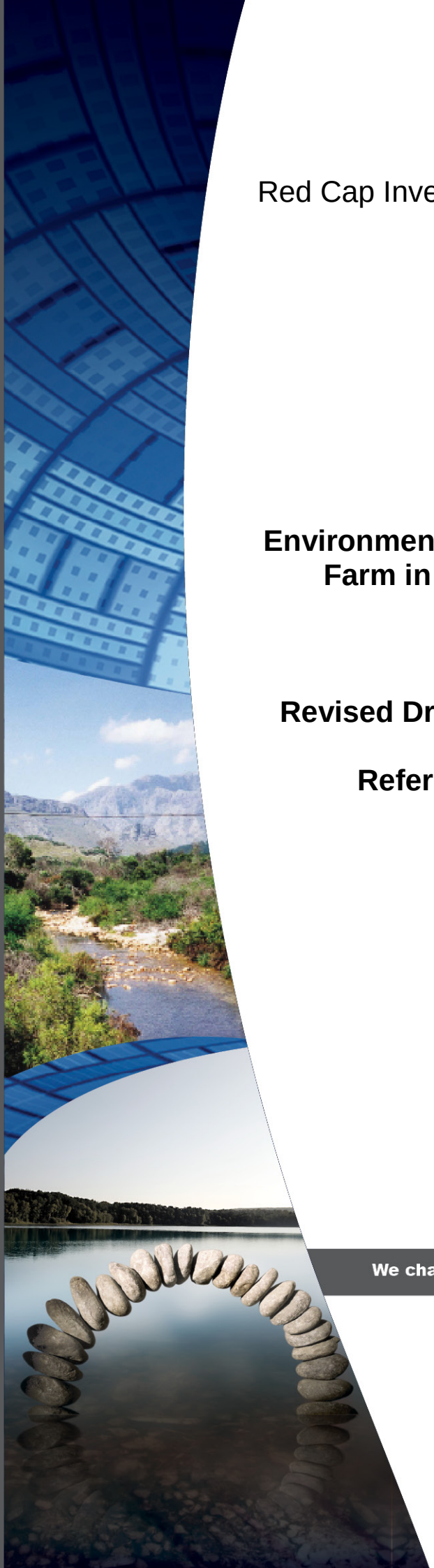

Red Cap Investments (Pty) Ltd

Environmental Impact Assessment for a Wind Farm in the Kouga Local Municipality

Volume 1 of 3

Revised Draft Environmental Impact Report

Reference number 12/12/20/1756

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Environmental Impact Assessment for a Wind Farm in the Kouga Local Municipality

Executive Summary / Impact Statement of Revised Draft Environmental Impact Report (January 2011)

DEVELOPMENT PROPOSAL

Red Cap Investments (Pty) Ltd (Red Cap) is proposing to develop a wind farm of up to 121 wind turbines near the villages of St Francis Bay, Oyster Bay and Paradise Beach in the Eastern Cape.

The proposed wind farm site spans three areas:

- The eastern cluster (27 turbines) close to Cape St Francis and Paradise Beach
- The central cluster (41 turbines) close to Oyster Bay
- The western cluster (53 turbines) close to the mouth of the Tsitsikamma River.

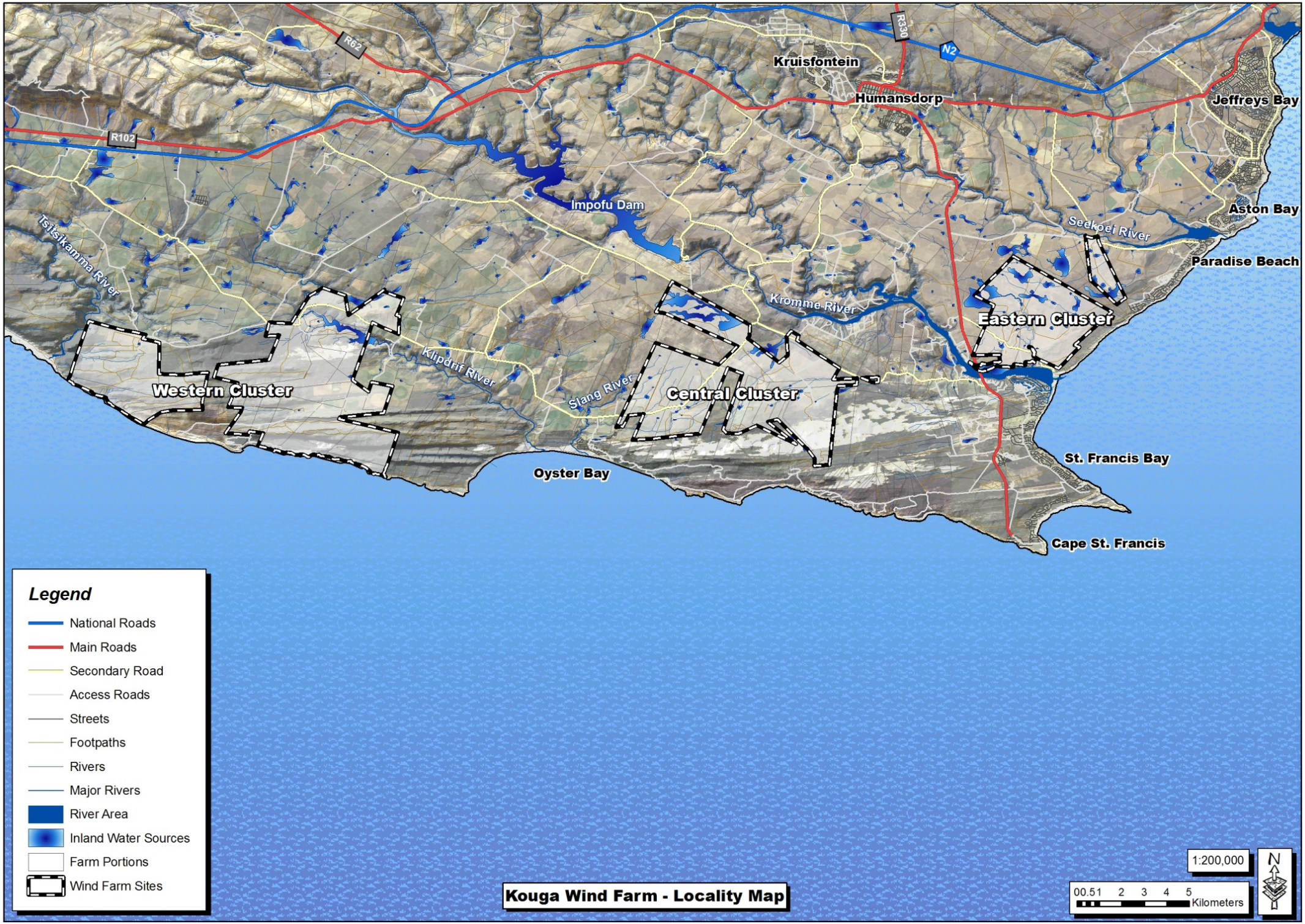
A regional map showing the study area is presented on the following page.

The location of the wind farm site was identified through a more than three year detailed wind data capturing and assessment process which indicated that this site had an exceptional wind regime. The proposed layout of the wind turbines was refined through an iterative process with input from all the environmental and technical specialists as part of the Environmental Impact Assessment (EIA) process. The aim of this iterative process was to ensure the final layout would not have any insurmountable environmental impacts. This was achieved by moving any 'problematic' turbines, roads or associated infrastructure and then reassessing the new layout with input from all the specialists. The final layout resulting from this process is termed "Layout 3" and it is the layout which is assessed in this Revised Draft Environmental Impact Report (EIR).

As part of this iterative process the developer agreed to phase the development with the first phase consisting of a maximum of 50 turbines. This was to ensure that any impacts which had a high uncertainty could be adequately monitored and more easily assessed and mitigated. If monitoring programmes revealed problematic impacts, these could then be addressed and mitigated for in the current and future phases.

Due to the large distances between turbines, the vast majority of the total 9 382ha of land that is being investigated for the wind farm, will not be disturbed. During the first phase less than 1% of the land will be permanently altered with the full wind farm resulting in a maximum of 1% of the land being permanently altered. As this 1% is spread over the 9 382ha the footprint of the development is never substantial in any one area.

No application was made as part of this process for the power lines that will feed the electricity from this project into the grid. Eskom has indicated that they will take the responsibility for connecting the wind farm to the grid, inclusive of any grid related EIAs. As such Eskom is undertaking a Basic Assessment process for one such line that will run through the central cluster. The developer is also in discussions with Eskom regarding the need for other possible short distance power line to feed the electricity generated from the other clusters into the grid. Any additional power line proposals will undergo their own Basic Assessments once finality is reached with Eskom on the way forward.



Kouga Wind Farm - Locality Map

NEED FOR THE ENVIRONMENTAL IMPACT ASSESSMENT AND THE PROCESS TO DATE

The National Environmental Management Act (Act No. 107 of 1998) (NEMA), as amended, requires that activities be investigated that may have a potential impact on the bio-physical environment, socio-economic conditions, and cultural heritage.

Under NEMA the EIA Regulations are published under GNR 385, and the associate Listing Notices GNR 386 and 387. Section 24(5) of NEMA stipulates that certain "listed activities" require environmental authorisation by way of either a Basic Assessment (BA) or a full Scoping and Environmental Impact Assessment as defined in the EIA Regulations Listing Notices (July 2006 EIA Regulations). The proposed construction and operation of the Kouga Wind Farm constitutes listed activities in both Listing Notices. However, GNR 387 supersedes GNR 386 and, as such, a full Scoping and Environmental Impact Assessment must be undertaken. The GNR 387 listed activities include:

1. The construction of facilities or infrastructure, including associated structures or infrastructure, for –

(a) The generation of electricity where –
(i) the electricity output is 20 megawatts or more; or
(ii) the elements of the facility cover a combined area in excess of 1 hectare;

2. Any development activity, including associated structures and infrastructure, where the total area of the developed area is, or is intended to be, 20 hectares or more.

In accordance with legislative requirements, an application for the proposed Kouga wind farm was submitted on 15 January 2010 to the Department of Environmental Affairs (DEA). The Scoping Report was finalised on 31 May 2010. The Scoping Report and Plan of Study for EIA were accepted by the DEA on 30 July 2010 subject to conditions. The Draft Environmental Impact Assessment Report was then compiled and reported on the investigation and evaluation of the impacts, issues and alternatives identified during the Scoping Phase. Where necessary, those impacts or issues that required detailed assessment were investigated further. All identified impacts were assessed and rated in terms of their environmental impact significance. Appropriate mitigation measures and recommendations were also formulated to minimize the potential negative environmental impacts. A Draft Environmental Impact Report was released for public comment on 12 November 2010 with the initial comment period extended to 8 January 2011.

This report is a revision of the Draft EIR which has been released for further public comment so that input may be provided before the report is finalised and submitted to the DEA for decision-making.

REASON FOR REVISED DRAFT REPORT

This Revised Draft EIR is an updated version of the Draft EIR released for public review. During the public participation process linked to the initial Draft EIR, numerous questions and issues were raised by Interested and Affected Parties which resulted in the decision to revise the Report to address all these questions and issues.

The Revised Draft EIR has been reworked to better present and clarify project information, identified impacts and the assessment thereof. Where necessary, the specialist studies were also updated and amended to better reflect the findings of the studies or to address new issues raised by Interested and Affected Parties. Additional specialist studies were also undertaken to provide additional assessment of impacts which were not assessed in the

Draft EIR. Although the proposed project and the overall findings of the original Report did not change it was decided that the revised report should be distributed for a second round of public comment.

The Revised Draft EIR comprises three (3) Volumes, namely the EIR and two (2) volumes of Appendices.

SUMMARY OF KEY FINDINGS

The issues and concerns that could result in potentially significant impacts identified during the Scoping and Impact Assessment Phase were investigated during the EIA Phase. These included issues and concerns related to the following:

- Vegetation (including wetlands)
- Hydrology
- Terrestrial fauna
- Bats
- Birds
- Cultural Heritage (including palaeontology)
- Visual/ aesthetics
- Noise
- Economics (including tourism)

Specialists were appointed to investigate potential impacts related to these aspects. The results of the studies were used to identify potentially significant impacts and refine the final configuration of the wind farm to ensure an optimal arrangement of turbines with respect to the social and biophysical attributes of the potentially affected environment.

An overview of key specialist findings is provided below.

VEGETATION AND WETLANDS

The vegetation study resulted in the identification of 7 similar ecological functional groups, namely:

- Grassy Fynbos, Dune Strandveld and Renosterveld communities
- Rocky Refugia habitats
- Seeps, Wetlands and Pans
- Riparian Vegetation along seeps and ephemeral river courses
- Thicket and Dune Forest
- Drift Sands, Dune Fields and Littoral Vegetation
- Transformed vegetation

The percentage coverage of these vegetation types is variable for each of the clusters and, consequently, the habitat sensitivity is also variable. An overview of findings for each cluster follows.

Eastern cluster

This area is characterised by an abundance of *Soutvlei Inland Pans* forming a network between islands of *Osbosch Thicket-Renosterveld* on higher lying areas. *Humansdorp Perennial Stream* along drainage lines, with *Kabeljous Valley Thicket* on dunes and slopes. *St Francis Strandveld* and *Zeekoei Limestone Strandveld* along coastal belt. *Soutvlei Inland Pans* are ephemeral or seasonal in nature, tending to have a perched water table with standing water present after rainfall. These pans tend to have a dominant grassy

composition, with herbs, shrubs and trees being excluded due to period inundation with water. *Inland pans* are clearly differentiated from surrounding vegetation by the presence of shallow depressions and by being dominated by grasses. Some areas of *Inland Pans* have been modified and excavated to increase water storage capacity. Transformed areas (predominantly agricultural pastures) are limited in extent to peripheral areas, since ephemeral pans have not been historically used for pasture cultivation due to perched water table.

Central cluster
Vegetation in the central cluster is dominated by *Oyster Bay Thicket-Grassy Fynbos*, with *Kouga Mesic Proteoid Fynbos* on hilltops. An extensive network of drainage lines (*Tsitsikamma Perennial Streams*) drain the site to the north and to the south. Bands of *St Francis Strandveld* and *Inland Primary* Dune are present on vegetated dunes along the coastal belt interspersed with un-vegetated *Primary Dunes*. *Oyster Bay Thicket-Grassy Fynbos* and *Tsitsikamma Perennial Streams* which have been highly modified through agriculture, with extensive areas converted to irrigated pastures throughout the site. Intact portions tend to be limited to isolated pockets (islands) between pastures and along drainage lines. Seep and wetland areas have also been drained to increase pasture footprint within the cluster. *Mesic Proteoid Fynbos* tends to be intact, especially where exposed rocky outcrops are present, due to unsuitability for cultivation.

Western cluster
Vegetation in this area is predominantly *St Francis Strandveld* in southern portion of site on linear vegetated dunes. *Tsitsikamma Dune Forest* and *Tsitsikamma Riverine Forest* occur on the peripheral northern portions of the site with *Oyster Bay Thicket-Grassy Fynbos* and *Tsitsikamma Riverine Forest* in northern areas on hills and drainage line slopes. *Inland Primary Dune* and *Drift Sands* also present within the site. A number of wetlands are present in dune slacks within the *Inland Primary Dune* vegetation.

Seeps, Wetlands, Streams and Pans
Of special interest is the fact that there are a number of seeps, wetlands, pans and streams in the clusters and particularly in the Eastern Cluster. These seasonal wetlands, seeps and riparian areas comprised primarily of the Soutvlei Inland Pans but are also represented by the Humansdorp Perennial Stream, St Francis Dune Stream and Tsitsikamma Perennial Stream Variant.

Impact Assessment
The impact assessment for the vegetation was done in a two pronged approach using the 7 ecological functional groupings detailed above:

1. A Terrestrial Habitat Sensitivity Assessment was undertaken for all three clusters to identify which turbines and infrastructure components are situated in a High Sensitivity Area and thus required specific mitigation or removal from the area.
2. An assessment of the impacts on the receiving environment (ecological functional groupings) in the study area to quantify these impacts and look at possible mitigation measures specific to each ecological functional grouping.

Potential impacts on the ecological functional groupings for all three clusters have been considered under several categories, including:

- Direct loss of vegetation and habitat
- Changes to species composition and ecological processes
- Loss of species of special concern (SSC) and their habitat
- Changes in natural fire regime and increased risk of alien infestations.

From this specialist assessment of the impact on the vegetation it was found that, with suitable mitigation, there would be no impacts of high negative significance and no fatal flaws to the development.

A number of potential impacts during construction on vegetation were found to have a high negative significance rating before mitigation. Through the implementation of appropriate mitigation measures, the majority of these dropped to low significance and the rest to medium (see summary Table 1 below). During operation two impacts, namely, Loss of species of special concern and SSC habitat of Rocky Outcrops, and the reduction of changes to ecological processes and functioning and habitat fragmentation of seeps, wetlands and streams, were identified as having a potential High significance which dropped to medium after mitigation. Changes to the fire regime in Fynbos, Renosterveld and Dune Strandveld, was found to be a medium positive impact after mitigation both during construction and operation. Some of the major mitigation measures were the need for micro-siting, vegetation search and rescue, rehabilitation as well as alien and fire management and these along with others have all been included in the EMP.

HYDROLOGY AND SURFACE/ GROUNDWATER LINKS WITH WETLANDS

The specialist study undertaken for this aspect dealt with specific impacts from a hydrological point of view on the ground water, hydrology and surface/ groundwater links with wetlands in the affected environments. An overview of the hydrology and wetlands of the proposed wind farm area is presented below for each of the clusters.

Eastern Cluster

The Eastern Cluster is located about halfway between Paradise Beach and St Francis Bay and the nearest two wind turbines are approximately 1.5 km and 1.72 km from the coastline. The Eastern Cluster lies within the K90E and K90F quaternary catchments. The area is drained by the Krom River to the south and the Seekoei River to the north.

The occurrence of wetlands in this cluster is driven primarily by surface rather than groundwater interactions. The relatively flat topography in the general area, coupled with low groundwater permeability, facilitates the spread of surface runoff, which pools in low-lying depressions and flats, giving rise to the extensive salt marsh (Soutvlei inland pans) and other wetland habitats, which occur between higher-lying terrestrial areas.

Central Cluster

The Central Cluster is located about halfway between Oyster Bay and Cape St Francis with the two nearest wind turbines of the Central Cluster located approximately 1.67 km and 1.99 km from the coast line. The Central Cluster lies within the K90E and K80F quaternary catchments. The area is drained by an extensive network of streams and watercourses to the south and tributaries of the Krom River to the north. The broader area around the study site is characterized by significant water resources in particular the Impofu Dam located along the Krom River to the north of the cluster. This dam tends to moderate high flows in the Krom River.

Wetlands in this area are driven by both surface and groundwater flows, and comprise a combination of wetland depressions, hillslope seeps and valley bottom wetlands. Of these, the latter drain mainly into the Slang River, which flows along the northern edge of the Oyster Bay dunefield and passes into the sea at Oyster Bay, to the east. However, valley bottom wetlands draining the eastern portion of the central cluster pass into the dunefield itself which is situated outside the study site. Wetlands in this cluster are largely disturbed systems, the integrity of which has already been impacted to some extent by largely agricultural activities in their vicinity and upstream catchment areas.

Western Cluster
The Western Cluster is located on the coast between Oyster Bay and the Tsitsikamma River and lies within the K80F quaternary catchment. The two wind turbines located nearest to the coast line are approx 1.09 km and 1.19 km from the coast, with the nearest wind turbines to Oyster Bay located approximately 7.3 north-west, inland from Oyster Bay. The area is drained by tributaries of the Klipdrift River to the north and the Tsitsikamma River to the west.

The wetlands and rivers / streams in this cluster, are likely to be driven by both surface and groundwater flows. Although the mobile dune areas in this area are small in comparison with the Oyster Bay dunefield in the vicinity of the central cluster, surface and groundwater flows from the north are nevertheless likely to play a role in recharge of the dune aquifer which is outside the study area.

Impact Assessment
From a groundwater perspective, the proposed wind farm would have a low and insignificant impact.

The Nuclear-1 EIA at the nearby Thyspunt site established that the stage height in major rivers in the area seldom rises by more than 5 to 8 m before discharging into the ocean. As the wind turbine situated at the lowest altitude would be at about 14 m above mean sea level (amsl), it is evident that the development of the wind farm is not at risk of major flooding and will not impede the flow of any of the perennial rivers. In addition, the infrastructure associated with the development of the Wind Farm has been located and designed to minimise any impact on the hydrology of the area.

The wetlands will be impacted by the development but given the fact that only about 1% of the over 9 000 ha will be permanently altered, and this will be spread across the three clusters, this potential impact is not seen as being significant if standard mitigation is implemented.

From this specialist assessment of the potential impact on the hydrology it was found that, with suitable mitigation, there would be no impacts of high negative significance and no fatal flaws to the proposed development. The mitigation measures included those proposed for wetlands by the vegetation specialist, as well as the need to undertake a Water Use Licence Application (WULA) as required by the National Water Act (Act No. 36 of 1998) and complying with all requirements of the Act with regards to surface water hydrology. These are all included in the EMP.

TERRESTRIAL FAUNA

The terrestrial fauna study deals with amphibians, reptiles and mammals which were identified through a site survey following which findings were compared with distribution records in relevant literature.

Key findings of the study for each cluster are as follows:

Eastern cluster
This cluster contains many reptilian species ranging from common to Red Data Species snakes, frogs and lizards The combination of wetlands and pans in the eastern cluster represents a significant potential habitat for Peringuey's Coastal Leaf-toed Gecko (*Cryptactites peringueyi*) which has a critically endangered conservation status. Its presence to the southwest of the cluster has been recorded. The two salt pan plant species *Restio* sp. and *Sarcocornia* sp. are known to be favoured by this gecko species. While the mammal list of the eastern cluster is somewhat reduced compared to the western and central clusters

due to the agricultural use of the land, it is still noteworthy. Mammal species present range from non-threatened common species to those included in the Red Data Species list.

Central cluster
The reptiles of the central cluster are primarily rock- and water-dependent as a result of the flat rocky outcrops that characterise this area. Again, the range of reptiles found there is wide from common to near threatened species. The rocky outcrops are also the preferred habitat for many amphibians due to the damp and cool conditions provided by the geological feature. Of significance is the corridor provided by the rocky outcrops into the natural undeveloped areas through to the seep areas. This is essential habitat for the survival of faunal species within the cluster. All the amphibians within the cluster are listed as least concern in terms of their conservation status. As with the western cluster (see below) mammals of all sizes are common to the central cluster and include species ranging from non-threatened common species to those included in the Red Data Species list.

Western cluster
The reptilian component of the western cluster comprises a variety of snake species from non-threatened to near threatened e.g. Yellow Bellied House Snake. Lizards are common to the cluster and incorporate a wide variety, some of which, like the FitzSimon's Long-tailed Sep are considered vulnerable. Others, like the Elandsberg Dwarf Chameleon, which is listed as endangered, is also thought to occur in the cluster. Amphibians are also common to the area, typically around water bodies, with no endangered species being identified. Many of the reptiles in the cluster are water dependent. Mammals of all sizes are common to the western cluster and include species ranging from non-threatened common species like the Scrub Hare to those included in the Red Data Species list such as the Honey Badger and Blue Duiker.

Impact Assessment
Potential impacts on fauna for all three clusters have been considered under several categories, including:

- Direct habitat destruction through site clearing and construction of turbines and associated infrastructure
- Road mortality by vehicle activity
- Entrapment or exclusion
- Disruption of ecological corridors
- Poaching.

From this specialist assessment of the impact on the terrestrial fauna it was found that, with suitable mitigation, there would be no impacts of high negative significance and no fatal flaws to the development.

The construction impacts of habitat destruction and road mortality from trucks, cars and other service vehicles on reptiles, amphibians and mammals, were found to have a high significance before mitigation and these reduced to low and medium after mitigation. No impacts of high significance were identified either post or pre mitigation for the operation phase and rather there were two positive impacts after mitigation during this phase. Some of the major mitigation measures are search and rescue operations, maintenance of corridors particularly where roads cross rivers and wetland areas, careful driving practices and these along with others have been included in the EMP.

BATS

The specialist bat study was based on desktop research and a site inspection aimed at identifying suitable bat roosting sites including buildings and hollow trees. Given a general dirth of information on the effect of wind farms on bats the findings of the study are associated with a degree of uncertainty.

It is estimated that approximately 12 bat species may occur in the general study area, and none of these species occur in the higher conservation categories of Vulnerable or Endangered. Suitable roosting habitat for three species were found in abundance in the form of sheds, barns and tree hollows. Cave dwelling species are less likely to occur due to the absence of suitable habitat.

Although the establishment of the wind farm is not expected to detrimentally affect bat roosts or foraging habitat, studies undertaken elsewhere indicate that bats may suffer severe injuries to their respiratory systems caused by a sudden drop in air pressure that occurs when bats get close to turbine blades. Migrating bat species may be particularly vulnerable to this form of mortality.

Impact Assessment
The specialist study identifies two categories of potential impacts during the operation phase:

- Site specific mortality from wind turbine blades
- Mass mortality affecting bat recruitment on a regional scale

From this specialist assessment of the impact on the bats it was found that, with suitable mitigation, there would be no impacts of high negative significance and no fatal flaws to the development.

The second impact can be regarded as a cumulative effect of more than one wind farm site in the region, particularly if these are sited on migratory routes which, to date, have not been clearly identified. The significance of the cumulative impact is the only one rated as high before mitigation but this reduces to low after mitigation. The confidence in the prediction of the magnitude of the impact on bats is not high but it is believed that with the proposed mitigation, which includes phasing the project, setting the turbines back from major water sources and conducting a monitoring program, any significant impacts can be avoided. Some of these mitigation measures have already been incorporated in the final layout and all of them are included in the EMP.

BIRDS

The avi-fauna (bird) study was based on a site visit and review of published information on bird distribution and abundance. As with the bat study, a limitation of the bird study is a lack of information about the nature of interaction between birds and wind farms specifically in South Africa. This is poorly understood in South Africa given the lack of existing wind farms and an absence of primary data.

The findings of the bird study indicate the possible occurrence of 74 species of conservation concern in the study area. These species are categorised as either near threatened or vulnerable. The Eastern Cape coastal precinct is known to have the highest densities of Denham's Bustard and White-bellied Korhaan in the country, and also has very high densities for Blue Crane, Secretarybird and White Stork. The Humansdorp population of White-bellied Korhaan (Barrow's Korhaan) is virtually isolated from the rest of the country, making it extremely important to protect. Coordinated Waterbird Count data for the area indicated the occurrence of cormorants, ducks, geese, gulls, egrets, terns, ibises, geese,

ducks, plovers and assorted waders south of the eastern cluster at the Krom River Mouth. Based on these findings, the following species were identified as most likely to be negatively impacted by the proposed wind farm: Denham's Bustard, White-bellied Korhaan, Blue Crane; African Marsh Harrier, Black Harrier, Secretary bird and White Stork.

Impact Assessment
Potential impacts on birds for all three clusters have been considered under several categories, including:

- Collision of birds with wind turbines
- Habitat destruction associated with the construction of the turbines
- Disturbance of birds by the turbines and associated infrastructure
- Habitat destruction during construction of associated infrastructure.

From this specialist assessment of the impact on the birds it was found that, with suitable mitigation, there would be no impacts of high negative significance and no fatal flaws to the proposed development.

Collision of birds with the turbines is the only impact that was given a high negative significance before mitigation. The assessment of this impact is complicated by the number of factors affecting the likely mortality rate including bird species, prey abundance, landscape features, weather, number of turbines, turbine size and spacing and lighting. Due to the conservation value of birds that may be affected, the potential impact was rated as high without mitigation and medium with mitigation, although this finding is qualified by uncertainty about the extent to which collisions may occur.

Mitigation measures proposed to reduce the significance of impacts on birds have been incorporated into the EMP and these include turbine design requirements and pre- and post-construction monitoring. The latter will be facilitated by the proposed phased construction plan which will enable a better understanding of the impacts on birds, based on the results of monitoring during the first phase, as a basis for mitigation during subsequent construction and operational phases.

CULTURAL HERITAGE

A Cultural Heritage Impact Assessment was undertaken with the aim of locating, identifying and assessing the significance of cultural heritage resources, inclusive of archaeological deposits or sites, built structures older than 60 years, burial grounds and graves, and cultural landscapes or viewscapes that may be affected by the proposed development. The findings of the Cultural Heritage Impact Study for each cluster are described below.

A palaeontological study was also undertaken which considered palaeontological fossils within the study area. The findings of the study identified no palaeontological issues of significance.

Eastern cluster
Five heritage sites were identified in the Eastern Cluster. Three of them comprise of Colonial Period farmsteads, pre-dating 60 years of age. These sites are at present all still in use and are fenced with access gates. One Colonial Period Cemetery was found which is no longer in use but is fenced with an access gate. The fifth site comprises of a low density and insignificant primarily Earlier Stone Age (ESA) Acheulean scatter.

Central cluster
Six archaeological and cultural heritage resources were identified during assessment of the central cluster study site. Four of these constitute Historical Period homesteads, pre-dating

60 years of age. With the exception of one house, the sites are at present still in use. One of the sites is formally fenced for purposes of conservation in terms of the National Heritage Resources Act. The remaining sites in this cluster comprise a fenced Historical Period Cemetery and a highly significant ESA and Middle Stone Age (MSA) site where artefacts are strewn over an approximate 1 km x 300 m area of exposed dunes.

Western cluster
Seven sites were identified in the Western Cluster as well as 2 potentially sensitive areas. Six of these are Historical Period farmsteads, structures or villages, older than 60 years of age. The sites are largely still in use, with the majority thereof fenced with access gates. The remaining site comprises a fenced Historical Period cemetery. Both potentially sensitive areas are characterized by a mosaic of overgrown and white shifting dunes; very reminiscent of the typical Late Stone Age (LSA) 'strandloper' type site environments. They have thus been identified as potentially sensitive areas even though no archaeological or heritage sites were identified in these areas during the field visits.

Impact Assessment
From the specialist assessment of the impacts on the cultural heritage resources it was found that, with suitable mitigation, there would be no fatal flaws to the proposed development. The proposed configuration of the wind farm ensures that there are no direct impacts on historical or stone age sites. The only site to have a high negative impact before mitigation was the site in the Central Cluster. The development layout was altered so that this site is not impacted and can thus be formally conserved which changed this impact to a high positive impact.

Over and above this there were two related impacts, one with a high negative significance and one with a high positive significance after mitigation. The negative impact was the impact on the cultural landscapes and viewscapes for sensitive visual cultural receptors. However, this is a subjective impact and depending on the cultural receptor the significance could be different. The positive impact was the impact on the Cultural Landscapes and viewscapes with regard to conservation of heritage resources. It was noted that the wind farm, due to it using up a large area of land but only permanently impacting about 1% of this, may be a very good means to identify cultural resources through EIA studies and a good way to ensure the land was not used for other more destructive activities thus conserving the resources.

The mitigation measures proposed included micro-siting, on site monitoring for some potentially sensitive sites during excavation and conservation of the sensitive stone age site. These and other mitigation measures are included in the EMP.

VISUAL

From a visual perspective, the landscape into which the wind farm will be introduced is largely agricultural and contains relatively few man-made structures. The blade tips of the turbines at an approximate maximum height of 150 to 160 m, will result in a marked change in the visual character of the landscape. Anticipated visual effects are described in a specialist visual study that was based on a site visit and photographic survey combined with an analysis using Geographic Information Systems (GIS) and a literature review. Criteria for defining potential visual impact include visibility of the wind farm components, viewer sensitivity, viewer exposure and visual intrusion. Map overlays including landforms and land cover are used to create sensitivity maps which indicate areas that are sensitive to change.

Impact Assessment
The findings of the specialist study resulted in the identification of five types of visual impact:

- Intrusion of large and highly visible construction activities on sensitive viewers

- Changes to views from mixed coastal resort-agricultural landscape
- Intrusion of large wind turbines on the existing views of sensitive visual receptors
- Impact of night lights on existing nightscape
- Impact of shadow flicker on residents in proximity to the wind farm.

Given the subjectivity associated with visual perception, the findings of the impact assessment are qualified by a medium level of confidence in the prediction. The most significant impact is likely to be associated with changes to views of the landscape from resort residents (sensitive viewers), specifically those residents of St Francis Bay that would see the Eastern Cluster from their properties, albeit at a distance. The significance of this impact is rated high with few mitigation options available to reduce the significance. However, it is noted that it is possible that this impact will reduce over time as viewers become accustomed to the turbines in their view. The impact of the turbines in changing the landscape is the only other impact rated as high but this could be negative or positive as it is very subjective and will most likely also reduce over time.

However, no fatal flaws were identified by the specialists and a range of mitigation measures, where possible, are proposed to reduce visual impact and these are included in the EMP.

NOISE

An increase in noise levels is a concern associated with wind farms which manifests during both the construction and operational phases of the development. A noise specialist was appointed to determine the likely increase in noise levels and recommend appropriate mitigation. The methodology used in the noise study included a desktop modelling exercise (using validated computer software) to predict noise levels from the operation of the turbines and field measurements to determine ambient noise levels in the vicinity of the proposed turbine localities. The field measurements were undertaken at seven monitoring points throughout the study area, chosen on the basis of their proximity to the proposed turbines and sensitive receptors (fauna, avifauna and human), using methods based on the South African National Standard (SANS) for noise monitoring.

Impact Assessment
From this specialist assessment of the impact of noise it was found that, with suitable mitigation, there would be no impacts of high negative significance and no fatal flaws to the proposed development.

The most significant impacts were identified to potentially be during the operational phase of the development. The predicted noise levels during operation are calculated using the manufacturer's specifications for two commonly used types of wind turbines. It is important to note that the noise modelling that was done for this study was very conservative as it did not take into consideration the effect that any ambient noise and specifically the prevailing wind may have on masking the operational noise of the turbines. This means that at a setback distance of 500 m, the operation of the turbines may very likely not be audible above the background noise of the prevailing winds especially as the wind speed increases. The results of this conservative modelling for all identified noise sensitive areas (NSA's) is presented in the specialist study. It is shown that recommended day/night limit of 45 dB(A) is only possibly exceeded at 6 out of the 32 Noise Sensitive Areas. Four of these areas are located in the Central Cluster and two in the Western Cluster. Based on the findings, the potential impact of noise during the operational phase is rated as high without mitigation but can be reduced to low post-mitigation and this is using the conservative noise modelling estimates, so the impact will most likely be less.

The two most important mitigation measures in this regard are micro-siting of the turbines affecting the 6 noise sensitive areas and ambient noise monitoring once these turbines are

erected to determine the exact power mode settings of the turbines needed to comply with the guideline limit of 45 dB(A) at the noise sensitive areas. These mitigation measures and others are incorporated into the EMP.

ECONOMY AND TOURISM

An economic specialist study was undertaken to assist in determining the potential impact of the proposed wind farm on the local economy and on tourism. Various sources of information were, as part of desktop review, utilised in combination with consultation with community members and authorities. Potential impacts were assessed in relation to the following:

- Institutional factors and policy
- Financial viability
- Financial benefit to landowners
- Land values in the potentially affected surroundings
- Tourism potential and development
- Economic spin-off during the construction and operations phases, including job creation, upliftment of the local communities through a BBBEE trust and corporate social investment initiatives.

Impact Assessment

The only impacts with high significance are positive impacts after mitigation and these are both during construction and operation. Benefits would be particularly prominent for the project proponents, land owners on the site, Historically Disadvantaged South Africans (HDSAs) residing within the geographic location of the Kouga Local Municipality through the proposed Broad-Based Black Economic Empowerment (BBBEE) trust, the general community through Corporate Social Investment (CSI) initiatives and in the achievement of national and regional energy policy goals. Less significant negative impacts would occur, *inter alia*, as a result of loss of land, general disruption and loss of amenity related to noise and visual aspects, and crime associated with an influx of contractual labour.

This economic analysis of the various phases of the wind farm project and its likely effects on the environment concluded that, with appropriate mitigation measures applied, the greatest benefit will be swayed in favour of society in general.

CUMULATIVE IMPACTS

The potential exists for negative consequences from the cumulative impacts caused by development of a significant number of wind farms across the country. Some of the potential negative cumulative impacts that were assessed in the EIR are the impacts on sensitive habitats, terrestrial fauna, vegetation, birds and bats as well as socio-economic and visual impacts.

Such potential cumulative impacts would only be a concern if decision making was undertaken in a policy vacuum, in the absence of appropriate policies/ legislation. Fortunately, in South Africa, developments such as this are subject to a broad range of legislated processes requiring approval including, but not limited, to the EIA process. The concern does however exist that existing legislation does not take into account wind farms and the potential cumulative impacts.

The key government departments instrumental in providing permission for the construction of wind farms in South Africa are the DEA and the Department of Agriculture, Forestry and Fisheries (DAFF). Both of these departments have existing legislation empowering them to control the current development pipeline. Over and above the existing legislation, both Departments are currently finalising polices specific to the development of wind farms and

their cumulative impacts. These policies will be an important addition to their existing arsenal of policies and will further ensure that the development of wind farms is done in a pragmatic, sustainable and sensible manner. The DEA is also finalising a Geographic Information System (GIS) based tool covering the entire country to assist the Department in assessing the potential impacts of wind farms and all future applications, including this one.

Another important factor to bear in mind when grappling with the issue of cumulative impacts is the fact that any wind farm planned on agricultural land will require the permission of the minister of DAFF to enter into a long term lease, over and above a positive authorisation. Although DAFF does not have any legislation specific to wind farms currently in place, they will only be entertaining the wind farm applications for long term leases post the finalisation of their policy.

Although the legislative barriers to the development of wind farms are significant, there are additional safeguards that will prevent an unchecked proliferation of wind farms in South Africa. The main barrier to a rapid expansion of wind farms is the limiting factor of suitable grid connections. This is an issue nationally and in the Kouga region specifically, the latest assessment by Eskom is that the maximum Mega-Watts (MW) that can be evacuated in the medium term is 220 MW (approximately 88 turbines). Over and above this is the fact that, at present, the government has only agreed to procuring up to 400 MW (possibly increasing to 700 MW) of wind energy up till 2013 for the whole of South Africa (as indicated in the Department of Energy's (DOE) Integrated Resource Plan 1 and 2) .

When assessing the cumulative impacts, one has to be cognisant of both the negative and positive impacts. The DOE has initiated the Medium Term Risk Mitigation Plan (MTRMP) to "keep the lights on". This plan shows two scenarios, the first being a 'business as usual' scenario where nothing extraordinary is done in the national electricity supply. In this scenario there is a total shortfall of 42 000 Giga-Watt Hours (GWh) of electricity over the period 2011 – 2016. The second scenario anticipates mitigation measures, such as the construction of wind farms and aggressive energy efficiency measures. The second scenario does, however, fall short of ensuring that the lights stay on. The consistent theme in the plans is that without extraordinary measures the lights will go out. The cost of this to the country has been calculated at R75,00/ kWh of unserved energy. The cumulative effect of which would result in significantly dire consequences to the national economy. As wind is considered the most appropriate technology to bring significant amounts of renewable energy onto the grid in the shortest time period and at the lowest cost, the potential positive cumulative impact of wind farms nationally is extremely significant, as would be the associated increased investment and job creation.

Another key positive cumulative impact is the carbon/ emissions free generation of electricity. This has a marked positive impact on the local health of communities in the vicinity of coal fired power stations as well as the global problem of climate change.

In weighing up the potential negative and positive cumulative impacts, the balance of probabilities is that the positive cumulative impacts outweigh the negative.

ALTERNATIVES

The EIA Regulations require that alternatives to a proposed listed activity be considered. Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives considered in the Revised Draft EIR include: site alternatives, land use alternatives, alternative layouts, the many small turbines versus less large turbines scenario and the no-go option.

The proposed land parcels contained in the three clusters are zoned as Agriculture, and are mainly used for extensive cattle grazing. Other than the current agricultural practices, no other alternative land uses have been proposed.

The state of technology at the present time is that the largest turbines that realistically can be used in South Africa have a nominal generation capacity of 3 MW. Hence as a minimum 100 turbines are needed to achieve the production capacity desired by the developer. Analysis has confirmed that all three clusters are required to carry the full 300 MW of wind generation capacity and ensure that mandatory ecological sustainability targets were not severely compromised. For this reason the proposed Kouga Wind Farm EIA has undergone major iterations of the project development plan in order to find the most acceptable solution from an environmental perspective and thus many alternative layouts have been assessed in an iterative process to arrive at Layout 3 which was assessed in this Report.

The scale of the facility will have an influence on the risk. To date it has been shown that large turbines kill the same number of birds as smaller ones. This means that with newer technology and larger turbines, fewer turbines are needed for the same power generation, possibly resulting in less mortalities altogether. By using a combination of the largest turbine models in the range of 2.3 to 3.0 MW each, the Kouga Wind Farm has responded positively to the issue of turbine size. For optimal wind power generation, relatively large spaces are required between turbines in order to avoid wake and turbulence effects. It can also have an effect on the number of collisions with birds. This constraint was responded to by placing turbines into all three clusters.

The no-go alternative is included in the EIA as a benchmark against which to assess the impacts (positive and negative) of the proposed wind power project. Government's long-term goal is the establishment of a renewable energy industry that will offer a sustainable, fully non-subsidised alternative to coal based power generation. Government's 10-year target is 10 000 GWh renewable energy contributions to final energy consumption by 2013, which is to be produced primarily from biomass, wind, solar and small-scale hydro. This is approximately 4% (1 667 MW) of the projected electricity demand for 2013 (41 539 MW), and is equivalent to replacing two 660 MW units of Eskom's combined coal fired power stations. The realisation of these targets would be greatly reduced should the no-go option be preferred over installing the wind power turbines on the Kouga coast.

CONCLUSIONS

The EIA process undertaken for the proposed wind farm and summarised in this Revised Draft EIR aims to ensure that the can make an informed decision on the environmental acceptability or otherwise of this proposed development.

The Revised Draft EIR for the proposed Kouga Wind Farm presents the findings of specialist investigations of nine key areas of concern that were identified during the Scoping and Impact Assessment process. The configuration of the roads and turbines were adjusted on the basis of the initial findings and there is further intention to optimise the layout and design based on the following:

- The proposed project will be developed in phases with the first phase having no more than 50 turbines
- Micro-siting which will be informed by engineering and environmental specialists
- Monitoring undertaken during the first phase of the development that will inform final detailed planning decisions for subsequent phases.

Construction Impacts

In weighing up the Construction Impacts after mitigation it appears the High positive local, regional, and national impacts outweigh the High, becoming Medium to Low negative impacts and that when, taking all the impacts into account, there is a positive bias.

When weighing up the fact that less than 1% of the area will be permanently altered and that all High negative biophysical impacts can be adequately mitigated, juxtaposed with the fact that there is a pressing need for investment, expenditure and employment in the area, it is concluded that the High positive social impacts which address these social issues outweigh the residual (after mitigation) Medium to Low negative biophysical impacts.

In weighing up all the other positive and negative construction impacts that were not rated as High before or after mitigation, it is concluded that they do not have a significant cumulative negative bearing on the environmental acceptance of this development as long as they are mitigated/ enhanced as required.

A summary of all the construction impacts is presented in Table 1.

Table 1: Summary of the Construction Phase Impacts Significance Ratings

	Section	Impact	Pre-Mitigation Significance	Post-Mitigation Significance
Vegetation				
Fynbos, Renosterveld and Dune Strandveld				
	7	Direct loss of vegetation and habitat	High	Medium
	7	Reduction or changes to ecological processes and functioning and habitat fragmentation	Medium	Low
	7	Loss of species of special concern and SSC habitat	Medium	Low
	7	Changes in natural fire regime	Low (+ve)	Medium (+ve)
	7	Increased risk of alien invasion	Medium	Low
Thicket and Dune Forest				
	7	Direct loss of vegetation and habitat	Medium	Low
	7	Reduction or changes to ecological processes and functioning and habitat fragmentation	High	Low
	7	Loss of species of special concern and SSC habitat	Medium	Low
Rocky Outcrops				
	7	Direct loss of vegetation and habitat	High	Low
	7	Reduction or changes to ecological processes and functioning and habitat fragmentation	High	Low
	7	Loss of species of special concern and SSC habitat	Medium	Low
Seeps, Wetlands and Streams				
	7	Direct loss of vegetation and habitat	High	Medium
	7	Reduction or changes to ecological processes and functioning and habitat fragmentation	High	Medium
	7	Loss of species of special concern and SSC habitat	Medium	Low
	7	Increased risk of alien invasion	Medium	Low
Terrestrial Fauna				
	9	Reptiles, Amphibians and Mammals: Habitat destruction	High	Medium
	9	Reptiles, Amphibians and Mammals: Road mortality from trucks, cars and other service vehicles	High	Low
	9	Reptiles and Mammals: Fauna harmed by fences	Medium	Low
	9	Reptiles and Amphibians: Corridor continuity	Medium	Medium
	9	Mammals: Corridor continuity	Medium	Low
	9	Mammals: Poaching	Low	Low
Birds				
	11	Habitat destruction caused by construction of turbines	Low	Low
	11	Disturbance to birds	Medium	Medium
	11	Habitat destruction from construction of associated	Low	Low

		infrastructure		
Visual				
	14	Large construction site and activities on sensitive viewers (*Status may be negative or positive depending on the viewer- i.e. subjective)	Medium (+ve / -ve)*	Medium (+ve / -ve)*
Noise				
	15	Impact of the construction noise on the NSAs	Low	Low
Socio-Economic				
	16	Disturbance of land-owners and users on the site	Medium	Low
	16	Disturbance of surrounding land users	Low	Low
	16	Disturbance of surrounding town residents	Medium	Low
	16	Associated project expenditure and investment	Medium (+ve)	High (+ve)
	16	Suppression of tourism	Medium	Low
	16	Increase in employment	Medium (+ve)	High (+ve)
	16	Crime associated with influx of work force	Medium	Low

As the decommissioning stage should have similar impacts to construction the same conclusions can thus be deduced for decommissioning.

Operational Impacts

In weighing up the Operational Impacts after mitigation it appears the High positive local, regional and national benefits outweigh the High negative local impacts and that when, taking all the impacts into account, there is a positive bias.

The impacts with residual (after mitigation) High negative significance are all related to changes in the views due to the wind farm. These predominantly impact on the local population and holiday makers. The residual impacts with a High positive impact are also socio-cultural and have a significant positive spinoff for the regional and national economy as well as the local community in general and more specifically the HDSAs of the area.

It would thus appear the groups most negatively impacted on by the proposed development also have some gain from the same development. The fact that wind energy will help reduce green house gas emissions and thus also help reduce global warming and related sea level rise in the long run, may also have a positive impact in the future on the communities of coastal towns like St Francis Bay which is already experiencing significant impacts from sea shore erosion. Furthermore, the benefit of electricity to those fortunate enough to have it in the Kouga area must also be taken into consideration when weighing up the pros and cons of this project especially given the dire situation the country faces if significant generation capacity is not brought on line in a very short time frame (one of wind energy's advantages is that it can be brought on line faster than any other economically viable large scale energy generation technique).

The benefits regionally, nationally and globally due to renewable energy over conventional energy generation are comprehensively documented and the exponential increase of renewable energy production globally is directly linked to these benefits for the global community. The South African Government has also recognized these benefits and that is why renewable energy is such an important part of the governments planning for future energy production in its integrated resource planning. These regional and national benefits also need to be weighed up against the local negative impacts.

The two main negative bio-physical impacts are the contentious impacts on birds and bats. However, the specialists involved believe that with the phasing of the project and the correct monitoring procedures these impacts are no longer of a High negative significance rating and are not fatal flaws of the proposed development.

In summary, there are High positive regional and national spinoffs from the proposed project and the local communities who are most negatively impacted are also the ones who gain the most from the related High positive benefits. Thus, there appears to be an overarching positive bias to the development if the project is looked at from a local, regional and national level.

In weighing up all the other positive and negative operational impacts that were not rated as High before or after mitigation it is concluded that they do not have a significant cumulative negative bearing on the environmental acceptance of this development which would alter the positive bias from the highly significant impacts weighed up above. This is as long as all the impacts are mitigated/ enhanced as required.

A summary of all the operation impacts are presented in Table 2.

Table 2: Summary of the Operational Phase Impacts Significance Ratings

	Section	Impact	Pre-Mitigation Significance	Post-Mitigation Significance
Vegetation				
Fynbos, Renosterveld and Dune Strandveld				
	7	Direct loss of vegetation and habitat	Medium	Low
	7	Reduction or changes to ecological processes and functioning and habitat fragmentation	Medium	Low
	7	Loss of species of special concern and SSC habitat	Medium	Low
	7	Changes in natural fire regime	Low (+Ve)	Medium (+Ve)
	7	Increased risk of alien invasion	Medium	Low
Thicket and Dune Forest				
	7	Direct loss of vegetation and habitat	Medium	Low
	7	Reduction or changes to ecological processes and functioning and habitat fragmentation	Medium	Low
	7	Loss of species of special concern and SSC habitat	Medium	Low
Rocky Outcrops				
	7	Direct loss of vegetation and habitat	Medium	Low
	7	Reduction or changes to ecological processes and functioning and habitat fragmentation	Medium	Low
	7	Loss of species of special concern and SSC habitat	High	Medium
Seeps, Wetlands and Streams				
	7	Direct loss of vegetation and habitat	Medium	Low
	7	Reduction or changes to ecological processes and functioning and habitat fragmentation	High	Medium
	7	Loss of species of special concern and SSC habitat	Medium	Low
	7	Increased risk of alien invasion	Medium	Low
Ground Water, Hydrology And Surface/ Groundwater Links With Wetlands				
	8	Impact on Ground Water, Hydrology and surface/ groundwater links with wetlands	Medium	Low
Terrestrial Fauna				
	9	Reptiles, Amphibians and Mammals: Habitat destruction	Medium (+Ve)	Medium (+Ve)
	9	Reptiles and Amphibians: Road mortality from trucks, cars and other service vehicles	Low	Very Low
	9	Mammals: Road mortality from trucks, cars and other service vehicles	Very Low	Insignificant
	9	Reptiles and Mammals: Fauna harmed by fences	Medium	Low
	9	Reptiles, Amphibians and Mammals: Corridor continuity	Medium (+Ve)	Medium (+Ve)
	9	Mammals: Poaching	Low	Low (+Ve)
Bats				
	10	Site-specific mortality	Medium	Low

	Section	Impact	Pre-Mitigation Significance	Post-Mitigation Significance
	10	Depression of recruitment of bats through mass mortality caused by several wind farms	High	Low
Birds				
	11	Collision of birds with turbines	High	Medium
	11	Disturbance to birds	Medium	Medium
Cultural Heritage				
	12	Impact on Colonial Period farmsteads or structures, pre-dating 60 years of age	No Impact	No Impact
	12	Impacts on Colonial/ Historical Period cemeteries	No Impact	No Impact
	12	Impacts on Site 1.3- low density primarily Early Stone Age (ESA) Acheulean scatter	Low To Very Low	Low To Very Low
	12	Impacts on Site 2.3- significant ESA and MSA site	High	High/ Medium (+Ve)
	12	Impacts on the intangible heritage resources	Neutral	Neutral
	12	Impacts on the cultural landscapes and viewscapes - for sensitive visual cultural receptors	High	High
	12	Impacts on the cultural landscapes and viewscapes- With regard to conservation of heritage resources	High	High (+Ve)
Palaeontology				
	13	Impacts on palaeontology	Low	Low
Visual				
	14	Change in mixed coastal resort - agricultural landscape	High (Reducing Over Time)	High (Reducing Over Time)
	14	Existing views of sensitive visual receptors (*Status may be negative or positive depending on the viewer- i.e. subjective)	High (Possibly Reducing Over Time) (+Ve / -Ve)*	High (Possibly Reducing Over Time) (+Ve / -Ve)*
	14	Night lighting on sensitive viewers	Medium	Medium
	14	Shadow flicker of wind turbines on sensitive viewers	Low	Very Low
Noise				
	15	Operational noise on the NSAs (except NSA 7, 8, 9, Ext 1, west Ext 1 and west Ext 2)	Low	Low
	15	Operational noise on NSA 7, 8, 9, Ext 1, west Ext 1 and west Ext 2	High	Low
Socio-Economic				
	16	Disturbance of land-owners and users on the site	Medium,	Low
	16	Disturbance of surrounding land users	Medium (-Ve To Neutral)	Low (-Ve To Neutral)
	16	Disturbance of surrounding town residents	Low	Low
	16	Financial benefits of the wind farm operation (local, regional and national)	Medium (+Ve)	High (+Ve)
	16	Suppression of tourism	Low (-Ve To Neutral)	Medium (-Ve To Neutral)
	16	Increase in employment	Medium (+Ve)	High (+Ve)
	16	Decline in property value	Medium	Low
Aerodromes				
	17	Impact on Aerodromes	High	No Impact

Cumulative Impacts

As has been indicated in the section summarising cumulative impacts above, in weighing up the potential negative and positive cumulative impacts, the balance of probabilities is that the positive cumulative impacts outweigh the negative.

RECOMMENDATIONS

Based on the findings of the EIA process undertaken for the proposed Kouga Wind Farm Development no fatal flaws were identified. As outlined in the Conclusion section above, when weighing up the residual positive and negative impacts for all the phases of the project, there is an inherent positive bias. All the communities that are impacted negatively will also gain positively from the project so no communities are benefiting at the total expense of another.

Furthermore, the positive residual impacts with high significance are local, regional and national whereas all the highly significant residual negative impacts are local, subjective socio-cultural impacts that will not endanger any biophysical environments. Finally, there are also the non-project specific significant positive impacts of renewable energy over conventional energy production, which are both biophysical and socio-cultural, with far reaching and long term implications.

