Report No: 3973/400850

AVIFAUNAL IMPACT ASSESSMENT

PROPOSED OPEN CYCLE GAS TURBINE POWER PLANT, FUEL SUPPLY PIPELINE, SUBSTATION AND TRANSMISSION LINES AT MOSSEL BAY

FINAL REPORT

September 2005

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AVIFAUNAL IMPACT ASSESSMENT

PROPOSED OPEN CYCLE GAS TURBINE POWER PLANT, FUEL SUPPLY PIPELINE, SUBSTATION AND TRANSMISSION LINES AT MOSSEL BAY

~ Final Report ~

1 BACKGROUND

In their forward planning for energy supply in South Africa, Eskom has identified the need for additional electricity generation by about 2006. As part of their electricity supply plan, Open Cycle Gas Turbine (OCGT) generation technology has been recognised as a means of providing peaking capacity in the short term.

As a consequence of this forward planning process, two OCGT plants are proposed in the Western Cape, one at Atlantis near to Cape Town and the other adjacent to the PetroSA facility (previously known as Mossgas) near Mossel Bay. See Figure 1 for a locality map. The information presented in this report refers only to the proposed Mossel Bay OCGT power plant and associated infrastructure.

Ninham Shand Consulting Services has been appointed by Eskom to undertake an avifaunal specialist study as part of the Environmental Impact Assessment (EIA) process for the proposed OCGT power plant and associated infrastructure.

1.1 Project overview

An OCGT power plant produces electricity by means of hot gas that turns a turbine, which powers a generator. The hot gas is produced by introducing fuel to compressed air in a combustion chamber. The fuel in this case would be kerosene and the plant would exhaust to the atmosphere.

The proposed project would be made up of the following components:

- The OCGT power plant (consisting of three or four gas turbines with an output of 150 to 250 MW each) adjacent to the existing PetroSA facility. The extent of the OCGT power plant and associated substation would be approximately 25 ha;
- A fuel supply pipeline to transport kerosene from the PetroSA facility to the OCGT plant;
- A substation adjacent to the OCGT plant, to feed the generated electricity to the transmission lines; and
- Two transmission lines of 400 kV capacity each from the OCGT substation to Proteus substation, to introduce the generated electricity into the national grid. Proteus substation is located approximately 10 km north west of PetroSA.

