SOCIAL IMPACT ASSESSMENT

RIETKLOOF WIND ENERGY FACILITY

WESTERN CAPE PROVINCE

JULY 2016

Prepared for

EOH Coastal and Environmental Services

By

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EXECUTIVE SUMMARY

INTRODUCTION AND LOCATION

Rietkloof Wind Farm (Pty) Ltd (the applicant), a subsidiary of G7 Renewable Energies (Pty) Ltd (G7), proposes to develop a 140 megawatt (MW) wind energy facility (WEF) near Matjiesfontein and Laingsburg in the Western Cape Province of South Africa. The closest towns to the site are the small railway siding at Matjiesfontein, situated 30km south of the project area, and Laingsburg, which is located a further 30km east of Matjiesfontein, along the N1 national road. The proposed WEF is located in the Laingsburg Local Municipality, which fall within the Central Karoo District Municipality.

EOH Coastal and Environmental Services were appointed by Rietkloof Wind Farm (Pty) Ltd to manage the Environmental Impact Assessment (EIA) process for the proposed WEF. Tony Barbour was appointed by EOH Coastal and Environmental Services to undertake a specialist Social Impact Assessment (SIA) as part of the EIA process. This report contains the findings of the SIA undertaken as part of the EIA process.

PROJECT DESCRIPTION

The infrastructure associated with the 140 MW Rietkloof WEF includes:

- Up to 70 potential wind turbine positions (between 1.5MW and 4MW in capacity each), each with a foundation of 25m in diameter and 4m in depth;
- The hub height of each turbine will be up to 120m, and the rotor diameter up to 140m;
- Permanent compacted hard-standing laydown areas for each wind turbine (70mx50m, total 24.5ha) will be required during construction and for on-going maintenance purposes;
- Electrical turbine transformers (690V/33kV) adjacent to each turbine (typical footprint of 2m x 2m, but can be up to 10m x 10m at certain locations) would be required to increase the voltage to 33kV;
- Underground 33kV cabling between turbines buried along access roads, where feasible;
- Internal access roads up to 12m wide, including structures for storm-water control would be required to access each turbine location and turning circles Where possible, existing roads will be upgraded;
- 33kV overhead power lines linking groups of wind turbines to onsite 33/132kV substation(s);
- A number of potential 33/132kV onsite substation location(s) will be assessed. The total footprint of this onsite substation will be approximately 200m x 200m;
- Up to 4 x 120m tall wind measuring lattice masts strategically placed within the wind farm development footprint to collect data on wind conditions during the operational phase;
- Temporary infrastructure including a large construction camp (~10ha) and an on-site concrete batching plant (~1ha) for use during the construction phase;
- Borrow pits and quarries for locally sourcing aggregates required for construction (~4.5ha), in addition to onsite turbine excavations where required. All materials excavated will eventually be used on the compacting of the roads and hard-standing areas and no material will be sold to any third parties. The number and

size of the borrow pits depends on suitability of the subsurface soils and the requirement for granular material for access road construction and other earthworks;
- Fencing will be limited around the construction camp and the entire facility would not necessarily need to be fenced off. The height of fences around the construction camp is anticipated to be up to 4m.

Based on the information from other WEF projects the construction phase for a 140 MW WEF is expected to extend over a period of 20-24 months and create approximately 250 (full-time equivalent) employment opportunities. The operational phase will employ approximately 20 people full time for a period of up to 20 years. The capital expenditure on completion is anticipated to be in the region of R 2.5 billion.

APPROACH TO THE STUDY

The approach to the SIA study is based on the Western Cape Department of Environmental Affairs and Development Planning Guidelines for Social Impact Assessment (February 2007). These guidelines are based on international best practice. The key activities in the SIA process embodied in the guidelines include:

- Collection and review of baseline socio-economic data;
- Review of relevant planning and policy frameworks for the area;
- Site specific information collected during the site visit to the area and interviews with key stakeholders;
- Review of information from similar projects; and
- Identification of social issues associated with the proposed project.

SUMMARY OF KEY FINDINGS

The key findings of the study are summarised under the following sections:

- Fit with policy and planning;
- Construction phase impacts;
- Operational phase impacts;
- Cumulative Impacts;
- Decommissioning phase impacts; and
- No-development option.

Policy and planning

The findings of the review indicated that renewable energy is strongly supported at a national, provincial and local level. At a national level the White Paper on Energy Policy (1998) notes:

- Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future; and
- The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind and that renewable applications are in fact the least cost energy service in many cases; more so when social and environmental costs are taken into account.

The IRP 2010 also allocates 43% of energy generation in South Africa to renewables. The development of and investment in renewable energy is also supported by the National Development Plan (NDP), New Growth Path Framework and National Infrastructure Plan, which all make reference to renewable energy. At a provincial level the development of renewable energy is supported by the Northern Cape Provincial Growth and Development Strategy, Northern Cape Provincial Spatial Development Framework, White Paper on Sustainable Energy for the Western Cape, Climate Change Strategy and Action Plan for the Western Cape and Western Cape Growth and Development Strategy. With regard to local level policy documents, the Namakwa DM and Laingsburg IDP make positive reference to the potentially viable development of renewable energy sources. In addition, economic diversification, employment creation and skilling are identified in both the Hoogland Karoo and Laingsburg IDPs as urgent, crucial needs.

The findings of the review of the relevant policies and documents pertaining to the energy sector therefore indicate that the renewable energy is supported at a national, provincial and local level. It is therefore the opinion of the authors that the establishment of the proposed wind energy facility is supported by relevant policies and planning documents.

The provincial and local policy and planning documents also make reference to the importance of tourism and the region's natural resources. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as the proposed facility, does not impact on the region's natural resources and the tourism potential of the Province. However, it should be noted that the proposed Rietkloof WEF is located in an area that has been identified as a Renewable Energy Development Zone by the CSIR under the DEAs SEA process. The area has therefore been identified as an area where renewable energy should be concentrated.

Construction Phase

The key social issues associated with the construction phase include:

Potential positive impacts

- Creation of employment and business opportunities, and opportunity for skills development and on-site training;
- Benefits associated with providing technical advice on wind energy to local farmers and municipalities;
- Improved cell phone reception.

The construction phase for a single 140 MW WEF is expected to extend over a period of 20-24 months and create approximately ~ 250 (full-time equivalent) employment opportunities. It is anticipated that approximately 55% (136) of the employment opportunities will be available to low skilled workers (construction labourers, security staff etc.), 30% (76) to semi-skilled workers (drivers, equipment operators etc.) and 15% (38) for skilled personnel (engineers, land surveyors, project managers etc.). The majority of the low and semi-skilled employment opportunities will be available to local residents in the area, specifically residents from Sutherland and Laingsburg. The majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community. This would represent a significant positive social benefit in an area with limited employment opportunities. In order to maximise the potential benefits the developer should commit to employing local community members to fill the low and medium skilled jobs.

The capital expenditure associated with the construction phase for a 140 MW WEF will be in the region of R 2.5 billion (2016 Rand value). The total wage bill for a 140 MW WEF will be in the region of R 69 million (2016 Rand value). A percentage of the wage bill will be spent in the local economy which will create opportunities for local businesses in the towns of Sutherland and Laingsburg. The sector of the local economy that is most likely to benefit from the proposed development is the local service industry. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport and security, etc. associated with the construction workers on the site. The benefits to the local economy will be confined to the construction period (20-24 months).

Local farmers and municipalities would also benefit from advice on wind energy provided by technical experts involved in the establishment of the WEF. This could assist to reduce reliance on coal generated energy and increase the use of renewable energy.

Potential negative impacts

- Impacts associated with the presence of construction workers on local communities;
- Impacts related to the potential influx of job-seekers;
- Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site;
- Increased risk of grass fires associated with construction related activities;
- Noise, dust, waste and safety impacts associated with construction related activities and vehicles;
- Impact on grazing and productive farmland.
- Impact on tourism.

The findings of the SIA indicate that the significance rating for all of the potential negative impacts with mitigation is **Low Negative**. All of the potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. However, in order to effectively mitigate the impact of construction workers on the local community of Laingsburg and Sutherland will require a commitment to employing local community members.

Table 1 summarises the significance of the impacts associated with the construction phase.

Table 1: Summary of social impacts during construction phase

Impact	Significance No Mitigation/ Enhancement	Significance With Mitigation/ Enhancement
Creation of employment and business opportunities	Low (+)	Moderate (+)
Benefits associated with providing technical advice to local farmers and municipalities	N/A	Moderate (+)
Presence of construction workers and potential impacts on family structures and social networks	Low (-)	Low (-)
Influx of job seekers	Low (-)	Low (-)
Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site	Moderate (-)	Low (-)
Increased risk of grass fires	Moderate (-)	Low (-)
Impact of heavy vehicles and construction activities	Moderate (-)	Low (-)
Loss of productive farmland	Moderate (-)	Low (-)
Impact on tourism	Low (-)	Low (-)

Operational Phase

The key social issues affecting the operational phase include:

Potential positive impacts

- Creation of employment and business opportunities. The operational phase will also create opportunities for skills development and training;
- Generation of income for local landowners and farmers;
- Benefits associated with the establishment of a Community Trust; and
- The establishment of renewable energy infrastructure.

The total number of permanent employment opportunities associated with a 140 MW WEF would be ~ 20. Of this total ~ 4 are low skilled workers, 10 semi-skilled and 6 skilled. The annual wage bill for the operational phase will be ~ R 2 million (2016 Rand value). The majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community. Given the location of the proposed facility the majority of permanent staff is likely to reside in Sutherland and or Laingsburg.

The proposed WEF will also generate revenue for the local farmers on whose land the turbines are located. This will represent a valuable source of income for these landowners, specifically given the challenges faced by farming in the area.

The establishment of a Community Trust also creates an opportunity to support local economic development in the area. Community Trusts provide an opportunity to generate a steady revenue stream that is guaranteed for a 20 year period. The revenue from the proposed WEF can be used to support a number of social and economic initiatives in the area, including:

- Creation of jobs;
- Education;
- Support for and provision of basic services;

- School feeding schemes;
- Training and skills development; and
- Support for SMME's.

The long term duration of the revenue stream associated with a WEF linked Community Trust also enables local municipalities and communities to undertake long term planning for the area. Experience has however also shown that Community Trusts can be mismanaged. This issue will need to be addressed in order to maximise the potential benefits associated with the establishment of a Community Trust.

The proposed development also represents an investment in infrastructure for the generation of clean, renewable energy, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.

Potential negative impacts
- Loss of productive agricultural land;
- The visual impacts and associated impact on sense of place; and
- Potential impact on tourism.

The findings of the SIA indicate that the significance of the majority of potential negative impacts with mitigation were **Low Negative**. The majority of potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. The significance of the visual impact was rated **Medium Negative.** The visual impacts on landscape character associated with large renewable energy facilities, such as WEFs, are highlighted in the research undertaken by Warren and Birnie (2009). In the South African context, many South Africans have a strong connection with and affinity for the large, undisturbed open spaces that are characteristic of the South African landscape. The impact of large, WEFs on the landscape is therefore likely to be a key issue in South Africa, specifically given South African's strong attachment to the land and the growing number of renewable energy applications. However, it should be noted that the proposed Rietkloof WEF is located in an area that has been identified as a Renewable Energy Development Zone by the CSIR under the DEAs SEA process. The area has therefore been identified as an area where renewable energy should be concentrated. Table 2 summarises the significance of the impacts associated with the operational phase.

Table 2: Summary of social impacts during operational phase

Impact	Significance No Mitigation/ Enhancement	Significance With Mitigation/ Enhancement
Creation of employment and business opportunities	Low (+)	Moderate (+)
Generation of income for landowners	Low (+)	Moderate (+)
Establishment of Community Trust	Moderate (+)	High (+)
Promotion of renewable energy projects	Moderate (-)	Moderate (+)
Visual impact and impact on sense of place	Moderate (-)	Moderate (-)[1]
Impact on tourism	Low (-)	Low (-)

[1] The significance should be viewed within the context of area being identified as a renewable energy development area.

Cumulative Impacts

Cumulative impact on sense of place

In the region of 18 renewable energy projects, including 14 WEFs, are proposed in the Komsberg REDZ area. The potential for cumulative impacts associated with combined visibility (whether two or more wind energy facilities will be visible from one location) and sequential visibility (e.g. the effect of seeing two or more renewable energy facilities along a single journey, e.g. road or walking trail) is therefore high. However, this should be viewed within the context of the identification of the area as a renewable energy development zone. The area has therefore been identified as an area where renewable energy should be concentrated.

In addition, due to the proximity of the different sites the various WEFs could be viewed as a single large WEF as opposed to a number of separate WEFs. While viewing these WEFs as a single large facility, as opposed to separate facilities, does not reduce the overall visual impact on the scenic character of the area, it does reduce the potential cumulative impact on the landscape. Viewing each of the proposed WEFs as a single, large WEF has the potential to reduce the cumulative impacts associated with combined visibility (whether two or more wind farms will be visible from one location) and sequential visibility (e.g. the effect of seeing two or more wind farms along a single journey, e.g. road or walking trail). The proximity of the WEFs also has the benefit of concentrating the visual impacts on the areas sense of place in to one area as opposed to impacting on a number of more spread out areas. Despite this the cumulative impact on the areas sense of place is rated as **Moderate Negative**. This significance rating should be viewed within the context of the proposed Rietkloof WEF location within an area that has been identified as a Renewable Energy Development Zone by the CSIR under the DEAs SEA process. The area has therefore been identified as an area where renewable energy should be concentrated.

Cumulative impact on services

The establishment of the proposed Rietkloof WEF and the other renewable energy facilities in the Komsberg REDZ will place pressure on local services in the townsw of Sutherland and Laingsburg, specifically medical, education and accommodation. This pressure will be associated with the influx of workers to the area associated with the construction and operational phases of the renewable energy projects proposed in the area, including the proposed Rietkloof WEF. The potential impact on local services can be mitigated by employing local community members. The presence of non-local workers during both the construction and operation phase will also place pressure on property prices and rentals. As a result, local residents, such as government officials, such as municipal workers, school teachers and the police, may no longer be able to buy or afford to rent accommodation in towns such as Sutherland and Laingsburg. With effective mitigation the impact is rated as **Low Negative.**

However, as indicated below, this impact should also be viewed within the context of the potential positive cumulative impacts for the local economy associated with the establishment of a renewable energy hub in the area. These benefits will create opportunities for investment in Laingsburg and Sutherland, including the opportunity to up-grade and expand existing services and the construction of new houses. In this regard the establishment of a renewable energy hub will create a unique opportunity for these towns to develop. In should also be noted that it is the function of national, provincial and local government to address the needs created by development and provide the required services. The additional demand for services and

accommodation created by the establishment of development renewable energy projects in the Komsberg REDZ should therefore be addressed in the Integrated Development Planning process undertaken by the KHLM and LLM.

Cumulative impact on local economies
In addition to the potential negative impacts, the establishment of the proposed WEF and other renewable energy projects in the area also has the potential to create a number of socio-economic opportunities for the Karoo Hoogland Local Municipality (KHLM) and Laingsburg Local Municipality (LLM), which, in turn, will result in a positive social benefit. The positive cumulative impacts include creation of employment, skills development and training opportunities, creation of downstream business opportunities. This benefit is rated as **High Positive** with enhancement.

Power lines and substations

With the exception of two substations sites, namely one located approximately 600m to the north east of Hartjieskraal farmstead (Alternative 7), and one 1.4 km to the south of Fortuin (Alternative 1), the remaining five substation sites are proposed on the more inaccessible portions of farms, at some distance from the relevant farmsteads. While none of the owners – including those of Hartjieskraal or Fortuin – raised any concerns or issues with regard to the proposed location of turbines or substations, it is recommended that substation site should not be located near existing dwellings. Alternative 1 and 7 are therefore not supported. In terms of access Alternative 2 appears to be the best option.

Based on the findings of the SIA the potential social impacts associated with the overhead power lines and substations will be limited, specifically within the context of the establishment of the wind turbines associated with the proposed WEF. In addition the majority of the power lines are confined to the site. The connection to the Eskom grid form part of separate Basic Assessment process and it not assessed as part of the SIA.

The final route selection of the power lines and location of the substation should be informed by current location of farm dwellings on the site and the findings of the VIA, and the botanical and agricultural assessments.

Access roads and construction camps

Three access road alternatives, namely alternative 1, 2 and 3, and 13 construction camp alternatives, namely alternative 1-4 and 6-14, have been identified. Based on the findings of the SIA none of the local farm owners raised any concerns regarding the proposed access road alternatives. However, Access Road Alternative 1 is the preferred access for the Brandvalley WEF. In addition Alternative 1 also provides access for the shared construction camp proposed by Mr le Roux, the owner of Fortuin as discussed below.

The location of construction camps was however raised as a key concern by a number of landowners. Concerns were raised by the owners of Fortuin (Andries le Roux), Hartjieskraal (Ernst Marais) and Nuwerus (Ziegfried Loots). The relevant owners indicated that the proposed sites are too close to the farm yard (Fortuin), would damage good grazing areas (Nuwerus) or damage a potential cropping area (Hartjieskraal). All three owners proposed alternative locations. This site is located near the intersection of the R354 and the Ou Mure Road and corresponds to Alterative 3 associated with the Brandvalley WEF. The proposal by Mr le Roux is also

supported by the owner of Nuwerus, Mr Loots. Based on this information Construction Camp Alternative Areas 4, 6, 7, 8, 9 and 10 are not supported by the findings of the SIA.

The owner of Hartjieskraal, Mr Marais, indicated that Alternative 1 and 14 would damage the best potential cropping area on his property. Mr Marais has proposed a site located to the west of the Barendkloof River, on slightly uneven terrain. This area corresponds to Alternative 11.

Based on the findings of the SIA it would appear that Construction Camp Alternative Areas 2, 3, 11 and 13 are suitable site alternatives. However, Alternative 12 is located adjacent to the R 354 and has the potential to create visual impacts for passing motorists. The option of establishing a shared site with the Brandvalley WEF near the intersection of the R354 and the Ou Mure Road that corresponds to Alterative 1 associated with the Brandvalley WEF should be considered. The disturbance associated with the establishment of a construction camp for the proposed Brandvalley and Rietkloof WEFs projects would therefore be confined to a single area.

Potential health impacts

The potential health impacts typically associated with WEFs include, noise, shadow flicker and electromagnetic radiation. As indicated above, the findings of a literature review undertaken by the Australian Health and Medical Research Council published in July 2010 indicate that there is no evidence of wind farms posing a threat to human health. The research also found that wind energy is associated with fewer health effects than other forms of traditional energy generation (WHO, 2004). Based on these findings it is assumed that the significance of the potential health risks posed by the proposed WEF is of **Low Negative** significance. A noise impact assessment is being undertaken to inform the EIA and will assess the significance of noise impacts.

No-Development Option

The No-Development option would represent a lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producer of carbon emissions in the world, this would represent a High negative social cost. The no-development option also represents a lost opportunity in terms of the employment and business opportunities (construction and operational phase) associated with the proposed Rietkloof WEF, and the benefits associated with the establishment of a Community Trust. This also represents a negative social cost.

However, at a provincial and national level, it should be noted that the proposed WEF is not unique. In this regard, a significant number of renewable energy developments, including WEFs, are currently proposed in the Western Cape and South Africa. Foregoing the development of the proposed Rietkloof WEF would therefore not necessarily compromise the development of renewable energy facilities in the Western Cape and or South Africa. However, the socio-economic benefits the local communities in the KHLM and LLM would be forgone. The significance of this opportunity cost to the local communities is rated as **Moderate Negative.**

Decommissioning Phase

Typically, the major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. After 20-25 years of operations, the WEF would either be decommissioned and the area rehabilitated or the structures would be replaced with more modern technology (referred to as refurbishment or re-powering). Both options would create temporary employment opportunities. In the case of refurbishment the permanent jobs would be retained. There would therefore be no job losses. In the case of decommissioning the 20 permanent jobs associated with the operational phase would be lost.

The potential impacts associated with the decommissioning phase can however be effectively managed with the implementation of a retrenchment and downscaling programme. With mitigation, the impacts are assessed to be **Low Negative.** The proponent should also investigate the option of establishing an Environmental Rehabilitation Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 20-25 year operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure. Alternatively, the funds from the sale of the WEF as scrap metal should be allocated to the rehabilitation of the site.

CONCLUSIONS AND RECOMMENDATIONS

The findings of the SIA indicate that the development of the proposed Rietkloof WEF will create employment and business opportunities for locals during both the construction and operational phase of the project. The establishment of a Community Trust will also benefit the local community. The enhancement measures listed in the report should be implemented in order to maximise the potential benefits. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole. In addition, the majority of the potential negative impacts, including the impacts associated with construction workers and the influx of job seekers, can be effectively mitigated. It is therefore recommended that the Rietkloof WEF be supported, subject to the implementation of the recommended mitigation measures and management actions contained in the SIA report. In this regard it is recommended that the Western and Northern Cape Provincial Governments, in consultation with the KHLM and LLM and the proponents involved in the development of renewable energy projects in the Komsberg REDZ, consider the establishment of a Development Forum to co-ordinate and manage the development and operation of renewable energy projects in the Komsberg REDZ, with the specific aim of mitigating potential negative impacts and enhancing opportunities.

In terms of preferred layout alternatives, the alternative with the lowest potential visual impact on adjacent farms is regarded as the preferred alternative. The placement of turbines should therefore be informed by the findings of the other specialist studies, specifically the VIA and agricultural assessment.

IMPACT STATEMENT

The findings of the SIA undertaken for the proposed Rietkloof WEF indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project. The establishment of a Community Trust will also benefit the area. It is therefore recommended that the Rietkloof WEF be supported, subject to the implementation of the recommended mitigation measures and management actions contained in the report and other key specialist studies, specifically the VIA and agricultural assessments.

ACRONYMS

CKDM	Central Karoo District Municipality
DEA&DP	Department of Environmental Affairs and Development Planning (Western Cape)
DEA	Department of Environmental Affairs (National)
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
HD	Historically Disadvantaged
IDP	Integrated Development Plan
IPP	Independent Power Producer
KHLM	Karoo-Hoogland Local Municipality
kV	Kilovolts
LED	Local Economic Development
LLM	Laingsburg Local Municipality
LM	Local Municipality
MF	Management Forum
MW	Megawatt
NCP	Northern Cape Province
NDM	Namakwa District Municipality
PSDF	Provincial Spatial Development Framework
REF	Renewable Energy Facility
SAAO	South African Astronomical Observatory
SALT	South African Large Telescope (Pty) Ltd
SDF	Spatial Development Framework
SIA	Social Impact Assessment
VIA	Visual Impact Assessment
WCP	Western Cape Province
WEF	Wind Energy Facility

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SECTION 1: INTRODUCTION

1.1 INTRODUCTION

Rietkloof Wind Farm (Pty) Ltd (the applicant), a subsidiary of G7 Renewable Energies (Pty) Ltd (G7), proposes to develop a 140 megawatt (MW) wind energy facility (WEF) near Matjiesfontein and Laingsburg in the Western Cape Province of South Africa. The closest towns to the site are the small railway siding at Matjiesfontein, situated 30km south of the project area, and Laingsburg, which is located a further 30km east of Matjiesfontein, along the N1 national road (Figure 1.1). The proposed WEF is located in the Laingsburg Local Municipality, which fall within the Central Karoo District Municipality. Table 1.1 lists the farm names.

EOH Coastal and Environmental Services were appointed by Rietkloof Wind Farm (Pty) Ltd to manage the Environmental Impact Assessment (EIA) process for the proposed WEF. Tony Barbour was appointed by EOH Coastal and Environmental Services to undertake a specialist Social Impact Assessment (SIA) as part of the EIA process. This report contains the findings of the SIA undertaken as part of the EIA process.

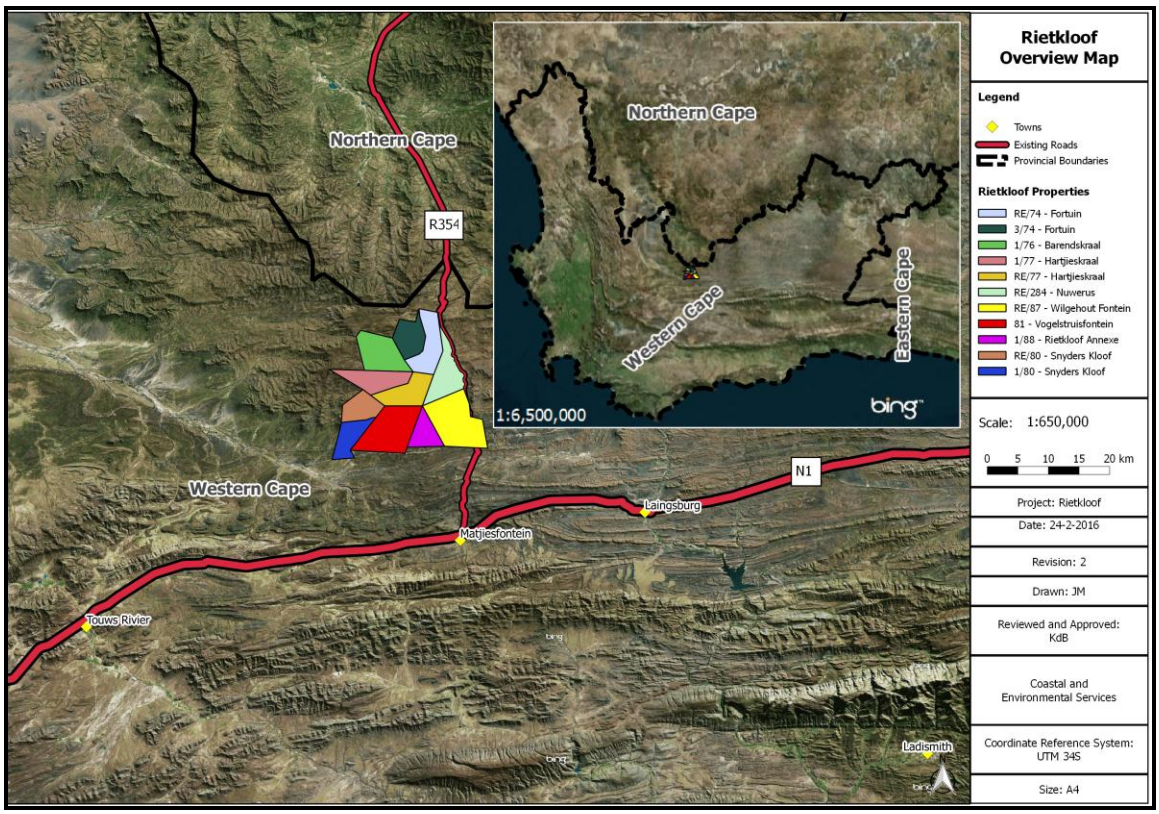

Figure 1.1: Location of Rietkloof WEF

Table 1.1: List of affected properties

Description of affected farm portions			
Farm Name and Number	21 digit SG Code	Municipality/Province	Farm size (ha)
Portion 1 of Barendskraal 76	C04300000000007600001	Laingsburg LM / Central Karoo DM / Western Cape	2,828.6
The Remainder of Fortuin 74	C04300000000007400000	Laingsburg LM / Central Karoo DM / Western Cape	2,454.98
Portion 3 Fortuin 74	C04300000000007400003	Laingsburg LM / Central Karoo DM / Western Cape	1,868.4
Portion 1 of Hartjieskraal 77	C04300000000007700001	Laingsburg LM / Central Karoo DM / Western Cape	2,241.6
The Remainder of Hartjieskraal 77	C04300000000007700000	Laingsburg LM / Central Karoo DM / Western Cape	2,241.63
The Remainder of Nuwerus 284	C04300000000028400000	Laingsburg LM / Central Karoo DM / Western Cape	2,521.1
Portion 1 of Rietkloof Annexe 88	C04300000000008800001	Laingsburg LM / Central Karoo DM / Western Cape	1,428.1
The Remainder of Snyders Kloof 80	C04300000000008000000	Laingsburg LM / Central Karoo DM / Western Cape	1,683.5
Portion 1 of Snyders Kloof 80	C04300000000008000001	Laingsburg LM / Central Karoo DM / Western Cape	1,623.6
Vogelstruisfontein 81	C04300000000008100000	Laingsburg LM / Central Karoo DM / Western Cape	4,040.7
Remainder of Wilgehout Fontein 87	C04300000000008700000	Laingsburg LM / Central Karoo DM / Western Cape	4,269.4
Total hectares			**27,201.61**

1.2 TERMS OF REFERENCE

The terms of reference for the SIA require:

- A description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed facility;
- A description and assessment of the potential social issues associated with the proposed facility; and
- Identification of enhancement and mitigation aimed at maximising opportunities and avoiding and or reducing negative impacts.

