

# ENVIRONMENTAL IMPACTS ASSESSMENT

of the proposed

## TREKKOPJE URANIUM PROJECT

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## CHAPTER 1. VERTEBRATE FAUNA OF THE TREKKOPJE AREA: REPTILES, AMPHIBIANS, MAMMALS & BIRDS

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### 1.1. Introduction

A rapid field survey was conducted from 14-16 April 2006 in the general vicinity of the proposed prospecting area - specifically focusing on the area with current prospecting/excavation trenches - in the Trekkopje area. This survey was to determine the actual as well as potential vertebrate fauna associated with this site and focused on reptile, amphibian, mammal and bird diversities occurring in the general proposed prospecting/mining area. The field survey is supplemented by an extensive literature review of probable reptiles, amphibians, mammals & birds that ought to occur at the site, but not necessarily observed whilst conducting the actual field survey.

The northwest escarpment area and ecotone areas in general - which includes the Trekkopje area - is rich in reptile, mammal and bird species diversity. It is often incorrectly accepted that deserts are "devoid of any life" due to the extremely harsh and marginal landscape. Mammals are generally not well represented in true deserts compared to reptiles and arthropods due to a variety of reasons, but most importantly mainly as a result of a lack of water. Most often humans associate significant life with mammals, however this does not mean that diversity is low but rather unique.

This field survey, albeit conducted during an unusually cold (and even rainy) spell, resulted in the observation and/or confirmation of 22 reptiles, 0 amphibians, 15 mammals and 35 birds in the general/immediate Trekkopje area.

It is estimated that at least 63 species of reptile, 6 amphibian, 52 mammal and 126 bird species occur in the general/immediate Trekkopje area of which a high proportion are endemics.

### 1.2. Methods

The following field methods were employed during the rapid field survey to determine reptile, amphibian, mammal and avian diversity at the Trekkopje exploration/excavation site:

#### Reptiles & Amphibians

##### Transects:

Transects of varying length were conducted in various habitats – mainly focusing on the current exploration/excavation sites – to determine reptile & amphibian diversity. Reptiles observed on these transects were caught, identified and released. Reptiles were caught using the noose & rod method. Transects were

conducted during the daytime to determine diurnal reptiles as well as during the night (using a gas lantern) to determine nocturnal reptiles.

#### Suitable habitat:

Identifying and investigating potentially suitable habitat (e.g. human litter, isolated rocks, dead trees, etc.) to locate reptiles & amphibians was another strategy employed. This was done during the above mentioned transects as well as when observing such habitat whilst moving through the area.

### Mammals

#### Transects:

Transects of varying length were conducted in various habitats – mainly focusing on the current exploration/excavation sites – to determine small mammal diversity. Collapsible Sherman small mammal traps were set (baited with peanut butter & oats) on these transects. Small mammals caught were identified and released.

Larger mammal tracks, scats, burrows and other telltale signs were identified to determine their presence in the area.

#### Owl pellets:

Owl pellets (Barn Owl *Tyto alba*) collected at the old tin mine shafts were analysed to determine small mammal diversity as included in the diet of these owls in the area. Barn owls prey predominantly on small mammals thus giving a good indication what exists in the immediate area.

### Birds

#### Transects:

Transects of varying length (walking & driving along the existing roads) were conducted in various habitats – mainly focusing on the current exploration/excavation sites – to determine avian diversity. Birds observed along these transects were viewed with a binocular (10x50) and identified using various reference books *in situ*.

#### Nests:

Nests located during these above mentioned transects were visited to determine the occupants and nest status.

### Literature review

An intensive literature survey (i.e. desktop survey) regarding reptiles, amphibians, mammals & birds that could potentially occur in the general/immediate Trekkopje area was conducted to supplement the actual fieldwork.

### 1.3. Results

#### 1.3.1. Reptile Diversity

The following table indicates the reptile diversity expected to occur in the Trekkopje area, actually encountered – i.e. confirmed – whilst conducting field work in the area and the ecological status.

Species: Scientific name	Species: Common name	Expected	Observed	Status
Tortoises & Terrapins				
<i>Geochelone pardalis</i>	Leopard Tortoise	√		
<i>Pelomedusa subrufa</i>	Marsh/Helmeted Terrapin	√		
SNAKES				
Thread Snakes				
<i>Leptotyphlops occidentalis</i>	Western Thread Snake	√		Endemic
<i>Leptotyphlops labialis</i>	Damara Thread Snake	√		
Pythons				
<i>Python anchietae</i>	Anchieta's Dwarf Python	√		Endemic
Burrowing Snakes				
<i>Xenocalamus bicolor</i>	Bicoloured Quill-snouted Snake	√		
Typical Snakes				
<i>Lamprophis fuliginosus</i>	Brown House Snake	√	√	
<i>Lycophidion capense</i>	Cape Wolf Snake	√		
<i>Lycophidion namibianum</i>	Namibian Wolf Snake	√	√	Endemic
<i>Pseudaspis cana</i>	Mole Snake	√		
<i>Pythonodipsas carinata</i>	Western Keeled Snake	√		Endemic
<i>Dipsina multimaculata</i>	Dwarf Beaked Snake	√	√	Endemic
<i>Psammophis trigrammus</i>	Western Sand Snake	√		Endemic
<i>Psammophis notostictus</i>	Karoo Sand Snake	√		
<i>Psammophis</i>	Namib Sand Snake	√	√	

