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# BOTANICAL ASSESSMENT OF PROPOSED ESKOM OCGT PLANT & ASSOCIATED TRANSMISSION LINES & SUBSTATION, MOSSEL BAY

Compiled for: Ninham Shand Consulting Services, Cape Town

Client : Eskom

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**EXECUTIVE SUMMARY**

This specialist botanical assessment was commissioned in order to help inform decisions relating to the application by Eskom to construct an Open Cycle Gas Turbine (OCGT) plant in the Mossgas area, some 13km west of Mossel Bay. Also investigated were three new alternative transmission line routes from the plant to the existing Proteus substation, and an access route to the plant from the N2 highway.

The site was visited in March 2005, and again in July 2005. The vegetation is best categorised using the Subtropical Thicket Ecosystem Planning Project (or STEP) classification, which refers to Herbertsdale Renoster Thicket (which accurately describes the mix of Thicket and Renosterveld vegetation). Urbanization is having a substantial negative impact on this vegetation type in the Mossel Bay, Hartenbos, and Groot Brak areas, and only 38% is left intact, and it is thus regarded as an Endangered vegetation type. An alternative source, the latest SA vegetation map, indicates that Proteus is located within Swellendam Silcrete Fynbos, which is an Endangered vegetation type (57% remaining), and that the original natural vegetation in the proposed plant area at Mossgas was primarily Mossel Bay Shale Renosterveld, which is also an Endangered vegetation type (42% remaining).

The natural vegetation in the vicinity of the proposed plant (up to 25ha in extent) has been largely transformed by agriculture. Extensive ploughing has meant that today this area has a Low regional conservation value, with no rare or localised plant species recorded or likely. However, about 200m east of the proposed plant is a small (1ha) patch of Shale Renosterveld, which must be avoided by all infrastructure, as it is an Endangered vegetation type, and supports numerous specimens of at least one Red Data listed species (*Bobartia robusta*). About 400m south of the proposed plant is a natural wetland area around a farm dam that should also be avoided for ecological reasons, although from a botanical point of view this area is of Low – Moderate significance.

The three alternative transmission line routes all cross some sensitive areas such as linear streams, small wetlands, and rocky outcrops, all of which must be avoided during construction. The preferred route is the central (straightest) one that crosses the least natural vegetation (20% less than other two routes), and where there is an existing line. Final tower placements should be checked and approved by the botanist.

Expansion of Proteus substation by about 9m to the north (within outer fence) will result in the loss of about 0.5ha of partly disturbed Silcrete Fynbos, which has a Moderate regional conservation value. Any tower placements outside the fence will need to be checed and approved by the botanist. No rare or localised plant species were recorded in the proposed expansion area. No expansion of the substation must be allowed to the east, outside the existing fence, as this is a highly sensitive area.

The alternative access roads / pipeline routes cross mostly disturbed areas of no botanical significance. However, both Alternatives 1 & 2 pass close to a sensitive area immediately east of the site, and this must be avoided, by means of bringing the road into the site 50m further south. Alternative 3 (from the N2) requires realignment in order to avoid impacting on small, scattered patches of natural vegetation within 50m of the boundary fence, and a larger patch near the bend. Even with realignment it will impact on a small strip of Moderate sensitivity vegetation. If the alignment is redesigned to incoporate the above recommendations the final alignment should have Low botanical impact, but on balance the mitigated versions of Alternatives 1 or 2 would still be preferred.

If all recommendations contained herein are implemented the overall impact on the natural vegetation in the area is likely to be Very Low.

A detailed Environmental Management Plan (EMP), which will incorporate the guidelines in this report, should be prepared for construction and operational phases.

## 1. INTRODUCTION AND STUDY AREA

Ninham Shand Consulting Services were appointed by Eskom to conduct an EIA process for the proposed development of an Open Cycle Gas Turbine (OCGT) plant and associated infrastructure (roads and transmission lines) near Mossgas, on the farm Bartelsfontein. The proposed OCGT site is about 1km west of Mossgas, just south of the railway line, and is located in what is currently a cultivated field. A proposed new access road to the site from the N2 highway was investigated, and three alternative transmission line routes from the plant to Proteus substation were also looked at. These cross a mix of agricultural lands and natural vegetation. The central, most direct route, would parallel an existing line, whilst the eastern route would be very close to the Herbertsdale road (R327) for much of its length. Finally, a small extension to the northern side of Proteus substation was surveyed, where a new road and limited infrastructure is required, covering up to 0.5ha of partly natural vegetation within the boundary fence.

