KwaNobamba Royal Residence Biodiversity Report

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1 INTRODUCTION AND METHOD

This report serves as an appendix to the Basic Assessment Report prepared by Brousse-James & Associates for the proposed KwaNobamba Royal Residence, which is located within an un-proclaimed section of the eMakhosini-Opathe Heritage Park. It focuses on fauna and flora in and around the development site, whilst a complimentary report, compiled by the Council for Geoscience, focuses on geology and soils. It is derived from a desktop study, two field visits, one on 3 April 2014 by B James and another on 14 May 2014 by B James and D Johnson, and also relies on personal knowledge of habitats and distribution by the two authors.

The information presented and discussed as a result of the desktop study component is drawn from the following sources:

1. Available literature (as cited in the individual sections).
2. Modelling (Ezemvelo KZN Wildlife species database).
3. University of Cape Town Animal Demography Unit (ADU) – verified observations for quarter degree square 2831AD.
4. Roberts Multimedia CD - Records extracted for quarter degree square 2831AD and interpreted by D Johnson.

1.1 Deficiencies in data sources

It is important to note that the KZN Wildlife database consists of a combination of modelled and actual recorded occurrences of species and that, even within protected areas managed by them, this database does not nearly include all of the species in those areas. The greatest confidence is placed in sampled records. It is clear that this database is quite inadequate on its own to predict animal species distributions, particularly because it does not take into account actual conditions on any given site. Even the ADU data, which is based on actual observations, is recorded at the coarse resolution of quarter degree squares and thus needs to be interpreted intelligently. Within that quarter degree square, one needs to determine whether or not the site under discussion has the habitat required by the species in question.

In the early 1990's, David Rowe-Rowe, of the Natal Parks Board, compiled two booklets on the occurrence and distribution of Carnivores (Rowe-Rowe, 1992) and Ungulates (Rowe-Rowe, 1994) in Natal. The data was sourced from Natal Parks Board internal records, as well as from farm data sheets compiled by Zone Officers. At that stage, conservation in the Province was divided between the Natal Parks Board and the KwaZulu Bureau of Natural Resources, so, unfortunately, these booklets do not adequately cover the former KwaZulu homeland areas. Nevertheless, they are a reasonable starting point for determining the distribution of these mammals, and knowledge of the animals' habitat requirements and some intelligent extrapolation can give a reasonable idea of what to expect in a given area of the Province. The information from these sources was supplemented with species accounts obtained from Skinner and Smithers (1990).

1.2 Species database and SEA Data

Ezemvelo KZN Wildlife has a species database, which is based on actual records of animal distributions within the Province. In addition, the "KZN Wildlife Strategic Environmental Assessment" (SEA), produced by Goodman (2000), modelled potential species distributions for 250 species, using existing distributions as a starting point. This project was later

replaced by a strategic conservation planning approach, which resulted in "C-Plan" and "Minset", as discussed below.

South Africa has ratified the International Convention on Biological Diversity, which commits the country, including KwaZulu-Natal, to develop and implement a strategy for the conservation, sustainable use and equitable sharing of the benefits of biodiversity. Provincial authorities are expected to compile and implement Bioregional Plans to ensure that a minimum area of each bioregion, with all its representative ecosystems, is protected (Goodman, 2000 & 2005).

To achieve this objective, KZN Wildlife undertook a project entitled, "Systematic Conservation Plan and Decision-Framework for KwaZulu-Natal", and aimed to:

- Determine acceptable goals and targets for the conservation of the Province's biodiversity.
- Identify critical areas of the Province that require protection in order to achieve these goals.
- Incorporate these results into a systematic, but flexible, decision framework suitable for inclusion into the Integrated Development Plans required by local authorities.

Clearly stated conservation targets or goals for biodiversity features are at the core of the systematic conservation planning framework. These features include all the major terrestrial and aquatic ecosystems and processes. In addition, they cover a selected number of species, which are either endemic to KwaZulu-Natal, or are nationally or internationally endangered and KwaZulu-Natal can make a significant contribution to their conservation. The goal is to conserve a representative and viable sample of each feature.

Minset is a function or tool within the KZN Wildlife C-Plan (Conservation Planning Software) that is used to identify a "minimum set" of sites (planning units) that would fulfil the role of achieving conservation targets within a number of constraints, such as avoiding highly productive agricultural land, or land adjacent to major highways. It presents the most efficient solution to achieving conservation targets, given other land use constraints.

Since the first public release of C-Plan data in 2005, KZN Wildlife has produced a number of refinements and iterations. The initial model was based on a pixel size of 2 x 2 km and was later refined to 1 x 1 km. The latest version dispenses with the original square pixel and works rather on a sub-catchment approach, which ends up being a much higher resolution.

The Minset output map shows areas that are already protected; "Mandatory Reserves" and "Negotiable Reserves". Mandatory Reserves are those areas that appear as totally irreplaceable on the irreplaceability map, since there are no other alternatives for achieving the conservation targets. Areas identified as Negotiable Reserves are the areas that the Minset function returns as the most efficient for achieving targets and constraints. However, there are alternatives to achieving the targets and constraints, but with less efficiency, and hence the designation of these areas is still negotiable.

A summary of the description regarding interpretation of the Minset data, received from Boyd Escott of KZN Wildlife, follows.

1. **Critical Conservation Areas 1 (previously BPA1)** designated planning units contain one or more features within an irreplaceability score of 1. This means that there are

no other localities identified as alternates to try and meet the conservation target for the designated feature(s).

2. **Critical Conservation Areas 2 (previously BPA2)** indicate the presence of one (or more) features with a very high irreplaceability score. In practical terms, this means that there are alternate sites within which the targets can be met, but there aren't many.

3. **Critical Conservation Areas 3 (previously BPA3)** indicate the presence of one (or more) features with a low irreplaceability score.

It must be cautioned that areas without a value in Minset are not open for wholesale development. Important species are still located within them and should still be accounted for in the EIA process. They are not highlighted because Minset highlights the "choice" areas from a biodiversity point of view only. Should one or more of the BPA2 and BPA3 sites be utilised for development, it is obvious that the target for whatever feature(s) were located within that Planning Unit will no longer be met. Ideally, Minset would have to be re-run to calculate the next optimal solution, the new Planning Units being "extracted" from the currently available areas.

The entire area within which the proposed development is to take place is recorded in Minset as a protected area, the eMakhosini-Opathe Heritage Park.

1.3 University of Cape Town Animal Demography Unit (ADU)

1.3.1 Reptiles

Reptile data (Section 3.4) was downloaded from the ADU website, by means of a service described as the Virtual Museum, which has a link to the Southern African Reptile Conservation Assessment (SARCA, 2011) dataset. The distribution database underlying this comprises approximately 120,000 distribution records for reptile taxa that occur in southern Africa, mainly in South Africa, Lesotho and Swaziland. The data was supplied by museums, conservation organisations and private individuals, or was drawn from the literature, or from SARCA field surveys. Approximately 7,000 of the records were submitted by members of the public, via the online Virtual Museum, and have associated reptile photographs to confirm identity of the species.

This data is to be used towards the production of an up-to-date Atlas and Red Data Book of the reptiles of South Africa, Lesotho and Swaziland.

1.3.2 Frogs

Frog records included in this report (Section 3.3 - Amphibians) are derived from the Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland (Minter *et al.*, 2004). This book is based on distribution data collected during seven years of fieldwork (1996-2003), as well as earlier data compiled from museum records, private collections, available literature and conservation agencies. The actual lists (Section 3.3) were downloaded from the ADU Website (ADU, 2011) and interpreted by means of Minter *et al.* (2004).

