DESCRIPTION OF THE AFFECTED ENVIRONMENT CHAPTER 6

This chapter of the EIA Report provides a description of the environment that may be affected by the Wind Energy Facility proposed on a site to the north of the Olifants River on the West Coast of the Western Cape Province. This information is provided in order to assist the reader in understanding the possible effects of the proposed project on the environment. Aspects of the biophysical, social and economic environment that could directly or indirectly be affected by, or could affect the proposed development have been described. This information has been sourced from both existing information available for the area and proposed development site as well as collected field data, and aims to provide the context within which the environmental assessment has been conducted. A more detailed description of each aspect of the affected environment is included within the specialist scoping reports contained within Appendices G - Q.

6.1 Location of the Proposed Wind Energy Facility Development Area

The site for the proposed wind energy facility is located in the West Coast District Municipality (WCDM) of the Western Cape Province. The WCDM is bordered by the Northern Cape Province to the north, and the Cape Metro and Cape Winelands Districts to the south and south-east. The western border is formed by the Atlantic Ocean, which forms the basis of the district's large and established fishing sector. The district includes five local municipalities, namely Matzikama, Cederberg, Bergriver, Saldanha Bay and Swartland, as well as District Management Areas (DMAs) (refer to Figure 6.1).

In terms of its specific location, the study site falls on the boundary between the District Management Area WCMA01 and the Matzikama Local Municipality – that is, the northern portion of the site falls within the within the WCMA01, and the southern section of the site falls within the Matzikama Local Municipality (LM) area. Vredendal, the largest town in the region, is located approximately 40 km south-east of the site. Primary access to this region is by means of the N7 national road and the R363 provincial main road.

The demarcated study site (an area of approximately 37 km^2) comprises the following farms:

» Portion 5 of the farm Gravewaterkop 158 (known as Skaapvlei)
» A portion of Portion 620 of the farm Olifants River Settlement (known as Skilpadvlei)
» A portion of Portion 617 of the farm Olifants River Settlement (known as Nooitgedag)

Figure 6.1: West Coast District Municipality

The western perimeter of the proposed wind energy facility development site is ~2 km inland from the coastline (i.e. the high-water mark). The West Coast is characterised by a flat to gently rolling terrain. The terrain lies between 60 m - 110 m above mean sea level. The natural vegetation is predominantly Namaqualand Strandveld and Namaqualand Sand Fynbos. However, large portions of the site have been transformed by dry land agriculture and sheep grazing.

6.2. Climatic Conditions

The West Coast area is characterised by a semi-arid Mediterranean climate with maximum temperatures ranging from 20°C – 30°C, depending on the season. Extreme temperatures can be extremely harsh, with summer temperatures often exceeding 40°C. The climate is strongly influenced by the cold Benguela current and coastal berg wind conditions. Rainfall is between 100 mm to 200 mm per annum, with the majority of the precipitation occurring during the winter months. The rainfall is supplemented by coastal fog, which often occurs in the area during winter.

The prevailing winds are predominantly from the south west during summer (onshore wind) and from the north east during winter (berg wind). The desiccating, hot, north-easterly 'berg winds' occur throughout the year. The cold ocean and warmer land mass results in typical daily cycle of offshore breezes at night and onshore winds increasing in strength during the day.

Meteorological stations are present in Vredendal, Brand-se-Baai (both of which are monitored by Namakwa Sands) as well as on the farm De Punt (monitored by Eskom). Key climatic data measured from these meteorological stations is summarised in Table 6.1.

Table 6.1: Key climatic data measured for the region

Weather Station	Vredendal	Brand-Se-Baai	Eskom's De Punt
Period of record	1958 to 1980	1994 to 2004	2003 - 2007
Precipitation (mm)	144	147 (main rainfall months May to September)	Average humidity 80% (100% maximum less than 10% of the time)
Evaporation Symons Tank (mm) A Pan (mm)	 1748 2182	 Not measured Not measured (estimated 1750mm)	 Not measured Not measured
Temperature (^{o}C)	-	-8.3^{o}C to 46.3^{o}C Ave July minimum: 8.6^{o}C Ave Feb maximum 23.8^{o}C	Average 15°C (no freezing with maximum 35°C for less than 1% of the time)
Wind Direction Wind velocity (m/s)	NW 6.5	S, SW 4.4	S, SW 6.2

Other relevant measurements obtained from the Eskom meteorological station at De Punt include:

» Wind gust maximum 3 sec mean – 180 km/hr (50 m/s)
» Maximum wind speed 10 minute mean – 114 km/hr (40 m/s)
» Turbulence < 15% at 50 m.

Figure 6.2 provides a wind rose of actual measured data (from the Eskom meteorological station at De Punt), which illustrates the predominant wind direction experienced on the West Coast north of the Olifants River. The length of time that the wind comes from a particular sector is shown by the length of the spoke, and the speed is shown by the thickness of the spoke. The wind direction is conventionally indicated from the periphery towards the centre of the graph, and not from the centre outwards.

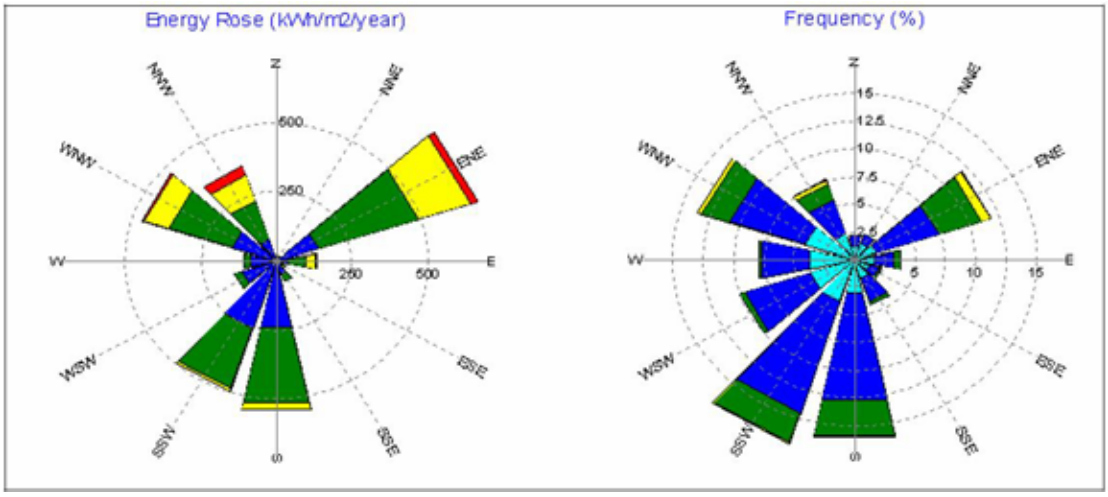


Figure 6.2: Wind Rose from measured data at the Eskom meteorological station at De Punt, indicating both wind energy as well as frequency of wind direction (% of time in a direction)

Figure 6.2 illustrates that the predominant wind direction is from the south and south west (i.e. percent of time in a direction). This is, however, not the strongest wind (or wind with most energy) experienced in this area, but the wind from the south west is experienced most frequently.

6.3. Regional Setting

The broader study area is an arid, sparsely populated area with less than 10 people per km^2 mostly concentrated within the small towns of the area. Large tracts of land within the study area are still in an untransformed state with varying degrees of degradation.

6.3.1. Ecological Profile

The site proposed for the development of the wind energy facility and associated power line falls within the Namaqualand coastal region of the Cape Floristic Region, and includes two biomes, i.e. the Fynbos biome, and the Succulent Karoo biome (Mucina & Rutherford 2006). These vegetation types are, due to the arid nature of this region, not very dense or tall in growth but rather scattered and low and represent a typical semi-desert environment. The Succulent Karoo is the only arid region recognised as a world biodiversity hotspot (Mittermeier *et al.*, 2000).

More than 90% of the Succulent Karoo is used as natural grazing, a form of land use that is, at least in theory, not incompatible with the maintenance of biodiversity and ecosystem processes (Desmet, 1999). However, much of the

remaining natural habitat is vulnerable to a wide range of other threats. These include (Desmet, 1999):

» The expansion of communally-owned land and the associated overgrazing and desertification
» Overgrazing of commercial (private-owned) rangelands
» Agriculture, especially in the valleys of perennial rivers
» Mining for diamonds, heavy minerals, gypsum, limestone, marble, monazite, kaolin, etc.
» Illegal collection of succulents and bulbs.

Namaqualand Strandveld is an extremely widespread vegetation type, especially in the context of the Cape Floristic Region, of which it is a part. This vegetation type extends from the Doringbaai area, some 20 km south of the Olifants River mouth, up the west coast for about 300 km, to the Hondeklipbaai area, and is therefore formally part of the Succulent Karoo biome. The vegetation type typically occurs in a band from 1 to 30 km inland, on deep sands, which are often grey, red, brown or orange. This vegetation type is regarded as a Least Threatened vegetation type in terms of the National Spatial Biodiversity Assessment (NSBA; Rouget *et al* 2004), with 92% of its original extent still intact. Significant habitat losses within this vegetation type have occurred in the recent past as a result of various mining activities along the west coast. Furthermore, Namaqualand Strandveld is significantly under-conserved in formal conservation areas, with less than 1% of the national target of 26% under some sort of conservation management, and it is therefore vulnerable to future transformation. A portion of this vegetation type will be protected within the proposed expansion of the Namaqua National Park in the area between the Groen and the Spoeg rivers.

There is significant variation within Namaqualand Strandveld in any one area, and it is possible to recognise a number of different forms or subtypes (plant communities), some of which are present in the study area.

Typical features of true Namaqualand Strandveld include a high percentage of succulents and leaf deciduous shrubs, moderate bulb diversity, and no Fynbos elements such as Ericaceae (heaths) and Proteaceae (proteas), with few Restionaceae (Cape reeds) and rare, range restricted and/or threatened plant species (more detail is included in Appendix G).

Figure 6.3: Photograph showing typical tall Namaqualand Strandveld, showing dominant succulent perennials

Namaqualand Sand Fynbos is part of an extensive belt, extending some 10 km to the east, 15 km southeast to the Doringbaai area, and over 200 km to the north. The vegetation type tends to occur on neutral to slightly acidic sands that are lighter in colour than Strandveld sands, and with a lower clay fraction. The unit is also listed as a Least Threatened vegetation type by the NSBA, but it is equally poorly conserved, with only 1% of its 29% (of original extent) target formally conserved (Rouget *et al.*, 2004). True Namaqualand Sand Fynbos is characterised by the presence of particular specialist species (refer to Appendix G). This is one of the few vegetation types within Namaqualand that is formally regarded as part of the Fynbos biome, and it is also very unusual in that it appears to be the only Fynbos vegetation type that regenerates in the absence of fire (Mucina & Rutherford 2006). Fires in such arid areas are extremely rare, and most landowners cannot remember their Fynbos areas ever having burnt. The primary threats to Namaqualand Sand Fynbos are climate change and mining for heavy mineral sands.

Figure 6.4: Sand Fynbos in the foreground on a dune ridge (note paler sands), with yellow flowered Strandveld elements (*Othonna cylindrica*)

The topography of the broader study area is described as undulating plains with the coastline (or coastal forelands) to the west characterised by steep cliff faces (refer to Figure 6.5). Two major river valleys occur within the region, these being the Olifants River south of the site and the Klein Goerap River approximately 40 km north of the site. Moving inland the terrain becomes more undulating and hilly, and is characterised by hills and low mountains east of the R363.

The region is characterised by a surface cover comprising primarily of red aeolian sand of Tertiary to Quaternary age, overlying granite and gneiss of the Namaqualand Metamorphic Complex. These wind-blown sands frequently form low-relief, mobile bedforms that are blown over underlying harder calcareous soils. The dunes are able to form up and down the slopes of hills and valleys to reveal micro 'climbing falling' dune morphologies.

The soils reported to occur within the study area are generally deep and have a low agricultural potential. This low agricultural potential is due to a combination of:

» excessive drainage due to the sandy texture
» low fertility associated with the low clay content
» a susceptibility to wind erosion if exposed, caused by the fine to medium grade of sand. This may be especially prevalent in dune areas.

Figure 6.5: Shaded relief map (indicating topography and elevation above sea level) of the broader study area

The low agricultural potential of the soil, coupled with the low rainfall in the area means that there is little potential for arable agriculture in the area and that the soils are suited for extensive grazing at best. The grazing capacity of the area is low, around 10 ha per small stock unit (sheep/goats) (ARC-ISCW, 2004).

The Olifants River valley forms a distinct hydrological feature within the study area. It has to a large degree dictated the settlement patterns in this arid region by providing a source of perennial water for irrigated agriculture. Irrigated cultivation in close proximity to the river is the primary agricultural activity of this district, and has resulted in the alteration of the riparian vegetation along this river.

Four main faunal habitats were identified in the study area: i.e. coastal strip, rocky habitat, white coastal dunes, and inland Succulent Karoo (Namaqualand Sand Fynbos and Namaqualand Strandveld). The coastal strip is a mixture of alternating fine grain sandy beaches and rocky shoreline. At a few locations, rocks extend to well above the high water mark, constituting a distinct habitat for rock-dwelling animal species. The white coastal sand dunes include both vegetated and exposed ones. The inland areas feature low to moderate relief and short xeric Succulent Karoo vegetation on red aeolian sand. The area is not rich in endemic animal species. The emphasis is primarily on smaller animals, rather than on the larger, more obvious big game of other areas.

The insect fauna of the area is poorly known since the large number of species involved and the problem of seasonality imposes considerable limitations on insect surveys of short duration. The survey of Picker (1990) has not revealed the presence of any rare or threatened species of insect in the immediate vicinity of the Namakwa Sands mine site, which is approximately 30 km to the north of the study area.

Sixteen frog species occur in the broader area surrounding the study site (Minter *et al*., 2004). Of these, only three are Red Data species, i.e.

» the Desert Rain Frog (*Breviceps macrops*) - listed as Vulnerable
» the Namaqua Stream Frog (*Strongylopus springbokensis*) - listed as Vulnerable
» the Karoo Caco (*Cacosternum karooicum*) - listed as Data Deficient and is endemic to the arid Karoo regions of the Western and Northern Cape Provinces.

At least 4 chelonian, 39 lizard and 22 snake species occur in the area. From available literature (Branch, 1998) and from previous sampling in the Namakwa Sands area at Brand-se-Baai (De Villiers, 1990; Mouton & Alblas, 2003), it is apparent that 44 reptile species may occur in the present smaller study area (more detail is included in Appendix H). Nine of these species are listed as Red Data species (Baard et al., 1999).

Rautenbach (1990) recorded 19 mammal species and confidently expects a further 16 species to occur in the Namakwa Sands mining area at Brand-se-Baai, 30 km to the north of the proposed site (refer to Appendix H). The species include insectivores, bats, hare/rabbit species, rodents, felid, canids, mustelid, viverrids, the dassie, and antelope species. At least four bat species are expected to frequent the study area (refer to Appendix H), none of which are of conservation importance.

Of the avian microhabitats within the area, the wetlands and Strandveld and Fynbos areas support, or partially support, the bulk of the local avian diversity (124 and 113 species respectively), as well as most of the Red-listed and endemic species of highest conservation priority (refer Appendix I). The Olifants River mouth and estuary is a sensitive area in terms of birds, and has been recognised as an Important Bird Area (Barnes, 1998). It is one of only four perennial estuaries on the west coast, making it an extremely attractive haven for many coastal bird species. Most of the bird species recorded there are water birds. Over 15 000 water birds occur regularly on the estuary.

Two nature reserves are located within the study area, i.e. the Lutzville Nature Reserve which is located approximately 20 km to the south-east of the proposed development site, and the Moedverloren Nature Reserve which is located approximately 25 km to the east of the proposed development site. The proposed Knersvlakte Biosphere Reserve, which has been identified as future Biosphere Reserve area within the West Coast region, incorporates the Moedverloren Nature Reserve.

The proposed site falls within the Knersvlakte Bioregion and is situated at least 30 km to the west of the Knersvlakte Biosphere Reserve 'core area'. Considering the six primary Spatial Planning Categories (SPCs)[8] detailed in the Knersvlakte Bioregion Spatial Plan, the area can currently be categorised as Category C: Agricultural Areas, constituting rural areas where extensive agriculture is practiced (that is, agricultural areas covered with natural vegetation providing for sustainable low-impact agriculture-related land-uses (e.g. stock-farming)). The proposed site is, however, indicated to lie on the periphery of the proposed 'buffer area' of the Knersvlakte Biosphere Reserve, which also includes Koekenaap as well as Transhex and Namakwa Sands mining areas. Currently, the area does not support a public or private conservation area, ecological corridor or rehabilitation area (as earmarked for the 'buffer area'), and would not have the potential to meet one of these land use planning goals while being utilised for extensive agricultural purposes.

6.3.2. Social Profile

The study site falls on the boundary between the District Management Area WCMA01 and the Matzikama Local Municipality (LM).

A number of communities are located in the Matzikama LM, the majority of which are located along the Olifants River. Vredendal is the largest town and functions

[8] The SPCs provide a framework to guide decision-making regarding land-use at all levels of planning, and they have been articulated in a spirit of creating and fostering an organised process that enables people to work together to achieve sustainable development in a coherent manner. The designation of SPCs does not change existing zoning or land-use regulations or legislation.

as the administrative centre of the Matzikama LM. Vredendal accounts for more than 32% of the total population of the Matzikama LM area, and is an advanced town with well-developed infrastructure, including an aerodrome. Other significant settlements within a 50 km radius of the proposed site include Lutzville, Koekenaap, Ebenhaeser, Papendorp (also known as Viswater), Strandfontein and Doringbaai. Between 2001 and 2006 the population within the Matzikama LM increased at an annual average growth rate of ~3.3%. This represents the highest growth rate in the West Coast District Municipality. Population growth is expected to slow down to an average annual rate of 2.5% between 2006 and 2010 (West Coast District, 2006).

Vredendal and Strandfontein have been identified as having high development potential (the Western Cape Growth Potential of Towns Study, 2004). The other towns in the area that are considered to have tourist potential are Doringbaai, Koekenaap, Ebenhaeser, Klawer, Lutzville and Vanrhynsdorp. The type of tourist potential is, however, not clearly defined. The proposed development site does not lie on any commonly used tourism route. However, the shoreline is frequented by people who regularly use the coast for recreational camping over the holiday season. Sites on the coast frequented by tourist include Strandfontein and Doringbaai, which are located along the Olifatnts River to the south of the study area and have formalised holiday accommodation, and Brand-se-Baai and Gert Du Toits-se-Baai, which are located to the north of the Olifants River (and north of the study area) and are frequented by campers.

The sub-regional economy in the area is traditionally based on primary sector activities such as dry land agriculture, livestock farming, fishing and mining, both in terms of employment provision and economic throughput. The agriculture, forestry and fishing sectors are the largest economic sectors in the Matzikama LM, with the agriculture and fisheries sectors providing only seasonal employment in the area.

The relatively deserted coastline is host to a number of mining developments, focussing mainly on diamond and heavy minerals mining. Of the mining activities in the area, the diamond mining operations of TransHex at Die Punt (in Matzikama LM) and the Namakwa Sands heavy minerals sand mining operations at Brand se Baai (in WCMA01) are the most significant. Other mining operations currently take place on the neighbouring farms Geelwal Karoo, Schaapvley Hills and Klipvlei Karoo Kop.

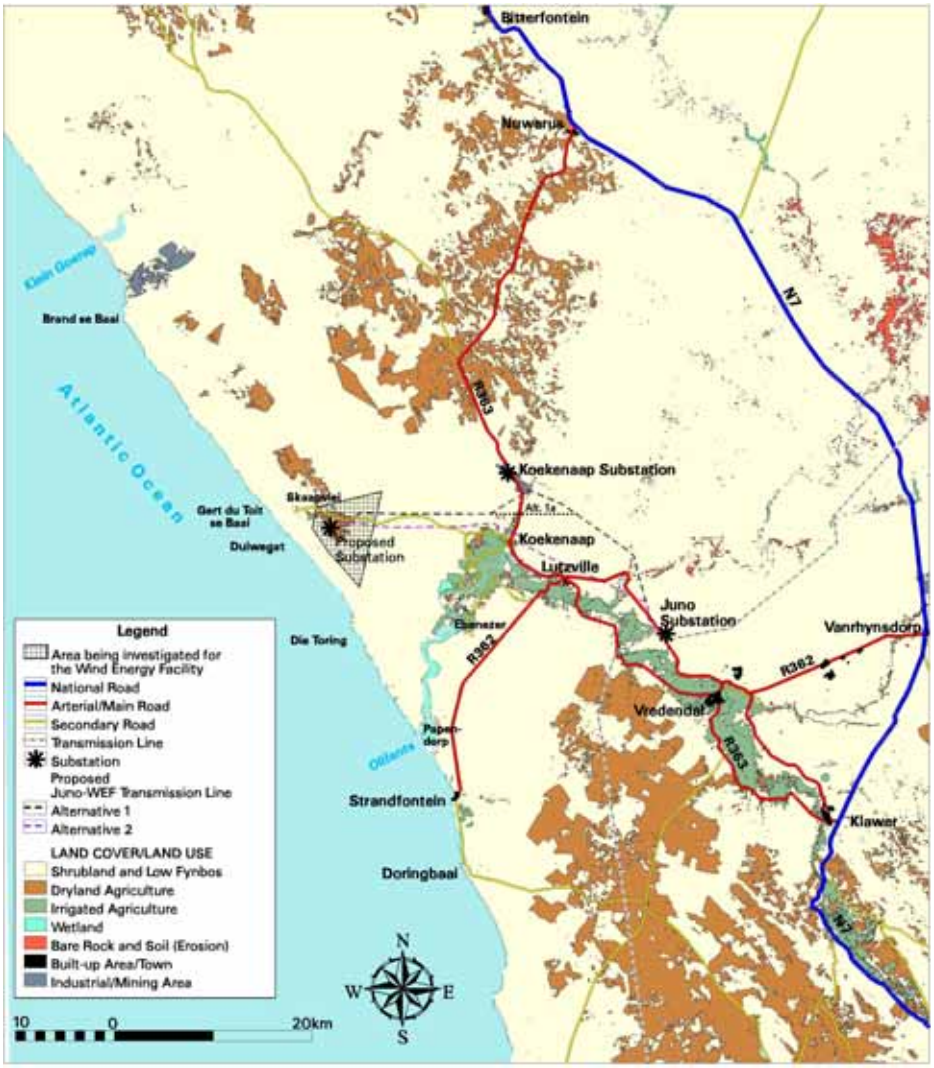


Figure 6.6: Land Cover/Land Use Map

Although unemployment rates of between 10% and 14% (as reported from the 2001 Census data) appear to be low when compared to the estimated June 2006 national employment rate (26.5%), the actual seasonal unemployment rates may be significantly higher due to the seasonal nature of the demand for labour associated with the fruit and vegetable cropping operations along the Olifants River valley. The unemployment rates out of season may, therefore, be significantly higher than the 2001 Census data indicates. In this regard a study undertaken for the WCDM in 2001 estimated that at least 50% of people employed in elementary work were effectively unemployed or underemployed. Youth unemployment is particularly high, with 70% of the unemployed being between the ages of 15 and 34 (West Coast District, 2006).

Based on the 2001 Census data, poverty rates in the area are considered to be high. Of the total number of households in the area, an estimated 30% - 38% had an income of R800 or less per month in 2001. Given the seasonal nature of

the agriculture and fishing industry many of the people in the area do not have access to income throughout the year.

Archaeological sites, mainly shell middens, are known to be common close to the shoreline. These have, however, been disturbed extensively in some areas due to mining activity. The recent presence/occupation of humans in the area is limited to ephemeral traces of agriculture and various impacts resulting from alluvial diamond mining activities, which are also mostly restricted to the immediate coast. The cultural landscape qualities are that of a relatively undisturbed landscape imprinted over by the archaeological sites of late Stone Age hunter gatherers then within the last 2 000 years, transhumant Koekhoen pastoralists. Colonial occupation up to now is ephemeral and of very recent duration. It is understood from recent finds that parts of Namaqualand were occupied by people almost a million years ago, however the greatest amount of archaeological sites are those which relate to the ancestors of the San and Khoekhoen which have been radiocarbon dated to the last 5 000 years. These sites are densest along the immediate coastline but may be found further inland close to water sources or natural foci (dunefields, rock outcrops) on the landscape. Colonial period heritage sites, apart from those related to the relatively recent heritage of mining, are extremely scarce.

6.4. Local Environment: Description of the Proposed Wind Energy Facility Development Site and Associated Power Line Alternatives

The proposed wind energy facility development site lies on the coastal ridge overlooking the Atlantic Ocean at a height of 60 m - 110 m above mean sea level (amsl) and consists of flat to slightly undulating topography, with slopes of less than 4% (Figure 6.7). The routes followed by both power line alternatives lie below 150 m amsl.

The western perimeter of the proposed development site is ~2 km inland from the coastline (i.e. the high-water mark). The natural vegetation is mainly Namaqualand Strandveld and Namaqualand Sand Fynbos. Large portions of the site have been transformed by dry land agriculture and sheep grazing. Access to the site is via the gravel road known as the Skaapvlei road (Divisional Road DR2225).

Figure 6.7: Photograph at the proposed site looking west indicating the nature of the topography within the area

6.4.1. Ecological Profile

The site proposed for the development of the wind energy facility and associated power line is almost completely underlain by unconsolidated to weakly consolidated sediments comprising primarily of red aeolian sand of Tertiary to Quaternary age, overlying granite and gneiss of the Namaqualand Metamorphic Complex. Surface erosion is expected to occur in association with the larger rainfall events.

Vegetated relict dunes cover most of the area north of the access road (Skaapvlei road) which traverse the area selected for the siting of the turbines. These dunes are not expected to be mobile, although local wind transport of sediment and topographic alteration can be anticipated. A much smaller area is evident south of this road. Many of the more obvious linear elements within this dunefield are orientated in a north - south direction.

Numerous, round, enigmatic structures, approximately 20 m in diameter, are assumed to represent mounds created by Meerkats (*Suricata suricatta*) or Harvester Termites (*Microhodotermes viator*) and are present on the study site. These features are also widespread in the area traversed by power line corridor alternatives. No other significant landforms of biological origin are known to be present within the study area. Calcretised root casts can be expected to occur within the unconsolidated cover of aeolian sediments, although no landform is known to be the result of these features in the area proposed for the siting of the wind turbines.

Soils within the broader study area are typically deep, brown to orange to yellow sands, and range from fairly alkaline sands in the more coastal areas to neutral and even slightly acidic sands in the stabilised inland dunes. The soils in the central transitional areas are often loamy sands, with the additional clays coming from underlying clays which are exposed in various places. Exposed rock is rare, but can be found in some of the interdune slacks, with the biggest exposures (each of about six patches covering less than 0.5 ha) occurring in the southern parts of the site on farm Portion 620. These rocks appear to be a form of ferricrete, and may form a hardpan layer below the surface.

The closest significant regional drainage system to the proposed site is the perennial Olifants River, which flows in a south-westerly directly into the sea about 25 km south-east of the study area. No significant drainage lines are located within the site. A small number of drainage lines, erosion gullies and rivers (tributaries to the Olifants River) and associated floodplains are traversed by the two power line alternatives.

Boreholes in the subregion are typically deep (~100 m), exhibit a substantial median depth to groundwater rest level (~60 m), and support a comparatively low median yield (~0.4 L/s). In addition, the groundwater chemistry information indicates a poor overall quality of groundwater in the subregion.

The soil patterns on the site, together with distance from the coast largely determine the vegetation patterns in the area, which is typical of these coastal vegetation types, as fire is not an ecosystem driver in these arid areas (De Villiers, *et al* 2005). The site falls within the Namaqualand coastal region of the Cape Floristic Region, and is used primarily as a sheep grazing area, although there are old strip cultivation areas on about 600ha, which have not been cultivated for at least 12 years.

Two distinct vegetation types occur in the area, and where they meet a highly complex mosaic of both may be found (refer to Figure 6.8). Namaqualand Strandveld (Succulent Karoo biome) occupies the coastal parts of the site, is an extremely widespread vegetation type along the west coast, and is regarded as a Least Threatened vegetation type in terms of the NSBA (Rouget *et al*, 2004), with over 90% still intact, but with 0% formally conserved. At least two Red Data Book listed plant species occur in this area, in low numbers. Namaqualand Sand Fynbos (Fynbos biome) is found in the interior and lower parts of the site on a series of stabilised dunes and interdune slacks. Soils in this area are less alkaline, and about 60% of the species are the same as those found in the Strandveld. This vegetation type is also listed as Least Threatened in the NSBA, with 98% remaining, and a conservation target of 29% (1% currently conserved). At least one Red Data Book listed species was found in this area, in significant

numbers, and the habitat is regarded as more sensitive than the Dune Strandveld area from an erosion and regional botanical point of view.

Sparsely vegetated clay areas are present, mainly in the south-eastern part of the site and on a hill at the western edge of the strip ploughed area (refer to Figure 6.8). These areas support a distinct plant community known as Short Strandveld vegetation that is not represented elsewhere on site (but which is very common in the Hardeveld to the north-east).

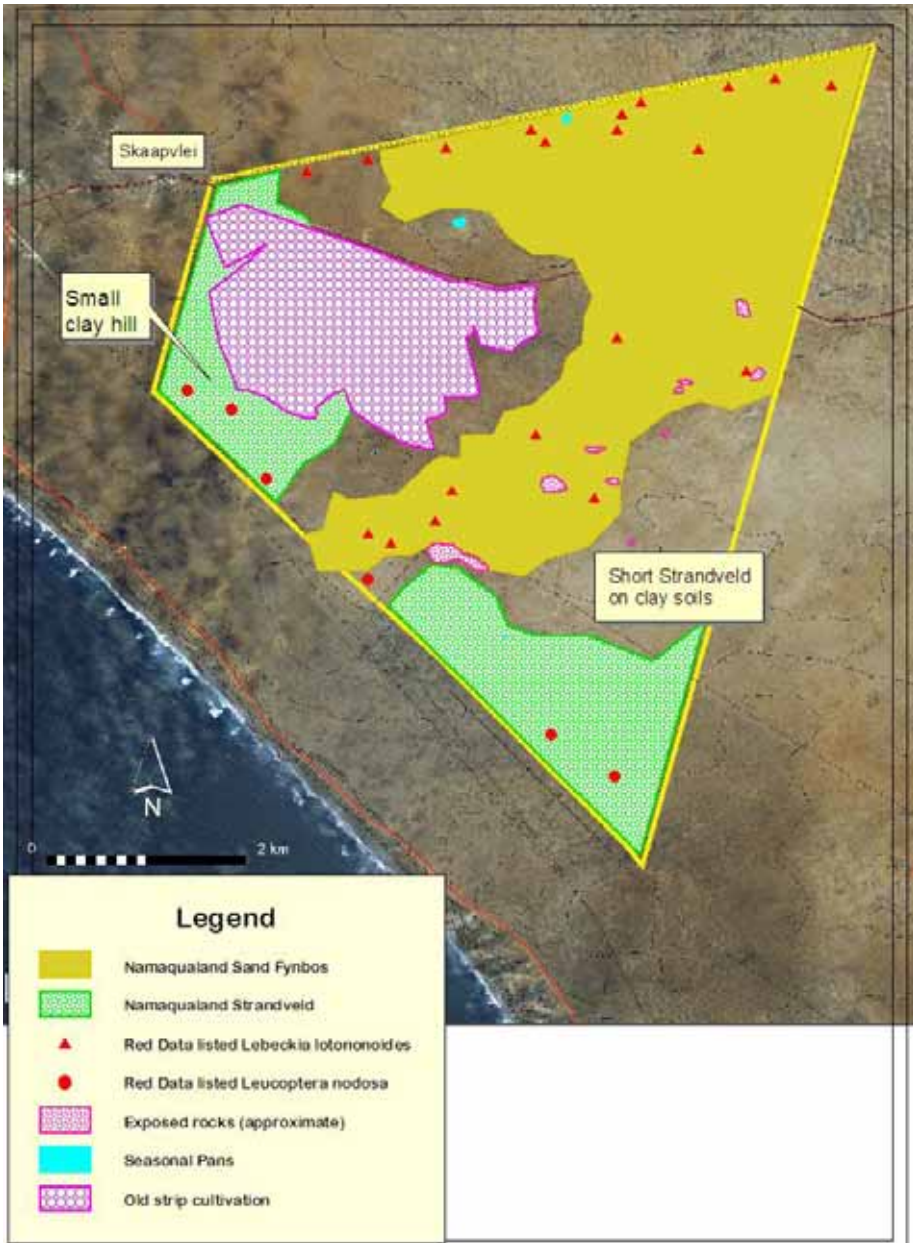


Figure 6.8: Satellite image of study area, showing key ecological & botanical features recorded. Unhatched areas within site are transitional mosaic areas with a mix of both Namaqualand Strandveld and Sand Fynbos. Red Data species locations are approximate only.

Several potentially sensitive plant species were recorded on the site within the various vegetation types:

» *Leucoptera nodosa*, a rare succulent shrub in the daisy family, was recorded in the western areas of the site. This species has recently been Red Data Book listed as Vulnerable. The species seems to occur on the site as scattered individual plants (refer to Figure 6.8), and is never common. The population on site could comprise up to 5% of the total population within a distance of 20 km of the site.
» *Hermannia* sp. *nov*. is possibly an undescribed (i.e. a "new" species) shrub recorded to be quite common on the proposed site. This 1 m tall, attractive shrub is widespread in the Namaqualand Strandveld from the Olifants River north to the Groen River, and is not threatened.
» *Lebeckia lotononoides* is a poorly known species that seems to be restricted to the Namaqualand Sand Fynbos. The sprawling species was recorded as being common on the proposed site (refer to Figure 6.9), mainly in the Sand Fynbos areas, but also in the ecotones. It is not currently Red Data listed, but is likely to be listed as Near Threatened in the forthcoming revision as some of its range is being impacted by mineral sand mining.
» The vygie *Vanzijlia annulata* is restricted to the coastal area from Doringbaai to the Groen River, but is not yet Red Data listed and is fairly common in many areas, including the proposed development site.
» *Ferraria foliosa* is a fairly wide ranging coastal endemic known from the area, and a few plants of a not yet flowering *Ferraria* were recorded on the proposed site, which are likely to be this species. This species is currently Red Data listed as Rare, but is due to be downlisted to Least Threatened.

There is a moderate possibility of other rare or localised plant species such as *Lebeckia lotononoides*, *Eriospermum arenosum*, *Babiana grandiflora* and *B. brachystachys* occurring on site. The Red Data Listed proteoid *Leucospermum rodolentum* is not present.

The sparsely vegetated clay areas support a distinct plant community that is not represented elsewhere on site, with species such as *Cephalophyllum* sp., *Drosanthemum* sp. (bead leaf vygie), *Salsola* sp. (gannabos), *Trachyandra involucrata*, *Bulbine praemorsa*, *Leipoldtia schultzei*, *Monilaria* sp., and *Psilocaulon junceum* (asbos). It is possible that some of these succulents could be regarded as threatened, or that rare geophytes are present in these patches.

The vegetation of the area is protected in terms of the Cape Nature and Environmental Conservation Ordinance (No 19 of 1974). This however provides little protection for the flora because the area is currently zoned for agriculture.

