APPENDIX D: SPECIALIST REPORTS

ANNEXURE A: Sensitivity Screening for the extension of The Christian Community Center

AVONTUUR

BASELINE TERRESTRIAL ECOLOGY STUDY & BIODIVERSITY VALUE ASSESSMENT



APRIL 2016

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EXECUTIVE SUMMARY

ECOREX Consulting Ecologists CC was appointed by Steven Henwood of Henwood Environmental Solutions to conduct a terrestrial ecology study and biodiversity value assessment on Portion 34 of the farm Avontuur 725 JT, approximately 5 km west of the town of Badplaas, Gert Sibande District, Mpumalanga. The study comprised flora and vertebrate fauna (mammals, birds, reptiles, frogs). The key objective of this study was to conduct a baseline terrestrial ecology survey and assess the biodiversity value of the terrestrial habitats represented. The study will form the basis for a future impact assessment.

The study area covers approximately 101 ha and is situated within KaNgwane Mountain Grassland, which is classified as **Vulnerable** and is listed as a Threatened Ecosystem. About 15 ha, or 68% of the study area, has been transformed, mostly through commercial crop cultivation and rural residential developments. The remaining 7 ha includes two untransformed vegetation communities, which were identified within the study area on the basis of distinctive vegetation structure, floristic composition and position in the landscape:

- Tall Closed Grassland;
- Seep Wetland.

One-hundred and thirty-nine plant species were recorded within the study area during fieldwork. Five of these are protected under the Mpumalanga Nature Conservation Act (No. 10 of 1998). No plant species of conservation concern were confirmed to occur in the study area. Ten species of conservation concern have been recorded within the quarter-degree grid 2530 DC and surrounding grids with similar habitat, of which three species have a moderate chance of occurring because of the presence of suitable habitat. All three are assessed as Declining.

No fauna species of conservation concern were confirmed during fieldwork. Four Near Threatened mammals, namely Serval, Water Rat, Honey Badger and Spotted-necked Otter, are considered to have a moderate to high likelihood of occurring in the study area. Thirteen bird species of conservation concern potentially occur in the general vicinity of the study area. None of these were confirmed in the study area during fieldwork and only two species have a moderate likelihood of occurring: Lanner Falcon and Southern Bald Ibis (both Vulnerable). No breeding habitat is present for either. Two Near Threatened reptiles have a

low likelihood of occurring and no amphibian species of conservation concern potentially occur.

Both untransformed vegetation communities have a High Biodiversity Value, which means that these are key systems that need to remain intact and functional. Impacts within these communities will have the highest significance levels and therefore the impact footprint should remain outside of these communities as much as possible. Tall Closed Grassland has High Conservation Value but Moderate Functional Value and Seep Wetland has a Moderate Conservation Value, but High Functional Value.

Most of the untransformed vegetation within the study area falls within **Critical Biodiversity Area (CBA): Optimal** in the MBSP. The transformed and degraded areas are classified as Heavily Modified. Areas falling within the Modified category are the preferred areas for a wide variety of land-use types, which includes housing and agricultural development.

Key potential impacts associated with the proposed development are:

- Loss of a portion of a Vulnerable vegetation type and listed Threatened Ecosystem;
- Loss of important regional biodiversity;
- Loss of plant species of conservation importance;
- Degradation of wetland habitat;
- Invasion of natural habitat by alien plants;
- Loss of habitat for conservation-important fauna.

Preliminary recommendations are as follows:

- A conservation buffer of 32m is recommended around all wetlands, measured from the outer edge of the temporary zone. The location of infrastructure should take place outside this buffer zone.
- The housing infrastructure footprint should be located outside all untransformed grassland and wetlands.
- If infrastructure is planned within any natural vegetation, the areas should be checked by a suitably experienced botanist to locate all conservation-important species. These plants should be marked and the relevant permits applied for before removal and translocated to nearby suitable habitat prior to vegetation being cleared.

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- According to the National Environmental Management: Biodiversity Act 2004 (Act 10 of 2004) Alien and Invasive Species Lists, 2014 all declared alien invasive plant species need to be removed from wetland areas. It is therefore recommended that the developers implement an alien plant control program to combat the infestation present. This program should include regular inspections and follow-ups.
- All existing and proposed roads to contain adequate stormwater drainage and erosion control measures.

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Abbreviations

mamsl	Metres Above Mean Sea Level
MBSP	Mpumalanga Biodiversity Sector Plan
MNCA	Mpumalanga Nature Conservation Act (No. 10 of 1998)
MTPA	Mpumalanga Tourism and Parks Agency
NEMBA ToPS	National Environmental Management: Biodiversity Act Threatened or Protected Species (No. 10 of 2004)
NFA	National Forest Act (No. 30 of 1998)
PRECIS	National Herbarium Pretoria (PRE) Computerised Information System

Terminology

Alien	Introduced from elsewhere: neither endemic nor indigenous.
Biodiversity	The structural, functional and compositional attributes of an area, ranging from genes to landscapes.
Degraded	An ecosystem that is a poor ecological state, usually through impacts such as invasion by alien plants, severe overgrazing, poor burning regimes, etc. These systems still contain a moderate proportion of indigenous flora.
Geophyte	Plants that produce their growth points from organs stored below the ground, an adaption to survive frost, drought and / or fire.
Transformed	Transformed ecosystems are no longer natural and contain little or no indigenous flora. Examples include agricultural lands, plantations, urban areas, etc.

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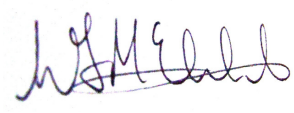
Declaration of Independence

We declare that we have been appointed as independent consulting ecologists with no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2010. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. Remuneration for our services by the proponent is not linked to approval by any decision-making authority responsible for authorising this development.



W.L.McCleland *12 April 2016*

D.R. McKenzie *12 April 2016*

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1. INTRODUCTION

ECOREX Consulting Ecologists CC was appointed by Steven Henwood of Henwood Environmental Solutions to conduct a terrestrial ecology study and biodiversity value assessment on a portion of land west of Badplaas that is earmarked for housing and agricultural development (Figure 1). This study will provide a basis for assessing potential impacts of the proposed project on terrestrial ecology and guide the design and location of planned infrastructure. The study comprised flora and key vertebrate fauna (mammals, birds, reptiles, frogs). The two key deliverables for this study were a baseline terrestrial ecology survey and an integrated Biodiversity Value Assessment.

The study team was as follows:

Duncan McKenzie – Terrestrial Ecologist. He has been involved in biodiversity assessments for ECOREX for eight years and countries of work experience include Lesotho, Swaziland, Mali, Mozambique, Sierra Leone, South Africa, Tanzania and Democratic Republic of the Congo. Duncan has previously worked as a Regional Coordinator for the Mondi Wetlands Project and lectures on many aspects of conservation in Nelspruit and the Kruger National Park. He is currently the Regional Co-ordinator for the South African Bird Atlas Project, sits on the KZN Bird Rarities Committee and is a co-author on the Wildflowers of the Kruger National Park project.

Linda McKenzie (GIS Specialist). Linda is a GIS Specialist/GIS Analyst with over 12 years' experience in the industry. For the last 3 years she has operated her own GIS Consultancy called Digital Earth. She has extensive experience in both the private and public sector, as has worked on a wide variety of projects and GIS applications. These include, most recently, vegetation and sensitivity mapping, landcover data capture, municipal roads master planning, hydroelectric scheme and wind farm feasibility mapping and town planning, land surveyor and engineering support services. Linda currently serves as treasurer for GISSA Mpumalanga and is a registered Professional GISc Practitioner (PGP0170).

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2. TERMS OF REFERENCE

A. Conduct an assessment of the terrestrial ecosystems within the project area (vertebrate fauna and flora), which will include the following:
   - Description of vegetation communities;
   - Vegetation Map;
   - Description of faunal assemblages (mammals, birds, reptiles and frogs).

B. Assessment of the Biodiversity Value of the vegetation units represented, which will comprise:
   - Assessment of conservation importance and functional importance of each vegetation unit;
   - Biodiversity Value Map – including no-go and buffer areas.

Emphasis will be placed on locating species of conservation importance (Red Data, endemic, and / or protected).

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3. STUDY AREA

The proposed development is situated on Portion 34 of the farm Avontuur 725 JT, approximately 5 km west of the town of Badplaas, Gert Sibande District, Mpumalanga (Figure 1). The study boundary forms a square of land around open grassland and a central developed area containing houses, sheds and orchards. The study area is approximately 22 hectares in size, of which 15 ha is either currently under macadamia orchards, timber plantations or buildings. The remaining 7 ha comprises natural vegetation in varying degrees of disturbance or degradation. Surrounding land uses include small-scale agricultural and residential developments. The study area is situated within the quarter-degree grid 2530 DC at an altitude of approximately 1200 mamsl.

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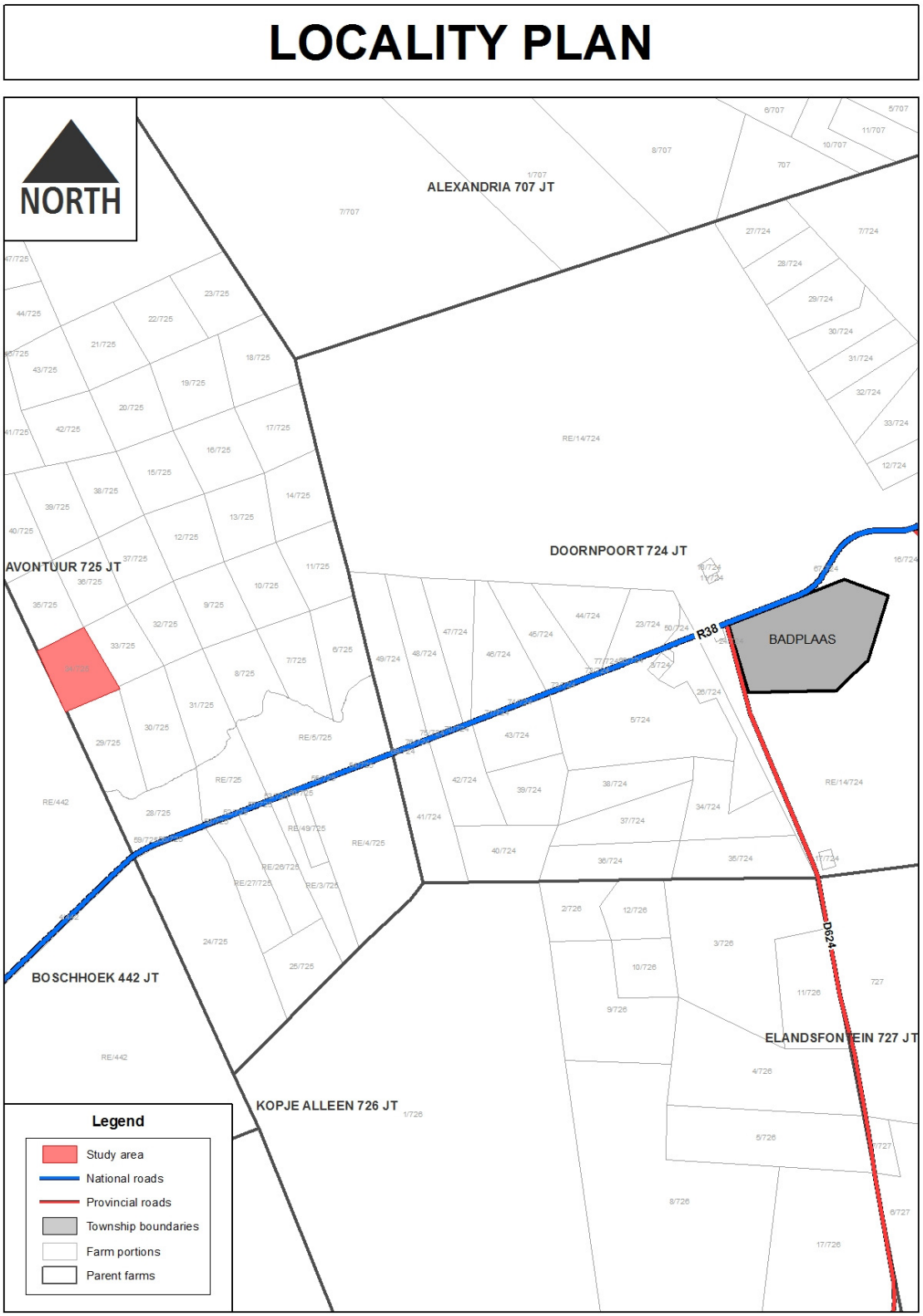

Figure 1. Location of Study Area

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4. METHODS

4.1 Flora

Desktop

Vegetation communities were identified prior to fieldwork using satellite imagery supplied by Digital Earth. Red Data plant species listed for the quarter-degree grid 2530 DC in the Mpumalanga Tourism & Parks Agency's threatened species database, as well as PRECIS data from the South African National Biodiversity Institute (SANBI), were used to produce a list of the most likely threatened species, which were searched for during fieldwork.

Fieldwork

Vegetation communities identified in the desktop phase were ground-truthed during a single day field trip on the 23rd February 2016. Representative meandering transects were surveyed on foot in each vegetation community and species lists compiled for each transect. Plants were listed according to each of the vegetation communities identified during the desktop phase. Plants not identified to species level were collected and dried in a plant press for identification at a later stage.

4.2 Fauna

Desktop

Lists of conservation-important mammals, birds, reptiles and frogs potentially occurring within the proposed agricultural development were prepared using data from the MTPA's threatened species database, Friedmann & Daly (2004), the Southern African Bird Atlas Project 2 http://sabap2.adu.org.za/, Barnes (2000), Minter *et al*. (2004) and Bates *et al*. (2014). The above data were captured mostly at a quarter-degree spatial resolution, but were refined by excluding species unlikely to occur within the study area, due to unsuitable habitat characteristics (e.g. altitude and land-use). Bat species thought to only forage over the study area (i.e. mostly cave-roosting species) were not included in the assessment due to the lack of suitable caves within the study area. Potential occurrence of fauna in the study area was predicted based on knowledge of known habitat requirements of local fauna species.

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Fieldwork

Birds were identified audially and visually using Bushnell 10x42 binoculars. Observations were made incidentally during the time that the vegetation survey was conducted, and limited to birds seen and heard within the study area and immediate surrounds. Mammals, reptiles and frogs were recorded incidentally as they were encountered during the survey through direct evidence (sightings) and indirect evidence (spoor, dung).

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4.3 Biodiversity Value Assessment

The biodiversity value of each vegetation community was based on a combination of Conservation Importance and Functional Importance, each of which were rated on a five-point scale, from Very Low to Very High, as indicated in Table 1. This method was based on Biodiversity Action Plan guidelines developed by Anglo American (Coombes, 2004).

Conservation Importance

The method of calculating conservation importance was based on six key parameters, which were each allocated a score that ranged between zero (Not Important) and twenty (Very Important) (Table 2). The overall conservation importance was based on the median value of the six parameters, namely:

1. *Protection Status*. The extent to which the vegetation community is currently formally protected (e.g. World Heritage Site; RAMSAR, National Park; Provincial Game Reserve; Private Conservancy etc.);

2. *Size*. The extent to which the larger vegetation type of which the defined area is a representative sample, still exists; this incorporates the conservation status of threatened vegetation types in that vegetation types with the highest threat status are assumed to have the lowest extent of habitat remaining;

3. *Species Diversity*. The extent to which the vegetation community supports a high diversity of plants or animals;

4. *Species of Conservation Concern*. The extent to which the vegetation community supports threatened species and other species of conservation concern;

5. *Unique Habitat or Taxa*. Presence of range-restricted plants or animals or unusual natural feature;

6. *Present Ecological State*. The extent to which the vegetation community is modified from natural conditions.

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Functional Importance

The method of calculating functional importance was based on four ecosystem service categories, which were each allocated a score that ranged between zero (Not Important) and twenty (Very Important) (Table 3). The overall functional importance was based on the median value of the four ecosystem service categories, namely:

1. *Provisioning Services*. The extent and frequency that the vegetation community provides consumable goods (e.g. food, freshwater, timber, fibre, medicinal plants, etc.);

2. *Regulating Services*. The extent to which the vegetation community provides regulating services (e.g. flood attenuation, water purification, storage, climate regulation, carbon sequestration, etc.);

3. *Cultural Services*. The extent to which the vegetation community provides cultural services (e.g. tourism attraction, spiritual attraction, aesthetic value, etc.), and;

4. *Supporting Services*. The extent to which the vegetation community provides supporting ecological services, either positive (e.g. migration corridor, refuge area, primary production, pollination, pest control, nutrient cycling, soil formation), or negative (e.g. disease sources, pest outbreaks).

By integrating assessments of the conservation importance and functional importance of the different vegetation communities, an assessment of Biodiversity Value was made. This is indicated spatially in Figure 3.

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Table 1. Method of calculating Biodiversity Value of vegetation communities

Conservation Importance	Functional Importance				
	Very High	High	Moderate	Low	Very Low
Very High	Very High	Very High	High	High	Moderate
High	Very High	High	High	Moderate	Moderate
Moderate	High	High	Moderate	Moderate	Low
Low	High	Moderate	Moderate	Low	Low
Very Low	Moderate	Moderate	Low	Low	Very Low

Table 2. Method of calculating Conservation Importance of vegetation communities

Parameter	Very High	High	Moderate	Low	Very Low
Protection Status	International	National	Regional	Local	None
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Size / Length	Very small	Small	Moderate	Large	Very Large
	(<500km^2)	(500 to 1,000km^2)	(1,000 to 20,000km^2)	(20,000 to 50,000km^2)	(> 50,000km^2)
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species Diversity	Noticeably High		Moderate		Noticeably Low
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species of Conservation Concern	Noticeably High		Moderate		Noticeably Low
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Unique Habitat or Taxa	Noticeably High		Moderate		Noticeably Low
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Present Ecological State	Natural, largely Unmodified	Slightly modified	Moderately Modified	Considerably Modified	Severely Modified
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

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Table 3. Method of calculating Functional Importance of vegetation communities

Parameter	Very High	High	Moderate	Low	Very Low
Provisioning Services	Constant	Regular	Frequent	Occassional	Intermittent
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Regulating Services	Very High	High	Moderate	Low	Very Low
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Cultural Services	Very High	High	Moderate	Low	Very Low
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Supporting Services	Very High	High	Moderate	Low	Very Low
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

4.4 Assumptions, Limitations And Knowledge Gaps

4.4.1 Seasonality

The assessment was based on a single field survey in the rain season only. It is possible that plants which flower at other times of the year are underrepresented. However, the timing of the survey did coincide with peak fauna activity levels and peak flowering times for many sensitive plant species and is unlikely to have significant consequences on a record of decision.

4.4.2 Overlooked Species

Certain plant species, particularly geophytes, will only flower in seasons when conditions are optimal and may thus remain undetected, even over a survey that encompasses several seasons. Other plant species may be overlooked because of very small size and / or extreme rarity. A sampling strategy will always represent merely a subset of the true diversity of the study area. However, the level of sampling effort for this study was appropriate for the objectives of the study.