1.3 PROJECT DESCRIPTION AND ALTERNATIVES

1.3.1 Wind Energy Facility (WEF)

A wind energy facility (WEF) consists of multiple wind turbines which are used to capture the kinetic energy of the wind and generate electricity. This captured kinetic energy is used to drive a generator located within the wind turbine and the energy is subsequently converted into electrical energy. A typical wind turbine consists of four primary components (Figure 1.2).

- The **foundation unit** upon which the turbine is anchored to the ground;
- The **tower** which will have a hub height of up to 120 m. The tower is a hollow structure allowing access to the nacelle. The height of the tower is a key factor in determining the amount of electricity a turbine can generate. The tower houses the transformer which converts the electricity to the correct voltage for transmission into the grid. The transformer can also be placed in a small housing outside the tower depending on the design;
- The **nacelle** (generator/turbine housing). The nacelle houses the gearbox and generator as well as a wind sensor to identify wind direction. The nacelle turns automatically ensuring the blades always face into the wind to maximise the amount of electricity generated;
- The **rotor** which is comprised of three rotor blades with a diameter of up to 140 m. The rotor blades use the latest advances in aeronautical engineering materials science to maximise efficiency. The greater the number of turns of the rotor the more electricity is produced.

The amount of energy a turbine can harness is dependent on the wind velocity and the length of the rotor blades. Wind turbines typically start generating power at wind speeds of between 10 - 15 km/hour, with speeds between 45 - 60 km/hour required for full power operation. In a situation where wind speeds are excessive, the turbine automatically shuts down to prevent damage. A turbine is designed to operate continuously, unattended and with low maintenance for more than 20 years or >120 000 hours of operation. Once operating, a WEF can be monitored and controlled remotely, with a mobile team used for maintenance, when required.

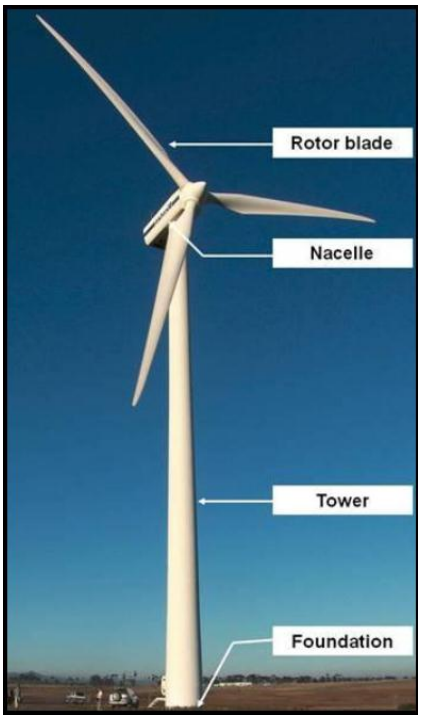

Figure 1.2: Typical example of wind turbine structure and components

The infrastructure associated with the 140 MW Rietkloof WEF includes:

- Up to 70 potential wind turbine positions (between 1.5MW and 4MW in capacity each), each with a foundation of 25m in diameter and 4m in depth;
- The hub height of each turbine will be up to 120m, and the rotor diameter up to 140m;
- Permanent compacted hard-standing laydown areas for each wind turbine (70mx50m, total 24.5ha) will be required during construction and for on-going maintenance purposes;
- Electrical turbine transformers (690V/33kV) adjacent to each turbine (typical footprint of 2m x 2m, but can be up to 10m x 10m at certain locations) would be required to increase the voltage to 33kV;
- Underground 33kV cabling between turbines buried along access roads, where feasible;
- Internal access roads up to 12m wide, including structures for storm-water control would be required to access each turbine location and turning circles Where possible, existing roads will be upgraded;
- 33kV overhead power lines linking groups of wind turbines to onsite 33/132kV substation(s);
- A number of potential 33/132kV onsite substation location(s) will be assessed. The total footprint of this onsite substation will be approximately 200m x 200m;
- Up to 4 x 120m tall wind measuring lattice masts strategically placed within the wind farm development footprint to collect data on wind conditions during the operational phase;
- Temporary infrastructure including a large construction camp (~10ha) and an on-site concrete batching plant (~1ha) for use during the construction phase;
- Borrow pits and quarries for locally sourcing aggregates required for construction (~4.5ha), in addition to onsite turbine excavations where required. All materials excavated will eventually be used on the compacting of the roads and hard-

standing areas and no material will be sold to any third parties. The number and size of the borrow pits depends on suitability of the subsurface soils and the requirement for granular material for access road construction and other earthworks;
- Fencing will be limited around the construction camp and the entire facility would not necessarily need to be fenced off. The height of fences around the construction camp is anticipated to be up to 4m;

Grid Connection Infrastructure

The following infrastructure will likely be ceded to Eskom at a later stage and will therefore be assessed in a separate Basic Assessment process:

- High voltage components of the 33/132kV onsite substation including transformers, isolators, cabling, light mast and other as required by Eskom. The onsite substation will have a footprint of up to 200m x 200m that will also house site offices, storage areas, ablution facilities and the maintenance building.
- 132kV above-ground distribution line to connect the onsite 33/132kV substation to the grid. The pylons for this line will have an average spacing of 250m to 300m.
- Extension of the Eskom high voltage infrastructure in order to connect the wind farm. There are three options being considered and the preferred option will be informed by environmental, technical considerations and Eskom's preference:
  - Extension of the existing 400kV Komsberg substation with several electrical components to be defined by Eskom (e.g. additional feeder bay, transformer bay) on the existing substation property;
  - Extension of the Bon Espirange satellite 132kV substation with several electrical components. The Bon Espirange satellite substation will be established by Eskom and other IPPs as an alternative to connecting all wind farms west of Komsberg directly to the Eskom Komsberg Substation; or
  - Construction of a central switching station (up to 200m x 200m) to be shared by both Brandvalley and Rietkloof if both are awarded preferred bidder status by the Department of Energy. If the central hub or switching station option is ultimately selected by Eskom, each project will build their own 33/132kV substation and connect to the central station. From there one 132kV line for both projects will lead to either the Komsberg or Bon Espirange substation.

Potentially Shared infrastructure

Depending on Eskom's requirements it might be feasible for both Brandvalley and Rietkloof to connect to a shared onsite 33/132kV substation, which could then be connected via an off-site overhead 132kV power line to Komsberg Substation. The latter could then be shared by both facilities. This would be assessed as a potential connection alternative in a separate Basic Assessment process as described above. Access roads, laydown areas, borrow pit locations and buildings and other infrastructure will also be shared as far as feasibly possible.

Based on the information from other WEF projects the construction phase for a 140 MW WEF is expected to extend over a period of 20-24 months and create approximately 250 (full-time equivalent) employment opportunities. The operational phase will employ approximately 30 people full time for a period of up to 20 years. The capital expenditure on completion is anticipated to be in the region of R 2.5 billion.

1.3.2 Alternatives

The following alternatives have been identified for consideration in the EIA Phase:

Fundamental alternatives

- Project area location alternative: One project location alternative namely, Rietkloof Wind Farm;
- Access road location alternatives: Three access road alternatives, namely access road alternative 1, 2 and 3, have been identified;
- Construction camp alternatives: Thirteen construction camp alternatives, namely construction camp alternative 1-4 and 6-14, have been identified;
- Onsite substation alternatives: Seven onsite substation location alternatives, namely Substation Alternative 1-7, have been identified (Figure 1.3).

Technology alternative

- One technology alternative namely a WEF.

Incremental alternatives

- Turbine layout alternatives.
- 200m buffer on access roads for sensitivity alternatives.

No-go alternative

The "No Development" alternative entails maintaining the status quo. In other words, the proposed development would not go ahead, and current land uses would continue as to before. While potential risks associated with the development would be avoided, potential benefits would be forfeited.

Figure 1.3: Location of access roads, substations and construction camps associated with Rietkloof WEF

1.4 OVERVIEW OF SITE AND ASSOCIATED LAND USES

1.4.1 Introduction

The Rietkloof WEF site is located approximately 35 km north-west of the town of Laingsburg, in the Western Cape, and 55 km south-east of Sutherland, in the Northern Cape. The entire WEF site is located to the west of the R354, which links the town of Sutherland to the N1. The site falls within Laingsburg Local Municipality (LLM), which is located in the Western Cape Province (WCP). The WEF site consists of 11 cadastral units, belonging to 7 different owners (Table 1.1). The site properties are primarily accessed via single track gravel roads off the tarred R354. Fortuin is accessed directly off the R354 (Figure 1.3).

1.4.2 Access roads

The site properties are primarily accessed via single track gravel roads off the tarred R354, which links the town of Sutherland to the north with the N1. Three site properties, namely, Fortuin, Nuwerus and Dwars-in-die-Weg, gain access directly off the R354 (Figure 1.3).

Alternative access to the properties located in the south of the WEF site is also possible from the N1 and R356 (Ceres), again via single track farm roads. The bulk of the WEF site is located well towards the west of the R354, and screened by broken topography. Three turbines on Nuwerus may be visible from the road. The WEF site will not be visible from any other major public roads, including the N1 and R356.

Four properties (Vogelstruisfontein, Hartjieskraal, Die Libanon, Barendskraal) are accessed off a semi-circular gravel road which, via Ou Mure, intersects with the R354 at Kruispad in the north, and near Dwars-in-die-Weg in the south ("Ou Mure road") (Photograph 1.1). The southern portion of the road also provides access to the two Snyderskloof properties from the R354 (via Vogelstruisfontein). The Snyderskloof properties are also accessible from two other gravel roads off the R354, located further to the south.

Photograph 1.1: Ou Mure road on Vogelstruisfontein farmyard

Property boundaries and internal farm camps are demarcated by farm gates along these gravel roads. Only key farm gates are locked, typically with a number of interlinked locks in order to provide access to various individual key holders, including Eskom. A 4x4 vehicle or bakkie with high ground clearance is required to drive on many portions of these roads. The roads are privately maintained, and mainly used by the owners or their visitors.

1.4.3 Topography

The study area is characterised by broken, hilly terrain associated with the transition to the Great Escarpment south of Sutherland. The southernmost portion of the site includes relatively flat areas (Photograph 1.2), but transitions northwards into progressively mountainous terrain (Photograph 1.3). The watershed between the north-west draining Olifants-Doorn and south-draining Gouritz River catchments is located near Ou Mure, a few kilometres to the north of the site. North of Ou Mure, the terrain spectacularly drops off to the north (Rietfontein farm). The bulk of the study site is characterised by series of high, near-parallel north-south trending hills (rûens) associated with the north-south trending valleys that form tributaries of the Groot and Wilgerhout Rivers. The majority of the watercourses are ephemeral. Farm buildings and irrigated areas are restricted to the valley floors. Many farms, especially those also cropping fodder or seed crops, have in-stream dams.

Photograph 1.2: Ou Mure road on even terrain on Rietkloof farm

Photograph 1.3: Hilly terrain to the south-east of Hartjieskraal farmstead

The study area is classified as arid, and vegetation cover is essentially comprised of renosterbos, karroid scrub, dwarf shrubs, and isolated patches of grass. Indigenous

trees are limited to the banks of ephemeral watercourses. Succulence increases from the Klein Roggeveld towards the Ceres Karoo portion of the site. The veld takes decades to regenerate from disturbances such as off-road driving and veld fires. The area is not considered fire prone. This is directly related to the low biomass associated with the "bossieveld", low lightning strike rates, and the sparse and intermittent presence of people.

1.4.4 Existing infrastructure

The extreme northern portion of the site is traversed by an east-west aligned Eskom 765 kV corridor which accommodates 2 separate lines (Photograph 1.4). A second corridor accommodating a single 400 kV line is located near parallel to the first, and just to the north of the site (300 m at the nearest point). All three lines feed into the large Eskom Komsberg substation located ~4.5 km to the north-east of the site, east of the R354 near Saaiplaas farm. A few Telkom lines traverse the area, and wind monitoring masts have been erected for the WEF project. With these exceptions, no other service infrastructure is currently located on the site properties.

Photograph 1.4: 765 kV lines located north of Kruispad adjacent to the R354

1.4.5 Overview of properties on the site

An overview of the relevant properties and associated land uses is provided in Table 1.2 and Figure 1.4 below. Key aspects associated with the site properties are briefly discussed below. The settlement pattern is sparse, and essentially associated with the valleys of a number of small watercourses (Figure 1.4). As a result of topography, sighting distances are essentially limited to the nearest ridgelines associated with these valleys. With the exception of Hartjieskraal and two of the farming operations located adjacent to the R354 - Fortuin and Dwars-in-die-Weg -

the site farms are not permanently inhabited by their owners (Photographs 1.5. and 1.6).

Table 1.2: Overview of properties comprising the WEF site

OWNER	PROPERTY	OPERATIONAL FARM NAME	LAND USE	HABITATION
Du Toit, Johan (Du Toit Thiersen (Pty))	Hartjieskraal 1/77	Die Libanon	Primarily as holiday farm. Conservation (unused veld) Small plantings of lucerne near farmstead.	Owners reside in Boland. 2 worker families live on property.
Gouws, Ryno	Rietkloof Annexe 1/88	Rietkloof	Primarily as holiday farm. Conservation (unused veld)	None. Owner resides in Gauteng.
Kriel, Johan (Sitruspoort Trust)	Vogelstruisfontein 81	Vogelstruisfontein	Vegetable seed and lucerne cropping (10 ha+) Sheep farming and dorper stud.	Owner on farm during the week, but resides in Boland. Two worker families live permanently on the farm.
Le Roes, Elma & Jaco (Hartebees Fontein Trust)	Snyders Kloof 1/80	Hartebeesfontein	Winter grazing.	None. Part of Hartebeesfontein farming operation based east of Laingsburg.
Le Roux, Andries (A de V le Roux Family Trust)	Fortuin RE/ 74; Fortuin 3/74	Fortuin	Winter grazing by sheep Vegetable seed and lucerne cropping. Self-catering cottage facility on Fortuin.	Owner permanently resides on farm. 6 farm worker families on Fortuin. 1 farm worker family on Kruispad.
Loots, Ziegfriedt (ZB Loots Family Trust)	Nuwerus RE/ 284	Nuwerus	Grazing. Lucerne cropping. Olives (small planting not as yet commercial)	Owner resides in Cape Town, but frequently visits farm to monitor operation. Three worker families permanently reside on farm.
Marais, Ernest	Hartjieskraal RE/77	Hartjieskraal	Winter grazing. Vegetable seed and lucerne cropping. Small-scale commercial jams and preserves making operation.	Owner permanently resides on farm. Two worker families permanently reside on farm.
Matthee, Christo (Mooi Nooientjies Trust)	Barendskraal 1/76	Barendskraal	Winter grazing.	None. No residential structures on property. Part of main operations based closer to Matjiesfontein.
Terblanche, Dr Jaco (Fantique Trade 379 CC)	Snyders Kloof RE/ 80	Snyderskloof	Primarily as holiday farm. Conservation (unused veld) Self-catering guest cottage.	Owners reside in Cape Town. Two worker families permanently reside on the property.
Theron, Wilhelm	Wilgehout Fontein RE/87	Dwars-in-die-Weg	Winter grazing. Vegetable seed cropping.	Owner resides on property. 3 worker families reside on property.

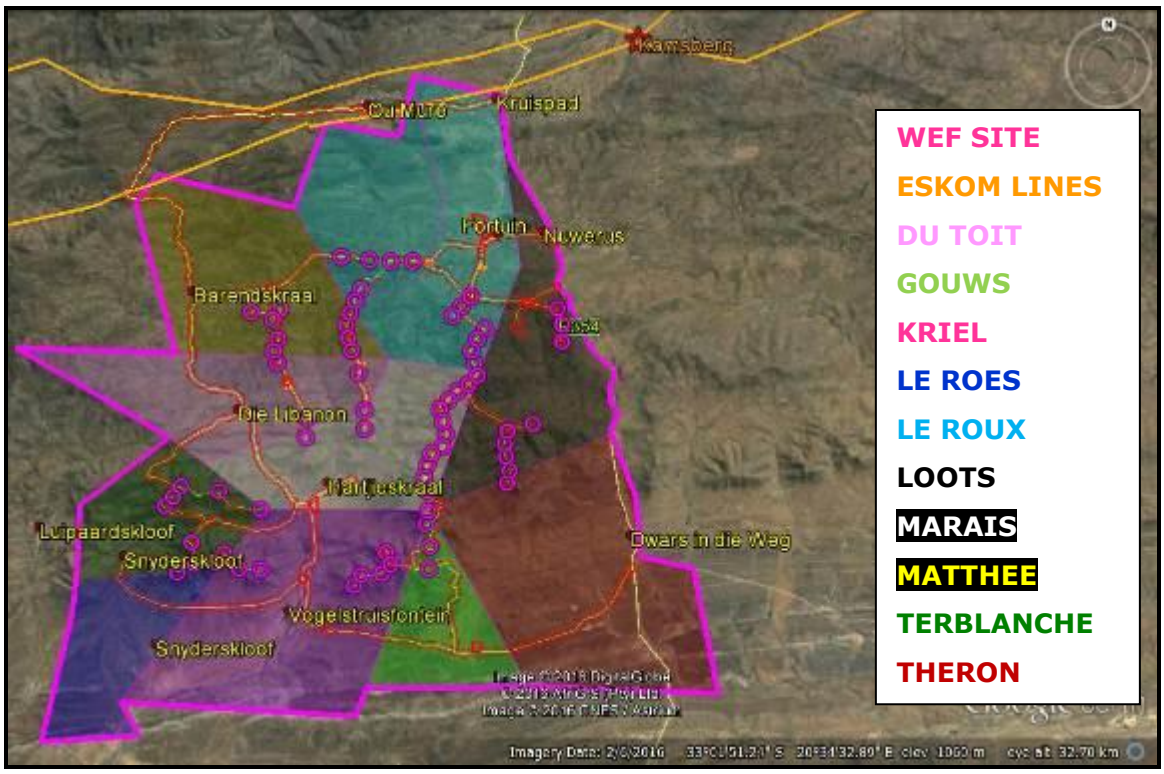

Figure 1.4: Overview of WEF property ownership

Photograph 1.5: Farmstead on Hartjieskraal

Photograph 1.6: Farm house and outbuildings on Fortuin farmstead

In some instances, properties form part of main operations based elsewhere, or are primarily used as holiday farms by primarily non-farmer owners based in Cape Town, Stellenbosch or Gauteng – e.g. Barendskraal (Matthee) and Snyderskloof (Terblanche) (Photographs 1.7 and 1.8).

Three properties do not have a permanent people presence, namely Snyderskloof (le Roes), Barendskraal (Matthee), and Rietkloof. Workers permanently live on Nuwerus, Snyderskloof, Vogelstruisfontein and Die Libanon, providing a people presence when the owners are absent.

Extensive small-stock farming, the study area's main land use, is by nature not labour intensive. Farming operations in the study area typically employ 2-3 permanent workers and their families. Worker dwellings are typically located on the periphery of the main farm werf (Photograph 1.9). Most large trees are associated with farmsteads and watercourses, and are typically alien eucalyptus or poplar species.

Photograph 1.7: Barendskraal farm yard seen from the south-east

Photograph 1.8: Restored farm house on Snyderskloof (Terblanche)

Photograph 1.9: Workers' houses located on the western periphery of Fortuin farmyard

The site is located on the transition zone between the Klein Roggeveld (east) and the Ceres Karoo (west) small stock farming regions. The farms are particularly suited as winter grazing; as the winters are relatively mild compared to adjacent areas, and also receives higher winter rainfall. It is therefore a traditional overwintering area for larger, often distant, operations based in the Roggeveld, Klein Roggeveld, Moordenaarskaroo, and even Groot Karoo.

Commercial small stock farming - mainly of merino, dorper and dormer sheep is the dominant land use in the broad region. A few operations also include sheep studs, such as the Dorper stud on Vogelstruisfontein. The veld is characterised by limited palatability to stock, and a high incidence of poisonous species, and is generally describes as "bitter veld" by stock owners. Karrooid scrub ("bossiesveld") constitutes the bulk of the grazing resource, supplemented by a more limited grass component. Carrying capacities are low, and several thousand hectares of grazing are required for commercial viability.

Major stock losses are currently experienced from small predators such as black-backed jackals, caracals, and Chacma baboons. Many farmers employ professional predator hunters from time to time, or set traps themselves. Stock theft however seems to affect only those properties along, or relatively accessible from the R354.

Stock-based activities are supplemented by the cultivation of fodder crops such as lucerne on most farms (Photograph 1.10). Plantings are typically small, and concentrated around farmsteads. Three sizeable vegetable seed operations are also located within the WEF site, namely Fortuin Vogelstruisfontein and Hartjieskraal (Photograph 1.11).

Photograph 1.10: Sheep grazing on irrigated pasture on Nuwerus

Photograph 1.11: Vegetable seed field between cropping cycles on Vogelstruisfontein

Laingsburg is one of the WCPs key vegetable seed producing areas. The hot, dry climate is conducive to the suppression of many parasites (e.g. mildew), and promotes quick, even drying of seed. Large distances between isolated cropping areas are ideal for ensuring no cross-pollination takes place with other seed cultivars.

All key study area crops – onions, leeks, carrots and artichokes – are bee-pollinated. The integrity of irrigation infrastructure and the unimpeded work of bees are of crucial importance to operations. Pollination is limited to short widows dictated by the flowering of the various crops (typically measured in weeks). Irrigation infrastructure is vulnerably to heavy vehicle movement, and dust generation is a major factor negatively affecting the presence of bees. Due to the limitations of terrain, soils and available irrigation water, seed cropping areas are limited in scale to a few hectares per farm, essentially located in proximity to watercourses, and not always contiguous. Seed is exclusively grown on contract to seed companies. Depending on climatic conditions and contractual obligations, the extent of actual plantings varies from year to year.

Natural game, including kudu, ribbok and klipspringer occur on study area farms, but no properties appear to have been stocked with introduced game. Game farming is not currently established on any of the site properties.

As in much of the area south of the Sutherland escarpment, tourism facilities – accommodation, walking trails, etc., appear to be limited self-catering cottage accommodation on few WEF properties, namely, Fortuin and Snyderskloof (Terblanche), and surrounds. However, to Cape Town or Boland-based owners, the properties provide their owners with the experience of a Karoo break-away and the associated vast open expanses.

1.5 APPROACH TO STUDY

The approach to the SIA study is based on the Western Cape Department of Environmental Affairs and Development Planning Guidelines for Social Impact Assessment (DEADP, 2007). These guidelines are based on international best practice. The key activities in the SIA process embodied in the guidelines include:

- Describing and obtaining an understanding of the proposed intervention (type, scale, and location), the settlements, and communities likely to be affected by the proposed project;
- Collecting baseline data on the current social and economic environment;
- Identifying the key potential social issues associated with the proposed project. This requires a site visit to the area and consultation with affected individuals and communities;
- Assessing and documenting the significance of social impacts associated with the proposed intervention;
- Identifying alternatives and mitigation measures.

The identification of potential social issues associated with proposed facility is based on observations during the project site visit, review of relevant documentation, experience with similar projects and the general area. Annexure A contains a list of the secondary information reviewed and interviews conducted. Annexure B outlines the assessment methodology that used to assign significance ratings during the assessment phase.

1.5.1 Definition of social impacts

Social impacts can be defined as "The consequences to human populations of any public or private actions (these include policies, programmes, plans and/or projects) that alter the ways in which people live, work, play, relate to one another, organise to meet their needs and generally live and cope as members of society. These impacts are felt at various levels, including individual level, family or household level, community, organisation or society level. Some social impacts are felt by the body as a physical reality, while other social impacts are perceptual or emotional" (Vanclay, 2002).

When considering social impacts it is important to recognise that social change is a natural and on-going process (Burdge, 1995). However, it is also important to recognise and understand that policies, plans, programmes, and/or projects implemented by government departments and/or private institutions have the potential to influence and alter both the ***rate*** and ***direction*** of social change. Many social impacts are not in themselves "impacts" but change process that may lead to social impacts (Vanclay, 2002). For example the influx of temporary construction workers is in itself not a social impact. However, their presence can result in range of social impacts, such as increase in antisocial behaviour. The approach adopted by Vanclay stresses the importance of understanding the processes that can result in social impacts. It is therefore critical for social assessment specialists to think through the complex causal mechanisms that produce social impacts. By following impact pathways, or causal chains, and specifically, by thinking about interactions that are likely to be caused, the full range of impacts can be identified (Vanclay, 2002).

