BIODIVERSITY ASSESSMENT REPORT FOR THE PROPOSED MINING RIGHT AND/ OR BULK SAMPLING ACTIVITIES INCLUDING TRENCHING IN CASES OF ALLUVIAL DIAMOND PROSPECTING WITHIN THE BOJANALA DISTRICT MUNICIPALITY (MOSES KOTANE LOCAL MUNICIPALITY), IN THE NORTH-WEST PROVINCE, SOUTH AFRICA

18/07/2017

Naledzani Environmental Services
Sustainability is our responsibility

PROPRIETARY INFORMATION

Contact details - Any queries relating to this document should be addressed to:

Mpho Ramalivhana

Suite 211 Elephant House

107 Albertina Sisulu Street

Johannesburg

Mobile: +27 78 901 4833

ramalivhanam@naledzanies.co.za or
ramalivhanam@gmail.com

Document Reference :	Fidulex Ecological Assessment
Prepared by :	Mpho Ramalivhana
Date Issued :	18 July 2017

DECLARATION OF INDEPENDENCE

I, Mpho Ramalivhana, declare that I:

- I consider myself bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP).
- At the time of conducting the study and compiling this report I did not have any interest, hidden or otherwise, in the proposed development that this study has reference to, except for financial compensation for work done in professional capacity.
- Work performed for this study was done in an objective manner. Even if this study results in views and findings that are not favourable to the client/applicant, I will not be affected in any manner by the outcome of any environmental process of which this report may form a part, other than being a member of the general public.
- I declare that there are no circumstances that may compromise my objectivity in performing this specialist investigation. I do not necessarily object to or endorse the proposed development, but aim to present facts, findings and recommendations based on relevant professional experience and scientific data.
- I do not have any influence over decisions made by the governing authorities.
- I undertake to disclose 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 a competent authority to such a relevant authority and the applicant.
- I have expertise and experience in conducting specialist reports relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity.
- This document and all information contained herein is and will remain the intellectual property of Naledzani Environmental Services and the specialist investigator responsible for conducting the study. This document, in its entirety or any portion thereof, may not be altered in any manner or form, for any purpose without the specific and written consent of the specialist investigator.
- I will comply with the Act, regulations and all other applicable legislation.
- I realize that a false declaration is an offence in terms of Regulation 71 of NEMA and is punishable in terms of section 24F of the Act.

Mpho Ramalivhana Pri Sci. Nat (Hons. Bot.; SAAB; SACNASP)

SPECIALIST INFORMATION

Mpho Ramalivhana of Naledzani Environmental Consultant holds an Honours Degree in Botany from the University of Limpopo (Turfloop Campus) and has 7 years professional experience in biodiversity assessment & management, and ecological research. He is a registered member for South African Council for Natural Scientist Professions (**400395/14**).

DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

Name of organization	Joan Construction and Projects (Pty) Ltd
Contact Person	Lufuno Mutshathama
Contact Details	Physical Address: Wood office park Suite D5 Kudu Street Allensnek Cell: 073 912 0800 Fax: 086 235 5142 E-mail: Joanprojects@gmail.com

Table of Contents

List of Tables

List of figures

ABBREVIATIONS

BGIS	Biodiversity Geographical Information System
CARA	Conservation of Agricultural Resources
CBA	Critical Biodiversity Area
CR	Critically Endangered
DEA	Department of Environmental Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EN	Endangered
ESA	Ecological support area
MM	Millimetres
NEMA	National Environmental Management Act, 107 of 1998
NEMBA	National Environmental Management Biodiversity Act, 10 of 2004
NES	Naledzani Environmental Services
ONA	Other Natural Area
PA	Protected Area
PRECIS	Pretoria Computerised Information System
QDGC	Quarter Degree Grid Cell
SANBI	South African National Biodiversity Institute
SARCA	Southern African Reptile Conservation Assessment
SFSD	Strategic Framework for Sustainable Development
VM	Virtual Museum
VU	Vulnerable

1. INTRODUCTION

Joan Construction and Projects (Pty) Ltd has been appointed to conduct and Environmental Impact Assessment (Scoping Process) for the mining right and/ or bulk sampling activities including trenching in cases of alluvial diamond prospecting within the Bojanala District Municipality (Moses Kotane Local Municipality), in the North-West Province, South Africa.

As part of the requirements of the EIA process, specific biodiversity surveys were recommended by the environmental consultant. Joan Construction and Projects appointed Naledzani Environmental Services cc (herein after referred to as 'NES') to conduct the biodiversity impact assessment for the proposed development.

1.1. Terms of reference

The terms of reference for this investigation are limited to a Terrestrial Biodiversity Assessment with the following objectives:

- To assess the proposed development in order to determine the general ecological state of the proposed project area;
- To survey and delineate environmentally sensitive areas;
- To assess the proposed development in terms of faunal and floral taxa including the potential for species to occur;
- To provide mapping of the environmentally sensitive and critical areas with respect to the proposed development;
- To assess and identify the potential impacts that may arise from the proposed project on the fauna and flora taxa;
- To provide mitigation measures to prevent and/or mitigate identified environmental impacts that may occur due to the proposed project; and
- The provision of an assessment report, indicate findings, recommendations and maps indicating sensitivities and/or no-go areas.

2. LEGISLATIVE REQUIREMENTS

A summary of the relevant sections of the acts that govern the activities and potential impacts to the environment associated with the development are listed below. It should be noted that these acts are listed below only with specific reference to biodiversity studies.

Table 1: Acts and regulations relating to the project

Legislation/Policy	Description
United Nations, 1992, The Convention on Biological Diversity.	The purpose of the Convention on Biological Diversity is to conserve the variability among living organisms, at all levels (including diversity between species, within species and of ecosystems). Primary objectives include (i) conserving biological diversity, (ii) using biological diversity in a sustainable manner and (iii) sharing the benefits of biological diversity fairly and equitably.
The Constitution of the Republic of South Africa Act No. 108 of 1996	The Constitution is the supreme law of the land and includes the Bill of rights which is the cornerstone of democracy in South Africa and enshrines the rights of people in the country. It includes the right to an environment which is not harmful to human health or well-being and to have the environment protected for the benefit of present and future generations through reasonable legislative and other measures.
Strategic Framework for Sustainable Development in South Africa	The development of a broad framework for sustainable development was initiated to provide an overarching and guiding National Sustainable Development Strategy. The Strategic Framework for Sustainable Development (SFSD) in South Africa (September 2006) is a goal orientated policy framework aimed at meeting the Millennium Development Goals. Biodiversity has been identified as one of the key crosscutting trends in the SFSD. The lack of sustainable practices in managing natural resources, climate change effects, loss of habitat and poor land management practices were raised as the main threats to biodiversity.
National Environmental	This is a fundamentally important piece of legislation and effectively promotes

Management Act 107 of 1998	sustainable development and entrenches principles such as the 'precautionary approach', 'polluter pays' principle, and requires responsibility for impacts to be taken throughout the life cycle of a project NEMA provides the legislative backing (Including Impact Assessment Regulations) for regulating development and ensuring that a risk-averse and cautious approach is taken when making decisions about activities.
Environmental Impact Assessment (EIA) Regulations of 08 December 2014	New regulations have been promulgated in terms of Chapter 5 of NEMA and were published on 08 December 2014 in Government Notice No. R. 985. Development and land use activities which require Environmental Authorisation in terms of the NEMA EIA Regulations, 2014, are in Listing Notice 3 (GG No. R.983, LN3) identified via geographic areas with the intention being that activities only require Environmental Authorization when located within designated sensitive areas. These sensitive/geographic areas were identified and published for each of the nine (9) Provinces.
National Environmental Management: Biodiversity Act No 10 of 2004	The Biodiversity Act provides for listing of threatened or protected ecosystems, in one of four categories: Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Protected (Government Gazette, 2011). The main purpose of listing threatened ecosystems is to reduce the rate of ecosystem and species extinction and includes the prevention of further degradation and loss of structure, function and composition of threatened ecosystems.
National Forest Act 84 of 1998	The protection, sustainable management and use of forests and trees within South Africa are provided for under the National Forests Act (Act 84 of 1998).
National Environmental Management: Protected Areas Act 57 of 2003	This Act provides for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. It also seeks to provide for the sustainable utilization of protected areas and to promote participation of local communities in the management of protected areas.

3. LIMITATIONS

- All species included in the plant species list (Appendix A) were observed and recorded in the study area during the time of the study;
- The bird species list was augmented by the desktop study;
- Any comments or observations made in this regard are based on observations, literature review, the expert knowledge and relevant professional experience of the specialist; and
- Naledzani Environmental Services reserves the right to amend this report, recommendations and/or conclusions at any stage should any additional or otherwise significant information come to light.

4. PROJECT DESCRIPTION AND LOCATION

4.1. Project location

The proposed project site is located on the farm Palmietfontein 208JP under the Moses Kotane Local Municipality of the Bojanala District in the North West. The site is located closer to the Pilanesberg National Park (located approximately 1.2 kilometres east of the proposed site. Coordinates for the corner points are listed on the table below

Table 2: Corner points for the proposed site

Corner points	Latitude	Longitude
A	25° 18' 5.04"	26° 57' 4.18"
B	25° 18' 5.04"	26° 57' 36.76"
C	25° 18' 36.72"	26° 57' 36.75"
D	25° 18' 36.28"	26° 57' 4.18"