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5. BIODIVERSITY BASELINE DESCRIPTION

5.1 Flora

5.1.1 Regional Context

According to Mucina & Rutherford (2006), the study area is situated within KaNgwane Mountain Grassland, which they classify as **Vulnerable**. More recently, KaNgwane Mountain Grassland has been listed as a Threatened Ecosystem (Notice 1002 of Government Gazette 34809, 9 December 2011), and classified as **Vulnerable**. This vegetation type occurs over much of the south-eastern Mpumalanga and western Swaziland Highveld and just enters northern KwaZulu-Natal. It occurs along the lower slopes of the Escarpment, from the Phongolo River in the south, northwards to the Usutu River and to the uppermost Lomati River near Carolina. KaNgwane Mountain Grassland originally covered about 612 000 ha, of which 41 % has been transformed, mostly through afforestation, cultivation and urbanisation. Less than 1 % is formally protected, and at least four plants are endemic to this vegetation type Mucina & Rutherford, 2006).

The northern portions of the study area have been classified within the Mpumalanga Biodiversity Sector Plan (MBSP) as **Critical Biodiversity Area (CBA): Optimal** (Lötter *et al., 2014*). The central transformed areas are classified as **Heavily Modified** and the southern portion is classified as **Other Natural Areas.** CBA: Optimal refers to areas that are optimally located to meet both the various biodiversity targets and other criteria. These areas are not irreplaceable but they are the most efficient land configuration to meet all biodiversity targets (Lötter *et al., 2014*). The land-use guidelines recommended in the MBSP for CBA: Optimal areas include maintaining the areas in a natural state with no further loss of habitat. This includes activities such as livestock or game farming and conservation management. Large-scale mining, cultivation, urban or industrial development are examples of unacceptable land uses. However, should small-scale land-use be proposed then there are a few guidelines set out to adhere to before development takes place. These include:

- Locating and designing the development to be as biodiversity-sensitive as possible;
- Performing specialist studies (eg. biodiversity);
- Provision of biodiversity offsets in exchange for biodiversity loss (Lötter *et al., 2014*).

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Other Natural Areas refer to areas that have not been identified as a priority in the current systematic biodiversity plan but retain most of their natural character, while performing a range of biodiversity and ecological functions. Other Natural Areas offer much more flexibility in terms of permissible land uses, but the desired management objective should be to minimise habitat and species loss and ensure ecosystem functionality through strategic landscape planning.

The study area is situated on the southern edge of the Barberton Centre of Plant Endemism, which is an area that has an unusually high number of plants unique to that area (Van Wyk & Smith, 2001).

5.1.2 Local Vegetation Communities

Two untransformed vegetation communities were identified within the study area on the basis of distinctive vegetation structure (grassland, woodland, thicket, etc.), floristic composition (dominant and diagnostic species) and position in the landscape (mid-slopes, terrace, crest, etc.). Transformed and degraded areas make up 15 ha, or 68% of the study area. Most of the transformed and degraded land is covered by macadamia orchards, various buildings and old lands. The untransformed vegetation communities are described in detail below:

5.1.2.1 *Setaria sphacelata – Loudetia simplex* Disturbed Tall Closed Grassland

This vegetation community occurs in two pockets north and south of the macadamia orchard in the central-western portion of the study area (Figure 2). *Setaria sphacelata – Loudetia simplex* Disturbed Tall Closed Grassland covers approximately 4 ha which equates to almost 18% of the area surveyed. Vegetation structure is Tall Closed Grassland (*sensu* Edwards, 1983; Table 4). Grasses dominate this community, and include *Setaria sphacelata, Loudetia simplex, Hyperthelia dissoluta, Themeda triandra* and *Diheteropogon amplectens*. Herbs are reasonably well represented with *Crabbea hirsuta, Dicoma anomala* subsp. *anomala, Euryops laxus, Helichrysum rugulosum, Polygala hottentotta, Ipomoea bathycolpos* and *Pearsonia sessilifolia* subsp. *filifolia* all regularly recorded. Geophytes recorded include *Hypoxis rigidula* var. *rigidula, H. obtusa, Ledebouria ovatifolia* and a *Gladiolus* species. Small clumps of indigenous trees and shrubs are found scattered throughout and include *Searsia chirindensis, Asparagus laricinus, Lopholaena coriifolia, Erythrina lysistemon, Gymnosporia buxifolia* and *Diospyros lycioides* subsp. *sericea*. Most of this community is disturbed through the presence of alien weeds such as *Bidens pilosa, Tagetes minuta* and

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Solanum sisymbriifolium as well as general disturbance through old farming activities. A total of 83 species (60% of the entire list) was recorded from *Setaria sphacelata – Loudetia simplex* Disturbed Tall Grassland (Appendix 1). Species fidelity, which is closely linked to community uniqueness, is very high, with 64 species (77% of the community list) occurring nowhere else in the study area.

Three conservation-important species were recorded (Table 6), none of which are considered to be of conservation concern as defined by Raimondo *et al*. (2009)[1]. They include a few *Aloe* species which were not in flower, scattered *Gladiolus* species (also not in flower) and a few *Brunsvigia natalensis*, all of which are protected under the Mpumalanga Nature Conservation Act (No. 10 of 1998).

Table 4. Photographs of Tall Closed Grassland

Disturbed Tall Closed Grassland was assessed as having High Biodiversity Value through integration of High Conservation Importance and Moderate Functional Importance scores (Table 7). It was rated as having High Conservation Importance (Appendix 5) because of a high rating in the following components:

- Protection Status – a High score was allocated due to this community being representative of a listed Threatened Ecosystem;
- Size – grassland patches are mostly small and fragmented and are embedded in a Vulnerable vegetation type;
- Unique Habitat or Taxa – 77% of the plants growing within the study area are restricted to this community;

[1] Species of conservation concern include those with a status of Declining, Near Threatened, Data Deficient, Vulnerable, Endangered and Critically Endangered)

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- Present Ecological State – grassland patches in the study area are largely untransformed, although still disturbed through alien plant infestation and historical farming activities.

Tall Closed Grassland was given a Moderate Functional Importance rating (Appendix 5) because of low scores in Provisioning and Regulating Services and moderate scores in Cultural Services (aesthetic value) and Supporting Services (outcrops acting as refuge areas for flora and fauna).

5.1.2.2 *Imperata cylindrica - Ischaemum fasciculatum* Seep Wetland

The Seep Wetland areas are restricted to the northern portion of the study are, and contain a small dam and an equally small portion of a stream in the far north-eastern corner (Figure 2). Vegetation structure is mostly Short Closed Grassland (*sensu* Edwards, 1983). Seep Wetland covers approximately 3 ha or 14% of the entire study area. The grasses *Imperata cylindrica* and *Ischaemum fasciculatum* dominate this community. Other common grass and sedge species recorded include *Kyllinga erecta, Leersia hexandra, Arundinella nepalensis, Eragrostis gummiflua, Setaria incrassata*, *Juncus exsertus, Miscanthus junceus, Paspalum urvillei* and *Pycreus polystachyos.* var*. polystachyos*. Common herbs found include *Helichrysum aureonitens, Mentha aquatica*, *Dissotis canescens, Pycnostachys reticulata* and *Nidorella auriculata*.

A total of 50 species (36% of the entire list) was recorded from Seep Wetland, the lowest species richness of the two untransformed vegetation communities in the study area (Appendix 1). Species fidelity, which is closely linked to community uniqueness, is high, with 37 species (74% of the community list) occurring nowhere else in the study area.

A single conservation-important species was recorded in this vegetation community: a *Habenaria* species with old flowers. This plant is protected under the Mpumalanga Nature Conservation Act (No. 10 of 1998).

Imperata cylindrica - Ischaemum fasciculatum Seep Wetland was assessed as having High Biodiversity Value through integration of Moderate Conservation Importance and High Functional Importance scores (Table 7). This community was rated as having Moderate Conservation Importance (Appendix 5) in spite of high ratings for the Protection Status – a High score was allocated because of legislation and government policy preventing development of wetlands. However, moderate scores in the other CI components reduced

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the overall CI score to Moderate. Wetlands were allocated a High Functional Importance rating (Appendix 5) because of high scores in the following components:

- Provisioning Services – fibres, medicinal plants;
- Regulating Services - flood attenuation, water purification;
- Supporting Services – nutrient cycling, migration corridors.

Table 5. Photograph of Seep Wetland

5.1.2.3 Transformed / Degraded

Approximately 68% of the study area is transformed. Much of the central area and eastern portions of the study area are either planted under macadamia orchards, have various buildings on or constitute re-vegetated old lands. These old lands are mostly found in the eastern and north-eastern portions and the former contour and crop rows are visible on the aerial imagery supplied by Digital Earth. These areas have mostly been re-colonised by the tall grass *Hyperthelia dissoluta* and contain very few herbaceous species. Some of these old lands are shown as CBA: optimal on the MBSP but are too small to have been mapped accurately on the scale used.

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5.1.3 Conservation-Important Flora

A total of 139 plant species was recorded within the study area during fieldwork (Appendix 1). Five of these are protected under the Mpumalanga Nature Conservation Act (No. 10 of 1998) (Table 6). The single *Aloe marlothii* growing within the degraded area is most likely planted. None are considered to be of conservation concern as defined by Raimondo *et al.* (2009).

Ten plant species with conservation concern have been recorded from the quarter-degree grid 2530 DC and surrounding grids with similar vegetation communities, of which three species have a moderate chance of occurring (Appendix 2). All three species are widespread across north-eastern South Africa and listed as Declining due to over-collection for the medicinal plant trade: the geophytes *Eucomis autumnalis* subsp. c*lavata*, *Hypoxis hemerocallidea* and *Crinum macowanii*. Although these species were not confirmed during fieldwork, they could have been overlooked because of tall and very dense grass and herbaceous cover. All three could potentially occur within the Seep Wetland which is already classified as having High Biodiversity Value so this is not seen as a significant limitation.

Table 6. Conservation-important plant species confirmed during fieldwork

Taxa	Growth Form	Protected	Vegetation Communities		
			Disturbed Grassland	Seep Wetland	Degraded / Transformed
Family Amaryllidaceae					
Brunsvigia natalensis Baker	bulb	MNCA	r		
Family Asphodelaceae					
Aloe marlothii A.Berger subsp. *marlothii*	succulent	MNCA			r
Aloe sp. (no flowers)	succulent	MNCA	r		
Family Iridaceae					
Gladiolus sp. (no flowers)	bulb	MNCA	r		
Family Orchidaceae					
Habenaria sp. (old flowers)	herb	MNCA		r	
		5	5		

MNCA = Mpumalanga Nature Conservation Act (No. 10 of 1998)
R = rare occurrence

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Figure 2. Vegetation communities identified within the Study Area

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5.2 Terrestrial Fauna

5.2.1 Mammals

Situated in the grassland biome just below the Escarpment, the Badplaas area has moderate mammal diversity and relatively low numbers of endemics and Red Data species[1]. Large tracts of grassland are present to the west of the study area but the area between Avontuur and the town of Badplaas has some disturbance from agriculture, townships and alien plant infestation. An estimated 24 conservation-important mammals potentially occur within the project area (Appendix 4). Several bat species are highly likely to occur overhead, such as Geoffroy's Horseshoe Bat (*Rhinolophus clivosus*), but these species are only likely to feed over the site because of the shortage of suitable roosting sites.

Of the potentially occurring species, 21 are considered to be of conservation concern[2] however only one is considered threatened (Appendix 4): Oribi (*Ourebia ourebi*). This small antelope has lost up to 50% of its habitat across eastern South Africa, mainly through afforestation, and the remaining 50% is often improperly managed for Oribi[3]. This species has a low likelihood of occurring within the study area due to the disturbance levels present and may at best only occasionally forage within the untransformed grasslands. Seven species are Near Threatened, which are species close to or likely to soon qualify for the status of Vulnerable. One of these, Serval (*Leptailurus serval*) has a high likelihood of occurring due to the presence of suitable habitat. Honey Badger (*Mellivora capensis*) and Side-striped Jackal (*Canis adustus*) have a moderate likelihood of occurring anywhere in natural habitat in the study area. Brown Hyaena has been recorded from the grid 2530 DC but is unlikely to occur regularly due to the high disturbance levels on the property. Highveld Golden Mole (*Amblysomus septentrionalis*) is also unlikely due to being on the very edge of its range. Water Rat (*Dasymys incomtus*) and Spotted-necked Otter (*Lutra maculicollis*) both have a moderate chance of occurring within the wetland habitats in the northern portion of the study area. The rest of the potentially occurring species are classified as Data Deficient, meaning that not enough data were available in order to assess their Red Data status[4]. It is probable that at least a few Data-Deficient species do occur, particularly shrews in the genera *Crocidura* and *Suncus.* Seven potentially occurring species are protected under

[1] Friedmann & Daly, 2004
[2] The same approach as Raimondo *et al.* (2009) has been followed here regarding species of conservation concern (i.e. those with a status of Declining, Near Threatened and Data Deficient) and threatened species (Vulnerable, Endangered and Critically Endangered)
[3] Friedman & Daly, 2004
[4] Friedman & Daly, 2004

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either the Mpumalanga Nature Conservation Act (No. 10 of 1998) or the National Environmental Management: Biodiversity Act Threatened or Protected Species (No. 10 of 2004).

Only two mammal species were confirmed to occur during fieldwork: African Molerat (*Cryptomys hottentotus*) and Grey Duiker (*Sylvicapra grimmia*) (Appendix 3), both species are common and widespread in South Africa.

5.2.2 Birds

The grassland biome supports a fairly low diversity of bird species within the Southern African sub-region. However, the presence of woodland and forest patches, along with additional waterbirds, has resulted in the total of 249 species recorded within the quarter-degree grid 2530 DC, in which the study area falls, during the second Southern African Bird Atlas Project (SABAP2)[1], which is currently in progress. At a finer scale, data from SABAP2 indicate that 171 bird species have already been recorded from the pentad (mapping unit) in which the study area is situated (2555_3030)[2]. A pentad covers an area of approximately 77 km^2, which is considerably smaller than a quarter-degree grid and thus a better indication of which species occur in the study area. Seventy-one bird species were confirmed to occur within the actual habitats represented in the study area during fieldwork, all of which are listed in Appendix 3.

Thirteen of the bird species potentially occurring within the study area (confirmed to occur in 2530 DC during SABAP2 or potentially occur due to presence of suitable habitat) have Red Data status (Appendix 4). None of these were confirmed to occur during fieldwork. Eleven species have a low likelihood of occurring because of a lack of suitable habitat or proximity of human settlements and development and are not dealt with any further here. One of the two bird species with a moderate likelihood of occurrence is listed as Vulnerable: Lanner Falcon (*Falco biarmicus*). This bird of prey has a moderate likelihood of foraging over the study area but is unlikely to be resident as no breeding habitat is present on site. The other species with a moderate likelihood of occurring is the Southern Bald Ibis (*Geronticus calvus*). This species is also listed as Vulnerable due to habitat loss and has been confirmed to occur in nearby Badplaas (*pers. obs.*). It will at best only be an occasional foraging visitor and no breeding habitat is available within the study area. White-bellied Korhaan (*Eupodotis senegalensis*) is confirmed for the grasslands around Badplaas (pers. obs.) but has a low

[1] http://sabap2.adu.org.za/pentad_info.php?pentad=2555_3030#menu_top accessed 12/04/2016
[2] Data accessed from http://sabap2.adu.org.za/pentad_info.php?pentad=2555_3030#menu_top on 12/04/2016

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likelihood of occurring with the untransformed grasslands within the study area due to human disturbance and poor habitat quality.

Seventy-one bird species were confirmed to occur in the study area during fieldwork (Appendix 3) although at least 30 species were restricted to the gardens and orchards within the study area and are not associated with tall grasslands. Thirty-three species were recorded from Tall Closed Grassland and 22 from the Seep Wetland areas. Sufficient sampling was undertaken for assessing habitat suitability for potentially occurring threatened species, the primary objective of the ornithological component of this study, and to describe broad bird assemblages. Further fieldwork is likely to increase the species richness of each assemblage but is unlikely to identify additional assemblages. Three broad assemblages or species-habitat associations were identified, each of which is briefly described below:

I. Grassland Assemblage

This assemblage occurs in the Tall Closed Grassland within the study area. Although some overlap occurs with the Seep Wetland the composition of species differs sufficiently to justify the inclusion of this assemblage. Bird species found include those species not commonly found in seeps such as Rufous-naped Lark, Lazy and Zitting Cisticolas, Cape Longclaw and Cinnamon-breasted Bunting. Thirty-three species (46%) were recorded from Grassland, the highest of the three assemblages (Appendix 3).

II. Wetland Assemblage

Wetland seeps occur in the northern portion of the study area. Species favouring dense sedge, grass and reedbeds include Levaillant's Cisticola, Dark-capped Yellow and Broad-tailed Warblers, Cape Grassbird and Common Waxbill while those favouring shorter grasses, open water areas include African Wattled Lapwing, Cape Wagtail and Hadeda Ibis. Twenty-two species were recorded in this assemblage, representing 31% of the total species list (Appendix 3).

III. Gardens / Plantations Assemblage

This is an artificial assemblage and is associated with gardens and tall evergreen trees planted around homesteads and in the macadamia orchard. It is characterised by common and widespread woodland birds such as Black-collared Barbet, Cape White-eye, Cape Robin-Chat, Greater Double-collared Sunbird and Purple-crested Turaco. Thirty species (42% of the species total) were confirmed in this assemblage of which 26 species were confined to this assemblage (Appendix 3).

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5.2.3 Reptiles & Frogs

Only 19 species of reptiles have been recorded from the grid 2530 DC, as listed on the Reptile Atlas of Southern Africa website (http://vmus.adu.org.za/) and in Bates *et al*. (2014). This low figure is probably as a result of poor collection and observer data and the actual species diversity is probably much higher. Of the potentially occurring species, three conservation-important reptiles potentially occur (Appendix 4). Two of these have been assessed as Near Threatened: Large-scaled Grass Lizard (*Chamaesaura macrolepis*) and Striped Harlequin Snake (*Homoroselaps dorsalis*), both with a low likelihood of occurrence due to scarcity or unsuitable habitat being present. One additional species, Southern African Python (*Python natalensis*), which is protected under the National Environmental Management: Biodiversity Act (No.10 of 2004) has a moderate likelihood of occurring within any of the vegetation communities within the study area. Only one reptile species was recorded during fieldwork: Flap-necked Chameleon (*Chamaeleo dilepis*) (Appendix 3).

Sixteen species of frogs have been recorded in 2530 DC, as listed on the Frogs of Southern Africa website (http://vmus.adu.org.za/) as well as in the frog atlas project (Minter *et al.*, 2004), none of which have Red Data or protected status. Only two frog species were recorded during fieldwork: Common River Frog (*Amietia angolensis*) and Boettger's Caco (*Cacosternum boettgeri*) (Appendix 3) although early summer fieldwork with nocturnal surveys will result in more species.