An SIA should therefore enable the authorities, project proponents, individuals, communities, and organisations to understand and be in a position to identify and anticipate the potential social consequences of the implementation of a proposed policy, programme, plan, or project. The SIA process should alert communities and individuals to the proposed project and possible social impacts, while at the same time allowing them to assess the implications and identify potential alternatives. The assessment process should also alert proponents and planners to the likelihood and nature of social impacts and enable them to anticipate and predict these impacts in advance so that the findings and recommendations of the assessment are incorporated into and inform the planning and decision-making process.

However, the issue of social impacts is complicated by the way in which different people from different cultural, ethic, religious, gender, and educational backgrounds etc. view the world. This is referred to as the "social construct of reality." The social construct of reality informs people's worldview and the way in which they react to changes.

1.5.2 Timing of social impacts

Social impacts vary in both time and space. In terms of timing, all projects and policies go through a series of phases, usually starting with initial planning, followed by implementation (construction), operation, and finally closure (decommissioning). The activities, and hence the type and duration of the social impacts associated with each of these phases are likely to differ.

1.6 ASSUMPTIONS AND LIMITATIONS

1.6.1 Assumptions

Assessment of alternatives

In terms of the alternatives, three fundamental alternatives have been identified that have a potential bearing on the SIA, namely, access road alternatives, construction camp alternatives, and on-site substation alternatives. Based on the findings of the SIA the social impacts associated with each of these three components of the proposed WEF are similar and the significance ratings low. Separate assessments have therefore not been undertaken for each alternative. The SIA does however, provide comment on the location of construction camps based on the input from the affected landowners.

Technical suitability

It is assumed that the development site represents a technically suitable site for the establishment of a wind energy facility.

Strategic importance of the project

The strategic importance of promoting wind energy is supported by the national and provincial energy policies.

Fit with planning and policy requirements

Legislation and policies reflect societal norms and values. The legislative and policy context therefore plays an important role in identifying and assessing the potential social impacts associated with a proposed development. In this regard a key component of the SIA process is to assess the proposed development in terms of its fit with key planning and policy documents. As such, if the findings of the study indicate that the proposed development in its current format does not conform to the spatial principles and guidelines contained in the relevant legislation and planning documents, and there are no significant or unique opportunities created by the development, the development cannot be supported.

However, the study recognises the strategic importance of wind energy and the technical, spatial and land use constraints required for wind energy facilities.

1.6.2 Limitations

Demographic data

The information contained in some key policy and land use planning documents, such as Integrated Development Plans etc., may not contain data from the 2011 Census. However, where required this data has been up-dated with the relevant 2011 Census data.

1.7 SPECIALIST DETAILS

Tony Barbour, the lead author of this report is an independent specialist with 25 years' experience in the field of environmental management. In terms of SIA experience Tony Barbour has undertaken in the region of 200 SIAs and is the author of the Guidelines for Social Impact Assessments for EIA's adopted by the Department

of Environmental Affairs and Development Planning (DEA&DP) in the Western Cape in 2007.

Schalk van der Merwe, the co-author of this report, has an MPhil in Environmental Management from the University of Cape Town and has worked closely with Tony Barbour on a number of SIAs over the last ten years.

1.8 DECLARATION OF INDEPENDENCE

This confirms that Tony Barbour and Schalk van der Merwe, the specialist consultants responsible for undertaking the study and preparing the SIA Report, are independent and do not have any vested or financial interests in the proposed WEF being either approved or rejected.

1.9 REPORT STRUCTURE

The report is divided into five sections, namely:

- Section 1: Introduction;
- Section 2: Policy and planning context;
- Section 3: Overview of study area;
- Section 4: Identification and assessment of key issues; and
- Section 5: Key Findings and recommendations.

SECTION 2: DESCRIPTION OF POLICY AND PLANNNIG CONTEXT

2.1 INTRODUCTION

Legislation and policy embody and reflect key societal norms, values and developmental goals. The legislative and policy context therefore plays an important role in identifying, assessing and evaluating the significance of potential social impacts associated with any given proposed development. An assessment of the "policy and planning fit[2]" of the proposed development therefore constitutes a key aspect of the Social Impact Assessment (SIA). In this regard, assessment of "planning fit" conforms to international best practice for conducting SIAs. Furthermore, it also constitutes a key reporting requirement in terms of the applicable Western Cape Department of Environmental Affairs and Development Planning's *Guidelines for Social Impact Assessment* (2007).

For the purposes of the meeting the objectives of the SIA the following national, provincial and local level policy and planning documents were reviewed, namely:

National
- National Energy Act (2008);
- White Paper on the Energy Policy of the Republic of South Africa (December 1998);
- White Paper on Renewable Energy (November 2003);
- Integrated Resource Plan (IRP) for South Africa (2010-2030);
- The National Development Plan (2011);
- New Growth Path Framework (2010);
- National Infrastructure Plan (2012);
- Astronomy Geographic Advantage (AGA) Act (Act 21 of 2007).

Provincial
- The One Cape 2040 Strategy (2012);
- White Paper on Sustainable Energy for the Western Cape Province (2010);
- Western Cape Provincial Strategic Plan 2014-2019 (2014);
- Western Cape Land Use Planning Act, 2014;
- Western Cape Provincial Spatial Development Framework (2014 Revision);
- Western Cape Climate Change Response Strategy (2014);
- Western Cape Infrastructure Framework (2013);
- Western Cape Green Economy Strategy Framework (2013);
- Western Cape Amended Zoning Scheme Regulations for Commercial Renewable Energy Facilities (2011);
- Western Cape Draft Strategic Plan (2010);
- Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape – Towards a Regional Methodology (2006);

[2] "Planning fit" can simply be described as the extent to which any relevant development satisfies the core criteria of appropriateness, need, and desirability, as defined or circumscribed by the relevant applicable legislation and policy documents at a given time.

- Guidelines for the Management of Development on Mountains, Hills and Ridges in the Western Cape (2002).

Local
- Central Karoo District Municipality Integrated Development Plan (2012-2017);
- Laingsburg Local Municipality Integrated Development Plan (2012-2017).
- Laingsburg Local Municipality Local Economic Development Strategy (2006).
- Laingsburg Local Municipality Integrated Development Plan (2012-2017); and
- Laingsburg Local Municipality Local Economic Development Strategy (2006).

In addition, Section 2.6 provides a summary of some of the key health and disturbance issues associated with wind farms based on international experience. The findings of the review concentrate on three documents, namely the National Wind Farm Development Guidelines produced by the Environment Protection and Heritage Council (EPHC) of Australia (Draft, July, 2010), recent research on wind energy development in Scotland undertaken by Warren and Birnie in 2009 (Warren, Charles R. and Birnie, Richard V. (2009) 'Re-powering Scotland: Wind Farms and the 'Energy or Environment?' Debate', and a review of the potential health impacts associated with wind farms undertaken by the Australian Health and Medical Research Council (July, 2010).

2.2 NATIONAL POLICY ENVIRONMENT

2.1.1 National Energy Act (Act No 34 of 2008)

The National Energy Act was promulgated in 2008 (Act No 34 of 2008). One of the objectives of the Act was to promote diversity of supply of energy and its sources. In this regard, the preamble makes direct reference to renewable resources, including wind:

"To ensure that diverse energy resources are available, in sustainable quantities, and at affordable prices, to the South African economy, in support of economic growth and poverty alleviation, taking into account environmental management requirements (…); to provide for (…) increased generation and consumption of renewable energies…" (Preamble).

2.1.2 White Paper on the Energy Policy of the Republic of South Africa

Investment in renewable energy initiatives, such as the proposed WEF, is supported by the White Paper on Energy Policy for South Africa (December1998). In this regard the document notes:

"Government policy is based on an understanding that renewables are energy sources in their own right, are not limited to small-scale and remote applications, and have significant medium and long-term commercial potential".

"Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future".

The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and ***wind*** and that renewable applications are in fact the least cost energy service in many cases; more so when social and environmental costs are taken into account.

Government policy on renewable energy is thus concerned with meeting the following challenges:

- Ensuring that economically feasible technologies and applications are implemented;
- Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options; and,
- Addressing constraints on the development of the renewable industry.

The White Paper also acknowledges that South Africa has neglected the development and implementation of renewable energy applications, despite the fact that the country's renewable energy resource base is extensive and many appropriate applications exist.

The White Paper also notes that renewable energy applications have specific characteristics that need to be considered. Advantages include:

- Minimal environmental impacts in operation in comparison with traditional supply technologies; and
- Generally lower running costs, and high labour intensities.

Disadvantages include:

- Higher capital costs in some cases;
- Lower energy densities; and
- Lower levels of availability, depending on specific conditions, especially with sun and wind based systems.

The IRP 2010 aims to allocate 43% of new energy generation facilities in South Africa to renewables.

2.1.3 White Paper on Renewable Energy

The White Paper on Renewable Energy (November, 2003) (further referred to as the White Paper) supplements the *White Paper on Energy Policy*, which recognizes that the medium and long-term potential of renewable energy is significant. This Paper sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa.

The White Paper notes that while South Africa is well endowed with renewable energy resources that have the potential to become sustainable alternatives to fossil fuels, these have thus far remained largely untapped. As signatory to the Kyoto Protocol[3], Government is determined to make good the country's commitment to

[3] The Kyoto Protocol is a protocol to the United Nations Framework Convention on Climate Change (UNFCCC), aimed at fighting global warming. The UNFCCC is an international environmental treaty with the goal of achieving "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system". The Protocol was initially adopted on 11 December 1997 in Kyoto, Japan and entered into force on 16 February 2005. As of November 2009, 187 states have signed and ratified the protocol (Wikipedia)

reducing greenhouse gas emissions. To this purpose, Government has committed itself to the development of a framework in which a national renewable energy framework can be established and operate.

South Africa is also a signatory of the Copenhagen Accord, a document that delegates at the 15th session of the Conference of Parties (COP 15) to the United Nations Framework Convention on Climate Change agreed to "take note of" at the final plenary on 18 December 2009. The accord endorses the continuation of the Kyoto Protocol and confirms that climate change is one of the greatest challenges facing the world. In terms of the accord South Africa committed itself to a reduction target of 34% compared to business as usual.

Apart from the reduction of greenhouse gas emissions, the promotion of renewable energy sources is aimed at ensuring energy security through the diversification of supply (in this regard, also refer to the objectives of the National Energy Act).

Government's long-term goal is the establishment of a renewable energy industry producing modern energy carriers that will offer in future years a sustainable, fully non-subsidised alternative to fossil fuels.:

2.1.4 National Integrated Resource Plan for Electricity (2010-2030)

The current iteration of the Integrated Resource Plan (IRP) for South Africa, initiated by the Department of Energy (DoE) after a first round of public participation in June 2010, led to the Revised Balanced Scenario (RBS) that was published in October 2010 and later up-dated in November 2013. The document outlines the proposed generation new build fleet for South Africa for the period 2010 to 2030. This scenario was derived based on the cost-optimal solution for new build options (considering the direct costs of new build power plants), which was then "balanced" in accordance with qualitative measures such as local job creation. In addition to all existing and committed power plants, the RBS included a nuclear fleet of 9,6 GW; 6,3 GW of coal; 11,4 GW of renewables; and 11,0 GW of other generation sources.

A second round of public participation was conducted in November/December 2010, which led to several changes to the IRP model assumptions. The main changes were the disaggregation of renewable energy technologies to explicitly display solar photovoltaic (PV), concentrated solar power (CSP) and wind options; the inclusion of learning rates, which mainly affected renewables; and the adjustment of investment costs for nuclear units, which until then represented the costs of a traditional technology reactor and were too low for a newer technology reactor (a possible increase of 40%).

Additional cost-optimal scenarios were generated based on the changes. The outcomes of these scenarios, in conjunction with the following policy considerations, led to the Policy-Adjusted IRP:

- The installation of renewables (solar PV, CSP and wind) were brought forward in order to accelerate a local industry;
- To account for the uncertainties associated with the costs of renewables and fuels, a nuclear fleet of 9,6 GW was included in the IRP;
- The emission constraint of the RBS (2140 million tons of carbon dioxide per year after 2024) was maintained; and
- Energy efficiency demand-side management (EEDSM) measures were maintained at the level of the RBS.

Figure 2.1 indicates the new capacities of the Policy commitment. The dates shown in Table 2.1 indicate the capacity is required in order to avoid security of supply concerns. The document notes that projects could be concluded earlier than indicated. In terms of allocation, wind was allocated between 600 and 800MW per year and solar between 500 and 700MW. With Round 4 announcement in April 2015 the allocation for wind and solar was doubled in the so called Round 4b and even an expedited Round 4c with an additional 1 800MW was introduced for bidding in October 2015. Furthermore the department announced that the current REIPPPP will be extended with an additional 63 00MW for the upcoming years. To date, there have been four (4) volumes or bidding windows under the REIPPPP. In April 2015, the DoE announced additional preferred bidders for the REIPPPP Bid Window 4 contributing 1 121MW to the national grid contributing to a total of 5 243MW procured since the implementation of the programme to date (DoE, 2015).

The key conclusions that are relevant to the renewable energy sector is that an accelerated roll-out of renewable energy options should be allowed in order to derive the benefits of these technologies.

	New build options								Committed					Non IRP
	Coal (PF, FBC, imports, own build)	Nuclear	Import hydro	Gas – CCGT	Peak – OCGT[1]	Wind	CSP	Solar PV	Coal	Other	DoE Peaker	Wind[2]	Other Renew.	Co-generation
	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
2010	0	0	0	0	0	0	0	0	380	260	0	0	0	0
2011	0	0	0	0	0	0	0	0	679	130	0	0	0	0
2012	0	0	0	0	0	0	0	300	303	0	0	400	100	0
2013	0	0	0	0	0	0	0	300	823	333	1020	400	25	0
2014	500	0	0	0	0	400	0	300	722	999	0	0	100	0
2015	500	0	0	0	0	400	0	300	1444	0	0	0	100	200
2016	0	0	0	0	0	400	100	300	722	0	0	0	0	200
2017	0	0	0	0	0	400	100	300	2168	0	0	0	0	200
2018	0	0	0	0	0	400	100	300	723	0	0	0	0	200
2019	250	0	0	237	0	400	100	300	1446	0	0	0	0	0
2020	250	0	0	237	0	400	100	300	723	0	0	0	0	0
2021	250	0	0	237	0	400	100	300	0	0	0	0	0	0
2022	250	0	1 143	0	805	400	100	300	0	0	0	0	0	0
2023	250	1 600	1 183	0	805	400	100	300	0	0	0	0	0	0
2024	250	1 600	283	0	0	800	100	300	0	0	0	0	0	0
2025	250	1 600	0	0	805	1 600	100	1 000	0	0	0	0	0	0
2026	1 000	1 600	0	0	0	400	0	500	0	0	0	0	0	0
2027	250	0	0	0	0	1 600	0	500	0	0	0	0	0	0
2028	1 000	1 600	0	474	690	0	0	500	0	0	0	0	0	0
2029	250	1 600	0	237	805	0	0	1 000	0	0	0	0	0	0
2030	1 000	0	0	948	0	0	0	1 000	0	0	0	0	0	0
Total	6 250	9 600	2 609	2 370	3 910	8 400	1 000	8 400	10133	1722	1020	800	325	800

2011 Determinations 2012 Determinations Eskom commitments (pre IRP)

Notes: 1. OCGT is seen as natural gas in the determination
2. Includes Sere (100MW)

Source: IRP 2010-2030 Update Report November 2013

Figure 2.1: IRP2010 Policy Adjusted Plan with Ministerial Determinations

2.1.5 National Development Plan

The National Development Plan (NDP) contains a plan aimed at eliminating poverty and reducing inequality by 2030. The NDP identifies 9 key challenges and associated remedial plans. Managing the transition towards a low carbon national economy is identified as one of the 9 key national challenges. Expansion and acceleration of commercial renewable energy is identified as a key intervention strategy.

2.1.6 The New Growth Path Framework

Government released the New Economic Growth Path Framework on 23 November 2010. The aim of the framework is to enhance growth, employment creation and equity. The policy's principal target is to create five million jobs over the next 10 years and reflects government's commitment to prioritising employment creation in all economic policies. The framework identifies strategies that will enable South Africa to grow in a more equitable and inclusive manner while attaining South Africa's developmental agenda. Central to the New Growth Path is a massive investment in infrastructure as a critical driver of jobs across the economy. In this regard the framework identifies investments in five key areas namely: ***energy***, transport, communication, water and housing.

The New Growth Path also identifies five other priority areas as part of the programme to create jobs, through a series of partnerships between the State and the private sector. The Green Economy is one of the five priority areas, including expansions in construction and the production of technologies for solar, wind and biofuels. In this regard clean manufacturing and environmental services are projected to create 300 000 jobs over the next decade.

2.1.7 National Infrastructure Plan

The South African Government adopted a National Infrastructure Plan in 2012. The aim of the plan is to transform the economic landscape while simultaneously creating significant numbers of new jobs and strengthen the delivery of basic services. The plan also supports the integration of African economies. In terms of the plan Government will invest R827 billion over the next three years to build new and upgrade existing infrastructure. The aim of the investments is to improve access by South Africans to healthcare facilities, schools, water, sanitation, housing and electrification. The plan also notes that investment in the construction of ports, roads, railway systems, ***electricity plants***, hospitals, schools and dams will contribute to improved economic growth.

As part of the National Infrastructure Plan, Cabinet established the Presidential Infrastructure Coordinating Committee (PICC). The Committee identified and developed 18 strategic integrated projects (SIPS). The SIPs cover social and economic infrastructure across all nine provinces (with an emphasis on lagging regions) and consist of:

- Five geographically-focussed SIPs;
- Three spatial SIPs;
- Three energy SIPs;
- Three social infrastructure SIPs;
- Two knowledge SIPs;
- One regional integration SIP;

- One water and sanitation SIP.

The three energy SIPS are SIP 8, 9 and 10.

SIP 8: Green energy in support of the South African economy
- Support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan (IRP 2010);
- Support bio-fuel production facilities.

SIP 9: Electricity generation to support socio-economic development
- Accelerate the construction of new electricity generation capacity in accordance with the IRP 2010 to meet the needs of the economy and address historical imbalances;
- Monitor implementation of major projects such as new power stations: Medupi, Kusile and Ingula.

SIP 10: Electricity transmission and distribution for all
- Expand the transmission and distribution network to address historical imbalances, provide access to electricity for all and support economic development.
- Align the 10-year transmission plan, the services backlog, the national broadband roll-out and the freight rail line development to leverage off regulatory approvals, supply chain and project development capacity.

2.1.8 Astronomy Geographic Advantage Act (2007);

The main purpose of the Astronomy Geographic Advantage (AGA) Act (Act 21 of 2007) is to provide for the preservation and protection of such areas within South Africa that are uniquely suited for optical and radio astronomy.

Regulations promulgated in terms of AGA in 2009 require all developments in the Sutherland area that entail external night lighting, to be fully cut-off, with no light emitted in the upward direction. This is aimed at protecting the observational integrity of SALT (Southern African Large Telescope), the largest single telescope in the Southern Hemisphere, located approximately 20 km east of Sutherland. SALT is located ~ 70 km to the north of the site and will not be impacted by the proposed WEF.

2.1.9 Strategic Environmental Assessment (SEA) for Wind and Solar PV energy in South Africa

The Strategic Environmental Assessment (SEA) for wind and solar PV energy in South Africa (CSIR, 2015) identified eight (8) ***Renewable Development Zones*** (REDZs). The REDZs identified areas where large scale wind energy facilities can be developed in in a manner that limits significant negative impacts on the environment while yielding the highest possible socio-economic benefits to the country. Parts of the proposed Rietkloof WEF fall within the Komsberg Wind REDZ (Figure 2.1 and 2.2). It is, however, important to note that the prioritised areas have not yet been gazetted or officially adopted for implementation, although this is foreseen to take place during 2016.

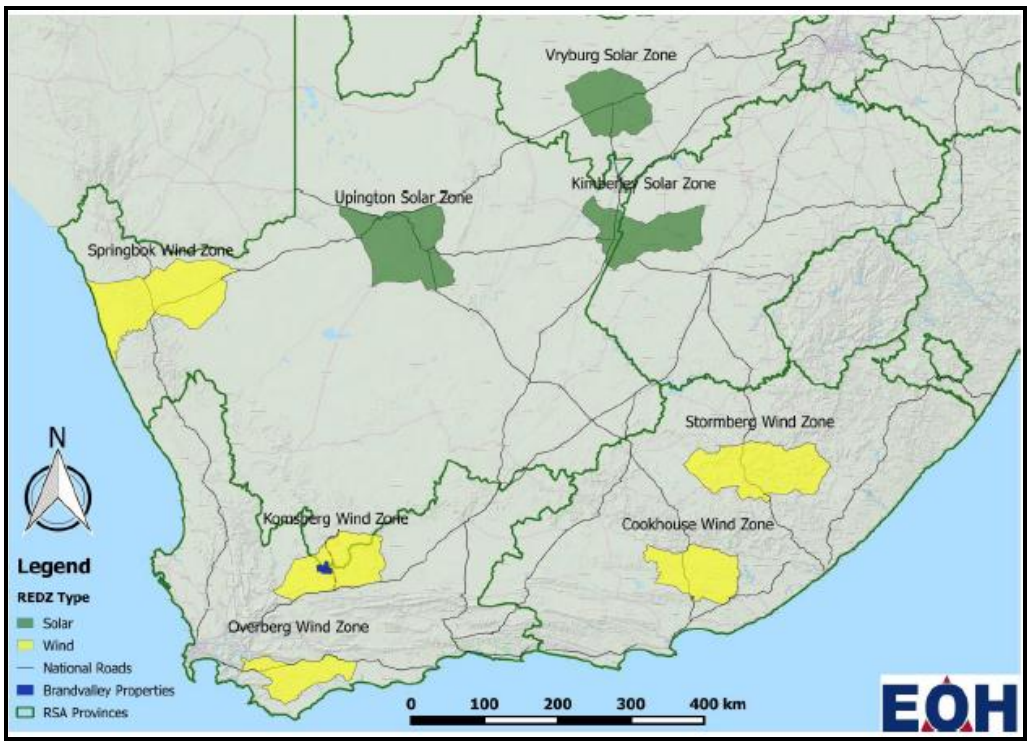

Figure 2.1: Location of Renewable Development Zones

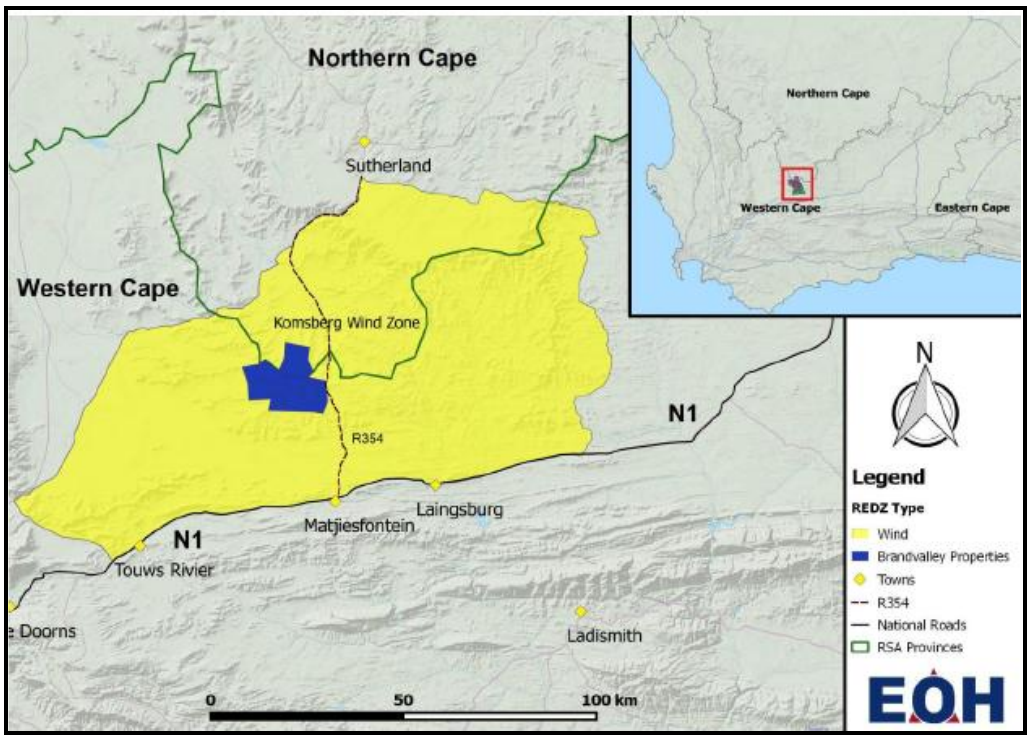

Figure 2.1: Location of proposed Rietkloof WEF within the Komsberg Wind Renewable Development Zone

2.3 PROVINCIAL POLICY AND PLANNING ENVIRONMENT

2.3.1 White Paper on Sustainable Energy for the Western Cape

The White Paper on Sustainable Energy (2010) compliments the Climate Change Strategy and Action Plan, specifically by *inter alia* setting targets for renewable energy generation. The White Paper is currently in Final Draft form. Once approved by Provincial cabinet, it will constitute the formal Western Cape's policy document on which the Western Cape Sustainable Energy Facilitation Bill will be based. The purpose of the White Paper and the envisaged Bill is to create an enabling policy environment in the Western Cape in order to promote and facilitate energy generation from renewable sources, as well as efficient energy use technologies and initiatives. This objective forms an integrated part of the Province's overarching energy policy objectives, namely:

- To ensure medium-term energy security, sufficient in order to support economic growth;
- To reduce energy poverty;
- To increase the efficient use of energy;
- To limit the greenhouse emissions footprint (associated with the use of fossil fuels);
- To decrease reliance on finite fossil fuel resources and associated unpredictable commodity markets.

The White Paper forms part of the Provincial Government of the Western Cape's (PGWC) strategy to aimed at removing a number of barriers (e.g. energy pricing, legal, institutional, low levels of investment confidence, insufficient knowledge) currently frustrating the province's energy goals by preventing the adoption and commercialization of clean energy (including electricity generation from renewable sources such as wind and solar) technologies and initiatives. The White Paper notes that, with regard to sources of renewable energy, wind and solar both represent commercially viable options in the province. The document proposes that special focus should be given to these renewables subsectors and specific associated technologies in particular in order to achieve critical mass of installation, and thus drive down establishment costs and ensure permanent employment opportunities.