The underlying geology in the Proteus area consists of sandy loams derived from Buffelskloof formation conglomerates and river terrace gravels and silcretes, whilst in the Mossgas area the soils are sandy loams derived from a mix of acid sands and the underlying Bokkeveld group shales (Malan 1987).

The sites were visited in March and July 2005.

## 2. TERMS OF REFERENCE

The terms of reference for this study were as follows:

- Source and review baseline information and participate in finalisation of TOR;
- Provide a broad description of the ecological characteristics of the site and surrounds;
- Describe plant diversity patterns at community and ecosystem level (main vegetation type, plant communities, and threatened ecosystems), species level (Red Data listed species), and in terms of significant landscape features, and presence of aliens.
- Provide a general comment on whether important plant processes are likely to be affected;
- Describe the significance of potential impacts, and make recommendations to prevent or mitigate these;

- Rank the transmission line routes in terms of likely impact on the vegetation;
- Provide a map of the salient elements discussed.

## 3. STUDY APPROACH

The sites were visited in March 2005, and again in July 2005. Characteristic plant species were noted, as well as any rare or threatened plant species or habitats. Unknown plants were identified in the Compton Herbarium at Kirstenbosch. The GIS based SA National Biodiversity Institute (SANBI) vegetation map for South Africa (Mucina & Rutherford 2003) was consulted, along with the available regional conservation plans (STEP and CAPE), and conclusions were drawn based on this documentation and professional experience in the area. The National Spatial Biodiversity Assessment results (Rouget *et al* 2004) were also consulted.

One of the primary assumptions of this study is that sufficient botanical information could be gathered during the site visit to make accurate conclusions regarding the conservation value of the area. Although by no means all plant species likely to be present on the site were recorded (eg. various annuals and bulbs were not at an identifiable stage), it is likely that a sufficiently accurate picture of the plant diversity was obtained, which is partly a result of using a habitat based approach, where habitats (type, quality, rarity) rather than species are used to inform mapping and decision making. As many Scoping studies do not specifically look at animals (mammals, birds, reptiles, etc.) or invertebrates, the botanical study is often used as a surrogate for these groups, the assumption being that presence of quality habitat is a major determinant of the likely presence of the animal species.

## 4. DESCRIPTION OF THE AFFECTED ENVIRONMENT

At least three different recent projects have mapped the original vegetation of this area, and this is confusing, as all three use different terminology, and do not draw the same boundaries. The CAPE project (Cowling *et al* 1999) maps the whole study area (at a relatively coarse scale) as being on the edge of Blanco Fynbos / Renosterveld Mosaic and Riversdale Coast Renosterveld (57% and 83.5% Irreplaceable respectively, according to that analysis).

The SANBI vegetation map (Mucina & Rutherford 2003) maps the Mossgas area as a mix of Albertinia Sand Fynbos and Mossel Bay Shale Renosterveld. The vegetation in the Proteus area is indicated as being Swellendam Silcrete Fynbos.

The recent National Spatial Biodiversity Assessment (Rouget et al 2004) indicates that the Sand Fynbos is a Vulnerable vegetation type (74% remaining), that the Silcrete Fynbos (57% remaining) and Shale Renosterveld (42% remaining) are both Endangered vegetation types.

The most accurate description is that of the STEP project, which refers to the entire study area as Herbertsdale Renoster Thicket (Cowling *et al* 2003), which accurately describes the mix of Thicket and Renosterveld vegetation in the area. This vegetation type is dominant in the area between the Gouritz River and Mossel Bay, occurring on the shale and conglomerate hills, but has been heavily impacted by agriculture, and as a result persists mostly on the steeper slopes. Rapid urbanization is having a substantial negative impact on this vegetation type (on both flats and steep slopes) in the Mossel Bay, Hartenbos, and Groot Brak areas, where it is also impacted by quarrying activities. Herbertsdale Renoster Thicket has been reduced to 38% of its original extent, with a conservation target of 25% (of the original extent), and it is thus regarded as an Endangered vegetation type in terms of STEP (Pierce 2003). The fact that both STEP (Pierce 2003) and the National Spatial Biodiversity Assessment (Rouget *et al* 2004) find that the area supports Endangered vegetation types in a regional and national context is significant.