1.3.3 Butterflies

Butterfly data (Section 3.5 - Invertebrates) was downloaded from Virtual Museum link on the ADU website (VMU, 2011). The distribution data, The Southern African Butterfly Conservation Assessment (SABCA), was a partnership between the South African National Biodiversity Institute, the Lepidopterists Society of Africa and the Animal Demography Unit (University of Cape Town). SABCA compiled a comprehensive database of records from museum and private collections, field surveys and its virtual museum. About 500,000 records are in existing collections. Field surveys were conducted around South Africa and prioritised to fill in gaps.

SABCA determined the distribution and diversity of butterflies in South Africa, Lesotho and Swaziland and conducted species assessments according to the IUCN criteria to produce an updated butterfly Red Data Book and Atlas, with distribution maps for each species at a quarter degree square grid scale.

1.4 Red Data Lists

Red Data Lists (Red Lists) and Red Data Books are scientific publications that document the conservation status of species. They are based on a system that categorises species according to their risk of extinction. Red Lists are not in themselves legislation to protect species, but are used to inform threatened species legislation.

Red Data List Categories

- Endangered (E): A taxon is considered to be facing a very high risk of extinction in the wild.
- Vulnerable (V): A taxon is considered to be facing a high risk of extinction in the wild.
- Near Threatened (NT): Does not qualify for Critically Endangered (CR), Endangered (E) or Vulnerable (V) now, but is close to qualifying for, or is likely to qualify for, a threatened category in the near future.
- Least Concern (LC): Does not qualify for CR, E, V or NT. Widespread and abundant taxa are included in this category.
- Data Deficient (DD): There is inadequate information to make a direct, or indirect, assessment of the taxon's risk of extinction based on its distribution and/or population status. More information on this taxon is required and acknowledges the possibility that future research will show that threatened classification is appropriate.

2 VEGETATION

The access road goes through Northern Zululand Sourveld (SVI22 KZN 42), which is on western edge of the proposed development, whilst the actual development will be within Zululand Lowveld (SVI 23 KZN 53).

The dominant structural vegetation type in Northern Zululand Sourveld is wooded grassland, in places pure sour grasslands and rarely also dense Bushveld thickets (Mucina & Rutherford, 2006). As observed on site, in places the dominant trees are *Senegalia* (*Acacia*) *sieberiana*, *S. (Acacia) tortilis* subsp. *heteracantha* and *Vachellia* (*Acacia*) *nilotica*. The conservation status of Northern Zululand Sourveld is Vulnerable and only 4 % of this vegetation type is statutorily conserved. Some 22 % is already transformed, mainly by cultivation and plantations. Therefore, the eMakhosini-Opathe Heritage Park has an important part to play in the conservation of this vegetation type.

Zululand Lowveld is found in extensive flat or slightly undulating landscapes, supporting a complex of various bushveld units, ranging from dense thickets of *Dichrostachys cinerea* and *Acacia* (now *Senegalia* or *Vachellia*) species, through park-like savanna with flat-topped *Senegalia* (*Acacia*) *tortilis*, to tree-dominated woodland, with broad-leaved open bushveld, with species such as *Sclerocarya birrea* subsp. *caffra* and *Senegalia (Acacia) nigrescens*. Tall grassveld types, with sparsely scattered, solitary trees, form a mosaic, with the typical savanna thornveld, bushveld and thicket patches. Tall trees include species such as *Senegalia (Acacia) burkei*, *S. (Acacia) nigrescens* and *Sclerocarya birrea* subsp. *caffra.* The conservation status of Zululand Lowveld is Vulnerable and some 11 % is statutorily conserved. About 26 % has been transformed, mostly by cultivation (Mucina & Rutherford, 2006).

The proposed site (Photo 1) is best described as wooded grassland, with tall grass consisting of a mix *of Aristida canescens, Cymbopogon plurinodis, Eragrostis superba, Heteropogon contortus, Hyparrhenia filipendula, Melinis nerviglumis, Melinis repens, Panicum maximum, Pogonarthria squarrosa, Setaria sphacelata* and *Themeda triandra*. Table 1 gives a list of trees found in and around the site and Table 2 gives a list of grasses and other herbaceous species found around the site. Infestation with alien plants was low, with a few isolated *Chromolaena odorata* (Triffid Weed/*usandaneswe*) plants found on the stream banks.

Table 1: Tree species recorded at KwaNobamba

Scientific Name	English Name	Zulu Name
Acokanthera oppositifolia	Dune Poison Bush	inhlulunguyembe
Aloe marlothii	Mountain Aloe	umhlaba
Berchemia zeyheri	Red Ivory	umnini
Brachylaena discolour	Coastal Silver-oak	unduli
Canthium inerme	Turkey Berry	umvuthwamini
Clerodendrum glabrum	Smooth Tinderwood	umqaqongo
Coddia rudis	Small Bone-apple	umgogwane onmcane
Combretum apiculatum	Red Bushwillow	umbondwe omnyama
Combretum molle	Velvet Bushwillow	umbondwe onhlope
Commiphora neglecta	Green-stemmed Corkwood	iminyela
Cussonia zuluensis	Zulu Cabbage Tree	umsenge
Dichrostachys cinerea	Sickle Bush	ugagane
Diospyros lycioides	Bluebushes	umnqandane
Dombeya rotundifolia	Wild Pear	unhliziyonkulu
Dovyalis caffra	Kei-apple	umqokolo

Scientific Name	English Name	Zulu Name
Dovyalis longispina	Coastal Kei-apple	umnyazuma
Dovyalis rhamnoides	Sourberry	umkhamgwinqi
Ehretia rigida	Puzzle Bush	umklele
Elaeodendron transvaalense	Bushveld Saffron	ingwavuma
Erythrina lysistemon	Coral Tree	umsinsi
Erythrococca berberidea	Prickly Redberry	uhlabazihlangane
Euclea crispa	Blue Guarri	umshekisane
Euclea daphnoides	White-stemmed Guarri	indungamuzi
Euclea undulata	Small-leaf Guarri	umshekisane
Euphorbia ingens	Giant Euphorbia	umhlonhlo
Gardenia volkensii	Savanna Gardenia	imralasangweni
Grewia occidentalis	Cross Berry	ilalanyathi
Gymnosporia glaucophylla	Angular-stemmed Spikethorn	
Gymnosporia nemorosa	White-spotted Forest Spikethorn	ingqwangane
Gymnosporia senegalensis	Confetti Spikethorn	isihlangu
Hippobromus pauciflorus	False Perdepis	uqhume
Lippia javanica	Fevertree	umsuswane
Mystroxylon aethiopicum	Bushveld Kooboberry	umgunguluzane
Ormocarpum trichocarpum	Caterpillarpod	umsindadlovana
Pappea capensis	Jacket Plum	indaba
Rhoicissus tridentata	Bushman's Grape	isinwazi
Schotia brachypetala	Weeping Boer Bean	umgxamu
Sclerocarya birrea	Marula	umganu
Searsia guenzii	Spikethorn Karee	inhlokoshiyane
Searsia pentheri	Crow-berry	nhlokoshiyane
Searsia rehmanniana	Blunt-leaf Crow-berry	inhlokoshiyane
Senegalia (Acacia) burkei	Monkey Thorn	umkhaya wehlalahlathi
Senegalia (Acacia) caffra	Common Hook Thorn	umtholo
Senegalia (Acacia) sieberiana	Paper Bark Thorn	umkhamba
Senegalia (Acacia) tortilis	Umbrella Thorn	umsasane
Sideroxylon inerme	White Milkwood	umakhwelafinhqane
Vachellia (Acacia) gerrardii	Grey-haired Thorn	umphuze
Vachellia (Acacia) natalitia	Sweet Thorn	umunga
Vachellia (Acacia) nilotica	Scented-pod Thorn	umnqawe
Vachellia (Acacia) robusta	Robust Acacia	umngamanzi
Vangueria infausta	Wild Medlar	umviyo
Ximenia caffra	Large Sourplum	umthunduluka-obomvu
Zanthoxylum capense	Small Knobwood	umnungumabela
Ziziphus mucronata	Buffalo Thorn	umpapha /umlahlenkose