The context, vision, identified goals and targets of the White Paper are briefly discussed below:

Context
The White Paper is rooted in an integrated set of high-level provincial policy documents, and in particular, the Western Cape Provincial Growth and Development Strategy (PGDS)[4] of 2007 and the Sustainable Development Implementation Plan (SDIP)[5]. These policy documents provide the overarching framework for the White Paper. Information contained in the internal Sustainable Energy Strategy (SES)

[4] The main purpose of the PGDS is to provide a strategic framework for accelerated and shared economic growth in the Western Cape. The PGDS builds on the 12 iKapa strategies which were developed by the relevant PGWC line departments, including the Provincial Spatial Development Framework (PSDF), the Sustainable Development Implementation Plan (SDIP) and the Climate Change Response Strategy (CCRS).
[5] This plan includes programmes to encourage biodiversity, effective open-space management and the better management of settlements by ensuring the sustainability of services in respect of water, waste, energy and land. The SES and White Paper both effectively form part of SDIP.

document which was prepared in 2007, largely informed the drafting of the White Paper.

Vision
The vision underpinning the White Paper, the so-called "2014 Sustainable Energy Vision for the Western Cape" is the following:

The Western Cape has a secure supply of quality, reliable, clean and safe energy, which delivers social, economic and environmental benefits to the Province's citizens, while also addressing the climate change challenges facing the region and the eradication of energy poverty (White Paper, 15).

Goals
Six goals have been identified in order to realise to this vision. These goals are grouped under economic, environmental and social sustainability categories. These goals are listed below, and each briefly discussed:

- Goal 1: alleviate energy poverty (Social sustainability): This goal is aimed at addressing energy-related under-development amongst the province's poor.
- Goal 2: Improve the health of the nation (Social sustainability): The goal is aimed at reducing health and safety risks associated with the use of fuels such as coal, paraffin and wood, as well as the generation of electricity from fossil fuels. In this regard it is noted that use of renewable sources to generate electricity does not emit harmful substances such as smoke, or oxides of sulphur nitrogen into the atmosphere. The document notes that improving the health of the nation includes improving the health of the individual through improved indoor climate as well as the outdoor climate.
- Goal 3: Reduce harmful emissions (Environmental sustainability): The White Paper notes that improved energy efficiency and increased use of renewable energy are cost effective methods to reduce Greenhouse Gas emissions, thereby combating Climate Change. Addressing Climate Change opens the door to utilizing additional finance mechanisms to reduce CO2 emissions.
- Goal 4: Reduce negative footprints in our environment (Environmental sustainability): The White Paper notes that the use of fossil fuels has a documented negative impact on the regional and local environment. The negative impact includes but is not limited to individual health, ground water pollution and air pollution. Any reduction in the use of fossil fuels through switching to clean(er) energy sources and more efficient energy uses is therefore desirable.
- Goal 5: Enhance energy security (Economic sustainability): The massive South African black-outs that started first in the Western Cape in early 2006 alerted the Province to its energy vulnerability. It is essential that the Western Cape increases its resilience against external energy supply disruptions and the massive price fluctuations caused by national or international decisions with regard to energy commodities (coal, oil):
- Goal 6: Improve economic competitiveness (Economic sustainability): It has been demonstrated internationally that one of the ways to improve economic competitiveness is by improving industrial and commercial energy efficiency. Support of industrial best practice energy management as a tool to stay competitive and improve the economy is important.

Targets
The PGWC agreed to targets for electricity from renewable sources and for energy efficiency to be achieved by 2014. The purpose of the White Paper is to quantify the relevant targets, and further to provide an incremental implementation plan until

2014. In this regard, four targets have been identified. Of these, two are of direct relevance to the proposed WEF:

- Target for electricity generated from renewable sources: *15% of the electricity consumed in the Western Cape will come from renewable energy sources in 2014, measured against the 2006 provincial electricity consumption* (White Paper, 21)

In this regard, the White Paper notes that in order to reach this target, it will be necessary for the PGWC to ensure that the environment to establish and generate renewable energy is such that a minimum of 15% of the electricity can be produced, and must be consumed, from renewable sources.

- Target for reducing carbon emissions: *The carbon emissions are reduced by 10% by 2014 measured against the 2000 emission levels* (p. 23).

In this regard, the White Paper notes that achieving this target largely depends on achieving the renewables target.

Applicability
The White Paper remains the most recent document in this regard. It was adopted by Provincial Cabinet in 2010. By 2011 DEA&DP had finalized a Draft Western Cape Sustainable Energy Bill[6]. However, in MEC Bredell's Departmental Oversight Report to WC Parliament in November 2013, he indicated that further drafting of the Bill has been suspended, as the process had been overtaken by developments in national legislation[7].

2.3.2 Western Cape Climate Change Response Strategy

The Western Cape Climate Change Response Strategy (WCCCRS) was adopted in February 2014. It is an update of the 2008 Western Cape Climate Change Response Strategy and Action Plan. The key difference with the 2008 Strategy is a greater emphasis on mitigation, including strategically suitable renewable energy development.

The 2014 WCCCRS was updated in accordance with the National Climate Change Response Policy (2013). It is strongly aligned with the overarching provincial objectives contained in the Western Cape Draft Strategic Plan 2009-2014 (2010), and the WCP 'Green is Smart' Strategy (2013). In line with the National Climate Change Response Policy, the Strategy takes a two-pronged approach to addressing climate change:

- **Mitigation:** Contribute to national and global efforts to significantly reduce Green House Gas (GHG) emissions and build a sustainable low carbon economy, which simultaneously addresses the need for economic growth, job creation and improving socio-economic conditions;
- **Adaptation:** Reduce climate vulnerability and develop the adaptive capacity of the Western Cape's economy, its people, its ecosystems and its critical

[6] www.gov.za/department-environmental-affairs-and-development-planning-2011-budget-speech-delivered-western-cape.
[7] Parliament of the Province of the Western Cape - Announcements, Tablings and Committee Reports (2013) F*riday, 15 November 2013,* 202 No 69 – 2013, Fifth session, Fourth Parliament, Item B.1.b (x).

infrastructure in a manner that simultaneously addresses the province's socio-economic and environmental goals (WCCCRS, 2014: 21).

The Strategy will be executed through an implementation framework which will include an institutional framework for both internal and external stakeholders, with a strong emphasis on partnerships. The framework still has to be prepared. A monitoring and evaluation system is further envisaged in order to track the transition to a low carbon and climate resilient WCP. Policy aspects dealing with mitigation are of specific relevance to renewable energy generation.

Energy and emissions baseline
Based on comprehensive 2009 data for all WCP energy use sectors, the following key findings pertain to overall WCP energy use and emissions:

- Electricity is the key fuel used in the WCP, accounting for 25% of total consumption;
- Approximately 95% of base load electricity is generated from low-grade coal and the remainder by nuclear. The vast bulk of WCP electricity is generated in the north of the country;
- In terms of emissions by sector, electricity is responsible for 55% of total WCP emissions. According to the Strategy, this supports the case for a shift towards renewables and clean energy types;
- Transport (55%) was the greatest energy user, followed by industry (33%). Although domestic consumption accounted for only 8%, it accounted for 18% of emissions, again underscoring the emission-intensive nature of electricity generation.

Mitigation potential
According to the Strategy, the main opportunities for mitigation include energy efficiency, demand-side management, and moving towards a less-emission intensive energy mix.

In the short to medium term, four areas with mitigation potential are identified, including promoting renewable energy in the form of both small-scale embedded generation as well as large scale renewable energy facilities. Together with other mitigation interventions, renewable energy generation is anticipated to result in the following socio-economic benefits:

- Reducing fuel costs to households and business;
- Improving the competitiveness of businesses;
- Job creation opportunities with the development of new economic sectors;
- Local business development;
- Improved air quality (with positive health impacts);
- Reducing the negative impact of large carbon footprints, particularly for export products; and
- Reducing stress on energy needs of the province and thereby increasing energy security (p. 27).

Renewable energy as strategic focus area
Initial implementation of the Strategy will focus on select focus areas aligned with the National Climate Change Response Policy Flagship Programmes and the Western Cape Green Economy Strategy Framework. These focus areas will be reviewed every five years – i.e. the next revision is due in 2019. Renewable area is identified as one of nine focus areas. The Strategy document notes that renewable energy is a key

area of focus for the Western Cape, and forms a fundamental component of the drive towards the Western Cape becoming the green economy hub for Africa.

The role of provincial government is identified as 'supporting the development of the renewable energy industry through promoting the placement of renewable energy facilities in strategic areas of the Western Cape as well as through supporting renewable energy industries' (p.32).

The document further notes that waste-to-energy opportunities are being investigated in order to facilitate large-scale rollout. Current investigation includes understanding the most appropriate technologies for waste-to-energy projects as well as developing decision support tools for municipalities to implement waste-to-energy programmes (p. 32).

Priority areas identified for renewable energy development:

- Development of the Renewable Energy economy in the WCP, in terms of both the appropriate placement of renewable energy as well as manufacturing opportunities;
- Development of waste-to-energy opportunities for both municipal and private sector (commercial and industrial) waste systems;
- Development of opportunities around small-scale renewable energy embedded generation activities (32).

2.3.3 Provincial Strategic Plan 2014-2019 (2014)

The Western Cape Provincial Strategic Plan (WCPSP) was adopted by Cabinet in 2014. It builds upon the 2009-2014 Draft Provincial Strategic Plan ('Building an Open Opportunity Society for All') which formed the overarching strategic framework during the incumbent provincial government's first term in office. The WCPSP 2014-2019 sets out the overarching vision and priorities for its second term in office, i.e. until 2019.

The vision statement for the 2014-2019 Plan is 'a highly skilled, innovation-driven, resource-efficient, connected, high-opportunity society for all'. It is hoped that the systems, structures and budgets which were put in place during the first term would help facilitate implementation of the new Plan. At the same time, the current Plan reflects provincial government's (PGWC) shift from a 'silo-based' (single department) to a transversal (cross-cutting) approach to government. The five strategic goals identified for the 2014-2019 period are:

- Creating opportunities for growth and jobs;
- Improving education outcomes and opportunities for youth development;
- Increasing wellness and safety, and tackling social ills;
- Enabling a resilient, sustainable, quality and inclusive living environment; and
- Embedding good governance and integrated service delivery through partnerships and spatial alignment (WCPSP, 2014: p.8).

Five sets of performance indicators are identified to evaluate implementation of strategies aimed at meeting these goals. In addition, the Plan identifies a number of 'game changers' which would help tackling provincial development issues, and result in palpable 'real' change. It envisages that action plans would be prepared by 2015/2016 for each of these identified 'game changers'. The 'game changers' are clustered around three priority areas. Key aspects of the Plan pertaining to renewable energy are discussed below.

Strategic Goal 1: Energy security as 'game changer'
Economic growth/ job creation (Strategic Goal 1) is one of the 3 priority development areas. Achieving Energy security is identified as one of two 'game changers' for fostering this. In this regard, the Plan notes that inadequate electricity supplies over the next five years and beyond threaten to be a significant impediment to growth. A number of strategic priorities are identified to address the issue, including the development of a WCP green economy. The Plan notes that PGWC has prioritized the development of a green economy, with the further aim of establishing it as the green economy hub of Africa.

The Plan further notes that the WCP has already established itself as the national renewable energy hub. In that regard, it is home to developers which have developed more than 60% of the 64 successful projects in the first three rounds of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), as well as a wide array of firms that provide key support services for the industry (engineering and environmental consultancies, legal advisors, etc.). The WCP has also seen the majority of local manufacturing investments. Three of the 4 PV manufacturers that have been successful in supplying to the REIPPPP projects are located in Cape Town, whilst 2014 also saw major global players opening manufacturing facilities for inverters and wind turbine towers.

Future energy security priorities include scaling up renewable energy generation in the province, including embedded generation such as rooftop solar PV, and the importation of liquid natural gas as an alternative power source to support further rollout of renewable energy and low carbon fuel switching (WCPSP, 2014: p.21).

Strategic Goal 4: Reducing greenhouse emissions and improving air quality
The Plan notes that PGWC is committed to improving the resilience, sustainability, quality and inclusivity of the urban and rural settlements. The Plan further notes that while some resource conservation and management improvements have been made, the WCP resource base remains under severe pressure.

Water, energy, pollution and waste, transport and resource-use inefficiencies are leading to extensive environmental degradation, poor air quality, loss of biodiversity and agricultural resources, which result in a deterioration of social and economic conditions. These challenges are further exacerbated by population growth and climate change impacts. It is anticipated that climate change will worsen air quality, as its effects will slow air circulation around the world, resulting in an increase in the frequency and severity of disasters (e.g. fires, floods, and coastal erosion) (WCPSP, 2014: p. 35).

Strategic outcomes pursued under Goal 4 include the enhanced management and maintenance of the ecological and agricultural resource-base; sustainable and integrated urban and rural settlements; and an improved climate change response.

Four outcomes are prioritized, including reduced greenhouse gas emissions and improved air quality. In this regard, the Plan notes that, as air quality and climate change are integrally linked, activities such as reducing fossil fuel burning will address both these priorities (WCPSP, 2014: p. 36). The Plan does not discuss reduced fossil fuel burning or renewable energy in any further detail.

With regard to interventions to air quality management, the Plan refers to the Western Cape Air Quality Management Plan (WCAQMP). The WCAQMP (2010) and

associated working groups focus on key interventions relating to governance and integrated management of air quality, climate change, town and regional planning and transport planning. The WCAQMP does not address renewable energy generation.

2.3.4 Western Cape Land Use Planning Act

In line with the Spatial Planning and Land Use Management Act, (Act 16 of 2013), the Western Cape Land Use Planning Act 2014 (LUPA) was adopted by PGWC in April 2014. Chapter III (which deals with spatial planning matters) sets out the minimum requirements for drafting a Provincial Spatial Development Framework (PSDF) for the WCP.

Of specific relevance, Section 4 requires a PSDF to (3) 'contain at least (*c*) provincial priorities, objectives and strategies, dealing in particular with (*iiii*) adaptation to climate change, mitigation of the impact of climate change, renewable energy production and energy conservation'. This requirement would apply to all future revisions of the PSDF. As such, it indicates PGWC's commitment to renewable energy production in order to respond to climate change.

2.3.5 Western Cape Provincial Spatial Development Framework

PSDFs are due for revision every five years. The 2014 Revision of the Western Cape PSDF replaces the 2009 PSDF. The 2014 PSDF was approved by MEC Bredell (Local Government, Environmental Affairs and Development Planning) in April 2014. In his Preface to the 2014 PSDF the MEC indicated that the 2014 PSDF carries the buy-in of all the Provincial departments to inform and guide their sector planning/spatial development strategies, and is therefore 'owned' by all Heads of Department (PSDF, p.2).

While it builds on and continues to incorporate the key principles and spatial policies of the 2009 PSDF, the new PSDF replaces the 2009 one as policy framework. A number of reasons necessitated this replacement. These include the fact that the 2009 PSDF was drafted in a climate of economic buoyancy before the global recession had hit home. The 2009 PSDF also had to be updated in line with new policy such as the One Cape 2040 vision, LUPA, and the National Development Plan (NDP), as well as the results of the 2011 Census. Finally, the 2014 PSDF reflects PGWC's new transversal (cutting across departments) approach to government, while providing greater clarity with regard to the planning responsibilities of the three spheres of government (2014)

Overarching guiding principles
The new PSDF is based on a set of 5 guiding principles, namely:

- Spatial justice;
- Sustainability and resilience;
- Spatial efficiency;
- Accessibility, and
- Quality and Livability.

Under Sustainability and resilience, the PSDF notes that land development should be spatially compact, resource-frugal, compatible with cultural and scenic landscapes, and should not involve the conversion of high potential agricultural land or

compromise ecosystems (p. 22). The 2004 Growth Potential Study was also revised in 2013 as part of the PSDF process[8].

Key spatial challenges are outlined in Chapter 2 of the PSDF. Energy security and climate change response are identified as key high-level future risk factors. The PSDF notes that the WCP is subject to global environmental risks such as climate change, depletion of material resources, anticipated changes to the global carbon regulatory environment, and food and water insecurity. The challenge would be to open up opportunities for inclusive economic growth, and decouple economic growth from resource consumptive activities (i.e. the development of a 'greener' economy, as outlined in the 2013 WCP Green is Smart strategy – see further below).

In this regard, the 2014 PSDF is in response to a number of associated escalating risks, including understanding the spatial implications of known risks (e.g. climate change and its economic impact and sea level rise, flooding and wind damage associated with extreme climatic events); and energy insecurity, high levels of carbon emissions, and the economic impacts of the introduction of a carbon tax (p. 27).

The WCP Spatial agenda

The spatial agenda for the WCP is set out in Chapter 2.6. This agenda is anticipated to deliver on the objectives of greater inclusivity, growth and environmental resilience. The agenda may be summarized as three linked sub-agendas, all addressed in the PSDF:

- (1) Growing the WCP economy in partnership with the private sector, non-governmental and community based organisations;
- (2) Using infrastructure investment as primary lever to bring about the required urban and rural spatial transitions, including transitioning to sustainable technologies, as set out in the 2013 Western Cape Infrastructure Framework (WCIF), while also maintaining existing infrastructure;
- (3.) Improving oversight of the sustainable use of the Western Cape's spatial assets. This sub-agendum is of specific relevance to climate change response and renewable energy. Its key objective is safeguarding the biodiversity networks, ecosystem services, agricultural resources, soils and water, as well as the WCP's unique cultural, scenic and coastal resources on which the tourism economy depends. In addition, it seeks to understand the spatial implications of known risks (e.g. climate change) and to introduce risk mitigation and/or adaptation measures (p. 33).

Chapter 3.1 deals with the sustainable use of the WCP's assets. These are identified as Biodiversity and Ecosystem services; Water resources; Soils and Mineral resources; Resource consumption and disposal; and Landscape and scenic assets. Policies are outlined for each of these themed assets. The last two themed assets are of specific relevance with regard to renewable energy.

Resource consumption and disposal

Key challenges facing the WCP are identified as matters pertaining to waste disposal, air quality, energy, and climate change.

[8] eadp-westerncape.kznsshf.gov.za/sites/default/files/news/files/2013-10-15/2013-growth-potential-study-of-towns-report_0.pdf. The 2014 PSDF is informed by three additional studies, also available at the above link.

Energy
With regard to energy use, the PSDF notes that the Cape Metro (albeit the province's most efficient user) and West Coast regions are the WCP's main energy users. It further notes that the WCP's electricity is primarily drawn from the national grid, which is dominated by coal-based power stations, and that the WCP currently has a small emergent renewable energy sector in the form of wind and solar generation facilities located in its more rural, sparsely populated areas. The PSDF also reiterates PGWC's commitment to shifting the economy towards gas[9] as transitional fuel (see WCIP below) (p. 50-1). Most of the energy discussion in the PSDF is dominated by aspects pertaining to natural gas.

With regard to renewable energy, the following policy provisions are of relevance:

- Policy R.4.6: *Pursue energy diversification and energy efficiency in order for the Western Cape to transition to a low carbon, sustainable energy future, and delink economic growth from energy use*;
- R.4.7: *Support emergent Independent Power Producers (IPPs) and sustainable energy producers (wind, solar, biomass and waste conversion initiatives) in suitable rural locations (as per recommendations of the Strategic Environmental Assessments for wind energy (DEA&DP) and renewable energy (DEA)*[10] (p.52).

Unlike the 2009 PSDF, the new PSDF does not provide any spatial provisions with regard to REF or transmission line infrastructure. Instead, such determination is envisaged in terms of the WCP WEF SEA, the DEA REF SEA, municipal SDFs, etc.

In this regard the two policy directives contained in the 2009 PSDF that had a direct relevance for WEFs are not contained in the 2014 revision, namely:

HR26 (…) transmission lines (…) should be aligned along existing and proposed transport corridors rather than along point to point cross-country routes. (Mandatory directive)
HR27 Wind farms should be located where they will cause least visual impact, taking into consideration the viability of the project. (Guiding directive)

Climate change
Water scarcity is identified as probably the key risk associated with climate change. Essentially the same primary response objectives outlined in the 2014 Western Cape Climate Change Response Strategy (WCCCRS – see 4. below) are identified in the PSDF. These are energy efficiency, demand management and renewable energy.

Policy provisions are made with regard to climate change adaptation and mitigation. Concerning renewable energy, the following is of relevance:

- R.4.16: *Encourage and support renewable energy generation at scale* (p.52).

[9] The PSDF at present envisages mainly from offshore West Coast gas fields via a terminal at Saldanha. The PSDF refers to the potential exploitation of own shale reserves, but also to the environmental sensitivity involved.
[10] See notes under Regional Methodology Review below.

Landscape and scenic assets

A specialist study was undertaken into the Province's cultural and scenic landscapes. This study[11] was one of the informants of the 2014 PSDF. It established that the WCP's cultural and scenic landscapes are significant assets underpinning the tourism economy, but that these resources are being incrementally eroded and fragmented. According to the study agriculture is being reduced to 'islands', visual cluttering of the landscape by non-agricultural development is prevalent, and rural authenticity, character and scenic value are being eroded. The mountain ranges belonging to the Cape Fold Belt together with the coastline are identified as the most significant in scenic terms, and noted to underpin the WCP's tourism economy.

A number of scenic landscapes of high significance are under threat, mainly from low density urban sprawl, and require strategies to ensure their long-term protection. These include landscapes under pressure for large scale infrastructural developments such as ***wind farms***, solar energy facilities, transmission lines and shale gas development in the Central Karoo (p. 54). With regard to renewable energy, the following policy provisions are of relevance:

- R.5.6: *Priority focus areas proposed for conservation or protection include -*

  - *Rural landscapes of scenic and cultural significance situated on major urban edges and under increasing development pressure, e.g. Cape Winelands;*
  - *Undeveloped coastal landscapes under major development pressure;*
  - *Landscapes under pressure for large scale infrastructural developments such as **wind farms**, solar energy facilities, transmission lines and fracking, e.g. Central Karoo; and*
  - *Vulnerable historic mountain passes and 'poorts'* (p.55).

Renewable energy within the Spatial Economy

Chapter 3.2 deals with opportunities in the WCP spatial economy, including with regard to regional infrastructure development. Essentially the same objectives are identified as in the WCIF, including the promotion of a renewable energy sector (p.61). General project-based (EIA and specialist assessment) provisions are made for evaluating the suitability of sites proposed for bulk infrastructure (Policy E.1) (p.63).

2.3.6 Western Cape Infrastructure Framework

The Western Cape Infrastructure Framework (WCIF)(2013) was developed by the WCP Provincial Department of Transport and Public Works in terms of the Provincial Government's mandate to coordinate provincial planning under Schedule 5A of the Constitution. The objective of the WCIF is to align the planning, delivery and management of infrastructure to the strategic agenda and vision for the Province, as outlined in the 2009-2014 Draft Provincial Strategic Plan. The One Cape 2040 and 2013 Green is Smart strategy were other key informants.

[11] DEA&DP Winter and Oberholzer (2013). *Heritage and Scenic Resources: Inventory and Policy Framework for the Western Cape. - A Study prepared for the Western Cape Provincial Spatial Development Framework*. Draft 5. See footnote 1 above.

The document notes that given the status quo of infrastructure in the province, and the changing and uncertain world facing the Western Cape over the 2-3 decades a new approach to infrastructure is needed. Namely one that satisfies current needs and backlogs, maintains the existing infrastructure, and plans proactively for a desired future outcome. The 2040 vision requires a number of transitions to shift fundamentally the way in which infrastructure is provided and the type of infrastructure provided in WCP.

The WCIF addresses new infrastructure development under five major 'systems' (themes), and outlines priorities for each. Energy is one of the 'systems' identified. The document notes that a provincial demand increase of 3% per year is anticipated for the period 2012-2040. Key priorities are in matching energy generation/ sourcing with the demand needed for WCP economic growth. Additionally, the energy focus should be on lowering the provincial carbon footprint, with an emphasis on renewable and locally generated energy.

Energy infrastructure transition
Three key transitions are identified for the WCP Energy 'system' infrastructure, namely:

- Shifting transport patterns to reduce reliance on liquid fuels;
- Promoting natural gas as a transition fuel by introducing gas processing and transport infrastructure; and
- Promoting the development of renewable energy plants in the province and associated manufacturing capacity (p. 31).

2.3.7 Western Cape Green Economy Strategy Framework

The Western Cape Green Economy Strategy (2013) – 'Green is Smart' - is a framework for shifting the Western Cape economy from its current carbon intensive and resource-wasteful path within a context of high levels of poverty to one which is smarter, greener, more competitive and more equitable and inclusive. The Strategy is closely aligned with provincial development goals and the 2014 WCCCRS.

The Strategy's point of departure is that while the WCP faces significant challenges in terms of climate change and economic development. Two of the WCP's key economic sectors - both of national importance - agriculture and tourism, are vulnerable to climate change. At the same time, these challenges hold significant potential for opportunities linked to attracting investment, economic development, employment creation, and more resilient infrastructure and patterns of consumption. These opportunities are partly linked to the WCP's existing leadership in some fields of green technology, including knowledge services.

The core objective of the Strategy is to position the WCP as the lowest carbon footprint province in South Africa, and a leading green economy hub on the African continent.

Drivers, Enablers and Priorities
The Strategy framework is made up of 5 drivers of the green economy which are market focused and principally private sector driven, and supported by 5 enablers which are either public sector driven, or the product of a collaborative effort.

The five drivers are: smart mobility, smart living and working, smart ecosystems, smart agri-processing and smart enterprise. The relevant cross-cutting enablers are:

finance, rules and regulations, knowledge management, capabilities, and infrastructure.

The framework also identifies priorities that would position the WCP as a pioneer and early adopter of green economic activity. These priorities have been identified in terms of the WCP being firstly, a front-runner or pioneer and secondly, an early adopter of innovations and technologies which already exist, but are not widely adopted in South Africa. Some priorities are considered game-changers, and are singled out as 'high level priorities for green growth'.

Three such 'high level priorities for green growth' are identified, two of which are of relevance here:

- Natural Gas and Renewables: Off-shore natural gas, potential gas baseload power plants and renewable energy IPP programme, together with a greenfield gas infrastructure, will be the game-changer for the Western Cape to be the lowest carbon province in South Africa, and achieve significant manufacturing investment;
- Green Jobs: A green growth path without job growth is unsustainable. There must be early pursuit of priorities with a high rate of job growth potential – notably rehabilitation of natural assets, responsible tourism and the waste sector (p.8).

