
11	Felidae	*Felis silvestris*	Wildcat	Least Concern (2016)	24	1957
12	Felidae	*Leptailurus serval*	Serval	Near Threatened (2016)	2	2018
13	Gliridae	*Graphiurus (Graphiurus) platyops*	Flat-headed African Dormouse	Data deficient	1	1979
14	Herpestidae	*Atilax paludinosus*	Marsh Mongoose	Least Concern (2016)	8	2018
15	Herpestidae	*Cynictis penicillata*	Yellow Mongoose	Least Concern (2016)	4	2014
16	Herpestidae	*Herpestes sanguineus*	Slender Mongoose	Least Concern (2016)	9	2019

17	Hipposideridae	*Cloeotis percivali*	Percival's Short-eared Trident Bat	Endangered (2016)	4	2011
18	Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	Least Concern	2	2013
19	Leporidae	*Lepus saxatilis*	Scrub Hare	Least Concern	3	2018
20	Macroscelididae	*Elephantulus brachyrhynchus*	Short-snouted Elephant Shrew	Least Concern (2016)	1	1959
21	Macroscelididae	*Elephantulus myurus*	Eastern Rock Elephant Shrew	Least Concern (2016)	2	2015
22	Molossidae	*Tadarida aegyptiaca*	Egyptian Free-tailed Bat	Least Concern (2016)	8	1907
23	Muridae	*Aethomys namaquensis*	Namaqua Rock Mouse	Least Concern	4	1964
24	Muridae	*Gerbilliscus brantsii*	Highveld Gerbil	Least Concern (2016)	4	1970
25	Muridae	*Mastomys natalensis*	Natal Mastomys	Least Concern (2016)	13	1970
26	Muridae	*Otomys angoniensis*	Angoni Vlei Rat	Least Concern (2016)	22	2017
27	Muridae	*Otomys auratus*	Southern African Vlei Rat	Near Threatened (2016)	11	1959
28	Muridae	*Rattus rattus*	Roof Rat	Least Concern	1	1955
29	Muridae	*Rhabdomys pumilio*	Xeric Four-striped Grass Rat	Least Concern (2016)	9	2007
30	Mustelidae	*Aonyx capensis*	African Clawless Otter	Near Threatened (2016)	2	2015
31	Mustelidae	*Hydrictis maculicollis*	Spotted-necked Otter	Least Concern (IUCN 2008)	1	2013
32	Mustelidae	*Mellivora capensis*	Honey Badger	Least Concern (2016)	1	2015
33	Mustelidae	*Poecilogale albinucha*	African Striped Weasel	Near Threatened (2016)	2	
34	Nesomyidae	*Dendromus melanotis*	Gray African Climbing Mouse	Least Concern (2016)	1	
35	Nesomyidae	*Dendromus mystacalis*	Chestnut African Climbing Mouse	Least Concern (2016)	1	2016
36	Nesomyidae	*Malacothrix typica*	Large-eared African Desert Mouse	Least Concern (2016)	5	1928
37	Nesomyidae	*Steatomys krebsii*	Kreb's African Fat Mouse	Least Concern (2016)	1	1923

38	Nesomyidae	*Steatomys pratensis*	Common African Fat Mouse	Least Concern (2016)	3	1957
39	Nycteridae	*Nycteris thebaica*	Egyptian Slit-faced Bat	Least Concern (2016)	2	
40	Procaviidae	*Procavia capensis*	Cape Rock Hyrax	Least Concern (2016)	1	2018
41	Rhinolophidae	*Rhinolophus blasii*	Blasius's Horseshoe Bat	Near Threatened (2016)	38	1933
42	Rhinolophidae	*Rhinolophus clivosus*	Geoffroy's Horseshoe Bat	Least Concern (2016)	12	2011
43	Soricidae	*Crocidura maquassiensis*	Makwassie Musk Shrew	Vulnerable (2016)	1	
44	Soricidae	*Crocidura mariquensis*	Swamp Musk Shrew	Near Threatened (2016)	1	1949
45	Soricidae	*Myosorex varius*	Forest Shrew	Least Concern (2016)	1	2014
46	Vespertilionidae	*Miniopterus fraterculus*	Lesser Long-fingered Bat	Least Concern (2016)	1	
47	Vespertilionidae	*Miniopterus natalensis*	Natal Long-fingered Bat	Least Concern (2016)	3	2011
48	Vespertilionidae	*Myotis tricolor*	Temminck's Myotis	Least Concern (2016)	9	1933
49	Vespertilionidae	*Neoromicia capensis*	Cape Serotine	Least Concern (2016)	14	2014
50	Vespertilionidae	*Pipistrellus (Pipistrellus) rusticus*	Rusty Pipistrelle	Near Threatened	2	2006
51	Vespertilionidae	*Scotophilus dinganii*	Yellow-bellied House Bat	Least Concern (2016)	2	2005
52	Viveridae	*Genetta maculata*	Common Large-spotted Genet	Least Concern	3	2013
53	Viverridae	*Genetta genetta*	Common Genet	Least Concern (2016)	4	2015