Table 2: Grass and herbaceous species recorded at KwaNobamba

Scientific Name	English Name	Zulu Name
Aristida canescens	Pale Three-awn	
Cymbopogon plurinodis	Narrow-leaved Turpentine Grass	
Eragrostis superba	Saw-tooth Love Grass	umsingizane
Helichrysum kraussii	Straw Everlasting	isipheshane
Heteropogon contortus	Spear Grass	
Hyparrhenia filipendula	Fine Thatching Grass	intunga
Indigofera sp.		
Melinis nerviglumis	Bristle-leaved Red Top	
Melinis repens	Natal Red Top	
Ocimum gratissimum	Wild Basil	uqabukhulu
Panicum maximum	Guinea Grass	
Pogonarthria squarrosa	Herringbone Grass	
Setaria sphacelata	Bristle Grass	
Solanum incanum	Bitter Apple	intuma-encane

Scientific Name	English Name	Zulu Name
Solanum nigrum	Black Nightshade	
Themeda triandra	Red Grass	

Anticipated Environmental Impacts, Mitigation and Management

On a localised scale, on the footprint of construction areas, there will be total destruction of vegetation. However, careful laying out of the development will serve to protect larger trees and sensitive landscaping, with appropriate locally indigenous trees, will serve to mitigate this loss of plant cover and habitat.

It is possible that construction workers may be tempted to remove parts of plants or entire plants for *muthi* or other purposes. These workers should be briefed prior to the commencement of work that, within a protected area, no plants may be removed or damaged in any way, for any purpose. The contractors employing these workers should also be held liable for the actions of their employees and any employee found removing plant material should be refused future entrance into the Park.

3 FAUNA

3.1 Mammals

The site is located within the eMakhosini-Opathe Heritage Park, but not within the formally proclaimed area of the Park. A number of ungulate species have been reintroduced into the area, but species such as White Rhinoceros and Buffalo are only found in the Opathe Nature Reserve Section at present. All of the carnivores listed in Table 3 occur naturally in the area.

Table 3: Carnivores recorded in eMakhosini-Opathe Heritage Park

Species	Common Name	RDB	IUCN	CITES	TOPS
Aonyx capensis[2]	Clawless Otter	NL		App. II	
Atilax paludinosus paludinosus[1]	Water Mongoose	NL			
Canis mesomelas[2]	Black-backed Jackal	NL			
Crocuta crocata[2]	Spotted Hyaena	NL			
Cynictis penicillata[1]	Yellow Mongoose	NL			
Felis serval[2]	Serval	R		App. II	
Galerella sanguinea[1]	Slender Mongoose	NL			
Genetta tigrina[1]	South African Large-spotted Genet	NL			
Ichneumia albicauda grandis[1]	White-tailed Mongoose	NL			
Mellivera capensis[2]	Ratel	V		App. II	
Panthera pardus melanotica[1,2]	Leopard			App. I	V
Poecilogale albinucha[1]	African Striped Weasel	DD			
Proteles cristatus[2]	Aardwolf	R			
Vulpes chama[1]	Cape Fox				P

Source: [1]Ezemvelo KZN Wildlife Database; [2]Rowe-Rowe (1996/1997)

Table 4: Ungulates recorded in the eMakhosini-Opathe Heritage Park

Species	Common Name	RDB	IUCN	CITES	TOPS
Aepyceros melampus melampus[1]	Impala		LC		
Alcelaphus buselaphus caama[1]	Red Hartebeest		LC		
*Ceratotherium simum simum**[1]	White Rhinoceros		NT	App. II	P
Connochaetes taurinus taurinus[1]	Blue Wildebeest		LR		
Equus quagga antiquorum[1]	Plains Zebra				
Genetta tigrina[1]	South African Large-spotted Genet	NL			
Giraffa camelopardalis capensis[1]	Giraffe		LR		
Potamochoerus larvatus koiropotamus[1]	Bushpig				
Raphicerus campestris[1]	Steenbok				
Redunca arundinum arundinum[1]	Southern Reedbuck		LR		P
Redunca fulvorufula fulvorufula[1]	Mountain Reedbuck		LR		
Sylvicapra grimmia[1]	Common Duiker, Grey duiker				
*Syncerus caffer caffer**[1]	African Buffalo		LR		
Tragelaphus angasii[1]	Nyala		LR		
Tragelaphus oryx oryx[1]	Eland		LR		
Tragelaphus scriptus[1]	Bushbuck				
Tragelaphus strepsiceros strepsiceros[1]	Greater Kudu		LR		

Note: * denotes species only found in the proclaimed section of the Park

Table 5: Other mammal species recorded in the eMakhosini-Opathe Heritage Park

Species	Common Name	RDB	IUCN	CITES	TOPS
Aethomys ineptus[1]	Tete veld rat				
Crocidura cyanea infumata[1]	Reddish-grey musk shrew	DD			
Mastomys natalensis natalensis[1]	Natal multimammate mouse				
Orycteropus afer afer[1]	Aardvark			App. II	
Otomys angoniensis tugelensis[1]	Angoni vlei rat				

Source: [1]Ezemvelo KZN Wildlife Database

Anticipated Environmental Impacts, Mitigation and Management

The proposed construction of the KwaNobamba Royal Residence will result in the loss of relatively small areas of habitat for animals, but otherwise poses no threat to any mammal species, unless construction workers set snares or kill animals that they encounter, but this can be controlled by good management.

Wherever there is food prepared or disposal of food-waste in protected areas, animals, such as baboons, monkeys or hyaena, may be inclined to frequent the area if the disposal of the waste is done carelessly. If these animals discover a new source of food in dustbins or kitchens and accommodation units, or if people deliberately feed them, they will become a major problem to be managed and a danger to people. Therefore, it is imperative that animal-proof bins are used that are impossible to accidentally leave open, and that residents and staff are educated not to feed any animals or leave food lying around. The waste management system and procedure within the Park, particularly disposal of waste food, needs to be tightly managed to prevent development of a problem animal situation.

3.2 Birds (Dr David Johnson)

3.2.1 Introduction

The list of birds expected at the proposed development site is based upon the following:

1. The 1980 Natal Bird Atlas (Cyrus & Robson 1980).
2. A computer-generated list of the birds in the Ulundi quarter-degree square 2831 AD of the Bird Atlas of southern Africa (Harrison *et al.*, 1997).
3. Personal experience of the birds of KwaZulu-Natal.
4. A site visit on 14 May 2014.

The list errs on the side of caution, a few more species will likely be found in due course.

3.2.2 Habitat

The site straddles the boundary between Northern Zululand Sourveld SVI 22 and Zululand Lowveld SVI 23 (Mucina & Rutherford, 2006). Both vegetation types are considered Vulnerable, so worthy of conservation in their own right. The vegetation on site is best described as wooded grassland. Open areas bear scattered trees, mostly acacias, with occasional tree clumps and thickets. There are very few alien weeds. Small eroded areas provide additional structural diversity. This is a rich habitat for birds, potentially supporting about 400 of the species occurring in north-eastern KwaZulu-Natal – half of the entire avifauna of the province.

