PRELIMINARY ECOLOGICAL REVIEW OF CORRIDOR ROUTES

132kV POWERLINE – CANDOVER TO PONGOLA

(March 2012)

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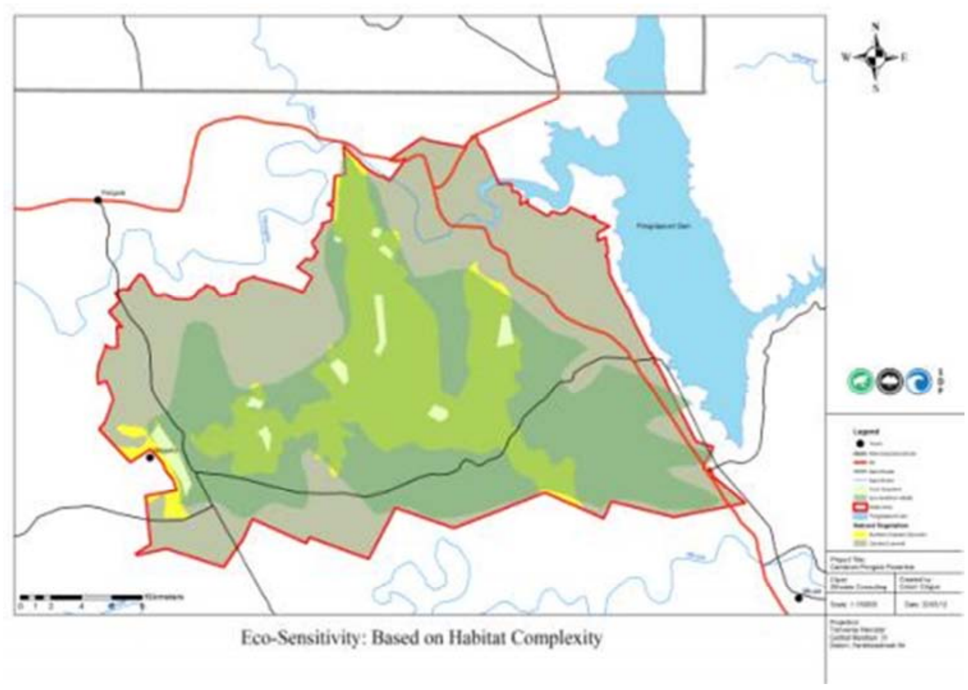
EXECUTIVE SUMMARY

The proposed establishment of a corridor route for the establishment of a 132kV power line between Candover and Pongola is the subject of a basic assessment exercise in terms of the National Environmental Management Act (107 of 1998).

Eskom Eastern Region have requested that due consideration be given to a delineated study area in order to identify possible line routes that should be subject to further evaluation in the basic assessment process.

This report utilizes various methodologies to determine suitable route options within the study area and identify areas where potentially high risk to ecological processes and functionality may arise through the establishment of such power line. As such, two corridor routes have been identified, with specific consideration being given to one such route. The areas of "high ecological sensitivity" are identified below.



Eco-Sensitivity: Based on Habitat Complexity

1. Background

Zitholele Consulting (Pty) Ltd have been engaged by Eskom Eastern Region Ltd to undertake an environmental authorization process relating to the establishment of a 132kV power line between the Candover Sub station in the south of the study area and the Pongola Substation in the north.

An initial review of possible corridor routes has been requested by Zitholele Consulting (Pty) Ltd which will be presented to Eskom Eastern Region for further consideration and review. This report serves to

- Provide a basic overview of the ecological significance of the study site.
- Identify key physical and biological parameters within the study site that would be of significance in the evaluation and selection of possible line corridors.
- Identify possible routes for further consideration within the basic assessment process.

The study site lies to the west of the Josini / Pongolapoort Dam and south of the town of Pongola and is indicated in the 1 : 250 000 map in Fig. 1.

