ECOLOGICAL AND WETLAND BASELINE AND IMPACT ASSESSMENT REPORT FOR THE PROPOSED KOOKFONTEIN PROSPECTING RIGHT APPLICATION

Vereeniging, Gauteng

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CLIENT

Prepared by:

The Biodiversity Company

Cell: +27 81 319 1225

Fax: +27 86 527 1965

info@thebiodiversitycompany.com

www.thebiodiversitycompany

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1 Introduction

The Biodiversity Company was commissioned to conduct a Biodiversity and Wetland study for the proposed Kookfontein prospecting application. The project area includes selected portions on the Kookfontein 545 IQ, Damfontein 541 IQ Smaldeel 542 IQ, Waldrift 599 IQ and Vlakfontein 546 IQ farms. This covers a total area of 3099.966 Ha. The minerals that will be prospected for are Sand (general), Clay (general) and Silica sand (general and silica).The project area can be found in the Emfuleni and Midvaal Local Municipalities of the Seibeng district, approximately 7 km South of Meyerton and 10 km North of Vereeniging.

The purpose of the specialist studies is to provide relevant input into the EIA process and to provide a report for the proposed activities associated with the prospecting. This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making, as to the ecological viability of the proposed project.

2 Document Structure

The table below provides the NEMA (2014) Requirements for Ecological Assessments, and also the relevant sections in the reports where these requirements are addressed (Table 2-1).

Table 2-1 Report Structure

Environmental Regulation	Description	Section in Report
NEMA EIA Regulations 2014 (as amended)		
Appendix 6 (1)(a):	Details of – (I) The specialist who prepared the report; and (II) The expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 3
Appendix 6 (1)(b):	A declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix A
Appendix 6 (1)(c):	An indication of the scope of, and the purpose for which, the report was prepared;	Section 4
Appendix 6 (1)(cA):	An indication of the quality and age of base data used for the specialist report;	Section 8
Appendix 6 (1)(cB):	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 12
Appendix 6 (1)(d):	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 10
Appendix 6 (1)(e):	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 8
Appendix 6(1)(f):	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 11
Appendix 6(1)(g):	An identification of any areas to be avoided, including buffers;	Section 11 and 12
Appendix 6(1)(h):	A 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 11
Appendix 6(1)(i):	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 7
Appendix 6(1)(j):	A description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 10
Appendix 6(1)(k):	Any mitigation measures for inclusion in the empr;	Section 13
Appendix 6(1)(l):	Any conditions for inclusion in the environmental authorisation;	Section 15
Appendix 6(1)(m):	Any monitoring requirements for inclusion in the empr or environmental authorisation;	Section 13
Appendix 6(1)(n):	A reasoned opinion- (i) whether the proposed activity, activities or portions thereof should be authorised; (ia) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities 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;	Section 14 & Section 15
Appendix 6(1)(o):	A description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
Appendix 6(1)(p):	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
Appendix 6(1)(q):	Any other information requested by the competent authority.	N/A

3 Specialist Details

Report Name	**ECOLOGICAL AND WETLAND BASELINE AND IMPACT ASSESSMENT REPORT FOR THE PROPOSED KOOKFONTEIN PROSPECTING RIGHT APPLICATION COLLIERY**
Submitted to	EIMS ENVIRONMENTAL IMPACT MANAGEMENT SERVICES
Report Writer	**Lindi Steyn**  Lindi Steyn has a PhD in Biodiversity and Conservation from the University of Johannesburg. She specialises in avifauna and has worked in this specialisation since 2013.
Report Writer	**Martinus Erasmus**  Martinus Erasmus obtained his B-Tech degree in Nature Conservation in 2016 at the Tshwane University of Technology. Martinus has been conducting EIAs, basic assessments and assisting specialists in field during his studies since 2015.
Report Writer / Reviewer	**Andrew Husted**  Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

4 Terms of Reference

The Terms of Reference (ToR) included the following:

- Description of the baseline receiving environment specific to the field of expertise (general surrounding area as well as site specific environment);
- Identification and description of any sensitive receptors in terms of relevant specialist disciplines (biodiversity and wetland) that occur in the project area, and the manner in which these sensitive receptors may be affected by the activity;
- Identify 'significant' ecological, botanical and faunal features within the proposed project areas;
- Identification of conservation significant habitats around the project area which might be impacted;
- Screening to identify any critical issues (potential fatal flaws) that may result in project delays or rejection of the application;
- Provide a map to identify sensitive receptors in the project area, based on available maps and database information;
- The delineation, classification and assessment of wetlands within 500 m of the project area;
- Implementation of WET-Health for determination of Present Ecological State (PES) of wetland areas;
- Implementation of WET-EcoServices for determination of ecosystem services for the wetland areas;
- Determine the Environmental Importance and Sensitivity (EIS) of wetland systems;
- Conduct risk assessments relevant to the proposed activity;
- Impact assessment, mitigation and rehabilitation measures to prevent or reduce the possible impacts as per the study.

5 Project Description

The Kookfontein prospecting proposed the drilling of 71 holes. As stated in the Prospecting Work Programme (Nimbargo Resources (pty) Ltd, 2019), the environmental sensitivity has not been taken into account for the location of the drill holes and will be assessed after all environmental studies has been concluded. The holes will be drilled at 500 m intervals, the depths are expected to vary between 100 m and 200 m. The dominant land uses surrounding the project area includes watercourses, cultivation, urban sprawls and mining (Figure 5-1). A locality map of the project area is shown in Figure 5-2, while the current proposed drill sites are shown in Figure 5-3.

Figure 5-1 Land cover associated with the project area (DEA, 2018)

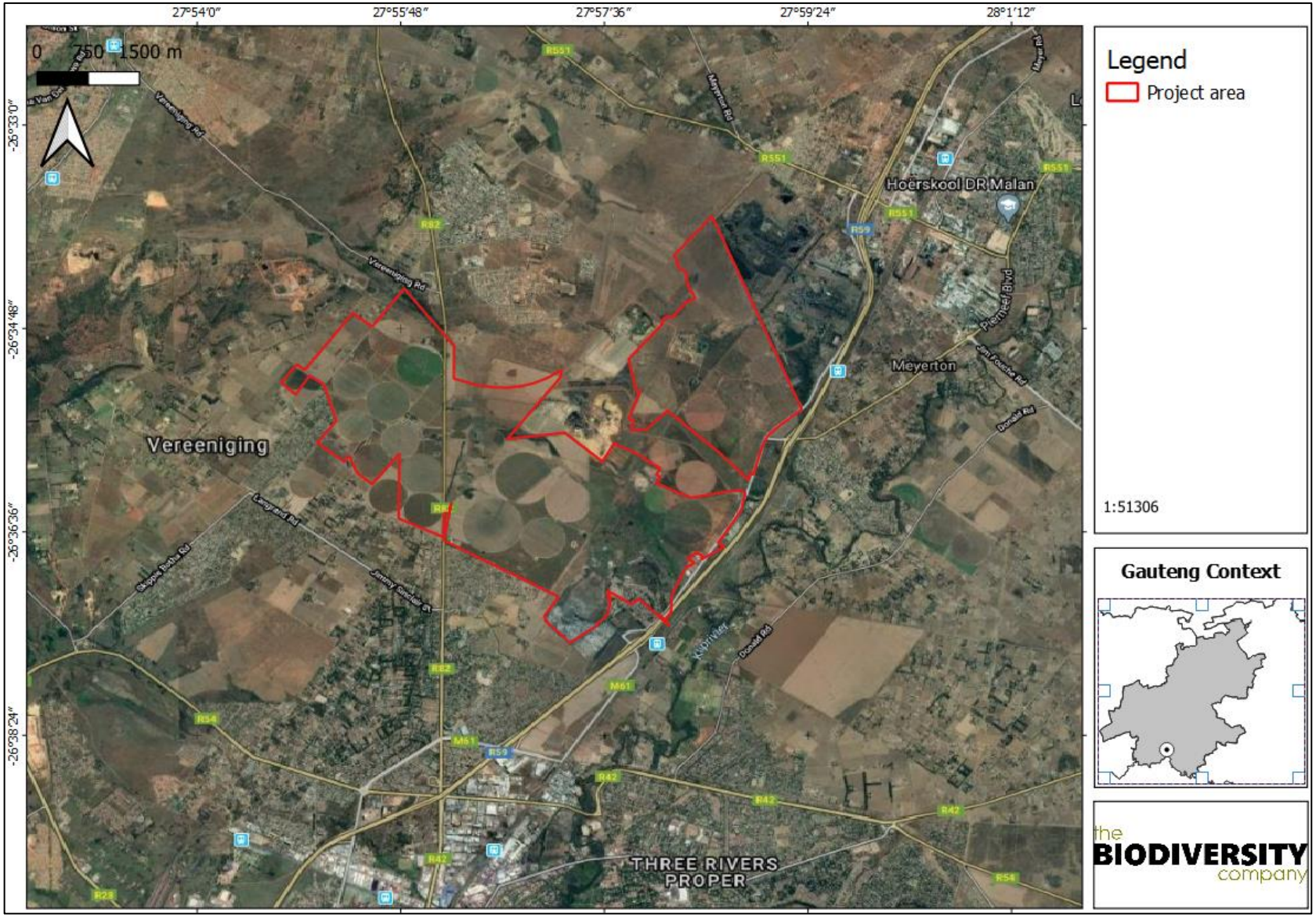


Figure 5-2 Locality of the project area

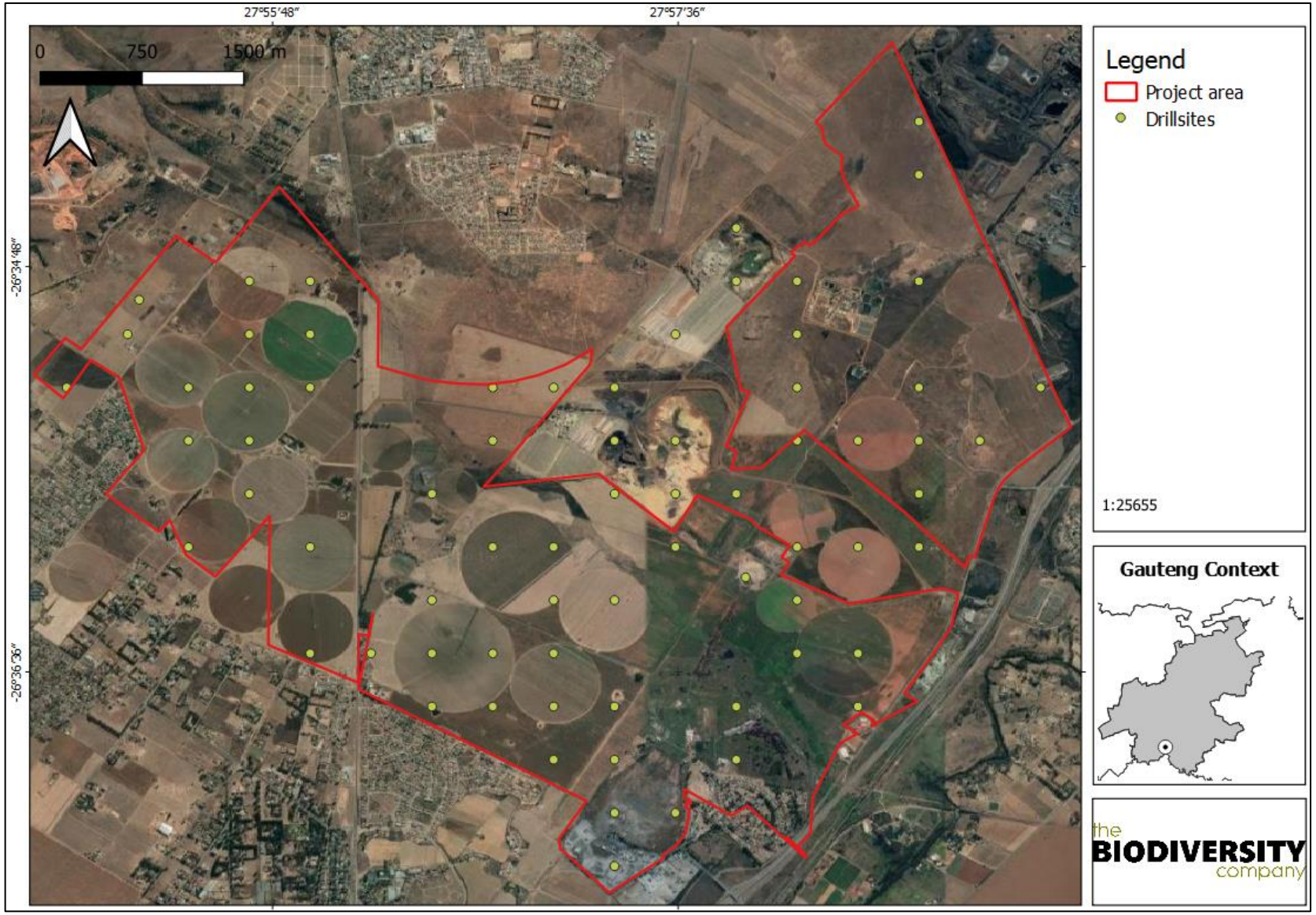


Figure 5-3 Proposed locations of the drill sites.

6 Key Legislative Requirements

The legislation, policies and guidelines listed below are applicable to the current project in terms of biodiversity and ecological support systems. The list below, although extensive, is not exhaustive and other legislation, policies and guidelines may apply in addition to those listed below (Table 6-1).

Table 6-1 A list of key legislative requirements relevant to biodiversity and conservation in Gauteng

INTERNATIONAL	Convention on Biological Diversity (CBD, 1993)
	The United Nations Framework Convention on Climate Change (UNFCC,1994)
	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
	The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
NATIONAL	Constitution of the Republic of South Africa (Act No. 108 of 2006)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management Biodiversity Act (Act No. 10 of 2004)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989)
	National Environmental Management Air Quality Act (No. 39 of 2004)
	National Protected Areas Expansion Strategy (NPAES)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Water Act, 1998 (Act 36 of 1998)
	National Freshwater Ecosystem Priority Areas (NFEPA's)
	National Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	National Heritage Resources Act, 1999 (Act 25 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations, 2014
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
PROVINCIAL	GDARD Requirements for Biodiversity Assessments (Version 3, 2014a)
	Gauteng Department of Agriculture and Rural Development (GDARD): Checklist for Biodiversity Assessments
	GDARD Mining and Environmental Impact Guide

7 Limitations

The following limitations should be noted for the study:

- Only a single season survey was conducted, this would constitute an early dry season survey;
- The wetlands within the PRA were the focus for the study, these systems were *ground-truth*ed and further assessed. Wetland areas beyond the PRA but within the 500 m regulated area were only considered at a desktop level;
- Access to some farm portions was restricted, these areas were only assessed at a desktop level;
- The areas within (and especially surrounding drainage lines) the MRA have significantly been modified. This modification could lead to inaccuracies pertaining to delineations and identification of wetland indicators. The majority of wetland areas were covered in tailing material/silt which renders the dominant soil form in such an instance as a Witbank soil form. The latter mentioned according to (DWAF, 2005) is classified as a terrestrial soil as opposed to hydromorphic soils;
- Some the delineated wetlands are characterised by artificial water inputs, which provides difficulties in identifying hydromorphic soils. Due to the extent of agricultural activities in the area, compounded by efforts to divert and drain areas the key consideration was *in situ* wetland identification and assessment; and
- The GPS used for water resource delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side

8 Methodologies

8.1 Terrestrial Assessment

8.1.1 Geographic Information Systems (GIS) Mapping

Existing data layers were incorporated into GIS software to establish how the proposed project might interact with any ecologically important entities. Emphasis was placed around the following spatial datasets:

- National Biodiversity Assessment (NBA) (Skowno *et al*., 2019);
- Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018);
- Gauteng Conservation Plan (2013);
- Department of Environmental Affairs (DEA) National Landcover 2015 (SANBI, 2018); and
- Mining and Biodiversity Guideline (SANBI & SAMBF 2012).

Brief descriptions of the standardised methodologies applied in each of the specialist disciplines are provided below. More detailed descriptions of survey methodologies are available upon request.

8.1.2 Botanical Assessment

The botanical study encompassed an assessment of all the vegetation units and habitat types within the project area. The focus was on an ecological assessment of habitat types as well as identification of any Red Data species within the known distribution of the project area. The South African National Biodiversity Institute (SANBI) provides an electronic database system, namely the Botanical Database of Southern Africa (BODATSA), to access distribution records on southern African plants. This is a new database which replaces the old Plants of Southern Africa (POSA) database. The POSA database provided distribution data of flora at the quarter degree square (QDS) resolution. The Red List of South African Plants website (SANBI, 2017) was utilized to provide the most current account of the national status of flora. Relevant field guides and texts consulted for identification purposes in the field during the surveys included the following:

- Field Guide to the Wild Flowers of the Highveld (Van Wyk & Malan, 1997);
- A field guide to Wild flowers (Pooley, 1998);
- Guide to Grasses of Southern Africa (Van Oudtshoorn, 1999);
- Orchids of South Africa (Johnson & Bytebier, 2015);
- Guide to the Aloes of South Africa (Van Wyk & Smith, 2014);
- Mesembs of the World (Smith *et al.,* 1998);
- Medicinal Plants of South Africa (Van Wyk *et al.,* 2013);
- Freshwater Life: A field guide to the plants and animals of southern Africa (Griffiths & Day, 2016); and
- Identification guide to southern African grasses. An identification manual with keys, descriptions and distributions (Fish *et al.,* 2015).

Additional information regarding ecosystems, vegetation types, and species of conservation concern (SCC) included the following sources:

- The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2012); and
- Red List of South African Plants (Raimondo *et al.,* 2009; SANBI, 2016).

The field work methodology included the following survey techniques:

- Timed meanders;
- Sensitivity analysis based on structural and species diversity; and
- Identification of floral red-data species.

8.1.3 Floristic Analysis

The wet season fieldwork and sample sites were placed within targeted areas (i.e. target sites) perceived as ecologically sensitive based on the preliminary interpretation of satellite imagery (Google Corporation) and GIS analysis (which included the latest applicable biodiversity

datasets) available prior to the fieldwork. The focus of the fieldwork was therefore to maximise coverage and navigate to each target site in the field in order to perform a rapid vegetation and ecological assessment at each sample site. Emphasis was placed on sensitive habitats, especially those overlapping with proposed propecting areas.

Homogenous vegetation units were subjectively identified using satelite imagery and existing land cover maps. The floristic diversity and search for flora SCC were conducted through timed meanders within representative habitat units delineated during the scoping fieldwork. Emphasis was placed mostly on sensitive habitats overlapping with the proposed project areas.

The timed random meander method is a highly efficient method for conducting floristic analysis, specifically in detecting flora SCC and maximising floristic coverage. In addition, the method is time and cost effective and highly suited for compiling flora species lists and therefore gives a rapid indication of flora diversity. The timed meander search was performed based on the original technique described by Goff *et al.* (1982). Suitable habitat for SCC were identified according to Raimondo *et al.* (2009) and targeted as part of the timed meanders.

At each sample site notes were made regarding current impacts (e.g. livestock grazing, erosion etc.), subjective recording of dominant vegetation species and any sensitive features (e.g. wetlands, outcrops etc.). In addition, opportunistic observations were made while navigating through the project area.

8.1.4 Faunal Assessment (Mammals & Avifauna)

The faunal desktop assessment included the following:

- Compilation of expected species lists;
- Identification of any Red Data or species of conservation concern (SCC) potentially occurring in the area; and
- Emphasis was placed on the probability of occurrence of species of provincial, national and international conservation importance.

Mammal distribution data were obtained from the following information sources:

- The Mammals of the Southern African Subregion (Skinner & Chimimba, 2005);
- Bats of Southern and Central Africa (Monadjem *et al.,* 2010);
- The 2016 Red List of Mammals of South Africa, Lesotho and Swaziland (www.ewt.org.za) (EWT, 2016); and
- Animal Demography Unit (ADU) - MammalMap Category (MammalMap, 2019) (mammalmap.adu.org.za).

The field survey component of the study utilised a variety of sampling techniques including, but not limited to, the following:

- Camera trapping;
- Visual observations;
- Small mammal trapping;

- Identification of tracks and signs; and
- Utilization of local knowledge.

Site selection for trapping focussed on the representative habitats within the project area. Sites were selected on the basis of GIS mapping and Google Earth imagery and then final selection was confirmed through ground truthing during the surveys. Habitat types sampled included pristine, disturbed and semi-disturbed zones, drainage lines, wetlands and rocky ridges.

8.1.5 Herpetology (Reptiles & Amphibians)

A herpetofauna desktop assessment of the possible species in the area was done and attention was paid to the SCCs, sources used included the IUCN (2017) and ADU (2019).

Herpetofauna distributional data was obtained from the following information sources:

- South African Reptile Conservation Assessment (SARCA) (sarca.adu.org);
- A Guide to the Reptiles of Southern Africa (Alexander & Marais, 2007);
- Field guide to Snakes and other Reptiles of Southern Africa (Branch, 1998);
- Atlas and Red list of Reptiles of South Africa, Lesotho and Swaziland (Bates *et al.,* 2014);
- A Complete Guide to the Frogs of Southern Africa (du Preez & Carruthers, 2009);
- Animal Demography Unit (ADU) - FrogMAP (frogmap.adu.org.za);
- Atlas and Red Data Book of Frogs of South Africa, Lesotho and Swaziland (Mintner *et al.,* 2004); and
- Ensuring a future for South Africa's frogs (Measey, 2011).

A herpetofauna field assessment were conducted in each habitat or vegetation type within the project area, as identified from the desktop study, with a focus on those areas which will be most impacted by the proposed development (i.e. the infrastructure development and waste dumping areas).

The herpetological field survey comprised the following techniques:

- Hand searching is used for reptile species that shelter in or under particular habitats. Visual searches, typically undertaken for species who's activities occur on surfaces or for species that are difficult to detect by hand-searches or trap sampling.

8.2 Wetland Assessment

The following information sources were considered for the desktop assessment;

- Aerial imagery (Google Earth Pro);
- Land Type Data (Land Type Survey Staff, 1972 - 2006);
- South African Inventory of Inland Aquatic Ecosystems (Van Deventer *et al*., 2019);
- The National Freshwater Ecosystem Priority Areas (Nel *et al*., 2011); and
- Contour data (5m).

8.2.1 Wetland Identification and Mapping

The National Wetland Classification Systems (NWCS) developed by the South African National Biodiversity Institute (SANBI) was considered for this study. This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels. In addition, the method also includes the assessment of structural features at the lower levels of classification (Ollis *et al.,* 2013).

The wetland areas are delineated in accordance with the DWAF (2005) guidelines, a cross section is presented in *Figure 8-1*. The outer edges of the wetland areas were identified by considering the following four specific indicators:

- The Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur;
- The Soil Form Indicator identifies the soil forms, as defined by the Soil Classification Working Group (1991), which are associated with prolonged and frequent saturation.
- The soil forms (types of soil) found in the landscape were identified using the South African soil classification system namely; Soil Classification: A Taxonomic System for South Africa (Soil Classification Working Group, 1991);
- The Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation; and
- The Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.

Vegetation is used as the primary wetland indicator. However, in practise the soil wetness indicator tends to be the most important, and the other three indicators are used in a confirmatory role.

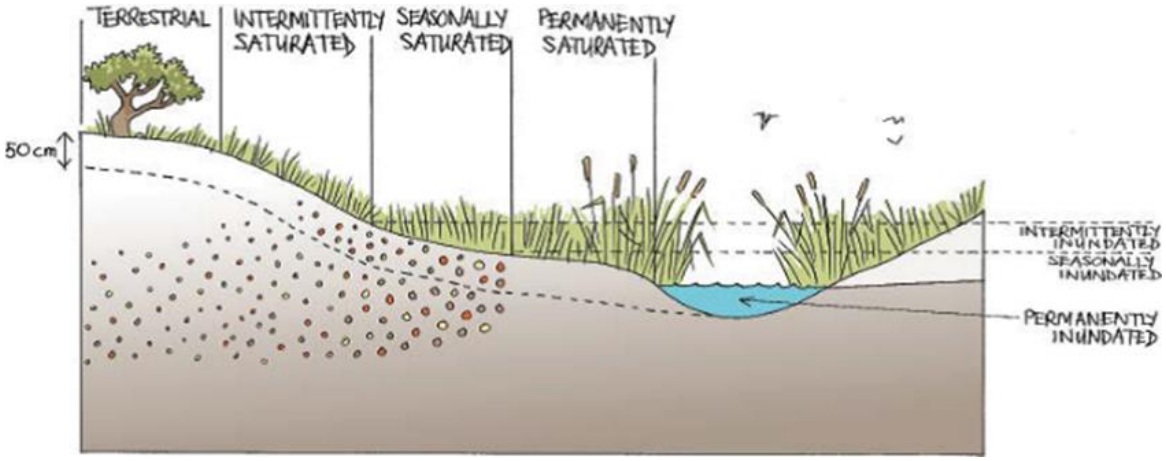


Figure 8-1 Cross section through a wetland, indicating how the soil wetness and vegetation indicators change (Ollis *et al.,* 2013).

8.2.2 Present Ecological Status (PES)

The overall approach is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present Ecological Status (PES)

score. This takes the form of assessing the spatial extent of impact of individual activities/occurrences and then separately assessing the intensity of impact of each activity in the affected area. The extent and intensity are then combined to determine an overall magnitude of impact. The Present State categories are provided in Table 8-1.

Table 8-1 The Present Ecological Status categories (Macfarlane *et al.,* 2009)

Impact Category	Description	Impact Score Range	PES
None	**Unmodified, natural**	**0 to 0.9**	**A**
Small	Largely Natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1.0 to 1.9	B
Moderate	Moderately Modified. A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	2.0 to 3.9	C
Large	Largely Modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4.0 to 5.9	D
Serious	Seriously Modified. The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognizable.	6.0 to 7.9	E
Critical	Critical Modification. The modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8.0 to 10	F

8.2.3 Ecological Importance and Sensitivity (EIS)

The method used for the EIS determination was adapted from the method as provided by DWS (1999) for floodplains. The method takes into consideration PES scores obtained for WET-Health as well as function and service provision to enable the assessor to determine the most representative EIS category for the wetland feature or group being assessed. A series of determinants for EIS are assessed on a scale of 0 to 4, where 0 indicates no importance and 4 indicates very high importance. The mean of the determinants is used to assign the EIS category as listed in Table 8-2 (Rountree *et al*., 1999).

Table 8-2 Description of Ecological Importance and Sensitivity categories

EIS Category	Range of Mean	Recommended Ecological Management Class
Very High	3.1 to 4.0	**A**
High	2.1 to 3.0	**B**
Moderate	1.1 to 2.0	**C**
Low Marginal	< 1.0	**D**

8.2.4 Ecological Classification and Description

The National Wetland Classification Systems (NWCS) developed by the South African National Biodiversity Institute (SANBI) will be considered for this study. This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels, and also then includes structural features at the lower levels of classification (Ollis *et al*., 2013).

8.2.5 Determining Buffer Requirements

The "Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries" (Macfarlane *et al*., 2014) was used to determine the appropriate buffer zone for the proposed activity.

9 Receiving Environment

9.1 Desktop Spatial Assessment

The following features describes the general area and habitat, this assessment is based on spatial data that are provided by various sources such as the provincial environmental authority and SANBI. The desktop analysis and their relevance to this project are listed in Table 9-1.

Table 9-1 Desktop spatial features examined.

Desktop Information Considered	Relevant/Not relevant	Section
Conservation Plan	The project area falls across both a CBA: Important and an ESA classified area	9.2
Rocky Ridges	Irrelevant: More than 500m away from a class 2 ridge	-
Ecosystem Threat Status	The project area is situated within an ecosystem that are listed as VU	9.3.1
Ecosystem Protection Level	The terrestrial ecosystems associated with the project area is rated as *not protected*	9.3.2
Protected Areas (SAPAD & SACAD)	Irrelevant; The nearest SAPAD is 7km NW, Johanna Jacobs Private Nature Reserve.	9.4
NFEPA Rivers and Wetlands	The project area does overlap with a true FEPA wetland.	9.3.4
NBA Wetlands	Not protected and poorly protected wetlands and rivers can be found in the project areas. These systems are classed as CR and LC	9.3.3
Mining and Biodiversity Guidelines	The project area fall in areas classified as "highest biodiversity importance" and "moderate biodiversity importance".	9.5
Important Bird and Biodiversity Areas	Irrelevant: The project area is approximately 9.8km away from the Suikerbosrand Nature Reserve IBA	-

9.2 Gauteng Conservation Plan

The Gauteng Conservation Plan (Version 3.3) (GDARD, 2014b) classified areas within the province on the basis of its contribution to reach the conservation targets within the province. These areas are classified as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) to ensure sustainability in the long term. The CBAs are classified as either 'Irreplaceable' (must be conserved), or 'Important'.

Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met.

The project area falls across both a CBA: Important and an ESA classified area (Figure 9-1). Sections of the project area is still unclassified.

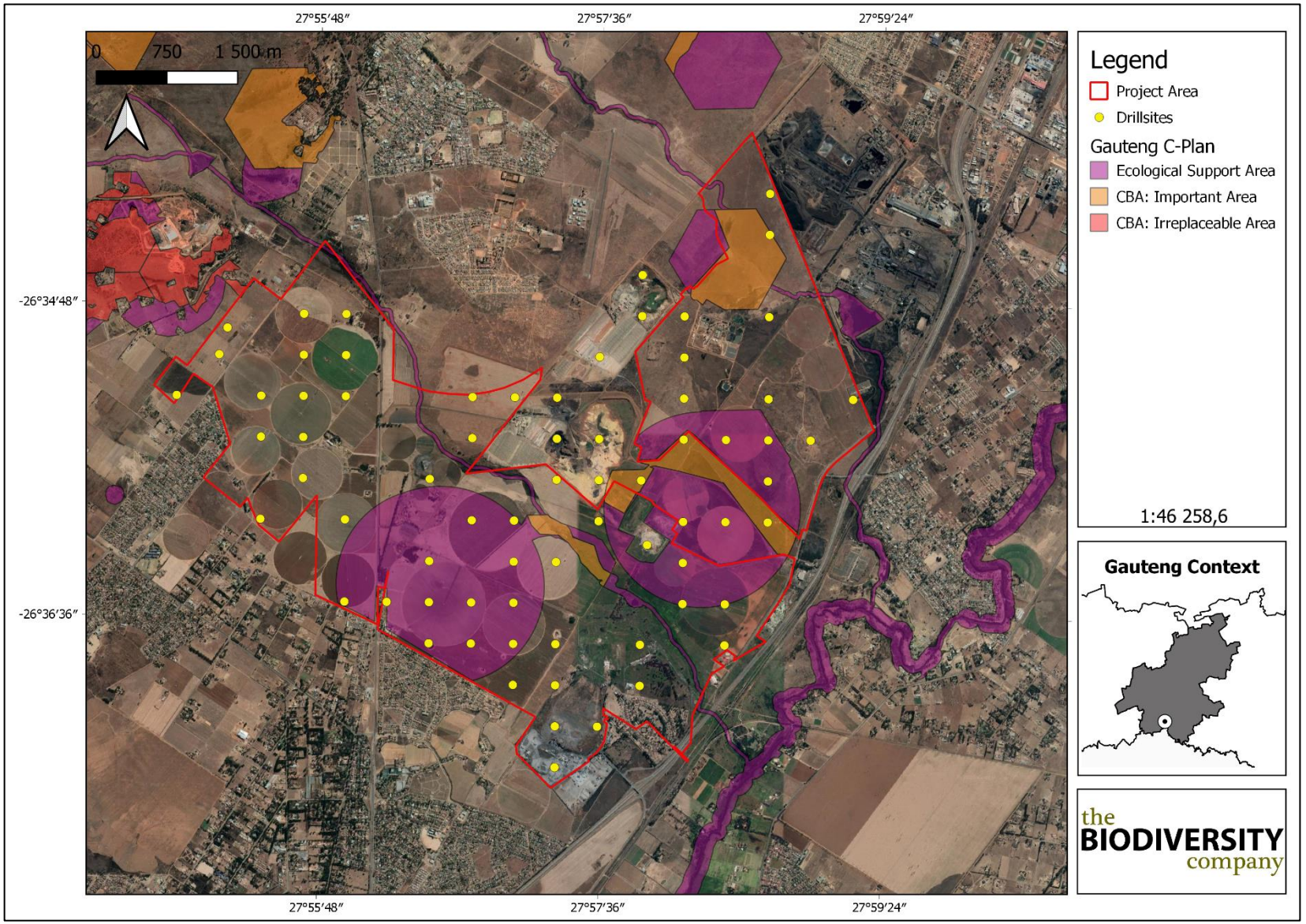


Figure 9-1 The project area superimposed on the Gauteng Conservation Plan Version 3.3

9.3 The National Biodiversity Assessment

The National Biodiversity Assessment (NBA) was completed as a collaboration between the SANBI, the DEA and other stakeholders, including scientists and biodiversity management experts throughout the country over a three-year period (Skowno *et al*., 2019).

The purpose of the NBA is to assess the state of South Africa's biodiversity with a view to understanding trends over time and informing policy and decision-making across a range of sectors (Skowno *et al*., 2019).

The two headline indicators assessed in the NBA are *ecosystem threat status* and *ecosystem protection level* (Skowno *et al*., 2019).

9.3.1 Ecosystem Threat Status

Ecosystem threat status outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition, on which their ability to provide ecosystem services ultimately depends (Skowno *et al*., 2019).

Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Threatened (LT), based on the proportion of each ecosystem type that remains in good ecological condition (Skowno *et al*., 2019).

The project area was superimposed on the terrestrial ecosystem threat status (Figure 9-2). As seen in this figure, the project area is situated within an ecosystem that are listed as VU (Figure 9-2).

Figure 9-2 The project area showing the regional ecosystem threat status of the associated terrestrial ecosystems (NBA, 2018)

9.3.2 Ecosystem Protection Level

Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as not protected, poorly protected, moderately protected or well protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Skowno *et al*., 2019).

The project area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the development (Figure 9-3). Based on Figure 9-3 the terrestrial ecosystems associated with the development are rated as *not protected* for the entire project area. This means that these ecosystems are considered not to be adequately protected in areas such as national parks or other formally protected areas.

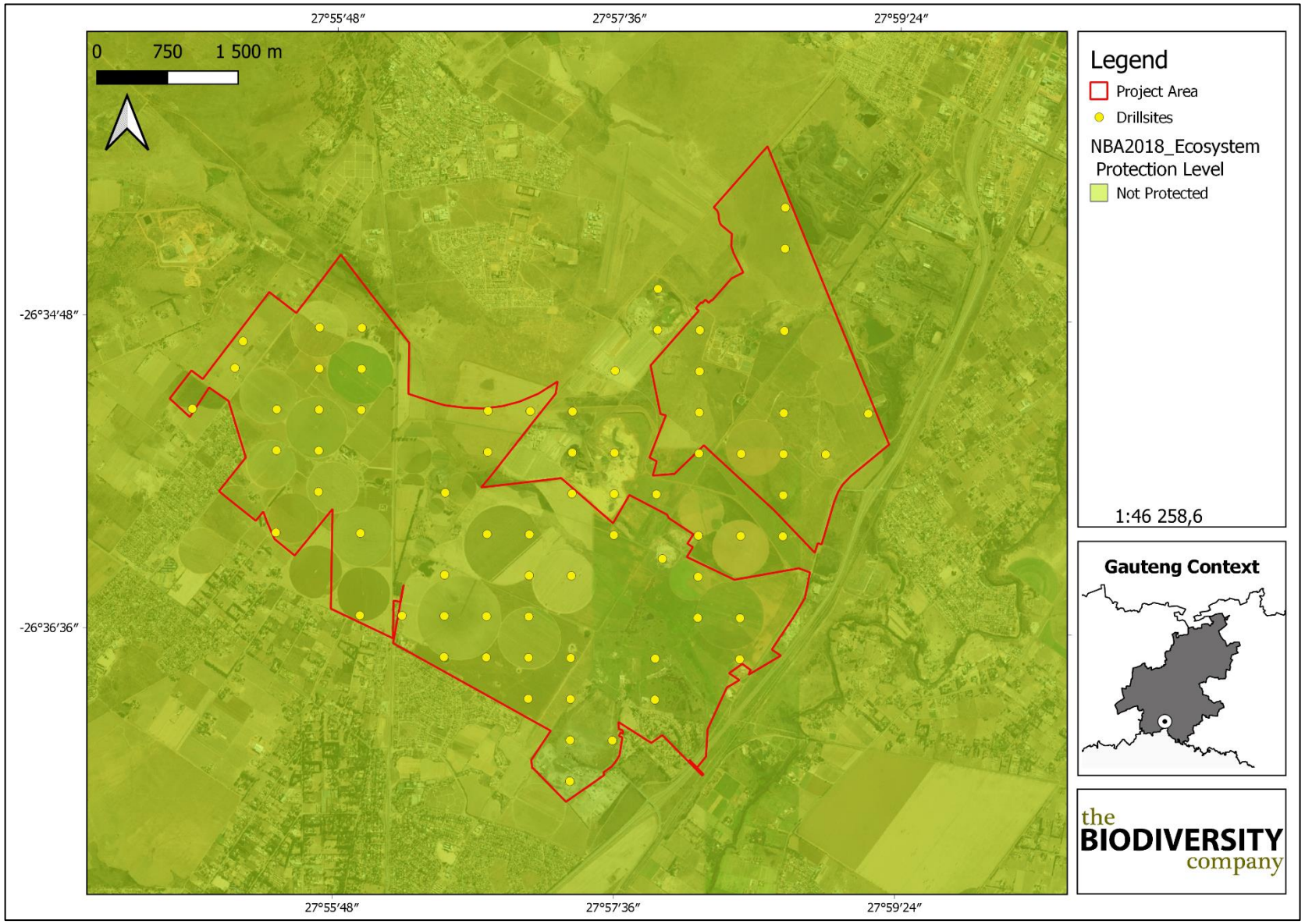


Figure 9-3 The project area showing the regional level of protection of terrestrial ecosystems (NBA, 2018)

9.3.3 Wetland National Biodiversity Assessment

This spatial dataset is part of the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) which was released as part of the National Biodiversity Assessment (NBA) 2018. National Wetland Map 5 includes inland wetlands and estuaries, associated with river line data and many other data sets within the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) 2018.

Ecosystem threat status (ETS) of river ecosystem types is based on the extent to which each river ecosystem type had been altered from its natural condition. Ecosystem types are categorised as CR, EN, VU or LC, with CR, EN and VU ecosystem types collectively referred to as 'threatened' (Van Deventer *et al.,* 2019; Skowno *et al.*, 2019).

Figure 9-4 shows that a not protected wetland and a poorly protected wetland can be found in the project area. Both a not protected and a poorly protected river can also be found in the project area. Figure 9-5 shows that these wetlands are CR and LC respectively while the river has an ecosystem threat status of CR.

