

**PROPOSED COAL-FIRED POWER STATION NEAR  
KENDAL,  
WITBANK AREA**

***ECOLOGICAL REPORT***

Prepared by:

*Dr. P.J. du Preez*

*MDA CC*

*P.O. Box 3943, Bloemfontein*

*9300*

Prepared for:

**NINHAM SHAND (Pty) Ltd**

George

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## **EXECUTIVE SUMMARY**

Machetcha Development Associates (MDA) has been appointed by Ninham Shand (Pty) Ltd to undertake a Vegetation and Zoological Survey of the two alternative sites for a new coal-fired power station in the Kendal area on the boundary between Gauteng and Mpumalanga.

From an ecological perspective, it was found that both sites are highly transformed. The outcome of the detailed evaluation is that Site X is the preferred site. However the footprint of the power station must be moved onto the high ground towards the north-east from the current position. The areas indicated for the ash dump and coal stockpile are also acceptable.

## **VEGETATION AND TERRESTRIAL FAUNA ASSESSMENT**

### **1. INTRODUCTION**

Machetcha Development Associates (MDA) has been appointed by Ninham Shand (Pty) Ltd to undertake a Vegetation and Zoological Survey of the two proposed sites for a new coal-fired power station in the Kendal area on the boundary between Gauteng and Mpumalanga.

The zoological as well as vegetation survey of the sites are important as protected, and endangered species could occur on these selected sites

This assessment, together with the recommendations, should be used in the planning and construction phases of the development, specifically the mitigation measures preventing potential disturbance to any sensitive vegetation, to ensure minimum impact on the environment as a result of the proposed development.

The aim of this study is:

- to comply with the requirements stipulated by the EIA process;
- to determine potential issues that would have a negative impact on the environment (terrestrial component);
- to select the most suitable site for a power station.

### **2. SCOPE AND LIMITATIONS**

MDA will provide an assessment of the potential impacts that the power station and related infrastructure would have on the ecology of the area (including potential impacts of the terrestrial fauna and flora).

#### **2.1 Vegetation**

- Veld composition in terms of:
  - \* Vegetative structure and classification (main vegetation types)
  - \* Plant species identification, including an indication of dominant species, rare and endangered species (Red data species), and exotic and invader species
  - \* Plant species and the environment
  - \* Plant species inter-relations
- Veld condition
  - \* Assessment of veld condition
  - \* Interpretation of veld condition assessment

- \* Rehabilitation needs and options
- \* Conservation status and potential

## **2.2 Terrestrial fauna**

- Animal species identification, including an indication of dominant species, rare and endangered species (Red data species), and exotic and invader species
- Animal species and their habitats
- Assessment of the habitat condition of the animals
- Desktop study to determine the probability of occurrence of any fauna of concern within these identified habitats.

## **2.3 Ecology**

- Determine the state of health of the ecosystem by taking into consideration all aspects concerning the natural resources;

Recommend mitigation measures to ameliorate the negative impacts of the proposed development on the natural environment to be included in the Environmental Management Plan.

## **3. ASSUMPTIONS**

None

## **4 LIMITATIONS**

- No information of detail vegetation or terrestrial fauna assessments of these three sites exists. However general descriptions of the region fauna and flora are available and were used.
- Not all the species present in these vegetation units could be noted due to the time of year and limited timeframes for the surveys and time of day (nocturnal mammals).

## **5. METHODOLOGY**

### **5.1 Information base (sources) for desk study**

Existing databases and Red Data Books were checked for information.

- Vegetation
  - \* VEGMAP (Mucina & Rutherford & Powrie, 2005).
  - \* Red Data Plant Lists (Golding 2002, Hilton-Taylor 1996)
  - \* Vegetation descriptions (Bredenkamp & Van Rooyen 1996; Bredenkamp & Brown 2003)
  - \* Field guides and books (Van Wyk & Malan, 1992; Van Oudtshoorn 1999).
- Terrestrial Animals
  - \* Field guides & books (Branch, 1998, Migdol 1994; Smithers 1983; Stuart & Stuart 1997).

### **5.2 Survey**

The sites were visited and transects were walked across the proposed areas. The following were noted.

- Veld composition in terms of:

- \* Vegetative structure and classification (main vegetation types)
- \* Plant species identification, including an indication of dominant species, rare and endangered species (Red data species), and exotic and invader species
- \* Plant species and the environment
- \* Plant species inter-relations
- Veld condition
- \* Assessment of veld condition
- \* Interpretation of veld condition assessment
- \* Rehabilitation needs and options
- \* Conservation status and potential
  
- Animal species identification, including an indication of dominant species, rare and endangered species (Red data species), and exotic and invader species
- Animal species and their habitats
- Assessment of the habitat condition of the animals

### 5.3 Criteria used to rank sites

In order to rank the three footprints to determine the most suitable area for the power plant, a comparative assessment was done, based on the vegetation characteristics, vegetation condition, and presence of terrestrial animals.

