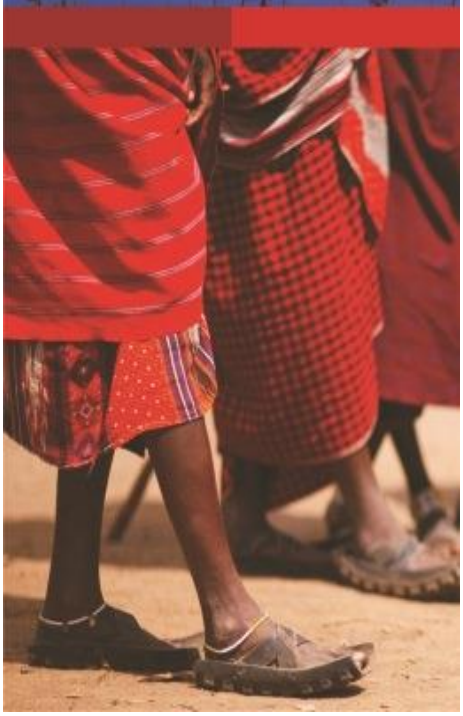

DIGBY WELLS
ENVIRONMENTAL

Biodiversity Assessment for the De Grooteboom Mining Operation

Project Number:

UAR2967

Prepared for:

De Groote Boom (Pty) Ltd

April 2015

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This document has been prepared by Digby Wells Environmental.

Report Type:	**Biodiversity Assessment**
Project Name:	**De Grooteboom Environmental Management Plan**
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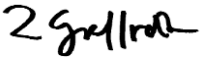
Rudi Greffrath *Cert.Sci.Nat*	Ecologist		2015-04-24

EXECUTIVE SUMMARY

De Groote Boom (Pty) Limited (DGB) has requested that Digby Wells Environmental (hereafter Digby Wells) undertake a biodiversity assessment of the area allocated for a proposed mine on the farm De Grooteboom 373 KT. DGB proposes to mine mine primarily chromite (and all associated minerals) covering an extent of not more than 5 ha on the Remaining Extent of the farm De Grooteboom 373 KT.. The purpose of the biodiversity report is to describe the flora and fauna associated with the mining area, including a description of the regional sensitivity, results of the field investigations, lists of flora and fauna species recorded on site and a description of watercourses associated with the study area.

The study area is situated in the Sekhukhuneland region (on the border of Mpumalanga and Limpopo Provinces) in the Limpopo Province. The region in which the farm falls consists of the Sekhukhuneland Mountain Bushveld regional vegetation type. The study area is located within the Sekhukhuneland Centre of Plant Endemism (SCPE). Due to unique geology associated with the Rustenburg Layered Suite (RLS) of the Bushveld Igneous Complex (BIC), 58 endemic plant species are known to occur in the area. Further to this, the SCPE is largely undescribed taxonomically and additional species may occur. Endemic fauna are also present in the SCPE, and the Sekhukhuneland Flat Lizard (*Platysaurus orientalis*) and the Cicada (*Pycna sylvia*) are likely to occur on site.

The site is also situated in a Nationally Threatened Ecosystem, namely Sekhukhune Mountainlands. The Sekhukhune Mountainlands have been allocated an ‘Endangereed Status’. This implies that the habitat is under threat and the further development may cause cumulative loss.

An initial field survey was undertaken for the bulk sampling area in September 2014, and for the remainder of the site (including the bulk sampling area) in March 2015. The plant species list amounted to 62 species although many more may occur. The natural vegetation was found to be largely intact and only a single alien plant was recorded for the site. Nine plant Species of Special Concern (SSC) were expected to occur on site, four of which were confirmed during the field survey, namely: *Searsia sekhukhuniensis* (Endemic and Rare), *Euclea* species A (Endemic and undescribed), *Euphorbia lydenburgensis* (Endemic) and *Rhoicissus sekhukhuniensis* (Endemic). The host plant for the formerly extinct Cicada (*Pycna silva*), *Vitex obovata subs. wilmsii*, was recorded throughout the site. This is regarded as a critical issue from a biodiversity perspective, as the cumulative loss of this plant may result in the extinction of *Pycna silva*.

A total of 6 mammals were confirmed to occur within the study area during the field survey, The Brown Hyaena (*Hyaena brunnea*) and African Leopard (*Panthera pardus*) were reported to be present on site by the farmer at De Grooteboom. The Wahlberg’s Epualetted Fruit Bat *(Epomophorus wahlbergi)* and Vervet Monkey *(Chlorocebus pygerythrus)* were observed in the *Acacia* woodland at the entrance to the property. In addition, Springhare

(*Pedetes capensis*) and Rock Hyrax (*Procavia capensis*) scat was observed. The Brown Hyaena and the African Leopard are both listed as Near Threatened (NT).

A total number of 39 bird species were observed throughout the property during the field survey. Although no bird SSC were recorded, regionally uncommon species were identified, including: Mountain Wagtail (*Motacilla clara*), Lizard Buzzard (*Kaupifalco monogrammicus*) and Red-billed Oxpecker (*Buphagus erythrorhynchus*).

A single reptile was recorded on site: Southern Rock Agama Lizard (*Agama atra*). The Sekhukhune Flat Lizard (*Platysaurus orientalis*), is likely to occur but was not identified during the field survey.

Pycna sylvia, a species of Cicada*,* previously thought to be extinct, was recently re-discovered in the Sekhukhuneland region. This arthropod has a very limited range, due to specific habitat requirements and those of its host plant, *Vitex obovata subsp*. *wilmsii*, as aforementioned.

The impact of the proposed mine is regarded as highly significant. Although limited in extent, the regional and local sensitivity of the study area deems it as very important for biodiversity and natural heritage. Plant endemism and diversity, as well as the fact that the SCPE has not been fully described taxonomically, are factors that contribute to the sensitivity of the site.

There is no mitigation for the loss of vegetation and associated SSC on site, as rehabilitation efforts can never restore the area to its natural state. The impact can however be reduced by implementing a plant translocation (or relocation) strategy. Plant SSC would be recorded, uprooted and re-planted in an area of similar ecological conditions. Alternatively, a nursery can be established on site.

Ephemeral watercourses occur in the study area and it is important that none are crossed or in any way impacted upon when vehicles and machinery are transported to the site. If these areas cannot be avoided, water use should be authorised by the Department of Water and Sanitation (DWS) and culverts and gabion structures should be constructed so that the risk of erosion is mitigated.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ACRONYMS AND ABREVIATIONS

BIC	Bushveld Igneous Complex
CR	Critically Endangered
DST	Department of Science and Technology
DRC	Democratic Republic of Congo
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EN	Endangered
EW	Extinct in the Wild
EX	Extinct
IUCN	International Union for the Conservation Networks
LC	Least Concern
LEMA	Limpopo Environmental Management Act, 2003.
MPRDA	Mineral and Petroleum Resource Development Act, 2002 (No. 28 of 2002)
NE	Not Evaluated
NEMBA	National Environmental Management: Biodiversity Act
NMMU	Nelson Mandela Metropolitan University
NT	Near Threatened
PRECIS	Pretoria Computerised Information System
QDS	Quarter Degree Square
RLS	Rustenburg Layered Suite
SABAP 2	South African Bird Atlas Project 2
SANBI	South African National Biodiversity Institute
SCPE	Sekhukhuneland Centre of Plant Endemism
SSC	Species of Special Concern
ToR	Terms of Reference
WUL	Water Use License

1 Introduction

Biodiversity is defined, according the National Environmental Management: Biodiversity Act of 2004 (NEMBA), as “the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems”. The NEMBA legislation upholds the country’s commitment to the protection of South Africa’s biological resources and it is imperative that development takes place in a sustainable way to achieve this.

The purpose of this report is to describe the flora and fauna associated with the De Groote Boom Mining Area. The study area is situated in a geologically unique region, where edaphic endemicity is common. Geological characteristics largely define habitat diversity and edaphic endemicity is the ecological state of plants occurring over specific geology or soils and nowhere else (Bárcenas-Argüello *et al.* 2013). Owing to the unique ultramafic substrates associated with the Rustenburg Layered Suite (RLS) of the Bushveld Igneous Complex (BIC), the Sekhukhuneland region is a habitat of rich biodiversity and plant endemism (Siebert *et al.* 2001). Two major groups of rock occur in the Sekhukhuneland Centre of Plant Endemsm (SCPE), namely, rocks related to serpentinite with high levels of Mg and rocks related to dolomite with high Ca levels. De Groote Boom occurs over the Dwarsrivier sub-suite of the BIC, comprised of norite, pyroxenite, anorthosite and gabbro. Localised intrusions include magnetite, diorite, dunite, bronzite and harzburgite (Mucina and Rutherford, 2006).

A total of 58 plant taxa (Hoare 2007) are known to be endemic to the area and an additional 50 plant taxa are regarded as near-endemic, some of which have not been completely described taxonomically.

2 Terms of Reference

DGB proposes to mine primarily chromite covering an extent of not more than 5 ha on the farm De Grooteboom 373 KT. Digby Wells has been commissioned to complete a flora and fauna report in partial fulfilment of the requirements for the Environmental Management Plan (EMP) for the study area. The agreed Terms of Reference include:

- A desktop assessment of the regional sensitivity of the study site;
- A field investigation to identify flora and fauna within the site including Species of Special Concern (SSC);
- Identification of watercourses on site;
- An assessment of the potential impacts that the proposed operation will have on flora, fauna and ephemeral watercourses on site; and
- An Impacts Assessment.

The following provincial legislation and best-practice documents are relevant to this study:

- Limpopo Environmental Management Act 7, 2003 (LEMA)
- Limpopo State of the Environment Report Overview, 2003;
- Limpopo Conservation Plan (C-Plan) and
- Waterberg Environmental Management Plan.

3 Study Area

The proposed study area is situated along the border of the Limpopo and Mpumalanga Provinces, in the Sekhukhuneland region close to the town of Steelpoort (Plan 1). The site is located in the SCPE (Sekhukhuneland Centre of Plant Endemism). De Grooteboom is situated adjacent to existing mining activity and it is likely that development has had some impact on biodiversity on site.

3.1 Regional Vegetation

The National Herbarium Pretoria (**PRE**) **C**omputerised **I**nformation **S**ystem (PRECIS) database lists 247 plant species for the Quarter Degree Square (QDS) 2430CC, in which De Grooteboom occurs. The majority of the study area falls within the Sekhukhuneland Mountain Bushveld vegetation type (Mucina and Rutherford, 2006). A small portion to the east of the site is classified as Sekhukhune Montane Grassland.

The Sekhukhuneland Mountain Bushveld, formerly classified as Sourish Mixed Bushveld by Acocks (1953), includes steep slopes of the Leolo Mountains, Dwars Rivier, Thaba Sekhune and the undulating hills of the Steelpoort Valley. The vegetation is characterised by open to closed microphyllous and broad-leaved savanna on hills and mountain slopes that form concentric belts parallel to the escarpment. Plant species are associated with ultramafic soils of the Bushveld igneous complex (BIC). Common and characteristic plants of the major vegetation unit on site are represented in Table 3-1 and Figure 3-1 shows an example of the landscape on site. The distribution of regional vegetation types is represented in Plan 2.

Table 3-1: Characteristic of the Sekhukhuneland Mountain Bushveld (Mucina and Rutherford 2006)

Plant form	Species
Trees:	*Acacia nigrescens, Acacia Senegal var. leiharchis (d),* ***Combretum apiculatum*** *(d),* ***Kirkia wilmsii*** *(d), Terminalia pruneloides (d), Vitex obovata subsp. wilmsii (d), Ziziphus mucronata (d), Bolusanthes speciosus, Boscia albitrunca, Brachylaena ilicifolia, Combretum molle, Commiphora mollis, Croton gratissimus,* ***Cussonia transvalensis****,* ***Hippobromus pauciflorus****,Ozoroa sphaerocarpa, Pappea capensis, Schotia latifolia* and *Sterculia rogersii.*
Tall shrubs:	*Dichrostachys cinerea (d),* ***Euclea crispa subsp. crispa*** *(d), Combretum hereroense, Euclea linearis, Pavetta zeyheri, Tinnia rhodesiana* and *Triaspis*

	glaucophylla.
Low Shrubs:	*Elephantorrhiza praetermissa (d), Grewia vernicosa (d), Asparagus intricatus, Barleria saxatilis, B. senensis, Clerodendrum ternatum, Commiphora africana, Hermannia glanduligera, Indigofera lydenburgensis, Jatropha latifolia var. angustata, Melhania prostrate, Phyllanthous gloucophyllous, Psiadia punctata,* ***Seersia keetii*** *and* ***Rhynchosia komatiensis.***
Succulents:	*Aloe castanea (d), A. cryptopoda (d),* ***A. marlothii subsp. marlothii*** and *Huernia stapelioides.*
Climbers:	*Clematis brachiata (d), Rhoicissus tridentata (d) and* ***Acacia ataxacantha*** and *Sarcostemma viminale.*
Graminoids:	***Aristida canescens*** *(d), Heteropogon contortus (d), Panicum maximum (d), Setaria lindenburgiana (d), Themeda triandra (d), Arsitida transvaalensis, Cymbopogon popschilii, Diheteropogon amplectens, Enneapogon scoparius, Loudetia simplex, Panicum deustum and Setaria sphacelata.*
Forbs:	*Berkheya insignis (d), Commelina africana (d), Cyphostemma woodii, Hypoxis rigidula, Sansevieria hyacinthoides, Kyphocarpa angustifoli* and, *Senecio latifolius.*

Key: (d) denotes dominant species and **Bold** denotes species that were recorded on site.

Figure 3-1: Landscape of the De Groote boom Study Area

3.2 Regional Sensitivity

De Grooteboom farm is located within a nationally threatened ecosystem, namely, the Sekhukhune Mountainlands (Plan 3). The Sekhukune Mountainlands has been allocated an 'Endangered' status and is considered as a priority areas for meeting explicit biodiversity targets; as defined in a systematic biodiversity plan (NEMBA 2011). This ecosystem covers an area of 121000 ha, none of which is formally protected.

The Sekhukuneland Mountainlands are located between Roossenekal, Die Berg, and towards Steelpoort. Key biodiversity features include: Juliana's Golden Mole *(Neamblysomus julianae)* and Gunning's Golden Mole *(Neamblysomus gunningi)*; eight

threatened bird species including Blue Crane *(Anthropoides paradiseus),* Blue Korhaan *(Eupodotis caerulescens)* and Cape Vulture *(Gyps coprotheres),* Grey Crowned Crane *(Balearica regulorum),* Rudd's Lark *(Heteromirafra ruddi),* Southern Ground Hornbill *(Bucorvus leadbeateri),* Wattled Crane *(Bugeranus carunculatus)*, Yellowbreasted Pipit *(Anthus chloris);* nineteen threatened plant species for example *Aloe fourei*, *Gladiolus rufomarginatus*, *Lydenburgia cassinioides*, *Resnova megaphylla*, *Scilla natalensis* and *Zantedeschia pentlandii*; and five vegetation types including Sekhukhune Montane Grassland, Sekhukhune Mountain Bushveld, Steenkampsberg Montane Grassland, Lydenburg Thornveld and Ohrigstad Mountain Bushveld. The ecosystem forms part of the Sekhukhuneland Centre of Endemism; it includes important sub-catchments, pans and wetlands.

3.3 Limpopo Conservation Plan

The Limpopo Conservation Plan (C-plan) shows that the entire site falls within an area considered to be critical for biodiversity (Plan 4) (Desmet *et al.* 2013). Critical biodiversity areas are required to meet the conservation targets of Limpopo C-plan. Critical Biodiversity 1 is a category that is regarded as irreplaceable and no alternative sites are available to replace them.

3.4 Watercourses on site

The National Freshwater Ecosystems Priority Areas (NFEPA) identifies important wetlands in South Africa (Plan 5). Ephemeral watercourses are present in the mining right area, associated with the Dwars Rivier wetland system. Not all wetlands on site have been identified by NFEPA, which may be attributable to the desktop nature of the NFEPA assessment. A valley flow wetland was identified, as represented in Plan 5 and allocated a rank of 6.

The National Water Act (no. 36 of 1998) (NWA) stipulates that a buffer of 100m should be placed around all wetlands. In discussions with the Department of Water and Sanitation, it has been noted that in view of the nature and location of the watercourses, it would be possible to obtain permission to encroach within this zone through the operation of a General Authorisation, provided that the impacts are minimised (see minutes of meeting held with DWS in Appendix C).