<i>leightoni namibensis</i>				
<i>Psammophis brevirostris leopardinus</i>	Leopard Grass Snake	√		
<i>Dasypeltis scabra</i>	Common Egg Eater	√	√	
<i>Telescopus</i> sp.	Damara Tiger Snake	√		Endemic
<i>Telescopus semiannulatus polystictus</i>	Western Tiger Snake	√		
<i>Aspidelaps lubricus infuscatus</i>	Coral Snake	√	√	
<i>Aspidelaps scutatus scutatus</i>	Shield-nose Snake	√		
<i>Naya nigricollis nigricincta</i>	Black-necked Spitting Cobra	√	√	Endemic
<i>Bitis arietans</i>	Puff Adder	√		
<i>Bitis caudalis</i>	Horned Adder	√	√	
<b>LIZARDS</b>				
<b>Skinks</b>				
<i>Typhlacontias brevipes</i>	FitzSimons' Burrowing Skink	√		Endemic
<i>Mabuya acutilabris</i>	Wedge-snouted Skink	√	√	
<i>Mabuya capensis</i>	Cape Skink	√		
<i>Mabuya occidentalis</i>	Western Three-striped Skink	√		
<i>Mabuya striata wahlbergi</i>	Striped Skink	√		
<i>Mabuya sulcata</i>	Western Rock Skink	√		
<b>Old World Lizards</b>				
<i>Mabuya variegata variegata</i>	Variegated Skink	√		
<i>Heliobolus lugubris</i>	Bushveld Lizard	√		
<i>Meroles anchietae</i>	Shovel-snouted Lizard	√		
<i>Meroles reticulatus</i>	Reticulated Desert Lizard	√		
<i>Meroles suborbitalis</i>	Spotted Desert Lizard	√		
<i>Pedioplanis breviceps</i>	Short-headed Sand Lizard	√		Endemic
<i>Pedioplanis namaquensis</i>	Namaqua Sand Lizard	√	√	
<i>Pedioplanis undata</i>	Western Sand	√		Endemic

	Lizard			
<i>Pedioplanis gaerdesi</i>	Kaokoveld Sand Lizard	√		Endemic
<i>Pedioplanis husabensis</i>	Husab Sand Lizard	√	√	Endemic
Plated Lizards				
<i>Cordylosaurus subtessellatus</i>	Dwarf Plated Lizard	√		
<i>Gerrhosaurus validus</i>	Giant Plated Lizard	√		
Monitors				
<i>Varanus albigularis</i>	Rock Monitor	√		
Agamas				
<i>Agama aculeata</i>	Ground Agama	√	√	
<i>Agama anchietae</i>	Anchieta's Agama	√	√	
<i>Agama planiceps</i>	Namibian Rock Agama	√		
Chameleons				
<i>Chamaeleo namaquensis</i>	Namaqua Chameleon	√	√	
Geckos				
<i>Afroedura africana africana</i>	African Flat Gecko	√		Endemic
<i>Chondrodactylus angulifer namibensis</i>	Giant Ground Gecko	√	√	
<i>Lygodactylus bradfieldi</i>	Bradfield's Dwarf Gecko	√	√	Endemic
<i>Narudasia festiva</i>	Festive Gecko	√		
<i>Pachydactylus bicolor</i>	Velvety Thick-toed Gecko	√	√	Endemic
<i>Pachydactylus kochii</i>	Koch's Thick-toed Gecko	√		Endemic
<i>Pachydactylus turneri</i>	Turner's Thick-toed Gecko	√		Endemic
<i>Pachydactylus mariquensis latirostris</i>	Marico Thick-toed Gecko	√		
<i>Pachydactylus punctatus</i>	Speckled Thick-toed Gecko	√		
<i>Pachydactylus scherzi</i>	Schertz's Thick-toed Gecko	√		Endemic
<i>Pachydactylus rugosus rugosus</i>	Large-scaled Thick-toed Gecko	√		Endemic
<i>Pachydactylus serval serval</i>	Western Spotted Thick-toed Gecko	√	√	Endemic

<i>Pachydactylus weberi</i>	Weber's Thick-toed Gecko	√		Endemic
<i>Ptenopus carpi</i>	Carp's Barking Gecko	√	√	Endemic
<i>Ptenopus garrulus maculatus</i>	Common Barking Gecko	√		Endemic
<i>Rhoptropus afer</i>	Common Namib Day Gecko	√	√	Endemic
<i>Rhoptropus boultoni</i>	Boulton's Namib Day Gecko	√	√	Endemic
<i>Rhoptropus bradfieldi</i>	Bradfield's Namib Day Gecko	√	√	Endemic

Source for literature review: Branch (1998), Broadley (1983), Griffin (2003), Hebbard (n.d.), Marais (1992)

Approximately 261 species of reptiles are known or expected to occur in Namibia thus supporting approximately 30% of the continents species diversity (Griffin 1998a). The occurrence of endemic lizards and snakes is high in the northwest escarpment area which includes the Trekkopje area. At least 22% or 55 species of Namibian lizards are classified as endemic. The occurrence of reptiles of "conservation concern" (includes about 67% of Namibian reptiles) is high in the northwest escarpment area (Griffin 1998a). Griffin (1998a) furthermore states that the escarpment area from the Erongo Mountains to the Kunene River has been neglected in the Namibian conservation network and require additional protection. Emergency grazing and large scale mineral extraction in critical habitats are some of the biggest problems facing reptiles (Griffin 1998a).

At least 63 species of reptiles are expected to occur in the Trekkopje area with 27 species being endemic – i.e. 43% endemic. These consist of at least 22 snakes (2 thread snakes, 1 python, 1 burrowing snake & 18 typical snakes), 8 of which are endemic (36%) to Namibia and 41 lizards, 19 (46%) of which are endemic to Namibia. Namibia with approximately 129 species of lizards (Lacertilia) has one of the continents richest lizard fauna (Griffin 1998a). Geckos have the highest occurrence of endemics in the Trekkopje area with 14 species or 78% of all the geckos (52% of all endemics) expected and/or known to occur in the area, being endemic to Namibia. Due to the fact that reptiles are an understudied group of animals, especially in Namibia, it is expected that more species may be located in the Trekkopje area than presented above.



### 1.3.2. Amphibian Diversity

The following table indicates the amphibian diversity expected to occur in the Trekkopje area.