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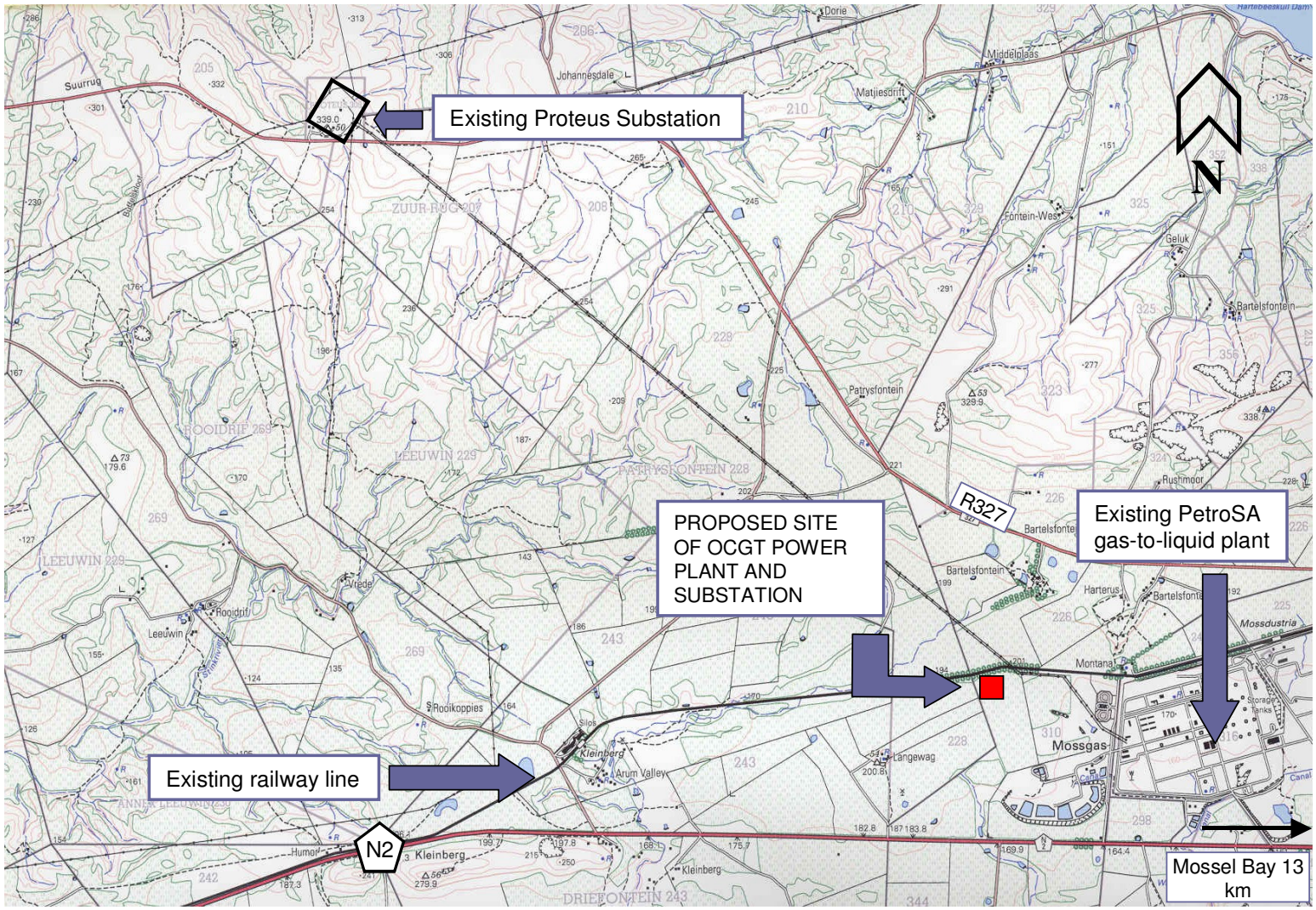

NINHAM SHAND CONSULTING SERVICES	Mossel Bay OCGT EIA	Figure 1	Location map	0 1 kilometers Source: 1:50 000 topographical sheet 3421 BB Herbertsdale

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It is envisaged that the OCGT power plant would operate for an average of two hours each morning and each evening. This is, however, dependent on electricity demand and system requirements. It could thus be necessary to operate for up to eight hours at a time.

1.2 Terms of reference and approach to study

The terms of reference for the specialist avifaunal study for the proposed OCGT project are to assess the potential impacts on birdlife in the area, to determine whether the proposed power plant site and the alternative transmission line routes will pose particular risks, and how any such risks should be dealt with. More specifically, the study entailed carrying out the following tasks:

- Providing a general description of the occurrence and status of birdlife in the study area;
- Describing the avifaunal habitats likely to be affected;
- Identifying rare or endangered species occurring in the study area;
- Assessing the potential interactions between the identified bird species and the transmission line route alternatives; and
- Providing a report capturing the above and including recommendations to mitigate possible impacts on birdlife.

The approach to the study has relied on:

- Two site visits between February and June 2005;
- An examination of a variety of photo- and cartographic material;
- Accessing the Southern African Bird Atlas Project (SABAP) report for the ¼ degree grid square that covers the study area (3421BB Herbertsdale);
- Consultation with Eskom personnel responsible for their infrastructure in the study area, as well as with other specialists and experts; and
- Reference to available information on the ecological conditions prevailing in the study area.

1.3 Assumptions and limitations

Since the location of the OCGT power plant and associated substation was determined during an earlier screening study undertaken by Eskom, prior to the inception of the EIA that this study forms part of, alternatives can only be addressed in terms of design and technology choice. This avifaunal study thus does not address the possible avifaunal impacts resulting from the OCGT power plant in the same amount of detail as it does the alternative transmission line routes.

This study is based on available information and the author's familiarity with wildlife interactions with utility structures in the study area (Lawson, 1993; Lawson & Wyndham, 1992). No specific recording or monitoring of the extant avifauna in the study area was undertaken during this specialist study. However, this is not believed to be inimical to the outcome of the assessment.