### 3.1 OCGT Site

The actual site for the plant itself has not been fixed, but ample space exists within the identified agricultural field to locate the plant with minimal impact on any natural vegetation. The field in question has been recently and regularly ploughed, and is also grazed by livestock (see Plate 1). It is likely that the field has been planted with pasture grasses, as it was dominated by grazing grasses at the time of the visits, such as *Eragrostis curvula* (weeping lovegrass), *Lolium* sp. (ryegrass), and *Cynodon dactylon* (fynkweek), along with a few indigenous but weedy species such as *Gnidia* sp., *Kyllinga* sp., *Oxalis obtusa* (suuring)*, Lobelia erinus, Arctotheca calendula* (Cape weed), and the alien dandelion. No rare or localised plant species are likely to persist. This area has a Very Low local and regional conservation value.

**Sensitive areas** in the vicinity of the proposed plant include a 10m wide strip immediately south of the railway line, where remnant Renosterveld can be found. Species diversity here is reduced due to agricultural activities, but includes *Barleria pungens, Digitaria velutina, Gnidia laxa, Gerbera piloselloides, Pycreus polystachyos, Hermannia saccifera, Aspalathus hispida, Drimia capensis* (maerman,

jeukbol), and *Scabiosa columbaria*. No rare or localised species were found, and the likelihoof of such species is Low. This area has a Moderate local and regional conservation value.

**Plate 1:** View of proposed OCGT site (upper left), showing agricultural land dominated by grasses, and sheep clustered around higher sensitivity wetland area (see Figure 1). The bluegums in the background are north of the proposed site.

The most sensitive area within 0.4km of the proposed site is an approx. 1ha patch of Shale Renosterveld about 200m to the east. This patch occurs immediately east of a farm fence, and its northern border is the railway line. The vegetation here is a remnant piece of Mossel Bay Shale Renosterveld, which as noted, is an Endangered vegetation type (Rouget *et al* 2004).