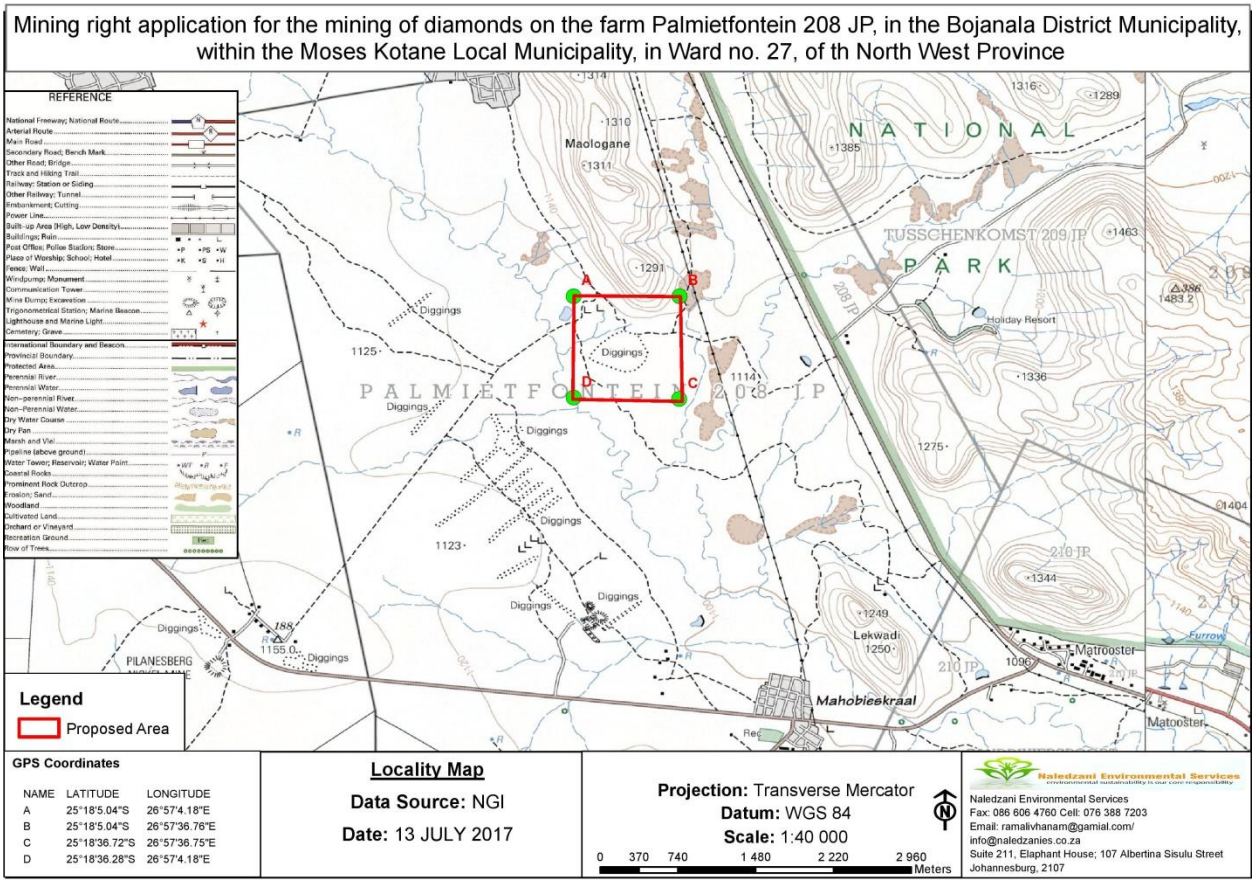

Figure 1: Locality map for the proposed project

4.2. Climatic Conditions

The proposed sites are situated in the Bojanala Platinum District Municipality in the North West Province. The western part of the municipality receives less than 300mm of rain per annum, the central part around 550mm, while the eastern and south-eastern parts receive over 600mm. The highest rainfall occurs in the summer months between October and April; rainfall is very low in winter. A large proportion of rain occurs as thunderstorms with heavy gusts of wind, lightning, hail and flash-floods (Climate Change Vulnerability: North West Province, 2015).

The area in the province are considered to be semi-arid (annual rainfall totals approximately 539mm). Droughts and floods occur regularly at both provincial and local scales, and play a significant role in almost every aspect of the social, economic and ecological environment within the province. Evaporation exceeds rainfall in most parts of the province, and as a result the North West province relies heavily on ground water resources to meet its needs (Climate Change Vulnerability: North West Province, 2015).

There are wide seasonal and daily variations in temperature; with very hot weather in summer (daily average high temperatures of 32ºC in January) and mild to cold weather in winter (average daily minimum in July is 0.9ºC). There is a high variance between minimum and maximum temperatures; daily maximums range from 17 to 31ºC in the summer (October to April) and 4 to 20ºC in the winter (May to September) (Climate Change Vulnerability: North West Province, 2015).

4.3. Broad vegetation classification

According to the new vegetation classification on BGIS (2012), the proposed site is located at the **Zeerust Thornveld ((SVcb 3)**.

4.3.1. Overview of the Biome type

Mucina and Rutherford (2011) described the project area as falling within the Savanna biome. The Savanna Biome is the largest Biome in southern Africa, occupying 46% of its area, and over one-third the area of South Africa. It is well developed over the Lowveld and Kalahari region of South Africa and is also the dominant vegetation in neighbouring Botswana, Namibia and Zimbabwe. It is characterized by a grassy ground layer and a distinct upper layer of woody plants. Where this upper layer is near the ground vegetation may be referred to as Shrubveld, where it is dense as Woodland, and the intermediate stages are locally known as Bushveld.

The environmental factors delimiting the biome are complex: altitude ranges from sea level to 2000 m; rainfall varies from 235 to 1000 mm per year; frost may occur from 0 to 120 days per year; and almost every major geological and soil type occurs within the biome. A major factor delimiting the biome is the lack of sufficient rainfall which prevents the upper tree layer from dominating, coupled with fires and grazing, which keep the grass layer dominant. Summer rainfall is essential for grass dominance, which, with its fine material, fuels near-annual fires. In fact, almost all species are adapted to survive fires, usually with less than 10% of plants, both in the grass and tree layer, killed by fire. Even with severe burning, most species can re-sprout from the stem bases (Mucina and Rutherford, 2011).

The grass layer is dominated by C 4-type grasses (C4 plants are more adapted to warm or hot seasonal conditions under moist or dry environments), which are at an advantage where the growing season is hot. But where rainfall has a stronger winter component, C 3-type grasses dominate. The shrub-tree layer may vary from 1 to 20 m in height, but in Bushveld typically varies from 3 to 7 m. The shrub-tree element may come to dominate the vegetation in areas which are being overgrazed.

Most of the Savanna vegetation types are used for grazing, mainly by cattle or game. In the southernmost Savanna types, goats are a major stock. In some areas crops and subtropical fruit are cultivated. These mainly include the Clay Thorn Bushveld, parts of Mixed Bushveld, and Sweet Lowveld Bushveld.

Conservation status of Savanna is comparatively good, mainly due to the presence of the Kruger and Kalahari Gemsbok National Parks within the biome. However, the high area conserved in South Africa, belies the fact that half of Savanna vegetation types are inadequately conserved, in having less than 5% of their area in reserves and, much of the area is used for game-farming and can thus be considered effectively preserved, provided that sustainable stocking levels are maintained. The importance of tourism and big game hunting in the conservation of the area must not be underestimated (Mucina and Rutherford, 2011).

4.3.2. Broad vegetation of the site

According to Mucina and Rutherford, 2011, the proposed site is located within the Zeerust Thornveld. The Zeerust Thornveld is distributed and is limited to the North-West Province. It extends along the plains from the Lobatsi River in the west via Zeerust, Groot Marico and Mabaalstad to the flats between the Pilanesberg and western end of the Magaliesberg in the east (including the valley of the lower Selons River).

It consists of deciduous, open to dense short woodland which is dominated by Acacia species with herbaceous layer mainly of grasses on deep, high bas-status and some clay soils on plains and lowlands. Important trees in this vegetation type include *Acacia burkei, A. erioloba, Acacia mellifera, A. nilotica, A. tortilis, Searsia lancea, Peltophorum africanum* and *Grewia flava*. Graminoid species *include Eragrostis lehmanniana, Panicum maximum, Aristida congesta* and *Cymbopogon pospischilii* while the herbaceous layer includes *Blepharis integrifolia, Chamaecrista absus, Cleome maculate, Dicoma anomala, Kyphocarpa angustifolia* and *Lophiocarpus tenuissimus*.

The vegetation type is classified as Least Threatened, with 19% target for conservation and less than 4% is statutorily conserved and spread between four reserves including Pienaar and Marico Bushveld Nature Reserves. 16% of this vegetation type has been transformed mainly by cultivation (Mucina and Rutherford, 2011).

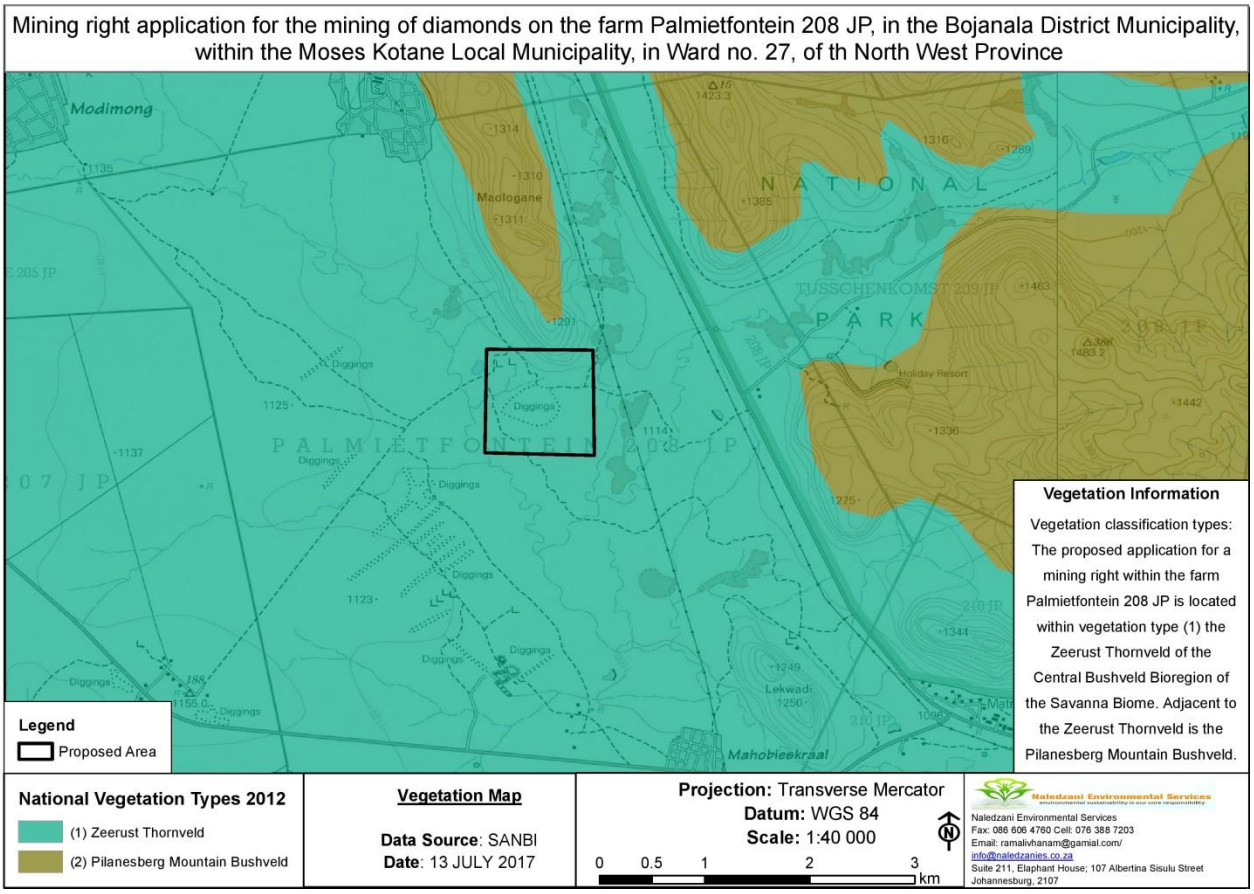

Figure 2: Vegetation map for the study area

4.4. Terrestrial threatened ecosystem

The South African National Biodiversity Institute (SANBI), in conjunction with the Department of Environmental Affairs (DEA), released a draft report in 2009 entitled “Threatened Ecosystems in South Africa: Descriptions and Maps”, to provide background information on the List of Threatened Ecosystems (SANBI, 2009). The purpose of this report was to present a detailed description of each of South Africa’s ecosystems and to determine their status using a credible and practical set of criteria. The following criteria were used in determining the status of threatened ecosystems:

- Irreversible loss of natural habitat;
- Ecosystem degradation and loss of integrity;
- Limited extent and imminent threat;
- Threatened plant species associations;
- Threatened animal species associations; and

- Priority areas for meeting explicit biodiversity targets as defined in a systematic conservation plan.