4 Expertise of the Specialists

Crystal Rowe (Pr. Sci. Nat), the flora specialist, achieved a Bachelor of Science and Honours in Botany at Nelson Mandela Metropolitan University (NMMU) and is an environmental consultant specialising in vegetation and wetland assessments. Experience includes ecological impact assessments, baseline vegetation assessments, estuarine ecological state assessments and wetland health assessments. Project experience includes various countries such as the Democratic Republic of Congo (DRC), Ethiopia, the Ivory Coast, Mali, Mozambique, Sierra Leone and extensively within South Africa.

Phil Patton (Pr. Sci. Nat.), the fauna specialist, achieved a Bachelor of Science (UPE), and a Batchelor of Science (Honours) at the University of Cape Town in Environmental and Geographical Science. Experience includes 15 years of environmental consulting and biodiversity assessments throughout Europe, the Middle East and southern and east Africa.

5 Methodology

The initial site visit took place on the 8th and 9th of September 2014 and the second visit took place from the 25th to the 27th of March 2015.

5.1 Flora

For vegetation, broad habitats were defined using aerial imagery for the desktop component. In addition, the following literature and databases were used to generate expected species lists and to ascertain the likelihood of the presence of SSC on site:

- PRECIS - This database provides taxonomic information for plant species occurring in southern Africa and follows the format of Germishuizen and Meyer, 2003. It is updated every two months and is supplied by SANBI. It is accessed on the Plants of Southern Africa (POSA) website;
- SABIF - South African Biodiversity Information Facility established by the Department of Science and Technology (DST); and
- Threatened Species Programme (TSP) listing in collaboration with the National Botanical Institute (NBI)].

For the fieldwork component, random transects were walked through the areas associated with the proposed mining area.

5.2 Fauna

Fauna that were assessed for this study include the basic groupings: birds, mammals, herpetofauna and invertebrates. For the desktop component of the faunal investigation, the following databases were accessed to determine the likelihood of occurrence of faunal species on site:

- SIBIS: SABIF - South African Biodiversity Information Facility established by the DST;
- Southern African Reptile Conservation Assessment (SARCA, 2010) for reptiles.
- Du Preez and Carruthers (2009) for amphibians; and
- Southern African Butterfly Conservation Atlas (LEPImap 2014).

The field work component involved active searching for faunal activity. The aim of the fieldwork component was to scan the study site to gain insight into the current faunal assemblages, detect any SSC that might have been making use of the site. Visual observations were made by traversing through the study area, noting the visual presence of animals or evidence of animal activity in the form of scat, spoor, nests, burrows and feathers. Any suitable micro-habitats, such as under rocks or logs, were investigated.

Three Shermann traps and one motion-sensitive camera were set up on site. Shermann traps are collapsible traps (23 cm x 9 cm x 7.5 cm) which are baited and laid in strategic areas that have the propensity to harbour small mammal species such as insectivores

(shrews) and rodents (gerbils, mice and rats) (as represented in Figure 5-1). Motion-sensitive cameras are also baited and are used to capture nocturnal animals that may cross the cameras path.

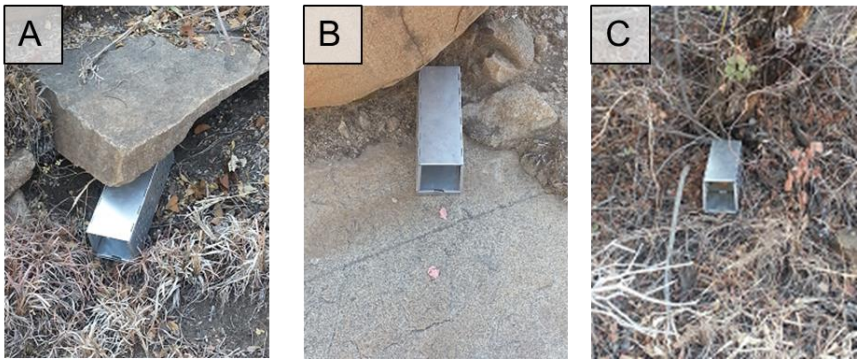


Figure 5-1: Shermann traps set up on site (A-C represent Shermann trap 1-3 respectively)

The principal ornithological field survey technique used was transect surveys. Transect surveys were planned based on representative sites of different avifaunal habitat, by simply following available roads and paths that transect over the relevant habitat types. Transect procedures involve slow attentive walks and drives along areas during which any bird seen or heard is identified and recorded; this was completed during diurnal surveys only.

The following was recorded:

- All birds encountered or noted during the survey (by call and by sight);
- All birds observed or heard by people residing in the study area; and
- List of rare or endangered species observed or obtained from relevant databases.

5.3 Species of Special Concern (SSC)

The International Union of Conservation Networks (IUCN) is the international authority for Red Data species. In South Africa, the Threatened Species Programme (TSP) undertakes this role, in collaboration with the South Africa National Biodiversity Institute (SANBI). SSC include any national Red Data, Nationally Protected, Provincially Protected or endemic species recorded on site. The Red Data listed flora and fauna species are identified were classified according to the following categories:

- Extinct (EX) – No known individuals remaining;
- Extinct in the Wild (EW) – Known only to survive in captivity, or as a naturalized population outside its historic range;
- Critically Endangered (CR) – Extremely high risk of extinction in the wild;
- Endangered (EN) – High risk of extinction in the wild;

- Vulnerable (VU) – High risk of endangerment in the wild;
- Near Threatened (NT) – Likely to become endangered in the near future;
- Least Concern (LC) – Lowest risk. Does not qualify for a more at risk category. Widespread and abundant taxa are included in this category;
- Data Deficient (DD) – Not enough data to make an assessment of its risk of extinction; and
- Not Evaluated (NE) – Has not yet been evaluated against the criteria.

5.4 Impacts Assessment

The potential impacts of the proposed operation will be rated using a clearly defined rating scale. The significance rating formula is as follows:

Significance = Consequence x Probability

Where

Consequence = Type of Impact x (Intensity + Spatial Scale + Duration)

And

Probability = Likelihood of an Impact Occurring

In addition, the formula for calculating consequence:

***Type of Impact** = **+1** (Positive Impact) or **-1** (Negative Impact)*

The weight assigned to the various parameters for positive and impacts to biodiversity is provided for in the formula and is presented in Table 5-1. The probability consequence matrix is displayed in Table 5-2, with the impact significance rating described in Table 5-3.

Table 5-1: Biodiversity Impact Assessment Parameter Ratings

Rating	Intensity		Spatial scale	Duration	Probability
	Negative Impacts ***(Type of Impact = -1)***	***Positive Impacts*** ***(Type of Impact = +1)***			
7	Very significant impact on the environment. Irreparable damage to highly valued species, habitat or ecosystem. Persistent severe damage. Irreparable damage to highly valued items of great cultural significance or complete breakdown of social order.	Noticeable, on-going social and environmental benefits which have improved the livelihoods and living standards of the local community in general and the environmental features.	International The effect will occur across international borders.	Permanent: No Mitigation The impact will remain long after the life of the Project.	Certain/ Definite. There are sound scientific reasons to expect that the impact will definitely occur.
6	Significant impact on highly valued species, habitat or ecosystem. Irreparable damage to highly valued items of cultural significance or breakdown of social order.	Great improvement to livelihoods and living standards of a large percentage of population, as well as significant increase in the quality of the receiving environment.	National Will affect the entire country.	Beyond Project Life The impact will remain for some time after the life of a Project.	Almost certain/Highly probable It is most likely that the impact will occur.
5	Very serious, long-term environmental impairment of ecosystem function that may take several years to rehabilitate.	On-going and widespread positive benefits to local communities which improves livelihoods, as	Province/ Region Will affect the entire province or region.	Project Life The impact will cease after the operational life span of the	Likely The impact may occur.

Rating	Intensity		Spatial scale	Duration	Probability
	Negative Impacts ***(Type of Impact = -1)***	***Positive Impacts*** ***(Type of Impact = +1)***			
	Very serious widespread social impacts. Irreparable damage to highly valued items.	well as a positive improvement to the receiving environment.		Project.	
4	Serious medium term environmental effects. Environmental damage can be reversed in less than a year. On-going serious social issues. Significant damage to structures / items of cultural significance.	Average to intense social benefits to some people. Average to intense environmental enhancements.	<u>Municipal Area</u> Will affect the whole municipal area.	<u>Long term</u> 6-15 years.	<u>Probable</u> Has occurred here or elsewhere and could therefore occur.
3	Moderate, short-term effects but not affecting ecosystem function. Rehabilitation requires intervention of external specialists and can be done in less than a month. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some.	<u>Local</u> Extending across the site and to nearby settlements.	<u>Medium term</u> 1-5 years.	<u>Unlikely</u> Has not happened yet but could happen once in the lifetime of the Project, therefore there is a possibility that the impact will occur.
2	Minor effects on biological or physical environment. Environmental damage can be	Low positive impacts experience by very few of population.	<u>Limited</u> Limited to the site and its	<u>Short term</u> Less than 1 year.	<u>Rare/ improbable</u> Conceivable, but only in extreme circumstances and/ or has not

Rating	Intensity		Spatial scale	Duration	Probability
	Negative Impacts ***(Type of Impact = -1)***	***Positive Impacts*** ***(Type of Impact = +1)***			
	rehabilitated internally with/ without help of external consultants. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.		immediate surroundings.		happened during lifetime of the Project but has happened elsewhere. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures.
1	Limited damage to minimal area of low significance that will have no impact on the environment. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low-level social and environmental benefits felt by very few of the population.	Very limited Limited to specific isolated parts of the site.	Immediate Less than 1 month.	Highly unlikely/None Expected never to happen.

Table 5-2: Probability Consequence Matrix

Probability	Significance																																					
7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	-21	**-20**	**-19**	**-18**	**-17**	**-16**	**-15**	**-14**	**-13**	**-12**	**-11**	**-10**	**-9**	**-8**	**-7**	**-6**	**-5**	**-4**	**-3**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
	Consequence																																					

Table 5-3: Significance Threshold Limits

Score	Description	Rating
109 to 147	A very beneficial impact which may be sufficient by itself to justify implementation of the Project. The impact may result in permanent positive change.	**Major (positive)**
73 to 108	A beneficial impact which may help to justify the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and/or social) environment.	Moderate (positive)
36 to 72	An important positive impact. The impact is insufficient by itself to justify the implementation of the Project. These impacts will usually result in positive medium to long-term effect on the social and/or natural environment.	Minor (positive)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the social and/or natural environment.	Negligible (positive)
-3 to -35	An acceptable negative impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the social and/or natural environment.	Negligible (negative)
-36 to -72	An important negative impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the Project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the social and/or natural environment.	Minor (negative)
-73 to -108	A serious negative impact which may prevent the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term change to the (natural and/or social) environment and result in severe effects.	Moderate (negative)

Score	Description	Rating
-109 to -147	A very serious negative impact which may be sufficient by itself to prevent implementation of the Project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects.	Major (negative)

5.5 Study limitations

- Vegetation of the Sekhukhuneland has not been completely described. As a consequence of this, there is limited literature available to aid in the identification of plant species. Some plants were only identified to genus level.

6 Results of the Flora Assessment

The study area is characterised by high plant diversity and endemism, with many edaphic plant specialists. Many of the species are xerophytic with adaptations such as succulence and underground storage organs. The species list of plants recorded on site amounted to 62 plant species, although many more may occur. Alien invasion was limited and the vegetation resembled the regional vegetation type in which the study occurs (section 7). Three broad habitats were identified:

- Rocky outcrops at the peak of hills;
- Thicket associated with drainage lines and
- Open rocky savanna along slopes of the De Grooteboom Koppie and lower elevations.

6.1 Rocky Outcrops

Rocky outcrops, found at the peak of hills, were typified by woody species: Stamvrug (*Englerophytum magalismontanum*) and Mountain Kirkia (*Kirkia wilmsii)* succulents: *Crassula alba*, Lydenburg Na-boom *(Euphorbia lydenburgensis*), *Opuntia stricta* and forbs: False Horsewood (*Hippobromus pauciflo*rus) and Mother-in-law's Tongue (*Sansevieria hyacinthoides*). Examples of species that are characteristic of this habitat are represented in Figure 6-1.

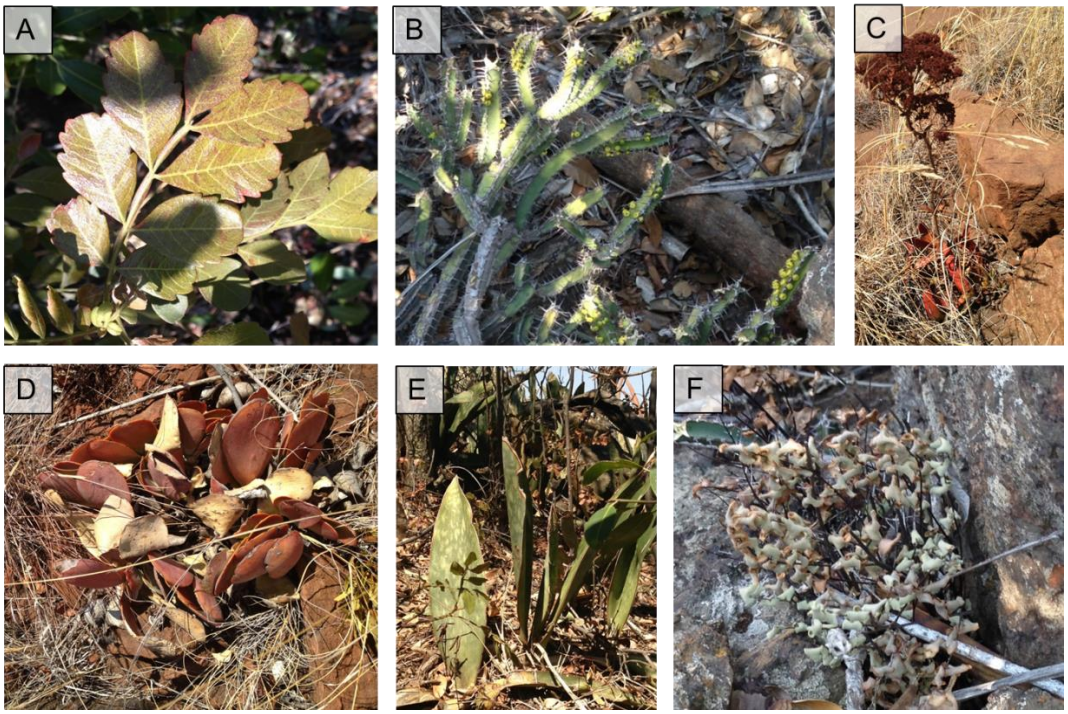


Figure 6-1: Examples of species found in the rocky outcrop vegetation (A: *Hippobromus pauciflorus* (False Horseweed); B: *Euphorbia lydenburgensis* (Lydenburg Na-boom); C: *Crassula alba*; D: *Kalanchoe luciae* (Desert Cabbage); E: *Sansevieria hyacinthoides* (Mother-in-law's Tongue) and F: *Pellaea calemelanos* (Hard Fern))

6.2 Thicket Vegetation

Thicket vegetation was found to be associated with drainage lines over a substrate of loose rocks. Plant species found here included: Stamvrug (*Englerophytum magaliesmontanum*), Blou Guarri (*Euclea crispa*), Sekhukhune Grape (*Rhoicissus sekukhuniensis*) and *Bitter Grape (R. tridentata*), Sekhukhune Curant (*Searsia sekhukhuniensis*) and Stapelioid Kleinia (*Kleinia stapeliiformis*). These species are strictly terrestrial, however, despite their position in drainage lines. Examples of characteristic species of this habitat are represented in Figure 6-2.