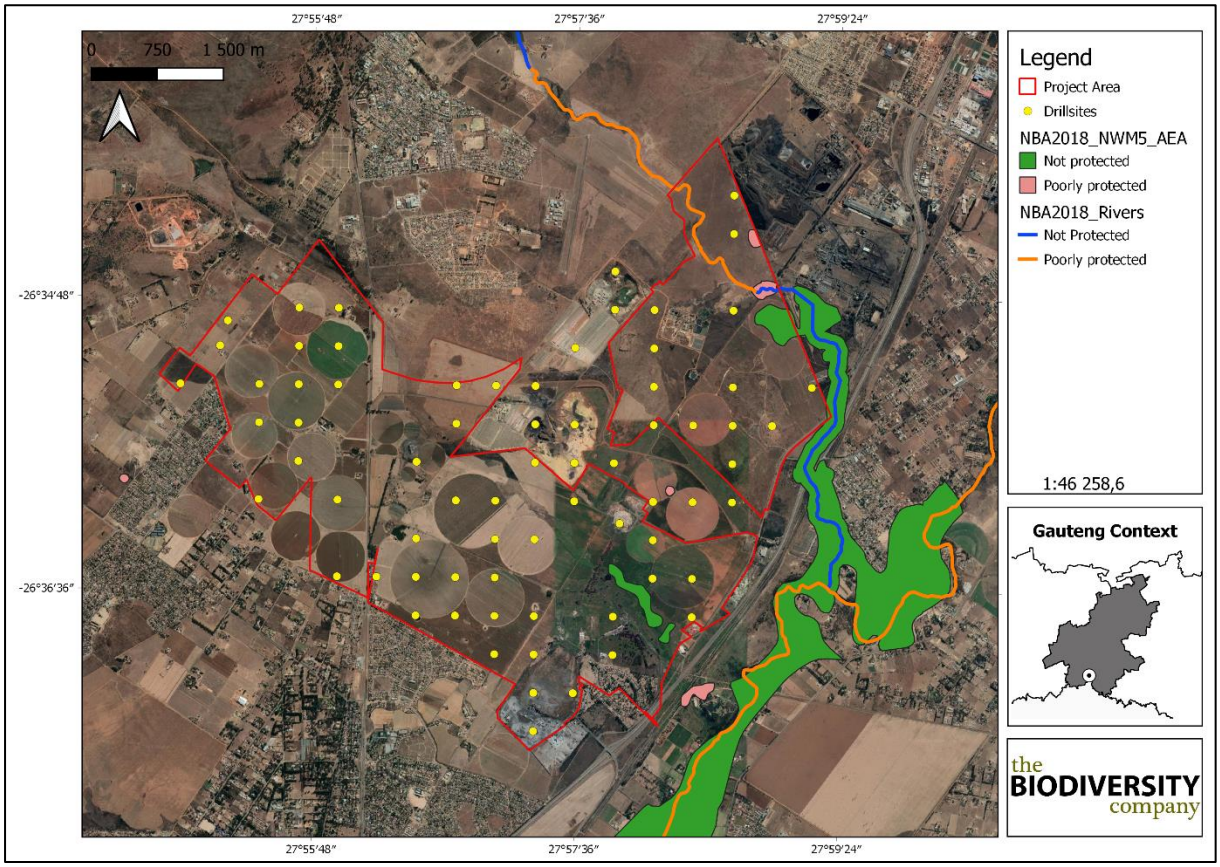


Figure 9-4 The project area in relation to the protection status of the wetland (NBA, 2018).

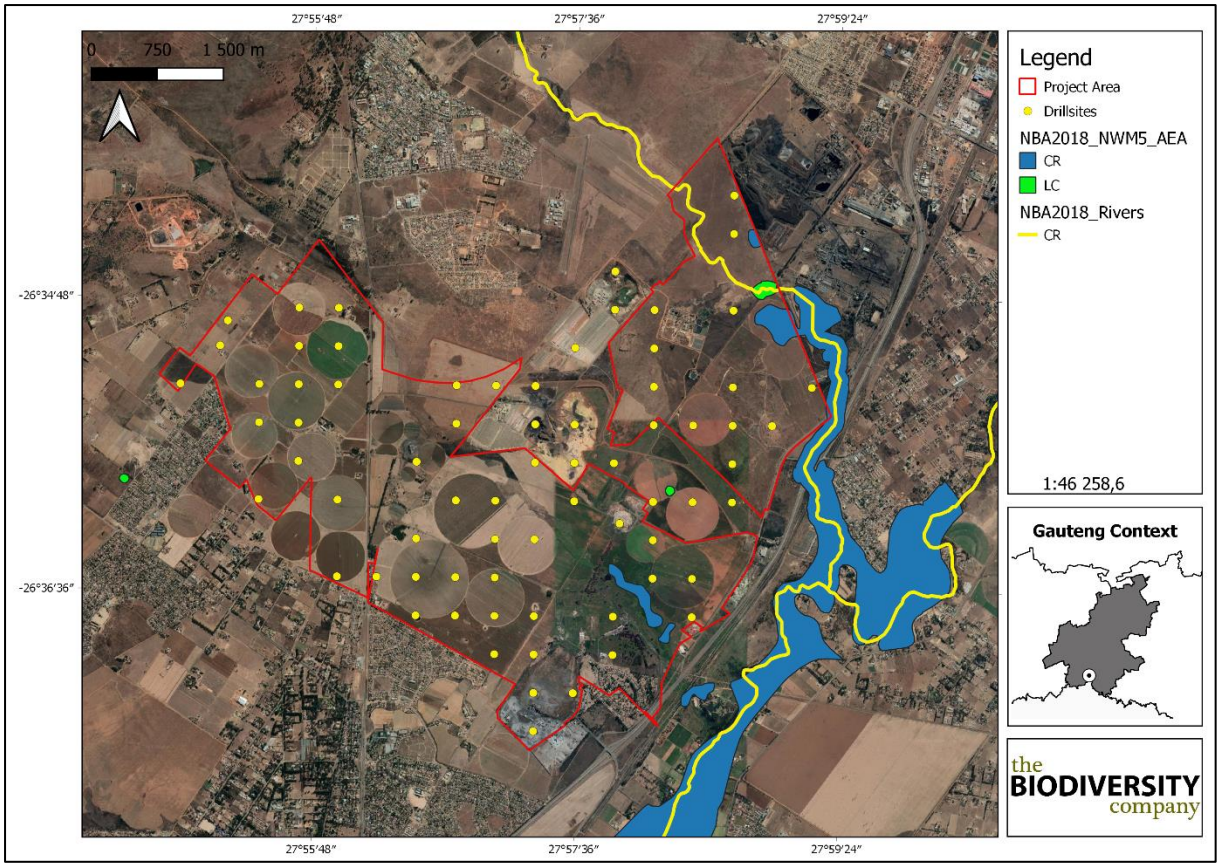


Figure 9-5 The project area in relation to the threat status of the wetland (NBA, 2018).

9.3.4 National Freshwater Ecosystem Priority Areas

The NFEPA spatial data has been incorporated in the above mentioned SAIIAE spatial data set. However, to ensure that this data sets are considered we included it as the Freshwater Ecosystem Priority Areas (FEPAs) (Driver *et al*., 2011) are intended to be conservation support tools and are envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act (NEM:BA) biodiversity goals (Nel *et al.,* 2011). The project area overlaps with two FEPA wetlands (Figure 9-6), and no FEPA rivers can be found in close proximity to the project area.

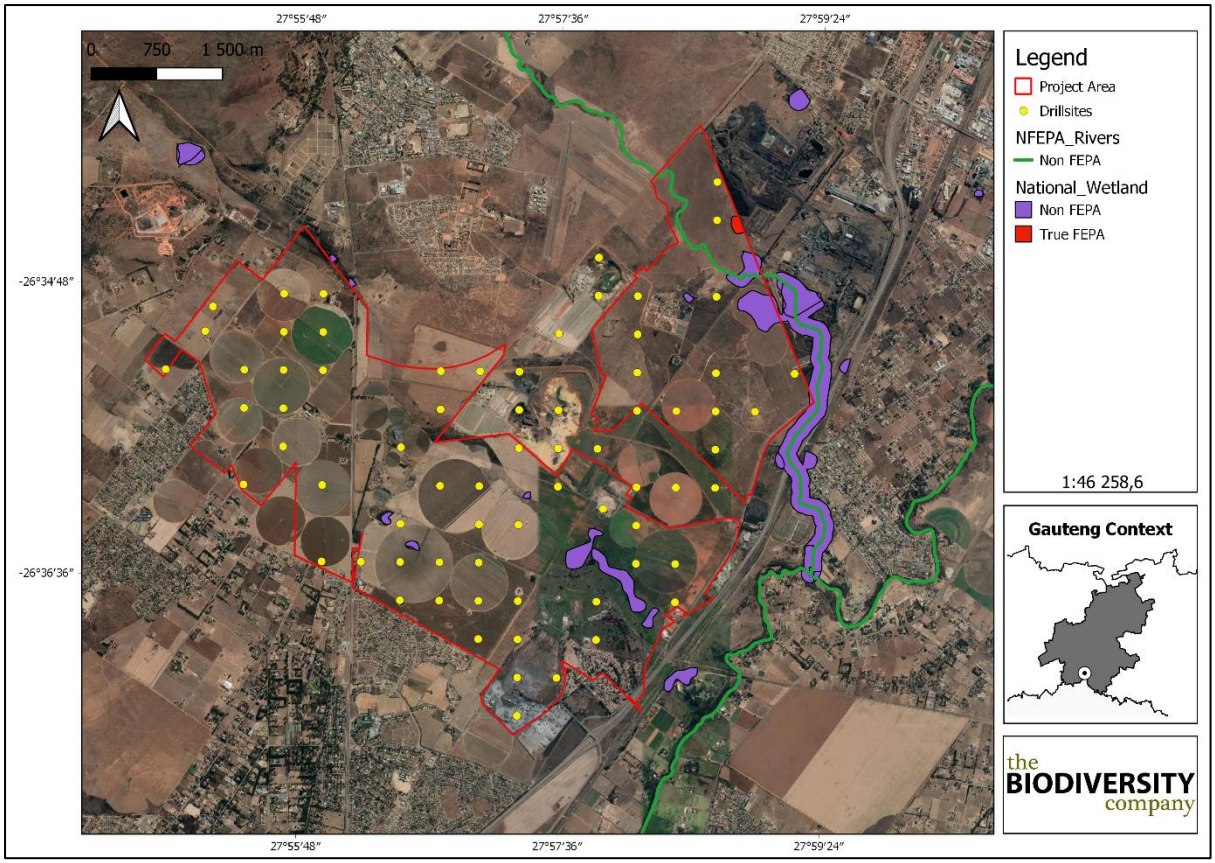


Figure 9-6 The project area in relation to the NFEPA spatial data.

9.4 Mining and Biodiversity Guidelines

The Mining and Biodiversity Guidelines (2013) was developed by the Department of Mineral Resources, the Chamber of Mines, the South African National Biodiversity Institute and the South African Mining and Biodiversity Forum, with the intention to find a balance between economic growth and environmental sustainability. The Guideline is envisioned as a tool to "foster a strong relationship between biodiversity and mining which will eventually translate into best practice within the mining sector. In identifying biodiversity priority areas which have different levels of risk against mining, the Guideline categorises biodiversity priority areas into four categories of biodiversity priority areas in relation to their importance from a biodiversity and ecosystem service point of view as well as the implications for mining in these areas:

A) Legally protected areas, where mining is prohibited;

B) Areas of highest biodiversity importance, which are at the highest risk for mining;

C) Areas of high biodiversity importance, which are at a high risk for mining; and

Areas of moderate biodiversity importance, which are at a moderate risk for mining. Table 9-2 shows the four different categories and the implications for mining within each of these categories.

The Guideline provides a tool to facilitate the sustainable development of South Africa's mineral resources in a way that enables regulators, industry and practitioners to minimise the impact of mining on the country's biodiversity and ecosystem services. It provides the mining sector with a practical, user- friendly manual for integrating biodiversity considerations into the

planning processes and managing biodiversity during the operational phases of a mine, from exploration through to closure. The Guideline provides explicit direction in terms of where mining-related impacts are legally prohibited, where biodiversity priority areas may present high risks for mining projects, and where biodiversity may limit the potential for mining.

Overall, proponents of a mining activity in biodiversity priority areas should demonstrate that:

- There is significant cause to undertake mining – by commenting on whether the biodiversity priority area coincides with mineral or petroleum reserves that are strategically in the national interest to exploit. Reference should also be made to whether alternative deposits or reserves exist that could be exploited in areas that are not biodiversity priority areas or are less environmentally sensitive areas;
- Through the process of a rigorous EIA and associated specialist biodiversity studies the impacts of the proposed mining are properly assessed following good practice. It is critical that sufficient time and resources are budgeted to do so early in the planning and impact assessment process, including appointing appropriate team of people with the relevant skills and knowledge as required by legislation;
- Cumulative impacts have been considered;
- The mitigation hierarchy has been systematically applied and alternatives have been rigorously considered;
- The issues related to biodiversity priority areas have been incorporated into a robust EMP as the main tool for describing how the mining or prospecting operation's environmental impacts are to be mitigated and managed; and
- Good practice environmental management is followed, monitoring and compliance enforcement is ensured.

Table 9-2 The mining and biodiversity guidelines categories

Category	Biodiversity priority areas	Risk for mining	Implications for mining
A. Legally protected	• Protected areas (including National Parks, Nature Reserves, World Heritage Sites, Protected Environments, Nature Reserves) • Areas declared under Section 49 of the Mineral and Petroleum Resources Development Act (No. 28 of 2002)	**Mining prohibited**	Mining projects cannot commence as mining is legally prohibited. Although mining is prohibited in Protected Areas, it may be allowed in Protected Environments if both the Minister of Mineral Resources and Minister of Environmental Affairs approve it. In cases where mining activities were conducted lawfully in protected areas before Section 48 of the Protected Areas Act (No. 57 of 2003) came into effect, the Minister of Environmental Affairs may, after consulting with the Minister of Mineral Resources, allow such mining activities to continue, subject to prescribed conditions that reduce environmental impacts.
B. Highest biodiversity importance	• Critically endangered and endangered ecosystems • Critical Biodiversity Areas (or equivalent areas) from provincial spatial biodiversity plans • River and wetland Freshwater Ecosystem Priority Areas (FEPAs) and	**Highest risk for mining**	Environmental screening, environmental impact assessment (EIA) and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, and to provide site-specific basis on which to apply the mitigation hierarchy to inform regulatory decision-making for mining, water use licenses, and environmental authorisations. If they are confirmed, the likelihood of a fatal flaw for new mining projects is very high because of the significance of the biodiversity features in these areas and the associated ecosystem services. These

	a 1km buffer around these FEPAs • Ramsar Sites		areas are viewed as necessary to ensure protection of biodiversity, environmental sustainability, and human well-being. An EIA should include the strategic assessment of optimum, sustainable land use for a particular area and will determine the significance of the impact on biodiversity. This assessment should fully consider the environmental sensitivity of the area, the overall environmental and socio-economic costs and benefits of mining, as well as the potential strategic importance of the minerals to the country. Authorisations may well not be granted. If granted, the authorisation may set limits on allowed activities and impacts and may specify biodiversity offsets that would be written into license agreements and/or authorisations.
C. High biodiversity importance	• Protected area buffers (including buffers around National Parks, World Heritage Sites* and Nature Reserves) • Transfrontier Conservation Areas (remaining areas outside of formally proclaimed protected areas) • Other identified priorities from provincial spatial biodiversity plans • High water yield areas • Coastal Protection Zone • Estuarine functional zone	**High risk for mining**	These areas are important for conserving biodiversity, for supporting or buffering other biodiversity priority areas, and for maintaining important ecosystem services for particular communities or the country as a whole. An EIA should include an assessment of optimum, sustainable land use for a particular area and will determine the significance of the impact on biodiversity. Mining options may be limited in these areas, and limitations for mining projects are possible. Authorisations may set limits and specify biodiversity offsets that would be written into license agreements and/or authorisations.
D. Moderate biodiversity importance	• Ecological support areas • Vulnerable ecosystems • Focus areas for protected area expansion (land-based and offshore protection)	**Moderate risk for mining**	These areas are of moderate biodiversity value. EIAs and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, identifying features (e.g. threatened species) not included in the existing datasets, and on providing site-specific information to guide the application of the mitigation hierarchy. Authorisations may set limits and specify biodiversity offsets that would be written into license agreements and/or authorisations.

Portions in the north and central part of the project area is classified as “highest biodiversity importance” with their associated highest risks for mining. The central part of the project area is classified as “moderate biodiversity importance” with its associated moderate risk for mining (Figure 9-7).

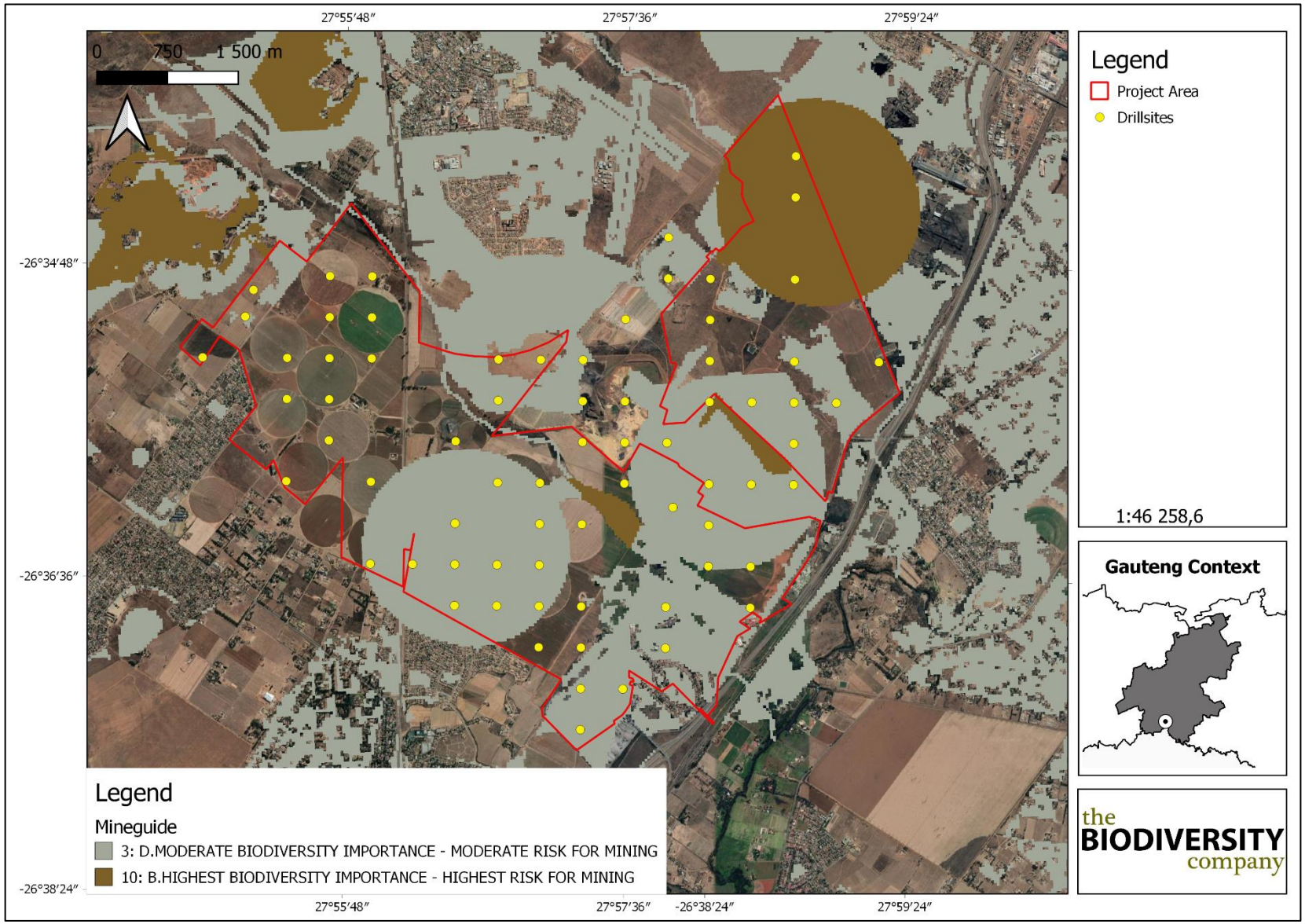


Figure 9-7 The project area superimposed on the Mining and Biodiversity Guideline spatial dataset (2013)

9.5 Soil and Geology

According to the land type database (Land Type Survey Staff, 1972 - 2006), the project area is characterised by the Ba 29 land type. Figure 9-8 illustrates the respective terrain units relevant to the Ba 29 land. The geology is described as quartzite, shale, slate, sandstone, diabase and lava of the Witwatersrand Supergroup; also of the Black Reef Formation and Pretoria Group of the Transvaal Sequence; chert and dolomite of the Chuniespoort Group, Transvaal Sequence.

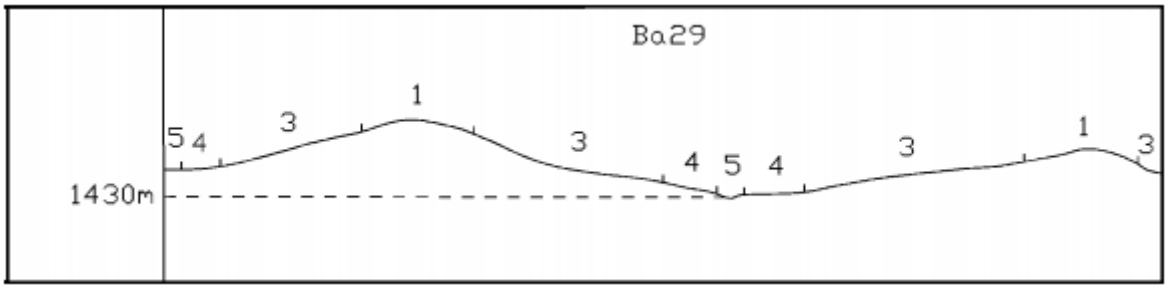


Figure 9-8 Illustration of land type Ba 29 terrain unit (Land Type Survey Staff, 1972 - 2006)

9.6 Desktop Assessment

9.6.1 Vegetation Assessment

The project area is situated within the grassland biome. This biome is centrally located in southern Africa, and adjoins all except the desert, fynbos and succulent Karoo biomes (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the grassland biome include:

a) Seasonal precipitation; and
b) The minimum temperatures in winter (Mucina & Rutherford, 2006).

The grassland biome is found chiefly on the high central plateau of South Africa, and the inland areas of KwaZulu-Natal and the Eastern Cape. The topography is mainly flat and rolling but includes the escarpment itself. Altitude varies from near sea level to 2 850 m above sea level.

Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. The grassland biome experiences summer rainfall and dry winters with frost (and fire), which are unfavourable for tree growth. Thus, trees are typically absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees.

9.6.1.1 Vegetation Types

The grassland biome comprises many different vegetation types. The project area is situated within the Soweto Highveld Grassland vegetation type according to Mucina & Rutherford (2006) (Figure 9-9).

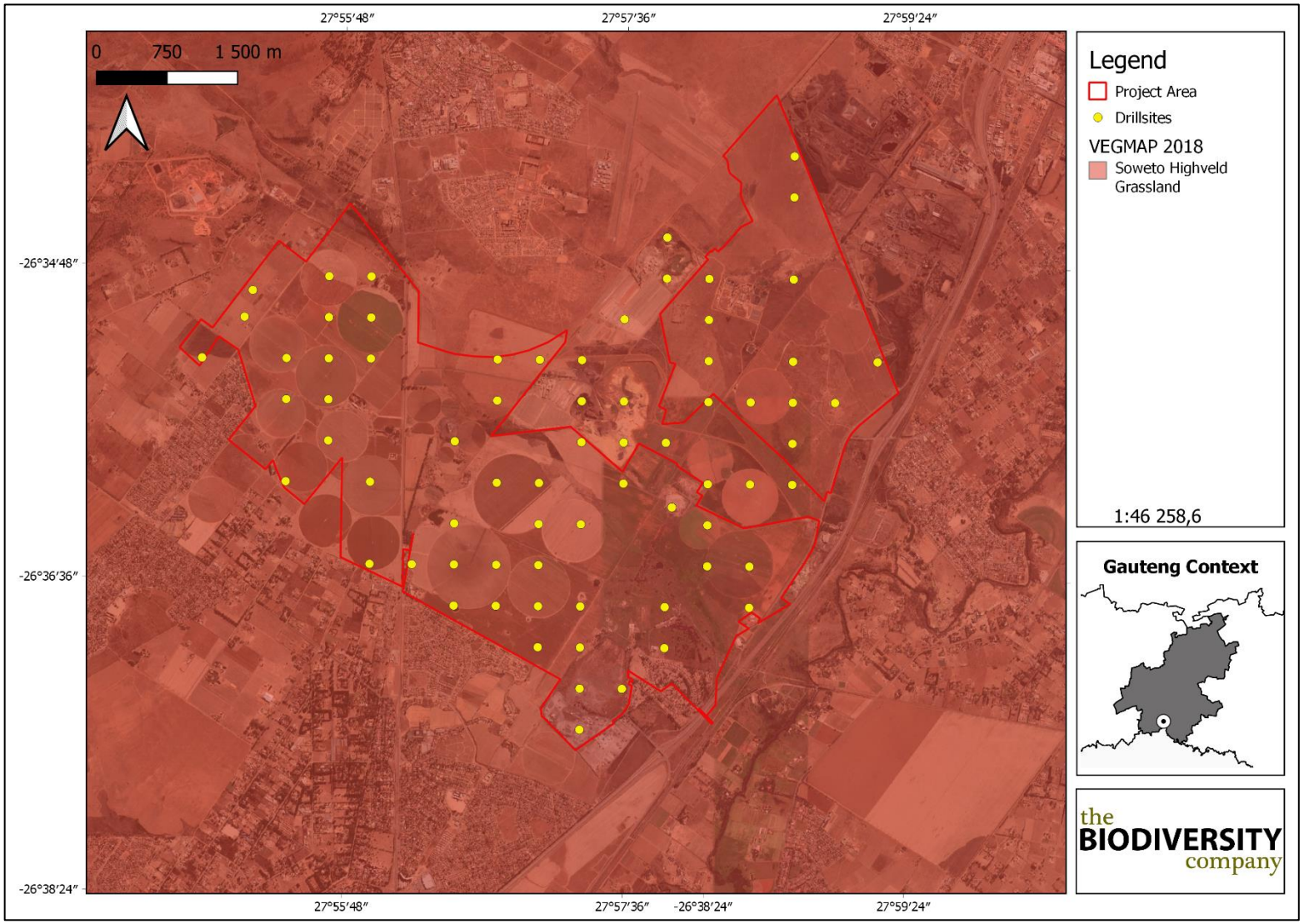


Figure 9-9 The project area showing the vegetation type based on the Vegetation Map of South Africa, Lesotho & Swaziland (BGIS, 2018)

9.6.1.1.1 Soweto Highveld Grassland

The Soweto Highveld Grassland vegetation type is found in Mpumalanga, Gauteng and to a little extent also in neighbouring Free State and North-West Provinces. This vegetation type typically comprises of an undulating landscape on the Highveld plateau supporting short to medium-high, dense, tufted grassland dominated almost entirely by *Themeda triandra* and accompanied by a variety of other grasses such as *Elionurus muticus, Eragrostis racemosa, Heteropogon contortus* and *Tristachya leucothrix*. Scattered small wetlands, narrow stream alluvia, pans and occasional ridges or rocky outcrops interrupt the continuous grassland cover (Mucina & Rutherford, 2006).

Important Plant Taxa

Important plant taxa are those species that have a high abundance, a frequent occurrence or are prominent in the landscape within a particular vegetation type (Mucina & Rutherford, 2006). The following species are important in the Soweto Highveld Grassland.

Graminoids: *Andropogon appendiculatus, Brachiaria serrata, Cymbopogon pospischilii, Cynodon dactylon, Elionurus muticus , Eragrostis capensis, E. chloromelas, E. curvula, E. plana, E. planiculmis, E. racemosa, Heteropogon contortus, Hyparrhenia hirta, Setaria nigrirostris, S. sphacelata, Themeda triandra, Tristachya leucothrix, Andropogon schirensis, Aristida adscensionis, A. bipartita, A. congesta, A. junciformis subsp. galpinii, Cymbopogon caesius, Digitaria diagonalis, Diheteropogon amplectens, Eragrostis micrantha, E. superba, Harpochloa falx, Microchloa caffra, Paspalum dilatatum* (Mucina & Rutherford, 2006).

Herbs: *Hermannia depressa, Acalypha angustata, Berkheya setifera, Dicoma anomala, Euryops gilfillanii, Geigeria aspera var. aspera, Graderia subintegra, Haplocarpha scaposa, Helichrysum miconiifolium, H. nudifolium var. nudifolium, H. rugulosum, Hibiscus pusillus, Justicia anagalloides, Lippia scaberrima, Rhynchosia effusa, Schistostephium crataegifolium, Selago densiflora, Senecio coronatus, Vernonia oligocephala, Wahlenbergia undulata* (Mucina & Rutherford, 2006).

Geophytic Herbs: *Haemanthus humilis subsp. hirsutus, H. montanus.*

Herbaceous Climber: *Rhynchosia totta* (Mucina & Rutherford, 2006).

Low Shrubs: *Anthospermum hispidulum, A. rigidum subsp. pumilum, Berkheya annectens, Felicia muricata, Ziziphus zeyheriana* (Mucina & Rutherford, 2006).

Conservation Status

According to Mucina and Rutherford (2006), the Soweto Highveld Grassland vegetation type is classified as EN. The national target for conservation protection for both these vegetation types is 24%, but only a few patches are statutorily conserved in Waldrift, Krugersdorp, Leeuwkuil, Suikerbosrand, Rolfe's Pan Nature Reserves or privately conserved in Johanna Jacobs, Tweefontein, Gert Jacobs, Nikolaas and Avalon Nature Reserves and the Heidelberg Natural Heritage Site.

By 2006 nearly half of the area of occupancy of this vegetation type had already been transformed by cultivation, urban sprawl, mining and building of road infrastructure. The amount of area transformed has most likely increased substantially. Some Soweto Grassland

areas have been flooded by dams including Grootdraai, Leeukuil, Trichardtsfontein, Vaal and Willem Brummer.

9.6.1.2 Plant Species of Conservation Concern

Based on the Plants of Southern Africa (BODATSA-POSA, 2019) database, 361 plant species have the potential to occur in the project area and its surroundings (Figure 9-10 and Table 9-3).

Of these 361 plant species (Appendix B), two (2) species are listed as being Species of Conservation Concern (SCC) (Figure 9-10).

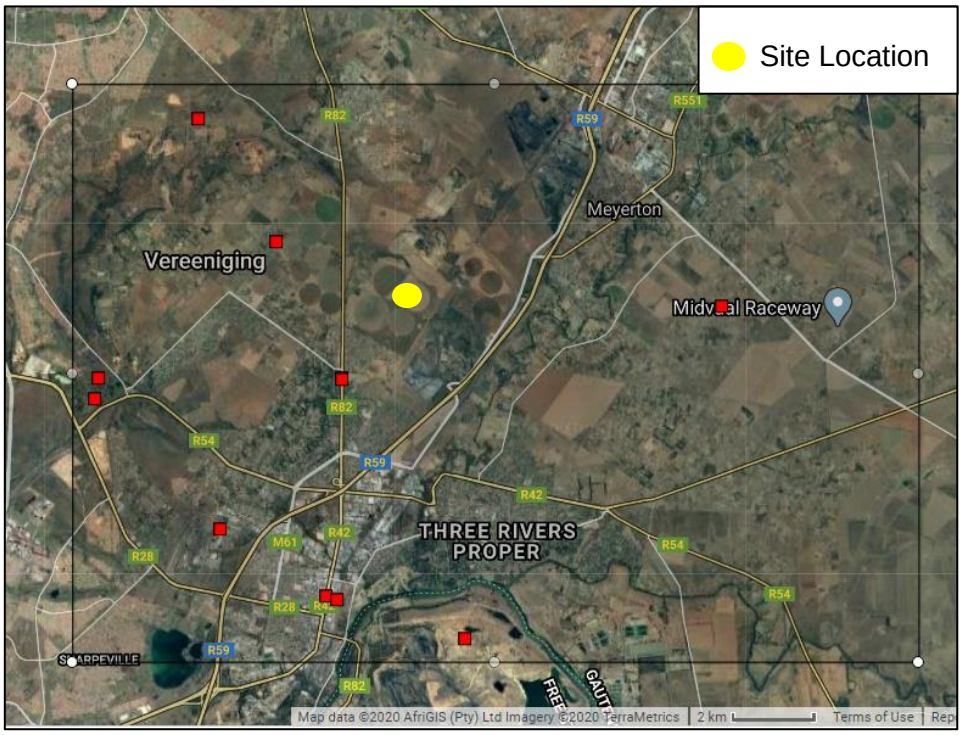


Figure 9-10 Map showing the grid drawn in order to compile an expected plant species list (BODATSA-POSA, 2019)

Table 9-3 Plant Species of Conservation Concern with the potential to occur in the project area

Family	Taxon	Author	IUCN	Ecology	Habitat
Asteraceae	*Gnaphalium nelsonii*	Burtt Davy	NT	Indigenous; Endemic	Seasonally wet places in grassland and savanna, and along dry watercourses.
Aizoaceae	*Lithops lesliei subsp. lesliei*	(N.E.Br.) N.E.Br.	NT	Indigenous	Primarily in arid grasslands, usually in rocky places, growing under the protection of forbs and grasses

9.6.2 Faunal Assessment

9.6.2.1 Avifauna

Based on the South African Bird Atlas Project, Version 2 (SABAP2) database, 273 bird species have the potential to occur in the vicinity of the project area. The full list of potential bird species is provided in Appendix C.

Of the potential bird species, twelve (12) species are listed as SCC either on a regional or global scale (Table 9-4). *The SCC include the following:*

- Two (2) species that are listed as EN on a regional basis;
- Three (3) species that are listed as VU on a regional basis; and
- Seven (7) species that are listed as NT on a regional basis.

On a global scale five (5) species as NT (Table 9-4).

Table 9-4 List of bird species of regional or global conservation importance that are expected to occur in close vicinity to the project area.

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Calidris ferruginea	Sandpiper, Curlew	LC	NT	Moderate
Ciconia abdimii	Stork, Abdim's	NT	LC	Low
Circus ranivorus	Marsh-harrier, African	EN	LC	High
Eupodotis senegalensis	Korhaan, White-bellied	VU	LC	High
Falco biarmicus	Falcon, Lanner	VU	LC	High
Falco vespertinus	Falcon, Red-footed	NT	NT	High
Glareola nordmanni	Pratincole, Black-winged	NT	NT	Moderate
Mycteria ibis	Stork, Yellow-billed	EN	LC	Moderate
Oxyura maccoa	Duck, Maccoa	NT	NT	Moderate
Phoenicopterus minor	Flamingo, Lesser	NT	NT	Low
Phoenicopterus ruber	Flamingo, Greater	NT	LC	Low
Rostratula benghalensis	Painted-snipe, Greater	NT	LC	Moderate
Sterna caspia	Tern, Caspian	VU	LC	Moderate

Calidris ferruginea (Curlew Sandpiper) is migratory species which breeds on slightly elevated areas in the lowlands of the high Arctic, and may be seen in parts of South Africa during winter. During winter, the species occurs at the coast, but also inland on the muddy edges of marshes, large rivers and lakes (both saline and freshwater), irrigated land, flooded areas, dams and saltpans (IUCN, 2017). Due to the presence of some of these habitat types within the project area the likelihood of occurrence of this species was rated as moderate.

Ciconia abdimii (Abdim's Stork) is listed as NT on a local scale and the species is known to be found in open grassland and savanna woodland often near water but also in semi-arid areas, gathering beside pools and water-holes. They tend to roost in trees or cliffs (IUCN, 2017). The existence of wet areas creates the potential for this species to occur in the area but due to the proximity of the urban footprint the likelihood of occurrence was rated as low.

Circus ranivorus (African Marsh Harrier) is listed as EN in South Africa (ESKOM, 2014). This species has an extremely large distributional range in sub-equatorial Africa. South African populations of this species are declining due to the degradation of wetland habitats, loss of habitat through over-grazing and human disturbance and possibly, poisoning owing to over-use of pesticides (IUCN, 2017). This species breeds in wetlands and forages primarily over

reeds and lake margins. There are some wetlands and marsh areas at the project area, therefore the likelihood of occurrence is considered to be high.

Eupodotis senegalensis (White-bellied Korhaan) is Near-endemic to South Africa, occurring from the Limpopo Province and adjacent provinces, south through Swaziland to KwaZulu-Natal and the Eastern Cape. It generally prefers tall, dense sour or mixed grassland, either open or lightly wooded, occasionally moving into cultivated or burnt land (Hockey *et al.,* 2005). Some of these habitat types are present in the project area and as such the likelihood of occurrence is rated as high.

Falco biarmicus (Lanner Falcon) is native to South Africa and inhabits a wide variety of habitats, from lowland deserts to forested mountains (IUCN, 2017). They may occur in groups up to 20 individuals, but have also been observed solitary. Their diet is mainly composed of small birds such as pigeons and francolins. The likelihood of incidental records of this species in the project area is rated as high due to the natural veld condition and the presence of many bird species on which Lanner Falcons may predate.

Falco chicquera (Red-necked Falcon) is classed as NT on a global scale. This species was recently split from its Indian counterpart *Falco chicquera chicquera*. The African species is mostly found in semi-dessert and savanna areas with some trees for perching. The number of this species is declining due to ongoing habitat degradation. The likelihood of occurrence in the project area is rated as high due to the availability of suitable habitat.

Glareola nordmanni (Black-winged Pratincole) is a migratory species which is listed as NT both globally and regionally. This species has a very large range, breeding mostly in Europe and Russia, before migrating to southern Africa. Overall population declines of approximately 20% for this species are suspected (IUCN, 2017). This species generally occurs near water and damp meadows, or marshes overgrown with dense grass. Due to it's migratory nature, this species will only be present in South Africa for a few months during the year and will not breed locally. There are some suitable habitat areas within the project area and as such the likelihood of occurrence is rated as moderate.

Mycteria ibis (Yellow-billed Stork) is listed as EN on a regional scale and LC on a global scale. This species is migratory and has a large distributional range which includes much of sub-Saharan Africa. It is typically associated with freshwater ecosystems, especially wetlands and the margins of lakes and dams (IUCN, 2017). Even though there are wetlands and a river in the project area they are not extensive and therefore the likelihood of occurrence is rated as moderate.

Oxyura maccoa (Maccoa Duck) has a large northern and southern range, South Africa is part of its southern distribution. During the species' breeding season, it inhabits small temporary and permanent inland freshwater lakes, preferring those that are shallow and nutrient-rich with extensive emergent vegetation such as reeds (*Phragmites spp*.) and cattails (*Typha spp*.) on which it relies for nesting (IUCN, 2017). The likelihood of occurrence of this species in the project area was rated as moderate.

Phoeniconaias minor (Lesser Flamingo) is listed as NT on a global and regional scale whereas *Phoenicopterus roseus* (Greater Flamingo) is listed as NT on a regional scale only. Both species have similar habitat requirements and the species breed on large undisturbed alkaline and saline lakes, salt pans or coastal lagoons, usually far out from the shore after seasonal rains have provided the flooding necessary to isolate remote breeding sites from terrestrial

predators and the soft muddy material for nest building (IUCN, 2017). Suitable habitat can not be found in the project area as such the likelihood of occurrence is rated as low.