Portion 620 of the farm Olifants River Settlement seems to have been significantly more heavily grazed than the other areas on the proposed site. An estimated 600 ha on the farm Gravewaterkop 158 has been previously cultivated using strip cultivation, having been planted with winter cereals. Significant natural rehabilitation has occurred in the strips since they were last cultivated approximately 12 years ago. The cultivated areas occur primarily on the Fynbos / Strandveld ecotone, although the unploughed strips indicate that the primary vegetation type is Strandveld. It is evident that both the ploughed and unploughed strips have been quite heavily grazed over many years, as a number of the more sensitive species have disappeared, and diversity is significantly lower here than in the nearby Strandveld areas where no strips are located.

Vegetation types crossed by the proposed power line alternatives include Namaqualand Strandveld, Namaqualand Sand Fynbos, Namaqualand Riviere, Namaqualand Spinescent Grassland, Vanrhynsdorp Gannabosveld and a small portion of Knersvlakte Quartz Vygieveld. Of these, the only potentially sensitive vegetation type in terms of the NSBA analysis (Rouget *et al* 2004) is the Knersvlakte Quartz Vygieveld. Namaqualand Strandveld, Namaqualand Sand Fynbos, Namaqualand Riviere, Namaqualand Spinescent Grassland are not considered to be a threatened ecosystem, and all have large untransformed portions within the Knersvlakte or on the Namaqualand coastal plain.

The Knersvlakte Quartz Vygieveld crossed by the proposed power line Alternative 1 contains significant patches of vegetation consider to be of very high sensitivity. Typical white quartzite pebble patches are the main feature of importance, although there also some unusual outcrops of virtually black rock. The quartz patches support a very high density of rare, threatened and localised plant species, most of which are bulbs and dwarf succulents. From a distance the areas may look totally devoid of plant life, but actually this is a high diversity habitat, and one that it very sensitive to any form of disturbance at all, as the dwarf succulents are easily crushed. This habitat type is one of the two most important habitats with the Knersvlakte Biosphere Reserve, and supports well over 50% of the 225 or so Knersvlakte endemic plant species.

Seven areas of small (< 1 ha in extent) non-perennial pans occur on the proposed development site. The largest of the identified pans is located north of the Skaapvlei road. The pans occur in a matrix of sandy soils, but are formed where the underlying clays come to the surface. The pans on this site do not appear to support any significantly different natural vegetation, which may be partly a result of disturbance in the form of heavy grazing. However, they have high ecological value, as the only natural open water sources in the area. These pans usually contain water for limited periods, typically during winter and spring, and may support numerous invertebrates, which attract wading birds such as

spoonbills, ducks, etc. Many other birds visit the pans when they contain water, but they are usually too saline for frogs.

Natural wildlife is common on the site, but species diversity is low – small and medium bovids (springbok, steenbok and duiker), small carnivores (meerkat and aardwolf) along with numerous rodents, birds and reptiles were observed during the course of this study. The presence of faunal species is dictated by the habitats present on and adjacent to the development site, and includes Strandveld, Sand Fynbos, permanent, seasonal and ephemeral pans, cultivated lands (including the old cultivated areas located on the farm Skaapvlei, and farmhouses, outbuildings and other rural infrastructure), and alien trees (mostly eucalypts and acacias in the areas crossed by both of the proposed routes for the power line running to the east of the proposed development site).

» There is no known presence of any rare or threatened species of insect on the proposed development site.
» Of the 16 frog species occurring in the broader study area, only the Namaqua Rain Frog (*Breviceps namaquensis*) and the Namaqua Caco (*Cacosternum namaquense*) potentially occur on the study site. The Karoo Toad (*Bufo gariepensis*) may be present further inland and therefore may occur in the area affected by the proposed power line. The Namaqua Rain Frog breeds terrestrially (i.e. there is no larval stage and no water body is required for breeding). The Namaqua Caco, on the other hand, needs at least a temporary water body for breeding. None of the three species potentially occurring in the study area are classified as Red Data species (Minter *et al*., 2004).
» Nine of the possible 44 reptile species are listed as Red Data species, three being classified as Vulnerable (i.e. Lomi's Blind Legless Skink, Armadillo Girdled Lizard and the Namaqua Dwarf Adder), two are classified as Lower Risk (i.e. the Large-scaled Girdled Lizard and the Namaqua Plated Lizard) and four are listed as Data Deficient (i.e. Cuvier's Blind Legless Skink, Austen's Thick-toed Gecko, the Rough Thick-toed Gecko, and the Speckled Padloper tortoise).
» An approximate 35 mammal species are anticipated to be present on the site, and inclued six insectivores, four bats, two hare/rabbit species, 10 rodents, one felid, three canids, one mustelid, five viverrids, the dassie, and two antelope species. Only two of the 11 Red Data species occurring in the broader study area, may be present in the study area, namely Grant's Golden Mole and the Namaqua Dune Mole-rat.
» At least four bat species are expected to frequent the study area (refer to Appendix H), none of which are of conservation importance.
» As many as 257 bird species could potentially be supported by the variety of avian microhabitats within the study area. Of these, 24 species are Red-listed, 66 species are regional endemics or near-endemics, and eight species

are Red-listed endemics (Barnes 2000, Hockey et al. 2005), of which two – Ludwig's Bustard and Black Harrier - are likely to occur regularly within the immediate footprint area of the wind energy facility.

» A total of 18 Red Data bird species were recorded across the study area, 6 of which are classified as Vulnerable and 12 as Near-threatened (details are provided in Appendix I).

» Bird species of conservation priority considered likely to occur in significant numbers within the area of the proposed wind energy facility site include Cape Spurfowl, South African Shelduck, Ludwig's Bustard, Southern Black Korhaan, Karoo Korhaan, Curlew Sandpiper, African Black Oystercatcher, Grey Plover, Common Ringed Plover, Chestnut-banded Plover, Caspian Tern, Swift Tern, African Marsh-Harrier, Black Harrier, Martial Eagle, Secretarybird, Lesser Kestrel, Lanner Falcon, Peregrine Falcon, White-breasted Cormorant, Cape Gannet, Crowned Cormorant, Bank Cormorant, Cape Cormorant, Greater Flamingo, Lesser Flamingo, Great White Pelican, Cape Bulbul, Layard's Tit-Babbler, Namaqua Warbler, Cape Clapper Lark, Karoo Lark, Cape Long-billed Lark, Sickle-winged Chat, and Black-headed Canary.

6.4.2. Social Profile

The study site and surrounds are sparsely populated. Human-made environment is limited to occasional wind pumps, fenced stock camps and off-road tracks which are only accessible with a four wheel drive vehicle. Much of the landscape, even within the site is undeveloped, being devoid of paths or tracks and is only accessible on foot. Ambient noise levels recorded in this area are considered to be equal to the acceptable day- and night-time noise rating levels for a rural residential district.

The closest farm homesteads or residences that might potentially be impacted upon by the proposed wind energy facility are located at Skaapvlei, Skilpadvlei and Nooitgedag (refer to Figure 6.9).

» The current operation on the farm Skaapvlei is comprised of a core flock of approximately 650 sheep. The average carrying capacity of Skaapvlei has been formally assessed at 7 ha/1 Standard Stock Unit (SSU) (Hansie Visser, pers. comm). One permanent labourer is associated with the operation. Two farmhouses are associated with Skaapvlei, with only one of the farmhouses permanently occupied. The second house is used as a second home utilised by the landowners. Two families currently reside on the property, one of which is the permanent worker on Skaapvlei. A number of outbuildings – including storage facilities for fodder – are also associated with Skaapvlei Farm.

» Skilpadvlei is currently utilised for grazing for approximately 500 sheep. The estimated average carrying capacity is 4 ha/1 SSU in good rainfall years, and

7 ha/1 SSU in dry years. One permanent labourer is associated with operations on Skilpadvlei. One farmhouse and a number of outside buildings are located on Skilpadvlei. One of the buildings is permanently occupied by the labourer and his family.

Figure 6.9: Locality map indicating the proposed wind energy facility site and proposed power line alternatives in relation to farm homesteads or residences and places of interest

» Nooitgedag and associated irrigation area smallholdings is currently utilised for sheep grazing. The property is currently being leased to Mr Samuel Agenbach. However, the landowner has indicated that he intends to develop the property for wilderness based tourism purposes in the future. Current activities include farming with a core flock of 600 sheep. The estimated average carrying capacity is 9 ha/1 SSU. Drought fodder for Nooitgedag is

sourced from the irrigation area smallholdings. One farmhouse is located on Nooitgedag, but is currently unoccupied. Currently, one permanent and tenured farm worker is associated with Nooitgedag.

Skaapvlei road is a proclaimed public road (DR2225), and is approximately 24 km in length. The entire road is a gravel road and in many areas crosses unstable sandy areas. The local road users have indicated that erosion on the road surface is common and problematic, and that road maintenance is difficult. As a result the road only remains in good riding condition for a short period after it has undergone route maintenance. For the remainder of the time the road is in a poor condition, which is exacerbated by the use of the road by heavy vehicles associated with the current mining operations in the area.

A number of smallholdings near Koekenaap currently gain access from the Skaapvlei road. In addition, the road provides sole road access to five active farming operations. These are (from Koekenaap in the east to Skaapvley Hills in the west):

» Kommandokraal Farm (Mr De Klerk)
» Skilpadvlei (Mr De Waal)
» Skaapvlei (Mr Hansie and Hennie Visser)
» Elsie Erasmus Kloof (Mr Frits Visser)
» Geelwal Karoo (Mr Willem Agenbach).

Two permanently inhabited houses are located adjacent to the road on Kommandokraal, and one on Skaapvlei. In addition, a further two farm houses currently utilised as second homes, are located adjacent to the road on Skaapvlei and Elsie Erasmus Kloof, respectively. The Trans Hex housing node on Skaapvley Hills is located at the western terminus of the Skaapvlei road. The road provides sole road access to sixteen associated households.

Due to the relative inaccessibility of the area, most of the associated tourism use is on an ad hoc 'self-drive' basis. A 4x4 vehicle is generally required in order to make use of the available road infrastructure along the coast, and until recently access control exercised by TransHex prevented members of the general public from accessing the land south of Skaapvlei. The absence of ablution facilities and potable water infrastructure also acts as a deterrent. Very few tour operators currently make use of the area. The most notable exception is Mr. Wynand Wiggens, a local farmer and tour operator who has developed the Swart Tobie hiking trail. The trail is 92 km long, and stretches from Brand se Baai in the north to the Olifants river estuary in the south.

Colonial period heritage is extremely scarce in the study area and surrounding vicinity. There are no built structures close to, or within the study area apart

from the provincial road, off-road tracks, stock drinking troughs, grazing camps and wind pump reservoirs. The nearest built settlement to the site is the Skaapvlei farm (just to the north of the site) and the Transhex mining camp a number of kilometres to the south of the site. Neither of these places can be considered to be significant heritage resources, although buildings and family graves at the Skaapvlei farm (not on the proposed development site) may be more than 60 years old.

Within the study area, the general patterning of pre-colonial occupation is very much in keeping with what would be expected in an arid area. Some 65 observations of archaeological material were recorded during the course of the study (refer to Appendix L). Many of these are ephemeral scatters which would not be impacted by the proposed development. The inland areas of the landscape are almost devoid of surface archaeological material, however ephemeral occurrences of mostly Middle Stone Age (MSA) material were noted associated with low ferricrete rafts, particularly in the central eastern part of the area. Almost every blowout/deflation that was inspected showed evidence of pre-colonial Late Stone Age occupation. These sites are generally ephemeral typically consisting of no more than 20-60 fragments of flaked quartz or silcrete with very little shell or bone.

A concentration of small shell middens was recorded at each of two dried springs that were once waterholes with potable water (Figure 6.10). The contents of the sites are varied – many are ephemeral limpet dominated shell scatters (Figure 6.11) that are visible in what was more recently ploughed land. These middens probably represent short duration camps. At least 3 of the sites are dense middens (even though they are some 3 km from the coast) and included fragments of animal bone. Stone artefacts are present on all sites. The raw materials used are wide ranging – notably quartz, crystal quartz, very high quality silcrete, hornfels, quartzite as well as cryptocrystalline silicates. The assemblages tend to be informal despite the high grades of raw material available. Ceramics are present on many of the waterhole-associated sites indicating that part of the occupation span took place within the last 2 000 years.

The value of the waterhole related sites is that they represent two complete systems of occupation which are of scientific value in terms of their potential to provide information about the cultural affinities of the people who lived there, and the time depth of their occupancy of the area.

Figure 6.10: A water hole which was the focus of settlement

Figure 6.11: One of the denser LSA middens found on the development site

The inspection of local existing borrow pits has revealed that the stratigraphy of surface sediments throughout the study area is similar. Typically the surface consists of red-yellow aeolian sands deposited over compacted and cemented sand, in places enriched by the presence of heavy minerals. The interface is commonly known as the Doorbank horizon – a hard crust of cemented material that is quite resistant to mechanical intrusion. Middle Stone Age material was noted eroding out of the interface between the recent sands and the underlying harder layers. The implication of this is that (as has been noted throughout the region) there is a generalised scatter of Early and Middle Stone age material dispersed throughout the study area on the Doorbank horizon where it has

become conflated and concentrated by natural processes over thousands of years. Ephemeral occurrences of Middle Stone Age artefacts were noted within the study area associated with low outcrops of ferricrete, however none of these are considered significant. Many of these artefacts are probably in secondary context as it was noted that the outcrops had attracted burrow-digging animals. The material was probably unearthed from the hardpan crust (Pleistocene Doorbank horizon) that underlies the surface sands throughout the region.

Fossil bone-rich archaeological sites have been noted close to the shoreline near Cliff Point and at Brand Se Baai. Sites such as these are rare and considered to be extremely valuable heritage resources. There is a possibility that fossil-rich Pleistocene deposits do exist in the study area in the aeolian sand body lying above the Doorbank horizon, possibly in the part of the site which is situated back from the summit of the coastal ridge.

ASSESSMENT OF IMPACTS: PROPOSED WIND ENERGY FACILITY CHAPTER 7

The construction activities for a wind energy facility project include land clearing for site preparation and access/haul roads; transportation of supply materials and fuels; construction of foundations involving excavations and cement pouring; compaction of laydown areas and roadways, manoeuvring and operating cranes for unloading and installation of equipment; laying cabling; and commissioning of new equipment. Decommissioning activities may include removal of the temporary project infrastructure and site rehabilitation. Environmental issues associated with these **construction** and **decommissioning** activities may include, among others, threats to biodiversity and ecological processes, including habitat alteration and impacts to wildlife through mortality, injury and disturbance; impacts to sites of heritage value; soil erosion; and nuisance noise from the movement of vehicles transporting equipment and materials during construction.

Environmental issues specific to the **operation** of a wind energy facility include visual impacts; noise produced by the spinning of rotor blades; avian/bat mortality resulting from collisions with blades; and light and illumination issues.

These and other environmental issues have been identified through a scoping evaluation of the proposed wind energy facility on the West Coast. Potentially significant impacts identified have now been assessed within the EIA phase of the study. The EIA process has involved input from specialist consultants, the project proponent, as well as input from key stakeholders (including government authorities) and interested and affected parties engaged through the public consultation process. The significance of impacts associated with a particular wind energy facility is dependant on site-specific factors, and therefore impacts vary significantly from site to site.

This chapter serves to assess the identified potentially significant environmental impacts associated with the proposed site for the development of a wind energy facility, and to make recommendations for the management of these impacts for inclusion in the Environmental Management Plan (refer to Appendix S).

7.1. Methodology for the Assessment of Potential Impacts associated with the proposed Wind Energy Facility

In order to assess the impacts associated with the proposed wind energy facility, it was necessary to understand the extent of the affected area. The affected area primarily includes the turbines, substation and associated access roads. A wind

energy facility is dissimilar to other power generation facilities in that it does not result in whole-scale disturbance to a site. A site of 37 km^2 (or 3 700 ha) was originally considered for the facility, with the anticipation that an area of ~25 km^2 would be required for the placement of the required infrastructure within this broader site. From the results of the facility layout determination exercise, it is now apparent that the effective utilised area required to accommodate the infrastructure is in fact approximately 16 km^2 in extent. This amounts to ~42% of the total 37 km^2 site earmarked for development, and is illustrated in Figure 7.1 below.

Figure 7.1: Illustration of the wind energy facility layout and the effective utilised area of 16 km^2 required to accommodate the bulk of the associated infrastructure.

The bulk of this effective area required for the wind energy facility footprint would not suffer any level of disturbance as a result of the required activities on site. Permanently affected areas comprise 100 turbine footprints (100 foundation areas of 15 m x 15 m in extent), access roads (6 m in width), a substation footprint (80 m x 80 m in extent) and a visitor's centre (~1 000 m^2 including

buildings and parking areas). The area of permanent disturbance can be summarised as follows:

Facility component - permanent	Approximate area/extent (in m^2)
100 turbine footprints (each 15 m x 15 m)	40 000
Permanent access roads (excluding Skaapvlei road which is an existing permanent feature bisecting the site) and power line footprints (parallel to permanent access road)	210 000
Substation footprint (80 m x 80 m)	6 400
Visitors centre buildings and parking areas	1 000
TOTAL	**257 400** (of a total area of 37 001 985) = 0.7% of site

Temporarily affected areas comprise laydown areas for turbines (each laydown area with a footprint of 40 m x 40 m) as well as a track of an additional 8 m in width for the crawler crane to move across the site (i.e. an additional 8 m width to the permanent road of 6 m in width). The 33 kV cabling to connect the turbines to the substation is to make use of the disturbed area travelled over by the crane. An approximately 1 m wide trench would be excavated, the cabling laid and the area rehabilitated. The area of temporary disturbance is as follows:

Facility component - temporary	Approximate area/extent (in m^2)
100 turbine laydown areas	160 000
Temporary crane travel track (8m) adjacent to permanent access road PLUS trench for 33 kV cabling	280 000
TOTAL	**440 000** (of a total area of 37 001 985) = 1,2% of site

If both the permanent and temporary disturbance areas detailed above are considered together, it is realised that a total area of 697 400 m^2 (i.e. almost 70 ha) can be anticipated to be disturbed to some extent (either permanently or in the short-term) during the construction of the wind energy facility. This amounts to **less than 2%** (i.e. a total of 1.9%) of the total 3 700 ha area which will form part of the total wind energy facility site.

In order to assess the areas where impacts could occur on the site, a site layout optimisation exercise revealed the best possible positions for the turbines, substation and other infrastructure from a technical perspective. It was proposed that the 100 turbines are constructed in four rows (marked as rows A-D) which lie parallel and equidistant to one another. In order to accommodate some element of flexibility for the actual physical placement of the turbine on the ground (e.g. in

order to avoid or mitigate an area of environmental sensitivity), the "turbine rows" were considered as "corridors" of disturbance. Each "corridor" would contain the turbines within the row together with other associated infrastructure such as the access road, laydown areas, cabling trench etc. There are, therefore, four "corridors" of disturbance across the site which were considered in detail through the specialist studies. These corridors were the focus of the studies, and in instances where ground-truthing was required, the corridors were investigated in more detail than the areas in between the corridors.

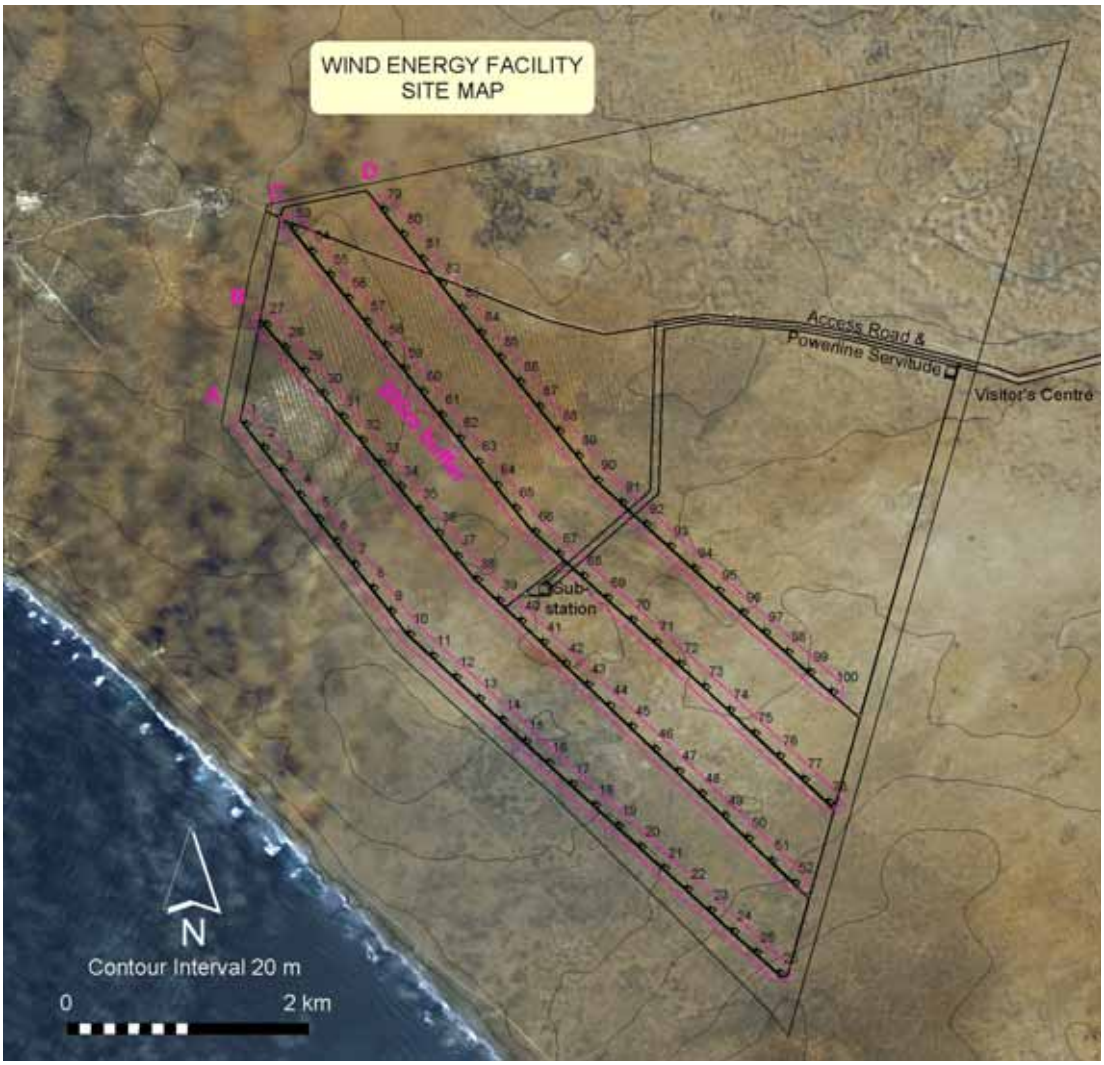


Figure 7.2: Illustration of the wind energy facility layout and the 200 m wide impact corridors identified for investigation.

For those specialists who were required to consider each turbine position as a separate/discrete "unit", the turbine positions provided were used as being 90% accurate.

A fifth disturbance corridor (not illustrated on the plan) also 200 m in width and equidistant from Row D was also investigated by those specialist investigations. This fifth corridor would effectively accommodate any turbines within rows A to D

which cannot be constructed on its specific earmarked site due to an environmental constraint – that is, this turbine could then be replaced by a turbine in row E to keep the number at approximately 100 turbines. The fifth row would be considered as "spare" positions only, and because of the distance from the ocean would not be considered as optimally placed turbines.

The substation was placed in a central position between Rows B and C in order to facilitate reducing the length of the longest cable required. This position was also considered practical as the facility is proposed to be built in the 2 phases, and one substation will therefore be able to service both Phase 1 and Phase 2.

Therefore, to summarise, the assessment considered the facility as 100 turbine positions plus related infrastructure as "impact corridors" (Rows A-D plus E), plus the substation site and access road. The "impact corridor" considered was 200 m wide and would accommodate the turbine footprints, laydown areas and internal access roads and underground cabling.

7.2. Assessment of Potential Impacts associated with the Construction and Operation of the Proposed Wind Energy Facility on the Identified Site on the West Coast

The sections which follow provide a summary of the findings of the assessment undertaken for potential impacts associated with the construction and operation phases of the proposed wind energy facility on the identified site. Issues were assessed in terms of the criteria as detailed in Chapter 4 (with the scores as per the significance methodology provided in brackets). Potential direct and indirect impacts of the proposed wind energy facility are assessed, and recommendations are made regarding mitigation and management measures for potentially significant impacts.

7.2.1. Potential Impacts on Vegetation

Impacts on vegetation may be both direct and indirect, with the former occurring mostly at the construction stage and the latter mostly at the operational stage. As there are no obvious concentrations of rare species or any threatened habitats or vegetation types on site there are **no areas of regionally high or very high sensitivity**. The development footprints will not impact on any botanical "no go" habitats or areas. Overall the impact of the proposed wind energy facility on the vegetation on site is likely to have a medium local (site scale; 3 700 ha site) and low regional (southern Namaqualand coast; < 500 000 ha) impact. The primary negative impacts are direct, permanent loss of natural vegetation (30 ha to 70 ha) in development footprints, and direct, long-term loss of natural vegetation (30 ha to 70 ha) in areas that will be disturbed by heavy construction machinery,

temporary dumping, etc. Most of these impacts cannot be avoided or mitigated in any significant way.

Indirect negative effects on the vegetation (disruption or change in ecological processes, shading, disturbance of wind flow, etc.) are likely to be minimal.

Impact table summarising the significance of impacts on vegetation (with and without mitigation)

Nature: Permanent loss of vegetation and habitat		
Direct permanent loss of vegetation in the development area (due to construction) is unlikely to amount to more than 20% (possibly no more than 15%) of the Strandveld, and 5% (possibly no more than 3%) of the Sand Fynbos on site. Approximately 25 km^2 of linear disturbance could be caused by the four turbine impact corridors and associated 6 m wide roads, and a further 20 ha of turbine bases and laydown areas, substation and visitors centre. It is estimated that less than 30 ha of vegetation will ultimately be *permanently* lost as a result of the establishment of the wind energy facility, which is less than 1% of the total 3 700 ha site (refer section 7.1).		
	Without mitigation	**With mitigation**
Extent	Local and regional (2)	Local and regional (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low – Medium (5)	Low (3)
Probability	Definite (5)	Definite (5)
Significance	**Medium – High (60)**	**Medium (45)**
Status (positive or negative)	Negative	Negative
Reversibility	Not in direct building footprints (<50 ha), but possible in other disturbance areas (<80 ha), although will take many decades.	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Partially	
Nature: Long-term loss of vegetation and habitat		
Disturbance of the natural vegetation as a result of heavy machinery and cable excavation will occur in various areas. Disturbance will be long-term but temporary, as these areas should eventually recover to a significant degree (if natural vegetation is retained in the adjacent areas). But it could take at least 15 years (and possibly much longer if rainfall is below normal) in order to recover to a point where at least 80% of the original diversity is once again present. Certain species may not return for many additional years, due to changes in soil structure (compaction).		
	Without mitigation	**With mitigation**
Extent	Local and regional (2)	Local and regional (2)
Duration	Long-term (4)	Long-term (4)

Magnitude	Low to Medium (5)	Low (3)
Probability	Definite (5)	Definite (5)
Significance	**Medium (55)**	**Medium (45)**
Status (positive or negative)	Negative	Negative
Reversibility	Not in direct building footprints (<50 ha), but possible in other disturbance areas (<80 ha), although will take many decades.	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Partially	

Mitigation:

» In order to minimise direct impacts on the habitats/vegetation, as much of the the previously cultivated area as possible should be utilised for the placement of infrastructure.

» The high local sensitivity area (clay hill) at the western corner of the site should ideally not be developed, as this supports an unusual mix of species on heavier clay soils, including at least one Red Data Book listed species (*Leucoptera nodosa*). This is likely to affect the first three turbine positions (turbines 1-3). In terms of best practice, the suggested mitigation is to move the turbines which affect this area (best practice requires avoidance of impacts). Where total avoidance of the sensitive area is not feasible, a suitably qualified botanist should be contracted to position the turbines and infrastructure in this area with the least impact possible, and to plan a Search & Rescue program for any plants of concern that can be translocated.

» Search and Rescue should be undertaken by a suitably qualified botanist in order to locate any sensitive plants before development and remove them to secure areas.

» Search and Rescue of certain translocatable, selected succulents, shrubs and bulbs occurring in permanent, hard surface development footprints (i.e. all buildings, new roads, and turbine positions) should take place.

» All rescued species should be bagged (and cuttings taken where appropriate) and kept in an on-site nursery (if water can be provided; otherwise off site) and should be returned to site once all construction is completed and rehabilitation of disturbed areas is required.

» Roads should be kept to a minimum (as per draft layouts presented, with only one or two links between turbine rows) in order to limit direct vegetation loss and habitat fragmentation (indirect impact).

» Following construction, rehabilitation of all areas disturbed during the construction phase and that are not required for regular maintenance operations must be undertaken. The main areas thus requiring rehabilitation will be parts of the laydown areas next to the turbines, the crane tracks alongside the permanent 6m roads, any cable routings where these fall outside the above-mentioned areas, and disturbed areas around the planned visitor centre and substation.

» All livestock should be removed from the site in order to facilitate rehabilitation.

» Mitigation, management and rehabilitation measures as detailed in the EMP must be implemented (refer to Appendix S).

Cumulative impacts

» Regional negative impact.
» Impacts of this type of development will be significantly less than for various existing and proposed mining operations in the region.

Implications for Project Implementation

» As there are no obvious concentrations of rare species or any especially threatened habitats or vegetation types on site there are no areas of regionally high or very high sensitivity.
» The development footprints will not impact on any botanical "no go" habitats or areas.
» The high local sensitivity area (clay hill) at the western corner of the site should not be developed, as this supports an unusual mix of species on heavier clay soils, including at least one Red Data Book listed species (*Leucoptera nodosa*). This is likely to affect the first three turbine positions (WTG 1-3), and suggested mitigation is to move these three out of this area (best practice requires avoidance of impacts). If this is not done then a suitably qualified botanist should be contracted to position the turbines and infrastructure in this area with the least impact possible, and to plan a Search and Rescue program for any plants of concern that can be translocated.
» Search and Rescue of certain translocatable, selected succulents, shrubs and bulbs occurring in permanent, hard surface development footprints (i.e. all buildings, new roads, and turbine positions) should take place prior to construction within the entire development area.
» All livestock should be removed from the site in order to facilitate rehabilitation.

7.2.2. Potential Impacts on Terrestrial Fauna

A wide range of vertebrate species, including threatened lizard and mammal species, are expected to occur in the general area where development will take place. Of the four faunal habitats identified in the immediate area (i.e., coastal strip, coastal dunes, rock and inland Succulent Karoo vegetation), the wind energy facility will only impact on the inland Succulent Karoo habitat (Namaqualand Strandveld and Namaqualand Sand Fynbos). Due to its extent and homogenous nature, this habitat is the least sensitive of the four habitats, although at least two Red Data reptile and one Red Data mammal species may be associated with it.

Five risk sources are expected to be associated with the construction of a wind energy facility on the proposed site. These are direct mortality of animal species during construction, habitat destruction, increased road kills, the barrier effect of roads and fences, and bat collision fatality.

Impact tables summarising the significance of impacts on terrestrial fauna (with and without mitigation)

Nature: ***Direct mortality on terrestrial fauna during construction of the wind energy facility and associated infrastructure***

Those species that cannot flee from the affected areas by themselves during the construction phase of the wind energy facility could potentially suffer direct mortality. Birds, large snakes and medium-sized mammals would be able to flee from the affected areas at the start of site clearing and/or construction. Tortoises and many other reptiles, as well as amphibians and small mammals, will not be able to flee effectively, either because they are too slow or because they are predisposed to take shelter. These species could therefore suffer direct mortality due to site clearing and excavations. Several species potentially occurring in the areas to be affected, are fossorial and will also not be able to flee.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Short-term (1)	Short-term (1)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Low (20)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Not applicable	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

Removal of animals from the affected areas before the start of site clearing/construction and relocating these to safe areas would only be a valid mitigation option in the case of tortoises. All other reptile and small mammal species are extremely difficult to catch and it would be a futile attempt to try and relocate them. Before site clearing, affected areas should be thoroughly searched for tortoises and meerkat colonies. Tortoises found must be released in adjacent unaffected areas. Meerkat colonies in affected areas should be dug up manually, affording the animals a fair chance to escape before heavy machinery is brought into the areas to clear the site or excavate.

Cumulative Impacts:

» Impacts of this type of development will be significantly less than for various existing and proposed mining operations in the region.

Nature: ***Loss of faunal habitats***

The construction of the wind energy facility, the erection of a transmission line and the upgrading of the access road will result in the loss of faunal habitat, which may impact on terrestrial fauna species.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)

Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (0)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	In many cases the impact will be irreversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

Instead of blanket site clearing for the erection of the wind turbines within the proposed site, the goal should be to keep as much as possible of the natural habitat within the site intact. By doing this, the significance rating of the impact could probably be lowered to *Low*.

Cumulative Impacts:

» Regional negative impacts on habitat loss and fragmentation.
» The impacts of this type of development will be significantly less than for various existing and proposed mining operations in the region.

Nature: Increased road kill rate

Two important impacts of the South African road system on terrestrial fauna in general are that of road kills and dispersal barriers. During the last three decades, collisions with vehicles probably overtook hunting as the leading direct human cause of vertebrate mortality on land (Forman & Alexander, 1998).

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (1)	Short-term (1)
Magnitude	Minor (2)	Small (0)
Probability	Probable (3)	Probable (3)
Significance	**Low (12)**	**Low (6)**
Status (positive or negative)	Negative	Negative
Reversibility	Not applicable	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

During the construction phase, a speed limit of 80 km/h on the access road should be enforced. The access road should be cleared of tortoises in advance of heavy equipment being transported along the route in order to avoid unnecessary fatalities. Eskom will need to dedicate a resource to do this or it must be the clear responsibility of somebody on the site.

Cumulative Impacts:

» Regional negative impacts as a result of increased road infrastructure.

» Cumulative impacts as a result of increased numbers of vehicles (particularly heavy vehicles) moving in the area (other vehicles are typically associated with the mining activities, farming activities or tourism).

Nature: Barrier effect of roads and fencing

The barrier effect of roads impacts on lower vertebrates and invertebrates, which may find hard road surfaces impassable barriers. The barrier effect of roads and fencing will only impact on species in the long-term. The risk will therefore only be applicable to the operational phase of the wind energy facility.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

The effect of surface quality on the ability of small animals to cross hard surfaces is not known, but it is expected that gravel surfaces will be less daunting for them than asphalt ones.

Cumulative Impacts:

Regional negative impacts as a result of increased road infrastructure and development.

Nature: Bat collision fatalities

Bat mortality at wind energy plants has been reported on worldwide. Bats occurring in the area may potentially suffer mortality from the rotor blades of the turbines when these animals forage at night, specifically if attracted to insects which are attracted to lights of, for example, the substation. The risk is only applicable to the operational phase of the wind energy facility, and major bat mortality is unlikely to occur at this site.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (1)
Probability	Probable (3)	Probable (3)
Significance	**Low (21)**	**Low (18)**
Status (positive or	Negative	Negative

negative)		
Reversibility	Not reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Partially	
Mitigation: Excessive lighting at the facility may attract flying insects and therefore also bats, which may lead to increased mortality. Excessive lighting at the facility should be avoided.		
Cumulative Impacts: None		

Implications for Project Implementation

» With the exception of habitat loss, the impacts on terrestrial fauna have all been rated as being of low significance. The impact of habitat loss is rated as being of medium significance.
» With the implementation of appropriate mitigation measures and the limitation of habitat destruction, all impacts on terrestrial fauna can be minimised to low significance.