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2 DESCRIPTION OF STUDY AREA

The study area is located on the lowland plain of the coastal hinterland of the Southern Cape, to the west and north of Mossel Bay. The site of the proposed OCGT power plant is adjacent to the western boundary of the PetroSA facility and the Proteus substation is located approximately 10km northwest of the proposed power plant (see Figure 1). Located at a distance of 1,5km and 3km respectively to the south and north of the proposed site are the N2 National Road and the R327 respectively, while the Kleinberg-Mossdustria railway line runs along the boundary immediately to the north.

PetroSA owns the land on which the proposed OCGT power plant and substation would be located. Although zoned for industrial purposes, it is currently being leased as grazing pasture to the adjacent farmer. The site is a changed environment as a result of the agricultural activities practiced there over a long period of time. The proposed fuel pipeline and access road routes also traverse similarly disturbed land owned by PetroSA.

2.1 Land use

The broader area is of a rural nature, with PetroSA constituting an industrial node within a largely agricultural landscape. The terrain within the study area is characterised by a combination of relatively flat areas and undulating valleys. The predominant farming activity in the study area is the cultivation of wheat as well as stock farming with cattle and sheep.

The proposed alternative routes for the transmission lines traverse a number of farms between the proposed OCGT power plant and the existing Proteus substation. The proposed alternative route alignments traverse, to a greater or lesser degree, a number of relatively undisturbed valleys, particularly within the vicinity of the Proteus substation. No water bodies or wetlands of sufficient significance to be the origins or destinations of mass movement of birds are present in the study area.

2.2 Habitats

As far as avifaunal habitat is concerned, the proposed site for the OCGT power plant and associated substation presently comprises agricultural land dedicated to crop production and grazing for stock. Typical pasture grasses predominate and the conservation value of the area is regarded as very low at both the local and regional levels (Helme, 2005), notwithstanding the occurrence of a few small patches of remnant indigenous vegetation found on the margins or boundaries of fenced camps. Given the depauperate floral conditions, avifaunal habitat is consequently homogenous and of low diversity.

With reference to the areas transected by the proposed transmission line routes, similarly changed floral conditions pertain in the areas subjected to agricultural activity. Generally, in the order of 60% of each route alignment comprises agricultural land, with the balance being relatively undisturbed indigenous vegetation (Helme, 2005)[1].

[1] Note however that the central route alternative transects a larger proportion of agricultural land.

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The indigenous vegetation found along the alignments of the transmission line route alternatives is referred to as to Herbertsdale Renoster Thicket[2] and provides a description of the array of plant communities found in the drainage lines and on the more exposed slopes. The Thicket vegetation in the drainage lines is typified by large shrubs such as various taaibos species, num nums, guarries, milkwoods and others. Where Renosterveld is found, grasses, smaller shrubs and geophytes are more in evidence.

The conservation value of the areas of natural vegetation over which the proposed alternative transmission line routes would pass are all regarded as locally and regionally high (Helme, 2005). It is axiomatic that this high conservation value is a consequence of the species-richness of the indigenous vegetation. Based on the concept of a systems approach, whereby the state of the habitat rather than that of individual species is used to determine ecological health, it can be expected that the diversity and abundance of avifauna in these areas will be significantly greater than in the agricultural areas.

2.3 Avifauna

2.3.1 General description

The SABAP data available for the study area (1:50 000 topo sheet no. 3421BB, Herbertsdale) provide the basis of the understanding of the extant avifauna reflected in this report. One hundred and fifty seven bird species have been recorded in the area, of which 22 species are known to have been breeding.

Of the swimming, diving and wading birds, the expected array of cormorants, herons, egrets, geese and ducks have been recorded. It is interesting that flamingoes have not been recorded, probably due to the absence of suitable shallow water bodies. African black duck have also not been recorded but this might be due to their cryptic nature.

As far as diurnal raptors are concerned, the only two surprising absentees are the black eagle and the African goshawk. The fact that no owls were recorded can only be ascribed to observational shortcomings, since barn and eagle owls are sure to occur. Neither the common European or fierynecked nightjar was recorded and this, together with the absence of owls, would suggest that nocturnal observations were limited.