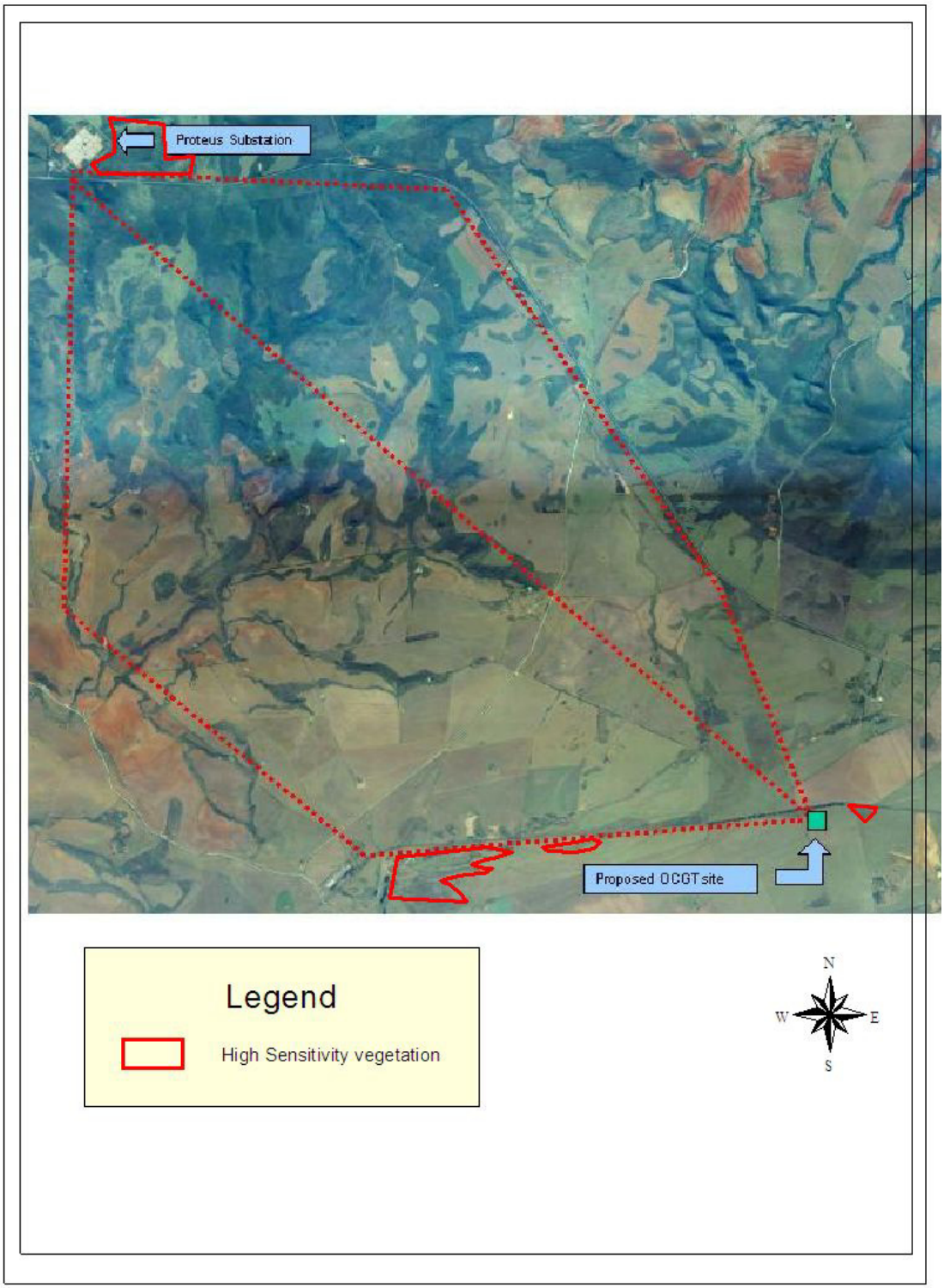


**Figure 1:** Botanical sensitivity map of the area. Note that only special areas close to proposed developments are individually mapped. For the remainder of the area crossed by the transmission lines the aerial photograph clearly indicates natural vegetation (darker areas) which are of higher conservation value and sensitivity than the agricultural lands (beige). Scale unknown.

The site is dominated by *Bobartia robusta* (blombiesie; see Plate 2), which is a Red Data listed species ("Rare" ; Hilton Taylor 1996) restricted to this vegetation type west and north of Mossel Bay. Other species include *Rhus lucida* (blinktaaibos), *Metalasia pungens* (blombos), *Cynodon dactylon*, *Hypoxis setosa*, and *Falkia repens*. Various bulbs species are likely to be common, some of which may be rare and/or localised. This area has a Very High local, and High regional conservation value, and should not be disturbed. Similar, but larger patches of remnant Renosterveld occur about 0.7km west of the proposed site (see Figure 1).

**Plate 2:** View to the south, showing sensitive remnant Shale Renosterveld patch some 200m east of proposed site. The prominent reed like plants in the foreground are *Bobartia robusta* (blombiesie), which is a Red Data listed species. The wetland area is visible in the right background.

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The other habitat of moderate concern is a grassy wetland area to the southeast of the proposed site, featured in Plates 1 and 2 (and see Figure 1). This was a natural drainage line, but has been dammed and quite heavily transformed by agriculture, notably heavy stock grazing. The vegetation is dominated by grasses and sedges, most of which are common and widespread, resilient species, but occasional rare bulb species could be present. Botanical conservation value is Low - Moderate. The

value of this area is an ecological value, in that it is a wetland area, supporting populations of frogs, invertebrates, and birds. The wetland effect extends at least 200m towards the current Mossgas plant from the small dam.

### 3.2 Proteus substation

The vegetation in the vicinity of the substation has been mapped for the new vegetation map of South Africa (Mucina & Rutherford 2003) as Swellendam Silcrete Fynbos. Only 57% of this vegetation type remains (primarily due to transformation by agriculture), and it is regarded as an Endangered vegetation (Rouget et al 2004). The CAPE project (Cape Action for People and the Environment) classified this area as Blanco Fynbos / Renosterveld Mosaic (Cowling & Heijnis 2001), and this was given a 57% Irreplaceability rating (Cowling et al 1999), meaning that just over half of the remaining area needs to be conserved in order to achieve conservation targets.