Species: Scientific name	Species: Common name	Expected	Observed	Status
Toads				
<i>Bufo dombensis</i>	Dombe Toad	√		Endemic
<i>Bufo hoeschi</i>	Hoesch's Toad	√		Endemic
<i>Bufo poweri</i>	Power's Toad	√		
Rain/Rubber Frogs				
<i>Breviceps adspersus</i>	Common Rain Frog	√		
<i>Phrynomantis annectens</i>	Marbled Rubber Frog	√		Endemic
Common Frogs				
<i>Tomopterna cryptotus</i>	Tremolo Sand Frog	√		

Source for literature review: Carruthers (2001), Channing (2001), Channing & Griffin (1993), Passmore & Carruthers (1995)

Approximately 4000 species of amphibians are known worldwide with just over 200 species known from southern Africa and at least 57 species expected to occur in Namibia. Griffin (1998b) puts this figure at 50 recorded species and a final species richness of approximately 65 species, 6 of which are endemic to Namibia. This "low" number of amphibians from Namibia is not only as a result of the generally marginal desert habitat, but also due to Namibia, including the Trekkopje area, being under studied and under collected. Most amphibians require water to breed and are therefore associated with the permanent water bodies, mainly in northeast Namibia. No permanent surface water exists in the Trekkopje area and water – i.e. amphibian breeding places – are rather limited to temporary pools after localised showers in the area. Such temporary rock pools were evident as observed during the field survey period when rain occurred in the area.

Amphibians are declining throughout the world due to various factors of which much has been ascribed to habitat destruction. Basic species lists for various habitats are not always available with Namibia being no exception in this regard while the basic ecology of most species is also unknown.

Griffin (1998b) puts the species richness in the general Trekkopje area as between 2 and 6 species. Although the Trekkopje area is under represented, with 3 toads, 2 rain or rubber frogs and 1 common frog expected (i.e. potentially could be found in the area) to occur in the general area of which 3 species (50%) are endemic to Namibia.

### 1.3.3. Mammal Diversity

The following table indicates the mammal diversity expected to occur in the Trekkopje area and mammals actually encountered – i.e. confirmed – whilst conducting fieldwork in the area.

Species: Scientific name	Species: Common name	Expected	Observed	Status
<b>Elephant Shrews</b>				
<i>Macroscelides proboscideus</i>	Round-eared Elephant-shrew	√		
<i>Elephantulus rupestris</i>	Smith's Rock Elephant-shrew	√		
<i>Elephantulus intufi</i>	Bushveld Elephant-shrew	√		
<b>Bats</b>				
<i>Mormopterus petrophilus</i>	Flat-headed Free-tailed Bat	√		
<i>Tadarida aegyptiaca</i>	Egyptian Free-tailed Bat	√		
<i>Laephotis namibensis</i>	Namib Long-eared Bat	√		Endemic
<i>Eptesicus hottentotus</i>	Long-tailed Serotine Bat	√		
<i>Pipistrellus zuluensis</i>	Aloe Serotine Bat	√		
<i>Myotis seabrai</i>	Angola Wing-gland Bat	√		Endemic
<i>Nycteris thebaica</i>	Common Slit-faced Bat	√		
<i>Rhinolophus fumigatus</i>	Rüppell's Horseshoe Bat	√		
<i>Rhinolophus clivosus</i>	Geoffroy's Horseshoe Bat	√		
<i>Rhinolophus denti</i>	Dent's Horseshoe Bat	√		
<b>Monkeys &amp; Baboons</b>				
<i>Papio ursinus</i>	Chacma Baboon	√		
<b>Hares &amp; Rabbits</b>				
<i>Lepus capensis</i>	Cape Hare	√	√	
<b>Rodents</b>				
<b>Squirrels</b>				
<i>Xerus inauris</i>	Cape Ground Squirrel	√		

<i>Xerus princeps</i>	Kaokoveld Ground Squirrel	√		Endemic
Porcupine, Springhare & Dassie Rat				
<i>Hystrix africaeaustralis</i>	Cape Porcupine	√		
<i>Pedetes capensis</i>	Springhare	√		
<i>Petromus typicus</i>	Dassie rat	√		Endemic
Rats & Mice				
<i>Parotomys littledalei</i>	Littledale's Whistling Rat			
<i>Rhabdomys pumilio</i>	Striped Mouse	√		
<i>Mus musculus</i>	House Mouse	√		
<i>Mastomys coucha</i>	Mutimammate Mouse	√		
<i>Mastomys natalensis</i>	Natal Mutimammate Mouse	√		
<i>Aethomys namaquensis</i>	Namaqua Rock Mouse	√		
<i>Desmodillus auricularis</i>	Short-tailed Gerbil	√		
<i>Gerbillurus paeba</i>	Hairy-footed Gerbil	√	√	
<i>Gerbillurus vallinus</i>	Brush-tailed Hairy-footed Gerbil	√		
<i>Gerbillurus tytonis</i>	Setzer's Hairy-footed Gerbil	√	√	
<i>Petromyscus collinus</i>	Pygmy rock mouse	√	√	
Carnivores				
<i>Proteles cristatus</i>	Aardwolf	√		
<i>Hyaena brunnea</i>	Brown Hyaena	√	√	
<i>Panthera pardus</i>	Leopard	√	√	
<i>Felis caracal</i>	Caracal	√		
<i>Felis lybica</i>	African Wild Cat	√	√	
<i>Otocyon megalotis</i>	Bat-eared Fox	√		
<i>Vulpes chama</i>	Cape Fox	√	√	
<i>Canis mesomelas</i>	Black-backed Jackal	√	√	
<i>Ictonyx striatus</i>	Striped Polecat	√	√	
<i>Genetta genetta</i>	Small-spotted Genet	√		
<i>Suricata suricatta</i>	Suricate	√	√	
<i>Cynictis</i>	Yellow Mongoose	√		