- **Vegetation characteristics**

- \* **Habitat diversity: Species composition / richness:** Normally a function of locality, habitat diversity and climatic conditions.

[Scoring: High - 1, Medium - 2, Low - 3]

- \* **Presence of rare and endangered species:** The occurrence or potential occurrence of any of the listed and /or endangered species can play a mayor role in the decision making process. Depending on the status and provincial conservation policy, presence of a Red Data species can potentially be a fatal flaw.

[Scoring: Occurrence actual or highly likely - 1, Occurrence possible - 2, Occurrence highly unlikely - 3]

- \* **Ecological function:** All plant communities play a role within the ecosystem. The ecological importance of all areas though, can vary significantly e.g. wetlands, drainage lines, ecotones, etc.

[Scoring: Ecological function critical for greater system - 1, Ecological function of medium importance - 2, No special ecological function (system will not fail if absent) - 3]

- \* **Uniqueness / conservation value:**

[Scoring: Very unique and / or in pristine condition - 1, Fair to good condition and / or medium uniqueness - 2, Not unique, degraded and / or poorly conserved - 3]

- **Vegetation condition**

The footprints are compared to a benchmark site in a good to excellent condition. Vegetation management practices (e.g. grazing regime, fire, management, etc.) can have a marked impact on the condition of vegetation.

\* **Percentage ground cover:** Ground cover is under normal and natural conditions a function of climate, and biophysical characteristics of the footprint. Under poor grazing management, ground cover is one of the first signs of vegetation degradation.

[Scoring: Good to excellent - 1, Fair - 2, Poor - 3]

\* **Vegetation structure:** This is the ratio between tree, shrub, sub-shrubs and grass layers. This ratio could be affected by browsing and grazing by animals.

[Scoring: All layers still intact and showing specimens of all age classes - 1, Sub-shrubs and / or grass layers highly grazed while tree layer still fairly intact (bush partly opened up) - 2, Mono-layered structure often dominated by a few unpalatable species (presence of barren patches notable) - 3]

\* **Infestation with exotic weeds and invader plants or encroachers**

[Scoring: No, or very slight infestation levels by weeds and invaders - 1, Medium infestation by one or more species - 2, Several weed and invader species present and high occurrence of one or more species (eg. Wattle). - 3]

\* **Degree of grazing / browsing impact:**

[Scoring: No, or very slight notable signs of browsing and / or grazing - 1, Some browse lines evident, shrubs shows signs of browsing, grass layer grazed though still intact - 2, Clear browse line on trees, shrubs heavily pruned and grass layer almost absent - 3]

\* **Signs of erosion:** The formation of erosion scars can often give an indication of the severity and /or duration of vegetation degradation

[Scoring: No or very little evidence of soil erosion - 1, Small erosion gullies present and / or evidence of slight sheet erosion - 2, Gully erosion well developed (medium to big dongas) and / or sheet erosion removed the topsoil over large areas - 3]

- **Terrestrial animal characteristics**

\* **Presence of rare and endangered species:** The occurrence or potential occurrence of any of the listed and /or endangered species can play a mayor role in the decision making process. Depending on the status and provincial conservation policy, presence of a Red Data species can potentially be a fatal flaw.

[Scoring: Occurrence actual or highly likely - 1, Occurrence possible - 2, Occurrence highly unlikely - 3]

#### **5.4 Site preference rating (SPR)**

The total scores for the criteria above were used to determine the preference ranking order for the different footprints investigated. On a scale of 0 – 30 scale, six different classes are described to assess the suitability of the footprints for the development of the proposed new power plant. The different classes are described in the table below:

**Table 1:** Footprint preference ranking

<b>SPR</b>	<b>SPR general flora description</b>	<b>Floral score equating to SPR class</b>
<b>IDEAL (5)</b>	Vegetation is totally transformed or in a highly degraded state, generally has a low level of species diversity, no species of concern and / or has a high level of invasive plants. The area has lost its inherent ecological function. The area has no conservation value and the potential for successful rehabilitation is very low. The site is ideal for the proposed development.	<b>29 – 30</b>
<b>PREFERRED (4)</b>	Vegetation is in an advanced state of degradation, has a low level of species diversity, no species of concern and / or has a high level of invasive plants. The area's ecological function is seriously hampered, has a very low conservation value and the potential for successful rehabilitation is low. The area is preferred for the proposed development.	<b>26 – 28</b>
<b>ACCEPTABLE (3)</b>	Vegetation is notably degraded, has a medium level of species diversity although no species of concern are present. Invasive plants are present but are still controllable. The area's ecological function is still intact but may be hampered by the current levels of degradation. Successful rehabilitation of the area is possible. The conservation value is regarded as low. The area is acceptable for the proposed development.	<b>21 – 25</b>
<b>NOT PREFERRED (2)</b>	The area is in a good condition although signs of disturbance are present. Species diversity is high and species of concern may be present. The ecological functioning is intact and very little rehabilitation is needed. The area is of medium conservation importance. The area is not preferred for the proposed development.	<b>11 – 20</b>
<b>SENSITIVE (1)</b>	The vegetation is in a pristine or near pristine condition. Very little signs of disturbance other than those needed for successful management are present. The species diversity is very high with several species of concern known to be present. Ecological functioning is intact and the conservation importance is high. The area is regarded as sensitive and not suitable for the proposed development.	<b>0 – 10</b>