3.2.3 The bird community

3.2.3.1 Species diversity

The actual species total expected is 209. The absence of permanent water excludes many typical Zululand species, though if a dam or dams are built, this would provide habitat for more species. The other main limiting factor is the small size of the site; many specialised micro-habitats are patchily distributed, so are absent locally. Nevertheless, this species total compares favourably with many smaller formal nature reserves. It is a function of several factors: structural diversity accommodates birds of both grassland and woodland, as well as a few other specialists; historical accident – the persistence and contiguity of an ancient habitat – has favoured the evolution of a rich biota; and the near-pristineness of the site. Most of these bird species are common, but this does not lessen their conservation significance. As in any community, richness as a biodiversity asset depends upon numbers. Numbers confer stability. So it is the common birds, generally considered to be doing nothing useful, and lacking the charisma of beautiful rarities, that are the vital ecosystem managers. For example, small mobile frugivores maintain the diversity of tree clumps, and the system becomes self-reinforcing.

3.2.3.2 Species status

Of the 209 species, 160 are resident, therefore breed, and these are joined in summer by 18 tropical migrants that have also come specifically to breed. The combined total represents a high proportion of the total list. Sixteen Palaearctic migrants also arrive in summer, but do

not breed. Eight altitudinal migrants, taking refuge from harsher conditions higher up, are present only in winter. The remaining species are vagrants or nomads.

3.2.3.3 Endemism

Endemic species are those that are restricted to a defined area. In the present case, we mean endemic to South Africa (ES) or southern Africa (es). The site has two South African Endemics; Barrow's Korhaan and Southern Boubou. In addition, there are four southern African endemics; Jackal Buzzard, Fiscal Flycatcher, Bushveld Pipit and Cape White-eye.

Endemism has great significance in evolutionary and genetic research. Since species evolve in isolation, a concentration of endemics in a particular area contributes to an understanding of the geological past and other related fields. Increasingly, endemism also has a role in eco-tourism. So, although the endemic species may not be rare, they are often the most sought after.

3.2.3.4 Red Data species

The value of a site to birds can also be judged by its contribution to conserving rare and endangered species. Few rare species have important ecological value – inasmuch as by being rare they are unable to influence events or processes to any great degree – but often act as the flagship for the habitat. Eight Red Data species (Barnes, 2000) are present. Four are classified Vulnerable; White-backed Vulture, Lappet-faced Vulture, Tawny Eagle and Martial Eagle. Four are Near-Threatened; Woolly-necked Stork, Black Stork, Secretarybird and Lanner Falcon.

Nearly all of these species have a flagship role. The Martial Eagle and Secretarybird are grassland specialists. The Tawny Eagle is a woodland species that could nest here, and the site would certainly be part of a foraging territory. The vultures, being the sanitation experts, are indicators of a healthy, toxin-free environment. No nests were noted on site, but both species, and all the other raptors, nest in nearby Imfolozi Game Reserve. The Black Stork and Lanner Falcon both rely upon rock ledges for nesting, so would use the site only for foraging. The Woolly-necked Stork used to be considered wetland-dependant, but is expanding both its range and habitat tolerance, and could conceivably nest on site in future.

Accurate and meaningful population estimates of scarce species are difficult to make in small areas. Almost all of the species will be represented by, at most, a single pair, more probably by a pair with a territory greater than the site. Some territory sizes are well known. Raptors especially need space. The Secretarybird needs about 10 km^2 per pair, the Martial Eagle, 100 km^2. Lanner Falcon nest sites are rarely closer than 10 km apart, suggesting very large territories. The Black Stork has a KwaZulu-Natal population of about 50 pairs, patchily scattered wherever there are secluded cliffs, so there is little doubt that one or more pairs nest within the general proximity of the proposed development, and that the site will sometimes be used for foraging. The loss of a single territory or breeding site of a rare species can be significant; continued erosion of a small population eventually leads to local extinction. The Precautionary Principle should be observed.

3.2.4 Overview

An oft-quoted definitive statement (Frankel & Soulé, 1981) is that long-term conservation of any species requires a population of 1,000 individuals to maintain sufficient genetic diversity. It is the standard conservation target. In the present case, none of the endemic and Red Data species has a population viable in isolation – as is true of rarer birds on every single private property. Quite possibly, none of the common species reaches that threshold at this site either. However, collectively, private land and any functioning habitat often makes a bigger contribution than formal reserves, and is essential to conservation. The reason that the majority of species, even some apparently common, survive at all is due to the cumulative amount of habitat available, and to its level of contiguity. The conclusion is that the site has nature conservation value, and every effort must be made to minimise the effects of any development.

3.2.5 Effects of proposed developments upon birds

There is no doubt that the proposed development will negatively affect birds. At the very least, some "eco-space" will be lost, and the fragmentation of the natural environment inches further forward. However, it is not always appreciated that disturbance, in the broadest sense, is a normal part of life. All animals interact with others, often on a daily life-or-death basis. Moreover, Africa's fauna has evolved in the constant presence of man. From earliest times, man has been a dangerous hunter-gatherer to be avoided, or at least carefully watched. So a bird's natural response to the approach of man is one of caution, with flight ever ready. Nevertheless, due consideration of the disturbances that will result from the proposed development is needed.

Any building operation in a rural place, however carefully conducted, causes habitat changes. One inevitable result is the introduction of alien invasive weeds, with associated damage to indigenous vegetation. Disturbance will occur in two phases. The first, but more intense, will be during the installation of structures. Subsequently, permanent, but lower-key disturbance, will be inevitable because of human residence.

The most critical period in any rural project is the very beginning: the actual construction work. First comes the bringing in of building materials. Of necessity, these materials will be temporarily stored on site, taking up space, until used. Some habitat damage at the storage site is inevitable. Potentially much more serious is the effect of the labour force. There is the possibility of unsupervised construction workers setting snares, raiding nests, making fires and causing other environmental damage. This often happens at rural building sites, and muti plants may be dug up too. Considerable ecological damage can be done. Another possibility is that builder's rubble and other waste products may end up beyond the building site, even though there is no need for it. This too can be very damaging; discarded wire, string and bits of plastic are responsible for lots of wildlife deaths and injuries. Burying rubbish is only a temporary solution.

3.2.6 Mitigation

There are several points to observe to optimise the conservation of the birdlife. The first step is to plan <u>temporary</u> tracks, turning circles, depots, latrine sites, etc., just in case a feature of conservation interest is under threat. All too often temporary features are duplicated because of lack of forethought. Beyond this, the main control at this stage is to enforce whatever

rules have been devised, both for the installation of the materials, control of leakages and disposal of scrap and waste. In particular, a firm stand must be made concerning conduct with the entire workforce before work starts. Much now depends upon attitude and attention to detail.

3.2.7 KwaNobamba bird list (209 species)

Species recorded on inspection day (14 May 2014) are denoted * in the table that follows. The codes for status, abundance and Red Data Book listing are as follows:

Status codes

R = Resident – present all year; known or presumed to breed, if not on site, then nearby.
P = Palaearctic migrant – non-breeding summer visitor; breeds during the northern summer in Europe and Asia: typically present November-March.
T = Tropical migrant – breeding summer visitor; winters in tropical Africa: typically present September-April.
A = Altitudinal migrant – breeds at higher altitudes; typically present May-August.
N = Nomad: movements erratic, not necessarily rare, and may breed.
V = Vagrant – single or erratic record outside the normal range.

ES = Endemic to South Africa.
es = Endemic to southern Africa.

Abundance codes

A = Abundant – occurs in large numbers.
C = Common – not necessarily abundant, but present at as great a density as the social system allows.
U = Uncommon – usually present, but not necessarily found on the day.
R = Rare – not always present.