11.3 APPENDIX C: EXPECTED HERPETOFAUNA LIST

Herpetofauna species to potentially occur within the study area based on Virtual Museum Reptile Map records. Please note that the list of reptile species are only based on previous recordings and do not include any other non-recording reptile species that might occur on sight. Species of conservation concern is highlighted in red.

#	Family	Scientific name	Common name	Red list category	Number of records	Last recorded
1	Agamidae	*Agama aculeata distanti*	Distant's Ground Agama	Least Concern (SARCA 2014)	6	2013
2	Agamidae	*Agama atra*	Southern Rock Agama	Least Concern (SARCA 2014)	12	2018
3	Chamaeleonidae	*Chamaeleo dilepis*	Common Flap-neck Chameleon	Least Concern (SARCA 2014)	4	2008
4	Colubridae	*Crotaphopeltis hotamboeia*	Red-lipped Snake	Least Concern (SARCA 2014)	7	2016
5	Colubridae	*Dasypeltis scabra*	Rhombic Egg-eater	Least Concern (SARCA 2014)	6	2003
6	Colubridae	*Dispholidus typus viridis*	Boomslang	Not evaluated	2	2003
7	Colubridae	*Philothamnus semivariegatus*	Spotted Bush Snake	Least Concern (SARCA 2014)	3	2018
8	Cordylidae	*Chamaesaura aenea*	Coppery Grass Lizard	Near Threatened (SARCA 2014)	1	1900
9	Cordylidae	*Cordylus vittifer*	Common Girdled Lizard	Least Concern (SARCA 2014)	6	2003
10	Cordylidae	*Smaug vandami*	Van Dam's Girdled Lizard	Least Concern (SARCA 2014)	8	2020
11	Elapidae	*Elapsoidea sundevallii media*	Highveld Garter Snake		2	1900
12	Elapidae	*Hemachatus haemachatus*	Rinkhals	Least Concern (SARCA 2014)	11	2013
13	Elapidae	*Naja annulifera*	Snouted Cobra	Least Concern (SARCA 2014)	1	2018
14	Elapidae	*Naja mossambica*	Mozambique Spitting Cobra	Least Concern (SARCA 2014)	1	1900
15	Gekkonidae	*Lygodactylus capensis*	Common Dwarf Gecko	Least Concern (SARCA 2014)	27	2020