In weighing up the potential negative and positive cumulative impacts, the balance of probabilities is that the positive cumulative impacts far outweigh the negative. Based on all of the above, it is recommended that the development be authorised to proceed as long as the mitigation measures identified in this EIA and incorporated in the Draft EMP are implemented.

AMENDMENTS

This Revised Draft Environmental Impact Report (Revised Draft EIR) is an updated version of the Draft EIR which was released for public review. During the public participation process linked to the initial Draft Environmental Impact Report, numerous questions and issues were raised by Interested and Affected Parties (I&APs) which resulted in the decision to revise the Report to address all these questions and issues.

The Revised Draft EIR has been reworked to better present and clarify project information, identified impacts and the assessment thereof. Where necessary, the specialist studies were also updated and amended to better reflect the findings of the studies or to address new issues raised by I&APs. Additional specialist studies were also undertaken to provide additional assessment of impacts which were not assessed in the Draft EIR. Although the proposed project and the overall findings of the original Report did not change it was decided that the revised report should be distributed for a second round of public comment.

The Revised Draft EIR contains the following main revisions and/or additions:

- Details on the Amendment of the EIA application
- Extensive revision of all Chapters
- Inclusion of additional chapters on:
  - EIA process
  - Public Participation Process
  - Screened Impacts
  - Cumulative Impacts
  - Aerodromes
  - Micro-siting
  - Environmental Management Programme
- Updating of all Specialist studies
- Updating of all sections in the EIR relating to the Specialist studies
- Additional Specialist Studies including:
  - Paleontological study
  - Hydrology Study
- Revision of the Issues and Response Report (all new questions and comments from the EIA phase have been noted and responded to in the updated report found in the appendix)
- Revision of the Environmental Management Programme
- Updating of maps and diagrams

It must be noted that the Revised Draft EIR has been split into three Volumes. Volume 1 comprises the EIR with Volume 2 and Volume 3 containing the Appendices.

Environmental Impact Assessment for a Wind Farm in the Kouga Local Municipality

Revised Draft Environmental Impact Report

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(The appendices are presented in Volumes 2 and 3, in two separate documents to this one)

VOLUME 2

VOLUME 3

ACRONYMS

AIA	Archaeological Impact Assessments
ASAPA	Association of Southern African Professional Archaeologist
CBA	Critical Biodiversity Areas
BID	Background Information Document
BBBEE	Broad-Based Black Economic Empowerment
CSI	Corporate Social Investment
ESA	Ecological Support Areas
GIBB	Arcus GIBB (Pty) Ltd
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning
DTS	Desk Top Study
EEZ	Exclusive Economic Zone
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EIR	Environmental Impact Assessment Report
EMP	Environmental Management Programme
EMS	Environmental Management Systems
EWT	Endangered Wildlife Trust
ERM	Environmental Resources Management
GN	Government Notice
GRBSP	Garden Route Biodiversity Sector Plan
HIA	Heritage Impact Assessment
HDSA	Historically Disadvantaged South African
I&APs	Interested & Affected Parties
IEM	Integrated Environmental Management
IDP	Integrated Development Plan
IPP	Independent Power Producer
IRP2010	Integrated Resource Plan
LSA	Later Stone Age
MAP	Mean Annual Precipitation
MTRMP	Medium Term Risk Mitigation Plan
NSBA	National Spatial Biodiversity Assessment
NGOs	Nongovernmental Organisations
PIA	Palaeontological Heritage Impact Assessments
REF	Renewable Energy Facility
REFiT	Renewable Energy Feed In Tariff
SANRAL	South African National Roads Agency Limited
SANS	South African National Standard
SAHRA	South African Heritage Resources Agency
SDP	Spatial Development Plan
SEF	Strategic Environmental Framework
ToR	Terms of Reference
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organisation
WTG	Wind Turbine Generator

ABBREVIATIONS

%	Percent
cm	Centimetres
dB(A)	DeciBels Adjusted
Kg	Kilograms
km	Kilometres
kV	Kilovolt
Kya	Thousand Years Ago
m	Metres
MW	Mega Watts
Mya	Million Years Ago
R	South African Rands

DEFINITIONS AND TERMS

Alternative: A possible course of action, in place of another, that would meet the same purpose and need (of the proposal). Alternatives can refer to any of the following but are not limited to: alternative sites for development, alternative projects for a particular site, alternative site layouts, alternative designs, alternative processes and alternative materials.

Blade: The part of the turbine that is moved by the wind, there are three blades on a typical wind turbine.

Environment: The surroundings within which humans exist and that are made up of:

i. the land, water and atmosphere of the earth
ii. micro-organisms, plant and animal life
iii. any part or combination of (i) and (ii) and the interrelationships among and between them
iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being. This includes the economic, social, cultural, historical and political circumstances, conditions and objects that affect the existence and development of an individual, organism or group.

Environmental Assessment: The generic term for all forms of environmental assessment for projects, plans, programmes or policies. This includes methods/tools such as environmental impact assessment, strategic environmental assessment, sustainability assessment and risk assessment.

Hub: The centre of a wind generator rotor, which holds the blades in place and attaches to the shaft.

Hub Height: The distance from ground level to the centre of the hub.

Impact: The positive or negative effects on human well-being and / or on the environment.

Interested and Affected Parties: Individuals, communities or groups, other than the proponent or the authorities, whose interests may be positively or negatively affected by the proposal or activity and/ or who are concerned with a proposal or activity and its consequences.

Laydown area: Area designated as the construction area including the layout, storage of construction materials and the construction camp

Lead Authority (or Decision-making Authority): The environmental authority at the national, provincial or local level entrusted in terms of legislation, with the responsibility for granting approval to a proposal or allocating resources and for directing or coordinating the assessment of a proposal that affects a number of authorities.

Mitigate: The implementation of practical measures to reduce adverse impacts or enhance beneficial impacts of an action.

Nacelle: The protective covering over a generator or motor.

Photovoltaic Cell (PV cell): A device that converts the energy of sunlight directly into electricity by the photovoltaic effect.

Photovoltaic Panel (PV panel): A packaged interconnected assembly of PV cells.

A Photovoltaic Array (PV array): Linked collection of photovoltaic panels which will make up the solar installation on the proposed project site.

Public Participation: The process of engagement between stakeholders (the proponent, authorities and I&APs) during the planning, assessment, implementation and/or management of proposals or activities.

Rotor: Consists of the blade and hub, the mechanical link between the blades and the low-speed shaft.

Rotor Diameter: The diameter of a circle swept by the rotor measured from blade tip to blade tip.

Scoping: The process of determining the spatial and temporal boundaries (i.e. extent) and key issues addressed in an environmental assessment. The main purpose of scoping is to focus the environmental assessment on a manageable number of important questions. Scoping should also ensure that only significant issues and reasonable alternatives are examined.

Significance: Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e. intensity, duration and likelihood). Impact significance is the value placed on the change by different affected parties (i.e. level of significance and acceptability). It is an anthropocentric concept, which makes use of value judgments and science-based criteria (i.e. biophysical, social and economic).

Wind measuring mast: A mast installed prior to wind farm development to monitor wind speed and direction.

1 INTRODUCTION

1.1 Project Overview

Red Cap Investments (Pty) Ltd (Red Cap) is proposing to develop a wind farm of up to 121 wind turbines near the villages of St Francis Bay, Oyster Bay and Paradise Beach in the Eastern Cape.

Such developments are required to undergo an Environmental Impact Assessment (EIA) process in accordance with regulatory requirements stipulated in the EIA Regulations promulgated in terms of Section 24(5) of the National Environmental Management Act (NEMA) (Act No. 107 of 1998), as amended. This Revised Draft Environmental Impact Report (Revised Draft EIR) has been compiled as part of this EIA process.

The proposed wind farm site spans three areas:

- The Eastern Cluster (27 turbines) close to Cape St Francis and Paradise Beach
- The Central Cluster (41 turbines) close to Oyster Bay
- The Western Cluster (53 turbines) close to the mouth of the Tsitsikamma River.

A regional map showing the study area is provided (Figure 12).

The proposed layout of the wind turbines was altered through an iterative process with input from all the environmental and technical specialists as part of the EIA process. The aim of this iterative process was to ensure the final layout would not have any insurmountable environmental impacts. This was achieved by moving any problematic turbines, roads or associated infrastructure and then reassessing the new layout with input from all the specialists. The final layout resulting from this process is termed “Layout 3” and it is the layout which is assessed in this Revised Draft EIR.

As part of this iterative process, the developer agreed to phase the development with the first phase consisting of a maximum of 50 turbines. This was to ensure that any identified potential impacts which had a high uncertainty could be adequately monitored and more easily mitigated. If monitoring programmes revealed significant impacts, these could then be addressed and mitigated for, in the current and future phases.

Due to the large distances between turbines the vast majority of the total 9 382ha of land, that is being investigated for the wind farm, will not be disturbed. During the first phase less than 1% of the land will be permanently altered with the full wind farm resulting in at maximum 1% of the land being permanently altered. As this 1% is spread over the 9 382ha the footprint of the development is never substantial in any one area.

No application was made as part of this process for the power lines that will feed the electricity from this project into the grid. Eskom has indicated that they will take the responsibility for connecting the wind farm to the grid, inclusive of any grid related EIAs, and as such they are already undertaking a Basic Assessment process for one such line that will run through the Central Cluster. The developer is also in

discussions with Eskom regarding the need for other possible short distance power lines to feed the electricity generated from the other clusters into the grid. Any additional power line proposals will undergo their own basic assessments once finality is reached with Eskom on the way forward.

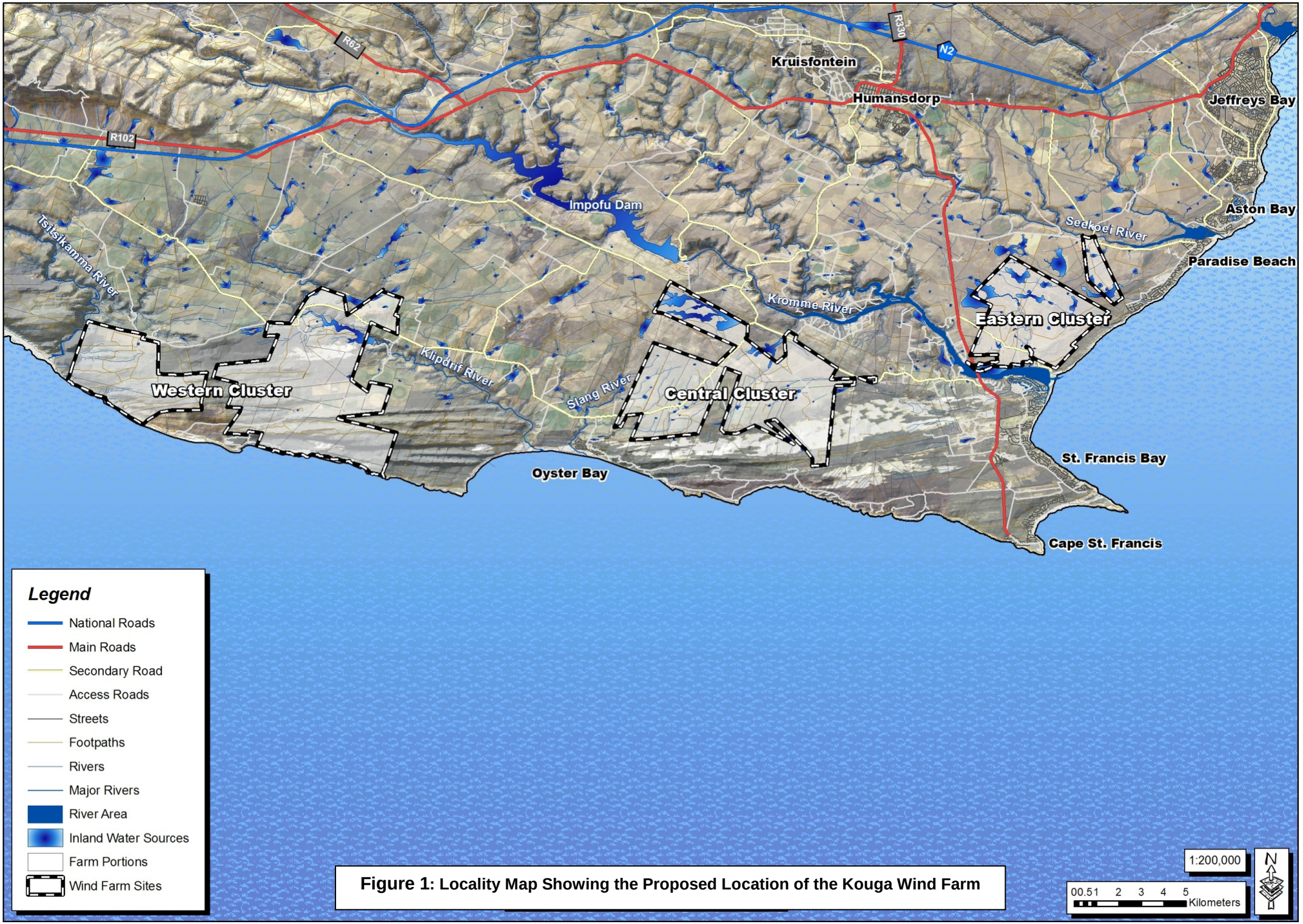

Figure 1: Locality Map Showing the Proposed Location of the Kouga Wind Farm

1.2 Project Justification

1.2.1 Background

The bulk of South Africa's electricity is generated from coal (90%). The Eastern Cape Province has no significant electricity generation capacity as the majority of generation capacity is situated outside its borders in the Gauteng and Western Cape Provinces.

1.2.2 Objectives of the project

South Africa is currently experiencing an energy supply crisis. The proposed project aims to provide much needed additional generation capacity into the national grid. Furthermore, the project aims to increase energy security and reduce greenhouse gas emissions, both regionally and nationally, through reduced dependency on coal as a source of electricity (Draft IRP 2010). Red Cap has initiated the Clean Development Mechanism (CDM) process to facilitate the sale of carbon credits from the project.

1.2.3 Motivation for the proposed activity

South Africa currently relies almost completely on fossil fuels as a primary energy source. Thus, alternative means of producing energy, such as renewable energy sources, which have less impact on the environment compared to fossil fuels, have to be considered. Refer to Section 19.1 and Appendix C for a more detailed overview on the viability and benefits of wind energy.

1.2.4 Renewable energy

Renewable energy will contribute to the diversification of energy resources through the implementation of a properly managed programme of action that will provide sufficient incentive for the sustainable development of the renewable energy-based industries (DME 1999).

1.2.5 Why wind energy?

Renewable energy stimulates sustainable development. Further, it will contribute towards the country meeting its international commitments made in respect of the reduction in green house gas emissions, as well as government's objectives set out in the White Paper on Renewable Energy. Wind energy is plentiful, renewable, widely distributed, clean and reduces greenhouse gas emissions when it displaces fossil-fuel derived electricity.

1.2.6 Why this site?

The proposed wind farm site was chosen based on the close proximity of the Eskom grid, perceived low environmental sensitivity due to the vast majority of land already being transformed, and the site location far from large urban areas. Wind modelling indicated that this site was situated in an area that has one of the premier wind regimes in South Africa and thus the potential to provide substantial renewable wind energy to the country by utilising the fewest turbines possible.

1.3 Environmental Impact Assessment Process

1.3.1 EIA Process Review / Summary

The National Environmental Management Act (Act No. 107 of 1998) (NEMA), as amended, EIA Regulations (Government Notices No R 385, R386 and R387) identify a number of "listed activities" for which authorisation is required. In order to obtain this authorisation, either a "Basic Assessment Process" or "Scoping and EIA Process" must be followed. Basic Assessments are typically required for activities that have less detrimental environmental impact, whilst the Scoping and EIA process is required for larger projects that typically have potentially significant detrimental impact on the environment. Both processes include a regulated public participation process (PPP). This environmental authorisation process commenced with the Environmental Scoping Phase. Following submission of an Environmental Scoping Report and associated Plan of Study for the Impact Assessment Phase, to and approval by the Department of Environmental Affairs (DEA), the Impact Assessment Phase is initiated. The prescribed PPP runs concurrently with both Phases.

The aim of Scoping is to determine the issues, concerns and queries of IAPs, potential impacts, potential alternatives, specialist studies required, and the scope of the Impact Assessment Phase.

The Environmental Scoping Phase was undertaken in accordance with the requirements of sections 24 and 24D of the NEMA, as read with GNR 385 (Regulations 27-36), 386 and 387 of the NEMA and the Integrated Environmental Management (IEM) Information Series (DEAT, 2002). The objectives of the Scoping Phase are to:

- Ensure that the process is open and transparent and involves the authorities, proponent, project team, stakeholders and general public
- Identify the important characteristics of the affected environment
- Ensure that feasible alternatives are identified and selected for further assessment
- Assess and determine possible impacts of the proposed project on the biophysical and socio-economic environment
- Ensure compliance with the relevant legislation

The Impact Assessment Phase focuses on the investigation and evaluation of the impacts, issues and alternatives identified during the Scoping Phase. Where necessary those impacts or issues that required detailed assessment are investigated further. All identified impacts are assessed and rated in terms of their environmental impact significance. Appropriate mitigation measures and recommendations are also formulated to minimize the potential negative environmental impacts. The Impact Assessment Phase thus comprises the actual assessment of potential impacts and the compilation of a comprehensive EIR. The Impact Assessment Phase also includes the compilation of a Draft Environmental Management Plan / Programme (EMP) for the design, construction and operational phases of the project.

Objectives of the Impact Assessment Phase and Report are to:

- Provide a detailed description of the proposed activity and the need and desirability of the project
- Provide a description of the property on which the activity is to be undertaken and the environment that may be affected by the activity
- Outline the PPP undertaken
- Discuss the alternatives of the project, including any benefits and negate impacts the alternatives may have on the environment and community
- Provide an indication of the methodology used in determining the significance of the potential environmental impacts
- Evaluate the impacts and provide mitigation measures
- Provide a summary of findings and recommendation of any specialist report.

Table 1 summarises the Scoping and EIA Process, which is required in terms of the NEMA EIA Regulations.

1.3.2 EIA Application Form

The Application component requires completion of the appropriate registration form by the Environmental Assessment Practitioner (EAP) and the proponent and the subsequent submission and registration of the project with the controlling authority.

An Application Form was completed and submitted to DEA on 02 December 2009. By way of a letter dated 15 January 2010, DEA acknowledged receipt of the Application Form on 4 January 2010. Reference number 12/12/20/1756 was assigned to the project.

An amended Application Form was then submitted to DEA on 14 December 2010. The amendment informed DEA of the change of EAP from Dr. N. Klages to Mr. R. Stow and included additional listed activities relating to the crossing of minor drainage lines, transformation of indigenous vegetation, abstraction of ground water and transformation of undeveloped land which had not been indentified at the time of the submission of the original Application.

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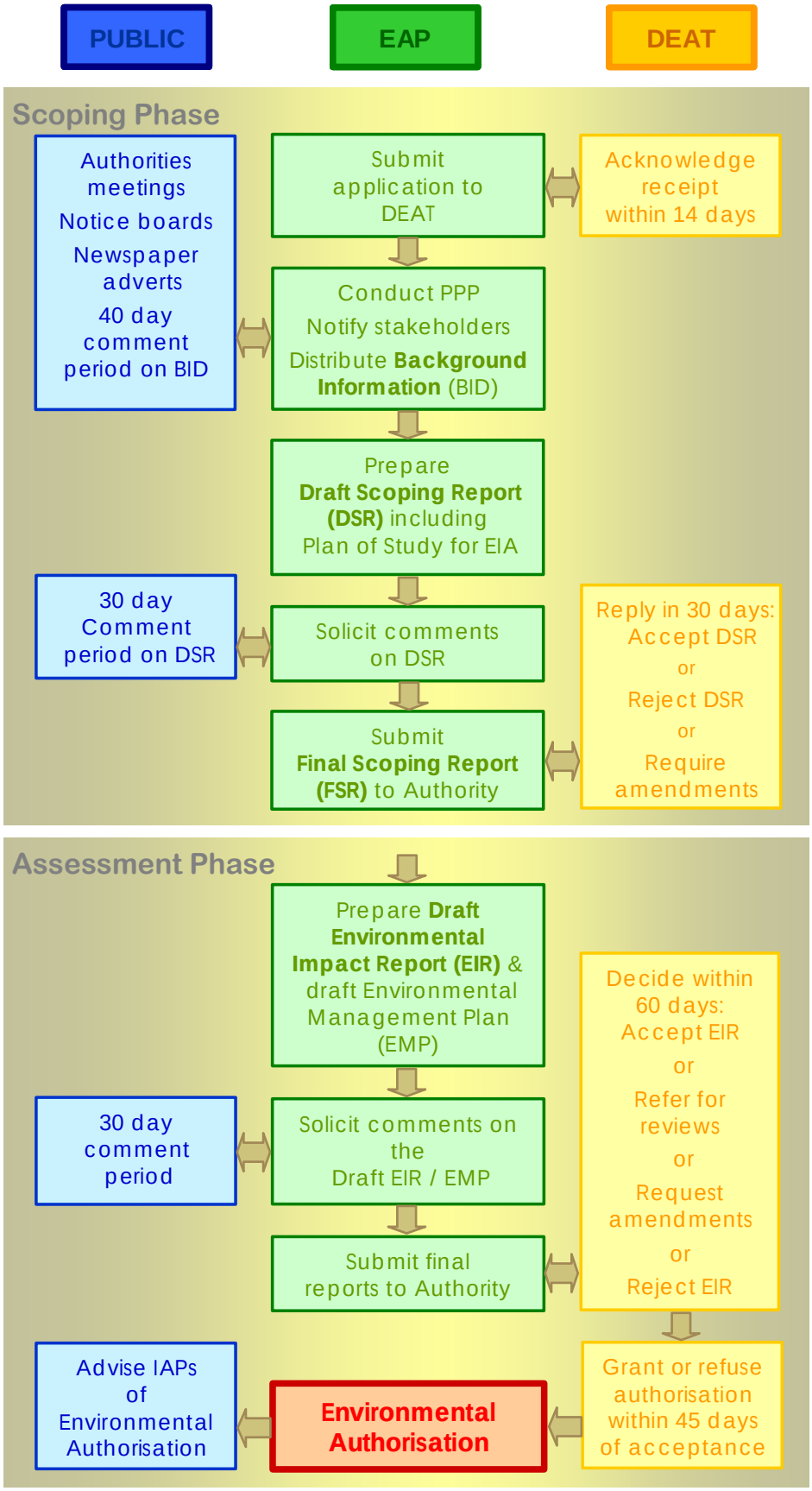


Figure 2: Summary of the Scoping and EIA Process

1.4 Public Participation Process

1.4.1 Objectives

Public participation is the involvement of all parties who potentially have an interest in a development or project, or may be affected by it, directly or indirectly. The process ensures an open, participatory approach to the study, the purpose of which is to ensure that all the impacts are identified and that the decision-making process is undertaken in an informed, transparent and accountable manner.

The objectives of public participation in an EIA are to provide sufficient and accessible information to stakeholders in an objective manner to assist them to:

During the Scoping Phase:

- Raise issues of concern and suggestions for enhanced benefits
- Verify that their issues have been recorded
- Assist in commenting on feasible alternatives
- Contribute relevant local information and knowledge to the environmental assessment.

During the EIA Phase:

- Contribute relevant local information and knowledge to the environmental assessment
- Verify that their issues have been considered in the environmental investigations
- Comment on the findings of the environmental assessment.

During the Decision-making Phase:

- Be notified of the decision by the competent environmental authority on whether or not the project may proceed, and provide the opportunity for appeal.

1.4.2 Scoping Phase Public Participation

The Public Participation Process (PPP) undertaken for this project was undertaken in compliance with Chapter 6 Regulation 56 of the EIA Regulations related to public participation processes.

(a) I&AP Notification and Registration

The proposed activity was advertised in the legal section of *The Herald* on 29 July 2009 and *Our Times* on 30 July 2009. A change in the scope of works and the addition of more farms necessitated another advertisement on 5 and 8 October 2009. A total of 6 notice boards were put up during the period 1 - 3 October 2009 along main access roads leading to the farm clusters. An additional notice board was displayed in St Francis Bay at the Spar Shopping Centre.

A Background Information Document (BID) was distributed to all I&APs via email, fax or hard copy on 1 October 2009. The BID provided a summary of the details of the project as well as the EIA process that was to follow. The BID distribution included hand delivery to all I&APs bordering or living on the study site. The BID was also sent via electronic mail on 28 September 2009 to the following authorities:

- Department of Economic Development and Environmental Affairs (DEDEA)
- South African Heritage Resources Agency (SAHRA)
- Kouga Municipality Ward 1 Councillor
- Civil Aviation Authority (CAA).

Copies of all public notification documents are included in Appendix D1.

As part of the requirements for NEMA EIA Regulation 57, GIBB developed, maintained and is constantly updating an electronic Interested & Affected Party (I&AP) Register for the project which includes role players, key stakeholders and the general public. Appendix D3 contains the latest I&AP Register.

(b) Landowner Correspondence

Land owners were contacted telephonically in the week prior to a planned site visit by the EIA Team. The land owners were given BIDs and engaged on a one-on-one basis during the period 1 – 3 October 2009. A list of all the land owners is included in the I&AP database (Appendix D3).

(c) Public Meetings

Two public meetings were held back to back in Oyster Bay and St Francis Bay on Thursday, 19 November 2009 during the Scoping Phase of the EIA. Along with the EAP, the proponent and the consulting engineers were also present to explain the nature of the development, the EIA process and to answer questions from the public. Issues raised were captured in an Issues & Response Report (IRR), which was subsequently sent to registered I&APs on 17 December 2009 so that they could see whether their concerns and comments had been captured correctly.

(d) Stakeholder Consultation

A one-on-one meeting was held with Ward Councillor B. Rheede (Ward 2) on 01 October 2009 to introduce the EIA process to him as well as to invite him to comment on the project.

(e) General Communication

In addition to consultations with key stakeholders, general correspondence has been via email and fax with telephonic discussions with I&APs regarding the need for the development, concerns and comments and the status of the project. All comments submitted have been recorded and responded to in the IRR (Appendix D8).

(f) Public Review

The Draft Scoping Report (DSR) was released for public comment on 14 April 2010 and was placed in libraries in Humansdorp and Jeffrey's Bay, the Ward 2 Councillors' offices in St Francis Bay; the GIBB offices in Greenacres, Port Elizabeth and on the Arcus GIBB website (http://projects.gibb.co.za) in order to allow the public to view and comment as appropriate. The DSR was made available for 41 days, excluding public holidays.

All new comments and issues were incorporated into the Final Scoping Report (FSR) which was submitted to the DEA on 27 May 2010. The FSR and associated Plan of Study (Pos) for EIA was accepted by the DEA on 30 July 2010 with conditions as stipulated in their acceptance letter provided in the Appendix B2.

1.4.3 Impact Assessment Phase Public Participation

In the Impact Assessment Phase, the public involvement initiated in the Scoping Phase was continued, thereby allowing the authorities, stakeholders and I&APs continued interaction in the EIA process.

(a) Distribution of the Draft EIR for Public Comment

The IA&Ps where notified of the issuing of the Draft EIR for comment on 11 and 12 November 2011 by email and by adverts in the *The Herald* and *Our Times*. Also, large posters were erected along major routes in and around the area of the proposed development and handouts were left at shopping centres in the area. Copies of the notification documents are attached in Appendix D2.

The report was put up on the GIBB website on 11 November 2011 and hard copies and CDs lodged in the following public venues on 12 November 2011:

- St Francis Bay Municipal Offices- Councilors Office, Sea Vista Community Leaders Office and at the front desk
- Jeffrey's Bay Public Library
- Humansdorp Public Library
- Oyster Bay Estates Office (Oesterbaai Eiendomme)

The Executive Summary of the Draft EIR was translated into Afrikaans and isiXhosa. Copies of the three language versions of the Executive Summary of the Draft EIR were distributed to registered I&APs via GIBB's website, email and as hardcopies.

Issues raised by I&APs were captured in the IRR (Appendix D8). Copies of the original comments received during the Impact Assessment Phase are included in Appendix D7.

(b) Public Meetings

During the EIA Phase, public meetings were held at the Oyster Bay Community Hall on 23 November 2010, at the Talhado Pre-Primary School in Sea Vista on 24 November 2010 and at the St Francis Bowling Club Hall on 25 November 2010. Along with the EAP, the proponent and the consulting engineers were also present to explain the nature of the development, the EIA process undertaken, the findings of the EIA and to answer questions from the public. Draft minutes of the three public meetings, plus the presentations shown at the public meetings, were sent to registered I&APs on 10 December 2010 for review (Appendix D4).

(c) Focus Group Meetings

A focus group meeting was held with representatives of the Kouga Black Chamber of Commerce in Jeffrey's Bay on 9 December 2010 attended by the EAP and the project proponent.

A focus group meeting was held with Chief Michael Williams and the Gamtkwqua Khoisan First Nation in Jeffrey's Bay on 20 December 2010 attended by GIBB and the project proponent.

Minutes of these meeting are captured in Appendix D5.

(d) Extension of Draft EIR Comment Period

On request from I&APs, GIBB extended the public comment period to 08 January 2011.

(e) Distribution of the Revised Draft EIR for Public Comment

This Revised Draft Environmental Impact Report (Revised Draft EIR) is an updated version of the Draft EIR released for public review in November 2010. During the public participation process linked to the initial Draft EIR a number of questions and issues were raised by I&APs and the developer. The decision was made that the best way to address these questions and issues was to update and rework the report and redistribute a **Revised** Draft EIR (this document) to the public for a second round of comment.

The Revised Draft EIR has been reworked to better present and clarify project information, identified impacts and the assessment thereof. Where necessary, the specialist studies were also updated and amended to better reflect the findings of the studies or to address new issues. Additional specialist studies were also undertaken to provide additional assessment of impacts which were not assessed in the original Draft EIR.

This Revised Draft EIR was distributed for a 30 day public comment period in January 2011.

(f) Compilation and Submission of the Final EIR to the DEA

Based on the comments received and where appropriate, the Final Environmental Impact Report (Final EIR) will be updated and amended before submission of the Final EIR to the DEA.

I&APs will also be notified of the submission and be given access to the Final EIR should they wish to submit additional comments to the authorities.

In terms of legal requirements, a crucial objective of the Draft EIA Report is to satisfy the requirements of Sections 32, 33 and 34 of the NEMA EIA Regulations. These sections regulate and prescribe the content of the EIA Report and specify the type of supporting information that must accompany the submission of the report to the authorities. An overview of where the requirements are addressed in this report is presented in **Table 1.**

Table 1: Location of NEMA Requirements within the Revised Draft EIA Report

Section	Requirement for EIA Report	Location in EIA Report
2 (a)(i)	EAP who compiled the report	Chapter 1.5
2 (a)(ii)	Expertise of the EAP undertaking the EIA	Chapter 1.5
2 (b)	Detailed description of the proposed activity	Chapter 3
2 (c)	Description of the property on which the activity is to be undertaken and the location of the activity on the property	Chapter 3.1
2 (d)	Description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity	Chapter 5
2 (e)	Details of the public participation process	Chapter 1.4
2 (e)(i)	Steps undertaken in accordance with the plan of study	Chapter 1
2 (e)(ii)	List of persons, organisations and organs of state that were registered as interested and affected parties	Appendix D3

2 (e)(iii)	A summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments	Appendix D8
2 (e)(iv)	Copies of any representation, objections and comments received from registered interested and affected parties	Appendix D6 and D7
2 (f)	Description of the need and desirability of the proposed activity and identified potential alternatives to the proposed activity including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity.	Chapter 1.2
2 (g)	An indication of the methodology used in determining the significance of potential environmental impacts	Chapter 6.3
2 (h)	A description and comparative assessment of all alternatives identified during the EIA process	Chapter 4
2 (i)	Summary of the findings and recommendations of any specialist report or report on specialised processes	Chapters 7 to 16
2 (j)	Description of all environmental issues that were identified during the EIA process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures	Chapters 7 to 16
2 (k)	Assessment of each identified potentially significant impact	Chapters 7 to 16
2 (k)(i)	Cumulative impacts	Chapter 19
2 (k)(ii)	Nature of the impacts	Chapters 7 to 16
2 (k)(iii)	Extent and duration of the impacts	Chapters 7 to 16
2 (k)(iv)	Probability of the impact occurring	Chapters 7 to 16
2 (k)(v)	Degree to which the impact can be reversed	Chapters 7 to 16
2 (k)(vi)	Degree to which the impact may cause irreplaceable loss of resources	Chapters 7 to 16
2 (k)(vii)	Degree to which the impact can be mitigated	Chapters 7 to 16
2 (l)	Description of any assumptions, uncertainties and gaps in knowledge	Chapter 22
2 (m)	Opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation	Chapter 22
2 (n)(i)	Summary of the key findings of the EIA	Chapter 22
2 (n)(ii)	Comparative assessment of the positive and negative implications of the proposed activity	Chapters 7 to 16 and 22
2 (o)	Draft Environmental Management Plan that complies with Regulation 35	Appendix H
2 (p)	Copies of any specialist reports and reports on specialised processes complying with regulation 33	Appendices G

1.5 Project Team Profiles

1.5.1 Proponent – Red Cap Investments

Red Cap Investments (Pty) Ltd is a private company active in the energy sector. Red Cap has both consulting and project development divisions that operate almost exclusively in the area of renewable energy and energy efficiency. The Red Cap Project Development Division is currently focused on the development of large scale wind farms in South Africa. The initial development efforts have been focused on the coastal regions of South Africa as they offer the most attractive wind regimes for the development of financially sustainable wind farms.

Red Cap's staff is comprised of highly skilled and motivated individuals with extensive experience in the field of energy. The ability of Red Cap to successfully develop energy projects has been further enhanced via the establishment of strategic technical partnerships with leading engineering/energy concerns, both local and international. These partnerships have expanded its capabilities and ensure that the projects under development are implemented in line with global best practice..

Project applicant:	Red Cap Investments		
Trading name (if any):	Red Cap Investments (Pty) Ltd		
Contact person:	Mark Tanton		
Physical address:	Suite 1, 1 Beach Road, Hout Bay, Cape Town		
Postal address:	24 Kestrel Way Kenrock Estate Hout Bay 7806		
Postal code:	7806	**Cell:**	082 375 4257
Telephone:	021 790 1392	**Fax:**	086 609 9261
E-mail:	mark@red-cap.co.za		

1.5.2 Project Engineers – Afri-Coast

Afri-Coast Engineers SA (Pty) Ltd is a wholly South African, independent and owner managed consulting engineering company, established in 1996 as Silva McGillivray Inc. with a fast growing professional team, committed to rendering a quality service. Shareholding is 100% by the owners of the company with a 41% BEE shareholding. Afri-Coast has been involved in a number of wind power farm projects as of late.

1.5.3 Environmental Assessment Practitioner – Arcus GIBB

Arcus GIBB (Pty) Ltd is a multi-disciplinary engineering and environmental consultancy organisation whose environmental division comprises over 30 highly qualified and experienced environmental professionals with vast collective experience. Most of our environmental staff are registered with IAIAsa and a number of our senior environmental scientists are registered professionals.

Arcus GIBB's Environmental Division has a proven track record in the planning, co-ordination, management and execution of a wide range of environmental projects Curricula vitae (CVs are attached in Appendix A). Key areas of expertise include:

Environmental Sciences:

- Environmental advisory services
- Environmental policy and corporate reporting
- Sustainability assessments
- Environmental management systems
- Environmental liability and risk assessment
- Integrated development planning
- Strategic environmental assessments
- Environmental impact assessments
- Public consultation
- Environmental management programmes
- Environmental training, monitoring and auditing
- Environmental permit and regulatory compliance management
- Coastal zone management
- Planning and botanical and rehabilitation assessments.

The EIA project team comprised the following members from Arcus GIBB:

Name	Ms. Jaana-Maria Ball
Position	Project Director and Senior EAP
Function	Client liaison Project review and management
Qualification	MBA M.Sc. (Botany), Dipl. Bus. Management Dipl. Project Management
Registrations	Pr. Sci. Nat. 400049/89 SAI & ES, 1998 SAAB, 2000
Years of Experience	18

Name	Russell Stow
Position	Project leader and EAP
Function	Project management and co-ordination Compilation of the Revised Draft EIR and Final EIR
Qualification	B.Sc (Hons): Environmental Management B.Sc: Environmental Biology & Environmental Science
Registrations	Pr.Sci.Nat. 400089/07
Years of Experience	10

Name	Dr Norbert Klages
Position	Project EAP
Function	EIA assessment and review of specialist studies
Qualification	Doctor of Natural Sciences (*cum laude*) MSc (cum laude) BSc
Registrations	Pr.Sci.Nat. No. 400412/04
Years of Experience	29

Name	Mr Jesse Jegels
Position	Environmental Scientist
Function	Public Involvement co-ordinator

	Research Document compilation
Qualification	MSc: Zoology BSc (Hons): Zoology BSc: Zoology and Biochemistry
Years of Experience	8

Name	Ms Inge Schovell
Position	Environmental Scientist
Function	Public Involvement assistant Research Document compilation
Qualification	National Diploma: Nature Conservation
Years of Experience	5

Name	Mrs Rashieda Davids
Position	Environmental Scientist
Function	Document compilation EMP compilation
Qualification	BSc (Hons): Environmental and Geographical Science BSc: Environmental and Geographical Science and Ocean and Atmosphere Science
Years of Experience	5

Contact details:

Arcus GIBB (Pty) Ltd Reg. 1992/007139/07
Port Elizabeth, South Africa
PO Box 63703, Greenacres 6057
Tel: +27 41 392 7500 Fax: +27 41 363 9300

1.5.4 Project Specialists

	Bird specialist	Economics	Fauna	Archaeological	Noise	Vegetation / Wetlands	Visual	Hydrological / Wetlands	Paleontological
Name:	Jon Smallie	Derek Zimmerman	Mark Marshall	Karen van Ryneveld	Brett Williams	Jamie Pote	Henry Holland	Lindsay Shand	Dr Willie de Klerk
Organisation / Company:	Endangered Wildlife Trust (EWT)	Rand International Capital	Sandula Conservation	Archaeo Maps	Safetech	Private	Mapthis Trust	SRK Consulting	Albany Museum
Address:	Private Bag X11 Parkview 2122 South Africa	4 Angela Avenue Charlo Port Elizabeth 6000	PO. Box 28924 Sunridge Park Port Elizabeth 6008	Postnet Suite 239 Private Bag X3 Beacon Bay 5205	PO Box 27607 Greenacres Port Elizabeth 6057	Postnet Suite 177 Private bag X0003 The Fig Tree Port Elizabeth 6033	8 Cathcart Street Grahamstown Eastern Cape 6139	Postnet Suite #206 Private Bag X18 Rondebosch 7701	Department of Geology Rhodes University Somerset Street Grahamstown 6139
Tel:	011 486 1102	041 368 8957		043 740 2370	041 365 6846		046 622 8735	021 659 3079	046 622 2312
Fax:	011 486 1506	086 618 0289		086 515 6848	041 365 2123	086 650 3506		021 685 7105	046 622 2398
Cell:		083 263 6796	082 261 9280	084 871 1064		083 743 9353	082 226 6689	083 230 3071	084 582 6072
E-mail:	ewt@ewt.org.za / jons@ewt.org.za	derekzim@worldonline.co.za	sandula@webmail.co.za	kvanryneveld@gmail.com	info@safetechsa.co.za	jamiepote@aerosat.co.za	henry@mapthis.co.za	lshand@srk.co.za	b.deklerk@ru.ac.za

1.6 Report Structure

This Revised Draft Environmental Impact Report is structured as follows:

1 INTRODUCTION
Contains background to and objectives of the proposed activity and details a motivation for the project. This section also outlines the approach to the EIA study, the Public Participation Process (PPP) undertaken and provides details of the project team.

2 LEGAL FRAMEWORK
Describes the legislative, policy and administrative requirements applicable to the proposed development and highlights specific applicable legislation.

3 PROJECT DESCRIPTION
Provides a detailed description of the proposed activities

4 ALTERNATIVES
Provides details of the project alternatives considered.

5 THE AFFECTED ENVIRONMENT
Describes the receiving biophysical and socio-economic baseline environment.

6 IMPACT ASSESSMENT
Describes the potential positive and negative impacts identified and details the methodology used to rate the potential impacts.

7 IMPACTS ON VEGETATION
Describes and assesses the potential impacts of the proposed development on vegetation and describes relevant mitigation measures.

8 IMPACTS ON GROUND WATER, HYDROLOGY AND SURFACE/ GROUNDWATER LINKS WITH WETLANDS
Describes and assesses the potential impacts of the proposed development on ground water, hydrology and wetlands and describes relevant mitigation measures.

9 IMPACTS ON TERRESTRIAL FAUNA
Describes and assesses the potential impacts of the proposed development on terrestrial fauna. Mitigation measures are also recommended.

10 IMPACT ON BATS
Describes and assesses the potential impacts of the proposed development on bats. Mitigation measures are also recommended.

11 IMPACTS ON BIRDS
Describes and assesses the potential impacts of the proposed development on birds and describes relevant mitigation measures.

12 IMPACTS ON CULTURAL HERITAGE RESOURCES
Describes and assesses the potential impacts of the proposed development on cultural heritage aspects and describes relevant mitigation measures

13 IMPACTS ON PALAEONTOLOGY
Describes and assesses the potential impacts of the proposed development on palaeontological components and describes relevant mitigation measures

14 VISUAL IMPACTS
Describes and assesses the potential visual impacts of the proposed development and describes relevant mitigation measures.

15 NOISE IMPACTS
Describes and assesses the potential noise impacts of the proposed development and describes relevant mitigation measures.

16 SOCIO-ECONOMIC IMPACTS
Describes and assesses the potential socio-economic impacts of the proposed development and describes relevant mitigation measures.

17 IMPACTS ON AERODROMES
Describes and assesses the potential impacts of the proposed development on the nearby aerodrome and describes relevant mitigation measures

18 SCREENED IMPACTS
Describes and assesses other common and / or standard potential impacts related to the construction of such developments.

19 CUMULATIVE IMPACTS
Qualitatively assesses potential cumulative impacts

20 MICRO-SITING
Describes the post-approval process of micro-siting the wind turbines

21 ENVIRONMENTAL MANAGEMENT PROGRAMME (EMP)
Provides brief description of the Environmental Management Programme designed for the proposed development.

22 CONCLUSIONS AND RECOMMENDATIONS
Summarises the key findings of the EIA and provides recommendations for the mitigation of potential impacts and the management of the proposed project.

23 REFERENCES
Contains a list of references used in compiling the report.

The report is separated into three Volumes with Volume 1 (this volume) containing the EIR and Volume 2 and 3 containing all the appendices.

2 LEGAL FRAMEWORK

This chapter details applicable legal provisions and aims to provide a review of relevant national and provincial legislation and regulations, and policy documents, which are applicable to (or have implications for) the proposed Project.

The applicable legislation includes the following but is not limited to:

- National Environmental Management Act (Act No. 107 of 1998) (as amended)
- NEMA EIA Regulations, 2006 (GN R. 385, R. 386 and R. 387)
- NEMA EIA Regulations, 2010 (GN R. 543, R. 544 and R. 545)
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
- Environment Conservation Act (Act No. 73 of 1989)
- National Heritage Resources Act (Act No. 25 of 1999) (NHRA)
- Conservation of Agricultural Resources Act (Act No. 43 of 1983) (CARA)
- Air Quality Act (Act No. 39 of 2004) (AQA)
- Electricity Regulation Act (Act No. 4 of 2006)
- Civil Aviation Act (Act No. 74 of 1962) (CAA)
- Occupational Health and Safety Act (Act No. 85 of 1993) (OHSA)
- Subdivision of Agricultural Land Act (Act No. 70 of 1970) (SALA)
- Agricultural Resources Act (Act No. 43 of 1983) (ARA)
- The Protected Areas Act (Act 57 of 2003) Section 17 (PAA)
- Sea Shore Act (Act No. 21 of 1935)
- Integrated Coastal Management Act (Act No. 24 of 2008) (ICM)
- Department of Environmental Affairs and Tourism (DEAT) Integrated Environmental Management Information Series No.2
- Regulations and Guidelines Governing Noise
- South African National Standard (SANS)
- World Health Organisation (WHO)
- Noise Control Regulations (NCR)
- Reference Legislation Governing Visual Impacts

The applicable legislation of high relevance is described and contextualised in the sub-sections below.

2.1 The Constitution of South Africa

The legal reference source for environmental law in South Africa is found in the Constitution of the Republic of South Africa (Act No.108 of 1996) and as such, all environmental aspects should be interpreted within the context of the Constitution. The Constitution has enhanced the status of the environment by virtue of the fact that environmental rights have been established (Section 24) and other rights created in the Bill of Rights which impact on environmental management. An objective of local government is to provide a safe and healthy environment (Section 152) and public administration must be accountable, transparent and encourage participation (Section 195(1)(e) to (g)).

2.2 The National Environmental Management Act

The National Environmental Management Act (Act No. 107 of 1998) (NEMA) is South Africa's overarching framework for environmental legislation. The objective of NEMA is to provide for operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance, and procedures for co-ordinating environmental functions exercised by organs of state.

NEMA sets out a number of principles that aim to implement the environmental policy of South Africa. These principles are designed, amongst other purposes, to serve as a general framework for environmental planning, as guidelines by reference to which organs of state must exercise their functions and to guide other law concerned with the protection or management of the environment.

The principles include a number of internationally recognised environmental law norms and some principles specific to South Africa, namely, the:

- Preventive principle
- Precautionary principle
- Polluter pays principle
- Equitable access for the previously disadvantaged to ensure human well-being.

Chapter 5 of NEMA is designed to promote integrated environmental management. Environmental management must place people and their needs at the forefront of its concerns, and serve their physical, psychological, developmental, cultural and social interests equitably. Development must be socially, environmentally and economically sustainable. Sustainable development therefore requires the consideration of all relevant factors including the following:

- The disturbance of ecosystems and loss of biological diversity is avoided, or, minimised and remedied
- The pollution and degradation of the environment are avoided, or, minimised and remedied
- The disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or, minimised and remedied
- That waste is avoided, or, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner
- The use and exploitation of non-renewable natural resources should be utilised responsibly and equitably
- The development, use and exploitation of renewable resources and the ecosystem of which they are part of, do not exceed the level beyond which their integrity is jeopardised
- A risk-averse and cautious approach is applied
- Negative impacts on the environment and on the people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.

2.2.1 NEMA EIA Regulations

Regulations promulgated under NEMA include the EIA Regulations published under GNR 385, which sets out the procedures that must be complied with in terms of applying for environmental authorisation. The associated Listing Notices are published under GNR 386 and 387 which document the specific activities including those applicable to the proposed renewable energy wind farm.

The Regulations require that written authorisation is obtained from the Minister or his delegated authority, in this case the national Department of Environmental Affairs (DEA). The Regulations also lays out in Regulations 27-36 how the EIA must investigate, assess and communicate the potential impacts of these activities. Environmental authorisation is not guaranteed and if granted, may be subject to conditions, will only be considered once the regulatory requirements have been met.

Section 24(5) of NEMA stipulates that certain "listed activities" require environmental authorisation by way of either a Basic Assessment (BA) or a full Scoping and Environmental Impact Assessment as defined in the EIA Regulations Listing Notices (July 2006 EIA Regulations). The proposed project constitutes listed activities in both Listing Notices. However, Government Notice (GN) R 387 supersedes GNR 386 and, as such, a full Scoping and Environmental Impact Assessment must be undertaken. The listed activities included in the EIA application for this project are listed in Table 2.

Table 2: List of Activities Relevant to the Project

Government Notice	Activity No	Describe each listed activity
GNR 386	1.(m)	The construction of facilities or infrastructure, including associated structures or infrastructure, for – any purpose in the one in ten year flood line of a river or stream, or within 32 metres from the bank of a river or stream where the floodline is unknown, excluding purposes associated with existing residential sue, but including – (i) canals; (ii) channels; (iii) bridges; (iv) dams; and (v) weirs;
GNR 386	12.	The transformation or removal of indigenous vegetation of 3 hectares or more or of any size where the transformation or removal would occur within a critically endangered or an endangered ecosystem listed in terms of section 52 of the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004).[1]
GNR 386	13.	The abstraction of groundwater at a volume where any general authorisation issued in terms of the National Water Act, 1998 (Act No. 36 of 1998) will be exceeded.
GNR 386	14.	The construction of masts of any material or type and of any height, including those used for telecommunication broadcasting and radio transmission, but excluding-

[1] To date, no critically endangered or endangered ecosystem has been formally declared in terms of this Act, although a draft list of threatened ecosystems was published for comment in Government Notice R 1477 of 2009 (Government Gazette 32689).

		(a) masts of 15 metres and lower exclusively used (i) by radio amateurs; or (ii) for lighting purposes (b) flag poles; and (c) lightning conductor poles.
GNR 386	15.	The construction of a road that is wider than 4 metres or that has a reserve wider than 6 metres, excluding roads that fall within the ambit of another listed activity or which are access roads of less than 30 metres long.
GNR 386	16.(b)	The transformation of undeveloped, vacant or derelict land to – residential, mixed, retail, commercial, industrial or institutional use where such development does not constitute infill and where the total area to be transformed is bigger than 1 hectare
GNR 387	1.(a)	The construction of facilities or infrastructure, including associated structures or infrastructure, for – The generation of electricity where – (i) the electricity output is 20 megawatts or more; or (ii) the elements of the facility cover a combined area in excess of 1 hectare;
GNR 387	2.	Any development activity, including associated structures and infrastructure, where the total area of the developed area is, or is intended to be, 20 hectares or more.

Eskom has indicated that they will take the responsibility for connecting the wind farm to the grid, inclusive of any grid related EIAs including the application for environmental authorisation for the 132 kV overhead power line to the Eskom Melkhout substation in support of the wind farm project. The EIA is being conducted by an independent environmental consultant firm. Listed activities in terms of the EIA regulations for the transmission line will be addressed in that process. Should any other grid connections be required the developer will lias with Eskom on this and either Eskom or the developer will undertake any required environmental applications in this regard.

2.2.2 Amended EIA Regulations

The NEMA EIA Amendment Regulations of 2010 promulgated in terms of the National Environmental Management Act (Act No. 107 of 1998) (NEMA), as amended came into effect on 2 August 2010. These Regulations, replace the 2006 EIA Regulations and include three sets of listed activities:

- GNR 543 – details the EIA Regulations and documents the procedure to be followed and criteria relating to the submission, processing and consideration and decisions on applications for environmental authorisation.
- GNR 544 – Is the listing notice detailing the Basic Assessment activities
- GNR 545 – Is the listing notice for activities requiring a Scoping/EIA
- GNR 546 – Is the listing notice for activities requiring environmental authorization in specific geographical areas

The transitional arrangements applicable to regulations are dealt with in Chapter 9 of R543, whereby pending applications (as is the case with this application) must be dispensed with in terms of the previous 2006 Regulations as if these new 2010 Regulations were not promulgated. However, if the application pending has components which were not listed previously but are listed now, the competent authority may authorise the current listed activity as if it were applied for provided the impacts and the requirements of the new regulations have been considered and assessed. Some listed activities have changed with the introduction of geographical areas and different thresholds.

2.2.3 Guidelines

The following guidelines have been considered in the production of this report:

- DEAT[2] (2002) Scoping, Integrated Environmental Management, Information Series 2, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
- DEAT (2005) Guideline 3: General Guide to the Environmental Impact Assessment Regulations, 2005, Integrated Environmental Management Guideline Series, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
- DEAT (2006). Guideline 4: Public Participation in support of the EIA Regulations, 2005. Integrated Environmental Management Guideline Series. Department of Environmental Affairs and Tourism (DEAT), Pretoria.
- DEAT (2006) Guideline 5: Assessment of Alternatives and Impacts in support of the Environmental Impact Assessment Regulations, 2006. Integrated Environmental Management Guideline Series, Department of Environmental Affairs and Tourism (DEAT), Pretoria.

2.3 The Environment Conservation Act

The objectives of the Environment Conservation Act (Act No. 73 of 1989) (ECA) are to provide for the effective protection and controlled utilisation of the environment. Following the enactment of NEMA, a number of the powers of the Act have either been repealed from or assigned to the provinces. These include the EIA Regulations for activities that were regarded as detrimental on the environment and were published under Government Notice Regulation 1182 of 05 September 1997, as amended. EIA Regulations were promulgated in 2006 under Section 24(5) of NEMA and are published under GNR 385, 386 and 387 of June 2006 and as such, replace those promulgated under ECA. These 2006 Regulations have since been replaced with the new 2010 EIA Regulations.

[2] Now DEA (Department of Environmental Affairs)

2.4 National Environmental Management: Biodiversity Act

The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA) provides for the management and conservation of South Africa's biodiversity within the framework of the NEMA. This Act allows for the protection of species and ecosystems that warrant national protection, the sustainable use of indigenous biological resources, the fair and equitable sharing of benefits arising from bio-prospecting involving indigenous biological resources and the establishment and functions of the South African National Biodiversity Institute. The NEM:BA further seeks to provide for co-operative governance in biodiversity management and conservation.

Key elements of the Act are:

- The identification, protection and management of species of high conservation value
- The identification, protection and management of ecosystems and areas of high biodiversity value
- Biodiversity Initiatives such as the Subtropical Thicket Ecosystem Plan (STEP) and Cape Action Plan for People and Environment (CAPE) may become accepted as bioregional plans and are thus implemented as legislation
- Alien invasive species control of which the management responsibility is directed to the landowner
- Section 53 of the Act identifies that any process or activity that is regarded as a threatening process in terms of a threatened ecosystem, requires environmental authorization via a full Environmental Impact Assessment (GNR 387).