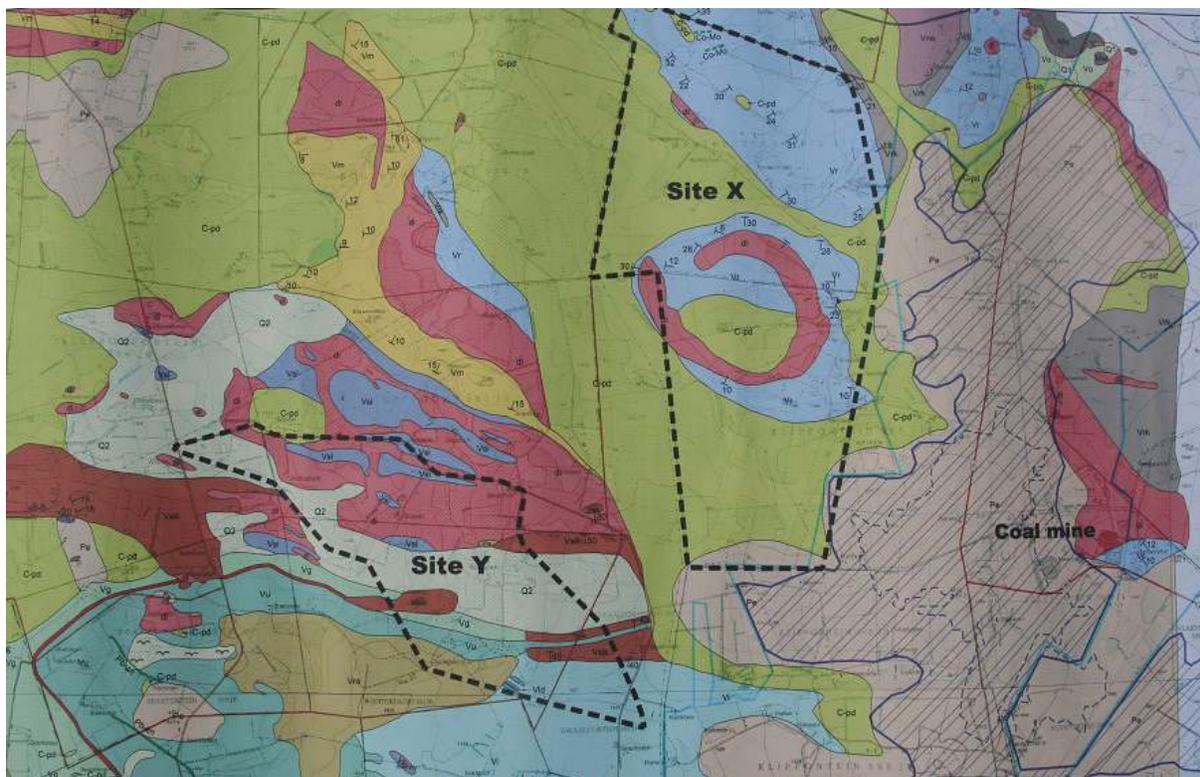
## 6. DESCRIPTIONS

### 6.1 Altitude & Geomorphology

The range in altitude is from 1550m to 1800m. The complex topography of the area is a result of stony hills, ridges, plateaux, plains and deeply weathered drainage lines. In areas where depressions occur, endorrheic pans forms an important component of the landscape. The complex topography results in mosaics of different habitats with different vegetation types.

### 6.2 Geology & Soil

Coal-bearing Karoo sediments form extensive flat plains with deep soils which are often ploughed for maize cultivation. Rocky outcrops present in the area consist mainly of quartzite and diabase dykes (See geological map).



**Figure 1: Geological map of the area.**

#### A & B Land Types

The A and B land types generally represent flat or slightly undulating landscapes, on granite, shale and Karoo sediments which mostly give rise to deep, freely drained soils or soils with a plinthic catena.

#### F Land Types

Shallow Glenrosa or Mispah soils are characteristic of these land types. The Fb land type represents the low andesite or quartzite ridges in the southern and central parts of the

Bankenveld. These ridges have grassland on cooler exposed sites and bush on warmer sheltered sites.

## **I Land Types**

The Ib land type is characteristic of the very rocky quartzite hills and ridges, with very little, shallow soil. These ridges have grassland on cooler exposed sites and bush on warmer sheltered sites.