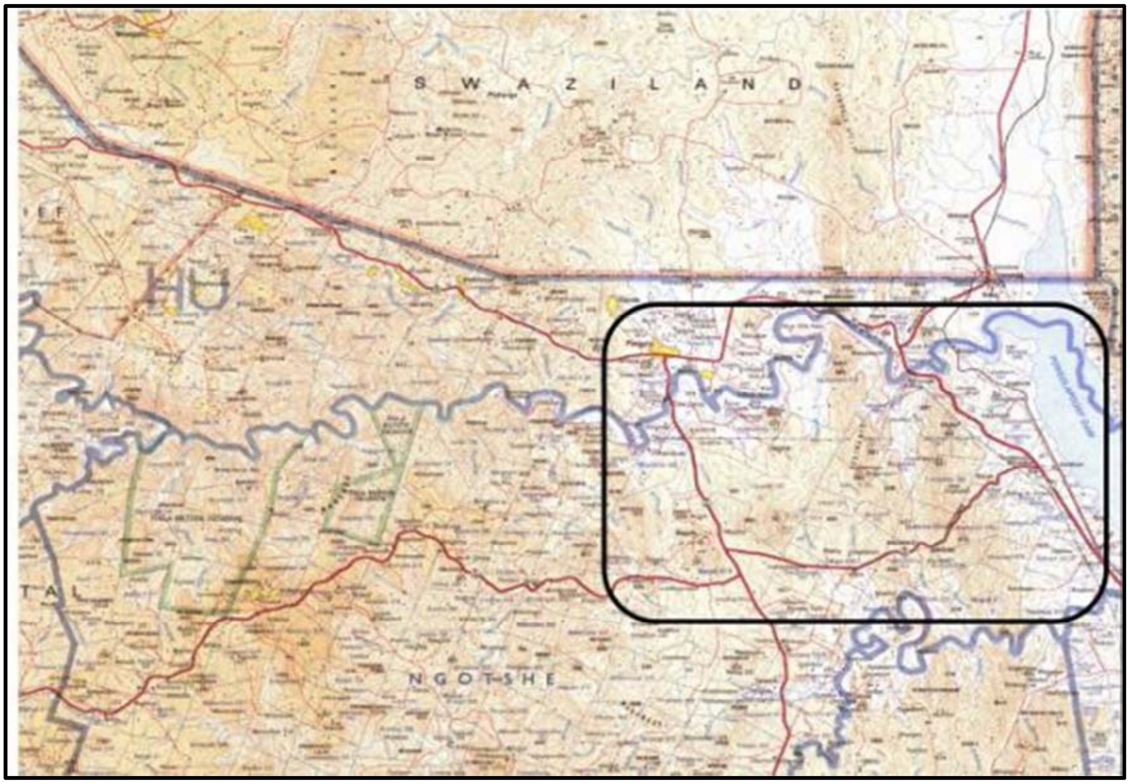


Fig.1 Study area in regional context, see box.

2. Methodology

Zitholele Consulting (Pty) Ltd provided a shape file indicating the outer perimeter of the study area, an area identified in consultation with Eskom Environmental Specialist personnel. The study area was viewed using aerial imagery provided through Google Earth, as well as overlaying such information with SANBI data relating to vegetation units for the area. In addition information was collated from on-site evaluations.

Three broad route possibilities were noted at an early stage of evaluation, these being ;

- a Northern route, which ostensibly follows the present power line running parallel to the N2
- A Central route, which ostensibly follows the R 66
- A Southern route, which lies along the southern edge of the study area

These routes are depicted in Fig. 2 below.

Fig. 2 Study area with Northern, Central and Southern Corridors identified.

Sustainable Development Projects cc undertook a site visit during the period 11 to 13 March 2012. The site visit entailed the following activities;

- Review of study area with specific consideration being given to:
  - Topography and prevailing terrain
  - Nature of vegetation within region, particularly giving consideration to areas of transformation, both as a result of regional infrastructure as well as settlement .
  - Areas of significant canopy and forest form as well as the prevalence of grasslands (sourveld).
  - Identification of points within study area where functional habitat was noted to abut transformed areas, or where vegetation and terrain was indicative of previous alteration to site. A total of 33 co-ordinates were recorded.

- Data from approximately 30 sites (10 points per route) along three possible corridors was collated, whereby:

- the dominant vegetation was noted along three possible routes and a list of species common to the assessed point was compiled

- species prevalence was evaluated, identifying species as either "present", "common" or "abundant".

Such data was deemed to be indicative of habitat and ecological significance associated with either the Northern, Central or Southern routes and would allow for comparison of habitat across possible corridors.

- desktop data was collated from digital imagery, which included:
    - Maximum slopes along routes
    - Highest elevation
    - Lowest elevation
    - Elevation variance
    - Length of route

The above information is considered to be a broad indicator of terrain, with variable terrain being indicative of varying habitat and as such higher diversity (Ferguson 1996). In addition, rugged terrain is less conducive to human settlement and habitation and by virtue of this, offers improved conservation value, particularly given the identification of this region as part of the Black Rhino Expansion Range. (NEMBA R 151 2011).