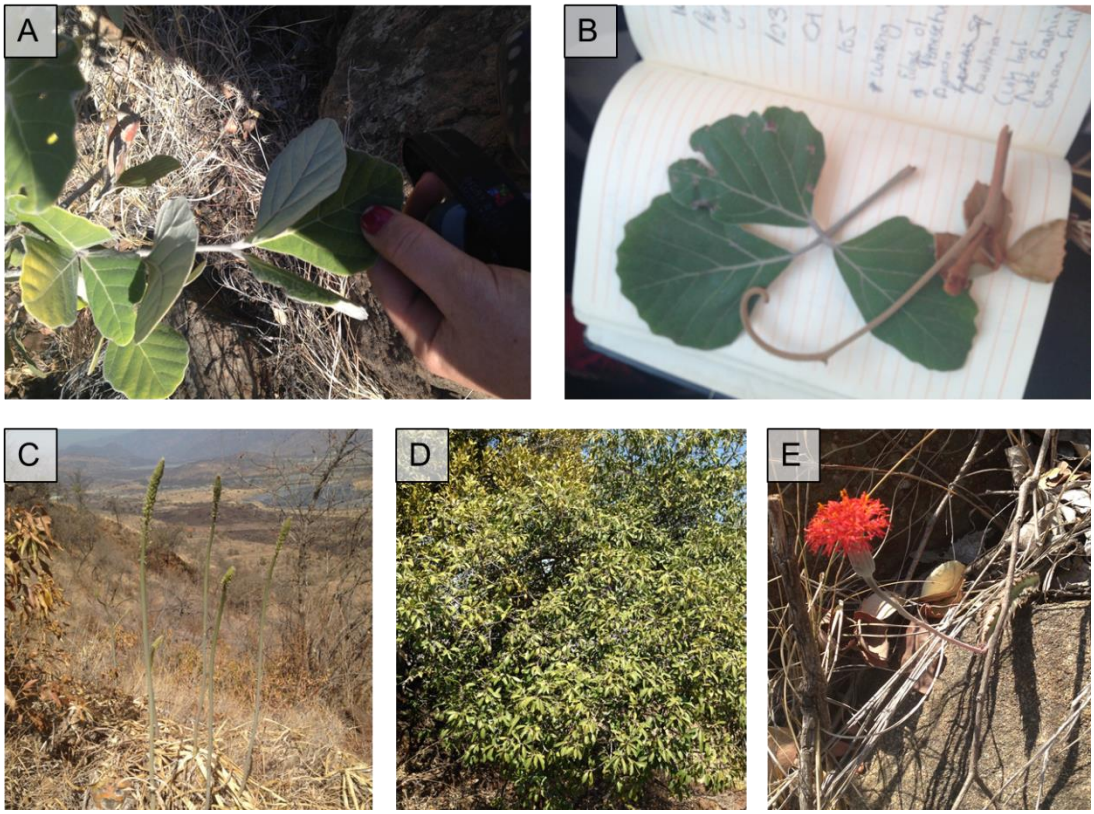


Figure 6-2: Examples of species found in the thicket associated with drainage lines (A: *Rhoicissus sekhukhuniensis* (Sekhukhune Grape); B: *R. tridentata* (Bitter Grape), C: *Ornithogalum* sp., *Englerophytum magalismontanum* (Stamvrug) and *Kleinia stapeliiformis* (Stapelioid Kleinia))

6.3 *Bolusanthes* Open Rocky Savanna

The majority of the study area was classified as *Bolusanthes*-dominated open rocky savanna. The landscape was undulating and soils were shallow owing to the dominance of rocks as a substrate. Woody species: Tree Wisteria (*Bolusanthes speciosus*), Mountain Cabbage Tree (*Cussonia transvaalensis*), Willow Beechwood (*Faurea saligna*), Common Sugar Bush (*Protea caffra*), Mouse-eared Combretum (*Combretum hereroense*) and Large-fruited Bushwillow (*C. zeyheri*); forbs such as: *Gazania* sp., *Ledebouria* sp. and *Rhynchosia komatiensis*; succulent plant: *Aloe marlothii* and xerophyte: Black-stick Lily (*Xerophyta retinervis*) were common in this habitat. Common grasses observed during the site visit included: Turpentine Grass (*Cymbopogon popschillii*), Perrenial Love Grass (*Eragrostis nindensis*) and Blue Bushman Grass (*Stipagrostis hirtigluma*). Examples of characteristic species of this habitat are represented in Figure 6-3.

Figure 6-3: Examples of species found in the rocky open savanna habitat (A: *Faurea saligna* (Willow Beechwood); B: *Xerophyta retinervis* (Black-stick Lily); C: *Protea caffra* (Common Sugar Bush); D: *Tristachya rehmannii*; E: *Eragrostis nindensis* (Perrenial Love Grass) and F: *Searsia keetii* (Keet's Slender Currant))

6.4 Flora Species of Special Concern

The PRECIS database lists six national red data species for the QDS 2340CC. Species that are provincially protected have been listed under Schedule 12 of LEMA (2003). One national red data plant was recorded on site, namely: *Searsia sekhukhuniensis* (Rare). This species was found along rocky slopes and in non-perennial drainage lines.

The study area was found to be rich in endemic species. Endemism is the ecological state where species are confined to a specific region or habitat. Four endemic species were recorded on site, as listed in In addition, the tall shrub *Vitex obovata subsp. wilmsii* was ubiquitous throughout the habitats on site. Although this species is not Red Data, it is understood to be the host plant for the once thought to be extinct Cicada, *Pycna sylvia.* This species is further discussed in section 7.4. Examples of what this plant looks like are found in Figure 6-4 and Figure 6-5.

Table 6-1, although additional species may occur. *Euclea* species A (Schmidt *et al.* 2004), which is similar to *E. linearis*, has not been taxonomically classified as yet. This highlights the need for further taxonomic study in the SCPE.

In addition, the tall shrub *Vitex obovata subsp. wilmsii* was ubiquitous throughout the habitats on site. Although this species is not Red Data, it is understood to be the host plant for the once thought to be extinct Cicada, *Pycna sylvia.* This species is further discussed in section 7.4. Examples of what this plant looks like are found in Figure 6-4 and Figure 6-5.

Table 6-1: Flora SSC on site

Family	Species	Common Name	National Red Data Status	LEMA (2003)	Sekhukhuneland Endemic	Recorded on site
ACANTHACEAE	*Dicliptera fruticosa*		NT			
ANACARDIACEAE	*Searsia sekhukhuniensis*		Rare		x	x
ARACEAE	*Zantedeschia jucunda*		VU			
CELASTRACEAE	*Elaeodendron transvaalense*	Anthill Saffron	NT			
	Lydenburgia cassinoides	Sekhukhuni's Bushmans Tea	NT		x	
EBENACEAE	*Euclea species A*				x	x
EUPHORBIACEAE	*Euphorbia lydenburgensis*				x	x
ORCHIDACEAE	*Eulophia speciosa*		Declining	x		
VITACEAE	*Rhoicissus sekhukhuniensis*				x	x

Figure 6-4: Examples of *Vitex obovata subsp. wilmsii* recorded on site

Figure 6-5: Example of *Vitex obovata subsp. wilmsii* in flower (www.ispotnature.org)

6.4.1.1 Ethnobotanical Plant Species

Ethnobotany is a branch of botany that focuses on the use of plants for medicines and other practical purposes. The use of native plants for ethnobotanical uses can be detrimental to populations that are overexploited.

South Africa has a rich diversity of medicinal plants that not only have a global significance, but also have a cultural and historical role (van Wyk *et al.* 2009). There is a rapidly growing concern for conservation of medicinal plants that are dwindling in number due to illegal harvesting (Institute of Natural Resources 2003). This is particularly apparent in rural areas where medicinal plants are overexploited by traditional doctors. Table 3-1 lists medicinal plant species recorded in the study area. It is likely that species recorded on site, that are endemic to the SCPE, may harbour medicinal uses but studies are yet to be done to confirm this.

Table 6-2: Medicinal plant species recorded on site (van Wyk *et al.* 2009)

Aloe marlothii
Used in traditional medicine to treat wounds and burns.
Euclea undulata
Used in traditional medicine in the Cape to treat heart disease and elsewhere it is used as a remedy for toothache and headaches. Decoctions of the roots of other *Euclea* species have purgative, analgesic and anti-inflammatory properties.
Sansevieria hyacynthoides
A popular remedy for earache and toothache. Used in traditional medicine to treat haemorrhoids, ulcers and intestinal worms.
Xerophyta retinervis
Dry roots are smoked to relieve asthma and smoke from the whole plant is used to stop nose-bleeding

7 Results of the Fauna Assessment

7.1 Mammals

From the desktop study conducted for the study area, the species listed in Table 7-1 were identified as being possible to occur within the study area or the immediate vicinity of the proposed mining area. It must be noted that some of these species are very sensitive to habitat and in some instances; the likeliness for them to occur is minimal. Red Data and protected mammal species, indicated in Table 7-1 are listed as rare, threatened or endangered, mostly because of their preferred habitat being destroyed or altered, this would include predominantly the terrestrial mammal species such as the South African Hedgehog (*Atelerixs frontalis*), Pangolin (*Manis temminckii*), or because of persecution as is the case with the Serval (*Leptailurus serval*) and the African Leopard (*Panthera pardus*). Relatively unspoilt habitat exists within the vicinity of the study area and although the presence of many of these species is not confirmed, there is a possibility that they may still occur on site.

Table 7-1: Mammal SSC that are likely to occur on site

Scientific name	Common name	SA Red Data status	Recorded on site
Amblysomus septentrionalis	Highveld Golden Mole	NT	
Atelerixs frontalis	South African Hedgehog	NT	
Chrysospalax villosus	Rough-haired Golden Mole	CR	
Cloeotis percivali	Short-eared Trident Bat	CR	
Dasymys incomtus	Water Rat	NT	
Hyaena brunnea	Brown Hyaena	NT	x
Leptailurus serval	Serval	NT	
Lutra maculicollis	Spotted-necked Otter	NT	
Manis temminckii	Pangolin	VU	
Mellivora capensis	Honey Badger	NT	
Miniopterus schreibersii	Schreiber's Long-fingered Bat	NT	
Myotis tricolor	Temminck's Hairy Bat	NT	
Myotis welwitschii	Welwitsch's Hairy Bat	NT	

Scientific name	Common name	SA Red Data status	Recorded on site
Pipistrellus rusticus	Rusty Bat	NT	
Raphicerus sharpie	Sharp's Grysbok	NT	
Rhinolophus clivosus	Geoffrey's Horseshoe Bat	NT	
Rhinolophus darlingi	Darling's Horseshoe Bat	NT	
Rhinolophus hildebrandtii	Hildebrandt's Horseshoe Bat	NT	
Rhinolophus landeri	Lander's Horseshoe Bat	NT	

7.1.1 Field Investigation Findings

According to the farm owner of the property where the proposed mine is located, both the Brown Hyaena (*Hyaena brunnea*) and the African Leopard (*Panthera pardus*) (both listed as NT) have recently been observed on the property. This discussion was held on the 9th September 2014.

Very few wild mammal species were observed during the site investigation from the 8th to the 9th September 2014; however, the signs of many species from droppings, scats and spoor were identified. The Wahlberg's Epualetted Fruit Bat *(Epomophorus wahlbergi)* roost and the small troop of Vervet Monkey *(Chlorocebus pygerythrus)* were observed in the *Acacia* woodland at the entrance to the property (as represented in Figure 7-1. During the site visit conducted on in March 2015 a red veld rat (*Aethomys chrysophilus*) was caught in a Sherman trap and an African Civet (*Civettictis civetta*) was caught on a camera trap placed in the river adjacent to the site (Figure 7-2).

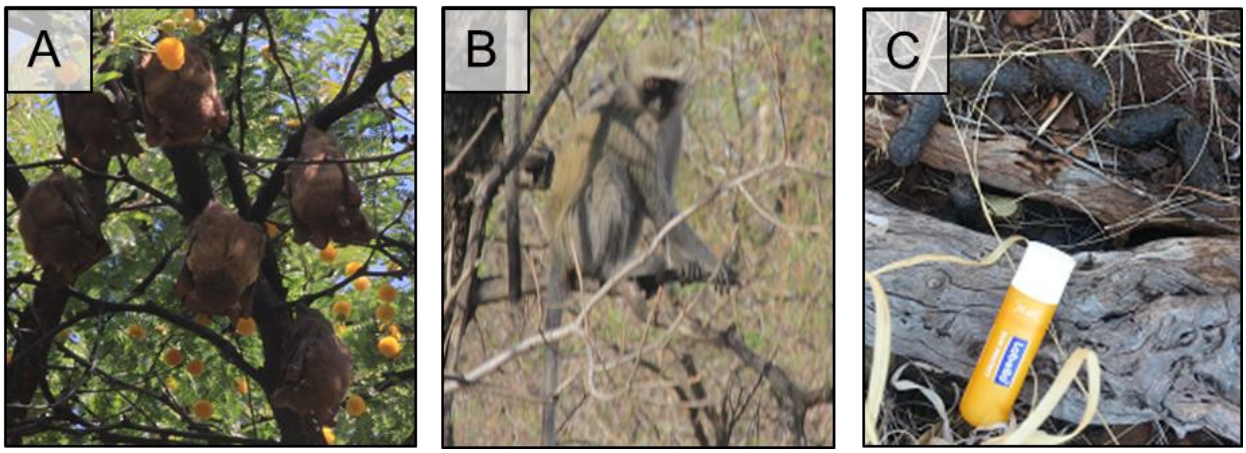


Figure 7-1: Examples of mammal findings on site (A: Wahlberg's Epauletted Fruit Bat (*Epomophorus wahlbergi*); B: Vervet Monkey (*Chlorocebus pygerythrus*) and C: Springhare (*Pedetes capensis*) scat)

Figure 7-2: African Civet (*Civettictis civetta*) captured on motion-sensitive camera

7.2 Avifauna

Birds have been viewed as good ecological indicators, since their presence or absence tends to represent conditions pertaining to the proper functioning of an ecosystem. Bird communities and ecological conditions are linked to land cover. As the land cover of an area changes, so do the types of birds in that area (The Bird Community Index, 2007). Land cover is directly linked to habitats within the study area. The diversity of these habitats should give rise to many different species.

According to the South African Bird Atlas Project (SABAP2), almost 300 species of birds have been identified in the Steelpoort (Sekhukhuneland) area; the majority of these birds are comprised of Bushveld, Grassland and Mountainous species. All birds that could be present within the vicinity of the De Grooteboom study area are listed in Table 7-2 and in the complete list in Appendix B (in **bold**).

Table 7-2: Red Data bird species potentially found within the De Grooteboom study area

Scientific Name	Common Name	IUCN Status
Geronticus calvus	Southern Bald Ibis	VU
Sagittarius serpentarius	Secretarybird	NT
Gyps coprotheres	Cape Vulture	VU

Stephanoaetus coronatus	African Crowned Eagle	NT
Circus ranivorus	African Marsh-Harrier	VU
Circus maurus	Black Harrier	NT
Falco biarmicus	Lanner Falcon	NT
Alcedo semitorquata	Half Collared Kingfisher	LC
Bugeranus carunculatus	Wattled Crane	CR
Anthropoides paradiseus	Blue Crane	VU
Balearica regulorum	Grey Crowned Crane	VU
Eupodotis senegalensis	White-bellied Korhaan	VU

7.2.1 Field Investigation Findings

Birds were recorded at several preferred areas within the proposed mining area, as well as generally throughout the site. Points were chosen near avifaunal zones of influence such as areas where bird parties and colony nesting were evident, as well as in areas of less impacted vegetation type as described by the vegetation assessment. All opportunistic sightings were also recorded throughout the study area. A total number of 39 species were directly observed throughout the property by the specialist in September 2014. Although no Red Data species were observed, regionally uncommon species were identified and included species such as the Mountain Wagtail (*Motacilla clara*), Lizard Buzzard (*Kaupifalco monogrammicus*) and Red-billed Oxpecker (*Buphagus erythrorhynchus*) – all photographed below. These species were all observed at the base of the hill where the proposed mining will take place.

Within the actual mining area, a number of regionally uncommon species were observed, none of which are species of special concern or Red Data. These included notable species such as Freckled Nightjar (*Caprimulgus tritigma*), Lazy Cisticola (*Cisticola aberrans*) and Sentinal Rock Thrush (*Monticola exploratory*) all of which prefer the rocky outcrop micro habitats available throughout the site. Examples of avifauna recorded on site are represented in Figure 7-3.

Figure 7-3: Examples of bird species recorded on site (A: Mountain Wagtail (*Motacilla clara*), B: Lizard Buzzard (*Kaupifalco monogrammicus*) and C: Red billed Oxpecker (*Buphagus erythrorhynchus*))

7.3 Herpetofauna

Amphibians and reptiles are viewed to be good indicators of changes to the whole ecosystem because they are sensitive to changes in the aquatic and terrestrial environments (Branch, 2006). Expected reptile species that may occur on site are listed in Table 7-3.

Table 7-3: Expected reptile list for the study area

Species Name	Common Name	Status
Python sebae natalensis	South African python	VU
Schismaderma carens	Red Toad	
Lamprophis capensis	Brown house snake	
Platysaurus orientalis	Sekukhune Flat Lizard	VU
Naja mossambica	Mozambique Spitting Cobra	
Lygodactylus capensis	Cape dwarf gecko	
Afroablepharus wahlbergii	Wahlberg's Snake-eyed Skink	
Nucras holubi	Holub's Sandveld Lizard	
Leptotyphlops scutifrons	Peter's thread snake	
Ptychadena anchietae	Plain Grass Frog	
Trachylepis margaritifera	Rainbow skink	
Chamaeleo dilepis dilepis	Common Flap-neck Chameleon	VU

Trachylepis varia	Variable Skink	
Acanthocercus atricollis atricollis	Southern Tree Agama	
Trachylepis margaritifer	Rainbow Skink	
Platysaurus orientalis orientalis	Distant's Ground Agama	

7.3.1 Field Investigation Findings

Due to the limited riverine or wetland environment, and the brevity of the site visit, no amphibians were observed during the September 2014 survey. It is possible for some of the sand frog and toad species to occur on site; however a more detailed investigation would be needed to verify this. The South African Rock Python (*Sebae natalensis)* () is found within the study area and is protected by the Limpopo Environmental Management Act. This species is also listed by NEMBA (2004) as a protected species and as vulnerable by the South African red data book (Branch, 1988).