### **6.3 Climate**

The area receives > 700 mm per annum, mainly in the form of thunderstorms during the summer months. Average daily maximum temperatures vary from 23-24°C. The average daily minimum temperature varies between 9 and 10°C.

### **6.4 Disturbance & Regeneration**

Grasslands of the Highveld are disturbance-driven systems, undergoing periodic (sometimes catastrophic) flooding (in riverine habitats) or slow but steady change mainly due to human induced impacts (e.g. frequent fires, grazing pressures, etc.). The cultivation of various crops (maize, wheat, vegetables, etc) completely destroys the natural vegetation. The selective and overgrazing of natural grassland gradually change the species composition of grassland.

### **6.5. Plant communities**

The vegetation belongs to the Moist Cool Highveld Grassland (Bredenkamp & Van Rooyen 1996). A synonym of this vegetation unit is Acocks' (1988) Eastern Bankenveld veld type.

#### **6.5.1 Vegetation units**

##### **A. Anthropogenic areas dominated mainly by exotic plants**

These sites are usually highly disturbed. Different types of roads and tracks (secondary, tertiary and tracks) cut through the study area. These areas are cleared of any vegetation but in some areas groves of Bluegums were planted along the roads. Farmsteads are also denuded of any natural vegetation. Large groves of exotic trees mainly Bluegum trees and Wattle Trees also occur around these sites.

A mosaic of cultivated lands and camps for the keeping of domestic stock is very conspicuous in the area. Large areas under especially maize cultivation were noted.

Borrow pits, prospecting pits as well as clay mines for the manufacturing of bricks were also noted.

### **B. *Hyparrhenia hirta* Anthropogenic Grassland**

This tall grassland occurs over vast areas, usually on shallow, leached soils on the Johannesburg granite dome, and on undulating north-facing warm andesitic lava slopes of the Suikerbosrand, Witwatersrand and Klipriviersberg areas. Disturbed grassland or other disturbed areas such as road reserves or fallow fields, not cultivated for some years, are also usually *Hyparrhenia* dominated (Coetzee *et al.* 1995; Bredenkamp & Brown 2003).

This *Hyparrhenia* – dominated grassland may appear to be quite natural, but they are mostly associated with an anthropogenic influence from recent or even iron-age times. This grassland is characterised by the tall growing dominant Thatch grass (*Hyparrhenia hirta*), and Bankrupt Bush (*Stoebe vulgaris*), an invader dwarf shrub which usually indicates grassland's degraded condition (Bredenkamp & Brown 2003).

This grassland mostly has low species richness, with only a few other species able to establish or survive in the shade of the dense sward of tall grass. Most of these species are relict pioneers or early seral species. The most prominent species include the grasses *Cynodon dactylon*, *Eragrostis plana*, *E. racemosa*, *E. curvula* and *Aristida congesta*. Forbs are rarely encountered, though a few individuals of species such as *Anthospermum rigidum*, *Conyza podocephala*, *Crabbea angustifolia* and *Helichrysum rugulosum* are often present (Bredenkamp & Brown 2003).

### **C. *Eragrostis plana* Moist Grassland**

The *Eragrostis plana* Grassland is well represented occurring mainly in high rainfall parts. This grassland type is a moist grassland, usually restricted to flat plains or bottomlands, mostly on moist, deep, clayey and poorly drained, seasonally wet soils, adjacent to wetlands, seasonal as well as perennial rivers. These habitats are often fairly unstable due to seasonal flooding and drying, which, together with frequent overgrazing, cause degradation of the vegetation (Bezuidenhout & Bredenkamp 1990).

*Eragrostis plana* is conspicuous, often dominant member of this grassland type. *Paspalum dilatatum*, and the rhizomatous *Cynodon dactylon*, often present in degraded sites, are also diagnostic, as well as the forbs *Crabbea acaulis*, *Berkheya radula*, *B. pinnatifida* and *Trifolium africanum*. Grass species such as *Eragrostis curvula*, *Themeda triandra*, *Setaria sphacelata* and *Digitaria eriantha* are often abundantly present, and may be locally dominant, while forbs are generally quite rare (Coetzee *et al.* 1995; Bredenkamp & Brown 2003).

### **D. *Cymbopogon plurinodis*-*Themeda triandra* Grassland**

The *Cymbopogon plurinodis*-*Themeda triandra* Grassland occurs on flat or undulating plains with deep, non-rocky soils. These grasslands are relatively poor in plant species, though, due to the arable soils, much has been destroyed for agricultural purposes. This type of grassland

is very widely distributed over the interior plateaux of South Africa (O'Connor & Bredenkamp 1997).