<i>penicillata</i>				
<i>Galerella nigrata</i>	Black Mongoose	√		Endemic
<i>Orycteropus afer</i>	Aardvark	√		
<i>Procavia capensis</i>	Rock Dassie	√	√	
<i>Sylvicapra grimmia</i>	Common Duiker	√		
<i>Antidorcas marsupialis</i>	Springbok	√	√	
<i>Orotragus oreotragus</i>	Klipspringer	√		
<i>Raphicercus campestris</i>	Steenbok	√	√	
<i>Oryx gazella</i>	Gemsbok	√	√	
<i>Tragelaphus strepsiceros</i>	Kudu	√		

Source for literature review: De Graaff (1981), Estes (1995), Joubert & Mostert (1975), Skinner & Smithers (1990) & Taylor (2000)

Namibia is well endowed with mammal diversity with at least 250 species occurring in the country. These include the well known big and hairy as well as a legion of smaller and lesser-known species. Mammal species richness is high in the northwest escarpment area, which includes the Trekkopje area. Currently 14 mammal species are considered endemic to Namibia of which 11 species are rodents and small carnivores of which very little is known. Most endemic mammals are associated with the Namib and escarpment with 60% of these rock-dwelling (Griffin 1998c). According to Griffin (1998c) the endemic mammal fauna is best characterized by the endemic rodent family *Petromuridae* (Dassie rat) and the rodent genera *Gerbillurus* and *Petromyscus*, all of which occur or are likely to occur in the Trekkopje area.

At least 52 species of mammals are expected to occur in the Trekkopje area of which 5 species (10%) are endemic to Namibia. Mammal species probably underrepresented in the above mentioned table for Trekkopje are bats and rodents, as these groups have not been well documented from the general area. Other species such as Baboon, Caracal, Kudu and Leopard may venture into the area from time-to-time depending on rainfall, prey and disturbance elsewhere.

The general Trekkopje area – albeit marginal habitat for most mammals – is understudied and under collected, especially regarding the bat and rodent fauna. At least 50% of the mammalian fauna that occur or are expected to occur in the Trekkopje area are represented by bats ( $\pm 10$  species) and rodents ( $\pm 16$  species). Important habitats often not realised and/or neglected include rivers (including ephemeral drainage lines) and their associated vegetation. Habitat alteration and overutilization are the two primary processes threatening most mammals (Griffin 1998c).

#### 1.3.4. Avian Diversity

The following table indicates the avian diversity expected to occur in the Trekkopje area and birds actually encountered – i.e. confirmed – whilst conducting fieldwork in the area. This table excludes aquatic and migratory birds and/or birds only attracted to the area after localized rain showers, but rather focus on birds that are breeding residents or can be found in the area during any time of the year. This would imply that many more birds could occur in the area depending on “favourable” environmental conditions.

Species: Scientific name	Species: Common name	Expected	Observed	Status
<i>Struthio camelus</i>	Ostrich	√	√	
<i>Sagittarius serpentarius</i>	Secretary bird	√		
<i>Gyps africanus</i>	Whitebacked Vulture	√		
<i>Torgos tracheliotus</i>	Lappetfaced Vulture	√	√	
<i>Elanus caeruleus</i>	Blackshouldered Kite	√		
<i>Aquila verreauxii</i>	Verreaux's Eagle	√		
<i>Aquila rapax</i>	Tawny Eagle	√		
<i>Polemaetus bellicosus</i>	Martial Eagle	√		
<i>Circaetus gallicus</i>	Blackcheded Snake Eagle	√	√	
<i>Buteo augur</i>	Augur Buzzard	√		
<i>Melierax canorus</i>	Southern Pale Chanting Goshawk	√	√	
<i>Falco peregrinus</i>	Peregrine Falcon	√		
<i>Falco biarmicus</i>	Lanner Falcon	√		
<i>Falco chicquera</i>	Rednecked Falcon	√		
<i>Falco tinnunculus</i>	Common Kestrel	√	√	
<i>Falco rupicoloides</i>	Greater Kestrel	√		
<i>Francolinus adspersus</i>	Redbilled Francolin	√		
<i>Francolinus hartlaubi</i>	Hartlaub's Francolin	√		Endemic
<i>Trunix sylvatica</i>	Kurrichane Buttonquail	√		
<i>Ardeotis kori</i>	Kori Bustard	√		
<i>Neotis ludwigii</i>	Ludwig's Bustard	√		
<i>Eupodotis rueppellii</i>	Rüppell's Korhaan	√	√	Endemic
<i>Eupodotis afra</i>	Black Korhaan	√		
<i>Vanellus armatus</i>	Blacksmith Plover	√		

<i>Burhinus capensis</i>	Spotted Dikkop	√		
<i>Cursorius rufus</i>	Burchell's Courser	√		
<i>Rhinoptilus africanus</i>	Doublebanded Courser	√		
<i>Pterocles namaqua</i>	Namaqua Sandgrouse	√	√	
<i>Pterocles bicinctus</i>	Doublebanded Sandgrouse	√		
<i>Columba guinea</i>	Rock Pigeon	√	√	
<i>Streptopelia capicola</i>	Cape Turtle Dove	√	√	
<i>Streptopelia senegalensis</i>	Laughing Dove	√	√	
<i>Oena capensis</i>	Namaqua Dove	√	√	
<i>Agapornis roseicollis</i>	Rosy faced Lovebird	√		Endemic
<i>Corythaixoides concolor</i>	Grey Lourie	√		
<i>Tyto alba</i>	Barn Owl	√	√	
<i>Otus leucotis</i>	Whitefaced Owl	√		
<i>Glaucidium perlatus</i>	Pearlspotted Owl	√		
<i>Bubo africanus</i>	Spotted Eagle Owl	√	√	
<i>Bubo lacteus</i>	Giant Eagle Owl	√		
<i>Caprimulgus tristigma</i>	Freckled Nightjar	√		
<i>Apus bradfieldi</i>	Bradfield's Swift	√		
<i>Colius colius</i>	Whitebacked Mousebird	√		
<i>Merops hirundineus</i>	Swallowtailed Bee-eater	√		
<i>Upupa epops</i>	Hoopoe	√		
<i>Phoeniculus cyanomelas</i>	Scimitar billed Woodhoopoe	√		
<i>Tockus monteiri</i>	Monteiro's Hornbill	√		Endemic
<i>Lybius leucomelas</i>	Pied Barbet	√		
<i>Dendropicos fuscescens</i>	Cardinal Woodpecker	√		
<i>Mirafraga sabota</i>	Sabota Lark	√		
<i>Mirafraga curvirostris</i>	Longbilled Lark	√	√	
<i>Mirafraga erythrochlamys</i>	Dune Lark	√	√	Endemic
<i>Chersomanes albofasciata</i>	Spikehealed Lark	√		
<i>Calandrella cinerea</i>	Redcapped Lark	√		