7.2.3. Potential Impacts on Avifauna

The impact zone of the wind energy facility and its associated infrastructure is likely to support as many as 257 bird species, of which 24 species are Red-listed, 66 species are regional endemics or near-endemics, and eight species are Red-listed endemics (Barnes 2000, Hockey et al. 2005), of which two – Ludwig's Bustard and Black Harrier - are likely to occur regularly within the immediate footprint area of the facility site. Of the six avian microhabitats identified, the wetlands and pristine and degraded Strandveld and Fynbos areas support or partially support the bulk of the local avian diversity (124 and 113 species respectively), as well as most of the Red-listed and endemic species of highest conservation priority.

A shortlist of 35 priority species was selected to include the following groups of species on the following basis:

» All Red-listed species considered likely to occur in the area with some regularity, particularly including those recorded in SABAP data for the general area in at least four months of the year and with an overall average reporting rate of >5% of submitted records (Harrison et al. 1997), and/or those recorded during visits to the site.
» All fully endemic, biome- or range-restricted species (sensu Barnes 1998) considered likely to occur in the area in significant numbers, particularly

including those recorded in SABAP data for the general area in at least eight months of the year and with an overall average reporting rate of >20% of submitted records (Harrison et al. 1997), and/or those recorded in numbers during site visits.

» Those congregatory waterbird species regularly recorded in particularly high numbers at the Olifants River Estuary (Taylor et al. 1999), but not covered by the above criteria.

This exclusive suite of species is the core focus of the assessment of impacts on avifauna, and all potential impacts of the proposed wind energy facility, as well as all required mitigation, are deemed to be adequately covered by catering only for these species, as effective surrogates for the entire avian assemblage.

The proposed wind energy facility is likely to have limited negative impacts on the avifauna in the surrounding area. Impacts on avifauna associated with the proposed wind energy facility include:

» disturbance during construction, maintenance and operation
» disturbance to the presence and distribution of the resident avifauna, and on the movement patterns of birds commuting through the area as a result of the operating wind energy facility
» habitat destruction
» collision with the turbines.

The threat of collision with the turbine blades is probably the most concerning issue, but the real extent of this threat is not currently well understood within the South African context. Unlike more problematic wind energy facilities identified in other parts of the world, the proposed wind energy facility is not positioned overly close to any known avian fly-ways, and does not otherwise impose on a particularly bird-rich environment, so it is unlikely to result in significant numbers of avian casualties through collision with the turbine blades, or cause undue loss of habitat or disturbance to any locally, regionally or nationally important bird populations.

Impact tables summarising the significance of impacts on avifauna (with and without mitigation)

Nature: Habitat destruction

A relatively small area of habitat for birds will be completely destroyed/lost in the construction process, and a larger quantity will be degraded or damaged by the process.

	Without mitigation[9]	**With mitigation**
Extent	Local (1 - 2)[10]	Local (1 - 2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Small to low (0 – 4)	Small to low (0 – 4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Low to Medium (24-44)**	**Low to Medium (24-44)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Partially	

Mitigation:

» Every effort should be made to minimise the development footprint and to rehabilitate the damaged vegetation to minimise the habitat losses to resident priority bird species.

» The specific sites of each of the turbines, and those allocated to the auxiliary structures of the wind energy facility, should be inspected immediately pre-construction as part of the monitoring programme to ensure that no critical avian micro-habitats are affected.

Cumulative Impacts:

» Regional negative impacts on habitat loss and fragmentation.

» The impacts of this type of development will be significantly less than for various existing and proposed mining operations in the region.

Nature: Disturbance

» Short-term disturbance issues arising from construction of the wind energy facility are likely to impact birds currently resident within the footprint area.

» Longer-term disturbance stemming from maintenance and operational activities at the site could occur as a result of human activity and noise around the facility.

» Disturbance to the presence and distribution of the resident avifauna, and on the movement patterns of birds commuting through the area as a result of the operating wind energy facility.

[9] Dependent on species being impacted. Refer to Appendix 3 of the specialist study contained within Appendix I.

[10] Where a score of 1 being low – likely to affect a relatively small segment of a widespread population - and a score of 5 being high – likely to affect a relatively large segment of a localised population.

	Without mitigation[11]	**With mitigation**
Extent	Local (1 - 2)	Local (1 - 2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Small to low (0 – 4)	Small to low (0 – 4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Low to Medium (16-44)**	**Low to Medium (16-44)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Partially	

Mitigation:

» In order to minimise impacts on bird species which may have active nests oin the immediate vicinity of the construction area, it may be necessary to (a) survey the construction area immediately before work commences, and (b) to work around any such nest sites located in this pre-construction survey.

» Should any important nest sites be located close to WEF in the pre-construction monitoring of the site, these should be given special consideration in the planning of all routine maintenance activities.

» The collection of quantitative information on the densities of key resident bird species in the area of the proposed wind energy facility will form a vital part of the survey and monitoring programme in order to determine potential disturbance impacts on these species.

Cumulative Impacts:

» Regional negative impacts as a result of increased development in the area.

» The impacts of this type of development will be significantly less than for various existing and proposed mining operations in the region.

Nature: Collision with the turbines

Collision with turbines could negatively affect a variety of collision prone species, most notably aggregations of waterfowl, flamingos, and possibly coastal seabirds, and individuals or loose flocks of Ludwig's Bustard, which might travel through the impact zone, especially when such movements occur during unfavourable weather conditions and/or at night, when visibility and control in flight are compromised. Also at risk of collision is the suite of both diurnal and nocturnal predatory birds present in the area, especially active pursuit hunters such as Peregrine Falcon and Lanner Falcon (*Falco biarmicus*), which may not account for the rotation of the turbine blades when chasing prey through the impact area of the wind energy facility.

[11] Dependent on species being impacted. Refer to Appendix 3 of the specialist study contained within Appendix I.

	Without mitigation[12]	**With mitigation**[13]
Extent	Local (1 - 2)	Local (1 - 2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Small to High (0 – 8)	Small to High (0 – 8)
Probability	Improbable to highly probable (2 – 4)	Improbable to probable (2 – 3)
Significance	**Low to High (12 – 60)**[14]	**Low to Moderate (12 – 45)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Partially, but must be informed by monitoring programme	

Mitigation:

Any significant impacts of the wind energy facility on priority bird populations be detected by the monitoring scheme, required mitigation could include:

» Painting the blades of selected, problem turbines.
» Temporarily (at certain times and/or in certain weather conditions) or even permanently shutting down selected, problem turbines.

Cumulative Impacts:

The cumulative effects of collisions with turbines over time, especially when applied to large, long lived, slow reproducing species (many of which are collision-prone), may be of considerable conservation significance.

Implications for Project Implementation

» The proposed wind energy facility is likely to have limited negative impacts on the avifauna in the surrounding area.
» The proposed facility is unlikely to result in significant numbers of avian casualties through collision with the turbine blades, or cause undue loss of habitat or disturbance to any locally, regionally or nationally important bird populations.
» Only one moderate-highly significant, taxon-specific impact (Ludwig's Bustard) and 25 moderately significant taxon-specific impacts have been

[12] Dependent on species being impacted. Refer to Appendix 3 of the specialist study contained within Appendix I of the DEIA report.

[13] Confidence levels regarding effectiveness of mitigation for the South African context is low as little monitoring data in this regard exists.

[14] Given (i) a current lack of quantitative data describing the nature, extent and timing of movements by priority bird species through the WEF area, and (ii) a general lack of locally-sourced information on the likely effects of commercially viable wind farms on South African avifauna, it is not possible at this stage to anticipate the possible scale and importance of this impact with confidence.

identified to be associated with the proposed wind energy facility, all of which have effective mitigation available.

» The threat of collision with the turbine blades is probably the most concerning issue, but the real extent of this threat is not currently well understood. It is *essential* that the bird interactions which do take place with the establishment of the facility are fully documented through a long-term monitoring programme.

7.2.4. Potential Impacts on Geomorphology and Surface Processes

The most sensitive landscape elements for planning purposes in the study area were identified to be wetlands (e.g. pans) and drainage lines. In terms of the current wind energy facility layout, one turbine (turbine number 62) and associated access road are possibly located within 50 m of a wetland (Row C), while the access road within Row B of turbines may pass within 50 m of another wetland. However, it would appear that by shifting the turbine and access road (in the case of the former) and the access road (in the case of the latter) at least 20 m and 10 m respectively within the impact corridor, these concerns may be avoided.

Impact tables summarising the significance of impacts on geomorphology (with and without mitigation)

Nature: Impoundment of overland flows by roads Roads constructed across slopes are likely to impound and/or divert overland flow. The nature of this impact will be dependant on *inter alia* the length of the slope above the road, its gradient, the composition of the substrate and the nature of the rainfall event.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Small (0)
Probability	Definite (5)	Definite (5)
Significance	**Medium (60)**	**Low (25)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation: » Use existing roads wherever possible. » Ensure new roads have culverts placed in topographic lows.		
Cumulative Impacts: None		

Nature: Increased runoff relative to the pre-disturbed state as a result of sealed surfaces (e.g. roads, roofs)

Increased runoff from a sealed surface in relation to the reference state may be associated with a relative increase in sediment transport and hence erosion on a slope or within a channel.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**Medium (50)**	**Medium (40)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Ensure roadside drainage ditches are sealed on steep slopes.

» Ensure runoff from roofs is directed towards a rainwater tank.

Cumulative Impacts:

None

Nature: Deposition of sediment by aeolian processes adjacent to or within infrastructure (e.g. substation or visitor's centre building)

A localised decrease in wind velocity caused by an obstacle may be associated with the deposition of sediment.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**Medium (50)**	**Medium (40)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Establish a drift fence or shrub barrier around susceptible structures in order to trap wind transported sediment.

Cumulative Impacts:
None

Nature: Accelerated aeolian sediment transport possibly leading to the development of deflation hollows		
A loss of vegetation (or other) cover will increase the susceptibility of sediments to wind erosion.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Small (0)
Probability	Definite (5)	Definite (5)
Significance	**Low (25)**	**Low (15)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation:		
» Re-vegetate areas where there has been a loss of vegetation as soon as is practically possible.		
Cumulative Impacts:		
None		

Nature: Accelerated fluvial sediment transport and hence erosion associated with overland flow		
A loss of vegetation cover may increase the susceptibility of a sediment surface to overland flow related erosion processes.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**Medium (35)**	**Low (25)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Re-vegetate areas where there has been a loss of vegetation as soon as is practically possible.

Cumulative Impacts:

None

Nature: Preferential aeolian erosion of sediment adjacent to structures and subsequent subsidence

The winnowing affect associated with local flow modifications caused by structures may lead to subsidence if these structures are undercut.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Small (0)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Ensure a good indigenous vegetation cover is maintained adjacent to the concrete pad at the foot of a turbine.

Cumulative Impacts:

None

Nature: Preferential fluvial erosion of sediment adjacent to structures and subsequent subsidence

The winnowing affect associated with local flow modifications caused by structures may lead to subsidence if these structures are undercut.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Small (0)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	

Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation: » Ensure runoff is deflected away from structures.		
Cumulative Impacts: None		

Nature: Excavation of foundations for wind turbines and other project related infrastructure (e.g. access roads, substation)

Excavation of foundations for infrastructure will be associated with localised surface modification.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Very short term (1)	Very short term (1)
Magnitude	Moderate (6)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**Medium (40)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	High	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Do not spread displaced sediment over vegetation, but rather deposit it evenly in an area devoid or largely devoid of vegetation.

Cumulative Impacts:

None

Nature: Sandblasting of structures leading to increased maintenance requirements

Sandblasting may lead to the erosion of plaster/mortar and potentially damage painted surfaces.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Small (0)
Probability	Definite (5)	Definite (5)
Significance	**Medium (40)**	**Low-Medium (30)**

Status (positive or negative)	Negative	Negative
Reversibility	High	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation: » Ensure a good indigenous vegetation cover is maintained adjacent to the concrete pad at the foot of a turbine.		
Cumulative Impacts: Additive impact.		

Nature: A reduction in the surface area of wetlands e.g. (pans) in the study area Construction of roads, tracks or other infrastructure in wetlands will lead to a loss of this habitat in the study area.		
	Without mitigation	**With mitigation[15]**
Extent	International (5)	-
Duration	Permanent (5)	-
Magnitude	Very high (10)	-
Probability	Very improbable (1)	-
Significance	**Low (20)**	**None**
Status (positive or negative)	Negative	-
Reversibility	Low	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation: » Avoid all pans and drainage lines and associated 50 m buffer zones, wherever possible for the siting of infrastructure, even if of a temporary nature.		
Cumulative Impacts: Regional loss of wetlands and pans.		

Implications for Project Implementation

» The majority of potential impacts on geomorphology and surface processes are rated as being of moderate significance. Impacts can be minimised through the use of existing roads, the minimisation of the development footprint and the rehabilitation of the site following construction.

[15] Assumption that mitigation will successfully avoid all wetlands and pans and their associated buffer areas, therefore not requiring scoring here.

» The most sensitive landscape elements for planning purposes in the study area and within the power line corridor will be the presence of wetlands/pans. These features and associated buffer zones (viz. 50 m) should be excluded from any development footprint wherever possible.
» In terms of the current wind energy facility layout one turbine (turbine number 62) and associated access road are possibly located within 50 m of a wetland (Row C), while the access road within Row B of turbines may pass within 50 m of another wetland. These concerns may be avoided by shifting the turbine and access road (in the case of the former) and the access road (in the case of the latter) at least 20 m and 10 m respectively within the impact corridor.
» Ideally, unvegetated and poorly vegetated aeolian dunes and sediments, which represent a high erosion risk, should be avoided for the siting of infrastructure. However, as most of the area selected for the siting of the turbines is associated with such areas, the crests of dunes, which represent the most sensitive component of the landscape, should be avoided wherever possible.

7.2.5. Potential Impacts on Heritage Sites

The main cause of impacts to archaeological sites is physical disturbance of the material itself and its context. The heritage and scientific potential of an archaeological site is highly dependent on its geological and spatial context. This means that even though, for example a deep excavation may expose archaeological artefacts, the artefacts are relatively meaningless once removed from the area in which they were found. Large-scale excavations will damage archaeological sites, as will road construction, building foundations and services.

The destruction of archaeological material is always considered to be a permanent and irreversible impact, although very often the intensity of an impact can be very low depending on the significance of the site in question.

Impact tables summarising the significance of impacts on heritage sites (with and without mitigation)

Nature: Impacts of turbine construction and related activities on Late Stone Age shell middens recorded on the site

Disturbance corridors as well as turbine construction areas and footings will potentially destroy archaeological material. Turbine Row B will directly affect an estimated 11 Late Stone Age shell middens and turbine Row C will affect a further 5 middens. The effect of the proposed activities will be the further lateral and vertical disturbance of midden material, destruction of artefactual material and bone and mixing of any preserved stratigraphy.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	Moderate (3)
Probability	Probable (4)	Probable (3)
Significance	**High (62)**	**Medium-low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	None	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Partially	

Mitigation:

» The density of midden sites is such that options for moving the road alignments and turbine sites within the 200 m corridor are somewhat limited. Without shifting the entire turbine row (which will impact on the entire facility layout), the mitigation is to undertake sampling of sites that will be impacted by the proposed activity. Once this is done satisfactorily, a destruction permit for the affected sites will need to be applied for and obtained from Heritage Western Cape by Eskom.

» Any other sites close to the proposed activity will need to be identified and protected through flagging as no-go areas.

» It is estimated that the following sites will require sampling or protection: Cluster A Middens 42, 43, 44, 45, 46, 49, 52, 52, 55; Cluster B Middens 10, 8 9, 22.

» An archaeologist should accompany the survey team so that sites requiring sampling or flagging can be accurately identified and on-site decisions made with respect to sampling, flagging or even wind turbine position adjustment (if possible). All sampling should be done ahead of construction work.

» Eskom and the project archaeologist will need to apply for sampling permits from Heritage Western Cape for work on any archaeological sites identified as needing intervention – in other words any archaeological site that will be affected by the access road, crane track, laydown areas, turbine bases and cable trenches.

Cumulative Impacts:

Cumulative impacts are a concern in that middens were once common archaeological resources throughout the Western Cape but which have been impacted to the extent that well conserved middens are now cherished heritage resources. Intact middens are increasingly only found in either remote localities or conservation areas. While the middens that have been found in the study area are not particularly rich or dense and many have suffered some disturbance from past agriculture, it is important to be aware that each one of them has research potential and heritage value in terms of their group value – they are all components of a past settlement pattern which responded to the pressures of the natural and social environments of the times.

Nature: ***Impacts of turbine construction and related activities on Pleistocene archaeological material***

The 2 m deep excavations for each of the wind turbine bases will penetrate aeolian sands and may impact on the Doorbank horizon displacing any Middle or Early Stone Age archaeological material that may exist. This applies to all turbine bases, however greatest likelihood of a find is in Row A.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (3)	Low (2)
Probability	Probable (2)	Probable (2)
Significance	**Low (18)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	No	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Partially	

Mitigation:

» Since the envisaged construction team is quite small, the most cost-effective mitigation would be to establish liaison with a responsible person on site who could photograph and report any finds to an archaeologist who would then arrange to mitigate/collect the find (if necessary). However this will only be successful with the full cooperation of contractors/site staff.

» It would also be desirable that during the excavation phase for turbine bases, an archaeologist makes a visit to log exposed sections and check for the presence of any significant material.

» If an important find is made, it may be necessary to divert plant to allow the necessary time to collect/record the find.

Cumulative Impacts:

» Regional loss of archaeological resources.

» Controlling of impacts to buried archaeological material such as stone artefacts scatters on the Doorbank horizon will require the commitment of both site staff and archaeologists. However the resource is considered to be widespread and the cumulative impact is not excessive.

Implications for Project Implementation

» In terms of historical and archaeological heritage the proposed activity is considered to be viable. Impacts are greater than initially expected, but are nevertheless controllable through with a program of archaeological sampling of Late Stone Age archaeological sites of site clusters A and B and where possible, micro adjustment of turbine and road positions (turbine numbers 29 and 30 in Row B; and turbine numbers 61 and 62 in Row C).

» Controlling of impacts to buried archaeological material such as stone artefacts scatters on the Doorbank horizon will require the commitment of both site staff and archaeologists. However the resource is considered to be widespread and the cumulative impact is not excessive.
» Eskom will need to apply for sampling permits from Heritage Western Cape for work on archaeological sites identified as needing intervention – i.e. any archaeological site that will be affected by the access road, crane track, laydown areas, turbine bases and cable trenches. The permit application will need to be accompanied by detailed specifications of which sites are to be sampled, how large the samples will be, and how and where the sampled material will be stored (the NHRA requires indefinite institutional storage of all archaeological remains). The turn around period for the issuing of permits is generally about 5 weeks and permits are usually valid for a period of a year but can be extended for a further 2 years if needs be. One the archaeological sampling is completed, a permit for destruction of any remaining archaeological material on any of the development sites must be obtained from Heritage Western Cape.
» The construction of the site visitors centre, substation and access roads are unlikely to result in any impacts and therefore no further action is required other than to report un-anticipated finds.
» Impacts to the natural cultural landscape qualities of the site are expected (refer to section 7.2.6). This may be mitigated by the fact the study area is set back from the scenic coastal escarpment (which is most frequently used by people) and the fact that the proposed wind turbines will need very little by way of support structures or staff facilities.

7.2.6. Potential Visual Impacts

Potential visual impacts associated with the construction phase

The construction phase of the wind energy facility is approximated at roughly two years (one week per turbine) should all 100 turbines be erected. This is obviously dependent on a number of external factors that may not always be controlled by either Eskom or the preferred contractors. During this time heavy vehicles will frequent the otherwise deserted roads and may cause, at the very least, a visual nuisance to other road users and land owners in the area.

Visual impacts associated with the construction phase, albeit temporary, should be managed according to the following principles:

» Reduce the construction period through careful planning and productive implementation of resources.
» Restrict the activities and movement of construction workers and vehicles to the immediate construction site.

» Ensure that the general appearance of construction activities, construction camps (if required) and lay-down areas are maintained by means of the timely removal of rubble and disused construction materials.
» Restrict construction activities to daylight hours (if possible) in order to negate or reduce the visual impacts associated with lighting.

Potential visual impacts associated with the operational phase

The result of the viewshed analyses for the proposed Wind Energy Facility is shown on Figure 7.3.

Figure 7.3: Potential visual exposure of the wind turbines and substation

This figure shows the core area (primary visual catchment) of potentially uninterrupted exposure of the facility as being greatly contained within the 25 km buffer zone. The majority of potentially uninterrupted exposure occurs within the

0 – 10 km zone. Visibility beyond the 25 km mark becomes scattered and broken and ultimately negligible as it nears a distance of 50 km distance. From such a distance, visibility, even on a perfectly clear day, could theoretically be possible although highly unlikely to constitute a negative visual impact. In practical terms this rationale implies that although the facility may potentially be visible (due to the flat terrain and the low visual absorption capacity of the natural vegetation) from sections of the N7 national road (50 km away), it would be difficult to distinguish the facility within the larger landscape.

The 0 – 25 km zone contains other areas and potential sensitive visual receptors (as discussed in Chapter 6) that would be exposed to the wind energy facility. Some of these include the towns of Koekenaap and Lutzville, sections of the R362 and R363 provincial roads, and other communities such as the Skaapvlei road smallholdings and Ebenezer Kolonie along the Olifants River. This zone further encompasses a number of homesteads and points of interest, as well as sections of the coastline. Visibility from the coastline would mainly be possible from the top of the cliffs and is unlikely from the beaches and rocky shore due to the sudden drop in topography (nearly 60 m) to sea level.

The substation will primarily be exposed to road users travelling along the Skaapvlei road, the Skaapvlei settlement and the Skilpadvlei homestead. It should, however, be noted that the substation will be placed centrally amongst the wind turbines and will be dwarfed by the large structures surrounding it. The wind turbines are expected to distract attention from the substation to a large degree.

Figure 7.4 provides an indication of the visual impact index associated with the wind energy facility. This is a combination of the results of the visual exposure, viewer incidence/perception and visual distance of the proposed wind energy facility (refer to Appendix M for more details). The index confirms the containment of the visual impact within a 25 km radius of the facility indicating possible exposure (beyond 25 km) to the facility at the lower end of the index. The area between 10 km and 25 km radius of the facility is predominantly low to medium with exceptions occurring at homesteads and access roads within this zone. Higher values occur along the R362 south of Lutzville and agricultural holdings and farmland adjacent to the Olifants River (including Ebenezer). These areas would, however, not have unobstructed views of the wind energy facility, as they all have their own visual clutter brought about by the land use activities and structural developments within these areas.

Figure 7.4: Visual impact index of the proposed wind energy facility

The core area of visual impact for the wind energy facility is indicated within the 10 km buffer radius of the facility. Even here, where the view of the facility is unobstructed, the majority of the zone (in terms of size) is indicated as medium on the index. This is due to the fact that this is a near vacant area, largely devoid of random observers. Exceptions occur along the secondary roads within this zone and specifically the Skaapvlei road. Other areas that appear highest on the visual impact index are specific homesteads (Skilpadvlei, Skaapvlei and Nooitgedag) and some sections of the coastline north of Gert du Toit se Baai and north of Die Toring.

The vegetation units present in the study area surrounding the wind energy facility range from 0.2 m to <2 m in height. This, coupled with the sparse

distribution of the plant species and the dimensions of the facility, it was determined that the visual absorption capacity of the natural vegetation is low to negligible for virtually the entire study area.

» *The potential to mitigate visual impacts*

The primary visual impact, namely the appearance and dimensions of the wind energy facility (mainly the wind turbines) is not possible to mitigate. The functional design of the structures and the dimensions of the facility cannot be changed in order to reduce visual impacts. A photo simulation from a distance of approximately 8 km from the facility is illustrated in Figure 7.5. Other photo simulations are included within the visual impact assessment report (refer Appendix M).

Figure 7.5: Photo simulation of the view from Skaapvlei road at an average distance of 8 km from the facility

Alternative colour schemes (i.e. painting the turbines sky-blue, grey or darker shades of white) are not permissible as the CAA's Marking of Obstacles expressly states, "Wind turbines shall be painted bright white to provide the maximum daytime conspicuousness". Failure to adhere to the prescribed colour specifications will result in the fitting of supplementary daytime lighting to the wind turbines, once again aggravating the visual impact. The potential for mitigation is therefore low or non-existent.

The mitigation of secondary visual impacts, such as security and functional lighting, may be possible and should be implemented and maintained on an on-going basis.

Impact tables summarising the significance of visual impacts (with and without mitigation)

Nature: Visual impact on users of major roads (R362, R363 and N7)		
	Without mitigation	**With mitigation**
Extent	Regional (3)	N/A
Duration	Long term (4)	N/A
Magnitude	Low (2)	N/A
Probability	Probable (R363 & R362)) (3) Improbable (N7) (2)	N/A
Significance	**Low (18-27)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	
Mitigation: » N/A		
Cumulative Impacts: » Impact ratings reflected above are based on the visual impacts associated with the entire extent of the development (i.e. 100 turbines). » No other developments of a similar nature exist in the area.		

Nature: Visual impact on users of other roads (Skaapvlei road) Skaapvlei road functions as the primary connecting road between Vredendal and the coastal/mining areas.		
	Without mitigation	**With mitigation**
Extent	Local (4)	N/A
Duration	Long term (4)	N/A
Magnitude	Very High (10)	N/A
Probability	Highly probable (4)	N/A
Significance	**High (72)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	
Mitigation: » N/A		
Cumulative Impacts: » Impact ratings reflected above are based on the visual impacts associated with the		

entire extent of the development (i.e. 100 turbines).
» No other developments of a similar nature exist in the area.

Nature: Visual impact on users of other roads (secondary roads < 10km from facility)		
	Without mitigation	**With mitigation**
Extent	Local (4)	N/A
Duration	Long term (4)	N/A
Magnitude	High (6)	N/A
Probability	Highly probable (4)	N/A
Significance	**Medium (56)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	
Mitigation: » N/A		
Cumulative Impacts: » Impact ratings reflected above are based on the visual impacts associated with the entire extent of the development (i.e. 100 turbines). » No other developments of a similar nature exist in the area.		

Nature: Visual impact on users of other roads (secondary roads > 10km from facility) The visual impact diminishes beyond the 10km and becomes medium and medium to low towards the 25km buffer radius.		
	Without mitigation	**With mitigation**
Extent	Local (4)	N/A
Duration	Long term (4)	N/A
Magnitude	Medium-low (3)	N/A
Probability	Probable (3)	N/A
Significance	**Medium-low (36)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	
Mitigation: » N/A		

Cumulative Impacts:

» Impact ratings reflected above are based on the visual impacts associated with the entire extent of the development (i.e. 100 turbines).

» No other developments of a similar nature exist in the area.

Nature: Visual impact on major towns and settlements

Major towns and settlements include Lutzville, Koekenaap and Papendorp.

	Without mitigation	**With mitigation**
Extent	Regional (3)	N/A
Duration	Long term (4)	N/A
Magnitude	Low (1)	N/A
Probability	Probable (3)	N/A
Significance	**Low (24)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	

Mitigation:

» N/A

Cumulative Impacts:

» Impact ratings reflected above are based on the visual impacts associated with the entire extent of the development (i.e. 100 turbines).

» No other developments of a similar nature exist in the area.

Nature: Visual impact on agricultural areas and smallholdings (west of the Olifants River)

Agricultural areas and smallholdings west of the Olifants River include the Skaapvlei road smallholdings. Visibility of the wind energy facility from these areas is highly unlikely.

	Without mitigation	**With mitigation**
Extent	Regional (3)	N/A
Duration	Long term (4)	N/A
Magnitude	Medium – high (6)	N/A
Probability	Probable (3)	N/A
Significance	**Medium (39)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be	No	

mitigated?		
Mitigation: » N/A		
Cumulative Impacts: » Impact ratings reflected above are based on the visual impacts associated with the entire extent of the development (i.e. 100 turbines). » No other developments of a similar nature exist in the area.		

Nature: Visual impact on agricultural areas and smallholdings (east of the Olifants River) Agricultural areas and smallholdings east of the river include Ebenezer). Visibility of the wind energy facility will be from a minimum distance of 10 km.		
	Without mitigation	**With mitigation**
Extent	Regional (3)	N/A
Duration	Long term (4)	N/A
Magnitude	Low (2)	N/A
Probability	Improbable (2)	N/A
Significance	**Low (18)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	
Mitigation: » N/A		
Cumulative Impacts: » Impact ratings reflected above are based on the visual impacts associated with the entire extent of the development (i.e. 100 turbines). » No other developments of a similar nature exist in the area.		

Nature: Visual impact on specific points of interest and individual homesteads (<10 km from facility) Homesteads within a 10 km radius of the facility include Skilpadvlei, Nooitgedag and Kommandokraal.		
	Without mitigation	**With mitigation**
Extent	Local (4)	N/A
Duration	Long term (4)	N/A
Magnitude	Very High (10)	N/A
Probability	Highly probable (4)	N/A
Significance	**High (72)**	N/A
Status (positive or negative)	Negative	N/A

Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	

Mitigation:

» N/A

Cumulative Impacts:

» Impact ratings reflected above are based on the visual impacts associated with the entire extent of the development (i.e. 100 turbines).

» No other developments of a similar nature exist in the area.

Nature: Visual impact on specific points of interest and individual homesteads (> 10 km from the facility)

Homesteads beyond 10km include Maurieskolk, Geluk, Geduld, Rooivlei, Graafwater and Baievlei.

	Without mitigation	**With mitigation**
Extent	Local (4)	N/A
Duration	Long term (4)	N/A
Magnitude	High (6)	N/A
Probability	Highly probable (4)	N/A
Significance	**Medium (56)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	

Mitigation:

» N/A

Cumulative Impacts:

» Impact ratings reflected above are based on the visual impacts associated with the entire extent of the development (i.e. 100 turbines).

» No other developments of a similar nature exist in the area.

Nature: Visual impact on homesteads >10 km from the site and Rob-Eiland

	Without mitigation	**With mitigation**
Extent	Local (4)	N/A
Duration	Long term (4)	N/A
Magnitude	Medium –low (3)	N/A
Probability	Probable (3)	N/A
Significance	**Medium-low (33)**	N/A
Status (positive or	Negative	N/A

negative)		
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	
Mitigation: » N/A		
Cumulative Impacts: » Impact ratings reflected above are based on the visual impacts associated with the entire extent of the development (i.e. 100 turbines). » No other developments of a similar nature exist in the area.		

Nature: Visual impact on Duiwe-gat, Die Toring, Gert du Toit se Baai		
	Without mitigation	**With mitigation**
Extent	Local (4)	N/A
Duration	Long term (4)	N/A
Magnitude	High (7)	N/A
Probability	Highly probable (4)	N/A
Significance	**Medium - High (60)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	
Mitigation: » N/A		
Cumulative Impacts: » Impact ratings reflected above are based on the visual impacts associated with the entire extent of the development (i.e. 100 turbines). » No other developments of a similar nature exist in the area.		

Nature: Visual impact on Brand se Baai		
	Without mitigation	**With mitigation**
Extent	Local (4)	N/A
Duration	Long term (4)	N/A
Magnitude	Low (1)	N/A
Probability	Improbable (2)	N/A
Significance	**Low (18)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	None	

Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	

Mitigation:

» N/A

Cumulative Impacts:

» Impact ratings reflected above are based on the visual impacts associated with the entire extent of the development (i.e. 100 turbines).

» No other developments of a similar nature exist in the area.

Nature: Visual impact on the Olifants and Klein Goerap Rivers		
	Without mitigation	**With mitigation**
Extent	Local (Olifants River) (4); Regional (Klein Goerap) (3)	N/A
Duration	Long term (4)	N/A
Magnitude	Low (1)	N/A
Probability	Improbable (1)	N/A
Significance	**Low (8-10)**	N/A
Status (positive or negative)	Neutral	N/A
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	

Mitigation:

» N/A

Cumulative Impacts:

» Impact ratings reflected above are based on the visual impacts associated with the entire extent of the development (i.e. 100 turbines).

» No other developments of a similar nature exist in the area.

Nature: Visual impact on the coastline (<10 km from the facility)

Sections of the coastline that could be negatively influenced by the WEF and may experience a high to very high visual impact are situated within the 10km buffer radius from the facility. The visual impact is more likely to occur on top of the coastal cliff rather than at sea level. This is due to the sudden drop of the topography (roughly 60m) to sea level effectively blocking views to the facility from beaches and the rocky shoreline.

	Without mitigation	**With mitigation**
Extent	Local (4)	N/A
Duration	Long term (4)	N/A
Magnitude	High - very high (8)	N/A
Probability	Highly probable (4)	N/A

Significance	**High (64)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	

Mitigation:

» N/A

Cumulative Impacts:

» Impact ratings reflected above are based on the visual impacts associated with the entire extent of the development (i.e. 100 turbines).

» No other developments of a similar nature exist in the area.

Nature: Visual impact on the coastline (>10 km from the facility)

Sections of the coastline that could be negatively influenced by the WEF and may experience a high to very high visual impact are situated within the 10km buffer radius from the facility. The visual impact is more likely to occur on top of the coastal cliff rather than at sea level. This is due to the sudden drop of the topography (roughly 60m) to sea level effectively blocking views to the facility from beaches and the rocky shoreline.

	Without mitigation	**With mitigation**
Extent	Regional (3)	N/A
Duration	Long term (4)	N/A
Magnitude	Medium – high (6)	N/A
Probability	Probable (3)	N/A
Significance	**Medium (39)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	

Mitigation:

» N/A

Cumulative Impacts:

» Impact ratings reflected above are based on the visual impacts associated with the entire extent of the development (i.e. 100 turbines).

» No other developments of a similar nature exist in the area.

Nature: Visual impact on nature reserves (Lutzille and Moedverloren nature reserves)

Both nature reserves identified in the area are located relatively far from the proposed wind energy facility (Lutzville at ~20 km and Moedverloren beyond 25 km).

	Without mitigation	**With mitigation**
Extent	Regional (3)	N/A
Duration	Long term (4)	N/A
Magnitude	Low (1)	N/A
Probability	Probable (3)	N/A
Significance	**Low (24)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	

Mitigation:

» N/A

Cumulative Impacts:

» Impact ratings reflected above are based on the visual impacts associated with the entire extent of the development (i.e. 100 turbines).

» No other developments of a similar nature exist in the area.

Nature: Visual impacts of lighting (glare)

Impacts associated with security and after-hours operational lighting (flood lights and aircraft warning lights), in terms of light trespass and glare

	Without mitigation	**With mitigation**
Extent	Local (4)	N/A
Duration	Long term (4)	N/A
Magnitude	Medium (4)	N/A
Probability	Probable (3)	N/A
Significance	**Medium (36)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	

Mitigation:

» N/A

Cumulative Impacts:

» Impact ratings reflected above are based on the visual impacts associated with the

entire extent of the development (i.e. 100 turbines).

» No other developments of a similar nature exist in the area.

Nature: Visual impacts of lighting (spill light)		
	Without mitigation	**With mitigation**
Extent	Local (4)	N/A
Duration	Long term (4)	N/A
Magnitude	Low (2)	N/A
Probability	Improbable (2)	N/A
Significance	**Low (20)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	

Mitigation:

» N/A

Cumulative Impacts:

» Impact ratings reflected above are based on the visual impacts associated with the entire extent of the development (i.e. 100 turbines).

» No other developments of a similar nature exist in the area.

Nature: Visual impacts of lighting (sky glow)

Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the amount of light sources. Each new light source, especially upwardly directed lighting, contribute to the increase in sky glow. The wind energy facility may contribute to the effect of sky glow in an otherwise dark environment.