Significantly, the Act provides for the protection of ecosystems and species that are threatened or in need of protection and seeks to prevent the introduction and spread of alien or invasive species. As such, it controls and regulates:

- Certain threatening activities occurring in identified ecosystems
- Certain activities which may negatively impact on the survival of identified threatened or protected species
- Certain restricted activities involving alien or listed invasive species.

2.5 National Water Act

The National Water Act (Act No. 36 of 1998) (NWA) is the fundamental law for managing South Africa's water resources. The purpose of the Act is to ensure that water resources of the nation are protected, used, developed, conserved and controlled. It is concerned with the allocation of equitable access and the conservation of water resources within South Africa. The NWA repeals many of the powers and functions of the Water Act (Act No. 54 of 1956).

Key aspects of the NWA include:

- Catchment Areas - Any disturbance to a watercourse such as the construction of a dam or weir type facility requires authorization from the DWA
- Water Supply - Under the NWA, a developer is required to obtain the necessary permits for water usage and crossing of a water body, river or stream
- Wastewater – the NWA is the principal piece of South African legislation governing wastewater management. Under the Act there are several important issues relating to wastewater to note:
    - It is an offence to wilfully or negligently pollute surface water or groundwater
    - In the event of a pollution incident, the offending party is obliged to report the incident to the regulatory authority
    - The regulatory authority can take the necessary steps to prevent the pollution of water resources and can recover the costs of clean up from the polluter.

2.6 National Heritage Resources Act

The purpose of the National Heritage Resources Act (Act No. 25 of 1999) (NHRA) is to promote good management of the national estate, defined as those heritage resources of South Africa which are of cultural significance, or other special value, and to enable and encourage communities to nurture and conserve their legacy so that it may be bequeathed to future generations[3]. The NHRA aims to promote the good management through an integrated system for the management of the national heritage resources which include:

- Places, buildings, structures and equipment of cultural significance;
- Places to which oral traditions are attached or that are associated with living heritage;
- Historical settlements and townscapes;
- Geological sites of scientific or cultural importance;
- Archaeological and palaeontological sites;
- Graves and burial grounds, including:
- Ancestral graves;
- Royal graves and graves of traditional leaders;
- Graves of victims of conflict;
- Graves of individuals designated by the Minister by notice in the Gazette; and
- Historical graves and cemeteries.
- Other human remains not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983); and
- Sites of significance relating to the history of slavery in South Africa.

The aim of the NHRA is to introduce an integrated, three-tier system for the identification, assessment and management of the national estate which operates on a national, provincial and local level. The legislation also makes provision for a

[3] (http://www.cidb.org.za/Documents/PDM/Comp_Leg/S27.pdf)

grading system for the evaluation of heritage resources on three levels which broadly coincide with their national, provincial and local significance[3].

Under the legislation the South African Heritage Resources Agency (SAHRA), was established, which replaced the National Monuments Council. SAHRA is responsible for the preservation of heritage resources with exceptional qualities of special national significance (Grade I sites). A Provincial Heritage Resources Authority, established in each province, will protect Grade II heritage resources which are significant within the context of a province or region. Buildings and sites of local interest (Grade III sites) is the responsibility of local authorities as part of their planning functions[3].

2.6.1 Archaeology, Palaeontology and Meteorites

According to Section 35 (Archaeology, Palaeontology and Meteorites) and Section 38 (Heritage Resources Management) of the NHRA, Palaeontological Heritage Impact Assessments (PIAs) and Archaeological Impact Assessments (AIAs) are required by law in cases where developments are proposed in areas underlain by potentially fossiliferous (fossil-bearing) rocks, especially where substantial bedrock excavations are envisaged, and where human settlement is know to have occurred during prehistory and the historic period.

Depending on the sensitivity of the fossil and archaeological heritage, and the scale of the development concerned, PIAs and AIAs could be produced as a stand-alone desktop study or a full assessment include field work and research and impact assessment. In most reports recommendations and mitigation measures are documented, particularly for the construction phase. These Reports are submitted to and endorsed by the responsible heritage management authority, who in the Eastern Cape is the national South African Heritage Resource Agency (SAHRA). A Section 35 Application must be made depending on the sensitivity of the heritage resources, for fossil, built environment and Stone Age archaeology.

2.6.2 Burial Grounds and Graves

In terms of Section 36 of the HRA, SAHRA is responsible for the protection of burial grounds and graves that are older than 60 years and must conserve and care for burial grounds and graves protected in terms of this section. SAHRA must also identify and record the graves of victims of conflict and any other graves which it deems to be of cultural significance and may erect memorials associated with these graves and must maintain such memorials. A Section 36 permit is required should a proposed project impact on burial grounds and graves that are older than 60 years.

2.6.3 Heritage Impact Assessment within the EIA in terms of Section 38

In terms of Section 38 of the Act, an application must be made to SAHRA when a Heritage Impact Assessment (HIA) is to be undertaken as a specialist study as part of an EIA by a certified and approved specialist. A Section 38 Application is required for the demolition of built environment features including:

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
(b) the construction of a bridge or similar structure exceeding 50 m in length;
(c) any development or other activity which will change the character of a site exceeding 5 000 m^2 in extent; or
    (ii) involving three or more existing erven or subdivisions thereof; or

(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

(d) the re-zoning of a site exceeding 10 000 m^2 in extent; or
(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority

The provisions of this section do not apply to a development if an evaluation of the impact of that development on heritage resources is required in terms of the NEMA and the associated EIA Regulations or the Minerals Act, 1991 (Act No. 50 of 1991), or any other legislation, provided that the consenting authority must ensure that the evaluation fulfils the requirements of the relevant heritage resources authority, and any comments and recommendations of the relevant heritage resources authority with regard to such development have been taken into account prior to the granting of the consent.

2.7 Conservation of Agricultural Resources Act

The Conservation of Agricultural Resources Act, (Act No. 43 of 1983), as amended, is regarded as one of the principal Acts governing the protection of agricultural natural resources. The main aim of the Act is to control the utilization of natural agricultural resources to ensure the conservation of soil, water and vegetation, as well as the combating of alien and invasive plants. According to Section 1 of the Act, conservation of natural agricultural resources includes the protection, recovery as well as the reclamation thereof.

It provides control measures for the cultivation of virgin soil (soil that has not previously been cultivated or not cultivated for at least ten years), the utilization and cultivation of land, including irrigated land, and the protection of water sources such as vleis (marshes, small lakes) and wetlands. It also includes control measures on the use of water to prevent water logging and regulate water flow patterns, the protection of vegetation, grazing potential of the veld, prevention of erosion and land degradation, construction and management of soil conservation structures, as well as the combating of weeds and invasive plants.

CARA defines different categories of alien plants and those listed under Category 1 are prohibited and must be controlled while those listed under Category 2 must be grown within a demarcated area under permit. This would have relevance if farming activities were to change dramatically with the introduction of a development or if alien species were used to re-vegetate areas. Neither of these are intentions of the Kouga Wind Farm project.

2.8 Sub-division of Agricultural Land (SALA) Act

Sub-division of Agricultural Land Act(Act No. 70 of 1970) (SALA)'s main objective is to manage the sub-division of agricultural land to prevent injudicious fragmentation of agricultural land and the creation of uneconomical units and thus manage the use of agricultural land.

2.9 White Paper on Renewable Energy

The **White Paper on Renewable Energy** supplements the government's overarching policy on energy as set out in its **White Paper on the Energy Policy of the Republic of South Africa** (DME 1998), which pledges 'Government support for the development, demonstration and implementation of renewable energy sources for both small and large-scale applications'.

Government's overall vision for the role of renewable energy in its energy economy is: An energy economy in which modern renewable energy increases its share of energy consumed and provides affordable access to energy throughout South Africa, thus contributing to sustainable development and environmental conservation.

The purpose of this White Paper is to set out government's principles, goals and objectives for renewable energy. It furthermore commits government to a number of enabling actions to ensure that renewable energy becomes a significant part of its energy portfolio over the next ten years.

With an increasing demand in energy predicted and growing environmental concerns about fossil fuel based energy systems, the development of large-scale renewable energy supply schemes is strategically important for increasing the diversity of domestic energy supplies and avoiding energy imports while minimising the environmental impacts.

2.10 National and Regional Planning

In the absence of a renewable energy Independent Power Producer (IPP) industry in South Africa to date, the need for detailed planning guidelines and or legislation has been limited. The recent activity in the sector has however catalysed various government departments to now develop detailed planning guidelines/legislation. Below is a summary of the most significant programmes currently underway.

2.10.1 Strategic Environmental Framework (SEF) for the Selection of Sites for Wind Farms

DEA has appointed consultants to undertake the first phase of the development of a Strategic Environmental Framework (SEF) for the selection of sites for wind farms. The first phase of which is scheduled for completion by 15 January 2011. The main

purpose of the first phase is to collate existing information into a framework that can be used by authorities in the evaluation of current applications that are meant to meet the renewable energy target by the end of 2013.

The second, much more comprehensive phase will incorporate more detailed work and research over a much longer period.

2.10.2 Guidelines for the Evaluation and Review of Applications Pertaining to Wind Farming on Agricultural Land

The Department of Agriculture, Forestry and Fisheries (DAFF) has the mandate to protect and manage the natural agricultural resource base of the country through current legislation, acts and policies. This especially has reference in ensuring that high potential and unique agricultural land is preserved for current and future production thereby ensuring sustainable utilization of the country's natural resource base and adhering to food security.

The department currently has two major acts are of relevance to the development of wind farms namely the Conservation of Agricultural Resources Act (Act No. 43 of 1983) (CARA) and the Sub-division of Agricultural Land Act (Act No. 70 of 1970) (SALA). These are described in sub-chapters 2.7 and 2.8 above.

Although the Acts empower the department to control the access of land for the development of wind farms, the department has initiated a process to develop guidelines for the establishment of wind farming structures and related supporting structures. The development of these guidelines is seen as important in ensuring that the process of approving the long term access to agricultural land for win d farms be managed in such a manner that it will not negatively impact on agricultural land and its associated production practices, nor result in the loss of high potential and unique agricultural land. It is expected that these guidelines will be completed by the end of the first quarter of 2011.

(a) Eastern Cape Province Spatial Development Plan (SDP)

The Department of Local Government and Traditional Affairs (DLGTA) was requested by the Province to review the Eastern Cape Provincial Spatial Development Plan (ECPSDP) with the key objective; *"to prepare an interactive Provincial Spatial Development Plan in a consultative approach that would result in a plan that sets out a broad framework for investment in a spatially oriented approach to give effect to the successful implementation of the PGDP."*

Although the plan does not specifically deal with guidelines for the development of wind farms, it does indicate areas where the province feels there is potential for wind energy projects. The Kouga region is shown on the map below (**Figure 14**) to be an area of high potential.

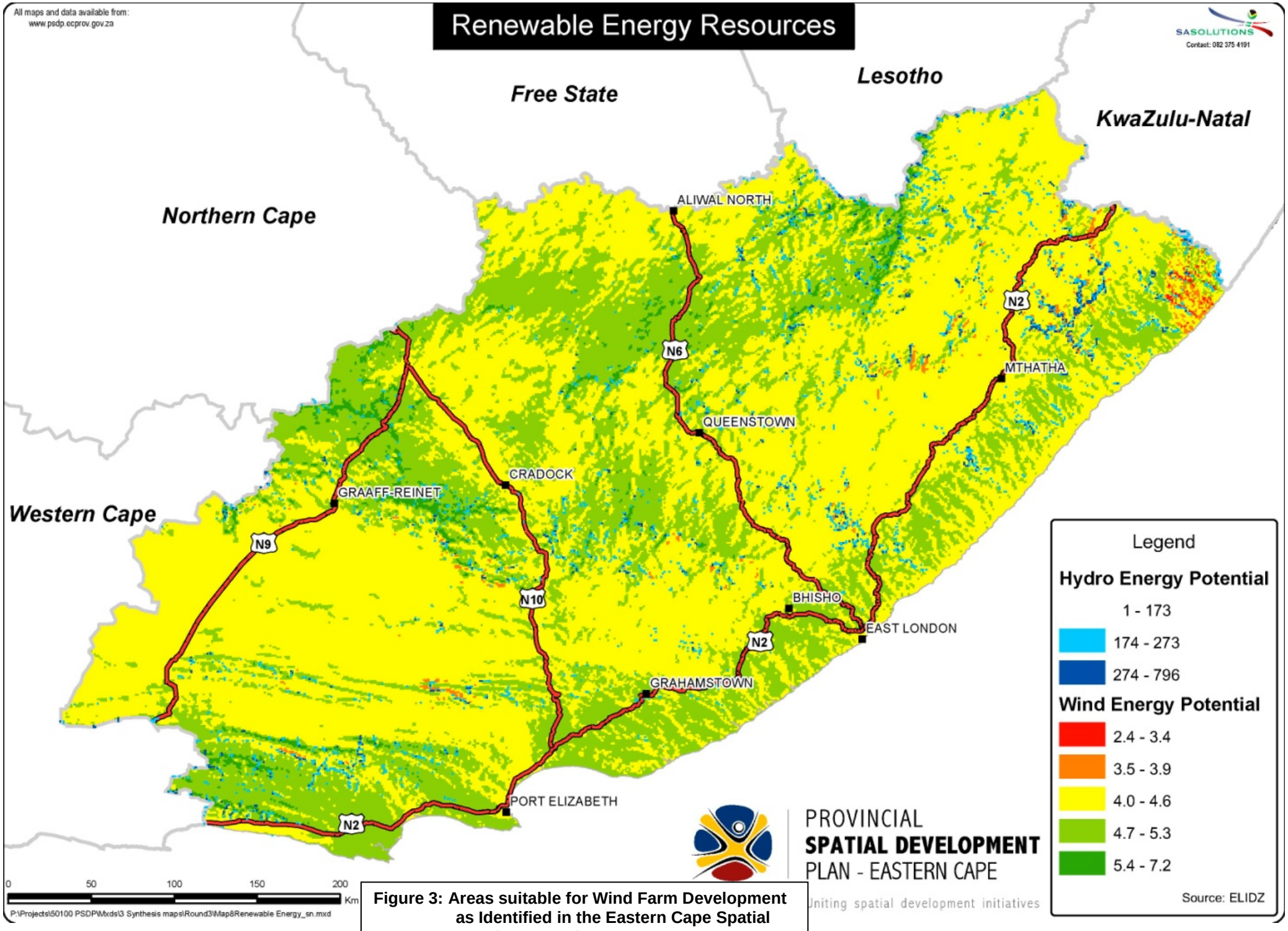


Figure 3: Areas suitable for Wind Farm Development as Identified in the Eastern Cape Spatial Development Plan

3 PROJECT DESCRIPTION

3.1 Site Location

The wind farm site comprises three clusters: the Eastern Cluster close to St Francis Bay and Paradise Beach; the Central Cluster close to Oyster Bay; and the Western Cluster close to the mouth of the Tsitsikamma River. See Figure 15 - Figure 17 or a detailed depiction of the three clusters.

These clusters comprise the farms or farm portions listed in Table 3. Option agreements have been put in place with the owners of the farms for the lease of required land portions and no land has been purchased. The farmers will still be able to continue with their farming with very little impact from the wind farm, should it go ahead.

Table 3: Land Parcels of the Study Site, Ownership, Area and Cluster

Parcel Number	Owner	Area (ha)	Cluster
5/743	Alton Krouse	41.1	Central
5/717	Conrad Dreyer	60.9	Western
6/717	Conrad Dreyer	152.2	Western
7/717	Conrad Dreyer	23.1	Western
8/717	Conrad Dreyer	23.7	Western
10/717	Conrad Dreyer	31.8	Western
11/717	Conrad Dreyer	186.6	Western
9/719	Conrad Dreyer	137.0	Western
10/719	Conrad Dreyer	54.0	Western
20/719	Conrad Dreyer	125.8	Western
4/722	Conrad Dreyer	70.4	Western
10/722	Conrad Dreyer	101.2	Western
11/722	Conrad Dreyer	38.4	Western
1/723	Conrad Dreyer	290.7	Western
3/723	Conrad Dreyer	54.3	Western
724	Conrad Dreyer	261.1	Western
725	Conrad Dreyer	318.1	Western
2/717	Conrad Dreyer	223.8	Western
9/717	Conrad Dreyer	68.1	Western
828	Conrad Dreyer	288.6	Western
4/719	Conrad Dreyer	393.9	Western
726	Conrad Dreyer Family	59.2	Western
RE/717	Dawid Zietsman	703.0	Central
2/742	Harley Knott	101.4	Central
7/742	Harley Knott	115.5	Central
10/742	Harley Knott	39.4	Central
12/742	Harley Knott	79.0	Eastern
14/701	Hermanus Benardus Du Toit	836.6	Eastern
RE/707	Hermanus Benardus Du Toit	693.0	Central
40/809	Jef Van Heesewijk	1.8	Central
41/809	Jef Van Heesewijk	1.9	Central
42/809	Jef Van Heesewijk	1.9	Central

Parcel Number	Owner	Area (ha)	Cluster
43/809	Jef Van Heesewijk	1.9	Central
44/809	Jef Van Heesewijk	1.9	Central
3/735	Johan Strydom	276.0	Western
718	Johannes Vermaak	765.4	Western
4/719	Johannes Vermaak	85.7	Western
22/719	Johannes Vermaak	61.4	Eastern
1/693	Louis Johannes Matthee	19.7	Eastern
RE/694	Louis Johannes Matthee	184.4	Central
RE/735	Oloeff Cilliers	245.7	Central
14/742	Roedolf Gerber	438.4	Central
8/713	Roedolf Gerber	314.6	Central
14/713	Roedolf Gerber	246.0	Central
32/713	Roedolf Gerber	277.3	Central
2/743	Roy Seeney	94.4	Central
3/743	Roy Seeney	61.8	Central
4/735	Roy Seeney	300.7	Central
5/735	Roy Seeney	218.4	Central
12/735	Roy Seeney	32.7	Central
826	Roy Seeney	178.2	Central
Total area		9 382.3	

The total area of 9 382.3 ha which has been set aside for the proposed development is divided per Cluster as indicated in Table 4. It must be remembered that only a very small percentage of this area is actually disturbed by the proposed development as each turbine is separated by at least 500 m from any other and also large areas of these farms are not suitable for one or other reason for turbines. More detail on the actual areas disturbed is presented in Section 3.11-"Surface Area to be Potentially Impacted by the Project".

Table 4: Area Breakdown Per Cluster of the Study Site

Cluster	West	Central	East
Percent	49	33	18
Area [ha]	4578	3070	1734

3.2 Turbine Layout

Turbines are ideally erected where the wind yield has been measured and modelled as optimal, but there are many other factors taken into account when turbines are positioned. The main principles observed are:

- Presence of most consistent and strongest wind;
- A willingness of farmers to accept wind turbines on their land;
- A suitable substrate for the foundations;
- Away from ecologically sensitive areas;
- Away from mobile dunes;
- Away from sensitive heritage sites;
- Close to each other to minimise the length of the access roads, yet distant enough from each other (>500 m) to avoid interference ("dirty air"),
- Close to established roads and electricity grid infrastructure;

- Situated in terrain accessible for trucks carrying abnormal loads;
- 500 m distant from inhabited dwellings.

Based on the above principles, as well the outcomes of the specialist investigations, a total of 121 potential turbine sites were identified through an iterative approach during the EIA process. This final layout of turbines is divided up into three clusters:

- 53 turbines in the Western Cluster
- 41 in the Central Cluster
- 27 in the Eastern Cluster.

This layout, which is the layout that has been assessed in this report, is termed "Layout 3" and is shown in Figure 15 - Figure 17 below.

Layout 3 was arrived at through a lengthy iterative process comprising three major and many minor revisions (see Section 4.2.3 for more details on this iterative process). Nevertheless, the locations of the turbines specified in Layout 3 should still be regarded as indicative because a detailed geotechnical analysis and micro-siting by environmental specialists of each position has not yet been completed. Turbine positions were specifically chosen to allow for a small degree of repositioning movements (micro-siting with input from the specialists) which would not affect the overall impact assessment for the proposed project.

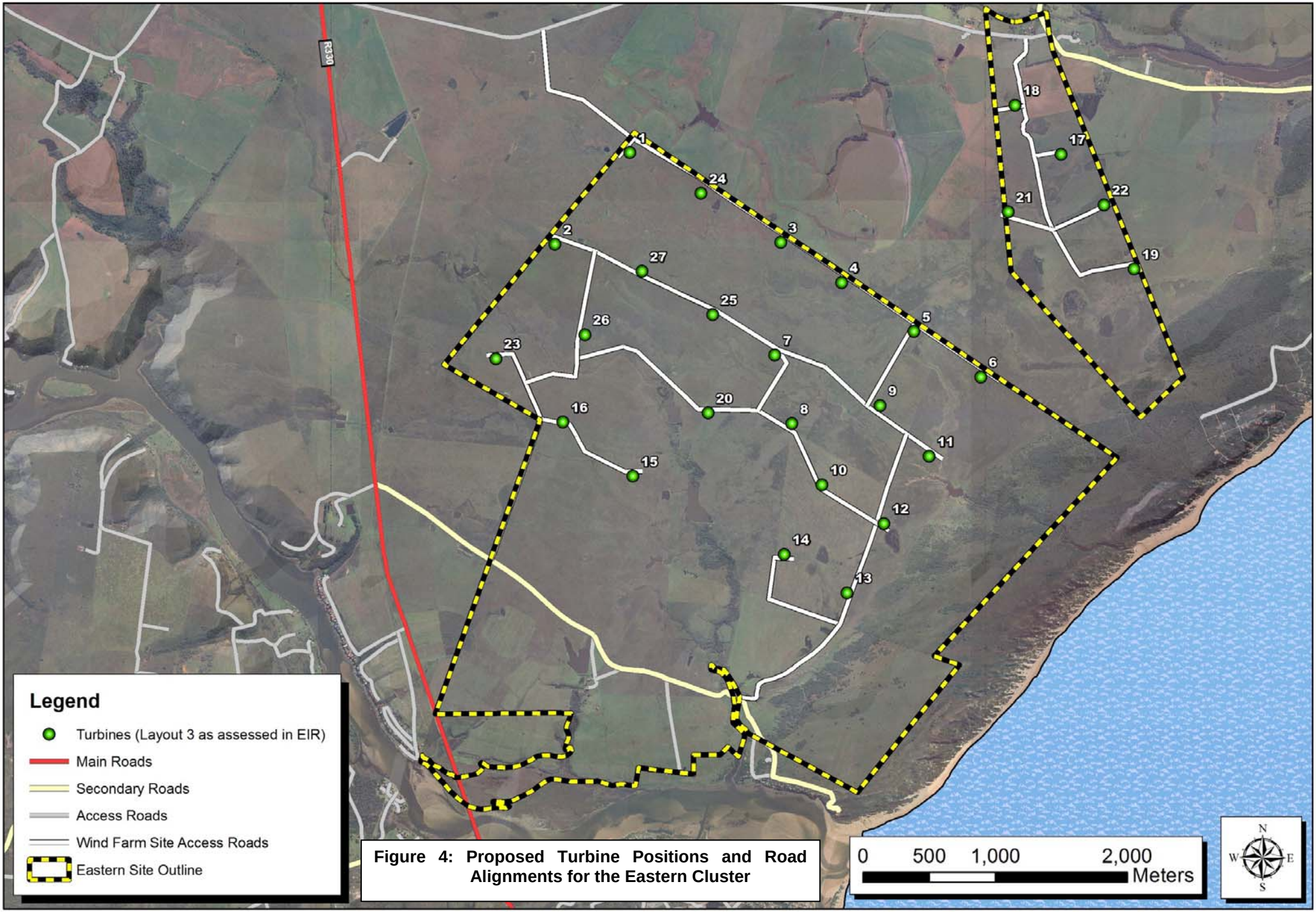


Figure 4: Proposed Turbine Positions and Road Alignments for the Eastern Cluster

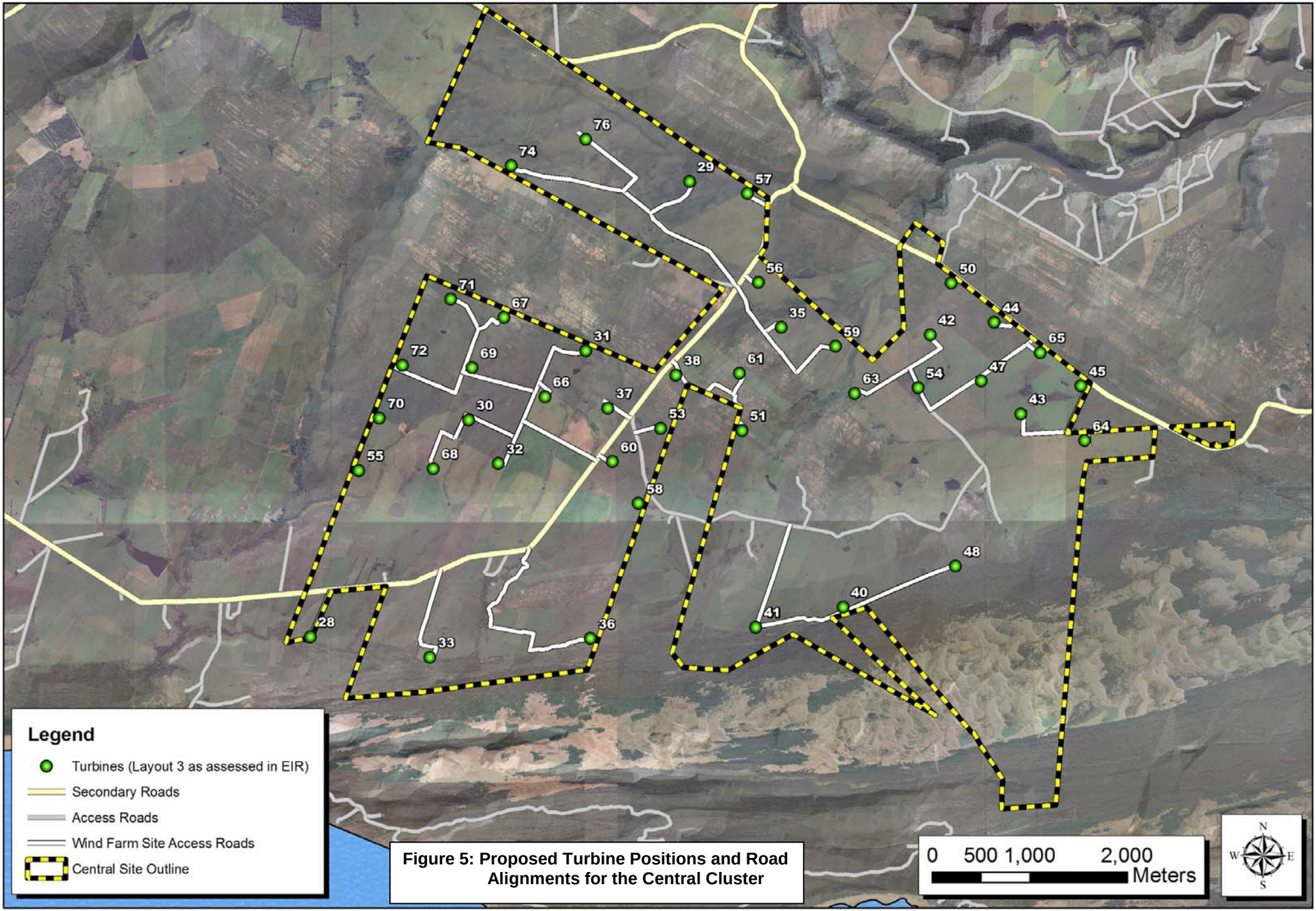


Figure 5: Proposed Turbine Positions and Road Alignments for the Central Cluster

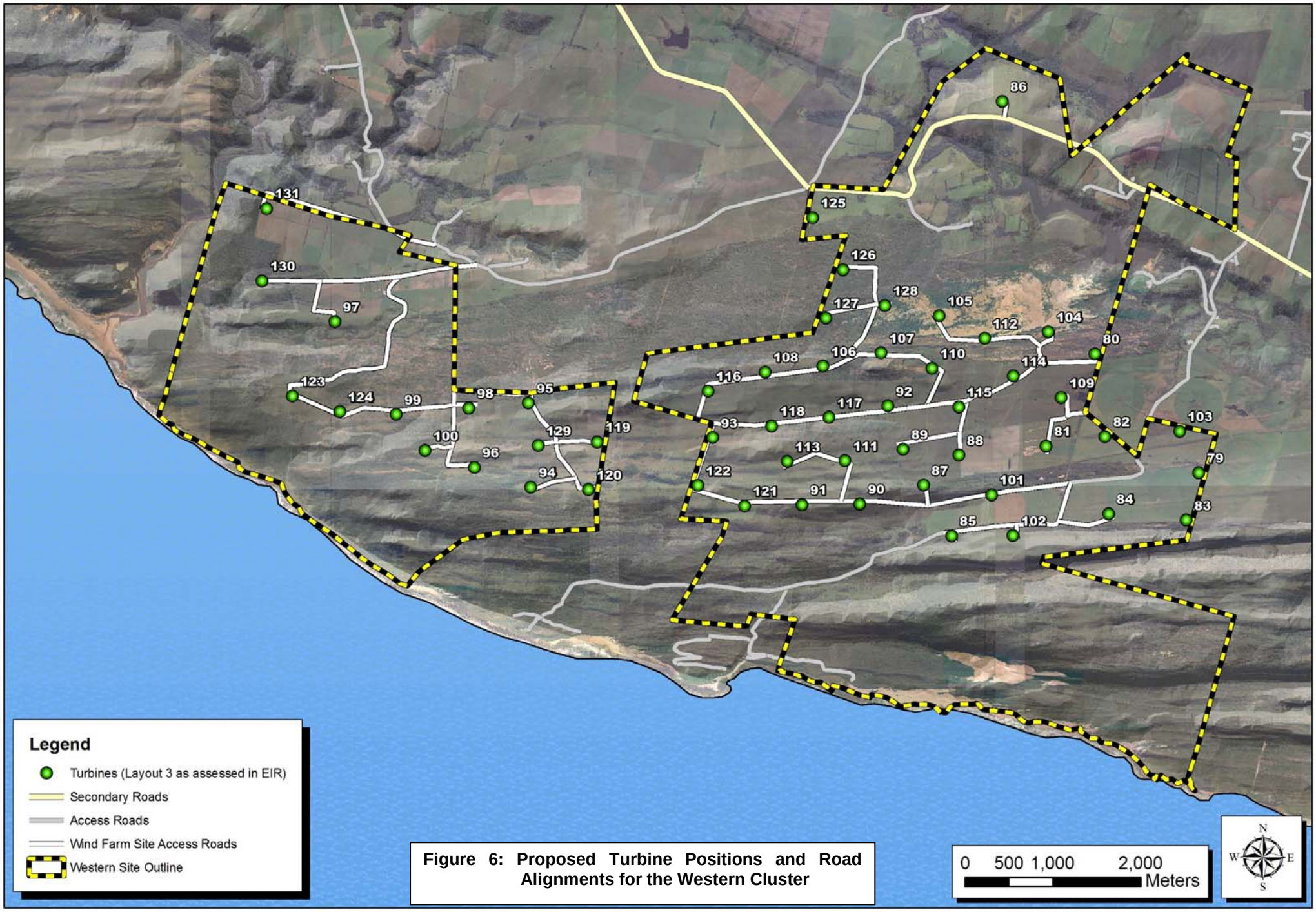


Figure 6: Proposed Turbine Positions and Road Alignments for the Western Cluster

3.3 Design Capacity

The Kouga Wind Farm project entails the construction and operation of a wind energy generation facility (i.e. wind farm) with a final nominal capacity of 300 MW. The generation capacity will be attained with 100 to 121 wind turbines of approximately 2.3 to 3.0 MW each depending on the make and its availability for the South African market.

3.4 Phasing of Project

During the EIA process it was proposed, by the specialists investigating the impacts on birds and bats, that the project be phased. The reason for this was the uncertainty with regard to the impacts of the turbines on birds and bats. By phasing the development the magnitude of any such potential impact would be reduced and it would be easier to mitigate for them if they were to be more problematic that anticipated. The first phase will also be used to identify realistic mitigation measures which could be implemented into the design and operation of any future phases.

The developers thus agreed to phase the development starting with a first phase of no more than 50 turbines.

3.5 Turbine Components

The wind turbine consists of the tower sections (generally three or four sections), a three-blade cantilevered rotor, gearbox and brake, hub, hub casing, nacelle, generator, spinner, and transformer/switchgear building (foot print 5 x 5 m). The blades are made of fibreglass reinforced epoxy resin. The blades transfer the kinetic energy from the wind into rotational energy in the transmission system. The generator is the component of the wind turbine that transforms mechanical energy into electrical energy and is specially designed for high efficiency at partial loads.

Hub heights are approximately 90 to 105 m above ground and rotor blades are approximately 45 to 56 m long. The maximum height from the ground at blade tip is therefore 150 to 160 m. The total weight of the assembled wind turbine is in the order of 360 tons. Dimensions and masses given above are indicative only and can only be confirmed at the detailed design stage.

3.6 Turbine Operation

The blades will rotate at speeds ranging from 6 to 22 revolutions per minute. The wind speed at which the unit produces power at its full capacity ranges between 12 to 14 m/s. Further, the cut-in wind speed (the speed at which the turbine starts turning and producing power) ranges between 3 - 5 m/s, whereas the cut-out wind speed is usually capped at about 25 m/s. If the average wind speed exceeds the maximum operational limit of 25 m/s, the turbine is shut down safely to prevent damage to the

unit. When the wind drops back below the restart speed, the safety systems reset automatically.

3.7 Assembly and Installation

Turbine foundations get cast well ahead of the arrival of the machine parts to allow for the steel reinforced concrete to mature. Normally the machine parts are pre-assembled on site upon arrival. The trucks leave the site after unloading is completed. Delivery of the tower sections follows the arrival of the machine parts. Pre-assembly of machine parts and installation of tower section occur concurrently. Installation of the machine house (nacelle), rotor and the hub with blades follow.

Two cranes are required for the installation of the tower. Assembly time by the cranes is expected to range between four days and two weeks, while moving the crane between different turbine positions may take one to two days.

The assembly of one turbine may take as long as two weeks, given the fact that the units will be constructed in a wind-rich environment necessitating interruptions in the crane operation. The total construction period of the entire wind farm cannot be stated with high precision. It is dependent on the exact number of turbines, the vagaries of the weather as well as uncertainties in the supply of critical components. It is likely to take many months.

3.8 Foundations, Laydown Areas and Construction Camps

Wind turbines are set on a plinth and foundations constructed from reinforced concrete. The dimensions of the foundations are matched to the geotechnical properties of the ground as well as the height and weight of the assembled turbine. The approximate size of a concrete foundation is 20 m x 20 m x 2.5 m depth. Each turbine foundation and plinth uses approximately 600 m^3 of concrete.

Each turbine will have a gravel surfaced hardstand of 30 m x 60 m for the cranes and also to serve as a laydown area for the components. The hardstands will be covered with topsoil and grassed post construction and is referred to as the “laydown area”.

During the construction phase, the service area of each turbine will be sufficiently large to allow the assembly cranes to operate, as well as allowing the offloading of components of the wind turbines. Laydown areas will be immediately adjacent to turbines. Laydown areas will be rehabilitated once construction is complete. At that point, only the access road and a small parking area for service vehicles will be kept free from vegetation.

It is proposed to have only one contractor’s construction camp site per cluster where heavy equipment, such as bulldozers, graders, trenching machines, will be parked and serviced and where supplies are kept. Workers will commute on a daily basis between the cluster construction camp site and the turbines under construction.
Cluster construction camps will be placed on already transformed ground, such as land that has been under the plough, as this minimises potential environmental impacts and allows for easy reinstatement to the previous condition, after construction is complete.

Dimensions and masses given above are indicative only and can only be confirmed at the detailed design stage.

3.9 Roads

The individual turbine parts are transported to site by road. While the first part of journey will take place on public roads, internal access roads connecting to the individual wind turbine positions sites have to be constructed before transportation and installation of the turbines is embarked upon. These roads will further serve as maintenance roads during the operational phase. The internal access roads will consist of well compacted multi-layer gravel, with a width of 5 m and will have appropriately designed open storm water management structures to mitigate erosion and water inundation after extreme weather events. The combined total length of the internal gravel roads for all three wind farm cluster is approximately 100 km, depending on the final approved layouts. Proposed road positions are shown in Figure 15 - Figure 17. All road building material will be sourced off-site from reputable quarries in the Kouga Local Municipality (LM). No new on-site borrow pits are considered at this stage

The tower sections, nacelle, hub and rotor are generally transported on low-bed trucks with a maximum total weight of approximately 120 tons and a length of 60 m. The blades are transported on trucks with a maximum total weight of approximately 35 tons. The maximum height of trucks including the load depends on the specific abnormal trucks available and the specific turbine components. It will be ensured that bridges and overhead cables are suitable for the abnormal trucks and loads selected. Similarly, the horizontal and vertical geometry of the roads must be able to accommodate the types of trucks being used or they will have to be upgraded at the developers expense to ensure this if there are no other option.

Owing to the abnormal loads being transported during the construction phase, the roads needed for the installation of the wind turbines is a major determinant of the success of the project. During the construction phase all the components of the turbine must be transported to the proposed construction site by trucks. In most cases, only a single component of a turbine can be transported per truck at any given time. In addition, cranes and heavy duty plant required during the installation must also be able to reach each construction site. The road requirements thus become very important when considering the location of the potential sites.

The proposed route and travel time must be well planned and coordinated in consultation with the relevant roads authority (SANRAL, provincial government and/or local municipality). The assistance of the local traffic regulatory authority will be required to oversee the transportation of the components and to ensure the safety of all road users. The consulting engineers have drawn up a transportation plan. Details are presented in Appendix E. The plan provides for engineering solutions to all potential obstacles along the way. It addresses bridge height clearances, on-ramp and off-ramp detours where unavoidable, culvert load bearing capabilities, turning circles and compulsory alterations to the geometry of rural public roads where this is necessary.

3.10 Internal and External Transmission Lines

The turbines produce electricity with an electromotive force (voltage) of 690 V that is transformed at the turbine to 11 or 22 kV. Transmission cables between closely spaced individual turbines are to be buried underground where possible. The internal cables will then converge at a substation in each cluster, where the voltage is transformed once more for external transmission by means of a 132 kV overhead power line to the Eskom Melkhout Substation located 3 km to the north of Humansdorp. Corridors for the external transmission lines have not been finalised as yet. Hence, the exact positions for the internal cluster substations linking up with them are not known at this stage. They will be placed on already transformed ground and not in indigenous vegetation.

In support of the wind farm project Eskom has commissioned a Basic Assessment for the 132 kV overhead power line linking the Central Cluster to the Eskom Melkhout Substation. It is being conducted by the independent environmental consultant firm Coastal & Environmental Services.

The electrical grid connections for the Eastern and Western Clusters will need to go through Basic Assessments in compliance with the EIA Regulations. The developer is discussing these connections with Eskom and plans to start Basic Assessment processes for them both in the near future.

3.11 Surface Area to be Potentially Impacted by the Project

As indicated above the total area of farmland on which the wind farm can be sited is 9382 ha. For the Draft EIR a conservative estimate of 65ha was used for the permanently altered land by the development. This is the number the specialists worked with in their assessments. A more accurate calculation has now been done and the components of the development that will permanently alter the land they are on and the areas that this will entail are depicted in ***Table 5*** below.

Table 5: Development components that will permanently alter the land and the relevant areas

Description		Western Cluster*		Central Cluster*		Eastern Cluster*		Total Area*	
	No. Turbines	17	53	17	41	16	27	50	121
		ha	ha	ha	ha	ha	ha	ha	ha
Concrete Foundations		0.56	1.76	0.56	1.36	0.53	0.89	1.66	4.01
Transformer Buildings		0.03	0.11	0.03	0.08	0.03	0.05	0.10	0.24
Electrical Sub-Station Yard		0.64	0.64	0.64	0.64	0.00	0.00	1.28	1.28
Control Room / Office		0.06	0.06	0.06	0.06	0.06	0.06	0.18	0.18
Gravel Access Roads		6.90	21.52	6.49	15.66	7.01	11.84	20.41	49.02
Total: Phase 1, 50 turbines		8		8		8		24	
Total: All 121 turbines			25		18		13		56

* These numbers are indicative only and can only be confirmed at the detailed design stage

From this it can be seen that only about 24ha will be permanently altered by the phase 1 of the project (50 turbines max) and then only about 56ha if all 121 turbines and associated infrastructure is to be eventually constructed. It is also important to note that this 24/ 56ha is disbursed over the entire 9 382ha site.

These numbers are indicative only and can only be confirmed at the detailed design stage and when the 50 turbines for phase 1 are chosen. However, even if the area permanently affected was as much as 100 ha this would still only equate to 1% of the total area. What this implies is that nowhere will the project have a significantly large footprint in one area and this fact will limit large scale impacts caused by permanent transformation of land.

Other areas such as buffer areas for construction requirements around the foundations, roads and buildings as well as all the temporary areas such as the construction camp and topsoil storage areas have been considered. These areas have been calculated and will also be about 1% of the total 9382 ha and thus not of a significant scale. Where possible, they will be located on disturbed land and rehabilitated after the construction period and thus will not be permanently degraded.

4 ALTERNATIVES

4.1 Consideration of Reasonable and Feasible Alternatives

The EIA Regulations require that alternatives to a proposed listed activity be considered. Alternatives are different means of meeting the general purpose and need of a proposed activity. This may include the assessment of site alternatives, activity alternatives, process or technology alternatives, temporal alternatives and/or the no-go alternative. The EIA Regulations indicate that alternatives that are considered in an assessment process be reasonable and feasible. I&APs must also be provided with an opportunity of providing inputs into the process of formulating alternatives during the Public Participation Process.

The entire project could be considered as an alternative source of energy to our current use of coal based power. The Applicant is in the business of harnessing electricity from wind power and has therefore not considered another means of generating electricity for this particular project.

4.2 Alternatives Considered in this EIA

Alternatives considered in this Draft EIR include:

- Site alternatives
- Land use alternatives
- Positioning of the wind turbines (alternative layouts)
- Many small turbines versus fewer large turbines scenario
- The no-go option.

4.2.1 Site Alternatives

The development stages listed below outline the process followed by the developer and the criteria used to arrive at the final selected site:

- Meso scale wind modelling of the country revealed that Kouga region was one of the best wind resources in South Africa
- High masts were erected in the area and the data used to develop detailed wind maps for the region
- The high resource wind areas were identified within the region
- The identified areas were then further refined by considering proximity to the Eskom grid and accessibility to major transport routes
- A preliminary EIA fatal flaw analysis was completed. Areas deemed to be environmentally sensitive were excluded from the target area
- Sites were then identified and land owners approached, with a view of realising a 300 MW project.

4.2.2 Land Use Alternatives

The proposed land parcels contained in the three clusters are zoned as Agriculture, and are mainly used for extensive cattle grazing. Other than the current agricultural

practices, no other alternative land uses have been proposed. The proposed wind farm activity would negligibly affect the current farming activities. The wind farm activities use small footprints and are not problematic in terms of cattle movement.

4.2.3 Alternative Layouts

The state of technology at the present time is that the largest turbines that can be realistically be used in South Africa, have a nominal generation capacity of 3 MW. Hence as a minimum 100 turbines are needed to achieve the production capacity desired by the developer. Analysis has confirmed that all three clusters are required to carry the full 300 MW of wind generation capacity and ensure that mandatory ecological sustainability targets were not severely compromised.

The proposed Kouga Wind Farm EIA has undergone three major layout iterations in order to find the most acceptable solution from an environmental perspective. The three iterations are introduced below and followed by a more detailed description on what caused the changes between the layouts (see Figure 18 and Figure 19).

Layout 1 of 6 July 2010 placed 89 turbines into the three clusters and aspired to add 11 or more as planning proceeded. It was based on the initial plan to use 3.0 MW turbines exclusively.

Layout 2 of 8 October placed 149 turbines into the three clusters (east: 29, central: 47, west: 73) in order to make provision for the use of a turbine model with a lower output, e.g. 2.5 MW.

Layout 3 of 22 October distributed 121 turbines into the three clusters (east 27, central: 41, west: 53.

Layout 3 is the preferred alternative and it is the layout that has been assessed in detail in this EIA process (see Figure 15 to Figure 17 for a detailed overview of Layout 3)

(a) Eastern Cluster

In respect of the Eastern Cluster, early feedback received from the ecological specialists (vegetation/wetlands, terrestrial fauna, birds) indicated that turbines and roads of Layout 1 intruded on seasonal pans and dams potentially compromising biodiversity. The layout was thus adapted to overcome these concerns.

Taking account of the environmental constraints identified from Layout 1, more turbines were added to the Eastern Cluster in Layout 2 in order to allow for the use of turbines with a lower generation capacity. Different pathways for the internal roads were also explored. Although these changes presented an improvement on Layout 1, they still did not meet the stringent demands made by the ecological specialists.

Layout 3 reduced the total number of turbines by 2 to 27 and rearranged the positions of the internal roads, thus achieving more effective mitigation of the identified potential impacts. Layout 3 also included buffers to ensure that noise consideration did not exceed regulated noise guidelines at Noise Sensitive Areas.

Layout 3 for the **Eastern Cluster** has evolved as a result of the consideration of the environmental and social constraints on the site. The changes in the layout will result in 27 turbines with a maximum output of power of between 67.5 MW to 81 MW of electricity, depending on the size of turbines to be used.

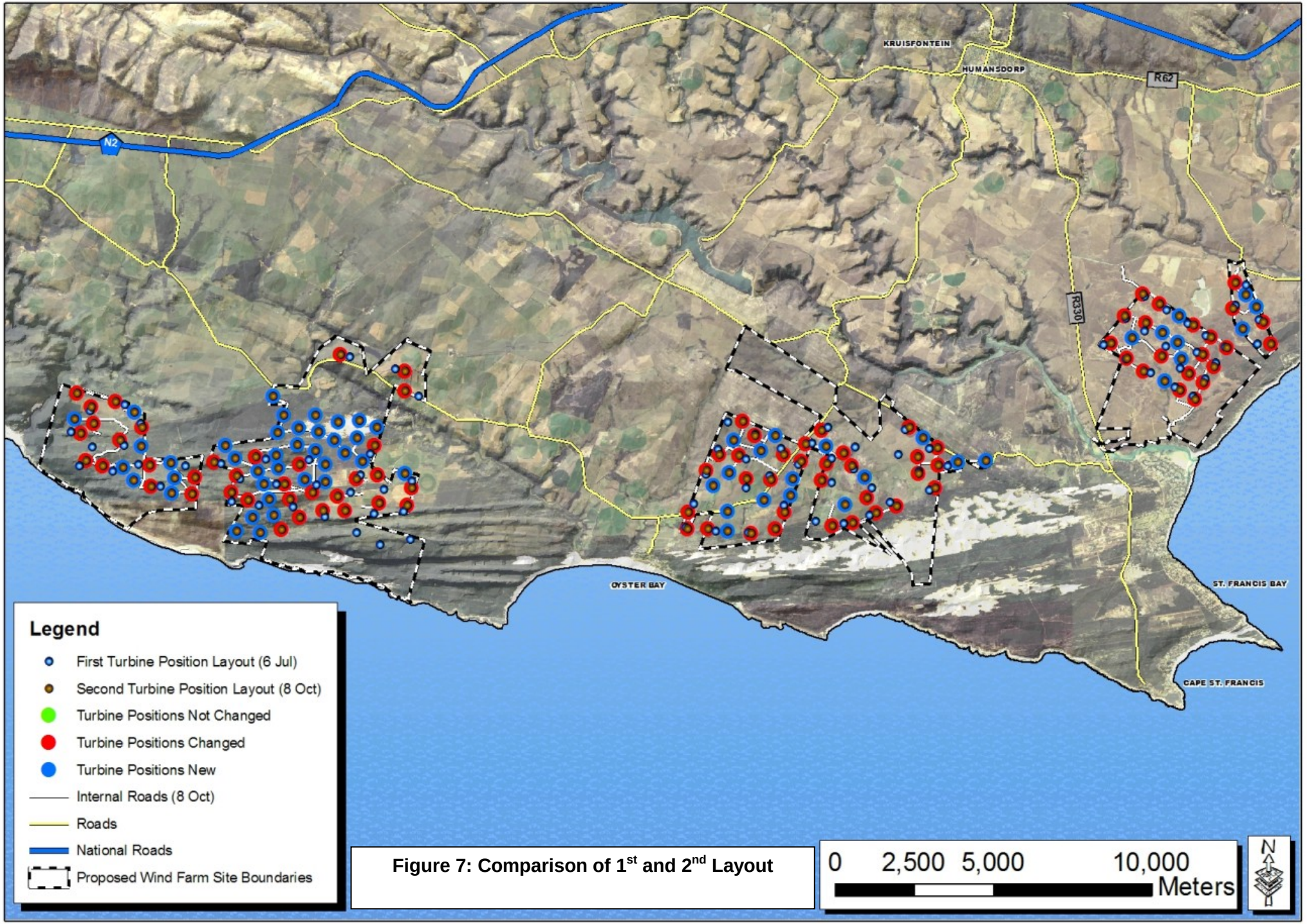


Figure 7: Comparison of 1st and 2nd Layout

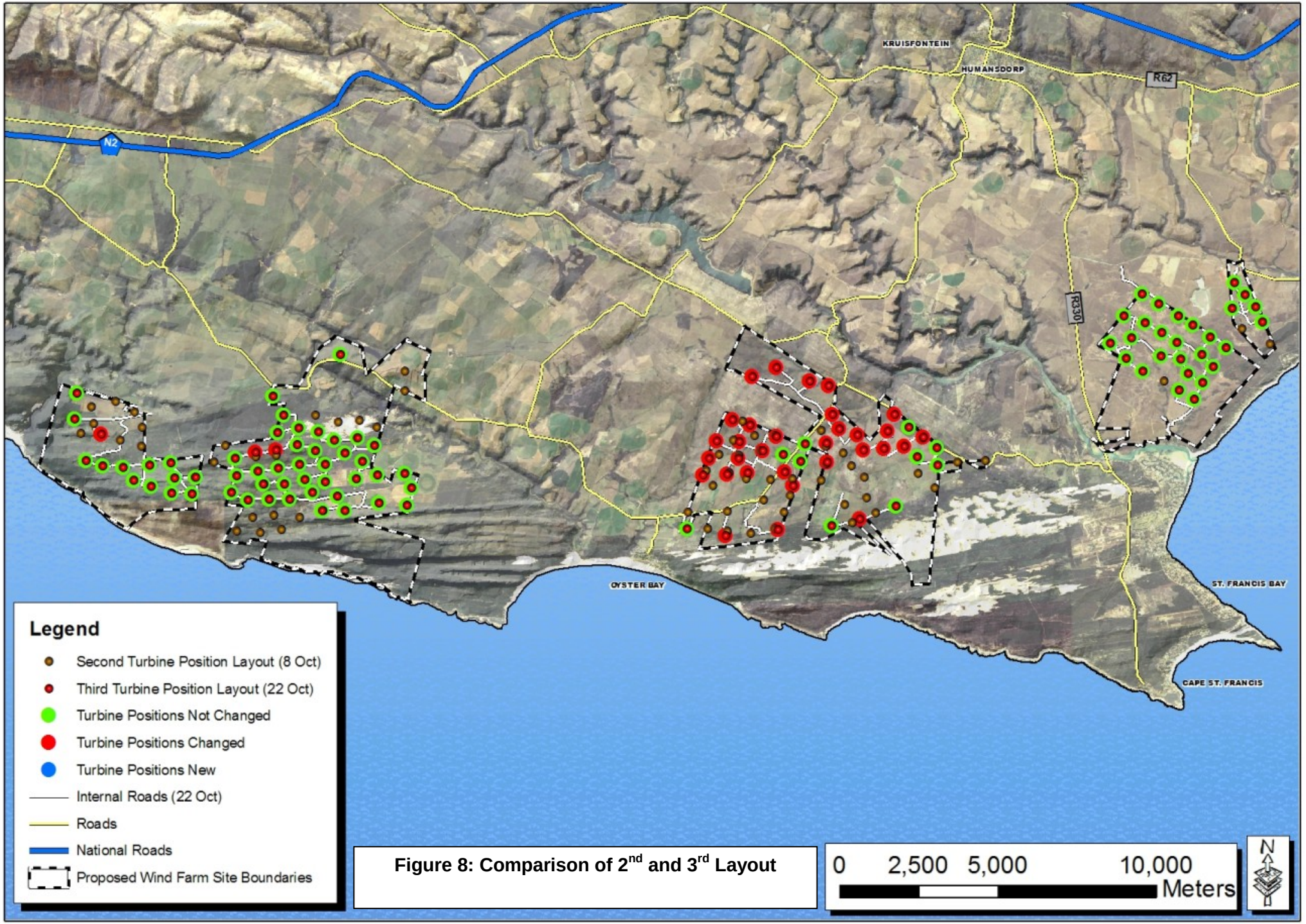


Figure 8: Comparison of 2nd and 3rd Layout

(b) Central Cluster

Feedback received from the ecological specialists (vegetation/wetlands, terrestrial fauna, birds) indicated that there were numerous environmental issues with turbine positions and roads of Layout 1 for the Central Cluster relating to surface water features in particular, as well as ecologically valuable rocky outcrop habitat. Layout 2 improved on the environmental acceptability of Layout 1, but by adding more turbines in Layout 2 in order to allow for the use of turbines with a lower generation capacity, as noise reduction targets at Noise Sensitive Areas (NSA) could not be attained. The layout also impacted seriously on heritage resources, which by that time had been identified. Layout 3 reduced noise impacts to within acceptable levels at Noise Sensitive Areas and reduced heritage and ecological impacts to acceptable levels taking into consideration effective mitigation strategies. Layout 3 for the Central Cluster has evolved as a result of the consideration of the environmental and social constraints on the site. The changes in the layout will result in the maximum output of power of between 102.5 MW to 123 MW of electricity, depending on the size of turbines to be used.