- The data was collated and subjected to the following;

    - The data was captured and prepared using Excel.
    - All data was evaluated using;

        - **Ordination evaluation using Redundancy Analysis** (RA). RA is a method of positioning multiple data sets into an ordination space and observing their relationship.

        - **DECORANA**. DECORANA is a statistical method of grouping data according to "similarity'.

- In addition to the above and using the data collated, spatial information was utilised in the compilation of a map identifying areas of high habitat function, based primarily on:
    - the absence of human settlement and associated anthropogenic activities
    - the presence of vegetation associated with Zululand Lowveld vegetation unit or Northern Zululand Sourveld
    - the absence of exotic plant invasion
    - topographic diversity
    - other factors deemed to be of ecological significance

- Such activities entailed the importation of co-ordinates into ARC GIS and the mapping of areas delimiting the above.

The two methods provide supporting information from which a decision can be made relating to the determination of the most appropriate line route corridor(s) as identified **from an ecological perspective**.

Further to the above a review of pertinent literature was undertaken as per reference, to validate the results.

3. Synopsis of Ecology Associated with Study Area

The study area according to Mucina and Rutherford (2007) and the spatial information provided by SA National Biodiversity Institute (SANBI) indicate that two vegetation units prevail within the study area (Fig. 3). The two units, namely Zululand Lowveld and Northern Zululand Sourveld are considered "vulnerable" in terms of their conservation status, while the habitat within the region, is noted as being of significance in terms of the National Environmental Management Biodiversity Act (NEMBA), being part of the Black Rhino Expansion Range (Fig. 4). More specific consideration of the two vegetation types is provided below in the context of the study area.

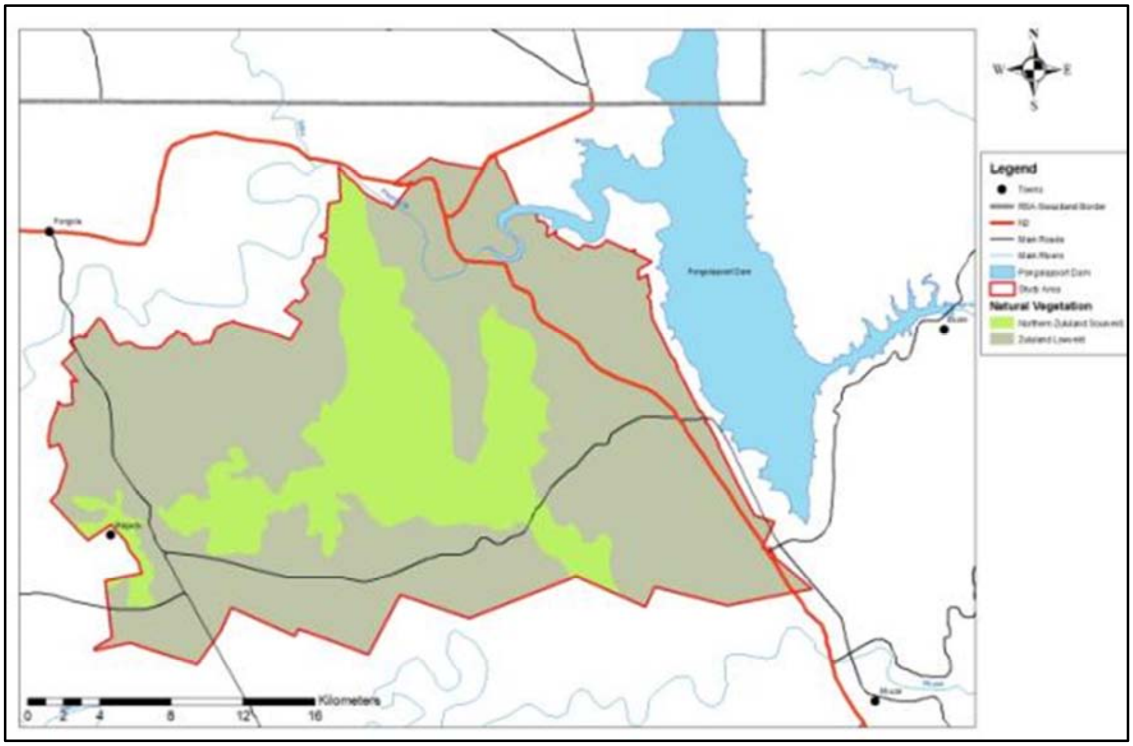


Fig. 3 Vegetation map of study area indicating Zululand Lowveld and Northern Zululand Sourveld.