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6. BIODIVERSITY VALUE ASSESSMENT

A qualitative integration of conservation importance and functional importance values for the untransformed vegetation communities and the transformed areas represented in the study area provides an indication of the biodiversity values of these communities. The data sheets for conservation importance and functional importance calculations for each community are presented in Appendix 5, and are dealt with in more detail under each vegetation community description. The integrated biodiversity values are summarised in Table 7 and presented spatially in Figure 3.

Both untransformed vegetation communities have a High Biodiversity Value (Table 7). One of these, Tall Closed Grassland, has High Conservation Value but Moderate Functional Value, highlighting the value of keeping these systems intact and out of the impact zone of this development. The Seep Wetland community has a Moderate Conservation Value, but High Functional Value. These two vegetation communities are the key areas of potential biodiversity / development conflict in this development project.

Table 7. Conservation Importance, Functional Importance and Biodiversity Values for vegetation communities in the Study Area

Vegetation Communities	Conservation Importance	Functional Importance	Biodiversity Value
Tall Closed Grassland	High	Moderate	High
Seep Wetland	Moderate	High	High
Transformed	Very Low	Low	Low

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Figure 3. Biodiversity Values of Vegetation Communities in the Study Area

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7. KEY POTENTIAL IMPACTS

While a detailed impact assessment is not required for this report, key potential impacts associated with the proposed development can be described. The following are potentially significant impacts on untransformed vegetation communities:

- **Loss of a portion of a Vulnerable vegetation type and listed Threatened Ecosystem** – if the proposed infrastructure overlaps with either of the two untransformed vegetation communities (Tall Closed Grassland or Seep Wetland), which are representative of KaNgwane Mountain Grassland, then this will be a significant impact;
- **Loss of important regional biodiversity –** most of the untransformed vegetation within the study area is classified within the Mpumalanga Biodiversity Sector Plan (MBSP) as Critical Biodiversity Area (CBA): Optimal which, according to the MBSP guidelines should be managed as either grazing or conservation land;
- **Loss of plant species of conservation importance** – five species could be impacted during the construction phase and would need to be rescued and relocated to adjacent suitable habitat if possible. Four of the five species are restricted to the two untransformed vegetation communities where no development is recommended at all while one is found within the transformed / degraded area just to the east of the homesteads (*Aloe marlothii*);
- **Degradation of wetland habitat** – construction activities could result in degradation of these habitats if not carefully managed, e.g. dumping of soil, building rubble, etc; long-term changes in surface and subsurface runoff could negatively affect wetland structure and function, particularly with respect to channel erosion caused by increased stormwater runoff;
- **Invasion of natural habitat by alien plants** – a large seed-base of invasive alien species is already present, and invasion by these species could increase as bare soil is exposed; if well managed, this is likely to only have moderate significance;
- **Loss of habitat for conservation-important fauna** – both untransformed vegetation communities are potentially key habitats and migration corridors for fauna that would be sensitive to impacts. Species such as Serval, Spotted-necked Otter, Southern Bald Ibis and Lanner Falcon have a moderate or high likelihood of occurring within these two communities.

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8. RECOMMENDATIONS

While this is not a detailed impact assessment, some preliminary recommendations and mitigation measures are listed below:

- A conservation buffer of 30m is recommended around all wetlands, measured from the outer edge of the temporary zone. The location of infrastructure should take place outside this buffer zone.
- The housing infrastructure footprint should be located outside all untransformed grassland and wetlands (Table 8).
- If infrastructure is planned within any natural vegetation, the areas should be checked by a suitably experienced botanist to locate all conservation-important species. These plants should be marked and the relevant permits applied for before removal and translocated to nearby suitable habitat prior to vegetation being cleared.
- According to the National Environmental Management: Biodiversity Act 2004 (Act 10 of 2004) Alien and Invasive Species Lists, 2014 all declared alien invasive plant species need to be removed from wetland areas. It is therefore recommended that the developers implement an alien plant control program to combat the infestation present. This program should include regular inspections and follow-ups.
- All existing and proposed roads to contain adequate stormwater drainage and erosion control measures.

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Table 8. Biodiversity / Development Conflict within the identified vegetation communities

Vegetation Communities	Biodiversity / Development Conflict	Development Recommendations
Tall Closed Grassland	High	Exclude from development footprint
Seep Wetland	High	Exclude from development footprint
Transformed	Low	Can be included within development footprint

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10. APPENDICES

Appendix 1. Checklist of Flora recorded during fieldwork

Taxa	Growth Form	Protected	Vegetation Communities: Tall Closed (Disturbed) Grassland	Vegetation Communities: Seep Wetland	Vegetation Communities: Degraded / Transformed
Family Acanthaceae					
Barleria ovata E.Mey. ex Nees	herb		r		
Chaetacanthus costatus Nees	herb		r		
Crabbea hirsuta Harv.	herb		u		
Justicia anagalloides (Nees) T.Anderson	herb		r		
Family Amaranthaceae					
* *Gomphrena celosioides* Mart.	herb				r
Family Amaryllidaceae					
Brunsvigia natalensis Baker	bulb	MNCA	r		
Family Anacardiaceae					
Lannea edulis (Sond.) Engl. var. edulis	dwarf shrub		r		
Searsia chirindensis (Baker f.) Moffett	tree		r		
Family Apocynaceae					
Gomphocarpus physocarpus E.Mey.	herb			r	
Family Araliaceae					
Cussonia spicata Thunb.	tree		r		
Family Asparagaceae					
Asparagus laricinus Burch.	shrub		r		
Family Asphodelaceae					
Aloe marlothii A.Berger subsp. *marlothii*	succulent	MNCA			r
Aloe sp. (no flowers)	succulent	MNCA	r		
Family Asteraceae					

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Asteraceae sp. (no flowers)	herb	r		
* *Acanthospermum australe* (Loefl.) Kuntze	herb	r		r
* *Bidens pilosa* L.	herb	r	r	r
* *Campuloclinium macrocephalum* (Less.) DC.	herb			
* *Conyza sumatrensis* (Retz.) E.Walker var. *sumatrensis*	herb			r
Dicoma anomala Sond. subsp. *anomala*	herb	u		
Euryops laxus (Harv.) Burtt Davy	herb	u		
Gazania krebsiana Less. subsp. *serrulata* (DC.) Roessler	herb	r		
Geigeria ornativa O.Hoffm. subsp. *ornativa*	herb	r		
Haplocarpha scaposa Harv.	herb	u		
Helichrysum aureonitens Sch.Bip.	herb		u	
Helichrysum caespititium (DC.) Harv.	herb	r		
Helichrysum nudifolium (L.) Less.	herb	r	u	
Helichrysum rugulosum Less.	herb	u		
Helichrysum sp.1	herb	r		
Helichrysum sp.2	herb		u	
* *Hypochaeris radicata* L.	herb			r
Lopholaena coriifolia (Sond.) E.Phillips & C.A.Sm.	shrub	r		
Macledium zeyheri (Sond.) S.Ortiz subsp. *zeyheri*	herb	u		
Nidorella auriculata DC.	herb	r	r	
Senecio inornatus DC.	herb		r	
*Senecio microglossu*s DC.	herb	u	r	
* *Tagetes minuta* L.	herb	r	r	r
Vernonia fastigiata Oliv. & Hiern	herb	r		
Family Campanulaceae				
Wahlenbergia krebsii Cham. subsp. *krebsii*	herb		r	
Family Capparaceae				
*Cleome monophyll*a L.	herb	r		r
Family Celastraceae				
Gymnosporia buxifolia (L.) Szyszyl.	shrub	r		
Family Commelinaceae				
Commelina africana L. var. *africana*	herb	u		
Floscopa glomerata (Willd. ex Schult. & J.H.Schult.) Hassk.	herb			u
Family Convolvulaceae				
Ipomoea bathycolpos Hallier f.	creeper	u		

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* *Ipomoea purpurea* (L.) Roth	climber			r
Family Cucurbitaceae				
Cucumis zeyheri Sond.	creeper	u		
Family Cyperaceae				
Bulbostylis hispidula (Vahl) R.W.Haines subsp. *pyriformis* (Lye) R.W.Haines	sedge		r	
Cyperus dives Delile	sedge		r	
Cyperus cf. *longus*	sedge		r	
Cyperus rupestris Kunth var. *rupestris*	sedge	r		
Cyperus sp. 1	sedge		u	
Fuirena pubescens (Poir.) Kunth var. *pubescens*	sedge		r	
Kyllinga erecta Schumach. var. *erecta*	sedge		u	
Pycreus polystachyos (Rottb.) P.Beauv. var. *polystachyos*	sedge		u	
Schoenoplectus muriculatus (Kük.) Browning	sedge		u	
Dipsacaceae				
Cephalaria zeyheriana Szab	herb	r		
Family Ebenaceae				
Diospyros lycioides Desf. subsp. *sericea*	tree	r		
Family Fabaceae				
* *Acacia mearnsii* De Wild.	tree			r
Chamaecrista comosa E.Mey. var. *capricornia* (Steyaert) Lock	herb	r	r	
Elephantorrhiza elephantina (Burch.) Skeels	dwarf shrub	u		
Eriosema burkei Benth. ex Harv. var. *burkei*	herb	u		
Eriosema salignum E.Mey.	herb	r		
Erythrina lysistemon Hutch.	tree	r		
*Indigofera hilari*s Eckl. & Zeyh. var. *hilaris*	herb	u		
Indigofera sp.	herb	r		
Lotononis laxa Eckl. & Zeyh.	herb	r		
Pearsonia sessilifolia (Harv.) Dummer subsp. *filifolia* (Bolus) Polhill	herb	u		
Rhynchosia adenodes Eckl. & Zeyh.	herb	r		
Tephrosia capensis (Jacq.) Pers. var. *capensis*	herb	u		
Zornia capensis Pers. subsp. *capensis*	herb	r		
Family Hyacinthaceae				
Ledebouria ovatifolia (Baker) Jessop	bulb	u		
Family Hypoxidaceae				
Hypoxis acuminata Baker	bulb	r	r	

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Hypoxis obtusa Burch. ex Ker Gawl.	bulb		r		
Hypoxis rigidula Baker var. *rigidula*	bulb		u		
Family Iridaceae					
Gladiolus sp. (no flowers)	bulb	MNCA	r		
Moreae sp. (no flowers)	bulb		r		
Family Juncaceae					
Juncus dregeanus Kunth subsp. *dregeanus*	sedge			u	
Juncus exsertus Buchenau	sedge			u	
Family Lamiaceae					
Leonotis intermedia Lindl.	dwarf shrub		r		
Mentha aquatica L.	herb			u	
Pycnostachys reticulata (E.Mey.) Benth.	herb			u	
Syncolostemon sp.	herb		r		
Family Lobeliaceae					
Monopsis decipiens (Sond.) Thulin	herb			r	
Family Malvaceae					
* *Hibiscus trionum* L.	herb			r	
Family Melastomataceae					
Dissotis canescens (E.Mey. ex R.A.Graham) Hook.f.	herb			u	
Family Meliaceae					
* *Melia azedarach* L.	tree				r
Family Moraceae					
* *Morus alba* L. var. *alba*	tree				r
Family Myriacaceae					
Morella serrata (Lam.) Killick	tree			r	
Family Orchidaceae					
Habenaria sp. (old flowers)	herb	MNCA		r	
Family Orobanchaceae					
Alectra sessiliflora (Vahl) Kuntze var. *sessiliflora*	herb			r	
Family Pedaliaceae					
Ceratotheca triloba (Bernh.) Hook.f.	herb		r		r
Family Pinaceae					
* *Pinus* sp.	tree				u
Family Polygalaceae					
Polygala hottentotta C.Presl	herb		u		

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Family Polygonaceae				
Persicaria decipiens (R.Br.) K.L.Wilson	herb		u	
Family Poaceae				
Andropogon eucomus Nees	grass		u	
Arundinella nepalensis Trin.	grass		f	
* *Cymbopogon pospischilii* (K.Schum.) C.E.Hubb.	grass	u	u	u
Diheteropogon amplectens (Nees) Clayton var. *amplectens*	grass	u		
Eragrostis curvula (Schrad.) Nees	grass	u		f
Eragrostis gummiflua Nees	grass	r	f	
Eragrostis plana Nees	grass	r		u
Eragrostis racemosa (Thunb.) Steud.	grass	u		
Heteropogon contortus (L.) Roem. & Schult.	grass	r		r
Hyperthelia dissoluta (Nees ex Steud.) Clayton	grass	f		d
Imperata cylindrica (L.) Raeusch.	grass		d	
Ischaemum fasciculatum Brongn.	grass		f	
Leersia hexandra Sw.	grass		f	
Loudetia simplex (Nees) C.E.Hubb.	grass	f		
Melinis repens (Willd.) Zizka subsp. *repens*	grass	r	r	r
Miscanthus junceus (Stapf) Pilg.	grass		u	
Panicum natalense Hochst.	grass	u		
* *Paspalum urvillei* Steud.	grass		u	
Phragmites mauritianus Kunth	grass		r	
Poaceae sp. 1	grass		f	
Hemarthria altissima (Poir.) Stapf & C.E.Hubb.	grass		f	
Setaria incrassata (Hochst.) Hack.	grass		u	
Setaria sphacelata (Schumach.) Stapf & C.E.Hubb. ex M.B.Moss	grass	d	r	u
Sporobolus africanus (Poir.) Robyns & Tournay	grass	r		u
Sporobolus pyramidalis P.Beauv.	grass	r		r
Themeda triandra Forssk.	grass	f		
Trachypogon spicatus (L.f.) Kuntze	grass	u		
Family Protaceae				
* *Macadamia* sp.	tree			d
Family Rubiaceae				
Afrocanthium mundianum (Cham. & Schltdl.) Lantz	tree	r		
Anthospermum rigidum Eckl. & Zeyh. subsp. *rigidum*	herb	r		

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*Pentanisia prunelloides (*Klotzsch ex Eckl. & Zeyh.) Walp. subsp. *prunelloides*	herb			u		
Pygmaeothamnus zeyheri (Sond.) Robyns var. *zeyheri*	dwarf shrub			r		
* *Richardia brasiliensis* Gomes	herb					r
Vangueria infausta Burch. subsp. *infausta*	tree			r		
Family Scrophulariaceae						
Phygelius aequalis Harv. ex Hiern	dwarf shrub				r	
Selago densiflora Rolfe	herb			r		
Family Sinopteridaceae						
Cheilanthes viridis (Forssk.) Sw. var. *viridis*	fern			r		
Family Solanaceae						
* *Solanum elaeagnifolium* Cav.	herb			r	r	r
* *Solanum mauritianum* Scop.	shrub			r		r
* *Solanum sisymbriifolium* Lam.	climber			r		r
Family Thelypteridaceae						
Thelypteris confluens (Thunb.) C.V.Morton	fern				r	
Family Thymeleaceae						
Lasiosiphon capitatus (L.f.) Burtt Davy	herb			u		
Family Verbenaceae						
* *Lantana camara* L.	shrub					r
Lippia javanica (Burm.f.) Spreng.	dwarf shrub			u		
* *Verbena bonariensis* L.	herb			r	r	r
Family Vitaceae						
Rhoicissus tridentata (L.f.) Wild & R.B.Drumm. subsp. *cuneifolia* (Eckl. & Zeyh.) Urton	climber			r		
TOTAL	**139**	**4**		**83**	**50**	**30**

NFA = National Forests Act	d = dominant
MNCA = Mpumalanga Nature Conservation Act	f = frequent
* = exotic species	u = uncommon
	r = rare

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Appendix 2. Potentially occurring plant species of conservation concern

Species	Family	Red Data Status	Habitat	Likelihood	Reason
Boophone disticha	Amaryllidaceae	Declining	Wide habitat tolerance	Low	Limited suitable habitat, disturbance
Crinum macowanii	Amaryllidaceae	Declining	Grassland	Moderate	Presence of suitable habitat
Aloe thorncroftii	Asphodelaceae	NT	High altitude rocky outcrops	Low	Unsuitable habitat and altitude
Callilepis leptophylla	Asteraceae	Declining	Grassland	Low	Disturbance
Gunnera perpensa	Gunneraceae	Declining	Wetland	Low	Unsuitable habitat present
Eucomis autumnalis subsp. *clavata*	Hyacinthaceae	Declining	Wide habitat tolerance	Moderate	Presence of suitable habitat
Eucomis montana	Hyacinthaceae	Declining	High altitude rocky outcrops	Low	Unsuitable habitat
Merwilla plumbea	Hyacinthaceae	NT	Open grassland, wetlands, rocky ridges	Low	Unsuitable habitat present
Hypoxis hemerocallidea	Hypoxidaceae	Declining	Open grassland, rocky woodland	Moderate	Presence of suitable habitat
Rapanea melanophloeos	Myrsinaceae	Declining	Rocky grassland	Low	Unsuitable habitat

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Appendix 3. Checklist of fauna recorded during fieldwork

Species	Family	Endemic	Protected	Red Data	Assemblages: Grassland	Wetland	Artificial Woodland
Mammals							
ORDER: RODENTIA							
Family: Bathyergidae (Mole-rats)							
African Mole-rat	*Cryptomys hottentotus*				x	x	
ORDER: CETARTIODACTYLA							
Family: Bovidae (cattle, antelope)							
Grey Duiker	*Sylvicapra grimmea*				x		
Subtotal	2	0	0	0	2	1	0
Birds							
ORDER: PELECANIFORMES							
Family Threskiornithidae (ibises, spoonbills)							
Hadeda Ibis	*Bostrychia hagedash*					x	
Family Ardeidae (herons, egrets, bitterns)							
Cattle Egret	*Bubulcus ibis*				x		
Black-headed Heron	*Ardea melanocephala*				x		
Family Scopidae (Hamerkop)							
Hamerkop	*Scopus umbretta*					x	
ORDER: GALLIFORMES							
Family: Numididae							
Helmeted Guineafowl	*Numida meleagris*				x		
ORDER: ACCIPITRIFORMES							
Family Accipitridae (kites, hawks & eagles)							
Black-shouldered Kite	*Elanus caeruleus*				x		
Long-crested Eagle	*Lophaetus occipitalis*				x		

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Steppe Buzzard	*Buteo vulpinus*	x		
ORDER: CHARADRIIFORMES				
Family Charadriidae (plovers)				
African Wattled Lapwing	*Vanellus senegallus*		x	
ORDER: COLUMBIFORMES				
Family Columbidae (pigeons, doves)				
Cape Turtle-Dove	*Streptopelia capicola*	x		
Red-eyed Dove	*Streptopelia semitorquata*			x
Laughing Dove	*Streptopelia senegalensis*			x
African Green-pigeon	*Treron calvus*			x
ORDER: MUSOPHAGIFORMES				
Family Musophagidae (turacos)				
Purple-crested Turaco	*Gallirex porphyreolophus*			x
ORDER: CUCULIFORMES				
Family Cuculidae (cuckoos & coucals)				
Diderick Cuckoo	*Chrysococcyx caprius*		x	
ORDER: APODIFORMES				
Family Apodidae (swifts)				
Little Swift	*Apus affinis*	over	over	over
White-rumped Swift	*Apus caffer*	over	over	over
African Palm-swift	*Cypsiurus parvus*	over	over	over
ORDER: COLIIFORMES				
Family Coliidae (mousebirds)				
Speckled Mousebird	*Colius striatus*			x
ORDER: CORACIIFORMES				
Brown-hooded Kingfisher	*Halcyon albiventris*			x
White-fronted Bee-eater	*Merops bullockoides*		x	
ORDER: PICIFORMES				
Family Lybiidae (African barbets)				
Crested Barbet	*Trachyphonus vaillantii*			x
Family Picidae (woodpeckers)				
Red-throated Wryneck	*Jynx ruficollis*			x
ORDER: FALCONIFORMES				