Renewable energy servicing hub

'Under the section dealing with drivers, renewable energy is discussed under 'Smart Enterprise'. The WCP's objective in terms of this driver is to establish the WCP as a globally recognized centre of green living, working, creativity, business and investment, and thereby attract investment, business and employment opportunities. Based on existing comparative advantages, three key opportunities are identified, one of which is of relevance here, namely to establish the WCP as Africa's new energy servicing hub.

In this regard, the Strategy document notes that WCP is well placed to be the most important research and servicing hub for the renewable and natural gas energy sectors in South Africa and on the African continent.

In support of this claim, it notes that the Darling Wind Energy Facility (WEF) was the first operational WEF in the country, and that a number of further WEFs and SEFs have been approved for the province under REIPPP. Estimated investment of REIPPP projects in the Western Cape in the first two rounds is just under R8 billion (wind and solar). WCP professional service firms play a leading advisory role in REIPPP projects across the country.

The WCP is further home to the country's first photovoltaic manufacturers, Tenesol/ SunPower and SolaireDirect. On the back of REIPP, AEG and jointly, Enertronica and Gefran have also established manufacturing facilities in the Cape, with growing interest from other companies. South Africa's first dedicated renewable training centre is being established in the Western Cape at the Cape Peninsula University of Technology (CPUT). The aim of the centre is to prepare a skilled labour pool for the new emerging renewable energies: wind, solar and bio. The first phase will combine theoretical and practical training for wind turbine service technicians and for solar farms. In the long run, the centre will also become a development and research facility for renewable energy.

The Strategy also notes that there are important initial opportunities in the construction of new energy infrastructure. However, the real long-term benefits lie in the servicing of operational infrastructure. In this regard, it is estimated that the annual servicing and maintenance costs of WEFs for instance amount to approximately 10% of the initial capital investment (p.36).

Public and market sector procurement are identified as some of the key enablers. The creation of a streamlined regulatory system – the reduction of 'red tape' – is identified as a key prerequisite for creating en enabling environment.

A leader in renewable energy research, manufacturing and servicing
Under the section dealing with enablers necessary to unlock development potential, renewable energy is discussed under "Smart Infrastructure". The Strategy document notes that existing infrastructure systems, particularly those relating to energy and transport, are carbon intensive, with high costs to the environment. Opportunities for the WCP are linked to tapping into infrastructural development funding by leveraging existing advantages.

With regard to the energy sector, the Strategy proposes that the WCP becomes an early adopter of natural gas processing and transport infrastructure, and become the hub of Concentrated Solar manufacture and servicing. Natural gas is identified as the key potential 'game changer' of the WCP economy, and at present the best way to transition the economy to a more fully-integrated renewables sector as major part of the WCP fuel mix in the long term. In this regard, the relative ease with which gas-fired stations could be activated make them an ideal supplement to less predictable wind and solar sources.

CSP manufacturing and servicing centre
Surprisingly, WEF and Solar PV manufacture and servicing receive no specific mention, while Concentrated Solar (CSP) does. The Strategy document justly notes that while the Northern Cape Province is the best suited for CSP facilities, the WCP has strong existing research capabilities in CSP at the University of Stellenbosch (US), and the WCP's existing manufacturing sector already has the capacity to manufacture many CSP components.

Potential opportunities of commercialisation of CSP technology for local (RSA, Africa) conditions based on US research could be substantial. This subsector is identified as an important area of collaboration between the two provinces to realise the potential benefits (p 41). The key action at this stage to initiate a WCP manufacturing and servicing centre is to lobby for support for a pilot of South African designed CSP technologies, adapted to SA conditions (p. 43).

2.3.8 One Cape 2040 Strategy

The One Cape 2040 (2012) vision was developed by the Western Cape Government, the City of Cape Town (CoCT) and the Western Cape Economic Development Partnership. It was adopted as policy by CoCT Council in 2012. It is aimed at stimulating a transition towards a more inclusive and resilient WCP economy. It seeks to set a common direction to guide planning and action and to promote a common commitment and accountability to sustained long-term progress.

The 2040 Strategy does not replace any existing statutory plans. Rather, it is intended as a basic reference point and guide for all stakeholders planning for long-term economic resilience and inclusive growth.

Six key transitions are identified which to define the necessary infrastructure-related shifts in the WCP. One of these 6 key transitions is an Ecological transition ('Green Cape') from an unsustainable, carbon-intensive resource use economy, to a sustainable, low carbon-footprint one. The development of renewable energy projects and natural gas are expected to significantly decrease the WCP's carbon footprint.

2.3.9 Western Cape Amended Zoning Scheme Regulations for Commercial Renewable Energy Facilities (2011)

Amendments to the Western Cape Land Use Ordinance (1985) (LUPO) were promulgated in 2011 in order to guide the development of commercial renewable energy generation facilities (REFs), mainly wind and solar[12]. The Zoning Scheme amendments are specifically intended to provide guidance with regard to land use compatibility, and applicable development restrictions and conditions, including provision for mandatory rehabilitation post construction and final decommissioning ("abandonment" in terms of the Provincial Notice[13]). The ambit of the Regulations include all REFs as well as associated ("appurtenant") infra/ structure(s) operated for commercial gain, irrespective of whether such feed into the electricity grid or not. The section below provides an overview of key points of relevance to the proposed WEF.

Zoning status

- In terms of zoning status, "renewable energy structures" are designated as a consent use in the zone Agriculture I.

Land use restrictions

- Restrictions with regard to height are mainly applicable to wind energy facilities (WEFs), but associated on-site buildings for all REFs are limited to a maximum of 8,5 m (ground to highest point of roof);
- Restrictions with regard to setback are only applicable to WEFs.

Establishment of a Rehabilitation Fund

- Prior to authorisation, the applicant ("owner") must make financial provision for the rehabilitation or management of negative environmental impacts, as well as of negative impacts associated with decommissioning or abandonment of the facility. Such provision should be in the form of a fund to be administrated by the Municipality, and should be to the satisfaction of the competent authority (i.e. Department of Energy).

Land clearing/ erosion management

- Land clearing should be limited to areas considered essential for the construction, operation and decommissioning of an REF;
- All land cleared during construction which does not form part of the REF structural footprint, must be rehabilitated in accordance with an approved rehabilitation plan;

[12] Province of the Western Cape (2011). *Provincial Gazette 6894, Friday 29 July 2011;* PN 189/2011 (pp. 1381-6).

[13] "A Renewable energy structure shall be considered *abandoned* when the structure fails to continuously operate for more than one year" (§ 4(3) (m)).

- Soil erosion must be avoided at all costs, and any high risk areas should be rehabilitated.

Visual impact management
- Visual and environmental impacts must be taken into account, to the satisfaction of the competent authority;
- Associated structures (i.e. substations, storage facilities, control buildings, etc.) must be screened from view by indigenous vegetation, and/or located underground, or be joined and clustered to avoid adverse visual impacts. In addition, appurtenant structures must be architecturally compatible with the receiving environment;
- Lighting should be restricted to safety and operational purposes, must be appropriately screened from adjacent land units, and should also be in accordance with applicable Civil Aviation Authority requirements.

Operational management and maintenance
- REFs may not cause or give rise to any noise or pollution, deemed to be a nuisance in terms of applicable Environmental Impact Assessment (EIA) regulations or Municipal by-laws;
- The REF owner/ operator is responsible for maintaining the REF in a good condition, including with regard to painting, structural repairs, on-going rehabilitation measures (e.g. erosion), as well as the upkeep of safety and security measures.

Decommissioning management
- An REF which has reached the end of its lifespan or that has been abandoned must be removed. The owner (operator) is responsible for the removal of such structures in whole, no longer than 150 days after the date of discontinued operation, and the land must be rehabilitated to the condition it was in prior to construction of the facility;
- Decommissioning activities must include the removal of all REF structures, associated structures, as well as transmission lines; the disposal of solid and hazardous waste according to applicable waste disposal regulations; and the stabilisation and re-vegetation of the site. In order to minimise disruptive impacts on vegetation, soils, etc., the competent authority may grant approval not to remove any underground foundations or landscaping.

In conclusion, it should be noted that the relevant provisions are mandatory (compliance requirements), and would therefore have to be implemented by the proponent.

2.3.10 Western Cape Draft Strategic Plan 2009-2014

The 11 Strategic Objectives embodied in the Western Cape Draft Strategic Plan 2009-2014 (2010)("Building an Open Opportunity Society for All") embody the key overarching strategic objectives identified by Provincial Government for its term in office from 2009-2014. Although the Draft Plan has been replaced by the WCPSP 2014-2019, it remains of relevance. In this regard, the objectives identified and work groups established in terms of it were some of the key informants of the 2014 WCCCRS. The 2013 WCIP is also explicitly based on the Draft Plan. Of the 11 Outcomes, the following are broadly applicable to REF projects:

- 1. Creating opportunities for growth and jobs;
- 6. Developing integrated and sustainable human settlements;

- 7. Mainstreaming sustainability and optimising resource use and efficiency;
- 9. Reducing and alleviating poverty.

According to the plan to achieve the outcomes pertaining to "Mainstreaming sustainability and optimising resource use and efficiency", key measures include:

- The promotion of energy efficiency in households, commerce, industry and all provincial offices, hospitals and schools; a green building programme and a green low-cost housing programme to increase the chances of the poor against climate change impacts.
- Development of a wind energy sector and energy production from alternative sources as well as net metering supported by a small-scale feed-in tariff to encourage small-scale renewable energy production.

Proposed socio-economic interventions are underpinned by the Administration's beliefs that "economic growth constitutes the foundation of all successful development; that growth is driven primarily by private sector business operating in a market environment; and that the role of the state is (a) to create and maintain an enabling environment for business and (b) to provide demand-led, private sector-driven support for growth sectors, industries and businesses" (WC Department of the Premier; 2010: 8).

2.3.11 Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape – Towards a Regional Methodology

The document developed in 2006 remains the most recent DEA&DP publication with regard to the locational/ siting aspects of WEFs. The document focuses specifically on the siting of wind energy facilities. Some of the key findings and recommendations that have a potential bearing on the study are briefly summarized below. However, it should be noted that the document does not have Guideline or Policy status.

Cumulative Impact Issues
The experience in Europe is that the very high cumulative impact of wind farms has resulted due to a policy of permitting small (wind) energy schemes in relatively close proximity to each other (only 2.5 km in Denmark). As a result the document recommends that:

- Large installations should be located extremely far apart (30 – 50km), and;
- Smaller installations should be encouraged in urban / brownfield areas.

Recommended Disturbed Landscape Focus
In addition to proposing that smaller facilities should be focused in urban/ brownfield areas, the proposed methodology further recommends focusing on existing disturbed rural landscapes, and in particular, those rural landscapes that have already been "vertically compromised" by the location, for example, of transmission lines, railway lines, and all phone towers.

Protecting Rural Landscape Values (put after "Urban Emphasis)
The document notes that in Europe in the past, a great degree of emphasis was given to quantifying views from residential locations. This policy emphasis has effectively led to commercial-scale renewable energy developments having been pushed into more "remote" rural locations. The study notes that in the South African context this policy would effectively "penalizing" rural areas, and compromising

wilderness and touristic visual values. As indicated above the area has been impacted upon by existing power and railway lines.

Site Specific Aesthetic Considerations
The document lists the following site-specific recommendations for turbines:

- Stick to linear, non-organic layouts;
- Placement in straight rows is preferred;
- Maintain consistency in height;
- Consistency of type across an entire facility is recommended.

In terms of REF spatial policy development the following initiatives also have a bearing on the proposed WEF:

- DEA/ CSIR are currently undertaking a Strategic Environmental Assessment (SEA) aimed at identifying strategic geographical areas best suited for the effective and efficient roll-out of large scale wind and solar PV energy projects, referred to as Renewable Energy Development Zones (REDZs). Through a process of positive and negative mapping as well as wide stakeholder consultation, eight focus areas have been identified as potentially being of national strategic importance for wind and solar PV development. In 2013 the DEA/ CSIR embarked on a national road show to meet with regional stakeholders, but it does not seem as if an SEA document, available for public review, has been prepared to date[14].
- According to DEA&DP's website, a WCP SEA for the placement of WEFs is currently being undertaken. The project, headed by Paul Hardcastle, is listed as 'under development', and no documents are available yet. The project context is unclear, but it is likely linked to the national REF SEA[15].

2.3.12 Guideline for the Development on Mountains, Hills and Ridges in the Western Cape (2002)

The aim of the Guideline is to provide a decision-making framework with regard to developments which include listed activities in terms of National Environmental Management Act Regulations, and which are proposed in an environment which is characterised by mountains, hills and ridges.

The Guideline notes that mountains, hills and ridges are subject to a range of development pressures. A guiding framework is therefore needed to control development in these areas. Key reasons listed are:

- Provide catchment areas for valuable water resources;
- Often characterized by unique and sensitive ecosystems;
- Have aesthetic / scenic value; and
- Provide "wilderness" experience opportunities.

The Guideline defines a mountain, hill or ridge as "*a physical feature that is elevated above the surrounding landscape*".

[14] See: http://www.csir.co.za/nationalwindsolarsea/background.html (accessed 18-04-15).
[15] eadp.westerncape.gov.za/wc-sustainable-energy-projects-db/wc-strategic-environmental-assessment-placement-wind-energy (accessed 18-04-15).

The Guideline is divided into 2 sections. The second deals with key decision-making criteria which need to be taken into account when adjudicating the suitability of developments in such areas. Key criteria which are of specific relevance to the proposed WEF include:

- Development on the crest of a mountain, hill or ridge should be strongly discouraged;
- Preserve landform features through ensuring that the siting of facilities is related to environmental resilience and visual screening capabilities of the landscape;
- Adopt the precautionary principle to decision making;
- The criteria used to assess developments in these areas include, amongst others, density of the development, aesthetics, location, value in terms of "sense of place", character of adjacent land use, character of the general area, and cumulative impacts which may arise from other existing and planned developments in the area.

The proposed WEF site is located in a landscape characterised by rolling hills in an agricultural setting. However, it should be noted that the Guidelines were developed in 2002 and do not take into account the locational requirements of WEFs. This issue will be discussed in more detail in the SIA.

2.4 DISTRICT AND LOCAL POLICY AND PLANNING ENVIRONMENT

The proposed Rietkloof WEF is located in the Laingsburg Local Municipality (LLM), which is located in the Central Karoo District Municipality. The closets towns to the site are Matjiesfontein, Laingsburg and Sutherland, which is located in the Karoo Hoogland LM (KHLM) of the Northern Cape Province. The KHLM borders on the Laingsburg LMT. The potential socio-economic opportunities and impacts associated with the proposed WEF are likely to affect residents living in both the KHLM and LLM. The Integrated Development Plans (IDPs) for both LMs are therefore summarised below with respect to their applicability and policy alignment with the proposed project.

2.4.1 Central Karoo District Municipality Integrated Development Plan

The Vision of the CKDM is "Working together in development and growth". The Mission statement linked to the vision is "*Central Karoo place a high priority upon ensuring that future growth improves the quality of life in the region. It is the desire to be financial sustainable, maintain the rural character and create healthy communities by facilitating economic growth, improving infrastructure and the green energy opportunities, providing and supporting alternative modes of delivery (shared services), improve marketing, branding and communication with all stakeholders, provide excellent disaster and risk management services, and maintaining housing choices for a range of income levels".*

The IDP identifies 8 Strategic Objectives which are aligned with the national key performance areas and the core functions of the municipality. The objective relevant to the proposed project is to pursue economic growth opportunities that will create descent work. The IDP goes onto note that the CKDM place a high priority upon ensuring that future growth improves the quality of life in the region. In this regard the DM seeks to be financial sustainable, maintain the rural character and create healthy communities by facilitating economic growth, improving infrastructure and the *green energy* opportunities, providing and supporting alternative modes of

delivery (shared services), improve marketing, branding and communication with all stakeholders, provide excellent disaster and risk management services, and maintaining housing choices for a range of income levels.

The Strategic Objectives that are relevant to the proposed WEF include:

- Strategic Objective 5: To establish an inclusive tourism industry through sustainable development and marketing which is public sector led, private sector driven and community based. Tourism (as indicated below) has been identified as a key growth sector. Care therefore needs to be taken to ensure that projects, such as the proposed WEF, do not impact negatively on the areas current and future tourism potential;
- Strategic Objective 6: To ensure a united integrated development path in a safe and sustainable environment. Under Strategic Objective 6: To ensure a united integrated development path in a safe and sustainable environment, the key strategic priority listed in the IDP is Green Energy;
- Strategic Objective 7: To pursue economic growth opportunities that will create descent work. The following activities listed under Strategic Objective 7 are relevant to the proposed WEF:
  - To increase SMME activities
  - The promote integrated youth, elderly, disabled and gender development
  - Facilitate the establishment and functioning of the Economic Development Agency (EDA)

Table 5.2 in Section 5.5, Strategy Alignment, provides a summary of the strategies for the district and local municipalities. The strategies that are of relevance to the proposed WEF are listed in Table 2.1 below:

Table 2.1: List of IDP strategies

Strategy	Laingsburg	Prince Albert	Beaufort West	Central Karoo District
Economic Development	Create an environment conducive for economic development	To stimulate, strengthen and improve the economy for sustainable growth.	Agricultural business to improve the job creation potential Creation of employment to reduce unemployment to acceptable levels To reduce poverty and to promote the empowerment of women, HIV/ AIDS sufferers involved in economic and household responsibilities	To pursue economic growth opportunities that will create descent work.
Standard of living	Improve the standards of living of all people in Laingsburg Improve the social environment with community beneficiation, empowerment and ownership Developing a safe, clean, healthy and sustainable environment for communities	To improve the general standards of living	To create a crime free, safe and healthy environment	To ensure a united integrated development path in a safe and sustainable environment To promote a safe and healthy environment and social viability of residents through the delivery of a responsible environmental health service. To effectively plan to minimise the impact of disasters on the community, visitors, infrastructure and environment
Skills development	To create an institution with skilled employees to provide a professional service to its clientele guided by municipal values	To commit to continuous improvement of human skills and resources to delivery effective services	Empowerment of personnel, management and council members for effective service delivery	
Tourism			Business initiatives and the optimising of tourism (South African and foreign)	To establish an inclusive tourism industry through sustainable development and marketing which is public sector led, private sector driven and community based.

A Strength, Weakness, Opportunities and Threats (SWOT) analysis was undertaken as part of the IDP process. Of relevance to the proposed project the Green Energy and Regional Local Economic Development were identified as key opportunities. However, tourism was also identified as a key opportunity. One of the key challenges is the transformation of the tourism industry and the increased involvement of HDIs.

The IDP also refers to the Central Karoo Growth and Development Strategy 2007-2022, which was developed following a conference held on 9 March 2007. As part of the strategy the Central Karoo Economic Development Agency [CKEDA] was established in September 2010. Some of the projects the EDA is involved include Hydroponics, Karoo Tourism Strategy and Regional LED Forum

2.4.2 Central Karoo Spatial Development Framework

The Central Karoo SDF indicates desired land-use patterns, addresses spatial reconstruction and provides guidance in respect of the location and nature of future development. The SDF adopts the vision and mission of the IDP and expresses it in a spatial sense. In terms of the SDF the Central Karoo is divided into five functional areas, namely:

- Rural areas;
- Rural settlements (Merweville, Matjiesfontein, Prince Albert Road and Klaarstroom);
- Institutional settlements (Nelspoort);
- Local towns (Leeu Gamka and Murraysburg);
- Main local towns Beaufort West, (Laingsburg and Prince Albert).

The SDF notes that care should be given the role played by the agricultural sector. In this regard:

- Agricultural areas have been affected by urban development and have placed pressure on agricultural resources;
- Care should be taken to maintain the rural character of non-urban areas;
- The formation of small rural towns should be avoided;
- Areas should provide for the development of alternative agricultural use, to make a positive contribution to sustainable economic growth. This includes tourism-orientated developments, packing and processing developments, housing for farm labourers and provisions for small-scale farming and intensive agriculture.

2.4.3 Laingsburg Local Municipality Integrated Development Plan

The Vision for the LLM as stated in the LLM IDP (2012-2017) is to make the Laingsburg Municipality a desirable place to live, invest and visit, where all people may enjoy a sustainable quality of life by the year 2017.

The Mission statement is "To create a people centered and economically viable municipality where all have equal access to i) basic social services, ii) educational and skills enhancement programmes, iii) entrepreneurial and job opportunities as well as, enjoy a clean, sustainable environment embedded in safety and security, which is governed by a participative, professional, transparent and accountable administration".

Key challenges facing the LLM include:

- Lack of employment opportunities;
- Low skills levels;
- Insufficient self-employment within the town; and
- Lack of investment.

While crime rates are generally low, there are high levels of domestic violence in Laingsburg. This is linked to the high levels of unemployment, combined with alcohol and drug abuse. The majority of women in the town are unemployed which results in a high dependence on working male partners. In addition, prostitution is rampant amongst young girls. This is linked to the role of truckers and the limited employment opportunities for young girls in the area.

The potential opportunities listed in the IDP that are potentially relevant to the proposed development include:

The SMME sector: The IDP notes that the SMME's sector in Laingsburg and particularly the informal sector can contribute significantly to the economy of Laingsburg, specifically on the diversification of Agricultural products. The proposed development has the potential to create opportunities for the local SMME sector.

Tourism sector: The tourism hospitality industry is identified as one the key sectors in terms of opportunities. Matjiesfontein Village and the associated hotel attracts about 10 000 visitors per year. However, the majority are one day or overnight visitors. The challenge is to attract them to stay longer and also visit other areas in the LLM. The IDP notes that this would require the development of the skills in the hospitality industry. The location of Laingsburg on the N1 also creates potential for attracting tourists to the town and the surrounding area.

Agriculture sector: The agriculture sector is the most prominent sector in the local economy. However in terms of employment, the agricultural potential, lie more on Agri-processing and Agri-businesses. Most of the agricultural products are sold in their raw form hence, there is potential for value adding locally. This would also create opportunities for SMMEs. The low skill levels do however represent a constraint.

The IDP lists a number of strategies. The following strategies are relevant to the proposed development:

Cross cutting strategies
The objective is to create a stable social environment conducive to empowerment, social development and community care by investing in human capital through skills development

Economic development
The objective is to create opportunities to increase household income. The strategies identified include:
- Investing in human capital through skills development strategies;
- Promotion of SMME's; and
- Resource mobilisation and investment through the support of private public partnerships.

Social development
The objective is to ensure a stable social environment and reduce poverty by 80%. The strategies include:

- Promotion of functional literacy through ABET; and
- Moral regeneration strategy and sports development.

Environmental and spatial development
The objective is the improvement / maintenance of environmental status of the Municipal area and eradication of the spatial legacy. The key relevant strategy is the development of alternative sources of energy

2.4.4 Laingsburg Local Municipality Local Economic Development Plan

The Local Economic Strategy document (MCA, 2006) notes that despite locational advantages, economic development remains a significant challenge for Laingsburg Municipality. In this regard a large portion of economic activity, especially in the transport sector has been redirected to Cape Town and George, as a result of technological advances in communication and road transport.

The potential comparative advantages for the LLM include:

- **Agricultural sector:** Agriculture remains the dominant economic activity in Laingsburg, consisting mainly of extensive sheep farming.
- **Transport:** Laingsburg is located on the N1 and therefore benefits from passing traffic. In peak season ~ 14 000 vehicles pass through the town per day, dropping to ~ 7000 during the experiences the passage of approximately 7000 vehicles per day during the rest of the year.
- **Primarily urban population:** Laingsburg's population is mostly urban at almost 90% (Central Karoo Economic Regeneration Study, SETPLAN). This is largely the result of an agricultural economy which is not labour intensive. The LED report notes that this urban population holds great potential as human capital if it can be equipped to become a productive resource for the economy. However, low education and skills levels remain a challenge.
- **Existing infrastructure and water provision:** Laingsburg and other towns in the Central Karoo are fortunate to have good infrastructure in terms of roads, sanitation, electricity and water-supply. The majority of residents are formally housed in Laingsburg. Furthermore, Laingsburg is the only municipality in the Central Karoo without a foreseeable problem in terms of water provision.

There are also a number of challenges facing future economic development of Laingsburg. These include:

- **Single dominant economic sector:** Agriculture is the most dominant sector in Laingsburg Municipality, both in terms of economic contribution as well as employment.
- **Lack of employment opportunities, skills shortages, and low self-employment:** There a shortage of employment opportunities in the town, especially for young people. Low skills levels contribute to the problem and the high unemployment levels.
- **Poverty and substance abuse:** The high levels of poverty are linked to very high levels of alcohol and drug abuse amongst impoverished residents.
- **Spatial and racial segregation:** The spatial form of Laingsburg is similar to most South African towns. It reflects the typical characteristics and legacy of Apartheid planning, which separated historically privileged groups from marginalised groups through the location and expansion of township development on the outskirts of the town.

The LED strategy identifies four strategic goals to address the economic challenges, namely:

- Sustainable Economic Growth;
- Job creation;
- Human Resource Development;
- Poverty and Substance Abuse Reduction.

2.4.5 Namakwa District Municipality Integrated Development Plan

The vision for the Namakwa DM as set out in the Namakwa District Municipality (NDM) Integrated Development Plan (IDP) 2006 – 2011 (Fourth revision 2011/2012) is for the "The establishment of a development-orientated and economically viable district through sustainable growth".

In order to comply with the vision, the mission statement concentrates on certain key focus areas, namely: Promotion of the quality of life of the Namakwa community through purposeful and quality service, and the effective and optimal utilisation of resources, focussing especially on:

- Economic development;
- Development, upgrading and maintenance of basic infrastructure;
- Development of human resources;
- Sustainable management and optimal utilisation of operational and natural resources;
- Creating of a safe, healthy and investment-friendly environment;
- Development of opportunities for local entrepreneurs; and
- Ensuring friendly, credible and transparent services and client satisfaction.

The NDM IDP also identifies a number of key performance areas (KPA). The KPA that is relevant to the proposed project is KPA 3: Local Economic Development. A number of projects are listed under the Local Economic Development KPA of these the following are of specific relevance to the project;

- Project No. LE02 : Renewable Energy Cluster: The Development of a synergy between the energy resources within Namakwa Region; and
- Project No. LE05: SMME Development Cluster: The development of a Management support system for SMME'S.