Terrestrial and ground nesting birds are well represented, as are the aerial-feeders. As far as the latter are concerned, a few of the summer visitors are absent from the records.

The conglomeration of species that make up the passerines comprises the bulk of the remaining records. The array that is represented is typical of what would be expected to occur in the study area.

[2] Derived from the Subtropical Thicket Ecosystem Planning Project classification.

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2.3.2 Conservation status

The following species are recorded as having particular conservation status in the SABAP report for the ¼ degree grid square that the study area is located in:

- Cape cormorant ~ near threatened

This cormorant is endemic to southern Africa and is more common on the west coast than the east, where the study area is located. Essentially a marine species, they breed on offshore islands and feed in coastal waters. Nesting occasionally occurs on the mainland close to the shoreline or in estuaries but always in dense colonies. There are no records of them breeding in the study area. Given their preferred habitats for foraging and breeding, it is unlikely that the OCGT power plant, substation and transmission lines would pose any risk to this species.

- Secretary bird ~ near threatened

Widespread throughout South Africa, this large ground-feeding bird does not spend much time in flight. Nevertheless, although they are ungainly on take-off and landing, secretary birds are strong fliers and can soar to great heights. Roosting and nesting occurs on the tops of trees but there are no breeding records in the study area. Due to their foraging in the open veld, they would certainly be found in proximity to the proposed transmission lines. While the risk to this species must be acknowledged, the little time they spend in the air, the height and visibility of the transmission line structures and their strong flying ability would suggest that the risk is not great.

- Cape vulture ~ vulnerable

Cape vultures were known to roost in a deeply incised section of the Gourits River just north of where it cuts through the Langeberg mountains south of Van Wyksdorp (pers obs). Although these birds forage very widely, the records from the study area indicate no breeding activity and a low frequency of reporting. Cape vultures often perch on transmission line towers. However, their low level of incidence and little likelihood of electrocution would suggest that the risk to this species is slight.

- African marsh harrier ~ vulnerable

Typically found over marshlands, this resident raptor also occurs over cultivated lands. However, their feeding behaviour is to fly low over the ground. They also nest at ground level, although there are no records of breeding in the study area. This harrier is known to perch on low structures such as fences but also soars to some height. The risk to this species is not considered to be significant.

- Black harrier ~ near threatened

The black harrier is a local migrant and occurs in a wide range of habitats. It typically hunts close to the ground where it also perches on termite mounds or low structures. Nesting also occurs close to the ground, although there are no breeding records from the study area. Given its feeding and nesting behaviour, it is unlikely that the transmission line structures would pose a significant risk to this species.

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- Blue crane ~ vulnerable

The blue crane has broadened its range in the last few decades into the extensive croplands of the Western Cape. Feeding and nesting on the ground, this bird nevertheless flies strongly and soars to considerable height. There are records of it breeding in the study area but it is not known to perch on transmission line towers. Their flight behaviour would suggest some threat from collision with transmission line conductors. However, the size and visibility of 400kV transmission line conductors make this less of a risk than with smaller transmission and distribution line structures.

- Stanley's bustard ~ vulnerable

A resident of the eastern arid and grassveld areas of South Africa, this bustard feeds and nests on the ground. There are no breeding records from the study area. Although it is a strong flyer and achieves some height, it is not known to use elevated perches such as trees or transmission line towers. While there may be some risk to this species, since they are known to collide with smaller transmission and distribution line conductors, the greater size and visibility of the 400kV structures would suggest that this likelihood is not particularly significant.

3 PROJECT DESCRIPTION

A general description of the proposed project was provided in Section 1.1 above. This section describes the structures that would comprise the OCGT power plant, substation and transmission lines, as well as the route and tower alternatives for the latter, from the point of view of affected habitats and possible consequences for avifauna.

3.1 Structures

The OCGT power plant and associated substation would comprise the turbines themselves with air intake structures and exhaust stacks, generator transformers, storage tanks, workshops, stores and administrative buildings. The substation would comprise transformers, coolant structures and an array of bus bars and gantries to support the outgoing conductors. There are clearly numerous components of these structures that pigeons, starlings and similar birds would seek out for roosting purposes. See Figure 2 for a site plan of the OCGT facility.