16	Gekkonidae	*Lygodactylus ocellatus*	Spotted Dwarf Gecko	Least Concern (SARCA 2014)	1	1900
17	Gekkonidae	*Pachydactylus affinis*	Transvaal Gecko	Least Concern (SARCA 2014)	13	2019
18	Gekkonidae	*Pachydactylus capensis*	Cape Gecko	Least Concern (SARCA 2014)	21	2016
19	Gerrhosauridae	*Gerrhosaurus flavigularis*	Yellow-throated Plated Lizard	Least Concern (SARCA 2014)	13	2017
20	Lacertidae	*Nucras holubi*	Holub's Sandveld Lizard	Least Concern (SARCA 2014)	1	1900
21	Lacertidae	*Nucras lalandii*	Delalande's Sandveld Lizard	Least Concern (SARCA 2014)	1	2017
22	Lamprophiidae	*Aparallactus capensis*	Black-headed Centipede-eater	Least Concern (SARCA 2014)	6	2018
23	Lamprophiidae	*Atractaspis bibronii*	Bibron's Stiletto Snake	Least Concern (SARCA 2014)	2	1981
24	Lamprophiidae	*Boaedon capensis*	Brown House Snake	Least Concern (SARCA 2014)	10	2017
25	Lamprophiidae	*Homoroselaps lacteus*	Spotted Harlequin Snake	Least Concern (SARCA 2014)	1	1900
26	Lamprophiidae	*Lamprophis aurora*	Aurora House Snake	Least Concern (SARCA 2014)	3	1974
27	Lamprophiidae	*Lycodonomorphus inornatus*	Olive House Snake	Least Concern (SARCA 2014)	1	2005
28	Lamprophiidae	*Lycodonomorphus rufulus*	Brown Water Snake	Least Concern (SARCA 2014)	5	2018
29	Lamprophiidae	*Lycophidion capense capense*	Cape Wolf Snake	Least Concern (SARCA 2014)	3	1900
30	Lamprophiidae	*Prosymna sundevallii*	Sundevall's Shovel-snout	Least Concern (SARCA 2014)	2	1966
31	Lamprophiidae	*Psammophis brevirostris*	Short-snouted Grass Snake	Least Concern (SARCA 2014)	8	2017
32	Lamprophiidae	*Psammophis crucifer*	Cross-marked Grass Snake	Least Concern (SARCA 2014)	3	1900
33	Lamprophiidae	*Psammophis trinasalis*	Fork-marked Sand Snake	Least Concern (SARCA 2014)	1	1900

34	Lamprophiidae	*Psammophylax rhombeatus*	Spotted Grass Snake	Least Concern (SARCA 2014)	9	2013
35	Lamprophiidae	*Pseudaspis cana*	Mole Snake	Least Concern (SARCA 2014)	2	1900
36	Leptotyphlopidae	*Leptotyphlops distanti*	Distant's Thread Snake	Least Concern (SARCA 2014)	2	1900
37	Leptotyphlopidae	*Leptotyphlops scutifrons scutifrons*	Peters' Thread Snake	Least Concern (SARCA 2014)	3	1900
38	Pythonidae	*Python natalensis*	Southern African Python	Least Concern (SARCA 2014)	1	2005
39	Scincidae	*Panaspis wahlbergi*	Wahlberg's Snake-eyed Skink	Least Concern (SARCA 2014)	6	2019
40	Scincidae	*Trachylepis capensis*	Cape Skink	Least Concern (SARCA 2014)	16	2017
41	Scincidae	*Trachylepis punctatissima*	Speckled Rock Skink	Least Concern (SARCA 2014)	19	2020
42	Scincidae	*Trachylepis varia sensu lato*	Common Variable Skink Complex	Least Concern (SARCA 2014)	12	2019
43	Testudinidae	*Kinixys lobatsiana*	Lobatse Hinged Tortoise	Least Concern (SARCA 2014)	2	2015
44	Testudinidae	*Stigmochelys pardalis*	Leopard Tortoise	Least Concern (SARCA 2014)	24	2019
45	Typhlopidae	*Afrotyphlops bibronii*	Bibron's Blind Snake	Least Concern (SARCA 2014)	10	2013
46	Typhlopidae	*Rhinotyphlops lalandei*	Delalande's Beaked Blind Snake	Least Concern (SARCA 2014)	1	1900
47	Viperidae	*Bitis arietans arietans*	Puff Adder	Least Concern (SARCA 2014)	2	2013
48	Viperidae	*Causus rhombeatus*	Rhombic Night Adder	Least Concern (SARCA 2014)	8	2010

11.4 APPENDIX D: EXPECTED AMPHIBIAN LIST

Amphibian species to potentially occur within the study area based on Virtual Museum Amphibian Map records. Please note that the list of amphibian species are only based on previous recordings and do not include any other non-recording amphibian species that might occur on sight. Species of conservation concern is highlighted in red.