<i>Alauda starki</i>	Stark's Lark	√		
<i>Ammomanes grayi</i>	Gray's Lark	√	√	Endemic
<i>Eremopterix verticalis</i>	Greybacked Finchlark	√	√	
<i>Hirundo fuligula</i>	Rock Martin	√	√	
<i>Riparia paludicola</i>	Brownthroated Martin	√		
<i>Dicrurus adsimilis</i>	Forktailed Drongo	√		
<i>Corvus capensis</i>	Black Crow	√	√	
<i>Corvus albus</i>	Pied Crow	√	√	
<i>Parus cinerascens</i>	Ashy Tit	√		
<i>Parus carpi</i>	Carp's Black Tit	√		Endemic
<i>Anthoscopus minutes</i>	Cape Penduline Tit	√		
<i>Turdoides bicolor</i>	Pied Babbler	√		
<i>Pycnonotus nigricans</i>	Redeyed Bulbul	√		
<i>Turdus litsitsirupa</i>	Groundscraper Thrush	√		
<i>Monticola brevipes</i>	Shorttoed Rock Thrush	√		
<i>Oenanthe monticola</i>	Mountain Chat	√	√	
<i>Cercomela familiaris</i>	Familiar Chat	√		
<i>Cercomela tractrac</i>	Tractrac Chat	√	√	
<i>Cercomela schlegelii</i>	Karoo Chat	√		
<i>Myrmecocichla formicivora</i>	Anteater Chat	√	√	
<i>Erythropygia paena</i>	Kalahari Robin	√		
<i>Namibornis herero</i>	Herero Chat	√	√	Endemic
<i>Parisoma subcaeruleum</i>	Titbabbler	√		
<i>Parisoma layardi</i>	Layard's Titbabbler	√		
<i>Sylvietta rufescens</i>	Longbilled Crombec	√		
<i>Eremomela icteropygialis</i>	Yellowbellied Eremomela	√		
<i>Eremomela gregalis</i>	Karoo Eremomela	√		
<i>Eremomela usticollis</i>	Burntnecked Eremomela	√		
<i>Achaetops pycnopygius</i>	Roackrunner	√		Endemic
<i>Cisticola aridula</i>	Desert Cisticola	√	√	

<i>Cisticola subruficapilla</i>	Greybacked Cisticola	√		
<i>Prinia flavicans</i>	Blackcheded Prinia	√	√	
<i>Melaenornis mariquensis</i>	Marico Flycatcher	√		
<i>Melaenornis infuscatus</i>	Chat Flycatcher	√		
<i>Batis pririt</i>	Pirit Batis	√		
<i>Motacila capensis</i>	Cape Wagtail	√		
<i>Anthus navaeseelandiae</i>	Richard's Pipit	√		
<i>Anthus similes</i>	Longbilled Pipit	√		
<i>Anthus vaalensis</i>	Buffy Pipit	√		
<i>Lanius collaris</i>	Fiscal Shrike	√	√	
<i>Laniarius atrococcineus</i>	Crimsonbreasted Shrike	√		
<i>Nilaus afer</i>	Brubru	√		
<i>Telophorus zeylonus</i>	Bokmakierie	√	√	
<i>Lanioturdus torquatus</i>	Whitetailed Shrike	√	√	Endemic
<i>Creatophora cinerea</i>	Wattled Starling	√		
<i>Lamprotornis nitens</i>	Glossy Starling	√		
<i>Onychognathus nabouroup</i>	Palewinged Starling	√		
<i>Nectarinia mariquensis</i>	Marico Sunbird	√		
<i>Nectarinia fusca</i>	Dusky Sunbird	√		
<i>Zosterops pallidus</i>	Cape White-eye	√		
<i>Plocepasser mahali</i>	Whitebrowed Sparrowweaver	√		
<i>Philetairus socius</i>	Sociable Weaver	√		
<i>Passer domesticus</i>	House Sparrow	√	√	
<i>Passer melanurus</i>	Cape Sparrow	√		
<i>Passer griseus</i>	Greyheaded Sparrow	√		
<i>Sporopipes squamifrons</i>	Scalyfeathered Finch	√	√	
<i>Ploceus velatus</i>	Masked Weaver	√		
<i>Quelea quelea</i>	Redbilled Quelea	√		
<i>Euplectes orix</i>	Red Bishop	√		
<i>Pytilia melba</i>	Melba Finch	√		
<i>Uraeginthus granatinus</i>	Violeteared Waxbill	√		
<i>Estrilda astrild</i>	Common Waxbill	√		
<i>Estrilda erythronotos</i>	Blackcheeked	√		



	Waxbill			
<i>Amadina erythrocephala</i>	Redheaded Finch	√		
<i>Vidua regia</i>	Shafttailed Whydah	√		
<i>Serinus atrogularis</i>	Blackthroated Canary	√		
<i>Serinus alario</i>	Blackheaded Canary	√		
<i>Serinus flaviventris</i>	Yellow Canary	√		
<i>Serinus albogularis</i>	Whitethroated Canary	√	√	
<i>Emberiza capensis</i>	Cape Bunting	√	√	
<i>Emberiza tahapisi</i>	Rock Bunting	√	√	
<i>Emberiza impetuani</i>	Larlike Bunting	√	√	

Source for literature review: Brown et al (1998), Maclean (1985) & Tarboton (2001)

\* Names of birds follow the old Roberts classification system.