Only one reptile species was identified and photographed on site, the Southern Rock Agama Lizard (*Agama atra*) (Table 7-3 A). This species was observed at the base of the hill and not officially within the proposed mining area, however, it is a common species with a wide distribution but endemic to Southern Africa. They are extremely active and fast-moving preferring sandy or rocky areas where grass is sparse. The Sekhukhune Flat Lizard (*Platysaurus orientalis*) (Table 7-3 B) has a restricted distribution and is endemic to the Sekhukhuneland natural region. This includes the Mpumalanga and Limpopo Escarpment. This species has been observed by a Digby Wells Ecologist in the close proximity to the De Grooteboom study area and in similar habitat, however it was not observed during the September 2014 survey.

Figure 7-4: Examples of herpetofauna associated with the study area (A: Juvenile Southern Rock Agama and B: Sekhukhune Flat Lizard (*Platysaurus orientalis*) photograph from: http://en.wikipedia.org/wiki/Sekukhune_Flat_Lizard)

7.4 Invertebrates

Butterflies are a good indication of the habitats available in a specific region (Woodhall 2005). Although many species are eurytropes (able to use a wide range of habitats) and are widespread and common, South Africa has many stenotrope or endemic species (specific habitat requirements with populations concentrated in a small area) which may be very specialised (Woodhall 2005). Butterflies are useful indicators as they are relatively easy to locate and catch, and therefore identify. Eighteen butterflies are expected to regularly occur, based on studies completed in the area by Digby Wells, as listed in Table 7-4.

In addition, the larvae of the butterfly *Pseudacrea boisduvalii trimeni* make use of the tree *Englerophytum magalismontanum* (Stamvrug) as a source of food. Although this species was not recorded on site, it is likely to occur as the host plant is found in the rocky outcrop habitat at the peak of hills (section 6.1).

The *Crassula* plant species found on rocky outcrops at the top of hills (section 6.1) are host plants for common butterflies: Henning's and Tailed Black Eye.

Table 7-4: Butterfly species expected to occur on site

Scientific Name	Common Name
Melanitis leda helena	Evening Brown
Acraea anemosa	Broad-bordered Acraea
Acreae neobule	Wandering Acraea
Danaus chrysippus	African Monarch butterfly
Junonia hierta cebrene	Yellow Pansy butterfly
Danays chrysippus	Southern Milkweed
Charaxes jasius	Koppie Emperor
Cyclyrius pirithous	Common Blue
Hyalites esebria esebria	Dusky Acrea butterfly
Phalantha aethiopica	Poplar Leopard
Alaena amazoula	Yellow Zulu
Catacroptera cloanthe	Pirate butterfly
Charaxes achaemenses	Bushveld Emperor

Pinacopteryx eriphia eriphia	Zebra White butterfly
Eurema brigitta brigitta	Broad-bordered yellow
Vanessa cardui	Painted Lady
Papilio demodocus	Citrus Swallowtail butterfly
Gegenes Hottentota	Latriellas Skipper

7.4.1 Field Investigation Findings

Five butterflies were recorded on site, namely: Yellow Pansy (*Junonia hierta*), African Monarch (Danaeus chryssipus), Citrus Swallowtail (*Papilio demodocus*), Lemon Traveller (*Colotis subfasciatus*) and a Wandering Acraea (*Acraea neobile*), were recorded during field investigations.

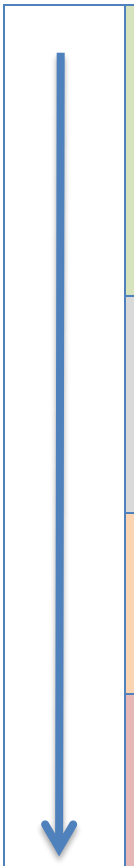
Important: Previous studies by Digby Wells specialists in the area identified a rare Cicada species. The *Pycna sylvia* was thought to be extinct and recently re-discovered in the Sekhukhuneland region. This arthropod has a very limited range, due to specific habitat requirements and its host plant is the *Vitex obovata subsp. wilmsii* which was found throughout the study site, especially in the lower-lying areas. This species is commonly found in drainage lines. *Pycna sylvia* (Figure 7-5) is endemic and localised to the Klein and Groot Dwars River valleys. Its proposed distribution is limited to this area and continual mining is further reducing the habitat of this already restricted species.

Figure 7-5: *Pycna silva* (Digby Wells 2009)

Sampling locations for the faunal assessment are represented in Plan 6.

8 Impacts Assessment

The aim of the Impact Assessment is to strive to avoid damage or loss of ecosystems and services that they provide, and where they cannot be avoided, to reduce and mitigate these impacts (DEA, 2013). Offsets to compensate for loss of habitat are regarded as a last resort, after all efforts have been made to avoid, reduce and mitigate. The mitigation hierarchy is represented in Figure 8-1.



Avoid or Prevent	Refers to considering options in project location, sitting, scale, layout, technology and phasing to avoid impacts on biodiversity, associated ecosystem services and people. This is the best option, but is not always possible. Where environmental and social factors give rise to unacceptable negative impacts, mining should not take place. In such cases, it is unlikely to be possible or appropriate to rely on the other steps in the mitigation.
Minimise	Refers to considering alternatives in the project location, sitting, scale, layout, technology and phasing that would minimise impacts on biodiversity, associated ecosystem services. In cases where there are environmental constraints, every effort should be made to minimise impacts.
Rehabilitate	Refers to rehabilitation of areas where impacts are unavoidable and measures are provided to return impacted areas to near natural state or an agreed land use after mine closure. Rehabilitation can, however, fall short of replicating the diversity and complexity of natural systems.
Offset	Refers to measures over and above rehabilitation to compensate for the residual negative impacts on biodiversity after every effort has been made to minimise and then rehabilitate the impacts. Biodiversity offsets can provide a mechanism to compensate for significant residual impacts on biodiversity.

Figure 8-1: Mitigation hierarchy

A small area of natural habitat is anticipated to be lost due to the proposed mining development and associated activities. Prior to the field investigations, a road had been constructed along the side of the De Grooteboom koppie parallel to the topographical contours. The impact of the proposed activity will involve a loss of habitat for both flora and fauna and will result in impediment of natural flow of water through the ephemeral watercourses that is cut off by the road. These factors are discussed and rated below.

8.1 Loss of habitat

The vegetation on site is regarded as intact and species diverse, with negligible invasion by alien plant species. Further to this, the area falls within the poorly conserved and studied SCPE, with endemics and Red Data plant species present. As a consequence of this, the

impacts of the proposed mining operation and associated aspects and features, although limited in extent are regarded as highly significant.

Due to disturbance of the soil and removal of vegetation, it is likely that alien plants may establish on site. Alien plants often reduce the diversity of an area due to their invasive habit. Invasive plants grow prolifically and out-compete native species. Alien species such as *Solanum panduriforme* and *Datura strumonium* have established in areas of disturbance along roads on site. Their spread into the remainder of the site where disturbance will take place is almost inevitable.

Loss of vegetation will be irreversible and although rehabilitation can be aimed at reinstating the land to some form of land-use, restoration of the natural habitat on site cannot be achieved. This is particularly significant in an area where some plant species remain undescribed. Many species in this habitat are adapted to specific soil composition and structure and the natural species composition cannot be restored after disturbance to the soil (Victor *et al.* 2005). The impacts attributed with the loss of habitat are listed below in the phase they occur.

8.1.1 Construction Phase

Loss of habitat					
Phase	**Construction**				
Criteria	**Details / Discussion**				
Description of impact	▪ Removal of vegetation ▪ Disturbance of the soil ▪ Vehicle operation				
Mitigation required	▪ Minimise the impacted area and clear only what is required ▪ Avoid erosion, manage alien invasive species establishment, ensure the re-establishment of natural vegetation ▪ Employ stormwater management measures				
Parameters	***Severity***	***Spatial scale***	***Duration***	***Probability***	***Significance***
Pre- Mitigation	Very Significant (7)	National (6)	Permanent (6)	Likely (6)	Major (negative) (115)
Post- Mitigation	Significant (6)	National (6)	Short-term (3-5 years) (3)	Likely (6)	Minor (negative) (90)

8.1.2 Operational Phase

No direct loss of habitat is expected during this phase of the project. Alien plant invasion is, however expected to occur. In addition, vehicular transport through the site may increase the risk of roadkill of fauna species that occur.

Loss of habitat

Phase	Operational				
Criteria	**Details / Discussion**				
Description of impact	▪ Establishment of alien plant species in disturbed areas				
Mitigation required	▪ Manage alien invasive species establishment continually through chemical or mechanical removal ▪ Reinstate vegetation cover through concurrent rehabilitation ▪ Erect signage to control the speed limit for trucks and other vehicles moving through the site				
Parameters	***Severity***	***Spatial scale***	***Duration***	***Probability***	***Significance***
Pre- Mitigation	Serious (4)	Limited (2)	Short-term (3-5 years) (3)	Likely (6)	Minor (negative) (54)
Post- Mitigation	Limited (1)	Minor (2)	Short-term (3-5 years) (3)	Probable (4)	Negligible (negative) (24)

8.1.3 Decommissioning Phase

No direct loss of habitat is expected during this phase of the project. Alien plant invasion is, however expected to occur as vehicles and machinery move throughout the site and disturb the soil.

Loss of habitat					
Phase	**Decommissioning**				
Criteria	**Details / Discussion**				
Description of impact	▪ Establishment of alien plant species in disturbed areas				
Mitigation required	▪ Manage alien invasive species establishment continually through chemical or mechanical removal ▪ Reinstate vegetation cover through concurrent rehabilitation				
Parameters	***Severity***	***Spatial scale***	***Duration***	***Probability***	***Significance***
Pre- Mitigation	Serious (4)	Limited (2)	Short-term (3-5 years) (3)	Likely (6)	Minor (negative) (54)
Post- Mitigation	Limited (1)	Minor (2)	Short-term (3-5 years) (3)	Probable (4)	Negligible (negative) (24)

8.1.4 Post-closure Phase

No direct loss of habitat is expected during this phase of the project. Alien plant invasion should be monitored for up to three years after closure.

Loss of habitat	
Phase	**Post-closure**

Criteria	Details / Discussion				
Description of impact	▪ On-going establishment of alien plant species in disturbed areas				
Mitigation required	▪ Manage alien invasive species establishment continually through chemical or mechanical removal				
Parameters	***Severity***	***Spatial scale***	***Duration***	***Probability***	***Significance***
Pre- Mitigation	Serious (4)	Limited (2)	Short-term (3-5 years) (3)	Likely (6)	Minor (negative) (54)
Post- Mitigation	Limited (1)	Minor (2)	Short-term (3-5 years) (3)	Probable (4)	Negligible (negative) (24)

8.2 Loss of SSC

The loss of vegetation habitat on site will reduce the area available for fauna species. Since fauna have the ability to flee the area, the impacts on common animal species is not regarded as highly significant. Endemic fauna, however, have specific habitat requirements and the impacts on these species are considered to be highly significant. Among faunal species of concern are: the Brown hyaena (NT), African Leopard (NT), Sekhukhune Flat Lizard (not confirmed on site) and the formerly Extinct Cycada, *Pycna sylvia* (not confirmed on site).

P. sylvia relies on host plant *Vitex obovata subsp*. *wilmsii* (recorded throughout the lower elevations of the site). Further loss of this plant species should be avoided at all costs. Each *V. obovata* individual should be tagged with clearly visible white tape prior to development. Each individual should be avoided and if this is not possible, should be relocated.

The impact of the loss of plant SSC can be reduced by implementing a plant relocation strategy. Plant SSC can be located, removed (and seeds collected) and relocated either in an area within proximity to the site or a nursery. If plants are to be translocated to a different area, it is imperative that the donor and host habitat are similar in with regard to topography, geology, soil form and orientation of the slope face. Alternatively, a nursery can be established on site where SSC can be relocated to. Loss of some SSC will invariably occur during either process. The cost of removal of plant SSC and establishment of a nursery on site can be estimated at R40, 000 (inclusive of a manual irrigation system).

8.2.1 Construction Phase

The greatest impact is expected during the construction phase for loss of SSC.

Loss of SSC	
Phase	**Construction**
Criteria	**Details / Discussion**
Description of	▪ Removal of vegetation

impact	▪ Increased human presence ▪ Machinery and vehicle operation (noise)				
Mitigation required	▪ Minimise the impacted area and clear only what is required ▪ Tag and avoid all Red Data plants ▪ Plant SSC according to a relocation plan as a last resort ▪ Restricting blasting and operation of machinery to daylight hours				
Parameters	***Severity***	***Spatial scale***	***Duration***	***Probability***	***Significance***
Pre- Mitigation	Very Significant (7)	National (6)	Permanent (6)	Likely (6)	High (108)
Post- Mitigation	Very Serious (5)	National (6)	Permanent (6)	Probable (4)	Minor (negative) (68)

8.2.2 Operational Phase

No impacts to SSC are expected during the operational phase.

8.2.3 Decommissioning Phase

No impacts to SSC are expected during the decommissioning phase.

8.2.4 Post-closure Phase

No impacts to SSC are expected during the decommissioning phase.

8.3 Impacts to non-perennial streams

Ephemeral watercourses have been identified to start in the mining area. There is a risk that watercourses will be impacted upon during constructios, due to the mining of the koppie and the also as roads will cross some drainage areas and existing roads at crossing points will be upgraded. Furthemore a road that has been established on the side of the *koppie* to access the mining area will affect the surface water flow and runoff.

The non-perennial streams can be regarded as temporary drainage for water use application and a buffer of 100m should be placed around each watercourse. With regard to the road crossing of the ephemeral stream towards the south of the property concerned, this could be achieved by a suitably designed culvert with attenuation measures, which would permit water flow to pass unimpeded from time to time and as required. Gabion structures should be constructed at the base of the culvert to avoid erosion after flash-flood events.

8.3.1 Construction Phase

The greatest impact to drainage areas is expected during the construction phase. A road passing along the koppie, prior to authorisation, has already resulted in disturbance to the natural flow of water through the site.

Disturbance to temporary drainage areas	
Phase	**Construction**

Criteria	Details / Discussion				
Description of impact	▪ Mining of the koppie ▪ Roads crossing drainage areas ▪ Upgrading of existing roads crossing drainage areas and streams				
Mitigation required	▪ Avoid drainage areas as far as possible (by 100m) ▪ Include culverts and gabion structures at road crossings				
Parameters	***Severity***	***Spatial scale***	***Duration***	***Probability***	***Significance***
Pre- Mitigation	Serious (4)	Local (3)	Long-term (4)	Likely (6)	Minor (negative) (66)
Post- Mitigation	Moderate (3)	Local (3)	Long-term (4)	Probable (4)	Minor (negative) (40)

8.3.2 Operational Phase

No impacts to temporary drainage are expected during the operational phase.

8.3.3 Decommsiossining Phase

No impacts to temporary drainage are expected during the decommissioning phase.

8.3.4 Post-closure Phase

No impacts to temporary drainage are expected during the post-closure phase.

8.4 Cumulative Impacts

The De Grooteboom mining area is located in an area that is regarded as ecologically pristine, high in plant species diversity with a large number of endemic species. The area is surrounded by large mining operations, currently, and can be seen as a good natural corridor for flora and fauna. Agricultural practices that leave signs of overgrazing have led to the onset of erosion.

The development of the proposed mining operation and associated infrastructure will place additional pressure on the environment especially the fauna; that will be subjected to increased human presence, reduction in habitat and elevated noise levels. The results of the fauna survey indicate that fauna activity within the area has declined potentially as a result of current activities around the area.

Further to this, the cumulative loss of the host plant (*Vitex obovata subsp. wilmsii*) for the endangered Cicada (*Pycna silva*) may result in its extinction. This is regarded as a critical ecological issue.

9 Discussion

The mining area is located in the SCPE and is characterised by Sekhukhuneland Mountain Bushveld. The regional vegetation has undergone minimal anthropogenic disturbance and was considered to be 94% intact in 2006 (Mucina and Rutherford 2006). Due to proposed and established mining activity in the area since this statistic was published, it is expected that the proportion of natural habitat remaining has reduced. Mining was taking place in the property adjacent to the proposed study area during the time that this report was compiled.