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Family Falconidae (falcons)				
Amur Falcon	*Falco amurensis*	x		
ORDER: PASSERIFORMES				
Family Malaconotidae (bushshrikes)				
Bokmakierie	*Telophorus zeylonus*	x		
Southern Boubou	*Laniarius ferrugineus*			x
Family Laniidae (shrikes)				
Southern Fiscal	*Lanius collaris*	x		x
Family Oriolidae (orioles)				
Black-headed Oriole	*Oriolus larvatus*			x
Family Dicruridae (drongos)				
Fork-tailed Drongo	*Dicrurus adsimilis*			x
Family Alaudidae (larks)				
Rufous-naped Lark	*Mirafra africana*	x		
Family Pycnonotidae (bulbuls)				
Dark-capped Bulbul	*Pycnonotus tricolor*			x
Family Hirundinidae (swallows & martins)				
Common House-martin	*Delichon urbicum*	x		
Lesser Striped Swallow	*Hirundo abyssinica*		x	
Greater Striped Swallow	*Hirundo cucullata*	x		
Barn Swallow	*Hirundo rustica*	x	x	x
Brown-throated Martin	*Riparia paludicola*		x	
Black Saw-wing	*Psalidoprocne holomelaena*	x		
Family Macrosphenidae (crombecs & African warblers)				
Cape Grassbird	*Sphenoeacus afer*		x	
Family Phylloscopidae (leaf warblers & allies)				
Willow Warbler	*Phylloscopus trochilus*			x
Family Acrocephalidae (reed warblers & allies)				
Dark-capped Yellow Warbler	*Chloropeta natalensis*		x	
Family Locustellidae (grassbirds & allies)				
Broad-tailed Warbler	*Schoenicola brevirostris*		x	
Family Cisticolidae (cisticolas & allies)				
Lazy Cisticola	*Cisticola aberrans*	x		

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Zitting Cisticola	*Cisticola juncidis*		x		
Croaking Cisticola	*Cisticola natalensis*		x		
Levaillant's Cisticola	*Cisticola tinniens*			x	
Neddicky	*Cisticola fulvicapilla*				
Bar-throated Apalis	*Apalis thoracica*				x
Drakensberg Prinia	*Prinia hypoxantha*	x		x	
Tawny-flanked Prinia	*Prinia subflava*		x		
Family Zosteropidae (white-eyes)					
Cape White-eye	*Zosterops virens*				x
Family Turdidae (thrushes)					
Kurrichane Thrush	*Turdus libonyanus*				x
Groundscraper Thrush	*Psophocichla litsipsirupa*				x
Family Muscicapidae (chats & Old World flycatchers)					
Cape Robin-Chat	*Cossypha caffra*				x
African Stonechat	*Saxicola torquatus*		x		
Family Nectariniidae (sunbirds)					
Amethyst Sunbird	*Chalcomitra amethystina*		x		x
Greater Double-collared Sunbird	*Cinnyris afer*	x			x
Family Passeridae (Old World sparrows)					
Southern Grey-headed Sparrow	*Passer diffusus*				x
Family Ploceidae (weavers & widowbirds)					
Red-collared Widowbird	*Euplectes ardens*		x	x	
Fan-tailed Widowbird	*Euplectes axillaris*		x	x	
Southern Red Bishop	*Euplectes orix*			x	
Village Weaver	*Ploceus cucullatus*				x
Spectacled Weaver	*Ploceus ocularis*				x
Southern Masked-Weaver	*Ploceus velatus*			x	x
Family Estrildidae (waxbills, mannikins)					
Orange-breasted Waxbill	*Amandava subflava*		x		
Cuckoo Finch	*Anomalospiza imberbis*		x		
Common Waxbill	*Estrilda astrild*		x	x	
African Firefinch	*Lagonosticta rubricata*			x	
African Quailfinch	*Ortygospiza atricollis*		x		

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Bronze Mannikin	*Spermestes cucullatus*				x		
Family Viduidae (indigobirds & whydahs)							
Pin-tailed Whydah	*Vidua macroura*				x	x	
Family Motacillidae (wagtails & pipits)							
African Pipit	*Anthus cinnamomeus*				x		
Cape Longclaw	*Macronyx capensis*				x		
Cape Wagtail	*Motacilla capensis*					x	
Family Fringillidae (finches, canaries & allies)							
Streaky-headed Seedeater	*Crithagra gularis*						x
Family Emberizidae (buntings)							
Cinnamon-breasted Bunting	*Emberiza tahapisi*				x		
Subtotal	71	2	0	0	33	22	30
Reptiles							
ORDER: SQUAMATA							
Family: Chamaeleonidae							
Flap-necked Chameleon	*Chamaeleo dilepis dilepis*				x		
Subtotal	1	0	0	0	1	0	0
Amphibians							
ORDER: ANURA							
Family: Pyxicephalidae							
Comon River Frog	*Amietia angolensis*					x	
Boettger's Caco	*Cacosternum boettgeri*					x	
Subtotal	2	0	0	0	0	2	0
TOTAL	**76**	**2**	**0**	**0**	**36**	**25**	**30**

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Appendix 4. Potentially occurring fauna of conservation concern

Species	Scientific Name	Red Data	Protected	Habitat	Likelihood	Reason
Mammals						
Highveld Golden Mole	*Amblysomus septentrionalis*	NT		Highveld grassland	Low	Edge of range, sub-optimal habitat
Cape Clawless Otter	*Aonyx capensis*		NEMBA	Rivers and streams	Moderate	Suitable habitat present
Side-striped Jackal	*Canis adustus*	NT		Woodland and grassland	Low	Disturbance, edge of range
Reddish-grey Musk Shrew	*Crocidura cyanea*	DD		Wide variety of habitats	Moderate	Suitable habitat present
Greater Musk Shrew	*Crocidura flavescens*	DD		Wide variety of habitats	Moderate	Suitable habitat present
Tiny Musk Shrew	*Crocidura fuscomurina*	DD		Wide variety of habitats	Moderate	Suitable habitat present
Swamp Musk Shrew	*Crocidura mariquensis*	DD		Wetland habitats	Moderate	Suitable habitat present
Lesser Red Musk Shrew	*Crocidura hirta*	DD		Wide variety of habitats	Moderate	Suitable habitat present
Peters' Musk Shrew	*Crocidura silacea*	DD		Wide variety of habitats	Moderate	Suitable habitat present
Water Rat	*Dasymys incomtus*	NT		Wetland habitats	Moderate	Suitable habitat present
Single-striped Grass-Mouse	*Lemniscomys rosalia*	DD		Woodland with tall grass	Moderate	Suitable habitat present
Serval	*Leptailurus serval*	NT	NEMBA	Grassland, wetlands	High	Suitable habitat present
Spotted-necked Otter	*Lutra maculicollis*	NT	NEMBA	Inland streams	Moderate	Suitable habitat present
Honey Badger	*Mellivora capensis*	NT	NEMBA	Wide variety of habitats	Moderate	Suitable habitat present
Forest Shrew	*Myosorex varius*	DD		Wide variety of habitats	Moderate	Suitable habitat present
Aardvark	*Orycteropus afer*		MNCA	Wide variety of habitats	Moderate	Suitable habitat present
Greater Galago	*Otolemur crassicaudatus*		MNCA	Thicket, closed woodland	Low	Only likely in transformed habitat
Oribi	*Ourebia ourebi*	EN		Mosaic of tall and short grasses	Low	Disturbance, degraded habitat
Brown Hyaena	*Parahyaena brunnea*	NT	NEMBA	Wide variety of habitats	Low	Disturbance, lack of prey
African Weasel	*Poecilogale albinucha*	DD		Wide variety of habitats	Moderate	Suitable habitat present
Meller's Mongoose	*Rhynchogale melleri*	DD		Savanna and grassland	Low	Rare species, edge of range
Least Dwarf Shrew	*Suncus infinitesimus*	DD		Wide variety of habitats	Moderate	Suitable habitat present
Greater Dwarf Shrew	*Suncus lixus*	DD		Wide variety of habitats	Moderate	Suitable habitat present
Lesser Dwarf Shrew	*Suncus varilla*	DD		Wide variety of habitats	Moderate	Suitable habitat present
Subtotal	24	21	7			

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Birds						
Half-collared Kingfisher	*Alcedo semitorquata*	NT		Riverine forest	Low	Unsuitable habitat present
African Marsh Harrier	*Circus ranivorus*	EN		Undisturbed wetland and grassland	Low	Unsuitable habitat present
Black Stork	*Ciconia nigra*	VU	NEMBA	Rivers, cliffs	Low	Limited suitable habitat
Blue Swallow	*Hirundo atrocaerulea*	CR	NEMBA	Mistbelt grassland	Low	No suitable habitat present
European Roller	*Coracias garrulus*	NT		Open woodland	Low	Edge of range, limited suitable habitat present
White-bellied Korhaan	*Eupodotis senegalensis*	VU		Open woodland and grassland	Low	Disturbance, unsuitable habitat present
Lanner Falcon	*Falco biarmicus*	VU		Wide variety of habitats	Moderate	Suitable foraging habitat present
Southern Bald Ibis	*Geronticus calvus*	VU	NEMBA	Montane grassland, ploughed lands	Moderate	No suitable habitat present
Cape Vulture	*Gyps coprotheres*	EN	NEMBA	Montane grassland	Low	Disturbance, lack of food
Martial Eagle	*Polemaetus bellicosus*	EN	NEMBA	Woodland, savannah	Low	Unsuitable habitat, human pressure
Secretarybird	*Sagittarius serpentarius*	VU		Open woodland, grassland	Low	Disturbance, limited suitable habitat present
Black-rumped Buttonquail	*Turnix nanus*	EN		Undisturbed highland grassveld	Low	Unsuitable habitat present
African Grass Owl	*Tyto capensis*	VU	NEMBA	Extensive tracts of open grassland and wetland	Low	Disturbance, sub-optimal habitat present
Subtotal	13	13	6			
Reptiles and Frogs						
Large-scaled Grass Lizard	*Chamaesaura macrolepis*	NT		Grassland and open woodland	Low	Rare in area, little known species
Striped Harlequin Snake	*Homoroselaps dorsalis*	NT		Mostly high altitude grasslands in Mpumalanga	Low	Unsuitable habitat and altitude
Southern African Python	*Python natalensis*		NEMBA	Wide variety of habitats, but usually near water or rocky outcrops	Moderate	Suitable habitat present
Subtotal	3	2	1			
TOTAL	**40**	**36**	**14**			

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EN = Endangered
VU = Vulnerable
NT = Near-threatened
DD = Data Deficient
MNCA = Mpumalanga Nature Conservation Act
NEMBA = National Environmental Management: Biodiversity Act

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Appendix 5. Biodiversity Values of Vegetation Communities

Tall Closed Grassland

Conservation Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Protection Status		International	National	Regional	Local	None
	14	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Size / Length		Very small (<500km^2)	Small (500 to 1,000km^2)	Moderate (1,000 to 20,000km^2)	Large (20,000 to 50,000km^2)	Very Large (> 50,000km^2)
	16	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species Diversity		Noticeably High		Moderate		Noticeably Low
	15	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
EVR Species		Noticeably High		Moderate		Noticeably Low
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Unique Habitat or Taxa		Noticeably High		Moderate		Noticeably Low
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Present Ecological State		Natural, largely Unmodified	Slightly modified	Moderately Modified	Considerably Modified	Severely Modified
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**13.0**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

EVR Species = Endangered, Vulnerable or Rare

Functional Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Provisioning Services		Constant	Regular	Frequent	Occassional	Intermittent
	13	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Regulating Services		Very High	High	Moderate	Low	Very Low
	9	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Cultural Services		Very High	High	Moderate	Low	Very Low
	9	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Supporting Services		Very High	High	Moderate	Low	Very Low
	13	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**11.0**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

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Seep Wetland

Conservation Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Protection Status		International	National	Regional	Local	None
	14	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Size / Length		Very small (<500km^2)	Small (500 to 1,000km^2)	Moderate (1,000 to 20,000km^2)	Large (20,000 to 50,000km^2)	Very Large (> 50,000km^2)
	17	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species Diversity		Noticeably High		Moderate		Noticeably Low
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
EVR Species		Noticeably High		Moderate		Noticeably Low
	8	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Unique Habitat or Taxa		Noticeably High		Moderate		Noticeably Low
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Present Ecological State		Natural, largely Unmodified	Slightly modified	Moderately Modified	Considerably Modified	Severely Modified
	15	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**13.0**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

EVR Species = Endangered, Vulnerable or Rare

Functional Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Provisioning Services		Constant	Regular	Frequent	Occassional	Intermittent
	14	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Regulating Services		Very High	High	Moderate	Low	Very Low
	14	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Cultural Services		Very High	High	Moderate	Low	Very Low
	11	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Supporting Services		Very High	High	Moderate	Low	Very Low
	14	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**14.0**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

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Transformed Areas

Conservation Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Protection Status		International	National	Regional	Local	None
	4	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Size / Length		Very small (<500km^2)	Small (500 to 1,000km^2)	Moderate (1,000 to 20,000km^2)	Large (20,000 to 50,000km^2)	Very Large (> 50,000km^2)
	17	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species Diversity		Noticeably High		Moderate		Noticeably Low
	6	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
EVR Species		Noticeably High		Moderate		Noticeably Low
	3	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Unique Habitat or Taxa		Noticeably High		Moderate		Noticeably Low
	4	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Present Ecological State		Natural, largely Unmodified	Slightly modified	Moderately Modified	Considerably Modified	Severely Modified
	4	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**4.0**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

EVR Species = Endangered, Vulnerable or Rare

Functional Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Provisioning Services		Constant	Regular	Frequent	Occassional	Intermittent
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Regulating Services		Very High	High	Moderate	Low	Very Low
	4	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Cultural Services		Very High	High	Moderate	Low	Very Low
	5	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Supporting Services		Very High	High	Moderate	Low	Very Low
	5	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**5.0**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

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Appendix 6. Curriculum Vitae of Duncan McKenzie

Name: Duncan Robert McKenzie
Profession: Terrestrial Ecologist
Date of Birth: 9 Nov 1977
Name of Firm: ECOREX Consulting Ecologists cc
Position in Firm: Ecologist
Years with firm: 8
Nationality: South African
Qualifications :

- N.Dip. [Nature Conservation] UNISA, RSA 2007
- N.Cert. [Nature Guiding] Drumbeat Academy, RSA 2004

Membership in Professional Societies:

- BirdLife South Africa
- Animal Demography Unit, University of Cape Town
- Botanical Society of South Africa

Languages :

	Speaking	Reading	Writing
English (home):	Excellent	Excellent	Excellent
Afrikaans:	Good	Good	Good
isiZulu:	Good	Fair	Fair
Spanish:	Fair	Fair	Fair

Countries of Work Experience : Botswana, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zimbabwe (Guiding). South Africa, Mozambique, DRC, Mali, Lesotho, Tanzania, Swaziland, Sierra Leone (Consulting Ecologist)

OVERVIEW OF EXPERIENCE

- 8 years' experience in specialist species identification, conducting baseline surveys, data analysis and report writing in various biomes in southern Africa, particularly savannah, forest and grassland biomes
- 2 years' experience game reserve management (KwaZulu-Natal)
- 5 years' experience (part time) of wetland delineation and management
- 2 years' experience of plant propagation and use for rehabilitation
- Specialist knowledge of identification of vascular plants
- Specialist knowledge of identification of mammals, birds, reptiles and amphibians
- SABAP2 Regional Co-ordinator: Mpumalanga
- Member of the Kwa-Zulu-Natal Bird Rarities Committee

Employment Record:

2007 - present	ECOREX	Ecologist
2005 - 2006	Iglu (London, UK)	Specialist Travel Agent
1997 - 2005	Duncan McKenzie Bird Tours	Owner, Specialist Guide
2001	KZN Wildlife	District Conservation Officer, Reserve Manager
1999 - 2001	Institute of Natural Resources	Part-time Horticulturalist and Rehabilitation Officer
1997-2001	Mondi Wetlands Project	Part-time Field Assistant and Regional Co-ordinator
1996-1997	Natal Parks Board	Ranger

Appendix 7. Specialists Declaration

10.4 The Specialist

Note: Duplicate this section where there is more than one specialist.

I Duncan Mckenzie., as the appointed specialist hereby declare/affirm the correctness of the information provided as part of the application, and that I:

- in terms of the general requirement to be independent (tick which is applicable):

√	other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
	am not independent, but another EAP that is independent and meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);

- have expertise in conducting specialist work as required, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- will ensure compliance with the EIA Regulations 2014;
- will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application;
- will take into account, to the extent possible, the matters listed in regulation **18** of the regulations when preparing the application and any report, plan or document relating to the application;
- will disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority or the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority (unless access to that information is protected by law, in which case I will indicate that such protected information exists and is only provided to the competent authority);
- declare that all the particulars furnished by me in this form are true and correct;
- am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B(2) of the National Environmental Management Act, 1998 (Act 107 of 1998).

Signature of the specialist

Ecorex Consulting Ecologists CC

Name of company

14/04/2016

Date

ECOREX Consulting Ecologists CC
PO Box 57 White River 1240
(013) 750-1893 (083) 231-5632 warren@ecorex.co.za

ANNEXURE B: HIA.

10.4 The Specialist

Note: Duplicate this section where there is more than one specialist.

I JEAN-PIERRE CELLIERS as the appointed specialist hereby declare/affirm the correctness of the information provided as part of the application, and that I:

- in terms of the general requirement to be independent (tick which is applicable):

X	other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or

	am not independent, but another EAP that is independent and meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);

- have expertise in conducting specialist work as required, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- will ensure compliance with the EIA Regulations 2014;
- will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application;
- will take into account, to the extent possible, the matters listed in regulation **18** of the regulations when preparing the application and any report, plan or document relating to the application;
- will disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority or the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority (unless access to that information is protected by law, in which case I will indicate that such protected information exists and is only provided to the competent authority);
- declare that all the particulars furnished by me in this form are true and correct;
- am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B(2) of the National Environmental Management Act, 1998 (Act 107 of 1998).

Signature of the specialist

KUDZALA ANTIQUITY CC

Name of company

14/08/2016

Date

Phase 1 Archaeological Impact Assessment on Plot 34 of the farm Avontuur 725 JT near Badplaas Resort, Mpumalanga Province.