Fig. 4 Zululand Lowveld, in foreground, with Northern Zululand Sourveld notable on high lying ground to the left of picture.

3.1 Zululand Lowveld

Zululand Lowveld is an acacia dominated woodland with a number of vegetative forms including *closed canopy* tending towards *thicket*, as well as *open woodland*. Where lower lying, poorly drained soils occur, primarily to the east and north of the area, *Acacia xanthophloea* can form the dominant vegetative consocies, with *Phoenix reclinata* and *Gymnosporia senegalensis* being common, particularly following disturbance of the land. This vegetation unit is the dominant vegetation form within the study area and dense, closed canopy areas are located centrally within the study area. Also common to the site is *Dichrostachys cinerea, Euclea divinorum* and *Acacia nigrescens* which form dense stands where burning or overgrazing has been prolific. Open woodland forms comprising of low canopy cover and sporadic clustering of woody species which include *Acacia karoo, Bolusanthus speciosa* and *Sclerocarrya birrea* is notable, particularly to the west and south of the study area (Fig. 5). Open pure grassland patches, with occasional woody specimens are also apparent within the study areas, where *Themeda triandra, Panicum maximum* and *P deusteum* prove to be dominant.

Fig 5 Typical Zululand Lowveld along northern line route. Note livestock compound to the foreground of picture and existing line route servitude.

3.2 Northern Zululand Sourveld

Northern Zululand Sourveld is a vegetative form comprising of open wooded grasslands tending towards, pure grassland, particularly where the land lies above, +/-500m amsl. This vegetation form comprises primarily of *Themeda triandra* and *Hyparrhenia hirta* graminoid species, grading to a more open Acacia dominated woodland form at lower elevations. (Fig. 6). The pure grassland stands are not particularly diverse, from a botanical perspective, however such areas offer a significant variation in habitat within the region and act as an important driver of diversity within the greater region. Such grasslands are of significant habitat value to larger avian species.

Fig. 6 Northern Zululand Sourveld, limited to points generally above 500m amsl

The master factors affecting the structure of the various habitat forms present within the study area, relate primarily to the *presence* or *absence* of fire within the landscape, as well as topography, where low lying areas may be subject to occasional surface water inundation and proximity to the water table, which favours select species, such as *Acacia xanthophloea*. As indicated above, the grassland appears to be significantly correlated with higher altitudes, as well as limited canopy cover.

It is evident that the spatial information provided by SANBI does not generally correlate with the vegetation forms presented on the ground. As such, Zululand Lowveld, as well as lands subject to anthropogenic alteration prevail, while Northern Zululand Sourveld is more limited in terms of its extent. At a regional level, it thus follows that these areas, particularly the graminoid dominant areas are of local significance.

At a broader level and utilizing research undertaken by the authors in the nearby Zululand Rhino Reserve (ZRR), it is evident that the presence of a closed canopy or open canopy system within the Zululand Lowveld vegetation form has significant correlation with the composition of grass communities within the vegetation unit. Fig 7, below, indicates the findings of the ZRR investigation. Such findings indicate that under a closed canopy regime, *Panicum deusteum* is the dominant grass species, while under a more open "woodland" form, the dominant grasses are *Themeda triandra* and *Setaria sphacelata*. Such information has significant ramifications for the evaluation of line routes, where it can be noted that the opening up of closed canopy areas will result in variation in graminoid dominance, with concomitant impacts on fauna.