Rostratula benghalensis (Greater Painted-snipe) shows a preference for recently flooded areas in shallow lowland freshwater temporary or permanent wetland, it has a wide range of these freshwater habitats which they occur in, in this case, sewage pools, reservoirs, mudflats overgrown with marsh grass which may possibly exist within the project area, thus the likelihood of occurrence is moderate.

Sterna caspia (Caspian Tern) is native to South Africa and are known to occur in inland freshwater systems such as large rivers, creeks, floodlands, reservoirs and sewage ponds. Habitat suitability was found to be moderate and thus the likelihood of occurrence is moderate.

9.6.2.2 Mammals

The IUCN Red List Spatial Data (IUCN, 2017) lists 79 mammal species that could be expected to occur within the project area. Of these species, 11 are medium to large conservation dependant species, such *Ceratotherium simum* (Southern White Rhinoceros) and *Tragelaphus oryx* (Common Eland) that, in South Africa, are generally restricted to protected areas such as game reserves. These species are not expected to occur in the project area and are removed from the expected SCC list. They are however still included in the expected species list (Appendix D).

Of the remaining 68 small to medium sized mammal species, fourteen (14) (20.5%) are listed as being of conservation concern on a regional or global basis (Table 9-5). The list of potential species includes:

- Two (2) that are listed as EN on a regional basis;
- Four (4) that are listed as VU on a regional basis; and
- Six (6) that are listed as NT on a regional scale.

On a global scale, 1 species is listed as EN, 2 are listed as VU and 5 as NT (Table 9-5).

Table 9-5 List of mammal species of conservation concern that may occur in the project area as well as their global and regional conservation statuses.

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Aonyx capensis	Cape Clawless Otter	NT	NT	High
Atelerix frontalis	South Africa Hedgehog	NT	LC	High
Crocidura maquassiensis	Makwassie musk shrew	VU	LC	Moderate
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT	Low
Felis nigripes	Black-footed Cat	VU	VU	Low
Hydrictis maculicollis	Spotted-necked Otter	VU	NT	High
Leptailurus serval	Serval	NT	LC	High
Mystromys albicaudatus	White-tailed Rat	VU	EN	Moderate
Ourebia ourebi	Oribi	EN	LC	Low
Panthera pardus	Leopard	VU	VU	Low

Parahyaena brunnea	Brown Hyaena	NT	NT	Low
Pelea capreolus	Grey Rhebok	NT	NT	Low
Poecilogale albinucha	African Striped Weasel	NT	LC	Moderate
Redunca fulvorufula	Mountain Reedbuck	EN	LC	Low

Aonyx capensis (Cape Clawless Otter) is the most widely distributed otter species in Africa (IUCN, 2017). This species is predominantly aquatic, and it is seldom found far from water. A number of wetlands and rivers can be found in the project area and as such the likelihood of occurrence is rated as high.

Atelerix frontalis (South African Hedgehog) has a tolerance of a degree of habitat modification and occurs in a wide variety of semi-arid and sub-temperate habitats (IUCN, 2017). Based on the Red List of Mammals of South Africa, Lesotho and Swaziland (2016), *A. frontalis* populations are decreasing due to the threats of electrocution, veld fires, road collisions, predation from domestic pets and illegal harvesting. Although the species is cryptic and therefore not often seen, there is suitable habitat in the project area therefore the likelihood of occurrence is rated as high.

Crocidura maquassiensis (Maquassie Musk Shrew) is listed as VU on a regional basis and is known to be found in rocky, mountain habitats. It may tolerate a wider range of habitats and individuals have been collected in Kwa-Zulu Natal from a garden, and in mixed bracken and grassland alongside a river at 1,500 m (IUCN, 2017). There is some suitable habitat for this species in the project area and therefore the likelihood of occurrence is rated as moderate.

Eidolon helvum (African Straw-coloured Fruit Bat) is listed as LC on a regional scale and NT on a global scale. This species has been recorded from a very wide range of habitats across the lowland rainforest and savanna zones of Africa (IUCN, 2017). Although considered to be widespread and abundant across its range, certain populations are decreasing due to severe deforestation, hunting for food and medicinal use (IUCN, 2017). This species is known to form large roosts and colonies numbering in the thousands to even millions of individuals (IUCN, 2017). No colonies of this species are known to occur in the project area or in the immediate vicinity, therefore it's likelihood of occurrence is rated as low.

Felis nigripes (Black-footed Cat) is endemic to the arid regions of southern Africa. This species is naturally rare, has cryptic colouring is small in size and is nocturnal. These factors have contributed to a lack of information on this species. Given that the highest densities of this species have been recorded in the more arid Karoo region of South Africa, the habitat in the project area can be considered to be sub-optimal for the species and the likelihood of occurrence is rated as low.

Hydrictis maculicollis (Spotted-necked Otter) inhabits freshwater habitats where water is un-silted, unpolluted, and rich in small to medium sized fishes (IUCN, 2017). Suitable habitat may be available in the wetland and river areas therefore the likelihood of occurrence is high.

Leptailurus serval (Serval) occurs widely through sub-Saharan Africa and is commonly recorded from most major national parks and reserves (IUCN, 2017). The Serval's status outside reserves is not certain, but they are inconspicuous and may be common in suitable habitat as they are tolerant of farming practices provided there is cover and food available. In sub-Saharan Africa, they are found in habitat with well-watered savanna long-grass environments and are particularly associated with reedbeds and other riparian vegetation

types. This species is known to be very adaptable to disturbances associated with agriculture and as such the likelihood of occurrence is rated as high.

Mystromys albicaudatus (White-tailed Rat) is listed as VU on a regional basis and EN on a global scale. It is relatively widespread across South Africa and Lesotho; the species is known to occur in shrubland and grassland areas. A major requirement of the species is black loam soils with good vegetation cover. The likelihood of occurrence in the project area are rated as moderate.

Ourebia ourebi (Oribi) has a patchy distribution throughout Africa and is known to occur in South Africa. Populations are becoming more fragmented as it is gradually eliminated from moderately to densely settled areas (IUCN, 2017). The likelihood of occurrence is rated as low due to the lack of suitable habitat for this species.

Panthera pardus (Leopard) has a wide distributional range across Africa and Asia, but populations have become reduced and isolated, and they are now extirpated from large portions of their historic range (IUCN, 2017). Impacts that have contributed to the decline in populations of this species include continued persecution by farmers, habitat fragmentation, increased illegal wildlife trade, excessive harvesting for ceremonial use of skins, prey base declines and poorly managed trophy hunting (IUCN, 2017). Although known to occur and persist outside of formally protected areas, the densities in these areas are considered to be low. The likelihood of occurrence in the project area is regarded as low because of the lack of suitable prey species.

Parahyaena brunnea (Brown Hyaena) is endemic to southern Africa. This species occurs in dry areas, generally with annual rainfall less than 100 mm, particularly along the coast, semi-desert, open scrub and open woodland savanna. Given its known ability to persist outside of formally protected areas the likelihood of occurrence of this species in the project area is moderate to good. Due to the absence of larger herbivore prey species in the project area the likelihood of occurrence of the brown hyaena is rated as low.

Pelea capreolus (Grey Rhebok) is endemic to a small region in southern Africa, inhabiting montane and plateau grasslands of South Africa, Swaziland, and Lesotho. In South Africa, their distribution is irregular and patchy, and they no longer occur north of the Orange River in the Northern Cape, or in parts of the North-West Province (IUCN, 2017). Grey Rhebok can be found in suitable habitat which has rocky hills, grassy mountain slopes, and montane and plateau grasslands in southern Africa. They are predominantly browsers, and largely water independent, obtaining most of their water requirements from their food. Based on the lack of their favoured habitat within the project area, the likelihood of occurrence of this species is rated as low.

Poecilogale albinucha (African Striped Weasel) is usually associated with savanna habitats, although it probably has a wider habitat tolerance (IUCN, 2017). Due to its secretive nature, it is often overlooked in many areas where it does occur. There is sufficient habitat for this species in the project area and the likelihood of occurrence of this species is therefore considered to be moderate.

Redunca fulvorufula (Mountain Reedbuck) is listed as EN both regionally and globally. The South African population has undergone a decline of 61-73% in the last three generations (15 years) (IUCN, 2017). Mountain Reedbuck live on ridges and hillsides in broken rocky country

and high-altitude grasslands (often with some tree or bush cover). Rocky areas are absent from the project area and as such the likelihood of occurrence is rated as low.

9.6.2.3 Herpetofauna (Reptiles & Amphibians)

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the ReptileMap database provided by the Animal Demography Unit (ADU, 2019) 57 reptile species have the potential to occur in the project area (Appendix E). One of the expected species are SCCs (IUCN, 2017).

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the AmphibianMap database provided by the Animal Demography Unit (ADU, 2019) 21 amphibian species have the potential to occur in the project area (Appendix F). No amphibian SCCs are expected to occur in the project area (Table 9-6).

Table 9-6 Reptiles species of conservation concern that may occur in the project area as well as their global and regional conservation statuses (IUCN, 2017; SANBI, 2016).

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Crocodylus niloticus	Nile Crocodile	VU	LC	Low

Crocodylus niloticus (Nile Crocodile) is listed as VU on a regional basis. The Nile crocodile is quite widespread throughout sub-Saharan Africa, in different types of aquatic environments such as lakes, rivers, and marshlands. No suitable perennial rivers are found in the project area as such the likelihood of occurrence is rated as low.

10 Field Survey

10.1 Terrestrial Assessment

The field survey for the Kookfontein prospecting (flora and fauna (mammals, avifauna, amphibians and reptiles)) as well as wetlands was conducted on the 7th of May 2020 by a wetland specialist and terrestrial ecologist. During the survey the floral and faunal communities in the project area were assessed. The project areas were ground-truthed on foot, which included spot checks in pre-selected areas to validate desktop data. Photographs were recorded during the site visits and some are provided under the Results section in this report. All site photographs are available on request.

10.1.1 Habitat Assessment

The main habitat types identified across the project area were initially identified largely based on aerial imagery. These main habitat types were refined based on the field coverage and data collected during the survey and can be seen in Figure 10-1. Emphasis was placed on limiting timed meander searches within the natural habitats and therefore habitats with a higher potential of hosting SCC. Each of the habitats identified are discussed in the sub-sections below.

Secondary Grassland

This habitat unit includes grassland areas with interspersed inconspicuous rocky ridges in certain areas. This habitat type is regarded as semi-natural grassland, but slightly disturbed

due to grazing by livestock and also human infringement in areas close to roads. Despite this, this habitat is regarded as having a high sensitivity and represents its Gauteng Conservation Plan (Version 3.3) classification as CBA.

Degraded Grassland

This habitat are areas where the grassland has been altered due to historic and/or current human activity. The condition of these grassland's ranges from heavily disturbed (largely due to ongoing overgrazing) to degraded grassland (due to historic infrastructure impacts, dumping and alien invasive plant species). These areas are regarded as least concern.

Transformed

This habitat unit represents all areas of commercial agriculture farms and existing urban infrastructure and includes houses, barns, feedlots, camps, roads etc. Due to the transformed nature of this habitat, it is regarded as having a least concern sensitivity.

Wetland and Riparian Areas

This habitat unit represents the wetland and riparian areas with the adjacent grassland that it is connected to. The wetland assessment where these areas are identified can be seen in Section 10.2 This habitat type is regarded as intact, but slightly disturbed due to grazing by livestock. This habitat is regarded as having a high sensitivity due to its importance within the landscape as a movement corridor for fauna, but also as a water resource within the local area.

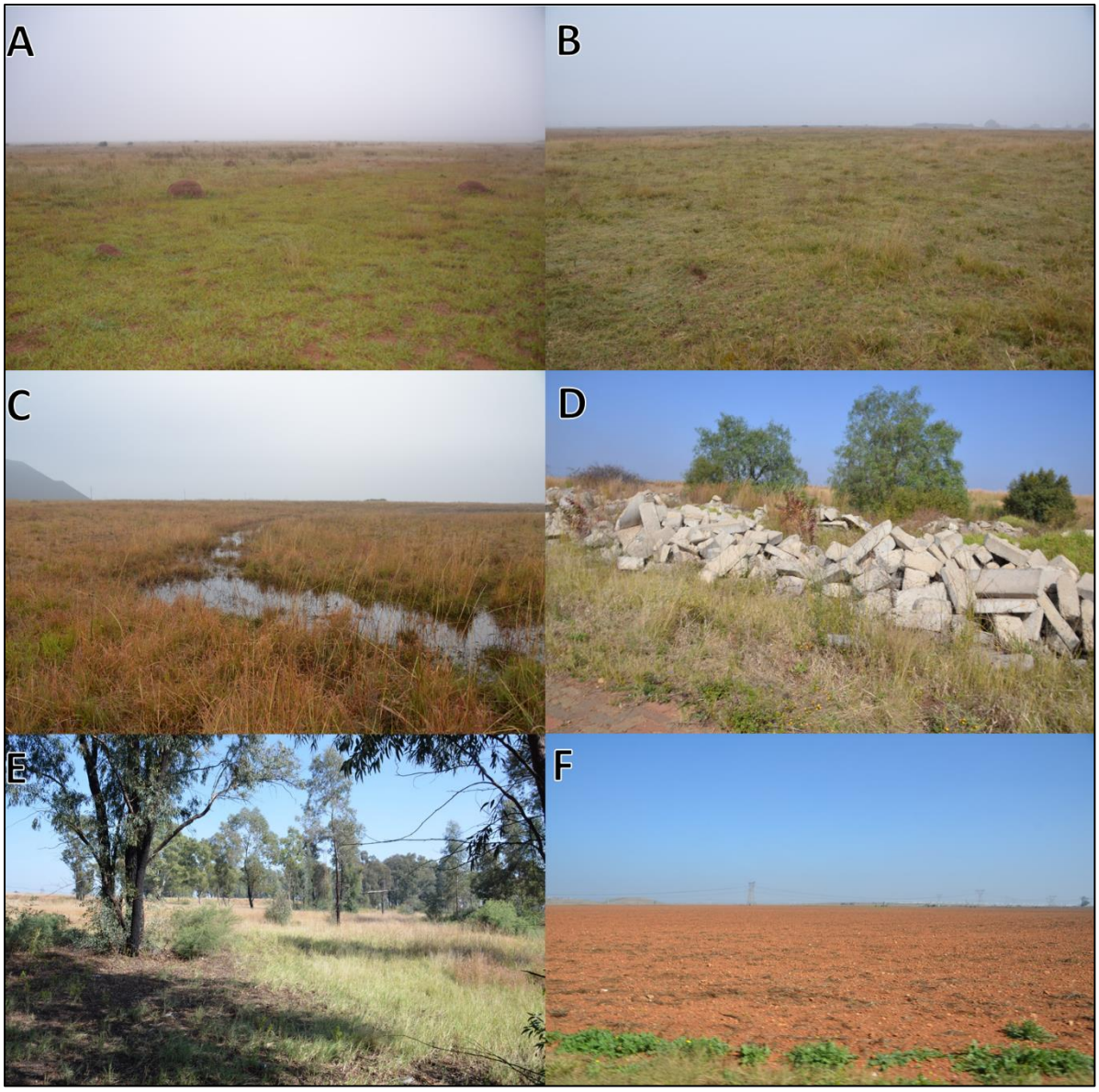


Figure 10-1 Photographs of the main habitats identified; A & B) Secondary grasslands, C) Wetland, D and E) Degraded areas and F) Transformed

10.1.2 Vegetation Assessment

The vegetation assessment was conducted throughout the extent of the project area. A total of 107 tree, shrub and herbaceous plant species were recorded in the project area during the field assessment (Table 10-1). Plants listed as Category 1 alien or invasive species under the National Environmental Management: Biodiversity Act (NEMBA) appear in green text. Plants listed in Category 2 or as 'not indigenous' or 'naturalised' according to NEMBA, appear in blue text. Plants protected in Gauteng are indicated with a *.Some of the plant species recorded can be seen in Figure 10-2.

Table 10-1 Trees, shrubs and weeds recorded in the project area

Scientific Name	Common Name	Threat Status (SANBI, 2017)	SA Endemic	Alien Category
Acacia mearnsii	Black Wattle			NEMBA Category 2
Acalypha peduncularis	Usununundu	LC	Not Endemic	
Achyranthes aspera	Devil's horsewhip			Naturalized exotic weed
Agrostis lachnantha	South African Bent Grass	LC	Not Endemic	
Aloe transvaalensis	Transvaal Spotted Aloe	LC	Not Endemic	
Amaranthus hybridus	Smooth pigweed			Naturalized exotic weed
Argemone ochroleuca	Mexican poppy			NEMBA Category 1b
Aristida congesta subsp. congesta	Tassel Three-awned Grass	LC	Not Endemic	
Arundo donax	Spanish Reed			NEMBA Category 1b
Berkheya pinnatifida	Isihlungu	LC	Not Endemic	
Berkheya seminivea		LC	Endemic	
Bidens pilosa	Blackjack			Naturalized exotic weed
*Boophone disticha**	Poison Bulb	LC-Protected	Not Endemic	
Brachiaria serrata	Red-Topped Signal Grass	LC	Not Endemic	
Brassica sp	Cabbage			Foodplant
Cereus jamacaru	Queen of the night			NEMBA Category 1b
Cirsium vulgar	Spear Thistle			NEMBA Category 1b
Cleome maculata	Spotted Cleome	LC	Not Endemic	
Commelina africana	Yellow Commelina	LC	Not Endemic	
Conyza bonariensis	Hairy Fleabane			Naturalized exotic weed
Cortaderia selloana	Pampas grass			NEMBA Category 1b
Cosmos bipinnatus	Cosmos			Naturalized exotic weed
Crabbea hirsuta	Prickle Head	LC	Not Endemic	
*Crinum bulbispermum**	Orange River Lily	LC-Protected	Not Endemic	
Cucumis zeyheri	Wild Cucumber	LC	Not Endemic	
Cymbopogon caesius	Broad Leaved Turpentine Grass	LC	Not Endemic	
Cynodon dactylon	Couch Grass, Quick Grass	LC	Not Endemic	
Datura ferox	Large Thorn Apple			NEMBA Category 1b.
Datura stramonium	Common Thorn Apple			NEMBA Category 1b.
Delosperma herbeum	Highveld White Vygie	LC	Not Endemic	
Dicoma anomala	Aambeibos	LC	Not Endemic	
Digitaria eriantha	Finger Grass	LC	Not Endemic	
Diospyros lycioides	Bloubos	LC	Not Endemic	
Enneapogon cenchroides	Agtdaegras	LC	Not Endemic	
Eragrostis chloromelas	Blue Love Grass	LC	Not Endemic	
Eragrostis curvula	Weeping Love Grass	LC	Not Endemic	
Eragrostis gummiflua	Gum Grass	LC	Not Endemic	

Eucalyptus camaldulensis	Red River Gum			NEMBA Category 1b
Felicia muricata	Taai-Astertjie	LC	Not Endemic	
Flaveria bidentis	Smelterbossie			NEMBA Category 1b
Gomphrena celosioides	Bachelor's button			Naturalized exotic weed
Gomphocarpus fruticosus	Narrow-leaved cotton bush	LC	Not Endemic	
Helichrysum inornatum		LC	Not Endemic	
Helichrysum nudifolium	Hottentot's Tea	LC	Not Endemic	
Helichrysum rugulosum	Marotole (SS)	LC	Not Endemic	
Hermannia depressa	Rooiopslag	LC	Not Endemic	
Hermannia lancifolia		LC	Not Endemic	
Hermannia transvaalensis		LC	Not Endemic	
Hilliardiella oligocephala	Bicoloured Vernonia	LC	Not Endemic	
Hyparrhenia hirta	Common Thatching Grass	LC	Not Endemic	
Hypoxis hemerocallidea*	Star-flower	LC-Protected	Not Endemic	
Hypoxis iridifolia	Moli-boea	LC	Not Endemic	
Hypoxis rigidula	Silver-leaved Star-flower	LC	Not Endemic	
Imperata cylindrica	Cogon grass	LC	Not Endemic	
Ipomoea purpurea	Morning glory			NEMBA Category 1b
Ledebouria marginata		LC	Not Endemic	
Ledebouria ovatifolia	Icubudwana	LC	Not Endemic	
Ledebouria revoluta		LC	Not Endemic	
Leersia hexandra	Cutgrass	LC	Not Endemic	
Lippia javanica	Fever Tea	LC	Not Endemic	
Loudetia simplex	Russet Grass	LC	Not Endemic	
Melia azedarach	"Syringa", Persian Lilac			NEMBA Category 1b.
Melinis repens	Natal Red Top	LC	Not Endemic	
Mirabilis jalapa	Marvel-of-peru			NEMBA Category 1b
Morus alba	White Mulberry, Common Mulberry		Not Endemic	NEMBA Category 3
Nicotiana glauca	Tree tobacco			NEMBA Category 1b
Oenothera rosea	Rose evening primrose			Naturalized exotic weed
Opuntia ficus-indica	Prickly pear			NEMBA Category 1b
Paspalum dilatatum	Dallis Grass			Naturalized exotic weed
Paspalum notatum	Bahiagrass			Naturalized exotic
Paspalum urvillei	Vasey Grass			Naturalized exotic weed
Pennisetum clandestinum	Kikuyu Grass			NEMBA Category 1b in protected areas and wetlands.
Perotis patens	Purple Spike Catstail	LC	Not Endemic	
Persicaria lapathifolia	Pale smartweed			Naturalized exotic weed
Phragmites australis	Common Reed	LC	Not Endemic	
Phytolacca octandra	Forest Inkberry			
Pinus pinaster	Cluster pine			NEMBA Category 2

Pogonarthria squarrosa	Herringbone Grass	LC	Not Endemic	
Populus alba	White popular			NEMBA Category 2
Prunus persica	Peach			Naturalized exotic weed
Richardia brasiliensis	Mexican clover			Naturalized exotic weed
Robinia pseudoacacia	Black locust			NEMBA Category 1b
Schizachyrium sanguineum	Red autumn grass	LC	Not Endemic	
Schkuhria pinnata	Dwarf Marigold			Naturalized exotic weed
Searsia lancea	Karee	LC	Not Endemic	
Searsia pyroides	Common Wild Currant	LC	Not Endemic	
Selago densiflora		LC	Not Endemic	
Senecio inornatus	Tall Marsh Senecio	LC	Not Endemic	
Setaria sphacelata var. sphacelata	Common Bristle Grass	LC	Not Endemic	
Setaria verticillata	Bur Bristle Grass	LC	Not Endemic	
Solanum campylacanthum	Bitter Apple	LC	Not Endemic	
Solanum mauritianum	Bugweed			NEMBA Category 1b
Solanum sisymbriifolium*	Sticky nightshade			NEMBA Category 1b
Sorghum bicolor	Sorghum	LC	Not Endemic	
Sporobolus africanus	Ratstail Dropseed	LC	Not Endemic	
Stoebe plumosa	Bankruptbush	LC	Not Endemic	
Tagetes minuta	Khaki Bush			Naturalized exotic weed
Themeda triandra	Red Grass	LC	Not Endemic	
Trichoneura grandiglumis	Rolling Grass	LC	Not Endemic	
Typha capensis	Bulrush, Common Cattail	LC	Not Endemic	
Urochloa mosambicensis	Bushveld Signal Grass	LC	Not Endemic	
Vachellia karroo	Sweet Thorn	LC	Not Endemic	
Verbena bonariensis	Wild Verbena			NEMBA Category 1b.
Xanthium strumarium	Rough cocklebur			NEMBA Category 1b
Zea mays	Maize			Foodplant
Zinnia peruviana	Peruvian zinnia			Naturalized exotic weed
Ziziphus zeyheriana	Klein-wag-'n-bietjie	LC	Not Endemic	

Figure 10-2 Some of the flora species recorded in the project area: A)*Selago densiflora*, B) *Boophone disticha*, C) *Cleome maculata*, D) *Ledebouria revoluta*., E) *Hypoxis iridifolia*, and F) *Helichrysum inornatum*

10.1.2.1 Protected plant species

Several individuals of three protected plant species within Gauteng (*Boophone disticha, Crinum bulbispermum and Hypoxis hemerocallidea*) were observed and marked during the field survey, and their locations mapped can be seen in Figure 10-3 . These plants are protected due to them being collected for their medicinal values and has led to a decrease in their numbers. Protected plant species can either be relocated in situ (preferred option) or a permit to destroy can be obtained.

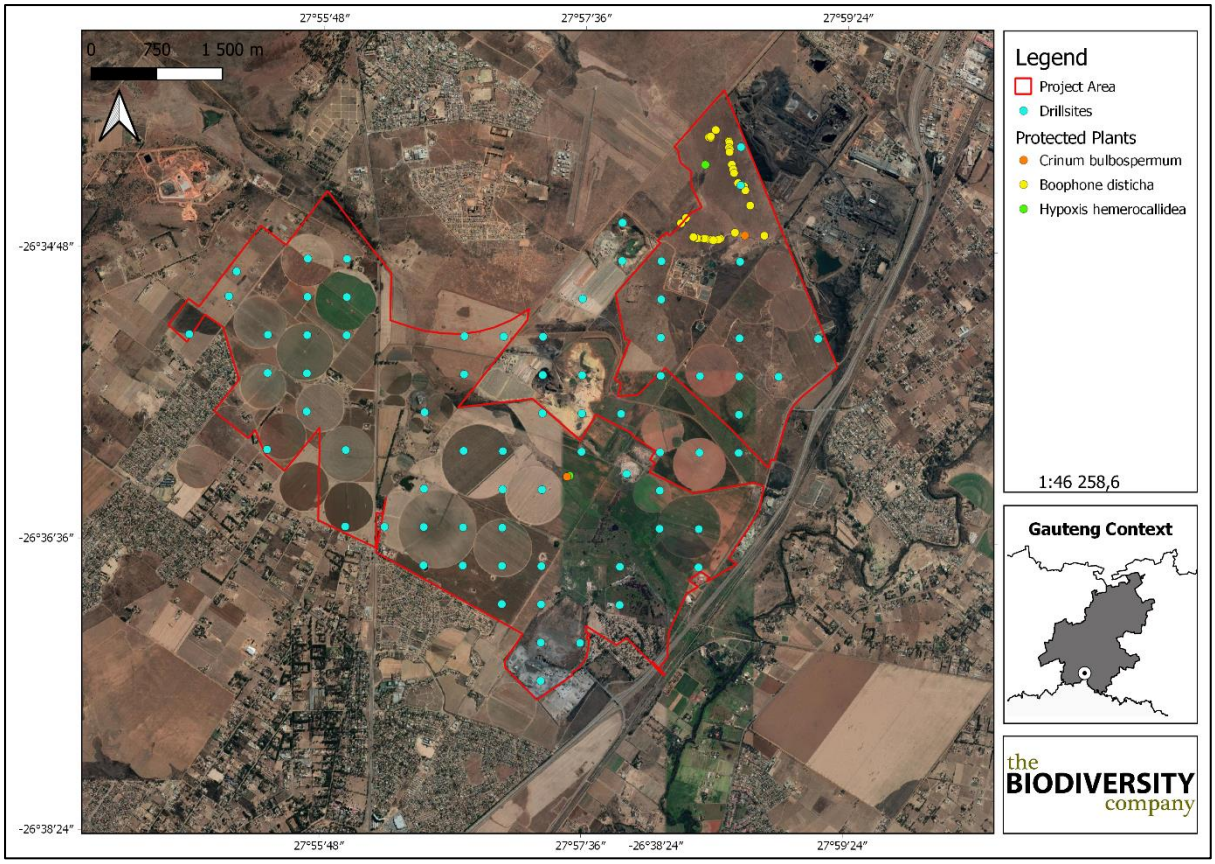


Figure 10-3 Locations of the protected plant species marked during the field survey.

Figure 10-4 Pictures of the protected species found during the field survey. A-C) *Boophone disticha* in its different forms as the plant changes for dormancy for winter, D-E) *Crinum bulbispermum and F) Hypoxis hemerocallidea.*

10.1.2.2 Alien and Invasive Plants

Declared weeds and invader plant species have the tendency to dominate or replace the canopy or herbaceous layer of natural ecosystems, thereby transforming the structure, composition, and function of these systems. Therefore, it is important that these plants are

controlled and eradicated by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species.

The National Environmental Management: Biodiversity Act (NEMBA) is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (Government Gazette No 78 of 2014). The Alien and Invasive Species Regulations were published in the Government Gazette No. 37886, 1 August 2014, and was amended in February 2018 in the Government Gazette No. 41445. The legislation calls for the removal and / or control of alien invasive plant species (Category 1 species). In addition, unless authorised thereto in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse.

Below is a brief explanation of the three categories in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA):

- Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.

- Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.

- Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.

- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

Note that according to the regulations, a person who has under his or her control a category 1b listed invasive species must immediately:

- Notify the competent authority in writing

- Take steps to manage the listed invasive species in compliance with:

    - Section 75 of the Act;

    - The relevant invasive species management programme developed in terms of regulation 4; and

- Any directive issued in terms of section 73(3) of the Act.

Twenty (20) alien and/or invasive plants were recorded during the field survey within the project area. It is recommended that an Alien Plant Species Management Plan be implemented within the project areas in order to prevent the prospecting activities and movement exacerbating the infestation.

10.1.3 Faunal Assessment

The faunal assessment was completed based on the desktop review and intensive biodiversity surveys which were conducted across the project area.

10.1.3.1 Avifauna

A total of twenty-three (23) bird species were recorded in the project area during the May 2020 surveys based on either direct observations, or the presence of visual tracks & signs (Figure 10-5 and Table 10-2).

Table 10-2 Avifaunal species recorded in the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Acridotheres tristis	Myna, Common	Unlisted	LC
Afrotis afraoides	Korhaan, Northern Black	Unlisted	LC
Alopochen aegyptiacus	Goose, Egyptian	Unlisted	LC
Anas undulata	Duck, Yellow-billed	Unlisted	LC
Ardea melanocephala	Heron, Black-headed	Unlisted	LC
Bostrychia hagedash	Ibis, Hadeda	Unlisted	LC
Bubulcus ibis	Egret, Cattle	Unlisted	LC
Cisticola juncidis	Cisticola, Zitting	Unlisted	LC
Colius striatus	Mousebird, Speckled	Unlisted	LC
Elanus caeruleus	Kite, Black-shouldered	Unlisted	LC
Larus cirrocephalus	Gull, Grey-headed	Unlisted	LC
Motacilla capensis	Wagtail, Cape	Unlisted	LC
Numida meleagris	Guineafowl, Helmeted	Unlisted	LC
Plegadis falcinellus	Ibis, Glossy	Unlisted	LC
Sphenoeacus afer	Grassbird, Cape	Unlisted	LC
Spreo bicolor	Starling, Pied	Unlisted	LC
Streptopelia capicola	Turtle-dove, Cape	Unlisted	LC
Streptopelia senegalensis	Dove, Laughing	Unlisted	LC
Threskiornis aethiopicus	Ibis, African Sacred	Unlisted	LC
Vanellus armatus	Lapwing, Blacksmith	Unlisted	LC
Vanellus coronatus	Lapwing, Crowned	Unlisted	LC
Vanellus senegallus	Lapwing, African Wattled	Unlisted	LC
Vidua paradisaea	Paradise-whydah, Long-tailed	Unlisted	LC

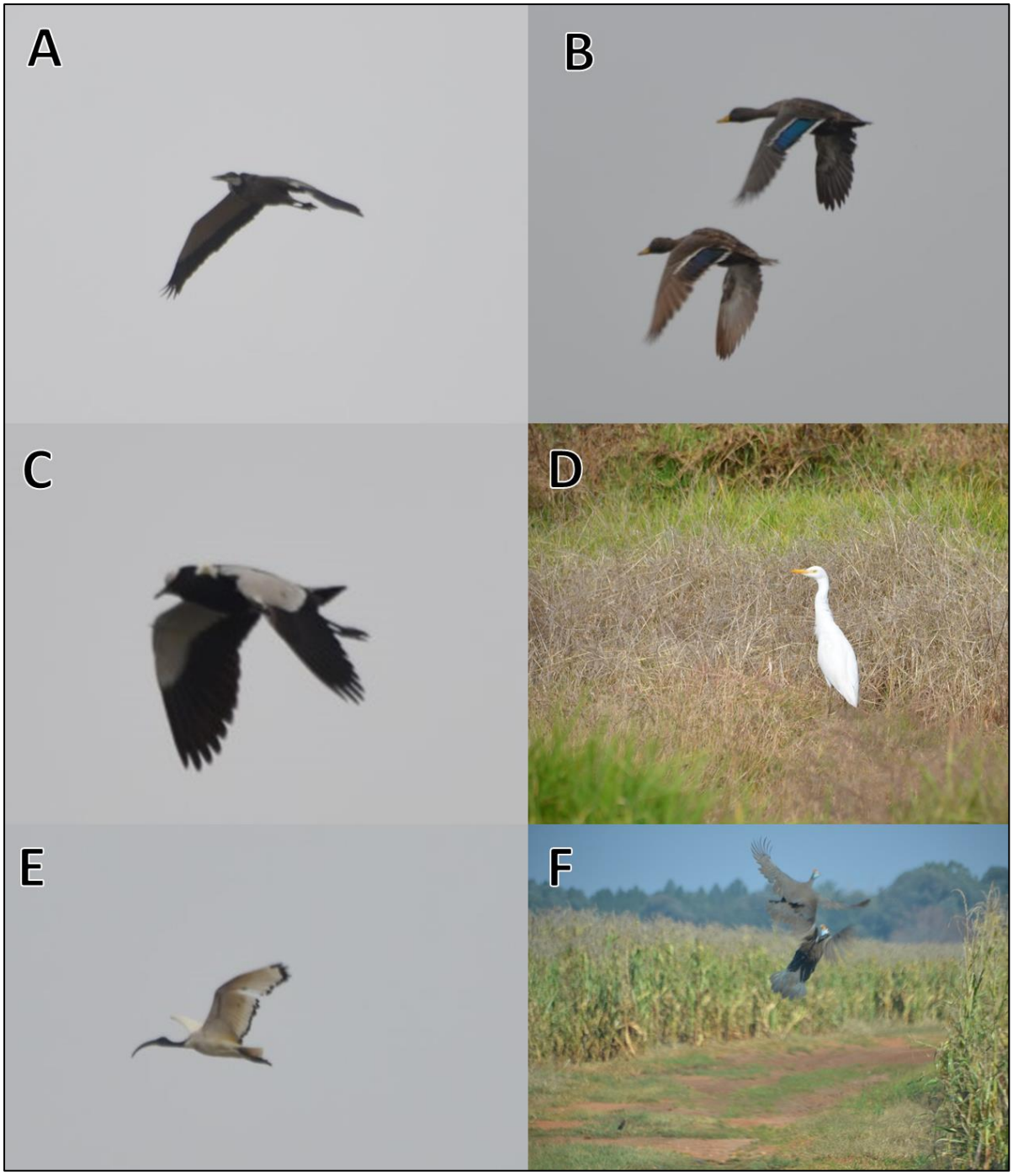


Figure 10-5 Some of the avifaunal species recorded on site: A) Black-headed Heron (*Ardea melanocephala*), B) Yellow-billed duck (*Anas undulata*), C) Blacksmith Lapwing (*Vanellus armatus*), D) Cattle Egret (*Bubulcus ibis*), E) African Sacred Ibis (*Threskiornis aethiopicus*) and F) Helmeted Guineafowl (*Numida meleagris*)

10.1.3.2 Mammals

Five mammal species were recorded in the project area during the May 2020 surveys based on either direct observation, camera trap photographs or the presence of visual tracks & signs (Table 10-3 and Figure 10-6). None of the species recorded were SCCs.

Table 10-3 Mammal species recorded in the Kookfontein project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Canis mesomelas	Black-backed Jackal	LC	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Felis silvestris	African Wildcat	LC	LC
Herpestes sanguineus	Slender Mongoose	LC	LC
Sylvicapra grimmia	Common Duiker	LC	LC

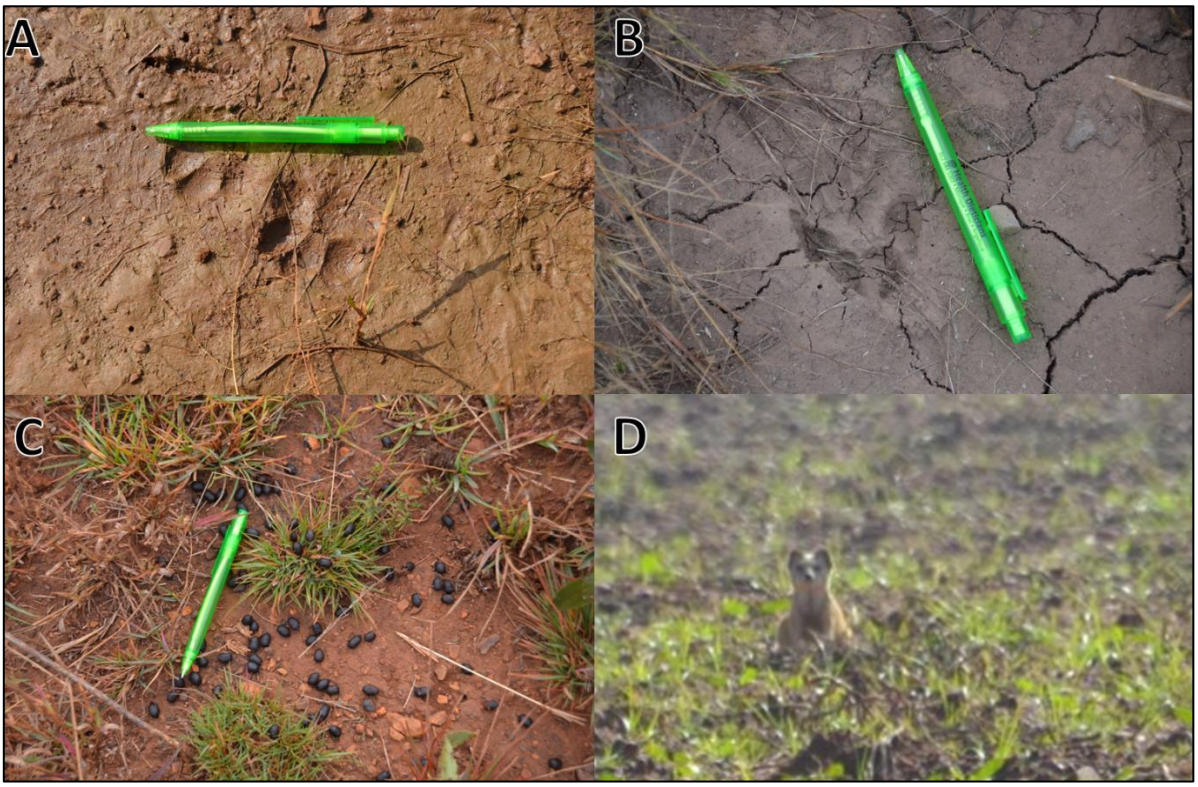


Figure 10-6 Some of the mammal species recorded in the project area: A) African Wildcat (*Felis silvestris*) tracks, B) Black-backed Jackal (*Canis mesomelas*), C) Common Duiker (*Sylvicapra grimmia*) and D) Yellow mongoose (*Cynictis penicillata*).

10.1.3.3 Herpetofauna

Two (2) reptile species and one (1) amphibian species were recorded in the project area during the May 2020 surveys (Table 10-4 and Figure 10-7). The species recorded were not SCCs. Herpetofaunal activity may have been low due to the seasonality of the survey being close to the winter season, resulting in a low number of individuals recorded.