Compiled by:

For **Henwood Environmental Consultants**

Surveyor: Mr JP Celliers

12 February, 2016

I, Jean-Pierre Celliers as duly authorised representative of Kudzala Antiquity CC, hereby confirm my independence as a specialist and declare that neither I nor the Kudzala Antiquity CC have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which the client was appointed as Environmental Assessment practitioner, other than fair remuneration for work performed on this project.

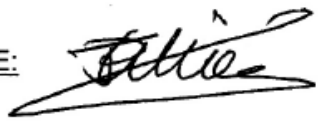
SIGNATURE: 

Table of Contents

Executive summary

Site name and location: Plot 34 of the farm Avontuur 725 JT, Badplaas, Mpumalanga Province.

Purpose of the study: An Archaeological and historic study in order to identify heritage resources on Plot 34 of the farm Avontuur 725 JT, located near Badplaas Resort, Mpumalanga.

1:50 000 Topographical Map: 2530 DC Badplaas (1985).

EIA Consultant: Henwood Environmental Consultants.

Client: Emoyeni Christian Organization.

Heritage Consultant: Kudzala Antiquity CC.
Contact person: Jean-Pierre (JP) Celliers Tel: +27 82 779 3748
E-mail: kudzala@lantic.net

Report date: 12 February 2016

Description and findings:

An Archaeological resource survey was undertaken by Kudzala Antiquity CC in respect of proposed expansion and upgrading of facilities on Plot 34 of the farm Avontuur 725 JT near Badplaas Resort. The study was done with the aim of identifying sites which are of heritage significance on the property and assessing their current preservation condition, significance and possible impact of the proposed development. This forms part of legislative requirements as appears in section 38 of the National Heritage Resources act (25 of 1999) and the NEMA (17 of 1998).

The survey was conducted on foot and with the aid of a motor vehicle in an effort to locate archaeological remains and historic features. A desktop archival study in combination with social consultation formed the basis on which sites were identified, located and assessed.

A total of seven (7) sites were located and documented. In terms of the archaeological component of the Act (25 of 1999, section 35) no sites or features of archaeological significance was recorded during the survey. In terms of the built environment in the area (section 34 of the Act) no significant buildings were identified. Three sites were recorded for orientation purposes (OBS 1-3) and a further four sites (buildings) were recorded and assessed (BA 1-4). From a heritage perspective it is therefore recommended that the proposed activities continue.

Disclaimer: *Although all possible care is taken to identify all sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the study. Kudzala Antiquity CC will not be held liable for such oversights or for costs incurred as a result of such oversights.*

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- The results of the project;
- The technology described in any report
- Recommendations delivered to the Client.

1. Introduction

1.1. Terms of reference

Kudzala Antiquity CC was commissioned to conduct an Archaeological and Heritage resources survey on Plot 34 of the farm Avontuur 725 JT near Badplaas Resort in Mpumalanga Province. The survey was conducted in respect of the potential impact on archaeological and heritage resources which may occur during the expansion and upgrading of facilities at the Emoyeni Christian Christian Organization which includes current houses, a new conference centre, a skills training workshop, new homes for orphaned children, homes for long term missionaries and a youth camp ground. The survey was conducted for Henwood Environmental Consultants.

1.2. Legislative Framework

The National Heritage Resources Act (Act 25, 1999) and the NEMA (National Environmental Management Act No. 107 of 1998) requires of individuals (engineers, farmers, mines and industry) or institutions to have specialist heritage impact assessment studies undertaken whenever any development activities are planned. This report is the result of an archaeological and heritage scoping study in accordance with the requirements as set out in Section 38 (3) of the National Heritage Resources Act (25 of 1999) in an effort to ensure that heritage features or sites that qualify as part of the national estate are properly managed and not damaged or destroyed.

The study aims to address the following objectives:

- Analysis of heritage issues;
- Assess the cultural significance of identified places including archaeological sites and features, buildings and structures, graves and burial grounds within a specific historic context;
- Identifying the need for more research;
- Surveying and mapping of identified places including archaeological sites and features, buildings and structures, graves and burial grounds;
- A preliminary assessment of the feasibility of the proposed development or construction from a heritage perspective;
- Identifying the need for alternatives when necessary;
- Recommending mitigation measures to address any negative impacts on archaeological and heritage resources.

Heritage resources considered to be part of the national estate include those that are of Archaeological, Cultural or historical significance or have other special value to the present community or future generations.

The national estate may include:

- places, buildings, structures and equipment of cultural significance;
- places to which oral traditions are attached or which are associated with living
- heritage;
- historical settlements and townscapes;
- landscapes and natural features of cultural significance;
- geological sites of scientific or cultural importance;
- archaeological and paleontological sites;
- graves and burial grounds including:
    - (i) ancestral graves;
    - (ii) royal graves and graves of traditional leaders;
    - *(iii)* graves of victims of conflict;
    - (iv) graves of individuals designated by the Minister by notice in the *Gazette;*
    - (v) historical graves and cemeteries; and other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);
- sites of significance relating to slavery in South Africa;
- movable objects including:

(i) objects recovered from the soil or waters of South Africa, including archaeological and paleontological objects and material, meteorites and rare geological specimens;
(ii) objects to which oral traditions are attached or which are associated with living heritage
(iii) ethnographic art and objects;
(iv) military objects
(v) objects of decorative or fine art;
(vi) objects of scientific or technological interest; and
(vii) books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section 1 of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996).

Cultural resources are unique and non-renewable physical phenomena (of natural occurrence or made by humans) that can be associated with human (cultural) activities (Van Vollenhoven 1995:3).

These would be any man-made structure, tool, object of art or waste that was left behind on or beneath the soil surface by historic or pre-historic communities. These remains, when studied in their original context by archaeologists, are interpreted in an attempt to understand, identify and reconstruct the activities and lifestyles of past communities. When these items are disturbed from their original context, any meaningful information they possess is lost, therefore it is important to locate and identify such remains before construction or development activities commence.

1.3. Approach

An AIA (Archaeological Impact Assessment) consists of three phases, this document deals with the first phase. This (phase 1) investigation is aimed at getting an overview of cultural resources in a given area, thereby assessing the possible impact a proposed development may have on these resources. The *purpose* of the archaeological study is to establish the whereabouts and nature of cultural heritage sites should they occur on the surveyed area. This includes settlements, structures and artefacts which have value for an individual or group of people in terms of historical, archaeological, architectural and human (cultural) development.

The *aim* of this study is to locate and identify such objects or places in order to assess whether they are of significance and warrant further investigation or protection. This is done by means of foot surveys, a desktop or detailed archival study as well as a study of the results of previous archaeological work in the area.

When the archaeologist encounters a situation where the planned project will lead to the destruction or alteration of an archaeological site, a second phase in the survey is normally recommended. During a phase two investigation mitigation measures are put in place and detailed investigation into the nature and origin of the cultural material is undertaken. Often at this stage, archaeological excavation is carried out in order to document and preserve the cultural heritage.

Phase three consists of the compiling of a management plan for the safeguarding, conservation, interpretation and utilization of cultural resources (Van Vollenhoven, 2002).

2. Description of surveyed area

The study area falls within the Albert Luthuli Local Municipality, Ehlanzeni District, Mpumalanga Province. The survey was carried out on approximately 21 ha of indigenous KaNgwane Montage Grassland and historic as well as current agricultural land (mixed use) near Badplaas Resort. Limiting factors include the dense nature of the grass which is often hard to access and also limits the visibility of archaeological and heritage sites and features.

Veld type: The vegetation forms part of the Grassland Biome and classed as KaNgwane Montane Grassland comprising undulating hills and plains on the Eastern edge of the Escarpment. It is a transitional area between the Highveld and Escarpment and contains elements of both. Vegetation mostly comprises short closed grassland with many forbes and a few scattered shrubs (Mucina and Rutherford, 2009).

Geology: Most of the area is located on mostly granite of the Mpuluzi Granite and Archaean gneiss with intrusions of diabase (Mucina and Rutherford, 2009).

3. Methodology

A desktop archival study followed by a physical survey of the proposed development area was conducted. This was done to assess whether graves or features of historical or archaeological value exist on the property. Limiting factors include the dense nature of the grass which are often hard to access and limits the visibility of archaeological and heritage sites and features.

Social Consultation: During the survey, owners of the property were consulted to establish whether any graves and other sites of possible heritage significance are located in the area. The informant consulted in this regard was Mr Daryll Mather-Pike, resident and founder of Emoyeni Christian Organization.

SAHRA (South African Heritage Resources Agency) and the relevant legislation (Act 25 of 1999, National Heritage Resources Act) require that the following components be included in an Archaeological impact assessment:

- Archaeology
- Shipwrecks
- Battlefields
- Graves
- Structures older than 60 years
- Living heritage
- Historical settlements
- Landscapes
- Geological sites
- Paleontological sites and objects

All the above-mentioned heritage components are addressed in this report, except shipwrecks, geological sites and paleontological sites and objects.

3.1. Desktop study

The purpose of the desktop study is to compile as much information as possible on the heritage resources of the area. This helps to provide an historical context for located sites. Sources used for this study include published and unpublished documents, archival material and maps. Information obtained from the following institutions or individuals were consulted:

- Lydenburg Museum, Lydenburg
- Published and unpublished archaeological reports and articles
- Published and unpublished historical reports and articles

- Historical maps
- SAHRIS database

3.1.1. Previous Archaeological studies in the area

Some Archaeological Impact Assessments (AIA) has been done in the vicinity of the proposed development area.

During an AIA conducted by Mr Jaco vd Walt in 2015 in respect of the development of a filling station in the CBD of Embhuleni, no archaeological or built heritage features were located.

An AIA conducted in 2010 by JP Celliers on the farm Kees Zyn Doorns 708 JT. Four sites were identified which had historic graves, six sites of archaeological significance were identified and recorded including Late Iron Age stone walling, Late Stone Age artefacts and historic ruins.

Mr Johnny van Schalkwyk conducted an AIA in 2008 in respect of the Nkomazi Wilderness River Crossings and recorded no sites or features of archaeological significance. He also conducted a similar study in 2002 for the Secunda-Mozambique Gas pipeline in the Carolina district. He located graves and Late Iron Age sites.

3.2. Significance of sites

The South African Heritage Resources Agency (SAHRA) formulated guidelines for the conservation of all cultural resources and therefore also divided such sites into three main categories. These categories might be seen as guidelines that suggest the extent of protection a given site might receive. They include sites or features of local (Grade 3) provincial (Grade 2) national (Grade 1) significance, grades of local significance and generally protected sites with a number of degrees of significance.

For practical purposes the surveyor uses his own classification for sites or features and divides them into three groups, those of low or no significance, those of medium significance, those of high significance **(*Also see table 5.2.Significance rating guidelines for sites*).**

Values used to assign significance to a site include:

- **Types of significance**

The site's scientific, aesthetic and historic significance or a combination of these is established.

- **Degrees of significance**

The archaeological or historic site's rarity and representative value is considered. The condition of the site is also an important consideration.

- **Spheres of significance**

Sites are categorized as being significant in the international, national, provincial, regional or local context. Significance of a site for a specific community is also taken into consideration.

It should be noted that to arrive at the specific allocation of significance of a site or feature, the specialist considers the following:

- Historic context
- Archaeological context or scientific value
- Social value
- Aesthetic value
- Research value

More specific criteria used by the specialist in order to allocate value or significance to a site include:

- The unique nature of a site
- The integrity of the archaeological deposit
- The wider historic, archaeological and geographic context of the site
- The location of the site in relation to other similar sites or features
- The depth of the archaeological deposit (when it can be determined or is known)
- The preservation condition of the site
- Quality of the archaeological or historic material of the site
- Quantity of sites and site features

In short, archaeological and historic sites containing data which may significantly enhance the knowledge that archaeologists currently have about our cultural heritage should be considered highly valuable. In all instances these sites should be preserved and not damaged during construction activities. When development activities do however jeopardize the future of such a site, a second and third phase in the Cultural Resource Management (CRM) process is normally advised which entails the excavation or rescue excavation of cultural material along with a management plan to be drafted for the preservation of the site or sites.

Graves are considered very sensitive sites and should never under any circumstances be jeopardized by development activities. Graves and burial grounds are incorporated in the *National Heritage Resources Act* under *section 36* and in all instances where graves are found by the surveyor, the recommendation would be to steer clear of these areas. If this is not possible or if construction activities have for some reason damaged graves, specialized consultants are normally contacted to aid in the process of exhumation and re-interment of the human remains.

4. History and Archaeology

4.1. Historic period

4.1.1. Early History

The first inhabitants of the eastern Lowveld were probably the San or Bushmen. They were a nomadic people who lived together in small family groups and relied on hunting and gathering of food for survival. Evidence of their existence is to be found in numerous rock shelters throughout the Lowveld where some of their rock paintings are still visible. A number of these shelters have been documented in the Nelspruit area (Bornman, 1995; Schoonraad in Barnard, 1975). It has been argued that the red ochre source for these paintings is to be found at Dumaneni, near Malelane (Bornman, 1995).

Two Late-Holocene (Later Stone Age) sites near Hazyview in the Kruger National Park date to the last 2500 years and are associated with pottery and microlith stone tools (Bergh, 1998: 95). This is contemporary to typical hunter-gatherer lifestyle and may also have been sites frequented by San.

It was only later that Bantu-speaking tribes moved into this area from the northern parts of Southern Africa and settled here. This period is referred to as the Early Iron Age (AD 200-1500 approx.). These were presumably Sotho-Tswana herder groups.

Various historians and ethnographers describe that the Lowveld was frequented by Swazi and Sotho-Tswana groups during historic time i.e. Late Iron Age times during the period AD 1500-1800. (Barnard, 1975; Bergh, 1998; Bornman, 2002; Herbst, 1985; Myburgh, 1949).

Old trade routes was well established before the period of Colonial expansion and these routes mainly existed as a direct consequence of metallurgy and mining for iron, tin, copper and some gold to make weapons, agricultural equipment and ornaments (Bergh, 1998:103). The earliest signs of iron mining and working in the old Transvaal dates to approximately 300 AD and copper mining and working in Southern Africa may have been practiced as early as 620 AD (Bergh, 1998:103).

These people were responsible for the establishment of large centrums like Monomtapa the Zimbabwe Complex and also the famed Mapungubwe in the Limpopo valley. At around 900 AD Arab merchants established a trade post at Sofala (Beira). Since the start of the 11th century, these Arabs had trade relations with the people of Zimbabwe. Textiles, porcelain and glass beads were traded for gold, ivory and other minerals.

An ancient trade route passed close-by the current Nelspruit and started from Delagoabay in a westward direction through the Lowveld towards the gold fields of Lydenburg, by passing through Malalapoort, the Nkhomati and Crocodile Rivers to Skipberg in the current Kruger National Park close-by the place where Pretoriuskop Rest Camp is located. From here onwards there were two possible routes up the mountains to reach the goldfields. The first one passed by Spitskop (Sabie) and from there on to Lydenburg. The second passed south of the “Devils Knuckles” to Lydenburg. The Voortrekkers used this route in 1845

when making the wagon route between Ohrigstad and Delagoabay (Berg, 1998: 104). There were also several linking routes to existing main routes, one of which started from Sabie or Lydenburg to the route which linked Delagoabay to the Soutpansberg via Pilgrim's Rest. It is also believed that a footpath existed at the foothills of the (Transvaal) Drakensberg which led around the mountain to link again with a major route alongside the Olifants River (Bergh, 1998:104).

In 1721 Dutch sailors reached Delagoa Bay and settled there for nine years, during this time they launched a number of expeditions inland. During August 1723 Lieutenant Jan Steffler and 17 men launched the first of these expeditions but they were ambushed by natives shortly after crossing the Lebombo Mountains. Exactly where they crossed the mountains is uncertain but it is possible that they were actually in northern Swaziland when they were attacked. Steffler succumbed as a result of this ambush and his followers returned to Delagoa Bay (Bergh, 1998:116).

A second attempt to create an inland route took place two years later in June 1725 when Francois de Cuiper and 34 men departed from Delagoa Bay and travelled in a north-western direction. They reached Gomondwano in the current Kruger National Park where they were also attacked by a local tribe. This resulted in them also having to return to Delagoa Bay. Altough this attempt was also not successful, it is seen as the first European intrusion into this northern area (Bergh, 1998:116).

In the (Eastern Transvaal) Lowveld a sub-group of the Northen Sotho, known as the eastern Sotho, were present nearby the eastern escarpment. They are known as the Pulana, Pai (emaMbayi) and Kutswe, these people moved from northern Swaziland further northwards when Swazi expanded into this area during the *mfecane* (Bergh, 1998:107-108). One of the recorded events relates to the attack of the Ndwande under Zwide on the Pedi in 1825 (Bergh, 1998:114-115). This seems to have started from the Lowveld in the region of the Pretoriuskop area towards Steelpoort.

During the nineteenth century the Lowveld area of Mpumalanga was extensively settled by both Bantu and European groups that migrated into this area. Bantu migration was mainly as a result of political upheaval during the *mfecane* ("the crushing" in Nguni). This was a period of bloody tribal and faction struggles in present-day KwaZulu Natal and on the Highveld area, which occurred around the early 1820's until the late 1830's (Bergh, 1998). It came about in response to heightened competition for land and trade, and caused population groups like gun-carrying Griquas and Shaka's Zulus to attack other tribes (Giliomee, 2003). During this period, a movement of Swazi people took place to the areas north and northwest of Swaziland. As a result reports indicate that the Swazi were living in the Lowveld area by the 1840's (Bergh, 1998).

Before the *mfecane* period (1820's) small farmer groups including the Pai and Pulana resided in the mountainous area surrounding Barberton and Nelspruit. The conflict during the *mfecane,* when the Swazi under Mswati II raided these smaller groups, resulted in scattered settlement of those who managed to

escape the Swazi onslaught. Evidence of these scattered settlements are sometimes found in the form of small stone walled enclosures in and around Barberton, Nelspruit and onwards to the Schoemanskloof.

According to Bornman:

"Mswati continued his attacks on the emaMbayi (Sotho) tribes living south of the Ngwenya (Crocodile) and the Mlambongwane (Kaap) Rivers, who fled into the present day Kruger National Park and into the mountainous area of Mphakeni (Crocodile Gorge) and the Three Sisters Mountains. But as soon as the Swazi army had retreated, the emaMbayi returned to their old haunts and reoccupied them.

Again the Swazi regiments drove the emaMbayi from this area. The battle, which took place near the creek, today known as Low's Creek, west of the Three Sisters Mountain, was so fierce that the creek ran red with the blood of the slain. After the battle the Swazi named the creek: the red (or blood) river (Mantibovu) and the Three Sisters they named Mbayiyane, meaning the 'mountain of the emaMbayi'.

Mswati proceeded systematically to settle this area with members of his own family and trusted commoners after they killed Tsibeni and evicted the remnants of his people who fled to an area near Legogote, where they are still living today" (Bornman, 1995). This is very near the town of White River.

Archaeological evidence recorded in *Prehistory of the Transvaal: a record of human activity* does however refer to the presence of terraced settlement and a set of "unusual group of walls" that most likely indicates the presence of a small Iron Age agricultural village in the vicinity of the area in which the farm is located in Mpumalanga (Mason, 1962). Information cited in the *Geskiedenisatlas van Suid-Afrika. Die vier noordelike provinsies* confirms the presence of Late Iron Age settlements in the area between ca 1000 and 1800 (Bergh, 1998).