This grassland is characterised by grasses such as Turpentine grass (*Cymbopogon plurinodis*) and *Trichoneura grandiglumis*. Although there are many diagnostic forbs present in this grassland, they are never dominant and are mostly inconspicuous and hidden in the dense grass layer. Of these *Helichrysum miconiifolium*, *Anthospermum hispidulum*, *Acalypha angustata*, *Ipomoea crassipes*, *Hermannia depressa* and the geophyte *Hypoxis hemerocallidea* are the most prominent. The dominant grass is mostly Red grass (*Themeda triandra*), with *Eragrostis curvula*, *Heteropogon contortus*, *Setaria sphacelata* and *Aristida congesta* also conspicuous (Coetzee *et al.* 1995; Bredenkamp & Brown 2003).

#### **E. *Monocymbium ceresiiforme*-*Loudetia simplex* Grassland**

This high altitude grassland is found throughout the study area on rocky midslopes of ridges and hills. The soils are often shallow with high rock cover (up to 60% in some cases). This vegetation is found mostly on cooler aspects, but also occur on the warmer north-facing aspects where scattered individuals of dwarf shrubs are present. In some degraded areas *Aristida junciformis*, *A. congesta* and *Cynodon dactylon* are more prominent (Coetzee *et al.* 1995; Bredenkamp & Brown 2003).

This grassland is dominated by the grasses *Monocymbium ceresiiforme*, *Digitaria monodactyla*, *Loudetia simplex*, *Trachypogon spicatus*, *Eragrostis racemosa*, *Andropogon shirensis*, *Schizachyrium sanguineum*, *Brachiaria serrata* and *Themeda triandra*.

The woody layer consists mainly of a few scattered individuals of the dwarf shrubs *Protea welwitschii*, *Lopholaenia coriifolia*, and the geoxylphyte *Parinari capensis*, that are locally prominent. The grasses *Alloteropsis semialata*, *Panicum natalense*, *Urelytrum agropyroides*, *Tristachya leucothrix*, *Monocymbium ceresiiforme*, *Digitaria monodactyla*, *Sporobolus pectinatus*, *Alloteropsis semialata*, *Bewsia biflora* and *Elionurus muticus* are also abundant together with the forbs *Cyanotis speciosa*, *Bulbostylis burchellii*, *Senecio venosus*, *Sphenostylus angustifolia* and *Pentanissia angustifolia* (Coetzee *et al.* 1995; Bredenkamp & Brown 2003).

#### **F. *Protea roupelliae* Cool Temperate Mountain Bushveld**

This unit is mainly found on relatively steep southern midslopes and rocky ridges. The slopes normally have a high rock cover with shallow sandy soils. These areas represent the relatively moist and cool habitats (Bredenkamp & Brown 2003).

The diagnostic species include the grass *Eragrostis micrantha* and the forbs *Crassula nodulosa*, *Gnidia sericocephala*, *Graderia subintegra*, *Indigofera hilaris*, *Indigofera melanadenia*,

*Lotononis eriantha*, *Nemesia fruticans*, *Tephrosia rhodesica*, *Tritonia nelsonii* and *Selago tenuifolia*. The vegetation is dominated by the grasses *Loudetia simplex*, *Trachypogon spicatus* and *Tristachya leucothrix*. Woody species present include the trees *Rhus leptodictya*, *Rhus lancea*, *Rhus pyroides*, *Euclea crispa*, the shrubs *Grewia occidentalis*, *Lippia javanica* and the grasses *Monocymbium ceresiiforme*, *Panicum natalense*, *Urelytrum agropyroides* *Themeda triandra* and the forb *Vernonia oligocephala* (Bredenkamp & Brown 2003).

### **G. *Themeda triandra*-*Acacia karroo* Microphyllous Woodland**

*Acacia karroo*-dominated woodlands is found on colluvial soils on footslopes, in bottomland plains and as riparian vegetation along streams and rivers. This vegetation type occurs over a wide range of soil and terrain types with low rock cover, but is mostly associated with moderately deep and often clayey, high nutrient, alluvial soils. The areas in which it occurs are in many cases overgrazed, due to the presence of palatable grass species. Overgrazed or poorly managed sites in the grassland are often invaded by *Acacia karroo* and associated species, resulting in bush encroachment and degradation of the herbaceous layer (Bredenkamp & Bezuidenhout 1990). This open woodland is characterised by the diagnostic trees *Acacia karroo* and *Ziziphus mucronata* dominating the woody layer. The diagnostic multi-stemmed shrubs *Asparagus suaveolens* and *Asparagus laricinus* and the forb *Teucrium trifidum* are almost always associated with this vegetation. The herbaceous layer is dominated by the grasses *Themeda triandra*, *Setaria sphacelata* while the grasses *Eragrostis curvula*, *Heteropogon contortus*, *Digitaria eriantha* and *Elionurus muticus* are also abundant locally (Bredenkamp & Brown 2003).

### **H. Grassy Pan Veld**

This sweet grassland is dominated by White Buffalograss (*Panicum coloratum*), Lovegrass species (*Eragrostis curvula*, *E. plana*), *Setaria nigrirostris* and *S. spacelata*. Redgrass (*Themeda triandra*), is also present but is not as dominant on the clayey soils as on the deeper red sands. Lovegrass (*Eragrostis spp.*) dominate when overgrazed and in cases of severely degraded veld Three-awn Rolling grass (*Aristida bipartita*) dominates.