Although Namibia's avifauna is comparatively sparse compared to the high rainfall equatorial areas elsewhere in Africa, approximately 658 species have already been recorded with a diverse and unique group of arid endemics (Brown et al 1998, Maclean 1985). High avian diversity is found in ecotone areas, which includes the ecotone along the escarpment between the savanna and the Namib biomes (i.e. Trekkopje area) (Brown et al 1998). The northwestern escarpment area is high in endemic birds with approximately 7-10 endemic species occurring in the north-south belt of dry savanna and escarpment running from Angola to the Erongo Mountains (Brown et al 1998). Fourteen species of birds are endemic or near endemic to Namibia with the majority of Namibian endemics occurring in the savannas (30%) and in the desert (30%) (Brown et al 1998).

At least 126 species of terrestrial ["breeding residents"] birds occur and/or could occur around the Trekkopje area at any time (Maclean 1985, Tarboton 2001). Obviously rainfall (or lack thereof) would affect bird species distribution and abundance. This however excludes all aquatic species (freshwater & marine) that could also be found in the area depending on rainfall and temporary pools, etc. in the area. At least 10 endemic species (71% of all Namibian endemic species or 8% of the species expected to occur in the area) can or are likely to occur in the general Trekkopje area either permanently or environmental conditions allowing. Four endemic bird species are confined to the Namib Desert with the Dune and Gray's Larks having the most restricted ranges in Namibia. Only approximately 1% of the birds occurring in desert and savanna biomes are listed as Red Data Birds – i.e. critically endangered, endangered or vulnerable Brown et al 1998). The Trekkopje area does not fall within an Important Birding Area (IBA) (Simmons 1998).

#### 1.4. Potentially Important Sites

Potentially important sites for reptiles, amphibians, mammals and birds in the general Trekkopje area would be the following:

- Rocky outcrops
- Rocky ridges
- Drainage lines – i.e. ephemeral rivers/rivulets
- Unique vegetation – i.e. patches in an otherwise homogenous area
- Old tin mine infrastructure – e.g. shafts & dumps

The following sites were identified as potentially important in the vicinity of the current prospecting/excavation sites at Trekkopje:

22°08'24.9"S; 15°00'15.0"E [808m]

- This is a low rocky "dolomite" outcrop close to the current exploration/excavation site and existing old tin mining shafts.
- This site is a confirmed (i.e. adults & eggs observed) breeding site for the endemic:
- \* *Rhoptropus boultoni* (Boulton's Namib Day Gecko) & *Pachydactylus bicolor* (Velvety Thick-toed Gecko)

22°08'13.1"S; 15°00'25.6"E [821m]

- This includes the old tin mining shafts and associated dumps close to the current exploration/excavation site and existing old tin mining shafts.
- \* These sites serve as breeding/roosting sites for Barn Owl (*Tyto alba*) & Spotted Eagle Owl (*Bubo africanus*) and could also serve as refugia for bats, although none were observed during the fieldwork.

22°10'10.1"S; 15°00'20.3"E [780m]

- Rocky ridge south of the current exploration/excavation site.
- \* The endemic *Pachydactylus serval serval* (Western Spotted Thick-toed Gecko) was observed in this area.

22°10'22.7"S; 14°51'59.9"E [593m]

- This is a large site dominated by *Salsola* sp. hummocks – a unique vegetation change within a large homogenous plain in the area – west of the current exploration/excavation site.
- \* Evidence of *Psammophis leightoni namibensis* (Namib Sand Snake) was found here.

22°11'05.9"S; 14°49'41.6"E [527m]

- This is an isolated low granite outcrop in the lichen zone west of the current exploration/excavation site.
- \* The endemic *Rhoptropus afer* (Common Namib Day Gecko) and *Pedioplanis namaquensis* (Namaqua Sand Lizard) were observed in this outcrop.
- Other areas not specifically plotted as above, but potentially still important would include the following:
  - Drainage lines  
A number of westwards flowing drainage lines run through the general Trekkopje area with obvious vegetation changes visible. These drainage lines include trees e.g. *Acacia erioloba*, *Acacia reficiens*, *Euclea pseudobenus*, etc. thus indication potential new/different habitats with potentially new/different species present.
  - Lichen fields  
These areas are mainly associated with the western parts of the Trekkopje area and potentially could result in new/different species associated with these areas although the botanical aspect is deemed the most important in these areas. Drainage lines and outcrops within these fields would nevertheless remain important habitat.
  - Old tin mine infrastructure  
These ruins are not only important from a historical perspective, but also serve as habitat for fauna, especially reptiles. The endemic *Pedioplanis husabensis* (Husab Sand Lizard) and *Rhoptropus bradfieldi* (Bradfield's Namib Day) were observed in the area.

## 1.5. Conclusion

It is estimated that at least 63 species of reptile, 6 amphibian, 52 mammal and 126 bird species occur in the general/immediate Trekkopje area of which a high proportion are endemics. It is estimated that 43% of the reptiles, 50% of the amphibians, 10% of the mammals and 8% of the birds known, or estimated to occur in the general Trekkopje area, are endemic to Namibia. Reptiles and amphibians – groups of animals often not considered important – are often the most common fauna (excluding arthropods) inhabiting and encountered in marginal desert environments with unique endemic species often associated with such areas.