(c) Western Cluster

Layout 1 of the Western Cluster faced major problems accommodating the topography of the land, thus making access to the more southerly portion very difficult for heavy vehicles. A set of turbines placed into the south eastern corner of the cluster in Layout 2 were judged to be too close to valuable dune thicket. A significant reduction by 20 turbines to a final total off 53 turbines in Layout 3 was instrumental in reducing environmental impacts and keeping turbine noise within acceptable levels. Layout 3 for the Western Cluster has evolved as a result of the consideration of the environmental and social constraints on the site. The changes in the layout will result in the maximum output of power of between 132.5 MW to 159 MW of electricity, depending on the size of turbines to be used.

It is good planning practice to provide for spare turbine positions in case unexpected problems come to the fore when construction gets underway. With a total of 121 identified turbine positions and careful design of the internal access roads Layout 3 has achieved this as well the environmental goal of minimising potential environmental impacts.

Another major change that came about through the environmental input during this iterative process was the agreement by the developer to restrict the first phase of the development to no more than 50 turbines. This, linked to the need to undertake ongoing monitoring programmes on certain impacts, was seen as an acceptable way of overcoming the potential high significance of some impacts which are not well understood such as potential bird and bat mortality.

(d) Many Small Turbines Versus Fewer Large Turbines Scenario

The scale of the facility will have an influence on the risk. According to Kingsley and Whittam (2005), “More turbines will result in more collisions [with birds]”. Although only two bird mortalities have been recorded at the experimental site at Klipheuwel, the differences between the 3 turbines at Klipheuwel and the proposed 121 turbines at the proposed Kouga site are significant. Larger facilities also have greater potential for disturbance and habitat destruction. The rotor design and dimensions also play a role. To date it has been shown that large turbines kill the same number of birds as smaller ones (Howell 1995, Erickson *et al*. 1999). This means that with newer technology and larger turbines, fewer turbines are needed for the same power generation, possibly resulting in less mortalities altogether (Erickson *et al.* 1999)). By using a combination of the largest turbine models in the range of 2.3 to 3.0 MW the Kouga Wind Farm has responded positively to the issue of turbine size.

(e) No-Go Alternative

This alternative is included in the EIA as a benchmark against which to assess the impacts (positive and negative) of the proposed wind power project. The no-go alternative must be considered in view of:

- The current land use and how the proposed activity influences these activities;
- The existing energy environment in South Africa and the need for alternative energy sources;
- The Constitution of the Republic of South Africa;
- The White Paper on the Energy Policy of South Africa;
- The National Integrated Energy Plan for the Republic of South Africa; and
- The White Paper on Renewable Energy.

The dominant land use in the area under investigation is cattle farming. Should the no-go option be preferred, the farmers would continue their operations without any significant impact on their livelihood. However, the farmers would not receive any income from the operation of the turbines on their land.

South Africa has an energy intensive economy, highly reliant on fossil fuels, and sees economic growth based on energy intensive industries as a key means to development. Eskom is the main role player in energy generation in South Africa. It produces 95% of the country's total power. Currently Eskom has a total installed generating capacity of some 42 000 MW (net 36 200 MW, peak 34 200 MW) with already new peak capacity in demand since 2007. 93% of its power production capacity is of coal based (10 large plants), 5% nuclear and 2% hydroelectric. Twenty two small power stations and back-up gas-turbines represent less than 1% of the national output, another 3% is used for own consumption by independent power producers.

In South Africa's bid to reduce emissions of carbon dioxide (by-product of coal based power) while at the same time addressing the need for economic growth, it would be necessary to look at alternative electricity generating technology. Technology that is more sustainable and environmentally friendly. Wind energy is the most suitable renewable energy resource for this region due to its high wind energy regime. Should the no-go option be preferred, it would be a loss to the countries objective of reducing reliance on coal based power and its associated impacts.

In terms of the Constitution of the Republic of South Africa, energy should be made available and be affordable to all citizens, irrespective of geographic location. The production and distribution of energy should be sustainable and lead to an improvement in the standard of living of citizens. Section 24 of the Constitution also states that everyone has the right to an environment which is not harmful to their health and wellbeing. The proposed wind farm gives effect to this.

The White Paper on the Energy Policy of South Africa (December 1998) provides the Government's overarching energy policy. The foundation of the South African energy policy is based on five major objectives which the policy seeks to achieve in both the short (1-2 years) to medium term (3-7 years). These objectives include promoting access to affordable energy services, for disadvantaged rural and urban households, small businesses and farms as well as community services. This includes the evaluation of grid or non-grid options to meet this objective, in particular renewable energy options are considered. The no-go option would hamper the achievement of the five major objectives of the Energy Policy.

In 2003 the Department of Minerals and Energy published an integrated energy plan, the National Integrated Energy Plan for the Republic of South Africa. The plan provides a framework for taking decisions on energy policy and for the development of different energy sources and energy technologies in the country. A computerised analysis of this plan has been undertaken based on the energy reserves, energy demand and consumption up to 2020 using different scenarios of the South African economy. The scenarios relate to future energy use based on the use of different energy sources, and also assess the implications of associated pollution including the emissions of greenhouse gases (Energy Research Centre 2004). Wind power energy forms part of the analysis and scenario predictions. The no-go option in this case would dilute some of the positive implications of investing in renewable energy sources.

The White Paper on Renewable Energy (November 2003) supplements the White Paper on Energy Policy, which recognises the significant medium and long-term potential of renewable energy. The White Paper sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. Government's long-term goal is the establishment of a renewable energy industry that will offer a sustainable, fully non-subsidised alternative to fossil fuels subsequently ensuring energy security through the development of renewable energy resources in order to reduce the requirement for coal based power generation.

To proceed towards this goal, the government's medium-term (10-year) target is 10 000 GW·h renewable energy contributions to final energy consumption by 2013, which is to be produced primarily from biomass, wind, solar and small-scale hydro. The renewable energy is to be utilised for power generation and non-electric technologies such as solar water heating and biofuels. This is approximately 4% (1 667 MW) of the projected electricity demand for 2013 (41 539 MW), and is equivalent to replacing two 660 MW units of Eskom's combined coal fired power stations. The realisation of these targets would be greatly reduced should the no-go option be preferred over installing the wind power turbines on the Kouga coast.

5 THE AFFECTED ENVIRONMENT

This section presents an overview of the biophysical and social-cultural environment of the site and surrounding area which may be directly or indirectly affected by the proposed wind farm development.

5.1 General description of the study area

The study area stretches over almost 40 km along the Kouga coast from the Krom River to the Tsitsikamma River. It is made up of 51 constituent farms and farm portions (Table 3) divided into three clusters and has a total size of 9382 ha.

The eastern wind farm cluster is located between the Jeffrey's Bay/Aston Bay/Paradise Beach coastal resort complex and St Francis Bay, while the Central Cluster lies between Cape St Francis and Oyster Bay. The Western Cluster is further removed from settlements and is located on the coast between Oyster Bay and the Tsitsikamma River.

5.2 Topography

The topography of the region is dominated by a flat coastal plain, with the more distinctive relief of the Cape Fold Belt mountains appearing to the north and west of the study area. Rivers have incised deeply into the coastal plain. Dunes and palaeo-dune fields of Oyster Bay and Cape St Francis are also present. The eastern and central wind farm clusters are located on relatively flat areas, while the western wind farm cluster is located among palaeo-dunes with higher relief.

5.3 Climate

The Kouga coast is well recognised for its strong winds arriving from the ocean. Throughout the year a high frequency of daily wind occurs in the area. The most dominant wind direction is from the west. This direction is particularly frequent during winter. An easterly wind component also occurs in summer.

The region features a bimodal rainfall pattern as it is in the transition zone between the summer and winter rainfall regions of the country. The mean annual rainfall is approximately 600 mm.

In general terms, the climate is mild without extreme conditions, with average summer temperatures of 24 °C and average winter temperatures of 17 °C. The coolest period is from about June to September.

5.4 Vegetation and Wetlands

The vegetation of the site falls within the Cape Floral Kingdom, one of six such plant kingdoms in the world. This kingdom has over 9 000 plant species, 70% of which grow nowhere else in the world (i.e. they are endemic to the Kingdom). The Cape Floral Kingdom, typically referred to as 'Fynbos', is generally characterised by three elements: the tough, wiry restioids (Cape Reeds) which form the graminoid (grass-like) layer; the heath component which is composed of small, narrow-leafed shrubs (the most famous examples are the Ericas); the proteoid component of proteas, cone-bushes and pin-cushions. Within the study area, the dominant component is a Grassy Fynbos community.

5.4.1 Regional Planning Framework

Systematic Conservation Planning provides a framework that highlights national and regional conservation planning processes. This is done by the development of numerous national and regional Plans which provide a good indication of the floral environment present within a particular area, as well as the respective conservation status.

The Garden Route Biodiversity Sector Plan (2010) (GRBSP) is the most relevant conservation planning initiative for this area. It provides a synthesis of prioritised information to planners and land-use managers, enabling the integration of biodiversity into land-use planning and decision-making. Numerous vegetation units from the GRBSP occur in the vicinity of the proposed development clusters. A summary of these affected vegetation units in the study area and their conservation / ecosystem status is presented in Table 6.

Table 6: The Garden Route Bioregional Sector Plan Vegetation Variants and Respective Conservation Statuses.

Vegetation Variant	Vegetation Habitat	Conservation Status	Farm sites*
Hartenbos Primary Dune	Primary Dune	Endangered	C, W
Humansdorp Perennial Stream	Perennial Stream	Least Threatened	E, C
Inland Drift Sands	Drift Sands	Vulnerable	C, W
Inland Primary Dune	Primary Dune	Endangered	W
Kabeljous Valley Flora	Valley Flora	Vulnerable	E
Kouga Mesic Proteoid Fynbos	Montane Mesic Proteoid	Least Threatened	C
Osbosch Flora-Renosterveld	Mesic Mosaic Valley Flora	Vulnerable	E
Oyster Bay Flora-Grassy Fynbos	Grassy Fynbos Mosaic Flora and Forest	Endangered	C, W
Soutvlei Inland Pans	Inland Pans	Vulnerable	E
St Francis Dune Stream	Perennial Stream	Least Threatened	W
St Francis Strandveld	Dune Mosaic Sand Fynbos	Least Threatened	C, W
Tsitsikamma Dune Forest	Coastal Dune Milkwood and Ekebergia	Vulnerable	W
Tsitsikamma Littoral Vegetation	Littoral Vegetation	Least Threatened	C, E, W
Tsitsikamma Perennial Stream	Perennial Stream	Critically Endangered	C, W

Vegetation Variant	Vegetation Habitat	Conservation Status	Farm sites*
Tsitsikamma Plateau Proteoid Fynbos	Montane Mesic Proteoid	Least Threatened	W
Tsitsikamma Riverine Forest	Coastal Riverine	Least Threatened	W
Zeekoei Limestone Strandveld	Dune Mosaic Sand Fynbos	Least Threatened	E

* C = Central; E = Eastern; W = Western; Note: This analysis is based on point localities for the site positions. Final position may change for sites occurring on any boundaries.

The GRBSP identifies areas that are critical for conserving biodiversity and in this way, facilitates the integration of biodiversity into decision-making (i.e. mainstreaming biodiversity). The overall aim is to minimise the loss of natural habitat in what are termed Critical Biodiversity Areas (CBA) and prevent the degradation of Ecological Support Areas (ESA), while encouraging sustainable development in other natural areas. The broad objective is to ensure appropriate land-use for the best possible sustainable benefits and to promote integrated management of natural resources.

Most of the Eastern Cluster falls within designated CBAs relating to the presence of the inland pans. Within the Central site, CBAs encompass the remnant patches of Oyster Bay Thicket Grassy Fynbos and ESAs where Tsitsikamma Perennial Streams are present. The St Francis Dune Strandveld within the Western Cluster is largely a CBA, with transformed areas being considered ESAs.

It is important to note that the GRBSP permits infrastructure installation related land-uses in designated CBA and ESA areas having a restricted nature and guidelines recommend 'strict controls' over activities in these areas. One of the infrastructure installations that are specifically accommodated in these areas is “wind farms or other alternative energy technologies requiring large areas of undeveloped land”.

Whilst the GRBSP identifies a number of distinct vegetation variants, for the purposes of the assessment of the impacts, these were grouped into similar ecological functional groups, namely:

- Grassy Fynbos, Dune Strandveld and Renosterveld communities
- Rocky Refugia habitats
- Seeps, Wetlands and Pans
- Riparian Vegetation along seeps and ephemeral river courses
- Thicket and Dune Forest
- Drift Sands, Dune Fields and Littoral Vegetation
- Transformed vegetation

5.4.2 Vegetation Specific to Each Cluster

Figure 9 - Figure 11 present pictures showing examples of the vegetation found in each cluster.

Typical Grassy Inland Pan vegetation surrounded by Osbosch Thicket-Renosterveld

Extensive Grassed Inland Pan

Transformed Inland pan - Dam with typical riparian vegetation, provides important faunal habitat.

Transformed vegetation - pasture with regeneration of pioneer species.

Figure 9: Pictures of Vegetation Types within the Eastern Cluster

Unique to the Eastern Cluster is the abundance of *Soutvlei Inland Pans* forming a network between islands of *Osbosch Thicket-Renosterveld* on higher lying areas. *Humansdorp Perennial Stream* occurs along drainage lines, with *Kabeljous Valley Thicket* on dunes and slopes and *St Francis Strandveld* and *Zeekoei Limestone Strandveld* along coastal belt. *Soutvlei Inland Pans* are ephemeral or seasonal in nature, tending to have a perched water table with standing water present after rainfall. *Soutvlei Inland Pans* tend to have a dominant grassy composition, with herbs, shrubs and trees being excluded due to period inundation with water. *Inland pans* are clearly differentiated from surrounding matrix by the presence of shallow depressions and domination by grasses. Some areas of *Inland pans* have been modified and excavated to increase water storage capacity. Transformed areas (predominantly agricultural pastures) are limited in extent to some peripheral areas.

Seep area.

Transformed vegetation - pasture.

Typical exposed Rocky Outcrop.

Typical intact Grassy Fynbos surrounding exposed outcrops.

Figure 10: Pictures of Vegetation Types within the Central Cluster

In the Central Cluster *Oyster Bay Thicket-Grassy Fynbos* is predominant throughout the level areas of the site, with *Kouga Mesic Proteoid Fynbos* on hilltops. An extensive network of drainage lines (*Tsitsikamma Perennial Streams*) drains the site to the north and to the south. Bands of *St Francis Strandveld* and *Inland Primary* Dune are present on vegetated dunes along the coastal belt interspersed with un-vegetated *Primary Dunes*. *Oyster Bay Thicket-Grassy Fynbos* and *Tsitsikamma Perennial Streams* are highly modified through agriculture, with extensive areas converted to irrigated pastures throughout the site. Intact portions tend to be limited to isolated pockets (islands) between pastures and along drainage lines. Seep and

wetland areas have also been drained to increase pasture footprint within the cluster. *Mesic Proteoid Fynbos* tends to be intact, especially where exposed rocky outcrops are present, due to unsuitability for cultivation.

Dunes vegetated with Thicket-Fynbos.

Degraded Primary Dune with alien infestation.

Small wetland in dune slack.

Transformed vegetation on extensive vegetated palaeodunes dunes.

Figure 11: Pictures of Vegetation Types within the Western Cluster

In the Western Cluster the vegetation is predominantly *St Francis Strandveld* in the southern portion of site on linear vegetated dunes. *Tsitsikamma Dune Forest* and *Tsitsikamma Riverine Forest* are found on peripheral northern portions of the site with *Oyster Bay Thicket-Grassy Fynbos* and *Tsitsikamma Riverine Forest* in the northern areas on hills and drainage line slopes. *Inland Primary Dune* and *Drift Sands* is also present within the site. A number of wetlands are present in dune slacks within the *Inland Primary Dune* vegetation.

5.4.3 Seeps, Wetlands, Streams and Pans

There are a number of seeps, wetlands, pans and streams in the clusters and particularly in the Eastern Cluster. These seasonal wetlands, seeps and riparian areas are presented in Figure 12 - Figure 14 and they comprised primarily of the Soutvlei Inland Pans but are also represented in the GRBSP Humansdorp Perennial Stream, St Francis Dune Stream and Tsitsikamma Perennial Stream Variant. No species of special concern were noted to be within the pans.

Large areas of the vegetation associated with these features is intact, but some degradation is evident as a result of historical land-use practices in the area, including

pastures. A few severely degraded (non-restorable) portions of this vegetation type are present.

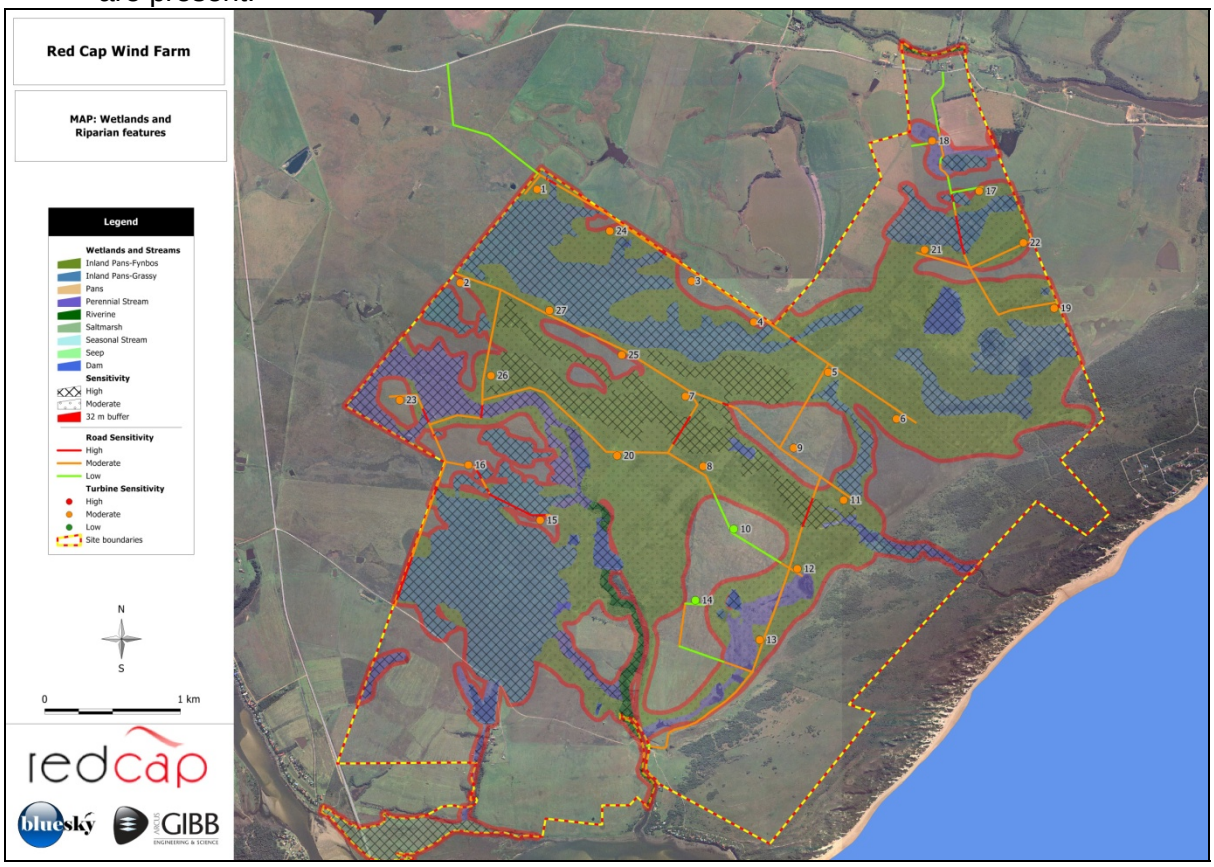


Figure 12: Mapped Riparian and Wetland Features for Eastern Cluster

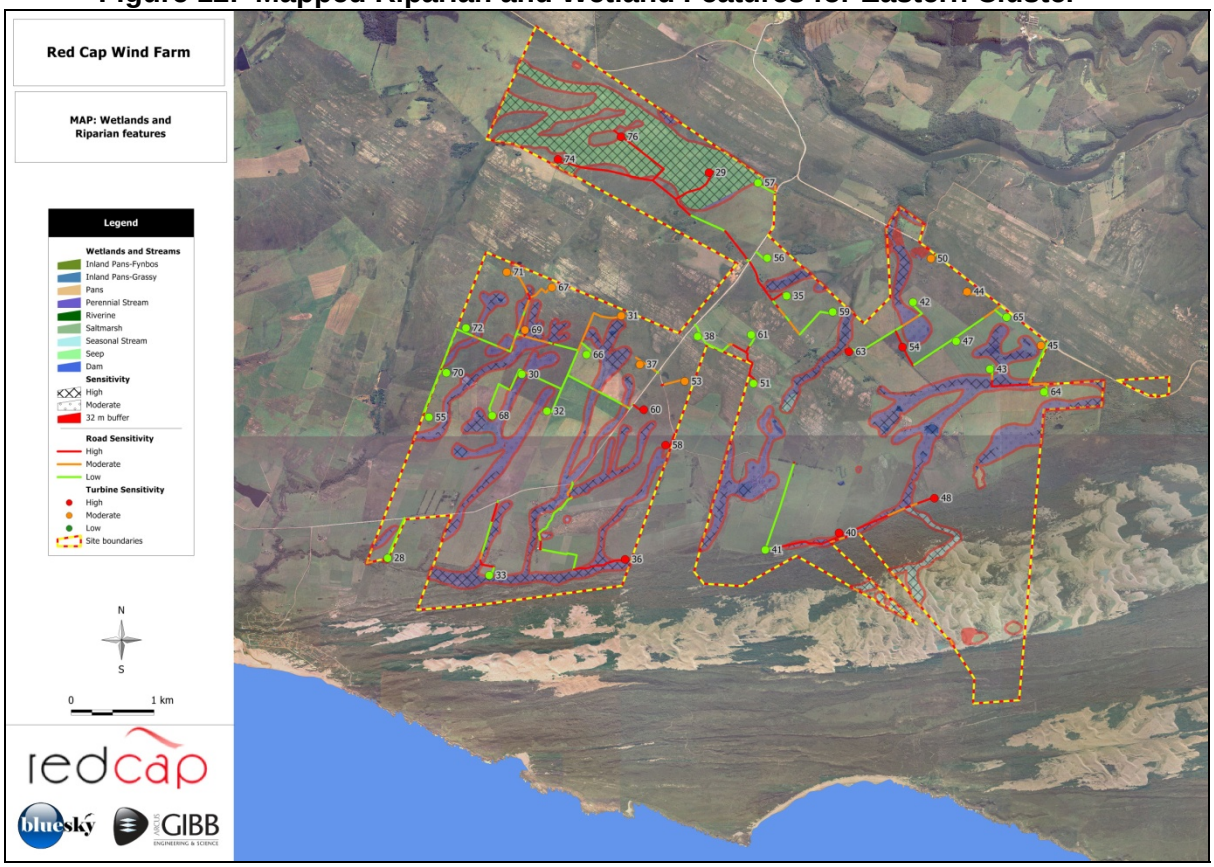


Figure 13: Mapped Riparian and Wetland Features for Central Cluster

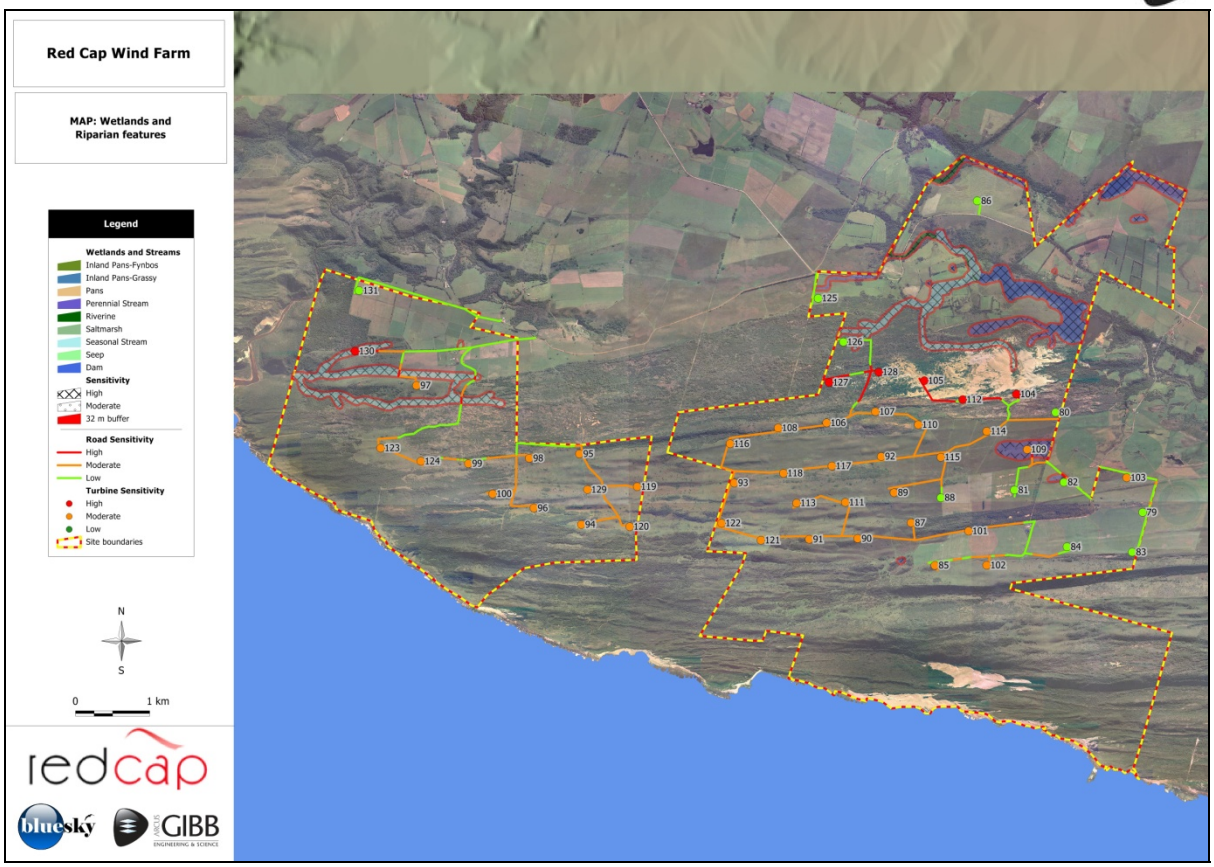


Figure 14: Mapped Riparian and Wetland Features for Western Cluster

5.5 Hydrology and Surface/ Groundwater Links with Wetlands

This section gives a brief description of the hydrology as well as the surface and groundwater links with wetland ecosystems in the study area. More detail, along with maps, is given on the seeps, wetlands and pans in the area in Section 5.4.3 which covers the vegetation and related wetlands.

5.5.1 Eastern Cluster

The Eastern Cluster is located about halfway between Paradise Beach and St Francis Bay and the nearest two wind turbines are approximately 1.5 km and 1.72 km from the coastline. This Eastern Cluster lies within the K90E and K90F quaternary catchments. The area is drained by the Krom River to the south and the Seekoei River to the north. It is anticipated that run-off occurs mainly during high rainfall events. Rainfall data extracted from the Daily Rainfall Data Extraction Utility indicates an average rainfall (MAP) of 558 mm (Jeffrey's Bay) as being applicable in this area.

The occurrence of wetlands in this cluster is driven primarily by surface rather than groundwater interactions. The relatively flat topography in the general area, coupled with low groundwater permeability, facilitates the spread of surface runoff, which pools in low-lying depressions and flats, giving rise to the extensive salt marsh (Soutvlei inland pans) and other wetland habitats described in the vegetation section (see Figure 12) which occur between higher-lying terrestrial areas. These seasonal

pans tend to be naturally brackish, as a result of both exposure to underlying shales and evapoconcentration which occurs as the pans dry out. Natural exposure of the wetland pans to periodic high flows and inundations is, however, likely to play an important role in sustaining these systems, as these events allow periodic flushing of salts, thus preventing the long-term development of hypersaline conditions. Higher flows may also scour flow channels, thus preventing excessive build-up of vegetation and so maintaining hydrological links between adjacent pans.

5.5.2 Central Cluster

The Central Cluster is located about halfway between Oyster Bay and Cape St Francis with the two nearest wind turbines of the Central Cluster located approximately 1.67 km and 1.99 km from the coast line. The Central Cluster lies within the K90E and K80F quaternary catchments. The area is drained by an extensive network of streams and watercourses to the south and tributaries of the Krom River to the north. It is anticipated that run-off occurs mainly during high rainfall events which feed the streams and watercourses draining the area. The broader area around the study site is characterized by significant water resources in particular the Impofu Dam located along the Krom River to the north of the cluster. This dam will tend to moderate high flows in the Krom River. Rainfall data extracted from the Daily Rainfall Data Extraction Utility indicates a relatively high Mean Annual Precipitation (MAP) of 664 mm (St Francis Bay) as being applicable to the area.

Wetlands in this area are driven by both surface and groundwater flows, and comprise a combination of wetland depressions, hillslope seeps and valley bottom wetlands (see Figure 13). Of these, the latter drain mainly into the Slang River, which flows along the northern edge of the Oyster Bay dunefield, and passes into the sea at Oyster Bay, to the east. However, valley bottom wetlands draining the eastern portion of the Central Cluster pass into the dunefield itself (which is situated outside the study area), forming extensive seasonal and permanent wetland depressions along the northern margins of the dunefields, which contribute to aquifer recharge within the dunefield. The aquifer itself gives rise to extensive duneslack wetland depressions within the mobile dune, as well as to large hillslope and coastal seep wetlands to the north of the mobile dune.

The area that would be affected by the proposed Central Cluster lies to the north of the mobile dune belt, and thus would not directly impinge on the important wetlands found within them. Wetlands in the cluster are largely disturbed systems, the integrity of which have already been impacted to some extent by largely agricultural activities in their vicinity and upstream catchment areas.

5.5.3 Western Cluster

The Western Cluster is located on the coast between Oyster Bay and the Tsitsikamma River and lies within the K80F quaternary catchment. The two wind turbines located nearest to the coast line are approx 1.09 km and 1.19 km from the coast, with the nearest wind turbines to Oyster Bay located approximately 7.3 north-west, inland from Oyster Bay. The area is drained by tributaries of the Klipdrift River to the north and the Tsitsikamma River to the west. It is anticipated that run-off occurs mainly during high rainfall events which feed the streams and watercourses draining the area. Rainfall data extracted from the Daily Rainfall Data Extraction Utility2 indicates a relatively high MAP of 689 mm (Slangrivier) as being applicable to the area.

The wetlands and rivers / streams in this cluster (see Figure 14) are likely to be driven by both surface and groundwater flows. Although the mobile dune areas in this area are small in comparison with the Oyster Bay dunefield in the vicinity of the Central Cluster, surface and groundwater flows from the north are nevertheless likely to play a role in recharge of the dune aquifer which is outside the study area. They thus contribute to throughflows, that support both limited dune slack wetland depressions in the mobile dunes, as well as coastal seep wetlands, which are likely to occur in areas where groundwater daylights along the rocky shoreline at the coast.

5.6 Terrestrial Fauna

This section looks at the vertebrates and invertebrates except for avifauna and bats which are covered in separate sections.

5.6.1 Vertebrates

The coastal region between the Tsitsikamma and Krom Rivers can be described as environmentally diverse as it provides habitat for a variety of faunal species, especially to the south of the land that is highly transformed by agricultural activities inside both the western and Central Clusters. The number of potential animal habitats is much reduced inside the Eastern Cluster owing to its transformation to grazing land, although the seasonal pans continue to attract substantial wetland fauna, especially birds and amphibians.

Arguably the greatest value in terms of faunal habitat occurs inside the Western Cluster. Here, extensive ecotonal areas exist where habitats intergrade. Owing to its remoteness, the fauna present in the Western Cluster also experiences the least disturbance from humans verified through the most frequent sightings of antelopes, and even spoor of caracal, wild cat and aardvark which were made in that cluster during field work for this EIA.

Species list of birds, amphibians, reptiles and mammals are provided in the relevant specialist reports provided in the Appendix G4.

5.6.2 Invertebrates

Scientific knowledge of the invertebrate fauna of the Kouga wind farm site is poor. In 2007, Dr M. Picker conducted a desktop study of invertebrates potentially impacted by the proposed Eskom Nuclear 1 power plant at Thyspunt situated south of the central wind farm cluster. It was followed by a survey of invertebrate biodiversity of selected groups by Afribugs CC in 2010 for the same project, for which GIBB is undertaking the EIA.

For the surveys, Afribugs CC chose ants and butterflies as the chief diversity surrogates of the site. At Thyspunt, 26 ant species were predicted to occur, of which three species were unknown to science and one being very rare. A total of 43 butterfly species were expected to occur at Thyspunt, but the Red List species probability of 0.01 is very low. None of these species are locally endemic, three are regionally endemic and three are endemic to South Africa.

Invertebrates make up 95% of all known animal species on earth. Owing to the richness in species, it is not feasible to carry out comprehensive biodiversity surveys

of all invertebrate species at a site. In the absence of comprehensive data sets of the occurrence and status of invertebrate species of conservation concern at the Kouga wind farm study site, a more promising way forward is to adopt use maps of land classes, such as vegetation types or habitat types (e.g. Kouga Sandstone Fynbos), to represent biodiversity features. This is also the approach used by the National Spatial Biodiversity Assessment (NSBA, Driver *et al*. 2005). By conserving suitable habitat, the survival chances of the species and populations contained therein are improved. Consequently, mitigation of potential impact on invertebrates is most readily achieved by the conservation of representatives of as many types of community and ecosystem as possible without compromising the viability of the proposed wind farm project.

5.6.3 Overview of the Fauna specific to each Clusters

(a) The Western Cluster

The reptilian component of the cluster comprises a variety of snakes species from non-threatened to near threatened e.g. Yellow Bellied House Snake. Lizards are common to the cluster and incorporate a wide variety, some of which, like the FitzSimon's Long-tailed Sep are considered vulnerable. Others, like the Elandsberg Dwarf Chameleon, which is listed as endangered, is also thought to occur in the cluster. Amphibians are also common to the area, typically around water bodies, with no endangered species being identified. Many of the reptiles in the cluster are water dependent.

Mammals of all sizes are common to the Western Cluster and include species ranging from non-threatened common species like the Scrub Hare to those included in the Red Data Species list such as the Honey Badger and Blue Duiker.

(b) The Central Cluster

The reptiles of the Central Cluster are primarily rock- and water-dependent as a result of the flat rocky outcrops that characterise this area. Again, the range of reptiles found there is wide from common to near threatened species. The rocky outcrops are also the preferred habitat for many amphibians due to the damp and cool conditions provided by the geological feature. Of significance is the corridor provided by the rocky outcrops into the natural undeveloped areas through to the seep areas. This is essential habitat for the survival of faunal species within the cluster. All the amphibians within the cluster are listed as least concern in terms of their conservation status.

As with the Western Cluster, mammals of all sizes are common to the Central Cluster and include species ranging from non-threatened common species to those included in the Red Data Species list.

(c) The Eastern Cluster

The combination of wetlands and pans in the Eastern Cluster represents a significant potential habitat for Peringuey's Coastal Leaf-toed Gecko (Cryptactites peringueyi) which has a critically endangered conservation status. Its presence to the southwest of the cluster has been recorded. The two salt pan plant species Restio sp. and Sarcocornia sp. are known to be favoured by this gecko species. This cluster contains many reptilian species ranging from common to Red Data species snakes, frogs and lizards.

While the mammal list of the Eastern Cluster is somewhat reduced compared to the western and Central Clusters due to the agricultural use of the land, it is still noteworthy. Mammal species present range from non-threatened common species to those included in the Red Data Species list.

5.7 Avifauna

The study area comprises a number of habitats favouring the presence of birds, particularly noteworthy of which is the abundance of surface water features, such as streams, dams and pans, which attract many bird species. Most of these bird species are not Red Listed species, but the more common water fowl and species associated with water (see Figure 15). One important exception to this is the Blue Crane, a Red Data species which roost in flocks in the shallow water at night.

Figure 15: Wetland on the Western side

Figure 16: Mixed bird habitat at the western site, including pasture, woodland, dams and dunes.

Another important habitat is the Woodlands which occur in bands, usually on higher ground since much of the lower ground is now pasture (see Figure 16).These areas are home mostly to the smaller bird species, few of which qualify as target species for this study. The only tall trees in this area appear to be exotic species, such as Eucalyptus which are used as roost and perch sites for various bird species (Figure 17).

Figure 17: Exotic Trees on the Eastern Side Serve as Important Perches

5.7.1 High Risk Birds of the Study Area

Species which could be found in the study area and which were identified as most likely to be negatively impacted by the proposed Kouga wind farm include Denham's Bustard, White-bellied Korhaan, Blue Crane; African Marsh Harrier, Black Harrier, Secretarybird and White Stork. By some large measure, these 'target' species will also serve as surrogates for other, more common species in terms of impact assessment and management.

5.8 Bats

Bats form an important component of South Africa's biodiversity, with 56 recorded species. Consultation of Taylor (2000) suggests that there are 12 species of bats that may occur in the general study area (Table 7). According to Friedman and Daly (2004) none of these species falls into the higher conservation categories of Vulnerable or Endangered.

Table 7: Species of Chiroptera likely to occur at or near the study site (NT: Near Threatened, LC: Least Concern)

Common Name	Scientific Name	Conservation Status
Cape Horseshoe Bat	Rhinolophus capensis	NT
Cape Serotine Bat	Eptesicus [Neoromicia] capensis	LC
Egyptian Freetailed Bat	Tadarida aegyptiaca	LC
Egyptian Fruit Bat	Rousettus aegyptiacus	LC
Egyptian Slitfaced Bat	Nycteris thebaica	LC
Geoffroy's Horseshoe Bat	Rhinolophus clivosus	NT
Longfingered Bat	Miniopterus schreibersii	NT
Lesser Woolly Bat	Kerivoula lanosa	NT
Longtailed Serotine Bat	Eptesicus hottentotus	LC
Mauritian Tomb Bat	Taphozous mauritianus	LC
Temminck's Hairy Bat	Myotis tricolor	NT
Wahlberg's Epauletted Fruit Bat	Epomophorus wahlbergi	LC

Suitable roosting habitat for some species of bats (e.g. Mauritian Tomb Bat, Egyptian Freetailed Bat, Cape Serotine Bat) was found in abundance on the study site in the form of sheds, barns and tree hollows. Conversely, at least three species - the Egyptian Fruit Bat, Longfingered Bat, Temminck's Hairy Bat, appear to roost habitually in caves. No caves that could serve as roosts for bats were found in any of the clusters of the study site, so the number of species present on site will very likely be less. As is the case for most other South African localities, no information is available in the scientific literature on the absolute numbers of bats present on site, but with the absence of communal daytime cave roosts the mass emergence of bats at dusk is not a feature of the study site.

In terms of ecological importance, insectivorous bats of the Suborder Microchiroptera are major predators of night-flying insects, including many crop pests, thus providing an important service to farmers, while fruit-eating bats of the Suborder Megachiroptera are important agents in the dispersal of seeds, as well as the pollination of night-flowering plants. In stark contrast to their important ecological function, bats are some of the least researched wild animals in South Africa.

Because bats have low reproductive rates, populations are very susceptible to elevated mortality or depressed recruitment. There is scientific concern about the conservation status of bats, as many species of bats are increasingly affected by multiple actions of humans such as ignorance, suspicion, pesticide poisoning, roost destruction and closure, habitat loss, over-exploitation, and extermination as pests.

5.9 Cultural Heritage

From an assessment of the relevant available archaeological and heritage literature and studies the probability of finding archaeological and cultural heritage sites within the proposed Kouga Wind Farm site is tabulated below:

Table 8: Probability and Type of Archaeological and Cultural Heritage Sites Likely within the Study Site

	Type of Archaeological Site	Probability
1	EARLY HOMININ	None
2	STONE AGE	
a	Early Stone Age (ESA)	Medium
b	Middle Stone Age (MSA)	Medium (Human remains not expected but should they be identified they will be of particular scientific significance)
c	Later Stone Age (LSA)	High (Human remains may well be expected; should they be identified they will be of both scientific and social significance)
i	Rock Art	Low
ii	Shell Middens	High
3	IRON AGE	
a	Early Iron Age	None
b	Middle Iron Age	None
c	Later Iron Age	Low
4	COLONIAL PERIOD	
a	Colonial Period	High (Human remains expected to be primarily associated with formal cemeteries)
b	Iron Age/ Colonial Period Contact	Low-Medium
c	Industrial Revolution	High

The most prominent and potentially sensitive site type in the general project area would be shell middens. Such sites are often found within white shifting sand dunes and vary greatly in character from several meters in extent to fairly small ephemeral scatters. Sites appear to be most common within approximately 400m, but up can still be found up to 2km from the shoreline and possibly even further inland. As only one of the proposed turbines is just within 1km of the coast the highly sensitive zone of approximately 400m from the shoreline will not be impacted by this development.

There is also the possibility of the proposed development encountering unmarked Later Stone Age (LSA) graves, which, if discovered or encountered during the course of development would be of significant social and scientific interest.

Aside from prominent Stone Age activity across the cultural landscape, colonial occupation from the late 1700s and particularly around 1820 greatly served to change the face of tangible heritage resources and the way of life along the south coast, closely related to the establishment of Cape St Francis as a small trading port and Humansdorp as a trading centre. Colonial Period farmsteads are found strewn across the landscape, with Built Structures pre-dating 60 years of age. Associated cultural activities are evidenced by agricultural and live stock farming activities, practiced by some farmers with ancestral ties to the project area dating to the 1820s and soon thereafter as well as associated colonist family cemeteries.

Evidence of the Industrial Revolution across the greater study area is easily identifiable by visible modern roads (albeit many are still gravel), power lines etc, in addition to large scale tourism and residential developments closer to Jeffrey's Bay and Cape St Francis.

5.9.1 Archaeological and Cultural Heritage Resources Identified in the Study Area

Eighteen archaeological and cultural heritage resources, as defined and protected by the NHRA 1999, were identified during this Cultural Heritage Impact Assessment. The identified sites are briefly described below per cluster.

(a) Eastern Cluster

Five sites were identified in the Eastern Cluster (Sites 1.1 - 1.5 in Figure 18).

Sites 1.1, 1.4 and 1.5 all comprise of Colonial Period Farmsteads, pre-dating 60 years of age. The sites are at present all still in use and are fenced with access gates, implying compliance with SAHRA Minimum Site Conservation Standards.

Site 1.2 comprises a Colonial Period Cemetery which is no longer in use. The site is at present fenced with an access gate, thus complying with SAHRA Minimum Site Conservation Standards.

Site 1.3 demarcates a low density primarily Early Stone Age (ESA) Acheulean scatter. The general site terrain comprises an area of more or less 2.4x0.8km in the general vicinity of turbines 4 and 20. The extremely low densities of artefacts at the site designate the area as a 'low density feature' rather than a site.

Figure 18: Archaeological and Cultural Heritage Resources Identified in the Eastern Cluster Superimposed on the Proposed Kouga Wind Farm Final Layout 3.

(b) Central Cluster

Six sites were identified in the Central Cluster (Sites 2.1-2.6 in Figure 19).

- Sites 2.1, 2.2, 2.4 and 2.6 constitute Historical Period Homesteads, pre-dating 60 years of age. Sites are at present still in use, aside from Site 2.4 and selected parts of Site 2.6. Sites are, as a norm, fenced with access gates, including individual fencing of farmhouses or within camp portions. Site 2.4 is formally fenced for purposes of SAHRA Site Conservation.
- Site 2.5 comprise of a Historical Period Cemetery which is at present formally fenced with an access gate, complying with SAHRA Minimum Site Conservation Standards.
- Site 2.3 is a significant ESA and MSA Stone Age site. It is characterized by highly significant deposits scattered across exposed dunes. The recorded surface site extent covers approximately 1x0.3km in extent running roughly parallel to contemporary beach dunes more or less 1.5km south of the site. The actual site extent may well extend beyond the perimeter of the recorded surface exposure. Farming impacts have unfortunately encroached on the possible northern and south-western portions and may have already impacted on the site.

The artefacts found at Site 2.3 are of high technological quality and represented by significant artefact ratios, despite the evident secondary context of the surface exposure. The assemblage can preliminary be dated to between 2Mya-150kya.

The primary raw material used for artefact production is sandstone. A small sandstone outcrop on site may have been used for sourcing raw material but poor

quality of the outcrops may imply that another source must have been present in the past or alternatively that artefacts were imported to the area, implying that the site represent an 'activity' site rather than a 'knapping' site.

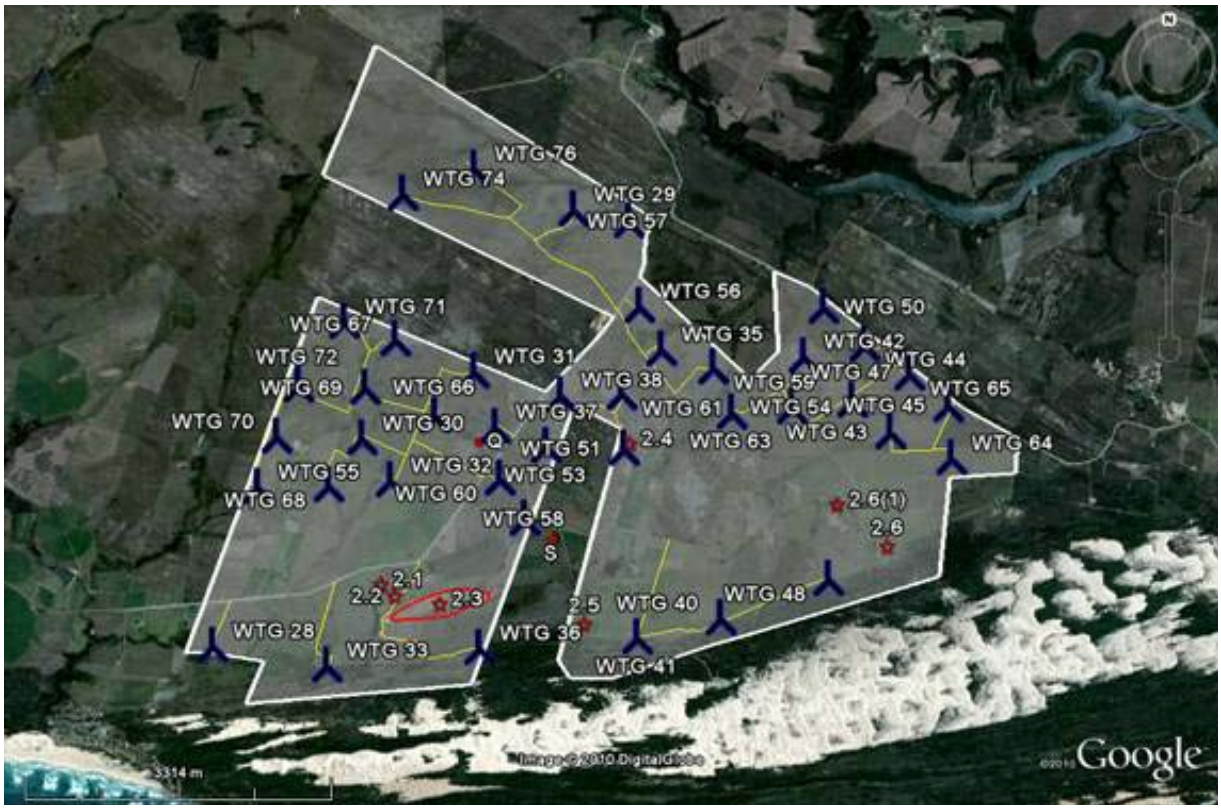


Figure 19: ***Archaeological and Cultural Heritage Resources Identified in the Central Cluster Superimposed on the Proposed Kouga Wind Farm Final Layout 3.***

As can be seen from Figure 19, the proposed wind farm study area and layout is to the north of the coastal dune field. This is fortunate as a number of archaeological sites have been discovered in these sensitive shifting dunes.

(c) Western Cluster

Seven sites were identified in the Western Cluster (Sites 3.1-3.7 in Figure 20) as well as 2 potentially sensitive areas (Area 1 and Area 2).

- Sites 3.1, 3.3, 3.4, 3.5, 3.6 and 3.7 are all Colonial Period Farmsteads, Structures or Villages, pre-dating 60 years of age. These sites are largely still in use, with the majority thereof fenced with access gates. Sites or site features at present not formally fenced are either still in use (formal conservation measures will hamper usage of the sites) or located in such close proximity to access roads that formal conservation may not prove feasible.
- Site 3.2 comprise of a Colonial Period Cemetery. Origin of the site date to the Colonial Period; continuing use is evident. The site is at present fenced with an access gate, thus complying with SAHRA Minimum Site Conservation Standards.
- Both Area 1 and Area 2 are characterized by a mosaic of overgrown and white shifting dunes; very reminiscent of the typical LSA 'strandloper' type site environments. They have thus been identified as potentially sensitive areas

even though no archaeological or heritage sites were identified in these areas during the field visits.

Figure 20: Archaeological and Cultural Heritage Resources Identified in the Western Cluster Superimposed on the Proposed Kouga Wind Farm Final Layout 3

5.9.2 Cultural Landscapes and Viewscapes

A 'Cultural Landscape' refers to a particular geographical area that represents the unique combined work of man and nature. According to Sauer (1925) 'The cultural landscape is fashioned from a natural landscape by a cultural group. Culture is the agent, the natural are the medium, the cultural landscape is the result'.

In order to better understand the concept of 'Cultural Landscape' it is necessary to separate the term 'Culture' to further our understanding of its many definitions. An integral part of culture is change; be it the result of a changing natural environment to which the culture have to adapt or contact with another culture, the primary force of cultural change. Culture is thus a process of constant change and adaptation; psychologically, behaviorally, technologically, politically, economically and spiritually (religiously), collectively referred to as 'cultural evolution'.

When considering the concept of 'Cultural Landscape', taking cognizance of the vital force of change as an agent of culture, it is only logical that cultural change will be reflected in a changing cultural landscape.

The concept of 'Cultural Landscape' has also been adapted and developed within international heritage arenas (UNESCO 2005) as part of an international effort to reconcile one of the most encompassing dualisms in Western thought; that of 'nature' and 'culture'. In so doing the World Heritage Committee has adopted 3 categories of

‘Cultural Landscape’, ranging from (a) those landscapes most deliberately ‘shaped’ by people, through (b) the full range of 'combined' works, to (c) those least evidently 'shaped' by people (yet highly valued).

The 3 categories extracted from the UNESCO Committee's Operational Guidelines, are as follows:

- A landscape designed and created intentionally by man
- An ‘organically evolved landscape’ which may be a ‘relict (or fossil) landscape’ or a ‘continuing landscape’
- An ‘associative cultural landscape’ which may be valued because of the religious, artistic or cultural associations of the natural environment.

Based on existing archaeological and cultural evidence for the study area, it can be concluded that the most prominent cultural landscapes that will be affected by the development can be summarized as:

-
- Stone Age (ESA & MSA)
- Stone Age (LSA)
- Colonial Period.

(a) The ESA and MSA Cultural Landscape

The ESA and MSA Cultural Landscape of the proposed Wind Farm study site can be classified, according to the UNESCO Operational Guidelines (Punnell 2006), as an ‘organically evolved fossil landscape’ that has been least evidently shaped by humans.

Inferred to have been the 1st impact on the natural or unaltered landscape, ESA settlement along the southern Cape coast can be described as highly significant, though sparsely scattered site distribution indicates fairly low population numbers over an extensive period of time, with limited use of natural resources and visual cultural impact on the landscape.

The ESA cultural landscape was overlain by subsequent MSA occupation, evidenced in the archaeological record by low quantities of sparely scattered artefacts. MSA visual impact on the natural landscape can again be described as minimal, though not denying extensive geographical use thereof.

(b) The LSA Cultural Landscape

The LSA Cultural Landscape of the proposed Kouga Wind Farm site can be classified, according to the UNESCO Operation Guidelines, as an ‘organically evolved, continuing cultural landscape’, varying from originally least evidently shaped to a present day combined impact by humans.

Early LSA occupation of the general Kouga Wind Farm site is evidenced by numerous shell middens known to occur in shifting dunes close to the shoreline and with related type sites reaching geographically much further inland. Despite the radically altered ‘modern’ LSA hunter-gatherer way of life, visual cultural impact on the landscape remained low.

Cultural contact and socio-political tension from the late 1700s onwards greatly contributed to the demise of the archaeologically recorded LSA cultural pattern and people of LSA descent joined the then mosaic of cultural complexity on the south coast; colonial settlers, traders, rebels and rulers, slaves and iron age conflict from

the east, in an intricate process of cultural adaptation and change that would forever transform their 'traditional' ways.

(c) The Colonial Cultural Landscape

The Colonial Cultural Landscape of the proposed Kouga Wind Farm site can be classified, according to the UNESCO Operation Guidelines, as an 'organically evolved, continuing cultural landscape', shaped by a range of combined human impacts.

Iron Age cultures are generally accredited with the introduction of farming practices in South Africa. However, the 18th Century saw Colonial farmers, with knowledge of farming practices brought from Europe radically influencing the lifeways of KhoiSan and other populations they encountered along the Southern Cape coast. New laws of land ownership (in stark contrast to that of indigenous hunter-gatherer and Iron Age groups), associated land-use practices and improved technology soon altered the natural environment to a degree unequalled before. Colonial settlement left a definite impact on the landscape, evidenced by the number of towns, villages and forts scattered across the landscape.