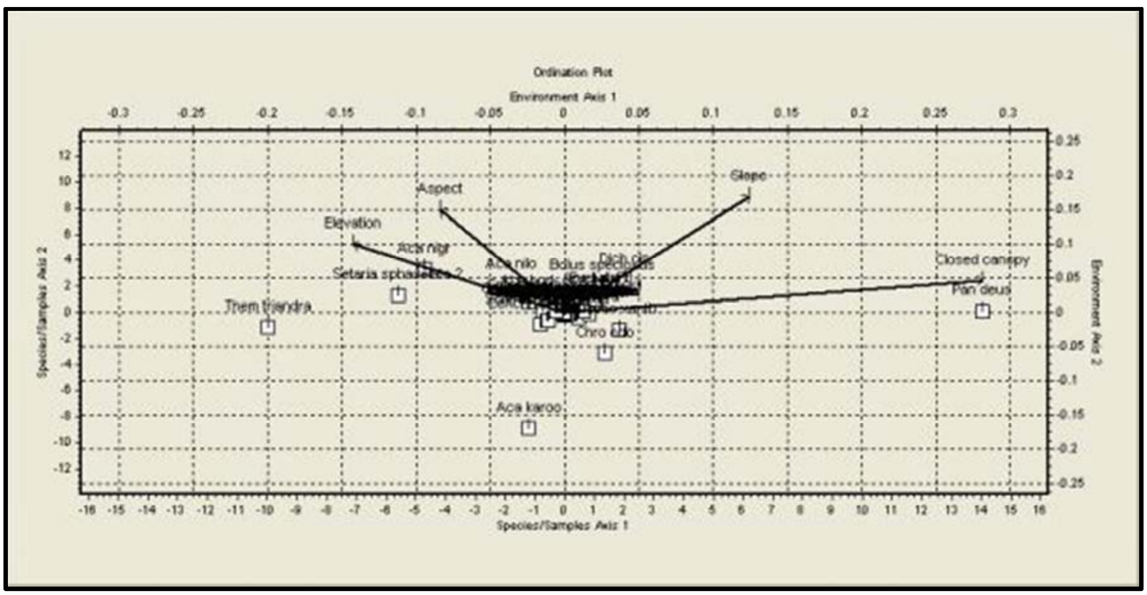


Fig. 7 Ordination plot indicating variation in grasslands according to nature of prevailing canopy and elevation in Zululand Lowveld vegetation unit.

In addition to the above, it should be noted that at a sub-regional level, the study site shows significantly variable and undulating terrain, a feature distinguishable to that encountered to the south (towards Mkuze), where the land is topographically limited. Topographic variation can be equated with floral and faunal variation (Roy 2002) and as such, on a comparative basis, the study area may be seen as being of greater value from an ecological perspective than neighbouring lands to the south.

3.3 Fauna

The study area, as indicated above, forms part of the Black Rhino Range, an initiative to expand habitat suitable for Black Rhino (*Diceros bicornis*), listed as "endangered ito R 151 of NEMBA. In addition, Wild Dog (*Lycaeon pictus*) or painted dog (also listed as "endangered" ito R151 of NEMBA) is well suited to the more open woodland areas within the region and such habitat has been identified as being of value in the conservation initiatives being implemented for this species. A large pack of such species is known from the Mkuze Protected Area and is noted to roam from the reserve northwards into the Mkuze – Candover region (V Purves pers comm.). Such movements are ostensibly governed by the availability of prey, which in these areas is likely to be bushbuck (*Tragelaphus scriptus*) or common duiker (*Sylvicapra grimmia*).

In addition to the above both Whiteheaded Vulture (*Trigonoceps occipitalis*) and the Lappetfaced Vulture (*Torgos tracheliotus*) are noted from within the region. As such, the ranges of both species overlap within this region. The range overlap of these two species is limited to this region within Kwa Zulu Natal, a feature that further supports the area as a region of significant raptor diversity. The variable topography, coupled with a relatively high incidence of thermals, assisted by the terrain makes this region in particular, of value to these species (*T tracheliotus* depends upon thermals to initiate sound flight(Shobrak 2001). Notably, both species nest within typical Acacia or "flat topped" trees with nesting sites being utilised over a number of years (this is particularly true for *T tracheliotus*).

Given the above, the avoidance of habitat conducive to either the mammal species and / or the raptors identified, should be a significant factor in determining an appropriate line route.

4. Results

All species data was evaluated for the line routes proposed using DECORANA, a statistical method that serves to group data through similarity. A plot of the results of this analysis is provided in Fig. 8 below.