Table 10-4 A list of herpetofauna recorded in the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
	Reptiles		
Pachydactylus affinis	Transvaal Gecko	LC	LC
Panaspis wahlbergi	Wahlberg's Snake-eyed Skink	LC	Unlisted

Amphibians			
Schismaderma carens	African Red Toad	LC	LC

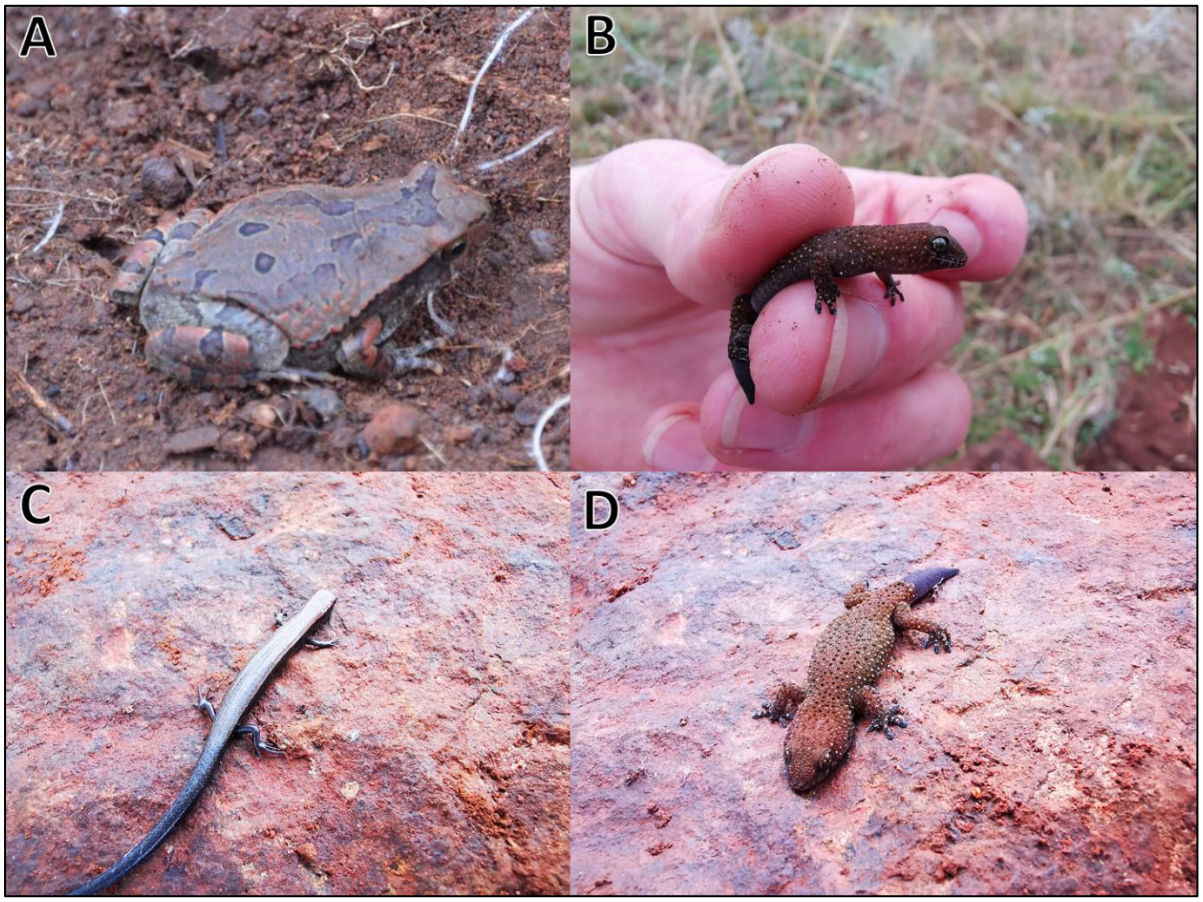


Figure 10-7 The herpetofauna species recorded in the project area: A) African Red Toad (*Schismaderma carens),* B & D) Transvaal Gecko *(Pachydactylus affinis)* and C) Wahlberg's Snake-eyed Skink (*Panaspis wahlbergi)*

10.2 Wetland Assessment

10.2.1 Wetland Delineation and Description

In preparation for the identification and delineation of wetland areas, a review of historical and current land uses was undertaken. It is evident from Figure 10-9 the extent of furrows created to aid agricultural activities in the area, with further modifications to the watercourses evident and presented in Figure 10-10. A Normalized Differential Vegetation Index (NDVI) was generated for the project area. The NDVI is a standardized vegetation index which allows for the generation of an image showing the relative biomass. The chlorophyll absorption in Red band and relatively high reflectance of vegetation in Near Infrared band (NIR) are using for calculating NDVI. The generation of an NDVI can assist with the identification of possible wetland area, and also contribute to the delineation of the extent of these areas (Figure 10-11). Figure 10-12 presents the watercourse delineated for the local area, which corresponds to the 1941 land cover map. The extent and location of the watercourse will be considered for the delineation and assessment of wetland areas.

The wetland areas were delineated in accordance with the DWAF (2005) guidelines (see Figure 10-13). During the field survey, a total of four wetland types (Figure 10-13), comprising

12 HGM units were identified and delineated for the assessment (Figure 10-14). A number of excavations, sinkholes, dams and artificial features were also identified and are presented in Figure 10-13. The location of these features has only been indicated, and no ecological assessment was completed for these features.

According to Holmes and Meadows (2012) sinkholes are typically associated with areas of dolomite where unique surface and sub-surface features are created by large-scale dissolution of soluble rocks. The dissolved carbonate rocks can for distinctive geomorphic features both at the surface and also underground. In South Africa sinkholes typically occur on dolomites of the Transvaal Supergroup, and on the Ghaap Plateau west of Kimberly (Holmes and Meadows, 2012). According to Holmes and Meadows (2012) the dissolution of dolomites can create surface features which include sinkholes, amongst other features. Sinkholes in the project area were recorded and depicted on the land cover map dated 1979 (Figure 10-9) The location of some surface features identified for the project area, including graves, rocky outcrops and sinkholes is presented in Figure 10-13.Photographs of some of the sinkholes recorded within the project area are presented in Figure 10-15 whereas the water resources observed are presented in Figure 10-16.

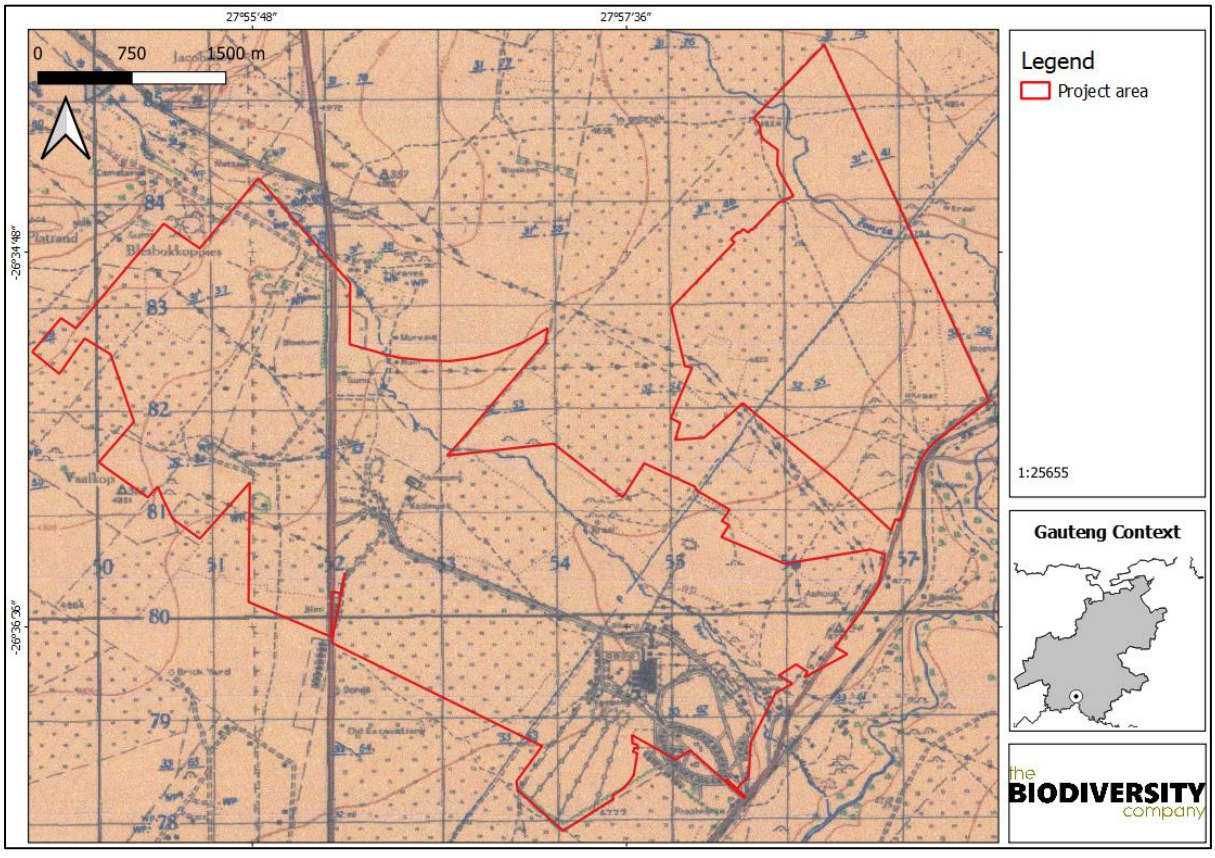


Figure 10-8 Land cover (1941) (South Africa 1: 50 000 Sheet 2627 DB)

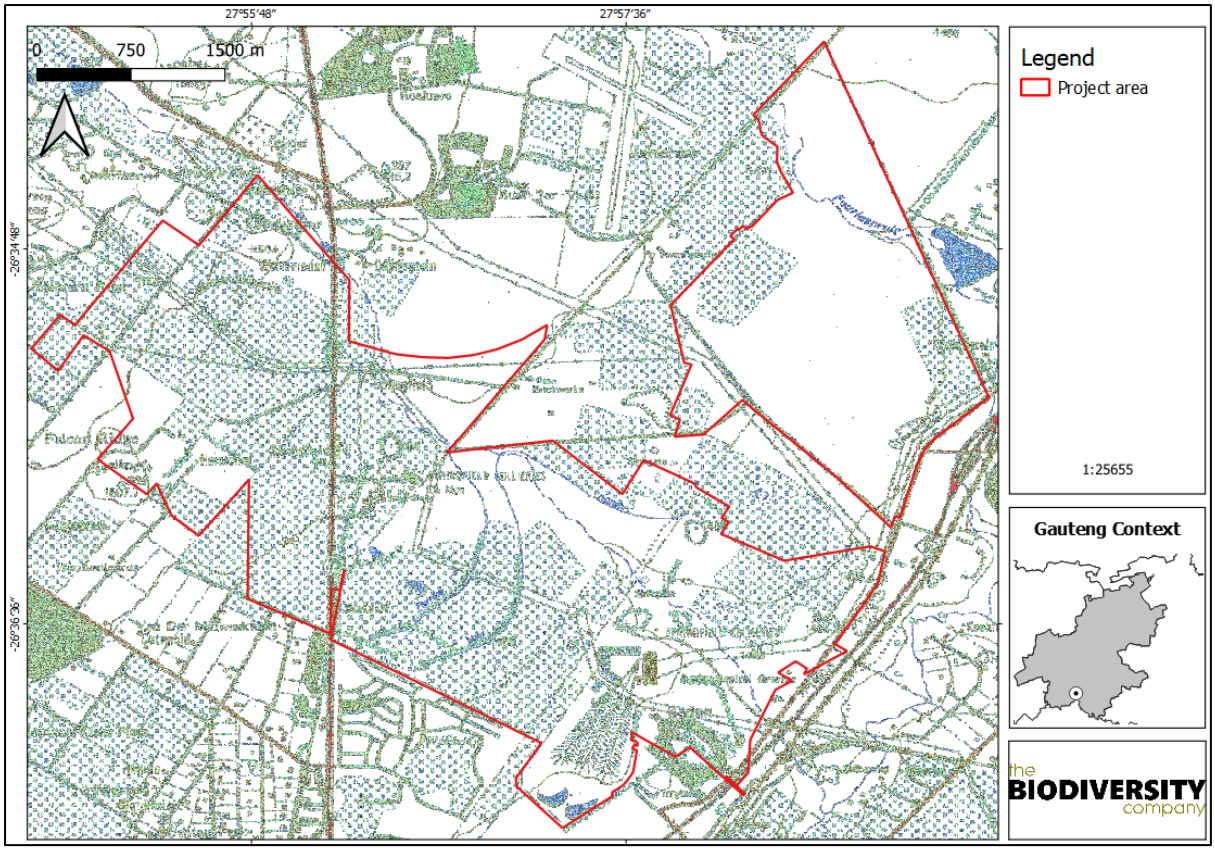


Figure 10-9 Land cover (1979) (South Africa 1: 50 000 Sheet 2627 DB)

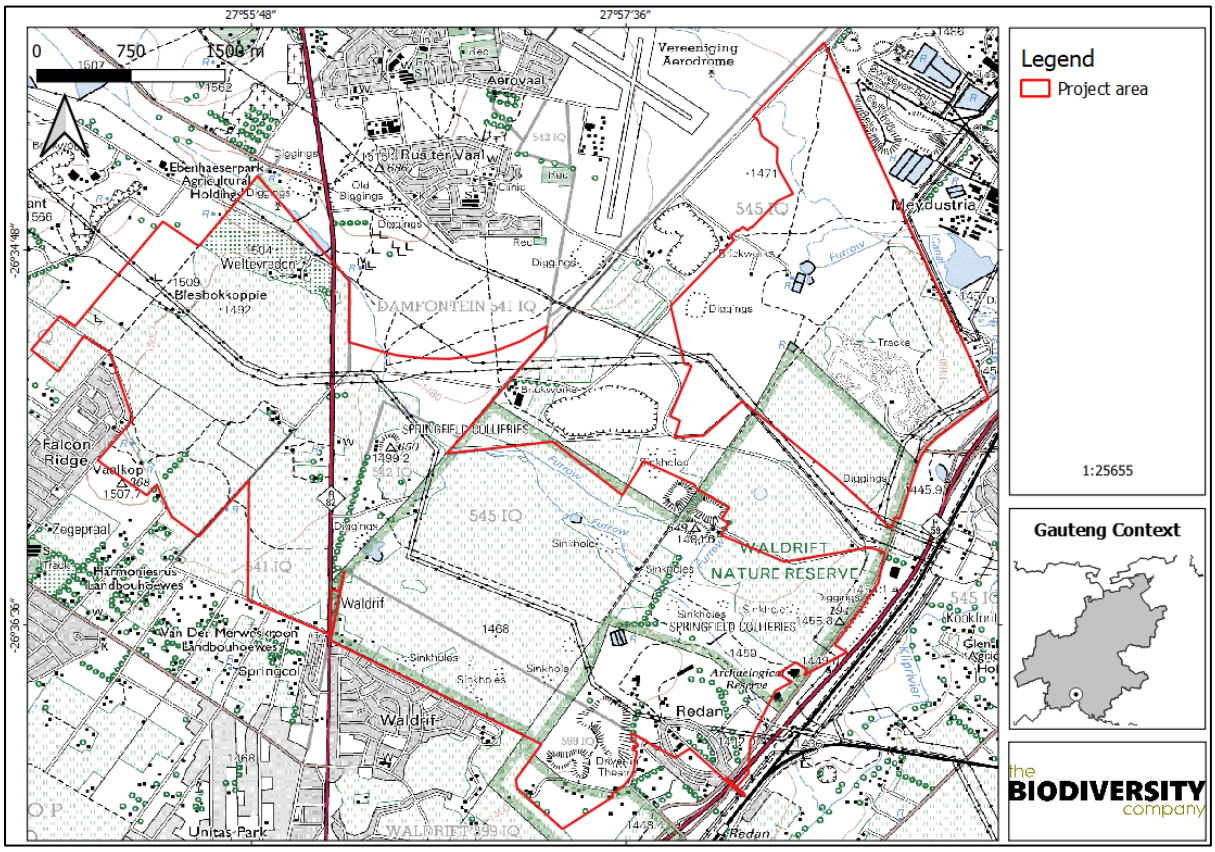


Figure 10-10 Land cover (2006) (South Africa 1: 50 000 Sheet 2627 DB)

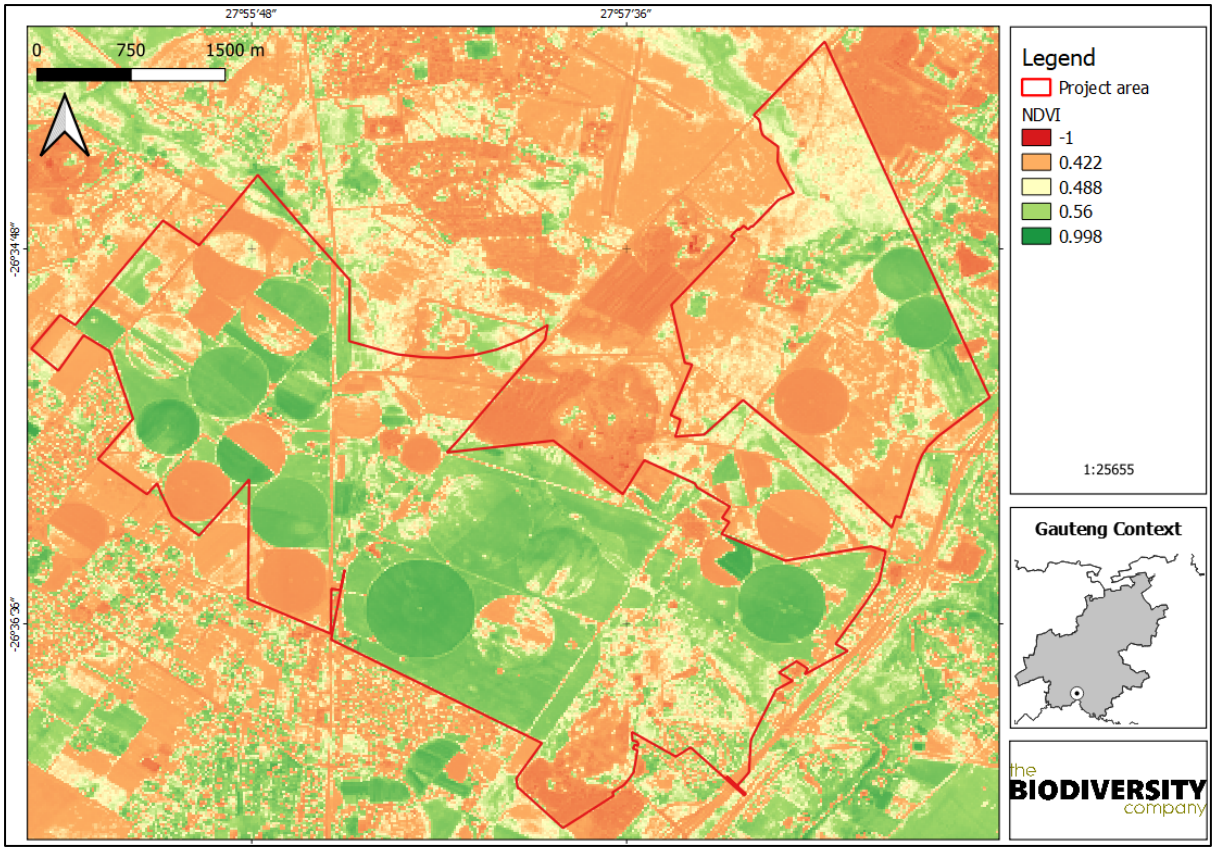


Figure 10-11 NDVI created for the project area

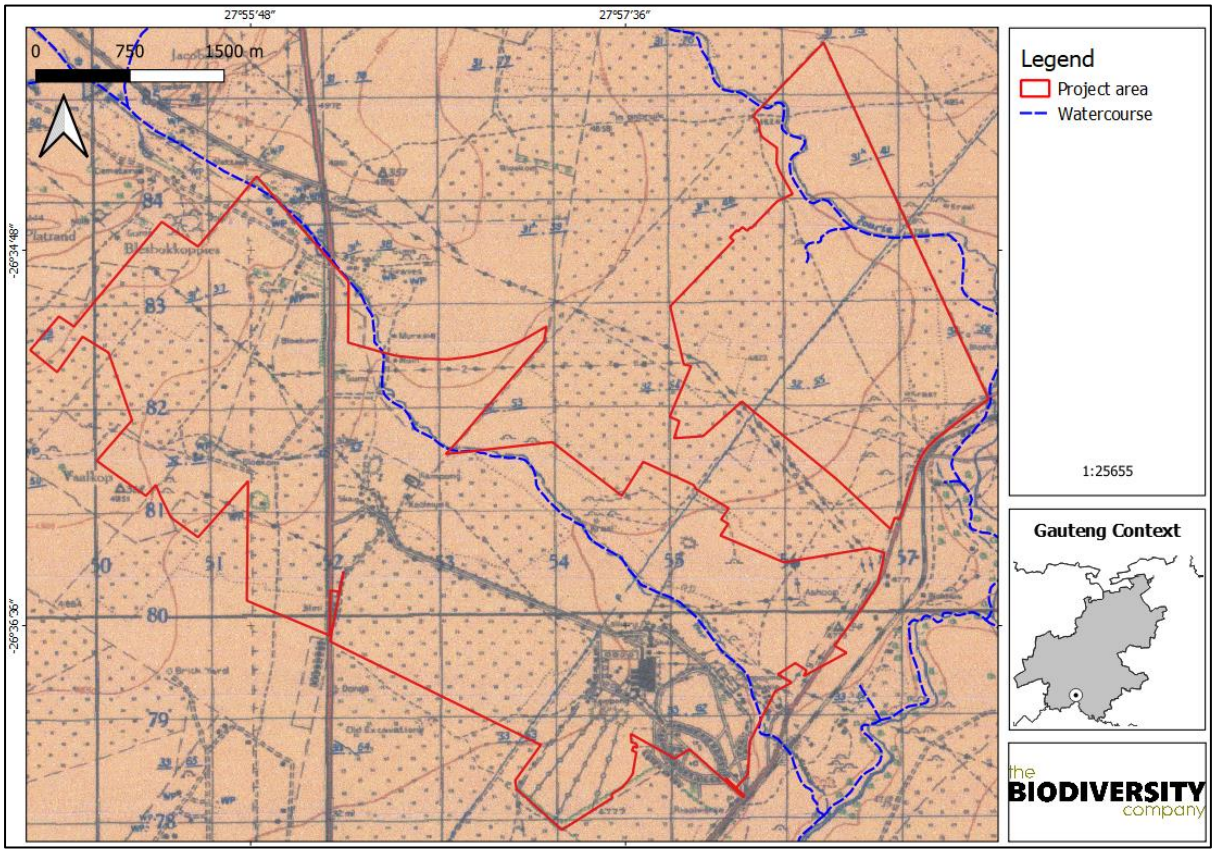


Figure 10-12 Land cover (1941) and delineated watercourses

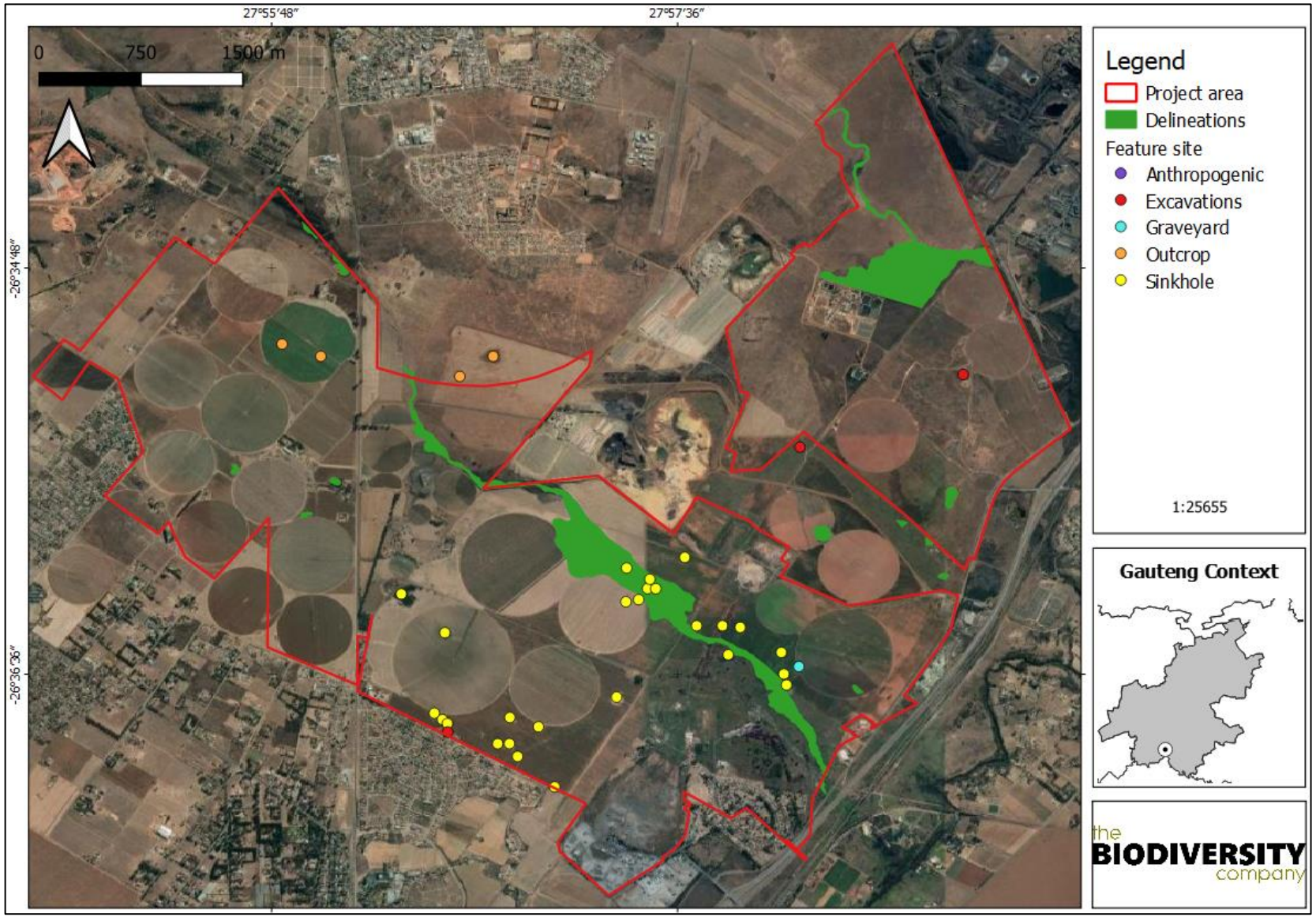


Figure 10-13 Delineation of wetlands within the Kookfontein project area

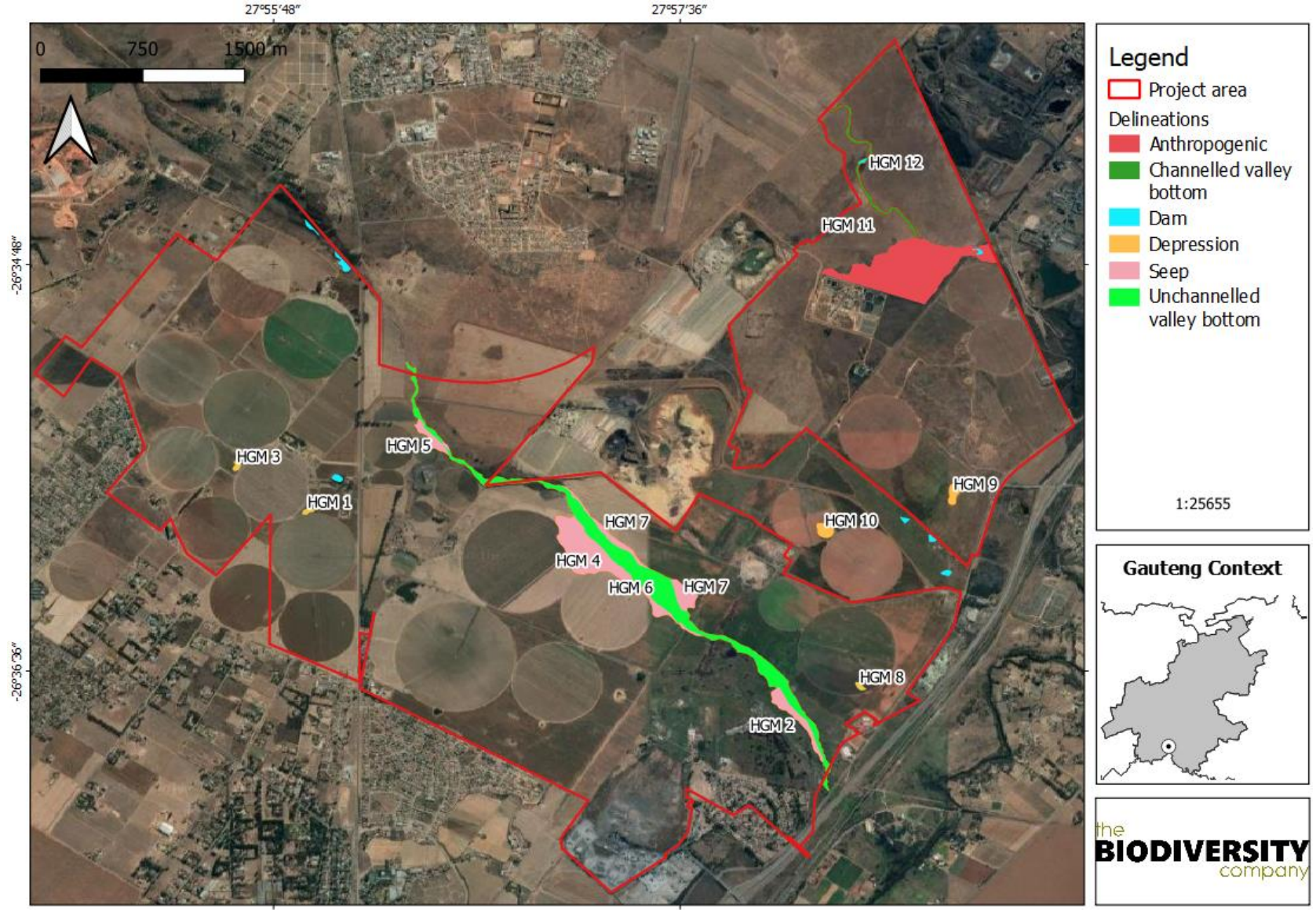


Figure 10-14 Delineation of HGM units within the Kookfontein project area

Figure 10-15 Photographs of some of the sinkholes recorded in the project area

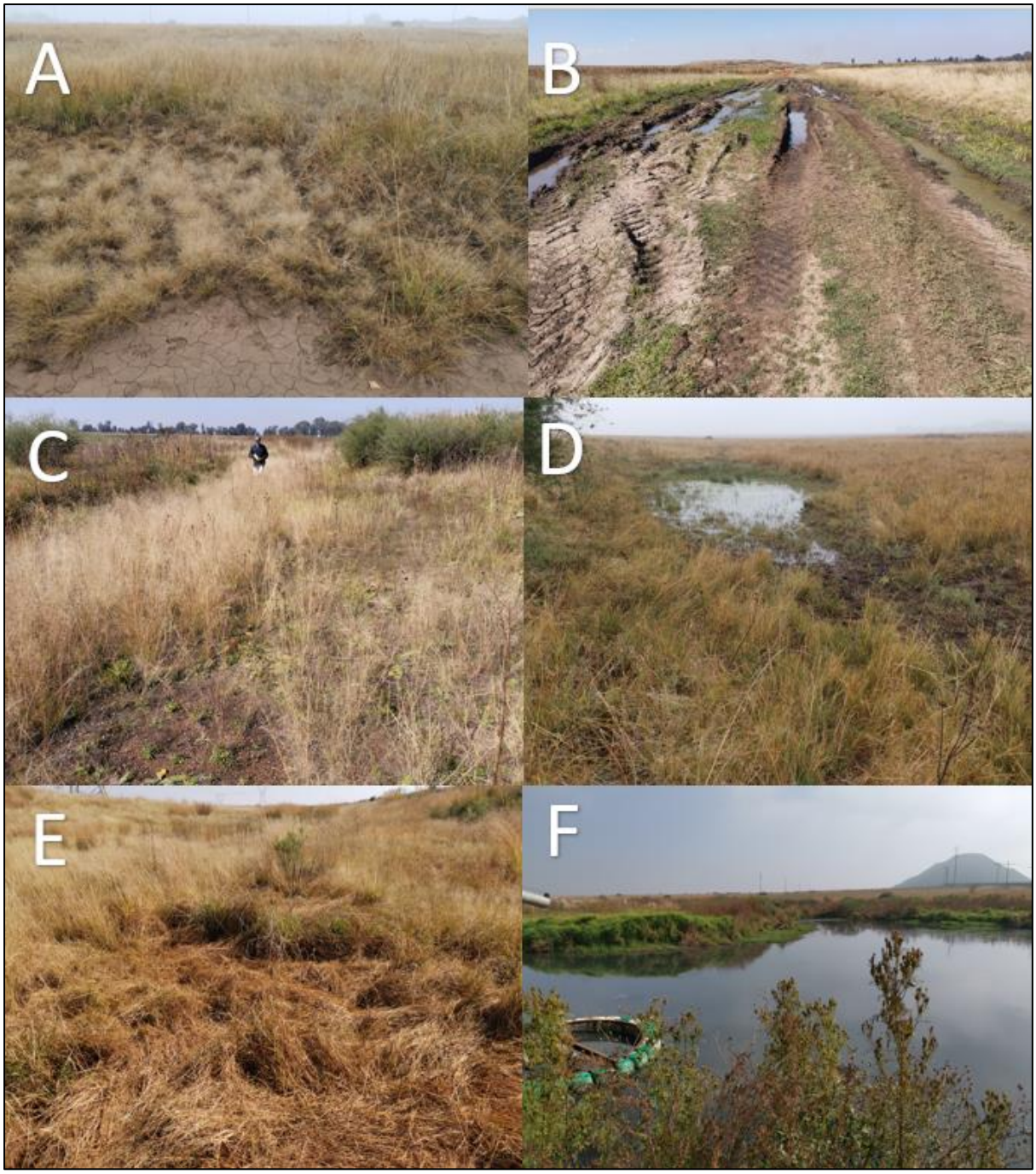


Figure 10-16 Photographs of identified water resources; A) A depression (HGM 11), B) Seep (HGM 4), C) Unchanneled valley bottom (HGM 6), Channelled valley bottom (HGM 12), E & F) Dams

10.2.2 Wetland Classification

A total of 12 HGM units were delineated and subject to more detailed analysis in terms of present ecological state (PES) ecological importance and sensitivity. A general ecosystem services description has been provided for the four primary wetland types identified for the project. The level 1-4 classification as per the national wetland classification system (Ollis *et al.,* 2013) is presented in (Table *10-5*).

Table 10-5 Wetland classification as per SANBI guideline (Ollis *et al*. 2013)

Wetland System	Level 1	Level 2		Level 3	Level 4		
	System	DWS Ecoregion/s	NFEPA Wet Veg Group/s	Landscape Unit	4A (HGM)	4B	4C
HGM 1	Inland	Highveld	Mesic Highveld Grasslands Group 3	Bench	Depression	Endorheic	Without channelled inflow
HGM 2	Inland	Highveld	Mesic Highveld Grasslands Group 3	Slope	Seep	Without channelled outflow	N/A
HGM 3	Inland	Highveld	Mesic Highveld Grasslands Group 3	Bench	Depression	Endorheic	Without channelled inflow
HGM 4	Inland	Highveld	Mesic Highveld Grasslands Group 3	Slope	Seep	Without channelled outflow	N/A
HGM 5	Inland	Highveld	Mesic Highveld Grasslands Group 3	Slope	Seep	Without channelled outflow	N/A
HGM 6	Inland	Highveld	Mesic Highveld Grasslands Group 3	Valley floor	Unchanneled valley bottom	N/A	N/A
HGM 7	Inland	Highveld	Mesic Highveld Grasslands Group 3	Slope	Seep	Without channelled outflow	N/A
HGM 8	Inland	Highveld	Mesic Highveld Grasslands Group 3	Bench	Depression	Endorheic	Without channelled inflow
HGM 9	Inland	Highveld	Mesic Highveld Grasslands Group 3	Bench	Depression	Endorheic	Without channelled inflow
HGM 10	Inland	Highveld	Mesic Highveld Grasslands Group 3	Bench	Depression	Endorheic	Without channelled inflow
HGM 11	Inland	Highveld	Mesic Highveld Grasslands Group 3	Bench	Depression	Endorheic	Without channelled inflow
HGM 12	Inland	Highveld	Mesic Highveld Grasslands Group 3	Valley floor	Channelled valley bottom	N/A	N/A

10.2.3 Hydromorphic Setting

Figure 10-17 presents a diagram of the HGM units, showing the dominant movement of water into, through and out of the system (Ollis *et al*., 2013). A description of the wetland HGM unit is provided below.

Channelled valley bottom wetlands are typically found on valley floors with a clearly defined, finite stream channel and lacks floodplain features, referring specifically to meanders. Channelled valley bottom wetlands are known to undergo loss of sediment in cases where the wetlands' slope is high and the deposition thereof in cases of low relief. Unchanneled valley bottom wetlands are typically found on valley floors where the landscape does not allow high energy flows.

Depressions are inward draining basins with an enclosing topography which allows for water to accumulate within the system. Depressions, in some cases, are also fed by lateral sub-surface flows in cases where the dominant geology allows for these types of flows.

Hillslope seeps are characterised by colluvial movement of material. These systems are fed by very diffuse sub-surface flows which seep out at very slow rates, ultimately ensuring that no direct surface water connects this wetland with other water courses within the valleys.