The study site also holds national importance as an official threatened ecosystem, the Sekhukhune Mountainlands. If the Sekhukune Mountainlands, listed as 'Endangered' are not conserved, the targets of the national Threatened Ecosystem programme will not be met.

Due to the fact that endemism and species richness are highly relevant to the prioritisation of areas for conservation, the De Grooteboom study area is regarded as particularly sensitive. Loss of endemic plant diversity in the study area will also result in a loss of faunal biodiversity and a resultant loss of faunal SSC. This is of specific relevance to invertebrates, such as the Cicada (*Pycna sylvia*), formerly classified as Extinct, known to occur in this area (although not yet confirmed to occur on site).

Four plants that harbour medicinal value have been recorded on site. The potential for the endemic plants recorded on site to harbour important medicinal properties has not yet been investigated. These species should be conserved until this has been confirmed.

The impact of the proposed mine is considered to be highly significant. In addition to loss of important natural heritage, alien invasion is expected to occur, resulting in further degradation of vegetation.

10 Recommendations

The following recommendations are relevant for this study:

- If any of the plant SSC are identified during clearing of vegetation for the mining area, they should be recorded with a GPS and reported so that a relocation strategy can be employed by a suitably qualified botanical specialist. Given that plant SSC are present in large numbers on site, it is highly likely that some of these species will be encountered. No plant SSC should be destroyed as a result of the proposed activity. This is particularly critical for *Vitex obovata subsp. wilmsii;*
- A laminated brochure can be developed with photos and given to operators on site, all SSC can be marked with biodegradable tape and permits applied for. Large plants are to be replaced by three young plants, medium plants by two plants and small plants by similar size plants. A database should be set up to include the following: species, number of individuals, GPS co-ordinates, size, height, whether they area multistemmed or not, crown size and a description of the health of each individual;

Flora and fauna monitoring is recommended using the stratified random sampling technique across transects through the site and that fauna and flora species are recorded as they are encountered. Alien species should be monitored for up to five years unless no recruitment is recorded for one year. Fixed-point photography should be undertaken at specific points on either side of each transect, at 1.5 m from the ground. The following should be adhered to for the monitoring programme:

- Monitoring must take place annually;
- Monitoring must be completed by qualified specialists;
- Adaptive management must applied;
- Monitoring during the wet season is essential; and
- Findings must be compared to previous years.

The following management and monitoring plans are recommended as part of the project:

- Biodiversity Land Management Plan;
- Fauna and Flora Monitoring plan and
- Alien Invasive Management Plan.

- Culverts and gabion structures should be constructed at road crossing through temporary drainage areas where these areas cannot be avoided from the mine and infrastructure plan.

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Appendix A: Plant Species Lists

Expected plant species list

Family	Species	Threat status
ACANTHACEAE	*Barleria rotundifolia Oberm.*	LC
ACANTHACEAE	*Blepharis subvolubilis C.B.Clarke*	LC
ACANTHACEAE	*Crabbea angustifolia Nees*	LC
ACANTHACEAE	*Crossandra greenstockii S.Moore*	LC
ACANTHACEAE	*Dicliptera fruticosa K.Balkwill*	NT
ACANTHACEAE	*Dyschoriste erecta C.B.Clarke*	LC
ACANTHACEAE	*Dyschoriste fischeri Lindau*	LC
ACANTHACEAE	*Dyschoriste rogersii S.Moore*	LC
ACANTHACEAE	*Justicia odora (Forssk.) Vahl*	LC
ACANTHACEAE	*Petalidium oblongifolium C.B.Clarke*	LC
AMARANTHACEAE	*Kyphocarpa angustifolia (Moq.) Lopr.*	LC
AMARYLLIDACEAE	*Cyrtanthus stenanthus Baker var. major R.A.Dyer*	LC
AMARYLLIDACEAE	*Haemanthus montanus Baker*	LC
ANACARDIACEAE	*Ozoroa sphaerocarpa R.Fern. & A.Fern.*	LC
ANACARDIACEAE	*Searsia discolor (E.Mey. ex Sond.) Moffett*	LC
ANACARDIACEAE	*Searsia engleri (Britten) Moffett*	LC
ANACARDIACEAE	*Searsia keetii (Schönland) Moffett*	LC
ANACARDIACEAE	*Searsia leptodictya (Diels) T.S.Yi, A.J.Mill. & J.Wen forma leptodictya*	Not Evaluated
ANACARDIACEAE	*Searsia sekhukhuniensis (Moffett) Moffett*	Rare
ANACARDIACEAE	*Searsia tumulicola (S.Moore) Moffett var. meeuseana (R.& A.Fern.) Moffett forma meeuseana*	Not Evaluated
ANEMIACEAE	*Mohria vestita Baker*	LC
ANTHERICACEAE	*Chlorophytum cyperaceum (Oberm.) Nordal*	LC
APOCYNACEAE	*Carissa bispinosa (L.) Desf. ex Brenan*	LC
APOCYNACEAE	*Ceropegia ampliata E.Mey. var. ampliata*	LC
APOCYNACEAE	*Ceropegia stapeliiformis Haw. subsp. serpentina (E.A.Bruce) R.A.Dyer*	LC
APOCYNACEAE	*Huernia stapelioides Schltr.*	LC
APOCYNACEAE	*Huernia zebrina N.E.Br. subsp. insigniflora (C.A.Maass) Bruyns*	LC
APOCYNACEAE	*Orbea carnosa (Stent) Bruyns subsp. carnosa*	LC
APOCYNACEAE	*Piaranthus atrosanguineus (N.E.Br.) Bruyns*	LC
APOCYNACEAE	*Raphionacme galpinii Schltr.*	LC
ARACEAE	*Stylochaeton natalensis Schott*	LC
ARACEAE	*Zantedeschia jucunda Letty*	VU
ARALIACEAE	*Cussonia natalensis Sond.*	LC
ARALIACEAE	*Cussonia paniculata Eckl. & Zeyh. subsp. sinuata (Reyneke & Kok) De Winter*	LC
ASPARAGACEAE	*Asparagus suaveolens Burch.*	LC
ASPHODELACEAE	*Aloe castanea Schönland*	LC
ASPHODELACEAE	*Aloe greatheadii Schönland var. davyana (Schönland) Glen & D.S.Hardy*	LC

ASPHODELACEAE	*Aloe pretoriensis Pole-Evans*	LC
ASPHODELACEAE	*Bulbine latifolia (L.f.) Schult. & J.H.Schult. var. latifolia*	LC
ASTERACEAE	*Amphiglossa triflora DC.*	LC
ASTERACEAE	*Artemisia afra Jacq. ex Willd. var. afra*	LC
ASTERACEAE	*Berkheya subulata Harv. var. subulata*	LC
ASTERACEAE	*Brachylaena ilicifolia (Lam.) E.Phillips & Schweick.*	LC
ASTERACEAE	*Dicoma anomala Sond. subsp. gerrardii (Harv. ex F.C.Wilson) S.Ortíz & Rodr.Oubiña*	LC
ASTERACEAE	*Emilia transvaalensis (Bolus) C.Jeffrey*	LC
ASTERACEAE	*Felicia clavipilosa Grau subsp. transvaalensis Grau*	LC
ASTERACEAE	*Geigeria burkei Harv. subsp. fruticulosa Merxm.*	LC
ASTERACEAE	*Gerbera jamesonii Bolus ex Adlam*	LC
ASTERACEAE	*Helichrysum athrixiifolium (Kuntze) Moeser*	LC
ASTERACEAE	*Helichrysum harveyanum Wild*	LC
ASTERACEAE	*Hilliardiella nudicaulis (DC.) H.Rob.*	LC
ASTERACEAE	*Kleinia stapeliiformis (E.Phillips) Stapf*	LC
ASTERACEAE	*Laggera decurrens (Vahl) Hepper & J.R.I.Wood*	LC
ASTERACEAE	*Psiadia punctulata (DC.) Vatke*	LC
ASTERACEAE	*Senecio microglossus DC.*	LC
ASTERACEAE	*Senecio oxyriifolius DC. subsp. oxyriifolius*	LC
ASTERACEAE	*Seriphium plumosum L.*	Not Evaluated
BRASSICACEAE	*Heliophila acuminata (Eckl. & Zeyh.) Steud.*	LC
BRYACEAE	*Bryum capillare Hedw.*	
BRYACEAE	*Bryum cellulare Hook.*	
BUDDLEJACEAE	*Nuxia gracilis Engl.*	LC
BURSERACEAE	*Commiphora glandulosa Schinz*	LC
BURSERACEAE	*Commiphora mollis (Oliv.) Engl.*	LC
CAPPARACEAE	*Boscia albitrunca (Burch.) Gilg & Gilg-Ben.*	LC
CAPPARACEAE	*Boscia foetida Schinz subsp. rehmanniana (Pestal.) Toelken*	LC
CAPPARACEAE	*Cleome angustifolia Forssk. subsp. petersiana (Klotzsch ex Sond.) Kers*	LC
CAPPARACEAE	*Maerua cafra (DC.) Pax*	LC
CELASTRACEAE	*Catha edulis (Vahl) Forssk. ex Endl.*	LC
CELASTRACEAE	*Elaeodendron transvaalense (Burtt Davy) R.H.Archer*	NT
CELASTRACEAE	*Gymnosporia tenuispina (Sond.) Szyszyl.*	LC
CELASTRACEAE	*Lydenburgia cassinoides N.Robson*	NT
CELASTRACEAE	*Maytenus undata (Thunb.) Blakelock*	LC
CELASTRACEAE	*Mystroxylon aethiopicum (Thunb.) Loes. subsp. schlechteri (Loes.) R.H.Archer*	LC
COLCHICACEAE	*Ornithoglossum vulgare B.Nord.*	LC
COMBRETACEAE	*Combretum molle R.Br. ex G.Don*	LC
COMBRETACEAE	*Combretum zeyheri Sond.*	LC
COMBRETACEAE	*Terminalia prunioides M.A.Lawson*	LC

COMMELINACEAE	*Commelina africana L. var. lancispatha C.B.Clarke*	LC
CONVOLVULACEAE	*Ipomoea bathycolpos Hallier f.*	LC
CONVOLVULACEAE	*Seddera suffruticosa (Schinz) Hallier f.*	LC
CONVOLVULACEAE	*Xenostegia tridentata (L.) D.F.Austin & Staples subsp. angustifolia (Jacq.) Lejoly & Lisowski*	LC
CRASSULACEAE	*Crassula acinaciformis Schinz*	LC
CRASSULACEAE	*Crassula brevifolia Harv. subsp. brevifolia*	LC
CRASSULACEAE	*Kalanchoe luciae Raym.-Hamet subsp. luciae*	LC
CUCURBITACEAE	*Cucumis anguria L. var. longaculeatus J.H.Kirkbr.*	LC
CUCURBITACEAE	*Cucumis myriocarpus Naudin subsp. myriocarpus*	LC
CYPERACEAE	*Cyperus austro-africanus C.Archer & Goetgh.*	LC
CYPERACEAE	*Cyperus congestus Vahl*	LC
CYPERACEAE	*Cyperus cyperoides (L.) Kuntze subsp. cyperoides*	LC
CYPERACEAE	*Cyperus cyperoides (L.) Kuntze subsp. pseudoflavus (Kük.) Lye*	LC
CYPERACEAE	*Cyperus decurvatus (C.B.Clarke) C.Archer & Goetgh.*	LC
CYPERACEAE	*Cyperus keniensis Kük.*	LC
CYPERACEAE	*Fuirena pubescens (Poir.) Kunth var. pubescens*	LC
DIOSCOREACEAE	*Dioscorea sylvatica Eckl. var. brevipes (Burtt Davy) Burkill*	Not Evaluated
DIOSCOREACEAE	*Dioscorea sylvatica Eckl. var. sylvatica*	Not Evaluated
EBENACEAE	*Diospyros lycioides Desf. subsp. nitens (Harv. ex Hiern) De Winter*	LC
EBENACEAE	*Diospyros whyteana (Hiern) F.White*	LC
EBENACEAE	*Euclea crispa (Thunb.) Gürke subsp. crispa*	LC
EBENACEAE	*Euclea daphnoides Hiern*	LC
EBENACEAE	*Euclea linearis Zeyh. ex Hiern*	LC
EBENACEAE	*Euclea sekhukhuniensis Retief, Siebert & A.E.van Wyk*	
EBENACEAE	*Euclea undulata Thunb.*	LC
EUPHORBIACEAE	*Croton gratissimus Burch. var. gratissimus*	LC
EUPHORBIACEAE	*Euphorbia enormis N.E.Br.*	LC
EUPHORBIACEAE	*Euphorbia schinzii Pax*	LC
EUPHORBIACEAE	*Jatropha latifolia Pax var. angustata Prain*	LC
EUPHORBIACEAE	*Jatropha latifolia Pax var. latifolia*	LC
FABACEAE	*Acacia ataxacantha DC.*	LC
FABACEAE	*Acacia gerrardii Benth. subsp. gerrardii var. gerrardii*	LC
FABACEAE	*Acacia grandicornuta Gerstner*	LC
FABACEAE	*Argyrolobium wilmsii Harms*	LC
FABACEAE	*Bolusanthus speciosus (Bolus) Harms*	LC
FABACEAE	*Dichrostachys cinerea (L.) Wight & Arn. subsp. africana Brenan & Brummitt var. africana*	LC
FABACEAE	*Elephantorrhiza praetermissa J.H.Ross*	LC
FABACEAE	*Indigastrum costatum (Guill. & Perr.) Schrire subsp. macrum (E.Mey.) Schrire*	LC
FABACEAE	*Indigofera alternans DC. var. alternans*	LC

FABACEAE	*Indigofera sanguinea N.E.Br.*	LC
FABACEAE	*Lotononis laxa Eckl. & Zeyh.*	LC
FABACEAE	*Mundulea sericea (Willd.) A.Chev. subsp. sericea*	LC
FABACEAE	*Ormocarpum kirkii S.Moore*	LC
FABACEAE	*Pearsonia cajanifolia (Harv.) Polhill subsp. cryptantha (Baker) Polhill*	LC
FABACEAE	*Pearsonia uniflora (Kensit) Polhill*	LC
FABACEAE	*Peltophorum africanum Sond.*	LC
FABACEAE	*Rhynchosia minima (L.) DC. var. minima*	LC
FABACEAE	*Senna italica Mill. subsp. arachoides (Burch.) Lock*	LC
FABACEAE	*Sphenostylis angustifolia Sond.*	LC
FABACEAE	*Tephrosia longipes Meisn. subsp. longipes var. longipes*	LC
FUNARIACEAE	*Funaria bergiana (Hornsch.) Broth.*	
HEDWIGIACEAE	*Braunia secunda (Hook.) Bruch & Schimp.*	
HYACINTHACEAE	*Dipcadi rigidifolium Baker*	LC
HYACINTHACEAE	*Dipcadi viride (L.) Moench*	LC
HYACINTHACEAE	*Drimia intricata (Baker) J.C.Manning & Goldblatt*	LC
HYACINTHACEAE	*Resnova humifusa (Baker) U.& D.Müll.-Doblies*	LC
HYPOXIDACEAE	*Hypoxis rigidula Baker var. rigidula*	LC
IRIDACEAE	*Freesia laxa (Thunb.) Goldblatt & J.C.Manning subsp. laxa*	LC
IRIDACEAE	*Gladiolus dalenii Van Geel subsp. dalenii*	LC
IRIDACEAE	*Gladiolus densiflorus Baker*	LC
IRIDACEAE	*Gladiolus reginae Goldblatt & J.C.Manning*	
IRIDACEAE	*Hesperantha coccinea (Backh. & Harv.) Goldblatt & J.C.Manning*	LC
KIRKIACEAE	*Kirkia wilmsii Engl.*	LC
LAMIACEAE	*Clerodendrum ternatum Schinz*	LC
LAMIACEAE	*Karomia speciosa (Hutch. & Corbishley) R.Fern. forma speciosa*	Not Evaluated
LAMIACEAE	*Leucas capensis (Benth.) Engl.*	LC
LAMIACEAE	*Ocimum tubiforme (R.D.Good) A.J.Paton*	LC
LAMIACEAE	*Orthosiphon fruticosus Codd*	LC
LAMIACEAE	*Plectranthus hadiensis (Forssk.) Schweinf. ex Spreng. var. tomentosus (Benth.) Codd*	LC
LAMIACEAE	*Rotheca louwalbertsii (P.P.J.Herman) P.P.J.Herman & Retief*	LC
LAMIACEAE	*Syncolostemon concinnus N.E.Br.*	LC
LAMIACEAE	*Tetradenia brevispicata (N.E.Br.) Codd*	LC
LAMIACEAE	*Tinnea rhodesiana S.Moore*	LC
LAMIACEAE	*Vitex obovata E.Mey. subsp. wilmsii (Gürke) C.L.Bredenkamp & D.J.Botha*	LC
LORANTHACEAE	*Tapinanthus forbesii (Sprague) Wiens*	LC
LORANTHACEAE	*Tapinanthus quequensis (Weim.) Polhill & Wiens*	LC
MAESACEAE	*Maesa lanceolata Forssk.*	LC
MALPIGHIACEAE	*Triaspis glaucophylla Engl.*	LC
MALPIGHIACEAE	*Triaspis hypericoides (DC.) Burch. subsp. nelsonii (Oliv.) Immelman*	LC