In terms of section 52 (1) (a), of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), a new national list of ecosystems that are threatened and in need of protection was gazetted on 9 December 2012 (Government Notice 1002 (Driver *et. al.*, 2004). The list classified all threatened or protected ecosystems in South Africa in terms of four categories; *Critically Endangered* (CR), *Endangered* (EN), *Vulnerable* (VU), or *Protected*. The purpose of categorizing these ecosystems is to prioritize conservation areas in order to reduce the rates of ecosystem and species extinction, as well as preventing further degradation and loss of structure, function, and composition of these ecosystems. It is estimated that threatened ecosystems make up 9.5% of South Africa, with critically endangered and endangered ecosystems accounting for 2.7%, and vulnerable ecosystems 6.8% of the land area. It is therefore vital that Threatened Terrestrial Ecosystems inform proactive and reactive conservation and planning tools, such as Biodiversity Sector Plans, municipal Strategic Environmental Assessments (SEAs) and Environmental Management Frameworks (EMFs), Environmental Impact Assessments (EIAs) and other environmental applications (Mucina *et al.,* 2006*)*. According to data sourced from South African National Biodiversity Institute (SANBI), the site is located within the Least Threatened Ecosystem (**Zeerust Thornveld**).

5. METHODOLOGY AND REPORTING

The information provided in this terrestrial biodiversity report is based mainly on the observations that were made during the field survey and a review of the available reports that contain known and predicted biodiversity and ecological information regarding the proposed site. A wide range of spatial data sets were interrogated and relevant information was extracted for the study site. A basic ecological sensitivity analysis was performed to identify areas of special interest or concern. The various approaches used and aspects taken into account are detailed below:

5.1. General

A desktop survey utilising aerial images and photography was undertaken to assemble background information regarding the different features and vegetation type present within the proposed project footprint including the buffer area. The initial site visit was conducted on the 11th of March 2017 for confirmation of site boundaries. The full site assessment was conducted from the 11th to the 12th of July 2017 to ensure that the true floristic reflection of the site is recorded.

5.2. Vegetation

The PRECIS list of plants recorded in the quarter degree grid square were obtained from SANBI. This list was consulted to verify the record of occurrence of the plant species seen on the site. A desk-top study of the habitats of the red-listed and orange-listed species known to occur in the area was done prior to site assessment. Visual assessment was used to assess the abundance of floral species. The vegetation types of Mucina & Rutherford (2006) were also used as reference but where necessary communities are named according to the recommendations for a standardized South African syntaxonomic nomenclature system (Brown, L.R., Du Preez, P.J., Bezuidenhout, H., Bredenkamp, G.J., Mostert, T.H.C., and Collins, N.B. 2013). By combining the available literature with the survey results, stratification of vegetation communities was possible.

5.3. Fauna survey

The majority of mammals and reptiles are either very secretive, nocturnal, hibernate (reptiles), migrate (birds) or prefer specific habitat so sampling and identification was limited.

5.3.1. Mammals

Records of all mammal species recorded in the four quarter degree grid squares were obtained from the Virtual Museum (VM) website of the Animal Demographic Unit of University of Cape Town prior to the site visits. The site assessment was conducted for mammal species diversity by direct and indirect methods using mammal sightings, burrows, holes and also verified by mammal book (Skinner and Chimimba, 2005). No trapping was conducted during the field survey.

5.4. Methodology Adapted in Assessing the Impacts

The significance of the impacts will be assessed considering the following descriptors:

Table 3: Impact assessment table

Nature of the impact		
Positive	+	Impact will be beneficial to the environment (a benefit).

Negative	-	Impact will not be beneficial to the environment (a cost).
Neutral	0	Where a negative impact is offset by a positive impact, or mitigation measures, to have no overall effect.
`Magnitude		
Minor	2	Negligible effects on biophysical or social functions / processes. Includes areas / environmental aspects which have already been altered significantly, and have little to no conservation importance (negligible sensitivity*).
Low	4	Minimal effects on biophysical or social functions / processes. Includes areas / environmental aspects which have been largely modified, and / or have a low conservation importance (low sensitivity*).
Moderate	6	Notable effects on biophysical or social functions / processes. Includes areas / environmental aspects which have already been moderately modified, and have a medium conservation importance (medium sensitivity*).
High	8	Considerable effects on biophysical or social functions / processes. Includes areas / environmental aspects which have been slightly modified and have a high conservation importance (high sensitivity*).
Very high	10	Severe effects on biophysical or social functions / processes. Includes areas / environmental aspects which have not previously been impacted upon and are pristine, thus of very high conservation importance (very high sensitivity*).
Extent		
Site only	1	Effect limited to the site and its immediate surroundings.

Local	2	Effect limited to within 3-5 km of the site.
Regional	3	Activity will have an impact on a regional scale.
National	4	Activity will have an impact on a national scale.
International	5	Activity will have an impact on an international scale.
Duration		
Immediate	1	Effect occurs periodically throughout the life of the activity.
Short term	2	Effect lasts for a period 0 to 5 years.
Medium term	3	Effect continues for a period between 5 and 15 years.
Long term	4	Effect will cease after the operational life of the activity either because of natural process or by human intervention.
Permanent	5	Where mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.

Probability of occurrence		
Improbable	1	Less than 30% chance of occurrence.
Low	2	Between 30 and 50% chance of occurrence.
Medium	3	Between 50 and 70% chance of occurrence.
High	4	Greater than 70% chance of occurrence.
Definite	5	Will occur, or where applicable has occurred, regardless or in spite of any mitigation measures.

Once the impact criteria have been ranked for each impact, the significance of the impacts will be calculated using the following formula:

Significance Points (SP) = (Magnitude + Duration + Extent) x Probability

The significance of the heritage impact is therefore calculated by multiplying the severity rating with the probability rating. The maximum value that can be reached through this impact evaluation process is 100 SP (points). The significance for each impact is rated as High (SP≥60), Medium (SP = 31-60) and Low (SP<30) significance as shown in the Table 7 below.

Table 4: Definition of significance rating

Significance of predicted NEGATIVE impacts		
Low	0-30	Where the impact will have a relatively small effect on the environment and will require minimum or no mitigation and as such have a limited influence on the decision
Medium	31-60	Where the impact can have an influence on the environment and should be mitigated and as such could have an influence on the decision unless it is mitigated.
High	61-100	Where the impact will definitely have an influence on the environment and must be mitigated, where possible. This impact will influence the decision regardless of any possible mitigation.
Significance of predicted POSITIVE impacts		
Low	0-30	Where the impact will have a relatively small positive effect on the environment.
Medium	31-60	Where the positive impact will counteract an existing negative impact and result in an overall neutral effect on the environment.
High	61-100	Where the positive impact will improve the environment relative to baseline conditions.

6. RESULTS OF THE ASSESSMENT

6.1. Vegetation Survey

The proposed site gives the feeling of a typical savanna biome characterised by trees, shrubs and the grass layer. From the outside look the area looks more dense and tact which is caused by the clumps of *Dichrostachys cinerea* that has clamp together but the field assessment provided otherwise. The grass layer was found to be dry with few grasses species confirmed to the species level. These include *Themeda triandra, Cymbopogon nardus, Hyparrhenia hirta, Cynodon dactylon, Trachypogon spicatus, Eragrostis curvula, E rigidior, Brachiaria serrata, Brachiaria eruciformis, Enneapogon scoparius, Panicum coloratum, Schmidtia pappophoroides* and *Elionurus muticus* (***See figure 3 below***).

Figure 3: Dry grass layer on site

The shrub and tree layer consists mainly of *Acacia karoo, A. caffra, A. tortilis, Asparagus densiflorus, A. cooperi, Ziziphus mucronata, and Dichrostachys cinerea (being the dominant species on siete)* as dominating species. Other species include *Rhus lancea, Opuntia-ficus indica, Momordica balsamina* and *Gymnosporia buxifolia.*

Figure 4: *Dichrostachys cinerea* with Acacia sp on site

Figure 5: *Rhus lancea* as an ever green species on site

Other plant species recorded on site include *Euphorbia cooperi, Combretum apiculatum, C. molle, Solanum mariantanum, Acacia mellifera, Datura stramonium, and Aloe marlothii, Grewia flava, Ficus abutilifolia, Melia azedarach. One one* species of concern/importance (*Sclerocarya birrea)* was recorded on site and according to the National Forest Act, 1998 (Act No. 84 of 1998) these species are listed as protected.

In terms of section 15(1) of the National Forests Act, 1998, no person may cut, disturb, damage or destroy any protected tree; or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any product derived from a protected tree, except under a licence or exemption granted by the Minister of Agriculture, Forestry and Fisheries.

Figure 6: Some of the *Sclerocarya birrea* recorded on site

6.2. Alien invasive plants

Declared weeds and invaders have the tendency to dominate or replace the herbaceous layer of natural ecosystems, thereby transforming the structure, composition and function of natural ecosystems. Therefore, it is important that all these transformers be eradicated and controlled by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species (Henderson, 2001).

According to the published Alien and Invasive Species regulations in terms of section 97(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) four categories of problem plants are identified as:

- **Category 1a** plants are high-priority emerging species requiring compulsory control. All breeding, growing, moving and selling are banned.
- **Category 1b** plants are widespread invasive species controlled by a management programme.
- **Category 2** plants are invasive species controlled by area. Can be grown under permit conditions in demarcated areas. All breeding, growing, moving, and selling are banned without a permit.
- **Category 3** plants are ornamental and other species that are permitted on a property but may no longer be planted or sold.

Numerous alien plant species were recorded in the study area at the time of the survey; most notably the extensive invasions by species such as *Melia azedarach, Opuntia ficus-indica* and *Cereus jamacaru* also have the potential to form dense stands. Table 8 lists the alien species as well as the various NEMBA categories for the alien species recorded during the survey.

Table 5: Alien species recorded in the study area.