#	Family	Scientific name	Common Name	Red List Category	# Records	Last Recorded
1	Bufonidae	*Schismaderma carens*	Red Toad	Least Concern	43	2017
2	Bufonidae	*Sclerophrys capensis*	Raucous Toad	Least Concern	3	2014
3	Bufonidae	*Sclerophrys gutturalis*	Guttural Toad	Least Concern	35	2016
4	Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	Least Concern	5	2018
5	Phrynobatrachidae	*Phrynobatrachus natalensis*	Snoring Puddle Frog	Least Concern	1	1973
6	Pipidae	*Xenopus laevis*	Common Platanna	Least Concern	9	2018
7	Ptychadenidae	*Ptychadena anchietae*	Plain Grass Frog	Least Concern	1	2002
9	Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	Least Concern (2017)	28	2019
10	Pyxicephalidae	*Amietia fuscigula*	Cape River Frog	Least Concern (2017)	1	2013
11	Pyxicephalidae	*Cacosternum boettgeri*	Common Caco	Least Concern (2013)	5	2000
12	Pyxicephalidae	*Pyxicephalus adspersus*	Giant Bull Frog	Least Concern	6	2014
13	Pyxicephalidae	*Strongylopus fasciatus*	Striped Stream Frog	Least Concern	8	1976
14	Pyxicephalidae	*Tomopterna cryptotis*	Tremelo Sand Frog	Least Concern	9	2000
15	Pyxicephalidae	*Tomopterna natalensis*	Natal Sand Frog	Least Concern	7	2000

11.5 APPENDIX E: EXPECTED INVERTEBRATE (LEPIDOPTERA-BUTTERFLIES)

#	Family	Scientific name	Common name	Conservation Status	Number of Records	Last recorded
1	LYCAENIDAE	Actizera lucida	Rayed blue	Least Concern (SABCA 2013)	31	2018-02-27
2	LYCAENIDAE	Alaena amazoula ochroma	Yellow zulu	Least Concern (SABCA 2013)	7	1974-01-05
3	LYCAENIDAE	Aloeides aranda	Yellow russet	Least Concern (SABCA 2013)	115	2017-08-29
4	LYCAENIDAE	Aloeides dentatis dentatis	Roodepoort toothed russet	Endangered (SABCA 2013)	224	2009-01-08
5	LYCAENIDAE	Aloeides henningi	Hillside russet	Least Concern (SABCA 2013)	122	2016-01-31
6	LYCAENIDAE	Aloeides molomo coalescens	Mottled russet		2	1949-10-19
7	LYCAENIDAE	Aloeides molomo molomo	Mottled russet	Least Concern (SABCA 2013)	55	2009-01-08
8	LYCAENIDAE	Aloeides taikosama	Dusky russet	Least Concern (SABCA 2013)	98	2019-01-22
9	LYCAENIDAE	Aloeides trimeni trimeni	Brown russet	Least Concern (SABCA 2013)	127	2019-09-20
10	LYCAENIDAE	Anthene amarah amarah	Black-striped ciliate blue	Least Concern (SABCA 2013)	23	2019-03-05
11	LYCAENIDAE	Anthene definita definita	Steel-blue-ciliate blue	Least Concern (SABCA 2013)	30	2019-10-19
12	LYCAENIDAE	Anthene livida livida	Pale ciliate blue	Least Concern (SABCA 2013)	6	2020-04-16
13	LYCAENIDAE	Anthene princeps	Lebombo ciliate blue	Least Concern (SABCA 2013)	2	2009-01-08