	Without mitigation	**With mitigation**
Extent	Regional (3)	N/A
Duration	Long term (4)	N/A
Magnitude	Medium – low (4)	N/A
Probability	Probable (2)	N/A
Significance	**Low (22)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	

Mitigation:

» N/A

Cumulative Impacts:

» Impact ratings reflected above are based on the visual impacts associated with the entire extent of the development (i.e. 100 turbines).
» No other developments of a similar nature exist in the area.

Implications for Project Implementation

» The placement of the wind energy facility and its associated infrastructure will have a visual impact on the natural scenic resources of the region. The natural and relatively unspoiled wide-open views surrounding the wind energy facility will be transformed for the entire operational lifespan (approximately 30 years) of the plant.
» The primary visual impact, namely the appearance and dimensions of the wind energy facility (mainly the wind turbines) is not possible to mitigate. The functional design of the structures and the dimensions of the facility cannot be changed in order to reduce visual impacts.
» The construction phase of the facility should be sensitive to potential observers in the vicinity of the construction site. The placement of lay-down areas and temporary construction camps should be carefully considered in order to not negatively influence the future perception of the facility.
» The facility would be visible for a large area that incorporates various sensitive visual receptors that should ideally not be exposed to industrial style structures.
» The facility has a novel and futuristic design that invokes a curiosity factor not present with other conventional power generating plants. The advantage being that the wind energy facility can become an attraction or a landmark within the region that people would actually want to come and see. As it is virtually impossible to hide the facility, the only option would be to promote it.
» A lighting engineer should be consulted to assist in the planning and placement of light fixtures in order to reduce visual impacts associated with glare and light trespass.
» The facility should be dismantled upon decommissioning and the site and surrounding area should be rehabilitated to its original (current) visual status.

7.2.7. Potential Noise Impacts

The land surrounding the proposed facility is primarily undeveloped, undisturbed farmland that is very sparsely populated. The closest farm homesteads or residences identified that might potentially be impacted upon by noise emanating from the wind turbines during operation are at Skaapvlei, Skilpadvlei and

Nooitgedag. The distances between the proposed wind energy facility site and these residences are:

» Skaapvlei situated approximately 690 m west of the nearest turbine
» Nooitgedag situated approximately 2 816 m south east of the nearest turbine
» Skilpadvlei situated approximately 5 135 m east of the nearest turbine

Sound level contours were calculated in order to determine the potential noise impact on receivers. The resultant $L_{Req,T}$ contours are displayed in Figure 7.6. The contours are to be interpreted as the $L_{Req,T}$ at any point on the contour during meteorological conditions providing most favourable propagation of sound from the sound source to the listener.

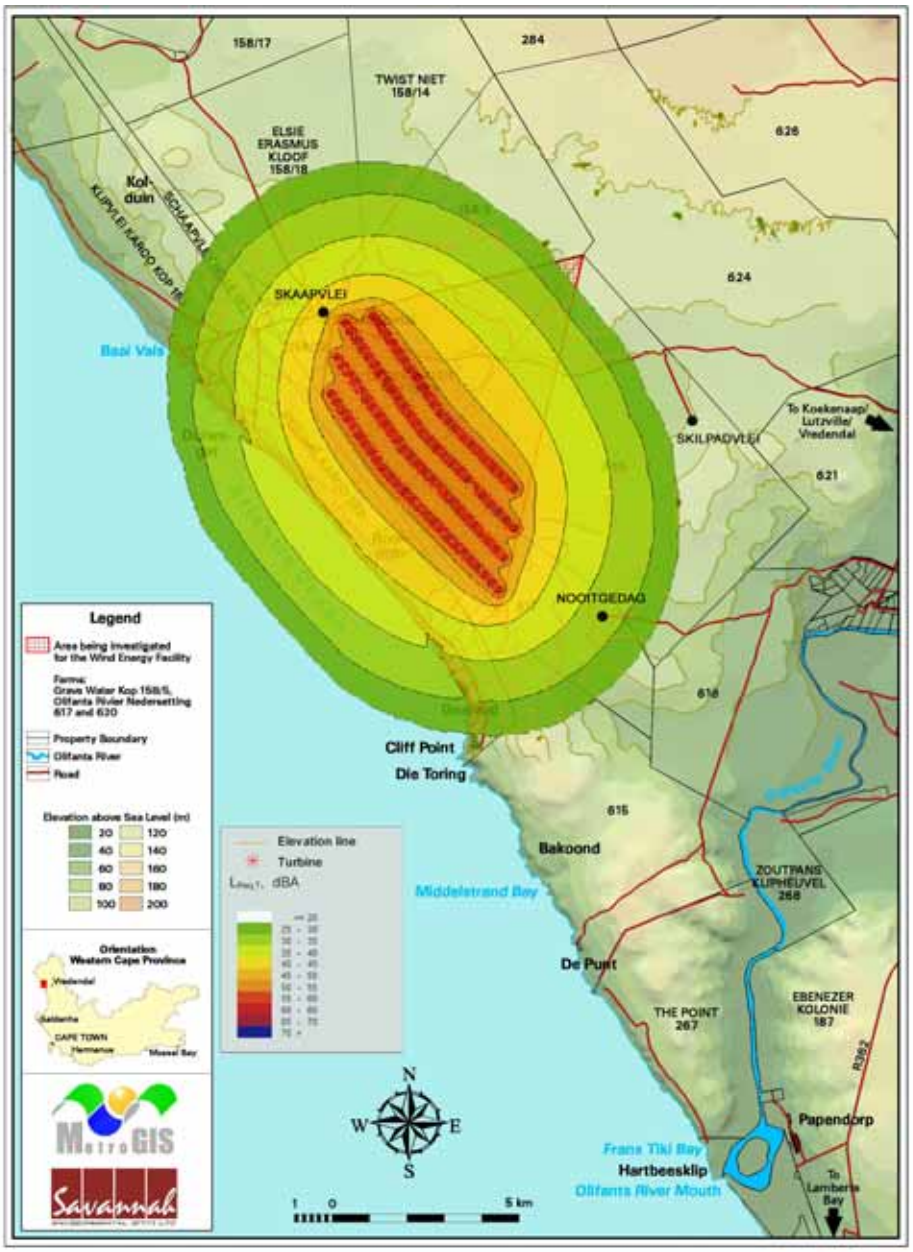


Figure 7.6: $L_{Req,T}$ contours for 100 wind turbines - maximum sound emission

The results of the assessment indicate that there would be no impact of outdoor noise emanating from the wind turbines at the nearest noise sensitive area, Skaapvlei, and at all other noise sensitive land. However, low-frequency noise emanating from the turbines might have a negative impact of low significance within dwellings at Skaapvlei.

On-site construction noise will not impact on any noise sensitive land other than in the vicinity of Skaapvlei. Traffic flow, particularly of heavy-duty vehicles, during construction would probably result in a noise impact on the residents of the agricultural smallholdings adjacent to the Skaapvlei Road who are situated close to the road. In order to minimise the noise of vehicular movement during the construction and operation of the facility it is recommended that the portion of the Skaapvlei road to the facility that passes these smallholdings consist of a low-noise road surface. Transportation of heavy equipment, such as the turbine nacelles, by slow moving, ultra-heavy-duty vehicles will result in a noise impact on communities along the entire route taken by the vehicles.

Impact tables summarising the significance of noise impacts (with and without mitigation)

Nature: Noise impact on Skaapvlei residences (outdoors) The nearest noise sensitive site, Skaapvlei, lies between the 40 and 45 dBA contour lines.		
	Without mitigation	**With mitigation**
Extent	Within 1 km (1)	N/A
Duration	Long term (4)	N/A
Magnitude	No effect (0)	N/A
Probability	Very Improbable (1)	N/A
Significance	**Low (5)**	N/A
Status (positive or negative)	Neutral	N/A
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	N/A	
Mitigation: » None required.		
Cumulative Impacts: None		

Nature: Noise impact on Skaapvlei residences (low frequency sound indoors) The nearest noise sensitive site, Skaapvlei, lies between the 40 and 45 dBA contour lines.		
	Without mitigation	**With mitigation**
Extent	Within 1 km (1)	N/A
Duration	Long term (4)	N/A
Magnitude	Minor (2)	N/A
Probability	Improbable (2)	N/A
Significance	**Low (14)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	N/A	
Mitigation: » None required.		
Cumulative Impacts: None		

Nature: Noise impact on other noise sensitive land (outdoors and low frequency indoor noise) At the other noise sensitive sites, Nooitgedag and Skilpadvlei, the $L_{Req,T}$ due to wind turbine noise would be less than 35 dBA and thus 10 dB or more below the 45 dBA expected at these sites during windy conditions.		
	Without mitigation	**With mitigation**
Extent	Beyond 1 km (1)	N/A
Duration	Long term (4)	N/A
Magnitude	No effect (0)	N/A
Probability	Very Improbable (1)	N/A
Significance	**Low (5)**	N/A
Status (positive or negative)	Neutral	N/A
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	N/A	
Mitigation: » None required.		
Cumulative Impacts: None		

Nature: Noise impacts from on-site construction activities

Site and construction work (including operation of heavy earth moving equipment) on the proposed wind energy facility site could be audible at the nearest residences, particularly Skaapvlei.

	Without mitigation	**With mitigation**
Extent	Within 1 km (1)	Within 1 km (1)
Duration	Short (2)	Short (2)
Magnitude	Low to Moderate (5)	Low to Moderate (4)
Probability	Highly probable (4)[16]	Highly probable (4)
Significance	**Medium (32)**	**Low (28)**
Status (positive or negative)	Negative	Negative
Reversibility	No	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	N/A	

Mitigation:

» Determine of whether time or other constraints would need to be stipulated with regard to all construction related vehicular traffic along the Skaapvlei access road.

» Monitoring of any limitations/constraints that might be imposed.

Cumulative Impacts:

None

Nature: Noise impacts from transport of components & equipment to site

Noise impacts from construction and transportation vehicles to the site travelling through the towns of Vredendal and Lutzville along the R363, as well as on the smallholding community on the Skaapvlei Road.

	Without mitigation	**With mitigation**
Extent	Nearest residential properties (1)	Nearest residential properties (1)
Duration	Short (2)	Short (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (36)**	**Low (28)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	

[16] Site and construction work at the north western part of the proposed wind energy facility site would be distinctly audible at Skaapvlei. During continuous operation of heavy earth moving equipment at that part of the site it anticipated that the daytime $L_{Req,d}$ would be exceeded by between 0 and 10 dB. Site and construction work at the south eastern part of the proposed WEF site would be barely audible at Nooitgedag above the ambient sound level on a wind still day and inaudible during the prevailing SSE wind. Site and construction work anywhere on the proposed facility site would be inaudible at Skilpadvlei and any other noise sensitive site further removed from the site.

Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation: » The introduction of a low noise road surface along the section of Skaapvlei Road passing the smallholding community is recommended in order to reduce the impact.		
Cumulative Impacts: None		

Implications for Project Implementation

» There will be no impact of outdoor noise emanating from the wind turbines at the nearest noise sensitive area, Skaapvlei, and at all other noise sensitive land.
» Low-frequency noise emanating from the turbines might have a low negative impact of low significance within dwellings at Skaapvlei.
» On-site construction noise would not impact on any noise sensitive land other than in the vicinity of Skaapvlei.
» Traffic flow during construction, particularly of heavy-duty vehicles, would potentially result in a noise impact on the residents of the agricultural smallholdings adjacent to the Skaapvlei Road whose homes are situated close to the road. In order to minimise the noise during vehicular movement during the construction and operation of the facility it is recommended that the portion of the Skaapvlei road to the facility that passes through these smallholdings (approximately 1 800m from the intersection with the R363) be improved to a reduced noise road surface (i.e. surface this portion of the road).
» It is anticipated that transportation of heavy equipment, such as the turbine nacelles, by slow moving, ultra-heavy-duty vehicles would result in a noise impact on communities along the entire route taken by the vehicles.

7.2.8. Potential Impacts associated with Transportation, Access & Infrastructure

Potential impacts associated with transportation and access relate to works within the site boundary (i.e. the wind energy facility and ancillary infrastructure) and works external works outside the site boundary (i.e. road reconstruction/rehabilitation (e.g. Skaapvlei Road), widening intersections, protection/accommodation of existing Eskom, Telkom and other municipal services, protection of existing road related structures etc. all within the existing road reserve).

During construction, the access/internal service roads must be built for 15 ton/axle loads to support the abnormal loads delivering the nacelles, crawler crane and other components. Suitable spoil material will be required to be sourced from the excavations on-site, or other commercial (permitted) sources.

Impact tables summarising the significance of impacts associated with transportation and access (with and without mitigation)

Nature: Internal Service Roads: Geometric Alignment

A grid pattern of roads does not follow contours and may result in roads being too steep to accommodate abnormally loaded vehicles getting to the turbine sites. To achieve smooth 'flat' gradients may require significant cut and fill earthworks but this can only be quantified once the maximum longitudinal gradients have been established from the transport contractors and during the design phase. All vegetation in the service road will be cleared and replaced with an appropriate pavement structure and G4 gravel wearing course. A 14m wide surface is therefore only required between the turbines were it is intended to walk the crane between installations. Each walk would be approximately 350m.

	Without mitigation	**With mitigation**
Extent	Confined to the internal study area (1)	N/A
Duration	Permanent (5)	N/A
Magnitude	Very high, although a small area is involved (8)	N/A
Probability	Definite (5)	N/A
Significance	**High (70)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	No	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	The degree of impact can be mitigated by rehabilitation and restoration of the side slopes.	

Mitigation:

» The power and ability of the transport vehicles to traverse various gradients with abnormal loads need to be determined prior to designing the alignment of the internal service roads.
» The crane lay down area, the operating platform and the service road area should be carefully planned and overlapped as much as practically possible.
» The lay down area is only required for the period it takes to establish and disestablish the crane. With careful programming of activities a significant portion of the lay down area could be the service road itself and or the 40m x 40m working platform area.

Cumulative Impacts:

None.

Nature: Road Pavement Structures

» Transporting materials from sources external to the site and mining concession areas will add direct and cumulative axle loading impacts onto the existing road network external to the site. On bituminous surfaced roads, and depending on the cause of failure, this is likely to manifest as surface failures, initially as 'crocodile cracking' of the bituminous surface followed by potholes and extensive 'crocodile cracking' in the wheel path. If the base course fails due to excessive loading, the failure is likely to manifest as longitudinal rutting in the wheel tracks of the road surface. Gravel roads will deteriorate faster, create significant dust, experience accelerated gravel loss and formation of corrugations.

» Modifications and/or improvement to the provincial road would be required to be agreed with the provincial and/or local authorities.

» If materials are not available from alternate permitted sources, it would be necessary to identify and open new borrow pits. This requires a new mining permit/right application to DME and requires a separate EIA process.

	Without mitigation	**With mitigation**
Extent	Local (1)	N/A
Duration	Long-term to permanent (5)	N/A
Magnitude	Very low (1)	N/A
Probability	Probable (4)	N/A
Significance	**Low – Medium (30)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	N/A	

Mitigation:

» The additional construction traffic has the potential to lead to premature failure of the access roads, both surfaced and gravel, between the source and the site.

» The gravel roads may need regular grading to smooth out the surface, but may need to be re-gravelled after completion of the project to ensure a good driving surface. Any consideration of formalising the DR2225 road to an asphalt surface would require further investigation and a detailed pavement design (in agreement with the provincial road department).

» Re-using materials from old mine tailings should be investigated since the material has already been disturbed and could be re-cycled for use in the project. The haul route will be to the west of the site and the impact on the external road network will be greatly reduced.

Cumulative Impacts:

None.

Nature: Impacts on Skaapvlei Road (DR2225)

The DR2225 is the unsurfaced gravel road to Skaapvlei and would be impacted upon by the abnormal wheel loads (specifically those with load limitations) and construction traffic.

These vehicles will impart additional axle loading onto the existing road pavement structure. The local road users have indicated that the road riding surface degrades under normal traffic.

	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Short-term (2-5 years) (2)	Short-term (2-5 years) (2)
Magnitude	Minor (2)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**Medium (35)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	N/A	

Mitigation:

» DR2225 is the only unsurfaced portion of the route and a maintenance strategy will need to be submitted to the satisfaction of the Provincial Governments, District Roads Engineer (DRE).

» An economic analysis of a variety road construction/maintenance treatments should be undertaken for the Skaapvlei Road where the benefits and costs for each alternative are analysed in terms of the "economic cost" (i.e. excluding taxes, subsidies and duties) and discounted over the expected design lives of the facilities.

» A maintenance plan for the duration of the construction contract needs to be formulated for DR2225 in consultation with the District Roads Engineer (Ceres).

» Eskom should investigate the extent of any upgrading required to form a durable haul route for the duration of the construction phase and leave the road in a similar (or better) condition upon completion. This upgrading could be limited to resolving existing localised problematic sections (horizontal, vertical alignment and drainage issues) and the possible re-gravelling (100-150 mm) of the route with a G4 gravel wearing course.

» To mitigate the impact of construction traffic through the populated area/smallholdings on Skaapvlei road, it is recommended that the first 800 m portion of the Skaapvlei road (DR2225) be reconstructed to a bituminous surfaced road from the R363. By negotiation, the District Road Engineer may permit Eskom the use of material from established borrow pits in the area for the sole purpose of maintaining this road.

» This route will require constant monitoring, possibly regular watering (to reduce gravel, sand and dust losses) and periodic scraping (keep a 'smooth' riding surface) during the construction phase.

Cumulative Impacts:

» Local negative impacts as a result of increased use of and impact to road infrastructure.

» Cumulative impacts as a result of increased numbers of vehicles (particularly heavy vehicles) utilising the local gravel roads (other vehicles are typically associated with the mining activities, farming activities or tourism), which could result in deterioration of the road infrastructure.

Implications for Project Implementation

» Potential impacts associated with transportation and access relate to works within the site boundary (i.e. the wind energy facility and ancillary infrastructure) and works external works outside the site boundary (i.e. road improvement (e.g. Skaapvlei Road), widening intersections, protection/accommodation of existing Eskom, Telkom and other municipal services, protection of existing road related structures etc.).
» Within the wind energy facility development area, the crane lay down area, the operating platform and the service road area should be carefully planned and overlapped as much as practically possible.
» The additional construction traffic has the potential to lead to premature failure of the access roads, both surfaced and gravel, between the source and the site. The gravel roads may need regular grading to smooth out the surface, but may need to be re-gravelled after completion of the project to restore the driving surface.
» A maintenance strategy will need to be submitted to the satisfaction of the Provincial Governments, District Roads Engineer (DRE) for Skaapvlei road (DR2225), as well as the R363.
» To mitigate the impact of construction traffic through the populated area/smallholdings on Skaapvlei road, it is recommended that the first 1 800 m portion of the DR2225 from the R363 be reconstructed to a bituminous surfaced road.
» By negotiation, the District Road Engineer may permit Eskom the use of material from their established borrow pits in the area for the sole purpose of maintaining the DR2225 road.
» Skaapvlei road (DR2225) will require constant monitoring, possibly regular watering (to reduce gravel, sand and dust losses) and periodic scraping (keep a 'smooth' riding surface) during the construction phase.
» Permits will be required for transporting all abnormal loads (project components). These permits are issued at the discretion of the Permit Issuing Authorities. The issue of these permits is a major consideration before addressing the physical capability of the transport companies to deliver these components.

7.2.9. Potential Impacts on Tourism Potential

Available tourism market trends indicate that the northern part of the West Coast receives between 5% and 10% of visitors to the Western Cape and that these are largely concentrated in the area to the south of the Olifants River mouth and Vredendal. There does not appear to be a marked trend of tourism growth in the area and the market size in the immediate vicinity of the study area is very limited. The area is outside of the West Coast tourism coastal development zones, which are located South of the Olifants River Mouth. The coastline in the

vicinity off the proposed site has been severely damaged by mining activities. There are no significant beaches in the area and the topography is undulating with the shoreline mainly consisting of rocky outcrops and cliffs.

None of the national or regional tourism planning initiatives has identified the study area as a priority tourism development area and it is not foreseen that the proposed wind energy facility at a site west of Koekenaap will have any substantial effects on the execution of national or regional tourism frameworks. The study area is not expected to become a key tourism area within the foreseeable future. However, the construction of a major wind energy facility may well become a tourist attraction for the area, should it be accompanied by high quality interpretation facilities.

Three potential impacts on tourism as a result of the wind energy facility have been identified and assessed within the EIA, i.e.:

i) reduced tourism activity;
ii) loss of tourism related nature scenery; and
iii) tourism economic benefits of the development.

Impact tables summarising the significance of impacts associated with tourism (with and without mitigation)

Nature: Impacts on tourism activity While the area is remote and not used as a general recreation or tourism area, some locals use sites such as Robeiland, Die Toring and Cliff Point for camping and angling purposes, mainly during peak holiday periods (Christmas/New Year Festive Period, Easter, etc.). The area is also used to a limited extent for organised hiking but this activity is very limited and occurs along the coastal zone.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	The impact cannot be reversed since it is caused by the visual and physical nature of the construction	
Irreplaceable loss of resources?	Very low	
Can impacts be mitigated?	Yes	

Mitigation:

» The overall experience of the broader area can potentially be enhanced through the contribution of Eskom to improvements for the area (especially if improvements have the intention to benefit the tourism-industry), largely offsetting potential negative impacts from a visual intrusion perspective. Eskom's Development Foundation is currently investigating opportunities for assisting the WCDM and the Matzikama Local Municipality in terms of realising some of the initiatives as specified in the District and Region's Integrated Development Plans.

Cumulative Impacts:

None

Nature: Impacts on the tourism-related nature and scenery

Nodes in the area of scenic and/or nature significance that could potential be impacted by the wind energy facility include:

» The Olifants River Mouth, which is currently a low-usage area but could grow in value and importance as a birding, camping and recreational tourism area. The wind energy facility location is approximately 15 km north of the Olifants River Mouth.

» The Olifants River Valley, Vredendal and surrounds, with most tourist activity concentrated in Vredendal and few visitors travelling to Lutzville and Koekenaap. Travellers mainly visit the area for business purposes, as a touring stop-over along the N7 Route and/or to purchase wines and other fresh produce of the area. Nature and scenery are added benefits and not prime motivators for visiting the immediate surrounds of the study area. The site is 10-12 km away from the current town fringe.

	Without mitigation	**With mitigation**
Extent	Local (2)	N/A
Duration	Permanent (5)	N/A
Magnitude	Low (4)	N/A
Probability	Very improbable (1)	N/A
Significance	**Low (11)**	N/A
Status (positive or negative)	Negative	
Reversibility	The impact cannot be reversed since it is caused by the visual and physical nature of the construction	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	

Mitigation:

» N/A

Cumulative Impacts:

None, as this is the primary facility of this nature in the area.

Should the possibility of future expansion of wind energy facilities in the area become a reality, the cumulative impact of such developments would be required to be considered at that time. The coastline further to north of the proposed site, towards and beyond the

Northern Cape boundary has areas which have not been impacted to a similar extent by mining activities. Any future expansion should be subject to additional tourism impact assessments and these should consider both the impacts of the specific proposals and the cumulative tourism impacts of multiple wind energy facilities along this section of coastline. Due consideration should then also be given to the possible expansion of the currently proposed facility (if authorised) as a first option in order to reduce the potential for wind energy turbines to be scattered along the coastline.

Nature: Positive impacts on the tourism economy of the area

Positive economic spin-offs for the area relate mainly to the wind energy facility becoming a tourism drawcard due to the substantial scale of the development and the general awareness of global warming, the importance of renewable energy and the need for Eskom to keep up with the growing electricity demand.

	Without mitigation	**With optimisation**
Extent	Local and regional (3)	Local and regional (3)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	High (8)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Medium (42)**
Status (positive or negative)	Positive	Positive
Reversibility	The positive tourism impacts will not be reversed but it could be reduced significantly should Eskom decide not to provide a high quality interpretation facility	
Irreplaceable loss of resources?	It will add to the economic resource base of the area rather than causing losses	
Can impacts be mitigated?	Yes	

Mitigation:

» Establishing a high quality interpretation facility.
» Providing technical and/or financial support to the local tourism authorities for packaging the area as a tour circuit and preparing promotional materials in this regard.

Cumulative Impacts:

None

Implications for Project Implementation

» The tourism component of the EIA focused on three potential tourism impacts of the wind energy facility, two of which are potentially negative at a local scale, namely i) reduced tourism activity and ii) loss of tourism related nature

scenery; and one that could be positive at a regional scale, namely iii) tourism economic benefits of the development.

» The proposed wind energy facility could become a tourist attraction for the area, should it be accompanied by high quality interpretation facilities. Incorporating a high quality Renewable Energy Interpretation Centre as part of the overall project development is strongly recommended. Such a facility could play a positive role in highlighting Eskom's leadership role and forward thinking in the area of renewable energy generation, while at the same time leaving a tourism legacy and providing a much-needed major tourist attraction to the benefit of the area.

7.2.10. Potential Impacts on the Social Environment

The key social issues identified during the social impact assessment (SIA) can be divided into:

» Policy and planning related issues
» Local, site-specific issues

The local site-specific issues can in turn be divided into construction and operational related issues.

» *Policy and planning issues*
The review of the relevant planning and policy documents was undertaken as a part of the assessment. The findings of the review of the relevant policies and documents pertaining to the energy sector indicate that wind energy and the establishment of wind energy facilities are supported at both the national and provincial level. At a provincial level, the wind energy potential along the west coast of the Western Cape Province is recognised. The proposed Eskom wind energy facility is therefore supported by national and provincial energy policies and is located in an area that has been identified as having high wind energy potential. The fit with national and provincial policies and planning guidelines therefore supports the proposed site for the establishment of the wind energy facility.

» *Construction phase*
The key issues pertaining to the construction phase include:

* Presence of construction workers on the site, and the potential increase in stock theft, trespassing and illegal hunting.
* Impact on the natural vegetation.
* Impact on Skaapvlei Road due to heavy vehicle traffic.
* Impact on farm infrastructure.
* Creation of local employment and business opportunities.

» *Operational phase*

The key impacts identified during the operational phase include:

- Impact of the proposed wind energy facility on the current farming activities, specifically the potential loss of valuable grazing land.
- The visual impacts and the associated impact on future land uses and sense of place.
- Creation of additional tourist opportunities.
- The promotion of clean energy as an alternative energy source.

The potential impact of the proposed wind energy facility on the current farming activities, specifically the potential loss of valuable grazing land is regarded as a key issue. The visual impact and the associated impact on sense of place are also recognised as a significant impact.

Impact tables summarising the significance of impacts on the social environment (with and without mitigation)

Nature: Presence of construction workers on the site The construction period for the first phase (50 wind turbines) is expected to last 12 months. In terms of the proposed activities small teams of between 6-15 skilled to semi-skilled workers will be deployed – sometimes more than one team of workers will be deployed on the site. However, at any given time the total number of construction workers on the site at any given time is therefore likely to be low. In addition, none of the construction workers will be housed in the nearby towns and not on the site.		
	Without mitigation	**With mitigation**
Extent	Local (3)	Local (1)
Duration	Short (2)	Short (2)
Magnitude	Minor (2)	Small (1)
Probability	Probable (3)	Probable (3)
Significance	**Low (21)**	**Low (12)**
Status (positive or negative)	Negative	Negative (For those farmers who may be affected. It may not be possible to completely prevent potential stock losses or damage to infrastructure)
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Eskom should establish a liaison committee made up of representatives from Eskom, the contractors and adjacent landowners to devise a code of conduct for workers to address conflicts that may arise.
» Eskom should compensate farmers in full for any stock losses and or damage to farm infrastructure that can be positively linked/proven to be linked to construction workers. This should be contained in the agreement of good conduct to be signed between Eskom and the adjacent and neighbouring landowners.
» Eskom should ensure that all construction workers are appropriately informed of the consequences of stock theft, illegal hunting and trespassing on adjacent farms at the outset of the construction phase.
» Construction workers found guilty of stealing livestock, illegal hunting and or damaging farm infrastructure should be dismissed and charged.
» No open fires for cooking or heating should be allowed on the site during the construction phase.
» Fire fighting equipment should be provided on site for fighting veld fires and other fires that may develop on site.
» Fire fighting training should be provided to selected construction staff at the outset of the construction phase.

Cumulative Impacts:

None.

Nature: Impact on the natural vegetation

The impact on the natural vegetation associated with the construction phase is assessed in detail as part of the specialist vegetation study (refer to Section 7.1.1 and Appendix G). The SIA seeks to comment on the response of the local farmers to the loss of natural vegetation. In this regard the loss of natural vegetation is regarded as an emotional issue by farmers whose livelihoods are dependent upon the land.

	Without mitigation	**With mitigation**
Extent	Local (3)	Local (2)
Duration	Medium (3)	Medium (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Low (27)**
Status (positive or negative)	Negative	Negative (For those farmers who may be affected. It may not be possible to completely prevent the loss of natural vegetation)
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» The mitigation measures identified in the specialist botanical study to minimise disturbances to the natural vegetation should be implemented.
» The construction area, including access roads, assembly areas etc. should be clearly demarcated and fenced off during the construction phase.
» The movement of all construction related vehicles should be limited to the demarcated areas both on the site and on adjacent farms.
» Contractors that move beyond the demarcated areas should be fined and required to rehabilitate damaged areas. The issue of fines should be referred to in the Construction EMP.
» Eskom should compensate landowners for damage caused to natural vegetation during the construction phase.
» A rehabilitation programme should be implemented to rehabilitate all disturbed areas. The rehabilitation programme should be informed by the findings of the specialist botanical study.

Cumulative Impacts:

» Regional negative impact.
» Impacts of this type of development will be significantly less than for various existing and proposed mining operations in the region.

Nature: Impact on Skaapvlei Road (construction phase)

The major impacts on the road surface are linked to the weight of construction machinery (750 tonne main lift crawler crane) and components (the nacelle weighing approximately 83t). The option of establishing a cement bathing plant at Lutzville has also been mooted. If this is the case the transport of cement from the proposed batching plant will also impact on the road surface. Any further deterioration in the already poor quality of the road is regarded as a key issue. (Refer also to the access and transportation specialist study in Section 7.1.8 and Appendix Q)

	Without mitigation	**With mitigation**
Extent	Local and Regional (4)	Local and Regional (4)
Duration	Short (2)	Long Term (4) (if road is up-graded and or surfaced)
Magnitude	High (8) (Negative impact on system)	High (8) (Benefit to system)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (56)**	**High (64)**
Status (positive or negative)	Negative	Positive (If road is upgraded and or surfaced as part of the project)
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» The findings of and recommended mitigation measures contained in the preliminary

technical assessment undertaken by Eskom of the Skaapvlei road should be considered. However, it should be borne in mind that there is an expectation amongst some members of the community that the road will be tarred, and this expectation may need to be managed by Eskom.

Cumulative Impacts:

» Local negative impacts as a result of increased use of and impact to road infrastructure.

» Cumulative impacts as a result of increased numbers of vehicles (particularly heavy vehicles) utilising the local gravel roads (other vehicles are typically associated with the mining activities, farming activities or tourism), which could result in deterioration of the road infrastructure.

Nature: Impact on farm infrastructure (construction phase)

The area identified for the proposed Wind Energy Facility potentially impacts upon the farm infrastructure on all three of the potentially affected properties, namely Nooitgedacht, Skilpadvlei and Skaapvlei Farms.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short (4) (If damage is not repaired)	Very Short (1) (If effective mitigation measures are implemented and or compensation is paid)
Magnitude	High (8) (if damage is not repaired)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Medium (39)**	**Low (12)**
Status (positive or negative)	Negative	Neutral (If effective mitigation measures are implemented and or compensation is paid)
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Eskom should liase with the local farmers to identify and map the location and condition of the farm infrastructure on the affected farms;

» Eskom should ensure that the location of all farm infrastructure on the affected farm is made available in map form to the contractors;

» Eskom should undertake to repair and replace any farm infrastructure damaged or destroyed as a result of the construction phase. In order to ensure that claims are legitimate it is recommended that Eskom in consultation with the affected farmers undertake an audit of farm infrastructure before the construction phase commences.

The same should apply to the operational phase;

» Where critical components of the farm infrastructure will be disrupted, such as water supply, Eskom must liase with the affected farmer/s to ensure that the disruptions are minimised and agree on the timeframe for repairing the damage;

» Eskom should ensure that construction workers who are found guilty of damaging farm infrastructure are dismissed and charged.

Cumulative Impacts:

None

Nature: Creation of employment and business opportunities (construction phase)

The construction phase for phase 1 (50 turbines) is expected to last approximately 12 months. During this period the project will create a number of employment and business opportunities associated with the construction of the components of the wind turbines, the transport of the various components of the wind turbines to the site, the preparation of the site for establishment of the turbines and the actual process of establishing the wind turbines on-site. In addition, employment and business opportunities will be created by the required upgrading of Skaapvlei Road and the installation of a 132 kV power line from the site to Juno Substation. The potential exists for local companies to either partnership or subcontract with the selected wind turbine supplier to create further job opportunities.

	Without mitigation	**With optimisation**
Extent	Local-Regional-National (3)	Local-Regional-National (3)
Duration	Short (2)	Short (2)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Medium (33)**
Status (positive or negative)	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Eskom should develop a database of local firms that qualify as potential service providers (construction companies, catering companies, waste collection companies etc) prior to the commencement of the tender process. These companies should be notified of Eskom's tender requirements, added to Eskom's database of suppliers and invited to bid for project related work.

» Where necessary, Eskom should assist local firms to fill in and submit the required tender forms.

» The local authorities, community organisations and leaders should be informed of the project and the potential job opportunities for locals.

» The employment selection process should seek to promote the employment of locals and the women wherever possible.

Cumulative Impacts:
None.

Nature: Impact on current farming activities (operational phase)
This issue relates to the potential long-term impact of the Wind Energy Facility on existing farming activities, specifically grazing available for sheep and other livestock. The loss of land to the facility may result in:

» Affected farming operations being reduced to sub-economic farming units due to reduction in size;
» Affected farming operations becoming uneconomic due to the loss of important grazing areas and or grazing rights.

In terms of the project the proposed study site currently impacts upon:

» Approximately 66 percent of the available summer grazing land on Nooitgedag Farm (leased by Mr. Agenbach);
» Approximately 25% of total area of Skilpadvlei Farm;
» Approximately 50% of the land owned by the Visser brothers (i.e. 5/158), and more than half the summer grazing area of the total land utilised by the Visser brothers.

	Without mitigation	**With mitigation**
Extent	Local (5)	Local (3)
Duration	Long term (4)	Short term (2) (If effective mitigation measures are implemented and or compensation is paid)
Magnitude	High to Very High (8-10)	Low-Moderate (4-6)
Probability	Highly Probable (4)	Probable (3)
Significance	**High (68-76)**	**Low-Moderate (27-33)**
Status (positive or negative)	Negative	Neutral (If effective mitigation measures are implemented and or compensation is paid)
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:
The option of granting grazing rights to the affected farmers should be considered by Eskom. However, given the long regeneration periods for disturbances to the natural vegetation it will take time for the areas disturbed by the construction activities to recover. This, combined with the low stock carrying capacity in the area (approximately 1 SSU/10 ha), will impact on the economic viability of the affected farms. However, in the absence of specialist agricultural assessment of the economic viability of the affected farms and until

such time as the final footprint has been established it is not possible to comment with any degree of certainty as to how each of the affected farm owners will be affected. This issue will need to be assessed as part of Eskom's negotiation process with the affected farmers.