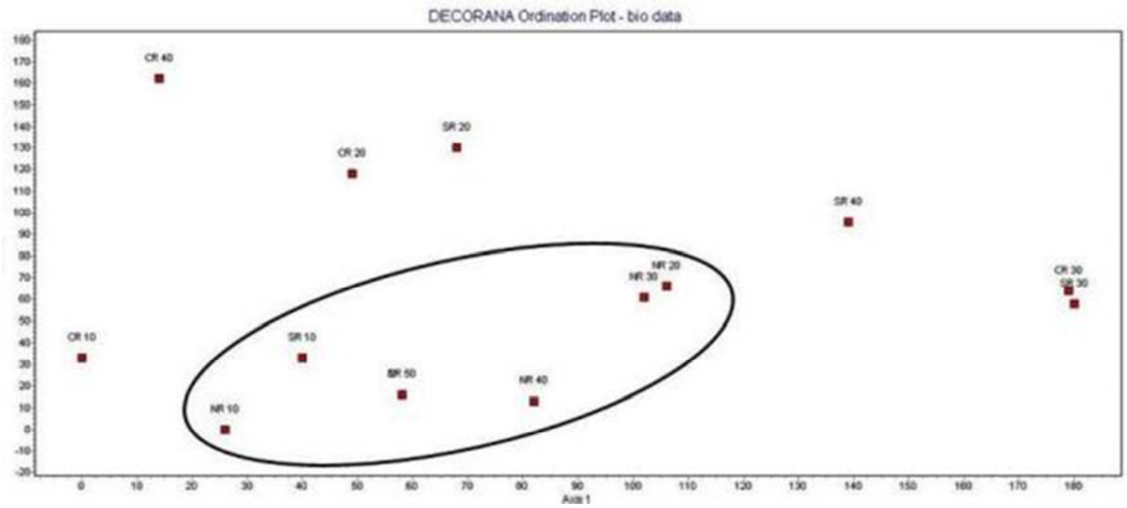


Fig. 8. Plot of DECORANA results for species data collected along three line routes.

The plot presented in Fig. 7 identifies that there is a significant variation of species, and hence habitat, along the three line routes in question. However, it is evident that the proposed Northern Route shows the least variation in habitat along its particular route. While this cannot be interpreted as showing this particular corridor to offer lower ecological significance, in comparison to the species diversity encountered along the Central and Southern line routes, **the northern line route shows the most consistent habitat, with least variability.**

Further to the above, the same data was evaluated using redundancy analysis (RA), a statistical method of grouping different sets of information in order to identify variations in data according to independent variables. As such, data collected from site and review of mapping and aerial imagery was utilised in the analysis. Fig 8 below provides the graphical result of such analysis