4.1.2. The Voortrekkers

The Groot Trek of the Voortrekkers started with the Tregardt- van Rensburg trek in 1835. The two men met where Tregardt and his followers crossed the Orange River at Buffelsvlei (Aliwal North). Here van Rensburg joined the trek northwards. On August 23, 1837 the Tregardt trek left for Delagoabay from the Soutpansberg. They travelled eastwards alongside the Olifants River to the eastern foothills of the Drakensberg. From here they travelled through the Lowveld and the current Kruger National Park where they eventually crossed the Lebombo mountains in March 1838. They reached the Fortification at Lourenço Marques on 13 April 1838 (Bergh, 1998:124-125).

Permanent European (Voortrekker) settlement of the eastern areas of Mpumalanga can be traced back to a commission under the leadership of A.H. (Hendrik) Potgieter who negotiated with the Portuguese Governor at Delagoabaai in 1844 for land. It was agreed that these settlers could settle in an area that was four days journey from the east coast of Africa between the 10˚ and 26˚ south latitudes. Voortrekkers started migrating into the area in 1845. Andries-Ohrigstad was the first town established in this area in July 1845 after the Voortrekkers successfully negotiated for land with the Pedi Chief Sekwati. Farms were given out as far west as the Olifants River. The western boundary was not officially defined

but at a Volksraad meeting in 1849 it was decided that the Elands River would be the boundary between the districts of Potchefstroom and Lydenburg as this eastern portion of the Transvaal was then known (Bergh, 1998).

Due to internal strife and differences between the various Voortrekker groups that settled in the broader Transvaal region, the settlers in the Ohrigstad area now governed from the town of Lydenburg decided to secede from the Transvaal Republic in 1856. The Republic of Lydenburg laid claim to a large area that included not only the land originally obtained from the Pedi Chief Sekwati in 1849 but also other areas of land negotiated for from the Swazis. The Republic of Lydenburg was a vast area and stretched from the northern Strydpoort mountains to Wakkerstroom in the south and Bronkhortsspruit in the west to the Swazi border and the Lebombo mountains east.

As can be expected, the migration of Europeans into the north would have a significant impact on the indigenous people who populated the land. This was also the case in Mpumalanga. In 1839 Mswati succeeded Sobhuza (also known as Somhlomo) as king of the Swazi. Threatened by the ambitions of his half brothers, including Malambule, who had support from the Zulu king Mpande, he turned to the Ohrigstad Boers for protection. He claimed that the land that the Boers had settled on was Swazi property. The Commandant General of the Ohrigstad settlement, Andries Hendrik Potgieter, responded that the land was ceded to him by the Pedi leader Sekwati, in return for protection of the Pedi from Swazi attacks (Giliomee, 2003).

However, in reaction to the increasingly authoritarian way in which Potgieter conducted affairs at Ohrigstad, the Volksraad of Ohrigstad saw Mswati's offer as a means to obtain more respectable title deeds for the property (Bonner, 1978). According to a sales contract set up between the Afrikaners and the Swazi people on 25 July 1846, the whites were the rightful owners of the land that had it southern border at the Crocodile River, which stretched out in a westerly direction up to Elandspruit; of which the eastern border was where the Crocodile and Komati rivers joined and then extended up to Delagoa bay in the north (Van Rooyen, 1951). The Europeans bought the land for a 100 heads of cattle (Huyser). The area where the farm Roodewal 251 JT is located formed part of the land that was ceded to the Europeans (Boers) by the Swazis. Apparently, Swazi people could stay on the land only if the farmers asked permission from the South African Republic for them to be able to do so (Huyser, p 87).

In 1858 the Zuid-Afrikaansche Republiek (ZAR) was officially established, and mainly consisted of all the other territories settled by the Boers in the Transvaal region. This development led to a boundary dispute between the ZAR and the Republic of Lydenburg regarding the western boundary of the latter. Nevertheless in 1860 the Republic of Lydenburg united with the ZAR as the District of Lydenburg and ceded the land west of the Olifants River as part of the unification agreement to the District of Pretoria (Bergh, 1998).

4.1.3. Historic context of the Carolina district

Various archaeologists, anthropologists and historians have taken interest in the history of the Carolina area in Mpumalanga. The main focus of their studies falls on the binary theme of white and black interaction and also what consequences this reaction elicited in the past two hundred years. The main black group that inhabits this area today is the Swazi people. The Swazi people have a very rich political and cultural history.

However, the original inhabitants of the area were the Bushmen or San people. The numerous Bushmen paintings to be found in the district surrounding the towns of Chrissiesmeer and Amsterdam bears testimony to this fact. Historian, Hans Bornman, states in his study of the Carolina area that the last of the Bushmen were killed in the Breyten area and by 1880 no more nomadic Bushmen were present in the region (Bornman, 1986).

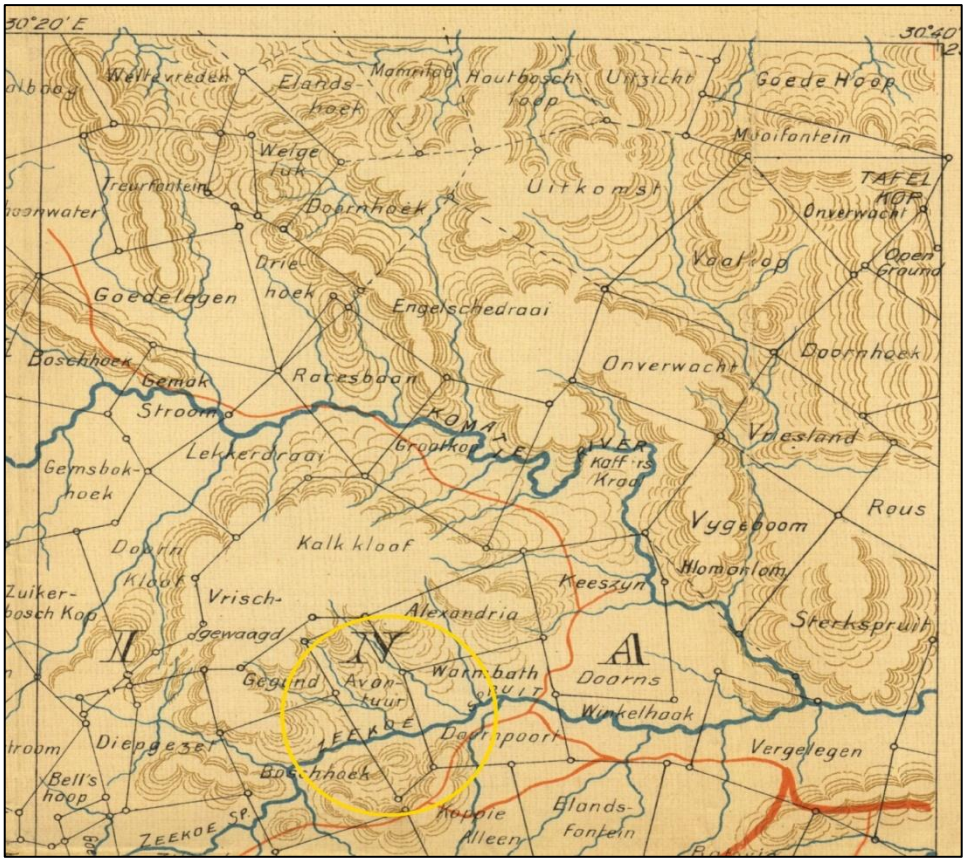

Fig. 4.1. Imperial Map of South Africa: Ermelo 1900. The farm Avontuur encircled in yellow.

By the mid nineteenth century white farmers had also moved into the area and it is known that the Voortrekkers under the leadership of Andries Hendrik Potgieter settled at Ohrigstad in the north-eastern Transvaal (Myburh, 1986). The ensuing interaction between the Swazi people and Boers at Ohrigstad and later at Lydenburg was to have an important impact on the history of the Carolina district.

The Swazi kingdom went through various internal dynastic troubles during the first half of the nineteenth century. As explained by historian Philip Bonner, the “disintegration [of the Swazi people] was averted by two timely interventions from outside: the one of the Ohrigstad Boers, who proffered sanctuary and support; the other from within Zululand itself” (Bonner, 1983). The latter is of importance as a threat of a Zulu invasion of Swaziland saw the Swazi people aligning themselves with the Boers who were subsequently given vast tracks of land in the eastern Transvaal for offering the Swazi protection against the Zulu.

In 1839 Mswati succeeded Sobhuza (also known as Somhlomo) as king of the Swazi. His succession to the thrown was marked by fission within the Swazi society. The reason for this relates to the complex dynastic rules and traditions when it comes to the appointment of the Swazi king. Mswati was at the time of ascending to the thrown still a minor and was only circumcised in 1845; the latter formed part of a traditional ceremony which showed that Mswati had reached the age of maturity and was now fit to rule over his people. Yet, in July 1846 his older half-brother, Somcuba, was still seen by the Ohrigstad Boers as “ruling in place of the king” (Bonner, 1978).

Mswati’s rule was threatened by the ambitions of various of his older half brothers of who, Malambule, had the support of the Zulu king Mpande. For protection against a possible coup from his brother and the threat of a Zulu invasion of Swaziland, Mswati turned to the Ohrigstad Boers for support; he claimed that the land on which the Boers had settled was Swazi property. However, the Commandant General of the Ohrigstad settlement, Andries Hendrik Potgieter, claimed supreme authority of the area as according to him the land was ceded to him personally by the Pedi leader, Sekwati, in return for the Boers protecting the Pedi from possible future Swazi attacks (Giliomee, 2003).

However, the Boer settlement at Ohrigstad was on the verge of civil war between the faction which supported the Volksraad and the faction of Potgieter. The Volksraad was increasingly becoming more agitated with the authoritarian style in which Potgieter governed the area.

The fact that Potgieter also claimed to be the personal title deed holder to the area led to further antagonism with the Volksraad. Soon the Volksraad viewed Mswati’s offer as an alternative means to obtain more respectable title deeds for the Boer Community (Bonner,1978). The Volksraad first negotiated with Sekwati, but Sekwati argued that he already gave the land to Potgieter and was therefore not willing to enter into a new agreement. In July1846 the Volksraad therefore entered into an agreement with the Swazi and secured a massive concession of land, stretching between the Crocodile and Olifants Rivers. This treaty coincided with Mswati’s half-brother Malambule securing the support of the Zulu King, Mpande, against Mswati. Once Mswati realised the imminent threat of war with the Zulu nation he was desperate for Boer assistance and protection. The war that followed saw Mpande’s army invading most of Swaziland and the Swazi people taking refuge with the Boers. In July 1848 the Zulu army left Swaziland. Potgieter viewed the Volksraad as his enemy and decided to try and sabotage the agreement between the Volksraad and Mswati. He tried to cast doubt on the authenticity of the agreement by trying to renegotiate a treaty with the Swazi during 1847-1848 (Bonner, 1978).

After the Volksraad met with Somcuba's aids in 1848 it was clear to them that the Swazi had been approached with an alternative offer from Potgieter. However, Somcuba's position became more ambiguous within the Swazi royal house. As Somcuba was viewed by the Boers as more important than King Mswati in the negotiations, Mswati started exerting pressure on his half-brother Somcuba to relinquish his authority. In Swaziland there was also increasing opposition to the 1846 concession of territory to the Boers. Adding to the opposition were the facts that Somcuba was the chief negotiator of the treaty and that Potgieter was determined to undermine the treaty. There was also a visible weakening of the Ohrigstad community due to disease and desertion (Bonner, 1978).
However, any thoughts that Mswati had of repudiating the treaty vanished with the departure of Potgieter, who left the area seeking new land to settle further north. The only option open to Mswati was to reaffirm the legality of the concession and to try and detach the Boers from Somcuba. Somcuba had been installed at Eludlambedlwini village in the eastern Transvaal and given charge of the Ludlambedlu cattle. The Ludlambedlu cattle were of great ritual and symbolic significance – and held in explicit trust by Somcuba for the king. However, Somcuba came to view the heard as his private procession and seemed to have appropriated the economic and ritual powers of the king in the time that he came under more pressure to relinquish his authority. In 1846 he for example did not hand over all cattle of the treaty with the Boers to Mswati. After the Zulu left Swaziland Somcuba refused to hand over the remaining cattle and the stage was set for a civil war between the two Swazi brothers (Bonner, 1983).

Somcuba fled to the protection of the Boers at Ohrigstad. The Boers aligned themselves with the plight of Somcuba against Mswati and the Swazi king thus did not seek any further aid from the Boers against the Zulu. Somcuba located himself less than forty miles from the royal capital at Hhohho. Mswati was finally able to dispose of Somcuba in 1855 (Bonner, 1978).
According to ethnologist, A.C. Myburg, Somcuba was murdered during an attack of Mswati's eMbhuleni regiment on Somcuba's kraal. Somcuba was buried at the foot of Ludayikop, Schagen 134, in the district of Nelspruit (Myburgh, 1956).

The diplomatic relationship between the Swazi and the Boers did not end with the death of Somcuba and in 1855 and 1866 the Swazis ceded vast tracks of land to the Boer government now established at Lydenburg. The 1855 treaty saw the inclusion of the land between the Crocodile and Komati Rivers (Opperman, 1948). After Mswati's death the Boers appointed a commission in 1866 to finalise the 1855 agreement and also to consolidate the land that was bought from the Swazi. The last payment for the land was settled in 1871 and subsequently the Swazi government acknowledged the sovereignty of the South African Republic (ZAR) in 1875 (Bonner, 1983).
In 1880 the Transvaal-Swazi Boundary Commission was appointed to finalise the boundary demarcations between the ZAR and Swaziland. During the 1870s there seemed to have been some dispute between the Boers and Swazi regarding the cession of land in the Komati Valley but the Commission reaffirmed these boundaries. As stated by Bonner: "The Transvaal became independent within its former borders,

and with no loss of territory to the east. The only protection Swaziland secured was a formal recognition by both parties of her independence." (Bonner, 1983).
White farmers settled in the vicinity of the Komati River and it soon became one of the most densely white populated areas of the ZAR. Although the area was on the transport route from the Natal Colony to Lydenburg the people of the area were situated 20 hours on horseback from Lydenburg and 9 hours on horseback from Nazareth (present day Middelburg). It was the discovery of gold, first on Kaapse Hoop and shortly thereafter on Moodies, west of the present day Barberton, which led to the farmers in the area calling for the establishment of a town in the vicinity (Bornman, 1986).

The town, Carolina, was proclaimed on 15 June 1886. It was at the time located in what was known as the Komati area in the then district of Lydenburg. The town was named after Magdalena Carolina Smit, the wife of Cornelis Coetzee, who was the owner of the farm Steynsdraai and who donated a portion of his farm for the establishment of the town (Myburgh, 1956). Coetzee donated the piece of land with his only prerequisite being that the town should be named after his wife (Bornman, 1986). In 1893 the Volksraad of the ZAR decided to declare Carolina and its surroundings a district in its own right. The boundaries of the district were determined and the first magistrate, one A.F. Jansen, assumed his duties in 1894 (Bornman, 1986).
According to Hans Bornman when the first whites settled in the Komati Valley no blacks lived in the area (1986). However, according to A.C. Myburgh there are various stone ruins in the Carolina district. These settlements consist of various stone enclosures and beehive -shaped stone huts and are usually located close to terraces and water canals. Many are also to be found on hilltops and are in many cases protected by a circular wall. Myburgh states that contemporary and archaeological evidence show that the ruins can be attributed to the Sotho people who used to live in the area until the hostilities of the Swazi forced them out of the area during the nineteenth century (Myburgh, 1956).
Although it is very difficult to estimate the exact number of blacks who resided in the Eastern Transvaal during the twentieth century some figures do exist. According to R. Massie, in his study: *Native Tribes of the Transvaal,* there were approximately 86 772 black people residing in the south-eastern districts of the Transvaal in 1905. This group consisted of Zulu, Swazi and Basotho peoples (Massie, 1905). Massie estimates that there were about 9143 blacks residing in the Carolina district. Massie also states that the Carolina area is inhabited almost entirely by Swazis and that the Komati Valley has been looked upon as being Swazi territory as the Swazi claimed to have driven the Basotho from the area (Massie, 1905).
N. van Warmelo, in his 1935 study entitled: *A preliminary survey of the Bantu tribes of Southern Africa*, also recorded the presence of Swazi people in the Carolina area during the 1930's (Van Warmelo, 1935). Van Warmelo stated that there were about 8466 black Tax payers living on European farms (Van Warmelo, 1935). According to a petition submitted by the Swazi to then Union Government in 1932 there were about 60 000 Swazi, who resided in the districts of Barberton, Carolina and Ermelo.

4.2. Archaeology

4.2.1. Stone Age

In Mpumalanga Province the Drakensberg separates the interior plateau also known as the Highveld from the low-lying subtropical Lowveld which stretches to the Indian Ocean. A number of rivers amalgamate into two main river systems, the Olifants River and the Komati River. This fertile landscape has provided resources for humans and their predecessors for more than 1,7million years (Esterhuizen & Smith in Delius, 2007).

The initial attraction of abundant foods in the form of animals and plants eventually also led to the discovery of and utilisation of various minerals including ochre, iron and copper. People also obtained foreign resources by means of trade from the coast. From 900AD this included objects which were brought across the ocean from foreign shores.

The Early Stone Age (ESA)

In South Africa the ESA dates from about 2 million to 250 000 thousand years ago in other words from the early to middle Pleistocene. The archaeological record shows that as the early ancestors progressed physically, mentally and socially, bone and stone tools were developed. One of the most influential advances was their control of fire and diversifying their diet by exploitation of the natural environment (Esterhuizen & Smith in Delius, 2007).

The earliest tools date to around 2, 5 million years ago from the site of Gona in Ethiopia. Stone tools from this site shows that early hominids had to cognitive ability to select raw material and shape it for a specific application. Many bones found in association with stone tools like these have cut marks which lead scientists to believe that early hominids purposefully chipped cobblestones to produce flakes with a sharp edge capable of cutting and butchering animal carcasses. This supplementary diet of higher protein quantities ensured that brain development of hominids took place more rapidly.

Mary Leaky discovered tools like these in the Olduwai Gorge in Tanzania during the 1960s. The tools are named after this gorge and is known as the Oldowan industry. These tools, only found in Africa, are mainly simple flakes which were struck from cobbles. This method of manufacture remained for about 1,5 million years. Although there is continuing debate about who made these tools, two hominids may have been responsible. The first of these was an early form of *Homo* and the second was *Parathropus robustus*, which became extinct about 1 million years ago (Esterhuizen & Smith in Delius, 2007).