It is therefore recommended that an agricultural specialist be appointed once the final footprint for the proposed Wind Energy Facility has been finalised. The specialist should be involved in the negotiation process undertaken by Eskom with the affected farmers.

Cumulative Impacts:
None.

Nature: Visual impact and implications for future land uses and sense of place (operational phase)

Due to the number of wind turbines (100) and their size (80 m high towers with an additional 45 m in height added on by blades) it will impossible to screen the wind energy facility from the adjacent farms. The proposed development will therefore be highly visible. (Refer also to the visual impact assessment in Section 7.1.6 and Appendix M)

	Without mitigation	**With mitigation**
Extent	Local (5)	Local (5)
Duration	Long-term (4)	Long-term (4)
Magnitude	High to Very High (10)	High (8)
Probability	Highly Probable (4)	Probable (3)
Significance	**High (76)**	**Moderate (51)**
Status (positive or negative)	Negative	Negative
Reversibility	No	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	

Mitigation:
None possible

Cumulative Impacts:
» Impact ratings reflected in visual impact tables above are based on the visual impacts associated with the entire extent of the development (i.e. 100 turbines).
» No other developments of a similar nature exist in the area.

Nature: Creation of tourism opportunities (operational phase)

The current tourist related activities in the area where the proposed Wind Energy Facility will be located are low. In this regard the establishment of a Wind Energy Facility does have the potential to attract additional tourists to the area. (Refer also to the tourism potential assessment in Section 7.1.9 and Appendix N)

	Without mitigation	**With optimisation**
Extent	Local-Regional (2)	Local-Regional (3)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Low (4)

Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Medium (36)**
Status (positive or negative)	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Eskom should liaise with representatives from the Matzikama Local Authority and the local tourism sector to raise awareness of the proposed wind energy facility.

» Eskom should establish a covered viewing site where passing visitors can stop and view the site. The viewing site should be equipped with information boards that provide visitors with information on the project and other relevant information, such as Eskom's policy with regard to renewable energy, South Africa's energy policy and needs, challenges associated with climate change and global warming etc.

» In order to maximise the benefits of the information board to the broader community it is recommended that the information be presented in the three official languages of the Western Cape, namely English, Afrikaans and Xhosa.

» A visitor centre and or information board will be established at the site. While the establishment of a visitor centre at the facility will benefit visitors to the site it is unlikely that the centre will, on its own, attract additional visitors to the area. Strategically located information boards linked to a viewing area located on the perimeter of the site would benefit passing visitors.

Cumulative Impacts:

None.

Nature: Promotion of clean, renewable energy (operational phase)

South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result South Africa is one of the highest per capita producer of carbon emissions in the world and Eskom, as an energy utility, has recently been identified as the world's second largest producer carbon emissions (Cape Times, 15 November 2007).

The establishment of a clean, renewable energy facility will therefore reduce, albeit minimally, South Africa's reliance on coal-generated energy and the generation of carbon emissions into the atmosphere.

	Without mitigation	**With optimisation**
Extent	Local-Regional-National (4)	Local-Regional-National (4)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	Very High (10)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**High (68)**	**High (76)**
Status (positive or negative)	Positive	Positive
Reversibility	Yes	

Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

In order to maximise the benefits of the proposed project Eskom should:

» Use the project to promote and increase the contribution of renewable energy to the national energy supply;

» Maximise the public's exposure to the project via an extensive communication and advertising programme.

In addition the facility has the potential to provide power to local communities and farmers and the Matzikama region. The IDP Manager indicated that the region would benefit significantly if the facility could provide cheaper electricity to the Matzikama region (L. Phillips, *pers. comm*). Cheaper electricity would provide a stimulus for much-needed local agri-industrial and other development in the area as well as an attraction to outside investors.

Cumulative Impacts:

None.

Implications for Project Implementation

» Impacts on the social environment as a result of construction of the wind energy facility can all be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region.

» Impacts during the operational phase relate mainly to the visual impact imposed by the facility on the local environment. The primary visual impact, namely the appearance and dimensions of the wind energy facility (mainly the wind turbines) is not possible to mitigate. The functional design of the structures and the dimensions of the facility cannot be changed in order to reduce visual impacts.

» Eskom should establish a liaison committee made up of representatives from Eskom, the contractors and adjacent landowners to devise a code of conduct for workers to address conflicts that may arise.

» The measures aimed at enhancing the employment and business opportunities and highlighting the projects contribution to clean, renewable energy should be implemented.

» The option of granting grazing rights to the affected farmers should be considered by Eskom. However, given the long regeneration periods for disturbances to the natural vegetation it will take time for the areas disturbed by the construction activities to recover. This, combined with the low stock carrying capacity in the area (approximately 1 SSU/10 ha), will impact on the economic viability of the affected farms. However, in the absence of specialist agricultural assessment of the economic viability of the affected farms and until such time as the final footprint has been established it is not possible to comment with any degree of certainty as to how each of the affected farm

owners will be affected. This issue will need to be assessed as part of Eskom's negotiation process with the affected farmers. It is recommended that an agricultural specialist be appointed once the final footprint for the proposed Wind Energy Facility has been finalised. The specialist should be involved in the negotiation process undertaken by Eskom with the affected farmers.

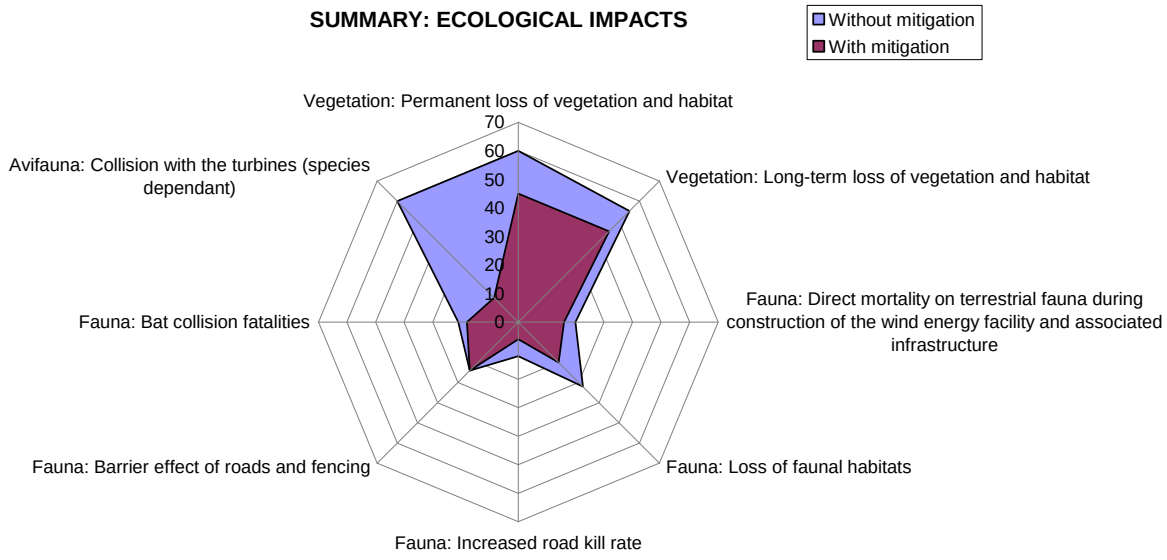
7.2.11. Summary of Impacts

As a summary of the potential impacts identified and assessed through the EIA process, the following provide a diagrammatic representation of the significance ratings for the potential ecological, visual and social impacts.

As indicated in Chapter 4, the significance weightings for potential impact have been rated as follows:

» **< 30 points:** Low (i.e. where this impact would not have a direct influence on the decision to develop in the area)
» **30-60 points:** Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated)
» **> 60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area).

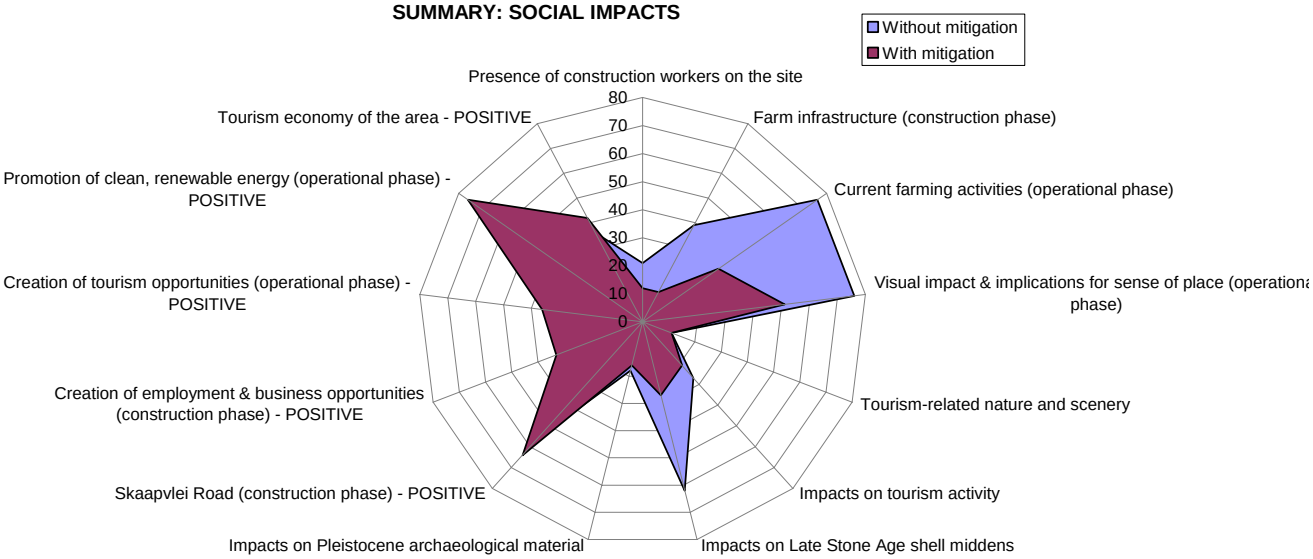
These ratings are illustrated on the axis of the graph. Impact ratings without mitigation are indicated in blue, and impact ratings with mitigation are indicated in purple.



Ecological impacts are primarily of low to moderate significance without mitigation. With the implementation of recommended mitigation measures, the impacts are reduced. Impacts on avifauna cannot be determined with confidence

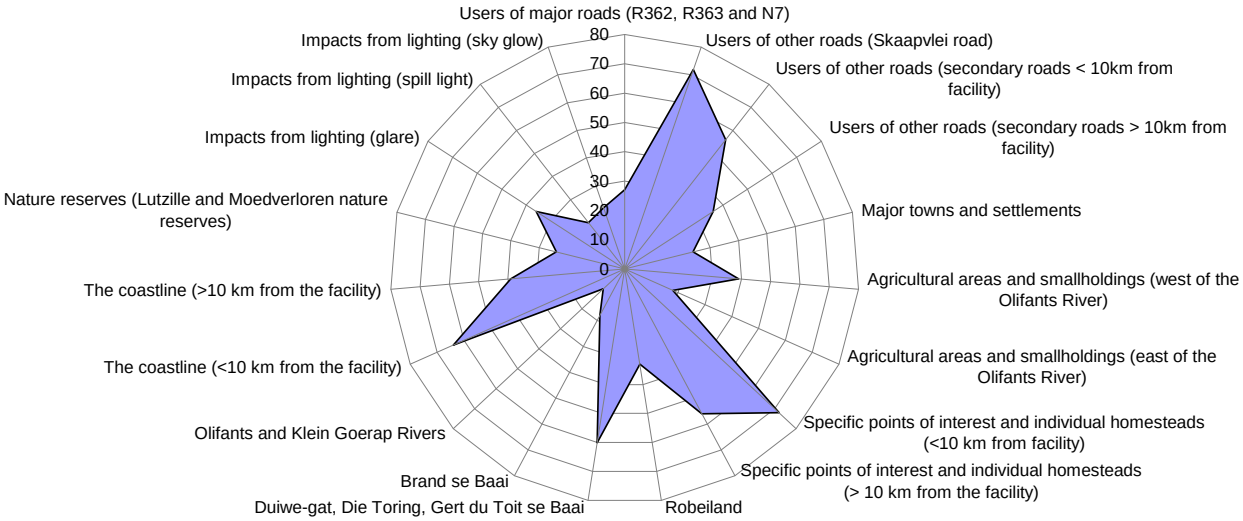
through this assessment, and monitoring of the interaction of the various species with the wind energy facility will provide further insight.

SUMMARY: SOCIAL IMPACTS



Social impacts are primarily of low to moderate negative significance without mitigation. With the implementation of recommended mitigation measures, the impacts are reduced. High negative impacts relate to impacts on farming practices on the proposed site, as well as visual impacts (discussed below). Several positive impacts/benefits to the social environment can also be realised. These are indicated on the left side of the graph.

SUMMARY: VISUAL IMPACTS



Visual impacts are the main impacts resulting from the proposed wind energy facility. The majority of impacts are of moderate significance. However, sensitive receptors in the immediate vicinity of the facility will experience impacts of high

moderate negative significance. Mitigation is not possible for such a facility in an area of this nature, and not significance ratings are therefore provided with mitigation.

7.3. Assessment of Potential Cumulative Impacts associated with the proposed Wind Energy Facility

Cumulative impact, in relation to an activity, refers to the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area[17]. The cumulative impacts associated with the proposed wind energy facility can be viewed from two perspectives: 1) cumulative impacts associated with the scale of the project, i.e. that up to 100 turbines located on one site; and 2) cumulative impacts associated with other activities/developments in the area.

The potential *direct* cumulative impacts as a result of the proposed project are expected to be associated predominantly with:

» Visual impact on the surrounding area – at a local level and driven primarily by the number of turbines proposed within the facility.

The potential *indirect* cumulative impacts as a result of the proposed project are expected to be associated predominantly with:

» Flora, fauna and ecological processes – at a regional level and driven primarily by the on-going negative effects of mining activities in the area.
» Increase grazing pressures (i.e. loss of land with grazing potential) - at a local and regional level.
» Increased pressure on road and other infrastructure (in particular Skaapvlei road).

Cumulative effects have been considered within the detailed specialist studies, where applicable (refer to Appendices G -Q) and are listed in the tables in section 7.2 above.

[17] Definition as provided by DEAT in the EIA regulations.

ASSESSMENT OF IMPACTS: PROJECT ALTERNATIVES CHAPTER 8

As a precursor to the commencement of the EIA process, Eskom embarked on a consultative process with DEAT and DEA&DP regarding the proposed wind energy facility project and the approach to undertaking an assessment for a facility of this nature in the Western Cape. It was determined, in consultation with DEAT and DEA&DP, that a site identification and selection process to determine areas along the West Coast coastline that are suitable for wind energy development should be undertaken for a larger area (at a regional level) using the methodology developed and recommended by DEA&DP for the siting of wind energy facilities in the Province[18].

Eskom then embarked on a regional site identification and selection process to determine and delineate areas north of the Olifants River as suitable sites for commercial wind energy development. Through the regional assessment site identification and selection process, Eskom were guided to site/locate their proposed wind energy facility within an area/zone of preference in terms of environmental and planning criteria (the site selection process undertaken is described in Chapter 4 of the Scoping Report). Eskom then delineated boundaries of a larger site with the best potential from a wind resource perspective coupled with the consideration of the results from the environmental and planning criteria.

The consideration of technical factors, such as the availability of wind resources[19], terrain, proximity to the electricity grid, and access requirements is considered important, as the technical drivers (and ultimately the technical viability of the project) are critical. Without considering this technical input, the areas identified through following the Regional Methodology are recognised as areas appropriate for development, and not specifically for development of a Wind Energy Facility. Therefore, these technical considerations were considered for this study area in parallel with the regional assessment.

This process was undertaken to ensure that the EIA process could commence with a viable and practical site for investigation (understanding the importance of the role played by the wind resource for a facility of this nature).

[18] *Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape - Towards a Regional Methodology for Wind Energy Site Selection* (Western Cape Provincial Government, May 2006).

[19] Discussed further in Chapter 3.

A report detailing the outcomes of the regional assessment and technical considerations was submitted to DEAT and DEA&DP in June 2007. DEAT accepted the process followed, and advised that results of the study were considered to be acceptable. The proposed site was, therefore, accepted by DEAT and no **location/site alternatives** were required to be considered further within this EIA process. A scoping study was initiated for the demarcated site (an area of approximately 37 km^2) comprising the following farms:

» Portion 5 of the farm Gravewaterkop 158 (known as Skaapvlei)
» A portion of Portion 620 of the farm Olifants River Settlement (known as Skilpadvlei)
» A portion of Portion 617 of the farm Olifants River Settlement (known as Nooitgedag)

No absolute 'no-go' areas were identified within the site evaluated within the Scoping Study, although a number of issues requiring further study were highlighted. The EIA phase has considered site specific siting alternatives within the larger proposed wind energy facility site.

This Chapter provides an assessment of the feasible and reasonable project alternatives[20] considered through the EIA process.

1. The **'do nothing' alternative**: Eskom does not establish a wind energy facility in the Western Cape (maintain status quo).
2. **Site-specific alternatives**: Relating to actual turbine positions and positions of the associated infrastructure on the site (i.e. access roads, substation/s, visitors centre) over an area of less than 20 km^2.
3. **Alternative servitudes for power line routing**: A double circuit 132 kV power line is proposed to connect the substation at the wind energy facility to the electricity distribution network/grid at the Juno Transmission Substation (outside Vredendal). Alternative routes/corridors for the 132 kV power line have been assessed in the EIA.
4. **Transportation route alternatives:** Relating to the transportation of all the components associated with the project to the site. The various transportation options (harbour, rail, air, road), as well as the possible routes associated with these options were assessed through the transportation study (refer Appendix Q) and summarised in section 8.4.

The sections which follow provide a summary of the assessment of these project alternatives.

[20] As required in terms of the EIA Regulations.

8.1. The 'do nothing' alternative

Internationally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of resources. The South African Government has set a 10-year cumulative target for renewable energy of 10 000 GWh renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro. This amounts to ~4% (1 667 MW) of the total estimated electricity demand (41 539 MW) by 2013.

In responding to the growing electricity demand within South Africa, as well as the country's targets for renewable energy, Eskom has a drive to establish renewable forms of energy generation capacity and contribute to the targets published in the Renewable Energy White Paper. Through research, the viability of a wind energy facility has been established, and Eskom propose that up to at least 200 MW can be realised from the proposed facility on the West Coast (based on turbine technology choice).

The 'do nothing' alternative translates to Eskom not establishing a wind energy facility on the demarcated site within the Western Cape (that is, maintaining the status quo). The following impacts would result:

» The project would not assist Eskom or the South African government in reaching their set targets for renewable energy.
» The potential to harness and utilise good wind energy resources at the site north of the Olifants River would be lost.
» The National electricity grid would not benefit from the additional generated power (Eskom propose that up to at least 200 MW can be realised from the proposed facility on the West Coast (based on turbine technology choice).

This is, therefore, not a preferred alternative.

8.2. Site-specific Alternatives in terms of Turbine and other Infrastructure Positioning

A detailed site layout optimisation/'micro-siting' exercise has been undertaken by Eskom to effectively 'design' the wind energy facility within the proposed development site. The layout of the wind turbines and ancillary infrastructure (including access roads, laydown areas and the substation site) was planned primarily in terms of the wind resource in the area. The overall aim was to maximise electricity production through exposure to the wind resource, while minimising infrastructure, operation and maintenance costs, and social and environmental impacts.

Specialist software was used to assist Eskom in selecting the optimum position (in terms of generating capacity) for each turbine. This micro-siting exercise revealed the best possible positions for the turbines, substation and other infrastructure from a technical perspective. It was proposed that the 100 turbines are constructed in four rows (marked as rows A-D) which lie parallel and equidistant to one another. In order to accommodate site-specific alternative turbine placements on the ground (e.g. in order to avoid or mitigate an area of environmental sensitivity), the "turbine rows" have been considered as 200 m wide "corridors" of disturbance, which provides a degree of flexibility for the placement of infrastructure. Each "corridor" would contain the row of turbines together with other associated infrastructure such as the access road, laydown areas, cabling trench etc, and is sufficiently wide to allow for alternative positioning of the infrastructure within the corridor.

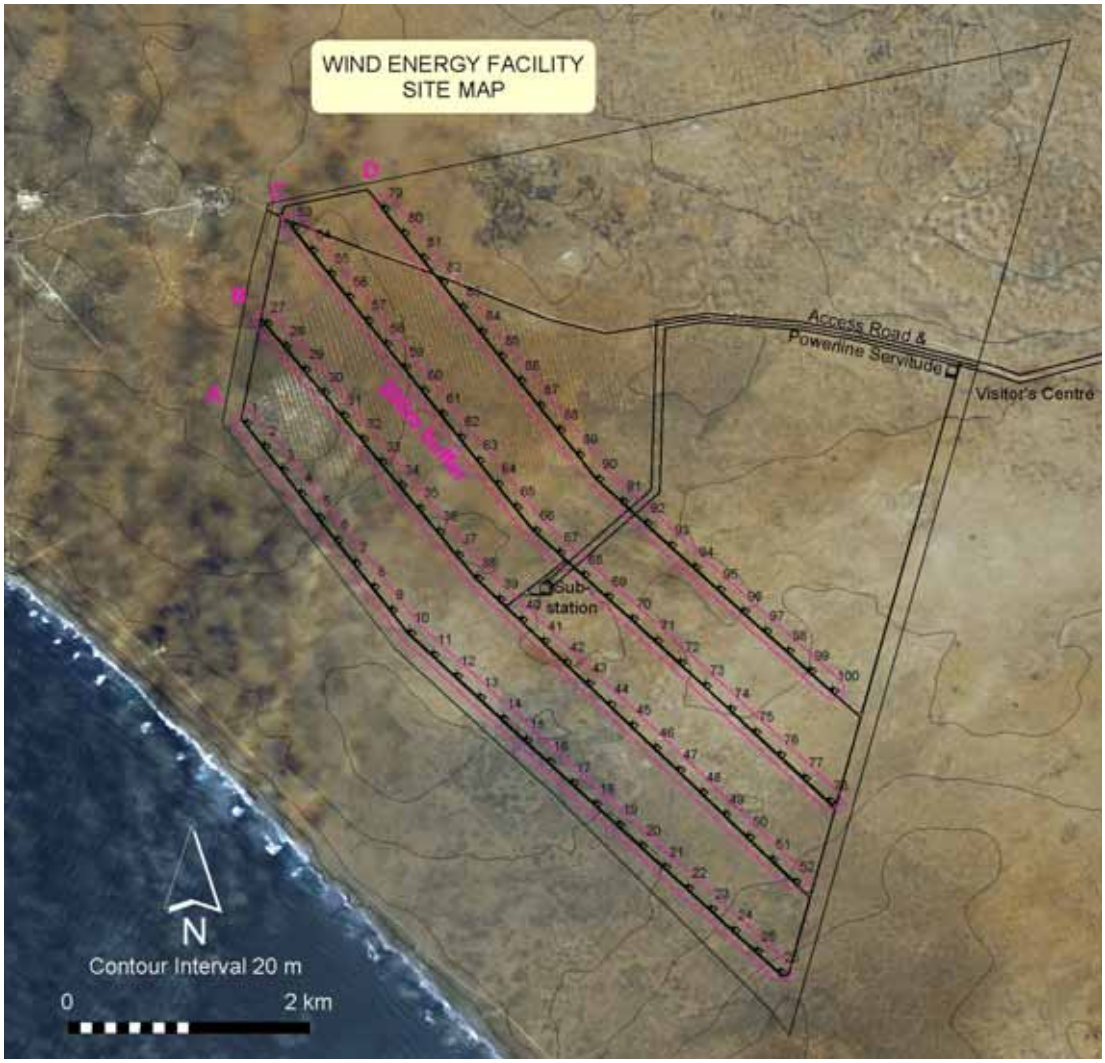


Figure 8.1: Illustration of the wind energy facility layout and the 200 m wide impact corridors identified for investigation.

This micro-siting information informed the specialist impact assessments undertaken at the EIA phase. The four "corridors" of disturbance have been

considered in detail through the specialist studies and conclusions drawn as to where changes in site-specific footprints may be required in order to avoid potentially sensitive areas (as discussed in Chapter 7 and Chapter 9).

8.3. Alternative Servitudes for Power Line Routing

Network integration studies and planning for the transmission of the power generated at the wind energy facility is being designed and will be finalised through the findings of the EIA process.

A double circuit 132 kV power line is proposed to connect the substation at the wind energy facility to the electricity distribution network/grid at the Juno Transmission Substation (outside Vredendal), a distance of approximately 40 km. The connection point to the Eskom power grid at the Juno Substation has been informed through an understanding of the local power requirements and the stability of the local electricity network.

The power line would be referred to as the Juno-Wind Farm 132 kV power line. Eskom's naming convention for power lines is based on the substations which a power line connects – in this case Juno Substation and the Wind Farm Substation - and these substations are referred to in alphabetical order (and not in the direction of current flow).

Alternative routes/corridors for the 132 kV power line have been identified and assessed in the EIA phase (refer to Figure 8.2). The power line servitude options are proposed to follow other existing linear infrastructure (including roads and or other power lines) as closely as possible in order to consolidate linear infrastructure in the area, and to minimise the need for additional points of access/access roads. The routes are as follows:

Alternative 1: From Juno Substation (near Vredendal), the alternative route crosses the R362 and follows the existing Juno-Koekenaap distribution power line for a total distance of 20km until it reaches the R363 (south of the Koekenaap Substation). At this point, the power line is proposed to cross this road and head west towards the wind energy facility, following the alignment of the Skaapvlei road. A sub-alternative (referred to as **Alternative 1a**) has been proposed to avoid an area of high botanical sensitivity, and follows the existing distribution line for about 15 km before heading due west across the R363 (north of the Keerweder settlement) towards the proposed wind energy facility. Alternative 1 is approximately 40 km in length. The sub-alternative Alternative 1a reduces the overall length of Alternative 1 by 1 km (i.e. 39 km total length).

Alternative 2: From Juno Substation (near Vredendal), the alternative route crosses the R362 and follows the existing Juno-Koekenaap distribution power line

for a couple of kilometres. The route then crosses back over the R362 in a north-westerly direction. Where this road makes a loop around an open quarry, the alternative crosses over the same road again and continues north of Lutzville alongside the Vredendal-Bitterfontein railway line for approximately 13.5 km until it the vicinity of Koekenaap. The route passes east and north of Koekenaap, over the R363 and north of the Skaapvlei road agricultural holdings before heading west towards the wind energy facility. The route follows the alignment just to the south of the Skaapvlei road, skirting the Skilpadvlei and Kommandokraal homesteads. Alternative 2 is approximately 36km in length.

Alternative 1 follows an existing power line for about 40% of its length, with the remainder being a new routing. Alternative 2 is virtually all a new power line routing, but follows other linear infrastructure including the Vredendal-Bitterfontein railway line.

The two proposed route alternatives are mapped out as corridors of 200 m in width. A 30 m wide servitude will be required for the final route. Eskom proposes to register a right of way along the eventual servitude, pay compensation for its use, but not to acquire ownership. Some leeway in the final siting of the power line (i.e. in response to existing conditions on the ground) is provided by the following factors:

» Lateral movement of the required 30 m servitude is possible within the wider 200 m corridor, and siting of the power line footings can be amended to avoid sensitive features or areas, such as homesteads or cultivated areas.
» The 200 m average distance between the power line towers can be increased or decreased in order to avoid sensitive features or areas, such as streams or cultivated areas. However, these increases will require higher towers for the relevant segment.

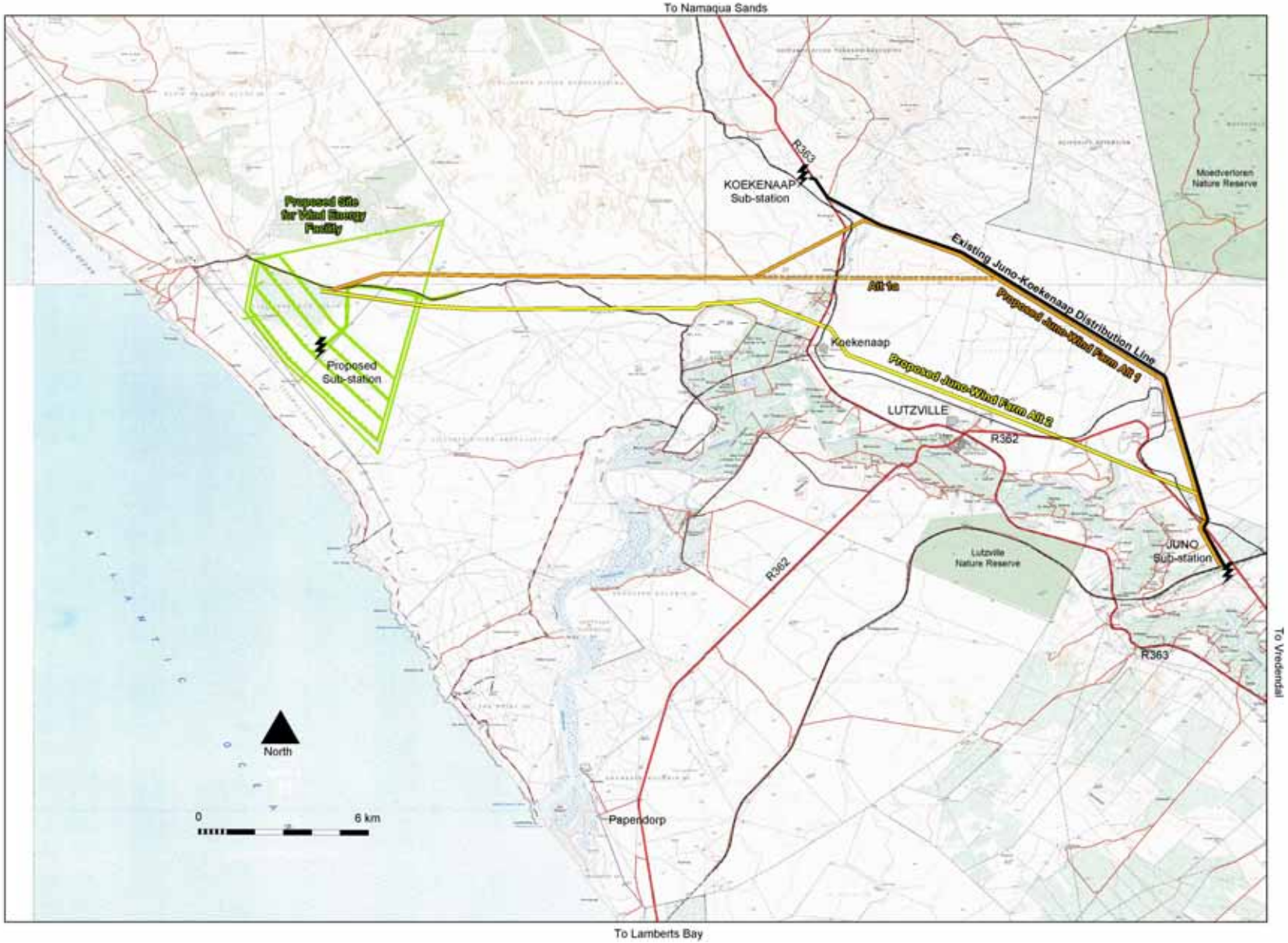


Figure 8.2: Alternative power line corridors 1 (and 1a) and 2 identified for consideration in the EIA process

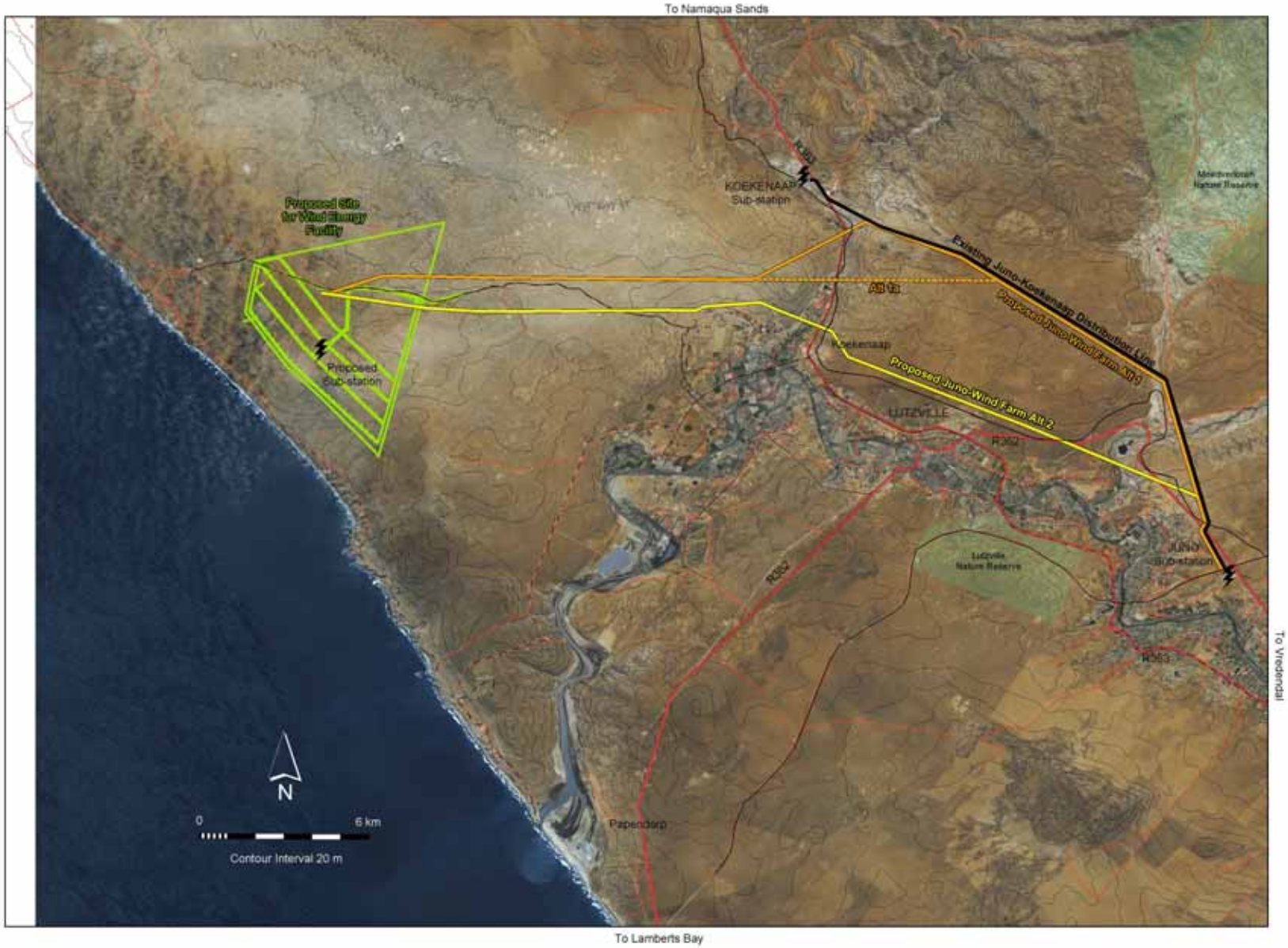


Figure 8.3: Alternative power line corridors 1 (and 1a) and 2 identified for consideration in the EIA process (illustrated on an aerial photo)

The sections which follow provide a comparative assessment of the identified power line alternatives.

8.3.1. Potential Impacts on Vegetation

One area of botanical sensitivity north of Koekenaap has been identified to be traversed by Alternative 1. In order to avoid this area of high sensitivity, a sub-alternative referred to as Alternative 1a has been considered. As indicated in Figure 8.4, there are significant patches of Very High sensitivity vegetation in this area, mostly in the form of Knersvlakte Quartz Vygieveld.