14	LYCAENIDAE	Axiocerses amanga amanga	Bush scarlet	Least Concern (SABCA 2013)	2	2004-05-01
15	LYCAENIDAE	Axiocerses coalescens	Black-tipped scarlet	Least Concern (SABCA 2013)	2	1981-12-20
16	LYCAENIDAE	Axiocerses tjoane tjoane	Eastern scarlet	Least Concern (SABCA 2013)	70	2019-03-02
17	LYCAENIDAE	Azanus jesous	Topaz babul blue	Least Concern (SABCA 2013)	46	2020-04-01
18	LYCAENIDAE	Azanus moriqua	Black-bordered babul blue	Least Concern (SABCA 2013)	14	2020-02-15
19	LYCAENIDAE	Azanus natalensis	Natal babul blue	Least Concern (SABCA 2013)	10	2020-02-15
20	LYCAENIDAE	Azanus ubaldus	Velvet-spotted babul blue	Least Concern (SABCA 2013)	35	2019-11-20
21	LYCAENIDAE	Cacyreus fracta fracta	Water geranium bronze	Least Concern (SABCA 2013)	1	1978-08-19
22	LYCAENIDAE	Cacyreus lingeus	Bush bronze	Least Concern (SABCA 2013)	3	1979-11-18
23	LYCAENIDAE	Cacyreus marshalli	Common geranium bronze	Least Concern (SABCA 2013)	66	2020-04-07
24	LYCAENIDAE	Cacyreus virilis	Mocker bronze	Least Concern (SABCA 2013)	38	2017-07-25
25	LYCAENIDAE	Capys disjunctus	Russet protea	Least Concern (SABCA 2013)	88	2009-01-08
26	LYCAENIDAE	Chilades trochylus	Grass jewel blue	Least Concern (SABCA 2013)	47	2019-01-19
27	LYCAENIDAE	Cigaritis ella	Ella's silverline	Least Concern (SABCA 2013)	13	2015-05-09

28	LYCAENIDAE	Cigaritis mozambica	Mozambique silverline	Least Concern (SABCA 2013)	36	2015-03-28
29	LYCAENIDAE	Cigaritis natalensis	Natal silverline	Least Concern (SABCA 2013)	24	2019-09-17
30	LYCAENIDAE	Cigaritis phanes	Silvery silverline	Least Concern (SABCA 2013)	1	2003-07-03
31	LYCAENIDAE	Crudaria leroma	Silver-spotted grey	Least Concern (SABCA 2013)	2	1981-10-17
32	LYCAENIDAE	Cupidopsis cissus cissus	Meadow blue	Least Concern (SABCA 2013)	32	2015-01-03
33	LYCAENIDAE	Cupidopsis jobates jobates	Tailed meadow blue	Least Concern (SABCA 2013)	18	2010-01-09
34	LYCAENIDAE	Deudorix antalus	Brown playboy	Least Concern (SABCA 2013)	12	2016-04-26
35	LYCAENIDAE	Eicochrysops messapus mahallakoaena	Cupreous ash blue	Least Concern (SABCA 2013)	55	2020-02-22
36	LYCAENIDAE	Euchrysops dolorosa	Sabie smoky blue	Least Concern (SABCA 2013)	45	2019-09-20
37	LYCAENIDAE	Euchrysops malathana	Grey smoky blue	Least Concern (SABCA 2013)	2	1975-01-12
38	LYCAENIDAE	Euchrysops subpallida	Ashen smoky blue	Least Concern (SABCA 2013)	5	1970-10-11
39	LYCAENIDAE	Hypolycaena philippus philippus	Purple-brown hairstreak	Least Concern (SABCA 2013)	1	1900-06-15
40	LYCAENIDAE	Iolaus trimeni	Protea sapphire	Least Concern (SABCA 2013)	95	2016-05-22
41	LYCAENIDAE	Lachnocnema bibulus	Common woolly legs	Least Concern (SABCA 2013)	4	2003-04-20