### **I. Riparian shrub on stream and riverbanks**

This riparian shrub community dominate the stream and riverbanks. Exotic trees such as Bluegums (*Eucalyptus camaldulensis*, *E. sideroxylon*) and the Weeping Willow (*Salix babylonica*) are present together with indigenous shrubs such as *Salix mucronata*, *Diospyros lycioides*, *Rhus pyroides*, *Lycium hirsutum*, *Acacia karroo*, *Combretum erythrophyllum* and *Ziziphus mucronata*.

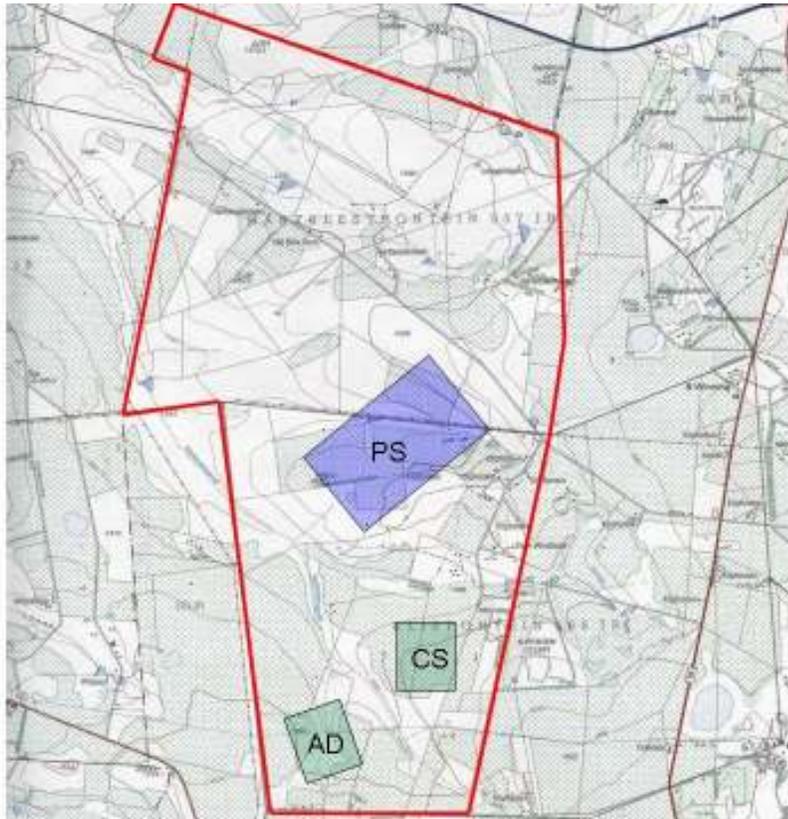
White Buffalograss (*Panicum coloratum*), Lovegrass species (*Eragrostis lehmanniana*, *E. obtusa*), *Setaria nigrirostris* and *S. spacelata* dominate the ground layer. Redgrass (*Themeda triandra*) is present certain areas.

## J. Seepage areas and wetland communities.

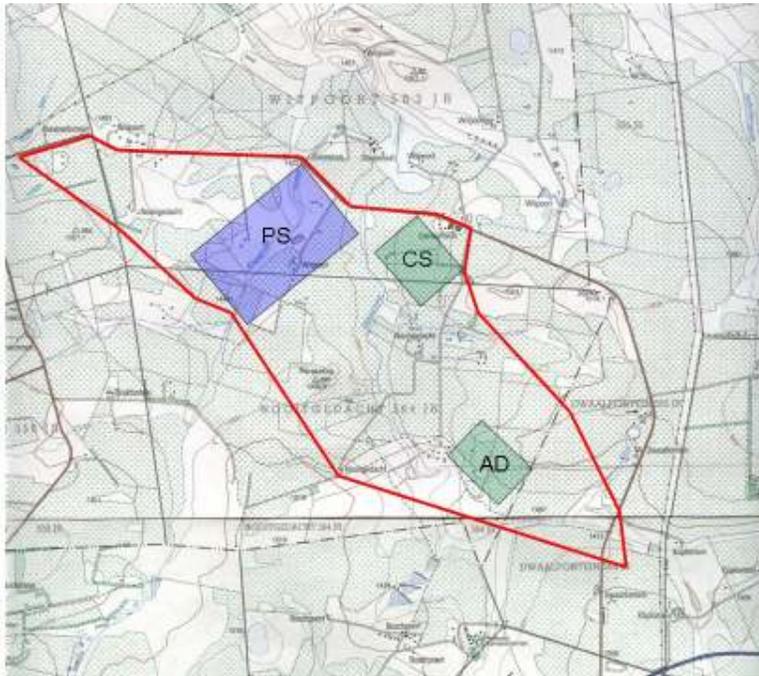
Seepage areas are seasonally wet areas that occur in sandy areas where water seeps into low-lying drainage lines after rains. These areas are usually covered by hygrophytes such as sedges and reeds. The dominant sedge in the study area is *Juncus rigidus*. Sometimes bulrush (*Typha capensis*) and reeds (*Phragmites australis*) also occurs.