'Development' soon became associated with infrastructural improvements; better road and railway networks. But in more rural areas, impact remained low; dispersed farmsteads, related farming infrastructure and agricultural fields with one of the most prominent visual Colonial Period impacts on the rural landscape being wind pumps (circa 1820 - 1840), marking a technological feat that opened up large parts of South Africa for economically viable farming. There was no evidence of any significant battles or battlefields in the immediate vicinity of the Kouga Wind Farm site, though. Subsequent large scale industrialization, initially propelled by descendants of early Colonial settlers and later period European immigrants left an equally marginal visual impact, limited to a better road infrastructure and power lines on the study site itself and an increased population and associated industry in nearby towns.

5.9.3 Palaeontology

The area under consideration is essentially underlain by two widely differing aged sediments:

- The older Palaeozoic sediments of the Table Mountain Group ("Table Mountain Sandstones") and the lower Bokkeveld Group
- The thin veneers of Plio-pleistocene and Holocene coastal aeolian sediments of the Algoa Group (Nanaga and Schelm-Hoek Formations respectively).

The Table Mountain and lower Bokkeveld Group rocks are generally sparsely fossiliferous as are the younger aeolian sediments. Fossils of marine organisms have over the past 150 years been collected from these sedimentary rocks and are today preserved in South African museum and universities, making up part of the National Estate.

In the study site there is also very limited outcropping the palaeontologically sensitive thin Cederberg Formation which is part of the Table Mountain Group. This occurs once in the West and twice in the Central Clusters.

5.10 Socio-Economic

The Eastern Cape has a population of 6 667 994 people which represents 13.7% of the population of 48 687 000 in South Africa. The population of the Kouga Municipality is 84 240, with an estimated 4.1% of these being resident in St Francis Bay, Cape St Francis and Oyster Bay, or 3,501 people. The Human Development Index (HDI) for Kouga is 0.64 and the Gini Coefficient is 0.57 with the 2007 unemployment rate at 21.2%

A general summary of the economic situation indicates that the Eastern Cape contributed 7.8% to the national economy in an amount of R 155 billion in 2007. The two largest sectors in the Eastern Cape economy are services (26.5%) and finance (20.1%) with manufacturing an important pillar in the economy at 15.6%. The highest growth over the past ten years has been in construction (130%) and finance (59%) The largest employer in the economy is the services sector at 30.2% with 294 504 employees. Trade and accommodation is the next largest employer with 200 967 employees.

The Kouga Municipal area accounts for 1.64% of the Eastern Cape economy with its foremost sectors also being finance (22.6%) and services (20.0%), with trade and accommodation being next largest at 16.5% and having shown a high growth of 94% over the past ten years. Construction has been the fastest growing sector in the economy at 203% in support of the growing trade and tourism industry.

During 2003 the Eastern Cape received 7.5 million tourists with 1.8 million of these in the Nelson Mandela Bay Municipality. Cacadu Municipality received 4.4 million tourists with 1.4 million of these having visited Kouga, and at an estimate of a 40% visitation rate, it is extrapolated that 554 965 of these tourist visited the St Francis Bay, Cape St Francis and Oyster Bay areas. Bednights sold in the Cacadu District amounted to 1 163 569 with 366 222 of these within the Kouga municipality, and approximately 146 489 in the greater St Francis area.

The total accommodation expenditure in the St Francis precinct is estimated at R 132 million, leading to a tourism economy of R 327 million and total tourism demand of R 486 million. The current tourism industry jobs are 947 with 140 SMMEs (Small, Medium and Micro Enterprises) being supported

5.11 Noise

Forty five noise sensitive areas (NSAs) were identified within the proposed Kouga wind farm site, spanning all three clusters of the proposed development, and on neighbouring farms surrounding the study site. These NSAs included mostly homesteads, farmhouses and settlements as shown in to Figure 23.

Figure 21: Sensitive Human Receptors in the Eastern Site

Figure 22: Sensitive Human Receptors in the Central Site

Figure 23: Sensitive Human Receptors in the Western Site

5.11.1 Ambient Noise Levels at the Proposed Site

The ambient noise was measured at seven (7) NSA locations - NSA 1&2, NSA 5, NSA 6, NSA 8, NSA 9, NSA 11, and NSA 14. A summary of the results are provided in Table 9.

Table 9: Ambient Noise Levels as Measured at 7 NSA Locations within the Study Site

Measuring Station	NSA 1&2	NSA 5	NSA 6	NSA 8	NSA 9	NSA 11	NSA 14
Leq dB(A) - day	52.6	31.1	-	40.9	40.7	-	-
Leq dB(A) - night	31.9	42.3	39.0	31.2	35.7	53.6	47.3

The ambient noise at each location varies substantially as the ambient sound is influenced by wind speed, human activities as well as vehicles and animal sounds. It is thus extremely difficult to isolate just the wind component.

Conclusions drawn from a field study in France by the noise specialist indicate that the total noise at 500 m away from the base of the turbine will be in the approximate range of 45 dB(A). The field studies found that this level included the ambient noise and the turbine noise, which was intermittently barely audible. It is not anticipated that the turbines will be heard indoors which would correspond to the SANS 10103 recommended ambient levels limit for rural areas.

5.12 Visual

This section gives a background to the existing landscape against which the visual impacts are assessed later on in this report.

5.12.1 Topography

The topography of the region is dominated by a flat coastal plain, with the more distinctive relief of the Cape Fold Belt mountains appearing to the north and west of the study area. Rivers have incised deeply into the coastal plain. The dunes and palaeo-dune fields of Oyster Bay and Cape St Francis are also prominent topographic features in the study area. The eastern and Central Clusters are located on relatively flat areas, while the Western Cluster is located among palaeo dunes with higher relief.

5.12.2 Land Cover

Dairy farming (dry land agriculture) is the dominant agricultural practise in the region. Grazing and cultivation has transformed most of the natural vegetation. The natural vegetation for most of the region is fynbos, with some thicket and bushland near the coast, especially around Cape St Francis and west of Oyster Bay. The thicket has been transformed to some extent near the settlements, as has the fynbos on the dunes at Oyster Bay.

5.12.3 Built Environment

Settlements in the interior, such as Humansdorp and Hankey were developed as service centres for the surrounding agricultural industry, while those along the coast are holiday resorts with high seasonal variation in population. The coastal resorts are rapidly expanding (especially Jeffrey's Bay). Several major roads dissect the region,

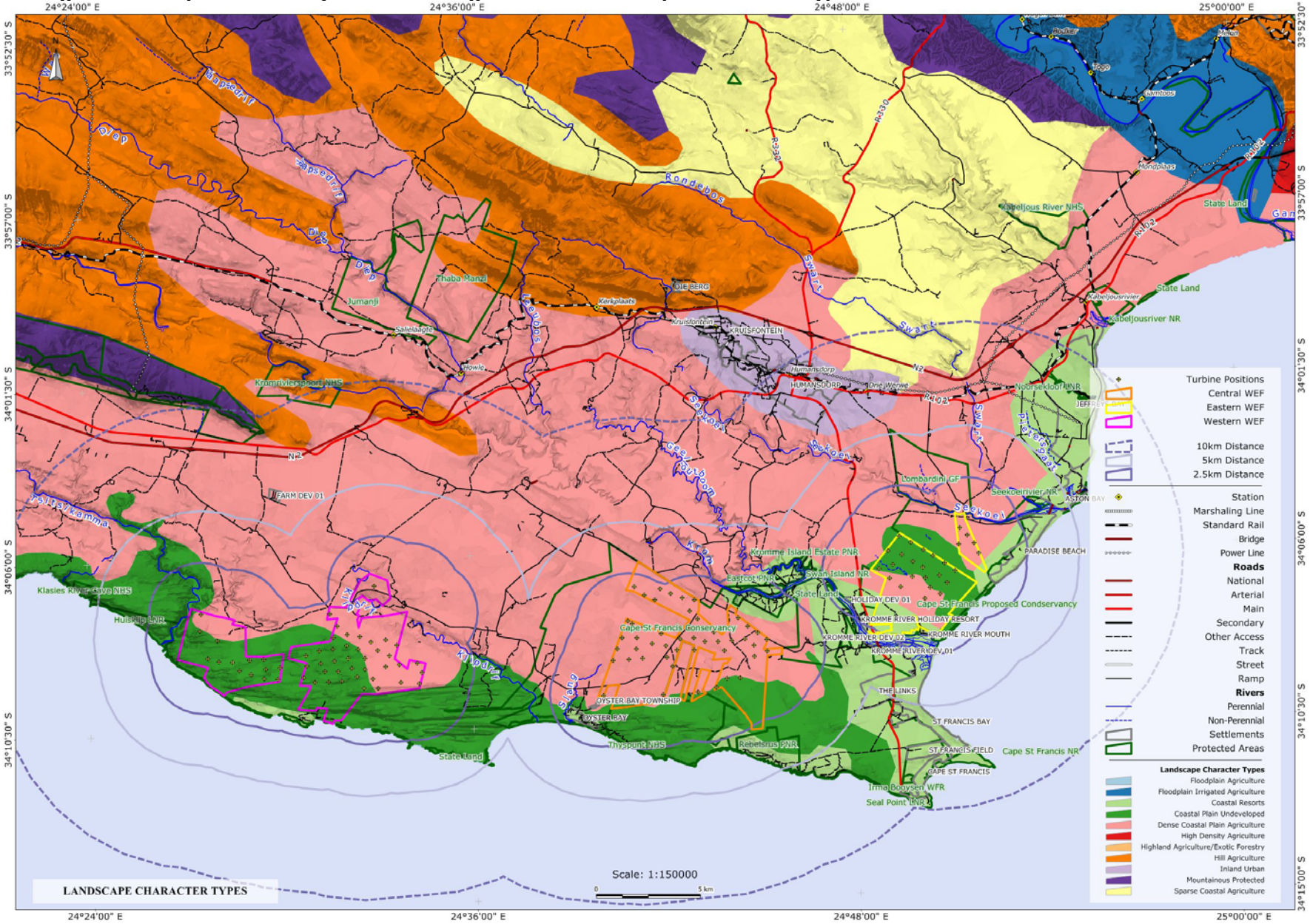
with the N2 being a major route between Cape Town and Port Elizabeth. The Eastern Cluster is located between the Jeffrey's Bay/Aston Bay/Paradise Beach coastal resort complex and St Francis Bay, while the Central Cluster separates Cape St Francis and Oyster Bay. The Western Cluster is further removed from settlements. There are currently no large scale industrial developments in the area.

5.12.4 Landscape Character of Area

In summary, the landscape character of the region is a mixture of low density agriculture (mostly dairy farming), coastal holiday resorts (seasonal variability in population) and urban developments.

The landscape is changing, however, as the surrounding urban centres continue to expand. See Figure **24** for overview of the landscape character of the area.

Figure 24: Map of the Study Area Showing Various Landscape Character Types



6 IMPACT ASSESSMENT

The purpose of the following chapters is to describe and assess the potential impacts that may arise as a result of the construction and operation of the proposed Kouga Wind Farm and to recommend associated and appropriate mitigation measures. These impacts include potential biophysical and human environment impacts, which were identified during the Scoping Phase of the EIA.

6.1 Potential Negative Impacts

The identified potential negative impacts include:

- Vegetation – damage to, or destruction of sensitive environments and consequent impacts on plants and their community functioning
- Hydrology and Wetlands – damage to, or destruction of wetlands and aquatic ecosystems
- Fauna – disturbance to animals and destruction of habitats and their constituent plant and animal species
- Avifauna and Bats – increased mortality due to collisions with turbines
- Visual – loss of sense of place and visual intrusion of turbines on landscape
- Noise – noise generated by spinning propellers
- Cultural heritage – damage and/or removal of artefacts and changes to cultural landscapes
- Standard Construction and Operational Impacts – waste management, health and safety, site management, stockpiling etc.

6.2 Potential Positive Impacts

Wind turbine generated power also has a number of potential advantages when considering the greater scheme of electricity generation:

- Wind power is one of the cleanest renewable resources available
- Wind power is considered the most appropriate technology to bring significant amounts of renewable energy onto the grid in the shortest time period and at the lowest cost thus helping prevent the dire electricity shortages that are forecast if new energy generation sources are not up and running soon
- Positive impacts of wind power may have a global reach
- Contribute to national and international efforts to reduce emissions of greenhouse gases and other air pollutants through the potential displacement of those created by fossil fuel power sources
- Improve sustainable production of electricity
- Increase energy supply, diversity and security
- Provide greater electricity distribution network efficiency, through reduced transmission losses
- Reduce cost of electricity supply in certain circumstances such as remote, off-grid rural communities

- Provide a source of income and employment in regional areas
- Encourage redevelopment and niche ancillary industries that manufacture energy technologies
- Reduce regional community and government dependence on fossil fuels

Wind is clean, free, indigenous and inexhaustible. Wind turbines do not need any type of fuel, so there are no environmental risks or degradation from the extraction, transport, processing or disposal of fuel. Not only is generation produced with zero emissions of carbon dioxide (during the operational phase) but it also does not release toxic pollutants or conventional air pollutants (smog-forming nitrogen dioxide and acid rain-forming sulphur dioxide). Furthermore, the adverse impacts caused by mountain top mining and strip mining of coal, including acid mine drainage and land subsidence are avoided, and the negative effects of nuclear power, including radioactive waste disposal, security risks and nuclear proliferation risks do not play a role. Finally, wind power can have a long-term positive impact on biodiversity by reducing the threat of climate change.

While the construction and operation of wind turbines can result in negative local environmental impacts on birds, landscapes, and sustainable land use (including protected areas), the negative environmental impacts from wind energy installations are much lower in intensity than those produced by conventional energies.

Water use can be a significant issue in energy production, particularly in areas where water is scarce, as conventional power plants use large amounts of water for the condensing portion of the thermodynamic cycle. For coal plants, water is also used to clean and process fuel.

Table 10: Water consumption using conventional power plants versus wind and solar plants (Gipe 1995)

Technology	litres/kWh
Nuclear	2.30
Coal	1.90
Oil	1.60
Combined Cycle Gas	0.95
Solar	0.110
Wind	0.004

Small amounts of water are used to clean wind turbine rotor blades in arid climates (where rainfall does not keep the blades clean). The purpose of blade cleaning is to eliminate dust and insect build up, which otherwise deforms the shape of the airfoil and degrades performance. Similarly, small amounts of water are used to clean photovoltaics (solar) panels. Wind therefore uses less than 1/600 as much water per unit of electricity produced as does nuclear, approximately 1/500 as much as coal, and approximately 1/250 as much as natural gas, the most popular choice for new power plants.

6.3 Impact Assessment Methodology

6.3.1 Assessment of Impacts

After the potential impacts relating to the project are identified and described in the Scoping Phase, it is necessary to evaluate how the impact will affect the surrounding environment. The potential impacts can then be assessed in order to determine their significance and to define mitigation measures or management measures to address the impact.

Environmental impacts can be defined as the consequences of an activity on environmental resources and the environmental impacts relating to the road project refer to biophysical, social, visual and cultural aspects. Significant impacts can lead to drastic changes in the status quo of the environment which can be direct, indirect or cumulative. Direct impacts are changes that result from direct interactions between the environment and project activities. Indirect impacts result from interactions between the environment and direct impacts while cumulative impacts are an accumulation of changes to the environment caused by project activities.

Once a potential impact has been identified, it is necessary to assess the impact in terms of the probability of occurrence of the impact, and its magnitude and extent (spatial and temporal). The result of the evaluation of the impact is a significance rating which provides an indication as to how important the impact is and how it must be managed, mitigated and monitored.

The components of the Assessment Methodology are described below:

a) Significance of impacts

High:	Impacts of high magnitude locally for longer than 6 years and/or regionally and beyond. The impact results in major alterations to the environment even if effective mitigation measures are implemented and will have an influence on decision-making.
Medium:	Impacts of moderate magnitude locally to regionally in the short term. The impact results in medium alterations to the environment and can be reduced or eliminated by the implementation of effective mitigation measures.
Low to very low:	Impacts will be localised and temporary. Impacts result in minor alterations to the environment and can easily be alleviated by the implementation of effective mitigation measures.
No impact:	A potential concern or impact, which, upon evaluation, is found to have no significant impact.

The impact significance is determined through the following criteria:

Spatial extent:	This refers to the geographical area in which the impact will be experienced and can be limited to being site specific, local (< 5 km from site), regional (within the Kouga Local Municipality) or national.
Intensity or magnitude of impact:	The intensity describes the severity or size of the impact. The level of intensity in terms of its potential for causing either negative or positive effects and can be expressed as high (natural and/or social functions and/or processes are severely altered), medium (natural and/or social functions and/or processes are notably altered) or low (natural and/or social functions and/or processes are negligibly altered).
Duration:	This refers to the expected timeframe of an impact and can be expressed as temporary (<1 year), short term (1 to 6 years), medium term (6 to 15 years), long term (15 - 30 years) or permanent.
Probability:	This considers the likelihood of the impact occurring and should be described as improbable (little or no chance of occurring), probable (< 50% chance of occurring), highly probable (50% - 90% chance of occurring) or definite (>90% chance of occurring).
Status of impacts	The status is the overall effect on the environment and should be stated as positive (a benefit) negative (a cost) or neutral.
Degree of confidence	Specialists are required to indicate their degree of confidence in the predictions, as low, medium and high, based on the availability of information and specialist knowledge.

7 IMPACTS ON VEGETATION

As indicated in Chapter 5.4 the Garden Route Biodiversity Sector Plan (GRBSP) identifies a number of distinct vegetation variants. However, for the purposes of the assessment of the impacts, these were grouped into similar ecological functional groups namely:

- Grassy Fynbos, Dune Strandveld and Renosterveld Communities
- Rocky Refugia Habitats
- Seeps, Wetlands and Pans
- Riparian Vegetation along seeps and ephemeral river courses
- Thicket and Dune Forest
- Drift Sands, Dune Fields and Littoral Vegetation
- Transformed Vegetation

The impact assessment for the vegetation was done in a two pronged approach using these ecological functional groupings:

- A Terrestrial Habitat Sensitivity Assessment was undertaken for all three clusters to identify which turbines and associated infrastructure are situated in a High Sensitivity Area and thus required specific mitigation or removal from the area.
- An assessment of the impacts on the receiving environment (ecological functional groupings) in the study area to quantify these impacts and look at possible mitigation measures specific to each ecological functional grouping.

It is important to note that the layout assessed in this report (Layout 3) is a layout that has been developed through an iterative process with input from all the specialists along the way. Thus from a vegetation perspective this layout that is being assessed here has actually already been adapted to overcome all the possible red flag turbine, road and associated infrastructure placements and what is being done now is a final assessment to fine tune the final layout.

7.1 Terrestrial Habitat Sensitivity and Related Individual Turbine Impact Assessment

An overall Habitat Sensitivity Assessment, incorporating key vegetation and ecological indicators, was undertaken and it includes the following key criteria:

- Relative levels of intactness in terms of overall loss of indigenous vegetation cover
- Presence, diversity and abundance of species of special concern (weighted in favour of local endemic species)
- Extent of invasion (severity and overall ecological impact), as well as the degree to which successful rehabilitation could take place
- Overall degradation incorporating above factors
- Relative importance of the vegetation communities relative to regional conservation status - indicated as vulnerability of the area as a result of loss.

The **Overall Sensitivity Score** of the vegetation within the site is calculated according to the following matrix which combines degradation and overall conservation status of the vegetation units of the site.

Table 11: Matrix to Determine Overall Sensitivity Score for Terrestrial Habitats

Degradation	Conservation Status			
	Least threatened	**Vulnerable**	**Endangered**	**Critically Endangered**
Severely degraded/ Transformed	Low	Low	Moderate	Moderate - High
Moderately degraded	Low	Moderate	High	High
Ecologically Pristine or near Pristine	Moderate	Moderate - High	High	Very High (No-Go area)

Using this matrix Vegetation Sensitivity Maps where developed for the three clusters and these are presented in Figure 25 - Figure 27. For mapping purposes the ecological functional groups identified above were sub-divided into communities, based on the Garden Route BSP Variant classification described in Section 5.4.1.

These figures also indicate the proposed turbine and road locations. Turbines and roads that are in a high sensitivity area are indicated in red, those in a moderate sensitivity area are indicated in orange and those in a low sensitivity area are indicated in green.

These maps take into account the wetlands, dams, seeps, streams and pans (as depicted in Figure 12 - Figure 14 in the Section 5.4.3) and thus consider the surface hydrology of the area.

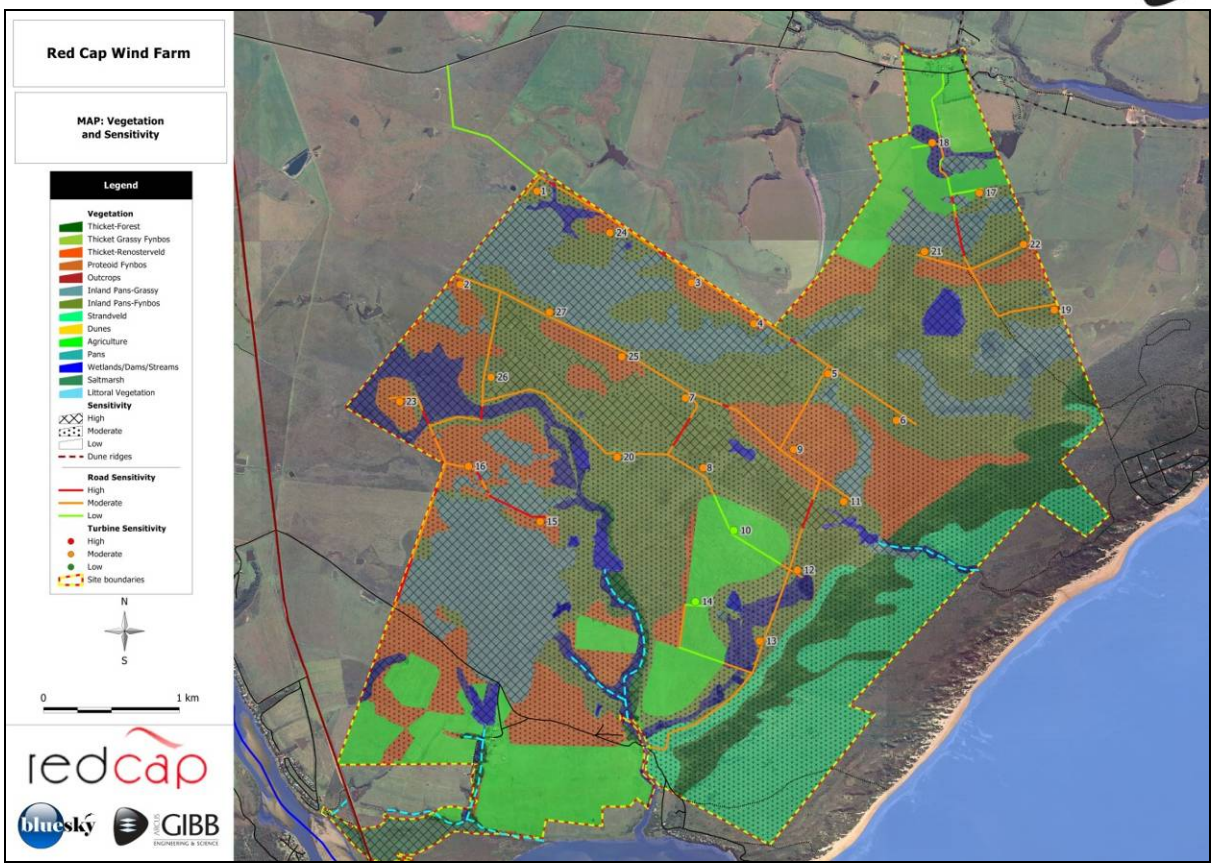


Figure 25: Mapped Vegetation Communities with Respective Ecological Sensitivity Indicated for the Eastern Cluster

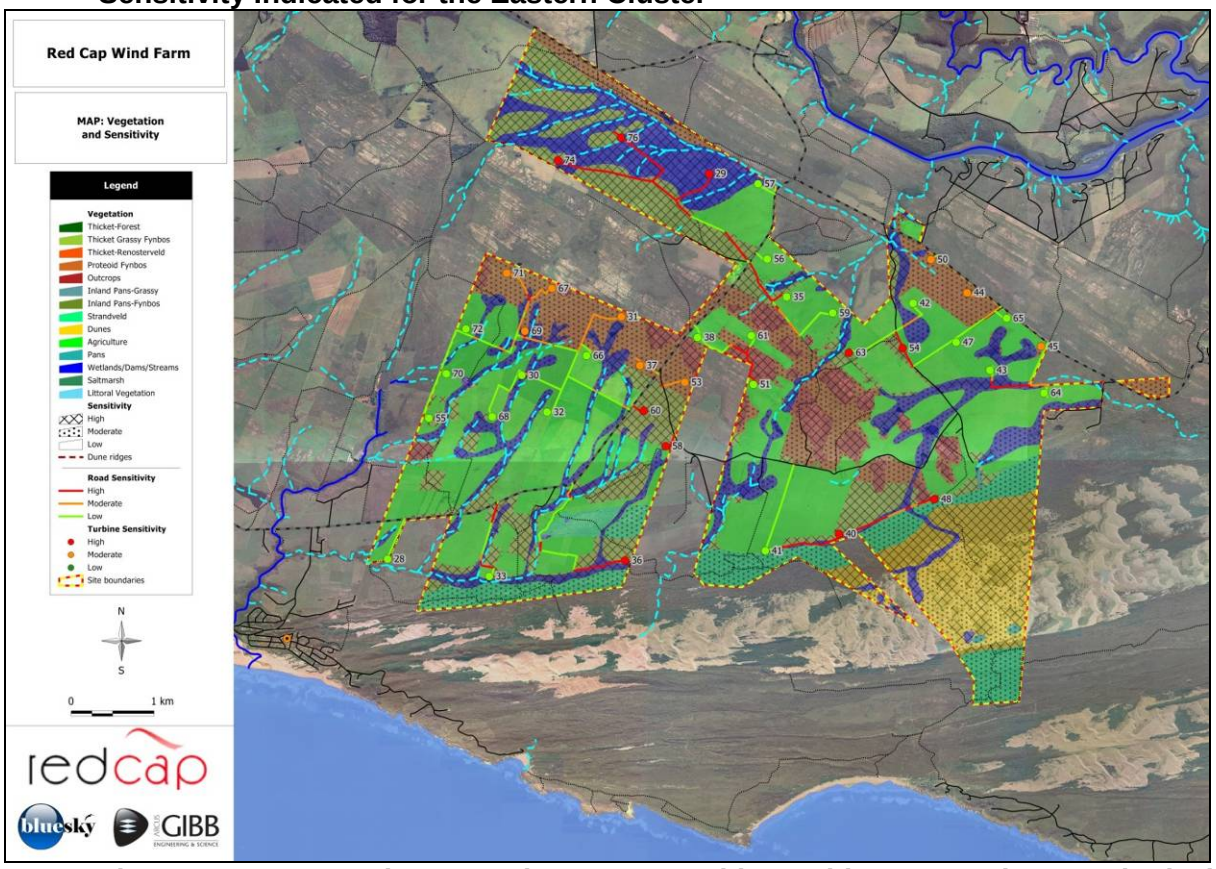


Figure 26: Mapped Vegetation Communities with Respective Ecological Sensitivity Indicated for the Central Cluster

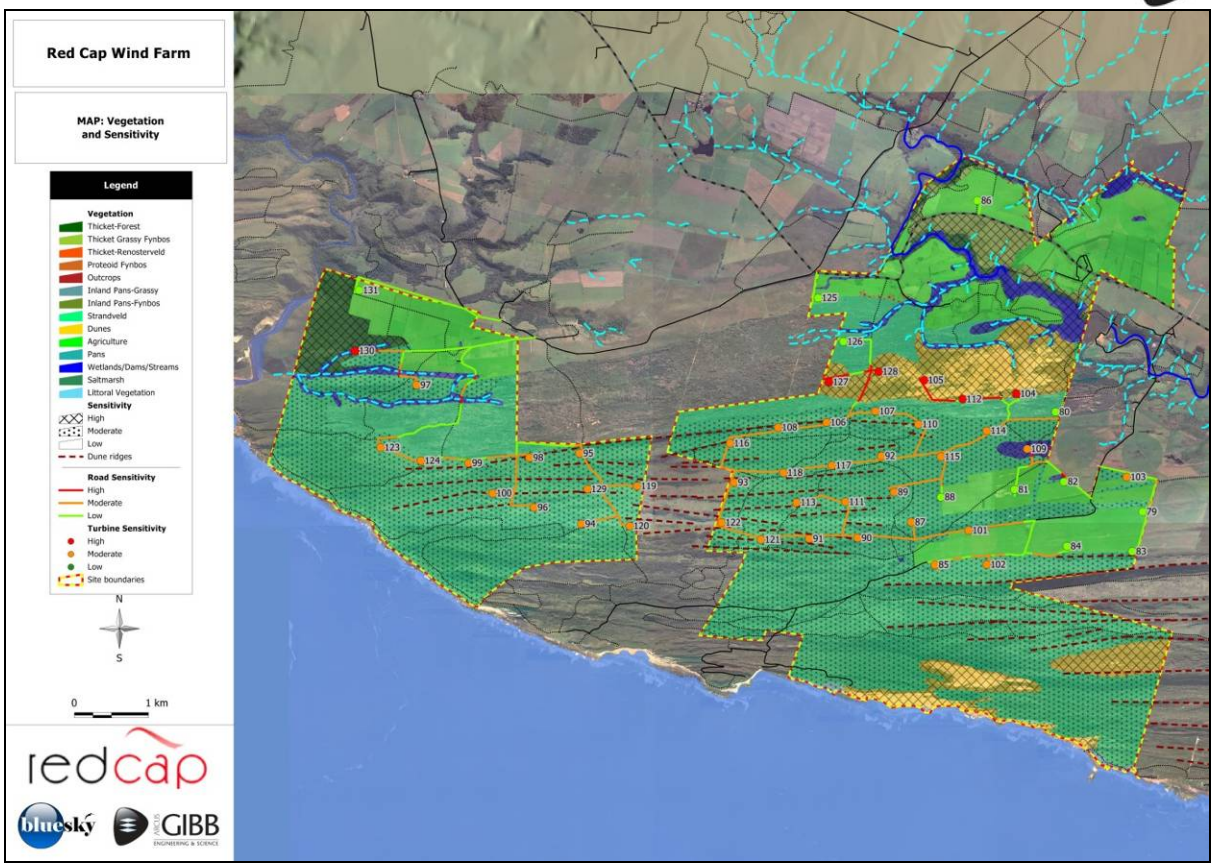


Figure 27: Mapped Vegetation Communities with Respective Ecological Sensitivity Indicated for the Western Cluster

From these maps, turbines that are located in high sensitivity areas can be identified and assessed to see if there is specific mitigation that can be undertaken to reduce the impact or if the only way to do this is to remove the turbine from the sensitive area.

It must be stressed that it is often not possible to accurately delineate these highly sensitive areas. The main reason being that they are often complex mosaics of highly sensitive areas interspersed with less sensitive areas suitable for development which are not feasible to map accurately. In such cases the conservative approach has been followed and the whole area is depicted as highly sensitive.

A good example of this is in the North West of the Central Cluster where turbines 29, 74 and 76 are situated in an area depicted as highly sensitive. The reason this whole area is mapped as highly sensitive is due to the fact that this area consists of a mosaic of lower lying highly sensitive habitats interspersed with many higher lying areas that are not as sensitive and would be suitable for turbine and infrastructure development.

Taking this into account, the vegetation specialist may indicate that impacts in such highly sensitive areas are permissible as during final design the infrastructure causing the impacts in this area will be micro-sited by the specialist to ensure they don't unduly impact on the highly sensitive portions of this area.

A number of other areas have a similar complexity of highly sensitive habitats interspersed with less sensitive habitats that were not feasible for the vegetation specialist to map in detail. In all of these cases the vegetation specialist took the conservative approach and marked the larger area as highly sensitive and any

permissible impact in these areas would thus require detailed input from the specialist during micro-siting.

7.1.1 Specific Mitigation for Turbines in a High Sensitivity Area

Table 12 lists all the turbines that are located in a high sensitivity area and indicates the specific mitigation recommended for these turbines to ensure that the impact is reduced to an acceptable level if they are to be constructed.

Table 12: Summary of Turbines in High Sensitivity Areas with Specific Mitigation Recommendations

Turbine	GRBSP habitat unit	Status	Vegetation	Cluster*	CBA /ESA	Comment
29	Tsitsikamma Perennial Stream	Cr	Seep	C	CBA	Final siting to keep footprint outside of seep and buffer
36	Oyster Bay Thicket-Grassy Fynbos	En	Thicket Grassy Fynbos	C	CBA	Final site selection to maximise use of surrounding degraded and transformed portions
40	Oyster Bay Thicket-Grassy Fynbos	En	Thicket Grassy Fynbos	C	CBA	Final site selection to maximise use of surrounding degraded and transformed portions
48	Oyster Bay Thicket-Grassy Fynbos	En	Thicket Grassy Fynbos	C	CBA	Final site selection to maximise use of surrounding degraded and transformed portions
54	Oyster Bay Thicket-Grassy Fynbos	En	Thicket Grassy Fynbos	C	CBA	Final site selection to maximise use of surrounding degraded and transformed portions
58	Oyster Bay Thicket-Grassy Fynbos	En	Thicket Grassy Fynbos	C	CBA	Final site selection to maximise use of surrounding degraded and transformed portions
60	Oyster Bay Thicket-Grassy Fynbos	En	Thicket Grassy Fynbos	C	CBA	Final site selection to maximise use of surrounding degraded and transformed portions
63	Oyster Bay Thicket-Grassy Fynbos	En	Thicket Grassy Fynbos	C	CBA	Final site selection to maximise use of surrounding degraded and transformed portions
74	Oyster Bay Thicket-Grassy Fynbos	En	Thicket Grassy Fynbos	C	CBA	Final site selection to maximise use of surrounding degraded and transformed portions
76	Oyster Bay Thicket-Grassy Fynbos	En	Thicket Grassy Fynbos	C	CBA	Final site selection to maximise use of surrounding degraded and transformed portions

Turbine	GRBSP habitat unit	Status	Vegetation	Cluster*	CBA /ESA	Comment
104	Inland Primary Dune	En	Primary Dune	W	CBA	Dune prone to shifting sands, any activities to be stabilised and alien species removed. . Alternatively, turbines to be micro sited to edge or outside of dune field.
105	Inland Drift Sands	Vu	Drift Sands	W	CBA	Dune prone to shifting sands, any activities to be stabilised and alien species removed. . Alternatively, turbines to be micro sited to edge or outside of dune field.
109	Tsitsikamma Perennial Stream	Cr	Perennial Stream (Modified)	W	CBA	Occurs in a modified stream, final siting to keep footprint outside of stream and buffer
112	Inland Primary Dune	En	Primary Dune	W	CBA	Dune prone to shifting sands, any activities to be stabilised and alien species removed. . Alternatively, turbines to be micro sited to edge or outside of dune field.
127	Inland Primary Dune	En	Primary Dune	W	CBA	Dune prone to shifting sands, any activities to be stabilised and alien species removed. . Alternatively, turbines to be micro sited to edge or outside of dune field.
128	Inland Primary Dune	En	Primary Dune	W	CBA	Dune prone to shifting sands, any activities to be stabilised and alien species removed. . Alternatively, turbines to be micro sited to edge or outside of dune field.
130	St Francis Dune Stream	Lt	Wetland	W	CBA	Final siting to keep footprint south of wetland and buffer

*E= Eastern Cluster, C= Central Cluster, W= Western Cluster

In consultation with the vegetation specialist it was agreed that Turbines 104, 105, 112, 127, 128, which were positioned in an inland primary dune/ driftsand area, would be micro-sited to just outside of the dune/ dritsand area. As can be seen Table 12 this was one of the possible mitigation options proposed for these turbines by the vegetation specialist. By doing this it also ensured that no turbines would be sited within primary dune/ driftsand areas.

7.2 Assessment of the Impacts on the Receiving Environment

Any assessment of impacts on the receiving environment must take note of the current status of the environment. For this reason the existing anthropogenic impacts within the study area which where considered are presented below:

- Degradation of vegetation as a result of historical land use, including agricultural activities – pastures and cattle grazing
- Vegetation clearing for infrastructure and buildings and roads.

A number of terrestrial ecological impacts have been identified during the construction and operational phases of the proposed wind farm. These are:

- Direct loss of vegetation and habitat
- Changes to species composition and ecological processes
- Increased fire risk and alien invasion from visitors/ traffic
- Loss of species of special concern and habitat

They are described below and then summarised in Table 13.

7.2.1 Description of Impacts

(a) Direct loss of vegetation and habitat

- Turbines, roads and infrastructure will result in the removal of vegetation
- Where vegetation has been disturbed or transformed (agriculture), this loss will be negligible
- Where intact, final impact will depend on the conservation status of associated vegetation unit.

(b) Changes to species composition and ecological processes

- Possible drying out of seeps and wetlands (and dams) as result of road network
- Changes in seed dispersal due to dispersal agent mortalities (i.e. Birds and bats) – most prevalent in thicket habitat.

(c) Increased fire risk and alien invasion from visitors/traffic

- Fire frequency and magnitude may be decreased after construction due to fire-break effect of roads and easier access during fires
- Alien species could be introduced during construction and operational phases, especially along road verges and adjacent to turbine footprints.

(d) Loss of Species of special concern and habitat

- Most prevalent in exposed outcrops on hilltops and ridges.

7.2.2 Impact assessment and mitigation

The impacts and the mitigations measures are presented in Table 13 which shows how each impact is relevant to each of the ecological functional groupings. The table is split into two sections, the first for impacts during construction and the second for impacts during operation**.**

Table 13: Vegetation Impact Assessment Summary

Nature of Impact	Status (-ve or +ve)	Extent	Duration	Intensity	Probability	Significance no mitigation	Mitigation/Management Actions	Significance with mitigation	Confidence level
Construction Phase									
A. Fynbos, Renosterveld and Dune Strandveld									
1. Direct loss of vegetation and habitat	-ve	localised	permanent	medium	definite	high	• Vegetation clearing must be limited to the required footprint. • Micro-siting of footprints should avoid more sensitive vegetation during final site planning.	medium	high
2. Reduction or changes to ecological processes and functioning and habitat fragmentation	-ve	localised	permanent	medium	definite	medium	• Road network to be kept to minimum width and avoid more sensitive seep areas and drainage lines. • Alien species should be monitored and cleared when necessary. • Avoid direct loss of natural vegetation outside of required footprints where possible. • Final planning to avoid ecologically sensitive areas.	low	high
3. Loss of species of special concern and SSC habitat	-ve	localised	permanent	low	probable	medium	• Vegetation clearing must be limited to the required footprint • Search and rescue operation to be undertaken before commencement of construction	low	high

Nature of Impact	Status (-ve or +ve)	Extent	Duration	Intensity	Probability	Significance no mitigation	Mitigation/Management Actions	Significance with mitigation	Confidence level
4. Changes in natural fire regime	+ve	localised	long term	medium	probable	low	• Maintaining sufficient buffer zones to allow the presence of suitable fire breaks • Roads may act as additional fire breaks and help to decrease extent of runaway fires • Road borders should be regularly maintained to ensure that vegetation remains short and that they therefore serve as an effective firebreak. • Flammable litter and discarded glass bottles should be removed regularly • Implement fire fighting strategy as part of EMP	medium	moderate
5. Increased risk of alien invasion	-ve	localised	long term	medium	probable	medium	• Alien invasive management plan to be implemented during operational phase. Rehabilitation to be implemented in a phased manner directly after construction for a given area is completed	low	high
• B. Thicket and Dune Forest									
6. Direct loss of vegetation and habitat	-ve	localised	permanent	medium	definite	medium	• Clearing of forest and thicket should be avoided, especially along drainage lines	low	high

Nature of Impact	Status (-ve or +ve)	Extent	Duration	Intensity	Probability	Significance no mitigation	Mitigation/Management Actions	Significance with mitigation	Confidence level
7. Reduction or changes to ecological processes and functioning and habitat fragmentation	-ve	localised	permanent	medium	definite	high	• Loss of Forest and Thicket limited in extent but no unnecessary thicket clearing to occur	low	high
8. Loss of species of special concern and SSC habitat	-ve	localised	permanent	medium	definite	medium	• Habitat transformation must be limited to the required footprint • Search and rescue operation to be undertaken before commencement of construction	low	high
• C. Rocky Outcrops									
9. Direct loss of vegetation and habitat	-ve	localised	permanent	medium	definite	high	• Vegetation clearing must be limited to the required footprint. • Micro-siting of footprints should avoid outcrops as far as possible during final site planning.	low	high
10. Reduction or changes to ecological processes and functioning and habitat fragmentation	-ve	localised	permanent	medium	definite	high	• Micro-siting of footprints should avoid outcrops as far as possible during final site planning. • Alien species should be monitored and cleared when necessary. • Avoid direct loss of natural vegetation outside of required footprints where possible. • Final planning to avoid ecologically sensitive areas.	low	high

Nature of Impact	Status (-ve or +ve)	Extent	Duration	Intensity	Probability	Significance no mitigation	Mitigation/Management Actions	Significance with mitigation	Confidence level
11. Loss of species of special concern and SSC habitat	-ve	localised	permanent	medium	definite	medium	• Vegetation clearing must be limited to the required footprint • Plant rescue and relocation operation must be conducted before any site clearing occurs, especially within rocky outcrops	low	medium
• D. Seeps, Wetlands and Streams									
12. Direct loss of vegetation and habitat	-ve	localised	permanent	medium	definite	high	• Vegetation clearing must be limited to the required footprint. • Micro-siting of footprints should avoid seep and wetland areas during final site planning. • Road crossing to avoid seep and wetland areas as far as possible, where not possible appropriate crossing design to limit loss of habitat	medium	high

Nature of Impact	Status (-ve or +ve)	Extent	Duration	Intensity	Probability	Significance no mitigation	Mitigation/Management Actions	Significance with mitigation	Confidence level
13. Reduction or changes to ecological processes and functioning and habitat fragmentation	-ve	localised	permanent	medium	definite	high	• Ecological corridors occur predominantly along the rivers, drainage lines and seep areas, so design should be such that it does not impede these corridors unnecessarily • Micro-siting of footprints should avoid seep and wetland areas during final site planning. • Road crossing to avoid seep and wetland areas as far as possible, where not possible appropriate crossing design to limit loss of habitat	medium	high
14. Loss of species of special concern and SSC habitat	-ve	localised	long term	medium	definite	medium	• Habitat transformation must be limited to the required footprint • Search and rescue operation to be undertaken before commencement of construction	low	medium
15. Increased risk of alien invasion	-ve	localised	long term	medium	probable	medium	• Alien invasive management plan to be implemented during operational phase Rehabilitation to be implemented in a phased manner directly after construction for a given area is completed	low	high

Nature of Impact	Status (-ve or +ve)	Extent	Duration	Intensity	Probability	Significance no mitigation	Mitigation/Management Actions	Significance with mitigation	Confidence level
Operational Phase									
A. Fynbos, Renosterveld and Dune Strandveld									
1. Direct loss of vegetation and habitat	-ve	localised	permanent	medium	definite	medium	• Alien invasive monitoring to be implemented as per EMP	low	high
2. Reduction or changes to ecological processes and functioning and habitat fragmentation	-ve	localised	permanent	medium	definite	medium	• Vegetation clearing must be limited to the required footprint • Alien invasive monitoring to be implemented as per EMP	low	high
3. Loss of species of special concern and SSC habitat	-ve	localised	permanent	low	probable	medium	• Vegetation clearing must be limited to the required footprint • No additional clearing to be undertaken during operational phase	low	high
4. Changes in natural fire regime	+ve	localised	long term	medium	probable	low	• Maintaining sufficient buffer zones to allow the presence of suitable fire breaks • Roads may act as additional fire breaks and help to decrease extent of runaway fires • Road borders should be regularly maintained to ensure that vegetation remains short and that they therefore serve as an effective firebreak. • Flammable litter and discarded glass bottles should be removed regularly • Implement fire fighting strategy as part of EMP	medium	medium

Nature of Impact	Status (-ve or +ve)	Extent	Duration	Intensity	Probability	Significance no mitigation	Mitigation/Management Actions	Significance with mitigation	Confidence level
5. Increased risk of alien invasion	-ve	localised	long term	medium	probable	medium	• Alien invasive monitoring to be implemented as per EMP	low	medium
B. Thicket and Dune Forest									
6. Direct loss of vegetation and habitat	-ve	localised	permanent	low	definite	medium	• Alien invasive monitoring to be implemented as per EMP	low	high
7. Reduction or changes to ecological processes and functioning and habitat fragmentation	-ve	localised	permanent	low	probable	medium	• Clearing of thicket should be avoided • Alien invasive monitoring to be implemented as per EMP	low	high
8. Loss of species of special concern and SSC habitat	-ve	localised	permanent	medium	definite	medium	• No additional vegetation clearing outside of designated footprint after construction phase completed	low	high
C. Rocky Outcrops									
9. Direct loss of vegetation and habitat	-ve	localised	permanent	medium	definite	medium	• Habitat transformation to be limited and no additional loss to occur after construction complete	low	high
10. Reduction or changes to ecological processes and functioning and habitat fragmentation	-ve	localised	permanent	medium	definite	medium	• Vegetation clearing must be limited to the required footprint • Alien invasive monitoring to be implemented as per EMP	low	high
11. Loss of species of special concern and SSC habitat	-ve	localised	permanent	low	probable	high	• Crossing through outcrops adjacent to streams should be avoided or kept to a minimum. • Alien invasive monitoring to be implemented as per EMP	medium	high

Nature of Impact	Status (-ve or +ve)	Extent	Duration	Intensity	Probability	Significance no mitigation	Mitigation/Management Actions	Significance with mitigation	Confidence level
D. Seeps, Wetlands and Streams									
12. Direct loss of vegetation and habitat	-ve	localised	permanent	medium	definite	medium	• Alien invasive monitoring to be implemented as per EMP	low	high
13. Reduction or changes to ecological processes and functioning and habitat fragmentation	-ve	localised	permanent	medium	definite	high	• Ecological corridors occur predominantly along the rivers, drainage lines and seep areas, so design should be such that it does not impede these corridors unnecessarily. • Micro-siting of footprints should avoid seep and wetland areas during final site planning. • Road crossing to avoid seep and wetland areas as far as possible, where not possible appropriate crossing design to limit loss of habitat	medium	high
14. Loss of species of special concern and SSC habitat	-ve	localised	permanent	medium	definite	medium	• No additional vegetation clearing outside of designated footprint after construction phase completed	low	high
15. Increased risk of alien invasion	-ve	localised	long term	medium	probable	medium	• Alien invasive monitoring to be implemented as per EMP	low	medium

Over and above all the mitigation measures indicated in the table above, a Vegetation Search and Rescue and Relocation Plan, an Alien and Fire Management Plan along with a Rehabilitation Plan (based on the draft specification provided in the annexure to the specialists report) are to be finalised during the final design stage after micro-siting.

7.3 Summary of Vegetation Impact Assessment

From a vegetation perspective, the layout assessed in this study (Layout 3) has already been adapted to overcome possible red flag impacts through the iterative process undertaken to arrive at this layout. The evaluation of this layout is thus to fine tune the assessment to date and to mitigate any remaining impacts.

From this specialist assessment of the impact on the vegetation it was thus found that, with suitable mitigation, there would be no impacts of high negative environmental significance and no fatal flaws to the proposed development.

8 IMPACTS ON GROUND WATER, HYDROLOGY AND SURFACE/ GROUNDWATER LINKS WITH WETLANDS

This section deals from a hydrological point of view with specific impacts on the ground water, hydrology and surface/ groundwater links with wetlands in the affected environments.

8.1 Ground water

From a groundwater perspective, the proposed wind farm would have a low and insignificant impact due to the nature of a wind farm and the underlying geohydrological conditions in the area.

8.2 Hydrology

The footprint of the Eastern Cluster is located between two major rivers and the footprint of the Western Cluster crosses the Klipdrift River and lies adjacent to the Tsitsikamma River; hence flooding from these rivers is a potential hazard along the low-lying areas under natural and existing topographic conditions. It must, however, also be kept in mind that the lowest wind turbine would be at about 14m amsl elevation and hence is unlikely to be at risk of flooding during extreme storm events.

Furthermore, from the Nuclear-1 study at the nearby Thyspunt site it has been established that the stage height in major rivers in the area seldom rises by more than 5 to 8 m before discharging into the ocean and hence it is expected that no major flood hazard would exist at the cluster sites.

The above shows that the proposed wind farm development is not at risk of flooding and will not impede the flow of any of the perennial rivers. In addition, the infrastructure associated with the development of the Wind Farm has been located and designed to minimise any impact on the hydrology of the area.

8.3 Wetlands

The construction of turbines and roads and associated infrastructure will have an impact on the wetlands and this is highlighted per cluster below.

8.3.1 Eastern Cluster

Wetlands in this cluster would be sensitive to any activities that resulted in changes in surface hydrology. Such changes are most likely to be associated with the crossing points of drainage lines upstream of, or within, wetlands, by roads or other infrastructure, and could occur as a result of even relatively minor constrictions in current flow paths, berming or diversion of flows.

8.3.2 Central Cluster

The area that would be affected by the proposed Central Cluster lies to the north of the mobile dune belt, and thus would not directly impinge on the important wetlands found in this dune belt. Wetlands in this cluster are largely disturbed systems, the integrity of which have already been impacted to some extent by largely agricultural activities in their vicinity and upstream catchment areas. Drainage lines and wetlands within the cluster would however be affected by increased flow velocities resulting from localised surface hardening, as well as changes in both water quality and water quantity. Any activities that resulted in the diversion or significant abstraction of either surface or groundwater flows that currently dissipate into the mobile dunes could have implications for aquifer recharge and hence for wetland function to the south of the cluster.

8.3.3 Western Cluster

Any activities in the Western Cluster that resulted in disruption to surface or groundwater flows both within the cluster area and to the north could have implications for wetland function and integrity. As in the case of the Central Cluster, drainage lines and wetlands within the cluster would be negatively affected by increased flow velocities resulting from localised surface hardening, as well as changes in both water quality and water quantity. Any activities that resulted in significant diversion of surface or groundwater flows could have implications for aquifer recharge and hence for wetland function to the south of the cluster. Bridge and road design should take cognisance of this aspect.

8.4 Impact Assessment and Mitigation

Considering the above and taking into account the fact that only about 56ha of land or less than 1% in over 9000ha will be permanently altered and that no significant impacts were identified by the hydrological specialists, the impact has been assessed to be of Low –ve significance for ground water, hydrology and surface/ groundwater links with wetlands.

This low significance rating is however linked to the following mitigation measures being undertaken:

- The mitigation measures for seeps wetlands and streams proposed in Section 7.2 dealing with the impacts on vegetation
- The undertaking of a Water Use Licence Application (WULA) as required by the National Water Act (Act 36 of 1998) and complying with all requirements of the act with regards to surface water hydrology. This will ensure that surface water management and all other relevant requirements of the Act are undertaken and that that road / bridge design and designs for flood hazard management will be in line with best practice mitigation of impacts on hydrology.

8.5 Summary of the Impact Assessment on Ground Water, Hydrology and Surface/ Groundwater Links with Wetlands

No impacts of high significance were identified by this study and it was given a rating of Low –ve provided mitigations measures were implemented including the need to apply for a Water Use Licence from the Department of Water Affairs. Through the Water Use Licence Application process, any additional or secondary impacts on these elements will be mitigated in detail.

9 IMPACTS ON TERRESTRIAL FAUNA

Five main impacts common to all clusters were identified which could potentially affect all the faunal groups; reptiles, amphibians and mammals:

- Habitat destruction through the construction of roads, widening of existing roads, building of bridges; and site clearing will destroy existing habitats
- Road mortality by vehicle activity
- Fauna harmed by fences through entrapment or exclusion from an area and causing self-harm in an effort to get through the fencing
- Corridor continuity or ecological corridor functioning may be disturbed or damaged when permanent structures are placed within a functioning corridor
- Poaching (mainly mammals) could take place near fence lines where workers or trespassers set up snares to trap animals for food.

The impacts, their significance ratings for the various faunal groups and possible mitigation measures are summarised and mitigated in Table 14 -

Table 18. Although assessed per cluster in the main specialist report, review of the assessment finds that the impacts and ratings are identical for all three clusters and as such, are grouped in this summary for ease of review.

Table 14: Impact: Habitat Destruction

Fauna	Phase	Mitigation	Significance	Mitigation
Reptiles Amphibians Mammals	Construction	Without	High	• Search and rescue operations conducted before construction phase begins. • Fauna must be relocated to a place similar to the place where they were found. • Construction areas must be clearly demarcated. • Habitat islands should be created within the area cleared for the constructional site office etc. This will act as a safety retreat for any reptiles "trapped" on the construction site; and aid in habitat creation during the operational phase. • Materials, such as rocks, removed during the constructional phase must be kept aside and used later for the rehabilitation. This will be beneficial for the re-creation of habitat for small mammals.
	Construction	With	Medium	
	Operation	Without	Medium (+)	
	Operation	With	Medium (+)	

Faunal (all groups) habitat destruction on the actual construction footprint of the roads, laydown areas and turbine positions will have a **Medium** environmental significance rating if mitigation measures are implemented. Operational impacts reflect a positive impact significance rating because the operational phase will provide safety and security for fauna as the immediate areas surrounding the development footprint will be of a nature that future habitat destruction is permanently prevented and will create new habitats, particularly for reptiles.