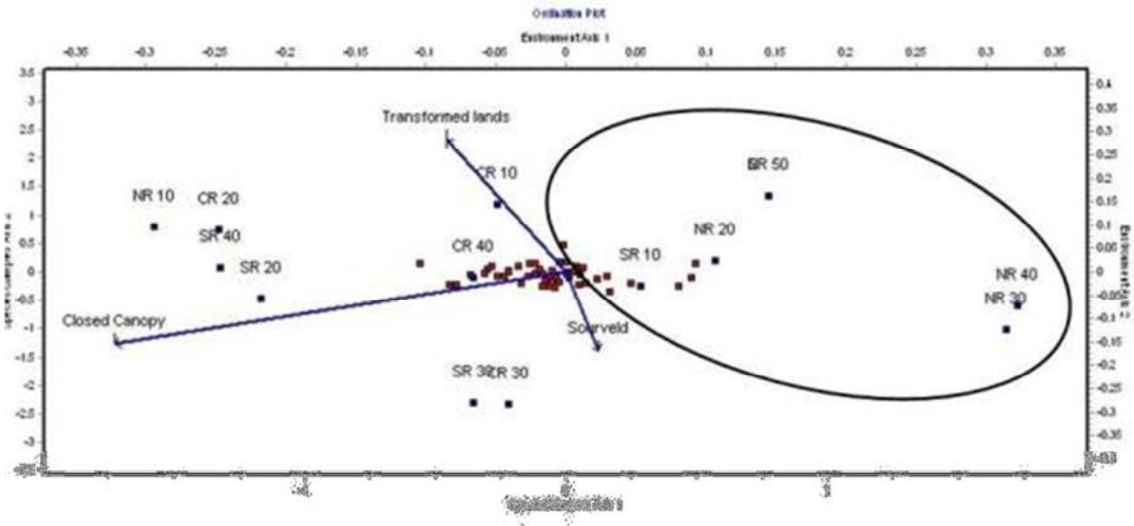
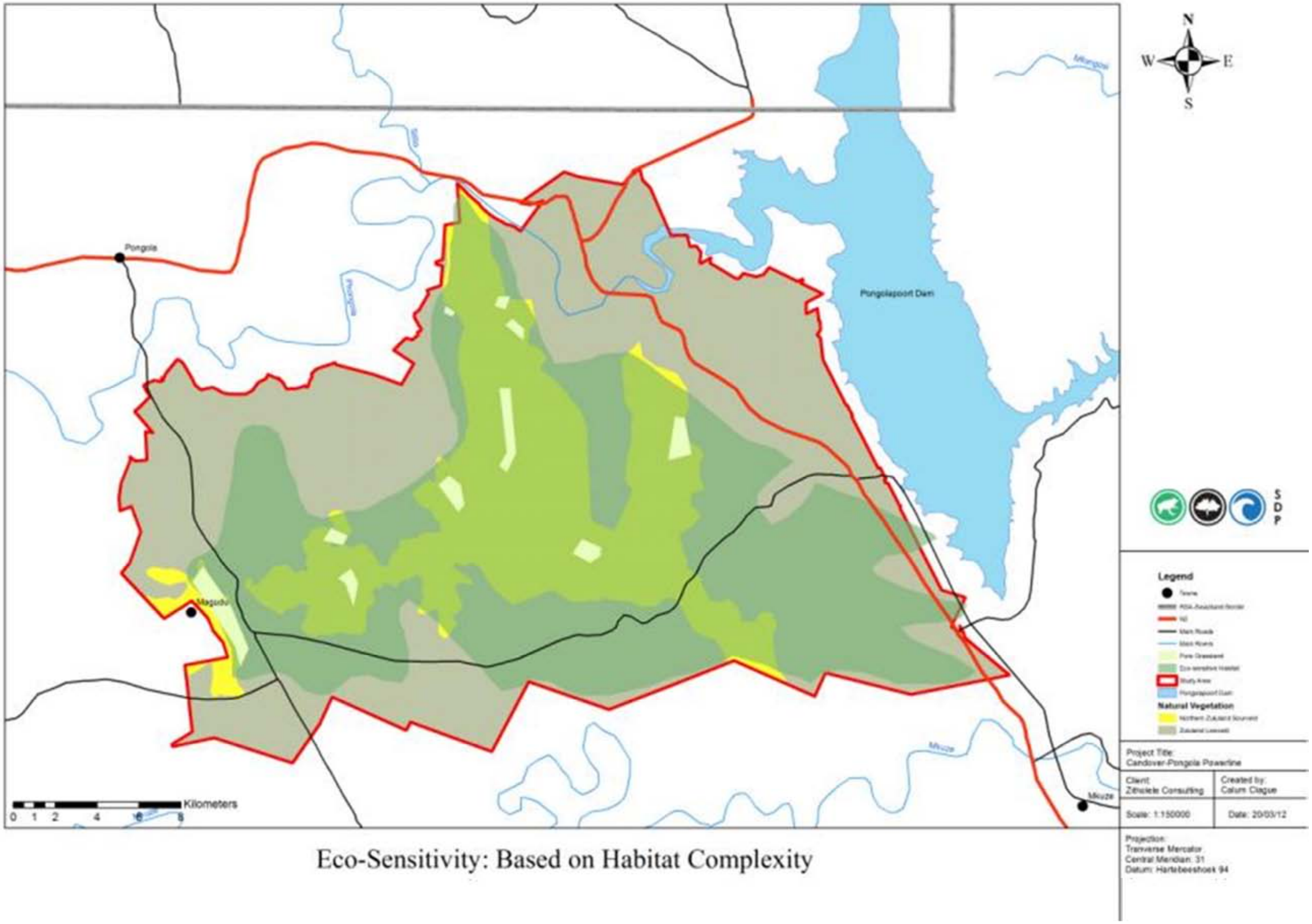


Fig 8. Plot of results of Redundancy Analysis of Route : Species data vs physical data.

The RA indicates through the grouping of data sets, that the Northern route does not correlate with the presence of either a closed canopy system, nor does it correlate particularly well with the presence of sourveld, in particular the pure grassland stands. Notably, points within the southern and central route offer similar correlations with both closed canopy Zululand Lowveld and Northern Zululand Sourveld vegetation units.

Further to the above a spatial representation of habitat forms within the study area was compiled. The result of this qualitative evaluation is indicated in Fig. 9 below and provides support to the quantitative results presented above. Notably, the most applicable route appears to follow that of the existing line (the northern line route), while the option of pursuing line routes either through the southern or central corridor options are less desirable in terms of impacts of an ecological significance.