Some time later, around 1, 7 million years ago more specialised tools known as Acheulean tools, appeared. These are named after tools from a site in France by the name of Saint Acheul, where they were first discovered in the 1800s. It is argued that these tools had their origin in Africa and then spread towards Europe and Asia with the movement of hominids out of Africa. These tools had longer and sharper edges and shapes which suggest that they could be used for a larger range of activities which

included the butchering of animals, chopping of wood, digging roots and cracking bone. *Homo ergaster* was probably responsible for the manufacture of Acheulean tools in South Africa. This physical type was arguably physically similar to modern humans, a larger brain and modern face, body height and proportion are all characteristics which are very similar to us. *Homo ergaster* was able to flourish in a variety of habitats in part because they were dependent on tools. They adapted to drier, more open grassland settings. Because these early people were often associated with water sources such as rivers and lakes, sites where they left evidence of their occupation are very rare. Most tools of these people have been washed into caves, eroded out of riverbanks and washed downriver. An example in Mpumalanga is Maleoskop on the farm Rietkloof where ESA tools have been found. This is one of only a handful of such sites in Mpumalanga.

Middle Stone Age (MSA)

A greater variety of tools with diverse sizes and shapes appeared by 250 000 BP. These replaced the large hand axes and cleavers of the ESA. This technological advancement introduces the Middle Stone Age (MSA). This period is characterised by tools which are smaller in size but different in manufacturing technique (Esterhuizen & Smith in Delius, 2007).

In contrast to the ESA technology of removing flakes from a core, MSA tools were flakes to start with. They were of a predetermined size and shape and were made by preparing a core of suitable material and striking off the flake so that it was flaked according to a shape which the toolmaker desired. Elongated, parallel-sided blades, as well as triangular flakes are common finds in these assemblages. Mounting of stone tools onto wood or bone to produce spears, knives and axes became popular during the MSA. These early humans not only settled close to water sources but also occupied caves and shelters. The MSA represents the transition of more archaic physical type (*Homo)* to anatomically modern humans, *Homo sapiens.*

The MSA has not been extensively studied in Mpumalanga but evidence of this period has been excavated at Bushman Rock Shelter, a well-known site on the farm Klipfonteinhoek in the Ohrigstad district. This cave was excavated twice in the 1960s by Louw and later by Eloff. The MSA layers show that the cave was repeatedly visited over a long period. Lower layers have been dated to over 40 000 BP while the top layers date to approximately 27 000 BP (Esterhuizen & Smith in Delius, 2007; Bergh, 1998).

Later Stone Age (LSA)

Early hunter gatherer societies were responsible for a number of technological innovations and social transformations during this period starting at around 20 000 years BP. Hunting of animals proved more successful with the innovation of the bow and link-shaft arrow. These arrows were made up of a bone tip which was poisoned and loosely linked to the main shaft of the arrow. Upon impact, the tip and shaft separated leaving the poisoned arrow-tip imbedded in the prey animal. Additional innovations include bored stones used as digging stick weights to uproot tubers and roots; small stone tools, mostly less than

25mm long, used for cutting of meat and scraping of hides; polished bone tools such as needles; twine made from plant fibres and leather; tortoiseshell bowls; ostrich eggshell beads; as well as other ornaments and artwork (Esterhuizen & Smith in Delius, 2007).

At Bushman Rock Shelter the MSA is also represented and starts at around 12 000 BP but only lasted for some 3 000 years. The LSA is of importance in geological terms as it marks the transition from the Pleistocene to the Holocene which was accompanied by a gradual shift from cooler to warmer temperatures. This change had its greatest influence on the higher lying areas of South Africa. Both Bushman Rock Shelter and a nearby site, Heuningneskrans, have revealed a greater use in plant foods and fruit during this period (Esterhuizen & Smith in Delius, 2007; Bergh, 1998).

Faunal evidence suggests that LSA hunter-gatherers trapped and hunted zebra, warthog and bovids of various sizes. They also diversified their protein diet by gathering tortoises and land snails *(Achatina*) in large quantities.

Ostrich eggshell beads were found in most of the levels at these two sites. It appears that there is a gap of approximately 4 000 years in the Mpumalanga LSA record between 9 000 BP and 5 000 BP. This may be a result of generally little Stone Age research being conducted in the province. It is, however, also a period known for rapid warming and major climate fluctuation which may have led people to seek out protected environments in this area. The Mpumalanga Stone Age sequence is visible again during the mid-Holocene at the farm Honingklip near Badplaas in the Carolina district (Esterhuizen & Smith in Delius, 2007; Bergh, 1998).

At this location, two LSA sites were located on opposite sides of the Nhlazatshe River, about one kilometre west of its confluence with the Teespruit. These two sites are located on the foothills of the Drakensberg where the climate is warmer than the Highveld but also cooler than the Lowveld (Esterhuizen & Smith in Delius, 2007; Bergh, 1998).

Nearby the sites, dated to between 4 870 BP and 200 BP are four panels which contain rock art. Colouring material is present in all the excavated layers of the site which makes it difficult to determine whether the rock art was painted during the mid- or later Holocene. Stone walls at both sites date from the last 250 years of hunter gatherer occupation and they may have served as protection from predators and intruders (Esterhuizen & Smith in Delius, 2007; Bergh, 1998).

4.2.2. Early Iron Age

The period referred to as the Early Iron Age (AD 200-1500 approx.) started when presumably Karanga (north-east African) herder groups moved into the north eastern parts of South Africa. It is believed that these people may have been responsible for making of the famous Lydenburg Heads, ceramic masks dating to approximately 600AD.

Ludwig von Bezing was a boy of more or less 10 years of age when he first saw pieces of the now famous Lydenburg heads in 1957 while playing in the veld on his father's farm near Lydenburg. Five

years later von Bezing developed an interest in archaeology and went back to where he first saw the shards. Between 1962 and 1966 he frequently visited the Sterkspruit valley to collect pieces of the seven clay heads. Von Bezing joined the archaeological club of the University of Cape Town when he studied medicine at this institution.

He took his finds to the university at the insistence of the club. He had not only found the heads, but potsherds, iron beads, copper beads, ostrich eggshell beads, pieces of bones and millstones. Archaeologists of the University of Cape Town and WITS Prof. Ray Innskeep and Dr Mike Evers excavated the site where von Bezing found the remains. This site and in particular its unique finds (heads, clay masks) instantly became internationally famous and was henceforth known as the Lydenburg Heads site.

Two of the clay masks are large enough to probably fit over the head of a child, the other five are approximately half that size. The masks have both human and animal features, a characteristic that may explain that they had symbolic use during initiation- and other religious ceremonies. Carbon dating proved that the heads date to approximately 600 AD and was made by Early Iron Age people. These people were Bantu herders and agriculturists and probably populated Southern Africa from areas north-east of the Limpopo river. Similar ceramics were later found in the Gustav Klingbiel Nature Reserve and researchers believe that they are related to the ceramic wares (pottery) of the Lydenburg Heads site in form, function and decorative motive. This sequence of pottery is formally known as the Klingbiel type pottery. No clay masks were found in similar context to this pottery sequence.

Two larger heads and five smaller ones make up the Lydenburg find. The heads are made of the same clay used in making household pottery. It is also made with the same technique used in the manufacture of household pottery. The smaller heads display the modeling of a curved forehead and the back neck as it curves into the skull. Around the neck of each of the heads, two or three rings are engraved horizontally and are filled in with hatching marks to form a pattern. A ridge of clay over the forehead and above the ears indicates the hairline. On the two larger heads a few rows of small clay balls indicate hair decorations. The mouth consists of lips – the smaller heads also have teeth. The seventh head has the snout of an animal and is the only head that represents an animal.

Some archaeological research was done during the 1970's at sites belonging to the EIA (Early Iron Age), location Plaston, a settlement close to White River (Evers, 1977). This site is located on a spur between the White River and a small tributary. It is situated on holding 119 at Plaston.

The site was discovered during house building operations when a collection of pottery shards was excavated. The finds consisted of pottery shards both on the surface and excavated.

Some of the pottery vessels were decorated with a red ochre wash. Two major decoration motifs occurred on the pots:

- Punctuation, using a single stylus and

- Broadline incision, the more common motif

A number of Early Iron Age pottery collections from Mpumalanga and Limpopo may be compared to the Plaston sample. They include Silver Leaves, Eiland, Matola, Klingbiel and the Lydenburg Heads site. The Plaston sample is distinguished from samples of these sites in terms of rim morphology, the majority of rims from Plaston are rounded and very few beveled. Rims from the other sites show more beveled rims (Evers, 1977:176).

Early Iron Age pottery was also excavated by archaeologist, Prof. Tom Huffman during 1997 on location where the Riverside Government complex is currently situated (Huffman, 1998). This site known as the Riverside site is situated a few kilometers north of Nelspruit next to the confluence of the Nelspruit and Crocodile River. It was discovered during the course of an environmental impact assessment for the new Mpumalanga Government complex/ offices. A bulldozer cutting exposed storage pits, cattle byres, a burial and midden on the crest of a gentle slope. Salvage excavations conducted during December 1997 and March 1998 recovered the burial and contents of several pits.

One of the pits contained among other items, pottery dating to the eleventh century (AD 1070 ± 40 BP) this relates the pottery to the Mzonjani and Broederstroom phases. The early assemblage belongs to the Kwale branch of the Urewe tradition.

During the early 1970's Dr Mike Evers of the University of the Witwatersrand conducted fieldwork and excavations in the Eastern Transvaal. Two areas were studied, the Letaba area south of the Groot Letaba River, west of the Lebombo Mountains, east of the great escarpment and north of the Olifants River. The second area was the Eastern Transvaal escarpment area between Lydenburg and Machadodorp.

These two areas are referred to as the Lowveld and escarpment respectively. The earliest work on Iron Age archaeology was conducted by Trevor and Hall in 1912. This revealed prehistoric copper-, gold- and iron mines. Schwelinus (1937) reported smelting furnaces, a salt factory and terraces near Phalaborwa. In the same year D.S. van der Merwe located ruins, graves, furnaces, terraces and soapstone objects in the Letaba area.

Mason (1964, 1965, 1967, 1968) started the first scientific excavation in the Lowveld which was followed by N.J. van der Merwe and Scully. M. Klapwijk (1973, 1974) also excavated an Early Iron Age (EIA) site at Silverleaves and Evers and van den Berg (1974) excavated at Harmony and Eiland, both EIA sites.

Recent research by the National Cultural History Museum resulted in the excavation of an Early Iron Age site in Sekhukuneland, known as Mototolong (Van Schalkwyk, 2007). The site is characterized by four large cattle kraals containing ceramics which may be attributed to the Mzonjani and Doornkop occupational phases.

4.2.3. Late Iron Age

The later phases of the Iron Age (AD 1600-1800's) is represented by various tribes including Ndebele, Swazi, BaKoni, Pedi marked by extensive stonewalled settlements found throughout the escarpment and particularly around Lydenburg, Badfontein, Sekhukuneland, Roossenekal and Steelpoort. The BaKoni were the architects of the stone-walled enclosures found throughout the escarpment area of Eastern Mpumlanga. These settlement complexes may be divided into three basic features: homesteads, terraces and cattle tracks. Researchers such as Mike Evers (1975) and Collett (1982) identified three basic settlement layouts in this area. Basically these sites can be divided into simple and complex ruins. Simple ruins are normally small in relation to more complex sites and have smaller central cattle byres and fewer huts. Complex ruins consist of a central cattle byre which has two opposing entrances and a number of semi-circular enclosures surrounding it. The perimeter wall of these sites is sometimes poorly visible. Huts are built between the central enclosure and the perimeter wall. These are all connected by track-ways referred to as cattle tracks. These tracks are made by building stone walls which forms a walkway for cattle to the centrally located cattle byres.

Smaller tribes such as the Pai and Pulana who resided in the Lowveld were attacked by and made to flee from the aggressive Swazi, especially during the *mfecane* (difaqane).They (Swazi) were particularly active in the Lowveld during the difaqane period (1820's) and it is well-known that they frequently attacked and ousted smaller herder groups like the Pai and Pulana, especially in the area today known as Low's Creek. They were however prevented from settling in the low-lying areas due to the presence of the tsetse fly and malaria. Consequently there is little evidence of large scale settlement in the Crocodile River valley until the time of colonial settlement (1890's) and later. Small, isolated dry-packed stone-walled enclosures found near Nelspruit and surrounding areas may be attributed to these smaller groups who hid away from the Swazi onslaught. The sites were probably not used for extended periods as they were frequently on the move as a result of the onslaught and therefore small, indistinct and with little associated cultural material.

5. Located sites, description and suggested mitigation

A total of seven (7) sites were located and documented. Sites **BA1-4** consists of buildings and dwellings none of which are regarded as being of heritage significance. A few sites were recorded for orientation and observation purposes (**sites OBS 1-3**).

Table 5.1. Summary of located sites and their significance

Type of site	**Identified sites**	**Significance**
Graves and graveyards	None	N/A
Late Iron Age	None	N/A
Early Iron Age	None	N/A
Historical buildings	None	N/A
Historical features	None	N/A
Stone Age sites	None	N/A

Table 5.2. Significance rating guidelines for sites

Field Rating	**Grade**	**Significance**	**Recommended Mitigation**
National Significance (NS)	Grade 1		Conservation, nomination as national site
Provincial Significance (PS)	Grade 2		Conservation; Provincial site nomination
Local significance (LS 3A)	Grade 3A	High Significance	Conservation, No mitigation advised
Local Significance (LS 3B)	Grade 3B	High Significance	Mitigation but at least part of site should be retained
Generally Protected A (GPA)		High/ Medium Significance	Mitigation before destruction
Generally Protected B (GPB)		Medium Significance	Recording before destruction
Generally Protected C (GPC)		Low Significance	Destruction

5.2. Description of located sites

5.2.1. Site BA 1.

Location: See Appendix B and D (fig. 1).

Description: A small house

Impact of the proposed development/ activity:

The proposed development will probably impact on the building as it will be upgraded.

Recommendation:

None necessary.

5.2.2. Site BA 2.

Location: See Appendix B and D (fig. 2).

Description: A timber residence.

Impact of the proposed development/ activity:

The house will possibly be impacted upon during the proposed development activity.

Recommendation:

None necessary.

5.2.3. Site BA 3.

Location: See Appendix B and D (fig. 3).

Description: This is a farm shed with corrugated iron roof sheeting and timber trusses. It has a concrete floor and foundations and walls and the outside walls are covered with corrugated iron sheeting. It is currently used as a workshop.

Impact of the proposed development/ activity:

The shed will possibly be impacted upon during the proposed development activity.

Recommendation:

Low significance, no recommendations needed.

5.2.4. Site BA 4.

Location: See Appendix B and D (fig. 4, 5).

Description: Two houses with corrugated iron sheeting covering a timber roof structure, brick and mortar walls, concrete floors and foundations. The walls are plastered and painted and windows steel framed and painted. Timber doors with steel frames.

Impact of the proposed development/ activity:

The houses will possibly be impacted upon during the proposed development activity as they will be upgraded for intern's accommodation.

Recommendation:

The houses are not regarded as being historically significant, therefore no recommendations needed.

5.2.5. Site OBS 1.

Location: See Appendix B and D (fig. 6, 7)

Description: Survey orientation point.

Impact of the proposed development/ activity:

N/A

Recommendation:

N/A

5.2.6. Site OBS 2.

Location: See Appendix B and D (fig. 8, 9).

Description: Survey orientation point.

Impact of the proposed development/ activity:

N/A

Recommendation:

N/A

5.2.7. Site OBS 3.

Location: See Appendix B and D (fig. 10).

Description: Survey orientation point

Impact of the proposed development/ activity:

N/A

Recommendation:

N/A

TABLE 5.3. General Significance of located sites and field rating.

Site No.	Description	Type of significance	Degree of significance	NHRA heritage resource & rating
BA 1	House	Heritage Architecture	Archaeological: N/A Historic: None	Buildings & Structures. Low. **GPC.**
BA 2	House	Heritage Architecture	Archaeological: None Historic: Medium	Buildings & Structures. Low. **GPC.**
BA 3	Workshop/ Shed	Heritage Architecture	Archaeological: None Historic: Low	Buildings & Structures. Low. **GPC.**
BA 4	House	Heritage Architecture	Archaeological: None Historic: Medium-High	Buildings & Structures. Low. **GPC.**
OBS 1	Survey orientation	None	Archaeological: None Historic: None	N/A
OBS 2	Survey orientation	None	Archaeological: None Historic: None	N/A
OBS 3	Survey orientation	None	Archaeological: None Historic: None	N/A

TABLE 5.4. Site condition assessment and management recommendations.

Site no.	Type of Heritage resource	Integrity of cultural material	Preservation condition of site	Relative location	Quality of archaeological/ historic material	Quantity of site features	Recommended conservation management
BA 1	Buildings & structures	N/A	Fair	Avontuur 725 JT	N/A	1	None
BA 2	Buildings & structures	N/A	Good	Avontuur 725 JT	N/A	1	None
BA 3	Buildings & structures	N/A	Good	Avontuur 725 JT	N/A	1	None
BA 4	Buildings & structures	N/A	Good	Avontuur 725 JT	N/A	1	None
OBS 1	None	N/A	N/A	Avontuur 725 JT	N/A	N/A	N/A
OBS 2	None	N/A	N/A	Avontuur 725 JT	N/A	N/A	N/A
OBS 3	None	N/A	N/A	Avontuur 725 JT	N/A	N/A	N/A

6. Findings and recommendations

Recommendations were allocated to each site as discussed in section 5: **Located sites and their description, tables 5.3 and 5.4.** A total of seven (7) sites were located and documented. In terms of the archaeological component of the Act (25 of 1999, section 35) no sites or features of archaeological significance was recorded during the survey. In terms of the built environment in the area (section 34 of the Act) no significant buildings were identified. Three sites were recorded for orientation purposes (OBS 1-3) and a further four sites (buildings) were recorded and assessed (BA 1-4). From a heritage perspective it is therefore recommended that the proposed activities continue.

The bulk of archaeological remains are normally located beneath the soil surface. It is therefore possible that some significant cultural material or remains were not located during this survey and will only be revealed when the soil is disturbed. Should excavation or large scale earth moving activities reveal any human skeletal remains, broken pieces of ceramic pottery, large quantities of sub-surface charcoal or any material that can be associated with previous occupation, a qualified archaeologist should be notified immediately. This will also temporarily halt such activities until an archaeologist have assessed the situation. It should be noted that if such a situation occurs it may have further financial implications.

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ARCHIVAL SOURCES

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3. CBD, 14929, PB4/19/2/12/708/1, Departement Plaaslike Bestuur, Gemeenskapsvorming Besigheidsregte, Kees Zyn Doorns.
4. CBD, 14929, PB4/19/2/12/708/3, Departement Plaaslike Bestuur, Gemeenskapsvorming Besigheidsregte, Kees Zyn Doorns.
5. CBD, 14929, PB4/19/2/12/708/4, Departement Plaaslike Bestuur, Gemeenskapsvorming Besigheidsregte, Kees Zyn Doorns.
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Appendix A

Terminology

"Alter" means any action affecting the structure, appearance or physical properties of a place or object, whether by way of structural or other works, by painting, plastering or other decoration or any other means.