Table 15: Impact: Road Mortality from Trucks, Cars and Other Service Vehicles

Fauna	Phase	Mitigation	Significance	Mitigation
Reptiles Amphibians	Construction	Without	High	• Materials which will attract reptiles must not be left on site, this will increase the presence of reptiles • Care must be taken to ensure slow driving on the site especially during rainfall periods • Speed limits should be enforced. • Signs should be erected to remind and warn vehicle users where frog/toad crossings are, extreme slow driving needs to be practised in these zones. • Where roads pass right next to major water bodies provision should be made for fauna such as toads to pass under the roads by using culverts or similar. • Keep the grass/vegetation short next to the road to reduce mammal activity near the road. This will also allow the vehicle driver and mammal to see the danger early enough to avoid a negative impact. • Dead animals must be removed off the road as this will attract scavengers which may also be harmed on the road. • Do not feed animals on or near the roads.
	Construction	With	Low	
	Operation	Without	Low	
	Operation	With	Very Low	
Mammals	Construction	Without	High	
	Construction	With	Low	
	Operation	Without	Very Low	
	Operation	With	Insignificant	

The impact significance on faunal road mortality from motorised vehicles during the construction phase is considered High when no mitigation is implemented. It can be reduced to Low when simple measures are effectively put in place. The impact significance of the movement of vehicles during the operational phase is considered Low to Very Low with or without mitigation measures.

Table 16: Impact: Fauna Harmed by Fences

Fauna	Phase	Mitigation	Significance	Mitigation
Reptiles Mammals	Construction	Without	Medium	• Fences surround the footprint high security installations must be of a nature to allow fauna to pass through it. • Regular visits to the site to check if any fauna are indeed trapped. • Access gates into the fenced off areas to be closed at all times. • Inward facing 90 degree corner fences must be sacrificed into two 45 degree corners, as this will decrease the stress of a wild animal when approaching a corner. The animal will turn in front of the corner instead of running directly into it. • Fences must be visible to animals. • Avoid using electric fencing.
	Construction	With	Low	
	Operation	Without	Medium	
	Operation	With	Low	

The types of fences expected to be used by the project are not regarded as having a deleterious effect on amphibians.

Table 17: Impact: Corridor Continuity

Fauna	Phase	Mitigation	Significance	Mitigation
Reptiles Amphibians	Construction	Without	Medium	• Placing of structures under roads to allow reptiles such as tortoises and terrapins to cross under the road will promote corridor continuity. • Do not places fences on the side of the roads • Construction of roads over wetlands/rivers/streams must be of the nature that the water is allowed to flow under the road, this will secure corridor continuity for amphibians.
	Construction	With	Medium	
	Operation	Without	Medium (+)	
	Operation	With	Medium (+)	
Mammals	Construction	Without	Medium	
	Construction	With	Low	
	Operation	Without	Medium (+)	
	Operation	With	Medium (+)	

With the implementation of the mitigating measures, ecological corridors can be maintained into the future.

Table 18: Impact: Poaching

Fauna	Phase	Mitigation	Significance	Mitigation
Mammals	Construction	Without	Low	• Conditions in the EMP should pay attention to poaching. Strict control by the ECO must ensure that this impact is addressed. • The workers on site must be educated about the laws protecting wildlife. Penalties should be used as a deterrent. • Regular fence inspections need to be conducted to remove any snares. • Workers in the area should be made aware of penalties for feeding of animals.
	Construction	With	Low	
	Operation	Without	Low	
	Operation	With	Low (+)	

The environmental impact significance of poaching related to the proposed project is considered to be low during both the construction and operational phases of the project, with or without mitigation. Implementation of recommended measures during the operational phase will actually produce a low positive benefit as it will encourage workers to be aware of conservation and prevent poaching through education.

The Search and Rescue which is proposed for a number of impact mitigations in the tables above refers only to the fauna which are in direct proximity to the activity mentioned. Therefore the search and rescue refers to micro habitat specific endangered animals near the specific development area and not animals within the entire area of development. The search and rescue operations are once off, and only conducted before the construction phase of the project.

9.1 Summary of Terrestrial Fauna Impact Assessment

The most important findings of the investigation on the impacts on the fauna are summarised below:

1. The erection of the wind turbines in terms of the constructional phase promotes certain negative impacts, but with the enforcement of mitigating measures, these impacts can be minimised, or removed entirely.
2. The erection of the wind turbines in terms of the operational phase has the potential to stimulate positive impacts, such as preserving habitat that would otherwise be lost if, for instance, holiday homes would be built instead of wind turbines.
3. In terms of the decommissioning phase, the impacts will be similar to the construction phase impacts.

10 IMPACT ON BATS

No primary research has been undertaken in South Africa on the impacts of wind turbines on bats with sparse information gathered in North America and in Europe although the killing of migratory tree bats by wind turbines in America has been documented since at least the 1990s. A key paper in this context is by Baerwald *et al.* (2008), who explained the killing of migratory bats by certain turbines in Canada's Alberta Province as the effects of barotrauma where the severe injuries to the bats' respiratory systems were consistent with a sudden drop in air pressure that occurs when the animals get close to turbine blades. It remains unclear what attracts the bats to the wind turbines in the first place, as their superior echolocation capabilities should enable them to avoid the spinning blades.

The proposed Kouga Wind Farm is not expected to lead to the loss of bat roosts or significant loss of foraging habitat. Hence, the potential for bat mortality from the operation of the wind turbines is the only negative impact identified for this project with the open air foraging species like the Egyptian Freetailed Bat most likely to be affected. The potential for cumulative effects on the bat population level does exist and may arise, if the operation of other wind farms in the general area proceeds without effective mitigation in place.

If the North American experience is applicable to the South African species, the operation of wind farms should be avoided along the seasonal migration routes of bats. As there are no caves present and no records of mass movement of bats in the area, it is unlikely that the coastal strip between the Krom and Tsitsikamma Rivers is used extensively by bats as a migration route. Given this fact, any mortality of bats due to the turbines will most likely only impact on local populations and possibly 'thin them out' but not to the levels recorded in North America.

Knowledge about this and other aspects of the biology of bats occurring in the study area is critical for the understanding of bat fatalities at wind farms in South Africa. Hence early morning searches for dead bats should be conducted at wind farms and the carcasses should be sent frozen to bat specialists for analysis, together with the circumstances of their finding.

Two specific potential impacts were identified:

- Site-specific mortality of bats from wind turbine blades during the operational phase
- Depression of recruitment of bats through mass mortality in the region caused by revolving turbine blades at several wind farms

These specific impacts are assessed and rated below.

Table 19: Impact: Site-Specific Mortality of Bats from Wind Turbine Blades During the Operational Phase

Extent	Duration	Intensity	Probability	Significance without mitigation	Significance with mitigation	Status	Confidence
Site specific	Long-term	Medium	Highly probable	Medium	Low	Negative	Medium

Table 20: Impact: Depression of Recruitment of Bats through Mass Mortality In the Region Caused By Revolving Turbine Blades At Several Wind Farms

Extent	Duration	Intensity	Probability	Significance without mitigation	Significance with mitigation	Status	Confidence
Regional	Long-term	High	Probable	High	Low	Negative	Medium

10.1 Mitigation Measures

Three main possible mitigation measures are to:

- Implement a monitoring programme
- Phase the construction and operation of the development
- Set the turbines back from major water courses

Given the fact that the confidence level in the prediction of the magnitude of this impact is not high, it is unreasonable to recommend that this project should not go ahead. It is also not reasonable to impose stringent mitigation measures especially given the fact that there is little surety as to what will actually work in South Africa and what the impact will be like. It is only through a monitoring programme during the operational phase that it can be established whether the locally occurring species will experience high mortality from the turbines and if this will result in a more significant impact than just thinning out the local population. It is thus recommended that the bat mortalities be recorded as part of the bird monitoring programme.

As indicated in the mitigation for the bird impacts, the development needs to occur in phases with the monitoring programme implemented in the first phase of the development. This would allow for the implementation of any mitigation measures identified during the monitoring programme to be implemented in subsequent phases. The developers have agreed to the monitoring and the phasing of the project and in this regard the first phase that will be applied for will not exceed 50 turbines.

The setting back of turbines from riparian habitats to help reduce bat mortality has already been implemented at the design stage, as the preferred internal turbine layout maintains a distance of 500m as far as possible from the Krom, Tsitsikamma, Slang and Klipdrift Rivers, and from Soutvlei.

Should post construction monitoring results show significant bat mortalities, then the developer must engage with specialists to reduce the impact caused by the wind farm. Ideas that could be considered if such high mortalities do occur is to slow turbine blades to near motionless in low-wind periods between dusk and dawn by modifying their cut-in speed. This technique significantly reduced bat mortality by some 60% in preliminary studies conducted in North America. The effectiveness of this measure is ascribed to the tendency of bats to stop foraging at very high wind speeds when turbines operate at maximum effect.

10.2 Summary of Bat Impact Assessment

The confidence level in the prediction of the magnitude of the impact on bats is not high but it is believed that with the proposed mitigation of phasing the project and at the same time conducting a monitoring program this potential impact can be reduced to a low significance.

11 IMPACTS ON BIRDS

At a landscape level, the proposed development is situated in an area of high sensitivity for avifauna. This is due to the numerous sources of surface water such as estuaries, dams, wetlands, and streams. These micro habitats have an effect on this project at a macro level, i.e. attracting high abundances of various bird species to the general area. This is unlikely to be mitigated effectively through the micro-siting of individual turbines within the clusters. However, during the EIA process there was an iterative review of the proposed turbine layout with input from all the relevant specialists. During this process, turbines that were considered to be too close to significant water bodies were moved so as to be on the safe side. This implies that the layout being assessed here (Layout 3) has already had all major site layout adjustments done which considered minimising impacts on avifauna.

Four main impacts on the avifauna were identified:

- Collision of birds with wind turbines
- Habitat destruction associated with the construction of the turbines
- Disturbance of birds by the turbines and associated infrastructure
- Habitat destruction during construction of associated infrastructure

The electrocution on 132kV power lines servicing the facility was not considered or assessed in this EIA as the 132kV powerlines are being covered by other assessments for the grid connection.

11.1 Assessment of the Collision of Birds with Wind Turbines

By far the greatest threat will be the collision of birds with wind turbines. In this regard it is critical to understand the various issues and factors at play, before an accurate assessment of the impacts of the proposed wind energy facility on the birds of the area can be conducted. Insight into the subject matter is almost exclusively based on experiences gained from overseas, as to date only eight wind turbines at three different locations have been constructed in South Africa.

The South African data collected and analysed to date also show low (single digit) bird mortality rates as opposed to those from overseas, but there is concern that the cumulative effects of many turbines standing together in the same general area may be important for long-lived and slow-reproducing species, such as Barrows Korhaan and Denham's Bustard. Indeed, bustards, storks, cranes and various species of water birds are often regarded as most vulnerable to collisions with powerlines. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines. Unfortunately, many of the collision-sensitive species are considered threatened in southern Africa.

Factors affecting the number of mortalities at a facility due to collisions include: bird species present, prey abundance, landscape features, weather, number of turbines, turbine size, turbine spacing and facility lighting.

The extent to which collision of the target species, and any others, occurs at the proposed turbines is dependent on their flight movements and behaviour. For instance, there could be several Denham's Bustard on site, but if they do not fly frequently enough, at the relevant altitude (estimated at approximately 50 – 140 m above ground) and in the relevant areas, collisions will not occur. Although harriers spend a lot of time flying, they may fly low enough to avoid risk. Additionally, one cannot assume that every bird flying towards a turbine will collide with it. In fact, very high avoidance rates have been established for other species internationally.

The cumulative impact of bird collisions in the area is likely to be significant. Many of the target species for this study are species that are, in all likelihood, already significantly impacted upon by collisions with overhead cables in the area. An additional mortality factor such as collision with turbines may prove detrimental to local populations of these species.

This impact has been judged to be of high significance, with a low confidence and is difficult to mitigate (Table 21).

Table 21: Impact Rating: Collision of Birds with Turbines

	Without mitigation	**With mitigation**
Extent	local	Local
Duration	Long term, project life	Long term, project life
Intensity/Magnitude	Medium	Medium
Probability	Highly probable	Highly probable
Significance	High	Medium
Status	Negative	Negative
Reversibility	Irreversible-birds killed	Irreversible-birds killed
Irreplaceable loss of resources	Yes	Yes
Can impacts be mitigated	Not adequately	Not adequately
Mitigation: See below		
Confidence: The avifaunal specialist expects that certain species, such as Denham's Bustard, will collide with the turbines. This is based on the species' proven vulnerability to colliding with overhead cables, and the proven vulnerability of the Gruidae family to collision with turbines elsewhere in the world. However, the specialist's confidence in the extent to which collisions will occur (the impact magnitude) remains low until there is real experience of this interaction.		

11.1.1 Mitigation Measures

Some mitigation options are:

- Only tubular towers be used (i.e. not lattice)
- Lighting of the turbines should be at a low level as provided for by CAA requirements
- Different patterns being painted on the blades was considered but this is not permissible due to CAA requirements.
- Dedicated monitoring programme
- Phasing the development

Given the low confidence in the prediction of the magnitude of this impact, it is unreasonable to recommend that this project should not go ahead. It is only through a dedicated monitoring programme during the operational phase that it can be established whether the locally occurring species are particularly exposed to the

dangers of spinning turbine blades. It is recommended that an independent body approved by the Endangered Wildlife Trust (EWT) be commissioned to conduct such a monitoring programme.

The development needs to be phased so that this monitoring programme should be implemented in the first phase of the development, which would allow for the implementation of any mitigation measures identified during the monitoring programme to be implemented in subsequent phases. The developers have agreed to the monitoring and the phasing of the project, and in this regard, the first phase that will be applied for will not exceed 50 turbines.

11.2 Assessment of the Habitat Destruction Associated with the Construction of the Turbines

During the construction and operational phases of this project, some habitat destruction and disturbance will take place. However, much of the various sites are transformed habitat, primarily for the cultivation of pastures for dairy farming. The Denham's Bustard appears to be concentrated in this area and although vegetation is not removed to any great extent, a combination of the noise and movement disturbance impact of the turbines and habitat alteration may reduce suitable areas available for this species to forage in. This would amount to habitat loss or fragmentation which is of potential concern. Destruction or alteration of already transformed habitat is of less concern, and so this impact is rated to be of low significance (Table 22).

Table 22: Impact Rating: Habitat Destruction Caused by Construction of Turbines

	Without mitigation	**With mitigation**
Extent	local	Local
Duration	Permanent	Permanent
Intensity/Magnitude	Low	Low
Probability	Definite	Definite
Significance	Low	Low
Status	Negative	Negative
Reversibility	Irreversible	
Irreplaceable loss of resources	Yes	
Can impacts be mitigated	No, vegetation is removed and replaced with infrastructure	
Mitigation: A full site specific EMP must be compiled for the project with avifaunal input. This will specify measures to mitigate for the habitat destruction caused by the construction of the turbines.		
Confidence: High		

11.3 Assessment of the Disturbance of Birds by the Construction and Operation of Turbines and Associated Infrastructure

The disturbance of avifauna during the construction of the turbines and associated infrastructure is likely to be of medium significance, but perhaps more important is the effect of the wind farm collectively on bird movement, breeding and foraging during the operational lifespan of the plant. This is difficult, if not impossible, to mitigate for (see Table 23).

Table 23: Impact Rating: Disturbance to Birds Caused by the Construction and Operation of the Turbines and Associated Infrastructure

	Without mitigation	**With mitigation**
Extent	Local to regional	Local to regional
Duration	Short term at construction but long term for project life	Short term at construction but long term for project life
Intensity/Magnitude	Low	Low
Probability	Probable	Probable
Significance	Medium	Medium
Status	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources	No	
Can impacts be mitigated	No	
Mitigation: A full site specific EMP must be compiled for the project with avifaunal input. This will specify measures to mitigate for the disturbance caused by the construction of the turbines if any are possible. Furthermore if any nesting birds are found pre-construction the EWT must be notified for advice in dealing with these species.		
Confidence: Medium		

11.4 Assessment of the Habitat Destruction during Construction of Associated Infrastructure

The iterative process that arrived at Layout 3, took account of a number of potential impacts on avifauna by altering the older layouts. This, along with the fact that only about 56 ha of land or less than 1% will be permanently altered out of over 9 000ha resulted in this impact being judged to be of low significance (Table 24).

Table 24: Impact Rating: Habitat Destruction from Construction of Associated Infrastructure, e.g. Power Lines, Control Buildings, Substations, Roads etc.

	Without mitigation	With mitigation
Extent	Local	Local
Duration	Permanent	Permanent
Intensity/Magnitude	Low	Low
Probability	Definite	Definite
Significance	Low	Low
Status	Negative	Negative
Reversibility	Irreversible	
Irreplaceable loss of resources	Yes	
Can impacts be mitigated	No	
Mitigation: A full site specific EMP must be compiled for the project with avifaunal input. This will specify any possible measures to mitigate for this impact.		
Confidence: High		

11.5 Preliminary Avifaunal Pre and Post Construction Monitoring Plan

In the above sections, a monitoring programme has been strongly advocated. The details on what would be expected and how to go about this monitoring programme has been extracted from the "Birds and Wind Energy Specialist Group" draft report compiled by Andrew Jenkins in 2010. Endangered Wildlife Trust and Bird Life South Africa along with prominent ornithologists have formed the "Bird and Wind Energy Specialist Group". This specialist group aims to address all issues to do with the interaction of birds and wind farms both positive and negative and cumulative. One of the main outcomes of this work will be a national specification for monitoring of bird interactions/ impacts with wind farms (Jenkins draft report mentioned above) and this is due to be finalised in the first quarter of 2011.

Once environmental authorization is obtained, it is recommended that a reconnaissance survey be conducted by a suitable ornithologist, to set up the final protocol, analyse data and report to the developer in line with the "Birds and Wind Energy Specialist Group" monitoring specifications.

The proposed monitoring plan will result in 12 months of pre-construction monitoring, 9 months of monitoring during the construction period and 12 months post-construction, amounting to approximately, and at least, 24 days per 12 month period or as required by the National Wind Energy Monitoring Specifications being developed by the "Birds and Wind Energy Specialist Group"

The primary aims of each monitoring project would be to:

- **Pre- and post-construction and once the facility is operational:** Document patterns of bird activity and determine the densities (including breeding densities for key species) of birds resident within the study area.
- **One full calendar year after the facility is commissioned:** Monitor patterns of bird activity in relation to weather conditions, time of day, season and land use and register and document the circumstances surrounding all avian collisions with the turbines, and all bird mortalities caused by ancillary infrastructure of the wind farm.

The bulk of the work involved should be done by trained observers, under the guidance and supervision of a qualified and experienced ornithologist (preferably by the EWT). Commitment will be required from the developer to consider the results of the monitoring and appropriate mitigation actions where necessary. These may include micro-siting or excluding certain turbines to avoid critical habitat or flight paths that may be identified as a result of the more detailed monitoring (pre-construction).

11.6 Summary of Bird Impact Assessment

The most important potential impacts of the proposed development will be collision of certain bird species with the turbine blades while habitat destruction and disturbance of birds is likely to be of lower significance.

Given the uncertainty of the magnitude of the potential bird mortality, it is not considered reasonable to recommend that this proposed project should not go ahead. In broad environmental terms, renewable energy options such as wind energy should be supported. The main reason for uncertainty with regard to the above aspects is the lack of operational wind farms in South Africa, and without building any wind farms we cannot begin to gather the data required to eliminate or reduce this uncertainty. A more reasonable approach is to obtain the best possible data on bird movement on site as soon as possible, in consultation with the developer, so as to develop an understanding of the issues at hand. EWT believes that the acceptance by the developer to phase the project with the first phase not having more than 50 turbines lends itself to obtaining good data on the impact from the first phase which would then inform how to proceed with subsequent phases. If significant numbers of collisions occur once the turbines are constructed, the developer will need to take reasonable measures to mitigate for these collisions in the current and subsequent phases.

12 IMPACTS ON CULTURAL HERITAGE RESOURCES

Seven main Cultural Heritage impacts were identified, namely:

- Impacts on the Colonial Period Farmsteads or Structures, pre-dating 60 years of age
- Impacts on Colonial/ Historical Period Cemeteries
- Impacts on Site 1.3- a low density primarily ESA Acheulean scatter
- Impacts on Site 2.3 - a significant ESA and MSA Stone Age site
- Impacts on Area 1 and 2- potentially sensitive LSA areas
- Impacts on the intangible heritage resources
- Impacts on the cultural landscapes and viewscapes

The affect on cultural heritage impacts due to the iterative process that was followed to develop the final "Layout 3" for the wind farm must be highlighted. Input from the cultural heritage specialists had a major influence on changes to the layout during this iterative process and thus it is not surprising that there are no significant negative cultural heritage impacts due to Layout 3.

There were no significant negative cultural heritage impacts identified. It was thus recommended by the specialist that that the proposed Wind Farm project proceeds as applied for provided the suggested mitigation measures are complied with.

12.1 Assessment of the Impacts on the Colonial Period Farmsteads or Structures, Pre-Dating 60 Years of Age

No wind turbine is located closer than about 500m to any of these sites due to the visual and noise requirements. All of these sites are also sufficiently protected with fences and will not be impacted on by the proposed development. Thus the impacts on these sites has been assessed with a high confidence to be of **No** significance (See Table 25).

Table 25: Impact Rating for Impacts on Colonial Period Farmsteads or Structures, Pre-Dating 60 Years of Age.

Extent	Duration	Intensity	Probability	Significance	Status	Confidence
Site specific	N/A	Low	Improbable	No impact	Neutral	High

12.2 Assessment of the Impacts on Colonial/ Historical Period Cemeteries

Three cemeteries were identified within the general project area and these were sites 1.2, 2.5 and 3.2. All are, at present, fenced with an access gate, thus complying with SAHRA Minimum Site Conservation Standards. No wind turbine or related infrastructure will be located close enough to any of these cemeteries to result in negative impacts and thus Table 26 indicates that there is no impact due to the proposed development on these sites.

Table 26: Impact Rating for Impacts on Colonial/ Historical Period Cemeteries

Extent	Duration	Intensity	Probability	Significance	Status	Confidence
Site specific	N/A	Low	Improbable	No impact	Neutral	High

12.3 Assessment of the Impacts on Site 1.3 - A Low Density, Primarily ESA Acheulean Scatter

Based on the particularly low recorded surface artefact ratio, with evidence of continuing poor sub-surface stratigraphic deposits and the expected absence of related organic material, the site is ascribed a South African Heritage Resources Agency (SAHRA) - Low Significance. It is recommended that development proceeds as applied for and that the site be destroyed / impacted on without the developer having to apply for a SAHRA Site Destruction Permit prior to impact.

The impact will thus be Low to Very Low negative as indicated in Table 27.

Table 27: Impact Rating for Impacts on Site 1.3

Extent	Duration	Intensity	Probability	Significance	Status	Confidence
Site specific	Permanent	Medium	Probable	Low to Very Low	Negative	High

12.4 Assessment of the Impacts on Site 2.3 - A Significant ESA and MSA Stone Age Site

Site 2.3 is ascribed a SAHRA - High Significance. The developer has opted to ensure that the site is not impacted and is rather conserved by altering the layout so that no turbines or any infrastructure will impact on the site. Thus “Layout 3” which is the layout assessed in this EIR and the final layout to come from the iterative process to determine the least impactful layout does not impact on Site 2.3. Site specific conservation measures are described in the Cultural Heritage Site Management Plan – Site 2.3, Welgelegen 735/3, Kouga Local Municipality, Eastern Cape which is appended to the Cultural Heritage Report undertaken for this project.

Thus, due to the fact that this site is no longer part of the proposed development the impact as depicted in Table 28 is a **Medium to High Positive** impact as the site is now known and can be conserved.

Table 28: Impact Rating for Impacts on Site 2.3

Extent	Duration	Intensity	Probability	Significance	Status	Confidence
Regional	Permanent	High	Highly Probable	High/ Medium	Positive/ Neutral	High

12.5 Assessment of the Impacts on Area 1 and 2 - Potentially Sensitive LSA areas

Both Areas 1 and 2 comprise of potentially sensitive areas and sites may well be encountered during the course of development. Although no sites were identified during the site visits, it is recommended as a precautionary approach that on-site archaeological monitoring (surface and sub-surface inspection) is undertaken at the start of construction in the vicinity of Area 1 (Turbine 99, 123 and 124) and Area 2 (Turbine 104, 105 and 112).

Should any sites be identified during on-site archaeological monitoring, future site management recommendations should be made and may include site conservation or Phase 2 archaeological mitigation.

12.6 Assessment of the Impacts on the Intangible Heritage Resources

Within the proposed wind farm study site there were no intangible heritage resources or sites associated with oral history identified.

Socio-cultural enquiry relating to the presence of intangible heritage resources was limited to landowners with strong ancestral ties to the proposed Kouga Wind Farm site. There was consent amongst these landowners that the proposed Wind Farm development will not impact negatively on any significant intangible heritage resources. The impact was, in general, regarded as a natural process of change directly related to industrialization and specifically energy demands, a resource that is of vital importance to modern farming practices and reflecting changing continuity of cultural tradition (early Colonial Period farming techniques vs. modern farming techniques).

In addition, none of the above mentioned consulted farmers have been contacted by any indigenous population or minority group with regards to the use of a specific heritage site, geographic locality or natural landscape feature for purposes of a specific cultural activity, be it of ceremonial or non-ceremonial nature. It can thus be reasonably inferred that no intangible heritage site of significant cultural value to any indigenous population or minority group is situated on the proposed Wind Farm site. However, the absence of directly identified intangible heritage sites does not exclude the fact that the general cultural landscape, specifically with regards to the strong emphasis on archaeological shell midden sites and possible LSA graves, are not indirectly of tangible or intangible significance to descendant KhoiSan populations. This is addressed in the assessment of the impacts on Cultural Landscapes.

In response to a request made at the public participation meeting to meet with the traditional leaders of the Khoisan in Kouga and the desire from the developer to engage with local leaders, a meeting was set up with the Gamtkwqua Khoisan First Nation. The meeting was attended by his honourable Chief Michael Williams and his council. During the course of the meeting the Chief gave his blessing for the project and indicated that they viewed it as a wonderful opportunity to uplift the local community (see letter in Appendix D7). The blessing of the Chief, whose efforts in keeping alive the heritage of the Khoisan people were recognized by the award of the

Kouga Mayoral Arts and Culture award, further enhancing the fact that the wind farm is supported by the local indigenous people.

This potential impacts on heritage resources is thus seen to have a **Neutral** significance.

12.7 Assessment of Impacts on the Cultural Landscapes and Viewscapes

As has been pointed out in the Visual Impact Assessment, the impact of the turbines on sensitive visual receptors will naturally be high due to the large size and thus visibility of the turbines. The visual impact of the proposed Kouga Wind Farm project on the cultural landscape is similarly found to be High -ve, permanent and non-mitigatable.

However, from a cultural point of view, the visual impact of the development could be seen as evidence of the natural process of 'cultural evolution', reflecting contemporary energy requirements and the emphasis on renewable energy sources. The proposed Kouga Wind Farm will also contribute, in part, to the conservation of the rural ambiance of the landscape established during the Colonial Period as it will prevent other more destructive development types from possibly taking place on the land in the future. Furthermore, it will allow the famers to continue to make a living from farming (which is becoming financially more challenging) due to an added income from the wind farm and thus again make it less likely that the land will be sold and used for other purposes.

If one considers the high sensitivity of the LSA cultural landscape along the southern Cape coast and increasing impact on and destruction of these unique, non-renewable heritage resources, the proposed Wind Farm development may well prove to be the most significant conservation measure considered to date. This needs to be weighed up against any perceived significant change to a landscape that has already been significantly altered from a pristine Khoisan landscape.

The support for the project by Chief Michael Williams and the Gamtkwqua Khoisan First Nation (see letter in Appendix D7) is taken as a good indication that the impact on the Khoisan cultural landsdcapes and viewscapes is not significant enough to warrant it affecting the proposed wind farm development.

This impact is thus seen to be very subjective but it could have a High negative potential impact to some sensitive cultural visual receptors. It will also, however, have a possible High positive impact with regard to conservation of heritage resources in the area.

12.8 Mitigation Measures

No significant impacts where identified but the developer should comply with the following mitigation measures:

- All turbine localities and linear development routes should be reassessed during the micro-siting process that is going to be undertaken as part of the

final detailed design process for the project if it receives a positive authorisation

- Site 1.3 can be destroyed without the developer having to apply for a SAHRA Site Destruction Permit
- Site 2.3 - The developer has opted to ensure that the site is not impacted and is rather conserved by altering the layout so that no turbines or any infrastructure will impact on the site. This has already been undertaken as is evidenced in the final Layout 3.
- In the Central Cluster, turbine localities 28, 33, 36, 40, 41 and 48 are located particularly close to the archaeologically potentially sensitive vegetated dune landscape to the south of the study site. On-site archaeological monitoring is recommended at the start of construction (surface and sub-surface archaeological inspection).
- In the Western Cluster, on-site archaeological monitoring to assess surface and sub-surface sections is recommended at the start of construction in the vicinity of Area 1 (turbines 99, 123 and 124) and Area 2 (turbine 104, 105 and 112)
- Should any archaeological or cultural heritage resources, as defined and protected by the NHRA 1999, and not reported on in this report, be identified during the course of construction, the developer should immediately cease operation in the vicinity of the find and report the site to SAHRA or an ASAPA accredited CRM archaeologist.
- The Kouga Wind Farm will not impact on any built structures. However, the EMP should include the requirement that all structures pre-dating 60 years of age are formally protected under the NHRA 1999, with an automatic blanket Provincial Heritage Resource status assigned to them. Any impact on, alteration to or destruction of these resources are subject to application and approval from SAHRA and has to be done under an Eastern Cape Provincial Heritage Resources Agency (EC PHRA) permit.
- The EMP should include the requirement that if any graves or human remains are encountered during the development the contractor/ developer should immediately alert both the police and SAHRA/ an Association of Southern African Professional Archaeologist (ASAPA) accredited CRM archaeologist. The process associated with the identification of human remains post-dating 60 years of age are managed by the police while the process associated with human remains pre-dating 60 years of age are managed by SAHRA under the NHRA 1999 and in accordance with requirements of the Human Tissues Act, Act No 65 of 1983 (HTA 1983) and the Human Tissues Amendment Act, Act No 51 of 1989 (HTAA 1989).
- A cleaning and healing process on the land should be undertaken under the guidance of Chief Michael Williams and the Gamtkwqua Khoisan First Nation before construction starts.

12.9 Summary of Cultural Heritage Impacts

The layout of the proposed Kouga Wind Farm was altered to accommodate heritage resources during the iterative process that arrived at Layout 3 which is the layout being assessed in this EIR. Due to this fact there were no significant impacts identified in Layout 3. With reference to cultural heritage compliance, as per the requirements of the NHRA 1999, it is recommended that the proposed Wind Farm project be allowed to proceed as applied for provided the developer complies with the mitigation measures proposed.

13 IMPACTS ON PALAEONTOLOGY

Throughout the southern Cape, but in particular within the Western Cape, fossils have been found in the sediment types which are present in the study area. However, within the three clusters of the proposed wind farm development, two geological factors have effectively eliminated fossils from being preserved. Firstly the tectonic overprint of the Cape Folding Event that took place around 310 million years ago and secondly, the long period of weathering and erosion that produced the African Land Surface and the coastal plane. There is, therefore, a very low likelihood of finding well preserved fossils in any of the three Kouga Wind Farm clusters.

The only rock unit that may be palaeontologicaly sensitive is the Cedarberg Formation which occurs in the Western and Central Cluster areas. Again, the chance of encountering this thin unit is remote and it will also have the metamorphic overprint which has effectively destroyed any potential fossils.

The significance of this impact is predicted to be Low as presented in Table 29.

Table 29: Palaeontological Impact Significance Rating

Nature of impact	Extent	Duration	Intensity	Probability	Significance without mitigation	Significance assuming mitigation	Status	Confidence level
Fossils in underlying sediments	Local	Long term	Low	Improbable	Low	Low	Neutral	High

13.1 Mitigation Measures

If at any stage during the construction phase of the wind turbines and the associated infrastructure, any semblance of a fossil were to be observed, it must be reported to the geological staff at either the Albany Museum or Rhodes University in Grahamstown so that it can be removed safely. Alternatively it can be reported to staff at the Council for Geosciences in Port Elizabeth.

13.2 Summary of Palaeontology Impact Assessment

No significant impacts were predicted as there is a Very Low likelihood of any well preserved fossils being found on the site. However, should any fossils be found they will need to be reported to the relevant parties so that they can be safely removed.

The assessment was undertaken in 4 steps as follows:

1. Using a computer to determine, from topographical information, a graphical representation of all the areas from which the wind farm clusters would be visible (these graphical representations are called “viewsheds”).
2. The viewsheds and information gathered during the field survey were then used to define 4 criteria (visibility, viewer sensitivity, visual exposure and visual intrusion) for the proposed development.
3. These criteria were in turn used to determine the intensity of potential visual impacts on sensitive viewers/ receptors.
4. All information and knowledge acquired as part of the assessment process was then used to determine the potential significance of the identified impacts.

The four visual impact criteria, a description of what they entail and their assessed intensity for the main receptors in the project area is presented in Table 30.

Table 30: Summary of Visual Impact Criteria

Criteria	Intensity on Receptors/ of Project
Visibility of the proposed project The visibility of the project is an indication of where in the region the development will potentially be visible from. The rating is based on viewshed size only and is an indication of how much of a region will potentially be affected visually by the development. A high visibility rating does not necessarily signify a high visual impact.	High
Viewer Sensitivity Viewer (or visual receptor) sensitivity is a measure of how sensitive potential viewers of the development are to changes in their views	• Residents of coastal resorts – Highly sensitive to changes in their views • Residents of inland towns – Highly sensitive to changes in their views • Residents on surrounding farms – Highly sensitive • Scenic viewpoints and protected areas – Highly sensitive – there are no recognised viewpoints protected for their scenic quality in the region • Motorists – Low sensitivity due to short exposure time and the fact that their focus on landscape is reduced.
Visual Exposure Visual exposure refers to the relative Visibility of a project or feature in the landscape. Exposure and visual impact tend to diminish exponentially with distance.	• Residents of coastal resorts – High for Paradise Beach, St Francis Bay and some developments along the Krom River near the eastern WEF • Residents of inland towns – Low visual exposure for Humansdorp and Kruisfontein due to their distance from the wind farm • Residents on surrounding farms – a number of buildings on farms surrounding wind turbines will experience high to very high visual exposure due to their proximity

	to the turbines and the fact that some of them will have views on more than one wind farm • Protected areas – Seekoeirivier Nature Reserve and Krom River Mouth Protected Nature Reserve will experience high visual exposure to the eastern wind farm • Motorists – high for R330, road between St Francis Bay and Oyster Bay and other farm roads.
Visual Intrusion Visual intrusion indicates the level of compatibility or congruence of the project with the particular qualities of the area – its sense of place. This is related to the idea of context and maintaining the integrity of the landscape	• Residents of coastal resorts – high for some areas in Paradise Beach and St Francis Bay, and along the Krom River • Residents of inland towns – low due to low visual exposure and complex views • Residents on surrounding farms – High for some due to their proximity to the wind farm and the fact that there are no existing features of a similar magnitude in the agricultural landscape • Protected areas – Seekoeirivier Nature Reserve and Krom River Mouth Protected Nature Reserve will experience high visual intrusion at some viewpoints • Motorists – High for a short time when in close proximity.

14.1 Visual Intrusion

Of high concern for many residents / holiday makers is the perceived visual intrusion on the "Sense of Place" (the distinct quality of an area that makes it memorable to the observer). The main groupings that are affected are:

- Residents of coastal resorts
- Residents on surrounding farms
- Protected Areas and Scenic Viewpoints
- Motorists

The most complex views are from the coastal resorts and other settlements. This is due to the fact that the coastal resorts are located in low sensitivity landscapes and residents will have many man-made features in most of their views. Although their visual exposure to the wind farm may be high due to the size of the turbines and their proximity, most of their views will also contain many other man-made features that contrast with the muted colours of the mountains and vegetation in the background (Figure 28).

Figure 28: View of St Francis Bay township

Figure 29 and Figure 30 provide an indication of what the Eastern Cluster will look like from viewpoints in St Francis Bay. Other resort developments with high visual exposure such as the Krom River developments near St Francis Bay and Paradise Beach will have similarly high visual intrusion ratings for clear views of the wind farm (i.e. for properties on the edge of the development with views **towards** the wind farm).

Figure 31– Figure 33 provide indicative views from some of the other affected receptor groups indicated above.

***Figure 29*: View across the Kromme River from the St Francis Bay Marina (KVP027 – 2.5km from Eastern WEF). a) Current View b) Photomontage with turbines.**

Figure 30: View from near Port St Francis across St Francis Bay (KVP028 – 5.2km from Eastern WEF). a) Current View b) Photomontage

Figure 31: Views in the vicinity of Oyster Bay (KVP004 - 400m from central WEF on road between St Francis Bay and Oyster Bay). a.) Current view b.) Photomontage.

Figure 32: View South-east from KVP025 Towards the Eastern WEF (nearest turbine is 3km away). a) Current view b) Photomontage

Figure 33: View South-west from KVP025 Towards the Central WEF (9km to nearest wind turbine). a.) Current view b.) Photomontage.

14.2 Impact Assessment and Mitigation

Five potential visual impacts were identified:

- Change in mixed coastal resort-agricultural landscape as a result of establishing a wind farm
- Intrusion of large and highly visible construction activity on sensitive viewers
- Intrusion of large wind turbines on the existing views of sensitive visual receptors
- Impact of night lights on existing nightscape
- Impact of shadow flicker on residents in close proximity to wind turbines.

These potential impacts are assessed below and mitigation measures are suggested.

14.3 Impact of a Change in Mixed Coastal Resort-agricultural Landscape as a Result of Establishing a Wind Farm

Some of the landscape character types have a high sensitivity to the change that will be caused by introduction of a wind farm, but most of the landscape that will be affected is either that of dairy farms or coastal resorts. The coastal resorts are rapidly expanding with many of them becoming urbanised with shopping malls and suburbs (e.g. St Francis Bay and Jeffrey's Bay).

14.3.1 Mitigation Measures

There are no mitigation measures that will change the significance of the landscape impact other than avoiding the site entirely. A reduction in wind turbine numbers is **unlikely** to have an appreciable effect since even a few wind turbines will still have high visibility and will still change the landscape character.

Table 31: Significance of Impact on Mixed Landscape caused by Introduction of a Wind Farm.

	Without mitigation	**With mitigation**
Extent	Regional	Regional
Duration	Long term	Long term
Intensity/Magnitude	Medium to high	Medium to high
Probability	High	High
Significance	High (reducing over time)	High (reducing over time)
Status	Negative	Negative
Confidence	Medium	Medium

The landscape is changing however, as the surrounding urban centres continue to expand, and wind turbines are congruent with agricultural landscapes elsewhere in the world. It is therefore likely that the significance of the impact will decrease as time passes.

14.4 Intrusion of Large and Highly Visible Construction Activity on Sensitive Viewers

The height of the features being built and the siting on ridges is likely to expose construction activities against the skyline. Large construction vehicles and equipment will be highly visible albeit for a relatively short period of time. An increase in activity of vehicles and workers in an otherwise quiet area will affect views, although it is common to see large trucks transporting milk on some of the roads in the region. Traffic will be disrupted while large turbine components are moved along public roads. Activity at night is also probable since transport of large turbine components may occur after work hours to minimise disruption of traffic on main roads.

14.4.1 Mitigation Measures

The most obvious causes of impact cannot be mitigated for since the turbines are so tall and they are to be installed on the top of ridges and sometimes close to settlements and roads. The duration of the impact is short though, and there are a number of mitigation measures that will curtail the intensity to some extent:

- New road construction should be minimised and existing roads should be used where possible
- The contractor should maintain good housekeeping on site to avoid litter and minimise waste
- Clearance of indigenous vegetation should be minimised and rehabilitation of cleared areas should start as soon as possible
- Erosion risks should be assessed and minimised as erosion scarring can create areas of strong contrast which can be seen from long distances especially on the palaeo-dune fields of the Western Cluster. As any turbines on the dune fields will be micro-sited out of the dune fields in accordance with the requirement of the vegetation specialists, there should be no risk of erosion in these dune fields
- Laydown areas and stockyards should be located in low visibility areas (e.g. valleys between ridges) and existing vegetation should be used to screen them from views where possible
- Night lighting of the construction sites should be minimised within requirements of safety and efficiency.

Table 32: Significance of Large Construction Sites and Activities on Sensitive Viewers

	Without mitigation	**With mitigation**
Extent	Regional	Regional
Duration	Very short	Very short
Intensity/Magnitude	High	High
Probability	Highly probable	Highly probable
Significance	Medium	Medium
Status	*Negative/Positive	*Negative/Positive
Confidence	Medium	Medium

*Status may be negative or positive depending on the viewer (subjective).

Most of the sensitive viewers are the landowners on whose farms the turbines will be erected and hence live in close proximity to the turbines and it is assumed they have

agreed to have turbines on their properties and are presumably informed on the effect of the construction phase on their views.

14.5 Intrusion of Large Wind Turbines on the Existing Views of Sensitive Visual Receptors

There are a number of sensitive visual receptors that will potentially experience high intensity visual impact from a combination of high visual exposure to the wind farm and high visual intrusion of the wind farm into existing views. Views from the edge of St Francis Bay near the Krom River mouth, as well as some houses in Paradise Beach will be highly intruded upon by the Eastern Cluster turbines. Other resort developments along the Krom River will also have their views changed significantly. The Seekoeirivier Nature Reserve will potentially have views highly intruded upon by the Eastern Cluster of the wind farm. Several farm residences or buildings will also have close views of wind turbines. Motorists travelling on the R330 and some of the farm roads in the region will pass very close to wind turbines.

14.5.1 Khoisan or Other Indigenous Cultural Receptors

If the visual receptor (sensitive to a particular cultural landscape) is located within the viewshed then their current view will be significantly altered by the turbines due to their size and their incongruence with the cultural landscape. If the current view of a Khoisan visual receptor (i.e. viewer or viewpoint) will be altered by the wind turbines then the severity or magnitude of the impact will be high due to the incongruence of a wind turbine in a Khoisan landscape, if the landscape is pristine in terms of Khoisan landscape values. However, it is unlikely that the remaining landscapes are still pristine in terms of those values. It should also be noted that wind farms are most likely more in line with Khoisan values than other traditional methods of electricity generation. Wind turbines are not permanent structures in the landscape and can be removed to leave the landscape once again in its current state (assuming no other developments occur).

14.5.2 Mitigation Measures

There are no mitigation measures that can reduce the impact significantly unless sites are avoided but there are a number of measures that can enhance the positive aspects of the impact:

- Ensure that there are no wind turbines closer than 500 m to a residence or historically valuable farm building unless sufficiently screened by vegetation from shadow flicker
- Maintain the turbines in good working order to ensure operation under the right conditions. A spinning rotor is perceived as being useful but stationary rotor when the wind is blowing is seen as not fulfilling its purpose and a negative impression is created.
- Signs near wind turbines should be avoided unless they serve to inform the public about wind turbines and their function. Advertising billboards should be avoided.
- According to the Civil Aviation Act (Act No. 74 of 1962), as amended, wind turbines shall be painted bright white to provide maximum daytime conspicuousness. The colours grey, blue and darker shades of white should be avoided altogether.

- Lighting should be designed to minimise light pollution without compromising safety. Investigate using motion sensitive lights for security lighting. Turbines are to be lit according to Civil Aviation regulations.
- An information kiosk can enhance the project by educating the public about the need and benefits of wind power. Engaging school groups can also assist the wind farm proponent, as energy education is paramount in developing good public relations over the long term. Instilling the concept of sustainability, and creating awareness of the need for wind farm developments, is an important process that can engage the entire community.

Table 33: Significance of the Visual Impact of the Proposed Wind Farm on Sensitive Viewers

	Without mitigation	**With mitigation**
Extent	Regional	Regional
Duration	Long term	Long term
Intensity/Magnitude	High	High
Probability	Highly probable	Highly probable
Significance	High (possibly reducing over time)	High (possibly reducing over time)
Status	*Negative/positive	*Negative/positive
Confidence	Medium	Medium

*Status may be negative or positive depending on the viewer (subjective).

Many existing views will be altered by the proposed Kouga Wind Farm. It is not clear whether the change will be perceived as positive (i.e. as a symbol of sustainable and environmentally less harmful energy harvesting) or negative since opinions on the visual aesthetics of wind farms differ widely. There is also an anticipated change in this perception over time. It is expected that the severity of the potential impact will be high for a number of highly sensitive viewers who live on or very close to the wind farm area as discussed above. For most of the other sensitive viewers discussed above the severity will be Moderate to Low.

14.6 Impact of Night Lights on Existing Nightscape

Wind farms are required by law to be lit at night as they represent hazards to aircraft due to the height of the turbines. Marking of turbines depends on wind farm layout and not all turbines need to be lit. Marking consists of a red flashing light of medium intensity (2 000 candela). The conceptual layouts of the wind farms are ‘clusters’ in terms of the lighting specification and only the outer turbines will probably need to be marked. See Appendix F regarding CAA lighting requirements for the marking of wind turbines.

14.6.1 Mitigation Measures

The aviation standards have to be followed and no mitigation measures are applicable in terms of marking the turbines. Lighting of ancillary buildings and structures should be designed to minimise light pollution without compromising safety. Motion sensitive lighting can be used for security purposes.

Table 34: Significance of the Impact of Night Lighting of the Wind Farm on Sensitive Viewers

	Without mitigation	With mitigation
Extent	Local	Local
Duration	Long term	Long term
Intensity/Magnitude	Low to moderate	Low to moderate
Probability	Probable	Probable
Significance	Medium	Medium
Status	Negative	Negative
Confidence	Medium	Medium

There are large urban areas and other light sources surrounding the Eastern, and to some extent the Central Cluster, to which the marking lights will add very little in terms of light pollution. Views at night will have the glow of large towns like Jeffrey's Bay and Humansdorp as backdrop to the wind farm lights. The intensity of the impact is therefore expected to be low for the eastern and Central Clusters, but moderate to high for the Western Cluster due to its distance from large light sources (not considering the incredible light pollution caused by chokka boats which will often be a backdrop to the wind farm). The significance of the impact is **Medium** due to the long term of the development, but it should be kept in mind that expansion of the urban centres such as Jeffrey's Bay and Humansdorp is likely to have a far greater impact in terms of light pollution than the wind farm.

14.7 Impact of Shadow Flicker on Residents in Close Proximity to Wind Turbines

The impact of shadow flicker caused by wind turbines appears to be a minor issue in most countries where wind farms are common. There is no official set of regulations governing the levels of exposure to shadow flicker and it is unclear what the health risks are. Most reports on shadow flicker suggest that the threshold for a significant impact is 30 hours per year or more and many countries have adopted this as an informal guideline. It should also be noted that shadow flicker is not 'blade glint'. Blade glint was a potential concern in the early days of wind farms when turbines were painted with highly reflective paint so that occasionally a light flash was caused as the sun was reflected off a turning blade. Modern wind turbines are painted with a non-reflective paint which prevents blade glint.

14.7.1 Mitigation Measures

The layout of the proposed Kouga Wind Farm must take cognizance of residents potentially affected by shadow flicker. Turbines should be placed >500 m from inhabited dwellings. The group of cottages in the Western Cluster presently situated ±460 m from a turbine in the north is partially screened by a 250 m wide stand of trees from shadow flicker. With the small adjustment to the final turbine position, the significance of this impact is rated as very low with mitigation in place. Trees are an effective measure against shadow flicker and the stand of trees in the north should be conserved in order to reduce the flicker effect.

Table 35: Significance of the Impact of Shadow Flicker of Wind Turbines on Sensitive Viewers

	Without mitigation	With mitigation
Extent	Local	Local
Duration	Long term	Long term
Intensity/Magnitude	Low	Low
Probability	Low probability	Very low probability
Significance	Low	Very low
Status	Negative	Negative
Confidence	Medium	Medium

14.8 Summary of Impact Assessment on Visual Impacts

It is clear that the proposed Kouga Wind Farm will alter existing views of sensitive viewers in the region on the landscape. Wind farms are likely to have highly significant visual impacts where there are visual receptors and landscape impacts regardless of visual receptors (unless it is an industrial landscape).

The significance of the landscape impact according to the rating methodology is expected to be high due to the regional scale of the impact and its duration. The landscape is changing, however, as the surrounding urban centres continue to expand, and wind turbines are congruent with agricultural landscapes elsewhere in the world. It is therefore likely that the significance of the impact will decrease as time passes. It is not clear whether the wind farm will have a positive or negative impact as opinions on the aesthetic appeal of wind farms vary widely.

The visual impact on sensitive viewers and viewpoints due to the construction phase of the proposed project is expected to be **Medium** due to short duration of the highly visible component of the construction phase. Not all of the construction phase will necessarily have a negative visual impact since the construction of wind turbines is an incredible engineering feat and viewers are likely to find it fascinating to observe.

15 NOISE IMPACTS

Noise impacts for both the construction and operational phase were assessed. The noise specialist was consulted in the early phases of the EIA to assist in the iterative process of fine-tuning the proposed layout to get to the final Layout 3 which is being assessed in this report. Through this process all turbines that were found to be problematic with regard to noise were moved and thus the assessment on this layout 3 is a final fine tuning of the process.

15.1 Predicted Noise Levels for the Construction Phase

The construction noise at the various sites will have a local impact as almost all construction machinery and equipment (front end loaders, excavators, overhead and mobile cranes, etc) produce sound power above the standard 45 dB. The sound pressure at about 10m from the noise source can be at or higher than 89 dB(A), diminishing as the observer moves away from the source until at about 1 300m where the construction noise will be approximately equivalent to the ambient noise. In all likelihood, the construction noise will have little impact on the surrounding community as it will most likely occur during the day when the ambient noise is louder and there are unstable atmospheric conditions.

Potential noise-generating impacts identified during the construction phase include:

- Pile driving during construction if the underlying geological structure requires this
- Simultaneous use of construction equipment which will affect the area surrounding the construction site for a short periods of time in all directions
- Use of construction vehicles which will add to the existing ambient levels and will most likely cause a disturbing noise, albeit for a short period of time.

15.2 Predicted Noise Levels for the Operational Phase

The effects of low frequency noise could include sleep disturbance, nausea or vertigo. These effects are unlikely to impact upon residents due to the distance between the turbines and the nearest communities as the sound power levels from the turbines are low.

Noise modelling targeting the identified Noise Sensitive Areas was undertaken for two different types of turbines which would likely be used on the site, namely the:

- The Nordex N90 2.5 MW model
- The Vestas V90 3.0 MW model.

Results for 4 m/s and for 8 m/s wind speed for the Nordex N90 turbine model for each on of the three clusters are shown in Figure 34 - Figure 39. Modelling results for the Vestas V90 3.0 MW model were very similar and are therefore not shown. Predicted noise levels generated by both turbine models (Nordex and Vestas) during operation

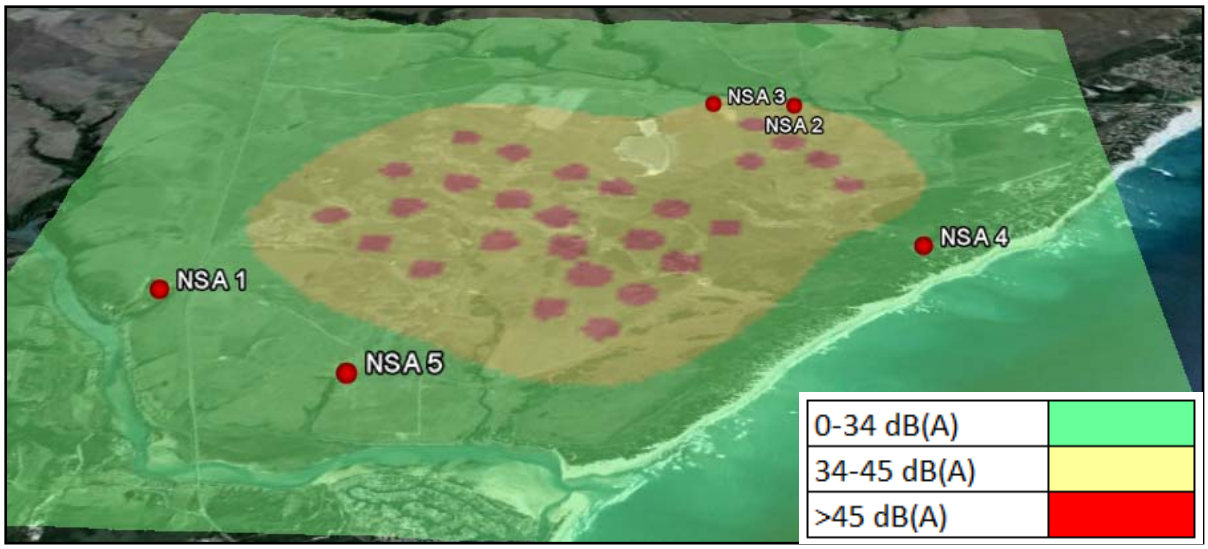
were generally below the recommended 45 dB(A) sound pressure. At six NSAs the modelling results exceeded the recommended limit. The affected areas were:

- Central Cluster - NSAs 7,8,9 and NSA Ext 1 when modelled using the Vestas V90 Turbine above 8m/s. All NSAs were below the 45dB(A) limit when modelled using the Nordex N90 WTG in low noise mode. This mode has a lower power output at 4-6m/s wind speed.
- Western Cluster – NSA West Ext 1 and 2 when modelled using the Vestas V90 and Nordex N90. The Nordex unit was marginally better when turbine's 79, 81, 83 and 84 were modelled using the low noise mode. The recommended limit was exceeded above 6 m/s for both turbine types.

It is important to note that the noise modelling that was undertaken for this study was very conservative as it did not take into consideration the effect that any ambient noise, and specifically, the prevailing wind, may have on masking the operational noise of the turbines. This means that at a setback distance of 500m, the operation of the turbines may very likely not be audible above the background noise of the prevailing winds especially as the wind speed increases (the ambient noise of the wind increases with wind speed).