Abundance and status codes pertain **locally**: for example species considered common within the main part of their range may be rare or vagrant here. Vagrants and nomads do not get an abundance code.

Red Data Book listing

C = Critical.
E = Endangered.
V = Vulnerable.
NT = Near-threatened.

The selection criteria are listed in Barnes (2000). The integration of defining factors is quite laborious, but suffice it to say that the final definitions are appropriate.

Table 6: Bird list for KwaNobamba

Roberts	Common name	Status	Abundance	Red Data
62	Grey Heron	R	U	
63	Black-headed Heron	R	C	
71	Cattle Egret	R	C	
81	Hamerkop	R	U	
83	White Stork	P	U	
86	Woolly-necked Stork	V		NT
91	Sacred Ibis	R	C	
94	Hadeda Ibis	R	C	
102	Egyptian Goose	R	C	
116	Spur-winged Goose	R	U	
118	Secretarybird	R	U	NT
123	White-backed Vulture	R	U	V
124	Lappet-faced Vulture	R	R	V
126	Black Kite	T	U	
126.1	Yellow-billed Kite	T	C	
127	Black-shouldered Kite	R	C	
128	African Cuckoo Hawk	R	U	
132	Tawny Eagle	R	U	V
134	Lesser Spotted Eagle	P	R	
135	Wahlberg's Eagle	T	C	
136	Booted Eagle	P	U	
140	Martial Eagle	R	U	V
142	Brown Snake-Eagle	R	U	
143	Black-chested Snake-Eagle	R	U	
149	Steppe Buzzard	P	C	
152	Jackal Buzzard	R es	U	
154	Lizard Buzzard	R	U	
157	Little Sparrowhawk	R	C	
158	Black Sparrowhawk	R	C	
159	Shikra	R	U	
160	African Goshawk	R	C	
161	Gabar Goshawk	R	U	
169	African Harrier-Hawk	R	C	
172	Lanner Falcon	R	U	NT
173	Eurasian Hobby	P	U	
188	Coqui Francolin	R	U	
189	Crested Francolin	R	C	
196	Natal Francolin	R	C	
200	Common Quail	T	C	
203	Helmeted Guineafowl	R	C	
205	Small Buttonquail	N		
233	Barrow's Korhaan	R ES	R	V
238	Black-bellied Bustard	R	U	
249	Three-banded Plover	R	C	
255	Crowned Lapwing*	R	C	
258	Blacksmith Lapwing	R	C	
260	African Wattled Lapwing	R	U	
297	Spotted Thick-knee	R	C	
352	Red-eyed Dove	R	C	
354	Cape Turtle-Dove*	R	A	
355	Laughing Dove	R	C	
356	Namaqua Dove	N		
358	Emerald-spotted Wood-Dove	R	U	
361	African Green-Pigeon	V		

Roberts	Common name	Status	Abundance	Red Data
371	Purple-crested Turaco	R	U	
375	African Cuckoo	T	U	
377	Red-chested Cuckoo	T	U	
378	Black Cuckoo	T	U	
380	Great Spotted Cuckoo	T	U	
382	Jacobin Cuckoo	T	U	
385	Klaas's Cuckoo	T	C	
386	Diderick Cuckoo	T	U	
391	Burchell's Coucal	R	U	
392	Barn Owl	R	U	
396	African Scops-Owl	R	U	
497	Southern White-faced Scops-Owl	R	U	
401	Spotted Eagle-Owl	R	C	
404	European Nightjar	P	C	
405	Fiery-necked Nightjar	R	C	
409	Square-tailed Nightjar	R	U	
411	Common Swift	P	C	
412	African Black Swift*	A	C	
415	White-rumped Swift	T	U	
417	Little Swift*	R	C	
418	Alpine Swift	T	U	
424	Speckled Mousebird	R	C	
426	Red-faced Mousebird*	R	C	
432	African Pygmy-Kingfisher	T	U	
435	Brown-hooded Kingfisher	R	C	
437	Striped Kingfisher	R	U	
438	European Bee-eater	P	C	
443	White-fronted Bee-eater*	R	C	
444	Little Bee-eater	R	C	
446	European Roller	P	C	
447	Lilac-breasted Roller	R	C	
449	Purple Roller	R	U	
451	African Hoopoe	R	C	
452	Green Wood-Hoopoe	R	U	
454	Common Scimitarbill	R	U	
459	Southern Yellow-billed Hornbill	R	U	
460	Crowned Hornbill	R	U	
463	Southern Ground-Hornbill	R	R	V
464	Black-collared Barbet	R	C	
465	Acacia Pied Barbet	R	U	
469	Red-fronted Tinkerbird	R	C	
473	Crested Barbet*	R	C	
474	Greater Honeyguide	R	C	
476	Lesser Honeyguide	R	C	
478	Brown-backed Honeybird	A	R	
483	Golden-tailed Woodpecker	R	C	
486	Cardinal Woodpecker	R	C	
487	Bearded Woodpecker	R	U	
489	Red-throated Wryneck	R	U	
494	Rufous-naped Lark	R	C	
496	Flappet Lark	R	C	
498	Sabota Lark	R	C	
507	Red-capped Lark	R	U	
518	Barn Swallow	P	A	
524	Red-breasted Swallow	T	U	

Roberts	Common name	Status	Abundance	Red Data
527	Lesser Striped Swallow	T	A	
529	Rock Martin	A	U	
530	Common House-Martin	P	U	
533	Brown-throated Martin	A	U	
536	Black Saw-wing	A	U	
538	Black Cuckoo-Shrike	R	U	
541	Fork-tailed Drongo*	R	C	
543	Eurasian Golden Oriole	P	R	
545	Black-headed Oriole*	R	C	
547	Cape Crow	R	C	
548	Pied Crow	R	C	
550	White-necked Raven	R	U	
554	Southern Black Tit*	R	C	
558	Grey Penduline-Tit	R	U	
568	Dark-capped Bulbul*	R	A	
572	Sombre Greenbul	R	C	
576	Kurrichane Thrush	R	C	
580	Groundscraper Thrush	R	C	
589	Familiar Chat	R	C	
596	African Stonechat	A	C	
600	Red-capped Robin-Chat	R	U	
601	Cape Robin-Chat	A	R	
602	White-throated Robin-Chat	R	U	
613	White-browed Scrub-Robin*	R	C	
619	Garden Warbler	P	U	
643	Willow Warbler	P	C	
648	Yellow-breasted Apalis	R	C	
651	Long-billed Crombec	R	C	
656	Burnt-necked Eremomela	R	U	
657	Green-backed Camaroptera	R	C	
664	Zitting Cisticola*	R	C	
672	Rattling Cisticola*	R	C	
678	Croaking Cisticola*	R	C	
679	Lazy Cisticola	R	C	
681	Neddicky*	R	C	
683	Tawny-flanked Prinia*	R	C	
689	Spotted Flycatcher	P	C	
691	Ashy Flycatcher	R	U	
694	Southern Black Flycatcher	R	C	
696	Pale Flycatcher	R	U	
698	Fiscal Flycatcher*	A es	C	
701	Chinspot Batis	R	C	
710	African Paradise-Flycatcher	T	C	
713	Cape Wagtail	R	C	
716	African Pipit	R	C	
718	Plain-backed Pipit	R	U	
719	Buffy Pipit	R	U	
723	Bushveld Pipit	R es	U	
728	Yellow-throated Longclaw*	R	C	
731	Lesser Grey Shrike	P	U	
732	Common Fiscal*	R	C	
733	Red-backed Shrike	P	C	
736	Southern Boubou*	R es	C	
740	Black-backed Puffback*	R	C	
741	Brubru*	R	C	