Wetlands are of a more permanent nature and occur in low-lying areas such as tributaries of streams and rivers. Here hydrophytes can be found. Typical plants are the Orange River Lily (*Crinum bulbispermum*), bulrush (*Typha capensis*) and reeds (*Phragmites australis*), sedges of the *Cyperus*, *Fuirena* and *Scirpus* genera also occur.

## 7. SITE SPECIFIC RESULTS



**Figure 1: Layout plan of Site X**



**Figure 2: Layout plan of Site Y**

### **7.1 Site X:**

#### **Habitat diversity: Species composition / richness:**

Habitat diversity is low due to the presence of a high percentage of land covered by maize fields.

Remaining patches of grassland is in a relatively degraded state due to grazing pressures. Species richness is also relatively low.

#### **Presence of rare and endangered species:**

A few protected species were found in wetland communities: *Cyrtanthus breviflorus* and *Crinum bulbispermum*.

#### **Ecological function:**

Grasslands:

The ecological function of the grassland has been changed to a large extent. All arable soils have been ploughed and changed into maize fields. Very few areas of the natural veld remain in a relatively pristine condition.

Rocky outcrops:

This vegetation type is, due to the presence of rocky outcrops, to some extent still intact, but due to selective grazing pressures these grasslands are now in a degraded condition. Several insect species were found on the site. Signs of small and medium-sized mammal's (Suricate, Ground squirrel, White-tailed mongoose, Slender mongoose, and Antbear) presence were also noted. According to the landowners, porcupine, springhare does still occur in the area.

#### **Uniqueness / conservation value:**

Site is not unique and large areas are not worth conserving.

#### **Percentage ground cover:**

In selectively and overgrazed areas the percentage ground cover is relatively low. Barren patches were noted.

#### **Vegetation structure:**

In natural grassland, no trees occur except in the following habitats: along drainage lines and on rocky outcrops.

*Acacia karroo*, *Diospyros lycioides* and *Rhus pyroides* are the dominant indigenous shrubs found in low-laying areas along drainage lines and seasonal streams.

In areas where diabase and quartzite forms outcrops, shrubs as *Diospyros lycioides*, *D. austro-africana*, *Ziziphus mucronata*, *Celtis africana* and *Rhus pyroides* dominates the plant community.

**Infestation with exotic weeds and invader plants:**

Black Wattle (*Acacia mearnsii*) is an exotic species that encroaches into grassland communities on the Highveld. It forms dense stands that destroy all natural vegetation under and around it.

**Degree of grazing / browsing impact:**

Area very degraded with a low carrying capacity

**Signs of erosion:**

No deep erosion gullies were noted; however erosion on degraded sites was notable.

**Table 2:** Site X:

	LOW (3)	MEDIUM (2)	HIGH (1)
<b>VEGETATION CHARACTERISTICS</b>			
Habitat diversity: Species composition / richness	3		
Presence of rare and endangered species:	3		
Ecological function	3		
Uniqueness / conservation value	3		
<b>VEGETATION CONDITION</b>			
Percentage ground cover	3		
Vegetation structure		2	
Infestation with exotic weeds and invader plants or encroachers	3		
Degree of grazing / browsing impact		2	
Signs of erosion		2	
<b>TERRESTRIAL ANIMAL CHARACTERISTICS</b>			
Presence of rare and endangered species	3		
Sub total	21	6	0
<b>TOTAL</b>	<b>27</b>		

**7.2 Site Y:**

**Habitat diversity: Species composition / richness:**

Habitat diversity is low (undulating plains with seasonal drainage lines).

Remaining grassland areas are in a relatively degraded state. Species richness is also relatively low.

**Presence of rare and endangered species:**

A few protected species were found in on the rocky outcrops: *Xerophyta retinervis*, *Delosperma herbium*, *Euphorbia clavaroides* and *Gladiolus crassipes*.

**Ecological function:**

Grasslands:

Most of the arable soils have been ploughed and changed into maize fields. Those areas of remaining natural veld, show signs of selective grazing. The ecological function of the grassland has been changed to a large extent.

Rocky outcrops:

A few of the high-laying areas is due to the presence of rocky outcrops, to some extent still intact. These areas show signs of selective grazing. Several insect species were found on the site. Signs of small and medium-sized mammal's (Suricate, Ground squirrel, White -tailed mongoose, Slender mongoose, and Antbear) presence were also noted.

**Uniqueness / conservation value:**

Site is not unique and large areas are not worth conserving.