However, the OCGT site would be located on agricultural land of low conservation significance, with a concomitantly low diversity of habitat-specific bird species. None of the conservation-worthy species identified in the study area are likely to be affected. Dealing with the occurrence of those birds that seek to roost and nest within the OCGT power plant and associated substation would be a design and management issue. The use of modular components, as opposed to earlier "piperack" designs, will ensure that less suitable nesting places are available, and a variety of repellents such as the silicone-based "Hotfoot" product are available.

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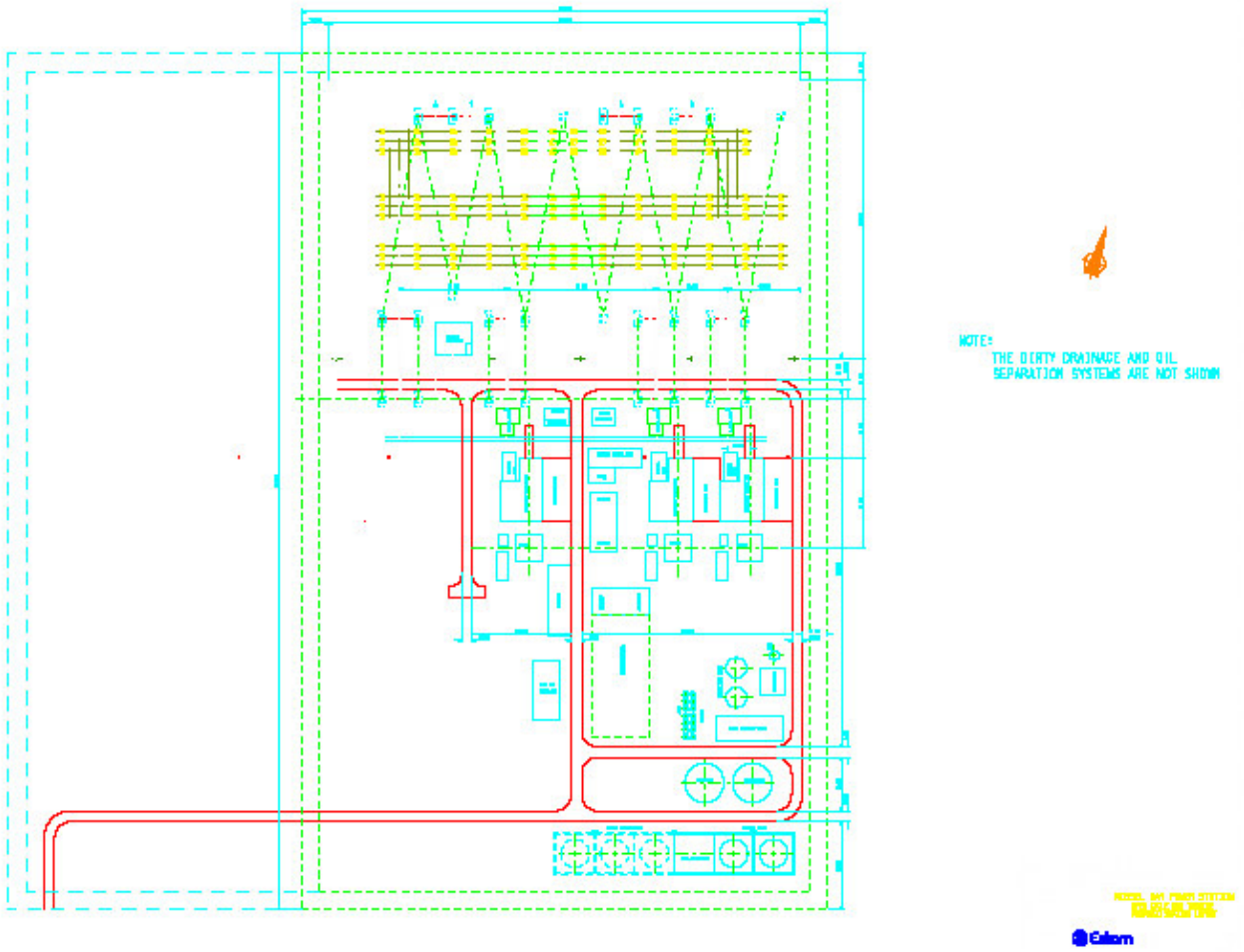