Roberts	Common name	Status	Abundance	Red Data
743	Brown-crowned Tchagra	R	U	
744	Black-crowned Tchagra*	R	C	
748	Orange-breasted Bush-Shrike*	R	C	
751	Grey-headed Bush-Shrike	R	U	
753	White-crested Helmet-Shrike	R	U	
760	Wattled Starling	N		
761	Violet-backed Starling	T	C	
764	Cape Glossy Starling*	R	C	
772	Red-billed Oxpecker	R	U	
780	Purple-banded Sunbird	R	C	
787	White-bellied Sunbird	R	C	
791	Scarlet-chested Sunbird	R	C	
792	Amethyst Sunbird	R	C	
796	Cape White-eye	R es	C	
804	Southern Grey-headed Sparrow	R	C	
805	Yellow-throated Petronia	R	U	
807	Thick-billed Weaver	R	U	
810	Spectacled Weaver	R	C	
811	Village Weaver	R	C	
814	Southern Masked-Weaver	R	U	
815	Lesser Masked-Weaver	R	C	
817	Yellow Weaver	R	U	
820	Cuckoo Finch	R	U	
821	Red-billed Quelea	N		
824	Southern Red Bishop	R	C	
828	Fan-tailed Widowbird	R	C	
829	White-winged Widowbird	R	U	
831	Red-collared Widowbird*	R	C	
834	Green-winged Pytilia	R	U	
840	African Firefinch	R	C	
842	Red-billed Firefinch	R	C	
844	Blue Waxbill*	R	C	
846	Common Waxbill	R	C	
852	African Quailfinch	R	U	
857	Bronze Mannikin	R	C	
860	Pin-tailed Whydah	R	C	
862	Long-tailed Paradise-Whydah	R	C	
864	Dusky Indigobird	R	C	
867	Village Indigobird	R	U	
869	Yellow-fronted Canary	R	C	
877	Brimstone Canary	R	U	
881	Streaky-headed Seed-eater	R	C	
884	Golden-breasted Bunting	R	C	
886	Cinnamon-breasted Bunting	R	U	

3.3 Amphibians

A list of frogs that should occur in the area, obtained from both the University of Cape Town Animal Demography Unit for the quarter degree square 2831AD and from the Ezemvelo KZN Wildlife Database, is listed below in Table 7.

Table 7: Frogs recorded for the quarter degree square 2831AD

Family	*Species*	Common name	RDB	Endemic
Arthroleptidae	*Arthroleptis wahlbergi*	Bush Squeaker	LC	
Brevicepitidae	*Breviceps bagginsi*	Bilbo's Rain Frog	DD	Yes
	Breviceps mossambicus	Mozambique Rain Frog	LC	
Bufonidae	*Amietophrynus gutturalis*	Guttural Toad	LC	
	Schismaderma carens	Red Toad	LC	
Hyperoliidae	*Hyperolius marmoratus*	Painted Reed Frog	LC	
	Hyperolius pusillus	Water Lily Frog	LC	
	Kassina senegalensis	Bubbling Kassina	LC	
Microhylidae	*Phrynomantis bifasciatus*	Banded Rubber Frog	LC	
Phrynobatrachidae	*Phrynobatrachus natalensis*	Snoring Puddle Frog	LC	
Ptychadenidae	*Ptychadena anchietae*	Plain Grass Frog	LC	
	Ptychadena oxyrhynchus	Sharpnosed Grass Frog	LC	
Pyxicephalidae	*Strongylopus grayii*	Clicking Stream Frog	LC	
	Tomopterna natalensis	Natal Sand Frog	LC	
	Tomopterna tandyi	Tandy's Sand Frog	LC	
Rhacophoridae	*Chiromantis xerampelina*	Southern Foam Nest Frog	LC	

Anticipated Environmental Impacts, Mitigation and Management

The actual development will have little direct impact on frog habitat as many of the frogs listed in Table 7 will be associated with wetland habitats, which occur marginally in the small stream below the site. If a dam or dams are built and extra wetland habitat is created as a result of that, there would be an increase in species in that habitat.

3.4 Reptiles

A list of reptiles that should occur in the area, obtained from both the University of Cape Town Animal Demography Unit for the quarter degree square 2831AD and from the Ezemvelo KZN Wildlife Database, is listed below in Table 8.

Table 8: Reptiles recorded in the eMakhosini Valley

Family	Species	Common name	RDB	Endemic
Atractaspididae	*Atractaspis bibronii*	Bibron's Stiletto Snake	LC	
	Macrelaps microlepidotus	Natal Black Snake	NT	Yes
Boidae	*Python natalensis*	Southern African Python	LC	
Chamaeleonidae	*Chamaeleo dilepis dilepsis*	Common Flap-neck Chameleon	LC	
Colubridae	*Crotaphopeltis hotamboeia*	Red-lipped Snake	LC	
	Duberria lutrix lutrix	South African Slug-eater	LC	Yes
	Philothamnus hoplogaster	South Eastern Green Snake	LC	

Family	Species	Common name	RDB	Endemic
	Psammophis brevirostris	Short-snouted Grass Snake	LC	
Gekkonidae	*Afroedura pondolia*	Pondo Flat Gecko	LC	Yes
	Homopholis wahlbergii	Wahlberg's Velvet Gecko	LC	
	Lygodactylus capensis capensis	Common Dwarf Gecko	LC	
	Pachydactylus maculatus	Spotted Gecko	LC	
Leptotyphlopidae	*Leptotyphlops scutifrons conjuctus*	Eastern Thread Snake	NL	
Testudinidae	*Kinixys natalensis*	Natal Hinged Tortoise	LC	
	Stigmochelys pardalis	Leopard Tortoise	LC	
Typhlopidae	*Afrotyphlops bibronii*	Bibron's Blind Snake	LC	
Viperidae	*Bitis arietans arietans*	Puff Adder	LC	
	Causus rhombeatus	Rhombic Night Adder	LC	

Anticipated Environmental Impacts, Mitigation and Management

Apart from some localised habitat destruction, construction staff are likely to kill any snakes encountered. Fortunately, snakes move off quickly and quietly when disturbed. However, staff should be educated and instructed not to kill any animals that they encounter during construction. Overall, there should not be a general negative impact on reptiles, since landscaping with indigenous plant species will retain suitable habitat for them.

3.5 Invertebrates

Between the Ezemvelo KZN Wildlife database records for the eMakhosini-Opathe Heritage Park and the UCT Animal Demography Unit for the quarter degree square 2831AD, a large number of different invertebrate species have been recorded and these are listed in Table 9.