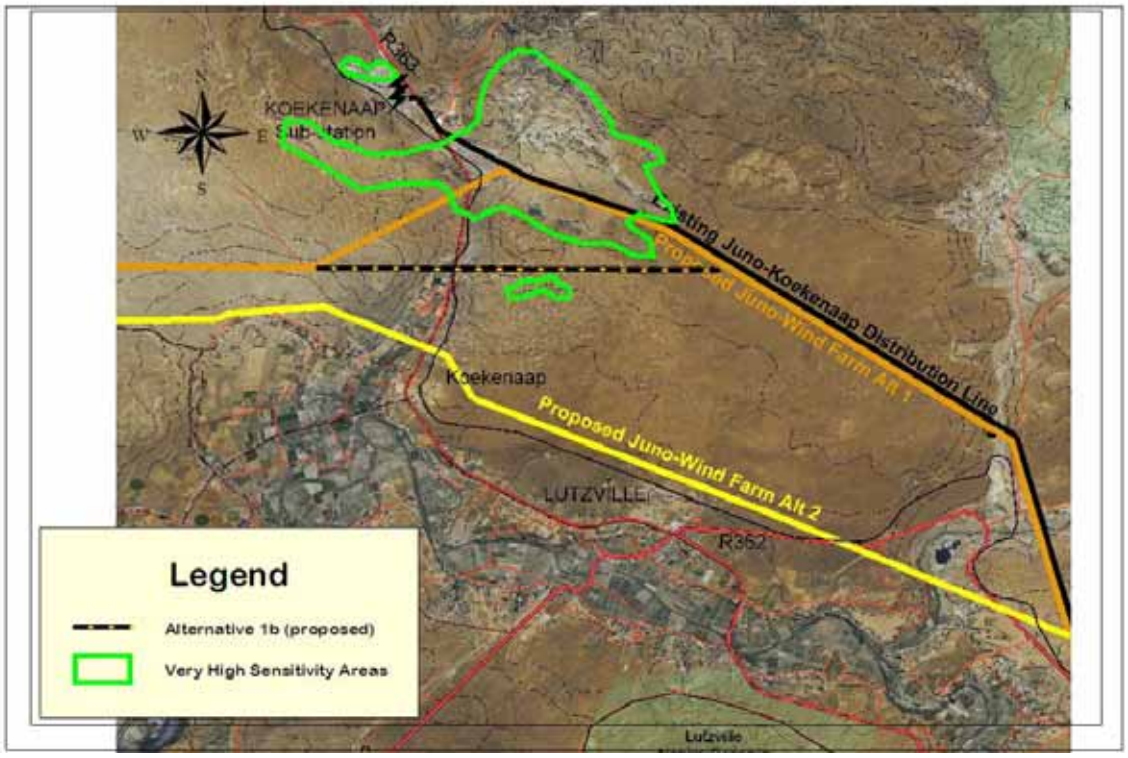


Figure 8.4: Proposed power line alternatives showing very high sensitivity areas in the Koekenaap and Lutzville area that should be avoided, and proposed Alternative 1a that is both shorter and crosses only lower sensitivity areas. No other high sensitivity botanical areas are crossed by either of the power line alternatives.

No other significant impacts on vegetation are anticipated to be associated with the proposed routes Alternative 1 and Alternative 2. Power lines usually have relatively small footprints and have little influence on the vegetation, especially in arid areas where there is no fire risk and the vegetation does not need to be bushcut beneath the line. Besides the Knersvlakte Quartz Vygieveld (which can be avoided by opting for Alternative 1a), none of the other vegetation types crossed by the proposed power line alternatives are considered to be a threatened ecosystem in terms of the NSBA analysis (Rouget, *et al*., 2004), and all have large untransformed portions within the Knersvlakte or on the

Namaqualand coastal plain. It is unlikely that any populations of threatened plants in these habitats will be impacted by the proposed power line.

The routing of the power line along Alternative 1a will entirely avoid the most sensitive habitats in the quartz patches near Koekenaap. Therefore, **Alternative 1 with sub-alternative 1a** is nominated as the preferred option.

Impact tables summarising the significance of impacts on vegetation (with and without mitigation) for power line Alternatives 1 & 2

Nature: Loss of vegetation and habitat: <u>Power line Alternative 1</u>
Long-term to permanent loss of vegetation and habitat in quartz patches near Koekenaap

A power line through the highly sensitive quartz patches would cause significant and permanent damage, in the form of plant loss due to crushing, and permanent habitat alteration. The fine covering of quartz pebbles is key to the habitat, and any heavy machinery severely disturbs this layer, effectively rendering the habitats unsuitable for these specialised plants for many decades thereafter. Given that the quartz patches are fairly small and localised on a landscape scale it is considered to be unacceptable to have infrastructure routed through them, when they are easy to avoid.

CapeNature does not support any activities that may negatively impact on the habitat/ecological functioning of habitats that may contain a unique signature of species, such as found in quartz patches.

Direct permanent loss of vegetation is expected in tower footprint areas. Disturbance of the natural vegetation as a result of construction will occur within the power line servitude. Disturbance will be long-term but temporary as these areas should eventually recover to a significant degree (if natural vegetation is retained in the adjacent areas), but could take at least 15 years (and possibly much longer if rainfall is below normal) in order to recover to a point where at least 80% of the original diversity is once again present. Certain species may not return for many additional years, due to changes in soil structure (compaction).

	Without mitigation	**With mitigation**
Extent	Local, regional and national (4)	Local (2)
Duration	Long term to permanent (5)	Short term to permanent (3)
Magnitude	Medium – High (6)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Very High (75)**	**Medium (45)**
Status (positive or negative)	Negative	Negative
Reversibility	Partly, but only over >100 yrs	Partly, but only over >10 yrs
Irreplaceable loss of resources?	Yes	No
Can impacts be	Only by use of Alternative	Not significantly

mitigated?	1a	
Mitigation:		
» Routing of the power line along Alternative 1a will entirely avoid the most sensitive habitats.		
» For remainder of route – minimise areas of disturbance for tower footings and during power line construction.		
» Utilise existing roads and points of access as far as possible to avoid the creation of new areas of disturbance.		
Cumulative Impacts:		
» Regional negative impact.		
» Impacts of this type of development will be significantly less than for various existing and proposed mining operations in the region.		

Nature: Loss of vegetation and habitat: <u>Power line Alternative 2</u>
Temporary to permanent loss of vegetation

Direct permanent loss of vegetation is expected in tower footprint areas. Disturbance of the natural vegetation as a result of construction will occur within the power line servitude. Disturbance will be long-term but temporary as these areas should eventually recover to a significant degree (if natural vegetation is retained in the adjacent areas), but could take at least 15 years (and possibly much longer if rainfall is below normal) in order to recover to a point where at least 80% of the original diversity is once again present. Certain species may not return for many additional years, due to changes in soil structure (compaction).

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short term to permanent (3)	Short term to permanent (3)
Magnitude	Low (4)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Medium (45)**	**Medium (45)**
Status (positive or negative)	Negative	Negative
Reversibility	Partly, but only over >10 yrs	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Not significantly	
Mitigation:		
» Minimise areas of disturbance for tower footings and during power line construction.		
» Utilise existing roads and points of access as far as possible to avoid the creation of new areas of disturbance.		
Cumulative Impacts:		
» Regional negative impact.		
» Impacts of this type of development will be significantly less than for various existing and proposed mining operations in the region.		

Comparative Assessment Statement

The routing of the power line along Alternative 1a will entirely avoid the most sensitive habitats in the quartz patches near Koekenaap. Therefore, **Alternative 1 with sub-alternative 1a** is nominated as the preferred option.

8.3.2. Potential Impacts on Terrestrial Fauna

Potential impacts associated with the construction of the proposed power line between the Wind Farm Substation and the Juno Substation relate mainly to direct mortality of animal species during construction, habitat destruction, increased road kills, and the barrier effect of roads and fences.

The two alternative routes (and sub-alternative) for the Juno-Wind Farm power line do not differ in any significant way as far as faunal habitat which they will traverse is concerned. Therefore, there is **no significant difference** in the potential impacts on terrestrial fauna associated with the erection of a power line along any of the routes identified. Therefore, the impacts for the two alternatives are not comparatively assessed in the tables below.

Impact tables summarising the significance of impacts on terrestrial fauna (with and without mitigation) for power line Alternatives 1 & 2 *(no comparative assessment required as similar for both alternatives)*

Nature: Direct mortality on terrestrial fauna during construction of the power line: <u>Power line Alternative 1 (and 1a) and Power line Alternative 2</u> Those species that cannot flee from the affected areas by themselves during the construction phase of the power line could potentially suffer direct mortality. These species could therefore suffer direct mortality due to site clearing and excavations at tower footprints, site clearing and excavations along service/access roads, and use of service roads.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Short-term (1)	Short-term (1)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Low (20)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Not applicable	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Removal of animals from the affected areas before the start of site clearing/construction and relocating these to safe areas would only be a valid mitigation option in the case of tortoises. All other reptile and small mammal species are extremely difficult to catch and it would be a futile attempt to try and relocate them.
» Minimise areas of disturbance for tower footings and during power line construction.
» Utilise existing roads and points of access as far as possible to avoid the creation of new areas of disturbance.

Cumulative Impacts:

None. The impacts of this type of development will be significantly less than for various existing and proposed mining operations in the region.

Nature: Loss of faunal habitats: <u>Power line Alternative 1 (and 1a) and Power line Alternative 2</u>

The construction of the power line and the use/establishment of an access road will result in the loss of faunal habitat, which may impact on terrestrial fauna species.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (0)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	In many cases the impact will be irreversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Instead of blanket site clearing for the erection of the power line towers, under the power line for stringing purposes, or for gaining access, the goal should be to keep as much as possible of the natural habitat intact. By doing this, the significance rating of the impact could be lowered to *Low*.
» Minimise areas of disturbance for tower footings and during power line construction.
» Utilise existing roads and points of access as far as possible to avoid the creation of new areas of disturbance.

Cumulative Impacts:

» Regional negative impacts on habitat loss and fragmentation.
» The impacts of this type of development will be significantly less than for various existing and proposed mining operations in the region.

Comparative Assessment Statement

There is no significant difference in the potential impacts on terrestrial fauna associated with the erection of a power line along the routes identified. Therefore, there is **no preference** between the alternatives power line routes.

8.3.3. Potential Impacts on Avifauna

Alternative 1 follows existing power line infrastructure for approximately 18 km of its length. This provides a distinct advantage in terms of reducing collision risk for birds. By bringing multiple power lines into a single, narrow corridor, the combined assemblage is significantly more visible to overflying birds, and the likelihood of collisions occurring with any one of the aggregated lines is reduced. The new Juno-Wind Farm 132 kV power line is likely to stand taller than the existing line, so once the new line is marked with diverters on the earthwire in key areas, this will have the additional benefit of reducing any collision risk already associated with existing line (which is currently unmarked). Alternative 1a also involves approximately 12 km of the new line running adjacent and parallel to the existing line, providing a similar advantage to Alternative 1.

In terms of the habitats traversed by the alignment options, they all include similar distances of open Strandveld (where Ludwig's Bustards and Secretarybirds are most likely to occur), and they all involve two crossings of relatively major watercourses (which might function as all-purpose avian flyways). Therefore, the inherent collision risk of the alternatives is otherwise very similar.

Overall, **Alternative 1** is nominated as the preferred option. Alternative 1 with sub-alternative 1a is acceptable. Alternative 2 is least favoured.

Impact tables summarising the significance of collision impacts on avifauna (with and without mitigation) for power line Alternatives 1 & 2

Nature: Collision with the overhead power line: <u>Power line Alternative 1 (or 1a)</u>
Birds may collide with the overhead cabling of the new power line. Collisions are one of the biggest single threats posed by overhead power lines to birds in southern Africa. Many collision sensitive birds are also long-lived, slow-reproducing species, demographically poorly equipped to absorb unnaturally inflated rates of adult mortality, and some of these species are now Red-listed, at least partly because of the long-term effects of collision casualties associated with power lines.
The most important collision-prone species within the impact zone of the proposed power line are Ludwig's Bustard and Secretarybird.

	Without mitigation[21]	**With mitigation**
Extent[22]	Local – Regional (1-3)	Local – Regional (1-3)
Duration	Permanent (5)	Permanent (5)
Magnitude	Small to High (0-8)	Small to Moderate (0-6)
Probability	Probable to highly probable (3-4)	Probable (3)
Significance	**Low – High (16-60)**	**Low – Medium (15-42)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Partially (use of Alternative 1 or 1a)	

Nature: Collision with the overhead power line: <u>Power line Alternative 2</u>

Birds may collide with the overhead cabling of the new power line. Collisions are one of the biggest single threats posed by overhead power lines to birds in southern Africa (van Rooyen 2004). Many collision sensitive birds are also long-lived, slow-reproducing species, demographically poorly equipped to absorb unnaturally inflated rates of adult mortality, and some of these species are now Red-listed, at least partly because of the long-term effects of collision casualties associated with power lines. The most important collision-prone species within the impact zone of the proposed power line are Ludwig's Bustard and Secretarybird.

	Without mitigation	**With mitigation**
Extent	Local – Regional (1-3)	Local – Regional (1-3)
Duration	Permanent (5)	Permanent (5)
Magnitude	Small to High (0-8)	Small to High (0-8)
Probability	Probable to highly probable (3-4)	Probable to highly probable (3-4)
Significance	**Low – High (16-60)**	**Low – High (16-60)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Partially	

Mitigation:

» Reduce the likelihood of collisions by bringing multiple power lines into a single, narrow corridor (i.e. through the adoption of Alternative 1 or 1a).

» All sections of the power line crossing open, relatively flat country frequented by both

[21] Dependent on species being impacted. Refer to Appendix 3 of the specialist study contained within Appendix I.

[22] Where a score of 1 is low – likely to affect a relatively small segment of a widespread population - and a score of 5 is high – likely to affect a relatively large segment of a localised population.

the Ludwig's Bustard and Secretarybird should be marked on the earthwire with a suitable marking device. » Any points where the power line crosses a watercourse, which might constitute a general flyway for local birds, should also be marked. » The final selection of sections of the power line to be fitted with marking devices should be identified after the pole positions have been pegged, by way of a walk-through conducted jointly by Eskom and a suitably qualified ornithologist. » A section of this power line should be regularly surveyed for collision casualties as part of the monitoring programme suggested for the wind energy facility itself, to evaluate the efficacy of the marking devices used, and to ensure that unmarked sections of line where casualties are recorded are subsequently marked.
Cumulative Impacts: » Positive impacts: By bringing multiple power lines into a single, narrow corridor, the combined assemblage is significantly more visible to overflying birds, and the likelihood of collisions occurring with any one of the aggregated lines is reduced. » Negative impacts: Increased numbers of power lines in various locations/positions within an area increases the risk of collisions.

In terms of impacts arising from electrocution or disturbance, there is **no significant difference** in the potential impacts on avifauna associated with the alternatives. Therefore, the impacts for the two alternatives are not comparatively assessed in the tables below.

Impact tables summarising the significance of impacts on avifauna (with and without mitigation) for power line Alternatives 1 & 2 *(no comparative assessment required as similar for both alternatives)*

Nature: ***Electrocution: <u>Power line Alternative 1 (and 1a) and Power line Alternative 2</u>***

Birds may be electrocuted when perching, or attempting to perch on the pylons supporting the new power line, by bridging the air gap between live components and/or live and earthed components (van Rooyen, 2004) and causing a short circuit. The electrocution risk of the proposed 132 kV power line will be entirely dependent on the design of the tower structures used. The raptor fauna of the area are those most likely to suffer electrocution on the proposed line, with the larger species – Martial Eagle, Black-chested Snake Eagle and possibly others most at risk.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Moderate (33)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	

Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Partially through careful tower selection/design	

Mitigation:

» The mono-pole tower structures currently favoured to support the power line are a good option in terms reducing of avian electrocution risk, provided that the clearances all-around are in excess of 2 m.

» Ideally, a section of this line should be regularly surveyed for electrocution casualties as part of the monitoring programme suggested for the wind energy facility itself, to verify that the selected tower design is a low electrocution risk option, and to ensure that should any electrocution casualties be picked up, the offending structures are accordingly fitted with bird guards in the appropriate places.

Cumulative Impacts:

None.

Nature: Disturbance: <u>Power line Alternative 1 (and 1a) and Power line Alternative 2</u>

During the construction and maintenance of power lines some habitat alteration will inevitably take place with the construction of access roads, and the clearing of servitudes. These activities may have an impact on birds breeding, foraging and roosting in or in close proximity to the servitude. Construction and maintenance activities on the line may disturb resident and breeding species of birds.

	Without mitigation[23]	**With mitigation**
Extent	Local (1 - 2)	Local (1 - 2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Small to low (0 – 4)	Small to very low (0 – 2)
Probability	Highly probable (4)	Probable (3)
Significance	**Low to Medium (24-44)**	**Low (18-27)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Partially	

Mitigation:

» All construction and maintenance activities should be carried out according to generally accepted environmental best practice, and the temporal and spatial footprint of the power line should be kept to a minimum.

» In particular, care should be taken in the construction of the power line in the vicinity of the river crossings, and existing roads must be used as far as possible for access

[23] Dependent on species being impacted. Refer to Appendix 3 of the specialist study contained within Appendix I.

during construction.

» In order to minimise impacts on bird species which may have active nests on the immediate vicinity of the construction area, it may be necessary to (a) survey the construction area immediately before work commences, and (b) to work around any such nest sites located in this pre-construction survey.
» Should any important nest sites be located close to the power line servitude in the pre-construction monitoring of the site, these should be given special consideration in the planning of all routine maintenance activities.
» Reduce the extent of habitat destruction through the consolidation of power line infrastructure thus enabling the use of existing service/access roads during construction and maintenance activities.
» Ideally, a pre-construction walk-through of the selected power line alignment should be done by an experienced ornithologist to check key areas for nests of threatened species.
» Any bird nests that are found subsequently should be reported to the EWT to allow expert advice on how to deal with the situation.

Cumulative Impacts:

Positive impacts: By bringing multiple power lines into a single, narrow corridor, the:

» need for additional service/access roads is reduced, thereby reducing the extent of disturbance
» extent of disturbance in the region can be minimised as maintenance activities on the parallel lines can be synchronised as far as possible.

Comparative Assessment Statement

Alternative 1 is nominated as the preferred option with regards to reducing collision-risk associated with a power line. Alternative 1 with sub-alternative 1a is acceptable. Alternative 2 is least favoured.

In terms of impacts arising from electrocution or disturbance, there is **no significant difference** in the potential impacts on avifauna associated with the alternatives.

Impact of birds on quality of supply on 132 kV line

Birds may cause electrical faults on power lines. This can happen in various ways, and the higher the number of faults recorded, the lower the quality of electricity supplied to end-users.

'Bird streamer' induced faulting is caused when a large bird produces a stream of faeces long enough to constitute an air gap intrusion between the conductor and the earthed structure, creating a short circuit. Bird pollution is a form of pre-deposit pollution. A flashover occurs when the insulator string gets coated with pollution, which compromises the insulation properties of the string. When the layer of pollution is dampened by rain or high humidity, the coating becomes conductive, insulation breakdown occurs and a flashover results. Bird's nests

may also cause faults when nesting material protrudes into the air gap. Crows in particular often incorporate wire and other conductive material into their nests.

Streamer-, pollution- and nest-related faults could occur when birds regularly perch or nest on pylons or towers, directly above live conductors. The risk of bird-related faulting will be dependent on the design of the tower structures used. (Species implicated: Herons, ibises, eagles and crows).

The favoured tower designs are poorly suited to use as nesting substrates by most bird species, and the perching areas are generally situated in areas either off-set or well away from the conductors, so the likelihood of birds having a significant negative impact on quality of supply is much reduced. However, any incidents of line faulting attributed to avian activities on the line should be reported to the EWT and will then be managed on a case-by-case basis.

8.3.4. Potential Impacts on Geomorphology and Surface Processes

A number of areas or landforms regarded as sensitive to development have been identified along the proposed power line alternative routes. These include erosion gully networks, floodplains, gullys, pans, potential headwater of drainage lines, eroded areas, incised drainage lines and drainage lines. The location of these in relation to each alternative considered is detailed in the specialist study contained within Appendix J.

As Alternative 2 is shorter (hence potentially less cumulative impact of the service road on the landscape), has fewer sensitive areas located along its length and is only associated with two floodplain traverses (as opposed to three associated with Alternative 1), **Alternative 2** is the preferred option from a geomorphological and surface processes perspective. This does not imply that Alternative 1 or Alternative 1a are unsuitable, and these alternatives are also considered to be acceptable.

In terms of impacts arising from geomorphological and surface processes, there is **no significant difference** in the potential impacts associated with the alternatives (except for the number of features potentially traversed). Therefore, the impacts for the two alternatives are not comparatively assessed in the tables below.

Impact tables summarising the significance of impacts on geomorphology and surface processes (with and without mitigation) for power line Alternatives 1 & 2 *(no comparative assessment required as similar for both alternatives)*

Nature: Excavation of foundations for power line towers and access roads: <u>Power line Alternative 1 (and 1a) and Power line Alternative 2</u>		
Excavation of foundations for power line towers or the establishment of access roads will be associated with localised surface modification.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Very short term (1)	Very short term (1)
Magnitude	Moderate (6)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**Medium (40)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	High	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation: » Minimise extent of modified areas and keep each area of disturbance to a minimum. » Rehabilitate as soon as possible post-disturbance. » Do not spread displaced sediment over vegetation.		
Cumulative Impacts: None		

Nature: Accelerated aeolian sediment transport possibly leading to the development of deflation hollows: <u>Power line Alternative 1 (and 1a) and Power line Alternative 2</u>		
A loss of vegetation (or other) cover will increase the susceptibility of sediments to wind erosion.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Small (0)
Probability	Definite (5)	Definite (5)
Significance	**Low (25)**	**Low (15)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	No	

Can impacts be mitigated?	Yes	

Mitigation:

» Minimise extent of modified areas and keep each area of disturbance to a minimum.
» Revegetate areas where there has been a loss of vegetation as soon as is practically possible.
» Do not spread displaced sediment over vegetation.

Cumulative Impacts:

None

Nature: Preferential aeolian erosion of sediment adjacent to structures and subsequent subsidence: <u>Power line Alternative 1 (and 1a) and Power line Alternative 2</u>

The winnowing affect associated with local flow modifications caused by structures may lead to subsidence if these structures are undercut.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Small (0)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Ensure a good indigenous vegetation cover is maintained adjacent to the tower footing.

Cumulative Impacts:

None

Nature: A reduction in the surface area of wetlands e.g. (pans) in the study area: <u>Power line Alternative 1 (and 1a) and Power line Alternative 2</u>

Construction of roads, tracks or other infrastructure in wetlands will lead to a loss of this habitat in the study area.

	Without mitigation	**With mitigation[24]**
Extent	International (5)	
Duration	Permanent (5)	

[24] Assumption that mitigation is successfully avoiding all wetlands and pans and their associated buffer areas.

Magnitude	Very high (10)	
Probability	Very improbable (1)	
Significance	**Low (20)**	**None**
Status (positive or negative)	Negative	
Reversibility	Low	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Avoid all pans and drainage lines and associated 50 m buffer zones, wherever possible for the siting of infrastructure, even if of a temporary nature.

Cumulative Impacts:

Regional loss of wetlands and pans.

Nature: Accelerated fluvial sediment transport and hence erosion associated with channelised/concentrated flow: <u>Power line Alternative 1 (and 1a) and Power line Alternative 2</u>

Erosion may be accentuated in flow concentration zones (e.g. culverts, roadside drainage ditches).

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Low (2)
Probability	Definite (5)	Probable (3)
Significance	**Medium-High (60)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Use existing roads wherever possible.

» With new roads, ensure culverts are suitably sized and roadside drainage ditches on steep sections are sealed.

» Construct mitre drains at regular intervals.

Cumulative Impacts:

None

Nature: ***Accelerated fluvial sediment transport and hence erosion associated with overland flow: <u>Power line Alternative 1 (and 1a) and Power line Alternative 2</u>***

A loss of vegetation cover may increase the susceptibility of a sediment surface to overland flow related erosion processes.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**Medium (35)**	**Low (25)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Revegetate areas where there has been a loss of vegetation as soon as is practically possible.

Cumulative Impacts:

None

Comparative Assessment Statement

In terms of impacts arising from geomorphological and surface processes, there is **no significant difference** in the potential impacts associated with the alternatives (except for the number of features potentially traversed). **Alternative 2** is nominated as a preferred option due to fewer features potentially traversed. However, Alternative 1 or sub-Alternative 1a are also considered to be acceptable.

8.3.5. Potential Impacts on Heritage Sites

The main cause of impacts to archaeological sites is physical disturbance of the material itself and its context. The heritage and scientific potential of an archaeological site is highly dependent on its geological and spatial context. This means that even though, for example a deep excavation may expose archaeological artefacts, the artefacts are relatively meaningless once removed from the area in which they were found. Large-scale excavations will damage archaeological sites, as will road construction, building foundations and services. The destruction of archaeological material is always considered to be a permanent

and irreversible impact, although very often the intensity of an impact can be very low depending on the significance of the site in question.

Inspection of borrow pits and easily accessible deflation hollows along the routes proposed as Alternative 1 (and 1a) and Alternative 2 have shown that unless there is a specific resource focus on the landscape that would attract pre-colonial occupation, the likelihood of significant material of heritage value is very low. Furthermore, the footprint of each tower is limited. This together with the fact that all identified alternatives traverse a landscape where heritage material is very sparse, results in a very low potential for impacts. All alternatives are expected to have similar archaeological/heritage impacts. However, **Alternative 1 (or Alternative 1 with sub-alternative 1a)** is nominated as the preferred option as it is preferable to confine any impacts that may occur to an existing impact corridor, and secondly the greater distance of these alternatives from the Olifants River reduces the possibility of impacting archaeological material. Alternative 2 is least preferred.

Therefore, there is **no significant difference** in the potential impacts on heritage sites associated with the erection of a power line along either of the routes identified. Therefore, the impacts for the two alternatives are not comparatively assessed in the tables below.

Impact tables summarising the significance of impacts on heritage sites (with and without mitigation) for power line Alternatives 1 & 2 *(no comparative assessment required as similar for both alternatives)*

Nature:	***Impacts on heritage sites associated with the construction of 132kV power line: Power line Alternative 1 (and 1a) and Power line Alternative 2***	
	Without mitigation	**With mitigation[25]**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (1)	Low (1)
Probability	Improbable (1)	Improbable (1)
Significance	**Low (6)**	**Low (6)**
Status (positive or negative)	Neutral	Neutral
Reversibility	No	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	No	

[25] Assumption that mitigation is successfully avoiding all wetlands and pans and their associated buffer areas.

Mitigation:
» N/A
Cumulative Impacts:
Regional loss of heritage resources.

Comparative Assessment Statement

All alternatives are expected to have similar archaeological/heritage impacts. However, **Alternative 1 (or Alternative 1 with sub-alternative 1a)** is nominated as the preferred option as it is preferable to confine any impacts that may occur to an existing impact corridor, and secondly the greater distance of these alternatives from the Olifants River reduces the possibility of impacting archaeological material. Alternative 2 is least preferred.

8.3.6. Potential Visual Impacts

The results of the viewshed analyses for the proposed power line alternatives are shown on Figure 8.5 and 8.6.

The visual exposure of Alternative 1 and Alternative 1a (Figure 8.5) virtually covers the whole 5 km buffer radius. This is largely due to the flat nature of the terrain and the low growth of the natural vegetation. The power line will be exposed to observers travelling along the R362 and R363. It will also not be exposed to any major populated places due to the power line traversing near vacant rural land for the largest part of its alignment.

A similar pattern of visual exposure is encountered when viewing the result of the visibility analysis of Alternative 2. The exposure of this alternative, however, occurs within a closer proximity to built-up areas and settlements such as Lutzville, Koekenaap, the Skaapvlei road agricultural holdings and the farm Skilpadvlei. This alternative will furthermore be more visible from the R362 as it crosses the road three times as opposed to only once for Alternative 1.

Figure 8.5: Potential visual exposure of the proposed power line Alternative 1 and 1a

Figure 8.6: Potential visual exposure of the proposed power line Alternative 2

The visual impact index for the proposed transmission line Alternative 1 is shown in Figure 8.7. The higher areas of visual impact are indicated within the immediate vicinity of the power line (i.e. within a 500 m buffer zone). Approximately 20 km of the power line is situated adjacent to the existing Juno-Koekenaap distribution line, whilst most of the line traverses near vacant land with a low viewer frequency. The highest visual impact indicated on the index occurs where the proposed line crosses the R362 near Juno substation and R363 near the Koekenaap Substation.

Alternative 1a traverses the R363 in close proximity to the Keerweder populated area (within 1 km north of the settlement) and could potentially have a visual impact on this community.

Figure 8.7: Visual impact index of the proposed power line Alternative 1 and Alternative 1a

The visual impact index for the proposed power line Alternative 2 (Figure 8.8) displays a similar pattern to Alternative 1 (i.e. a higher visual impact within a 500 m radius of the line). Alternative 2 is, however, located closer to built-up and residential areas (Koekenaap and the Skaapvlei road smallholdings) and therefore has additional areas of high impact in these areas. It further has a higher visual exposure where it crosses the R362 three times where it will be

exposed to road users for a greater length of time than is the case for Alternative 1. This proposed alternative alignment also traverses adjacent to and across the Skaapvlei road and has the potential to visually impact on road users and other homesteads (Kommandokraal) located in close proximity to this road.

Figure 8.8: Visual impact index of the proposed power line Alternative 2

The visual impacts associated with the construction of a 132 kV power line to the Juno substation occur at a local level. This is due to the less visually intrusive nature of the proposed monopole power line towers suggested for this line. These structures are less obtrusive than the more commonly used lattice structures that are more bulky in appearance and therefore more visible. The visual exposure (within a 5 km radius) of the identified alternatives indicated a similar pattern due to the homogeneous nature of the topography and the low

visual absorption capacity of the natural vegetation (refer to impact tables below).

The determination of the potential visual impact and selection of the preferred alternative for the transmission line was based on the following comparative criteria:

» The length of the alignment
» The proximity and exposure to major roads (based on the number of road crossings)
» The proximity and exposure to populated places
» The consolidation of existing linear infrastructure (existing power line servitudes, access roads, etc.)

A comparative table indicates a summary of the above criteria. Positive values were awarded for opportunities and negatives where constraints were identified.

Power line Alternatives Visual Assessment Comparison

Alter-native	Length (Total)	Proximity to major roads	Proximity to populated places	Consolidation of existing infrastructure	Total Value
1	40km (-1)	2 crossings (-2)	Remote (+1)	High potential (up to 20km) (+2)	(0) Preferred
1a	39km (0)	2 crossings (-2)	Close proximity to Keerweder (-1)	Average potential (15km) (+1)	(-2) Accept-able
2	36km (+1)	4 crossings (-4)	Close proximity to Koekenaap, Skaapvlei Rd. smallholdings, Skilpadvlei & Kommando-kraal (-4)	Low potential (less than 3.5km) (-1)	(-5) Not preferred

Impact tables summarising the significance of visual impacts (with and without mitigation) for power line Alternatives 1 & 2

Nature: Visual impact associated with power line <u>Alternative 1</u>		
	Without mitigation	**With mitigation**
Extent	Local (4)	N/A
Duration	Long-term (4)	N/A
Magnitude	Medium (5)	N/A
Probability	Probable (3)	N/A

Significance	**Medium (39)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Not easily. The primary visual impact, namely the appearance and dimensions of the power line is not possible to mitigate. The functional design of the structures and the dimensions of the power line cannot be changed in order to reduce visual impacts.	
Mitigation: Not possible to mitigate to any significant extent due to the nature of the towers and the nature of relief of the area.		
Cumulative Impacts: Impacts are likely, as the power line is associated with other linear infrastructure (i.e. the existing Juno-Koekenaap power line and Skaapvlei road) – this can be viewed as positive or negative, depending on the perspective of the viewer.		

Nature: Visual impact associated with power line <u>Alternative 1a</u>		
	Without mitigation	**With mitigation**
Extent	Local (4)	N/A
Duration	Long-term (4)	N/A
Magnitude	Medium – high (7)	N/A
Probability	Highly probable (5)	N/A
Significance	**High (75)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Not easily. The primary visual impact, namely the appearance and dimensions of the power line is not possible to mitigate. The functional design of the structures and the dimensions of the power line cannot be changed in order to reduce visual impacts.	

Mitigation: N/A
Cumulative Impacts: Impacts are likely, as the power line is associated with other linear infrastructure (i.e. the existing Juno-Koekenaap power line for part of its length and Skaapvlei road) – this can be viewed as positive or negative, depending on the perspective of the viewer.

Nature: Visual impact associated with power line <u>Alternative 2</u>		
	Without mitigation	**With mitigation**
Extent	Local (4)	N/A
Duration	Long-term (4)	N/A
Magnitude	High (8)	N/A
Probability	Highly probable (5)	N/A
Significance	**High (80)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	None	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Not easily. The primary visual impact, namely the appearance and dimensions of the power line is not possible to mitigate. The functional design of the structures and the dimensions of the power line cannot be changed in order to reduce visual impacts.	
Mitigation: N/A		
Cumulative Impacts: Impacts are likely, as the power line is associated with other linear infrastructure (i.e. the existing Vredendal-Bitterfontein railway line and Skaapvlei road) – this can be viewed as positive or negative, depending on the perspective of the viewer.		

Comparative Assessment Statement

Alternative 1 is nominated as the preferred option with regards to reducing visual impact associated with a power line. Alternative 1 with sub-alternative 1a is acceptable. Alternative 2 is least favoured.

8.3.7. Potential Impacts on Tourism Potential

Available tourism market trends indicate that the northern part of the West Coast receives between 5% and 10% of visitors to the Western Cape and that these are largely concentrated in the area to the south of the Olifants River mouth and Vredendal. There does not appear to be a marked trend of tourism growth in the area and the market size in the immediate vicinity of the study area is very limited. The area is outside of the West Coast tourism coastal development zones, which are located South of the Olifants River Mouth.

While the study area is not known as an area of outstanding natural and scenic value and visitors are not expected to visit the area specifically for its scenic qualities, the broader region and the N7 Cape-to-Namibia route are promoted as a scenic nature area due to the variety of landscapes and the expansive, undeveloped countryside along the route.

The key concern regarding impacts on tourism-related nature and scenery relates to potential impacts of the Juno-Wind Farm 132 kV power line structures on views from the main roads and towns in the area. The routing of the power line will be particularly important. From a tourism perspective the urban areas and main travel routes should be avoided.

Alternative 1 is preferred since it crosses the R363 at a right angle and then routes away from the road to link up with the existing Juno-Koekenaap power line. This routing avoids a parallel routing along the road, valley and urban areas with travellers being able to see the power line towers along or at regular intervals along the route, as will be the case with Alternative 2.

Impact tables summarising the significance of impacts on tourism potential (with and without mitigation) for power line Alternatives 1 & 2

Nature: ***Impacts on the tourism-related nature and scenery: <u>Power line Alternative 1 (and 1a)</u>***		
	Without mitigation	**With mitigation**
Extent	Local (2)	N/A
Duration	Permanent (5)	N/A
Magnitude	Low (4)	N/A
Probability	Improbable (2)	N/A
Significance	**Low (22)**	N/A
Status (positive or negative)	Negative	
Reversibility	The impact cannot be reversed since it is caused by the visual and physical	

	nature of the construction	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	To some degree, if the route is away from sensitive tourist receptors. The visual impact cannot be mitigated easily due to the appearance and dimensions of the power line.	
Mitigation: » Route the power line away from sensitive tourist receptors.		
Cumulative Impacts: Impacts are likely, as the power line is associated with other linear infrastructure (i.e. the existing Juno-Koekenaap power line and Skaapvlei road) – this can be viewed as positive or negative, depending on the perspective of the viewer.		