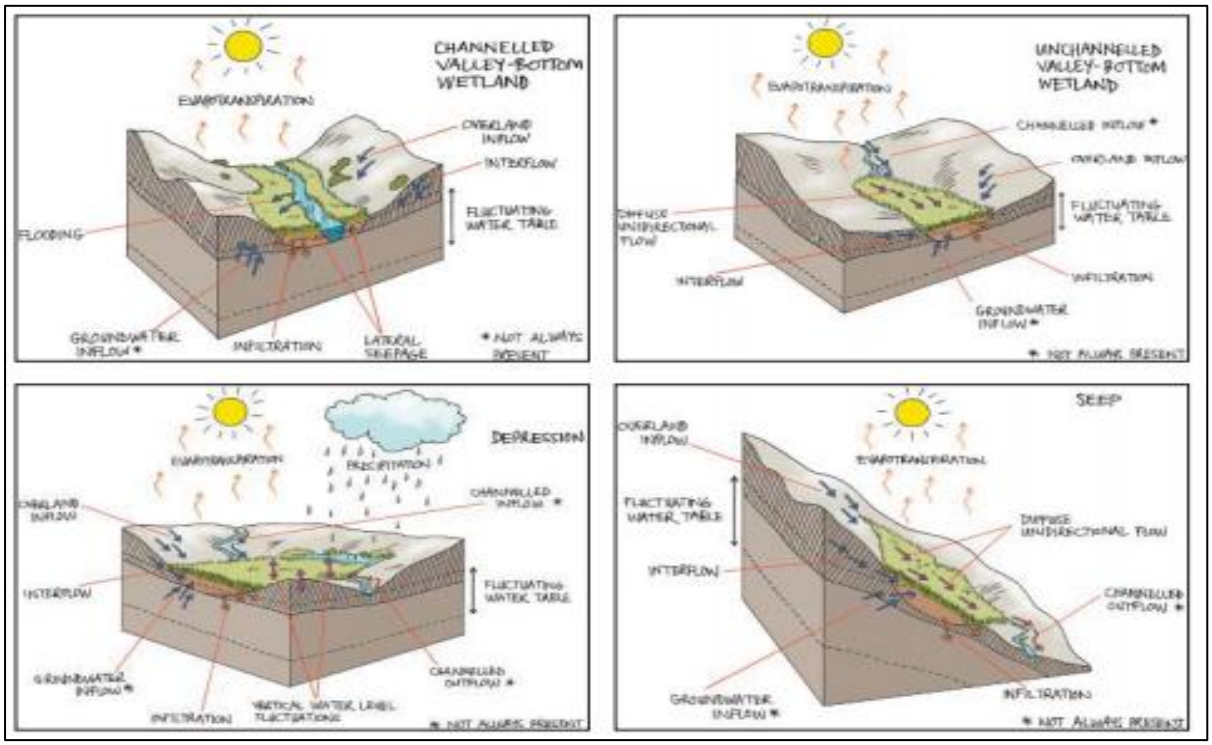


Figure 10-17 Amalgamated diagram of the wetland units, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis *et al*. 2013)

10.2.4 Soil

Soil sampling during the site visit revealed mainly dark orthic topsoils underlain by a G-horizon which were classified as a Katspruit soil form, although some areas contained a more gritty, sandy substrate which was classified as a Kroonstad soil form. Descriptions of these dominant soil forms are shown in Figure 10-18.

10.3 Vegetation

Dominant wetland species within the permanent zones include *Typha capensis* and *Phragmites australis* while seasonal to temporary zones where characterised by *Andropogon eucomus, Imperata cylindrica*, *Scirpoides dioecus*, *Juncus effuses* and *Schoenoplectus brachyceras*. Some examples of the wetland vegetation detected on site is shown in Figure 10-19.

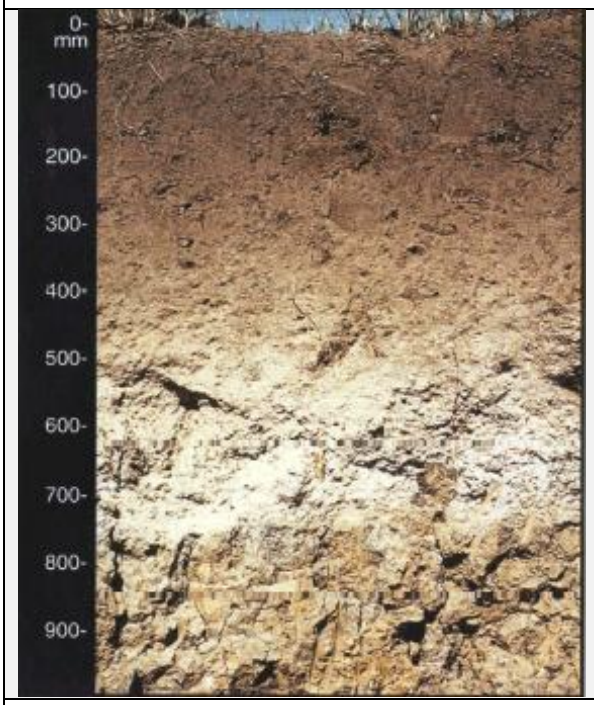
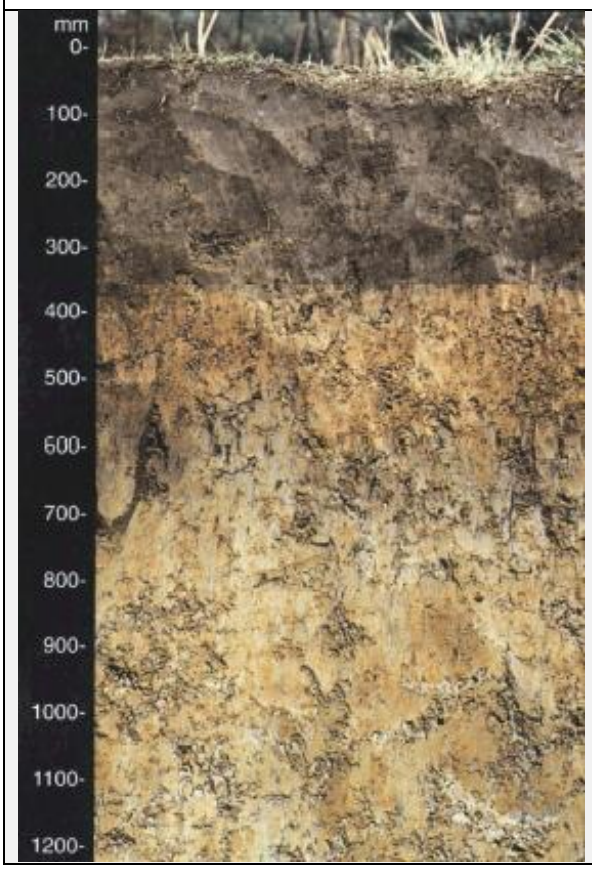
Kroonstad	
	The terrain was mid-slope to channel. Saturation was typically permanent to seasonal. The soil shows an orthic A horizon over an E over a G horizon. The G-horizon acts as a plug with virtually no permeability and as a result water moves laterally downslope leaching the E-horizon.
Katspruit:	
	Widespread associated with a number of permanent zones. Permanent. Orthic over G horizon. In the Katspruit soil form an orthic A horizon overlies a G horizon which is typical moist with grey matrix colours. Mottling may or may not occur down to a depth of 50 cm. Many of the Katspruit soils associated with the valley bottom systems in the area are not characteristically saturated at depth. This is largely the result of incision of the stream channel, which serves to drain these areas. The soil profile thus dries out.

Figure 10-18 Cross section of soil profiles (SASA, 1999)

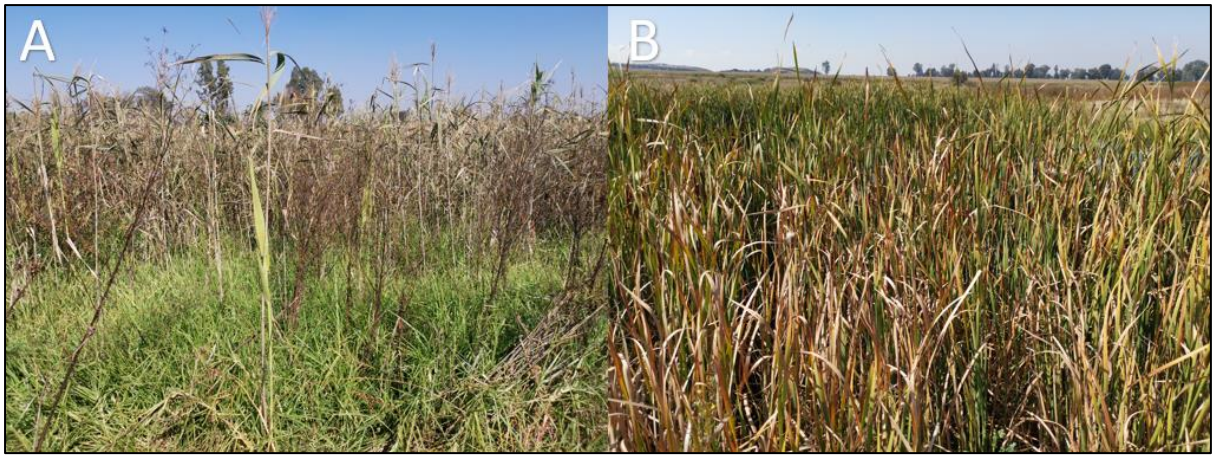


Figure 10-19 Photographs of *Phragmites australis* (A) and *Typha capensis* (B) identified for the assessment

10.3.1 Ecological Functional Description

A general description of the ecoservices typically associated with each HGM type is provided here. Table 10-6 provides a general guide as to the hydrological benefits likely to be provided by the respective HGM types. It is however important to note that the descriptions of the respective functions are merely typical expectations.

Table 10-6 Preliminary rating of the hydrological benefits likely to be provided by a wetland based on its particular HGM type (Kotze *et al*., 2009)

WETLAND HYDRO-GEO-MORPHIC TYPE	REGULATORY BENEFITS POTENTIALLY PROVIDED BY WETLAND							
	Flood attenuation		Stream flow regulation	Enhancement of water quality				
	Early wet season	Late wet season		Erosion control	Sediment trapping	Phos-phates	Nitrates	Toxicants[2]
1. Floodplain	++	+	0	++	++	++	+	+
2. Valley-bottom - channelled	+	0	0	++	+	+	+	+
3. Valley-bottom -unchannelled	+	+	+?	++	++	+	+	++
4. Hillslope seepage connected to a stream channel	+	0	+	++	0	0	++	++
5. Isolated hillslope seepage	+	0	0	++	0	0	++	+
6. Pan/ Depression	+	+	0	0	0	0	+	+

Rating: 0 Benefit unlikely to be provided to any significant extent
+ Benefit likely to be present at least to some degree
++ Benefit very likely to be present (and often supplied to a high level)

According to (Kotze *et al*. 2009), channelled valley bottom wetlands tend to contribute less to sediment trapping and flood attenuation than other systems. Channelled valley bottom

wetlands are well known to improve the assimilation of toxicants, nitrates and sulphates, especially in cases where sub-surface flows contribute to the systems' water source (Kotze *et al*., 2009).

Unchanneled valley bottoms are characterised by sediment deposition, a gentle gradient with streamflow generally being spread diffusely across the wetland, ultimately ensuring prolonged saturation levels and high levels of organic matter (Kotze *et al.* 2009). The assimilation of toxicants, nitrates and phosphates are usually high for unchanneled valley bottom wetlands, especially in cases where the valley is fed by sub-surface interflow from slopes. The shallow depths of surface water within this system adds to the degradation of toxic contaminants by means of sunlight penetration.

According to (Kotze *et al.* 2009), the generally impermeable nature of depressions and their inward draining features are the main reasons why the streamflow regulation ability of these systems is mediocre. Additionally, depressions do not tend to contribute meaningfully to sediment trapping. The reason for this phenomenon is due to winds picking up sediments within pans during dry seasons which ultimately leads to the removal of these sediments and the deposition thereof elsewhere. The assimilation of nitrates, toxicants and phosphates are some of the higher rated ecosystem services for depressions due to the continuous precipitation and dissolving of minerals and other contaminants during dry and wet seasons respectively, (Kotze *et al.,* 2009).

Hillslope seeps are well documented by (Kotze *et al.,* 2009) to be associated with sub-surface ground water flows. These systems tend to contribute to flood attenuation given their diffuse nature. This attenuation only occurs while the soil within the wetland is not yet fully saturated. The accumulation of organic material and sediment contributes to prolonged levels of saturation due to this deposition slowing down the sub-surface movement of water. Water typically accumulates in the upper slope (above the seep). The accumulation of organic matter additionally is essential in the denitrification process involved with nitrate assimilation. Seeps generally.

10.3.2 The Ecological Health

The PES for the assessed HGM units is presented in Table 10-7. Figure 10-21 presents the PES classification for the project area.

All the identified HGM units have been modified to some extent, with the level of modification ranging from "Critically Modified", "Largely Modified" to "Moderately Modified". Local land uses, comprising predominantly of agricultural and anthropogenic activities by way of the landfill, mining and wastewater treatment facility have all contributed to wetland modifications (Figure 10-20)

The hydrology of the channelled systems has been altered by efforts to drain and divert water through the unchanneled system in particular, and also the construction of impoundments with the valley bottom areas. The hydrology of the channelled system has been further altered with hydrological inputs from the wastewater treatment facility. The geomorphology of the systems has been altered the encroachment of land use activities either into, or within the periphery of these wetlands. Attempts to drain and divert water has caused desiccation of the unchanneled system to some extent, with water inputs still be provided to some extent by the adjacent hillslope areas. It was also evident in selected areas that attempts had been made to also drain slope areas to accommodate agricultural activities. These attempts to manage the

hydrological inputs for the area has caused the narrowing of selected wetland areas. Attempts to also maximise agricultural activities has also reduced the catchment areas associated with depressions reducing the overall extent of these systems. The local land uses, and associated disturbances have all contributed to modifications to the associated wetland vegetation structure. It was evident in all the wetland systems that alien vegetation is well established. Further to this, local activities have contributed to the complete removal of vegetation to maximise crop production.

Table 10-7 Summary of the scores for the wetland PES

Wetland	Hydrology	Geomorphology	Vegetation	Overall PES Score
HGM 1	F: Critically Modified	E: Seriously Modified	F: Critically Modified	F: Critically Modified
HGM 2	D: Largely Modified	C: Moderately Modified	E: Seriously Modified	D: Largely Modified
HGM 3	F: Critically Modified	E: Seriously Modified	F: Critically Modified	F: Critically Modified
HGM 4	E: Seriously Modified	E: Seriously Modified	F: Critically Modified	E: Seriously Modified
HGM 5	D: Largely Modified	D: Largely Modified	E: Seriously Modified	C: Moderately Modified
HGM 6	D: Largely Modified	E: Seriously Modified	C: Moderately Modified	D: Largely Modified
HGM 7	C: Moderately Modified	C: Moderately Modified	D: Largely Modified	C: Moderately Modified
HGM 8	E: Seriously Modified	E: Seriously Modified	F: Critically Modified	E: Seriously Modified
HGM 9	D: Largely Modified	D: Largely Modified	D: Largely Modified	D: Largely Modified
HGM 10	D: Largely Modified	D: Largely Modified	D: Largely Modified	D: Largely Modified
HGM 11	C: Moderately Modified	C: Moderately Modified	C: Moderately Modified	C: Moderately Modified
HGM 12	C: Moderately Modified	C: Moderately Modified	C: Moderately Modified	C: Moderately Modified

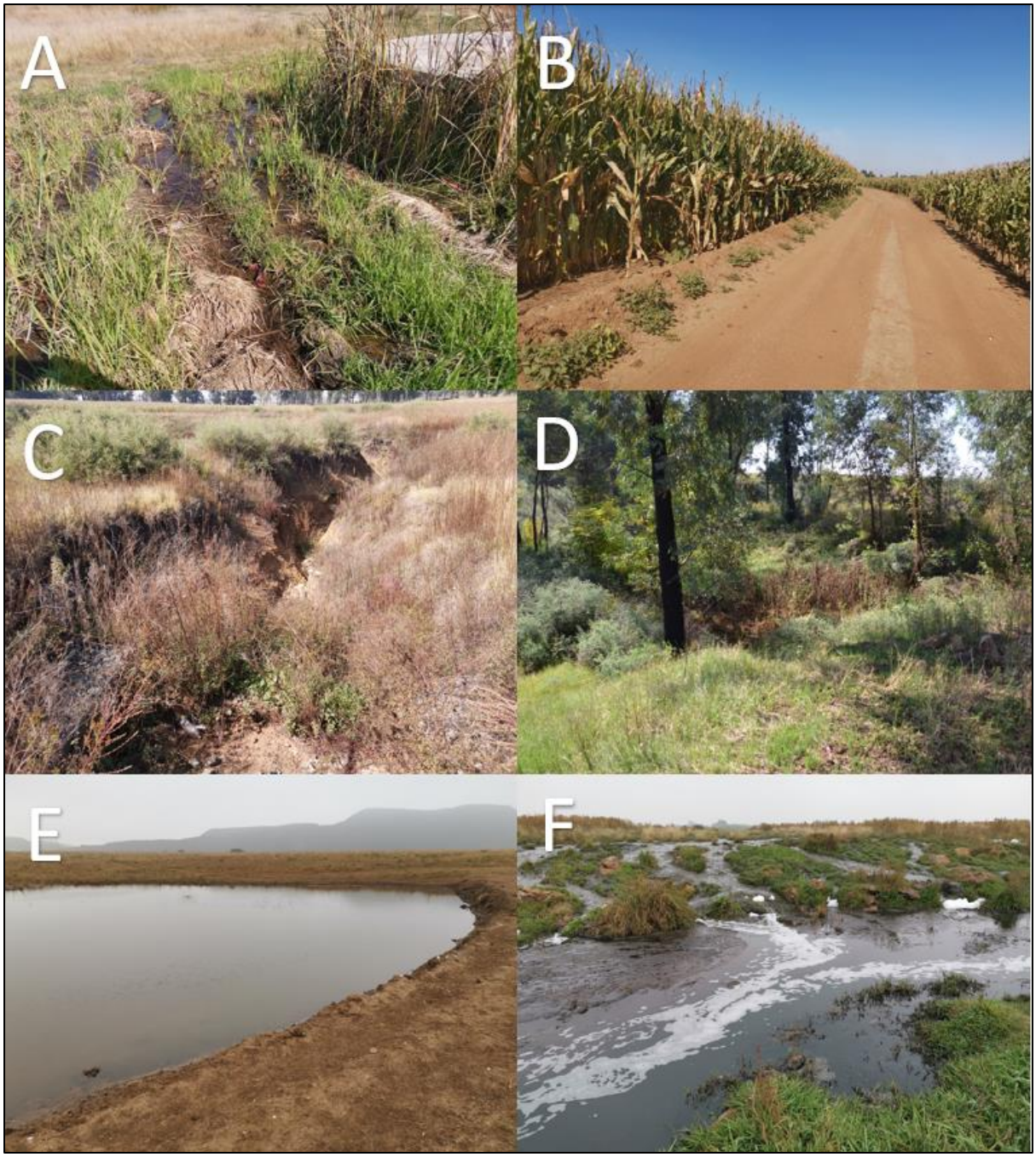


Figure 10-20 Photographs of aspects contributing to the modified status of the wetlands; A) Service infrastructure, B) Agriculture and access routes, C) Erosion and water diversions, D) Alien vegetation, E) Dams, F) Impaired water quality and altered surface flows

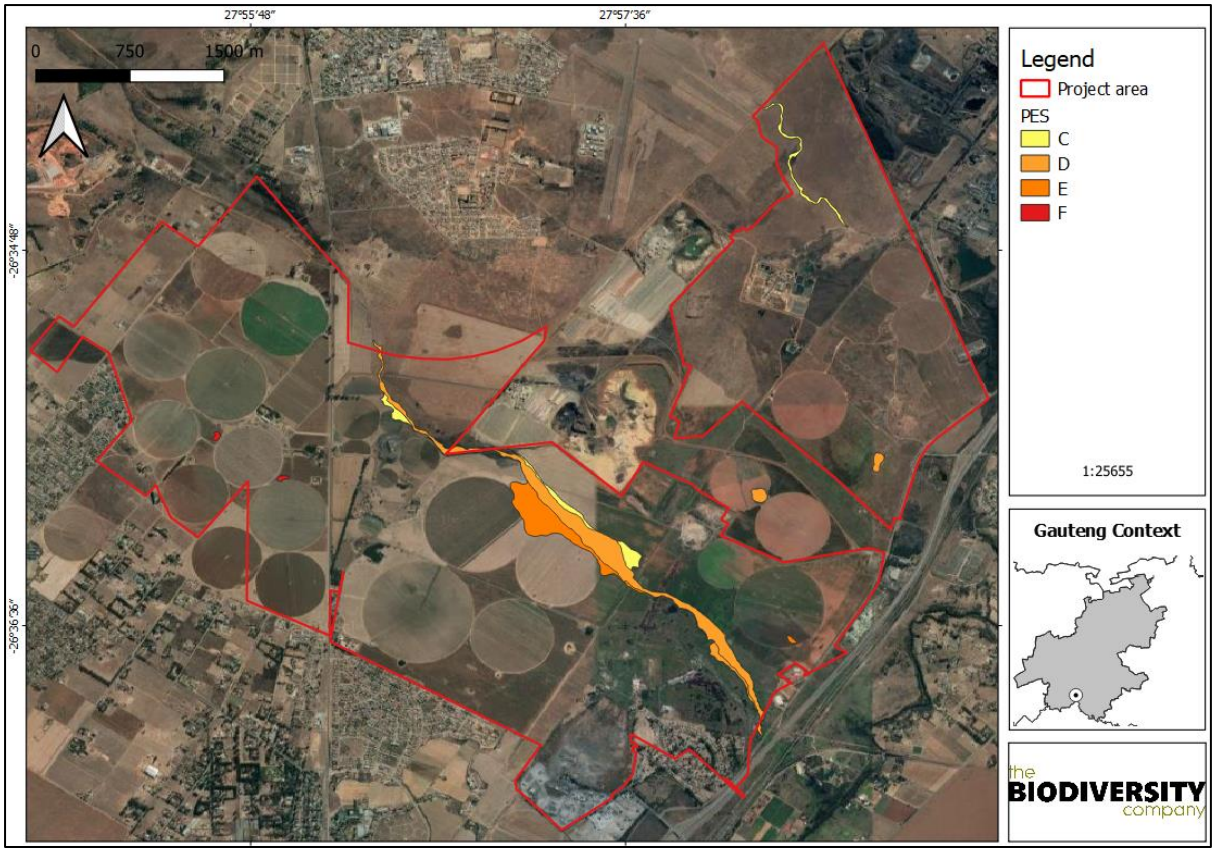


Figure 10-21 The PES classifications for the project area

10.3.3 The Ecological Importance & Sensitivity

The wetland EIS assessment was applied to the HGM units described in the previous section to assess the levels of sensitivity and ecological importance of the wetlands. The results of the assessment are shown in Table 10-8 and can be seen in Figure 10-22.

Several factors were considered when establishing the EIS of the various wetlands. Regional to national scale considerations included NFEPA river or wetland status, protected areas and ecosystem threat and protection levels. Local considerations included habitat integrity and diversity, likelihood of supporting conservation important species and potential for hosting significant congregations of local or migratory species. The NFEPA Wetveg recognises the local wetland systems as Critically Endangered and Not Protected within the Mesic Highveld Grasslands Group 3 zones (Nel and Driver, 2011).

Table 10-8 The EIS results for the delineated HGM types

Wetland Importance & Sensitivity	Importance											
	HGM 1	HGM 2	HGM 3	HGM 4	HGM 5	HGM 6	HGM 7	HGM 8	HGM 9	HGM 10	HGM 11	HGM 12
EIS	D	C	D	C	C	B	C	D	C	C	C	A

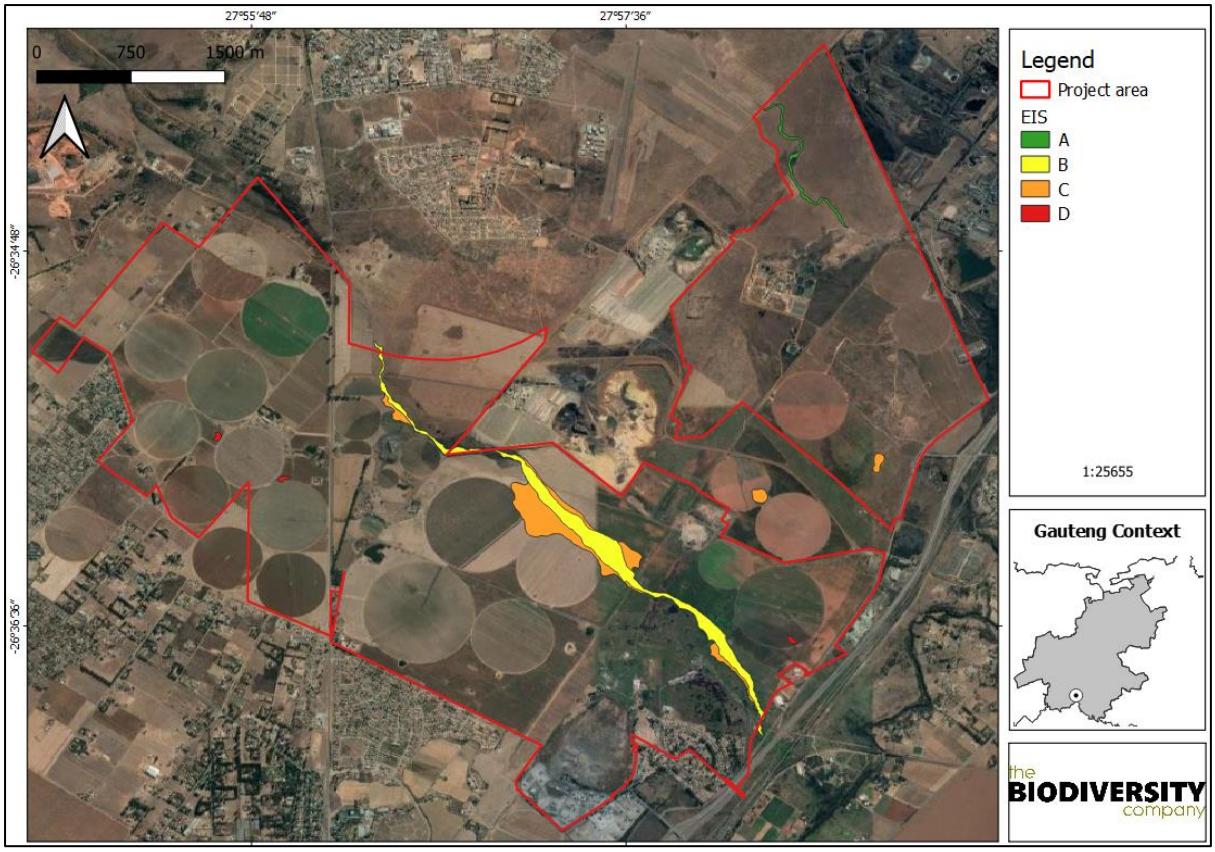


Figure 10-22 The EIS classifications for the project area

10.3.4 Buffer Requirements

According to the Gauteng Department of Agriculture and Rural Development (GDARD) requirements for biodiversity assessments, a buffer zone of 30m (within urban areas) and 50m (outside urban areas) is required. Based on this, a 50m buffer zone is recommended for this project. According to the buffer zone guidelines for wetlands, rivers and estuaries (Macfarlane and Bredin, 2017) the minimum recommended buffer zone for prospecting is 15m. This would be based on a commitment to rehabilitate and manage buffer zones to ensure that these areas function optimally. Further mitigation measures have been prescribed (for the risk assessment) to reduce some of the key threats that pose a risk to the water resources.

The "*Buffer zone guidelines for wetlands, rivers and estuaries*" (Macfarlane and Bredin 2017) was used to determine the appropriate wetland buffer zone for the proposed activity (in this case the category prospecting). The post-mitigation buffer requirements as given by this model is 15 m for the proposed project.

Based on the above, a 50m buffer zone is deemed sufficient for the requirements of this project.

11 Terrestrial Sensitivity

11.1 Approach

EIMS has developed a comprehensive sensitivity mapping methodology for use by all specialists in order to standardise the scoring system which allows for a comparative assessment of all impacts. The methodology utilises a revised scoring table as well as including a base score for the entire project area in question. This deviated from the past approach where features were scored based on their inherent sensitivity.

The updated methodology has shifted the focus from: (1) Scoring inherent environmental sensitivity towards (2) Scoring the proposed project impact on landscape features. The new scoring methodology (Figure 11-1) shifted focus to identifying sensitive/non-sensitive areas in terms of the development activity, rather than the original method which focused purely on the sensitivity of the landscape/environment.

The new scoring methodology has made provision for specialists to score areas/features that would be suitable or preferred for development. It should be noted that features/areas should be scored in terms of the proposed project context and not purely on “perceived sensitivity of landscape features”. Thus, the specialist should continually be asking themselves the question “how will this feature be affected by the proposed development”. In cases where the development is anticipated to create a high negative impact, the high or very high scoring should be applied. High and very high scores must be justified. The final shape files must include a column indicating why each feature was assigned a certain score/sensitivity. In addition, a separate column must be provided indicating the numerical score in Figure 11-1.

To ensure that accurate site selection decisions will take place, the specialist must score sensitivity relative to the site in question. Ideally the specialist should only use very high sensitivity in rare cases, where such a score can be justified. Please note that legal licencing requirements or permit requirements should not be factored into the sensitivity score, this should be represented by a separate shapefile indicating additional legal requirements.

Sensitivity Rating	Description	Weighting	Preference
Least Concern	The inherent feature status and sensitivity is already degraded. The proposed development will not affect the current status and/or may result in a positive impact. These features would be the preferred alternative for mining or infrastructure placement.	-1	Preferrable
Low/Poor	The proposed development will have not have a significant effect on the inherent feature status and sensitivity.	0	Negotiabl
High	The proposed development will negatively influence the current status of the feature.	+1	Restricted
Very High	The proposed development will negatively significantly influence the current status of the feature.	+2	

Figure 11-1 The sensitivity matrix utilised for the sensitivity mapping process (as provided by EIMS)

11.2 Sensitivity

A 50m buffer was added to each drill site in order to take most impacts expected from the prospecting activities into consideration, other than access routes. Areas that were classified as having a *Least Concerned* sensitivity area those areas that have been transformed and the best options for prospecting. The *Low* sensitivities are those areas which were deemed by the specialists to have been impacted but still is considered moderately ecologically important or sensitive, these areas may be considered for prospecting if the mitigations are adhered to (Figure 11-2). The areas assigned a *High* sensitivity are the are the semi-natural areas in which the assigned to the CBA area is still represented, these areas should be preferably avoided for prospecting.

It is important to note that these maps do not replace any local, provincial or government legislation relating to these areas or the land use capabilities or sensitivities of these environments. The maps are also not final as it is based on desktop data alone and will be adapted once the area has been ground truthed.

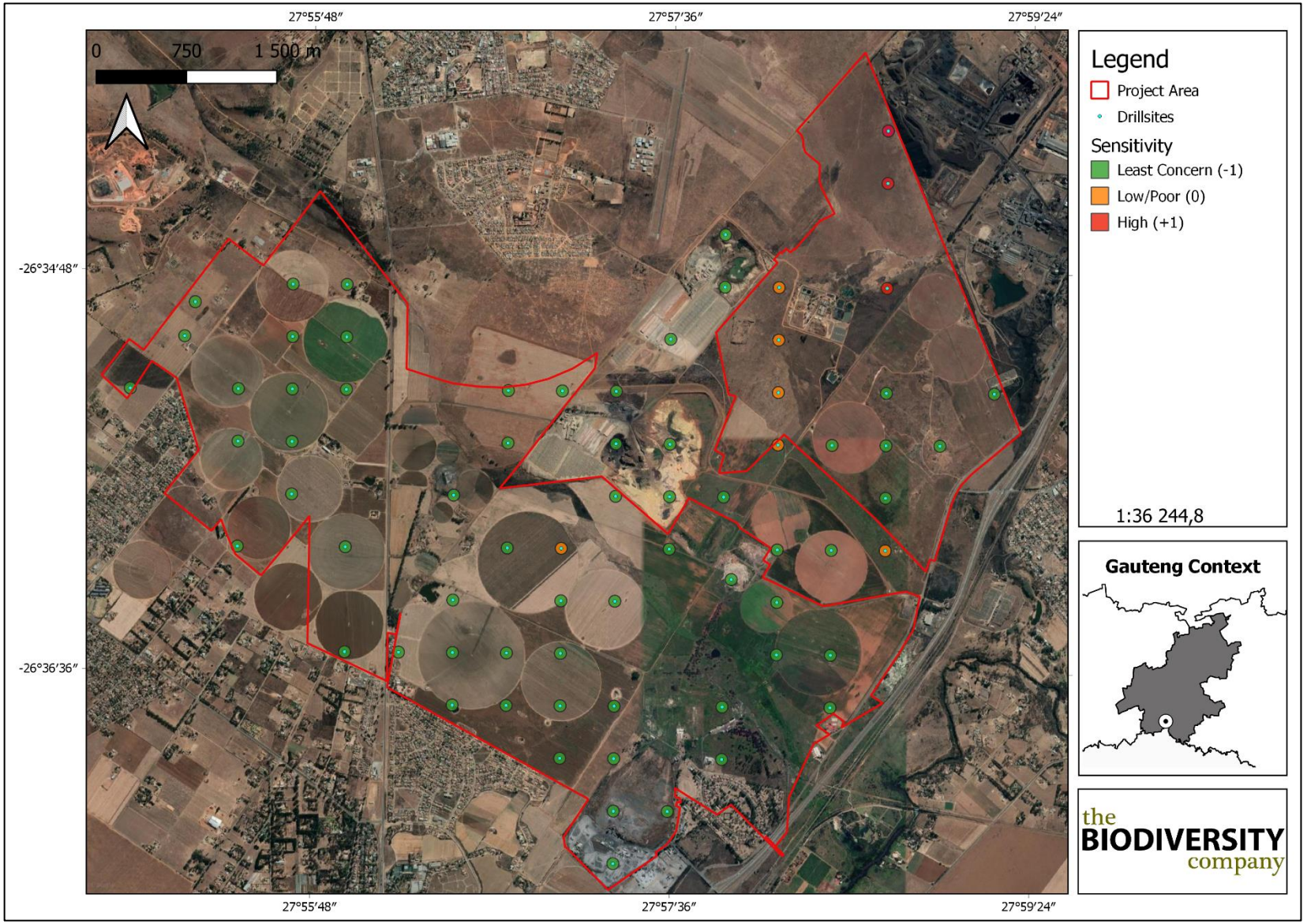


Figure 11-2 The sensitivities of the 50m buffer around the prospecting drill site.

12 Wetland Sensitivity

12.1 Approach

Graham and de Winnaar (2009) developed guidelines to determine appropriate buffers for the protection of freshwater wetlands from various land use impacts in KwaZulu-Natal. These guidelines have also been considered for this assessment, despite the project being located in Gauteng. This method uses a step-wise approach to define an appropriate buffer width based on ecological and biophysical attributes. Figure *11-2* shows the conceptual buffer delineation model which has been implemented for this project.

According to these guidelines, the minimum buffer width for different wetland types in the presence of “mines” is 175m. This 175m is well-suited for intensive mining activities and is therefore considered to be “generous” for the requirements of a drilling programme. Whereas according to the buffer zones guidelines (Macfarlane and Bredin, 2017) 25m and 15m are the minimum recommended buffer zone widths for “mining (worst case)” and “prospecting (all materials)” respectively. This is based on the requirement that the buffer zone must be managed to ensure that the area functions optimally.

According to Desbonnet *et al*. (1994) a buffer width of 200m will enable approximately 90% or greater sediment and pollutant removal, and also be an excellent general wildlife and avian habitat value buffer, likely to support a diverse community. Desbonnet *et al*. prescribed the following maximum buffer widths:

- 100m for wetland species for high intensity impacts from adjacent land uses; and
- 30m for wetland species for low intensity impacts from adjacent land uses.

In addition to the completion of a desktop assessment, further GIS processing was conducted to better understand the landscape and support the determination of buffer area widths. The National Aeronautics and Space Administration (NASA) Shuttle Radar Topography Mission (SRTM) (V3.0, 1 arcsec resolution) Digital Elevation Model (DEM) was obtained from the United States Geological Survey (USGS) Earth Explorer website. Basic terrain analysis was performed on this DEM using the GIS software in order to detect flow accumulations and potential drainage lines, catchment areas and surface flow directions.

As illustrated in Figure *11-2*, the determined buffer width may be modified by taking ecological criteria into consideration (Buffer A) which was considered for this assessment, or for wetlands located within catchments with low EIS ratings (Buffer B) which was implemented for this assessment. Separate buffer calculations were made on the basis of biophysical attributes which included the HGM type, slope and habitat integrity (PES) (Buffer C). The methodology implemented in order to determine the extent of the areas of risk is as follows:

- Updated the desktop wetland shapefiles with the wetlands delineated in field in order to obtain a single wetland shapefile;
- Standardised the attributes table for the updated wetlands shapefiles using the national wetland classification system nomenclature (i.e. NFEPA wetland nomenclature); and

- Buffers were then assigned systematically to each feature following the proposed process outline presented in Figure *11-2*.

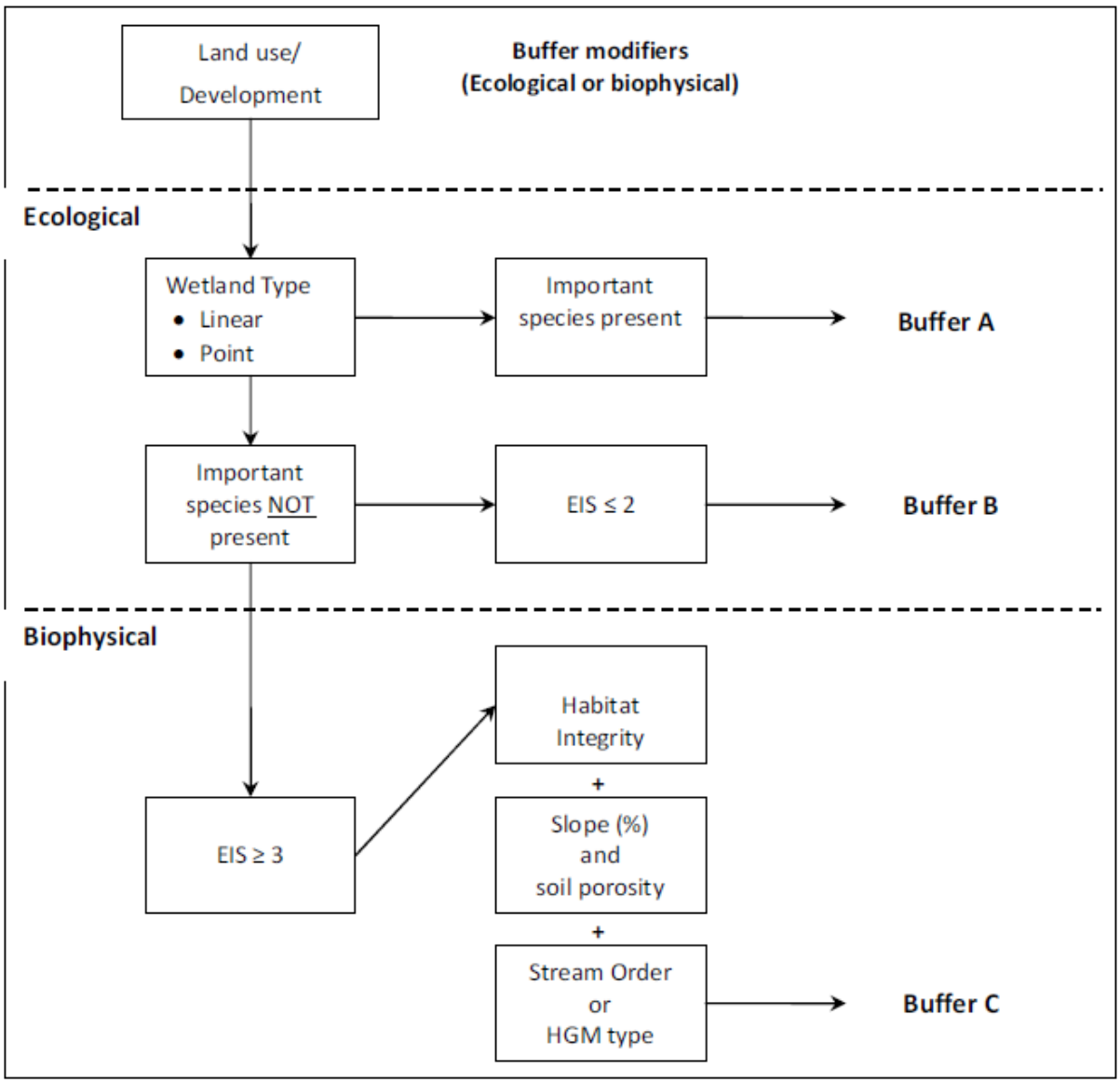


Figure 12-1 Model for wetland buffer width determination according to land use in KwaZulu-Natal (Source: Graham and de Winnaar, 2009)

12.2 Sensitivity

For the purposes of this project, all the wetland types are High Risk (or sensitivity). According to Rountree *et al*. (2012) floodplains and valley bottom systems are the most sensitive to flooding, and unchanneled valley bottom systems are the most affected by low flow changes. Figure 12-2 presents the extent of the respective risk (or sensitivity) areas for prospect drilling in relation to the project area. Based on the layout of the drill sites provided, only one site is within the recommended 50m buffer zone and should be relocated. This site is in the vicinity of HGM 4 (see Figure 12-2). The following buffer widths (or sensitivity areas), comprising of fixed and site-specific widths were calculated:

- The High Risk or high sensitivity areas include the entire extent of the actual wetland areas for the delineated wetland types;
- According to the buffer zones guidelines (Macfarlane and Bredin, 2017) 25m is the minimum recommended buffer zone width for "mining (worst case)". Desbonnet *et al*. (1994) prescribed a maximum buffer width of 30m for wetland species for low intensity impacts from adjacent land uses. Based on this, a (fixed) 50m buffer has been allocated to all wetland areas and demarcated as a Moderate Risk area;
- The Low Risk buffer is variable and dependent on the HGM type, PES, EIS and slope. The respective buffer areas are below:

Wetland Type	HGM	Moderate Risk Buffer	Low Risk Buffer
Channelled valley bottom	HGM 12	50	216
Depression	**HGM 8**	**50**	**58**
Depression	HGM 1	50	58
Depression	HGM 3	50	58
Depression	HGM 10	50	72
Depression	HGM 11	50	72
Depression	HGM 9	50	72
Seep	HGM 7	50	72
Seep	HGM 4	50	72
Seep	HGM 5	50	72
Seep	HGM 7	50	72
Seep	HGM 2	50	72
Unchanneled valley bottom	HGM 6	50	130

- Any other area beyond the Low Risk buffer width would constitute a No Risk area, or no sensitivity area.