Table 9: Invertebrates recorded in the eMakhosini Valley

Phyllum: Annelida		
Class: Clitellata		
Order: Oligochaeta (Earthworms)		
Family	**Species**	**English**
Microchaetidae	*Proandricus babanango*	Babanango earthworm
	Tritogenia diversa	Diverse earthworm
Phyllum: Arthropoda		
Class: Arachnida		
Order:Scorpiones		
Liochelidae	*Cheloctonus jonesi*	Jones' scorpion
Class: Diplopoda		
Order: Spirostreptida (millipedes)		
Spirostreptidae	*Doratogonus flavifilis*	Yellow-banded black millipede
	Doratogonus krausi	Kraus's black millipede
	Orthoporoides cf. corrugatus	
Class: Insecta		
Order: Blattodea (Coackroaches)		
Blattidae	*Deropeltis erythrocephala*	Red-headed cockroach

Order Coleoptera (Beetles)		
Alleculidae	*Alleculid sp.*	
Carabidae	*Cypholobe notata*	Marked ground beetle
	Haplotrachelus pasimachoides	
	Metagonium gilvipes	
	Thermophilum homoplatum	Two-spotted ground beetle
Cerambycidae	*Cordylomera schoenherri*	Schoenherr's long-horned beetle
	Hesperophanes amicus	Friendly long-horned beetle
Chrysomelidae	*Ageniosa propinqua*	Neighbouring convex leaf beetle
	Altica foveigera	Pitted-back leaf beetle
Cicindelidae	*Dromica citreoguttata*	Lemon-spotted tiger beetle
	Dromica sculpturata	Sculptured tiger beetle
	Prothymidia angusticollis	Narrow-necked tiger beetle
	Pseudodromica tuberculata	Tuberculate tiger beetle
Curculionidae	*Eremnus viridianus*	Viridian-green weevil
	Lixus hottentottus	Hottentot weevil
	Sciobius panzanus	Mpanzi snout weevil
Lycidae	*Lycus constrictus*	
Meloidae	*Decapotoma lunata*	Lunate blister beetle
	Eletica pubicollis	Hairy-necked blister beetle
	Mylabris oculata	
Melyridae	*Pectinus ramulosus*	Branchlet-bearing soft-winged flower beetle
Rhipiphoridae	*Macrosiagon bipunctatum*	Two-dotted wedged-shaped beetle
Scarabaeidae (Cetoniinae)	*Cyrtothyrea marginalis*	Marginal fruit chafer
	Dischista cincta	Girdled fruit chafer
	Leucocelis haemorrhoidalis	Blood-red-based fruit chafer
Scarabaeidae (Melolonthinae)	*Schizonycha sp.*	
Scarabaeidae (Sericinae)	*Trochalus sp.*	
Tenebrionidae	*Himatismus buprestoides*	Depressed tapering darkling beetle
	Praeugena nobilis	Noble darkling beetle
	Selinopodus giganteus	Giant flattened darkling beetle
Order: Diptera (Flies)		
Antomyiidae	*Anthomyia subabyssinica*	Abyssinica-like root-maggot fly
Asilidae	*Neolophonotus argyphus*	Silver-white robberfly
	Ommatius macquarti	Macquart's robber fly
Bombyliidae	*Bombylella elegans*	
	Bombylella ornata	Ornate bee fly
	Exoprosopa eluta	Washed-out bee fly
	Systoechus silvaticus var. turneri	Turner's forest woolly bee fly
	Systoechus sp.	
Syrphidae	*Allobaccha sapphirina*	Sapphire hoverfly

Order: Hemiptera		
Cicadidae	*Platypleura sp.*	
Alydidae	*Euthetus leucostictus*	White-lined broad-headed bug
	Tenosius capicola	Greyish broad-headed bug
Coreidae	*Anoplocnemis sp.*	
Dinidoridae	*Coridius lividus*	Livid dinidorid bug
Lygaeidae	*Spilostethus rivularis*	Brooklet milkweed bug
Nabidae	*Nabid sp.*	
Pentatomidae	*Agonoscelis versicolor*	Sunflower seed bug
Order: Hymenoptera (Apocrita) - Bees & Wasps		
Anthophoridae	*Xylocopa caffra*	
Apidae	*Amegilla spilostoma*	Fringed bee
	Apis mellifera scutellata	African honeybee
Formicidae	*Ant sp.*	
Megachilidae	*Coelioxys sp.*	
	Megachile combusta	Burnt leaf-cutter bee
	Megachile frontalis	Frontal leaf-cutter bee
	Megachile mossambica	Mocambique leaf-cutter bee
	Megachile nasicornis	Nose-horned leaf-cutter bee
	Megachile wahlbergi	Wahlberg's leaf-cutter bee
	Noteriades sp.	
Pompilidae	*Hemipepsis dedjas*	
	Hemipepsis gestroi	Gestro's spider-hunting wasp
Sphecidae	*Ammophila vulcania*	Fire caterpillar-hunting wasp
	Prionyx kirbyii	
	Sphecid sp.	
Vespidae	*Vespid sp.*	
Order: Lepidoptera (Butterflies & Moths)		
Arctiidae	*Lepista pandula*	Small Elegant Footman
Hesperiidae	*Calleagris kobela*	Mrs Raven's skipper
	Coeliades forestan forestan	Striped policeman
	Coeliades pisistratus	Two-pip policeman
	Gegenes niso niso	Common hottentot
	Kedestes mohozutza	Fulvous ranger
	Kedestes nerva nerva	Scarce ranger
	Metisella aegipan aegipan	Mountain sylph
	Spialia depauperata australis	Wandering sandman
	Tagiades flesus	Clouded forester
	Tsitana tsita	Dismal sylph
Limacodidae	*Chrysopoloma bicolor*	Two-coloured Slug
	Chrysopoloma varia	Variable slug moth
Noctuidae	*Chalciope delta*	White Triangle
Pyralidae	*Epicrocis africana*	African pyrale
Sphingidae	*Rhodafra opheltes*	Broad Striped Hawk

Lycaenidae	*Actizera lucida*	Rayed Blue
	Aloeides oreas	Oreas copper
	Aloeides swanepoeli	Swanepoel's copper
	Aloeides taikosama	Dusky copper
	Aloeides trimeni trimeni	Trimen's copper
	Anthene amarah amarah	Black striped hairtail
	Anthene definita definita	Common hairtail
	Anthene millari	Millar's hairtail
	Aphnaeus hutchinsonii	Hutchinson's highflier
	Axiocerses amanga amanga	Bush scarlet
	Axiocerses tjoane tjoane	Eastern scarlet
	Azanus jesous	Topaz babul blue
	Azanus natalensis	Natal babul blue
	Azanus ubaldus	Velvet-spotted babul blue
	Cacyreus fracta fracta	Water Bronze
	Cacyreus lingeus	Bush bronze
	Cacyreus marshalli	Common geranium bronze
	Chloroselas pseudozeritis pseudozeritis	Brilliant gem
	Chrysoritis lycegenes	Mooirivier opal
	Cigaritis natalensis	Natal Bar
	Cnodontes penningtoni	Pennington's Buff
	Cupidopsis cissus cissus	Common meadow blue
	Durbania amakosa natalensis	Amakoza rocksitter
	Euchrysops osiris	Osiris smoky blue
	Harpendyreus noquasa	Marsh mountain blue
	Hypolycaena philippus philippus	Purple-brown Hairstreak
	Iolaus sidus	Red-line sapphire
	Lachnocnema durbani	D'Urban's woolly legs
	Lampides boeticus	Lucerne Blue
	Lepidochrysops asteris	Brilliant blue
	Lepidochrysops patricia	Patricia blue
	Lepidochrysops plebeia	Twin-spot Blue
	Lepidochrysops tantalus	King blue
	Leptomyrina gorgias gorgias	Common black-eye
	Leptotes pirithous pirithous	Common zebra blue
	Myrina silenus ficedula	Common fig tree blue
	Orachrysops subravus	Grizzled blue
	Tarucus sybaris sybaris	Dotted blue
	Tuxentius melaena melaena	Black pie
	Virachola antalus	Brown playboy
	Virachola vansoni	Van Son's playboy
	Zizeeria knysna knysna	African grass blue
	Zizina otis antanossa	Dark grass blue
	Zizula hylax	Tiny grass blue