The vegetation in the study area (abutting northern edge of existing yard) has been partly disturbed by previous developments at the substation (see Plate 3). Species indicative of disturbance include *Cynodon dactylon* (kweek grass), *Anthospermum spathulatum, Hermannia saccifera, Carpobrotus edulis* (suurvy)*, Eragrostis curvula, Melinis repens* (Natal redtop grass), *Hyparrhenia hirta* (thatching grass), *Aristida junciformis* (steekgras), and *Chrysanthemoides monilifera* (bietou). Also indicative of disturbance are the relative lack of succulents, bulbs, and large Proteaceae. Other species in the area are *Metalasia pungens, Erica discolor, Erica copiosa, Elytropappus rhinocerotis* (renosterbos), *Oedera capensis, O. genistifolia, Hermannia alnifolia, Helichrysum patulum* (kooigoed)*, Aspalathus alopecurus, Ficinia oligantha, Ischyrolepis triflorus, Selago dolosa, Cliffortia serpyllifolia, Crassula ericoides*, and *Oxalis obtusa*. There is no significant alien invasive vegetation in the area.

The site has a Low – Moderate local and Low regional conservation value. No rare species were recorded, and none is likely. The only currently known locality of the very rare orchid *Satyrium muticum* lies some 400m to the east of Proteus (B. Liltved – pers.comm.), but no orchids were seen on the expansion area.

**Plate 3:** View of northern edge of existing Proteus yard, inside outer fence. Partly disturbed vegetation, indicated by abundance of grass and lack of Proteas, bulbs, and succulents.

### 3.3 Transmission lines

Three alternative routes were identified for the new transmission lines between Proteus and the OCGT (Figure 1). In all three cases the routes cross about 60% agricultural land, and about 40% natural vegetation. However, the central route is the most direct, and crosses about 20% less natural vegetation than the other two routes. Due to the disrtances involved and lack of exact routings, the entire routes were not surveyed in detail, but the following observations are relevant.

The natural vegetation type is Swellendam Silcrete Fynbos, with elements of Shale Renosterveld, especially on the lower slopes. In the gulleys and drainage lines a type of Thicket is present (along with wetland elements in some cases), with an abundance of large shrubs. Species include *Aloe ferox, Rhus pterota, Rhus rehmanniana, Rhus lucida* (blinktaaibos), *Rhus pallens, Diospyros dichrophylla* (bladder nut), *Polygala myrtifolia* (Septemberbossie), *Carissa bispinosa* (num num), *Euclea undulata* (guarrie), *Gymnosporia buxifolia* (pendoring), *Sideroxylon inerme*

(milkwood), *Schotia latifolia* (boerboon), *Sarcostemma viminale* (melkbos), *Rhoicissus digitata,* and *Grewia occidentalis* (cross berry).

It should be noted that milkwoods are protected under the Forestry Act (122 of 1984), and may only be disturbed (this includes cutting or pruning in any way) with the relevant permit from Dept. Water Affairs and Forestry. Rare species are unlikely in the Thicket patches.

Dominant species in the Renosterveld component here are *Rhus lucida*, *Oedera genistifolia, Elytropappus rhinocerotis* (renosterbos), *Merxmuellera stricta* (wiregrass), *Ficinia oligantha*, *Cymbopogon* sp. (turpentine grass), *Cynodon dactylon* (kweekgras), and *Themeda triandra* (rooigras). There are numerous bulb species, including *Polyxena ensifolia*, *Crossyne guttata* (Maartblom), *Babiana* prob. *patersoniae* (uintjie), *Massonia depressa* (krimpvarkies), *Oxalis pardalis, Oxalis heterophylla* (suuring), *Hypoxis setosa* (dwarf African potato), *Drimia capensis* (jeukbol), and *Ledebouria ovalifolia*. Other species include *Knowltonia vesicatoria*, *Falkia repens, Hibiscus aethiopicus, Pelargonium elongatum*, *Gerbera pilosellifolia*, *Sutera revoluta, Eriocephalus africanus* (kapokbossie), *Crassula ericoides, Crassula nudicaulis, Stachys sublobata, Hermannia saccifera, Hermannia cuneifolia* (poprosie), *Hermannia lavandulifolia*, *Asparagus capensis* (katdoring), *Barleria pungens*, *Muraltia linearis, Muraltia juniperifolia, Trichodiadema* cf*. attonsum, Freesia fergusoniae*, *Ischyrolepis triflorus*, *Acrodon bellidiflorus*, *Tephrosia capensis, Commelina africana, Tribolium uniolae* (haasgras), *Agathosma ovata* (buchu), *Falkia repens*, and *Indigofera alopecuroides*. The high bulb diversity is typical of the Renosterveld vegetation, and there is a low – moderate likelihood of rare species.