Nature: Impacts on the tourism-related nature and scenery: <u>Power line Alternative 2</u>		
	Without mitigation	**With mitigation**
Extent	Local (2)	N/A
Duration	Permanent (5)	N/A
Magnitude	Low (4)	N/A
Probability	Highly probable (4)	N/A
Significance	**Medium (44)**	N/A
Status (positive or negative)	Negative	
Reversibility	The impact cannot be reversed since it is caused by the visual and physical nature of the construction	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	To some degree, if the route is away from sensitive tourist receptors. The visual impact cannot be mitigated easily due to the appearance and dimensions of the power line.	
Mitigation: » Route the power line away from sensitive tourist receptors or out of the line of sight where possible.		
Cumulative Impacts: Impacts are likely, as the power line is associated with other linear infrastructure (i.e. the existing Vredendal-Bitterfontein railway line and Skaapvlei road) – this can be viewed as positive or negative, depending on the perspective of the viewer.		

Comparative Assessment Statement

Alternative 1 is nominated as the preferred option with regards to reducing tourism-related nature and scenery impacts as a result of visual impacts associated with a power line. Alternative 1 with sub-alternative 1a is acceptable. Alternative 2 is least favoured.

8.3.8. Potential Impacts on the Social Environment

All alternatives traverse privately-owned land. The majority of these properties are utilised for small livestock grazing or cultivation activities.

The closest dwellings to Alternative 1 are located approximately 2 km from the proposed route (Skilpadvlei and Kommandokraal). The closest settlement is Koekenaap (approximately 3 km). In addition to the properties affected by Alternative 1, sub-Alternative 1a traverses cultivated land on (an) agricultural smallholding(s) immediately north of Keerweder.

The number of directly affected landowners associated with Alternative 2 is considerably more than Alternative 1 as the properties are typically smaller in extent closer to the towns, settlements and the Olifants River floodplain. Alternative 2 passes close to smallholdings on the Skaapvlei road, the town of Koekenaap, and also cuts across a number of smallholdings and farms along the 15 km stretch between Koekenaap and Liebendal railway station. Alternative 2 also traverses land (in three places) that is either currently under cultivation, or has been under cultivation in the recent past. The total linear distance of the affected lands is in the region of ~3 km. Alternative 2 also passes within 800 m of the Koekenaap settlement and 500 m (or less) of the Uitkyk (Lutzville) residential area, and also passes in close proximity of an existing airstrip. It is not known whether the airstrip facility is registered and or currently in use.

The comparative assessment of Alternative 1 and 2 considers the following socio-economic factors:

» **Number of properties and owners affected**. This has direct implications with regard to the number of people which may be adversely affected, as well as for the process required to negotiate compensation.
» **The potential impacts on arable land and land under cultivation**. In this regard arable land and land under cultivation should were possible be avoided. Arable land is scarce in the study area and as such more valuable than grazing land. In addition, irrigation networks on cultivated land parcels may be disrupted, and the presence of power line infrastructure (towers) may impact on the movement of farm equipment. In comparison, impacts on land used for grazing will be minimal. The impact on grazing land will be further

reduced by the small width of the servitude (32 m) and ability to use the servitude after the natural vegetation has recovered from construction phase disturbances. The proponent, as part of their negotiations with landowners to purchase property, will undertake evaluation of the affected property by independent valuators.

» **Dwellings and residential areas** should be avoided as far as possible, mainly as a result of negative visual impacts. In addition, a power line is not permitted to pass over such infrastructure.

Power line Alternatives Social Impact Assessment Comparison

Criteria	Alternative 1	Alternative 1a	Alternative 2
Distance from dwellings	2km+ from dwellings on 2 properties	Passes within approximately 300 m of cluster of farm buildings – number of inhabited dwellings unknown	<1km from Skilpadvlei farmstead; Across Kommandokraal farmstead (2 inhabited dwellings)
Distance from settlements	~3km from Koekenaap	~2km from Koekenaap	<1km from Koekenaap; <500 m from Uitkyk
Arable/ cultivated land	Crosses none	Traverses approximately 500 m linear stretch of cultivated land north of Keerweder	Traverses approximately linear total of ~3 km in 3 distinct places
Impacts on private infrastructure	No significant	Potential impacts on irrigation infrastructure	In close proximity to private airstrip; Potential impacts on irrigation infrastructure

From the comparative assessment table above, it is concluded that **Alternative 1** is the preferred route from a social perspective, followed by Alternative 1a with Alternative 2 being the least preferred. In this regard Alternative 1 affects fewer properties, is located further away from farmhouses and settlements and impacts on land that is of lower value and supports less labour.

Nature: Impacts on the social environment: <u>Power line Alternative 1 (and 1a)</u>		
	Without mitigation	**With mitigation**
Extent	Local-Regional (4)	Local-Regional (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	No	

Can impacts be mitigated?	To a limited degree	

Mitigation:

» Route the power line away from sensitive tourist receptors.

» Final location of the power line within the 200m corridor and the location of the 30m wide servitude should be negotiated with the affected landowners.

Cumulative Impacts:

Impacts are likely, as the power line is associated with other linear infrastructure (i.e. the existing Juno-Koekenaap power line and Skaapvlei road) – this can be viewed as positive or negative, depending on the perspective of the viewer.

Nature: Impacts on the social environment: <u>Power line Alternative 1a</u>		
	Without mitigation	**With mitigation**
Extent	Local-Regional (4)	Local-Regional (3)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Medium (30)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	To a limited extent	

Mitigation:

» Route the power line away from sensitive tourist receptors.

» Final location of the power line within the 200m corridor and the location of the 30m wide servitude should be negotiated with the affected landowners.

Cumulative Impacts:

Impacts are likely, as the power line is associated with other linear infrastructure (i.e. the existing Juno-Koekenaap power line and Skaapvlei road) – this can be viewed as positive or negative, depending on the perspective of the viewer.

Nature: Impacts on the social environment: <u>Power line Alternative 2</u>		
	Without mitigation	**With mitigation**
Extent	Local-Regional (4)	Local-Regional (3)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (4)	Minor (3)
Probability	Probable (3)	Probable (3)
Significance	**Medium (39)**	**Medium (33)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	

Irreplaceable loss of resources?	No	
Can impacts be mitigated?	To a limited extent	
Mitigation: » Route the power line away from sensitive tourist receptors. » Final location of the power line within the 200m corridor and the location of the 30m wide servitude should be negotiated with the affected landowners.		
Cumulative Impacts: Impacts are likely, as the power line is associated with other linear infrastructure (i.e. the existing Vredendal-Bitterfontein railway line and Skaapvlei road) – this can be viewed as positive or negative, depending on the perspective of the viewer.		

The following mitigation measures should be considered for all alternatives under consideration:

» Minimal disturbance of natural vegetation during construction phase
» Consultation with affected land owners with regard to actual siting of servitude, power line towers and access routes (construction and maintenance)
» Consultation with affected land owners with regard to compensation mechanisms
» Consultation with affected land owners with regard to procedures to ensure that farming operations are not affected by maintenance visits (e.g. farm gates and gates between camps).

Comparative Assessment Statement

Alternative 1 is the preferred option from a social perspective. Alternative 1 affects fewer properties, is located further away from farmhouses and settlements and impacts on land that is of lower value and supports less labour. Alternative 1 with sub-alternative 1a is acceptable. Alternative 2 is least favoured.

8.3.9. Nomination of a Preferred Power Line Alternative

From the results of the specialist investigations, Alternative 1 is nominated as the preferred power line alternative by the majority of specialist findings. Alternative 1a is also considered to be acceptable, with Alternative 2 being the least preferred.

With the implementation of Alternative 1, an impact of very high significance on vegetation is anticipated in the area to the north of Koekenaap due to long-term to permanent loss of vegetation and habitat in quartz patches in this area. A power line through these highly sensitive quartz patches would cause significant and permanent damage in the form of plant loss due to crushing, and permanent

habitat alteration. The fine covering of quartz pebbles is key to the habitat, and any heavy machinery would severely disturb this layer, effectively rendering the habitats unsuitable for these specialised plants for many decades after disturbance. Given that the quartz patches are fairly small and localised on a landscape scale, it is not considered acceptable to have infrastructure routed through them when they can be relatively easy to avoid. The significance of this impact is not off-set by the fact that an existing disturbance occurs in the form of the existing power line. New impacts would develop with the introduction of new power line infrastructure.

Therefore, in order to avoid the only Very High impact associated with the construction of the Juno-Wind Farm power line, it is proposed that **Alternative 1a** is nominated as the preferred alternative. This alternative still meets the acceptance level for environmental impacts, and will ensure that impacts are minimised to an acceptable level which can be managed through the implementation of an Environmental Management Plan.

8.4. Transportation Route Alternatives: for transportation of all components associated with the project to the site

The various transportation options (harbour, rail, air, road), as well as the possible routes associated with these options were assessed through the transportation study (refer Appendix Q).

At the time of writing this report, it is understood that majority of the wind turbine components (i.e. nacelles, towers and blades) will be imported. There is a possibility that some tower components may be manufactured 'locally' in the Western Cape, however this is yet to be determined. The transport routes between a "local" manufacturer and the transport routes included in this assessment report are unknown and cannot be assessed at this stage. The various transportation routes, location of harbours and airfields are depicted regionally in Figure 8.9.

From an assessment of the alternative transportation options, it has been concluded that only **road transport** is considered feasible for the transportation of wind turbine components. Certain construction plant and equipment could be transported by rail to Koekenaap and transported to site on low bed trucks or driven under own power. A summary of the assessment of transportation options is provided below (refer also to Appendix Q).

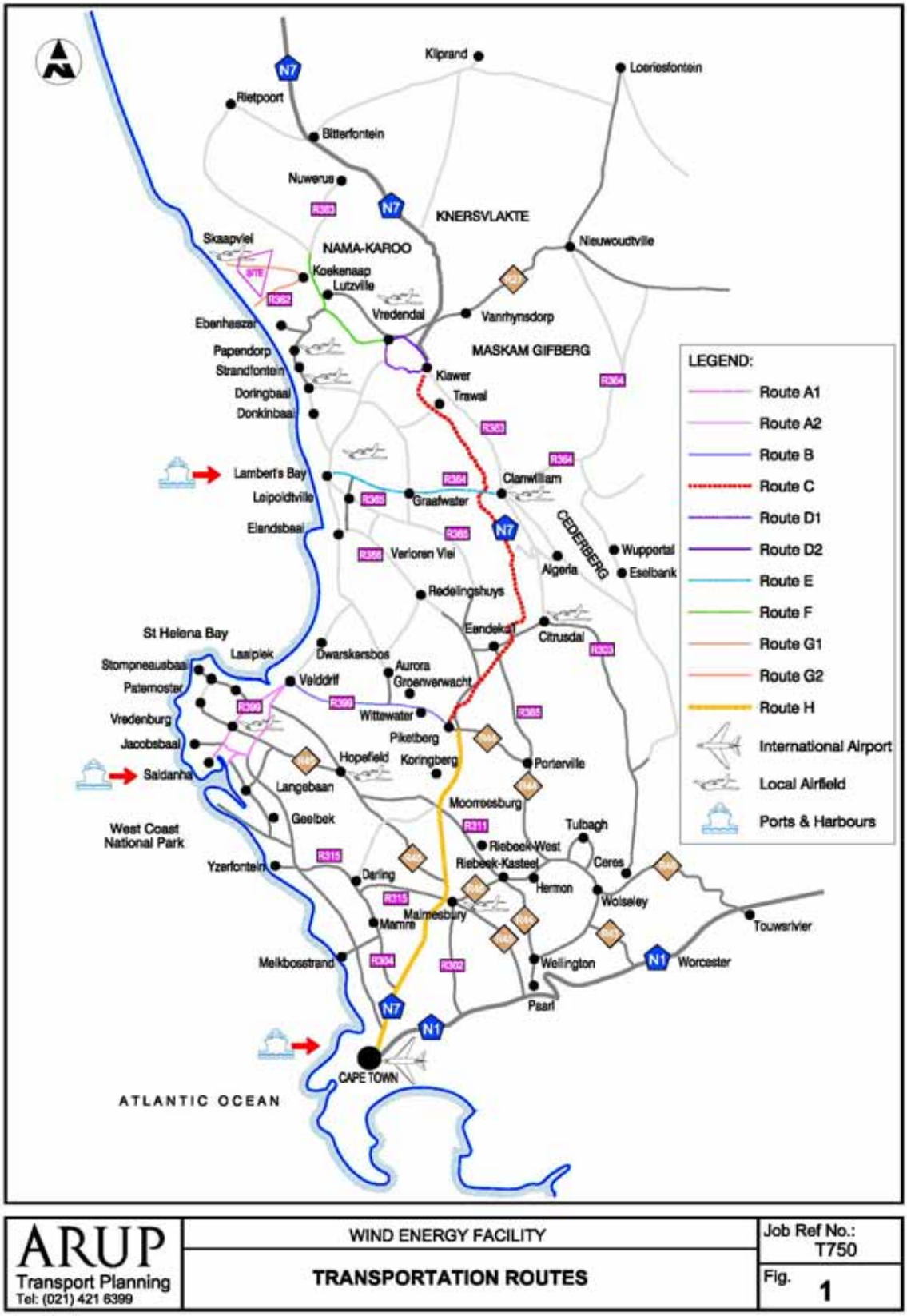


Figure 8.9: Transportation route map illustrating alternatives for the transportation of components to the facility site

8.4.1. Harbours

Three harbours were identified as possible entry points for the imported wind turbine components, namely Cape Town, Saldanha Bay and the fishing harbour at Lamberts Bay. Cape Town and Saldanha are both deep-water ports with heavy lifting equipment on the quayside. There has been no consultation with the port authorities regarding capacity during this assessment. Lamberts Bay would require further investigation to determine draught clearance on entry to the port and whether the lifting equipment within the harbour has the capacity to transfer the larger loads to road based transport vehicles. Abnormal vehicle access and the adequacy of the access roads to the harbour and the road network would also require careful evaluation by Eskom/transport contractor. For the purpose of this report, all harbours are assumed possible entry points and transport routes have been assessed between them and the proposed wind energy facility site.

8.4.2. Rail Transport

At a regional level, a rail network does exist between Cape Town, Saldanha Bay, Koekenaap, ending at Bitterfontein. The Saldanha - Sishen Iron Ore railway line runs from the Iron Ore terminal at Saldanha Bay, past Velddrif and follows the coastline until Standfontein where it swings north-east passing south of Lutzville on a north-east alignment. This is a purpose-built facility for transporting iron ore from the mines in Sishen to the export terminal at Saldanha Bay with no connection to the "local" rail network.

Spoornet[26] have revealed that the maximum load width is 3,302 m and maximum load height is 2,896 m. There is no rolling stock that can accommodate rigid 45 m long blade containers, the 20 m tower sections or the nacelles and hence rail cannot be used to transport wind turbine components. Certain construction plant and equipment could, however, be transported by rail to Koekenaap and transported to site on low bed tracks or driven under own power.

8.4.3. Road Transport

The major components of the wind turbines are to be imported and will need to be transported from the port of entry to the site. All major road routes (including Trunk Roads, Proclaimed Main, Divisional Roads and the Saldanha-Sishen Railway line service/toll road) between the major harbours and the proposed site were driven and assessed visually for possible use as a haul routes for the transportation of the wind energy facility components.

[26] Telephonic consultation with Mr Dennis Shaw, a Spoornet official involved in authorising rail route clearances.

» *Routes assessed in the Scoping Phase:*

A comprehensive route assessment was undertaken for roads that would be preferred by the National, Provincial and Local Road Authorities. These routes are generally of a high standard and many of the structures have already been assessed for load bearing capacity and are already recognised transport routes for abnormal (heavy) loads.

- N7 (Cape Town to Klawer)
- R27 (West Coast Road, Cape Town to Velddrif), with possibly a diversion along Boundary Road – Koeberg Road and Blaauwberg Road in the Milnerton / Table View area for an super-load (GVM > 125 Ton)
- R399 (Saldanha Bay to Picketburg)
- R362 and/or R363 (Klawer to Vredendal)
- R363 (Vredendal to Koekenaap)
- Koekenaap to the site along the existing local surfaced and gravel access roads.

Constraints and challenges (such as intersections, problematic geometric horizontal and vertical road alignment, cattle grids, level (road/rail) crossings, road related structures (portal culverts, structures over canals, bridges, retaining walls etc.) and low overhead services etc.) that may occur along the transport routes were identified from a desk-top assessment and from aerial photos. Specific authority requirements regarding the transportation of abnormal loads and any structures that may require further investigation along the proposed transport routes were identified through consultation with relevant officials of the South African National Roads Agency (SANRAL), Provincial Administration: Western Cape (Bridge Engineer and District Engineer – Ceres), West Coast District Municipality and the City of Cape Town. These requirements and issue(s) requiring further investigation by Eskom (and the companies tasked with the transportation of turbine components and construction plant and equipment) during the detailed design phase should that route be selected and permitted as the final haul route (or routes) are summarised within the specialist transportation report contained within Appendix Q. The Permit Issuing Authority for abnormal loads is the Provincial Administration: Western Cape. No other EIA requirements are triggered in this regard.

» *Other Transportation Routes Assessed:*

During the public participation phase of the project, a number of concerns were raised regarding the significant number of large slow moving abnormal loads that will be necessary along the N7 during the construction phase of the project. There was a concern about the narrow section of N7, which has an approximately 6 m to 7 m wide asphalt surface between Citrusdal and Clanwilliam, and the difficulty motorists will experience passing these vehicles. For example, it is estimated that for each of the 50 wind turbine

installations (Phase 1) there will be 6 abnormal load trips (4 trips for the ~20 m tower sections, 1 trip for the nacelle and 1 trip for the 3 x 45 m blades). These trips will be phased over the proposed 12 month construction phase which averages at approximately 1 load per day.

A visual assessment of other transportation route options parallel and to the west of the N7 was undertaken with the purpose of identifying whether alternative routes offer a viable alternative. A summary of the information gathered is provided in the specialist transportation report contained within Appendix Q. The routes considered within this study are generally deemed unsuitable for the hauling of abnormal loads and therefore no further detailed assessment was completed. Routes which could potentially be used do not form a logical link in the routing between origin and destination.

» *Conclusions and Recommendations*

Routes A, B, C, D (Option 1), F and G1 or Routes H, C, D (Option 1), F and G1 (refer to Figure 8.9) are the preferred transportation routes for the transport of components and equipment between Saldanha Bay and/or Cape Town and the site for a number of reasons.

* They are generally established abnormal load routes and the road pavements structures, bridges and culverts etc. have, to some extent, been designed to accommodate the abnormal loads. Use of the other routes assessed cannot be totally dismissed as possible options, but these would require further (and possibly extensive) investigations into the structural capacity of the pavement structure and numerous bridges and culverts, and could invoke numerous complaints from residents along these routes.
* These routes are generally all surfaced roads and in relatively good condition. The good riding quality of smooth surfaced roads (as opposed to uneven and corrugated surfaces of gravel roads) will ensure reduced wear and tear on the transport vehicles as well as ensure the wind energy facility components do not get damaged in transit.
* The transportation of the components will be phased over the construction period, estimated to be 24 months for the full facility and very dependant on the regularity of supply of the wind farm components (blades and nacelles) from international suppliers. With the components being dispatched from a holding area (assumed to be near one of the selected harbours) when required for installation on site. Establishing a large storage or holding area near the harbour will reduce/eliminate the need to construct a large storage area on site and hence the impact on the site, will be limited.
* Normal construction plant and equipment will either drive to site under their own power or be transported on low-beds. These are normally

licensed vehicles and do not need abnormal load permits. Many plant items will make a single trip to site and then be deployed in and around the site for the duration of the construction contract (minimum 12 months).

* These higher order roads are generally built with more generous road widths (sometimes with shoulders) and wider road reserves. The accommodation of abnormally long vehicles is likely to be easier with limited impact at intersections and temporary encroachment into corner properties.
* The extent of any road widening, intersection improvements associated with the transport routes has still to be determined but selecting the major roads will assist in limiting the associated impact.

Impact tables summarising the significance of transportation impacts (with and without mitigation)

Nature: Small localised improvements along the selected route between Cape Town and/or Saldanha Bay and the site These improvements will most likely include improvements to corners at intersections, removal of traffic islands, relocation of street furniture, installation of temporary support to culverts, bridges and canal crossings, vertical re-alignment of existing road to accommodate clearance of low-bed trailers and horizontal re-alignment of tight bends to accommodate 45 m blade trailers. It is considered likely that the works potentially required will be within existing road reserves. Where the work comprises an improvement or maintenance, no EIA applications are required in this regard.		
	Without mitigation	**With mitigation**
Extent	Localised to the point where small scale modifications (1)	N/A
Duration	Short- to medium-term (3)[27]	N/A
Magnitude	Minor (2)	N/A
Probability	Definite (5)	N/A
Significance	**Low (30)**	N/A
Status (positive or negative)	Negative on surfaced and gravel roads	
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	N/A	
Mitigation: » None		

[27] Dependent on the modification under consideration

Nature: Impacts on road surfaces

All the haul routes will be impacted upon by the abnormal wheel loads (specifically those with load limitations) and construction traffic. These vehicles will impart additional axle loading onto the existing road pavement structure. The structural capacity of the surfaced roads and un-surfaced gravel roads varies depending on the sub-soil conditions, sub-grade support material, and the thickness and quality of the materials making up the road pavement structure. The thickness of the existing road pavement layer(s), in-situ subgrade support and hence the structural strength of the road is unknown at this stage. The transportation of components and construction vehicles will potentially have an impact on the road surfaces along the transport routes.

	Without mitigation	**With mitigation**
Extent	Regional (3)	N/A
Duration	Short-term (2-5 years) (2)	N/A
Magnitude	Minor (2)	N/A
Probability	Probable (5)	N/A
Significance	**Medium (35)**	N/A
Status (positive or negative)	Neutral[28] or negative[29]	Neutral
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	N/A	

Mitigation:

» It is recommended that Eskom obtain the current road inspection assessments from the Provincial Administration and confirm a "Status Quo" condition rating of the proclaimed main roads in and around the Koekenaap, Lutzville and Vredendal area that could potentially be affected by the construction works.

» Eskom and the Provincial Government will be required to agree on any structural improvements required for the roads required to be utilised (ahead of project components being delivered to site), and will be required to agree on an on-going maintenance strategy for any roads, or portion of roads, to be utilised for the duration of the construction phase.

[28] There will be insignificant impact on roads that are designated abnormal load haul routes. There may be the need for minor modifications to intersections (accommodation of services, possibly supporting existing structures e.g. portal culverts, bridges, etc).

[29] For roads not currently rated for/designed for abnormal loads.

CONCLUSIONS AND RECOMMENDATIONS CHAPTER 9

Eskom Holdings Limited is proposing to establish a commercial wind energy electricity generation facility on a site in the Western Cape Province. It is proposed for a cluster of up to **100 wind turbines** (typically described as a wind energy facility) to be constructed over of approximately 16 km^2 in extent. An area of 37 km^2 in extent was identified for investigation at the start of the process, with an anticipated impact on an area of ~25 km^2. On review of the available layout of the facility, an effective area in the order of **16 km^2** could potentially be impacted upon.

The construction and commissioning of the facility is proposed to be implemented in **two phases**, with the first commissioned phase of the project planned to comprise approximately 50 turbines (that is, approximately fifty 2 MW to 2,5 MW industry standard turbines which would generate in the order of 100 MW). The second phase would comprise the remaining fifty turbines (the total facility not exceeding 100 turbines). The generating capacity of the facility will be dictated by the choice of turbine (a current industry standard of 2 MW turbines has been assumed at this time).

The three primary components of the project (i.e. areas of activity) include the following:

» A **Wind Energy Facility** including up to 100 wind turbine generator units, a substation, underground electrical cabling between turbines and the substation, internal access roads, and an office building and visitors centre at the facility entrance.
» Overhead **power lines** (132 kV distribution lines) from the wind farm substation feeding into the electricity network/grid at the Juno transmission substation (near Vredendal).
» Upgrading activities to the existing Divisional Road 2225 (known as Skaapvlei road) to provide access to the site (i.e. act as a **haul road** during the construction phase) from the R363 main tarred road at Koekenaap.

Through a regional assessment site identification and selection process, Eskom was guided to site/locate their proposed wind energy facility within an area/zone of preference in terms of environmental and planning criteria, and delineated boundaries for a larger site with the best potential from a wind resource perspective coupled with the consideration of the results from the environmental and planning criteria.

An area ~37 km^2 in extent falling within the Matzikama Local Municipality and the WCMA01 on the West Coast was identified by Eskom as being potentially suitable for wind energy development. This area comprises the following farms:

» Portion 5 of the farm Gravewaterkop 158 (known as Skaapvlei)
» A portion of Portion 620 of the farm Olifants River Settlement (known as Skilpadvlei)
» A portion of Portion 617 of the farm Olifants River Settlement (known as Nooitgedag)

The environmental impact assessment (EIA) for the proposed Wind Energy Facility has been undertaken in accordance with the EIA Regulations published in Government Notice 28753 of 21 April 2006, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998).

The EIA Phase aimed to achieve the following:

» Provide an overall assessment of the social and biophysical environments affected by the proposed project.
» Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with the proposed wind energy facility and associated infrastructure.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public involvement process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

The conclusions and recommendations of this EIA are the result of the assessment of identified impacts by specialists, and the parallel process of public participation. The public consultation process has been extensive and every effort has been made to include representatives of all stakeholders in the study area.

9.1. Evaluation of the Proposed Project

The preceding chapters of this report together with the specialist studies contained within Appendices G - Q provide a detailed assessment of the environmental impacts on the social and biophysical environment as a result of the proposed project. This chapter concludes the EIA process by providing a holistic evaluation of the most important environmental impacts identified through the process. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental consultants during the course of the EIA and presents an informed opinion of the environmental impact of the proposed project.

In summary, the following table summarises the potential impact and the assessed significance of these impacts for the Wind Energy Facility and associated infrastructure.

Nature of impact	Impact without mitigation	Impact with mitigation
Impacts on vegetation		
Permanent loss of vegetation and habitat	Medium – High	Medium
Long-term loss of vegetation and habitat	Medium	Medium
Impacts on terrestrial fauna		
Direct mortality on terrestrial fauna during construction of the wind energy facility and associated infrastructure	Low	Low
Loss of faunal habitats	Medium	Low
Increased road kill rate	Low	Low
Barrier effect of roads and fencing	Low	Low
Bat collision fatalities	Low	Low
Impacts on Avifauna		
Habitat destruction	Low – Medium	Low – Medium
Disturbance	Low - Medium	Low – Medium
Collision with turbines	Low - High	Low – Medium
Impacts on Geomorphology and Surface Processes		
Impoundment of overland flows by roads	Medium	Low
Increased runoff relative to the pre-disturbed state as a result of sealed surfaces (e.g. roads, roofs)	Medium	Medium
Deposition of sediment by aeolian processes adjacent to or within infrastructure (e.g. substation or visitor's centre building)	Medium	Medium
Accelerated Aeolian sediment transport possibly leading to development of deflation hollows	Low	Low
Accelerated fluvial sediment transport and hence erosion associated with overland flow	Medium	Low
Preferential Aeolian erosion of sediment adjacent to structures and subsequent subsidence	Medium	Low
Preferential fluvial erosion of sediment adjacent to structures and subsequent subsidence	Medium	Low
Excavation of foundations for wind turbines and other project related infrastructure (e.g. access roads, substation)	Medium	Low
Sandblasting of structures leading to increased maintenance requirements	Medium	Low - Medium
Reduction in the surface area of wetlands (e.g. pans) in the study area	Low	None
Impacts on Heritage Sites		
Impacts of turbine construction and related activities on Late Stone Age shell middens recorded on the site	High	Medium - Low
Impacts of turbine construction and related activities on Pleistocene archaeological material	Low	Low

Nature of impact	Impact without mitigation	Impact with mitigation
Visual Impacts		
Visual impact on users of major roads (R362, R363 and N7)	Low	N/A
Visual impact on users of other roads (Skaapvlei road)	High	N/A
Visual impact on users of other roads (secondary roads <10 km from facility)	Medium	N/A
Visual impact on users of other roads (secondary roads >10 km from facility)	Medium - Low	N/A
Visual impact on major towns and settlements	Low	N/A
Visual impact on agricultural areas and smallholdings (west of the Olifants River)	Medium	N/A
Visual impact on agricultural areas and smallholdings (east of the Olifants River)	Low	N/A
Visual impact on specific points of interest and individual homesteads (<10 km from facility)	High	N/A
Visual impact on specific points of interest and individual homesteads (>10 km from facility)	Medium	N/A
Visual impact on homesteads <10 km from the site and Rob Eiland	Medium - Low	N/A
Visual impact on Duiwe-gat, Die Toring, Gert du Toit se Baai	Medium - High	N/A
Visual impact on Brand se Baai	Low	N/A
Visual impact on the Olifants and Klein Goerap Rivers	Low	N/A
Visual impact on the coastline (<10 km from the facility)	High	N/A
Visual impact on the coastline (>10 km from the facility)	Medium	N/A
Visual impact on nature reserves (Lutzville and Moedverloren nature reserves)	Low	N/A
Visual impacts of lighting (glare)	Medium	N/A
Visual impacts of lighting (spill light)	Low	N/A
Visual impacts of lighting (sky glow)	Low	N/A
Noise Impacts		
Noise impact on Skaapvlei residences (outdoors)	Low	N/A
Noise impact on Skaapvlei residences (low frequency sound indoors)	Low	N/A
Noise impact on other noise sensitive land (outdoors and low frequency indoor noise)	Low	N/A
Noise impacts from on-site construction activities	Medium	Low
Noise impacts from transport of components & equipment to site	Medium	Low
Impacts associated with Transportation, Access & Infrastructure		
Service road: geometric alignment	High	N/A
Road pavement structures	Low - medium	N/A
Impacts on Skaapvlei road (DR2225)	Medium	Low
Impacts on Tourism Potential		
Impacts on tourism activity	Low	Low
Impacts on tourism-related nature and scenery	Low	N/A

Nature of impact	Impact without mitigation	Impact with mitigation
Positive impacts on the tourism economy of the area	Medium (positive)	Medium (positive)
Impacts on the Social Environment		
Presence of construction workers	Low	Low
Impact on the natural vegetation	Medium	Low
Impact on Skaapvlei road (construction phase)	Medium	High (positive)
Impact on farm infrastructure (construction phase)	Medium	Low (neutral)
Creation of employment and business opportunities (construction phase)	Low (positive)	Medium (positive)
Impact on current farming activities (operational phase)	High	Low – Medium (neutral)
Visual impact and implications for future land uses and sense of place (operational phase)	High	Medium
Creation of tourism opportunities (operational phase)	Low (positive)	Medium (positive)
Promotion of clean, renewable energy (operational phase)	High (positive)	High (positive)

In addition, the following table summarises the potential impact and the assessed significance of these impacts for the alternative servitudes for power line routing.

Nature of impact	Impact without mitigation		Impact with mitigation	
	Alternative 1 (& Alternative 1a)	Alternative 2	Alternative 1 (& Alternative 1a)	Alternative 2
Impacts on Vegetation				
Loss of vegetation & habitat	Very High	Medium[30]	Medium	Medium
Impacts on Terrestrial Fauna				
Direct mortality on terrestrial fauna during construction	Low	Low	Low	Low
Loss of faunal habitats	Medium	Low	Medium	Low
Impacts on Avifauna				
Collision with overhead power line	Low - High	Low - Medium	Low - High	Low – High
Electrocution	Medium	Low	Medium	Low
Disturbance	Low – Medium	Low	Low – Medium	Low
Impacts on Geomorphology and Surface Processes				
Excavation of foundations for power line towers and access roads	Medium	Low	Medium	Low
Accelerated Aeolian sediment	Low	Low	Low	Low

[30] Mitigation requires the implementation of Alternative 1a.

Nature of impact	Impact without mitigation		Impact with mitigation	
	Alternative 1 (& Alternative 1a)	Alternative 2	Alternative 1 (& Alternative 1a)	Alternative 2
transport possibly leading to the development of deflation hollows				
Preferential aeolian erosion of sediment adjacent to structures and subsequent subsidence	Medium	Low	Medium	Low
Reduction in the surface area of wetlands (e.g. pans) in the study area	Low	None	Low	None
Accelerated fluvial sediment transport and hence erosion associated with channelised/ concentrated flow	Medium - High	Low	Medium - High	Low
Accelerated fluvial sediment transport and hence erosion associated with overland flow	Medium	Low	Medium	Low
Impacts on Heritage Sites				
Impacts on heritage sites associated with the construction of the 132 kV power line	Low	Low	Low	Low
Visual Impacts				
Visual impacts	Medium (High[31])	N/A	High	N/A
Impacts on Tourism Potential				
Impacts on tourism-related nature and scenery	Low	N/A	Medium	N/A
Impacts on the Social Environment				
Impacts on the social environment	Medium	Low (Medium)	Medium	Medium

The most significant environmental impacts associated with the proposed project, as identified through the EIA, therefore include:

» Visual impacts on the natural scenic resources of the region imposed by the components of the facility.
» Local site-specific impacts as a result of physical disturbance/modification to the site with the establishment of the facility.
» Impacts associated with the overhead power line between Juno Substation and the Wind Energy Facility substation.

[31] Visual impact associated with Alternative 1a higher due to closer proximity to populated places

» Impacts associated with the transportation of components to the site during the construction phase.
» Impacts on the social environment.

9.1.1. Visual Impacts associated with the Wind Energy Facility and associated Infrastructure

The most significant impact associated with the proposed wind energy facility and associated infrastructure is the visual impact on the natural scenic resources of this region imposed by the components of the facility. Potentially uninterrupted exposure of the facility is largely contained within the 25 km buffer zone of the site. The majority of potentially uninterrupted exposure occurs within the 0 – 10 km zone. Photo simulations were undertaken in order to illustrate the potential visual impact of the facility within the receiving environment (refer Appendix M). One of the photo simulations from a distance of approximately 5.6 km from the facility is illustrated in Figure 9.1.

Figure 9.1: Photo simulation of the view from Skaapvlei road at an average distance of 5.6 km

Visibility beyond the 25 km mark becomes scattered and broken and ultimately negligible as it nears the 50 km buffer distance. From such a distance, visibility, even on a perfectly clear day, could theoretically be possible although highly unlikely to constitute a negative visual impact. In practical terms, this rationale implies that although the facility may potentially be visible (due to the flat terrain and the low visual absorption capacity of the natural vegetation) from sections of the N7 national road (50 km away), it would be difficult to distinguish the facility within the larger landscape.

The natural and relatively unspoiled wide-open views surrounding the wind energy facility and power line corridor will be transformed for the entire operational lifespan (approximately 30 years) of the facility. The primary visual impact, namely the appearance and dimensions of the wind energy facility

(mainly the wind turbines) is not possible to mitigate to any significant extent within this landscape. The functional design of the structures and the dimensions of the facility cannot be changed in order to reduce visual impacts. Alternative colour schemes (i.e. painting the turbines sky-blue, grey or darker shades of white) are not permissible as the CAA's Marking of Obstacles expressly states, "*Wind turbines shall be painted bright white to provide the maximum daytime conspicuousness*". Failure to adhere to the prescribed colour specifications will result in the fitting of supplementary daytime lighting to the wind turbines, once again aggravating the visual impact. The potential for mitigation is therefore low or non-existent.