NINHAM SHAND CONSULTING SERVICES	Mossel Bay OCGT EIA	Figure 2	Site Layout	Not to Scale

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3.2 Routes

Three route alignments between the OCGT power plant site and the Proteus substation have been identified (Ninham Shand, 2005). For all the alternatives, the two transmission lines would run parallel to each other. In addition, for all alternatives, the transmission lines would pass south of the Proteus substation and then around to enter the substation at its north-western side. See Figure 3 for a plan of the transmission line route alternatives.

- The first route alternative would exit the OCGT power plant on its north-western side, cross over the railway line, run in a north-north-westerly direction for approximately 2km along a farm boundary, towards the R327. Thereafter the proposed route runs adjacent to the R327 for the remaining 10km to Proteus substation. This alternative crosses farmland before forming part of an existing utility corridor comprising a road, telephone lines and distribution lines. The total length would be approximately 12km, of which about 5km comprises natural vegetation.

- The second route alternative would exit the OCGT power plant on its north-western side and follow the alignment of the existing two 132kV transmission lines that run between PetroSA and Proteus substation. The proposal is to erect the two new transmission lines parallel and to the west of the existing transmission lines. The alignment would traverse a number of farms, a secondary road and cultivated land. The total length would be approximately 10km, of which just more than 3km comprises natural vegetation.

- The third route alternative would exit the OCGT power plant on its western side and run parallel and to the north of the railway line in a westerly direction for approximately 4km to Kleinberg. It would then cross over an existing secondary road to run parallel to an existing 66 kV distribution line. Thereafter, the transmission lines would then follow a route of about 10km running northwards along a valley to the Proteus substation. This alignment follows an existing utility corridor (railway line), and traverses cultivated land as well as less disturbed valleys. The total length would be approximately 14km, of which about 6km comprises natural vegetation.

Although the mobility of avifauna in general would suggest that the presence of natural vegetation is not of particular relevance to the desirability of transmission line structures, at a localised level it may be argued that intrusions into these more diverse habitats should be avoided. At this coarse level of evaluation, the second route alternative, i.e. along the existing 132kV alignment, could be argued to be the preferred option.

3.3 Towers

Alternatives in tower structures have also been identified (Ninham Shand, 2005), as follows:

- Compact cross rope suspension towers;
- Cross rope suspension towers;
- Self supporting bend or strain towers; and
- Self supporting towers.