"Archaeological" means –

- Material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artifacts, human and hominid remains and artificial features or structures;
- Rock Art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- Wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artifacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation; and
- Features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found;

"Conservation", in relation to heritage resources, includes protection, maintenance, preservation and sustainable use of places or objects so as to safeguard their cultural significance;

"Cultural significance" means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance;

"Development" means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of a heritage authority in any way result in a change to the nature, appearance or physical nature of a place, or influence its stability and future well-being, including –

- construction, alteration, demolition, removal or change of use of a place or a structure at a place;
- carrying out any works on or over or under a place;
- subdivision or consolidation of land comprising, a place, including the structures or airspace of a place;

- constructing or putting up for display signs or hoardings;
- any change to the natural or existing condition or topography of land; and
- any removal or destruction of trees, or removal of vegetation or topsoil;

"Expropriate" means the process as determined by the terms of and according to procedures described in the Expropriation Act, 1975 (Act No. 63 of 1975);

"Foreign cultural property", in relation to a reciprocating state, means any object that is specifically designated by that state as being of importance for archaeology, history, literature, art or science;

"Grave" means a place of internment and includes the contents, headstone or other marker of such a place, and any other structure on or associated with such place;

"Heritage resource" means any place or object of cultural significance;

"Heritage register" means a list of heritage resources in a province;

"Heritage resources authority" means the South African Heritage Resources Agency, established in terms of section 11, or, insofar as this Act (25 of 1999) is applicable in or in respect of a province, a provincial heritage resources authority (PHRA);

"Heritage site" means a place declared to be a national heritage site by SAHRA or a place declared to be a provincial heritage site by a provincial heritage resources authority;

"Improvement" in relation to heritage resources, includes the repair, restoration and rehabilitation of a place protected in terms of this Act (25 of 1999);

"Land" includes land covered by water and the air space above the land;

"Living heritage" means the intangible aspects of inherited culture, and may include –

- cultural tradition;
- oral history;
- performance;
- ritual;
- popular memory;
- skills and techniques;
- indigenous knowledge systems; and
- the holistic approach to nature, society and social relationships;

"Management" in relation to heritage resources, includes the conservation, presentation and improvement of a place protected in terms of the Act;

"Object" means any moveable property of cultural significance which may be protected in terms of any provisions of the Act, including –

- any archaeological artifact;
- palaeontological and rare geological specimens;
- meteorites;
- other objects referred to in section 3 of the Act;

"Owner" includes the owner's authorized agent and any person with a real interest in the property and –

- in the case of a place owned by the State or State-aided institutions, the Minister or any other person or body of persons responsible for the care, management or control of that place;
- in the case of tribal trust land, the recognized traditional authority;

"Place" includes –

- a site, area or region;
- a building or other structure which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure;
- a group of buildings or other structures which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures;
- an open space, including a public square, street or park; and
- in relation to the management of a place, includes the immediate surroundings of a place;

"Site" means any area of land, including land covered by water, and including any structures or objects thereon;

"**Structure"** means any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith.

Appendix B

List of located sites

A total of seven sites were located on the project area and numbered BA 1-4 and OBS 1-3 respectively. The former are sites or features which were assessed and the latter are sites or observation points recorded for survey orientation purposes. The initials “BA” represent Badplaas (town) and the farm “Avontuur” followed by the number of the site, similarly, the initials OBS represent observation and orientation points during the survey. A spatial location with the aid of a GPS (Global Positioning System) was added to each site.

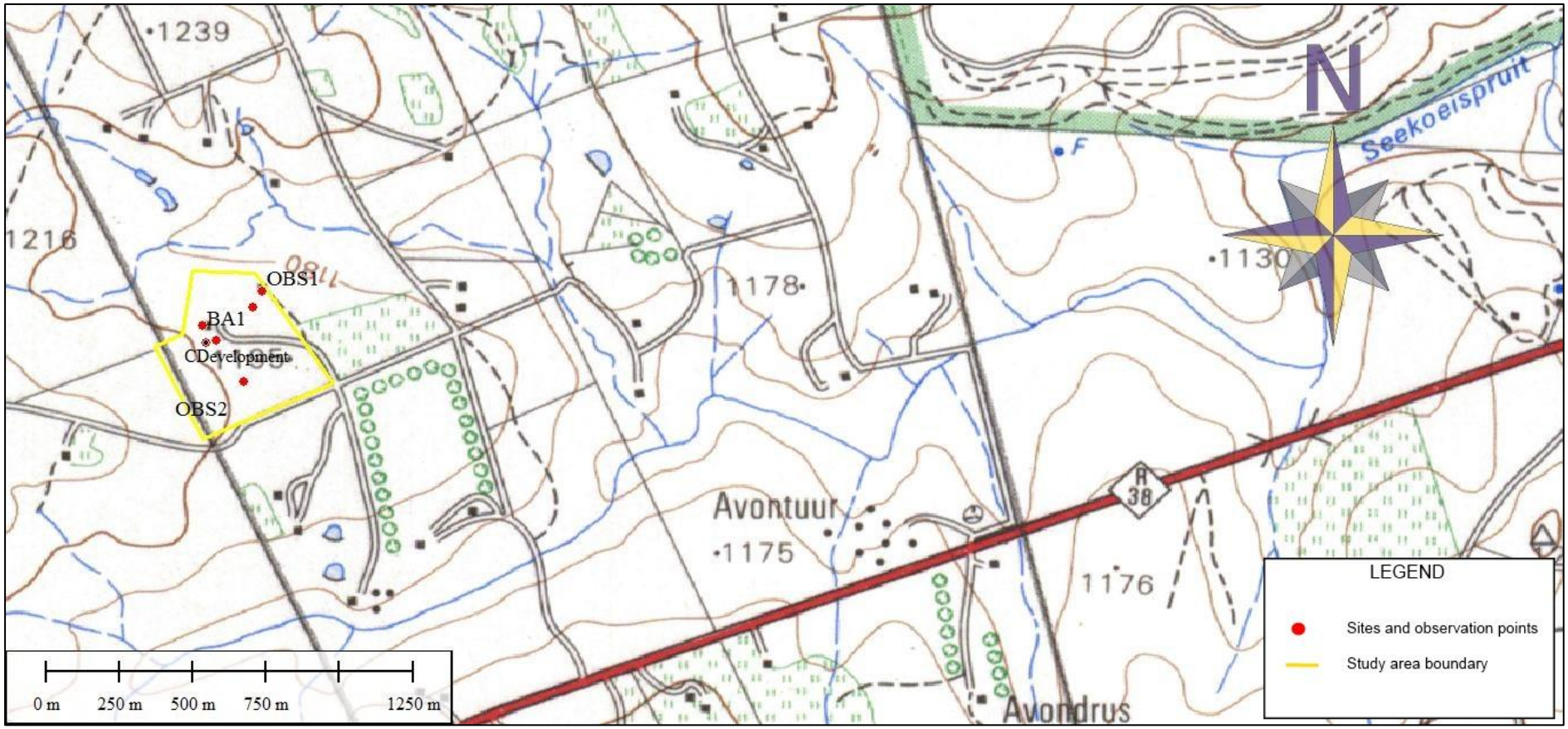
Table A. Site Locations.

Site Name	Date of compilation	GPS Coordinates		Photo figure No.
BA1	23/01/2016	S25°57'29.42"	E030°30'51.41"	1
BA 2	23/01/2016	S25°57'35.07"	E030°30'45.30"	2
BA 3	23/01/2016	S25°57'35.07"	E030°30'45.30"	3
BA 4	23/01/2016	S25°57'34.88"	E030°30'46.44"	4, 5

Table B. Survey Orientation Locations.

Site Name	Date of compilation	GPS Coordinates		Photo figure No.
OBS 1	23/01/2016	S25°57'31.23"	E030°30'50.47"	6, 7
OBS 2	23/01/2016	S25°57'39.37"	E030°30'49.49"	8, 9
OBS 3	23/01/2016	S25°57'33.18"	E030°30'44.90"	10

Appendix C


1239
1216
1178
1130
1175
1176
Avontuur
Avondrus
Seekoeispruit
N
OBS1
BA1
CDevelopment
OBS2
R 38
0 m
250 m
500 m
750 m
1250 m
LEGEND
Sites and observation points
Study area boundary


2/28/2012 11:09:09 am
11:09 am
11:19 am
BA1
OBS1
OBS3
BA3
BA4
BA2
OBS2
LEGEND
Sites and observation points
Study area boundary
© 2016 Google
Image © 2016 CNES / Astrium
© 2016 AfriGIS (Pty) Ltd.
244 m
2003
Imagery Date: 2/12/2014 25°57'38.17" S 30°30'51.63" E elev 1205 m eye alt 2.30 km
Google earth

Appendix D

Fig. 1. Site BA 1. Dwelling. Photo taken in South-eastern direction.

Fig. 2. Site BA 2. Timber home. The photo was taken in a Western direction.

Fig. 3. Site BA 3. A corrugated iron workshop and storage shed.

Fig. 4. Site BA 4. One of two houses to be used as accommodation for interns.

Fig. 5. Site BA 4. A second home.

SURVEY ORIENTATION SITES

Fig. 6. Site OBS 1. Looking towards the South West.

Fig. 7. Site OBS 1. Looking towards the West.

Fig. 8. Site OBS 2. Photo taken in a Western direction. Previously cultivated fields.

Fig. 9. Site OBS 2. Photo taken in a Northern direction. Previously cultivated fields.

Fig. 10. Site OBS 3. A macadamia nut orchard. The photo was taken in a North-eastern direction.

ANNEXURE C: PIA

10.4 The Specialist

Note: Duplicate this section where there is more than one specialist.

I …**Marion Kathleen Bamford**……, as the appointed specialist hereby declare/affirm the correctness of the information provided as part of the application, and that I:

- in terms of the general requirement to be independent (tick which is applicable):

X	other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or

	am not independent, but another EAP that is independent and meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);

- have expertise in conducting specialist work as required, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- will ensure compliance with the EIA Regulations 2014;
- will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application;
- will take into account, to the extent possible, the matters listed in regulation **18** of the regulations when preparing the application and any report, plan or document relating to the application;
- will disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority or the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority (unless access to that information is protected by law, in which case I will indicate that such protected information exists and is only provided to the competent authority);
- declare that all the particulars furnished by me in this form are true and correct;
- am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B(2) of the National Environmental Management Act, 1998 (Act 107 of 1998).

MK Bamford _____

Signature of the specialist

University of the Witwatersrand

Name of company

14 August 2016

Date

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

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Marion.bamford@wits.ac.za
20 January 2016

Nokukhanya Khumalo
SAHRA
P O Box 4637
Cape Town
8000

Dear Ms Khumalo

RE: Palaeontological Impact assessment for Plot 34 of the farm Avontuur, near Badplaas, Mpumalanga.

As requested by Steven Henwood on behalf of Emoyeni Christian organization a desktop palaeontological impact assessment has been done as part of the EIA for the development of Plot 34 of the Farm Avontuur 725, near Badplaas. The organization proposes to expand and develop farming, accommodation and training facilities for the local children and young adults and work with local churches. They have bought the farm/plot as they would like to develop the following an orchard and buildings.

The rocks to the region around Badplaas are mostly ancient basement rocks of the Barbertion Greenstone Belt with a few outliers of slightly younger rocks of the Malmani subgroup. The rocks are ancient and igneous so there is no likelihood of any fossils being preserved. No further palaeontological assessment is required.

Yours sincerely

MKBamford

Prof Marion Bamford
Head of Division: Palaeoenvironments
ESI, Wits

Palaeontological Impact Assessment for the proposed Avontuur Christian Centre, near Badplaas, Mpumalanga Province

Desktop Study

For
Steven Henwood
PO Box 12340, Steiltes
Nelspruit, 1213

20 January 2016

Prof Marion Bamford
Evolutionary Studies Institute
University of the Witwatersrand
P Bag 3, WITS 2050
Johannesburg, South Africa
Marion.bamford@wits.ac.za

Palaeontological Impact Assessment for the proposed Avontuur Christian Centre, near Badplaas, Mpumalanga Province

Background

As requested by Steven Henwood on behalf of Emoyeni Christian organization a desktop palaeontological impact assessment has been done as part of the EIA for the development of Plot 34 of the Farm Avontuur 725, near Badplaas (Fig 1). The organization proposes to expand and develop farming, accommodation and training facilities for the local children and young adults and work with local churches. They have bought the farm/plot as they would like to develop the following:

- The expansion of the current +- 400 macadamia trees on the farm plus a number of fruit trees, by about 1600 macadamia trees.
- The establishment of a vegetable garden to supply food for the 6 feeding site (1000 to 1300 children).
- The establishment of tunnel farming, aquaponics - fish and vegetables.
- The construction/upgrade of existing infrastructure.
  - Existing 2 homes to be used as accommodation for local and international interns
  - Build a conference center with accommodation for teams, training, and conferences.
  - Build a skills training workshop.
  - Build homes for orphaned children
  - Build homes for long term missionaries
  - Build a kids/youth camp ground.

Methods and Terms of Reference

1. In order to determine the likelihood of fossils occurring in the affected area geological maps, literature, palaeontological databases and published and unpublished records must be consulted.

2. If fossils are likely to occur then a site visit must be made by a qualified palaeontologist to locate and assess the fossils and their importance.

3. Unique or rare fossils should either be collected (with the relevant SAHRA permit) and removed to a suitable storage and curation facility, for example a Museum or University palaeontology department or protected on site.

4. Common fossils can be sacrificed if they are of minimal or no scientific importance but a representative collection could be made if deemed necessary.

The published geological and palaeontological literature, unpublished records and databases were consulted to determine if there are any records of fossils from the sites and the likelihood of any fossils occurring there.

Figure 1: Location of the proposed Emoyeni Christian centre, farm and facilities. Google map provided by Steven Henwood.

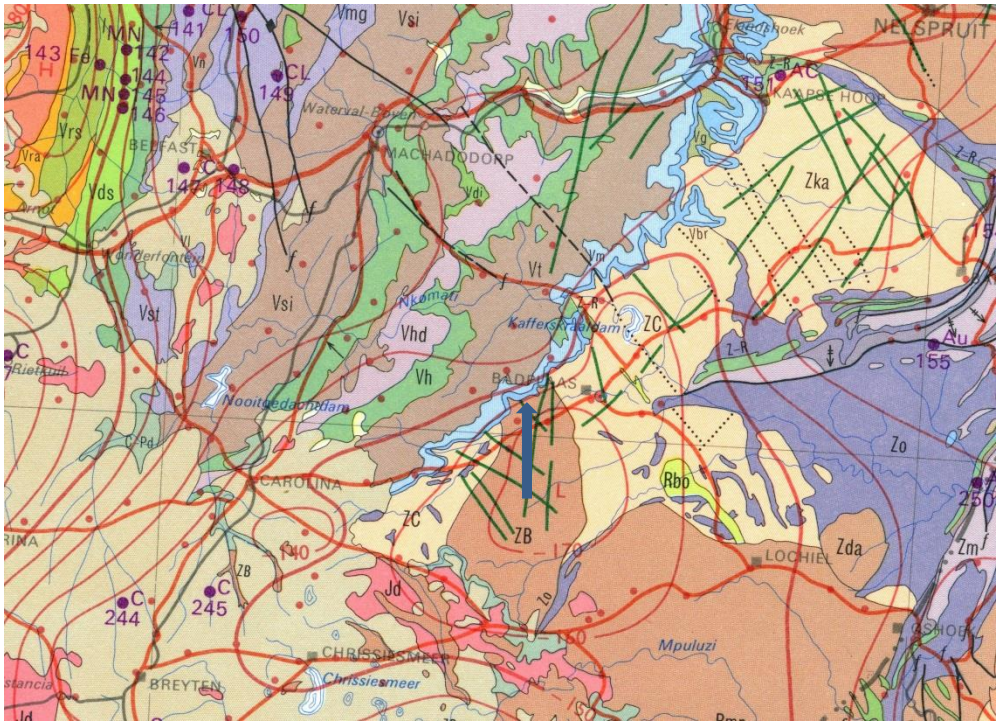

Figure 2 Geological map of the area around Badplaas. The approximate location of the proposed power lines is indicated with the arrow. Abbreviations of the rock types are explained in Table 1. Map enlarged from the Geological Survey 1: 1 000 000 map 1984.

Geology and Palaeontology

The rocks to the region around Badplaas are mostly ancient basement rocks with a few outliers of slightly younger rocks of the Malmani subgroup. The rocks are ancient and igneous so there is no likelihood of any fossils being preserved. Only in the Vryheid Formation is there a small chance of finding fossils but these sediments are over 100 km away.

Symbol	Group/Formation	Lithology	Approximate Age
Jd	Jurassic	Dolerite dykes, intrusive	Jurassic, approx. 180 Ma
Pv	Vryheid Fm	Shales, sandstone, coal	Lower Permian, Middle Ecca
Vh	Hekpoort Fm, Pretoria Group	Basaltic andesite, pyroclastic rocks	2222 Ma
Vt	Timeball Hill and Rooihooghte, Pretoria Group	Shale, quartzite, conglomerate, breccia, diamictite	>2300
Vm	Malmani subgroup, Chuniespoort Group	Dolomite, chert	2585 Ma
Vbr	Black Reef	Quartzite, conglomerate, shale basalt+	>2642 Ma
Zda	Dalmein Formation	Granodiorite	3215 Ma
Zo	Onverwacht Group. Barberton Series	basalt	3510 Ma
ZB	Unnamed granite	Potassic granite and granodiorite	Barberton Greenstone belt
ZC	Kaap Valley Granite	granite	3227 Ma

Table 1: Explanation of symbols for the geological map and approximate ages (Brandl et al., 2006; Eriksson et al., 2006; Johnson et al., 2006).

The SAHRIS palaeosensitivity map indicates that this area is blue (no probability of fossils occurring there http://www.sahra.org.za/sahris/map/palaeo)

Recommendation

If, in the extremely unlikely event that fossil plant material is discovered during the construction of the buildings or orchards , then it is recommended that a professional palaeontologist be called to assess the importance and rescue them if necessary (with the relevant SAHRA permit).

If the fossil material is deemed to be of scientific interest then further visits by a professional palaeontologist would be required to collect more material. Only when the excavations for foundations have commenced will it be possible to see if there are any fossils.

Therefore, as far as the palaeontological heritage is concerned, the construction of the Christian Centre and facilities may proceed. No further palaeontological assessments are required.

References

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Erikssen, P.G., Altermann, W., Hartzer, F.J., 2006. The Transvaal Supergroup and its pre-cursors. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. pp 237-260.

Johnson, M.R., van Vuuren, C.J., Visser, J.N.J., Cole, D.I., Wickens, H.deV., Christie, A.D.M., Roberts, D.L., Brandl, G., 2006. Sedimentary rocks of the Karoo Supergroup. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 461 – 499.

MKB
20Jan2016

ANNEXURE D: Wetland Delineation

Plot 34 Badplaas

Wetland delineation

- Pegs
- Wetland boundary
- Wetland
- Study site
- World Imagery

0 65 130 260 Meters

1:4 000

Delineated and maped by: Stephen Hardy
Date: 07/03/16