MALVACEAE	*Corchorus asplenifolius Burch.*	LC
MALVACEAE	*Grewia bicolor Juss. var. bicolor*	LC
MALVACEAE	*Grewia flava DC.*	LC
MALVACEAE	*Grewia vernicosa Schinz*	LC
MALVACEAE	*Hermannia modesta (Ehrenb.) Mast.*	LC
MALVACEAE	*Hermannia montana N.E.Br.*	LC
MALVACEAE	*Hibiscus meyeri Harv. subsp. meyeri*	LC
MALVACEAE	*Hibiscus microcarpus Garcke*	LC
MALVACEAE	*Hibiscus pusillus Thunb.*	LC
MALVACEAE	*Hibiscus trionum L.*	
MALVACEAE	*Melhania rehmannii Szyszyl.*	LC
MALVACEAE	*Waltheria indica L.*	LC
MELASTOMATACEAE	*Dissotis canescens (E.Mey. ex R.A.Graham) Hook.f.*	LC
MELIACEAE	*Turraea obtusifolia Hochst.*	LC
MORACEAE	*Ficus ingens (Miq.) Miq.*	LC
MORACEAE	*Ficus sur Forssk.*	LC
OCHNACEAE	*Ochna inermis (Forssk.) Schweinf.*	LC
OLACACEAE	*Ximenia americana L. var. americana*	
OLEACEAE	*Jasminum multipartitum Hochst.*	LC
OLEACEAE	*Jasminum quinatum Schinz*	LC
OLEACEAE	*Olea capensis L. subsp. enervis (Harv. ex C.H.Wright) I.Verd.*	LC
OLEACEAE	*Olea europaea L. subsp. africana (Mill.) P.S.Green*	LC
OLINIACEAE	*Olinia emarginata Burtt Davy*	LC
ORCHIDACEAE	*Eulophia hereroensis Schltr.*	LC
ORCHIDACEAE	*Eulophia leontoglossa Rchb.f.*	LC
ORCHIDACEAE	*Eulophia ovalis Lindl. var. bainesii (Rolfe) P.J.Cribb & la Croix*	LC
ORCHIDACEAE	*Eulophia parvilabris Lindl.*	LC
ORCHIDACEAE	*Eulophia speciosa (R.Br. ex Lindl.) Bolus*	Declining
ORCHIDACEAE	*Habenaria lithophila Schltr.*	LC
ORCHIDACEAE	*Habenaria tridens Lindl.*	LC
ORCHIDACEAE	*Mystacidium capense (L.f.) Schltr.*	LC
OROBANCHACEAE	*Alectra orobanchoides Benth.*	LC
OROBANCHACEAE	*Graderia subintegra Mast.*	LC
OROBANCHACEAE	*Striga asiatica (L.) Kuntze*	LC
OROBANCHACEAE	*Striga gesnerioides (Willd.) Vatke*	LC
PEDALIACEAE	*Holubia saccata Oliv.*	LC
PEDALIACEAE	*Sesamum triphyllum Welw. ex Asch. var. triphyllum*	LC
PHYLLANTHACEAE	*Flueggea virosa (Roxb. ex Willd.) Voigt subsp. virosa*	LC
PHYLLANTHACEAE	*Phyllanthus parvulus Sond. var. garipensis (E.Mey. ex Drège) Radcl.-Sm.*	LC
POACEAE	*Aristida diffusa Trin. subsp. burkei (Stapf) Melderis*	LC
POACEAE	*Aristida rhiniochloa Hochst.*	LC

POACEAE	*Bewsia biflora (Hack.) Gooss.*	LC
POACEAE	*Enneapogon scoparius Stapf*	LC
POACEAE	*Eragrostis curvula (Schrad.) Nees*	LC

Plant Species Recorded on site

Family	Species	Status
Asphodelaceae	*Anthericum sp.*	
Acanthaceae	*Blepharis obovata*	LC
Amaranthaceae	*Hermbstaedtia odorata*	LC
Anacardiaceae	*Ozoroa paniculosa var. paniculosa*	LC
Anacardiaceae	*Searsia keetii*	LC
Anacardiaceae	*Searsia sekhukhuniensis*	Rare
Apocynaceae	*Sarcostemma viminale*	
Asparagaceae	*Asparagus sp.*	
Asphodelaceae	*Aloe marlothii*	LC
Asteraceae	*Flaveria bidentis*	Alien
Asteraceae	*Gazania sp.*	
Asteraceae	*Kleinia stapelieformis*	
Asteraceae	*Vernonia sp.*	
Asteraceae	*Zinnia peruviana*	Alien
Burseraceae	*Commiphora pyracanthoides*	LC
Cactaceae	*Opuntia stricta*	Alien
Combretaceae	*Combretum heroense*	Not evaluated
Combretaceae	*Combretum zeyheri*	LC
Commelinaceae	*Commelina bengalensis*	Alien
Crassulaceaea	*Crassula alba*	LC
Crassulaceaea	*Kalanchoe luciae*	LC
Dracaenaceae	*Sansevieria hyacinthoides*	LC
Ebenaceae	*Euclea crispa*	LC
Ebenaceae	*Euclea sp. A*	
Ebenaceae	*Euclea undulata*	LC
Euphorbiaceae	*Euphorbia lydenburgensis*	LC
Euphorbiaceae	*Mimusops zeyheri*	LC
Fabaceae	*Acacia ataxacantha*	LC
Fabaceae	*Acacia karroo*	LC
Fabaceae	*Bolusanthus speciosus*	LC
Fabaceae	*Peltephorum africanum*	LC
Fabaceae	*Rhynchosia komatiensis.*	
Hyacinthaceae	*Ledebouria (potentially dolomiticola)*	Potentiall

		y VU
Hyacinthaceae	*Ornithogalum sp.*	
Iridaceae	*Gladiolus (potentially reginae)*	
Kirkaceae	*Kirkia wilmsii*	LC
Lamiaceae	*Vitex obovata subsp. obovata*	LC
Malphigiaceae	*Triaspis glaucophylla*	LC
Malvaceae	*Dombeya rotundifolia var. rotundifolia*	LC
Orobanchaceae	*Striga asiatica*	LC
Poaceae	*Aristida canescens*	LC
Poaceae	*Aristida stipitata*	LC
Poaceae	*Cymbopogon popschilii*	LC
Poaceae	*Digitaria eriantha*	
Poaceae	*Diheteropogon filifolius*	LC
Poaceae	*Eragrostis nindensis*	LC
Poaceae	*Fingerhuthia africana*	LC
Poaceae	*Microchloa sp.*	
Poaceae	*Schmidtia pappophoides*	
Poaceae	*Stipagrostis hirtiglum;a*	LC
Poaceae	*Themeda triandra*	LC
Poaceae	*Tristachya biseriata*	LC
Proteaceae	*Faurea saligna*	LC
Rhamnaceae	*Ziziphus mucronata*	LC
Sapindaceae	*Hippobromus pauciflorus*	LC
Sapotaceae	*Englerophytum magalismontanum*	LC
Sinopteridaceae	*Pellaea calemelanos*	LC
Velloziaceae	*Xerophyta retinervis*	LC
Viscaceae	*Viscum sp.*	
Vitaceae	*Cyphostemma sp.*	
Vitaceae	*Rhoicissus sekhukhiensis*	LC
Vitaceae	*Rhoicissus tridentata*	LC

Appendix B: Expected Bird Species List

Species Name	Common Name	SA Red-data Status
Phalacrocorax lucidus	White-breasted Cormorant	
Microcarbo africanus	Reed Cormorant	
Phalacrocorax lucidus	African Darter	
Ardea cinerea	Grey Heron	
Ardea melanocephala	Black-headed Heron	
Ardea purpurea	Purple Heron	
Ardea alba	Great Egret	
Coccyzus americanus	Yellow-billed	
Egretta ardesiaca	Black Heron	
Bubulcus ibis	**Cattle Egret**	
Scopus umbretta	Hamerkop	
Ciconia ciconia	White Stork	
Threskiornis aethiopicus	African Sacred Ibis	
Geronticus calvus	Southern Bald Ibis	VU
Plegadis falcinellus	Glossy Ibis	
Bostrychia hagedash	**Hadeda Ibis**	
Platalea alba	African Spoonbill	
Dendrocygna viduata	White-faced (Whistling-) Duck	
Alopochen aegyptiaca	Egyptian Goose	
Anas undulata	Yellow-billed Duck	
Anas sparsa	African Black Duck	
Anas hottentota	Hottentot Teal	
Anas erythrorhyncha	Red-billed Teal (Duck)	
Anas smithii	Cape Shoveler	
Netta erythrophthalma	Southern Pochard	
Sarkidiornis melanotos	Comb (Knob-billed) Duck	
Plectropterus gambensis	Spur-winged Goose	
Sagittarius serpentarius	Secretarybird	NT
Gyps coprotheres	Cape Vulture	VU
Elanus caeruleus	**Black-shouldered Kite**	
Verreaux's (Black) Eagle	Verreaux's (Black) Eagle	
Aquila wahlbergi	Wahlberg's Eagle	
Stephanoaetus coronatus	African Crowned Eagle	NT
Circaetus cinereus	Brown Snake-Eagle	
Circaetus pectoralis	Black-chested Snake-Eagle	
Haliaeetus vocifer	African Fish-Eagle	
Buteo buteo	Steppe (Common) Buzzard	
Buteo rufofuscus	Jackal Buzzard	
Accipiter rufiventris	Rufous-chested Sparrowhawk	
Accipiter badius	Shikra (Little Banded Goshawk)	

Circus ranivorus	African Marsh-Harrier	VU
Circus maurus	Black Harrier	NT
Polyboroides typus	African Harrier-Hawk	
Pandion haliaetus	Osprey	
Falco biarmicus	Lanner Falcon	NT
Falco subbuteo	Eurasian Hobby	
Falco amurensis	Amur Falcon	
Falco tinnunculus	**Rock Kestrel**	
Falco rupicoloides	Greater Kestrel	
Peliperdix coqui	Coqui Francolin	
Scleroptila africanus	Grey-winged Francolin	
Scleroptila shelleyi	Shelley's Francolin	
Scleroptila levaillantii	Red-winged Francolin	
Pternistis natalensis	**Natal Spurfowl (Francolin)**	
Pternistis swainsonii	Swainson's Spurfowl (Francolin)	
Numida meleagris	**Helmeted Guineafowl**	
Bugeranus carunculatus	Wattled Crane	CR
Anthropoides paradiseus	Blue Crane	VU
Balearica regulorum	Grey Crowned Crane	VU
Rallus caerulescens	African Rail	
Porphyrio porphyrio	African Purple Swamphen	
Gallinula chloropus	Common Moorhen	
Fulica cristata	Red-knobbed Coot	
Eupodotis senegalensis	White-bellied Korhaan	VU
Actophilornis africanus	African Jacana	
Charadrius tricollaris	Three-banded Plover	
Vanellus coronatus	Crowned Lapwing	
Vanellus armatus	Blacksmith Lapwing	
Vanellus senegallus	African Wattled Lapwing	
Actitis hypoleucos	Common Sandpiper	
Tringa glareola	Wood Sandpiper	
Tringa stagnatilis	Marsh Sandpiper	
Calidris minuta	Little Stint	
Philomachus pugnax	Ruff	
Gallinago nigripennis	African (Ethiopian) Snipe	
Burhinus capensis	Spotted Thick-knee	
Chlidonias hybridus	Whiskered Tern	
Chlidonias leucopterus	White-winged Tern	
Columba guinea	Speckled (Rock) Pigeon	
Columba arquatrix	African Olive Pigeon	
Streptopelia semitorquata	**Red-eyed Dove**	

Streptopelia capicola	Cape Turtle Dove	
Spilopelia senegalensis	**Laughing Dove**	
Oena capensis	Namaqua Dove	
Turtur tympanistria	Tambourine Dove	
Tauraco porphyreolophus	Purple-crested Turaco	
Cuculus solitarius	Red-chested Cuckoo	
Cuculus clamosus	Black Cuckoo	
Chrysococcyx caprius	Dideric Cuckoo	
Asio capensis	Marsh Owl	
Caprimulgus tristigma	**Freckled Nightjar**	
Apus barbatus	African Black (Black) Swift	
Asio capensis	**White-rumped Swift**	
Apus horus	Horus Swift	
Apus affinis	Little Swift	
Tachymarptis melba	Alpine Swift	
Cypsiurus parvus	African Palm-Swift	
Colius striatus	**Speckled Mousebird**	
Urocolius indicus	Red-faced Mousebird	
Ceryle rudis	Pied Kingfisher	
Megaceryle maxima	Giant Kingfisher	
Alcedo cristata	Malachite Kingfisher	
Halcyon albiventris	Brown-hooded Kingfisher	
Halcyon chelicuti	Striped Kingfisher	
Merops apiaster	European Bee-eater	
Upupa epops	African Hoopoe	
Tockus leucomelas	**Southern Yellow-billed Hornbill**	
Lybius torquatus	**Black-collared Barbet**	
Tricholaema leucomelas	Acacia PiedBarbet	
Pogoniulus chrysoconus	Yellow-fronted Tinkerbird	
Trachyphonus vaillantii	Crested Barbet	
Indicator indicator	Greater Honeyguide	
Campethera abingoni	Golden-tailed Woodpecker	
Jynx ruficollis	Red-throated Wryneck	
Mirafra africana	**Rufous-naped Lark**	
Calandrella cinerea	Red-capped Lark	
Hirundo rustica	Barn (European) Swallow	
Hirundo albigularis	White-throated Swallow	
Cecropis semirufa	Red-breasted) Swallow	
Cecropis cucullata	Greater Striped-Swallow	
Ptyonoprogne fuligula	**Rock Martin**	
Delichon urbicum	Common House-Martin	

Riparia paludicola	Brown-throated Martin	
Riparia cincta	Banded Martin	
Psalidoprocne pristoptera	Black Saw-wing	
Dicrurus adsimilis	**Fork-tailed Drongo**	
Oriolus larvatus	Black-headed Oriole	
Corvus capensis	Cape (Black) Crow	
Corvus albus	**Pied Crow**	
Pycnonotus barbatus	Dark-capped Bulbul	
Turdus libonyana	**Kurrichane Thrush**	
Psophocichla litsitsirupa	Olive Thrush	
Monticola rupestris	Groundscraper Thrush	
Monticola rupestri	Cape Rock-Thrush	
Monticola explorator	**Sentinel Rock-Thrush**	
Oenanthe monticola	Mountain Chat (Wheatear)	
Oenanthe pileata	Capped Wheatear	
Campicoloides bifasciatus	Buff-streaked Chat (Wheatear)	
Cercomela familiaris	**Familiar Chat**	
Thamnolaea cinnamomeiventri	Mocking Cliff-Chat	
Myrmecocichla formicivora	Ant-eating Chat	
Saxicola rubicola	African Stonechat	
Cossypha caffra	Cape Robin-Chat	
Cossypha humeralis	White-throated Robin-Chat	
Cercotrichas leucophrys	White-browed Scrub-Robin	
Acrocephalus baeticatus	African Reed-Warbler	
Acrocephalus schoenobaenus	Sedge Warbler	
Acrocephalus gracilirostris	Lesser Swamp- Warbler	
Iduna natalensis	Dark-capped Yellow Warbler	
Bradypterus baboecala	Little Rush- Warbler	
Phylloscopus trochilus	Willow Warbler	
Apalis thoracica	**Bar-throated Apalis**	
Camaroptera brevicaudata	Grey-backed Camaroptera	
Sphenoeacus afer	Cape Grassbird	
Cisticola juncidis	Zitting Cisticola	
Cisticola textrix	Cloud Cisticola	
Cisticola ayresii	Wing-snapping Cisticola	
Cisticola cinnemoneus	Pale-crowned Cisticola	
Cisticola lais	Wailing Cisticola	
Cisticola chiniana	Rattling Cisticola	
Cisticola tinniens	Le Vaillant's Cisticola	
Cisticola aberrans	Lazy Cisticola	
Cisticola fulvicapilla	**Neddicky**	