Nymphalidae	*Acraea acara acara*	Acara acraea
	Acraea aganice aganice	Wanderer
	Acraea aglaonice	Clear-spotted acraea
	Acraea machequena	Machequena acraea
	Acraea natalica	Natal acraea
	Acraea neobule neobule	Wandering donkey acraea
	Acraea oncaea	Window acraea
	Bicyclus anynana anynana	Squinting bush brown
	Bicyclus safitza safitza	Common bush brown
	Byblia anvatara acheloia	Joker
	Byblia ilithyia	Spotted joker
	Cassionympha cassius	Rainforest brown
	Catacroptera cloanthe cloanthe	Pirate
	Charaxes brutus natalensis	White-barred charaxes
	Charaxes druceanus druceanus	Silver-barred charaxes
	Charaxes jahlusa argynnides	Pearl-spotted charaxes
	Charaxes jasius saturnus	Foxy charaxes
	Charaxes varanes varanes	Pearl charaxes
	Danaus chrysippus orientis	African monarch, Plain tiger
	Eurytela hiarbas angustata	Pied piper
	Hamanumida daedalus	Guinea-fowl butterfly
	Hypolimnas misippus	Common diadem
	Junonia hierta cebrene	Yellow pansy
	Junonia oenone oenone	Blue pansy
	Lachnoptera ayresii	Blotched leopard
	Paralethe dendrophilus albina	Forest beauty
	Paralethe dendrophilus indosa	Forest beauty
	Pardopsis punctatissima	Polka dot
	Physcaeneura panda	Dark-webbed ringlet
	Precis archesia archesia	Garden commodore
	Precis hierta cebrene	Yellow Pansy
	Precis octavia sesamus	Gaudy Commodore
	Protogoniomorpha parhassus	Mother-of-pearl
	Pseudonympha magoides	False silver-bottom brown
	Pseudonympha poetula	Drakensberg brown
	Stygionympha scotina scotina	Eastern hillside brown
	Telchinia anacreon	Orange acraea
	Telchinia cabira	Yellow-banded acraea
	Telchinia encedon encedon	White-barred acraea
	Telchinia esebria	Dusky acraea
	Telchinia serena	Dancing acraea
	Vanessa cardui	Painted lady

Papilionidae	*Graphium antheus*	Large striped swordtail
	Graphium leonidas leonidas	Veined swordtail
	Graphium morania	White lady
	Papilio dardanus cenea	Mocker swallowtail, Flying Handkerchief
	Papilio demodocus demodocus	Citrus swallowtail
	Papilio nireus lyaeus	Green-banded swallowtail
Pieridae	*Afrodryas leda*	Autumn leaf vagrant
	Belenois aurota	Brown-veined white
	Belenois creona severina	African common white
	Belenois gidica abyssinica	African veined white
	Catopsilia florella	African migrant
	Colias electo electo	African clouded yellow
	Colotis antevippe gavisa	Red tip
	Colotis auxo auxo	Sulphur orange tip
	Colotis euippe omphale	Smoky orange tip
	Colotis evenina evenina	Orange tip
	Colotis regina	Queen purple tip
	Colotis vesta argillaceus	Veined tip
	Eronia cleodora	Vine-leaf vagrant
	Eurema brigitta brigitta	Broad-bordered grass yellow
	Mylothris agathina agathina	Common dotted border
	Pinacopteryx eriphia eriphia	Zebra white
	Teracolus eris eris	Banded gold tip
Order: Mantodea - Mantids		
Empusidae	*Hemiempusa capensis*	
Order: Neuroptera - lacewigs, mantidflies, antlions		
Ascalaphidae	*Tmesibasis lacerata*	Blotched long-horned antlion
Myrmeleontidae	*Creoleon nubifer*	
	Cueta punctatissima	Dotted-winged antlion
	Neuroleon chloranthe	Green-flowered antlion
Order: Odonata - Dragonflies & Damselflies		
Gomphidae	*Crenigomphus hartmanni*	Hartmann's stout-tip
	Paragomphus genei	Common lesser brown-tail
Libellulidae	*Trithemis furva*	Lowland spectrum-blue dropwing
	Trithemis kirbyi ardens	Kirby's dropwing
	Zygonyx torridus	Torrent cascader
Lestidae	*Lestes plagiatus*	Highland emerald damsel
Order:Orthoptera - grasshoppers		
Acrididae	*Acorypha pallidicornis*	Pale-horned forceps-tailed grasshopper
	Acrida bicolor	Two-coloured stick grasshopper
	Acrotylus blondeli	Blondel's burrowing grasshopper
	Acrotylus diana	Diana's burrowing grasshopper
	Aulacobothrus dorsatus	Fine-keeled grasshopper

	Brachycrotaphus tryxalicerus	Wide-winged dotted grasshopper
	Cataloipus cognatus	Blue-legged related grasshopper
	Coryphosima stenoptera	Narrow-winged grasshopper
	Faureia milanjica	Mulanje grasshopper
	Gastrimargus crassicollis	Grassland hill grasshopper
	Gastrimargus determinatus vitripennis	Transparent-winged cross-marked grasshopper
	Gymnobothroides hemipterus	
	Gymnobothrus linea-alba	
	Heteropternis guttifera	Spotted divergent-winged grasshopper
	Machaeridia bilineata	Two-lined grasshopper
	Mesopsis laticornis	Broad-horned grasshopper
	Metaxymecus gracilipes	
	Orthochtha dasycnemis dasycnemis	Common shaggy-legged grasshopper
	Orthochtha rosacea	Rosy-winged grasshopper
	Oxya hyla hyla	Woodland spine-kneed grasshopper
	Pseudoarcyptera cephalica	Red-legged bow-winged grasshopper
	Pseudogmothela pallida	Pale long-spurred grasshopper
	Vitticatantops maculatus	Blotched dark-striped grasshopper
Lentulidae	*Eremidium curvicercus*	Curved-cercus wingless grasshopper
Pamphagidae	*Lamarkiana nasuta*	
	Lobosceliana cinerascens	Ash-greyish grasshopper
Pyrgomorphidae	*Maura rubroornata*	Red-adorned grasshopper
	Phymateus leprosus	Leprous milkweed locust
Order: Phasmotodea - Stick Insects		
Heteronemiidae	*Bactrododema tiaratum*	Giant stick insect

Anticipated Environmental Impacts, Mitigation and Management

Although there will be limited destruction of insect habitat, on the whole, the proposed development will not have a significant impact on any insect populations, particularly if sensitive placement of accommodation units within the landscape takes place and if landscaping with appropriate locally indigenous species is implemented.

4 DISCUSSION AND CONCLUSIONS

There will be some localised destruction of plant communities as a result of the proposed development, but careful placement of the development will avoid the destruction of mature trees and landscaping with appropriate locally indigenous trees will assist in mitigating habitat losses.

No direct impacts to any animal species are anticipated, though it is likely that construction workers may kill snakes, should they encounter them whilst working, or they may be tempted to snare animals or raid nests. To prevent this, it should be part of the contract that construction workers are briefed, before commencing work, that they will be working in a protected area and that killing of any animal whatsoever will not be tolerated. They should

also be restricted to carefully demarcated areas, with penalties for movement out of those areas.

Wherever there is food prepared or disposal of food-waste in protected areas, animals, such as baboons, monkeys or hyaena, may be inclined to frequent the area if the disposal of the waste is done carelessly. If these animals discover a new source of food in dustbins or accommodation units, or if people deliberately feed them, they will become a major problem to be managed and a danger to people. Therefore, it is imperative that animal-proof bins are used that are impossible to accidentally leave open, and that the people are educated not to feed any animals or leave food lying around.

In general, during construction, strict controls should be maintained over contractors and construction personnel to ensure that plants are not unnecessarily damaged or destroyed and animals are not killed when encountered. In addition, toilet facilities should be provided to avoid faecal contamination of the site. Sufficient waste bins should be provided and staff should be educated and instructed to use them, both from the problem animal perspective and to prevent site pollution and blowing of plastic bags away from site into the veld.

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