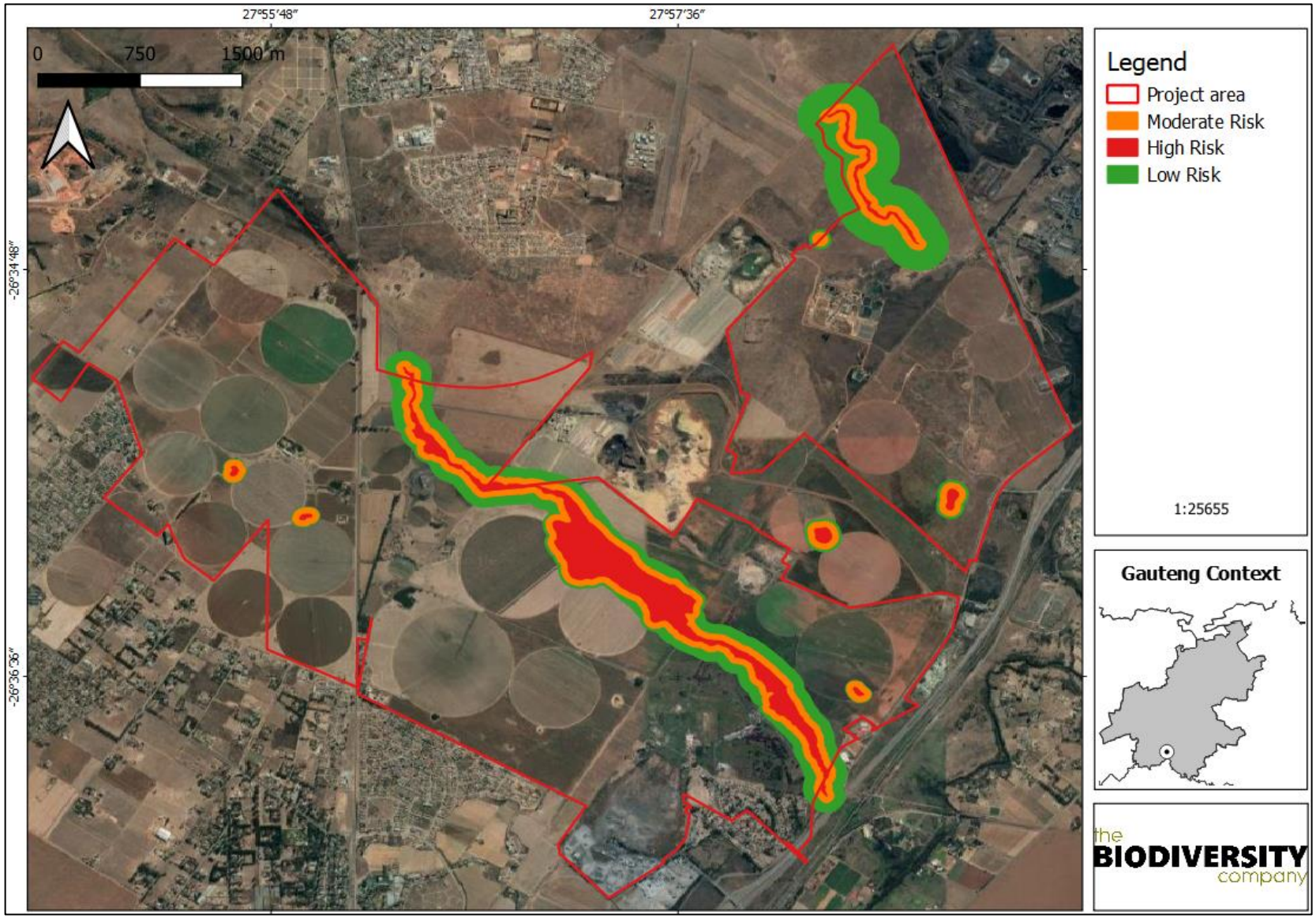


Figure 12-2 Sensitivity of delineated wetland systems

13 Impact Assessment

Potential impacts were evaluated against the data captured during the fieldwork to identify relevance to the project area, specifically the proposed development footprint area. The relevant impacts were then subjected to a prescribed impact assessment methodology. The details of this methodology can be provided on request.

Impacts were assessed in terms of the construction/operational, decommissioning/ rehabilitation and closure phases. Mitigation measures were only applied to impacts deemed relevant based on the impact analysis and can be seen in section 13.

13.1 Impact Assessment Methodology

An impact assessment methodology was provided by EIMS to determine the environmental risk associated with various aspects related to the proposed activities (prospecting). This impact assessment takes the following components into consideration.

- The nature of the associated impact (positive or negative);
- The extent of the proposed activities;
- The duration of the proposed activities;
- The magnitude of the effects caused by the proposed activities;
- The reversibility of associated impacts; and
- The probability of relevant aspects affecting sensitive receptors.

Each one of the above-mentioned components are given a rating, which cumulatively provides the specialist with a pre-mitigation environmental risk rating. These components are then scored again taking into consideration mitigating factors. The cumulative impact and irreplaceable loss to sensitive receptors are then scored to ultimately indicate a “Priority Factor” score.

13.2 Current Impacts

The current impacts observed during surveys are listed below. Photographic evidence of a selection of these impacts is shown in Figure 13-1.

- Fences;
- Overgrazing and trampling of natural vegetation and wetlands by livestock;
- Farm roads and highways (and associated traffic and wildlife road mortalities);
- Erosion;
- Feral animals such as dogs and cats;
- Alien and/or Invasive Plants (AIP);
- Servitudes and infrastructure (powerlines)
- Water contamination and sewage;

- Mining; and
- Vegetation removal

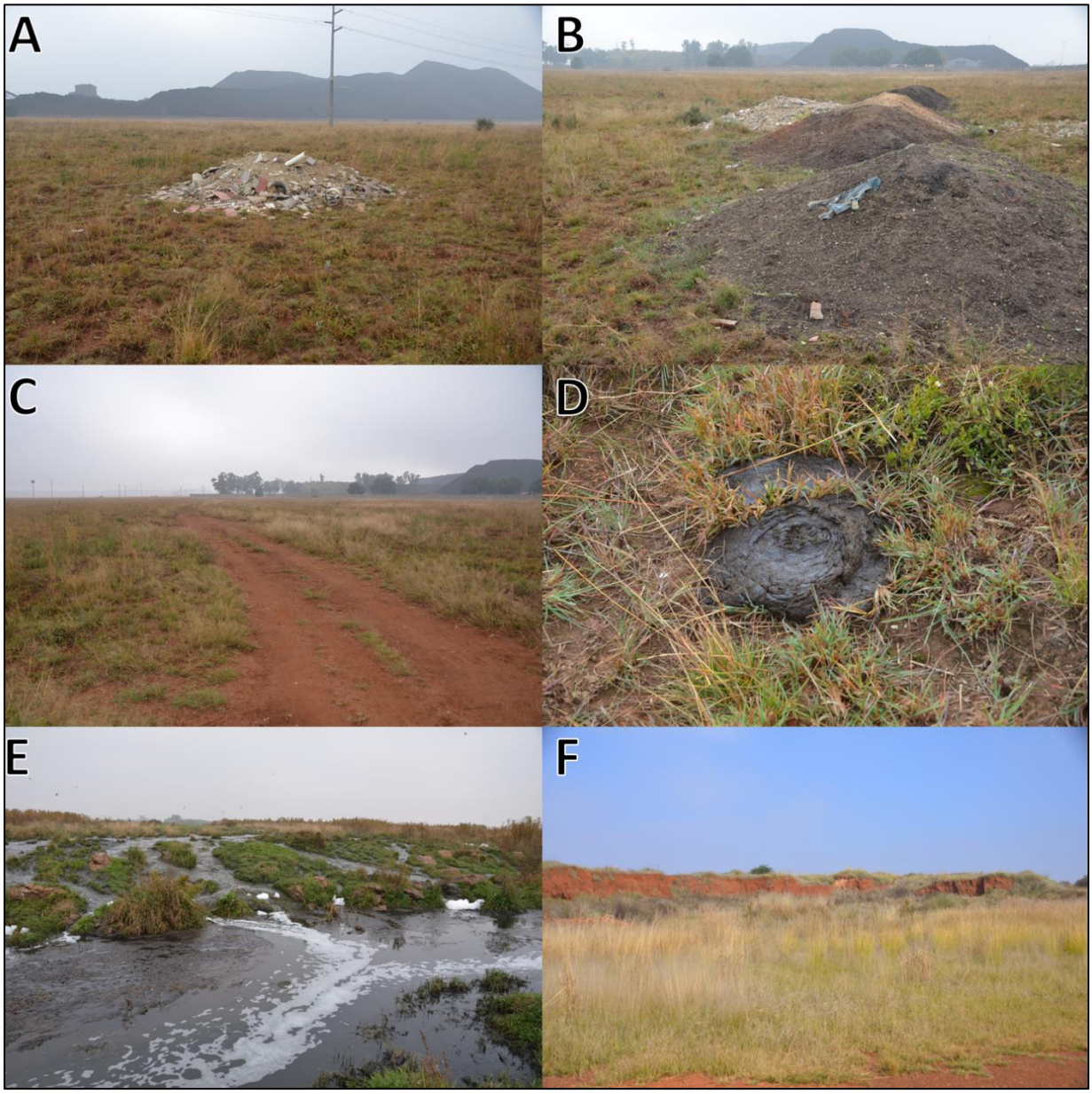


Figure 13-1 Some of the identified impacts within the project area; A) Dumping of building rubble, B) Sand stock piles, C) Roads, D) Cattle, E) Sewage discharge and F) Erosion

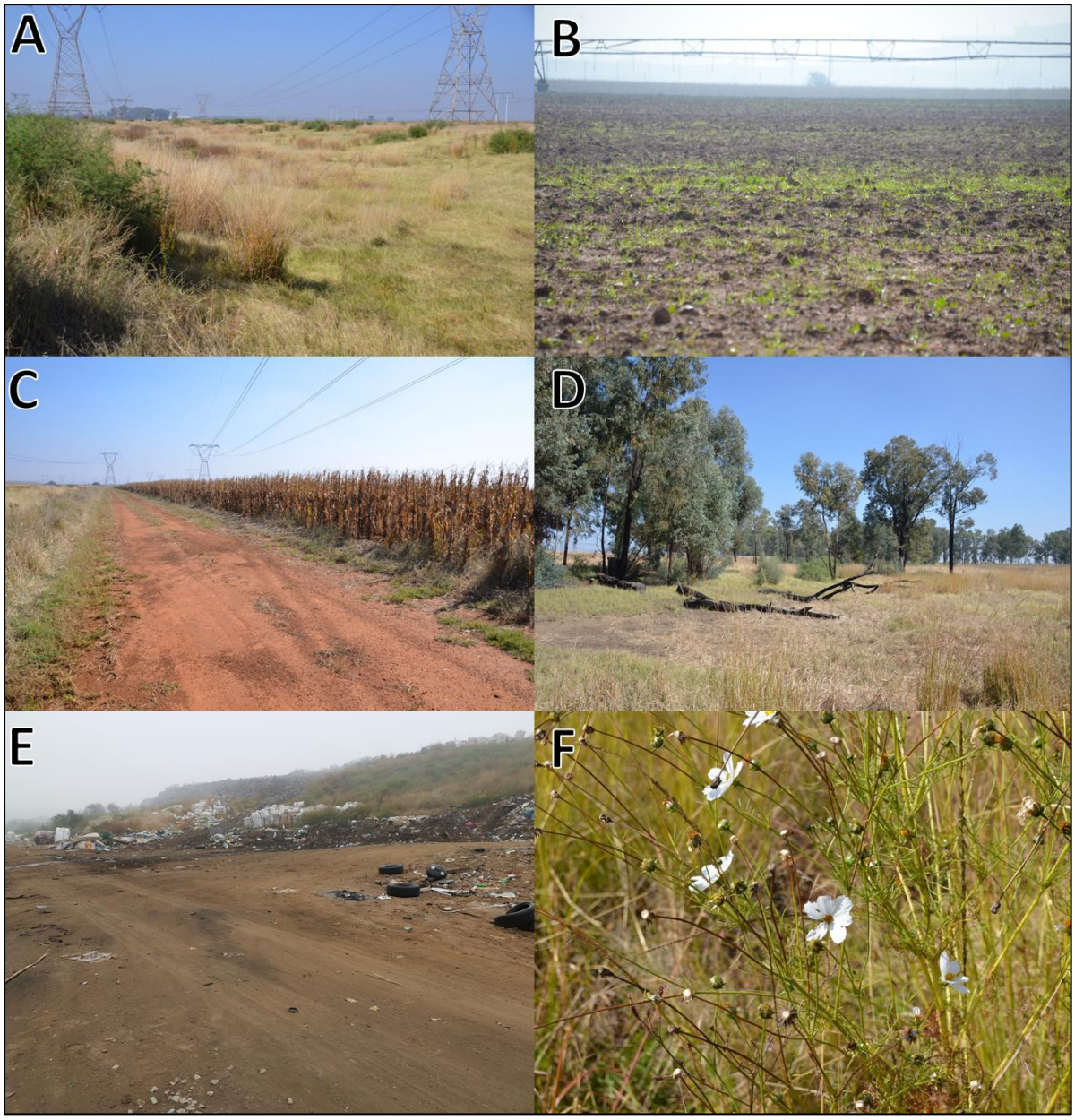


Figure 13-2 Some of the impacts observed in the project area; A) Powerlines, B &C) Agriculture, D & F) Alien invasive plants, and E) Litter and dumping area

13.3 Terrestrial Impact Assessment

The anticipated impacts are derived from the main activities associated with the prospecting which include:

- Clearing of vegetation for sumps and the drill entrance;
- Laydown for drill rods, fuel and chemical storage chemical toilets; and
- Earth sumps for water recycling; and
- Drill site establishments may result in small volumes of hydrocarbons being stored on site

13.3.1 Planning Phase Impacts

The planning phase activities are considered a low risk as they typically involve desktop assessments and initial site inspections. This would include compiling of a waste management plans, obtaining of necessary permits, environmental and social impact assessments, characterisation of baseline site conditions, finalising drill sites and facilities and consultation with various contractors involved with a diversity of proposed project related activities going forward. Only one minor impact was assessed regarding the planning phase:

13.3.1.1 Temporary disturbance of wildlife due to increased human presence and possible use of machinery and/or vehicles.

As more vehicles will be driving in the area to survey various components of the project, the wildlife will be disturbed. The possible use of heavy machinery can also lead to the trampling of both vegetation and faunal species.

13.3.2 Construction Phase/Operational Phase

This phase includes the entire prospecting activity, from access to the location until the hole has been drilled. The impacts of the drill site establishment (approximately 400m^2) was assessed for both fauna and flora for the various drill areas. The drill sites were assessed collectively as their location and sensitivity and not regarded as final and they may be relocated or not drilled based on the conclusions of the environmental studies.

13.3.2.1 Destruction, further loss and fragmentation of the vegetation community

The vegetation communities are classed as EN, through site clearing, more of the vegetation communities will be lost. Unmitigated, this will also lead to habitat fragmentation and the establishment of alien invasive species as well as soil erosion.

Activities that will contribute to this impact:

- Driving/ moving outside of designated areas;
- Physical removal of vegetation;
- Temporary site establishment (laydown, chemical toilets etc.);
- Soil dust precipitation as a result of site establishment;
- Dumping of waste products;
- Hydrocarbon storage and leakages; and
- Random events such as fire (cooking fires or cigarettes).

13.3.2.1.1 Cumulative Impacts

- Further loss of EN vegetation type;

13.3.2.1.2 Irreplaceable Loss of Resources

- Loss of protected plant species.

13.3.2.1.3 Impacts on Alternatives Considered

No alternatives assessed as it was assumed that all points will be drilled.

13.3.2.2 Loss of CBA and ESA, sections of area classed as moderate and highest biodiversity importance.

Portions of the project area is classified as a CBA, ESA, highest biodiversity importance and moderate biodiversity importance. The area also falls over the Waldrift Nature Reserve which is classified as a protected area as per the SAPAD (2019) data. Activities that will contribute to this impact:

- Driving/ infringing outside of designated areas;
- Physical removal of vegetation;
- Temporary site establishment (laydown, chemical toilets etc.);
- Soil dust precipitation as a result of site establishment;
- Dumping of waste products;
- Hydrocarbon storage and leakages; and
- Random events such as fire (cooking fires or cigarettes).

13.3.2.2.1 Cumulative Impacts

- Loss of movement corridors; and
- Loss of habitat for species including migratory species.

13.3.2.2.2 Irreplaceable Loss of Resources

- Loss of CBA: optimal habitat; and
- Loss of wetland habitat;

13.3.2.2.3 Impacts on Alternatives Considered

No alternatives assessed as it was assumed that all points will be drilled.

13.3.2.3 Introduction of alien species, especially plants

The spread of alien invasive species will result in the loss of habitat and water for indigenous fauna and flora. It can also contribute to the spreading of potentially dangerous diseases due to invasive - and pest species. Overall the fauna assemblage will be changed. Activities that will contribute to this impact:

- Vegetation removal and disturbance of soil;
- Vehicles potentially spreading seed;
- Unsanitary conditions surrounding infrastructure promoting the establishment of alien and/or invasive; and
- Eating area increasing pest species such as rats and flies.

13.3.2.3.1 Cumulative Impacts

- Loss of habitat for indigenous species; and
- Spread of disease to surrounding areas.

13.3.2.3.2 Irreplaceable Loss of Resources

- Loss of CBA: optimal and ESA habitat;and
- Loss of protected flora.

13.3.2.3.3 Impacts on Alternatives Considered

No alternatives assessed as it was assumed that all points will be drilled.

13.3.2.4 Erosion due to storm water runoff and wind

Erosion will lead to the loss of vegetation, the removal/ relocation of the topsoil and the destruction of habitat. Activities that will contribute to this impact:

- Storm water runoff from roads, and other paved areas;
- Vehicles driving outside demarcated areas;
- Footpaths outside demarcated areas;
- Clearing of vegetation;
- Water runoff from areas with bare soil; and
- Compacting of roads.

13.3.2.4.1 Cumulative Impacts

- Removal of topsoil; and
- Loss of habitat for indigenous species.

13.3.2.4.2 Irreplaceable Loss of Resources

- Loss of CBA area; and
- Loss of protected plant species.

13.3.2.4.3 Impacts on Alternatives Considered

No alternatives assessed as it was assumed that all points will be drilled.

13.3.2.5 Displacement of faunal community due to habitat loss, direct mortalities and disturbance (road collisions, noise, light, dust, rock chips, vibration and poaching).

Faunal community will be influenced in a number of ways, including the loss of habitat, disturbances that will either make them move out of the area if possible or have to adapt and

possible deaths due to physical harm or indirect harm. Activities that will contribute to this impact:

- Clearing of vegetation;
- Roadkill due to vehicle collision;
- Pollution of water resources due to dust effects and run-off;
- Intentional killing of fauna for food (hunting) or otherwise (killing of snakes);
- Disease caused by increased dust levels;
- Increase in pest species in the area due to new food source created; and
- Vibrations, noise and rock chips skidding out due to the drilling activities.

13.3.2.5.1 Cumulative Impacts

- Loss of habitat for indigenous species.

13.3.2.5.2 Irreplaceable Loss of Resources

- Loss of faunal SCCs.

13.3.2.5.3 Impacts on Alternatives Considered

No alternatives assessed as it was assumed that all points will be drilled.

13.3.2.6 Potential leaks, discharges, pollutant from drilling machines and storage leaching into the surrounding environment

Hydrocarbons leaching into the surrounding area will result in the loss of usable water resources, the loss of fauna and flora species. This will also result in the contamination of the topsoil and reduce the likelihood of successful rehabilitation of an area.

Activities that will contribute to this impact:

- Loss of vegetation; and
- Loss of top soil.

13.3.2.6.1 Cumulative Impacts

- Loss of usable water resources for fauna species; and
- Loss of viable habitat.

13.3.2.6.2 Irreplaceable Loss of Resources

- Loss of usable water resources for fauna species resulting in loss of SCC and other species.

13.3.2.6.3 Impacts on Alternatives Considered

No alternatives assessed as it was assumed that all points will be drilled.

13.3.3 Decommissioning and Rehab/Closure Phase

The decommissioning will involve the removal of the surface infrastructure and the backfilling of the holes. Followed by the rehabilitation of the areas. It is anticipated that these holes will be closed as prospecting progresses.

13.3.3.1 Continued encroachment of an indigenous and EN vegetation community by alien invasive plant species as well as erosion due to disturbed soils

The spread of alien invasive species will result in the loss of habitat and water for indigenous fauna and flora. Overall the fauna assemblage will be changed. Erosion will also disrupt the vegetation in the surrounding areas and result in habitat loss. Activities that will contribute to this impact:

- Vehicles potentially spreading seed;
- Unsanitary conditions during infrastructure removal promoting the establishment of alien and/or invasive;
- Storm water runoff from roads, and other bare areas;
- Vehicles driving outside demarcated areas; and
- Footpaths outside demarcated areas.

13.3.3.1.1 Cumulative Impacts

- Loss of habitat; and
- Loss of indigenous flora species due to competition.

13.3.3.1.2 Irreplaceable Loss of Resources

- Loss of flora SCCs; and
- Loss of habitat and food sources for Fauna SCCs.

13.3.3.1.3 Impacts on Alternatives Considered

No alternatives assessed as it was assumed that all points will be drilled.

13.3.3.2 Continued displacement and fragmentation of the faunal community (including threatened or protected species) due to ongoing anthropogenic disturbances (noise, dust and vibrations) and habitat degradation/loss (litter, road mortalities and/or poaching).

During the decommissioning phase infrastructure will now be broken down, removed and disturbed. As the infrastructure is being removed this will disrupt the ecosystem. Activities that will contribute to this impact:

- Roadkill due to vehicle collision;
- Pollution of water resources due to dust effects and run-off; and

- Intentional killing of fauna for food (hunting) or otherwise (killing of snakes).

13.3.3.2.1 Cumulative Impacts

- Loss of suitable habitat.

13.3.3.2.2 Irreplaceable Loss of Resources

- Loss of faunal SCCs.

13.3.3.2.3 Impacts on Alternatives Considered

No alternatives assessed as it was assumed that all points will be drilled.

13.3.4 Assessment of Significance

Table 13-1 shows the significance of potential impacts associated with the prospecting, on biodiversity before and after the implementation of mitigation measures as well as cumulative and irreplaceable loss.

Table 13-1 Assessment of significance of potential impacts on terrestrial biodiversity associated with the project

Identifier	Impact	Pre-mitigation ER	Post-mitigation ER	Confidence	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score
Planning								
12.3.1.1	Temporary disturbance of wildlife due to increased human presence and possible use of machinery and/or vehicles.	-15	-4	High	1	2	1.13	-4.50
Construction Phase/Operational Phase								
12.3.2.1	Destruction, further loss and fragmentation of the vegetation community	-17	-6	High	2	2	1.25	-7.50
12.3.2.2	Loss of CBA and ESA, sections of area classed as moderate and highest biodiversity importance as well as portions of an area classified as a protected area.	-21.25	-4.5	Medium	3	2	1.38	-6.19
12.3.2.3	Introduction of alien species, especially plants	-14	-4	High	2	2	1.25	-5.00
12.3.2.4	Erosion due to storm water runoff and wind	-14	-7.5	High	2	2	1.25	-9.38
12.3.2.5	Displacement of faunal community due to habitat loss, direct mortalities and disturbance (road collisions, noise, light, dust, rock chips, vibration and poaching).	-16	-6.75	High	2	2	1.25	-8.44
12.3.2.6	Potential leaks, discharges, pollutant from drilling machines and storage leaching into the surrounding environment	-14	-4	High	2	2	1.25	-5.00
Decommissioning and Rehab/Closure Phase								
12.3.3.1	Continued encroachment of an indigenous and EN vegetation community by alien invasive plant species as well as erosion due to disturbed soils	-15	-6.75	Medium	2	2	1.25	-8.44
12.3.3.2	Continued displacement and fragmentation of the faunal community (including threatened or protected species) due to ongoing anthropogenic disturbances (noise, dust and vibrations) and habitat degradation/loss (litter, road mortalities and/or poaching).	-15	-6.75	Medium	2	2	1.25	-8.44

13.4 Wetland Risk Assessment

The potential risks posed to wetlands as a result of the proposed project are detailed in Table 13-3. These ratings are based on the DWS Section 21 (c) and (i) Risk Assessment matrix. As per the risk matrix guidelines all activities associated with construction, operation and decommissioning have been accounted for. Ratings are given for pre- and post-mitigation scenarios. No drill sites are located within the delineated wetlands. It is apparent from the risk assessment that all aspects considered for the drilling programme pose a Low Risk (pre-mitigation). These Low Risks may largely be attributed to the adherence to the 50m buffer zone. Further to this, mitigation measures have been prescribed which will contribute to reduced risk level.

It is estimated that the total working area for each drill site is approximately <400m^2. The depths for the holes can be drilled in 1-3 days. Exploration drilling includes clearing an area, anchoring the drill rig, installing a sump to accommodate the need of fluids during the drilling process and ultimately extracting core and laying core out to be logged. It is worth noting that the mentioned sumps are typically lined and that all fluids and chemicals used are environmentally friendly.

Table 13-2 Typical Impacts expected for the various drilling programme aspects

Activity	Aspect	Risks
	Andrew Husted (Pr Sci Nat 400213/11)	
Phase	**Drilling Programme**	**Expected Impacts**
	Vertical Holes / Drilling	
Construction / operation phase	Clearing of vegetation	Impeding hydro-dynamics; Siltation of water resources; Erosion of water resources; Loss of indigenous vegetation; Altering hydromorphic soils; Drainage pattern change; Direct loss of wetland areas; Decrease in functionality; Additional water quality impairment.
	Stripping and stockpiling of topsoil	
	Establish working area	
	Digging of sump (lining)	
	Drilling of hole	
	Water use for drilling	
	Vehicle access	
	Leaks and spillages from machinery, equipment & vehicles	
	Solid waste disposal	
	Human sanitation& ablutions	
	Re-fuelling of machinery and vehicles	
	Laying of core samples	
	Backfill of material	
Decommission phase	Removal of pipe, cage and slab	Impeding hydro-dynamics; Siltation of water resources; Additional water quality impairment.
	Capping/cementing of hole	

Table 13-3 DWS Risk Impact Matrix for the proposed drilling programme (Andrew Husted Pr Sci Nat 400213/11)

Activity	Aspect	Impact	Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating Classes
Construction	Clearing of vegetation	Impeding the flow of water.	3	2	3	3	2.75	1	1	4.75	1	3	5	2	11	52.25	Low	Section 12.4.2	Low
	Stripping and stockpiling of topsoil		2	2	2	2	2	1	1	4	1	3	5	2	11	44	Low	Section 12.4.2	Low
	Establish working area		2	2	2	2	2	2	1	5	1	2	5	2	10	50	Low	Section 12.4.2	Low
	Digging of sump (lining)		2	2	1	2	1.75	1	1	3.75	1	2	5	2	10	37.5	Low	Section 12.4.2	Low
	Drilling of hole		1	1	1	2	1.25	1	1	3.25	3	2	5	4	14	45.5	Low	Section 12.4.2	Low
	Water use for drilling		2	3	1	2	2	2	1	5	1	2	5	1	9	45	Low	Section 12.4.2	Low
	Vehicle access	Siltation of watercourse.	1	2	1	3	1.75	2	1	4.75	2	2	5	2	11	52.25	Low	Section 12.4.2	Low
	Leaks and spillages from machinery, equipment & vehicles	Water quality impairment.	1	2	1	2	1.5	2	1	4.5	2	2	1	3	8	36	Low	Section 12.4.2	Low
	Solid waste disposal		1	2	1	3	1.75	2	1	4.75	2	2	1	2	7	33.25	Low	Section 12.4.2	Low
	Human sanitation& ablutions		1	2	1	3	1.75	2	1	4.75	2	2	1	2	7	33.25	Low	Section 12.4.2	Low
	Re-fuelling of machinery and vehicles		1	2	1	1	1.25	1	1	3.25	2	2	1	2	7	22.75	Low	Section 12.4.2	Low
	Laying of core samples		1	1	2	2	1.5	1	1	3.5	2	2	1	2	7	24.5	Low	Section 12.4.2	Low
	Backfill of material		1	1	1	2	1.25	1	1	3.25	1	2	5	2	10	32.5	Low	Section 12.4.2	Low

Decommission	Removal of structures, machinery, and equipment	Impeding the flow of water.	1	1	1	2	1.25	1	2	4.25	2	3	1	2	8	34	Low	Section 12.4.2	Low
	Capping of hole	Siltation of watercourse. Water quality impairment.	1	1	1	1	1	1	2	4	1	1	1	2	5	20	Low	Section 12.4.2	Low

13.4.1 Recommendations

The following recommendations are provided:

- It is recommended that all drill sites be located outside (or beyond) the 50m buffer zone;
- Drill sites must be decommissioned and rehabilitated on completion of drilling each hole, and not let to be rehabilitated on completion of the drilling programme; and
- Existing access routes should be prioritised for the programme, with all newly required features adhering to the buffer zone.

13.4.2 Mitigation Measures

The following mitigation measures are typically prescribed:

- Adhere to the 50m buffer zones;
- Restrict all construction related activities to within the designated footprint area;
- ;Use wetland spatial data, load it onto a GPS and use it to mark out the prescribed 50m buffer on the boundary of a wetland;
- Retain as much vegetation cover as possible for all selected routes and working areas;
- Removed vegetation should be preserved and replaced for rehabilitation of the drill sites. Rehabilitation should be completed for the closure of each hole, and not at the end of the drilling programme;
- Promptly remove all alien and invasive plant species that may emerge during drilling (i.e. weedy annuals and other alien forbs) must be removed;
- The use of herbicides is not recommended in or near wetlands (opt for mechanical removal);
- Appropriately stockpile topsoil cleared from the project area. This can be used for rehabilitation of the drill site;
- Clearly demarcate drill site footprint area, and limit all activities to within this area;
- Minimize unnecessary clearing of vegetation;
- Landscape and re-vegetate all denuded areas as soon as possible;
- Re-instate topsoil and lightly till disturbance footprint;
- Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) or construction materials on site (e.g. concrete) in such a way as to prevent leaks;
- Provide appropriate sanitation facilities and service them regularly;
- Site establishment must be undertaken in an orderly manner and all amenities must be installed before the onset of drilling;

- All contractors and labour must undergo environmental awareness training, and be encouraged to maintain a “clean”” working area, and report any (potential) risks to the environment as a result of the drilling programme;
- All structures must be temporary and should preferably be pre-fabricated or constructed of re-usable/recyclable materials;
- A method statement is required from the Contractor(s) that includes the layout of the drilling site, amenities and wastewater / water management during drilling;
- Ablution facilities with chemical toilets must be provided for all labour. The labour must be encouraged to make use of the ablution and under no circumstances shall indiscriminate excretion and urinating be permitted other than in supplied facilities;
- The locations of domestic waste areas, chemical storage areas, fuel storage area, site offices and placement of ablution facilities must be demarcated on an approved site plan. The temporary storage of domestic waste shall be in covered waste skips, but these must be emptied on a weekly basis;
- The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected must be disposed of at a licensed disposal facility;
- The Contractor must be in possession of an emergency spill kit that must be complete and available at all times on site;
- Any possible contamination of topsoil by hydrocarbons, concrete or concrete water must be avoided. Any contaminated soil must be treated *in situ* or be placed in containers and removed from the site for disposal in a licensed facility;
- Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use;
- No storage of vehicles or equipment will be allowed outside of the designated drilling site area. Make use of existing tracks and routes as much as possible before new routes are constructed;
- No servicing of equipment on site unless absolutely necessary. Leaking equipment must be repaired immediately or be removed from site to facilitate repair;
- All vehicles and equipment must be well maintained to ensure that there are no oil or fuel leakages; and
- All disturbed and compacted footprint areas must be rehabilitated and landscaped after drilling is complete. These areas must either be rehabilitated to the original land use or an agreed upon land use.

14 Specialist Management Plan

Table 14-1 presents the recommended mitigation measures and the respective timeframes, targets and performance indicators for the terrestrial study. The mitigations within this section has been taken into consideration during the impact assessment in cases where the post-mitigation environmental risk is lower than that of the pre-mitigation environmental risk.

Table 14-1 Mitigation measures including requirements for timeframes, roles and responsibilities for the terrestrial study

Management outcome: Vegetation and Habitats				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Reduce the amount of unnecessary people and restrict vehicle access as much as possible on the property by making use of spatial data.	Planning	Project manager, Environmental Officer	Number of contractors within the area	Ongoing
Drill sites must be in areas regarded as least concern sensitivity. All high sensitivity areas must be avoided and declared "No-go" areas.	Construction/Operational Phase	Project manager, Environmental Officer	Infringement into these areas	Ongoing
Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. Clearing of vegetation should be minimized and avoided where possible. Maintain small patches of natural vegetation within the prospecting site to accelerate restoration and succession of cleared patches;	Life of operation	Project manager, Environmental Officer	Areas of indigenous vegetation (Moderate and High Sensitivity sites)	Ongoing
When vegetation is cleared, hand cutting techniques should be used as far possible in order to avoid the use of heavy machinery.	Construction/Operational Phase	Environmental Officer	Clearing method	Daily
All construction/operational and access must make use of the existing roads;	Construction/Operational Phase	Environmental Officer & Design Engineer	Roads and paths used	Ongoing
Apply for a permit to destroy protected plant species or relocate the species *in situ* as necessary per drill site.	Life of operation	Environmental Officer	Relocation/destruction of protected plant species	Ongoing
All laydown, chemical toilets etc. should be restricted to least concern sensitivity areas. Any materials may not be stored for extended periods of time and must be removed from the project area once the construction/closure phase has been concluded. No permanent structures should be permitted at drill sites. Buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. No storage of vehicles or equipment will be allowed outside of the designated project areas.	Construction/Operational Phase	Environmental Officer & Design Engineer	Laydown areas and material storage & placement.	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to two years after the closure
All structure footprints to be rehabilitated and landscaped after prospecting is complete. Rehabilitation of the disturbed areas existing in the project area must be made a priority. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are endemic to this vegetation type;	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Drill site footprint rehabilitation	Quarterly monitoring

Progressive rehabilitation will enable topsoil to be returned more rapidly, thus ensuring more recruitment from the existing seedbank Any woody material removed can be shredded and used in conjunction with the topsoil to augment soil moisture and prevent further erosion.	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Drill site footprint rehabilitation	During Phase
A spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers	Life of operation	Environmental Officer & Contractor	Spill events, Vehicles dripping.	Ongoing
Leaking equipment and vehicles must be repaired immediately or be removed from project area to facilitate repair	Life of operation	Environmental Officer & Contractor	Leaks and spills	Ongoing
Storm Water run-off & Discharge Water Quality	Life of operation	Environmental Officer & Design Engineer	Water Quality	Monthly
It should be made an offence for any staff to /take bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.	Life of operation	Project manager, Environmental Officer	Any instances	Ongoing
Any topsoil that is removed during construction must be appropriately removed and stored according to the national and provincial guidelines. This includes on-going maintenance of such topsoil piles so that they can be utilised during decommissioning phases and re-vegetation	Construction/Operational Phase	Project manager, Environmental Officer	Topsoil removal and storage	Ongoing
A fire management plan needs to be complied and implemented to restrict the impact fire might have on the rehabilitated areas.	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Fire Management	During Phase
Management outcome: Fauna				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
A qualified environmental control officer must be on site when construction begins to identify SCC that will be directly disturbed and to relocate fauna/flora that are found during the prospecting activities. The area must be walked though prior to construction to ensure no faunal species remain in the habitat and get killed. Should animals not move out of the area on their own relevant specialists must be contacted to advise on how the species can be relocated.	Life of operation	Environmental Officer, Contractor	Presence of any floral or faunal SCC.	Ongoing

Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to amphibian species and nocturnal mammals	Construction/Operational Phase	Environmental Officer	Noise levels	Ongoing
No trapping, killing, or poisoning of any wildlife is to be allowed	Life of operation	Environmental Officer	Evidence of trapping etc	Ongoing
The duration of the construction should be minimized to as short term as possible, to reduce the period of disturbance on fauna	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Construction/Closure Phase	Ongoing
Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas such as the wetland. Fluorescent and mercury vapor lighting should be avoided and sodium vapor (yellow) lights should be used wherever possible.	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light.	Ongoing
All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing
Schedule prospecting activities and operations during least sensitive periods, to avoid migration, nesting and breeding seasons.	Life of operation	Project manager, Environmental Officer & Design Engineer	Activities should take place during the day in the case.	Ongoing
The holes need to be sealed to ensure that no fauna species can fall in the drill hole.	Construction/Operational Phase	Environmental Officer & Design Engineer	Sealing of holes	After each sit, progressively.