**Percentage ground cover:**

Barren patches occur in areas where animals have grazed selectively and trampled certain areas.

**Vegetation structure:**

In natural grassland, no trees occur except in the following habitats: along drainage lines and on rocky outcrops.

The following shrubs occur in areas where diabase and quartzite forms outcrops: *Ziziphus mucronata*, *Diospyros lycioides*, *D. austro-africana*, *Celtis africana* and *Rhus pyroides* dominates the plant community.

*Diospyros lycioides*, *Acacia karroo* and *Rhus pyroides* are the indigenous shrubs found in low-laying areas along drainage lines and seasonal streams.

**Infestation with exotic weeds and invader plants:**

The exotic invader namely the Black Wattle (*Acacia mearnsii*) encroaches into grassland communities on the Highveld. It forms dense sometimes impenetrable mono-stands.

**Degree of grazing / browsing impact:**

Area very degraded with a low carrying capacity

**Signs of erosion:**

No deep erosion gullies were noted; however erosion on degraded sites was notable.

**Table 3:** Site Y:

	LOW (3)	MEDIUM (2)	HIGH (1)
<b>VEGETATION CHARACTERISTICS</b>			
Habitat diversity: Species composition / richness	3		
Presence of rare and endangered species:	3		
Ecological function	3		
Uniqueness / conservation value	3		

<b>VEGETATION CONDITION</b>			
Percentage ground cover	3		
Vegetation structure		2	
Infestation with exotic weeds and invader plants or encroachers	3		
Degree of grazing / browsing impact		2	
Signs of erosion		2	
<b>TERRESTRIAL ANIMAL CHARACTERISTICS</b>			
Presence of rare and endangered species		2	
Sub total	18	8	0
<b>TOTAL</b>	<b>26</b>		

## 8. SITE PREFERENCE RATING (SPR)

**Table 4:** Site Preference Ratings for the proposed Sites

Site	Score	Site Preference rating	Value
Site X	27	Preferred	4
Site Y	26	Preferred	4

## 9. CORRIDORS

The various corridors are needed to transport coal, ash as well as water to and from the power plant. In the case of Site X these corridors cross mainly transformed land (mainly by agricultural activities), a number of drainage lines would be crossed. In the case of site Y more sensitive habitats would be crossed.

## 10. DISCUSSION

### Site X:

This site has scored a relatively high value of 27 (preferred), meaning that the site has been largely transformed due to human impacts. Vegetation is in an advanced state of degradation, has a low level of species diversity, a few species of concern were found on or around the selected sites. Mono-cultures of maize, wattles, and bluegums (exotics) have replaced the natural vegetation to a large extent. The area's ecological function is seriously hampered, has a very low conservation value and the potential for successful rehabilitation is low. The area is preferred for the proposed development.

The only problem is that the proposed location of the power station itself. It is positioned across a seasonal stream that eventually drains into the Wilge River. There are also two springs that feed this stream. Downstream of the earth-walled dam is a stand of the protected bulbous plant *Cyrtanthus breviflorus*. (**Annexure A**)

It is recommended that the site should be moved to high ground, further north-east (area mainly under maize cultivation), for the following reasons: The stream would not have to be diverted and secondly the stand of *Cyrtanthus breviflorus* would not have to be destroyed.

The footprints for the coal stockpile as well as the ash dump are mainly on maize fields.

**Site Y:**

This site has scored a relatively high value of 26 (preferred), meaning that the site has been largely transformed due to human impacts. Like Site X, the vegetation is in an advanced state of degradation, has a low level of species diversity, a few species of concern were found on or around the selected sites. The exotics present are extensive area covered by mono-cultures of maize, as well as bush clumps of wattles, and bluegums. The area's ecological function is seriously hampered, has a very low conservation value and the potential for successful rehabilitation is low.

Although this site has scored a high value (26) it is not as suitable as site X for the following reason:

The proposed power plant as well as ash dump sites are positioned across rocky outcrops of quartzite (ash dump site) and diabase (power plant site). In both cases these outcrops contain protected species such as *Xerophyta retinervis* and *Delosperma herbeum* (ash dump) and *Gladiolus crassifolius*, and *Euphorbia clavaroides* (power plant)(**Annexure A**).

**11. CONCLUSIONS**

From an ecological perspective, it was found that both areas are highly transformed. The outcome of the detailed evaluation is that Site X is the preferred site. However the footprint of the power station must be moved onto the high ground towards the north-east from the current position. The areas indicated for the ash dump and coal stockpile are also acceptable.

The corridors to be used in case of Site X would also have a relatively lower impact than those of Site Y.

**12. RECOMMENDATIONS**

Protected species (fauna and flora) were found on both sites. Mitigation measures such as search and rescue exercises on the selected footprint have to be conducted to relocate protected plants and animals. Other detailed mitigation measures such as erosion control, etc. will be highlighted in the specialist report of the selected site.

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# **ANNEXURE A**