Scientific name	Common name	Category
Melia azedarach	Syringa	1b
Opuntia ficus-indica	Prickly pear	1b
Argemone Mexicana	Mexican prickly poppy	1b
Solanum mariantanum	Bug weed	1b
Datura stramonium	Devils snare	1b

Figure 7: Some of the dry *Datura Stramonium* plants on site

6.3. Medicinal Plants

The demand for medicinal plants is increasing while the frequently used species and the communal land that it is harvested from are on the decline. With an increase in the country's population and the high rate of infectious diseases, this will put an even higher strain on the already scarce natural medicinal resources (Emery *et al*., 2002). Areas of high biodiversity are thus important for the conservation and sustainable use of these resources and should be protected. Most of the medicinal plant species recorded in the study area was alien species.

Table 6: Medicinal plants recorded in the study areas.

Scientific name	Common name	Conservation Status
Opuntia ficus-indica	Prickly pear	Exotic
Rhus lancea	Karee	Indigenous
Ziziphus mucronata	Buffalo thorn	Indigenous
Aloe Marlothii	Mountain aloe	Indigenous

Figure 8: *Aloe marlothii* recorded as a medicinal plant on site

6.4. Description of the CBAs for the North West Province

Critical Biodiversity Areas (CBA's) are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services (SANBI, 2007). These form the key output of a systematic conservation assessment and are the biodiversity sectors inputs into multi-sectoral planning and decision making tools.

The primary purpose of CBA's is to inform land-use planning and the land-use guidelines attached to CBA's aim to promote sustainable development by avoiding loss or degradation of important natural habitat and landscapes in these areas and the landscape as a whole. CBA's can also be used to inform protected area expansion and development plans. The use of CBA's here follows the definition laid out in the guideline for publishing bioregional plans (Anon, 2008):

- "**Critical biodiversity areas** (CBAs) are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses".
- "**Ecological support areas** (ESA's) are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development,

such as water provision, flood mitigation or carbon sequestration. The degree of restriction on land use and resource use in these areas may be lower than that recommended for critical biodiversity areas."

The guideline for bioregional plans defines three basic CBA categories based on three high-level land management objectives which were adapted for the Gauteng Province (**Table 7**).

Table 7: A framework for linking spatial planning categories (CBAs) to land-use planning and decision-making guidelines based on a set of high-level land biodiversity management objectives.

CBA category	Land Management Objective
PA & CBA 1	**Natural landscapes**: • Ecosystems and species fully intact and undisturbed • These are areas with high irreplaceability or low flexibility in terms of meeting biodiversity pattern targets. If the biodiversity features targeted in these areas are lost then targets will not be met. • These are landscapes that are at or past their limits of acceptable change.
CBA 2	**Near-natural landscapes**: • Ecosystems and species largely intact and undisturbed. • Areas with intermediate irreplaceability or some flexibility in terms of area required to meet biodiversity targets. There are options for loss of some components of biodiversity in these landscapes without compromising our ability to achieve targets. • These are landscapes that are approaching but have not passed their limits of acceptable change.
Ecological Support Areas (ESA)	**Functional landscapes**: • Ecosystems moderately to significantly disturbed but still able to maintain basic functionality. • Individual species or other biodiversity indicators may be severely disturbed or reduced. • These are areas with low irreplaceability with respect to

CBA category	Land Management Objective
	biodiversity pattern targets only.
Other Natural Areas (ONA) and Transformed	**Production landscapes**: manage land to optimize sustainable utilization of natural resources.

The biodiversity criteria used to define Critical Biodiversity Areas (CBAs) in the North West Province are listed in **Table 8** below.

Table 8: Biodiversity criteria used to define Critical Biodiversity Areas (CBAs) in the North West Province.

Map Category Name	Sub-Category Name	Description of biodiversity features used to define CBA category	Shp File Name	Shp File CBA Field Name	CBA Level Codes
Protected Areas	Protected Areas	Protected areas recognised in the National Environmental Management Protected Areas Act, 57 of 2003 including South African National Parks and North West Provincial Parks. These were formerly known as Type 1 and 2 protected areas.	NW Protected Areas	CBA_pa	PA
	Conservation areas	Conservation areas not recognised in the National Environmental Management Protected Areas Act, 57 of 2003 t (*e.g.* conservancies and private nature reserves or game farms where there is no legal agreement). These were formerly known as Type 3 protected areas.	NW Protected Areas	CBA_pa	CA
Critical Biodiversity Areas (CBAs)	Critical Patches: Ecosystem Status - Critically Endangered Ecosystems	Remaining patches larger than 3ha of provincially critically endangered ecosystems (vegetation types). i.e. The amount remaining intact of this vegetation type is less than representation target therefore all remaining patches of these vegetation units are of the highest conservation priority and further transformation of natural habitat should be avoided	NW Vegetation Patches	CBA_saveg	T1
	Critical Patches: Ecosystem	Remaining patches larger than 5ha of provincially endangered and vulnerable ecosystems (vegetation types), i.e. The amount remaining intact of this vegetation type is less than 60%.	NW Vegetation Patches	CBA_saveg	T2

Map Category Name	Sub-Category Name	Description of biodiversity features used to define CBA category	Shp File Name	Shp File CBA Field Name	CBA Level Codes
	Status - Endangered And Vulnerable Ecosystems	Any further transformation of these vegetation types should be limited to existing transformed or heavily degraded areas.			
	Critical Patches: Endemic Vegetation Types	Remaining patches larger than 10ha of Endemic or Near-Endemic (>80% in province) vegetation types to the province with a global distribution of less than 50 000ha. These are vegetation types whose conservation target can only be achieved in the NW Province. Also, the small extent of these vegetation units makes them vulnerable to transformation.	NW Vegetation Patches	CBA_end	T2
	Critical Biodiversity Corridors Linkages	Critical linkages in the provincial biodiversity corridor network where existing conversion of natural landscapes to other uses has severely restricted options for maintaining connectivity in the natural landscape.	NW Biodiversity Corridors Critical Linkages	CBA_links	T1
	Important Terrestrial Habitats: Experts Areas	Areas in the terrestrial environments less than 10 000 ha in extent identified by experts as being important for biodiversity conservation	NW Expert Terrestrial	CBA_exp_T	T1

Map Category Name	Sub-Category Name	Description of biodiversity features used to define CBA category	Shp File Name	Shp File CBA Field Name	CBA Level Codes
	Important Habitats: Features	Important natural features (habitats, springs, scenic landscapes) identified in the existing SDF data	NW Features	CBA_fea	T2
	Important Habitats: Hills and Ridges	Hills and ridges identified as sensitive habitats in the existing provincial SDF dataset. The hill and ridges layer was developed to address the special biodiversity significance of these topographic features in the Province. The layer was re-developed from scratch using the GIS modelling approach used in Gauteng Province and modified for the North West Province.	NW Hills and Ridges	CBA_hill	T2
	Existing or Proposed Protected Area Development Corridors	Existing protected area development corridors identified in previous studies: 1. Pilanesberg Nature Reserve corridor	NW PA Development Corridors	CBA_pa1	T2
Critical Biodiversity Areas (CBAs)	Biodiversity Development Nodes	Potential biodiversity or nature-based industry development nodes identified through the systematic biodiversity assessment. Nodes coincide with areas of important remaining or intact biodiversity that contribute significantly towards achieving biodiversity conservation goals (e.g. achieving targets, economic development).	NW Biodiversity Nodes	CBA_node	T2

Map Category Name	Sub-Category Name	Description of biodiversity features used to define CBA category	Shp File Name	Shp File CBA Field Name	CBA Level Codes
		In most cases these are the last remaining areas in the landscape where extensive reserve networks can be developed as other areas are heavily transformed and are thus better suited to stewardship type conservation. Note: the areas indicated are notional indicating broadly areas for biodiversity development			
	Biodiversity Corridors	Provincial-level biodiversity corridor network aimed at retaining connectivity between all geographic areas in the province. Corridor network identified, following a least cost path analysis. The corridor network was designed as a product of the systematic assessment and was based on the following set of design criteria or principles agreed to by the stakeholders and experts involved with this project: • The corridor network needs to incorporate all existing identified landscape or biodiversity corridors. These include: • Pilanesberg Nature reserve • The corridor network needs to link core conservation landscapes through a province-wide network that covers the complete range of altitudinal and latitudinal zones.	NW Biodiversity Corridor	CBA_corr	T2

Map Category Name	Sub-Category Name	Description of biodiversity features used to define CBA category	Shp File Name	Shp File CBA Field Name	CBA Level Codes
		• The corridor network should where possible incorporate most terrestrial and freshwater priority areas. • The corridor network should not focus on one component of biodiversity (e.g. grassland) in the design but rather consider all components of biodiversity pattern and ecological process. • Give effect to the principles and axes of landscape corridor design embodied in the National Spatial Biodiversity Assessment. NOTE: The corridor network is notional to indicate general alignment of biodiversity corridors at the provincial level. Only areas designated as critical corridor linkages are mandatory as there are no other options for linking the landscape.			

The entire area is located within a Critical Biodiversity Area 2. From the visual assessment the area of the proposed area can be regarded to have medium sensitivity. This is because about 20% of the site is already cleared for previous mining activities. A high number of protected plants such as *Sclerocarya birrea* are likely to be removed.