The objective of Project No: LEO2 is to ensure the participation of the NDM in the development of a synergy between wind energy, natural gas, solar, bio-fuel and wave energy so that the energy sector can enhance competitive and comparative advantage of the Namakwa region. The performance indicators listed in the IDP include the facilitation of quarterly Local Economic Development Forum (LED) Forum meetings with stakeholders/future partners in wind (TPE), solar, wave and natural gas (Forest International) in order to exchange information before June 2012. The key outputs of the project listed in the IDP include:

- Establishment of renewable energy resources like natural gas, wind, bio-fuel, waves, solar, hydro and waste recycling in the key municipalities and the NDM as whole.

The proposed Gunstonftein WEF is therefore supported by and supports the energy related objectives set out in the NDM IDP.

2.4.6 Karoo Hoogland Integrated Development Plan

The 2014/ 2015 Revision of the Karoo Hoogland Integrated Development Plan (IDP) was approved in May 2014.

The key socio-economic development intervention areas identified in the IDP for the Karoo Hoogland LM are: (a) Basic service delivery, (b) Economic development by focusing on space research (SKA and SALT) and historical value of settlements, and (c) the conservation of the natural vegetation that is unique to the arid environment.

The IDP notes that the focus on economic development, primarily based on the tourism potential of the area, is considered a more viable approach towards improving capital flows into the LM's towns than to try and build the supply from within. The LM should therefore direct attention to the key roads within its boundaries for these to be developed in the interest of the local economic development opportunities available to its population. The LM's towns are identified as priority investment areas, as this is where the population is concentrated. 3 key investment priorities are identified:

- Investment in infrastructure to provide a basic level of infrastructure services;
- Investment in human capital to promote economic growth; and
- Investment in human capital to promote general welfare and stimulate the local economy.

With regard to key performance areas (KPAs), KPA 3 Local Economic Development (LED) is of relevance. Priority issues identified under LED include:

- The development of a tourism industry;
- Addressing social challenges that hinder economic development;
- Education, illiteracy and skills development, and
- Creating a safe and affordable haven for visitors and residents.

Key strategies to address KPA3 priority issues include:

- Establish, in consultation with stakeholders, a strategy for the management of alcohol abuse and related welfare challenges;
- Develop youth empowerment programmes;
- Develop and source skills related to social development;
- Establish, with relevant stakeholders, general training and skills development; programmes accessible by the community;
- Engage with relevant stakeholders regarding the enhancement of education in the LM; and
- Enhance skills and SMME development with a view to marketing services outside the region.

The IDP also includes a discussion on climate change and renewable energy. In this regard, the vulnerability of the LM is noted, as is national and provincial government's commitment to commercial-scale renewable energy generation. The IDP notes that two WEFs, namely Roggeveld and Suurplaat (near Klein Roggeveld substation) are currently proposed for development in the LM. No reference is made to the Rietkloof or other WEF proposals in the LM area. As the LM currently does not have an SDF, no spatial/ siting guidance is provided with regard to the study area or WEFs in general.

2.5 INTERNATIONAL EXPERIENCE WITH WIND FARMS

2.5.1 Introduction

This section summarises some of the key social issues associated with wind farms based on international experience. The findings of the review concentrate on three documents.

The first is the National Wind Farm Development Guidelines produced by the Environment Protection and Heritage Council (EPHC) of Australia (Draft, July, 2010). The guidelines highlight the potential social and biophysical impacts associated with WEFs. Given the similarities between South Africa and Australia, such as large, unobstructed landscapes and climates, these guidelines are regarded as relevant to the South Africa situation.

The second relates to recent research on wind energy development in Scotland undertaken by Warren and Birnie in 2009 (Warren, Charles R. and Birnie, Richard V.(2009) 'Re-powering Scotland: Wind Farms and the 'Energy or Environment?' Debate'). The Scottish experience is also regarded as relevant to the South Africa context for a number of reasons. Firstly, installed wind power capacity has expanded rapidly in Scotland over the past decade. Before 1995 no wind farms existed. By late 2008, there were 59 operational onshore wind farms, 65 consented to or under construction and a further 103 in the planning process (BWEA, 2008). South Africa faces a similar situation, with a rush of applicants seeking approval for WEFs. Secondly, the impact on the landscape, specifically the Scottish Highlands, was one of the key concerns raised in Scotland. The impact on undeveloped, natural landscapes is also likely to become an issue of growing concern in South Africa. The key points raised in the article by Warren and Birnie that are relevant to South Africa are summarized below.

The third document is a review of the potential health impacts associated with wind farms undertaken by the Australian Health and Medical Research Council (July, 2010).

2.5.2 National Wind Farm Development Guidelines (Australia)

The Environment Protection and Heritage Council (EPHC) of Australia developed a set of guidelines for the establishment of Wind Farms (National Wind Farm Development Guidelines, DRAFT - July 2010). The section below summarizes the key social issues listed in the guidelines.

Wind Turbine Noise

The guidelines note that excessive noise may cause annoyance, disturbance of activities such as watching TV, or sleep disturbance when received at a noise-sensitive location such as a dwelling. At higher levels, environmental noise has been linked to long-term health issues such as raised blood pressure and cardiovascular disease.

With regard to WEFs, the noise produced by wind turbines is associated with their internal operation and the movement of the turbine blades through the air. The noise levels associated with a WEF are dependent on a number of factors, including, the number of turbines operating, wind speed and direction. Noise levels diminish with distance from the wind farm. The guidelines also note that a unique characteristic of wind turbines is that while noise emission increase with increasing wind speed, this is

also often, but not always, accompanied by an increase in the background noise environment. The background noise is associated with wind blowing past or through objects, such as trees or buildings. As a result, the background noise near a dwelling may be high enough to 'mask' the sound of the turbines.

Concerns have also been raised regarding the potential health impacts associated with low frequency noise (rumbling, thumping) and infrasound (noise below the normal frequency range of human hearing) from wind farms. The guidelines indicate that low frequency noise and infrasound levels generated by wind farms are normally at levels that are well below the uppermost levels required to cause any health effects. This issue is addressed in the review undertaken by the Australian Health and Medical Research Council (July, 2010).

Noise monitoring

With regards to monitoring, the guidelines recommend that the operational phase of the wind farm should include unattended post-construction noise monitoring for a sufficient period of time to demonstrate compliance with the noise criteria under expected worst-case conditions.

The Guidelines also recommend that a procedure should be developed, prior to construction activities commencing, to handle any complaints of construction noise. Similar procedures should concurrently be developed for implementation during operations and decommissioning stages. Complainants should be requested to keep a diary or sound log where they can note times of day and associated weather conditions when wind farm noise emission are found to be a problem. The sound log can also include a description of the type of sound heard. This information can then be used to help try and identify meteorological conditions, particularly wind speed and direction, where the wind farm noise emission is most problematic. A noise impact assessment is being undertaken as part of the EIA.

Landscape Impacts

The guidelines note that due to the size and layout of wind turbine towers, the construction of WEFs will impact upon the landscape and its significance. Therefore, the significance of landscape values, and the extent of the impact, should be assessed. In this regard the impact of a wind farm on a landscape is not necessarily just visual – other 'values' can also be affected. Community values and perceptions of landscape may include associations, memories, knowledge and experiences or other cultural or natural values (National Wind Farm Development Guidelines, DRAFT - July 2010). Therefore, the assessment should consider the impact on landscape values in addition to considering the visual impacts.

The guidelines also note that landscapes change over time, both naturally and through human intervention. In addition, landscape values, being subjective, change not only with time, but also from person to person. As a result, there are a wide variety of opinions of what is valued and what is not. The perceptions by which we value landscapes are influenced by a range of factors such as visual, cultural, spiritual, environmental, and based on memories or different aesthetics (National Wind Farm Development Guidelines, DRAFT - July 2010).

Shadow flicker

Shadow flicker is produced by wind turbine blades blocking the sun for short periods of time (less than 1 second) as the blades rotate causing a strobing effect. Since wind turbines are tall structures, shadow flicker can be observed at considerable

distances but usually only occurs for brief times at any given location. The most common effect of shadow flicker is annoyance.

The likelihood of shadow flicker affecting people is dependent on the alignment of the wind turbine and the sun, and their distance from the wind turbine. The main risk associated with shadow flicker is the potential to disturb residents in the immediate vicinity. The Guidelines note that the investigations undertaken when developing the Guidelines indicated that the potential risk for epileptic seizures and distraction of drivers is negligible to people living, visiting or driving near a wind farm. An assessment of shadow flicker will be undertaken as part of the EIA.

Mitigation measures
Where shadow flicker is an issue the following mitigation measures can be implemented.

- Plant screening vegetation between their property and the turbine(s); and
- Install heavy blinds or shutters on affected windows.

The Guidelines also recommend that the issue of shadow flicker should be addressed in the design and layout of the wind farm.

Electromagnetic Interference (EMI)
Wind turbines can produce electromagnetic interference (EMI), in two ways. Firstly, in the form of an electric and magnetic (electromagnetic) field that may interfere with radio communications services, and secondly, due to the obstruction of radio communications services by the physical structure of the wind turbines. Microwave, television, radar and radio transmissions are all examples of radio communication signals that may be impacted by the development of a wind farm.

The preliminary design of the wind farm considered the potential interference with radio communication services. Turbines were placed and avoided the Fresnel Zone 1 to avoid impacts. EMI studies will be undertaken once the turbine positions are confirmed from an environmental perspective.

The first Fresnel Zone was calculated and integrated into the applicant's layout design as a no-go zone. In the applicant's own and overseas studies undertaken for other projects and having dealt extensively with other providers such as Telkom, Eskom and Sentech including their own specialist studies, the generally accepted rule to avoid any potential electromagnetic interference on existing telecommunication infrastructure is to not place any fixed structures in direct line of sight of communication links and avoid the infringement of the first Fresnel Zone in order to guarantee the signal quality and stability. There are divergent views in the industry regarding the effect and extent to which moving blades infringing on the first Fresnel Zone impact signal quality. Some specialist studies show that there is an impact on the signal while other reports highlight that there are sufficient gaps between the blades to not cause any significant interference. Due to the knowledge gap and the uncertainty regarding the blade impacts, the applicant has taken the conservative approach and has added an additional buffer of one blade length around the first Fresnel zone. These rules and the provided data, including buffers, have informed the turbine placement process and therefore avoids any potential issues with your communication link

Blade glint
Blade glint can be produced when the sun's light is reflected from the surface of wind turbine blades. Blade glint has potential to annoy people.

Cumulative impacts
The Guidelines note that the cumulative impact of multiple wind farm facilities in a region is likely to become an increasingly important issue for wind farm developments in Australia. This is also likely to be the case in South Africa. The assessment of cumulative impacts is also required for additional phases of existing or approved wind farms. The Scottish Natural Heritage (2005) describes a range of potential cumulative landscape impacts of wind farms on landscapes, including:

- Combined visibility (whether two or more wind farms will be visible from one location).
- Sequential visibility (e.g. the effect of seeing two or more wind farms along a single journey, e.g. road or walking trail).
- The visual compatibility of different wind farms in the same vicinity.
- Perceived or actual change in land use across a character type or region.
- Loss of a characteristic element (e.g. viewing type or feature) across a character type caused by developments across that character type.

The guidelines note that cumulative impacts need to be considered in relation to dynamic as well as static viewpoints. The experience of driving along a tourist road, for example, needs to be considered as a dynamic sequence of views and visual impacts, not just as the cumulative impact of several developments on one location. The viewer may only see one wind farm at a time, but if each successive stretch of the road is dominated by views of a wind farm, then that can be argued to be a cumulative visual impact (National Wind Farm Development Guidelines, DRAFT - July 2010).

Cumulative impacts may be visual and aesthetic, but they can also occur in relation to non-visual values about landscape. Non-visual values include sounds/noise, associations, memories, knowledge and experiences or other cultural or natural values. As an example, the Guidelines indicate that locating four wind farms in a valley previously best known for its historic wineries might change the balance of perception about the valley's associational character, irrespective of whether all four wind farms were sited in a single view shed (National Wind Farm Development Guidelines, DRAFT - July 2010).

The Guidelines also note that the rapid expansion of wind energy sector also has the potential for consultation "fatigue", specifically in areas where more than one WEF is proposed. An abundance of community meetings, information sessions or materials about various developments, may result in community members tiring of attending local events or engaging in local discussions or activities.

Mitigation
The Guidelines indicate that mitigation measures for wind farms are not very effective and therefore **general location** and **site selection** is of utmost importance.

2.5.3 Experience from Scotland and Europe

The information summarized below is based on research on wind farms undertaken by Warren, Charles R. and Birnie, Richard V published in the Scottish Geographical Journal in 2009.

Institutional capacity and strategic guidance
The research found that the rapid establishment of numerous large wind farms in Scotland has proved highly controversial. From around 2002, the potential negative impacts of wind farm developments have been the highest profile environmental issue in Scotland, generating extensive media coverage.

The experience in Scotland indicated that the speed of the wind power 'gold rush' took everyone by surprise – politicians, planners, scientists, land managers, conservationists and the public alike. As a result, a severe burden was placed in officials and related planning and development control procedures. In addition, officials and planners had very few specific criteria for assessing proposals, notably because of the lack of overall strategic locational guidance. Basic data on most aspects of wind farm development, including environmental impacts, is limited and short term. As a result, the debates regarding wind farms often degenerated into exchanges of claims and counter-claims that were typically long on assertion and short on evidence.

The potential for a similar situation to develop in South Africa is high. In addition, the lack of a National set of Guidelines for Wind Farms and spatial information on sensitive landscapes is a concern.

Landscape Impacts
In the Scottish case, the primary argument employed to oppose wind farms related to the impact on valued landscapes. As in the South African case, the visual impacts are exacerbated by the fact that the locations with the greatest wind resources are often precisely those exposed upland areas which are most valued for their scenic qualities, and which are often ecologically sensitive. The establishment of wind farms together with the associated service roads and infrastructure, transforms landscapes which are perceived to be natural into 'landscapes of power' (Pasqualetti et al., 2002, p. 3).

Impacts on Tourism
In addition to the loss of amenity for those who live and work nearby, the concern was that wind farms would damage the Scottish tourist industry. The paper notes that Scotland's image as a country of magnificent, varied, unspoilt scenery is a major reason why tourists come here. The concern raised is that wind farms will cause tourists to stay away by tarnishing that image. The same argument could be applied to South Africa. However, the paper notes that, "so far, however, there is no clear evidence to support this assertion". In this regard far more visitors appeared to associate wind farms with clean energy than with landscape damage, suggesting that they could help to promote Scotland's reputation as an environmentally friendly country as long as they are sensitively sited (NFO System Three, 2002). In addition, some tourists may choose to avoid areas with wind farms, but on current (albeit limited) evidence, wind farms seem unlikely to have more than small, localised impacts on tourism. However, the paper notes that this could change as more are built.

The key lesson for South Africa is this regard is that wind farms should be located in areas that minimize the potential impact on landscapes and as such also reduce the potential impact on tourism. This highlights the need for spatial information on sensitive landscapes. However, as indicated in Section 2.1.9, the proposed Rietkloof WEF falls within the Komsberg Wind REDZ. The area has therefore been identified an area that is suitable for the establishment of WEFs.

Noise impacts
The study found that early wind turbines were criticized for being noisy, and this reputation has stuck. However, the research found that modern designs are remarkably quiet, allowing normal conversation underneath a working turbine. The paper notes that at a distance of 350 m, wind farms generate a noise level of 35–45 decibels (dB) (cf. a busy office: 60 dB; a quiet bedroom: 35 dB), and this is often difficult to detect above normal background sounds such as the noise of the wind (SDC, 2005). Research by Krohn and Damborg (1999) indicated that turbine noise affected very few people, however, for those few the impact can be significant.

Explaining Public Perceptions of Wind Farms
Research found that the media coverage in Scotland relating to wind farms gives the impression that the majority of the public are strongly opposed to this form of renewable energy. However, every survey of public attitudes, from the earliest days of wind power onwards, has found just the opposite. Both in the UK and across Europe, large majorities (often around 80%) support renewable energy generally and wind power specifically (Krohn & Damborg, 1999; Devine-Wright, 2005a; SDC, 2005; Wolsink, 2007b). The research therefore found that the strong, consistent support is at odds with the widespread local opposition.

The research also found temporal and spatial patterns in attitudes. In this regard, attitudes to wind farms often followed a U-shaped progression over a period of time (Gipe, 1995; Wolsink, 2007a). The initial positive support of the concept (when no nearby schemes are planned) became more critical when a local wind farm was proposed. This opposition then shifted towards more positive attitudes once locals had experienced the wind farm in operation. In this regard several studies found that the strongest support for wind farms is amongst those who have personal experience of them (Fullilove, 2005) and/or those living closest to them (Braunholtz, 2003; Elliott, 2003; SEI, 2003). Some of the opposition arose from exaggerated perceptions of the likely negative impacts, fears which are often not realised (Elliott, 1994; Braunholtz, 2003).

However, the research found that over and above all these interacting influences, two factors are of particular importance in determining whether people support or oppose specific wind farm proposals. One is their perception and evaluation of the landscape impact and the other is whether they and their community have a personal stake in the development. Both of these factors are relevant to the South African situation.

The Influence of Landscape Perceptions on Attitudes
The paper notes that one of the few established empirical facts in the wind farm debate is that aesthetic perceptions, both positive and negative, are the strongest single influence on public attitudes (Pasqualetti et al., 2002; Warren et al., 2005; Wolsink, 2007b; Aitken et al., 2008). In addition, across Europe, the strength of anti-wind farm groups is strongly related to national attitudes to landscape protection; opposition is greatest in countries where landscapes are traditionally valued highly (Toke et al., 2008). In Scotland, the primary motivation of most

opposition groups is the strong belief that wind farms despoil landscapes, whereas advocates of wind power typically perceive wind turbines as benign or positive features. The paper notes that given that aesthetic perceptions are a key determinant of people's attitudes, and that these perceptions are subjective, deeply felt and diametrically contrasting, it is not hard to understand why the arguments become so heated. Because landscapes are often an important part of people's sense of place, identity and heritage, perceived threats to familiar vistas have been fiercely resisted for centuries.

The paper identifies two other factors that are important in shaping people's perceptions of wind farms' landscape impacts. The first is the cumulative impact of increasing numbers of wind farms (Campbell, 2008). If people regard a region as having 'enough' wind farms already, then they may oppose new proposals. The second factor is the cultural context. Whereas in Scotland the landscape effects of wind farms are often described in negative terms, in places such as Denmark wind turbines have become an integral part of the cultural landscape. Despite the widely varying perceptions, one of the few areas of consensus in the Scottish debate is that landscape issues are central, and that if wind farms are to be built, sensitive siting in the landscape is critical.

The impact on landscapes is also likely to be a key issue in South Africa, specifically given South African's strong attachment to the land and the growing number of wind farm applications.

The Influence of Ownership on Attitudes

The research found that the second influential factor related to the issue of ownership. Experience across Europe indicated that wind power became more socially acceptable when local communities were directly involved in, and benefited from the developments. In Denmark, Germany, the Netherlands and Sweden, where wind farms have typically been funded and controlled by local cooperatives, there has long been widespread support for wind power (Redlinger et al., 2002; Meyer, 2007; Szarka, 2007). However, in Britain where the favoured development approach has been the private developer/public subsidy model, many proposals have faced stiff local opposition.

These findings have potentially important implications for the future development of the wind energy sector in South Africa and the support from locally affected communities.

In conclusion the paper notes that despite being very acrimonious, the wind farm debate has helped to reintroduce energy issues to the arena of public debate. This is a significant positive benefit. For many years, most people have used electricity with little or no regard for the environmental costs of energy production. The high profile debates over wind farms and the potential impact on the Scottish Highlands have highlighted the fact that societies energy needs do have environmental implications.

2.5.4 Health impacts of wind farms

This section summarizes the key findings of a literature review undertaken by the Australian Health and Medical Research Council published in July 2010.

Effects of Noise from Wind Turbines on Human Health

The health and well-being effects of noise on people can be classified into three broad categories:

- Subjective effects including annoyance, nuisance and dissatisfaction;
- Interference with activities such as speech, sleep and learning; and
- Physiological effects such as anxiety, tinnitus or hearing loss (Rogers, Manwell & Wright, 2006).

The findings of the literature review indicate that the measurement of health effects attributable to wind turbines is regarded as very complex. However, in summary the findings of the literature review indicated that:

- Sound from wind turbines does not pose a risk of hearing loss or any other adverse health effects in humans. Sub audible, low frequency sounds and infrasound from wind turbines do not present a risk to human health (Colby, et al 2009).
- 'There is no reliable evidence that infrasounds below the hearing threshold produce physiological or psychological effects' (Berglund & Lindvall 1995).
- Infrasound associated with modern wind turbines is not a source which will result in noise levels which may be injurious to the health of a wind farm neighbour (DTI, 2006);
- There is no peer-reviewed scientific evidence indicating that wind turbines have an adverse impact on human health (CanWEA, 2009).
- Wind energy is associated with fewer health effects than other forms of traditional energy generation and in fact will have positive health benefits (WHO, 2004).

The overall conclusion of the review based on current evidence is that wind turbines **do not** pose a threat to health if planning guidelines are followed.

Effects of Shadow Flicker and Blade Glint on Human Health

The findings of the review found that the evidence on shadow flicker does not support a health concern (Chatham-Kent Public Health Unit, 2008) as the chance of conventional horizontal axis wind turbines causing an epileptic seizure for an individual experiencing shadow flicker is less than 1 in 10 million (EPHC, 2009). As with noise, the main impact associated with shadow flicker from wind turbines is annoyance.

With regard to blade glint, manufacturers of all major wind turbine blades coat their blades with a low reflectivity treatment, which prevents reflective glint from the surface of the blade. According to the Environment Protection and Heritage Council (EPHC) the risk of blade glint from modern wind turbines is considered to be very low (EPHC, 2009).

Effects of Electromagnetic Radiation and Interference from Wind Turbines on Human Health

Review found that Electromagnetic Fields (EMF) emanate from any wire carrying electricity and Australians are routinely exposed to these fields in their everyday lives. The same would apply to South Africans. In this regard the electromagnetic field produced by the generation and export of electricity from wind farms does not pose a threat to public health (Windrush Energy 2004). The closeness of the electrical cables between wind turbine generators to each other, and shielding with metal armour effectively eliminate any EMF (AusWEA, nd. b).

SECTION 3: OVERVIEW OF THE STUDY AREA

3.1 INTRODUCTION

Section 3 provides an overview of the study area with regard to:

- The relevant administrative context;
- The municipal level demographic and socio-economic context.

The majority of the site is located within the LLM, which falls within the CKDM. As such a socio-economic overview of the CKDM is provided below. The potential socio-economic opportunities and impacts associated with the proposed WEF are likely to affect residents living in the two closest towns, namely Laingsburg and Sutherland, located in the LLM and KHLM respectively. The section also provides a demographic overview of the Karoo Hoogland Local Municipality (KHLM) and the towns of Laingsburg and Sutherland.

3.2 ADMINISTRATIVE CONTEXT

The proposed Rietkloof WEF is located in the LLM, which falls within the Central Karoo District Municipality (Figure 3.1).

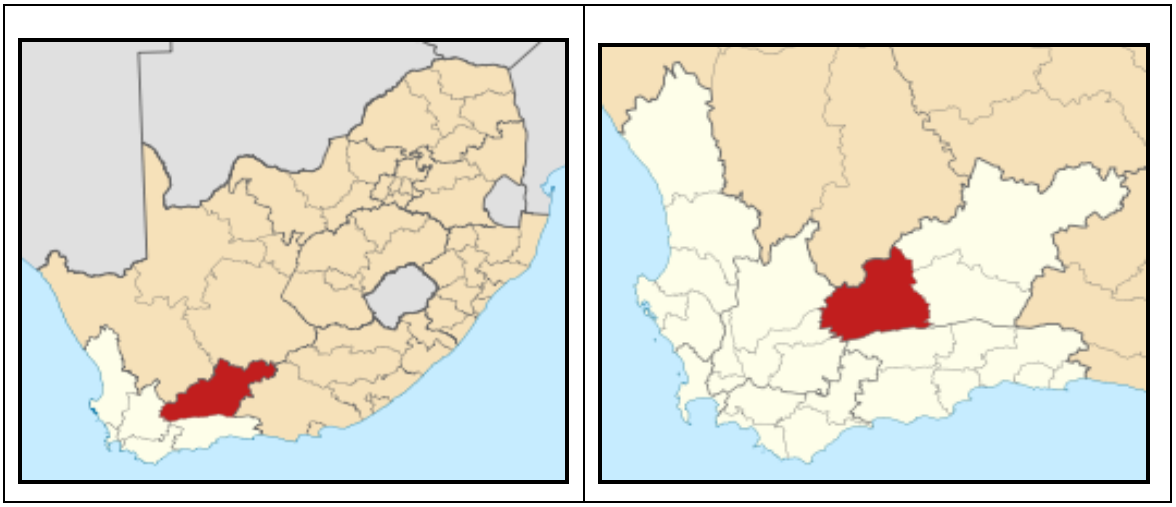

Figure 3.1: Location of Central Karoo District Municipality (left) and Laingsburg Local Municipality (right) within the Western Cape Province (white) *(Source: Wikipedia)*

The Laingsburg LM (WC051) is a Category B Municipality[16], and one of four constituent B-Municipalities comprising the Central Karoo District Municipality (CKDM) (DC5). The administrative seat of the Laingsburg Municipality is in the town of Laingsburg, while Beaufort west serves as the administrative seat for the CKDM. The Laingsburg LM measures approximately 8 781 km², and is essentially a one-town municipality. The bulk of the municipality's population resides in Laingsburg. Two small settlements, Matjiesfontein and Vleiland also occur in the Municipality. Due to its small population, Laingsburg LM is not subdivided into Wards. For planning purposes, the municipal area has however been subdivided into three planning areas, each with a publicly elected Area Committee. The study area falls under the Laingsburg Area (town and rural area to the north). The Municipality is bisected by the east-west running N1. The N1 provides a direct road link to Cape Town and the more densely populated Boland to the south-west, and Beaufort West, the Orange Free State and Gauteng to the north-west. While relatively large distances separate the Municipality from other large urban areas, the N1 nevertheless ensures that the Municipality is not isolated.