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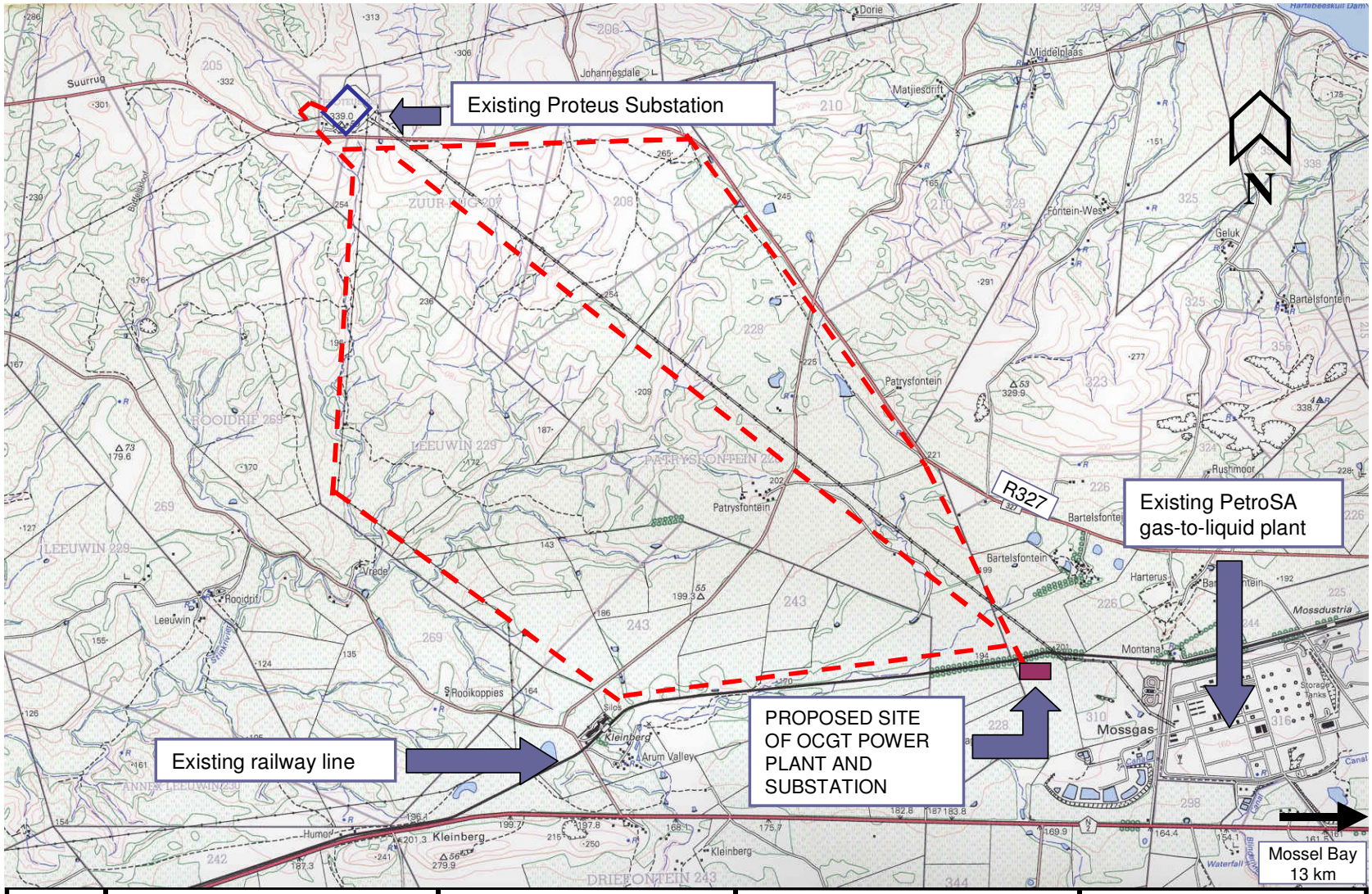

	Mossel Bay OCGT EIA	Figure 3	ROUTE ALTERNATIVES FOR TRANSMISSION LINES	0 1 kilometers Source: 1:50 000 topographical sheet 3421 BB Herbertsdale

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Given the configuration of the conductor bundles and their supporting insulator strings, the cross rope suspension towers offer less likelihood of faeces contamination from bird streamers, and indeed the possibility of electrocution of perching birds. One of the two cross rope alternatives would thus be the preferred tower configuration.

3.4 Potential impacts on avifauna

Injury or mortality often result from interactions between animals and transmission line structures. Interaction with such structures poses a very real threat to some populations of rare or endangered bird species. The cranes and larger raptors are cases in point in southern Africa. Interaction is usually in the form of collision with transmission line conductors, although electrocution at towers also occurs. Not only wild birds are at risk. Primates and domestic animals and birds are also known to come into contact with transmission line structures. Any rare or endangered species of wildlife likely to occur in, or migrate through, a transmission line corridor should be identified and protected, to ensure that the diversity of wildlife in the area is maintained. A variety of mitigatory measures are available, such as insulation and line marking, and animal interactions can usually be significantly reduced by application of these measures. It must be noted that the impacts that result from animal interactions with transmission lines are not only of ecological significance. Animal interactions often result in outages, i.e. temporary disconnections, of the electricity supply and this has significance for the business performance of the electricity company concerned. Contamination of insulators by the faeces from birds nesting, roosting or perching on transmission line towers, increases the risk of flashovers that result in outages. However, the greatest proportion of electricity supply loss on smaller transmission systems often results from interactions with less rare but numerically more abundant species like crows.