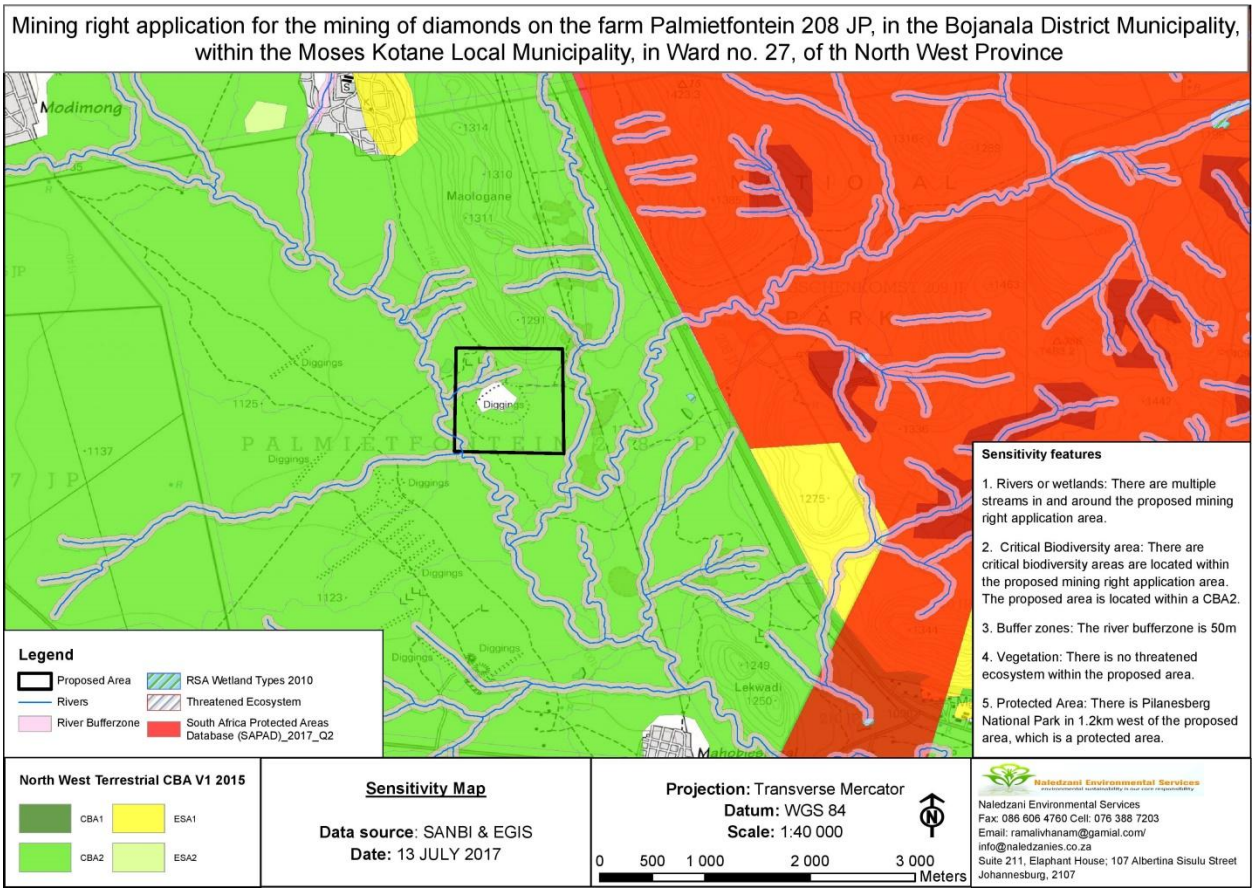

Figure 9: Sensitivity Map for the proposed area.

6.5. Mammals

During site survey no red data mammals (a list of animals that are endangered and how they are being threatened) have been confirmed for the study areas. The animals encountered include cows, Rabbits and mouse. The mammal community consists primarily of pioneer species, such as rodents (e.g. the genus Mastomys) and other species that are widespread and common to most vegetation types.

About Sixteen mammal species were recorded within the study area. Although more species are known to occur in the bigger area, the study area itself may not be suitable for all these species. Previous mining activities may have led to the exclusion many mammal species from the site. No Red Data mammal species were recorded.

Scientific name	Common name	IUCN Red List of Threatened Species (2011)
Lemniscomys rosalia	Striped Mouse	Least concern
Aethomys chrysophilus	Red Veld Rat	Least concern
Mastomys coucha	Multimammate Mouse	Least concern
Lepus saxatili	Scrub Hare	Not listed
Hystrix africaeaustralis	Porcupine	Least concern
Paraxerus cepapi	Tree Squirrel	Not listed

6.6. Herpetofauna (Reptiles)

According to the NW Biodiversity Inventory and Database (2003) the reptile and amphibian biodiversity of the region in which the study area is located has a ranking of medium. 2 reptile species were recorded during the study. All of the recorded species are common. No Red Data reptile species were recorded.

Scientific name	Common name
Lamprophis fuliginosus	Brown House Snake
Mabuya varia	Variable Skink

7. ASSESSMENT OF IMPACTS

7.1. Introduction

The Regulations in terms of Chapter 5 of the National Environmental Management, Act No. 107 of 1998 requires that a description must be given of the potential impacts the proposed development will have on the environment. The details indicated the identified impacts for the area an the proposed mitigation measures.

Table 9: Environmental Impacts assessed by combining the consequences (extent, duration, intensity) with the probability of occurrence before and after mitigation for the proposed project

Impacts and Mitigation measures relating to the proposed project										
Activity/Aspect	**Impact**	**Stage**	**Nature**	**Magnitude**	**Extent**	**Duration**	**Probability**	**Significance before mitigation**	**Mitigation measures**	**Significance after mitigation**
Vegetation Clearing for the establishment of a mine	Destruction of protected plant species	Construction	Negative	Moderate (6)	Site only (1)	Long term (4)	Definite (5)	Medium (55)	• Supervision by an ecologist to ensure success of the rescue operation • All rescued plants should be bagged translocated to a suit area, preferably planted closer to where they were removed. Replanting should only occur in springs or early summer (September to November), once the first rains have fallen, in order to facilitate establishment. • A permit to disturb cut or remove any protected plant species (*Sclerocarya birrea)* should be acquired from the relevant provincial authority prior to such disturbance taking place.	Low
	Removal of the natural vegetation	Construction and operation	Negative	High (8)	Site only (1)	Long term (4)	Definite (5)	High (65)	• Areas designated for vegetation clearing should be identified and visibly marked off. • Vegetation clearing in natural areas should be kept to a minimum and restricted to the proposed development footprint only, *i.e. the area to be mined as well as access road and mine infrastructure.* • Exposed areas should be rehabilitated with indigenous plants to the project area as soon as construction is finished.	Low
	Disturbance to animals on site	Construction and operation	Negative	Moderate (6)	Local (2)	Long term (4)	High (4)	Medium (48)	• Do not disturb nests, breeding sites or young ones. Do not attempt to kill or capture snakes unless directly threatening the safety of employees. • Dogs or other pets are not allowed to the worksite as they are threats to the natural wild animal • A low speed limit should be enforced on site to reduce wild animal-vehicle collisions • No animals should be intentionally killed or destroyed and poaching and hunting should not be permitted on the site. • Severe contractual fines must be imposed and immediate dismissal on any contract employee who is found attempting	Low

									to snare or otherwise harms remaining faunal species. • Hunting weapons are prohibited on site. • Contract employees must be educated about the value of wild animals and the importance of their conservation. • The ECO must conduct regular site inspections of removing any snares or traps that have been erected. • Employees and contractors should be made aware of the presence of, and rules regarding, flora and fauna through suitable induction training and on-site signage.	
	Increased soil erosion	Construction	Negative	Low (4)	Local (2)	Long term (4)	Definite (5)	Medium (50)	• Following construction, rehabilitation of disturbed areas is required. • Avoid areas with sensitive soils, steep slopes during rain or windy season.	Low
	Establishment and spread of declared weeds	Construction and Operation	Negative	Moderate (6)	Site only (1)	Long term (4)	Definite (5)	Medium (55)	• The best mitigation measure for alien and invasive species is the early detection and eradication of these species which will be ensured with the use of a monitoring programme. • An alien invasive management programme should be developed and implemented in order to control alien invasive species	Low
Waste generation	Pollution due to oil and fuel spills, erosion, and ablution facilities.	Construction and Operation	Negative	High (8)	Local (2)	Long term (4)	Definite (5)	High (70)	• Proper ablution facilities on site must be provided. • Constant rehabilitation of erosion problems. • Proper storage facilities of construction materials. • Waste management is very important. Proper storage and removal strategy must be in place. • Proper Standard Operating Procedures in place regulating refuelling and other potential polluting activities. • Must have rehabilitation strategy as part of EMP such as a clean-up plan/strategy if spills occur and proper facilities (ablution) to ensure no sewerage spills into drainage lines and streams.	Low
	Pollution due to construction waste (mining wast)	Construction and Operation	Negative	High (8)	Local (2)	Medium Term (3)	Medium (4)	Medium (52)	• Use a licensed waste contractor to dispose of any waste generated on site • Do not bury wastes on-site.	Low

7.2. Consideration of cumulative impacts

Section 2 of the NEMA requires the consideration of cumulative impacts as part of any environmental assessment process. EIAs have traditionally, however, failed to come to terms with such impacts, largely as a result of the following considerations:

- Cumulative effects may be local, regional or global in scale and dealing with such impacts requires coordinated institutional arrangements; and
- EIA's or biodiversity assessments are typically carried out on specific development area, whereas cumulative impacts result from broader biophysical, social and economic considerations, which typically cannot be addressed at the project level.

In terms of this study, cumulative impacts that may arise are:

- The increase in any surface water flow velocities would then increase the risk of soil erosion and later downstream sedimentation. Should sediments eventually reach the downstream systems, this could have impacts on sediments loads, but also smother benthic habitats (plants and invertebrates).
- Further habitat loss for Avi-fauna as the area is already cleared off during previous utilisation,
- The development will contribute towards the increases of alien plants if not controlled properly.
- During construction phase the activity would contribute to cumulative fauna disturbance and disruption in the area, but the impact would be of local extent and not of high significance. Disturbance of animal has already taken place due to mining and also the pipeline currently being constructed.
- Clearing of vegetation is one of the cumulative impacts that will arise but it is anticipated to be of low significance as the site has already been transformed and thus the ecological value is reduced.

8. CONCLUSION AND RECOMMENDATIONS

Although there is a variety of highly sensitive ecological receptors in the Pilanesberg area, the current development components are restricted to areas of moderate to low sensitivity. A further characteristic is the low extent of habitat loss and ecological interference resulting from the development components.

The major impacts associated with the development are likely to occur during the construction phase of the development, with operational phase impacts generally being very low on account of the low disturbance levels likely to be generated at this time. Many of the construction phase impacts cannot be fully mitigated as they are unavoidable consequences of the development. Important mitigation recommendations associated with the development would include ensuring that the disturbance footprint is kept to a minimum, translocating sensitive species prior to construction; topsoil stockpiling and redistributing after construction; and ensuing compliance to the recommended mitigation measures by any contractors used on the project.

Provided that the mitigation measures as suggested can be implemented, then the overall impact of the development components would be of low overall significance and it is not likely that the development would result in an overall net loss of biodiversity or long-term degradation of the receiving environment.

9. BIODIVERSITY OFFSET

9.1. Requirement for the offset

The requirement for the offset stems from the extended mitigation requirements outlined in the National Environmental Management Act 107 of 1998 (NEMA) and the associated environmental authorisation process. The principles in NEMA state that the environment is held in public trust for the people, and must be protected as the ‘people’s common heritage’. The principles point to the need to conserve biodiversity and ecological integrity and, where impacts on biodiversity and disturbance to ecosystems cannot be altogether avoided, they must be minimized and remedied. These principles bind the proponent and the competent authority in the authorisation process.

It was apparent from the outset, and from previous EIAs and that any mine on the Pilaniesberg area would likely impact on biodiversity of high conservation value. This realisation emphasised the need to avoid and minimize impacts from the start, but also raised the likelihood of the need for biodiversity offsets. The competent authority requested the proponent to conduct a detailed offset study as part of the ESIA.

The standard notes further that offset mechanisms are to adhere to 'like for like or better' principle. The Standard also references compliance with the IFC Performance Standard 6 on Biodiversity. To satisfy IFC PS6 requirements, an offset is needed as both Natural and Critical Habitat will suffer residual impacts.