If the atmospheric conditions are such that the wind is very light (<4 m/s) at ground level but exceeds the cut-in speed at hub height, it is feasible that little ambient noise masking will occur. As the wind speed increases, the ambient noise also increases and masks the wind turbine noise. The critical wind speeds are thus between 4-6 m/s when there is a possibility of little masking.

Figure 34: Eastern Cluster Noise Isopleths and NSAs (Nordex N90 - Wind speed 4m/s)



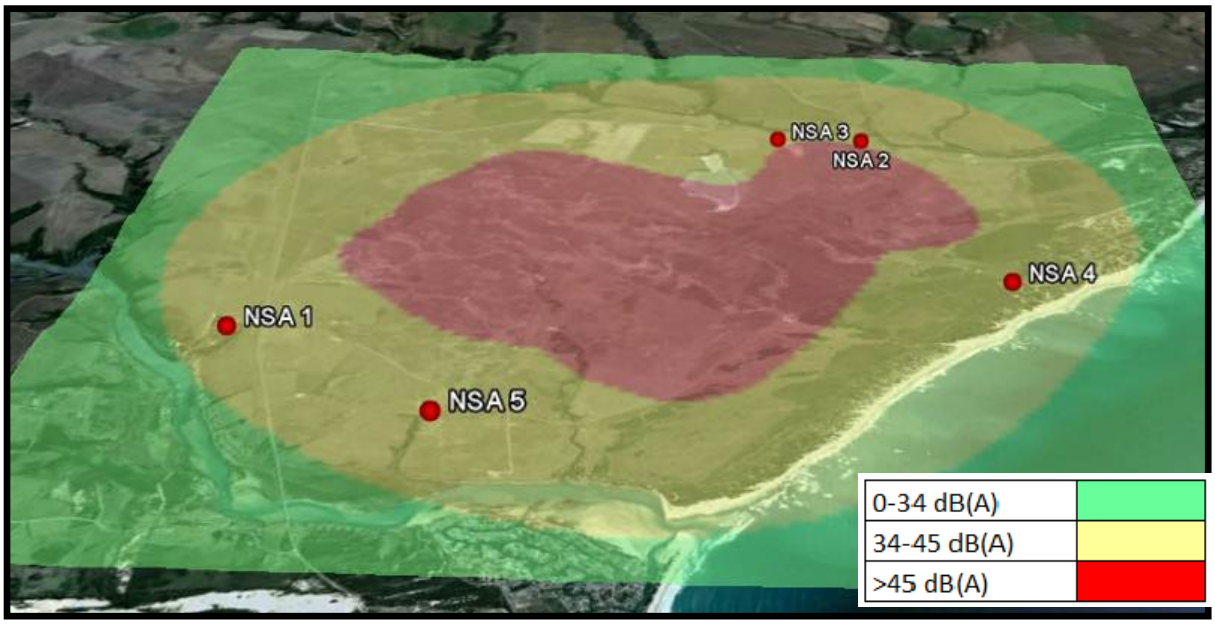


Figure 35: Eastern Cluster Noise Isopleths & NSA's (Nordex N90 - Wind speed 8m/s)

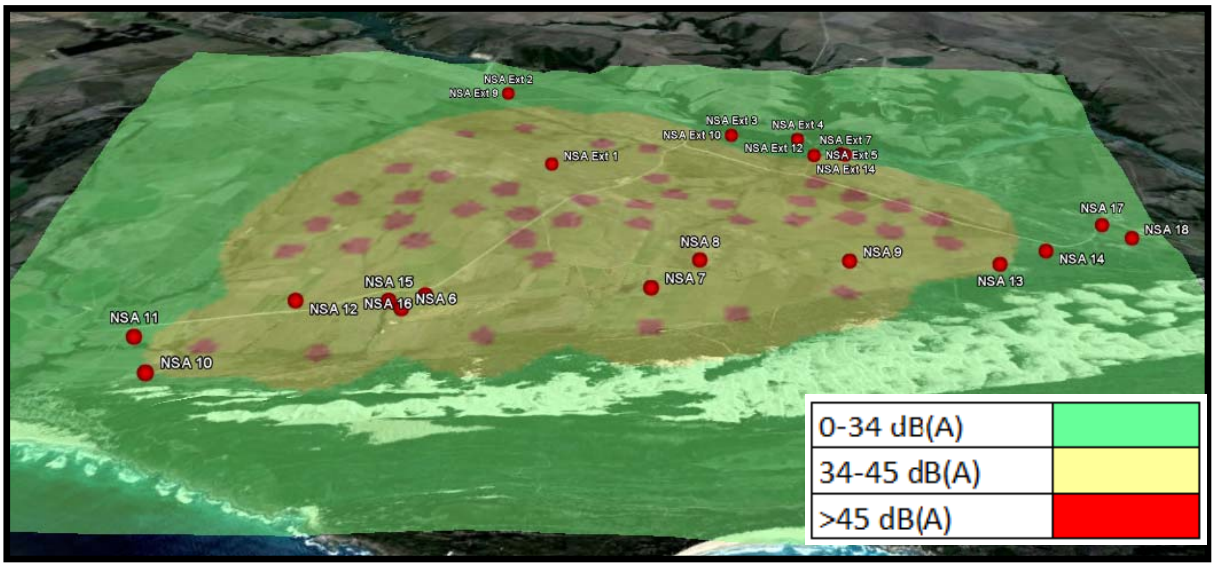


Figure 36: Central Cluster Noise Isopleths & NSAs (Nordex N90 - Wind speed 4m/s)

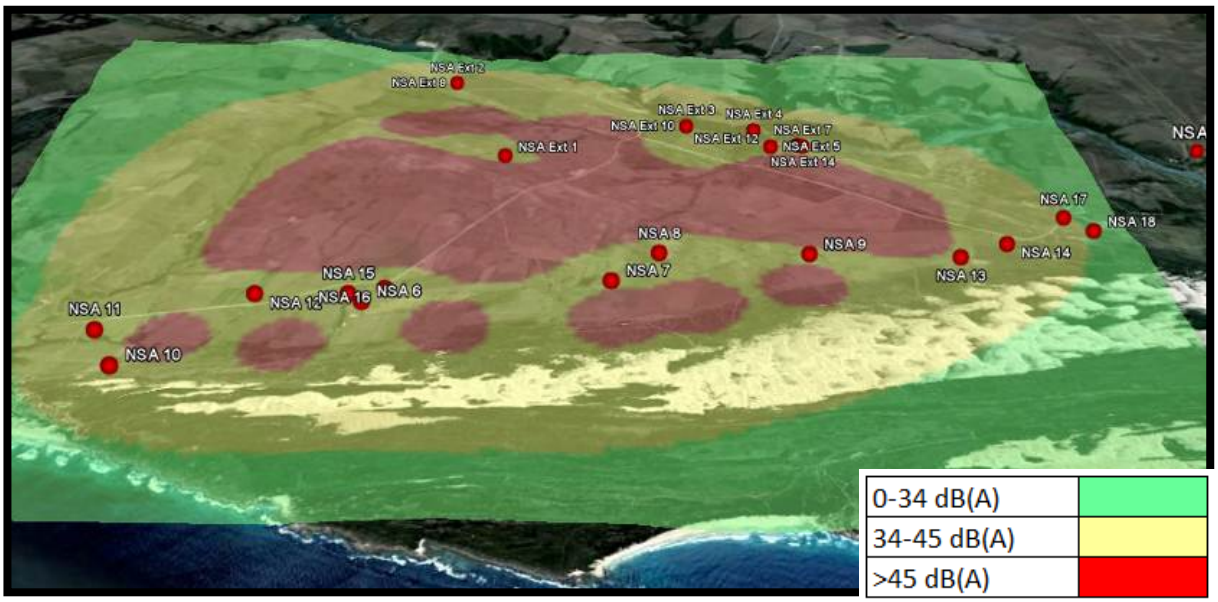


Figure 37: Central Cluster Noise Isopleths & NSAs (Nordex N90 - Wind speed 8m/s)

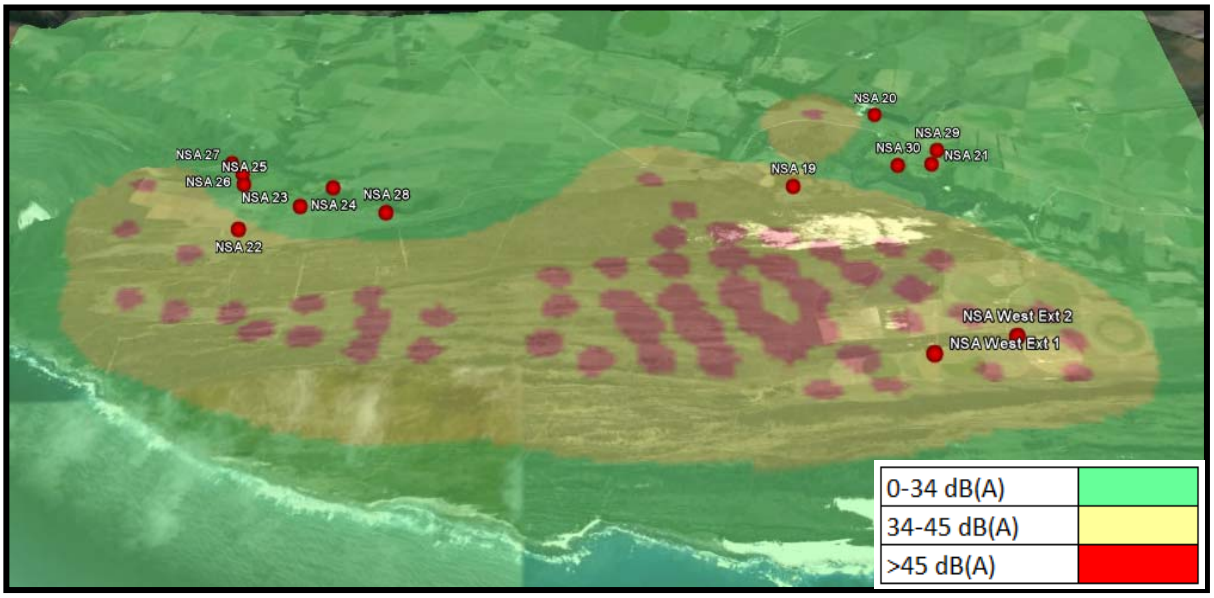


Figure 38: Western Cluster Noise Isopleths & NSAs (Nordex N90 - Wind speed 4m/s)

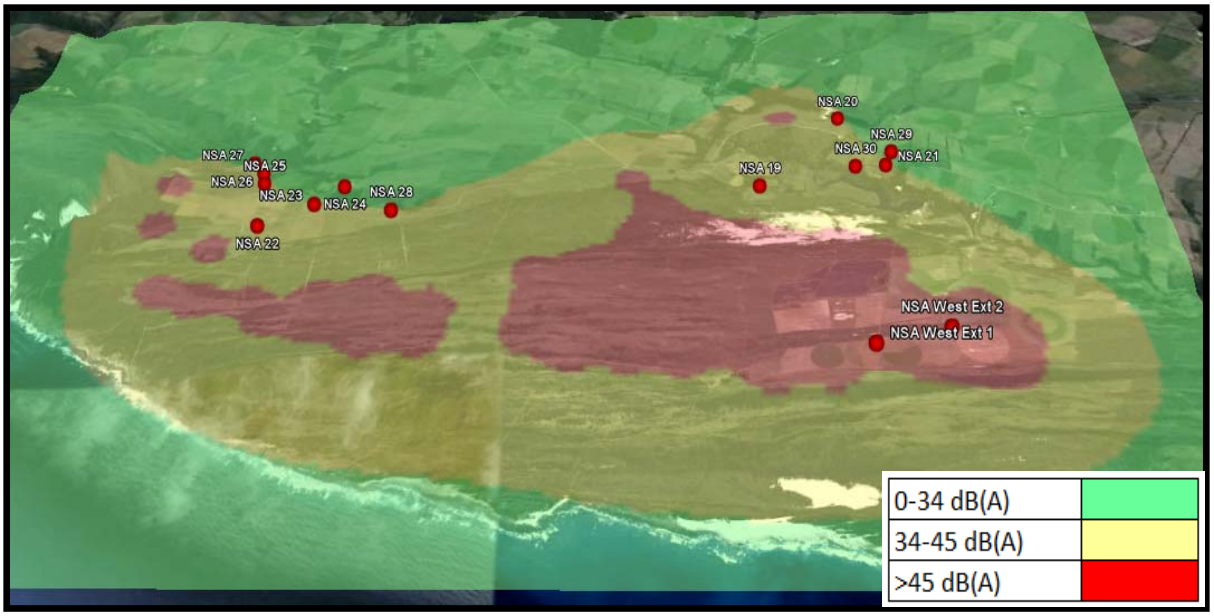


Figure 39: Western Cluster Noise Isopleths & NSAs (Nordex N90 - Wind speed 8m/s)

15.3 Assessment of Impacts

The potential impacts of the proposed Kouga Wind Farm for the construction and operational phases are presented below in Table 36.

Table 36: Noise Impact Assessments During Construction and Operation

Nature of impact	Extent	Duration	Intensity	Probability	Significance without mitigation	Significance with mitigation	Status	Confidence level
Impact of the construction noise on the NSAs	Local	Short term	Low	Probable	Low	Low	Low	High
Impact of the operational noise on the NSAs (except NSA 7, 8, 9, Ext 1, west Ext 1 and west Ext 2)	Local	Long term	Low	Probable	Low	Low	Low	High
Impact of the operational noise on NSA 7, 8, 9, Ext 1, west Ext 1 and west Ext 2	Local	Long term	Low	Probable	High	Low	Low	High

15.4 Recommended Mitigation Measures

15.4.1 Construction Activities

- All construction operations should only occur during daylight hours if possible
- No construction piling should occur at night
- Construction staff should be given “noise sensitivity” training in order to mitigate the noise impacts caused during construction
- All wind turbines should be located at a setback distance of 500m from any homestead and a day/night noise criteria level at the nearest residents of 45 dB(A) should be used to locate the turbines. The 500m setback distance can be relaxed if local factors; such as high ground between the noise source and the receiver, indicates that a noise disturbance will not occur.
- Positions of turbines jeopardizing compliance with accepted noise levels should be revised during the micro-siting of the units in question and predicted noise levels re-modelled by the noise specialist, in order to ensure that the predicted noise levels are less than 45 dB(A) at adjacent NSAs.

15.4.2 Operational Phase

- If the Nordex or similar turbines are used, they should be operated in a low noise mode in the 4-6m/s wind speed range only if onsite measurements (after construction) at the West cluster NSA West Ext 1 and 2 and the Central Cluster NSA 7,8,9 and Ext1 show the noise emissions exceed the recommended limits
- Ambient noise monitoring is recommended once the turbines are erected. This is to determine the exact power mode settings needed to comply with the guideline limit in the 45 dB(A) range.

15.5 Summary of Impact Assessment of Noise

The results of the study indicate the following:

- There will be a short term increase in noise in the vicinity of the site during the construction phase as the ambient level will be exceeded. The impact during the construction phase will be difficult to mitigate.
- During the operational stage the noise level at 4 to 6 Noise Sensitive Areas (depending on which make of turbine is used) was found to exceed the noise target when the wind is at 8 m/s. The modelling used to determine this did not take account of the ambient noise especially from wind. It is very likely that the ambient noise will cancel out any noise from the turbines at wind speeds greater than 6m/s.
- For lower wind speeds the power settings of the turbines will possibly need to be adjusted to reduce the noise generated and this can be determined once they are constructed and noise readings are taken at the relevant NSAs.
- Thus it is not recommended that any changes be made to Layout 3 which has been assessed in this report. However, the developer must determine for themselves if it is economically viable to operate certain turbines near the affected 6 NSAs at lower power settings.

16 SOCIO-ECONOMIC IMPACTS

A range of impacts have been assessed in order to determine the positive and negative affects within the affected area, and to analyse the balance between these impacts, together with providing mitigating actions where necessary. A summary of these assessments is provided in the following subsections.

16.1 Impacts Assessed

16.1.1 Institutional Factors and Policy Environment

The effects of excessive greenhouse gases and the negative effect these have on the environment has become an international phenomenon and call to action, with renewable energy seen as one of the key interventions which can assist in mitigating the harmful effects of global warming. The national energy policy environment favours wind energy, which is seen as an initiative that can provide greater energy security in a cost competitive manner in the long term.

Municipalities have a developmental mandate and the Kouga Municipality's Integrated Development Plan (IDP) and Spatial Development Framework (SDF) have been consulted in order to ensure that this wind farm project is in accordance with these policies. The IDP specifically provides for 'sustainable resource management and use' and advocates the pursuance of renewable energy alternatives and the promotion of energy efficiency. The SDF envisages that a significant capital outlay is required in order to upgrade both the urban and rural electricity networks.

16.1.2 Financial Viability and Risks

The Kouga Wind Farm developers and their financiers have evaluated the financial risks of the projects and are satisfied that the correct risk mitigation measures have been put in place. The major financial consideration is the financial covenant provided by the South African national government through its REFiT policy, which provides a guarantee for the purchase of the electricity generated for a period of twenty-five years.

The balance between financial benefits and costs for the community, developers and country have been evaluated, and although it is recognised that the achieving of profits for some can come at an unacceptable cost to wider society, the overall balance is in favour of the wind farm project.

16.1.3 Land Owners within the Site Boundaries

An extensive consultation process has been undertaken with the farmers upon whose land the three proposed clusters are to be established and all of these farmers have entered into written long-term lease agreements with the project developers for the erection of wind turbines and the related access roads, infrastructure and grid connections. These landowners stand to benefit from the financial proceeds of these lease agreements as well as with having the access and infrastructure upon their farms upgraded.

16.1.4 Impacts on Surrounding Landowners and Commercial Enterprises

The international experience is that most wind farms have negative responses from adjacent landowners in the initial stages of implementation, with the perceived negative impacts being primarily associated with noise and visual impacts. Other agricultural users surround the three wind farm clusters in the main, with the St Francis Bay site being in view of the town of St Francis Bay.

The wind farm clusters are sufficiently far away from residential areas that the audible noise levels can be reduced to meet the South African National Standard (SANS). Regarding the visual intrusion of wind farms, the international experience has been that residential land values are not adversely affected by wind farms, and that in some instances values have increased at a higher rate than similar properties not in sight of wind farms (Barclay 2010). It is not unreasonable to expect that South African commercial enterprises will react to, and will be affected by, nearby wind energy installations in the same way as their counterparts in Europe and in North America.

16.1.5 Impacts on Tourism Potential and Development

Tourism impacts are often driven by changes in the sense of place in an area, with the proposed development thus having the potential to impact on tourism as its nature dictates that it is likely to change the character of the area. Wind turbines and power line pylons are deemed to be unattractive within coastal landscapes.

Potential positive impacts could also arise should the development provide an added attraction in the area that could draw tourists. Considered as a whole, the key potential drivers of negative tourism impacts (primarily visual impacts) do not seem to be significant enough to provide any clear basis to conclude that the project would entail more than a low level of risk for tourism. It is quite possible that this risk would be off-set by the positive attraction provided by the project. It is therefore predicted that the net tourism impacts associated with the project would be neutral to low positive with mitigation.

16.1.6 Economic Impacts from Construction and Operation

A project of this nature generates new economic activity within the region together with a broad range of employment opportunities and economic impacts due to knock-on effects. The civil engineering and construction components of the project will take place over a period of three to four years and will result in an additional 360 jobs being created per year. Of these, 326 will be for semi-skilled workers which will be from the surrounding communities, and could possibly be people that are currently unemployed. Approximately 68% of all the jobs will be within the Kouga area with a further 30% within the Eastern Cape. These employees will earn a total of R31 million per year, with R19 million being within the Kouga area and R13 million within the Eastern Cape.

The South African component of the work is expected to be R335 million per 100 mega-watt installed, with three wind farm clusters planned in consecutive years. This represents 30% of the expenditure with the remaining R1.1 billion per wind farm, cluster being for the imported wind turbines. The economic impact upon Gross Domestic Product (GDP) is expected to be R1.978 billion per wind farm cluster once the economic multiplier effect has taken place in the economy.

It is anticipated that the annual operating costs per wind farm cluster will be R46 million of which 85% will be spent in the Eastern Cape and 70% within the Kouga

precinct. The economic multiplier for the electricity, gas and water sector of the economy realises an economic impact of R142 million per year per wind farm cluster, with 70% of this expenditure remaining within the Kouga precinct.

The development of a renewable energy cluster brings with it the requirement for a wide spectrum of skills needs. Across the phases (manufacture to generation and operation and maintenance), there is the need for such expertise as mechanical, electrical, chemical, materials, structural and civil engineers in addition to other non-engineering professions. Apart from highly trained professions, there is the need for specialist skills, such as heavy transport, crane operation and turbine installation abilities.

The developer is committed to supporting social and economic development in all of its projects. Although this project will have a significant positive impact both nationally and regionally, preventing economic leakage from the Kouga area is a priority for Red Cap.

Red Cap will, as part of its procurement policy, require that its suppliers maximize their local content. Red Cap will also work closely with the Kouga Municipality and the Kouga Black Chamber of Commerce to identify suitable local companies to work with suppliers. Another important criteria to be used by Red Cap when assessing supplier bids, will be the level of local skills development and training to be implemented during both the construction and operations phases.

As part of Red Cap's commitment to support social and economic development, and to empower the communities of historically disadvantaged South Africans (HDSAs) residing within the geographic location of the Kouga Local Municipality, a Broad-Based Black Economic Empowerment ("BBBEE") Trust will be established. The Trust shall have as its sole object to hold and manage shares in the Kouga Wind Farm and to use the economic benefits of the shares, directly or indirectly, to carry on, support or facilitate any one or more of the trust benefit activities for the benefit of the Beneficiaries. The Beneficiaries of the Trust will be the communities of historically disadvantaged South Africans (HDSAs) residing within the geographic location of the Kouga Local Municipality.

Red Cap will also be implementing a Corporate Social Investment (CSI) initiative which will benefit the local community generally.

16.2 Impact Assessment

This economic impact assessment has evaluated a broad range of issues that are deemed to be of importance to the various I&APs within the sphere of influence of the proposed Kouga Wind Farm. Ultimately, the installation of wind turbines and associated infrastructure has the potential to impact both positively and negatively on the land owners, whose land parcels would be included in the project, and the surrounding communities and towns. Positive impacts would flow primarily from sharing in the profits of the projects while negative impacts could be associated with the loss of land, disruption of activities and the introduction of nuisance factors (primarily noise, maintenance intrusion and visual impacts).

The impacts identified in the socio-economic study have been rated for the construction and operational phase of the project, based on the information available to the specialist at the time of compilation of the report (Table 37 and - ***Table 38***).

Table 37: Impact Assessment Matrix for the Construction Phase

Nature of Impact	Extent	Duration	Intensity	Probability	Significance - without mitigation	Significance -assuming mitigation	Status	Confidence level
Disturbance of land-owners and users on the site	On site	Short term	Low	Highly Probable	Medium	Low	Negative	Medium
Disturbance of surrounding land users	Local	Short term	Low	Highly Probable	Low	Low	Negative	Medium
Disturbance of surrounding town residents	Local	Short term	Low	Highly Probable	Medium	Low	Negative	High
Associated project expenditure & investment benefiting the economy	Local, regional and national	Short term	Medium	Highly Probable	Medium	High	Positive	High
Suppression of tourism	Local and regional	Short term	Low	Probable	Medium	Low	Negative	Medium
Increase in Employment	Local, regional and national	Short term	High	Highly Probable	Medium	High	Positive	High
Crime associated with influx of work force	Local and regional	Short term	Medium	Probable	Medium	Low	Negative	High

The potential for petty crime associated with the influx of workers during the construction phase of the proposed wind farm was a potential impact that was not explicitly rated, but was eluded to in the main report. This impact was, however, rated and included in this impact table.

Most of the farmers anticipate that during the construction phase of the project, with the influx of semi skilled workers there will probably be an increase in petty theft with the possibility of stock theft, but will guard against this and improve security appropriately during the construction phase.

Table 38: Impact Assessment Matrix for the Operational Phase

Nature of impact	Extent	Duration	Intensity	Probability	Significance - without Mitigation	Significance -assuming Mitigation	Status	Confidence level
Disturbance of land-owners and users on the site	On site	Long term	Low	Improbable	Medium,	Low	Negative	High
Disturbance of surrounding land users	Local	Long term	Low	Improable	Medium	Low	Negative to neutral	High
Disturbance of surrounding town residents	Local	Long term	Low	Improable	Low	Low	Negative	High
Financial benefits of the wind farm operation	Local, regional and national	Long term	High	Highly Probable	Medium	High	Positive	High
Suppression of tourism	Local and regional	Long term	Low	Impro bable	Low	Medium	Negative to neutral	Medium
Increase in Employment	Local and regional	Long term	Medium	Highly Probable	Medium	High	Positive	High
Decline in property value	Local and regional	Long term	Medium	Probable	Medium	Low	Negative	High

The potential decline in the property values of the surrounding settlements during the operational phase of the project that was eluded to in the socio-economic report but not explicitly rated has been rated by the EAP and included above.

The international experience is that most wind farms have negative responses from adjacent landowners in the initial stages of implementation. In most instances, once the wind farms have become operational they are recognised for their contribution to security of energy supply and are accepted as a part of the landscape. In a recent study in the United Kingdom, the price of houses near wind farms was analysed and it found that wind farm developers would typically locate their development in a way that it did not affect property prices, and that “the threat” of a wind farm often had a more significant negative effect than the actual presence of one. The report finds that ‘far from having a negative impact on value, property prices within a five mile radius of a wind farm appeared to rise above the regional average, suggesting that wind turbines actually had a positive effect on value.’ (Barclay 2010). As a result of the prediction of minimal or insignificant negative impacts, it is deemed highly unlikely that there would be any negative impacts on the values of properties surrounding the three clusters. The low significance with mitigation rating was thus based on this conclusion.

16.3 Mitigation Measures

The proposed mitigation measures relevant to all the above impacts are as follows:

- Mitigation measures proposed for noise, visual, ecological, bird and bat impacts be implemented
- Secure the construction sites and apply professional construction practices.
- Maintenance to wind turbines to be performed during normal working hours and with due respect of agricultural activities taking place on the land.
- Construction vehicles carrying materials to the site should avoid using roads through densely populated built-up areas along the coast so as not to disturb existing retail and commercial operations.
- Establish a community based trust and implement a Corporate Social Investment policy.
- Implement the recommendations of the Environmental Management Programme (EMP).

16.4 Summary of Impact Assessment of the Socio-Economic Impacts

This economic analysis of the various phases of the wind farm project and its likely effects on the environment has revealed that with appropriate mitigation measures applied, the greatest benefit is swayed in favour of society in general.

Benefits would be particularly prominent for the project proponents, land owners on the site, historically disadvantaged South Africans (HDSA's) residing within the geographic location of the Kouga Local Municipality through the proposed BBBEE trust, the general community through CSI initiatives and in the achievement of national and regional energy policy goals. The project would result in significant positive economic spin-offs, primarily because of the large expenditure injection associated with it both directly and through the trust and CSI initiatives.

Tourism risks in particular are considered acceptable and the project stands a good chance of resulting in positive impacts on tourism given its novelty appeal and potential to evoke positive associations with clean energy.

The general consensus is that the greater benefit to the local community and the South African economy and the provision of clean and secure electricity over the long-term outweighs the primarily short-term inconvenience during construction and the minimal impact during operations.

17 IMPACTS ON AERODROMES

The only aerodrome in the area that is close enough to the proposed wind farm to be impacted is the Paradise Beach Aerodrome. This aerodrome is situated about 1 km to the east of the Eastern Cluster.

Paradise Beach Aerodrome has a “non-instrument Code number 2 Runway”. The Civil Aviation Authority (CAA) requires that any structure taller than 45 m is situated at a minimum of 2 500 m from the edge of such a runway. Red Cap has held discussions with CAA and to ensure there are no issues, has agreed to extend this exclusion zone to approximately 3 km from the end of the Runway. The exact distance of this exclusion zone, which will be somewhere between 2.5 km and 3 km, will only be finalised once the Kouga Wind Farm is authorised and the final layout can be confirmed.

This exclusion zone will result in the possible removal of turbines 6, 17, 18, 19, 21, 22 in the Eastern Cluster from the proposed layout

17.1 Mitigation Measures

Red Cap has agreed to remove any turbines within the exclusion zone required by the CAA once the design has been finalised after issuing of an authorisation.

17.2 Summary of Aerodrome Impact Assessment

With the implementation of the CAA required setback from the Paradise Beach Aerodrome there will be no impact on aerodromes in the area.

18 SCREENED IMPACTS

The proposed project will also produce a range of other impacts common to all projects that involve construction and which require ongoing maintenance. These impacts are well understood and can be relatively easily managed and mitigated through the implementation of strict standardised procedures and practices contained in the Construction and Operational Environmental Management Programmes, thereby significantly reducing their potential environmental impact. Education of the labour force is also an important component of the Programmes as through understanding and awareness, the construction workers not only reduce their destructive habits but practice basic environmental protection. The monitoring and auditing of the construction and operational phases of the project against the EMP further ensures that where impacts or non-compliances are identified, they are documented and corrective measures implemented immediately for stop or prevent further impacts from occurring.

The screened impacts described below were not investigated and assessed in the Impact Assessment Phase as their nature and impact pathways are well understood. Mitigation measures for these impacts are detailed in the EMP.

18.1 General Pollution

The construction and operation of the Kouga Wind Farm may cause general pollution of this sensitive environment. General pollution in this case refers mainly to litter that has been unlawfully disposed of outdoors. It can be packaging or other unwanted items and can be a form of visual pollution and adversely affect wildlife and environmental quality.

Litter impacts on animals through entanglement and ingestion, and is responsible for the deaths of thousands of animals every year. Material that is dumped into receiving waters can also smother and destroy habitats for aquatic animals and can reduced oxygen levels from decomposition or dilution of unnatural and organic material dumped into the environment.

The aesthetic appeal of areas can also be reduced when litter is strewn on the ground and in rivers, thus impacting on recreation and tourist appeal. Litter can become a breeding ground for disease-causing insects and rodents.

18.2 Soil and Water Contamination

The construction and operation of the Kouga Wind Farm can contaminate soil and water resources. Soil contamination may occur during the Construction Phase of the roads as a result of improper management and use, disposal or spillage of hazardous substances such as fuel, oil and cement and the like. If not cleaned up these substances can leach into the soil resulting in soil contamination and further entering the groundwater system from which contaminants are easily dispersed and can negatively impact on the downstream environment. Furthermore, solid waste material

generated during construction may cause soil contamination if not correctly disposed of or while stored for disposal. During the Operational Phase of the project, spills from vehicles using the service roads may wash into the stormwater system and enter the soil from seeping in the ground at discharge points.

Soil contamination occurring during the Construction Phase would likely only impact the individual turbine sites and immediate area in the short term.

18.3 Air Quality

The impacts to air quality related to the construction and operation of the proposed Kouga Wind Farm relate primarily to dust generated during clearing of vegetation, earthmoving activities and vehicles on site travelling on the gravel roads, and emissions from the exhaust of construction plant machinery and lard vehicles delivering turbine components. The levels of dust are generated are dependent on the time of year, the intensity of the activity and the prevailing winds at the time of construction. Soil stockpiles on site are also dust generators as the loose material is easily erodible in high wind area such as the proposed project area. The impact of dust also depends on the wind direction and the relative locations of dust sources and receptors.

18.4 Traffic Impact

The construction of the Kouga Wind Farm will require the transportation of large turbine components by trucks to the site which will be considered abnormal loads in terms of the Road Traffic Act (Act No 29 of 1989). The size of these vehicles and the slow speeds at which they move may impact on traffic in the areas and towns through which they will need to travel to reach the sites. Other heavy vehicles transporting transformers, cables, construction materials for the operation and maintenance buildings, and substation will also use these same roads.

A Transport Study (Summary attached as Appendix E) was undertaken to ensure all transportation of large loads will be in line with all relevant legislation and that the impact on road uses and communities is reduced as far as possible.

The increase in traffic could create noise, dust and safety impacts for other road users and people living or working within close proximity to the selected transport route.

18.5 Waste Generation

The construction phase of the proposed Wind Farm will generate a variety of waste products which include:

- Solid waste and soil overburden from Initial site and vegetation clearing
- Excess Construction rubble from construction processes such as roads, buildings, foundations and the like
- Excess Construction materials
- General domestic waste from site personnel such as bottles, food, cans and general rubbish
- Turbine transportation package such as crates, plastic etc.

Waste water will be produced from toilet facilities (temporary chemical toilets) and the use of other liquids ('generating grey water') in construction activities e.g. washing facilities, ablutions etc.

As per standard construction practice, solid and liquid waste will be stored on site temporarily before it is removed by an appropriate contractor. During this storage period, there is potential for solid and liquid waste to leach into the soil and/ or groundwater, causing harm to the natural environment and potentially contaminating the soil and/or groundwater. All construction sites utilise oil, fuels and solvents to some degree for various construction practices. Although not stored or used in significant quantities, these materials are considered hazardous and as such, need to be stored, managed and handled as such.

In terms of the Operation Phase of the Wind Farm development, general waste, such as office waste, and effluent from onsite toilet facilities will be produced in minimal quantities and will be limited to the activities of any operational and maintenance staff on-site.

A variety of effective mitigation measures are available and implementable to limit and prevent the potential impact resulting from waste and effluent generation on-site and can significantly reduce the potential impact rating of the impact. These measures are incorporated in the EMP.

19 CUMULATIVE IMPACTS

Cumulative effects are commonly understood as the impacts which combine from different projects and which result in significant change, which is larger than the sum of all the impacts and requires a holistic view, interpretation and analysis of the biophysical, social and economic systems. The preceding impact assessment chapters have assessed the impacts associated with the Kouga Wind Farm project with little consideration of the cumulative impacts. Recognising the legislated requirement, it is important to assess cumulative impacts associated with the proposed development.

In the last year there has been a substantial increase in proposed renewable energy developments in South Africa due to the regulatory framework evolving to facilitate the introduction of renewable energy from Independent Power Producers (IPPs). Specifically in the Kouga region there are a number of proposed wind farms that have undergone or are undergoing EIA processes and these include:

- Mainstream/Genesis Phase 1 Project (16 MW), which was approved by the Eastern Cape Government in March 2009
- Mainstream/Genesis Phase 2 Mainstream EIA
- Dieprivier Mond DEA ref: 12/12/20/1863
- Happy Valley DEA ref: 12/12/20/1861
- Jeffrey's Bay DEA ref: 12/12/20/1718
- Broadlands DEA ref: 12/12/20/1752
- Zuurbron DEA ref: 12/12/20/1753
- Redcap Investments DEA ref: 12/12/20/1756

However, there is uncertainty related to the cumulative impacts on environmental factors such as other proposed developments, visual amenity, landscape character, destruction of sensitive habitats, and birds and bats in the local area. It is these negative local cumulative impacts which, when assessed together, could have regional significance and which need to be weighed up against the positive local, regional and national impacts.

19.1 Wind Farm Developments

The benefits of renewable energy and particularly wind energy are well documented internationally. One of the main benefits is the reduction of greenhouse gas and particulate emissions, and also the reduction in scarce water use for electricity generation.

There are also significant economic benefits from renewable energy developments at a local, regional and national level. These are detailed in Appendix C but summarised in the list below:

- Renewable Energy creates jobs and boosts industrial development, particularly in rural areas. Adopting a 25% Renewable Energy (RE) target (i.e. 100 TWh) for South Africa is expected to create up to 40,000 jobs directly relating to the renewable energy industry, 12,000 of which will be in rural

areas. Conventional economic analysis would also suggest that each of these jobs will generate one other.

- Diversification of a country's portfolio of generation plants is proven to lower overall generation cost, lower portfolio risk and lower marginal costs of electricity by displacing the most expensive electricity units on the system. Renewable energy has a marginal fuel price of zero since the fuel is free and there is no additional cost to supplying an additional unit of electricity.
- Wind Farms, as opposed to thermal plants, save water that would have been used for coal-fired power generation. It is estimated that the 30,000 MWs of wind power, a figure central to the 25% RE target by 2025, would save in excess of 80 Billion litres of water each year.
- Renewable Energy generates significant and predictable tax income for the National Treasury.
- Renewable Energy decreases greenhouse gas emissions resulting in avoided costs to the economy in terms of global carbon emission obligations and the domestic social and economic impacts of such.

These benefits are being realised around the world were governments are supporting the development of the renewable energy market. In 2008 and 2009, more wind energy capacity was installed in Europe than any other form of conventional or renewable form of power showing their belief in the benefits of wind energy.

The areas that are suitable for wind generation are often areas like the Kouga Municipality which does not have a significant economic base, and thus such developments can have far reaching positive cumulative impacts on the upliftment of local communities.

19.1.1 Concentration of Wind Farms along the Coast of South Africa

Each unique electricity generating technology has a preferred location with specific attributes favourable to its construction and operation. For example, coal powered power stations are located close to the source of coal and water for cooling resulting in the majority of these in South Africa being located in and around Mpumalanga Province. Nuclear energy is also reliant on large amounts of water for cooling resulting in the feasible sites being located along the coast.

This can lead to the concentrations of similar energy generation technologies/plants in areas suitable to them with the causality of cumulative impacts either in specific local or on similar habitats.

It is only logical that wind farms need to be located in areas with high average wind speeds. What this results in is that the predominant feasible locations in South Africa for wind farms, due to this major constraint, is in a thin band along the coast as well as some inland regions. This could result in more pronounced cumulative impacts in coastal areas of South Africa. When assessing these impacts one has to be acutely aware of the fact that it is specifically these coastal regions that exhibit the most appropriate climatic conditions for the successful and sustainable operation of wind farms. If Government is to implement the goals of increasing the percentage of renewable energy in its energy mix and, as is described in its latest Integrated Resource Plan (IRP), from a coal dominated energy mix to a low carbon future to reduce carbon dioxide (CO^2) emissions, then the wind in these coastal areas needs to be harvested by wind farms. The possible negative cumulative effects of the wind farms in theses areas needs to be weighed up against the cumulative positive impacts of wind energy for the local communities, the region and the country. In this regard, a study by the South African Wind Energy Association (SAWEA) has shown

that wind energy in South Africa by 2025 could replace the equivalent of about 6000MW of conventional base load generation (i.e more than either Medupi or Kusile, the new coal power stations being built at present in South Africa) (see Appendix C).

19.1.2 REFiT Constraints

Although there are currently a significant number of wind farms planned across the country, the reality is that there are very few that will ultimately be constructed over the next few years. The two main reasons for this are the limited amount of projects that will receive Power Purchase Agreements (PPA) under the Renewable Energy Feed-in Tariff (REFiT) programme and issues around suitable grid connections.

The Department of Energy (DOE) has chosen the route of a Renewable Energy Feed-in Tariff REFIT as its preferred route to support the development of renewable energy. Any procurement of renewable energy under the REFIT needs to take place within the framework of the prevailing Integrated Resource Plan (IRP). The IRP governs the energy mix of the country and is the master plan for energy in the country. The current IRP, as gazetted at the end of 2009, allows for the procurement of 400 MW of wind power from 2011 up until the end of 2013. It is widely expected that the allocation of the 400 MW will be allocated to numerous projects, spread across the length and breadth of South Africa. The primary reason for spreading the wind farms across the country is to maximize the average availability of power generation from the wind farms. Assuming an average wind turbine capacity of 2.5 MW, this would result in approximately 160 turbines being erected across the country.

The DOE is currently in the process of revising the current IRP, the revised plan being commonly referred to as the IRP2010. The draft IRP2010 indicates that the allocation of megawatts for wind specific projects up until the end of 2013 could be increased from the 400 MW in the existing IRP up to 700 MW. This is however still in draft form and should the allocation be increased to 700 MW, this will still only enable the construction of a minimal number of wind farms in the country.

The second significant limiting factor to the development of numerous wind farms across the country in the short to medium term is the availability of suitable grid connections. Although South Arica has a well established national grid, there are severe limitations to what capacity the grid can handle for new generation grid connections. The majority of wind farms planned will require the fortification of the grid, something that Eskom has stated will only be considered after 2014.

Eskom has further confirmed that the main substation in the Kouga region, the Melkhout Substation, has the ability to evacuate approximately 220 MW of wind power without significant fortification of the grid (only about 88 turbines in total). This is even less than the 300MW (120 turbines) that an independent specialists had informed the developer was the case and which the developer has referenced before. This implies that in the Kouga region, the number of wind farms will be severely restricted in the short to medium term.

19.1.3 Phasing of Development

Red Cap has also agreed to phase their development and only start with no more than 50 turbines and to undertake ongoing monitoring programmes to understand the potential cumulative impacts better. This will also go a long way to ensure that any potential significant cumulative impacts are identified while there are only a limited number of turbines in the area. Relevant mitigation measures developed through the knowledge learnt from the small first phase can thus be undertaken for future wind

farm developments in the area to ensure that the impact does not reach unacceptable magnitudes.

19.1.4 Cumulative Impacts being addressed at National Government Level

The DEA is responsible nationally for reviewing and making the decision regarding all EIA applications for power generation. As such the DEA is the best placed to consider and aggregate the cumulative impact based on up to dated decision making. Over and above the centralised nature of the decision making, the DEA is currently engaged in developing a Strategic Environmental Framework (SEF) for the selection of sites for wind farms. DEA has appointed consultants to undertake the first phase of the development of a Strategic Environmental Framework (SEF) for the selection of sites for wind farms. The first phase of which is scheduled for completion by 15 January 2011. The main purpose of the first phase is to collate existing information into a framework that can be used by authorities in the evaluation of current applications that are meant to meet the renewable energy target by the end of 2013.

The second, much more comprehensive phase will incorporate more detailed work and research over a much longer period. The second phase will ultimately regulate projects planned under the IRP2010.

All these factors highlight that with the current restricted level of feasible wind farm development in the country the cumulative effects are not currently seen as a major concern in South Africa. In the medium to long term as more wind farms aim to come on line this may become more of a concern. However, by then more information will be available from monitoring the impacts of actual wind farms, informing future decision making. This is even more so in the Kouga region which can only accept a limited quotient of wind energy into the grid.

Should government formally elect to support the procurement of significantly greater volumes of wind energy, DEA will have the requisite guidelines in place and knowledge from monitoring programs linked to the few approved wind farms to ensure that potential future cumulative effects are minimised.

Although it is the DEA that ultimately decides on whether or not wind farm will be given an environmental approval, the majority of wind farms in South Africa, and in particular those planned in the Kouga region, are situated on agricultural land. The Department of Agriculture, Forestry and Fisheries (DAFF) has the mandate to protect and manage the natural agricultural resource base of the country through current legislation, acts and policies. This especially has reference in ensuring that high potential and unique agricultural land is preserved for current and future production thereby ensuring sustainable utilization of the country's natural resource base and adhering to food security.

The department currently has two major Acts are of relevance to the development of wind farms namely the Conservation of Agricultural Resources (CARA) Act, (Act No. 43 of 1983) and the Sub-division of Agricultural Land (SALA) Act (Act No. 70 of 1970).

CARA is regarded as one of the principal Acts governing the protection of agricultural natural resources. The main aim of the Act is to control the utilization of natural agricultural resources to ensure the conservation of soil, water and vegetation, as well as the combating of alien and invasive plants. According to Section 1 of the Act, conservation of natural agricultural resources includes the protection, recovery as well as the reclamation thereof. It provides control measures for the cultivation of virgin

soil (soil that has not previously been cultivated or not cultivated for at least ten years), the utilization and cultivation of land, including irrigated land, and the protection of water sources such as vleis (marshes, small lakes) and wetlands. It also includes control measures on the use of water to prevent water logging and regulate water flow patterns, the protection of vegetation, grazing potential of the veld, prevention of erosion and land degradation, construction and management of soil conservation structures, as well as the combating of weeds and invasive plants. SALA's main objective is to manage the sub-division of agricultural land to prevent injudicious fragmentation of agricultural land and the creation of uneconomical units and thus manage the use of agricultural land.

The afore mentioned legislation required that the minister of DAFF approve each and every long term lease required for wind farms planned on agricultural land. Although these acts empower the department to control the access of land for the development of wind farms, the department has initiated a process to develop guidelines specific for the evaluation and review of applications pertaining to wind farming on agricultural land. The development of these guidelines is seen as important in ensuring that the process of approving the long term access to agricultural land for wind farms be managed in such a manner that it will not negatively impact on agricultural land and its associated production practices, nor result in the loss of high potential and unique agricultural land. It is expected that these guidelines will be completed by the end of the first quarter of 2011. In the absence of the wind farm specific guidelines DAFF is currently not approving any applications for long term leases. One of the key criteria of the guideline will be to assess the cumulative impact of each wind farm on agriculture. This will have a direct correlation with the broader themes associated with cumulative impacts of wind farms and will act as a significant limiting factor to the proliferation of wind farms in South Africa.

19.2 Sensitive Habitats

The cumulative loss of or damage to sensitive habitats may be significant, especially if multiple, large developments are sited in such locations. The EIA has recognised the significance of the sensitive environment within which the proposed project is planned and has, through a re-iterative process designed a layout that attempts to ensure that sensitive environments are either not impacted upon or where no other option exists, that the impact is minimized and mitigated. At a cumulative level, it is anticipated that all other developments will also be required through instruction and guidance by authorities to ensure the impacts on the most sensitive areas are minimized or removed from the development plans. Again, considering the maximum number of turbines expected to be approved for the Kouga area in the short to medium term due to the grid constraint is only approximately 88, the cumulative potential impact on sensitive habitats of the total number of turbines, regardless of the number applied for in the various EIAs, is expected to be Low.

19.3 Fauna (Excluding Avifauna and Bats) and Flora

The proposed Kouga Wind Farm is dominated by a Grassy Fynbos community although much of the land is used for agriculture. Red Cap has gone through an extensive re-iterative process to site as many of the turbines in areas that are already

disturbed. There are, however, a few sites in sensitive areas and realistically, even with every effort and appropriate mitigation measure implemented, some portion of the flora and fauna will be impacted and/or lost.

Due consideration must however be given to the fact that although the total development area is 9382ha covering 3 areas, the actual total permanently altered area is only about 56ha – 1% of the total area. Of this, Phase 1 will only permanently alter about 24ha (<1%). As such, the anticipated total area of sensitive vegetation impacted by the proposed Kouga Wind Farm development is significantly small given the 9382ha the disturbance is spread over.

Further to this, in the broader context of the Kouga Municipal area, although there are numerous EIAs requesting approval to construct approximately 1400 turbines, it is expected that in the short to medium term, as detailed above, the grid constraints will only allow a maximum of about 88 turbines for the entire Kouga area. The cumulative environmental impact on flora and fauna (excluding bats and birds) for the entire Kouga area is limited in the short to medium term by this grid constraint of about 88 turbines and is considered to be of low significance.

19.4 Birds and Bats

The main threat posed by the wind turbines to avifauna and bats is the collision of birds and bats with the spinning turbine blades and has been judged to be of high significance before mitigation but dropping to medium to low respectively after mitigation. An increase in this impact due to multiple wind farms in close proximity to each other and the potential cumulative impact is obvious.

As with the site specific impacts, cumulative impacts on bird and bat populations could include alteration of flight paths, mortality caused by collision with the wind turbine blades and/or collision with the power line network associated with the wind farm; habitat destruction due to physical footprint of turbines, disturbance and/or displacement by construction and maintenance activities, and electrocution on the required power line and substation infrastructure.
Recognising the limited knowledge available of the impacts of wind farms on birds, the EWT and Bird Life South Africa along with prominent ornithologists, have formed the Bird and Wind Energy Specialist Group which aims to address all issues to do with the interaction of birds and wind farms both positive and negative and cumulative. One of the main outcomes of this work will be a national specification for monitoring of bird interactions/ impacts with wind farms and this is due to be finalised in the first quarter of 2011. Red Cap will be implementing a monitoring plan based on this specification. Estimated erection of the first turbine is end 2012 which should allow for at least 12 months of monitoring prior to any operation of a turbine.

At this stage mitigation of cumulative impacts has been limited to recommending long term monitoring before construction and during the operational phase of the first phase of the wind farm. The recommendation has also been to limit the first phase to a maximum of 50 turbines. As more data becomes available on the interaction with birds or bats and wind farms in South Africa and in the Kouga region specifically, methodologies for the assessment of cumulative impacts will be developed and adapted to take cognisance of local conditions. The limiting of the first phase of development to 50 turbines will ultimately result in any future phases benefitting from these methodologies.

19.5 Associated Infrastructure

All major developments have associated with them a variety of infrastructure requirements that are either permanent components of the projects or temporary if part of the construction needs e.g. access roads, turbine bases, sub-stations. This is generally fairly small scale, but could affect local hydrology in sensitive habitats and result in direct habitat loss. The effects will be dependent on the size of the wind farm and especially the extent of any road network required.

However, as highlighted above, the footprint area requirements for the proposed development including associated infrastructure is limited to 1% of the study area. Although the EIA has identified and recognised some impacts related to infrastructure, none are considered fatal flaws; and with practical and responsible mitigation can be significantly reduced to acceptable levels. In this context, the cumulative impact of infrastructure for similar developments when considered together is expected to remain similar in significance, particularly considering the emphasis given to mitigating construction impacts and rehabilitation in current EIAs.

19.6 Socio-Economic Impacts

Positive socio-economic impacts to the local, regional and national economy through employment and procurement of services could be significantly positive if all the proposed wind farm projects were to be developed. This benefit relates firstly to the construction phases and the need for labour and then during the operational phase to the development of the necessary skills by local companies to construct and maintain the equipment, possibly resulting in South African companies manufacturing the machinery locally as opposed to importing machinery from overseas. Over and above this there is likely to be a significant long term boost to the local economy and specifically the HDSA's through BBBEE structures like the trust to be set up by Red Cap and through CSI initiatives that will be linked to all wind farms.

The cumulative impact in terms of loss of agricultural land is unlikely to be significant due to the limited land given to develop the turbines. In almost all cases, agricultural activities would still continue with little or no impact on production. A more profound impact on agriculture would be the injection of additional revenues via remuneration from the wind farms into the farms. These additional revenues could prove crucial in providing an economic buffer to the farmers of potential marginal farms to weather agricultural downturns. This could mitigate the causality of job losses usually associated with economic downturns.

Property prices in these areas cold increase as a result of the added value that energy generation offers but could also decrease if public perception is that properties near wind farms are not as appealing as properties that do not experience the ongoing impacts of wind farms i.e. visual (incl. sense of place) and noise. At this point, with little practical and learned experience to rely on, the cumulative impact remains variable and unknown due to the nature of human perception.

19.7 Visual Impacts

The landscape character of the region is a mixture of low density agriculture (mostly dairy farming), coastal holiday resorts (seasonal variability in population) and urban development. Some of the landscape character types have a high sensitivity to the change that will be caused by introduction of a wind farm, but most of the landscape that will be affected is either that of dairy farms or coastal resorts. The coastal resorts are rapidly expanding with many of them becoming urbanised with shopping malls and suburbs (e.g. Jeffrey's Bay and St Francis Bay). The area is also well recognised for its scenic beauty.

The sheer size of the turbines could result in a loss of scenic views and the sense of open space. In addition, the alteration of the landscape from open veld or rural farmland character to a more industrial type character will have an impact on the sense of place which in turn could have an impact on tourisms and associated activities. The Kouga wind farm as a stand alone development in such an environment is likely to attract some interest, resulting in some positive benefits. On a cumulative scale, it is unlikely that similar developments in close proximity to each other would change the visual impact.

The Visual Impact Assessment recognises the likelihood of the impact occurring is highly probable due to the size of the wind farm and its components and their high visibility and therefore the significance rating is scored as High. Little can be done to mitigate the visual impact due to the design specifications of turbines and the CCA requirements i.e. turbines must be white. When considered cumulatively with other proposed developments and wind farms, bearing in mind that only approximately 88 probable wind turbines will be erected in the short to medium term, the cumulative visual impact will remain high. The Visual Impact Assessment does, however, indicate that over time, as people become used to the turbines, the significance of the visual impact will decrease, but will still be present. The study further states that the landscape is continuously changing as the surrounding urban centres continue to expand, and since wind farms are congruent with agricultural landscapes elsewhere in the world, the significance of the impact will decrease as time passes.

A reduction in wind turbine numbers is unlikely to have an appreciable effect since even a few wind turbines will still have high visibility and will change the landscape character.

19.8 National Electricity Supply

South Africa is experiencing an electricity supply crisis. In response to the crisis the DOE has initiated the Medium Term Risk Mitigation Plan (MTRMP) to *"keep the lights on"*. This plan shows two scenarios, the first being a business as usual scenario where nothing extraordinary is done in the national electricity supply. In this scenario there is a total shortfall of 42,000 GWh over the period 2011 – 2016. The second scenario anticipates mitigation measures, such as the construction of wind farms and aggressive energy efficiency measures. The second scenario does however fall short of ensuring that the lights stay on. The consistent theme in the plans is that without

extraordinary measures the lights will go out. The cost of this to the country has been calculated at R75 kWh for unserved energy by the DOE. Should the first scenario prevail, the cost to the economy over a 5 year period would be R3,15 trillion. The quantum of this cumulative burden on the national economy would be dire. Should the scenario 1 be mitigated, the positive cumulative impact of this alone on the economy would be significant, as would the associated increased investment and job creation.

Another key positive cumulative impact is the carbon/emissions free generation of electricity. This has a marked positive impact on the local health of communities in the vicinity of coal fired power stations as well as the global problem of climate change. As has been shown above, wind energy in South Africa by 2025 could replace the equivalent of about 6000MW of conventional base load generation (i.e more than either Medupi or Kusile, the new coal power stations being built at present in South Africa) (see Appendix C).