42	LYCAENIDAE	Lachnocnema durbani	Grassland woolly legs	Least Concern (SABCA 2013)	25	2019-09-20
43	LYCAENIDAE	Lampides boeticus	Pea blue	Least Concern (SABCA 2013)	94	2020-04-21
44	LYCAENIDAE	Lepidochrysops glauca	Silvery giant cupid	Least Concern (SABCA 2013)	2	1981-11-14
45	LYCAENIDAE	Lepidochrysops ignota	Zulu giant cupid	Least Concern (SABCA 2013)	53	2009-01-08
46	LYCAENIDAE	Lepidochrysops ketsi ketsi	Ketsi giant cupid	Least Concern (SABCA 2013)	9	1967-01-07
47	LYCAENIDAE	Lepidochrysops ortygia	Koppie giant cupid	Least Concern (SABCA 2013)	78	1988-01-07
48	LYCAENIDAE	Lepidochrysops patricia	Patrician giant cupid	Least Concern (SABCA 2013)	39	2009-01-08
49	LYCAENIDAE	Lepidochrysops plebeia plebeia	Twin-spot giant cupid	Least Concern (SABCA 2013)	26	2018-02-20
50	LYCAENIDAE	Lepidochrysops ruthica	Ruth's giant cupid		1	1990-09-25
51	LYCAENIDAE	Leptomyrina henningi henningi	Plain black-eye	Least Concern (SABCA 2013)	63	2018-12-05
52	LYCAENIDAE	Leptotes brevidentatus	Short-toothed zebra blue	Least Concern (SABCA 2013)	11	1972-04-30
53	LYCAENIDAE	Leptotes jeanneli	Jeannel's zebra blue	Least Concern (SABCA 2013)	1	1970-11-04
54	LYCAENIDAE	Leptotes pirithous pirithous	Common zebra blue	Least Concern (SABCA 2013)	56	2012-11-02
55	LYCAENIDAE	Lycaena clarki	Eastern sorrel copper	Least Concern (SABCA 2013)	14	1975-11-20
56	LYCAENIDAE	Myrina dermaptera nyassae	Lesser fig tree blue		7	2002-09-01

57	LYCAENIDAE	Myrina silenus ficedula	Common fig tree blue	Least Concern (SABCA 2013)	99	2018-07-24
58	LYCAENIDAE	Oraidium barberae	Dwarf blue	Least Concern (SABCA 2013)	1	2010-06-19
59	LYCAENIDAE	Pseudonacaduba sichela sichela	Dusky line blue	Least Concern (SABCA 2013)	7	2018-11-03
60	LYCAENIDAE	Tarucus sybaris sybaris	Dotted pierrot	Least Concern (SABCA 2013)	67	2020-02-15
61	LYCAENIDAE	Tuxentius melaena melaena	Black pie	Least Concern (SABCA 2013)	15	2020-03-31
62	LYCAENIDAE	Uranothauma nubifer nubifer	Black heart	Least Concern (SABCA 2013)	50	2019-10-26
63	LYCAENIDAE	Deudorix dinochares	Apricot playboy	Least Concern (SABCA 2013)	5	2015-05-30
64	LYCAENIDAE	Zintha hintza hintza	Hintza pierrot	Least Concern (SABCA 2013)	19	2019-01-22
65	LYCAENIDAE	Zizeeria knysna knysna	African grass blue	Least Concern (SABCA 2013)	136	2020-05-23
66	LYCAENIDAE	Zizina otis antanossa	African clover blue	Least Concern (SABCA 2013)	1	1900-06-15
67	LYCAENIDAE	Zizula hylax	Tiny grass blue	Least Concern (SABCA 2013)	54	2019-01-08

11.6 APPENDIX F: PROPOSED RESCUE AND RELOCATION PLAN FOR THE RED DATA LISTED PLANT SPECIES, *HYPOXIS HEMEROCALLIDEA* AND *BOOPHONE DISTICHA* FOUND ON THE PROPOSED DEVELOPMENT SITE

General information

Hypoxis hemerocallidea falls within the botanical family Hypoxidaceae. The members of this family are fairly small to medium-sized herbaceous plants, with grass-like leaves and an invisible stem which is modified into a corm or rhizome (a rounded underground storage organ resembling a bulb). The flowers are borne on leafless shoots known as scrapes and are trimerous (arranged in whorls of three) and radically symmetric. The plant is easily recognizable by its yellow star-shaped flowers and strap-like leaves. *Hypoxis hemerocallidea* favours grassland, preferring full sunlight, although it is known to occur in other habitat types. The leaves of *Hypoxis hemerocallidea* are distinctly three-ranked and arching and are densely covered with hairs.

Hypoxis hemerocallidea is one of the most commonly used species in the traditional medicinal plant trade and is currently also used in primary health care as an immune booster for patients with HIV/AIDS. The rootstock is used in the treatment of urinary infections, heart weakness, internal tumours and nervous disorders. The plant is also currently used to alleviate many immune related ailments, such as colds, flu, arthritis tumours and cancers (www.plantzafrica.com).