Prinia subflava	**Tawny-flanked Prinia**	
Prinia flavicans	Black-chested Prinia	
Muscicapa striata	Spotted Flycatcher	
Myioparus plumbeus	Grey Tit-Flycatcher	
Melaenornis pammelaina	**Southern Black-Flycatcher**	
Sigelus silens	Fiscal Flycatcher	
Batis capensis	Cape Batis	
Batis molitor	**Chinspot Batis**	
Terpsiphone viridis	African Paradise-Flycatcher	
Motacilla clara	Mountain (Long-tailed) Wagtail	
Motacilla capensis	Cape Wagtail	
Anthus cinnamomeus	African Pipit	
Anthus similis	Long-billed Pipit	
Anthus vaalensis	Buffy Pipit	
Anthus lineiventris	Striped Pipit	
Macronyx capensis	Cape (Orange-throated) Longclaw	
Lanius minor	Lesser Grey Shrike	
Lanius collaris	**Common Fiscal**	
Laniarius ferrugineus	**Southern Boubou**	
Dryoscopus cubla	Puffback	
Nilaus afer	Brubru	
Tchagra senegala	**Black-crowned Tchagra**	
Telophorus zeylonus	Bokmakierie	
Acridotheres tristis	Common Myna	
Lamprotornis nitens	Cape Glossy Starling	
Onychognathus morio	Red-winged Starling	
Promerops gurneyi	Gurney's Sugarbird	
Nectarinia famosa	Malachite Sunbird	
Cinnyris afer	Greater Double-collared Sunbird	
Cinnyris talatala	White-bellied Sunbird	
Chalcomitra amethystina	Amethyst (Black) Sunbird	
Zosterops virens	**Cape White-eye**	
Passer domesticus	House Sparrow	
Passer melanurus	Cape Sparrow	
Passer griseus	Greyheaded Sparrow	
Petronia superciliaris	Yellow-throated Petronia	
Ploceus cucullatus	Village Weaver	
Ploceus capensis	Cape Weaver	
Ploceus velatus	**Southern Masked-Weaver**	
Ploceus subaureus	Golden-Weaver	
Anomalospiza imberbis	Cuckoo Finch	

Quelea quelea	Red-billed Quelea	
Euplectes orix	Southern Red Bishop	
Euplectes afer	Yellow-crowned Bishop	
Euplectes capensis	Yellow (Yellow-rumped) Bishop	
Euplectes axillaris	Fan-tailed Widowbird	
Euplectes albonotatus	White-winged Widowbird	
Euplectes ardens	Red-collared Widowbird	
Euplectes progne	Long-tailed Widowbird	
Lagonosticta rubricata	**African Firefinch**	
Uraeginthus angolensis	Blue Waxbill	
Estrilda astrild	Common Waxbill	
Coccopygia melanotis	Swee (Black-faced) Waxbill	
Ortygospiza fuscocrissa	African Quailfinch	
Amandava subflava	Orange-breasted Waxbill	
Amadina erythrocephala	Red-headed Finch	
Lonchura cucullata	Bronze Mannikin	
Vidua macroura	Pin-tailed Whydah	
Vidua funerea	Dusky Indigobird	
Serinus mozambicus	**Yellow-fronted (eyed) Canary**	
Serinus atrogularis	Black-throated Canary	
Serinus flavivertex	Cape (Yellow-crowned) Canary	
Serinus gularis	Streaky-headed Seedeater	
Emberiza flaviventris	Golden-breasted Bunting	
Emberiza capensis	**Cape Bunting**	
Emberiza tahapisi	Cinnamon-breasted Bunting	
Milvus aegyptius	**Yellow-billed Kite**	
Milvus migrans	Black Kite	

Appendix C: Minutes of meeting with DWS

To:	Mr Henk Moen	**Date:**	2015-04-23
From:	Crystal Rowe	**Proj #:**	UAR2967
RE:	**Ephemeral Streams associated with De Grooteboom**		

Dear Henk,

This memo serves to summarise the conclusions from a meeting held with the Department of Water and Sanitation (DWS) at their national office (Sedibeng) in Pretoria on the 20th of March 2015. The meeting was held to discuss the presence of ephemeral streams within the De Grootboom property and whether or not these streams could be regarded as wetlands or not. See example in Figure 1 and the distribution of the streams in Figure 2.

Figure 1: Example of temporary drainage on the De Grooteboom property (Left – gulley erosion through a main channel and Right – example of a narrow drainage channel)

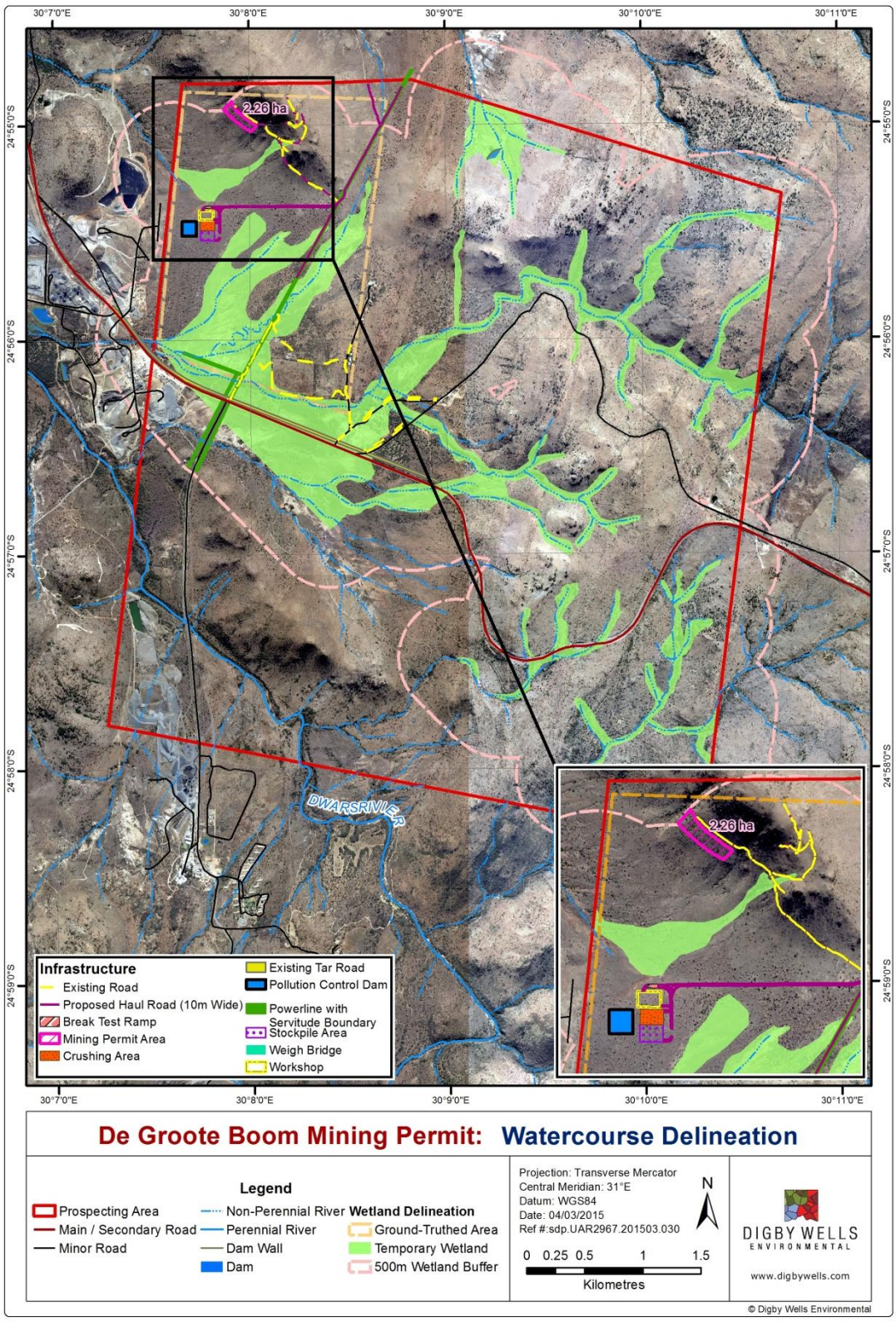

Figure 2: Delineation of ephemeral streams

It was concluded that the ephemeral streams can be regarded as watercourses (and not wetlands) for water use application and that a buffer of 100m should be placed around each watercourse. With regard to the road crossing of the ephemeral stream towards the south of the property concerned, this could be achieved by a suitably designed culvert with attenuation measures, which would permit water flow to pass unimpeded from time to time and as required. This could likewise be covered by a General Authorisation properly motivated.

In terms of GN R1198, a General Authorisation would as a general principle relieve a water user from the need to apply for a licence for impeding or diverting the flow of water in a watercourse in terms of section 21 (c) or altering the bed, banks, course or characteristics of a watercourse in terms of section 21 (i) of the Act for the purpose of rehabilitating a wetland for conservation purposes (a wetland being regarded as a watercourse under the Act).

No water use application is required for the use of existing roads, provided that they are not upgraded. In addition, a full water management plan is required, with details of stormwater management, water sources (boreholes) and waste water management.

The relevant submissions should be made to the provincial authority in Mpumalanga.

Regards,

Crystal Rowe

Wetlands and Flora Specialist

Appendix D: List of Plans

Plan 1: Locality

Plan 2: Regional Vegetation

Plan 3: Threatened Ecosystems

Plan 4: Limpopo Conservation Plan (C-plan)

Plan 5: National Freshwater Ecosystems Priority Areas (NFEPA)