19.9 Conclusion

One of the key criteria in assessing the cumulative impacts associated with the proposed project is the assessment of similar projects planned and existing. Currently in South Africa there are no operational wind farms of any significance and the assessment must be done on projects that are planned. All planned projects are subject to the national EIA process, and as such are aggregated by the DEA. The DEA is finalising a framework to manage the cumulative impacts as a measure to be used over and above the existing NEMA process. Although the details of this framework are yet to be finalised the timing around finalisation will result in this project being reviewed within the parameters of the framework.

Off all the direct cumulative impacts of this project the ones of greatest significance are the birds and bats as well as visual. The cumulative impact on birds and bats is currently unknown due to the absence of any bird and bat wind farm specific operational data in South Africa. To mitigate this uncertainty, the project will be limited to a first phase of 50 turbines, a precautionary measure proposed by the specialist. The visual cumulative impact is itself an extremely subjective one that is considered by some to be positive and others negative, but as is the nature of subjective impacts is impossible to quantify.

These cumulative impacts need to be weighed up with the further constraints of grid limitations in the region of 220 MW (latest information from Eskom which is less than the 300MW previously assumed), the procurement constraints under the REFiT of an initial amount of 400/700 MW as well as the need to obtain permission from the minster of DAFF for each and every wind farm planned on land zoned for agriculture. The current draft DAFF guidelines are seen as an important tool for ensuring that the process of approving the long term access to agricultural land for wind farms be managed in such a manner that it will not negatively impact on agricultural land and its associated production practices, nor result in the loss of high potential and unique agricultural land.

These potential negative cumulative impacts must be weighed up against the potential positive cumulative impacts. The electricity supply crisis faced by South Africa could result in a worst case scenario of a shortfall of 42,000 GWh of unserved energy with an associated cost to the economy of R3,15 trillion. One of the key

mitigation measures in ensuring this does not occur is the generation of electricity from renewable energy IPPs. As wind is considered the most appropriate technology to bring significant amounts of renewable energy onto the grid in the shortest time period and at the lowest cost, the potential positive cumulative impact of wind farms nationally is extremely significant. A direct consequence of the increased electricity supply will be the positive socio-economic impacts, both regionally and nationally.

Another key positive cumulative impact is the carbon/emissions free generation of electricity. This has a marked positive impact on the local health of communities in the vicinity of coal fired power stations as well as the global problem of climate change.

In weighing up the potential negative and positive cumulative impacts, the balance of probabilities is that the positive cumulative impacts far outweigh the negative.

20 MICRO-SITING

If this project is granted environmental authorisation, then micro-siting of the final turbines, roads and infrastructure will need to be undertaken in accordance with the requirements of the relevant environmental and engineering specialists. This approach is common environmental practice for projects such as power lines which have a small local footprint but are spread out over a large distance. It is also now being adopted for wind farm projects due to them being spread over large areas but only having a small total footprint. This project will be spread over 9382ha but will only be permanently altering about 24ha for phase 1 and 56ha for all 121 turbines (or 1% of the total wind farm site) and thus the micro-siting approach is ideal to ensure negative impacts are satisfactorily minimised.

At this stage in the project process there is no certainty on the granting of an environmental approval or the conditions that may be linked to such an approval if it is granted. DEA has to consider this Final EIR before it can make such a decision. Only once DEA has issued an Authorisation indicating if they do or do not authorise this project can the allowable turbine, road and other infrastructure locations and any conditions linked to them be known. Thus only once an environmental approval is granted can the detailed geotechnical studies on the approved layout and related final design begin. Furthermore, the detailed geotechnical and final design are very costly undertakings and it is not feasible to undertake them until there is certainty on the layout and on the fact that the project has at a minimum got environmental approval.

As indicated previously in this report, Layout 3, which is the layout being assessed in this EIR, was arrived at through a lengthy iterative process comprising three major and many more minor revisions (see Section 4.2.3 for more details on this iterative process). Nevertheless, the locations of the turbines specified for Layout 3 should still be regarded as indicative because of the need for a detailed geotechnical analysis and micro-siting by environmental specialists of each position. Turbine positions were specifically chosen to allow for a small degree of repositioning movements (with input from the specialists) which would not affect the overall impact assessment of the proposed project.

The micro-siting itself will also be an iterative process. The result of the detailed geotechnical investigation undertaken once an environmental authorisation is granted may indicate that the location of some of the turbines and related infrastructure will need to be adjusted slightly or that some of the locations are not feasible at all and will have to be abandoned. This geotechnical micro-sited layout will then be assessed on site during a combined site visit by the relevant environmental specialists, engineers and geotechnical specialists. This will entail all of these specialists discussing and assessing each turbine and the related infrastructure as a group while on site. The result of this on site micro-siting investigation will be that all the environmental requirements for micro-siting of the turbine and related infrastructure will have been undertaken by the relevant environmental specialists while taking account of the detailed engineering and geotechnical constraints. A final layout will then be achieved that is based on Layout 3 but with small micro-siting changes to ensure a viable development without unacceptable environmental impacts.

The layout of every turbine and all infrastructure will be assessed in this process. However, some locations will require more detailed input from the relevant specialists due to the environmental sensitivity of the specific area. Figure 51 to Figure 53 show for each cluster the areas that will require more detailed input from the relevant specialist by depicting the significant constraints that are mappable.

These figures also indicate all “no-go” areas. These are areas that due to one or other constraint have been determined as “no go” areas for the development. For these “no-go” areas the constraint also needs to be specific enough so as to be able to depict an exact delineation for their edge.

If it is not feasible to map the exact boundaries of a “no-go” area due to certain complexities such as a complex mosaic of highly sensitive areas interspersed with less sensitive areas, then the conservative approach is taken and the general area is highlighted in these figures as highly sensitive. The relevant specialist would be involved in ensuring that during micro-siting no development happens in the critical parts of these areas.

A good example of this is in the North West of the Central Cluster where turbines 29, 74 and 76 are situated in an area depicted as highly sensitive. The reason this whole area is mapped as highly sensitive is due to the fact that this area consists of a mosaic of lower lying highly sensitive habitats interspersed with many higher lying areas that are not as sensitive and would be suitable for turbine and infrastructure development.

Taking this into account the vegetation specialist has indicated that the predicted impacts in this area are permissible as during micro-siting the infrastructure causing the impacts in this area will be positioned by the specialist to ensure they don’t unduly impact on the highly sensitive portions of this area.

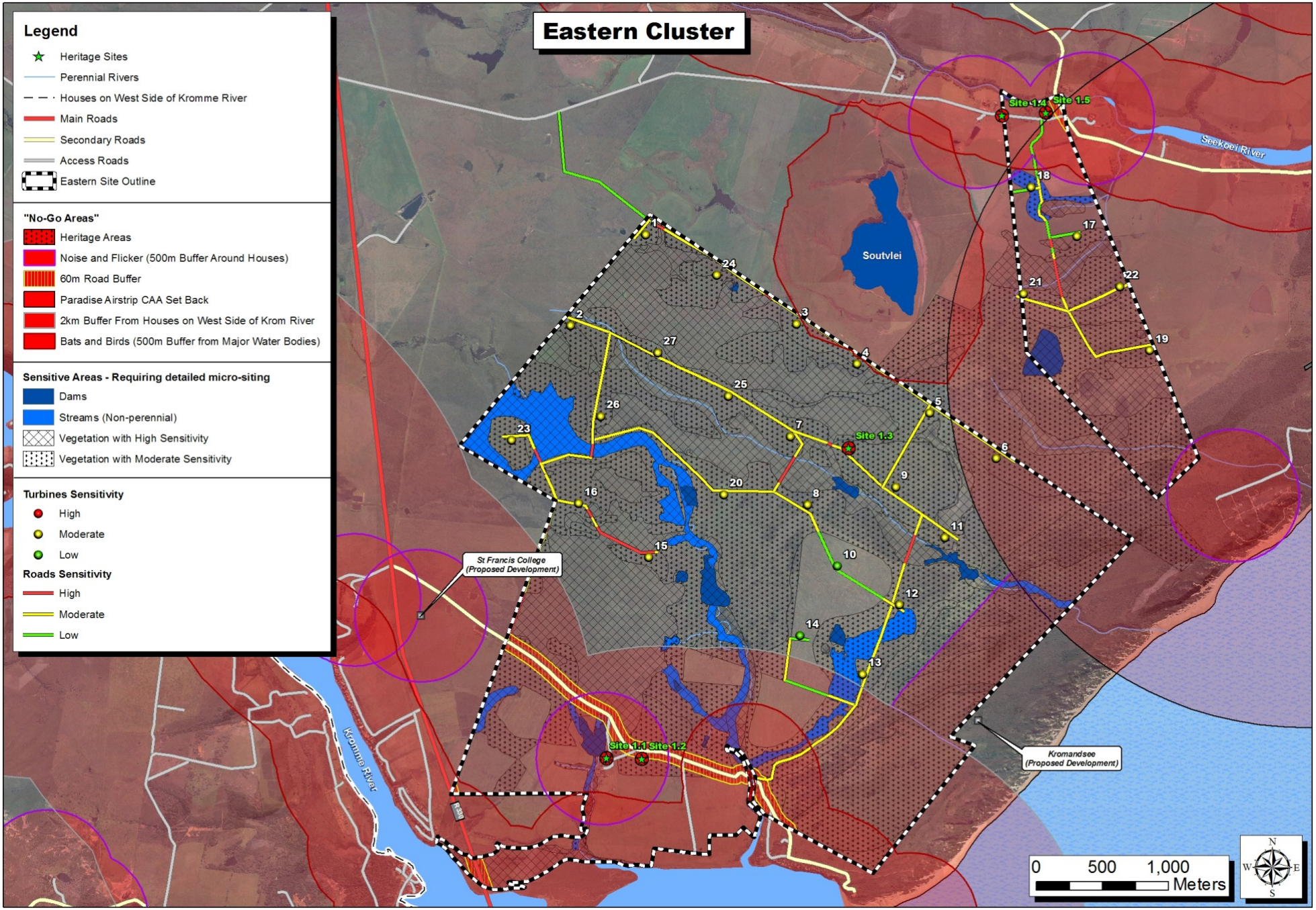


Figure 40: Sensitive Areas and "no-go" Areas to be Taken Account of During Micro-siting for the Eastern Cluster

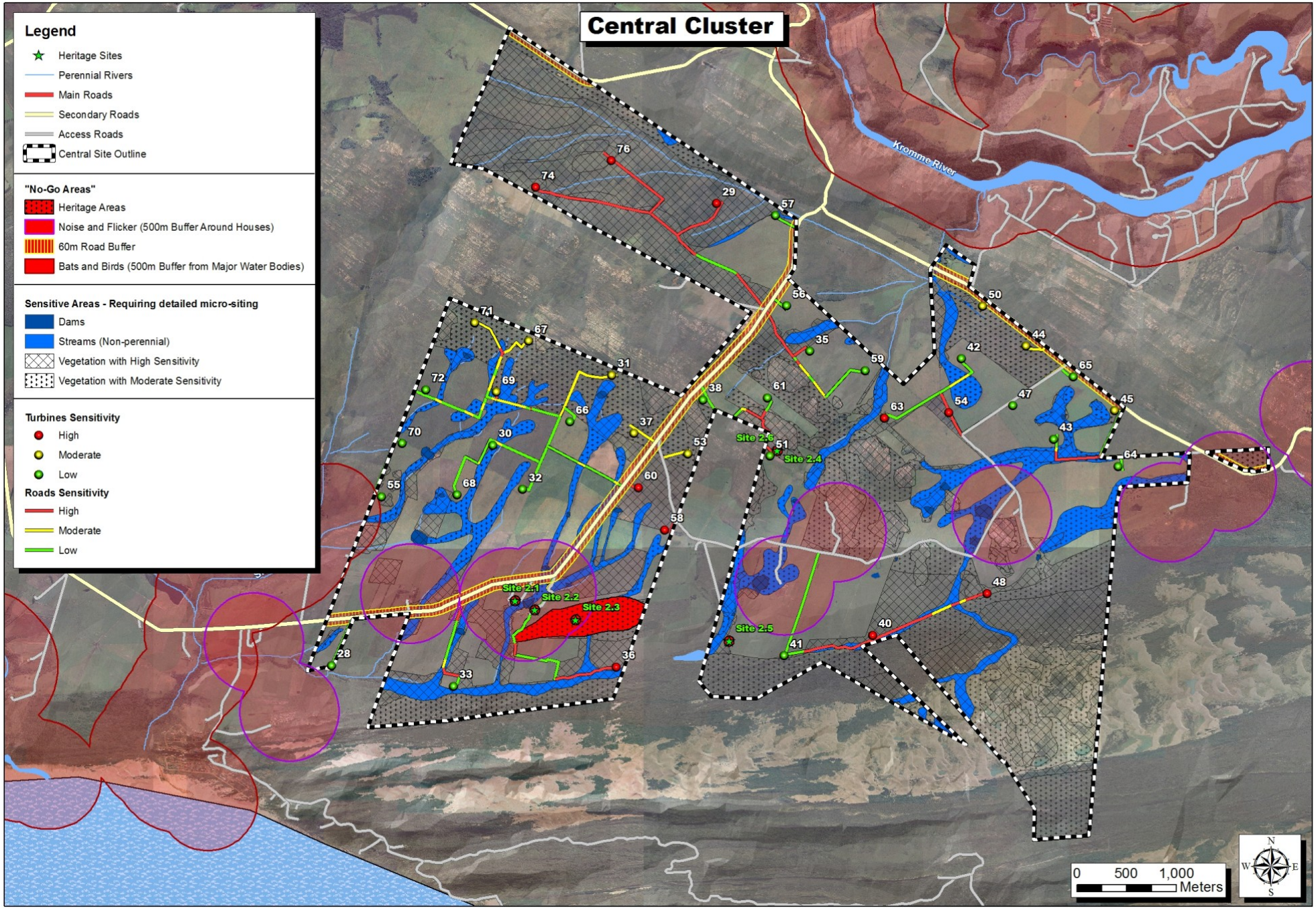


Figure 41: Sensitive Areas and "no-go" Areas to be Taken Account of During Micro-siting for the Central Cluster

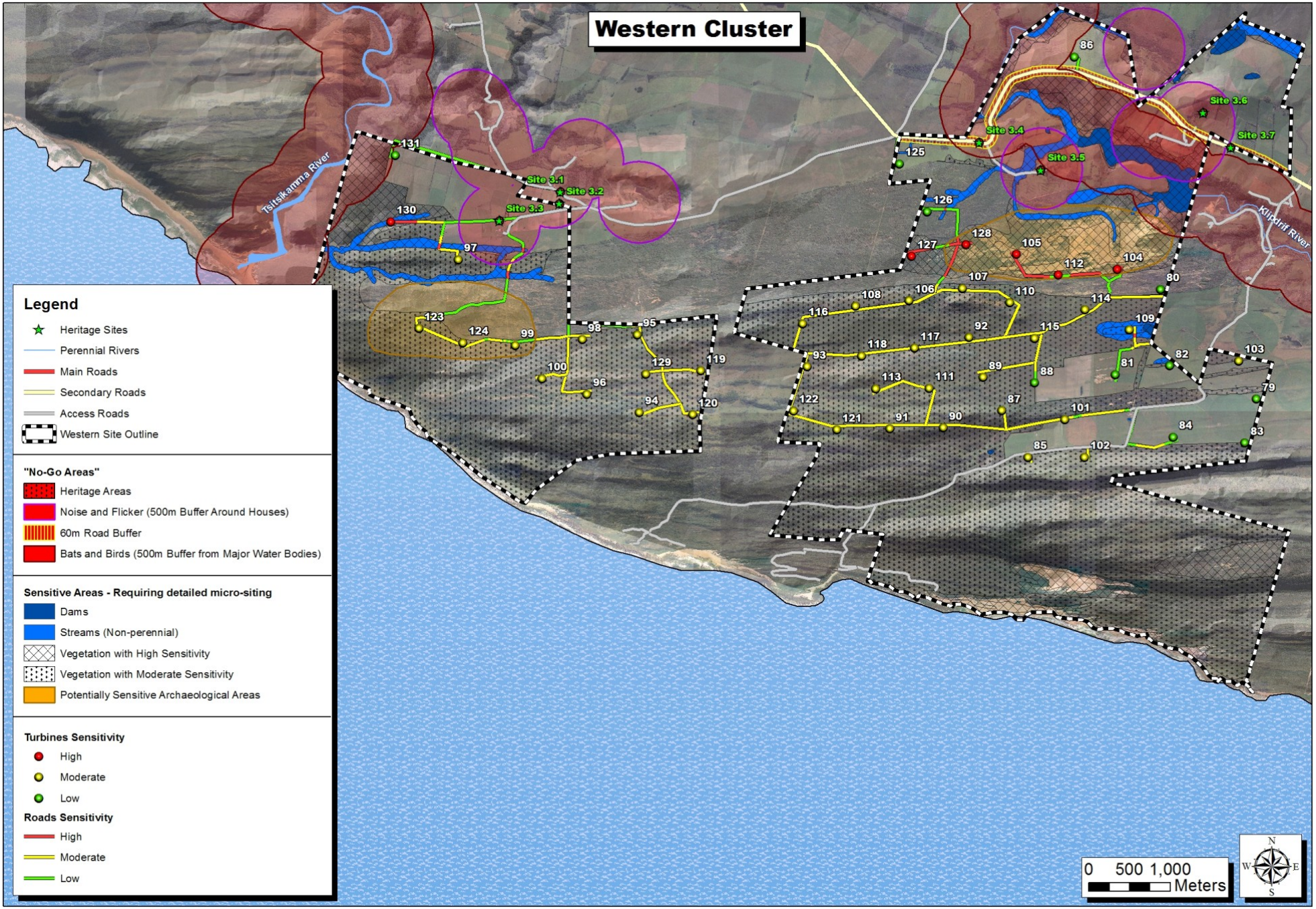


Figure 42: Sensitive Areas and "no-go" Areas to be Taken Account of During Micro-siting for the Western Cluster

21 ENVIRONMENTAL MANAGEMENT PROGRAMME (EMP)

The purpose of the EMP is to manage the impacts of construction and operational activities. The effective implementation of the EMP will ensure that the required works are conducted in an environmentally sound manner and that the potential negative impacts of construction and operational activities are minimised and/or prevented.

The Draft EMP (Appendix H) covers pre-construction, constructional and the operational phases of the project. The EMP details the responsibilities and authority of the various parties involved in the project and contains Environmental Specifications to which the Contractor and Operator are required to adhere to throughout the duration of the project. The Draft EMP covers impacts that have been identified in the EIA Process and other general construction and operational impact management.

22 CONCLUSIONS AND RECOMMENDATIONS

The Environmental Impact Assessment (EIA) process undertaken for the proposed wind farm and summarised in this Environmental Impact Report (EIR) aims to ensure that the Department of Environmental Affairs (DEA) can make an informed decision on the environmental acceptability or otherwise of this proposed development.

The DEA will use the information compiled in this EIR to understand the potential positive and negative impacts and then will weigh these up to decided if the balance is in favour of the project going ahead and if it is to go ahead, what measures need to be put in place to ensure that the potential negative impacts are mitigated, The decision arrived at should ensure the greater good from a biophysical and socio-cultural point of view is achieved for all.

In this conclusion an initial attempt has been made to weigh up the impacts. This was done based on experience and knowledge gained through the process since its initiation and thus a good objective understanding of the issues and impacts.

This chapter summarises the findings of the EIA and then makes recommendations regarding the project as a whole and mitigations measures to reduce and enhance respectively negative and positive environmental impacts linked to the proposed Layout 3 of the wind farm.

If this project is granted environmental authorisation, then micro-siting of the final turbines, roads and infrastructure will need to be undertaken in accordance with the requirements of the relevant environmental and engineering specialists. The result of this onsite micro-siting investigation will be that all the environmental requirements for micro-siting of the turbine and related infrastructure will have been undertaken by the relevant environmental specialists, giving a further level of environmental scrutiny to ensure any impacts are properly mitigated. A final layout will then be achieved that is based on Layout 3 but with small micro-siting changes to ensure a viable development without unacceptable environmental impacts.

The proposed project will be developed in phases with the first phase having no more than 50 turbines. This is to ensure that any impacts which have a high uncertainty can be adequately monitored and more easily mitigated. If monitoring programmes reveal problematic impacts, these can then be addressed and mitigated for in the current and future phases.

Before the potential impacts associated with the development are summarised it is important to put the impacts into perspective. Due to the large distances between turbines the vast majority of the total 9382ha of land, that is being investigated for the Kouga Wind Farm, will not be disturbed. During the first phase a maximum of less than 1% (approximately 24ha) of land will be permanently altered with the full wind farm resulting in no more than 1% (approximately 56ha) of permanently altered land. In both instances this 1% is spread over the 9382ha and thus the physical footprint of the development is never substantial in any one area.

22.1 Summary of the Biophysical and Socio-Cultural Impacts During Construction / Decommissioning

During the construction phase of the project no impacts were identified that had a High –ve significance rating after mitigation. Rather, two socio-economic impacts were found to have a High +ve impact after mitigation/ enhancement measures were undertaken.

These are:

- Project expenditure & investment benefiting the local, regional and national economy
- Increase in Employment

Four potential impacts were identified to have a high –ve significance before mitigation. These are presented below along with their significance rating after mitigation:

- Direct loss of vegetation and habitat for certain sensitive habitat types- High –ve changing to Medium/ Low -ve after mitigation
- Changes to ecological processes and functioning and habitat fragmentation for certain sensitive habitat types- High –ve changing to Medium/ Low –ve after mitigation
- Destruction of habitat important to sensitive reptiles, amphibians and mammals- High –ve changing to Medium –ve after mitigation
- Road mortality of reptiles, amphibians and mammals- High –ve changing to Low –ve after mitigation

22.1.1 Conclusion on Construction Impacts

In weighing up the Construction Impacts after mitigation it appears the High positive local, regional, and national impacts outweigh the High, becoming Medium to Low negative impacts and that when, taking all the impacts into account, there is a positive bias.

When weighing up the facts that less than 1% of the area will be permanently altered and that all high –ve biophysical impacts can be adequately mitigated, juxtaposed with the fact that there is a pressing need for investment, expenditure and employment in the area, it is concluded that the high positive social impacts which address these social issues outweigh the residual (after mitigation) medium to low negative biophysical impacts.

In weighing up all the other positive and negative construction impacts that were not rated as High before or after mitigation it is concluded that they do not have a significant cumulative negative bearing on the environmental acceptance of this development as long as they are mitigated/ enhanced as required.

A summary of all the construction impacts is presented in Table 39 below.

Table 39: Summary of the Construction Phase Impacts Significance Ratings

	Section	Impact	Pre-Mitigation Significance	Post-Mitigation Significance
Vegetation				
Fynbos, Renosterveld and Dune Strandveld				
	7	Direct loss of vegetation and habitat	High	Medium
	7	Reduction or changes to ecological processes and functioning and habitat fragmentation	Medium	Low
	7	Loss of species of special concern and SSC habitat	Medium	Low
	7	Changes in natural fire regime	Low (+ve)	Medium (+ve)
	7	Increased risk of alien invasion	Medium	Low
Thicket and Dune Forest				
	7	Direct loss of vegetation and habitat	Medium	Low
	7	Reduction or changes to ecological processes and functioning and habitat fragmentation	High	Low
	7	Loss of species of special concern and SSC habitat	Medium	Low
Rocky Outcrops				
	7	Direct loss of vegetation and habitat	High	Low
	7	Reduction or changes to ecological processes and functioning and habitat fragmentation	High	Low
	7	Loss of species of special concern and SSC habitat	Medium	Low
Seeps, Wetlands and Streams				
	7	Direct loss of vegetation and habitat	High	medium
	7	Reduction or changes to ecological processes and functioning and habitat fragmentation	High	medium
	7	Loss of species of special concern and SSC habitat	Medium	Low
	7	Increased risk of alien invasion	Medium	Low
Terrestrial Fauna				
	9	Reptiles, Amphibians and Mammals: Habitat destruction	High	Medium
	9	Reptiles, Amphibians and Mammals: Road mortality from trucks, cars and other service vehicles	High	Low
	9	Reptiles & Mammals: Fauna harmed by fences	Medium	Low
	9	Reptiles & Amphibians: Corridor continuity	Medium	Medium
	9	Mammals: Corridor continuity	Medium	Low
	9	Mammals: Poaching	Low	Low
Birds				
	11	Habitat destruction caused by construction of turbines	Low	Low
	11	Disturbance to birds	Medium	Medium
	11	Habitat destruction from construction of associated infrastructure	Low	Low
Visual				
	14	Large construction site and activities on sensitive viewers (*Status may be negative or positive depending on the viewer- i.e subjective)	Medium (+ve / -ve)*	Medium (+ve / -ve)*
Noise				
	15	Impact of the construction noise on the Noise sensitive areas (NSAs)	Low	Low
Socio-Economic				
	16	Disturbance of land-owners and users on the site	Medium	Low
	16	Disturbance of surrounding land users	Low	Low
	16	Disturbance of surrounding town residents	Medium	Low
	16	Associated project expenditure and investment	Medium (+ve)	High (+ve)
	16	Suppression of tourism	Medium	Low
	16	Increase in Employment	Medium (+ve)	High (+ve)
	16	Crime associated with influx of work force	Medium	Low

As the decommissioning stage should have similar impacts to construction the same conclusions can thus be deduced for decommissioning.

22.2 Summary of the Biophysical and Socio-Cultural Impacts During Operation

During the operational phase of the project three impacts were identified as having High –ve significance ratings and four as having a High +ve significance rating **after mitigation / enhancement**. All of these impacts are of a socio-cultural nature and there were no residual High –ve or +ve biophysical impacts after mitigation.

The High –ve impacts are all of local scale, they are interrelated due to them all being linked to visual impacts, two of them are likely to reduce in significance over time and one could even be seen as positive depending on who is being affected.

These impacts are:

- Impact on the Cultural Landsapes and Viewscapes for sensitive visual cultural receptors - High –ve after mitigation
- Existing Views of sensitive visual receptors- High –ve after mitigation but reducing over time
- Change in the mixed coastal resort-agricultural landscape - High –ve or +ve (subjective- depending on individual viewers) after mitigation and possibly reducing over time

The impact on the Cultural Landsapes and Viewscapes is a very subjective issue. For example, if the current view of a Khoisan viewer or viewpoint will be altered by the wind turbines then the severity or magnitude of the impact will be high due to the incongruence of a wind turbine in a Khoisan landscape. That is if the landscape is pristine in terms of Khoisan landscape values. However, it is unlikely that there remain landscapes which are still pristine in terms of those values. The support for the project by Chief Michael Williams and the Gamtkwqua Khoisan First Nation is taken as a good indication that the impact on the Khoisan cultural landscapes and viewscapes is not significant enough to warrant it affecting the proposed wind farm development.

Also from a cultural point of view, the visual impact of the development could be seen as evidence of the natural process of 'cultural evolution', reflecting contemporary energy requirements and the emphasis on renewable energy sources. The proposed Wind Farm development will also contribute, in part, to the conservation of the rural ambiance of the landscape established during the Colonial Period as it will prevent other more destructive development types from possibly taking place on the land in the future.

The High +ve impacts are all socio-cultural and have significant benefits locally as well as regionally and nationally.

These are presented below:

- Impact on Archaeological Site 2.3 which is a significant Stone Age site - High/ Medium +ve after mitigation.
- Impact on the Cultural Landscape and Viewscapes with regard to the conservation of heritage resources - High +ve after mitigation
- Financial Benefits of the wind farm on a local, regional and national level - High +ve after mitigation
- Increase in Employment - High +ve after mitigation

As a direct consequence of this EIA for the proposed project, a significant archaeological site (Site 2.3) in the Central Cluster was discovered and now can be properly conserved and studied in future. The proposed wind farm development required over 9000ha of land to be investigated from a cultural heritage perspective. If it is built it will only permanently alter about 1% of this landscape in areas that will not impact on cultural heritage resources and thus, it will in fact be ensuring that no other more destructive activities than the present farming can take place on the land. If one considers the high sensitivity of the Later Stone Age (LSA) cultural landscape along the southern Cape coast and increasing impact on and destruction of these unique, non-renewable heritage resources, the proposed wind farm development may well prove to be a significant cultural heritage conservation measure.

The last two impacts with a High +ve significance after mitigation are socio-economic. The operation of the Kouga Wind Farm will generate significant new economic activity within the region together with a broad range of employment opportunities and economic impacts due to knock-on effects both locally and nationally. It will also have a direct significant positive impact on the local community generally and more specifically it will empower the communities of historically disadvantaged South Africans (HDSA's) residing within the Kouga Local Municipality. This will be achieved through the Corporate Social Investment (CSI) initiatives the wind farm company will fund as well as through the BBBEE Trust it will set up which will hold and manage shares in the wind farm and use the economic benefits of the shares for upliftment projects in the area.

Six potential impacts were identified to have a High –ve significance before mitigation and these were both bio-physical as well as Socio-economic.
These impacts are presented below along with their significance rating after mitigation:

- Loss of species of special concern and their related habitat- High –ve changing to Medium –ve after mitigation
- Changes to ecological processes and functioning and habitat fragmentation for certain sensitive habitat types- High –ve changing to Medium –ve after mitigation
- Depression of recruitment of bats through mass mortality caused by several wind farms- High –ve changing to Low –ve after mitigation
- Collision of birds with Turbines- High –ve changing to Medium –ve after mitigation
- Potential noise impacts from operational turbines on 6 noise sensitive areas- High –ve changing to Low –ve after mitigation
- Impact on the Paradise Beach Aerodrome- High –ve changing to No Impact after mitigation

Of these the most contentious are the impacts on the birds and the bats.

The reason for this is that there is a low confidence in the prediction of the magnitude of the impact on bats and birds due to the lack of data regarding impacts from operational wind farms in South Africa on bats and birds. In the absence of any existing wind farms the required data cannot begin to be gathered to eliminate or reduce this uncertainty. Given this uncertainty, it is not considered reasonable to recommend that this project should not go ahead. A more reasonable approach, as proposed by the specialists, is to phase the project so that the first phase is no more than 50 turbines and to initiate a detailed monitoring programme for birds and bats. The Endangered Wildlife Trust (EWT) believes that the acceptance by the developer to phase the project lends itself to obtaining good data by monitoring of bird activity and any impacts from the first phase which would then inform how to proceed with subsequent phases. If significant numbers of collisions occur once the turbines are constructed, the developer will need to take reasonable measures to mitigate for these collisions in subsequent phases.

EWT and Bird Life South Africa, along with prominent ornithologists, have formed the "Bird and Wind Energy Specialist Group". This specialist group aims to address all issues to do with the interaction of birds and wind farms both positive and negative and cumulative. One of the main outcomes of this work will be a national specification for monitoring of bird interactions/ impacts with wind farms. The bird specialist who undertook the avifauna study for this report is from the EWT and is intricately involved in this process and has used the draft version of this national specification to guide his proposed mitigation measures for this project.

22.2.1 Conclusion on Operational Impacts

In weighing up the Operational Impacts after mitigation it appears the High positive local, regional and national benefits outweigh the High negative local impacts and that when, taking all the impacts into account, there is a positive bias.

As has been indicated, the impacts with residual (after mitigation) High –ve significance are all related to changes in the views due to the wind farm. These predominantly impact on the local population and holiday makers. The residual impacts with a High +ve impact are also socio-cultural and have a significant positive spinoff for the regional and national economy as well as the local community in general and more specifically the Historically Disadvantaged South Africans (HDSA's) of the area.

It would thus appear the groups most negatively impacted on by the proposed development also have a lot to gain from the same development. The fact that wind energy will help reduce green house gas emissions and thus also help reduce global warming and related sea level rise in the long run, may also have a +ve impact in the future on the communities of coastal towns like St Francis Bay which is already experiencing significant impacts from sea shore erosion. Furthermore, the benefit of electricity to those fortunate enough to have it in the Kouga area must also be taken into consideration when weighing up the pros and cons of this project especially given the dire situation the country faces if significant generation capacity is not brought on line in a very short time frame (one of wind energy's advantages is that it can be brought on line faster than any other economically viable large scale energy generation technique).

The benefits regionally, nationally and globally due to renewable energy over conventional energy generation are comprehensively documented and the

exponential increase of renewable energy production globally is directly linked to these benefits for the global community. The South African Government has also recognized these benefits and that is why renewable energy is such an important part of the governments planning for future energy production in IRP. These regional and national benefits also need to be weighed up against the local negative impacts.

The two main negative bio-physical impacts are the contentious impacts on birds and bats. However, the specialists involved believe that with the phasing of the project and the correct monitoring procedures these impacts are no longer of a High –ve significance rating and are not fatal flaws of the development.

In summary, there are High +ve regional and national spinoffs from the proposed project and the local communities who are most negatively impacted are also the ones who gain the most from the related High +ve benefits. Thus, there appears to be an overarching positive bias to the development if the project is looked at from a local, regional and national level.

In weighing up all the other positive and negative operational impacts that were not rated as High before or after mitigation it is concluded that they do not have a significant cumulative negative bearing on the environmental acceptance of this development which would alter the positive bias from the highly significant impacts weighed up above. This is as long as all the impacts are mitigated/ enhanced as required. A summary of all the operation impacts is presented in Table 40 below.

Table 40: Summary of the Operational Phase Impacts Significance Ratings

	Section	Impact	Pre-Mitigation Significance	Post-Mitigation Significance
Vegetation				
Fynbos, Renosterveld and Dune Strandveld				
	7	Direct loss of vegetation and habitat	Medium	Low
	7	Reduction or changes to ecological processes and functioning and habitat fragmentation	Medium	Low
	7	Loss of species of special concern and SSC habitat	Medium	Low
	7	Changes in natural fire regime	Low (+Ve)	Medium (+Ve)
	7	Increased risk of alien invasion	Medium	Low
Thicket And Dune Forest				
	7	Direct loss of vegetation and habitat	Medium	Low
	7	Reduction or changes to ecological processes and functioning and habitat fragmentation	Medium	Low
	7	Loss of species of special concern and SSC habitat	Medium	Low
Rocky Outcrops				
	7	Direct loss of vegetation and habitat	Medium	Low
	7	Reduction or changes to ecological processes and functioning and habitat fragmentation	Medium	Low
	7	Loss of species of special concern and SSC habitat	High	Medium
Seeps, Wetlands And Streams				
	7	Direct loss of vegetation and habitat	Medium	Low
	7	Reduction or changes to ecological processes and functioning and habitat fragmentation	High	Medium
	7	Loss of species of special concern and SSC habitat	Medium	Low
	7	Increased risk of alien invasion	Medium	Low
Ground Water, Hydrology And Surface/ Groundwater Links With Wetlands				
	8	Impact on Ground Water, Hydrology and surface/ groundwater links with Wetlands	Medium	Low
Fauna				
	9	Reptiles, Amphibians & Mammals: Habitat destruction	Medium (+Ve)	Medium (+Ve)

	9	Reptiles & Amphibians: Road mortality from trucks, cars and other service vehicles	Low	Very Low
	9	Mammals: Road mortality from trucks, cars and other service vehicles	Very Low	Insignificant
	9	Reptiles and Mammals: Fauna harmed by fences	Medium	Low
	9	Reptiles, Amphibians and Mammals: Corridor continuity	Medium (+Ve)	Medium (+Ve)
	9	Mammals: Poaching	Low	Low (+Ve)
Bats				
	10	Site-specific mortality	Medium	Low
	10	Depression of recruitment of bats through mass mortality caused by several wind farms	High	Low
Birds				
	11	Collision of birds with turbines	High	Medium
	11	Disturbance to birds	Medium	Medium
Cultural Heritage				
	12	Impact on Colonial Period Farmsteads or Structures, pre-dating 60 years of age	No Impact	No Impact
	12	Impacts on Colonial/ Historical Period Cemeteries	No Impact	No Impact
	12	Impacts on Site 1.3- low density primarily Early Stone Age (ESA) Acheulean scatter	Low To Very Low	Low To Very Low
	12	Impacts on Site 2.3- significant ESA and MSA Stone Age site	High	High/ Medium (+Ve)
	12	Impacts on the intangible heritage resources	Neutral	Neutral
	12	Impacts on the Cultural Landscapes and Viewscapes- for sensitive visual cultural receptors	High	High
	12	Impacts on the Cultural Landscapes and Viewscapes - with regard to conservation of heritage resources	High	High (+Ve)
Palaeontology				
	13	Impact on Palaeontology	Low	Low
Visual				
	14	Change in mixed coastal resort-agricultural landscape	High (Reducing Over Time)	High (Reducing Over Time)
	14	Existing views of sensitive visual receptors (*Status may be negative or positive depending on the viewer- i.e. subjective)	High (Possibly Reducing Over Time) (+Ve / -Ve)*	High (Possibly Reducing Over Time) (+Ve / -Ve)*
	14	Night lighting on Sensitive Viewers	Medium	Medium
	14	Shadow flicker of wind turbines on sensitive viewers	Low	Very Low
Noise				
	15	Operational noise on the Noise sensitive areas (NSAs) (except NSA 7, 8, 9, Ext 1, west Ext 1 and west Ext 2)	Low	Low
	15	Operational noise on NSA 7, 8, 9, Ext 1, west Ext 1 and west Ext 2	High	Low
Socio-Economic				
	16	Disturbance of land-owners and users on the site	Medium,	Low
	16	Disturbance of surrounding land users	Medium (-Ve To Neutral)	Low (-Ve To Neutral)
	16	Disturbance of surrounding town residents	Low	Low
	16	Financial benefits of the wind farm operation (local, regional and national)	Medium (+Ve)	High (+Ve)
	16	Suppression of tourism	Low (-Ve To Neutral)	Medium (-Ve To Neutral)
	16	Increase in employment	Medium (+Ve)	High (+Ve)
	16	Decline in property value	Medium	Low
Aerodromes				
	17	Impact on Aerodromes	High	No Impact

22.3 Summary of the Cumulative impacts

The potential exists for negative consequences from the cumulative impacts caused by development of a significant amount of wind farms across the country. This eventuality would only transpire if decision making was undertaken in a policy vacuum, in the absence of appropriate policies/legislation. Fortunately, in South Africa, developments such as this are subject to a broad graft of legislated processes requiring approval, including but not limited to the EIA process. The concern does however exist that existing legislation does not take into account wind farms and the potential cumulative impacts.

The key government departments instrumental in providing permission for the construction of wind farms in South Africa are the DEA and DAFF. Both of these departments have existing legislation (NEMA and CARA/SALA respectively) empowering them to control the current development pipeline. Over and above the existing legislation, both departments are currently finalising polices specific to the development of wind farms and their cumulative impact. These policies will be an important addition to their existing arsenal of policies and will further ensure that the development of wind farms is done in a pragmatic, sustainable and sensible manner. The DEA is also finalising a Geographic Information System (GIS) based tool covering the entire country to assist the Department in assessing the potential impacts of wind farms and all future applications, including this one.

Another important factor to bear in mind when grappling with the issue of cumulative impact is the fact that any wind farm planned on agricultural land will require the permission of the minister of DAFF to enter into a long term lease, over and above a positive authorisation. Although DAFF does not have any legislation specific to wind farms currently in place, they will only be entertaining the wind farm applications for long term leases post the finalisation of their policy.

Although the legislative barriers to the development of wind farms are significant, there are additional safeguards that will prevent an unchecked proliferation of wind farms in South Africa. The main barrier to a rapid expansion of wind farms is the limiting factor of suitable grid connections. This is an issue nationally and in the Kouga region specifically, the latest assessment by Eskom is that the maximum MW that can be evacuated in the medium term is 220 MW (approximately 88 turbines).

When assessing the cumulative impacts, one has to be cognisant of both the negative and positive impacts. The DOE has initiated the Medium Term Risk Mitigation Plan (MTRMP) to “keep the lights on”. This plan shows two scenarios, the first being a ‘business as usual’ scenario where nothing extraordinary is done in the national electricity supply. In this scenario there is a total shortfall of 42 000 GWh over the period 2011 – 2016. The second scenario anticipates mitigation measures, such as the construction of wind farms and aggressive energy efficiency measures. The second scenario does, however, fall short of ensuring that the lights stay on. The consistent theme in the plans is that without extraordinary measures the lights will go out. The cost of this to the country has been calculated at R75/ kWh of unserved energy. The cumulative effect of which would result in significantly dire consequences to the national economy. As wind is considered the most appropriate technology to bring significant amounts of renewable energy onto the grid in the shortest time period and at the lowest cost, the potential positive cumulative impact of wind farms nationally is extremely significant, as would be the associated increased investment and job creation.

Another key positive cumulative impact is the carbon/emissions free generation of electricity. This has a marked positive impact on the local health of communities in the vicinity of coal fired power stations as well as the global problem of climate change.

In weighing up the potential negative and positive cumulative impacts, the balance of probabilities is that the positive cumulative impacts outweigh the negative.

22.4 Overall Evaluation of Impacts and Recommendation by the Environmental Assessment Practitioner

Based on the findings of the EIA process undertaken for the proposed Kouga Wind Farm, no impacts were identified that, in the opinion of the EAP, should be considered "fatal flaws" from an environmental perspective, and thereby necessitate substantial re-design or termination of the proposed project.

As outlined in the Conclusion section above, when weighing up the residual positive and negative impacts for all the phases of the project, there is an inherent positive bias. All the communities that are impacted negatively will also gain positively from the project so no communities are benefiting at the total expense of another.

Furthermore, the positive residual impacts with high significance are local, regional and national whereas all the highly significant residual negative impacts are local, subjective socio-cultural impacts that will not endanger any biophysical environments. Finally, there are also the non-project specific significant positive impacts of renewable energy over conventional energy production, which are both biophysical and socio-cultural, with far reaching and long term implications.

In weighing up the potential negative and positive cumulative impacts, the balance of probabilities is that the positive cumulative impacts far outweigh the negative.

Based on all of the above, it is recommended that the development be authorised to proceed as long as the mitigation measures identified in this EIA and presented below and included in the project EMP (see Appendix H) are implemented.

22.5 Overarching Mitigation Measures

- Layout 3 (the layout assessed in this EIR) be approved with the allowance for micro-siting
- Micro-siting of all turbines to be undertaken with all relevant specialists.
- The project is to be phased with the first phase not to be more than 50 turbines
- Bird monitoring to be undertaken in line with specifications presented in the Avifauna specialist study
- Bat mortalities to be monitored and recorded as part of the bird monitoring programme
- The developer must ensure that they, and all other relevant parties involved in the project such as the contractor, operator etc., abide by EMP presented in

Appendix H of this report during the final design/ planning, construction and operation phases of the project.

22.6 Final Design/ Planning and Construction Phases Mitigation Measures

22.6.1 Vegetation

- Micro-siting of all turbine final layouts
- Turbines 104, 105, 112, 127, 128 to be micro-sited to just outside the active inland primary dune field in the Western Cluster
- Vegetation clearing must be limited to the required footprint
- Alien species should be monitored and cleared when necessary
- Search and rescue operation to be undertaken before commencement of construction
- Rehabilitation to be implemented in a phased manner directly after construction
- A vegetation search and rescue and relocation plan, an alien and fire management plan along with a Rehabilitation Plan (based on the specification provided in the annexure to the specialists report) is to be finalised during the final design stage
- Mitigation particular to Fynbos, Renosterveld and Dune Strandveld:
  - Road network to be kept to minimum width and avoid more sensitive seep areas and drainage lines.
  - Flammable litter and discarded glass bottles should be removed regularly
  - Mitigation particular to Thicket and Dune Forest
  - Clearing of forest and thicket should be avoided, especially along drainage lines
  - Loss of Forest and Thicket limited in extent but no unnecessary thicket clearing to occur
- Mitigation particular to Rocky Outcrops:
  - Crossing through outcrops adjacent to streams should be avoided or kept to a minimum
- Mitigation particular to Seeps, Wetlands and Streams
  - Road crossing to avoid seep and wetland areas as far as possible, where not possible appropriate crossing design to limit loss of habitat
  - Ecological corridors occur predominantly along the rivers, drainage lines and seep areas, so design should be such that it does not impede these corridors unnecessarily.

22.6.2 Hydrology

- The undertaking of a Water Use Licence Application (WULA) as required by the National Water Act (Act No. 36 of 1998) and complying with all requirements of the Act with regards to surface water hydrology.

22.6.3 Terrestrial Fauna

- Search and rescue operations to be conducted before construction phase begins
- Fauna must be relocated to a place similar to the place where they were found
- Construction areas must be clearly demarcated

- Habitat islands should be created within the area cleared for the constructional site office etc.
- Materials, such as rocks, removed during the constructional phase must be kept aside and used later for the rehabilitation
- Construction Waste which will attract reptiles must not be left on site, this will increase the presence of reptiles
- Care must be taken to ensure slow driving on the site especially during rainfall periods
- Speed limits should be enforced
- Signs should be erected to remind and warn vehicle users where frog/toad crossings are, extreme slow driving needs to be practised in these zones
- Where roads pass right next to major water bodies provision should be made for fauna such as toads to pass under the roads by using culverts or similar
- Dead animals must be removed off the road as this will attract scavengers which may also be harmed on the road
- Do not feed animals on or near the roads
- Fences must be of a nature to allow fauna to pass through
- Regular visits to the site to check if any fauna are trapped
- Access gates into the fenced off areas to be closed at all times
- Inward facing 90 degree corner fences must rather be designed as two 45 degree corners
- Fences must be visible to animals
- Avoid using electric fencing
- Placing of structures under roads to allow reptiles such as tortoises and terrapins to cross under the road
- Do not places fences on the side of the roads
- Construction of roads over wetlands/rivers/streams must be of the nature that the water is allowed to flow under the road, this will secure corridor continuity for amphibians
- The workers on site must be educated about the laws protecting wildlife
- Penalties should be used as a deterrent
- Regular fence inspections need to be conducted to remove any snares
- Workers in the area should be made aware of penalties for feeding of animals.

22.6.4 Birds

- Only tubular towers for turbines be used (i.e. not lattice)
- Lighting of the turbines should be at a the lowest level as provided for by CAA requirements
- If any nesting birds are found pre-construction the EWT must be notified for advice in dealing with these species.
- Monitoring of birds and interaction with turbines in line with monitoring specifications presented in the Avifauna Specialist report.

22.6.5 Bats

- As far as possible, set back turbines 500m from the Krom, Tsitsikamma, Slang and Klipdrift Rivers, and from Soutvlei.

22.6.6 Cultural Heritage

- All turbine localities and linear development routes should be reassessed during the micro-siting process
- No development to impact on Site 2.3 - a significant Stone Age site
- No development to impact on Colonial Period Farmsteads or Structures, pre-dating 60 years of age or on Colonial/ Historical Period Cemeteries
- Central Cluster, turbine localities 28, 33, 36, 40, 41 and 48 are located particularly close to the archaeologically potentially sensitive vegetated dune landscape to the south of the study site. On-site archaeological monitoring is recommended at the start of construction (surface and sub-surface archaeological inspection)
- In the Western Cluster, on-site archaeological monitoring to assess surface and sub-surface sections is recommended at the start of construction in the vicinity of Area 1 (Turbine 99, 123 and 124) and Area 2 (turbine 104, 105 and 112)
- Should any archaeological or cultural heritage resources as defined and protected by the NHRA 1999 and not reported on in this report be identified during the course of construction, the developer should immediately cease operation in the vicinity of the find and report the site to SAHRA or an ASAPA accredited CRM archaeologist
- A cleaning and healing process should be undertaken on the land under the guidance of Chief Michael Williams and the Gamtkwqua Khoisan First Nation before construction starts.

22.6.7 Visual

- New road construction should be minimised and existing roads should be used where possible
- Erosion risks should be assessed and minimised as erosion scarring can create areas of strong contrast which can be seen from long distances especially on the palaeo-dune fields of the Western Cluster
- Laydown areas and stockyards should be located in low visibility areas (e.g. valleys between ridges) and existing vegetation should be used to screen them from views where possible
- Night lighting of the construction sites should be minimised within requirements of safety and efficiency
- Ensure that there are no wind turbines closer than 500m to a residence or farm building unless sufficiently screened by vegetation from shadow flicker
- Lighting should be designed to minimise light pollution without compromising safety. Investigate using motion sensitive lights for security lighting. Turbines are to be lit according to Civil Aviation regulations.

22.6.8 Noise

- All construction operations should only occur during daylight hours if possible.
- No construction piling should occur at night
- Construction staff should be given “noise sensitivity” training in order to mitigate the noise impacts caused during construction
- All wind turbines should be located at a setback distance of 500m from any homestead and a day/night noise criteria level at the nearest residents of 45 dB(A) should be used to locate the turbines. The 500m setback distance can be relaxed if local factors; such as high ground between the noise source and the receiver, indicates that a noise disturbance will not occur.

- Positions of turbines jeopardizing compliance with accepted noise levels should be revised during the micro-siting of the units in question and predicted noise levels re-modelled by the noise specialist, in order to ensure that the predicted noise levels are less than 45 dB(A) at adjacent NSAs.

22.6.9 Socio-economic

- Construction vehicles carrying materials to the site should avoid using roads through densely populated built-up areas along the coast so as not to disturb existing retail and commercial operations
- The Developer must establish a community based trust and implement a Corporate Social Investment policy

22.6.10 Aerodromes

- Abide by the requirements of the CAA with regard to set back distance of the turbines from the Paradise Beach Aerodrome and meet all CAA requirements for lighting of the wind farm

22.7 Operational Phase Mitigation Measures

22.7.1 Vegetation

- Alien invasive monitoring to be implemented
- No additional clearing to be undertaken during operational phase
- Maintaining sufficient buffer zones to allow the presence of suitable fire breaks
- Road borders should be regularly maintained to ensure that vegetation remains short and that they therefore serve as an effective firebreak
- Flammable litter and discarded glass bottles should be removed regularly

22.7.2 Terrestrial Fauna

- Keep the grass/vegetation short next to the road to reduce mammal activity near the road
- Care must be taken to ensure slow driving on the site especially during rainfall periods
- Speed limits should be enforced
- Dead animals must be removed off the road as this will attract scavengers which may also be harmed on the road
- Do not feed animals on or near the roads
- Regular visits to the site to check if any fauna are trapped
- Access gates into the fenced off areas to be closed at all times
- Fences must be visible to animals.

22.7.3 Birds

- Monitoring of birds and their interaction with turbines as specified in the specifications supplied by the Avifauna specialist in his report for this EIA.

22.7.4 Bats

- Monitoring of Bat Mortalities (morning searches) as part of the bird monitoring process
- Any retrieved carcasses should be sent frozen to bat specialists for analysis, together with the circumstances of their finding.

22.7.5 Cultural Heritage

- No development to impact on Site 2.3 - a significant Stone Age site
- No development to impact on Colonial Period Farmsteads or Structures, pre-dating 60 years of age or on Colonial/ Historical Period Cemeteries
- Should any archaeological or cultural heritage resources as defined and protected by the NHRA 1999 and not reported on in this report be identified during the course of operation, it should be reported to SAHRA or an ASAPA accredited CRM archaeologist.

22.7.6 Visual

- Maintain the turbines in good working order to ensure operation under the right conditions
- Signs near wind turbines should be avoided unless they serve to inform the public about wind turbines and their function. Advertising billboards should be avoided
- An information kiosk can enhance the project by educating the public about the need and benefits of wind power. Engaging school groups can also assist the wind farm proponent, as energy education is paramount in developing good public relations over the long term.

22.7.7 Noise

- If the Nordex or similar turbines are used, they should be operated in a low noise mode in the 4-6m/s wind speed range only if onsite measurements (after construction) at the West Cluster NSA West Ext 1 and 2 and the Central Cluster NSA 7,8,9 and Ext1 show the noise emissions exceed the recommended limits
- Ambient noise monitoring is recommended once the turbines are erected. This is to determine the exact power mode settings needed to comply with the guideline limit in the 45 dB(A) range.

22.7.8 Socio-economic

- Always have a representative of the developer as one of the trustees of the Trust to ensure good corporate governance.

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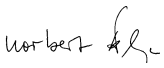
DATE 11/11/2010	SIGNATURE	SIGNATURE 	SIGNATURE 

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APPENDIX A

CURRICULUM VITAE OF EAPS

APPENDIX B

Correspondence with DEA

APPENDIX B1

Amended EIA Application Form

APPENDIX B2

DEA Scoping Report Letter of Acceptance

APPENDIX C

SAWFA Report for Wind Energy

APPENDIX D

Public Participation Documentation

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Scoping Phase Public Notification Documents

APPENDIX D2

Assessment Phase Minutes of Public Meetings

APPENDIX D3

I&AP Register

APPENDIX D4

Assessment Phase Public Minutes of Public Meetings

Oyster Bay –
St Francis Bay –
Sea Vista –

Oyster Bay Public Meeting Minutes

St Francis Bay Public Meeting Minutes

Sea Vista Public Meeting Minutes

APPENDIX D5

Minutes of Focus Group Meetings

Kouga Black Chamber of Commerce –
Gamtkwqua Khoisan First Nation –

Kouga Black Chamber of Commerce
Focus Group Meeting Minutes

Gamtkwqua Khoisan First Nation
Focus Group Meeting Minutes

APPENDIX D6

Scoping Phase I&AP Comments Received

APPENDIX D7

Assessment Phase I&AP Comments Received

APPENDIX D8

Issues and Response Report

APPENDIX E

Report on Transport Routes

APPENDIX F

CAA Obstacle Limitations and Markings Outside Aerodrome of Heliport

APPENDIX G

SPECIALIST REPORTS

APPENDIX G1

SPECIALIST REPORTS

Vegetation

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SPECIALIST REPORTS

Ground Water, Hydrology and Surface / Groundwater Links with Wetlands

APPENDIX G3

SPECIALIST REPORTS

Terrestrial Fauna

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Avifauna

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Socio-Economic

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Noise

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SPECIALIST REPORTS

Visual

APPENDIX H

ENVIRONMENTAL MANAGEMENT PROGRAMME

APPENDIX I

DOCUMENT CONTROL SHEET