Unique habitat favourable to reptiles (e.g. rocky outcrops & ridges) should be avoided during the prospecting/excavation as well as any other development phases. Knowledge and identification of such areas beforehand could be used

to prevent localised destruction and development in these potentially sensitive areas.

The Trekkopje area where the current prospecting/excavations are being conducted are fortunately (from an environmental point of view) not as unique and diverse as other areas within the general location (e.g. lichen fields, rocky outcrops/ridges and significant ephemeral drainage lines). Areas that are of importance in the vicinity of the current prospecting/excavations are identified in the section "Potential important sites" and should be avoided.

The eventual actual mining/excavation area would be relatively small and thus only have localised negative implications on the environmental and associated fauna. The associated infrastructure (e.g. mine dumps, slimes dam(s), plant, infrastructure, etc.) would have a similar effect. The overall impact on the local fauna (e.g. reptiles, amphibians, mammal & birds) and associated habitat destruction would be relatively small. Good planning prior to mining/excavation (including associated infrastructure development) and access route(s) development as well as adhering to proposed mitigation measures would minimise the overall effect on the local fauna in the Trekkopje area.

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## CHAPTER 2. ASSESSING IMPACTS

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### 2.1. Introduction

All developments change or are destructive to the local environment to some or other degree. Assessing potential impacts is occasionally obvious, but more often difficult to predict accurately. Such predictions may change depending on the scope of the development – i.e. development, once initiated, may have a different effect on the environment as originally predicted. Thus continuing monitoring of such impacts during the development phase(s) is imperative.

#### 2.1.1. Envisaged impacts

##### *Habitat destruction*

Habitat destruction is deemed the most important aspect potentially influencing fauna in the Trekkopje area. The following table indicates the potential/envisaged impacts expected regarding habitat destruction:

<i>Description</i>	Habitat destruction will vary depending on the scale/intensity of the prospecting/mining operation and the actual eventual location of the mining operations.
<i>Extent</i>	LIM & L Localised total destruction of the habitat will be associated with the actual excavation (mining) site including associated infrastructure with local impact also expected to occur within the general area (LIM). This however, would be a relatively small area with localised implications (L).
<i>Duration</i>	LT & P The duration of the mining impact is expected to be permanent (P) in the actual mining area – i.e. pit/excavation area. This however, would be a relatively small area with localised implications.  Rehabilitation of the actual mining site, associated infrastructure and access routes, etc. would however reverse this impact somewhat (LT).
<i>Intensity</i>	L, M & H The magnitude of the impact depends on the site – i.e. the actual mining site would be permanently altered (H). This however, would be a relatively small area with localised implications.

	<p>The adjacent sites associated with the actual mining operation (e.g. slimes &amp; mine dumps, plants, roads, etc.) would be affected moderately (M). This however, would be a relatively small area with localised implications.</p> <p>Areas not directly affected by the mining operation although within the mining area would be affected minimally (L). This would include dust, noise &amp; other associated disturbances in the area.</p> <p>Method(s) used in the quantification process: Endemic species are most often associated with specific habitat requirements and cannot tolerate drastic changes. Habitats such as rocky outcrops &amp; ridges affected/destroyed during the mining would thus permanently affect species associated with these.</p>
Mitigation	<p>Avoid mining/excavation and associated infrastructure in sensitive habitats such as rocky outcrops &amp; ridges, drainage lines and unique vegetation (also ecotone areas) zones. This would minimise the effect on fauna associated with these unique areas in an otherwise marginal area.</p> <p>Avoid placing dumping sites, slimes dam(s) &amp; associated infrastructure in sensitive areas – e.g. in/close to drainage lines, lichen fields, etc. This would minimise the negative effect on the local environment especially unique features serving as habitat to endemic species.</p> <p>Avoid placing access routes (roads &amp; tracks) through sensitive areas – e.g. lichen fields, over rocky outcrops/ridges. This would minimise the effect on localised potentially sensitive habitats in the area.</p> <p>Avoid driving randomly through the area (i.e. “track discipline”), but rather stick to permanently placed roads/tracks. This would minimise the effect on localised potentially sensitive habitats in the area.</p> <p>Remove unique habitats and features and relocate to a less sensitive/disturbed site if possible. Another strategy could be to incorporate unique habitats and features into the mine layout – i.e. serve as protected islands or even be incorporated into the “gardening” of the mine layout.</p> <p>Rehabilitation of the disturbed areas – i.e. actual mining and associated areas, but also the prospecting “scars” and associated tracks. Such rehabilitation would not only confirm</p>

	the mining company's environmental integrity, but also show true local commitment to the environment.
<i>Frequency of occurrence</i>	I Intermittent (I) habitat destruction is expected to occur with "new" or "alternative" prospecting in the area. This would depend on the future prospecting and/or extension to the proposed mining site.
<i>Probability</i>	P, HP & D Definite (D – 100%) negative impact on habitat is expected in the actual mining/excavation area. This however, would be much localised and cover only a small area – i.e. immediate mining/excavation and associated developments.  Highly Probable (HP – 75%) negative impact on habitat is expected in the adjacent developed areas (e.g. slimes & mine dumps, plants, roads, etc.).  Probable (P – 50%) negative impact on habitat is expected in the infrastructure (roads/tracks) to and around the mining area. Precautionary principle (e.g. avoid unique habitat features) would decrease the significance of these potential impacts.
<i>Significance</i>	Before mitigation: Medium After mitigation: Low to Medium
<i>Status of the impact</i>	Negative Localised unique habitats (e.g. rocky outcrops & ridges, drainage lines, lichen fields, etc.) would bear the brunt of this proposed mining development. This obviously depends on where exactly the mining and associated infrastructure would be placed.
<i>Legal requirements</i>	N/A
<i>Degree of confidence in predictions</i>	As an ecologist specialising in desert environments and more specifically on desert herpetofauna, I am very sure of the above mentioned predictions made and would suggest that the mitigation measures be implemented to minimise potentially negative aspects regarding the local fauna in the area.