4 EVALUATION

4.1 OCGT power plant and substation

As described in Section 3.1 above, none of the conservation-worthy bird species identified for special attention in the study area would be likely to be negatively affected by the construction and operation of the OCGT power plant and substation. While there would be localised disturbance from construction activity and operational noise and heat, the displacement of birdlife would not pose threats that are inimical to the viability of the affected species or to the feasibility of the proposed development.

Dealing with the operational impacts resulting from the roosting and nesting activities of pigeons, starlings and similar species should be recognised as a management task.

4.2 Transmission line routes

From discussions with Eskom's Senior Supervisor responsible for the transmission system in the study area, it appears that bird fatalities have not been recorded on the existing 132kV lines (Scott, pers com). However, carcasses in the veld are rapidly scavanged[3] and this information

[3] Up to 70% in 24 hours, as cited by Brown & Lawson, 1989.

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must be regarded as anecdotal, notwithstanding the fact that such large structures and concomitant conductor diameters are seldom the cause of bird collisions. Of interest in this discussion was reference to tortoise shells frequently being found at the Proteus substation. The small size and manner in which they are predated would suggest that crows are responsible (Palmer, pers com).

Further information provided by Eskom personnel indicates that the risk of bird faeces causing failure of the insulator strings is higher on the sections of 400kV transmission line between Droërivier and Proteus, and Bacchus and Proteus, where streamers are more frequently seen, than on the 132kV section to the PetroSA facility. It was also noted that spurwinged geese and Egyptian geese are the most frequently seen birds perching on the towers (Scott, pers com).

With reference to Section 2.3.2 above, secretary birds, blue cranes and Stanley's bustards are the only species that emerge as potentially at some risk from the proposed transmission lines. However, recommending the central alignment along the existing 132kV transmission line is also substantiated by the very presence of the existing line. Having been a feature in the landscape for many years, and acknowledging that the risk in this case is from possible collision with conductors, optimising on an existing transmission line corridor would not see the introduction of a new physical intrusion into the landscape. The fact that spurwinged and Egyptian geese presently perch safely on the 132kV towers indicate that the more wide-ranging species that perch at height are not at risk. It should be noted that secretary birds, blue cranes and Stanley's bustards do not typically perch on transmission line towers. The greater homogeneity of an already less diverse habitat when compared to the first and third route alternatives also suggests that localised impacts on birdlife will be minimal.

Notwithstanding the opinion expressed in the previous paragraph, it is acknowledged that under stormy weather conditions of high winds and reduced visibility, the risk of collision with the transmission line conductors is considerably higher. However, avifauna exposed to such conditions while in flight are generally at a higher risk of injury from various other causes and specific mitigation, such as bird flight diverters installed on the conductors, are then in any event ineffective.

As far as the visibility of the transmission line structures for aviation activities is concerned, optimising the existing 132kV alignment will also mean that warning spheres will not be required since the combined utility corridor would be well recognised in the landscape.

5 CONCLUSION

5.1 Recommendations

Localised impacts on avifauna that result from the construction and operation of the OCGT power plant and substation are not considered significant and can be addressed as a management responsibility. The construction Environmental Management Plan (EMP) and operational Environmental Management System (EMS) likely to be conditions of the authorisation of the project could provide the means of achieving this.

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As far as the transmission line route is concerned, the recommendation is that the second or central alternative should be adopted. This would see the new 400kV transmission lines routed to the west and parallel to the existing 132kV transmission lines. While the considerable widening of the present servitude is acknowledged, it is our opinion that this alignment would result in the least harmful consequences for avifauna in both the local and regional area.

5.2 Mitigation

Provided that a construction EMP and an operational EMS are put in place that include adequate reference to managing avifaunal impacts, no specific mitigatory measures are required for the OCGT power plant and substation. Respective examples of such management actions are ensuring that driptrays are emptied before birds have access to them and the use of bird repellants.

No specific mitigatory measures in the form of bird flight diverters, bird guards or aviation spheres are envisaged for the transmission line conductors or towers. This presupposes that the second or central route alternative is adopted and that one of the cross rope tower designs is specified.

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Annexure 1:
Southern African Bird Atlas Project report for ¼ degree grid square 3421BB Herbertsdale.

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Annexure 2:
Photographs of the OCGT site and transmission line route alternatives

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