Plan 6: Faunal Sampling Locations


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30°12'0"E
24°51'0"S
24°54'0"S
24°57'0"S
25°0'0"S
KENNEDY'S VALE 361
R555
SPITSKOP 333
DOORNHOEK 355
ELLOFSPRUIT
KLIPPUNT 357 KT
TWEEFONTEIN 360
FRISCHGEWAAGD 359
TWEEFONTEIN MINE RETURN WATER DAM
ZWAKWATER 377 KT
KALKFONTEIN 367
DWARS RIVIER 372
DE GROOTEBOOM 373
DWARSRIVIER
RIETFONTEIN 375 KT
RICHMOND DAM
WATERVALRIVIER
THORNCLIFFE 374
RICHMOND 370
WELGEVONDEN 9
NAAWPOORT 11 JT
VYGENHOEK 10 JT
MODDERPRUIT 13 KT
De Groote Boom Mining Permit: Local Setting
Legend
Prospecting Area
Main / Secondary Road
Minor Road
Non-Perennial River
Perennial River
Dam Wall
Dam
Wetland
Farm Boundary
Projection: Transverse Mercator
Central Meridian: 31°E
Datum: WGS84
Date: 29/08/2014
Ref #: sdp.UAR2967.201408.074
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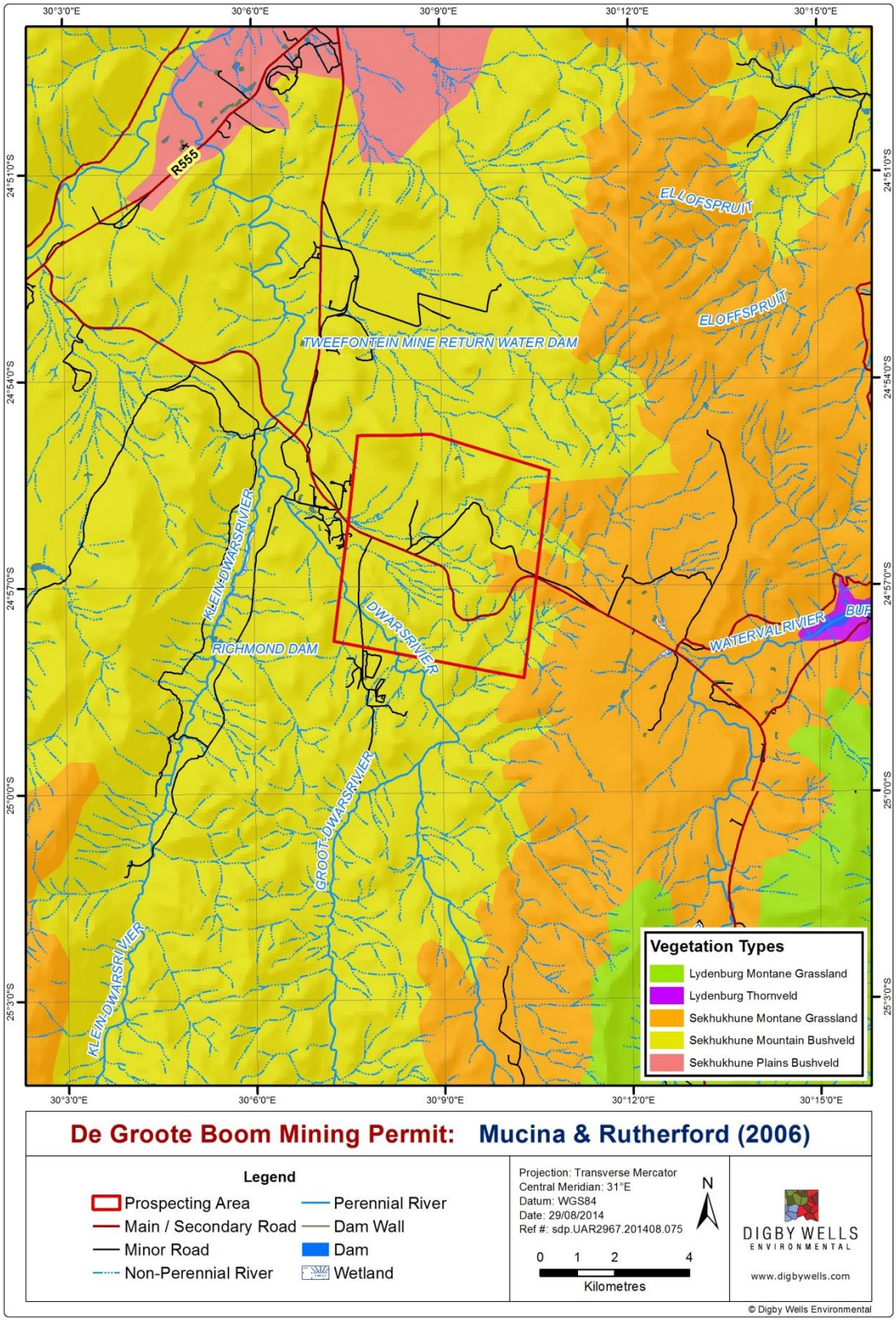
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R555
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ELOFFSPRUIT
TWEEFONTEIN MINE RETURN WATER DAM
KLEIN-DWARSRIVIER
DWARSRIVIER
RICHMOND DAM
WATERVALRIVIER
GROOT-DWARSRIVIER
KLEIN-DWARSRIVIER
Vegetation Types
Lydenburg Montane Grassland
Lydenburg Thornveld
Sekhukhune Montane Grassland
Sekhukhune Mountain Bushveld
Sekhukhune Plains Bushveld
De Groote Boom Mining Permit: Mucina & Rutherford (2006)
Legend
Prospecting Area
Main / Secondary Road
Minor Road
Non-Perennial River
Perennial River
Dam Wall
Dam
Wetland
Projection: Transverse Mercator
Central Meridian: 31°E
Datum: WGS84
Date: 29/08/2014
Ref #: sdp.UAR2967.201408.075
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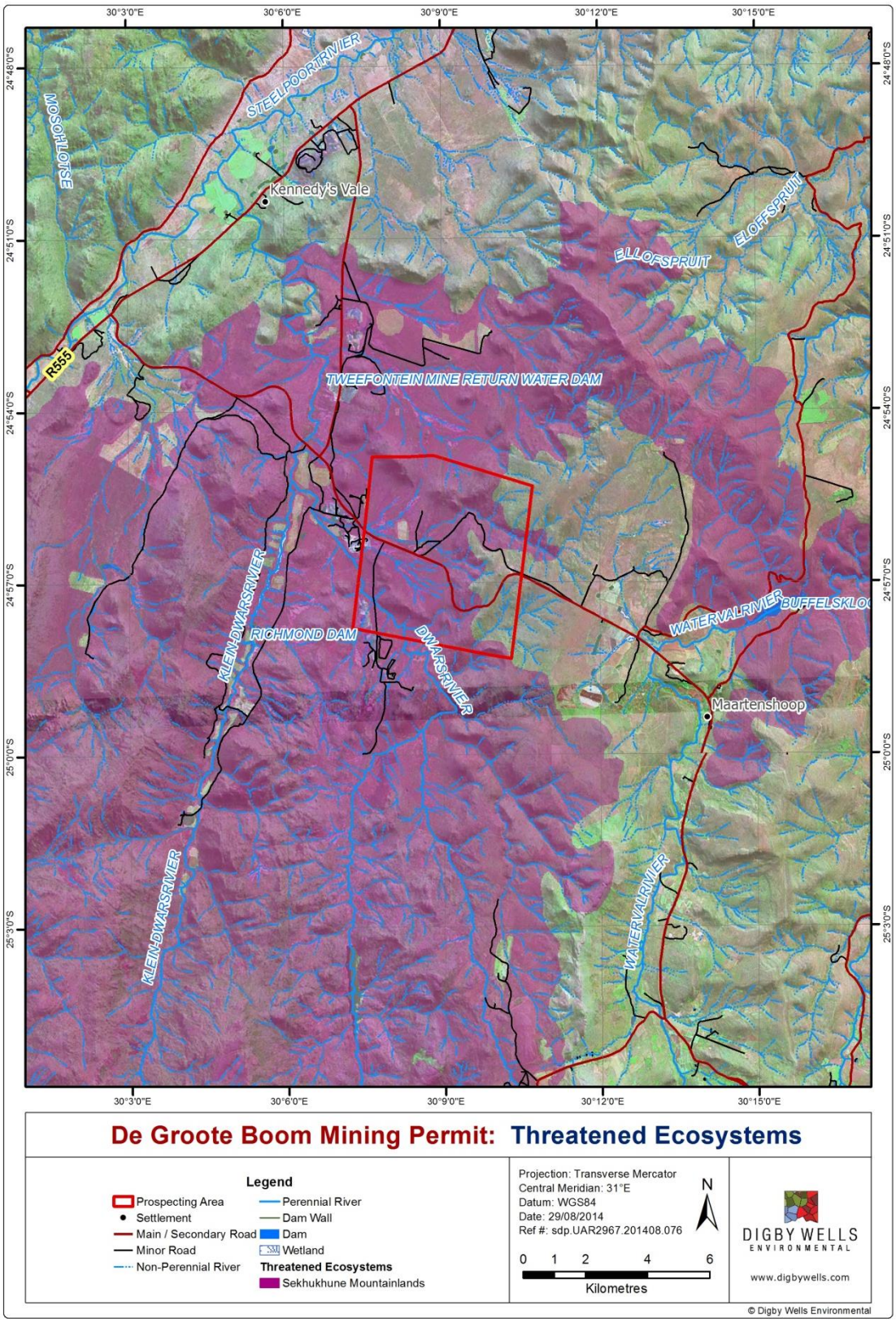
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25°0'0"S
25°3'0"S
MOSHLOSIE
STEELPOORTRIVIER
Kennedy's Vale
ELLOFSPRUIT
R555
TWEEFONTEIN MINE RETURN WATER DAM
KLEIN-DWARSRIVIER
RICHMOND DAM
DWARSRIVIER
WATERVALRIVIER
BUFFELSKLO
Maartenshoop
KLEIN-DWARSRIVIER
WATERVALRIVIER
De Groote Boom Mining Permit: Threatened Ecosystems
Legend
Prospecting Area
Settlement
Main / Secondary Road
Minor Road
Non-Perennial River
Perennial River
Dam Wall
Dam
Wetland
Threatened Ecosystems
Sekhukhune Mountainlands
Projection: Transverse Mercator
Central Meridian: 31°E
Datum: WGS84
Date: 29/08/2014
Ref #: sdp.UAR2967.201408.076
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Kilometres
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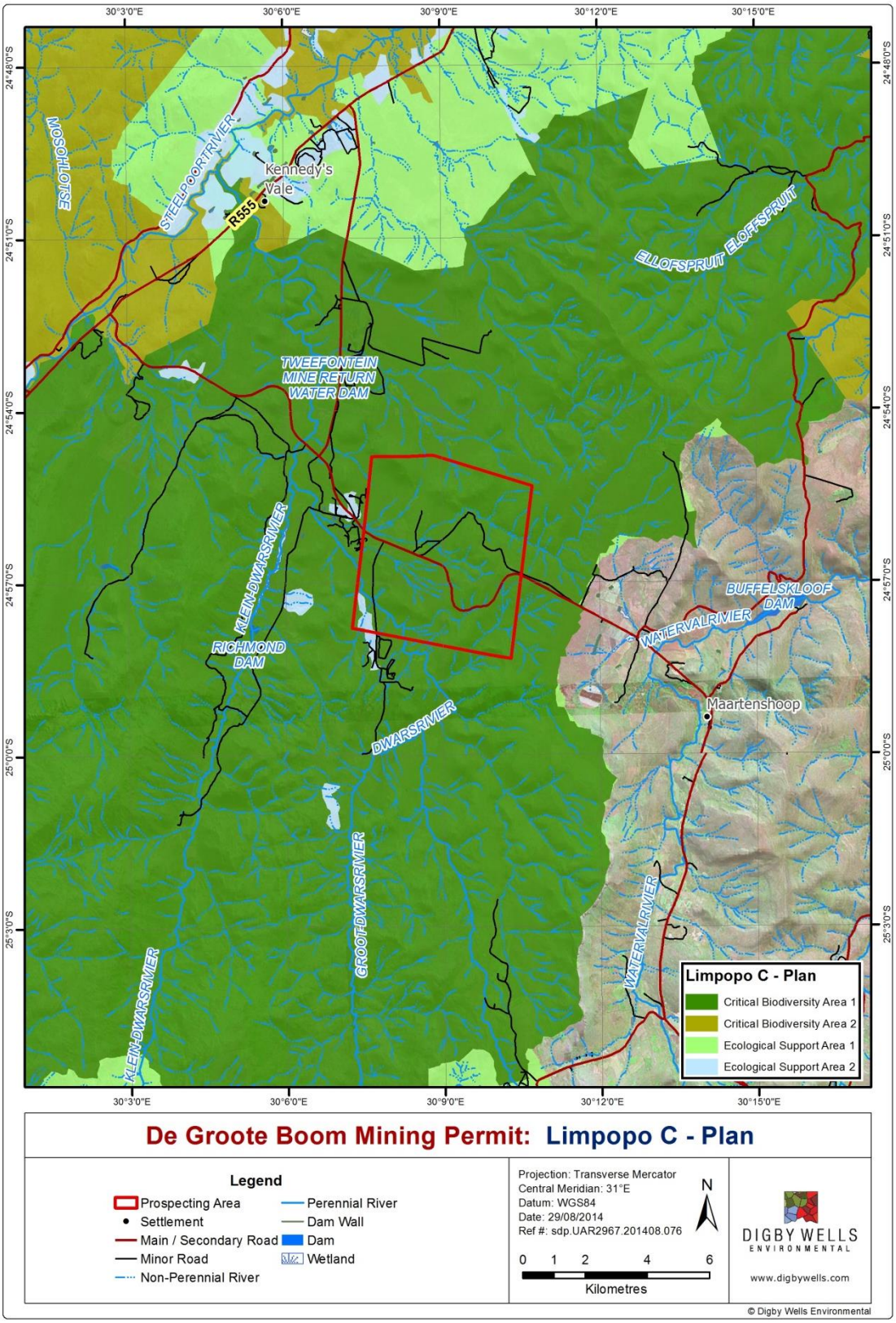
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24°57'0"S
25°0'0"S
25°3'0"S
MOSOMLOTSE
STEELPOORTRIVIER
Kennedy's Vale
R555
ELLOFSPRUIT
ELOFFSPRUIT
TWEEFONTEIN MINE RETURN WATER DAM
KLEIN-DWARSRIVIER
RICHMOND DAM
BUFFELSKLOOF DAM
WATERVALRIVIER
Maartenshoop
DWARSRIVIER
GROOT-DWARSRIVIER
KLEIN-DWARSRIVIER
WATERVALRIVER
Limpopo C - Plan
Critical Biodiversity Area 1
Critical Biodiversity Area 2
Ecological Support Area 1
Ecological Support Area 2
De Groote Boom Mining Permit: Limpopo C - Plan
Legend
Prospecting Area
Settlement
Main / Secondary Road
Minor Road
Non-Perennial River
Perennial River
Dam Wall
Dam
Wetland
Projection: Transverse Mercator
Central Meridian: 31°E
Datum: WGS84
Date: 29/08/2014
Ref #: sdp.UAR2967.201408.076
N
0 1 2 4 6
Kilometres
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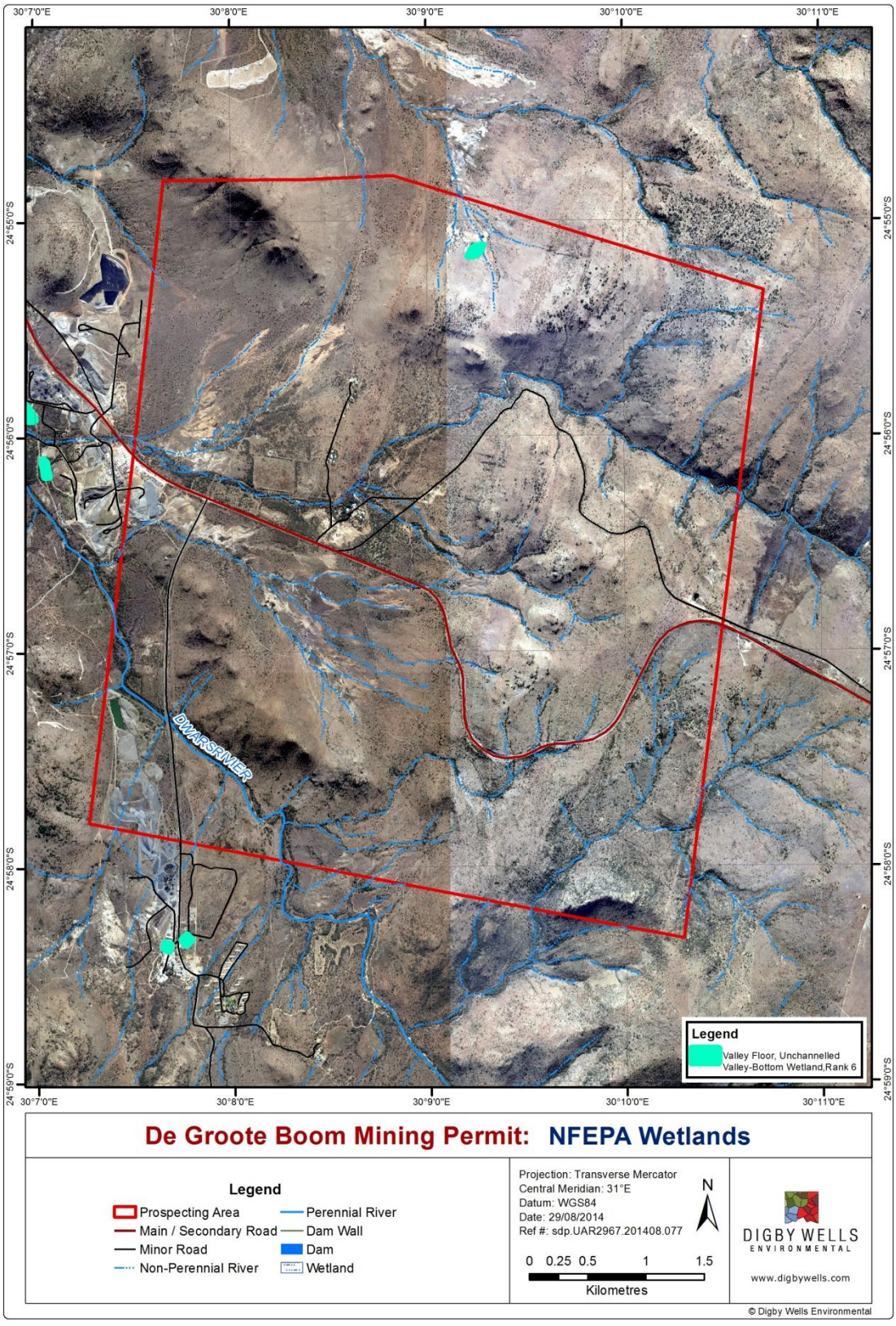
30°7'0"E
30°8'0"E
30°9'0"E
30°10'0"E
30°11'0"E
24°55'0"S
24°56'0"S
24°57'0"S
24°58'0"S
24°59'0"S
DWARSRIVIER
Legend
Valley Floor, Unchannelled
Valley-Bottom Wetland,Rank 6
De Groote Boom Mining Permit: NFEPA Wetlands
Legend
Prospecting Area
Main / Secondary Road
Minor Road
Non-Perennial River
Perennial River
Dam Wall
Dam
Wetland
Projection: Transverse Mercator
Central Meridian: 31°E
Datum: WGS84
Date: 29/08/2014
Ref #: sdp.UAR2967.201408.077
N
0 0.25 0.5 1 1.5
Kilometres
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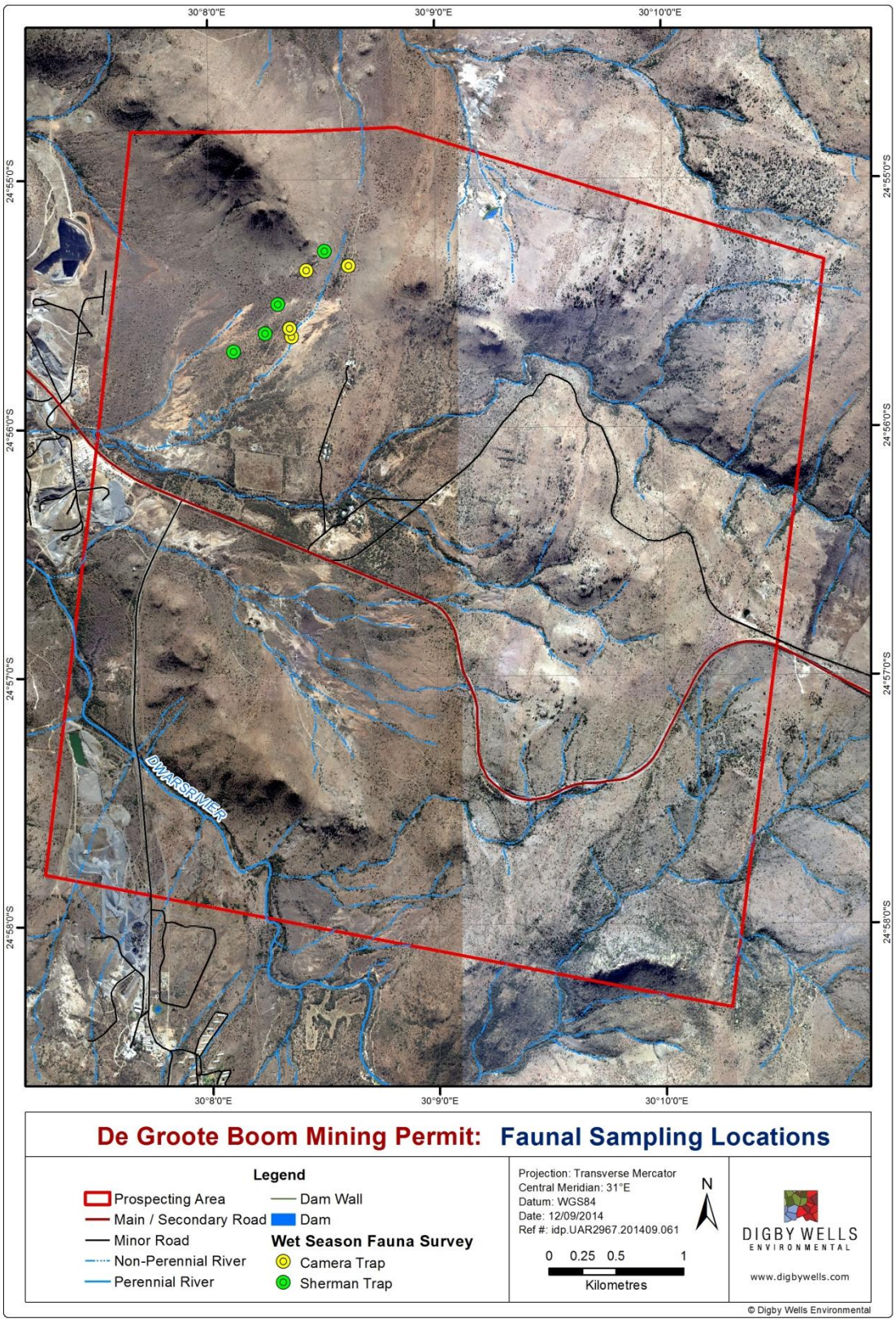
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24°55'0"S
24°56'0"S
24°57'0"S
24°58'0"S
DWARSRIVIER
De Groote Boom Mining Permit: Faunal Sampling Locations
Legend
Prospecting Area
Main / Secondary Road
Minor Road
Non-Perennial River
Perennial River
Dam Wall
Dam
Wet Season Fauna Survey
Camera Trap
Sherman Trap
Projection: Transverse Mercator
Central Meridian: 31°E
Datum: WGS84
Date: 12/09/2014
Ref #: idp.UAR2967.201409.061
N
0 0.25 0.5 1
Kilometres
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