### Reptiles

Reptiles are the group of animals expected to be most adversely affected by the mining/exploration activities at Trekkopje. The following table indicates the potential/envisaged impacts expected regarding reptiles:

<i>Description</i>	Reptiles are generally sedentary in their habits and the destruction of localised preferred habitats (e.g. rocky outcrops & ridges) would negatively affect them.
<i>Extent</i>	<p>LIM &amp; L The major extent of this impact would be limited to the actual mining/excavation sites and associated infrastructure (e.g. slimes &amp; mine dumps, plants, roads, etc.) (LIM).</p> <p>Access routes (roads &amp; tracks) locally would also impact on species, especially regarding nocturnal species (L).</p>
<i>Duration</i>	<p>LT &amp; P Once the preferred habitat has been destroyed locally the impact would be permanent (P).</p> <p>Vehicular movement in the area (roads &amp; tracks) would continuously have an effect on reptiles, especially nocturnal species (LT).</p>
<i>Intensity</i>	<p>L &amp; H The magnitude of the impact depends on the site – i.e. available habitat in the actual mining site would be permanently altered (H). The adjacent sites associated with the actual mining operation (e.g. slimes &amp; mine dumps, plants, roads, etc.) would be affected moderately (H). Areas not directly affected by the mining operation although within the mining area would be affected minimally (L).</p> <p>Method(s) used in the quantification process: Endemic species are most often associated with specific habitat requirements and cannot tolerate drastic changes. Habitats such as rocky outcrops &amp; ridges affected/destroyed during the mining would thus permanently affect species associated with these.</p>
<i>Mitigation</i>	<p>Avoid sensitive habitats such as rocky outcrops &amp; ridges, drainage lines and unique vegetation (also ecotone areas) zones. This would minimize the effect on mainly endemic reptiles associated with these unique areas.</p> <p>Avoid driving randomly through the area, but rather stick to permanently placed roads/tracks. This would minimize roadkills</p>

	<p>and the overall effect on reptiles moving through the area.</p> <p>Avoid excessive vehicle speed in the area. This can be ensured by using/maintaining "speed bumps" on roads/tracks in the area. This would minimize excessive reptile road kills in the area.</p> <p>Minimize night driving in the area. Large proportions of desert adapted reptiles are nocturnal and would be affected by night driving. This would minimize road kills of nocturnal reptiles in the area.</p> <p>Remove and/or relocate endemic species from area(s) to be mined before commencing with such operations. These species could be live captured without too much fuss and relocated to similar habitats.</p>
<i>Frequency of occurrence</i>	<p>C</p> <p>Continuous (C) problems regarding reptile road kills could be expected if mitigation measures (See above) are not put in place to limit these.</p>
<i>Probability</i>	<p>HP &amp; D</p> <p>Definite (D – 100%) negative impact on reptiles are expected in the actual mining/excavation area.</p> <p>Highly Probable (HP – 75%) negative impact on reptiles are expected in the adjacent developed areas (e.g. slimes &amp; mine dumps, plants, roads, etc.) as well as with the associated infrastructure (roads/tracks) to and around the mining area.</p> <p>Precautionary principle (e.g. road bumps, speed limits &amp; limited night driving) would decrease the significance of these potential impacts.</p>
<i>Significance</i>	<p>Before mitigation: Medium</p> <p>After Mitigation: Low to Medium</p>
<i>Status of the impact</i>	<p>Negative</p> <p>Reptiles associated with specific habitats (e.g. rocky outcrops &amp; ridges) would bear the brunt of this proposed mining development.</p>
<i>Legal requirements</i>	N/A

<i>Degree of confidence in predictions</i>	As an ecologist specialising in desert environments and more specifically on desert herpetofauna, I am very sure of the above mentioned predictions made and would suggest that the mitigation measures be implemented to minimise potentially negative aspects regarding the local, especially local endemics in the area.
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## CHAPTER 3. SUMMARY

No development is without its impacts on the environment. However, with sound planning beforehand, adhering to proposed mitigation measures thereafter as well as continuous monitoring of potential impacts, environmental problems associated with such development can be contained and/or minimised. The following tables summarise the most severe implications envisaged (i.e. worst case scenario(s) associated with the actual mining/excavation site(s)) in the Trekkopje area:

### *Habitat Implications:*

HABITAT IMPLICATIONS	CONSTRUCTION		OPERATION	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
Extent	Limited & Locally	Limited	Limited & Locally	Limited
Duration	Permanent	Long Term	Permanent	Long Term
Intensity	Very High & High	Low & Medium	Very High & High	Low & Medium
Mitigation	Various	Various	Various	Various
Frequency of occurrence	Intermittent	Intermittent	Intermittent	Intermittent
Probability	Probable, Highly Probable & Definite	Probable	Probable, Highly Probable & Definite	Probable
Significance	Medium	Low to Medium	Medium	Low to Medium
Status	Negative	Localised negative	Negative	Localised negative
Legal requirements	N/A	N/A	N/A	N/A
Degree of confidence in predictions	Certain	Certain	Certain	Certain

*Faunal Implications:*

FAUNAL IMPLICATIONS	CONSTRUCTION		OPERATION	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
Extent	Limited & Locally	Limited	Limited & Locally	Limited
Duration	Permanent & Long Term	Long Term	Permanent & Long Term	Long Term
Intensity	High & Low	Low	High & Low	Low
Mitigation	Various	Various	Various	Various
Frequency of occurrence	Continuous	Intermittent	Continuous	Intermittent
Probability	Highly Probable & Definite	Probable	Highly Probable & Definite	Probable
Significance	Medium	Medium to Low	Medium	Medium to Low
Status	Negative	Localised negative	Negative	Localised negative
Legal requirements	N/A	N/A	N/A	N/A
Degree of confidence in predictions	Certain	Certain	Certain	Certain