At least two rare species are common and widespread in the loams on conglomerate (*Bobartia robusta*; Red Data Book listed as “Rare”; and *Protea lanceolata* – recently listed as “Endangered”; Rebelo et al – In press), and there is a low - moderate likelihood of certain very rare cryptic dwarf succulents such as *Euphorbia bayeri* (local endemic), or various *Haworthia* species. There is also a small likelihood that the very rare *Satyrium muticum* could occur here. As noted, the milkwoods are a Protected Species.

All areas of natural vegetation have a High local and regional conservation value in this area.

### 3.4 New access road to OCGT plant

The three alternative new road (and possible pipeline) routes cross mostly heavily disturbed, agricultural lands, dominated by grazing grasses such as *Cynodon dactylon* (fynkweek). For sensitive areas see Figure 2.

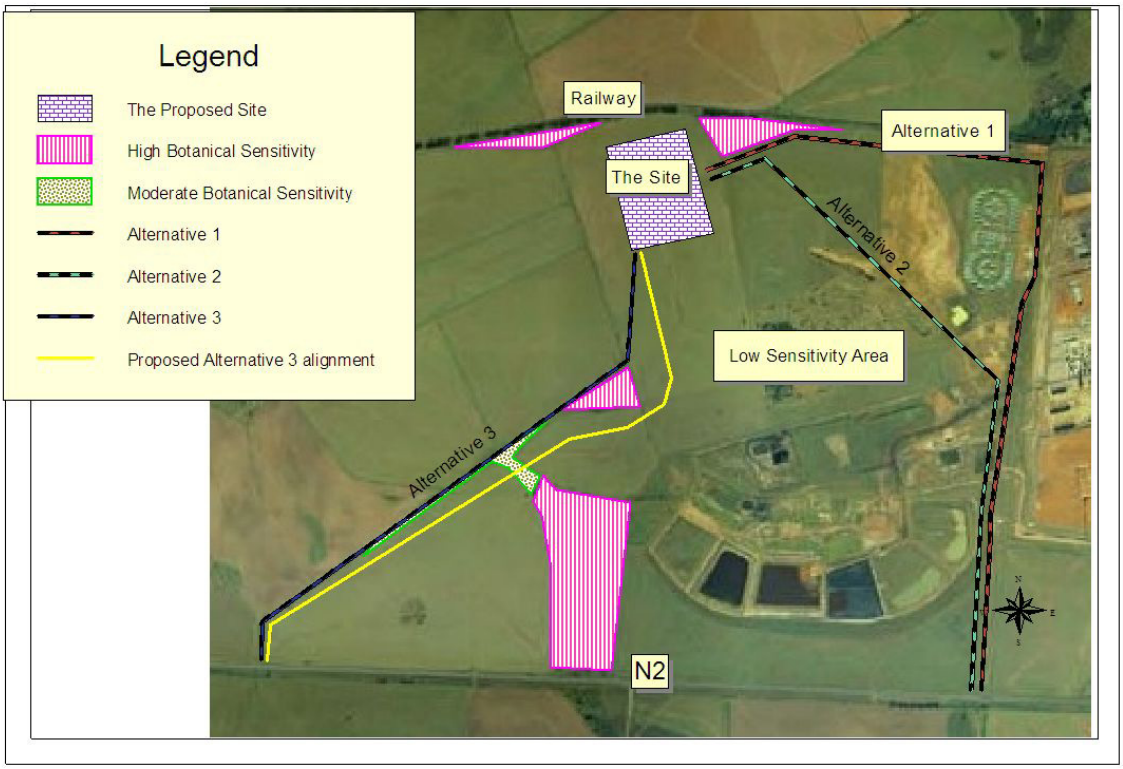


**Figure 2:** Map of proposed alternative road access routes in relation to sensitive botanical areas. Scale unknown.

#### 3.4.1 Alternatives 1 & 2

Both these Alternative routes are very similar from a botanical perspective, and from the details provided it would appear that both will avoid any sensitive areas. Most of the routes cross heavily disturbed ground of Very Low botanical significance. The key area that must be avoided is identified in Figure 1 and 2, and lies just east of the proposed site. This is an area of High conservation value Renosterveld vegetation, with large numbers of the Red Data listed species *Bobartia robusta*. The road alignments appear to run along the southern edge of this sensitive area, and it is recommended that a buffer of at least 50m be maintained between the road edge and the sensitive area.

### 3.4.3 Alternative 3

All but 95% of the route has previously been ploughed. Species diversity is very low, and there is an almost zero likelihood of any rare or localised plant species ocurring along the route, except within the area described below.

Scattered Thicket elements, such as *Rhus lucida* (blinktaaibos) occur within 5m of the fence line (see Plate 4), and are important roosting and shelter sites for numerous birds and insects, and thus have ecological value, although botanical value is Low - Moderate. About 50m southwest of where the proposed road bends to the north is a patch of heavily disturbed natural Renosterveld vegetation of Moderate conservation value. Species diversity is relatively low, due to heavy grazing by stock, and only one species of conservation concern was noted, being *Bobartia robusta* (illustrated in Plate 2). This species is quite common in this patch, being non-palatable. The species is a regional endemic, and is Red Data listed, and this patch should thus be avoided.

**Plate 4:** View to the southwest from main bend in Alternative 3 access road, showing remnant vegetation along edge of ploughed fields. The Moderate conservation value patch of vegetation is on the left hand side of the fence in the foreground.

## 4. GENERAL MITIGATION AND MANAGEMENT RECOMMENDATIONS

The proposed development can be mitigated by a number of primary steps (construction and planning phases), as well as the implementation of various management actions (operational phase).