9.2. How the Offset fits into the ESIA

The biodiversity offset constitutes the final measure to mitigate residual negative impacts of the proposed mining operation, after avoidance, minimization and rehabilitation actions have been decided. As such, its influence on the final significance of negative impacts – and thus compliance with the NEMA principles - must be taken into account by the relevant competent authority in reaching a decision on the mine. In addition, the capacity implications of the offset (financial and other resources) to the proponent must be addressed by the proponent and assurance provided to the decision maker that the offset could and would be successfully implemented.

Documentation of the need for, and the design and proposed implementation of, the biodiversity offset, must be made available to stakeholders in the ESIA process, to ensure that they are given an opportunity to comment on the offset proposals before the final ESIA is revised and submitted to the decision-making authority.

9.3. Scope of Offset actions

The following objectives comprise the scope of the Offset.

1. stablish a core Protected Area through purchase and consolidation of the top 9 identified properties and those Black Mountain Mine properties where no mining is or is likely to take place, or the purchase of development rights or other rights to the land to:
    a. afford protection for ecosystems and/or habitats of affected species,
    b. increase ecological connectivity,
    c. restore ecological function, and
    d. facilitate management of the protected area.
2. If there is a requirement to approach No Net Loss as far as possible for the open bush habitat unit, then two additional properties may need to be secured depending on the final portfolio chosen in 1 above.
3. Declare and manage of the remaining Black Mountain Mine properties where active mining is happening as a Protected Environment buffer area to the Protected Area, with permanent land use restrictions on the surface biodiversity.
4. Securing an appropriate conservation agency / organisation to manage the proposed Protected Area.
5. Establishing a funding mechanism for the long-term management of the Protected Area.

The biodiversity features that must be represented in the offset area are likely to be found on portions of particular properties (to a greater or lesser extent). As such, it is unlikely that the exact area required by the offset to be set aside, or the exact mix of different ecosystems will be present on particular target properties. The final portfolio of properties targeted for offset action must yield an equivalent or greater area of the various components to satisfy the offset requirements; an exception to this requirement could be made for Calcrete Gravel Patches, where remnant patches of this habitat are found in discrete areas outside the core area targeted for offsets, likely making them impracticable to secure.

9.4. Aligning the Offset vision with local and regional plans

An explicit objective of this offset design is that it must contribute to the creation of a protected area in the region that is aligned with the local, regional and national planning frameworks. A key task is therefore to identify suitable target sites for the offsets that are aligned with:

- Identified Critical Biodiversity Areas and biodiversity corridors in the District Bioregional Plan;
- SAN Parks protected area vision; and,
- The priority areas identified in the National Protected Area Expansion Strategy 2010.

9.5. Establishment and Management of the Offset area

The offset area would need to be established and managed for at least as long as the impacts of the development persist. In the case of such a large open pit, it is assumed that the impact will be in perpetuity. Thus, outright protection of the land in perpetuity is suggested as the only viable offset mechanism in area. This option is considered feasible as the opportunity costs of setting aside a few farms are low, the region has long been identified for protected area creation, and the on-going operating costs are likely to be available from the development proponents.

9.5.1. Management authority

It is a prerequisite for the establishment of a Protected Area (under section 20 or 23 of the NEM: Protected Areas Act (Act 57 of 2003) that a management authority be appointed to establish and/or manage the Offset Protected Area. The client, two statutory bodies and one private potential candidate with the capacity to secure and manage the offset area have potential to act as the implementing agent/management authority. Black Mountain Mining has indicated that they would prefer to outsource this function, as opposed to developing the required in-house capacity.

Two options thus seem to present themselves to establish and manage the protected area:

1. SAN Parks or NW:READ, as existing management authorities in the region, could be approached to take this on.
2. A private service provider, with the necessary expertise and experience, could be approached to undertake this task for a defined period (preferably the life time of the offset), with budget. At the end of this period, a subsequent decision could be taken on which authority is better placed to take over the responsibility for the offset area.

The Act further requires that a Management Plan be developed and submitted to the Minister or MEC as appropriate for consent, within a year of the declaration of the land as a Protected Area. However, NW:READ has required that at least the objectives of the Management Plan be submitted, along with an agreement that binds the Mine to establish the offset area, to them as part of the final EIA and authorisation process. The management objectives and agreement could be included as conditions of authorisation for the associated activities of Mine.

The offset/ Protected Area management plan would need to cover a suite of relevant management actions, monitoring requirements and adaptive management measures. The extent to which the Offset commitments (in terms of own properties declared and financial liabilities for acquisition and management funding) should also become part of the EMP or the environmental management system for the mine is unclear.

Clearing the invasive species from properties secured for the offset is one of the few direct management actions required. This has not been costed as it is a legal requirement under legislation, and thus should not form part of an offset programme.

9.5.2. Duration of Offset commitment

International good practice recommends that offset commitments should last for at least the duration of the residual impacts of the proposed development. The EMP notes the anticipated life of this mine to be 20 years, with potential for additional mining underground for a further 30 years. As this is an open pit, there is little chance of concurrent rehabilitation. In any event, rehabilitation in this dry and brittle environment is likely to take a substantial time. There is a paucity of experience in this arid region, indicating that a multiplier would be appropriate for determining the area to be offset. We therefore suggest 50 years to be a suitable starting point for the lifespan of the biodiversity offset commitments.

9.6. Offset Recommendations

1. Secure a statutory management authority for the offset area
2. Acquire the land (or the rights to the land) as quickly as possible

3. Pursue complementary approaches in the environmental mitigation, monitoring and adaptive management, and offset arenas, with the social and labour plan and sustainable development objectives or opportunities, as well as other large scale developments in the region
4. Seek to involve local parties as partners in implementation, especially to optimise any local socio-economic benefits.

10. INVASIVE ALIEN PLANT MANAGEMENT

10.1. Purpose of the Invasive Alien Management Plan

The purpose of the invasive alien management plan is:

- to ensure that alien plants do not become established on site;
- to ensure that alien plant species do not become dominant in all or parts of the landscape;
- to implement a monitoring programme to detect the presence of alien plant species as well as to monitor the success of the alien management plan.

10.2. Responsible persons

Effective management of alien plant species during the construction and operational phases of the project will be dependent on a number of project personnel. These are listed below:

The Developer

This refers to the project proponent. They will be responsible for the following:

- Ensure that the requirements set out in this management plan are adhered to and implemented;
- Allocate the responsibilities assigned to the Environmental Control Officer (ECO) to an independent suitably qualified individual prior to the start of construction activities on site; and
- Provide all principal contractors working on the project with a copy of this management plan as part of tender contract documentation to allow the contractors to cost for its requirements within their respective construction contracts.

The Environmental Control Officer (ECO)

The ECO is responsible for monitoring and verifying the implementation of the management plan during the construction phases of the project. To effectively implement the management plan, the ECO must be aware of

the findings, mitigation measures and conclusions of the Final EIA Report, the Environmental Authorisation, and this management plan.

The Contractor

The contractor, being any directly appointed company or individual undertaking the implementation of works, will be responsible for complying with the management plan at all times during the construction phase.

10.3. Current invasive alien species on sites

The species identified include *Melia azedarach Opuntia ficus-indica, Argemone mexicana, and Solanum mariantanum*. The proposed mining project will likely introduce disturbance into this landscape that may promote conditions that will lead to the introduction and/or spread of invasive alien species.

10.4. Control Guidelines

10.4.1. Prevention

A prevention strategy should be considered and established, including regular surveys and monitoring for invasive alien plants, effective rehabilitation of disturbed areas and prevention of unnecessary disturbance of natural areas. Prevention could also include measures such as washing the working parts and wheels of earth-moving equipment prior to it being brought onto site, visual walk-through surveys every three months.

10.4.2. Early identification and eradication

Keeping up to date on which weeds are an immediate threat to the site is important, but efforts should be planned to update this information on a regular basis. When new Invasive Alien Plant Species are spotted an immediate response of locating the site for future monitoring and either hand-pulling the weeds or an application of a suitable herbicide should be planned. It is, however, better to monitor regularly and act swiftly than to allow invasive alien plants to become established on site.

10.4.3. Containment and control

If any alien invasive plants are found to become established on site, action plans for their control should be developed, depending on the size of the infestations, budgets, manpower considerations and time. Appropriate registered chemicals and other possible control agents should be considered in the action plans for each site/species. The key is to ensure that no invasions get out of control.

10.5. Alien invasive control methods

There are various means of managing invasive alien plants. These include mechanical, chemical and biological control.

10.5.1. Mechanical control

This entails damaging or removing the plant by physical action. Different techniques could be used, e.g. uprooting, felling, slashing, mowing, ringbarking or bark stripping. This control option is only really feasible in sparse infestations or on small scale, and for controlling species that do not coppice after cutting. Species that tend to coppice need to have the cut stumps or coppice growth treated with herbicides following the mechanical treatment. Mechanical control is labour intensive and therefore expensive, and could cause severe soil disturbance and erosion. For the current project, hand-pulling or manual removal using hand tools (in this case cut stumping) will be the most appropriate methods since there are no existing dense stands of invasive alien plants.

10.6. Chemical control

Chemical control should only be used as a last resort, since it is hazardous for natural vegetation. It should not be necessary if regular monitoring is undertaken, which should be effective for controlling invasive alien plants. Chemical control involves the use of registered herbicides to kill the target weed. Managers and herbicide operators must have a basic understanding of how herbicides function. The use of inappropriate herbicides and the incorrect use of the appropriate herbicides are wasteful, expensive practices and often do more harm than good, especially when working close to watercourses. Some herbicides can quickly contaminate fresh water and/or be transported downstream where they may remain active in the ecosystem.

Contractors using herbicides are required to have a permit according to Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947). Herbicides are either classified as selective or non-selective. Selective herbicides are usually specific to a particular group of plants, e.g. those specified for use on broad leaf plants, but should not kill narrow-leaf plants such as grasses. Non-selective herbicides can kill any plant that they come into contact with and are therefore not suitable for use in areas where indigenous vegetation is present.

Chemical application techniques include foliar (leaf) application, stem applications (basal stem, total frill, stem injections) and stump applications (cut stump, total stump, scrape and paint).

10.6.1. Biological control

Biological weed control consists in the use of natural enemies to reduce the vigour or reproductive potential of an invasive alien plant. Biological control agents include insects, mites, and micro-organisms such as fungi or bacteria. They usually attack specific parts of the plant, either the reproductive organs directly (flower buds, flowers or fruit) or the seeds after they have dropped. The stress caused by the biological control agent may kill a plant outright or it might impact on the plants reproductive capacity. In certain instances, the reproductive capacity is reduced to zero and the population is effectively sterilized. All of these outcomes will help to reduce the spread of the species.

To obtain biocontrol agents, provincial representatives of the Working for Water Programme or the Directorate: Land Use and Soil Management (LUSM), Department of Agriculture, Forestry and Fisheries (DAFF) can be contacted.