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In addition to the above, the concept of *ecological corridors* and *"continuity of natural landscape* provides for the consideration of linkages with habitat and landscape features within adjacent lands. Fig 10. below identifies some key ecological linkages that should be maintained or considered in any further detailed work undertaken on this line route. Specific consideration of impacts on avian and other faunal populations both within and without the region should be given consideration.

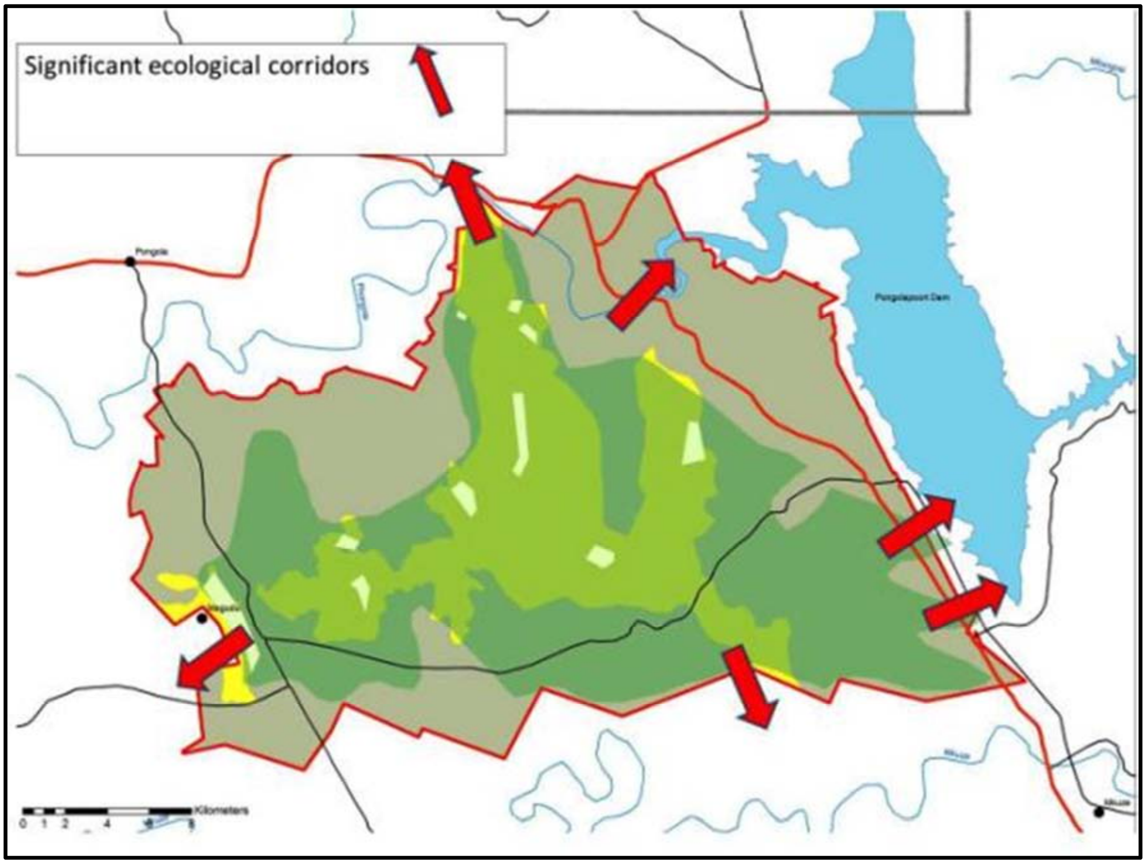

Fig. 10. Study area highlighting linkages with ecologically significant habitat on adjacent lands.

<u>5. Conclusion</u>

The object of this preliminary ecological evaluation is to identify and select corridors for the proposed 132kV line that should be subject to further evaluation across, not only the ecological spectrum, but inclusive of other environmental factors.

From the above information it is evident that the most applicable corridor / line route, at a preliminary level is the Northern Corridor Route. Should comparative or alternative routes be selected, it is proposed that the Southern Route be considered. The central route, associated with the R 66 roadway through Candover is not considered to be a feasible option for the routing of the proposed line (see Fig. 11).

Fig. 11 Typical terrain associated with central line route.

<u>Reference</u>

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