Construction and planning phase mitigation for the primary impact (loss of natural vegetation within the development footprints) should involve:

- The OCGT plant and associated infrastructure (except transmission lines) must be located in old agricultural lands, at least 100m away from all sensitive areas identified in Figure 1.
- The preferred route for the new transmission line is the central route, which minimises the distance over natural vegetation. There would not appear to be a significant difference between the eastern and western routes in terms of impact on vegetation.
- Pylon positions must be carefully placed when impacting on areas of natural vegetation is unavoidable – all wetlands and rocky outcrops should be specifically avoided. All pylon (tower) positions should be checked by the botanist once they have been identified, and moved where necessary.
- Expansion of the Proteus yard by about 10m to the north will not result in the loss of any critical species or plant community, as this area is previously partly disturbed.
- There should not be any expansion of the Proteus yard or outer fence to the east, as this is a highly sensitive area.
- Mitigation for the Access Road Alternatives 1 & 2 involves keeping the road 50m south of the sensitive area identifed east of the site, which will then avoid all sensitive botanical areas. Mitigation for the Alternative 3 access road involves keeping the road reserve at least 50m south and east of the boundary fence, to avoid impacting on the small patches of remnant vegetation of Moderate conservation value. It will have to cross a narrow strip of Moderate sensitivity vegetation, which would have a Low negative impact (see proposed Alternative 3 layout in Figure 2).
- No specific Search and Rescue program should be necessary if all sensitive areas are avoided.

Operational phase mitigation should involve:

- all areas of natural vegetation witin 200m of any installations should be cleared of alien invasive plant species on an ongoing (annual) basis, by hand, (using DWAF approved means), and sufficient funds should be made available for this by Eskom.
- For landscaping purposes no Category 1 invasive alien plants (see CARA regulations) should be used on the sites. This means no seringa, Brazilian pepper tree, pampas grass, etc. Furthermore, it is also recommended that buffalo or kweek grass be used instead of kikuyu (highly invasive). This is extremely important as otherwise some of these highly invasive (and in many cases illegal to plant; see CARA regulations) species are likely to spread into adjacent natural areas, and result in their gradual degradation and costly clearance.

If all the above recommendations are taken into account and implemented it is likely that the overall negative impact of the development on the natural vegetation in the area will be Very Low - Low.

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