The mitigation of secondary visual impacts, such as security and functional lighting, construction activities, etc. may be possible and should be implemented and maintained on an on-going basis.

9.1.2. Local Site-specific Impacts

A wind energy facility is dissimilar to other power generation facilities in that it does not result in whole-scale disturbance to a site. A site of 37 km^2 was originally considered for the facility, with the anticipation that an area of ~25 km^2 would be required for the placement of the required infrastructure within this broader site. From the results of the facility layout determination exercise, it is now apparent that the effective area required to accommodate the infrastructure is in fact approximately 16 km^2 in extent (this amounts to approximately 42% of the total 37 km^2 site earmarked for development). The bulk of this effective area required for the facility footprint would not suffer any level of disturbance as a result of the required activities on site.

Permanently affected areas comprise 100 turbine footprints (100 foundation areas of 15 m x 15 m in extent), access roads (6 m in width), a substation footprint (80 m x 80 m in extent) and a visitor's centre (~1 000 m^2). The area of permanent disturbance is as follows:

Facility component - permanent	**Approximate area/extent (in m^2)**
100 turbine footprints (each 15 m x 15 m)	40 000
Permanent access roads (excluding Skaapvlei road which is an existing permanent feature bisecting the site) and power line footprints (parallel to permanent access road)	210 000
Substation footprint (80 m x 80 m)	6 400
Visitors centre building and parking areas	1 000
TOTAL	**257 400** (of a total area of 37 001 985) = 0.7% of site

Temporarily affected areas comprise laydown areas for turbines (each laydown area with a footprint of 40 m x 40 m) as well as a track of an additional 8 m in width for the crawler crane to move across the site (i.e. an additional 8 m width to the permanent road of 6 m in width). The 33 kV cabling to connect the turbines to the substation is to make use of the disturbed area travelled over by the crane. An approximately 1 m wide trench would be excavated, the cabling laid and the area rehabilitated. The area of temporary disturbance is as follows:

Facility component - temporary	**Approximate area/extent (in m^2)**
100 turbine laydown areas	160 000
Temporary crane travel (8m) track adjacent to permanent access road PLUS trench for 33 kV cabling	280 000
TOTAL	**440 000** (of a total area of 37 001 985) = 1,2% of site

Therefore, a total area of 697 400 m^2 (i.e. almost 70 ha) can be anticipated to be disturbed to some extent during the construction of the wind energy facility. This amounts to 1.9% of the total 3 700 ha area which will form part of the total wind energy facility site.

From the specialist investigations undertaken for the proposed wind energy facility development site, no absolute environmental 'no go' areas were identified. Nor were areas of regionally high or very high sensitivity identified.

The only area which can be considered as a 'no go' area for the construction of infrastructure (including turbines) is the portion of the site within the 95 m building restriction to the DR2225 (Skaapvlei road). In the case of a divisional road, any structure built should be 95 m away from the centre of the road. This could potentially affect **turbine positions 53 and 82**, as well the internal access road. Construction of infrastructure in this restricted zone would not be acceptable in terms of the Road Access Guideline. The opportunity for relocating these turbines within the disturbance corridor would be required to be investigated.

From an environmental perspective, potentially sensitive areas including the a) Short Strandveld and Namaqualand Sand Fynbos vegetation types, b) archaeological sites (with an approximate 30 m buffer for each site) as well as c) possible pans (with an approximate 50 m buffer) have been highlighted as being potentially affected by the facility. These areas are illustrated in Figure 9.2.

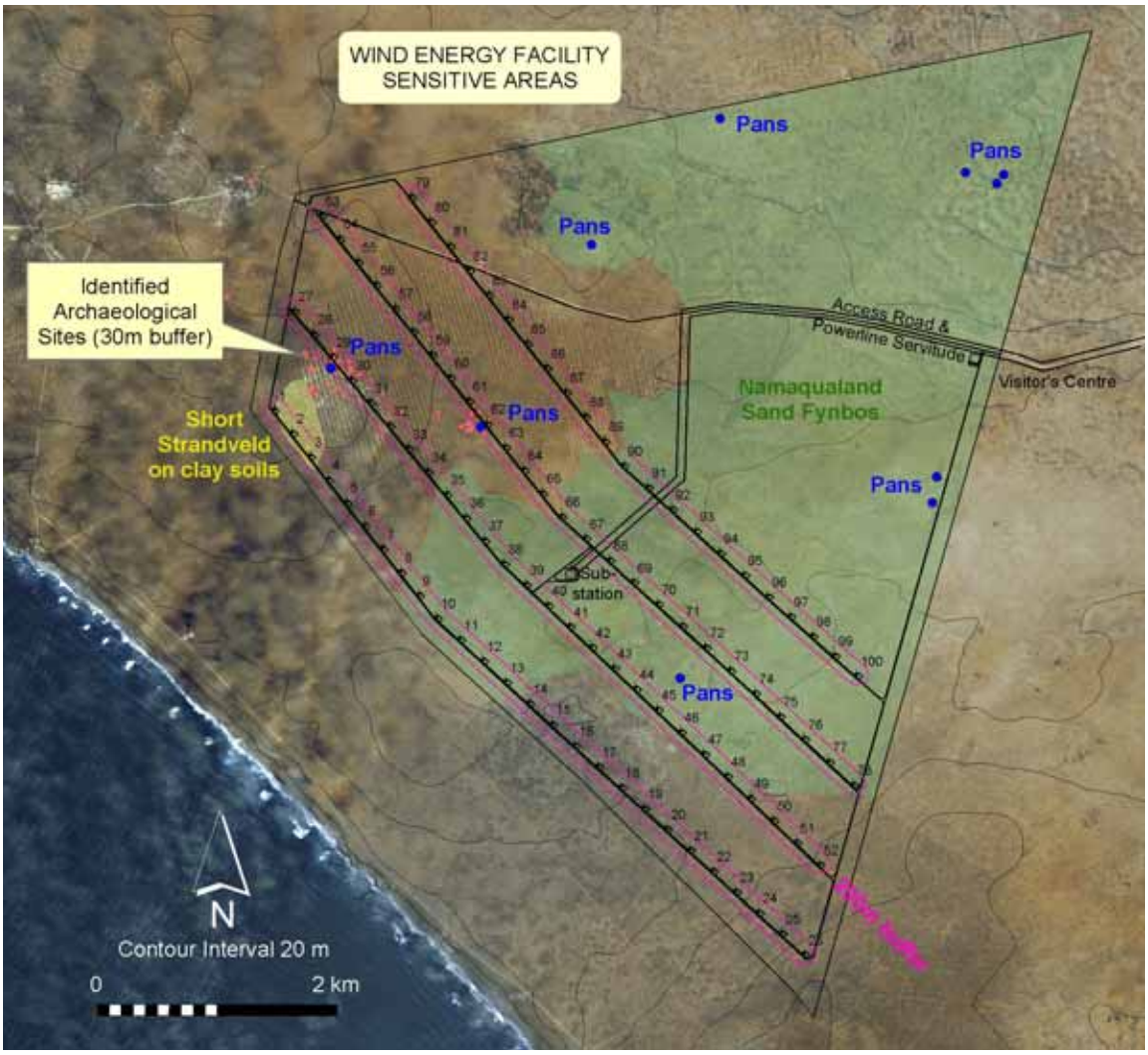


Figure 9.2: Identified potentially sensitive areas in relation to the Wind Energy Facility layout

The extent of the Namaqualand Sand Fynbos (Fynbos biome) vegetation type is illustrated in Figure 9.1 above. This vegetation type is listed as Least Threatened in the NSBA, with 98% remaining, and a conservation target of 29% (1% currently conserved). As at least one Red Data Book listed species was found in significant numbers in this area during the field survey, and as the habitat is regarded as more sensitive than the Dune Strandveld area from an erosion and regional botanical point of view, it is highlighted as an area of potential sensitivity for which due care is required. Therefore it has been highlighted on Figure 9.1 above, but is not considered a 'no-go' area. It is recommended that a Search and Rescue exercise should locate any Red Data Book listed species plants before development and remove them to secure areas.

The areas illustrated on Figure 9.2 above which should be avoided (where possible) or alternatively subject to intensive ground-truthing prior to construction works beginning are clustered to the western corner of the site. These areas include:

1. The high local sensitivity area (Short Strandveld on clay soils) in terms of vegetation at the western corner of the site. This area supports an unusual mix of species on heavier clay soils, including at least one Red Data Book listed species (*Leucoptera nodosa*).
2. Two small wetlands which may be located within 50 m of a turbine and/or internal access road.
3. A concentration of small shell middens recorded at each of two dried springs that were once waterholes with potable water. The value of the waterhole-related sites is that they represent two complete systems of occupation which are of scientific value in terms of their potential to provide information about the cultural affinities of the people who lived there, and the time depth of their occupancy of the area.

A zoomed-in image of the western portion of the site is provided in Figure 9.3 to illustrate the local/site specific areas of sensitivity in more detail.

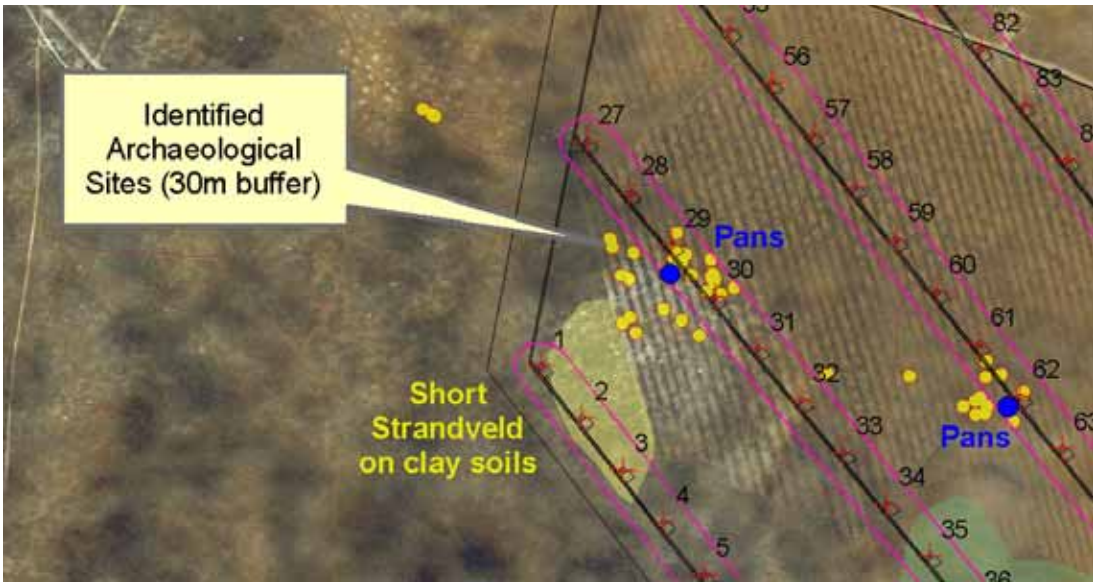


Figure 9.3: Identified potentially sensitive areas in relation to the Wind Energy Facility layout (200m 'impact corridor' illustrated in pink, turbine positions illustrated as a red X, laydown areas illustrated as a square adjacent to the X, and access roads as a solid line)

In order to minimise potential impacts during construction on these three potentially sensitive areas within the site, the following recommendations have been made:

1. The extent of the high local sensitivity area (clay hill) at the western corner of the site should be accurately defined through a field survey/ground-truthing exercise by a suitably qualified botanist familiar with the vegetation of the area. This will determine:

a) if the area can be effectively avoided at the design stage through micro-siting relocation of the first three turbine positions (**turbine numbers 1-3**) and associated infrastructure within the impact corridor, or if the turbine positions require total re-positioning within the turbine field/site to avoid the area completely (best practice requires avoidance of impacts); or

b) how the positioning of infrastructure in this area can be undertaken with the least possible impact, and allow for a Search and Rescue program to be planned for any plants of concern that can be translocated, and to obtain any permits from CapeNature which may be required for the disturbance or translocation of Red Data/protected plants.

Although the placement of turbines and infrastructure in this area cannot be viewed as a fatal flaw, it is supported (from a best practice botanical perspective) that the impact be avoided or minimised to an acceptable level.

2. The crests of the aeolian dunes (which are typically poorly vegetated and represent a high erosion risk) should be avoided, wherever possible, for the siting of infrastructure such as internal access roads.

3. In order to ensure adequate buffer areas around the wetland areas on the site, **turbine number 62** and the associated access road (Row C) and the access road within Row B of turbines should be shifted at least 20 m and 10 m respectively within the impact corridor.

4. In order to minimise impacts on historical and archaeological heritage, the following must be considered:

a) a program of archaeological sampling of Late Stone Age archaeological sites of the two clusters of sites be undertaken, and

b) where technically possible, micro adjustment of turbine and road positions (**turbine numbers 29 and 30** in Row B; and **turbine numbers 61 and 62** in Row C) should be implemented.

All sampling should be undertaken ahead of construction work at the affected sites. Eskom will need to apply for sampling permits from Heritage Western Cape[32]. The permit application will need to be accompanied by detailed specifications of which sites are to be sampled, how large the samples will be, and how and where the sampled material will be stored (the NHRA requires indefinite institutional storage of all archaeological remains). This information should be informed by the design of the facility. Once the archaeological sampling is completed, a permit for destruction of any remaining archaeological material on any of the development sites must be obtained from Heritage Western Cape.

[32] The turn around period for the issuing of heritage permits by Heritage Western Cape is generally about 5 weeks. Permits are usually valid for a period of a year but can be extended for a further 2 years if required.

In order to minimise direct impacts on the ecology of the site, where possible infrastructure and laydown areas should be placed within the previously cultivated/disturbed area. The substation has been located in a central position between Rows B and C in order to facilitate the reduction in the length of the longest 33 kV cable between the turbines and substation. This site does not fall within this previously disturbed area. In consideration of the repositioning of this substation to this disturbed area to minimise ecological impacts, increased negative impacts to the social environment, including visual and lighting impacts on users of Skaapvlei road and on the residences at Skaapvlei, would be realised. Therefore, on balance of the technical, ecological and social considerations, the central location of the substation is considered acceptable.

However, in order to limit site-specific impacts on vegetation during the construction phase, it is recommended that a survey of all permanent, hard surface development footprints (i.e. all buildings, new roads, and turbine positions) be undertaken by suitably qualified botanist prior to the commencement of construction in order to identify and rescue any translocatable, selected succulents, shrubs and bulbs. All rescued plant species should be bagged (and cuttings taken where appropriate) and kept in an on-site nursery (if water can be provided; otherwise off-site) and should be returned to site once all construction is completed and rehabilitation of disturbed areas is required.

During operation of the facility, the threat of collision of avifauna with the turbine blades is the most concerning issue. However, the real extent of this threat is not currently well understood within the South African context. Unlike more problematic wind energy facilities identified in other parts of the world, the proposed wind energy facility is not positioned overly close to any known avian fly-ways, and does not otherwise impose on a particularly bird-rich environment, so it is **unlikely** to result in significant numbers of avian casualties through collision with the turbine blades, or cause undue loss of habitat or disturbance to any locally, regionally or nationally important bird populations. However, it is *essential* that the bird interactions which do take place with the establishment of the facility are fully documented, and that every opportunity to learn about birds and their interactions with wind energy facilities in the South African environment is fully exploited. To this end, the initiation of a comprehensive pre-and-post commissioning monitoring programme, and a longer-term scheme for surveying bird movements in relation to the wind energy facility and fully documenting all collision casualties, is considered critical. Such a monitoring programme will also inform and refine any post-construction mitigation of impacts which might ultimately be required.

9.1.3. Impacts Associated with the Power Line between Juno Substation and the Wind Energy Facility Substation

A double circuit 132 kV power line is proposed to connect the substation at the wind energy facility to the electricity distribution network/grid at the Juno Transmission Substation (outside Vredendal), a distance of approximately 40 km. Alternative routes/corridors for the 132 kV power line have been identified and assessed in the EIA phase (refer to Figure 9.4). The power line servitude options are proposed to follow other existing linear infrastructure (including roads and or other power lines) as closely as possible to consolidate linear infrastructure in the area, and to minimise the need for additional points of access.

From the results of the specialist investigations, Alternative 1 is nominated as the preferred power line alternative by the majority of specialist findings, with the key exception being the botanical assessment. Alternative 1a is also considered to be acceptable, with Alternative 2 being the least preferred.

One area of botanical sensitivity north of Koekenaap has been identified to be traversed by Alternative 1. This area comprises significant patches of Very High sensitivity vegetation, mostly in the form of Knersvlakte Quartz Vygieveld. With the implementation of Alternative 1, an impact of very high significance on vegetation is anticipated in this area due to long-term to permanent loss of vegetation and habitat in quartz patches in this area. A power line through these highly sensitive quartz patches would cause significant and permanent damage in the form of plant loss due to crushing, and permanent habitat alteration. The fine covering of quartz pebbles is key to the habitat, and any heavy machinery severely disturbs this layer, effectively rendering the habitats unsuitable for these specialised plants for many decades after disturbance. Given that the quartz patches are fairly small and localised on a landscape scale, it is not considered acceptable to have infrastructure routed through them when they are relatively easy to avoid (and activities that may negatively impact on the habitat/ecological functioning of habitats that may contain a unique signature of species e.g. quartz patches are also not supported by CapeNature). The significance of this impact is not off-set by the fact that an existing disturbance occurs in the form of the existing power line. New impacts would develop with the introduction of new power line infrastructure.

Therefore, in order to avoid the only Very High impact associated with the construction of the Juno-Wind Farm power line, it is proposed that the corridor **Alternative 1 with sub-alternative 1a** is nominated as the preferred alternative. This alternative meets the acceptance level for all identified environmental impacts.

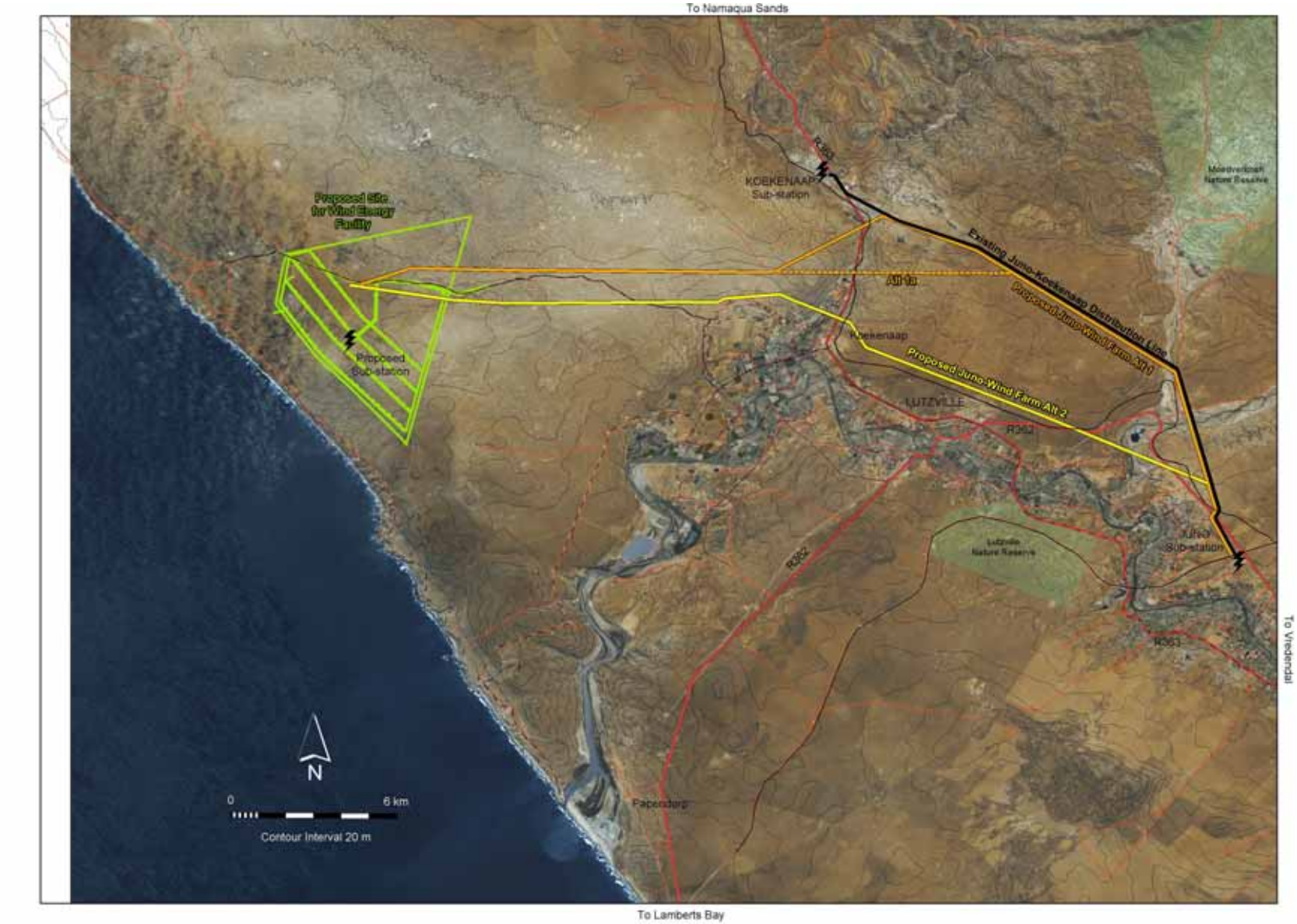


Figure 9.4: Alternative power line corridors 1 (and 1a) and 2 identified for consideration in the EIA process

In January 2008, a site inspection of the power line alternatives with the relevant environmental and local authorities culminated in a deviation of this preferred route being suggested by and supported by the officials on-site. This recommended deviation is illustrated in Figure 9.5. The rationale for the recommended deviation includes:

» The route does not affect additional landowners.
» The point where the power line would be required to cross the river provides benefits in that it is north of the agricultural lands which flank the river and would otherwise be impacted by the placement of power line towers. This appears to be the most logical position for the crossing of the river by the power line.
» The route would lie to the north of the high-lying ground to the north of Skaapvlei road and the smallholdings in the vicinity, and would therefore be shielded from users of the Skaapvlei road and residents in the area. This would minimise the potential visibility of the line.
» The route would still successfully avoid those areas of very high botanical sensitivity (Knersvlakte Quartz Vygieveld) as previously highlighted.

No additional or cumulative environmental impacts are predicted to be associated with the recommended alignment since it lies directly adjacent to the broader 200 m wide corridor that was assessed in this EIA process and traverses the same area which was assessed by all the specialists during the EIA investigations. This alignment will ensure that impacts are minimised as far as possible to an acceptable level which can be managed through the implementation of an Environmental Management Plan (EMP). This deviation was also supported by the officials. Therefore, the deviation as recommended by the relevant officials is supported and nominated as the preferred alternative for the construction of the 132 kV power line.

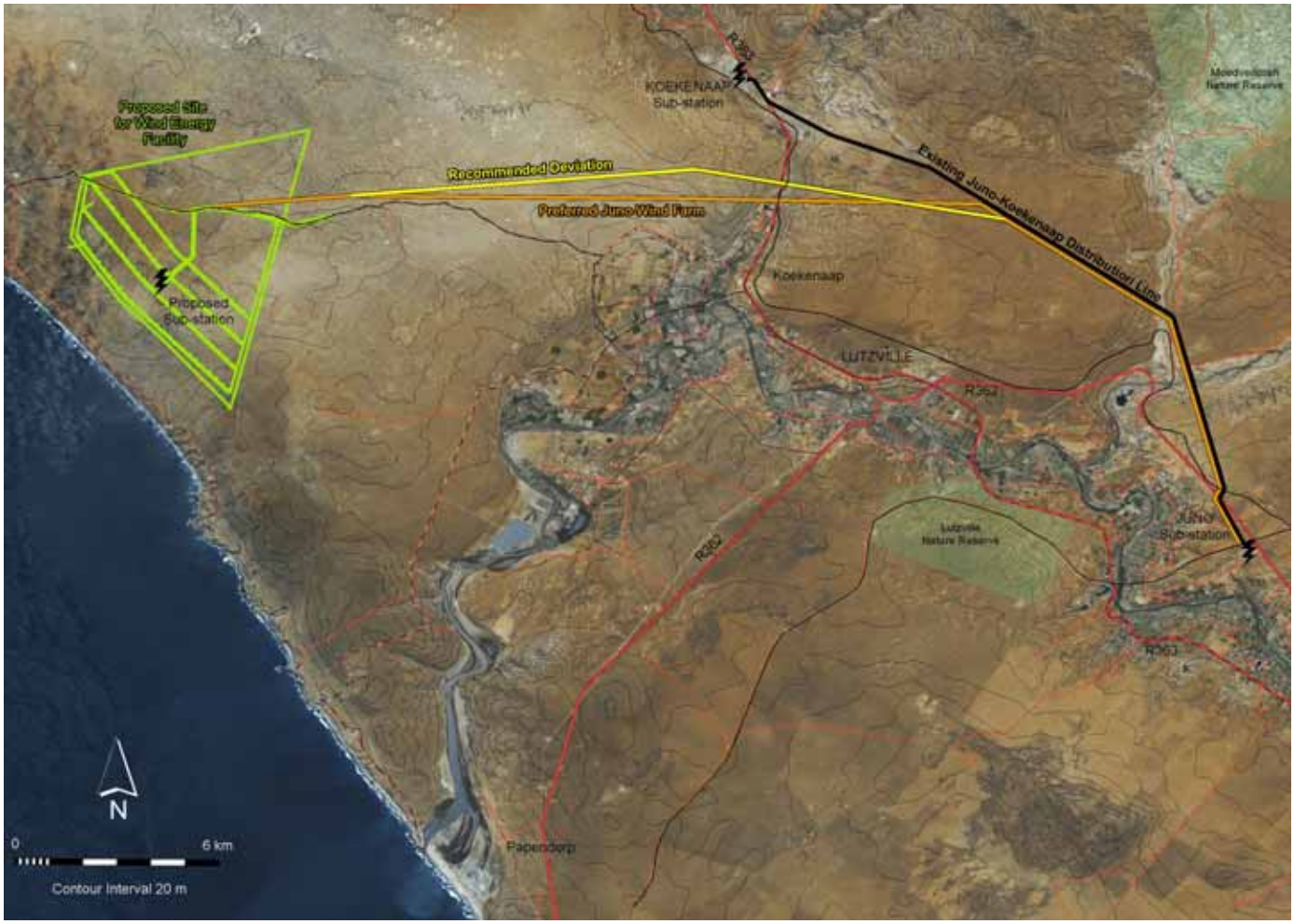


Figure 9.5: Map indicating Alternative 1 with sub-alternative 1a compared to the deviation as recommended by the relevant officials when on-site.

9.1.4. Impacts Associated with the Transportation of Components to the Site during the Construction Phase

Potential impacts associated with transportation and access relate to works within the site boundary (i.e. the wind energy facility and ancillary infrastructure) and external works outside the site boundary (i.e. road reconstruction/rehabilitation (e.g. Skaapvlei Road), widening intersections, protection/accommodation of existing Eskom, Telkom and other municipal services, protection of existing road related structures etc.).

During construction, the access and internal service roads must be upgraded/constructed to support 15 ton axle loads to support the abnormal loads delivering the nacelles, crawler crane and other components. Options to obtain suitable spoil material from sources such as the adjacent diamond mining concession area or from commercial sources (and transported to the site by trucks) are required to be investigated, and current indications are that the

borrowed material from commercial sources will be sufficient. It is assumed existing commercial quarries have already been authorised and that material is available in the area.

The crawler crane required for the erection of the wind turbines has a tracked width of 11 m when assembled. Within the wind energy facility development area, the crane lay down area, the operating platform and the service road area should be carefully planned and overlapped as much as practically possible in order to limit impacts on the surrounding area.

The additional construction traffic to the site has the potential to lead to premature failure of access roads, both surfaced and gravel, between the source and the site. The gravel road may need regular grading to smooth out the surface, but may need to be re-gravelled after completion of the project to ensure the condition of the driving surface. A maintenance strategy for the project construction phase will need to be submitted by Eskom to the satisfaction of the Provincial Governments, District Roads Engineer (DRE) for Skaapvlei road (DR2225), as well as any other surfaced road for which it may be deemed necessary. The formalisation of the main local access (Skaapvlei road) to an asphalt surface could be considered, provided the existing pavement structure is adequate. This will be determined through discussions between Eskom and the Provincial Government from both a technical and economic perspective, and will require a detailed pavement design. In addition, in order to mitigate the impact of turning construction traffic and other vehicles using the R363, it is recommended that the intersection (and possibly the first 1 800 m portion of the Skaapvlei Road (DR2225)) be reconstructed to a bituminous surfaced road. This would also assist in minimising the noise impact on the residents of the agricultural smallholdings adjacent to the Skaapvlei road who are situated close to the road.

Permits will be required to be obtained by Eskom for transporting all abnormal load components to site. These permits are at the discretion of the permit issuing authorities.

9.1.5. Impacts on the Social Environment

The land surrounding the proposed facility is primarily undeveloped farmland that is very sparsely populated. The closest farm homesteads or residences to the proposed wind energy facility site are at Skaapvlei, Skilpadvlei and Nooitgedag. The distances between the proposed wind energy facility site and these residences are:

» Skaapvlei situated approximately 690 m west of the nearest turbine
» Nooitgedag situated approximately 2 816 m south east of the nearest turbine

» Skilpadvlei situated approximately 5 135 m east of the nearest turbine

Impacts on the social environment are expected during both the construction phase and the operational phase of the wind energy facility. Impacts are expected at both a local and regional scale. Impacts on the social environment as a result of the construction of the wind energy facility can be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region.

On-site construction noise would not impact on any noise-sensitive land other than in the vicinity of the Skaapvlei farm buildings/dwellings. No construction crew camp will be established on the site, and construction workers will be housed in neighbouring formal towns. Construction activities on the site will be restricted to daylight hours, and the construction phase is anticipated to extend for a minimum 24-month period.

Impacts on current and future agricultural activities are of potential concern. It is Eskom's intention to purchase the three properties which comprise the 37 km^2 area. The end use of the property will be primarily for electricity generation (the property would be re-zoned to industrial in order to accommodate the facility). The option of granting grazing rights to the affected farmers would be required to be considered by Eskom. However, given the long regeneration periods for disturbances to the natural vegetation it will take time for the areas disturbed by the construction activities to recover. This, combined with the low stock carrying capacity in the area (approximately 1 SSU/10 ha), will impact on the economic viability of the affected farms. It is recommended that an opinion from an agricultural-economist specialist be sought once the final footprint for the proposed wind energy facility is available in order to understand the impact on each of the affected farm owners, and to inform the negotiation process undertaken by Eskom with the affected landowners.

Impacts during the operation phase relate mainly to the visual impact imposed by the facility on the local environment (refer to Section 9.1.1 above). There will be no impact of outdoor noise emanating from the wind turbines during the operational phase at the nearest noise sensitive area (i.e. Skaapvlei) and at all other noise sensitive land. Low-frequency noise emanating from the turbines might have a low negative impact of low significance within dwellings at Skaapvlei.

The proposed wind energy facility could become a tourist attraction for the area, with benefits to the local tourism industry. The inclusion of a Renewable Energy Interpretation Centre (including weather-proof information boards) at the visitors centre is recommended. Such a facility could play a positive role in highlighting Eskom's leadership role and forward thinking in the area of renewable energy

generation, while at the same time providing a much-needed major tourist attraction to the benefit of the area.

9.2. Overall Conclusion (Impact Statement)

Internationally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of resources. The South African Government has set a 10-year cumulative target for renewable energy of 10 000 GWh renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro. This amounts to ~4% (1667 MW) of the total estimated electricity demand (41 539 MW) by 2013.

In responding to the growing electricity demand within South Africa, as well as the country's targets for renewable energy, Eskom has a drive to establish renewable forms of energy generation capacity and contribute to the targets published in the Renewable Energy White Paper. Through research, the viability of a wind energy facility has been established and Eskom proposes that a facility comprising up 100 wind energy turbines can be established on the identified site on the West Coast.

The positive implications of establishing a wind energy facility on the demarcated site within the Western Cape include:

» The project would assist Eskom or the South African government in reaching their set targets for renewable energy.
» The potential to harness and utilise good wind energy resources at the site north of the Olifants River would be realised.
» The National electricity grid would benefit from the additional generated power (Eskom propose that up to at least 200 MW can be realised from the proposed facility on the West Coast (based on turbine technology choice).
» Promotion of clean, renewable energy in South Africa.
» Positive impacts on the tourism economy of the area.
» Creation of local employment and business opportunities for the area.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed project conclude that there are **no environmental fatal flaws** that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. The significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures. With reference to the information available at this planning approval stage in the project cycle, the

confidence in the environmental assessment undertaken is regarded as **acceptable**.

The proposed power line alternatives are all considered to be acceptable from an environmental perspective, with **Alternative 1 with sub-alternative 1a** being considered as the preferred alternative and more appropriate for development in order to minimise impacts of unacceptably high significance on a botanically sensitive habitat. This alternative is further improved through the recommendations of officials when on-site, where a small deviation to Alternative 1 was recommended and accepted by all the environmental authorities when on site.

9.3. Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility, the findings of the EIA, and the understanding of the low significance level of potential environmental impacts, it is the opinion of the EIA project team that the environmental impacts associated with the application for the proposed wind energy facility and associated infrastructure can be mitigated to an acceptable level. The visual impact associated with the facility is the primary impact which cannot be significantly mitigated, however the impact of high significance is restricted to within a distance of 10 km of the site.

The following conditions would be required to be included within an authorisation issued for the project:

» As far as possible, wind turbines and associated laydown areas and access roads which could potentially impact on sensitive areas should be shifted within the impact corridor in order to avoid these areas of high sensitivity (i.e. best practice is impact avoidance). Where this is not possible, alternative mitigation measures as detailed in this report must be implemented.
» Power line Alternative 1 with sub-alternative 1a must be adopted in order to minimise impacts of unacceptably high significance on vegetation. In addition, the deviation of Alternative 1, as recommended by the relevant officials when on-site, must be adopted to minimise concerns/impacts in the vicinity of the smallholdings north of Skaapvlei road.
» The extent of the improvements to Skaapvlei road (DR2225) be determined to ensure a durable haul route for the duration of the construction phase, and for the road to remain in a similar (or better) condition upon completion of the construction phase.
» In order to improve road traffic safety and mitigate the impact of construction traffic through the populated area/smallholdings on Skaapvlei road, it is recommended that the R363/Skaapvlei road intersection as well as the first

1 800 m portion of the DR2225 from the R363 be improved to a bituminous surfaced road.

» All mitigation measures detailed within this report and the specialist report contained within Appendices G to Q must be implemented.

» The Environmental Management Plan (EMP) as contained within Appendix S of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed wind energy facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered to be key in achieving the appropriate environmental management standards as detailed for this project. It is also recommended that the process of communication and consultation with the community representatives is maintained after the closure of this EIA process, and, in particular, during the construction phase associated with the proposed project.

» Applications for all other relevant and required permits required to be obtained by Eskom be submitted. This includes permits for the transporting of all components (abnormal loads) to site, disturbance to archaeological sites, disturbance of protected vegetation, and disturbance to any wetlands.

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