As indicated above, the KHLM borders on the Laingsburg LM. The potential socio-economic opportunities and impacts associated with the proposed WEF are likely to affect residents living in both the KHLM and LLM. The KHLM (NC066) is one of seven B-Municipalities comprising the Namakwa District Municipality (NDM) (DC6). The administrative seat of the Karoo Hoogland LM is split between the towns of Sutherland, Williston and Fraserburg. The administrative seat of the Namakwa DM is Springbok. The Namakwa DM is comprised of a very extensive area. Sutherland is located approximately 539 km from Springbok. The KHLM measures approximately 34 038 km² in extent. Urban settlement is essentially limited to the towns of Sutherland, Williston and Fraserburg, with large distances separating the three from one another. The Municipality is comprised of 4 Wards.

3.3 STUDY AREA TOWNS

3.3.1 Sutherland

Sutherland was established in 1857 on the farm De List in order to provide the Roggeveld region with a church site. The town is located on the south-western edge of the Great Escarpment, and is renowned as one of the coldest places in South Africa. Sub-zero winter temperatures are common in winter, and the Roggeveld Mountains to the north of town are often covered in snow.

The town is modest in size. The historic (white) part of town is centered on the Dutch Reformed Church building. Streets are laid out in a grid pattern, are generously proportioned, and characteristically lined with mature Aleppo pines and cypresses. Spatially, the town remains largely segregated. Erven in this part of town are generous in size, and many are planted with orchards. The Coloured areas of Kerkgronde, Skema and Hopland are located on the east side of the main town. A substantial number of traditional cut-stone dwellings survive in town, as do a number of historic braakdakhuise (thatched stone houses) in various states of disrepair in Kerkgronde.

[16] A category-B municipality is defined as a municipality that shares executive and legislative authority in its area with a category- C municipality within whose area it falls

Retail and services are essentially concentrated along the two tarred roads in town, namely the tarred main road, Piet Retief Street (an extension of the R354) and Sarel Cilliers Street (an extension of the R356). Retail establishments include a number of superettes, butcheries, an agricultural co-op/ hardware store, and at least 5 liquor stores. A post office and one bank (Standard) are located in Piet Retief Street.

Two primary schools and one secondary school are located in the town. A hospital is also located in Sutherland, however, the services provided by the hospital are limited. The nearest fully operational hospital is in Calvinia, approximately 160 km north of Sutherland. The town has no resident doctors or dentists, and no pharmacy is located in town.

Unlike Laingsburg, Sutherland is relatively isolated and does not benefit from high volumes of passing traffic. This spatial isolation has direct negative consequences with regard to maintaining economically viable operations not linked to primary agriculture, as well as attracting investment capital into the Municipality. As a result residents of Sutherland typically travel to Worcester or even Cape Town on a monthly basis to do their shopping etc. The town is not serviced by any public transport, and people without cars typically hire someone from the local community to provide transport for trips out of town.

The town itself has seen only some modest growth as lifestyle resettlement destination over the past decade. Of significant importance in this regard was the establishment of the town as tourist / astronomical destination since the commissioning of the South African Large Telescope (SALT) in 2005. The establishment of the town as tourism destination has resulted in modest growth in available retail facilities. This has been further stimulated by the presence of a resident population and visiting researchers at the SAAO/ SALT facility.

A further consequence has been a steep increase in property prices since 2005, and the scarcity of available rental stock. The increase in property prices has made it even more difficult for historically disadvantaged members of the community to acquire property in the traditionally white part of town. The existing scarcity of available rental stock is likely to have potential implications in terms of the town's ability to accommodate personnel associated with the construction phase. In addition, competition for available rental stock is also likely to impact on visiting researchers at the SAAO/ SALT facility.

3.3.2 Laingsburg

The town of Laingsburg is located on the N1 and essentially represents the gateway to the Great Karoo. The town was established in 1881 along the banks of the ephemeral Buffelsrivier, mainly to provide a stop-over for travellers to the Kimberley diamond fields. The town's Victorian origins are still visible in a number of late-Victorian style houses located along the main road and some of the side roads. The town serves as regional agricultural service centre for its hinterland, but service and retail opportunities associated with the N1 also play an important role in the town's economy.

The N1 provides a direct road link to Cape Town and the more densely populated Boland to the south-west, and Beaufort West, the Orange Free State and Gauteng to the north-west. While relatively large distances separate the municipality from other large urban areas, the N1 nevertheless ensures that the town is not isolated. While many benefits are associated with this situation, it has at the same time increased

the town's vulnerability to infectious diseases such as TB and HIV, and more recently, to the influx of hard drugs such as tik. "Highway relationships" and prostitution linked to the movement of truckers along the N1 constitute a significant risk with regard to the transmission of STDs and of unwanted pregnancies.

Laingsburg's location in proximity to the real or imagined economic opportunities associated with people movement along the N1 has been specifically significant. This situation of urban concentration (and rural depopulation) has gained significant momentum over the past decade or so as a result of significant labour shedding by the agricultural sector in the wake of implementation of the Extension of Security of Tenure Act (ESTA) legislation. The movement of the land has been further compounded by an increasing shift away from traditional stock farming to less labour-intensive game farming. Approximately 80% of the LM's population lives in Laingsburg. The lack of local employment opportunities has resulted in significant concentration of poverty in the town, mainly amongst the Coloured population group.

3.4 CENTRAL KAROO DISTRICT MUNICIPALITY

3.4.1 Introduction

The Central Karoo District Municipality (CKDM) is the largest DM in the Western Cape Province covering an area of 38 853 km², which constitutes ~ 30% of the total area of the Province. However, with a population of 71 011 the CKDM is the least populated DM in the Province. The distances between settlements within the district therefore tend to be large. The district comprises of three Local Municipalities:

- Beaufort West Municipality;
- Prince Albert Municipality;
- Laingsburg Municipality.

Beaufort West is the most populated of the local municipalities with a population size of 49 586, followed by Prince Albert (13 136) and Laingsburg (8 289) (Census 2011). The main language spoken in the district is Afrikaans followed by IsiXhosa.

3.4.2 Economic overview

The CKDM IDP (2012-2017) indicates that economic development remains a developmental challenge for the DM. This is due to the low population density, distance from large markets and the arid climate. In addition there are high levels of unemployment and poverty and a lack of skilled persons.

In 2008 the CKDM economic growth rate was 6% compared to the Province's annual growth rate of 4.3% (CKDM IDP 2012-2017). However, the due to global recession the growth rate in 2009 was 0.2 %, while the Province's economy contracted by 1.2%. The decline in the growth from 2008 to 2009 was due to the impact of the 2008/09 global recession (Figure 3.3).

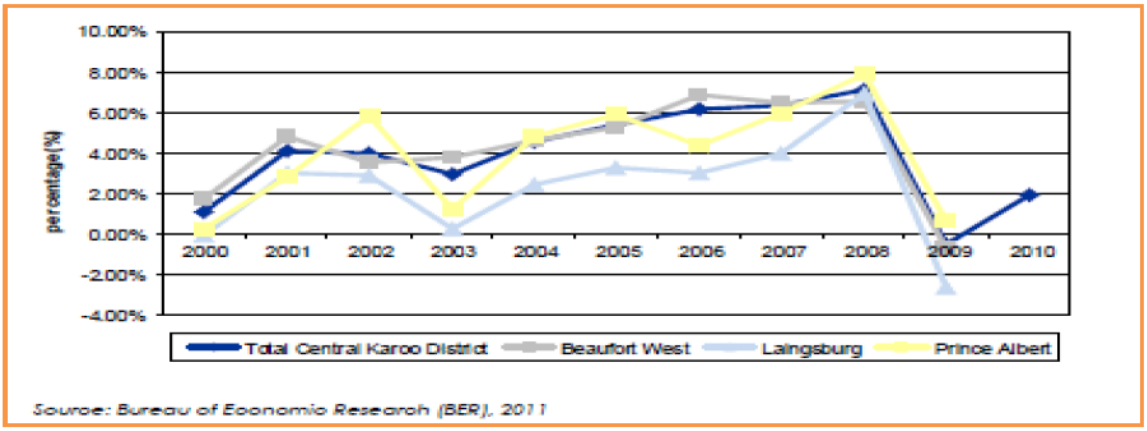

Figure 3.3: CKDM GDP-R Growth, 1999 to 2009

The contribution of the different economic sectors to the local economy has changed over the last 10 years. The 2009 figures compared to the 1999 figures indicate that the most significant changes were in the finance, insurance, real estate and business services sector and manufacturing sector. These sectors increased by 8.9% and 4.4% respectively, while the agriculture and transport, storage and communication sectors decreased by 7.0% and 3.8%, respectively.

In the Beaufort West LM mining and quarrying displayed a growth rate of 26.9% while manufacturing recorded a growth rate of 10.12%. In the Prince Albert LM the construction (15.2%) and finance, insurance, real estate and business (14.4%) sectors all displayed strong growth. In the Laingsburg LM construction (11.8%) and manufacturing (9.7%) recorded strong growth.

In terms of employment the most important economic sector is the Community, social and personal services sector (16.9%), followed by agriculture; hunting; forestry and fishing (15.7%) and wholesale and retail trade (14.0%). The agriculture sector also plays a key role in the other District Municipalities in the Western Cape, accounting for 27.9% and 24.2% the jobs in the West Coast and Cape Winelands respectively.

3.4.3 Employment

The Community survey of 2007 found that the Central Karoo had the lowest percentage of the Western Cape's labour force (0.8%). At the same time the DM also had the highest unemployment rate (30.8%). Based on the 2011 Census figures the unemployment rate in the CKDM was 23.1% compared to 21.6% for the Western Cape Province. Within the DM the unemployment rates for the LLM, Prince Albert and Laingsberg LM were 25.5%, 17.9% and 19.4% respectively in 2011 (Census 2011).

As indicated above, the majority of employment in the Central Karoo is within the agriculture sector. However, the agriculture sector is dependent on exports to Europe. Due to the financial crisis in 2008 exports to Europe have declined significantly, which in turn has resulted in job losses in the agriculture sector.

Although unemployment impacts across gender, race, age and other social divides its effects within certain groups are more pronounced. Some of the differential impacts

of unemployment can be found within the breakdown of gender, population group and age.

In terms of unemployment by population group, the unemployment rate for Black Africans (45.0%) was greater than any other population group. The figure for Coloureds was 33.4% while for Whites is was only 2.6%. Disparities are also found within different age groups, with younger age groups experiencing higher levels of unemployment and representing significantly higher shares of the unemployed in comparison with their share of the labour force. The unemployment rate for those in younger age groups is significantly higher than the older age groups. The differences in unemployment rates between age groups may in part be accounted for in the higher education, skill and experience levels of relatively older workers – these characteristics make work-seekers more attractive to prospective employers and improve their chances of finding employment (CKDM IDP 2012-2017).

In terms of gender, males make up 52.9% of the CKDMs labour force. Although males represent more than half of the labour force, they represent only 41.3% of the district's total unemployed population. The high representation of females within the unemployed translates into a significantly higher unemployment rate for females (38.3%) compared with males (24.0%) CKDM IDP 2012-2017).

CKDM has third lowest proportion of skilled labour force (38.6%) and the second highest of low skilled (26.6%) people in the Western Cape. The low skill levels in the CKDM places a strain on the region's economy and poses a challenge to the areas future development (CKDM IDP, 2012-2017). The IDP notes that a large proportion of occupations in the DM are classified as either skilled (39%) or highly skilled (21%). The concentration of employment opportunities in the skilled sector therefore means that there are relatively few opportunities available to those with low skill levels. The current proportion of low skilled occupations available in the District is 27% (CKDM IDP 2012-2017). This mismatch in terms of skills levels and employment opportunities highlights the need for individuals to up-skill in order to improve their chances of finding employment within the district CKDM IDP 2012-2017).

3.4.4 Household income

The CKDM IDP (2012-2017) indicates that the 32% of households in 2009 earned income between R0 and R42 000, 41.8% earned between R42 000 and R132 000, 23.1% between R132 000 and R600 000 and 3.1% earn above R600 000. The IDP notes that the figures indicated that there has been a shift in earning power in the number of people earning at the lower end of the scale while the people in the middle to upper ends of the scale has increased significantly.

3.4.5 Human development index[17]

The Human Development Index (HDI) for the CKDM increased from 0.57 in 2001 to 0.60 in 2010. While the HDI within the CKDM has improved over the past decade the CKDM has the lowest HDI of all the Districts, followed by the West Coast and Cape

[17] **The Human Development Index (HDI)** is a composite, relative index that attempts to quantify the extent of human development of a community and is based on measures of life expectancy, literacy and income. The HDI therefore provides a measure of people's ability to live a long and healthy life, to communicate, to participate in the life of the community and to have sufficient resources to obtain a decent living. In terms of measurement the maximum level is 1, which indicates a high level of human development, and a minimum value of 0.

Winelands DM. Within the CKDM the Prince Albert Municipality has the lowest HDI followed by Laingsburg Municipality. The low HDI poses a major challenge for the district in terms of creating employment opportunities to improve the standard of living in the area.

3.4.6 Poverty rate[18] and indigent households

Research undertaken by Global Insight indicates that the number of people living in poverty in the CKDM in 2010 was approximately 20 200 people. In this regard the CKDM had the highest number of people living in poverty in the Western Cape (32.5%). Prince Albert has the highest proportion of poor people and it is rising compared to the rest of the district (Table 3.1).

Table 3.1: Western Cape Province- Poverty Rate, Percentage of People Living in Poverty, 2001 and 2010 per municipality

Municipality	2001 (%)	2010 (%)
City of Cape Town	23.9	19.7
West Coast District	32.0	30.4
Cape Winelands District	30.9	25.7
Overberg District	31.0	29.6
Eden District	31.6	21.7
Central Karoo District	38.7	32.5

Municipality	2001 (%)	2010 (%)
Laingsburg Municipality	37.6	36.1
Prince Albert Municipality	44.1	43.3
Beaufort West Municipality	37.5	29.1

According to the Western Cape Department of Local Government information the number of households in the Central Karoo District totalled 14 945 of which 5 903 (39.5%) were classified as indigent (August 2011). From the Department's information, of the total number of households, 43.1 % received free basic access to water, 40.2 % to electricity, 39.4% to sanitation services. Within the CKDM the Beaufort West LM has the highest number of indigent households followed by the Prince Albert and Laingsburg LM (Table 3.2).

[18] **The poverty rate** represents the percentage of people living in households with an income less than the poverty income. The poverty income is defined as the minimum monthly income needed to sustain a household and varies according to household size, the larger the household the larger the income required to keep its members out of poverty. The poverty income used is based on the Bureau of Market Research's Minimum Living Level (BMR report no. 235 and later editions, Minimum and Supplemented Living Levels in the main and other selected urban areas of the RSA, August 1996). For example, the monthly income needed to keep a 1 person household out of poverty in 2010 is estimated to be R1 315, while for a two person household it is R1 626; a four person household requires an estimated income of R2 544 to stay out of poverty while a household with eight or more person requires an estimated R4 729.

Table 3.2: Indigent Households within the Central Karoo Municipality

Municipality	Households	Indigent Households
Laingsburg Municipality	1960	663
Beaufort West Municipality	10 135	4 351
Prince Albert Municipality	2 850	889

3.4.7 Gini coefficient[19]

The Gini coefficient for the DMs in the Western Cape Province are largely similar, and vary between 0.57 (City of Cape Town) and 0.6 (West Coast DM). The Gini coefficient for the CKDM was 0.58 in 2019 (Table 3.3). Within the CKDM the Prince Albert Municipality had the highest Gini coefficient in 2010 (0.61) followed by the Laingsburg Municipality (0.59). The income inequality within the CKDM is exacerbated by the high unemployment rates and low income levels.

Table 3.3: Western Cape Province-Gini coefficient 2001 and 2010 per City/District /Municipality

Municipality	2001	2010
City of Cape Town	0.60	0.57
West Coast District	0.59	0.60
Cape Winelands District	0.60	0.59
Overberg District	0.58	0.58
Eden District	0.59	0.56
Central Karoo District	0.59	0.58

Municipality	2001	2010
Laingsburg Municipality	0.59	0.59
Prince Albert Municipality	0.61	0.61
Beaufort West Municipality	0.59	0.57

3.4.8 Main transport corridors

The N1 national road that bisects the Central Karoo is a key transport corridor for road-based freight transport, passenger services and private vehicles. This vital link bisects South Africa on a northeast-southwest axis, providing access to and between Limpopo Province, Gauteng, the Free State and the Western Cape. Within the Central Karoo District it links the towns of Beaufort West, Leeu-Gamka, Laingsburg and Matjiesfontein. This road is part of the SANRAL network.

Running parallel to the N1 through the Central Karoo is the long-distance main railway line connecting Cape Town to Johannesburg / Pretoria and the other main urban centres of South Africa.

[19] **The Gini coefficient** is a summary statistic of income inequality, which varies from 0, in the case of perfect equality where all households earn equal income, to 1 in the case where one household earns all the income and other households earn nothing. In practice the coefficient is likely to vary from approximately 0.25 to 0.70.

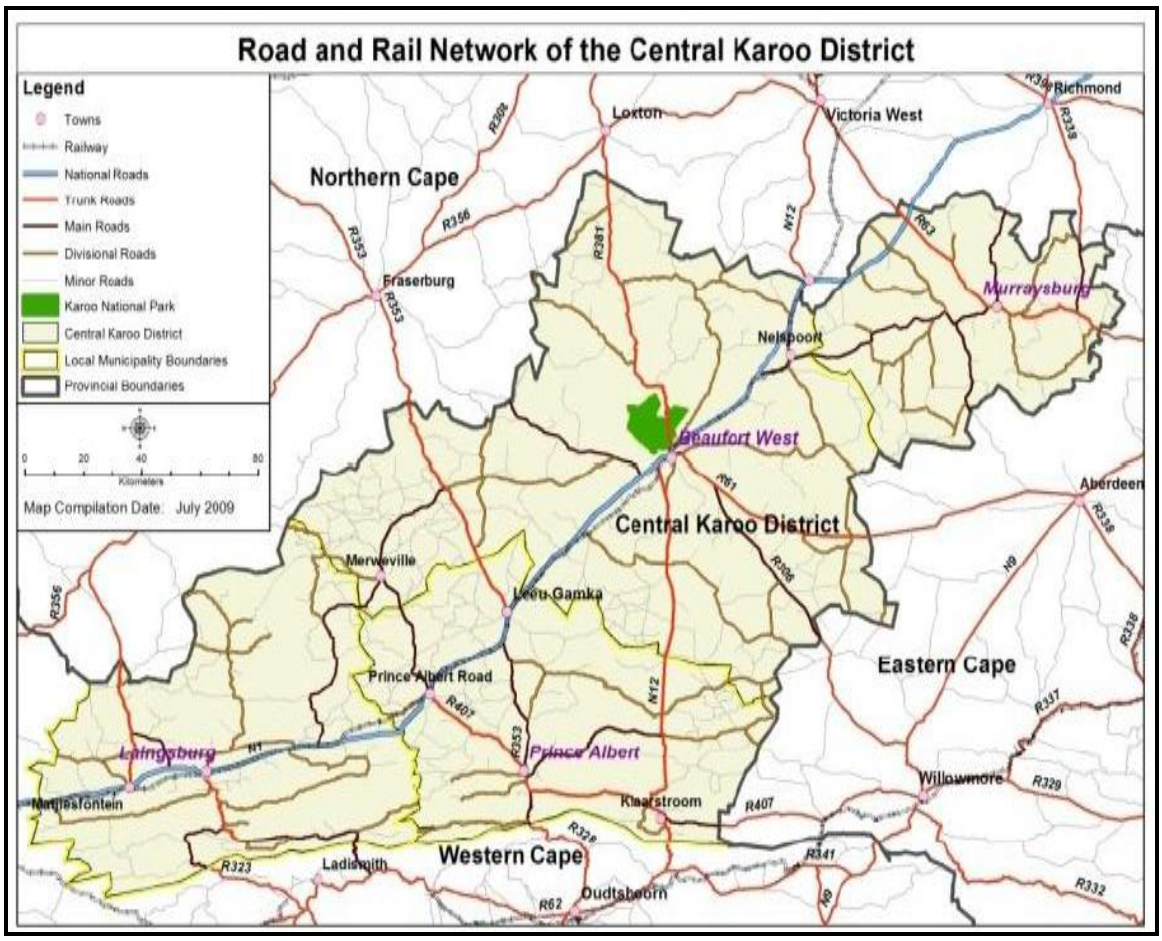

Figure 3.4: Transport links within the CKDM

3.5 KAROO HOOGLAND AND LAINGSBURG MUNICIPALITY

3.5.1 Demographic information

As indicated in Table 3.4, the population of the KHLM increased by from 10 512 in 2001 to 12 558 in 2011, which represents an increase of ~ 19%. The population of the LLM increased from 6 680 in 2001 to 8 289 in 2011 (~ 24%) over the same period. This represents an average annual increase of ~ 1.8% and 2.16% for the KHLM and LLM respectively. The increase in the population in both the KHLM and LLM was linked to an increase in the economically active 15-65 year age group. The increase in the economically active 15-65 age group in also reflected in the decrease in the dependency ratios in both the KHLM and LLM (see below).

The majority of the population is in the LLM was Coloured (79%), followed by Whites (13.3%) and Black Africans (7%)(Census, 2011). The dominant language within the Municipality is Afrikaans (~90%), followed by English (1.6%) and isiXhosa (~1.2%)(Census 2011). The Coloured population group also made us the majority in the KHLM (78.9%), followed by Whites (14.6%) and Black African (5.5%). The dominant language within the Municipality is Afrikaans (~ 90.2%), followed by English (1.2%) and isiXhosa (~0.8%)(Census 2011).

As expected, the number of households in both the KHLM and LLM increased between 2001 and 2011. The household size in the KHLM decreased marginally, from 3.3 to 3.0. The household size in the LLM stayed at 3.3 between 2001 and 2011.

The dependency ratio in both the KHLM and LLM decreased from 63.6 to 60.5 and 58.7 to 50.9 respectively. The age dependency ratio is the ratio of dependents, people younger than 15 or older than 64, to the working, age population, those ages 15-64. The increase represents a positive socio-economic improvement, and reflects a decreasing number of people dependent on the economically active 15-64 age group. This decrease is linked to the increase in the percentage of economically active people in both the KHLM and LLM. Despite the decrease the dependency ratios for the KHLM and LLM are higher than the provincial (45) dependency ratio.

In terms of percentage of formal dwellings, the number of formal dwellings in the KHLM increased from 94.5 % in 2001 to 96.93% in 2011. The number of formal dwellings in the LLM remained constant at 96.6% for the same period. This represents a positive socio-economic advantage for the area. The high level of formal dwellings is also likely to reflect a low in-migration into the both the KHLM and LLM, which in turn is likely to be an indication of the limited economic opportunities in the area.

Household income

Based on the data from the 2011 Census, 5.3% of the population of the LLM have no formal income, 2% earn between 1 and R 4 800, 2.9% earn between R 4 801 and R 9 600 per annum, 20.9% between R 9 601 and R 19 600 per annum and 25.4% between R 19 600 and R 38 200 per annum (Census 2011). The figures of the KHLM indicate that 6.6% have no formal income, 2.4% earn between 1 and R 4 800, 5% earn between R 4 801 and R 9 600 per annum, 24.9% between R 9 601 and R 19 600 per annum and 26.2% between R 19 600 and R 38 200 per annum (Census 2011).

The poverty gap indicator produced by the World Bank Development Research Group measures poverty using information from household per capita income/consumption. This indicator illustrates the average shortfall of the total population from the poverty line. This measurement is used to reflect the intensity of poverty, which is based on living on less than R 3 200 per month for an average sized household. Based on this measure, 56.5% and 64.8% of the households in the LLM and KHLM respectively, live close to or below the poverty line. The low-income levels reflect the limited formal employment opportunities in the LLM and KHLM. This is due the reliance of both LMs on the agricultural sector. The low income levels are a major concern given that an increasing number of individuals and households are likely to be dependent on social grants. The low income levels also result in reduced spending in the local economy and less tax and rates revenue for the district and local municipality.

Education

The education levels in both the KHLM and LLM also improved, with the percentage of the population over 20 years of age with no schooling dropping in the KHLM decreasing from 28.0% to 18.4%. For the LLM the decrease was from 20.0% to 11.7%. The percentage of the population over the age of 20 with matric also increased in both the KHLM and LLM, from 13.9% to 16.9% in the KHLM and 12.4% to 16.7% in the LLM. The levels in both the KHLM and LLM are however lower than the national (28.4%) provincial (28.1%) averages.

Table 3.4: Overview of key demographic indicators for the Karoo Hoogland and Laingsburg Municipalities

	KHLM		LLM	
ASPECT	**2001**	**2011**	**2001**	**2011**
Population	10 512	12 588	6 680	8 289
Households	2 942	3 843	1 922	2 408
Household size (average)	3.2	3.0	3.3	3.3
% Population <15 years	29.7	27.7	29.3	26.5
% Population 15-64	61.1	62.3	63	66.3
% Population 65+	9.1	10	7.7	7.2
Dependency ratio per 100 (15-64)	63.6	60.5	58.7	50.9
Formal Dwellings %	95.7 %	97.0 %	96.6 %	96.6 %
Unemployment rate (official) - % of economically active population	28.6	14.6	26.3	17.9
Youth unemployment rate (official) - % of economically active population 15-34	40.3	20	37	22
No schooling - % of population 20+	28	18.4	20	11.7
Higher Education - % of population 20+	8.1	8.7	5.9	8.7
Matric - % of population 20+	13.9	16.9	12.4	16.7

Source: Compiled from StatsSA Census 2011 Municipal Fact Sheet

3.5.2 Municipal services

As indicated in Table 3.5, the provision of and access to municipal services as measured in terms of flush toilets, weekly refuse removal, piped water and electricity, has, with the exception of waste removal in the LLM and households that use electricity for lighting in the KHLM, increased in both the KHLM and LLM for the period 2001 to 2011. However, the improvements in the LLM have not been as significant. It is also worth noting that despite the high percentage of formal dwellings in the LLM (96.6%) the level of services to these dwellings in terms of flush toilets, weekly refuse removal and piped water are all below 70%. This reflects poor service levels.

In addition, the service levels in the KHLM, with the exception of with piped water inside dwellings, and LLM are all lower than the 2011 provincial averages for the Northern and Western Cape Province respectively. In ths case of the Western Cape the provincial figures are significantly higher, namely flush toilets (85.9%), weekly refuse removal (89.9%), piped water (78.7%) and electricity (93.4%).