Management outcome: Alien Vegetation

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Compilation of and implementation of an alien vegetation management plan.	Life of operation	Project manager, Environmental Officer & Contractor	Assess presence and encroachment of alien vegetation	Quarterly monitoring
The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas	Construction/Operational Phase	Project manager, Environmental Officer & Contractor	Footprint Area	Life of operation
Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site	Life of operation	Environmental Officer & Health and Safety Officer	Presence of waste	Life of operation
A pest control plan must be put in place and implemented; it is imperative that poisons not be used due to the likely presence of SCCs	Life of operation	Environmental Officer & Health and Safety Officer	Evidence or presence of pests	Ongoing

Management outcome: Dust

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all roads and dumps especially. This includes wetting of exposed soft soil surfaces and not conducting activities on windy days which will increase the likelihood of dust being generated.	Life of operation	Contractor	Dustfall	As per the air quality report and the dust monitoring program.
Management outcome: Waste management				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Waste management must be a priority and all waste must be collected and stored effectively.	Life of operation	Environmental Officer & Contractor	Waste Removal	Weekly
Litter, spills, fuels, chemicals and human waste in and around the project area.	Construction/Closure Phase	Environmental Officer & Health and Safety Officer	Presence of Waste	Daily
A minimum of one toilet must be provided per 10 persons. Portable toilets must be pumped dry to ensure the system does not degrade over time and spill into the surrounding area.	Life of operation	Environmental Officer & Health and Safety Officer	Number of toilets per staff member. Waste levels	Daily
The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility	Life of operation	Environmental Officer & Health and Safety Officer	Availability of bins and the collection of the waste.	Ongoing
Where a registered disposal facility is not available close to the project area, the Contractor shall provide a method statement with regard to waste management. Under no circumstances may domestic waste be burned on site	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Collection/handling of the waste.	Ongoing
Refuse bins will be emptied and secured Temporary storage of domestic waste shall be in covered waste skips. Maximum domestic waste storage period will be 10 days.	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Management of bins and collection of waste	Ongoing
Management outcome: Environmental awareness training				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff of the presence of Red / Orange List species, their identification, conservation status and importance, biology, habitat requirements and management requirements the Environmental Authorisation and within the EMPr.	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing

15 Conclusion

The project area has been altered both currently and historically. Agriculture has had an extensive impact on both the fauna and the flora and the habitats in general.

The only remaining natural habitats, i.e. secondary grassland and wetland habitats, even though somewhat degraded are the most sensitive habitats within the project area. The ecological integrity, importance and functioning of these areas play a crucial role as a water resource system and an important habitat for various fauna and flora. The preservation of these habitats is the most important aspect to consider for the proposed project, even more so due to the sensitivity of the area according to the various ecological datasets. The secondary grassland and wetland habitats contained several individuals of protected plant species, hence avoiding the high sensitivity areas, and adhering to the mitigation regarding the low/poor sensitive areas, negates the necessity for destroying the plants. The wetland habitats need to be protected and avoided due to the role of this habitat as a water resource.

Of the 71 prospecting points;

- 3 were identified as high sensitivity, mainly due to the areas representing CBA or being in the wetland buffer zone of 50m;
- 6 were identified as low/poor, mainly due their proximity to wetlands or their location being in secondary grassland that is Endangered; and
- 62 were identified in least concern areas due to the modified that of those areas.

Careful consideration must be afforded each of the mitigation measures provided in this report. In the event that environmental authorisation is issued for this project, proven ecological (or environmental) controls and mitigation measures must be entrenched in the management framework.

16 Impact Statement

An impact statement is required as per the NEMA regulations with regards to the proposed development.

Considering the above-mentioned information, no fatal flaws are evident for the proposed project. It is the opinions of the specialists that the Kookfontein prospecting project, may be favourably considered, should on condition all prescribed mitigation measures and supporting recommendations are implemented.

17 References

ADU (Animal Demography Unit). (2019). Virtual Museum. (Accessed: November 2019).

Alexander, G. & Marais, J. (2007). A guide to the Reptiles of Southern Africa. Struik, Cape Town.

Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M., Marais, J., Alexander, G.J & de Villiers, M.S. (Eds). (2014). Atlas and Red List of Reptiles of South Africa, Lesotho and Swaziland. Suricata 1. South African Biodiversity Institute, Pretoria.

BGIS (Biodiversity GIS). (2018). http://bgis.sanbi.org/ (Accessed: November 2019).

Birdlife South Africa. (2015). Checklist of Birds - List of Threatened Species. https://www.birdlife.org.za/publications (Accessed: November 2019).

BODATSA-POSA. (2019). Plants of South Africa - an online checklist. POSA ver. 3.0. http://newposa.sanbi.org/. (Accessed: November 2019).

Branch, W.R. (1998). Field Guide to Snakes and Other Reptiles of Southern Africa. Struik, Cape Town.

DEA. (2015). National land cover data for SA. https://egis.environment.gov.za/national_land_cover_data_sa (Accessed: June 2019).

Desbonnet, A., P. Pogue, *et al*. (1994). Vegetated Buffers in the Coastal Zone – A Summary Review and Bibliography, University of Rhode Island: 1-72.

Driver, A., Nel, J.L., Snaddon, K., Murray, K., Roux, D.J., Hill, L., Swartz, E.R., Manuel, J. & Funke, N. (2011). Implementation Manual for Freshwater Ecosystem Priority Areas. Report to the Water Research Commission, Pretoria.

Du Preez, L. & Carruthers, V. (2009) A Complete Guide to the Frogs of Southern Africa. Struik Nature, Cape Town.

DWAF: The Regulations on the National Forests Act of 1998 (Act No. 84 of 1998) – published 29 April 2009 in the Government Gazette under the auspices of the Department of Water Affairs and Forestry (DWAF).

Eskom. (2015). Taylor, M.R., Peacock, F. & Wanless, R.M. (Eds). The 2015 Eskom Red Data Book of birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg.

EWT. (2016). Mammal Red List 2016. www.ewt.org.za (Accessed: March 2020).

EWT (Endangered Wildlife Trust). (2017). Threatened Amphibian Programme. (2015). The Southern African Frog Atlas Project https://www.ewt.org.za/TAP/refrence.html (SAFAP, now FrogMAP). http://vmus.adu.org.za (Accessed: March 2020).

Fish, L., Mashau, A.C., Moeaha, M.J. & Nembudani, M.T. (2015). Identification Guide to Southern African Grasses: An Identification Manual with Keys, Descriptions, and Distributions. SANBI, Pretoria.

FrogMap. (2017). The Southern African Frog Atlas Project (SAFAP, now FrogMAP). http://vmus.adu.org.za (Accessed: May 2016).

GDARD. (2014). Technical Report for the Gauteng Conservation Plan (Gauteng C-Plan v3.3). Gauteng Department of Agriculture and Rural Development: Nature Conservation Directorate. 60 pages.

GDARD. (2014). Requirements for biodiversity assessments: Version 3. Gauteng Department of Agriculture and Rural Development, Johannesburg.

Goff, F., Dawson, G., & Rochow, J. (1982). Site examination for threatened and endangered plant species. *Environmental Management, 6*(4), 307-316.

Graham, M. And G. De Winnaar (2009). Developing guidelines to determine appropriate buffers for the protection of freshwater wetlands from various land use impacts in Kwazulu-Natal (Draft): 1-24.

Griffiths, C., Day, J. & Picker, M. (2016). Freshwater Life: A Field Guide to the Plants and Animals of Southern Africa. Struik Nature, Cape Town.

Holmes, P. & Meadows, M. (2012). Southern African Geomorphology. Recent trends and new directions. ISBN: 978-1-920382-02-5.

IUCN. (2017). The IUCN Red List of Threatened Species. www.iucnredlist.org (Accessed: November 2019).

Johnson, S. & Bytebier, B. (2015). Orchids of South Africa: A Field Guide. Struik publishers, Cape Town.

Kotze, D.C., Marneweck, G.C., Batchelor, A.L., Lindley, D.C. & Collins, N.B. (2009). A Technique for rapidly assessing ecosystem services supplied by wetlands. Mondi Wetland Project.

Land Type Survey Staff. (1972 - 2006). Land Types of South Africa: Digital Map (1:250 000 Scale) and Soil Inventory Databases. Pretoria: ARC-Institute for Soil, Climate, and Water.

Macfarlane, D.M., Dickens, J. & Von Hase, F. (2009). Development of a methodology to determine the appropriate buffer zone width and type for developments associated with wetlands, watercourses and estuaries Deliverable 1: Literature Review. INR Report No: 400/09.

Macfarlane, D.M., Bredin, I.P., Adams, J.B., Zungu, M.M., Bate, G.C., Dickens, C.W.S. (2014). Preliminary guideline for the determination of buffer zones for rivers, wetlands and estuaries. Final Consolidated Report. WRC Report No TT 610/14, Water Research Commission, Pretoria.

Macfarlane DM and Bredin IP. 2017. Part 1: technical manual. Buffer zone guidelines for wetlands, rivers and estuaries

MammalMap. (2017). http://mammalmap.adu.org.za/ (Accessed: March 2020).

Measey, G.J. (2011). Ensuring a Future for South Africa's Frogs: A Strategy for Conservation Research. South African National Biodiversity Institute, Pretoria.

Mining and Biodiversity Guidelines (2013). SANBI: Mining and Biodiversity Guidelines: Biodiversity priority areas sensitive to the impacts of mining categorized into four categories. bgis.sanbi.org

Minter, L., Burger, M., Harrison, J.A. & Kloepfer, D. (2004). Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland. Smithsonian Institute Avian Demography Unit, Washington; Cape Town.

Monadjem, A., Taylor, P.J., Coterrill, F.D.P. & Schoeman, C. (2010). Bats of southern and central Africa: a biogeographic and taxonomic synthesis. Wits University Press, Johannesburg.

Mucina, L. & Rutherford, M.C. (Eds.). (2006). The vegetation of South Africa, Lesotho and Swaziland. Strelizia 19. South African National Biodiversity Institute, Pretoria South African.

NBA. (2018). Terrestrial Ecosystem Threat Status 2018. http://bgis.sanbi.org/. (Accessed: March 2020).

Nimbargo Resources (pty) Ltd. (2019). Prospecting Work Programme. Department: Mineral resources.

Pooley, E. (1998). A Field Guide to Wild Flowers: KwaZulu-Natal and Eastern Region. The Flora Publications Trust; ABC Bookshop, Durban.

Raimonde, D. (2009). Red list of South African Plants. SANBI, Pretoria.

Rountree, M.W., Malan, H. & Weston, B. (Eds). (2012). Manual for the Rapid Ecological Reserve Determination of Inland Wetlands (Version 2.0). Joint Department of Water Affairs/Water Research Commission Study. Report No 1788/1/12. Water Research Commission, Pretoria.

SABAP2 (Bird Atlas Project). (2017). http://vmus.adu.org.za/. (Accessed: March 2020).

SACAD (South Africa Conservation Areas Database) and SADAP (South Africa Protected Areas Database) (2019). http://egis.environment.gov.za

SANBI & SAMBF (2012). SANBI: Mining and Biodiversity Guidelines: Biodiversity priority areas sensitive to the impacts of mining categorized into four categories. bgis.sanbi.org

SANBI. (2016). Red List of South African Plants version 2017.1. Redlist.sanbi.org (Accessed: March 2020).

SANBI. (2017). Technical guidelines for CBA Maps: Guidelines for developing a map of Critical Biodiversity Areas & Ecological Support Areas using systematic biodiversity planning. Driver, A., Holness, S. & Daniels, F. (Eds). 1st Edition. South African National Biodiversity Institute, Pretoria.

Skinner, J.D. & Chimimba, C.T. (2005). The Mammals of the Southern African Subregion (New Edition). Cambridge University Press, South Africa.

Skowno, A.L., Raimondo, D.C., Poole, C.J., Fizzotti, B. & Slingsby, J.A. (eds.). (2019). South African National Biodiversity Assessment 2018 Technical Report Volume 1: Terrestrial Realm. South African National Biodiversity Institute, Pretoria.

Smith, G.F., Chesselet, P., van Jaarsveld, E.J., Hartmann, H., Hammer, S., van Wyk, B., Burgoyne, P., Klak, C. & Kurzweil, H. (1998). Mesembs of the world. Briza Publishers, Pretoria.

Van Oudtshoorn, F. (2004). Gids tot die grasse van Suider-Afrika. Second Edition. Briza Publikasies, Pretoria.

Van Wyk, B. & Van Wyk, P. (1997). Field guide to trees of Southern Africa. Struik Publishers, Cape Town.

Van Wyk, B. & Malan, S. (1997). Field Guide to the Wild Flowers of the Highveld: Also Useful in Adjacent Grassland and Bushveld, Struik Publishers, Cape Town.

Van Wyk, B-E., Van Oudtshoorn, B. & Gericke, N. (2013). Medicinal Plants of South Africa. Briza Publications, Pretoria.

18 Appendices

Appendix A Specialist declarations

DECLARATION

I, Martinus Erasmus, declare that:

- 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 71 and is punishable in terms of Section 24F of the Act.

Martinus Erasmus

Terrestrial Ecologist

The Biodiversity Company

March 2020

DECLARATION

I, Lindi Steyn, declare that:

- 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 71 and is punishable in terms of Section 24F of the Act.

Lindi Steyn

Terrestrial Ecologist

The Biodiversity Company

March 2020

DECLARATION

I, Andrew Husted, declare that:

- 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 71 and is punishable in terms of Section 24F of the Act.

Andrew Husted

Wetland Ecologist

The Biodiversity Company

March 2020

Appendix B Flora species expected in the project area and surrounds

Family	Taxon	Author	IUCN	Ecology
Cyperaceae	*Abildgaardia ovata*	(Burm.f.) Kral	LC	Indigenous
Euphorbiaceae	*Acalypha angustata*	Sond.	LC	Indigenous
Asteraceae	*Acanthospermum australe*	(Loefl.) Kuntze		Not indigenous; Naturalised
Lamiaceae	*Acrotome hispida*	Benth.	LC	Indigenous
Lamiaceae	*Ajuga ophrydis*	Burch. ex Benth.	LC	Indigenous
Hyacinthaceae	*Albuca setosa*	Jacq.	LC	Indigenous
Hyacinthaceae	*Albuca sp.*			
Hyacinthaceae	*Albuca virens subsp. arida*	(Ker Gawl.) J.C.Manning & Goldblatt	LC	Indigenous
Hyacinthaceae	*Albuca virens subsp. virens*	(Ker Gawl.) J.C.Manning & Goldblatt	LC	Indigenous
Orobanchaceae	*Alectra pumila*	Benth.	LC	Indigenous
Poaceae	*Alloteropsis semialata subsp. eckloniana*	(R.Br.) Hitchc.	LC	Indigenous
Asphodelaceae	*Aloe subspicata*	(Baker) Boatwr. & J.C.Manning		Indigenous
Amaranthaceae	*Alternanthera pungens*	Kunth		Not indigenous; Naturalised
Amaranthaceae	*Amaranthus deflexus*	L.		Not indigenous; Naturalised
Amaranthaceae	*Amaranthus thunbergii*	Moq.	LC	Indigenous
Lythraceae	*Ammannia baccifera subsp. baccifera*	L.		Not indigenous; Naturalised
Lythraceae	*Ammannia prieuriana*	Guill. & Perr.	LC	Indigenous
Amaryllidaceae	*Ammocharis coranica*	(Ker Gawl.) Herb.	LC	Indigenous
Boraginaceae	*Anchusa riparia*	A.DC.	LC	Indigenous
Poaceae	*Andropogon appendiculatus*	Nees	LC	Indigenous
Poaceae	*Andropogon eucomus*	Nees	LC	Indigenous
Rubiaceae	*Anthospermum rigidum subsp. pumilum*	Eckl. & Zeyh.	LC	Indigenous
Aponogetonaceae	*Aponogeton rehmannii*	Oliv.	LC	Indigenous
Scrophulariaceae	*Aptosimum indivisum*	Burch. ex Benth.	LC	Indigenous
Asteraceae	*Arctotis arctotoides*	(L.f.) O.Hoffm.	LC	Indigenous
Asteraceae	*Arctotis microcephala*	(DC.) Beauverd	LC	Indigenous
Asteraceae	*Arctotis sp.*			
Papaveraceae	*Argemone ochroleuca subsp. ochroleuca*	Sweet		Not indigenous; Naturalised; Invasive
Fabaceae	*Argyrolobium pauciflorum*	Eckl. & Zeyh.	LC	Indigenous
Poaceae	*Aristida adscensionis*	L.	LC	Indigenous
Poaceae	*Aristida congesta subsp. congesta*	Roem. & Schult.	LC	Indigenous
Poaceae	*Aristida junciformis subsp. junciformis*	Trin. & Rupr.	LC	Indigenous
Poaceae	*Aristida sciurus*	Stapf	LC	Indigenous
Apocynaceae	*Asclepias brevipes*	(Schltr.) Schltr.	LC	Indigenous; Endemic
Apocynaceae	*Asclepias fulva*	N.E.Br.	LC	Indigenous
Apocynaceae	*Asclepias gibba var. media*	(E.Mey.) Schltr.	LC	Indigenous
Apocynaceae	*Asclepias meyeriana*	(Schltr.) Schltr.	LC	Indigenous

Apocynaceae	*Asclepias stellifera*	Schltr.	LC	Indigenous
Asparagaceae	*Asparagus laricinus*	Burch.	LC	Indigenous
Apocynaceae	*Aspidoglossum biflorum*	E.Mey.	LC	Indigenous
Elatinaceae	*Bergia pentheriana*	Keissl.	LC	Indigenous
Amaryllidaceae	*Boophone disticha*	(L.f.) Herb.	LC	Indigenous
Poaceae	*Brachiaria advena*	Vickery	NE	Not indigenous; Naturalised
Poaceae	*Brachiaria serrata*	(Thunb.) Stapf	LC	Indigenous
Apocynaceae	*Brachystelma foetidum*	Schltr.	LC	Indigenous
Apocynaceae	*Brachystelma ramosissimum*	(Schltr.) N.E.Br.	LC	Indigenous
Bryaceae	*Bryum argenteum*	Hedw.		Indigenous
Asphodelaceae	*Bulbine abyssinica*	A.Rich.	LC	Indigenous
Asphodelaceae	*Bulbine narcissifolia*	Salm-Dyck	LC	Indigenous
Cyperaceae	*Bulbostylis burchellii*	(Ficalho & Hiern) C.B.Clarke	LC	Indigenous
Cyperaceae	*Bulbostylis hispidula subsp. pyriformis*	(Vahl) R.W.Haines	LC	Indigenous
Cyperaceae	*Carex glomerabilis*	V.I.Krecz.	LC	Indigenous
Apocynaceae	*Ceropegia sandersonii*	Decne. ex Hook.f.	LC	Indigenous
Verbenaceae	*Chascanum adenostachyum*	(Schauer) Moldenke	LC	Indigenous
Pteridaceae	*Cheilanthes hirta var. brevipilosa*	Sw.	LC	Indigenous
Pteridaceae	*Cheilanthes hirta var. hirta*	Sw.	LC	Indigenous
Pteridaceae	*Cheilanthes viridis var. viridis*	(Forssk.) Sw.	LC	Indigenous
Agavaceae	*Chlorophytum fasciculatum*	(Baker) Kativu	LC	Indigenous
Agavaceae	*Chlorophytum transvaalense*	(Baker) Kativu	LC	Indigenous
Asteraceae	*Cineraria lyratiformis*	Cron	LC	Indigenous
Ranunculaceae	*Clematis brachiata*	Thunb.	LC	Indigenous
Nyctaginaceae	*Commicarpus pentandrus*	(Burch.) Heimerl	LC	Indigenous
Apiaceae	*Conium chaerophylloides*	(Thunb.) Sond.	LC	Indigenous
Convolvulaceae	*Convolvulus arvensis*	L.		Not indigenous; Naturalised; Invasive
Convolvulaceae	*Convolvulus sagittatus*	Thunb.	LC	Indigenous
Asteraceae	*Conyza podocephala*	DC.		Indigenous
Malvaceae	*Corchorus asplenifolius*	Burch.	LC	Indigenous
Rubiaceae	*Cordylostigma virgata*	(Willd.) Groeninckx & Dessein		Indigenous
Asteraceae	*Coreopsis lanceolata*	L.		Not indigenous; Cultivated; Naturalised; Invasive
Caryophyllaceae	*Corrigiola litoralis subsp. litoralis*	L.	NE	Indigenous
Asteraceae	*Cotula anthemoides*	L.	LC	Indigenous
Asteraceae	*Cotula microglossa*	(DC.) O.Hoffm. & Kuntze ex Kuntze	LC	Indigenous; Endemic
Crassulaceae	*Cotyledon orbiculata var. oblonga*	L.	LC	Indigenous
Amaryllidaceae	*Crinum bulbispermum*	(Burm.f.) Milne-Redh. & Schweick.	LC	Indigenous
Cucurbitaceae	*Cucumis hirsutus*	Sond.	LC	Indigenous
Orobanchaceae	*Cycnium tubulosum subsp. tubulosum*	(L.f.) Engl.	LC	Indigenous

Poaceae	*Cymbopogon caesius*	(Hook. & Arn.) Stapf	LC	Indigenous
Apocynaceae	*Cynanchum virens*	(E.Mey.) D.Dietr.	LC	Indigenous
Poaceae	*Cynodon dactylon*	(L.) Pers.	LC	Indigenous
Boraginaceae	*Cynoglossum hispidum*	Thunb.	LC	Indigenous
Cyperaceae	*Cyperus congestus*	Vahl	LC	Indigenous
Cyperaceae	*Cyperus difformis*	L.	LC	Indigenous
Cyperaceae	*Cyperus eragrostis*	Lam.		Not indigenous; Naturalised
Cyperaceae	*Cyperus esculentus var. esculentus*	L.	LC	Indigenous
Cyperaceae	*Cyperus fastigiatus*	Rottb.	LC	Indigenous
Cyperaceae	*Cyperus laevigatus*	L.	LC	Indigenous
Cyperaceae	*Cyperus marginatus*	Thunb.	LC	Indigenous
Cyperaceae	*Cyperus obtusiflorus var. flavissimus*	Vahl	LC	Indigenous
Cyperaceae	*Cyperus semitrifidus*	Schrad.	LC	Indigenous
Cyperaceae	*Cyperus usitatus*	Burch.	LC	Indigenous
Amaryllidaceae	*Cyrtanthus breviflorus*	Harv.	LC	Indigenous
Amaryllidaceae	*Cyrtanthus contractus*	N.E.Br.	LC	Indigenous
Solanaceae	*Datura stramonium*	L.		Not indigenous; Naturalised; Invasive
Aizoaceae	*Delosperma herbeum*	(N.E.Br.) N.E.Br.	LC	Indigenous
Aizoaceae	*Delosperma sp.*			
Asteraceae	*Denekia capensis*	Thunb.	LC	Indigenous
Apiaceae	*Deverra burchellii*	(DC.) Eckl. & Zeyh.	LC	Indigenous
Scrophulariaceae	*Diclis rotundifolia*	(Hiern) Hilliard & B.L.Burtt	LC	Indigenous
Asteraceae	*Dicoma anomala subsp. gerrardii*	Sond.	LC	Indigenous
Asteraceae	*Dicoma macrocephala*	DC.	LC	Indigenous
Poaceae	*Digitaria brazzae*	(Franch.) Stapf	LC	Indigenous
Poaceae	*Digitaria eriantha*	Steud.	LC	Indigenous
Poaceae	*Digitaria sp.*			
Poaceae	*Digitaria ternata*	(A.Rich.) Stapf	LC	Indigenous
Poaceae	*Digitaria tricholaenoides*	Stapf	LC	Indigenous
Hyacinthaceae	*Dipcadi marlothii*	Engl.	LC	Indigenous
Hyacinthaceae	*Dipcadi viride*	(L.) Moench	LC	Indigenous
Hyacinthaceae	*Drimia calcarata*	(Baker) Stedje	LC	Indigenous
Hyacinthaceae	*Drimia multisetosa*	(Baker) Jessop	LC	Indigenous
Acanthaceae	*Dyschoriste burchellii*	(Nees) Kuntze	LC	Indigenous
Amaranthaceae	*Dysphania ambrosioides*	(L.) Mosyakin & Clemants		Not indigenous; Naturalised; Invasive
Amaranthaceae	*Dysphania multifida*	(L.) Mosyakin & Clemants		Not indigenous; Naturalised; Invasive
Poaceae	*Echinochloa jubata*	Stapf	LC	Indigenous
Poaceae	*Ehrharta erecta var. erecta*	Lam.	LC	Indigenous
Cyperaceae	*Eleocharis limosa*	(Schrad.) Schult.	LC	Indigenous

Fabaceae	*Elephantorrhiza elephantina*	(Burch.) Skeels	LC	Indigenous
Poaceae	*Eragrostis capensis*	(Thunb.) Trin.	LC	Indigenous
Poaceae	*Eragrostis cilianensis*	(All.) Vignolo ex Janch.	LC	Indigenous
Poaceae	*Eragrostis curvula*	(Schrad.) Nees	LC	Indigenous
Poaceae	*Eragrostis gummiflua*	Nees	LC	Indigenous
Poaceae	*Eragrostis heteromera*	Stapf	LC	Indigenous
Poaceae	*Eragrostis lappula*	Nees	LC	Indigenous
Poaceae	*Eragrostis racemosa*	(Thunb.) Steud.	LC	Indigenous
Poaceae	*Eragrostis tef*	(Zuccagni) Trotter	NE	Not indigenous; Naturalised
Asteraceae	*Erigeron canadensis*	L.		Not indigenous; Naturalised; Invasive
Fabaceae	*Eriosema burkei var. burkei*	Benth. ex Harv.	LC	Indigenous
Brassicaceae	*Erucastrum austroafricanum*	Al-Shehbaz & Warwick	LC	Indigenous
Fabaceae	*Erythrina zeyheri*	Harv.	LC	Indigenous
Orchidaceae	*Eulophia hians var. hians*	Spreng.	LC	Indigenous
Euphorbiaceae	*Euphorbia clavarioides*	Boiss.	LC	Indigenous
Euphorbiaceae	*Euphorbia hirsuta*	L.		Not indigenous; Naturalised; Invasive
Euphorbiaceae	*Euphorbia inaequilatera*	Sond.	LC	Indigenous
Euphorbiaceae	*Euphorbia striata*	Thunb.	LC	Indigenous
Asteraceae	*Euryops transvaalensis subsp. transvaalensis*	Klatt	LC	Indigenous
Poaceae	*Eustachys paspaloides*	(Vahl) Lanza & Mattei	LC	Indigenous
Convolvulaceae	*Falkia oblonga*	Bernh. ex C.Krauss	LC	Indigenous
Polygonaceae	*Fallopia convolvulus*	(L.) Holub		Not indigenous; Naturalised
Asteraceae	*Felicia fascicularis*	DC.	LC	Indigenous
Asteraceae	*Felicia muricata subsp. muricata*	(Thunb.) Nees	LC	Indigenous
Cyperaceae	*Fimbristylis complanata*	(Retz.) Link	LC	Indigenous
Cyperaceae	*Fuirena coerulescens*	Steud.	LC	Indigenous
Asteraceae	*Gazania krebsiana subsp. serrulata*	Less.	LC	Indigenous
Asteraceae	*Gazania sp.*			
Asteraceae	*Geigeria aspera var. aspera*	Harv.	LC	Indigenous
Geraniaceae	*Geranium multisectum*	N.E.Br.	LC	Indigenous
Asteraceae	*Gerbera ambigua*	(Cass.) Sch.Bip.	LC	Indigenous
Gisekiaceae	*Gisekia pharnaceoides var. pharnaceoides*	L.	LC	Indigenous
Iridaceae	*Gladiolus longicollis subsp. longicollis*	Baker	LC	Indigenous
Iridaceae	*Gladiolus longicollis subsp. platypetalus*	Baker	LC	Indigenous
Iridaceae	*Gladiolus papilio*	Hook.f.	LC	Indigenous
Asteraceae	*Gnaphalium nelsonii*	Burtt Davy	NT	Indigenous; Endemic
Amaranthaceae	*Gomphrena celosioides*	Mart.		Not indigenous; Naturalised
Amaranthaceae	*Guilleminea densa*	(Humb. & Bonpl. ex Schult.) Moq.		Not indigenous; Naturalised; Invasive
Celastraceae	*Gymnosporia buxifolia*	(L.) Szyszyl.	LC	Indigenous

Amaryllidaceae	*Haemanthus montanus*	Baker	LC	Indigenous
Asteraceae	*Haplocarpha scaposa*	Harv.	LC	Indigenous
Asteraceae	*Helichrysum argyrosphaerum*	DC.	LC	Indigenous
Asteraceae	*Helichrysum aureonitens*	Sch.Bip.	LC	Indigenous
Asteraceae	*Helichrysum caespititium*	(DC.) Harv.	LC	Indigenous
Asteraceae	*Helichrysum lineare*	DC.	LC	Indigenous
Asteraceae	*Helichrysum rugulosum*	Less.	LC	Indigenous
Malvaceae	*Hermannia cordata*	(E.Mey. ex E.Phillips) De Winter	LC	Indigenous; Endemic
Malvaceae	*Hermannia depressa*	N.E.Br.	LC	Indigenous
Malvaceae	*Hermannia sp.*			
Poaceae	*Heteropogon contortus*	(L.) Roem. & Schult.	LC	Indigenous
Malvaceae	*Hibiscus microcarpus*	Garcke	LC	Indigenous
Malvaceae	*Hibiscus pusillus*	Thunb.	LC	Indigenous
Malvaceae	*Hibiscus trionum*	L.		Not indigenous; Naturalised
Asteraceae	*Hilliardiella elaeagnoides*	(DC.) Swelank. & J.C.Manning		Indigenous
Poaceae	*Hyparrhenia hirta*	(L.) Stapf	LC	Indigenous
Hypericaceae	*Hypericum aethiopicum subsp. sonderi*	Thunb.	LC	Indigenous
Hypericaceae	*Hypericum lalandii*	Choisy	LC	Indigenous
Hypoxidaceae	*Hypoxis acuminata*	Baker	LC	Indigenous
Hypoxidaceae	*Hypoxis filiformis*	Baker	LC	Indigenous
Hypoxidaceae	*Hypoxis hemerocallidea*	Fisch., C.A.Mey. & Ave-Lall.	LC	Indigenous
Hypoxidaceae	*Hypoxis iridifolia*	Baker	LC	Indigenous
Fabaceae	*Indigofera cryptantha var. cryptantha*	Benth. ex Harv.	LC	Indigenous
Fabaceae	*Indigofera torulosa var. angustiloba*	E.Mey.	LC	Indigenous; Endemic
Convolvulaceae	*Ipomoea crassipes var. crassipes*	Hook.	LC	Indigenous
Convolvulaceae	*Ipomoea oblongata*	E.Mey. ex Choisy	LC	Indigenous
Cyperaceae	*Isolepis fluitans var. fluitans*	(L.) R.Br.	LC	Indigenous
Scrophulariaceae	*Jamesbrittenia aurantiaca*	(Burch.) Hilliard	LC	Indigenous
Juncaceae	*Juncus oxycarpus*	E.Mey. ex Kunth	LC	Indigenous
Acanthaceae	*Justicia anagalloides*	(Nees) T.Anderson	LC	Indigenous
Crassulaceae	*Kalanchoe paniculata*	Harv.	LC	Indigenous
Rubiaceae	*Kohautia amatymbica*	Eckl. & Zeyh.	LC	Indigenous
Cyperaceae	*Kyllinga pulchella*	Kunth	LC	Indigenous
Amaranthaceae	*Kyphocarpa angustifolia*	(Moq.) Lopr.	LC	Indigenous
Fabaceae	*Lablab purpureus subsp. uncinatus*	(L.) Sweet	LC	Indigenous
Thymelaeaceae	*Lasiosiphon burchellii*	Meisn.	LC	Indigenous
Thymelaeaceae	*Lasiosiphon capitatus*	(L.f.) Burtt Davy	LC	Indigenous
Thymelaeaceae	*Lasiosiphon kraussianus*	(Meisn.) Meisn.		Indigenous
Asteraceae	*Lasiospermum pedunculare*	Lag.	LC	Indigenous; Endemic

Hyacinthaceae	*Ledebouria cooperi*	(Hook.f.) Jessop	LC	Indigenous
Hyacinthaceae	*Ledebouria luteola*	Jessop	LC	Indigenous
Hyacinthaceae	*Ledebouria sp.*			
Poaceae	*Leersia hexandra*	Sw.	LC	Indigenous
Araceae	*Lemna gibba*	L.	LC	Indigenous
Brassicaceae	*Lepidium didymum*	L.		Not indigenous; Naturalised; Invasive
Fabaceae	*Lespedeza cuneata*	(Dum.Cours.) G.Don	NE	Not indigenous; Naturalised
Fabaceae	*Lessertia frutescens subsp. microphylla*	(L.) Goldblatt & J.C.Manning	LC	Indigenous
Plantaginaceae	*Linaria vulgaris*	Mill.	NE	Not indigenous; Naturalised; Invasive
Verbenaceae	*Lippia scaberrima*	Sond.	LC	Indigenous
Fabaceae	*Listia heterophylla*	E.Mey.	LC	Indigenous
Aizoaceae	*Lithops lesliei subsp. lesliei*	(N.E.Br.) N.E.Br.	NT	Indigenous
Boraginaceae	*Lithospermum cinereum*	A.DC.	LC	Indigenous
Asteraceae	*Litogyne gariepina*	(DC.) Anderb.	LC	Indigenous
Lobeliaceae	*Lobelia sonderiana*	(Kuntze) Lammers	LC	Indigenous
Fabaceae	*Lotononis laxa*	Eckl. & Zeyh.	LC	Indigenous
Lunulariaceae	*Lunularia cruciata*	(L.) Dumort. ex Lindb.		Indigenous
Solanaceae	*Lycium cinereum*	Thunb.	LC	Indigenous
Marsileaceae	*Marsilea macrocarpa*	C.Presl	LC	Indigenous
Fabaceae	*Medicago laciniata var. laciniata*	(L.) Mill.	NE	Not indigenous; Naturalised
Fabaceae	*Medicago sativa*	L.	NE	Not indigenous; Cultivated; Naturalised; Invasive
Fabaceae	*Melilotus indicus*	(L.) All.	NE	Not indigenous; Naturalised; Invasive
Poaceae	*Melinis nerviglumis*	(Franch.) Zizka	LC	Indigenous
Oleaceae	*Menodora africana*	Hook.	LC	Indigenous
Poaceae	*Microchloa kunthii*	Desv.	LC	Indigenous
Phrymaceae	*Mimulus gracilis*	R.Br.	LC	Indigenous
Iridaceae	*Moraea pallida*	(Baker) Goldblatt	LC	Indigenous
Haloragaceae	*Myriophyllum spicatum*	L.		Not indigenous; Cultivated; Naturalised; Invasive
Aizoaceae	*Nananthus aloides*	(Haw.) Schwantes	LC	Indigenous
Scrophulariaceae	*Nemesia fruticans*	(Thunb.) Benth.	LC	Indigenous
Lythraceae	*Nesaea schinzii*	Koehne	LC	Indigenous
Asteraceae	*Nidorella resedifolia subsp. resedifolia*	DC.	LC	Indigenous
Asteraceae	*Nolletia rarifolia*	(Turcz.) Steetz	LC	Indigenous; Endemic
Lamiaceae	*Ocimum obovatum subsp. obovatum*	E.Mey. ex Benth.	NE	Indigenous
Onagraceae	*Oenothera tetraptera*	Cav.		Not indigenous; Naturalised; Invasive
Rubiaceae	*Oldenlandia herbacea var. herbacea*	(L.) Roxb.	LC	Indigenous
Hyacinthaceae	*Ornithogalum flexuosum*	(Thunb.) U.Mull.-Doblies & D.Mull.-Doblies	LC	Indigenous
Hyacinthaceae	*Ornithogalum juncifolium var. juncifolium*	Jacq.	NE	Indigenous

Orchidaceae	*Orthochilus welwitschii*	Rchb.f.	LC	Indigenous
Asteraceae	*Osteospermum muricatum subsp. muricatum*	E.Mey. ex DC.	LC	Indigenous
Asteraceae	*Osteospermum scariosum var. scariosum*	DC.	NE	Indigenous
Oxalidaceae	*Oxalis corniculata*	L.		Not indigenous; Naturalised; Invasive
Oxalidaceae	*Oxalis latifolia*	Kunth		Not indigenous; Naturalised; Invasive
Oxalidaceae	*Oxalis obliquifolia*	Steud. ex A.Rich.	LC	Indigenous
Polygonaceae	*Oxygonum dregeanum subsp. canescens*	Meisn.	NE	Indigenous
Apocynaceae	*Pachycarpus schinzianus*	(Schltr.) N.E.Br.	LC	Indigenous
Rubiaceae	*Pachystigma pygmaeum*	(Schltr.) Robyns	LC	Indigenous
Poaceae	*Panicum schinzii*	Hack.	LC	Indigenous
Papaveraceae	*Papaver argemone*	L.		Not indigenous; Naturalised
Apocynaceae	*Parapodium costatum*	E.Mey.	LC	Indigenous
Malvaceae	*Pavonia burchellii*	(DC.) R.A.Dyer	LC	Indigenous
Fabaceae	*Pearsonia cajanifolia subsp. cajanifolia*	(Harv.) Polhill	LC	Indigenous; Endemic
Geraniaceae	*Pelargonium nanum*	L'Her.	LC	Indigenous
Pteridaceae	*Pellaea calomelanos var. calomelanos*	(Sw.) Link	LC	Indigenous
Rubiaceae	*Pentanisia angustifolia*	(Hochst.) Hochst.	LC	Indigenous
Asteraceae	*Pentzia globosa*	Less.	LC	Indigenous
Asteraceae	*Pentzia incana*	(Thunb.) Kuntze	LC	Indigenous
Polygonaceae	*Persicaria amphibia*	(L.) Delarbre	LC	Not indigenous; Naturalised
Polygonaceae	*Persicaria lapathifolia*	(L.) Delarbre		Not indigenous; Naturalised; Invasive
Solanaceae	*Physalis viscosa*	L.		Not indigenous; Naturalised; Invasive
Phytolaccaceae	*Phytolacca heptandra*	Retz.	LC	Indigenous
Aytoniaceae	*Plagiochasma microcephalum var. microcephalum*	(Steph.) Steph.		Indigenous
Plantaginaceae	*Plantago lanceolata*	L.	LC	Indigenous
Polygalaceae	*Polygala hottentotta*	C.Presl	LC	Indigenous
Polygalaceae	*Polygala transvaalensis subsp. transvaalensis*	Chodat	LC	Indigenous
Potamogetonaceae	*Potamogeton crispus*	L.	LC	Indigenous
Potamogetonaceae	*Potamogeton pectinatus*	L.	LC	Indigenous
Potamogetonaceae	*Potamogeton schweinfurthii*	A.Benn.	LC	Indigenous
Rosaceae	*Potentilla supina*	L.		Indigenous
Urticaceae	*Pouzolzia mixta*	Solms		Indigenous
Proteaceae	*Protea welwitschii*	Engl.	LC	Indigenous
Asteraceae	*Pseudopegolettia tenella*	(DC.) H.Rob., Skvarla & V.A.Funk		Indigenous
Pteridaceae	*Pteris vittata*	L.	LC	Indigenous
Cyperaceae	*Pycreus macranthus*	(Boeck.) C.B.Clarke	LC	Indigenous
Cyperaceae	*Pycreus nitidus*	(Lam.) J.Raynal	LC	Indigenous