10.7. Alien invasive Plant management plan

The following management actions are aimed at reducing soil disturbance during the construction and operational phases of the development, as well as reducing the likelihood that alien species will be brought onto site or otherwise encouraged.

Action	Frequency
The ECO is to provide permission prior to any vegetation being cleared for development	Daily
Clearing of vegetation should be undertaken as the work front progresses – mass clearing should not occur unless the cleared areas are to be prepared immediately afterwards.	Weekly
Cleared areas that have become invaded can be sprayed with appropriate herbicides provided that these products are of such a nature that breaks down on contact with the soil. Residual herbicides should not be used	Weekly
Although organic matter is frequently used to encourage regrowth of vegetation on cleared areas, no foreign material for this purpose should be brought onto site.	Weekly
Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment.)	Weekly
Alien vegetation regrowth on areas disturbed by construction must be	Monthly

controlled throughout the entire site	
The alien plant removal and control method guidelines should adhere to best-practice for the species involved. Such information can be obtained from the DWAF Working for Water website and also http://invasives.org.za/	Monthly
Pesticides may not be used. Herbicides may be used to control listed alien weeds and invaders only.	Monthly
Where areas of natural vegetation have been disturbed by construction activities, revegetation with indigenous, locally occurring species should take place where the natural vegetation is slow to recover or where repeated invasion has taken place following disturbance.	Biannually, but revegetation should take place at the start of the rainy season

REFERENCES

Brown, L.R., Du Preez, P.J., Bezuidenhout, H., Bredenkamp, G.J., Mostert, T.H.C., and Collins, N.B. 2013. Guidelines for phytosociological classifications and descriptions of vegetation in southern Africa. Koedoe 55(1), Art. #1103, 10pp

Department of Environmental Affairs and Tourism, 2007. National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004): Publication of lists of Critically Endangered, Endangered, Vulnerable and Protected Species. Government Gazette, Republic of South Africa.

Henderson, L. (2001). Alien Weeds and Invasive plants: A complete guide to declared weeds and invaders in South Africa. Agricultural Research Council, Pretoria.

Hilton-Taylor, C. (1996). Red Data List of Southern African Plants. Conservation Biology Research unit, National Botanical Institute, Pretoria.

http://invasives.org.za/

http://posa.sanbi.org/searchspp.php

http://sabap2.adu.org.za/

http://vmus.adu.org.za/

http://www.dwaf.gov.za/wfw/Control

Mucina L. & Rutherford M.C. (eds) 2010. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Rutherford, M. C. and Westfall, R. H. (1994). Biomes of Southern Africa: an objective categorisation, Pretoria: National Botanical Institute.

APPENDIX A: PLANT SPECIES RECORDED WITHIN THE PROPOSED AREA

Scientific name	Common name
Acacia burkei	Black monkey thorn
Acacia caffra	Common hook-thorn
Acacia gerrardii	Red thorn
Acacia karroo	Sweet thorn
Acacia mellifera	Black thorn
Acacia tortilis	Umbrella thorn
Aloe aborescens	Krantz aloe
Aloe marlothii	Mountain aloe
Argemone Mexicana	Mexican prickly poppy
Aristida congesta	Buffalo Grass or Cats-Tail Three-Awned Grass
Aristida scabrivalvis	Asgaaisteekgras
Asparagus cooperi	Haakdoring
Asparagus densiflorus	Asparagus fern
Bidens pilosa	Blackjack

Blepharis integrifolia	Rankklits
Brachiaria serrata	Red top grass, velvet signal
Carissa bispinosa	Num-num
Carissa edulis	Simple-spined num-num
Cinerea dichrostachys	Sickle-bush
Combretum apiculatum	Red bushwillow
Combretum molle	Velvet bushwillow
Commelina Africana	Yellow commelina
Cymbopogon nardus	Citronella grass
Cymbopogon pospischilii	Bitter Turpentine Grass
Cynodon dactylon	Couch grass
Datura stramonium	Devils snare
Diospyros lycioides	Bluebush, star-apple, monkey plum
Elephantorrhiza elephantine	Elephant's foot
Elionurus muticus	Simon Grass, Mat Grass
Eragrostis curvula	Weeping Love grass

Eragrostis lehmanniana	Lehmann love grass
Euclea crispa	Blue guarri
Euphorbia cooperi	Bushveld candelabra euphorbia
Ficus abutilifolia	Large-leaved rock fig, rock wild fig
Grewia flava	Raisin bush
Gymnosporia senegalensis	Confetti tree
Heteropogon contortus	Spear Grass
Hyparrhenia hirta	Thatch Grass
Ipomea purpurea	Morning glory
Limeum viscosum	Klosaarbossie
Lippia javanica	Lemon-bush
Melia azedarach	Chinaberry tree, Pride of India, bead-tree
Melinis nerviglumis	bristle-leaved red top
Melinis repens	Rose Natal grass, or simply Natal grass
Momordica balsamina	African cucumber
Opuntia-ficus indica	Prickly pear

Panicum maximum	Guinea grass
Rhus lancea	Karee
Rubus rigidus	Braambos or Braambossie
Sclerocarya birrea	Marula
Setaria sphacelata	Common Bristle Grass
Solanum mariantanum	Bitter apple
Themeda triandra	Red grass
Trachypogon spicatus	Giant spear grass
Vangueria infusta	wild medlar
Ziziphus mucronata	Buffalo thorn
Ziziphus zeyheri	

APPENDIX B: LIST OF BIRDS LIKELY TO INHABIT THE AFFECTED QDGC

No.	Species Ref	Species name	Taxonomic name
1	622	Apalis, Bar-throated	*Apalis thoracica*
2	533	Babbler, Arrow-marked	*Turdoides jardineii*
3	536	Babbler, Southern Pied	*Turdoides bicolor*
4	432	Barbet, Acacia Pied	*Tricholaema leucomelas*
5	431	Barbet, Black-collared	*Lybius torquatus*
6	439	Barbet, Crested	*Trachyphonus vaillantii*
7	673	Batis, Chinspot	*Batis molitor*
8	404	Bee-eater, European	*Merops apiaster*
9	407	Bee-eater, Southern Carmine	*Merops nubicoides*
10	409	Bee-eater, White-fronted	*Merops bullockoides*
11	808	Bishop, Southern Red	*Euplectes orix*
12	812	Bishop, Yellow-crowned	*Euplectes afer*
13	722	Bokmakierie, Bokmakierie	*Telophorus zeylonus*
14	709	Boubou, Southern	*Laniarius ferrugineus*
15	779	Buffalo-weaver, Red-billed	*Bubalornis niger*
16	545	Bulbul, Dark-capped	*Pycnonotus tricolor*
17	872	Bunting, Cinnamon-breasted	*Emberiza tahapisi*
18	874	Bunting, Golden-breasted	*Emberiza flaviventris*
19	723	Bush-shrike, Grey-headed	*Malaconotus blanchoti*

No.	Species Ref	Species name	Taxonomic name
20	144	Buzzard, Lizard	*Kaupifalco monogrammicus*
21	154	Buzzard, Steppe	*Buteo vulpinus*
22	628	Camaroptera, Grey-backed	*Camaroptera brevicaudata*
23	860	Canary, Black-throated	*Crithagra atrogularis*
24	866	Canary, Yellow	*Crithagra flaviventris*
25	859	Canary, Yellow-fronted	*Crithagra mozambicus*
26	575	Chat, Anteating	*Myrmecocichla formicivora*
27	570	Chat, Familiar	*Cercomela familiaris*
28	648	Cisticola, Lazy	*Cisticola aberrans*
29	646	Cisticola, Levaillant's	*Cisticola tinniens*
30	642	Cisticola, Rattling	*Cisticola chiniana*
31	629	Cisticola, Zitting	*Cisticola juncidis*
32	573	Cliff-chat, Mocking	*Thamnolaea cinnamomeiventris*
33	4131	Coucal, Burchell's	*Centropus burchellii*
34	1036	Coucal, White-browed	*Centropus superciliosus*
35	277	Courser, Temminck's	*Cursorius temminckii*
36	216	Crane, Blue	*Anthropoides paradiseus*
37	621	Crombec, Long-billed	*Sylvietta rufescens*
38	523	Crow, Cape	*Corvus capensis*
39	522	Crow, Pied	*Corvus albus*
40	352	Cuckoo, Diderick	*Chrysococcyx caprius*

No.	Species Ref	Species name	Taxonomic name
41	348	Cuckoo, Jacobin	*Clamator jacobinus*
42	351	Cuckoo, Klaas's	*Chrysococcyx klaas*
43	347	Cuckoo, Levaillant's	*Clamator levaillantii*
44	343	Cuckoo, Red-chested	*Cuculus solitarius*
45	317	Dove, Laughing	*Streptopelia senegalensis*
46	318	Dove, Namaqua	*Oena capensis*
47	314	Dove, Red-eyed	*Streptopelia semitorquata*
48	940	Dove, Rock	*Columba livia*
49	517	Drongo, Fork-tailed	*Dicrurus adsimilis*
50	100	Duck, White-faced	*Dendrocygna viduata*
51	133	Eagle, Verreaux's	*Aquila verreauxii*
52	137	Eagle, Wahlberg's	*Aquila wahlbergi*
53	61	Egret, Cattle	*Bubulcus ibis*
54	601	Eremomela, Burnt-necked	*Eremomela usticollis*
55	600	Eremomela, Yellow-bellied	*Eremomela icteropygialis*
56	821	Finch, Cut-throat	*Amadina fasciata*
57	820	Finch, Red-headed	*Amadina erythrocephala*
58	789	Finch, Scaly-feathered	*Sporopipes squamifrons*
59	833	Firefinch, African	*Lagonosticta rubricata*
60	835	Firefinch, Jameson's	*Lagonosticta rhodopareia*
61	837	Firefinch, Red-billed	*Lagonosticta senegala*

No.	Species Ref	Species name	Taxonomic name
62	707	Fiscal, Common (Southern)	*Lanius collaris*
63	678	Flycatcher, Fairy	*Stenostira scita*
64	665	Flycatcher, Fiscal	*Sigelus silens*
65	661	Flycatcher, Marico	*Bradornis mariquensis*
66	664	Flycatcher, Southern Black	*Melaenornis pammelaina*
67	654	Flycatcher, Spotted	*Muscicapa striata*
68	173	Francolin, Coqui	*Peliperdix coqui*
69	174	Francolin, Crested	*Dendroperdix sephaena*
70	339	Go-away-bird, Grey	*Corythaixoides concolor*
71	89	Goose, Egyptian	*Alopochen aegyptiacus*
72	88	Goose, Spur-winged	*Plectropterus gambensis*
73	165	Goshawk, Southern Pale Chanting	*Melierax canorus*
74	323	Green-pigeon, African	*Treron calvus*
75	192	Guineafowl, Helmeted	*Numida meleagris*
76	72	Hamerkop, Hamerkop	*Scopus umbretta*
77	55	Heron, Black-headed	*Ardea melanocephala*
78	54	Heron, Grey	*Ardea cinerea*
79	443	Honeybird, Brown-backed	*Prodotiscus regulus*
80	442	Honeyguide, Lesser	*Indicator minor*
81	418	Hoopoe, African	*Upupa africana*
82	424	Hornbill, African Grey	*Tockus nasutus*