As *Hypoxis hemerocallidea* is a relatively hardy bulbous plant, with a shallow root structure, it is suitable for relocation to areas of similar habitat. A “rescue and relocation” plan is therefore proposed for these individuals. This is perceived to be a viable mitigation measure for ensuring the ongoing survival of this species in the area, as an area is already designated for conservation on the site.

Boophone Disticha falls within the botanical family Amaryllidaceae. This family consists mostly of bulbous plants, which occurs naturally throughout the tropics and warm temperate regions of the world. All Amaryllidaceae are perennials and apart from *Clivia, Cryptostephanus* and *Scadoxus,* which have rhizomes, the majority have bulbous storage organs. While growing, the bulb is kept sufficiently deep below ground by special roots that lengthen and contract. Most often the leaves are strap-shaped and smooth but occasionally they have unusual shapes, markings and coverings. Amaryllidaceae usually have numerous flowers held in an umbrella-like cluster at the end of a leafless stem, called a scape (www.plantzafrica.com).

Boophone disticha is a deciduous bulbous plant with a thick covering of dry scales above the ground. The large, round heads have short stems and appear to grow directly from the bulb, almost at ground level. The colour of the flowers varies from shades of pink to red and are sweetly scented (July to Oct.). The pedicels (flower stalks) elongate after flowering to form a large seed-head. This breaks off at the top of the scape (stalk) and tumbles across the veld, dispersing the seed. The greyish-green leaves are erect, arranged in

a conspicuous fan and are usually produced after flowering. This spring-flowering species will flower even if it does not receive any water in winter (www.plantzafrica.com).

Boophone disticha has many medicinal uses. Traditional healers use it to treat pain and wounds. Parts of the plant are used by certain African tribes and by some Europeans to cure various ailments: the outer covering of the bulb is applied to boils and abscesses; fresh leaves are used to stop bleeding of wounds (www.plantzafrica.com).

The plant thrives in full sun in well-drained, sandy soil and in rocky areas. It should be planted in a protected area, although it can stand drought it does not like frost. The bulb should be planted in such a way that the neck and part of the bulb show above the ground. The plants seem to grow equally well in well-drained, sandy soil and in hard ground, but they take a long time to flower after being moved. The bulbs do not produce flowers until they are quite large (www.plantzafrica.com).

The “rescue and relocation” plan must be undertaken prior to the onset of the construction phase of the development and must be completed by an appropriate service provider.

Proposed “Rescue and Relocation” Plan

Step 1:
An appropriate service provider must be appointed to conduct and manage the operation.

Step 2:
Each individual plant located outside the areas of medium ecological sensitivity needs to be located, correctly identified (*Hypoxis hemerocallidea* is sometimes confused with other species of Hypoxis, such as *Hypoxis iridifolia*) and marked, using a brightly coloured marker to ensure visual location later.

Step 3:
To safely remove each individual plant, minimal damage to the corm must be ensured. The hole must be dug approximately 30 cm from the base of the plant and at least 30 cm deep to ensure minimal damage. Removal of the plant from its site should be done with care, pushing the plant up from the corm/rootstock. The plant should not be pulled from the soil using the leaves.

Step 4:
Once removed, the plants must be placed in appropriately sized propagating bags (dependent on each individual plant), utilising soil directly from the site. Should the soil prove to be of poor quality, organic fertilizer or compost must be added to the soil. These plants must be cared for until completion of the construction phase of the development. As these plants can tolerate moderate bouts of water stress, caution must be taken not to over-water or drown the individuals. Over-watering would also cause leeching of the soil, reducing nutrients available to the plants.

Step 5:

Once the construction phase is complete, the plants must be relocated on the property. Plants can either be transferred to the existing *Hypoxis hemerocallidea/ Boophone disticha* community or may be incorporated into the cultivated gardens of the development. Should plants be transferred to the existing community, caution must be taken not to damage other species of plant in the area. Holes must be dug prior to transfer of plants and must be large enough to ensure plants do not become dislodged during heavy rainfall.