Ranunculaceae	*Ranunculus multifidus*	Forssk.	LC	Indigenous
Ranunculaceae	*Ranunculus trichophyllus*	Chaix	LC	Indigenous
Apocynaceae	*Raphionacme hirsuta*	(E.Mey.) R.A.Dyer	LC	Indigenous
Fabaceae	*Requienia pseudosphaerosperma*	(Schinz) Brummitt	LC	Indigenous
Fabaceae	*Rhynchosia adenodes*	Eckl. & Zeyh.	LC	Indigenous
Fabaceae	*Rhynchosia hirsuta*	Eckl. & Zeyh.	LC	Indigenous
Fabaceae	*Rhynchosia minima var. minima*	(L.) DC.	NE	Indigenous
Fabaceae	*Rhynchosia minima var. prostrata*	(L.) DC.	NE	Indigenous
Fabaceae	*Rhynchosia nervosa var. nervosa*	Benth. ex Harv.	LC	Indigenous
Fabaceae	*Rhynchosia pentheri var. pentheri*	Schltr. ex Zahlbr.	LC	Indigenous
Fabaceae	*Rhynchosia sordida*	(E.Mey.) Schinz	LC	Indigenous
Fabaceae	*Rhynchosia totta var. totta*	(Thunb.) DC.	LC	Indigenous
Fabaceae	*Rhynchosia totta var. venulosa*	(Thunb.) DC.		Indigenous
Ricciaceae	*Riccia cavernosa*	Hoffm.		Indigenous
Apocynaceae	*Riocreuxia polyantha*	Schltr.	LC	Indigenous
Brassicaceae	*Rorippa fluviatilis*	(E.Mey. ex Sond.) R.A.Dyer		Indigenous
Brassicaceae	*Rorippa fluviatilis var. fluviatilis*	(E.Mey. ex Sond.) R.A.Dyer	LC	Indigenous
Brassicaceae	*Rorippa nudiuscula*	Thell.	LC	Indigenous
Lamiaceae	*Rotheca hirsuta*	(Hochst.) R.Fern.	LC	Indigenous
Polygonaceae	*Rumex crispus*	L.		Not indigenous; Naturalised; Invasive
Polygonaceae	*Rumex nepalensis*	Spreng.		Not indigenous; Naturalised
Aizoaceae	*Ruschia sp.*			
Salicaceae	*Salix sp.*			
Amaranthaceae	*Salsola kali*	L.		Not indigenous; Naturalised; Invasive
Lamiaceae	*Salvia repens var. repens*	Burch. ex Benth.	LC	Indigenous
Lamiaceae	*Salvia repens var. transvaalensis*	Burch. ex Benth.	LC	Indigenous
Lamiaceae	*Salvia runcinata*	L.f.	LC	Indigenous
Orchidaceae	*Satyrium hallackii subsp. ocellatum*	Bolus	LC	Indigenous
Amaryllidaceae	*Scadoxus puniceus*	(L.) Friis & Nordal	LC	Indigenous
Hyacinthaceae	*Schizocarphus nervosus*	(Burch.) Van der Merwe	LC	Indigenous
Cyperaceae	*Schoenoplectus decipiens*	(Nees) J.Raynal	LC	Indigenous
Cyperaceae	*Scirpoides burkei*	(C.B.Clarke) Goetgh., Muasya & D.A.Simpson	LC	Indigenous
Cyperaceae	*Scleria woodii*	C.B.Clarke	LC	Indigenous
Anacardiaceae	*Searsia pyroides var. pyroides*	(Burch.) Moffett	LC	Indigenous
Gentianaceae	*Sebaea leiostyla*	Gilg	LC	Indigenous
Convolvulaceae	*Seddera capensis*	(E.Mey. ex Choisy) Hallier f.	LC	Indigenous
Scrophulariaceae	*Selago burkei*	Rolfe	LC	Indigenous; Endemic
Scrophulariaceae	*Selago densiflora*	Rolfe	LC	Indigenous

Asteraceae	*Senecio laevigatus var. integrifolius*	Thunb.	LC	Indigenous; Endemic
Asteraceae	*Senecio othonniflorus*	DC.	LC	Indigenous
Asteraceae	*Senecio sp.*			
Poaceae	*Setaria incrassata*	(Hochst.) Hack.	LC	Indigenous
Poaceae	*Setaria pumila*	(Poir.) Roem. & Schult.	LC	Indigenous
Poaceae	*Setaria sp.*			
Malvaceae	*Sida chrysantha*	Ulbr.	LC	Indigenous
Malvaceae	*Sida ternata*	L.f.	LC	Indigenous
Caryophyllaceae	*Silene burchellii subsp. pilosellifolia*	Otth ex DC.		Indigenous
Solanaceae	*Solanum americanum*	Mill.		Not indigenous; Naturalised; Invasive
Solanaceae	*Solanum campylacanthum*	Hochst. ex A.Rich.		Indigenous
Solanaceae	*Solanum humile*	Lam.		Indigenous
Asteraceae	*Sonchus dregeanus*	DC.	LC	Indigenous
Poaceae	*Sporobolus fimbriatus*	(Trin.) Nees	LC	Indigenous
Lamiaceae	*Stachys hyssopoides*	Burch. ex Benth.	LC	Indigenous
Poaceae	*Stipagrostis zeyheri subsp. sericans*	(Nees) De Winter	LC	Indigenous
Orobanchaceae	*Striga asiatica*	(L.) Kuntze	LC	Indigenous
Orobanchaceae	*Striga gesnerioides*	(Willd.) Vatke	LC	Indigenous
Talinaceae	*Talinum caffrum*	(Thunb.) Eckl. & Zeyh.	LC	Indigenous
Fabaceae	*Tephrosia burchellii*	Burtt Davy	LC	Indigenous
Fabaceae	*Tephrosia capensis var. angustifolia*	(Jacq.) Pers.	LC	Indigenous; Endemic
Fabaceae	*Tephrosia capensis var. capensis*	(Jacq.) Pers.	LC	Indigenous
Fabaceae	*Tephrosia lupinifolia*	DC.	LC	Indigenous
Fabaceae	*Tephrosia semiglabra*	Sond.	LC	Indigenous
Lamiaceae	*Teucrium trifidum*	Retz.	LC	Indigenous
Santalaceae	*Thesium confine*	Sond.		Indigenous
Santalaceae	*Thesium hirsutum*	A.W.Hill	LC	Indigenous; Endemic
Santalaceae	*Thesium impeditum*	A.W.Hill	LC	Indigenous
Santalaceae	*Thesium lesliei*	N.E.Br.	LC	Indigenous
Asteraceae	*Tolpis capensis*	(L.) Sch.Bip.	LC	Indigenous
Asphodelaceae	*Trachyandra asperata var. macowanii*	Kunth	LC	Indigenous
Asphodelaceae	*Trachyandra asperata var. nataglencoensis*	Kunth	LC	Indigenous
Asphodelaceae	*Trachyandra saltii var. saltii*	(Baker) Oberm.	LC	Indigenous
Poaceae	*Trachypogon spicatus*	(L.f.) Kuntze	LC	Indigenous
Zygophyllaceae	*Tribulus terrestris*	L.	LC	Indigenous
Poaceae	*Triraphis andropogonoides*	(Steud.) E.Phillips	LC	Indigenous
Alliaceae	*Tulbaghia acutiloba*	Harv.	LC	Indigenous
Poaceae	*Urochloa brachyura*	(Hack.) Stapf	LC	Indigenous
Poaceae	*Urochloa panicoides*	P.Beauv.	LC	Indigenous

Asteraceae	*Ursinia nana subsp. nana*	DC.	LC	Indigenous
Urticaceae	*Urtica urens*	L.		Not indigenous; Naturalised; Invasive
Fabaceae	*Vachellia karroo*	(Hayne) Banfi & Galasso	LC	Indigenous
Vahliaceae	*Vahlia capensis subsp. capensis*	(L.f.) Thunb.	LC	Indigenous
Vahliaceae	*Vahlia capensis subsp. vulgaris*	(L.f.) Thunb.	NE	Indigenous
Vahliaceae	*Vahlia capensis subsp. vulgaris*	(L.f.) Thunb.	NE	Indigenous
Plantaginaceae	*Veronica anagallis-aquatica*	L.	LC	Indigenous
Campanulaceae	*Wahlenbergia undulata*	(L.f.) A.DC.	LC	Indigenous
Solanaceae	*Withania somnifera*	(L.) Dunal	LC	Indigenous
Asteraceae	*Xanthium strumarium*	L.		Not indigenous; Naturalised; Invasive
Apocynaceae	*Xysmalobium brownianum*	S.Moore	LC	Indigenous
Araceae	*Zantedeschia albomaculata subsp. macrocarpa*	(Hook.) Baill.	LC	Indigenous
Asteraceae	*Zinnia peruviana*	(L.) L.		Not indigenous; Naturalised; Invasive
Rhamnaceae	*Ziziphus mucronata subsp. mucronata*	Willd.	LC	Indigenous
Rhamnaceae	*Ziziphus zeyheriana*	Sond.	LC	Indigenous
Fabaceae	*Zornia capensis subsp. capensis*	Pers.	LC	Indigenous
Fabaceae	*Zornia milneana*	Mohlenbr.	LC	Indigenous

Appendix C Avifauna species expected in the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Accipiter melanoleucus	Sparrowhawk, Black	Unlisted	LC
Accipiter minullus	Sparrowhawk, Little	Unlisted	LC
Accipiter ovampensis	Sparrowhawk, Ovambo	Unlisted	LC
Acridotheres tristis	Myna, Common	Unlisted	LC
Acrocephalus arundinaceus	Reed-warbler, Great	Unlisted	LC
Acrocephalus baeticatus	Reed-warbler, African	Unlisted	Unlisted
Acrocephalus gracilirostris	Swamp-warbler, Lesser	Unlisted	LC
Acrocephalus palustris	Warbler, Marsh	Unlisted	LC
Acrocephalus schoenobaenus	Warbler, Sedge	Unlisted	LC
Actitis hypoleucos	Sandpiper, Common	Unlisted	LC
Actophilornis africanus	Jacana, African	Unlisted	LC
Afrotis afraoides	Korhaan, Northern Black	Unlisted	LC
Alcedo cristata	Kingfisher, Malachite	Unlisted	Unlisted
Alopochen aegyptiacus	Goose, Egyptian	Unlisted	LC
Amadina erythrocephala	Finch, Red-headed	Unlisted	LC
Amandava subflava	Waxbill, Orange-breasted	Unlisted	Unlisted
Amaurornis flavirostris	Crake, Black	Unlisted	LC
Amblyospiza albifrons	Weaver, Thick-billed	Unlisted	LC
Anas capensis	Teal, Cape	Unlisted	LC
Anas erythrorhyncha	Teal, Red-billed	Unlisted	LC
Anas hottentota	Teal, Hottentot	Unlisted	LC
Anas platyrhynchos	Duck, Mallard	Unlisted	LC
Anas smithii	Shoveler, Cape	Unlisted	LC
Anas sparsa	Duck, African Black	Unlisted	LC
Anas undulata	Duck, Yellow-billed	Unlisted	LC
Anhinga rufa	Darter, African	Unlisted	LC
Anser anser	Goose, Domestic	Unlisted	LC
Anthus cinnamomeus	Pipit, African	Unlisted	LC
Anthus leucophrys	Pipit, Plain-backed	Unlisted	LC
Anthus vaalensis	Pipit, Buffy	Unlisted	LC
Apalis thoracica	Apalis, Bar-throated	Unlisted	LC
Apus affinis	Swift, Little	Unlisted	LC
Apus apus	Swift, Common	Unlisted	LC
Apus barbatus	Swift, African Black	Unlisted	LC
Apus caffer	Swift, White-rumped	Unlisted	LC
Apus horus	Swift, Horus	Unlisted	LC
Ardea cinerea	Heron, Grey	Unlisted	LC

Ardea goliath	Heron, Goliath	Unlisted	LC
Ardea melanocephala	Heron, Black-headed	Unlisted	LC
Ardea purpurea	Heron, Purple	Unlisted	LC
Ardeola ralloides	Heron, Squacco	Unlisted	LC
Arenaria interpres	Turnstone, Ruddy	Unlisted	LC
Asio capensis	Owl, Marsh	Unlisted	LC
Batis molitor	Batis, Chinspot	Unlisted	LC
Bostrychia hagedash	Ibis, Hadeda	Unlisted	LC
Bradypterus baboecala	Rush-warbler, Little	Unlisted	LC
Bubo africanus	Eagle-owl, Spotted	Unlisted	LC
Bubulcus ibis	Egret, Cattle	Unlisted	LC
Burhinus capensis	Thick-knee, Spotted	Unlisted	LC
Buteo rufofuscus	Buzzard, Jackal	Unlisted	LC
Buteo vulpinus	Buzzard, Common	Unlisted	Unlisted
Butorides striata	Heron, Green-backed	Unlisted	LC
Calandrella cinerea	Lark, Red-capped	Unlisted	LC
Calendulauda sabota	Lark, Sabota	Unlisted	LC
Calidris ferruginea	Sandpiper, Curlew	LC	NT
Calidris minuta	Stint, Little	LC	LC
Campethera abingoni	Woodpecker, Golden-tailed	Unlisted	LC
Caprimulgus rufigena	Nightjar, Rufous-cheeked	Unlisted	LC
Centropus burchellii	Coucal, Burchell's	Unlisted	Unlisted
Cercomela familiaris	Chat, Familiar	Unlisted	LC
Cercotrichas leucophrys	Scrub-robin, White-browed	Unlisted	LC
Cercotrichas paena	Scrub-robin, Kalahari	Unlisted	LC
Ceryle rudis	Kingfisher, Pied	Unlisted	LC
Chalcomitra amethystina	Sunbird, Amethyst	Unlisted	LC
Charadrius hiaticula	Plover, Common Ringed	Unlisted	LC
Charadrius pecuarius	Plover, Kittlitz's	Unlisted	LC
Charadrius tricollaris	Plover, Three-banded	Unlisted	LC
Chersomanes albofasciata	Lark, Spike-heeled	Unlisted	LC
Chlidonias hybrida	Tern, Whiskered	Unlisted	LC
Chlidonias leucopterus	Tern, White-winged	Unlisted	LC
Chrysococcyx caprius	Cuckoo, Diderick	Unlisted	LC
Chrysococcyx klaas	Cuckoo, Klaas's	Unlisted	LC
Ciconia abdimii	Stork, Abdim's	NT	LC
Ciconia ciconia	Stork, White	Unlisted	LC
Cinnyris talatala	Sunbird, White-bellied	Unlisted	LC
Circus ranivorus	Marsh-harrier, African	EN	LC
Cisticola aridulus	Cisticola, Desert	Unlisted	LC
Cisticola ayresii	Cisticola, Wing-snapping	Unlisted	LC

Cisticola chiniana	Cisticola, Rattling	Unlisted	LC
Cisticola fulvicapilla	Neddicky, Neddicky	Unlisted	LC
Cisticola juncidis	Cisticola, Zitting	Unlisted	LC
Cisticola lais	Cisticola, Wailing	Unlisted	LC
Cisticola textrix	Cisticola, Cloud	Unlisted	LC
Cisticola tinniens	Cisticola, Levaillant's	Unlisted	LC
Colius colius	Mousebird, White-backed	Unlisted	LC
Colius striatus	Mousebird, Speckled	Unlisted	LC
Columba arquatrix	Olive-pigeon, African	Unlisted	LC
Columba guinea	Pigeon, Speckled	Unlisted	LC
Columba livia	Dove, Rock	Unlisted	LC
Corvus albus	Crow, Pied	Unlisted	LC
Corvus capensis	Crow, Cape	Unlisted	LC
Corythaixoides concolor	Go-away-bird, Grey	Unlisted	LC
Cossypha caffra	Robin-chat, Cape	Unlisted	LC
Coturnix coturnix	Quail, Common	Unlisted	LC
Creatophora cinerea	Starling, Wattled	Unlisted	LC
Crithagra atrogularis	Canary, Black-throated	Unlisted	LC
Crithagra flaviventris	Canary, Yellow	Unlisted	LC
Crithagra gularis	Seedeater, Streaky-headed	Unlisted	LC
Crithagra mozambicus	Canary, Yellow-fronted	Unlisted	LC
Crithagra sulphuratus	Canary, Brimstone	Unlisted	LC
Cuculus solitarius	Cuckoo, Red-chested	Unlisted	LC
Cypsiurus parvus	Palm-swift, African	Unlisted	LC
Delichon urbicum	House-martin, Common	Unlisted	LC
Dendrocygna bicolor	Duck, Fulvous	Unlisted	LC
Dendrocygna viduata	Duck, White-faced Whistling	Unlisted	LC
Dendropicos fuscescens	Woodpecker, Cardinal	Unlisted	LC
Dryoscopus cubla	Puffback, Black-backed	Unlisted	LC
Egretta alba	Egret, Great	Unlisted	LC
Egretta ardesiaca	Heron, Black	Unlisted	LC
Egretta garzetta	Egret, Little	Unlisted	LC
Egretta intermedia	Egret, Yellow-billed	Unlisted	LC
Elanus caeruleus	Kite, Black-shouldered	Unlisted	LC
Emberiza tahapisi	Bunting, Cinnamon-breasted	Unlisted	LC
Estrilda astrild	Waxbill, Common	Unlisted	LC
Estrilda erythronotos	Waxbill, Black-faced	Unlisted	LC
Euplectes afer	Bishop, Yellow-crowned	Unlisted	LC
Euplectes albonotatus	Widowbird, White-winged	Unlisted	LC
Euplectes ardens	Widowbird, Red-collared	Unlisted	LC
Euplectes axillaris	Widowbird, Fan-tailed	Unlisted	LC

Euplectes orix	Bishop, Southern Red	Unlisted	LC
Euplectes progne	Widowbird, Long-tailed	Unlisted	LC
Eupodotis senegalensis	Korhaan, White-bellied	VU	LC
Falco amurensis	Falcon, Amur	Unlisted	LC
Falco biarmicus	Falcon, Lanner	VU	LC
Falco naumanni	Kestrel, Lesser	Unlisted	LC
Falco peregrinus	Falcon, Peregrine	Unlisted	LC
Falco rupicolus	Kestrel, Rock	Unlisted	LC
Falco vespertinus	Falcon, Red-footed	NT	NT
Fulica cristata	Coot, Red-knobbed	Unlisted	LC
Gallinago nigripennis	Snipe, African	Unlisted	LC
Gallinula angulata	Moorhen, Lesser	Unlisted	LC
Gallinula chloropus	Moorhen, Common	Unlisted	LC
Glareola nordmanni	Pratincole, Black-winged	NT	NT
Halcyon albiventris	Kingfisher, Brown-hooded	Unlisted	LC
Halcyon senegalensis	Kingfisher, Woodland	Unlisted	LC
Haliaeetus vocifer	Fish-eagle, African	Unlisted	LC
Himantopus himantopus	Stilt, Black-winged	Unlisted	LC
Hirundo abyssinica	Swallow, Lesser Striped	Unlisted	LC
Hirundo albigularis	Swallow, White-throated	Unlisted	LC
Hirundo cucullata	Swallow, Greater Striped	Unlisted	LC
Hirundo fuligula	Martin, Rock	Unlisted	Unlisted
Hirundo rustica	Swallow, Barn	Unlisted	LC
Hirundo spilodera	Cliff-swallow, South African	Unlisted	LC
Indicator indicator	Honeyguide, Greater	Unlisted	LC
Indicator minor	Honeyguide, Lesser	Unlisted	LC
Ixobrychus minutus	Bittern, Little	Unlisted	LC
Jynx ruficollis	Wryneck, Red-throated	Unlisted	LC
Lagonosticta rhodopareia	Firefinch, Jameson's	Unlisted	LC
Lagonosticta rubricata	Firefinch, African	Unlisted	LC
Lagonosticta senegala	Firefinch, Red-billed	Unlisted	LC
Lamprotornis nitens	Starling, Cape Glossy	Unlisted	LC
Laniarius atrococcineus	Shrike, Crimson-breasted	Unlisted	LC
Laniarius ferrugineus	Boubou, Southern	Unlisted	LC
Lanius collaris	Fiscal, Common (Southern)	Unlisted	LC
Lanius collurio	Shrike, Red-backed	Unlisted	LC
Lanius minor	Shrike, Lesser Grey	Unlisted	LC
Larus cirrocephalus	Gull, Grey-headed	Unlisted	LC
Lophaetus occipitalis	Eagle, Long-crested	Unlisted	LC
Lybius torquatus	Barbet, Black-collared	Unlisted	LC
Macronyx capensis	Longclaw, Cape	Unlisted	LC

Megaceryle maximus	Kingfisher, Giant	Unlisted	Unlisted
Melierax gabar	Goshawk, Gabar	Unlisted	LC
Merops apiaster	Bee-eater, European	Unlisted	LC
Merops bullockoides	Bee-eater, White-fronted	Unlisted	LC
Milvus aegyptius	Kite, Yellow-billed	Unlisted	Unlisted
Mirafra africana	Lark, Rufous-naped	Unlisted	LC
Mirafra cheniana	Lark, Melodious	LC	LC
Mirafra fasciolata	Lark, Eastern Clapper	Unlisted	LC
Motacilla aguimp	Wagtail, African Pied	Unlisted	LC
Motacilla capensis	Wagtail, Cape	Unlisted	LC
Motacilla flava	Wagtail, Western Yellow	Unlisted	LC
Muscicapa striata	Flycatcher, Spotted	Unlisted	LC
Mycteria ibis	Stork, Yellow-billed	EN	LC
Myrmecocichla formicivora	Chat, Anteating	Unlisted	LC
Netta erythrophthalma	Pochard, Southern	Unlisted	LC
Numida meleagris	Guineafowl, Helmeted	Unlisted	LC
Nycticorax nycticorax	Night-Heron, Black-crowned	Unlisted	LC
Oena capensis	Dove, Namaqua	Unlisted	LC
Oenanthe monticola	Wheatear, Mountain	Unlisted	LC
Oenanthe pileata	Wheatear, Capped	Unlisted	LC
Onychognathus morio	Starling, Red-winged	Unlisted	LC
Ortygospiza atricollis	Quailfinch, African	Unlisted	LC
Oxyura maccoa	Duck, Maccoa	NT	NT
Pandion haliaetus	Osprey, Osprey	Unlisted	LC
Parisoma subcaeruleum	Tit-babbler, Chestnut-vented	Unlisted	Unlisted
Passer diffusus	Sparrow, Southern Grey-headed	Unlisted	LC
Passer domesticus	Sparrow, House	Unlisted	LC
Passer melanurus	Sparrow, Cape	Unlisted	LC
Pavo cristatus	Peacock, Common	Unlisted	LC
Pernis apivorus	Honey-buzzard, European	Unlisted	LC
Petronia superciliaris	Petronia, Yellow-throated	Unlisted	LC
Phalacrocorax africanus	Cormorant, Reed	Unlisted	LC
Phalacrocorax carbo	Cormorant, White-breasted	LC	LC
Philomachus pugnax	Ruff	Unlisted	LC
Phoenicopterus minor	Flamingo, Lesser	NT	NT
Phoenicopterus ruber	Flamingo, Greater	NT	LC
Phoeniculus purpureus	Wood-hoopoe, Green	Unlisted	LC
Phylloscopus trochilus	Warbler, Willow	Unlisted	LC
Platalea alba	Spoonbill, African	Unlisted	LC
Plectropterus gambensis	Goose, Spur-winged	Unlisted	LC
Plegadis falcinellus	Ibis, Glossy	Unlisted	LC

Plocepasser mahali	Sparrow-weaver, White-browed	Unlisted	LC
Ploceus capensis	Weaver, Cape	Unlisted	LC
Ploceus cucullatus	Weaver, Village	Unlisted	LC
Ploceus velatus	Masked-weaver, Southern	Unlisted	LC
Podiceps cristatus	Grebe, Great Crested	Unlisted	LC
Podiceps nigricollis	Grebe, Black-necked	Unlisted	LC
Polyboroides typus	Harrier-Hawk, African	Unlisted	LC
Porphyrio madagascariensis	Swamphen, African Purple	Unlisted	Unlisted
Prinia flavicans	Prinia, Black-chested	Unlisted	LC
Prinia subflava	Prinia, Tawny-flanked	Unlisted	LC
Prodotiscus regulus	Honeybird, Brown-backed	Unlisted	LC
Psittacula krameri	Parakeet, Rose-ringed	Unlisted	LC
Psophocichla litsipsirupa	Thrush, Groundscraper	Unlisted	Unlisted
Pternistis swainsonii	Spurfowl, Swainson's	Unlisted	LC
Pycnonotus nigricans	Bulbul, African Red-eyed	Unlisted	LC
Pycnonotus tricolor	Bulbul, Dark-capped	Unlisted	Unlisted
Pytilia melba	Pytilia, Green-winged	Unlisted	LC
Quelea quelea	Quelea, Red-billed	Unlisted	LC
Rallus caerulescens	Rail, African	Unlisted	LC
Recurvirostra avosetta	Avocet, Pied	Unlisted	LC
Rhinopomastus cyanomelas	Scimitarbill, Common	Unlisted	LC
Riparia cincta	Martin, Banded	Unlisted	LC
Riparia paludicola	Martin, Brown-throated	Unlisted	LC
Riparia riparia	Martin, Sand	Unlisted	LC
Rostratula benghalensis	Painted-snipe, Greater	NT	LC
Sarothrura rufa	Flufftail, Red-chested	Unlisted	LC
Saxicola torquatus	Stonechat, African	Unlisted	LC
Scleroptila levaillantoides	Francolin, Orange River	Unlisted	LC
Scopus umbretta	Hamerkop	Unlisted	LC
Sigelus silens	Flycatcher, Fiscal	Unlisted	LC
Spermestes cucullatus	Mannikin, Bronze	Unlisted	Unlisted
Sporopipes squamifrons	Finch, Scaly-feathered	Unlisted	LC
Spreo bicolor	Starling, Pied	Unlisted	LC
Stenostira scita	Flycatcher, Fairy	Unlisted	LC
Sterna caspia	Tern, Caspian	VU	LC
Streptopelia capicola	Turtle-dove, Cape	Unlisted	LC
Streptopelia semitorquata	Dove, Red-eyed	Unlisted	LC
Streptopelia senegalensis	Dove, Laughing	Unlisted	LC
Struthio camelus	Ostrich, Common	Unlisted	LC
Sturnus vulgaris	Starling, Common	Unlisted	LC
Sylvia communis	Whitethroat, Common	Unlisted	LC

Sylvietta rufescens	Crombec, Long-billed	Unlisted	LC
Tachybaptus ruficollis	Grebe, Little	Unlisted	LC
Tadorna cana	Shelduck, South African	Unlisted	LC
Tchagra australis	Tchagra, Brown-crowned	Unlisted	LC
Telophorus zeylonus	Bokmakierie, Bokmakierie	Unlisted	LC
Terpsiphone viridis	Paradise-flycatcher, African	Unlisted	LC
Thalassornis leuconotus	Duck, White-backed	Unlisted	LC
Thamnolaea cinnamomeiventris	Cliff-chat, Mocking	Unlisted	LC
Threskiornis aethiopicus	Ibis, African Sacred	Unlisted	LC
Tockus nasutus	Hornbill, African Grey	Unlisted	LC
Trachyphonus vaillantii	Barbet, Crested	Unlisted	LC
Tricholaema leucomelas	Barbet, Acacia Pied	Unlisted	LC
Tringa glareola	Sandpiper, Wood	Unlisted	LC
Tringa nebularia	Greenshank, Common	Unlisted	LC
Tringa stagnatilis	Sandpiper, Marsh	Unlisted	LC
Turdus libonyanus	Thrush, Kurrichane	Unlisted	Unlisted
Turdus olivaceus	Thrush, Olive	Unlisted	LC
Turdus smithi	Thrush, Karoo	Unlisted	LC
Tyto alba	Owl, Barn	Unlisted	LC
Upupa africana	Hoopoe, African	Unlisted	LC
Uraeginthus angolensis	Waxbill, Blue	Unlisted	LC
Urocolius indicus	Mousebird, Red-faced	Unlisted	LC
Vanellus armatus	Lapwing, Blacksmith	Unlisted	LC
Vanellus coronatus	Lapwing, Crowned	Unlisted	LC
Vanellus senegallus	Lapwing, African Wattled	Unlisted	LC
Vidua chalybeata	Indigobird, Village	Unlisted	LC
Vidua macroura	Whydah, Pin-tailed	Unlisted	LC
Vidua paradisaea	Paradise-whydah, Long-tailed	Unlisted	LC
Vidua purpurascens	Indigobird, Purple	Unlisted	LC
Zosterops pallidus	White-eye, Orange River	Unlisted	LC
Zosterops virens	White-eye, Cape	Unlisted	LC

Appendix D Mammals expected in the project area

Species	**Common Name**	**Conservation Status**	
		Regional (SANBI, 2016)	**IUCN (2017)**
Aethomys ineptus	Tete Veld Rat	LC	LC
Aethomys namaquensis	Namaqua rock rat	LC	LC

Alcelaphus buselaphus	Hartebeest	LC	LC
Antidorcas marsupialis	Sclater's Shrew	LC	LC
Aonyx capensis	Cape Clawless Otter	NT	NT
Atelerix frontalis	South Africa Hedgehog	NT	LC
Atilax paludinosus	Water Mongoose	LC	LC
Canis mesomelas	Black-backed Jackal	LC	LC
Caracal caracal	Caracal	LC	LC
Ceratotherium simum	White Rhinoceros	NT	NT
Connochaetes gnou	Black Wildebeest	LC	LC
Connochaetes taurinus	Blue Wildebeest	LC	LC
Crocidura cyanea	Reddish-grey Musk Shrew	LC	LC
Crocidura maquassiensis	Makwassie musk shrew	VU	LC
Cryptomys hottentotus	Common Mole-rat	LC	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Damaliscus pygargus	Blesbok	LC	LC
Desmodillus auricularis	Short-tailed Gerbil	LC	LC
Diceros bicornis	Black Rhinoceros	EN	CR
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT
Elephantulus brachyrhynchus	Short-snouted Sengi	LC	LC
Elephantulus myurus	Eastern Rock Sengi	LC	LC
Eptesicus hottentotus	Long-tailed Serotine Bat	LC	LC
Equus quagga	Plains Zebra	LC	NT
Felis nigripes	Black-footed Cat	VU	VU
Felis silvestris	African Wildcat	LC	LC
Genetta genetta	Small-spotted Genet	LC	LC
Gerbilliscus brantsii	Highveld Gerbil	LC	LC
Gerbilliscus leucogaster	Bushveld Gerbil	LC	LC
Herpestes sanguineus	Slender Mongoose	LC	LC
Hydrictis maculicollis	Spotted-necked Otter	VU	NT
Hystrix africaeaustralis	Cape Porcupine	LC	LC
Ichneumia albicauda	White-tailed Mongoose	LC	LC
Ictonyx striatus	Striped Polecat	LC	LC
Leptailurus serval	Serval	NT	LC
Lepus saxatilis	Scrub Hare	LC	LC
Lepus victoriae	African Savanna Hare	LC	LC
Mastomys coucha	Multimammate Mouse	LC	LC
Mellivora capensis	Honey Badger	LC	LC
Mungos mungo	Banded Mongoose	LC	LC
Mus musculus	House Mouse	Unlisted	LC
Myotis tricolor	Temminck's Hairy Bat	LC	LC
Myotis welwitschii	Welwitsch's Hairy Bat	LC	LC

Mystromys albicaudatus	White-tailed Rat	VU	EN
Neoromicia capensis	Cape Serotine Bat	LC	LC
Neoromicia zuluensis	Aloe Bat	LC	LC
Nycteris thebaica	Egyptian Slit-faced Bat	LC	LC
Orycteropus afer	Aardvark	LC	LC
Otomys angoniensis	Angoni Vlei Rat	LC	LC
Otomys irroratus	Vlei Rat (Fynbos type)	LC	LC
Ourebia ourebi	Oribi	EN	LC
Panthera pardus	Leopard	VU	VU
Papio ursinus	Chacma Baboon	LC	LC
Parahyaena brunnea	Brown Hyaena	NT	NT
Pedetes capensis	Springhare	LC	LC
Pelea capreolus	Grey Rhebok	NT	NT
Phacochoerus africanus	Common Warthog	LC	LC
Poecilogale albinucha	African Striped Weasel	NT	LC
Procavia capensis	Rock Hyrax	LC	LC
Proteles cristata	Aardwolf	LC	LC
Raphicerus campestris	Steenbok	LC	LC
Rattus rattus	House Rat	Exotic (Not listed)	LC
Redunca fulvorufula	Mountain Reedbuck	EN	LC
Rhabdomys pumilio	Xeric Four-striped Mouse	LC	LC
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	LC	LC
Rhinolophus darlingi	Darling's Horseshoe Bat	LC	LC
Saccostomus campestris	Pouched Mouse	LC	LC
Sauromys petrophilus	Flat-headed Free-tail Bat	LC	LC
Scotophilus dinganii	Yellow House Bat	LC	LC
Steatomys krebsii	Krebs's Fat Mouse	LC	LC
Steatomys pratensis	Fat Mouse	LC	LC
Suncus varilla	Lesser Dwarf Shrew	LC	LC
Suricata suricatta	Suricate	LC	LC
Sylvicapra grimmia	Common Duiker	LC	LC
Syncerus caffer	African Buffalo	LC	LC
Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC	LC
Tragelaphus oryx	Common Eland	LC	LC
Vulpes chama	Cape Fox	LC	LC
Xerus inauris	Cape Ground Squirrel	LC	LC

Appendix E Reptiles species expected in the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Acontias gracilicauda	Thin-tailed Legless Skink	LC	LC
Afroedura nivaria	Drankensberg Flat Gecko	LC	LC
Afrotyphlops bibronii	Bibron's Blind Snake	LC	LC
Agama aculeata distanti	Eastern Ground Agama	LC	LC
Agama atra	Southern Rock Agama	LC	LC
Aparallactus capensis	Black-headed Centipede-eater	LC	LC
Atractaspis bibronii	Bibron's Stiletto Snake	LC	Unlisted
Bitis arietans arietans	Puff Adder	LC	Unlisted
Boaedon capensis	Brown House Snake	LC	LC
Causus rhombeatus	Rhombic Night Adder	LC	LC
Chamaeleo dilepis	Common Flap-neck Chameleon	LC	LC
Cordylus vittifer	Common Girdled Lizard	LC	LC
Crocodylus niloticus	Nile Crocodile	VU	LC
Crotaphopeltis hotamboeia	Red-lipped Snake	LC	Unlisted
Dasypeltis scabra	Rhombic Egg-eater	LC	LC
Dispholidus typus	Boomslang	LC	Unlisted
Duberria lutrix	Common Slug-eater	LC	LC
Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	LC	Unlisted
Hemachatus haemachatus	Rinkhals	LC	LC
Hemidactylus mabouia	Common Tropical House Gecko	LC	Unlisted
Homoroselaps lacteus	Spotted Harlequin Snake	LC	LC
Kinixys lobatsiana	Lobatse hinged-back Tortoise	LC	LC
Lamprophis aurora	Aurora House Snake	LC	LC
Lycodonomorphus inornatus	Olive House Snake	LC	LC
Lycodonomorphus laevissimus	Dusky-bellied Water Snake	LC	LC
Lycodonomorphus rufulus	Brown Water Snake	LC	Unlisted
Lycophidion capense capense	Cape Wolf Snake	LC	Unlisted
Lygodactylus capensis capensis	Common Dwarf Gecko	LC	Unlisted
Lygodactylus ocellatus	Spotted Dwarf Gecko	LC	LC
Naja annulifera	Snouted Cobra	LC	Unlisted
Nucras lalandii	Delalande's Sandveld Lizard	LC	LC
Pachydactylus affinis	Transvaal Gecko	LC	LC
Pachydactylus capensis	Cape Gecko	LC	Unlisted
Panaspis wahlbergi	Wahlberg's Snake-eyed Skink	LC	Unlisted
Pedioplanis lineoocellata lineoocellata	Spotted Sand Lizard	LC	Unlisted
Pelomedusa galeata	South African Marsh Terrapin	Not evaluated	Unlisted
Pelomedusa subrufa	Central Marsh Terrapin	LC	Unlisted

Philothamnus semivariegatus	Spotted Bush Snake	LC	Unlisted
Prosymna ambigua	Angolan Shovel-snout	Unlisted	LC
Prosymna sundevallii	Sundevall's Shovel-snout	LC	LC
Psammophis brevirostris	Short-snouted Grass Snake	LC	Unlisted
Psammophis crucifer	Cross-marked Grass Snake	LC	LC
Psammophis subtaeniatus	Stripe-bellied Sand Snake	LC	LC
Psammophis trinasalis	Fork-marked Sand Snake	LC	Unlisted
Psammophylax rhombeatus	Spotted Grass Snake	LC	Unlisted
Psammophylax tritaeniatus	Striped Grass Snake	LC	LC
Pseudaspis cana	Mole Snake	LC	Unlisted
Python natalensis	Southern African Python	LC	Unlisted
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	LC	Unlisted
Smaug vandami	Van Dam's Dragon Lizard	LC	LC
Stigmochelys pardalis	Leopard Tortoise	LC	LC
Telescopus semiannulatus semiannulatus	Eastern Tiger Snake	LC	Unlisted
Trachylepis capensis	Cape Skink	LC	Unlisted
Trachylepis damarana	Damara skink	Unlisted	LC
Trachylepis punctatissima	Speckled Rock Skink	LC	LC
Trachylepis varia sensu lato	Variable Skink	LC	LC
Varanus niloticus	Water Monitor	LC	Unlisted

Appendix F Amphibians expected in the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Amietia delalandii	Delalande's River Frog	LC	Unlisted
Amietia fuscigula	Common River Frog	LC	LC
Amietia poyntoni	Poynton's River Frog	LC	LC
Breviceps adspersus	Bushveld Rain Frog	LC	LC
Cacosternum boettgeri	Common Caco	LC	LC
Chiromantis xerampelina	Southern Foam Nest Frog	LC	LC
Kassina senegalensis	Bubbling Kassina	LC	LC
Phrynobatrachus natalensis	Snoring Puddle Frog	LC	LC
Ptychadena anchietae	Plain Grass Frog	LC	LC
Pyxicephalus adspersus	Giant Bullfrog	LC	LC
Schismaderma carens	African Red Toad	LC	LC
Sclerophrys capensis	Raucous Toad	LC	LC
Sclerophrys garmani	Olive Toad	LC	LC
Sclerophrys gutturalis	Guttural Toad	LC	LC
Sclerophrys poweri	Power's Toad	LC	LC
Semnodactylus wealii	Rattling Frog	LC	LC
Strongylopus fasciatus	Striped Stream Frog	LC	LC
Tomopterna cryptotis	Tremelo Sand Frog	LC	LC
Tomopterna natalensis	Natal Sand Frog	LC	LC
Tomopterna tandyi	Tandy's Sand Frog	LC	LC
Xenopus laevis	Common Platanna	LC	LC