No.	Species Ref	Species name	Taxonomic name
83	4129	Hornbill, Red-billed	*Tockus erythrorhynchus*
84	426	Hornbill, Southern Yellow-billed	*Tockus leucomelas*
85	507	House-martin, Common	*Delichon urbicum*
86	83	Ibis, Glossy	*Plegadis falcinellus*
87	84	Ibis, Hadeda	*Bostrychia hagedash*
88	849	Indigobird, Dusky	*Vidua funerea*
89	850	Indigobird, Purple	*Vidua purpurascens*
90	851	Indigobird, Village	*Vidua chalybeata*
91	122	Kestrel, Greater	*Falco rupicoloides*
92	125	Kestrel, Lesser	*Falco naumanni*
93	123	Kestrel, Rock	*Falco rupicolus*
94	402	Kingfisher, Brown-hooded	*Halcyon albiventris*
95	403	Kingfisher, Striped	*Halcyon chelicuti*
96	399	Kingfisher, Woodland	*Halcyon senegalensis*
97	14189	Kite, Black	*Milvus migrans*
98	128	Kite, Black	*Milvus migrans*
99	130	Kite, Black-shouldered	*Elanus caeruleus*
100	1035	Korhaan, Northern Black	*Afrotis afraoides*
101	224	Korhaan, Red-crested	*Lophotis ruficrista*
102	247	Lapwing, African Wattled	*Vanellus senegallus*
103	245	Lapwing, Blacksmith	*Vanellus armatus*

No.	Species Ref	Species name	Taxonomic name
104	242	Lapwing, Crowned	*Vanellus coronatus*
105	3550	Lark, Agulhas Clapper	*Mirafra marjoriae*
106	4140	Lark, Cape Clapper	*Mirafra apiata*
107	1183	Lark, Eastern Clapper	*Mirafra fasciolata*
108	490	Lark, Pink-billed	*Spizocorys conirostris*
109	458	Lark, Rufous-naped	*Mirafra africana*
110	460	Lark, Sabota	*Calendulauda sabota*
111	823	Mannikin, Bronze	*Spermestes cucullatus*
112	506	Martin, Rock	*Hirundo fuligula*
113	792	Masked-weaver, Lesser	*Ploceus intermedius*
114	392	Mousebird, Red-faced	*Urocolius indicus*
115	390	Mousebird, Speckled	*Colius striatus*
116	391	Mousebird, White-backed	*Colius colius*
117	734	Myna, Common	*Acridotheres tristis*
118	637	Neddicky, Neddicky	*Cisticola fulvicapilla*
119	521	Oriole, Black-headed	*Oriolus larvatus*
120	359	Owl, Barn	*Tyto alba*
121	365	Owlet, Pearl-spotted	*Glaucidium perlatum*
122	748	Oxpecker, Red-billed	*Buphagus erythrorhynchus*
123	387	Palm-swift, African	*Cypsiurus parvus*
124	682	Paradise-flycatcher, African	*Terpsiphone viridis*

No.	Species Ref	Species name	Taxonomic name
125	852	Paradise-whydah, Long-tailed	*Vidua paradisaea*
126	531	Penduline-tit, Cape	*Anthoscopus minutus*
127	788	Petronia, Yellow-throated	*Petronia superciliaris*
128	311	Pigeon, Speckled	*Columba guinea*
129	692	Pipit, African	*Anthus cinnamomeus*
130	238	Plover, Three-banded	*Charadrius tricollaris*
131	650	Prinia, Black-chested	*Prinia flavicans*
132	649	Prinia, Tawny-flanked	*Prinia subflava*
133	712	Puffback, Black-backed	*Dryoscopus cubla*
134	830	Pytilia, Green-winged	*Pytilia melba*
135	189	Quail, Common	*Coturnix coturnix*
136	844	Quailfinch, African	*Ortygospiza atricollis*
137	805	Quelea, Red-billed	*Quelea quelea*
138	582	Robin-chat, White-throated	*Cossypha humeralis*
139	412	Roller, European	*Coracias garrulus*
140	413	Roller, Lilac-breasted	*Coracias caudatus*
141	415	Roller, Purple	*Coracias naevius*
142	309	Sandgrouse, Yellow-throated	*Pterocles gutturalis*
143	264	Sandpiper, Wood	*Tringa glareola*
144	586	Scrub-robin, Kalahari	*Cercotrichas paena*
145	588	Scrub-robin, White-browed	*Cercotrichas leucophrys*

No.	Species Ref	Species name	Taxonomic name
146	105	Secretarybird, Secretarybird	*Sagittarius serpentarius*
147	711	Shrike, Crimson-breasted	*Laniarius atrococcineus*
148	706	Shrike, Lesser Grey	*Lanius minor*
149	724	Shrike, Magpie	*Corvinella melanoleuca*
150	708	Shrike, Red-backed	*Lanius collurio*
151	146	Snake-eagle, Black-chested	*Circaetus pectoralis*
152	145	Snake-eagle, Brown	*Circaetus cinereus*
153	803	Southern Masked-weaver, Southern	*Ploceus velatus*
154	786	Sparrow, Cape	*Passer melanurus*
155	785	Sparrow, Great	*Passer motitensis*
156	784	Sparrow, House	*Passer domesticus*
157	3852	Sparrow, Northern Grey-headed	*Passer griseus*
158	4142	Sparrow, Southern Grey-headed	*Passer diffusus*
159	780	Sparrow-weaver, White-browed	*Plocepasser mahali*
160	158	Sparrowhawk, Little	*Accipiter minullus*
161	157	Sparrowhawk, Ovambo	*Accipiter ovampensis*
162	484	Sparrowlark, Chestnut-backed	*Eremopterix leucotis*
163	183	Spurfowl, Natal	*Pternistis natalensis*
164	185	Spurfowl, Swainson's	*Pternistis swainsonii*
165	737	Starling, Cape Glossy	*Lamprotornis nitens*
166	745	Starling, Red-winged	*Onychognathus morio*

No.	Species Ref	Species name	Taxonomic name
167	736	Starling, Violet-backed	*Cinnyricinclus leucogaster*
168	576	Stonechat, African	*Saxicola torquatus*
169	80	Stork, White	*Ciconia ciconia*
170	772	Sunbird, Amethyst	*Chalcomitra amethystina*
171	755	Sunbird, Marico	*Cinnyris mariquensis*
172	763	Sunbird, White-bellied	*Cinnyris talatala*
173	493	Swallow, Barn	*Hirundo rustica*
174	502	Swallow, Greater Striped	*Hirundo cucullata*
175	503	Swallow, Lesser Striped	*Hirundo abyssinica*
176	501	Swallow, Red-breasted	*Hirundo semirufa*
177	495	Swallow, White-throated	*Hirundo albigularis*
178	385	Swift, Little	*Apus affinis*
179	383	Swift, White-rumped	*Apus caffer*
180	715	Tchagra, Black-crowned	*Tchagra senegalus*
181	714	Tchagra, Brown-crowned	*Tchagra australis*
182	97	Teal, Red-billed	*Anas erythrorhyncha*
183	275	Thick-knee, Spotted	*Burhinus capensis*
184	557	Thrush, Groundscraper	*Psophocichla litsipsirupa*
185	552	Thrush, Kurrichane	*Turdus libonyanus*
186	437	Tinkerbird, Yellow-fronted	*Pogoniulus chrysoconus*
187	514	Tit, Ashy	*Parus cinerascens*

No.	Species Ref	Species name	Taxonomic name
188	527	Tit, Southern Black	*Parus niger*
189	658	Tit-babbler, Chestnut-vented	*Parisoma subcaeruleum*
190	316	Turtle-dove, Cape	*Streptopelia capicola*
191	106	Vulture, Cape	*Gyps coprotheres*
192	107	Vulture, White-backed	*Gyps africanus*
193	685	Wagtail, African Pied	*Motacilla aguimp*
194	596	Warbler, Icterine	*Hippolais icterina*
195	607	Warbler, Marsh	*Acrocephalus palustris*
196	599	Warbler, Willow	*Phylloscopus trochilus*
197	841	Waxbill, Black-faced	*Estrilda erythronotos*
198	839	Waxbill, Blue	*Uraeginthus angolensis*
199	838	Waxbill, Orange-breasted	*Amandava subflava*
200	840	Waxbill, Violet-eared	*Granatina granatina*
201	797	Weaver, Village	*Ploceus cucullatus*
202	1172	White-eye, Cape	*Zosterops virens*
203	1171	White-eye, Orange River	*Zosterops pallidus*
204	846	Whydah, Pin-tailed	*Vidua macroura*
205	847	Whydah, Shaft-tailed	*Vidua regia*
206	814	Widowbird, White-winged	*Euplectes albonotatus*
207	321	Wood-dove, Emerald-spotted	*Turtur chalcospilos*
208	419	Wood-hoopoe, Green	*Phoeniculus purpureus*

No.	Species Ref	Species name	Taxonomic name
209	451	Woodpecker, Bearded	*Dendropicos namaquus*
210	450	Woodpecker, Cardinal	*Dendropicos fuscescens*
211	614	Wren-warbler, Barred	*Calamonastes fasciolatus*

APPENDIX C: AMPHIBIAN SPECIES OCCURRING WITHIN THE AFFECTED QDDC

Scientific Name	Common name	Likelihood of occurrence
Amietophrynus garmani	Olive toad	High
Amietophrynus gutturalis	Guttural Toad	High
Amietophrynus poweri	Power's Toad	Medium
Poyntonophrynus fenoulheti	Northern Pygmy Toad	Medium
Schismaderma carens	Red toad	High
Kassina senegalensis	Bubbling Kassina	Medium
Phrynomantis bifasciatus	Banded Rubber Frog	Medium
Phrynobatrachus natalensis	Snoring Puddle Frog	Medium
Xenopus laevis	Common Platanna	Low
Ptychadena anchietae	Plain Grass Frog	High
Ptychadena mossambica	Broadbanded Grass Frog	Medium
Afrana angolensis	Common or Angola River Frog	High
Cacosternum boettgeri	Common Caco	High
Pyxicephalus adspersus	Giant Bull Frog	Low
Pyxicephalus edulis	African Bull Frog	Low
Tomopterna cryptotis	Tremelo Sand Frog	Medium
Tomopterna natalensis	Natal Sand Frog	Medium
Chiromantis xerampelina	Southern Foam Nest Frog	Medium