Table 3.5: Overview of access to basic services in the Karoo Hoogland and Laingsburg Municipalities

Municipal Services	KHLM		LLM	
	2001	2011	2001	2011
Formal Dwellings %	94.5	96.9	96.6	96.6
% households with access to flush toilet	23	39.4	62.8	68.1
% households with weekly municipal refuse removal	59.5	62.7	63.1	59.5
% households with piped water inside dwelling	50.1	59.8	60.1	66.3
% households which uses electricity for lighting	66.7	64.9	73.7	79.4

Source: Compiled from StatsSA Census 2011 Municipal Fact Sheet

3.3 LOCAL ECONOMY

The focus of this section is on the area in the vicinity of Laingsburg and Sutherland.

3.3.1 Agricultural sector

Commercial stock farming forms the economic backbone of the Laingsburg/Sutherland region, and essentially consists of extensive small stock farming, typically sheep. Carcass, wool and multi-purpose breeds are stocked. The grass component is insufficient to support meaningful numbers of large stock. Goats are suited to the region, but are not generally favoured due to their very destructive browsing habit.

Operations in the Sutherland/ Laingsburg region are characterised by the seasonal movement of stock between pastures located in different farming areas. This transhumance pattern is centuries old, and is based on the utilisation of summer (Great Karoo, Moordenaarskaroo) and winter rainfall areas (Klein Roggeveld, Tankwa, Ceres Karoo) in turn to ensure continuous fresh pasture throughout the year, and to protect veld from overgrazing linked to inherently low carrying capacities as a result of arid conditions. Operations therefore typically consist of a number of farms, mostly ranging in size from 5000 ha to 10 000 ha in total, dispersed over a large area.

The Klein Roggeveld and Tankwa are milder in winter than the Roggeveld and great escarpment north of Sutherland, and thus better suited to lambing ewes. At the same time, these regions are very hot and dry in summer, making it preferable to move stock back to the Moordenaarskaroo or Roggeveld. As was indicated in Section 1.4, the majority of farms comprising the WEF serve only as winter grazing for main operations located in the Roggeveld, Klein Roggeveld or Moordenaarskaroo. The Tankwa farms on which the bulk of the WEF infrastructure is proposed is valued for its comparatively warm winters, higher winter rainfall than the surrounding areas, and the abundance of streams and small watercourses. At the same time, it becomes unbearably hot and dry in summer. Veld carrying capacities are low, around 6 ha to 1 sheep.

The employment opportunities associated with extensive stock farming are limited and in many instances only available seasonally (e.g. shearing). Virtually no beneficiation of primary produce (meat, wool, hides) currently takes place locally. As a result, the local primary agricultural sector supports only very limited local secondary employment and investment.

Most farming operations in the broad region produce fodder crops on a small scale, mainly for own use. The Laingsburg-Sutherland-Ceres area is a key producer of vegetable seed crops, namely onions, garlic, leeks and carrots. Olives, drying peaches, citrus and other crops are also grown on a small scale in the Laingsburg area. All cropping activities are irrigation-based. Cropping areas and potential cropping areas are therefore restricted in this region of low rainfall, ephemeral rivers and deep groundwater. With regard to the WEF study area, vegetable seed is produced on at least 3 site farms. In the case of Rietfontein and Klipbanksfontein (Conradie), workers are transported in during planting and harvesting for a few days at a time, with a skeleton staff supervising operations throughout the year.

Game farming is currently increasingly displacing stock farming in the Laingsburg area. Game farming is even less employment-intensive than stock farming, with the result that an already limited employment base is in danger of erosion. However, this trend is at present limited to virtually absent in the area south of Sutherland, including the WEF site and surrounds.

3.3.2 Tourism

Tourist flows into the study area municipalities are currently modest, and mainly associated with the town of Sutherland (observatory) and the small Victorian rail siding of Matjiesfontein along the N1 west of Laingsburg.

The construction and commissioning of the South African Large Telescope (SALT), the largest telescope in the Southern Hemisphere, is credited as the most important contributing factor to the growth of the tourism sector in Sutherland. Prior to the construction of SALT in 2005 the accommodation in the town was limited to a single guesthouse and one hotel. At present, the town has over 30 B&B/guest house facilities and one hotel (providing a total of approximately 300 beds), as well as a number of restaurants and coffee shops/ bistros. In addition, fourteen guest farms have become established around the town. An estimated 15 000 visitors visit the town annually. The majority of tourist are from the Western Cape and visit the town during the winter months when atmospheric conditions for viewing are optimal. Peak visitor numbers are over the June school holidays. Snow tourism is also becoming a major attraction. As major attractions are limited to a few winter months, accommodation facilities and restaurants battle with significant under-subscription during most of the year.

Matjiesfontein is a quaintly preserved/ restored scattering of Victorian houses and the Lord Milner Hotel around a rail siding. Thanks to its location near the N1, Matjiesfontein is arguably one of South Africa's best-known bastions of Victoriana and nostalgia tourism. Matjiesfontein is largely dedicated to residential and tourism uses. Its location along the N1, between Laingsburg and Touwsrivier, makes it ideal as a stop or stop-over for tourists. Travellers are less well catered for, as general shops and services (e.g. fuel station) are not represented. Information provided by the Karoo Hoogland Tourism Bureau as well as the Laingsburg Tourism Bureau indicates that no significant tourism attractions or destinations are located in the WEF study area. Guest accommodation is available on two farms to the south of the WEF site, but mainly caters for contractors and consultants working in the area. In this regard, the WEF is located more or less in between two major accommodation destinations, namely Matjiesfontein and Sutherland (le Roux, pers. comm.). No other tourism destinations or facilities are currently located in or around the WEF site.

SECTION 4: IDENTIFICATION OF KEY ISSUES

4.1 INTRODUCTION

Section 4 provides an assessment of the key social issues identified during the study. The identification of key issues was based on:

- Review of project related information;
- Interviews with key interested and affected parties;
- Experience/ familiarity of the authors with the area and local conditions; and
- Experience with similar projects.

The assessment section is divided into the following sections:

- Assessment of compatibility with relevant policy and planning context ("planning fit";
- Assessment of social issues associated with the construction phase;
- Assessment of social issues associated with the operational phase;
- Assessment of social issues associated with the decommissioning phase.
- Assessment of the "no development" alternative; and
- Assessment of cumulative impacts.

4.2 ASSESSMENT OF POLICY AND PLANNING FIT

As indicated in Section 1.6, legislative and policy context plays an important role in identifying and assessing the potential social impacts associated with a proposed development. In this regard a key component of the SIA process is to assess the proposed development in terms of its fit with key planning and policy documents.

For the purposes of the meeting the objectives of the SIA the following national, provincial and local level policy and planning documents were reviewed, namely:

National
- National Energy Act (2008);
- White Paper on the Energy Policy of the Republic of South Africa (December 1998);
- White Paper on Renewable Energy (November 2003);
- Integrated Resource Plan (IRP) for South Africa (2010-2030);
- The National Development Plan (2011);
- New Growth Path Framework (2010);
- National Infrastructure Plan (2012);
- Astronomy Geographic Advantage (AGA) Act (Act 21 of 2007).

Provincial
- The One Cape 2040 Strategy (2012);
- White Paper on Sustainable Energy for the Western Cape Province (2010);
- Western Cape Provincial Strategic Plan 2014-2019 (2014);
- Western Cape Land Use Planning Act, 2014;

- Western Cape Provincial Spatial Development Framework (2014 Revision);
- Western Cape Climate Change Response Strategy (2014);
- Western Cape Infrastructure Framework (2013);
- Western Cape Green Economy Strategy Framework (2013);
- Western Cape Amended Zoning Scheme Regulations for Commercial Renewable Energy Facilities (2011);
- Western Cape Draft Strategic Plan (2010);
- Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape – Towards a Regional Methodology (2006);
- Guidelines for the Management of Development on Mountains, Hills and Ridges in the Western Cape (2002).

Local
- Central Karoo District Municipality Integrated Development Plan (2012-2017);
- Laingsburg Local Municipality Integrated Development Plan (2012-2017).
- Laingsburg Local Municipality Local Economic Development Strategy (2006).
- Laingsburg Local Municipality Integrated Development Plan (2012-2017); and
- Laingsburg Local Municipality Local Economic Development Strategy (2006).

The findings of the review indicated that renewable energy is strongly supported at a national and local level. At a national level the White Paper on Energy Policy (1998) notes:

- Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future; and,
- The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind and that renewable applications are in fact the least cost energy service in many cases; more so when social and environmental costs are taken into account.

The IRP 2010 also allocates 43% of energy generation in South Africa to renewables, while the New Growth Path Framework and the National Infrastructure Plan both support the development of the renewable energy sector.

The development of and investment in renewable energy is also supported by the National Development Plan (NDP), New Growth Path Framework and National Infrastructure Plan, which all make reference to renewable energy. At a provincial level the development of renewable energy is supported by the White Paper on Sustainable Energy for the Western Cape, Climate Change Strategy and Action Plan for the Western Cape and Western Cape Growth and Development Strategy.

The findings of the review of the relevant policies and documents pertaining to the energy sector therefore indicate that the development of renewable energy is supported at a national and provincial level. The area has also been identified as an area where renewable energy should be concentrated. It is therefore the opinion of the authors that the establishment of the proposed WEF is supported by the relevant policies and planning documents.

The provincial and local policy and planning documents also make reference to the importance of tourism and the region's natural resources. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as the proposed facility, does not impact on the region's natural resources and the tourism potential of the Province. However, it should be noted that the proposed

Rietkloof WEF is located in an area that has been identified as a Renewable Energy Development Zone (REDZ) by the CSIR under the DEAs SEA process. The area has therefore been identified as an area where renewable energy should be concentrated.

4.3 CONSTRUCTION PHASE SOCIAL IMPACTS

The key social issues associated with the construction phase are the following:

Potential positive impacts
- Creation of employment and business opportunities, and opportunity for skills development and on-site training;
- Benefits associated with providing technical advice on wind energy to local farmers and municipalities.

Potential negative impacts
- Impacts associated with the presence of construction workers on local communities;
- Impacts related to the potential influx of job-seekers;
- Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site;
- Increased risk of grass fires associated with construction related activities;
- Noise, dust, waste and safety impacts associated with construction related activities and vehicles;
- Impact on grazing and productive farmland;
- Impact on tourism.

4.3.1 Creation of local employment, training, and business opportunities

Based on the information from other WEF projects the construction phase for a 140 MW WEF is expected to extend over a period of 20-24 months and create approximately 250 (full-time equivalent) employment opportunities during peak construction. The work associated with the construction phase will be undertaken by contractors and will include the establishment of the WEF and the associated components, including, access roads, substation, services and power line. It is anticipated that approximately 55% (136) of the employment opportunities will be available to low skilled workers (construction labourers, security staff etc.), 30% (76) to semi-skilled workers (drivers, equipment operators etc.) and 15% (38) for skilled personnel (engineers, land surveyors, project managers etc.).

Members from the local community in the area are likely to be in a position to qualify for the majority of the low skilled and semi-skilled employment opportunities. The majority of these employment opportunities are also likely to accrue to Historically Disadvantaged (HD) members from the local KHLM and LLM community. A small number of employment opportunities may also be created in the WLM. As indicated above, the levels of unemployment in the KHLM, LLM and WLM are relatively high. The creation of potential employment opportunities, even temporary employment, will represent a significant, if localised, social benefit. However, in the absence of specific commitments from the developer to maximise local employment targets the potential opportunities for local employment will be limited. In this regard the KHLM

Municipal Manager, Mr. Allistar Gibbons[20], indicated that based on the experience from the last major construction project in the Sutherland area (SALT, 2001-2004) there was no meaningful skills transfer for locals. Locals were employed as unskilled labour, and remained such after SALT was constructed. The majority of the skilled employment opportunities are likely to be associated with the contactors appointed to construct the WEF and associated infrastructure.

While the current pool of suitably qualified local community members in Laingsburg, Sutherland and the LLM may be limited the construction of a number of renewable energy projects in the area which are planned to commence in 2016 will create opportunities to develop the required skills prior to the commencement of the construction phase for the proposed Rietkloof WEF. It is estimated that these projects will be employing 50-70% of their workers locally and where training is required it will be carried out in order to comply with commitments for local employment made to the Department of Energy. In addition, the implementation of a training and skills development programme prior to the commencement of construction would also increase the potential to employ local community members. The number of low skilled and semi-skilled positions taken up by members from the local community will depend on the effective implementation of these enhancement measures by the proponent in consultation with the KHLM, LLM and potentially the Department of Labour.

The capital expenditure associated with the construction of a 140 MW WEF will be in the region of R 2.5 billion (2016 Rand value). A percentage of the capital expenditure associated with the construction phase has the potential to benefit local companies. However, the opportunities for companies in Sutherland and Laingsburg are likely to be limited. In this regard the benefits are likely to accrue to companies based in towns based further afield, such as Worcester and Cape Town. Implementing the enhancement measures listed below can enhance these opportunities. However, the potential opportunities for local companies are likely to be limited due to the high import content associated with WEF projects.

The total wage bill for the 20-24 month construction phase of a 140 MW WEF will be in the region of R 69 million (2016 Rand value). This is based on a monthly wage of R 8 000 for low-skilled workers, R 12 000 for semi-skilled workers and R 30 000 for skilled workers over a period of 22 months. A percentage of the wage bill will be spent in the local economy and will create opportunities for local businesses in Sutherland and Laingsburg. The sector of the local economy that is most likely to benefit from the proposed development is the local service industry. This is confirmed by the experience with the other renewable projects. The potential opportunities for the local service sector are linked to accommodation, catering, cleaning, transport and security, etc. associated with the construction workers on the site. The benefits to the local economy will be confined to the construction period (20-24 months).

However, based on the findings of the site visit there is not sufficient accommodation in Laingsburg and Sutherland and surrounds to accommodate the ~ 250 workers associated with the construction phase, unless these workers are sourced locally. The local farmers in the area have also indicated that they do not support the establishment of a construction camp on the site to house workers. The issue of accommodation therefore represents a key challenge and will need to addressed in

[20] Mr Gibbons (Manager, Karoo Hoogland Municipality, Sutherland, was interviewed on 28 July 2015, as part of the SIA for the Kareebosch WEF.

consultation with the KHLM, LLM, community representatives and local farmers from the area should the project proceed.

The implementation of the proposed enhancement measures listed below would also enable the establishment of the proposed WEF to support co-operation between the public and private sectors which would support local economic development in the KHLM and LLM.

The hospitality industry in the area is also likely to benefit from the provision of accommodation and meals for professionals (engineers, quantity surveyors, project managers, product representatives etc.) and other (non-construction) personnel involved on the project. Experience from other renewable energy projects indicates that the potential opportunities are not limited to on-site construction workers but also to consultants and product representatives associated with the project.

Table 4.1: Impact assessment of employment and business creation opportunities during the construction phase

Nature: Creation of employment and business opportunities during the construction phase						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Short Term	Regional	Slight Beneficial	Positive	Probable	Low (+)
With Mitigation/ Enhancement	Short Term	Regional	Severely Beneficial	Positive	Definite	Moderate (+)

Comment on No Go option
There is no impact, as the current status quo will be maintained. The potential employment and economic benefits associated with the construction of the proposed WEF would however be forgone.

Recommended enhancement measures
The following enhancement measures are also recommended in order to enhance local employment and business opportunities associated with the construction phase:

- An accredited training and skills development programme aimed at maximising the opportunities for local workers to be employed in the low and semi-skilled positions should be initiated prior to the initiation of the construction phase. In this regard the programme should be aimed at community members from Laingsburg and Sutherland. The programme should be developed in consultation with the Department of Labour and the KHLM and LLM. The recommended targets of 50% and 30% of low and semi-skilled positions respectively should be taken up by local community members. Due to the low skills levels in the area, the majority of semi-skilled and skilled posts are likely to be filled by people from outside the area;
- The recruitment selection process for the training and skills development programme should seek to promote gender equality and the employment of women wherever possible;

- Before the construction phase commences the proponent should meet with representatives from the KHLM and LLM to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase;
- The local authorities and relevant community representatives should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project;
- Where reasonable and practical the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria;
- The contractor should liaise with the KHLM and LLM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;
- Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information;
- The KHLM and LLM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.

Note that while preference to local employees and companies is recommended, it is recognised that a competitive tender process may not guarantee the employment of local labour for the construction phase.

4.3.2 Technical advice for local farmers and municipalities

The establishment of a WEF in the area creates an opportunity for the technical staff involved in the project to provide local farmers and the KHLM and LLM with advice regarding the installation of wind energy technology to supplement their current and future energy needs. Experience from other renewable energy projects indicate that farmers would appreciate assistance in this regard in the form of expert opinion as to what type of small scale wind technologies could be installed to meet their needs and how best to install small-scale wind energy installations on their farms. This could be achieved via a workshop / discussion with the local farmers in the area. Local municipalities would also benefit from the knowledge of technical staff involved in the establishment of the project.

Table 4.2: Assessment of benefit of technical advice for local farmers and municipalities

Nature: Potential benefit for local farmers and municipalities associated with providing advice on installation of small-scale wind energy technology to supplement their energy needs						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	N/A as represents current status quo	N/A	N/A	N/A	N/A	N/A
With Mitigation/ Enhancement	Long Term	Regional	Slightly beneficial	Positive	May Occur	Moderate (+)

Assessment of No Go option
There is no impact as the current status quo would be maintained. The potential positive benefit for local farmers and the municipality in terms of potential future energy savings would however be lost.

Recommended mitigation measures
- The proponent in consultation with the contractor should investigate the option of holding a workshop/s with local farmers and representatives from KHLM and LLM to discuss options for installing small-scale wind energy facilities and the technology and costs involved.

4.3.3 Impact of construction workers on local communities

The presence of construction workers poses a potential risk to family structures and social networks in the town of Sutherland and Laingsburg. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to potentially risky behaviour, mainly of male construction workers, including:

- An increase in alcohol and drug use;
- An increase in crime levels;
- The loss of girlfriends and/or wives to construction workers;
- An increase in teenage and unwanted pregnancies;
- An increase in prostitution; and
- An increase in sexually transmitted diseases (STDs), including HIV.

As indicated above, the majority of the low skilled (136) and semi-skilled (76) work opportunities associated with the construction of a 140 MW WEF can potentially benefit members from the local community. If these opportunities are taken up by local residents the potential impact on the local community will be low as these workers will form part of the local family and social network. Employing members from the local community to fill the low-skilled job categories will therefore reduce the risk and mitigate the potential impact on the local communities. The use of local residents to fill the low skilled job categories will also reduce the need to provide accommodation for construction workers in Sutherland and Laingsburg. This would

also reduce the potential pressure on local services, such as clinics. The skilled workers (38) are likely to be accommodated in local guest houses in Sutherland, Laingsburg and surrounds.

While the risks associated with construction workers at a community level will be low, at an individual and family level they may be significant, especially in the case of contracting a sexually transmitted disease or an unplanned pregnancy. The experience with the Abengoa solar energy project in the Northern Cape Province has demonstrated that this risk is real. The presence of construction workers associated with the Abengoa project resulted in an increase in the spread of STD, increase in un-planned pregnancies, increase in drugs, alcohol abuse and anti-social behaviour. Mr. Allistar Gibbons (KHLM, Manager (Sutherland))[21] also indicated that the construction of SALT had left a tangible legacy of HIV, TB and single mothers.

In terms of potential threat to the families of local farm workers in the vicinity of the site, the risk is likely to be low. This is due to the low number of permanent workers residing on local farms in the area. The potential risk is therefore likely to be limited. The risk can also be effectively mitigated by ensuring that the movement of construction workers on and off the site is carefully controlled and managed. However, given the nature of construction projects it is not possible to totally avoid these potential impacts at an individual or family level.

Table 4.3: Assessment of impact of the presence of construction workers in the area on local communities

Nature: Potential impacts on family structures and social networks associated with the presence of construction workers						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Short Term	Regional	Moderate	Negative	Probable	Moderate (-)
With Mitigation/ Enhancement	Short Term	Regional	Slight	Negative	Probable	Low (-)[22]

Comment on No Go option
There is no impact as the current status quo would be maintained. The potential employment and economic benefits associated with the construction of the proposed WEF would however be forgone.

Recommended mitigation measures
- The proponent should consider the implementation of an accredited training and skills development programme aimed at maximising to opportunity for local workers to be employed for the low and semi-skilled positions prior to the initiation of the construction phase. In this regard the programme should be

[21] Mr Gibbons (Manager, Karoo Hoogland Municipality, Sutherland, was interviewed on 28 July 2015, as part of the SIA for the Kareebosch WEF.
[22] The significance is rated Low (-) for the community as a whole. However, for individuals who may be impacted by the behaviour of construction workers the impact would be Moderate-High (-)

aimed at community members from Laingsburg and Sutherland. The programme should be developed in consultation with the Department of Labour and the KHLM and LLM. The recommended targets are 50% and 30% of low and semi-skilled positions respectively should be taken up by local community members. Due to the current low skills levels in the area, the majority of semi-skilled and skilled posts are likely to be filled by people from outside the area;

- The recruitment selection process for the training and skills development programme should seek to promote gender equality and the employment of women wherever possible;
- The proponent should establish a Monitoring Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from the LLM, farmers and the contractor(s). The MF should also be briefed on the potential risks to the local community and farm workers associated with construction workers;
- The proponent and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation;
- The proponent and contractor (s) should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;
- The contractor should provide transport to and from the site on a daily basis for low and semi-skilled construction workers. This will enable the contractor to effectively manage and monitor the movement of construction workers on and off the site;
- The contractors should make the necessary arrangements to transport workers from other local towns in the area, such as Worcester and Paarl, home over weekends. This will reduce the risk posed to local family structures and social networks in Laingsburg and Sutherland;
- No construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

4.3.4 Influx of job seekers

Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become "economically stranded" in the area or decide to stay on irrespective of finding a job or not. As in the case of construction workers employed on the project, the actual presence of job seekers in the area does not in itself constitute a social impact. However, the manner in which they conduct themselves can impact on the local community.

Experience from other projects has also shown that the families of job seekers may also accompany individual job seekers or follow them at a later date. In many cases the families of the job seekers that become "economically stranded" and the construction workers that decided to stay in the area, subsequently moved to the area. The influx of job seekers to the area and their families can also place pressure on the existing services in the area, specifically low income housing. In addition to the pressure on local services, the influx of construction workers and job seekers can also result in competition for scarce employment opportunities. Further secondary impacts included increase in crime levels, especially property crime, as a result of the

increased number of unemployed people. These impacts can result in increased tensions and conflicts between local residents and job seekers from outside the area.

These issues are similar to the concerns associated with the presence of construction workers and are discussed in Section 4.3.3. However, in some instances the potential impact on the community may be greater given that they are unlikely to have accommodation and may decide to stay on in the area. In addition, they will not have a reliable source of income. The risk of crime associated with the influx of job seekers it therefore likely to be greater. However, the findings of the SIA indicate that potential for economically motivated in-migration and subsequent labour stranding in Sutherland and Laingsburg is likely to be low. This is due to their small size, location and the limited economic opportunities that these small towns offer. The risks associated with job seekers staying on in Sutherland and Laingsburg are therefore likely to be low and are likely to be limited to the construction phase.

Table 4.4: Assessment of impact of job seekers on local communities associated with the construction phase

Nature: Potential impacts on family structures, social networks and community services associated with the influx of job seekers						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Short Term	Regional	Slight	Negative	Probable	Low (-)
With Mitigation/ Enhancement	Short Term	Regional	Slight	Negative	Probable	Low (-)

Comment on No Go option
There is no impact as the current status quo would be maintained. The potential employment and economic benefits associated with the construction of the proposed WEF would however be forgone.

Recommended mitigation measures
It is not possible to prevent job seekers from coming to the area in search of a job. However, as indicated above, the potential influx of job seekers to the area as a result of the proposed WEF is likely to be low. In addition:

- The proponent should implement a "locals first" policy, specifically with regard to unskilled and low skilled opportunities;
- The proponent should implement a policy that no employment will be available at the gate and or in Sutherland and Laingsburg (except for local residents).

4.3.5 Risk to safety, livestock and farm infrastructure

The presence on and movement of construction workers on and off the site poses a potential safety threat to local famer's and farm workers in the vicinity of the site. In addition, farm infrastructure, such as fences and gates, may be damaged and stock losses may also result from gates being left open and/or fences being damaged or stock theft linked either directly or indirectly to the presence of farm workers on the site. Irrigation infrastructure (or stock watering infrastructure), including buried

pipelines, is located on most study area properties. The relevant owners should be consulted closer to the time, i.e. at the start of the construction phase to identify the location of the relevant infrastructure and ensure that it is not damaged during the construction phase.

The local farmers in the area interviewed indicated that the presence of construction workers on the site increased the exposure of their farming operations and livestock to the outside world, which, in turn, increased the potential risk of stock theft and crime. The local farmers did, however, indicate that the potential risks (safety, livestock and farm infrastructure) can be effectively mitigated by careful planning and managing the movement of construction on the site workers during the construction phase.

Interviewees have indicated that the area is currently regarded as safe and stock theft is not currently considered to be a problem in the immediate area. Access to the farms on the site is via single track gravel roads off the tarred R354 (N1 to Sutherland). Three site properties, namely Fortuin, Nuwerus and Dwars-in-die-Weg, are accessed directly off the R354. Alternative access to properties located in the south of the WEF site is also possible from the N1 and R356 (Ceres), again via single track farm roads leading from these.

Four properties (Vogelstruisfontein, Hartjieskraal, Die Libanon, Barendskraal) are accessed off a semi-circular gravel road which, via Ou Mure, intersects with the R354 at Kruispad in the north, and near Dwars-in-die-Weg in the south ("Ou Mure road"). The southern portion of the road also provides access to the two Snyderskloof properties from the R354 (via Vogelstruisfontein). The Snyderskloof properties are also accessible from two other gravel roads off the R354, located further to the south. The local farmers in the area avoid keeping sheep in these camps at night.

The potential impact of construction related activities on vegetable seed cropping operations should also be taken into account. This issue was raised by the owner of Vogelstruisfontein, Mr Kriel, but plantings on Fortuin, owned by Mr Andries le Roux, may also potentially be affected. Actual plantings on properties vary from year to year, depending on weather and demand. The seed crops rely on bees for pollination and only flower for a few weeks of the year. Bees are susceptible to dust, and any excessive dust generated by construction vehicles may impact on the pollination process. Mr Kriel and le Roux should be contacted to discuss timing of construction related activities in the vicinity for his cropping areas.

In terms of safety, as indicated above, the majority of the farms are not inhabited. The issue of safety was therefore not raised as a concern. With regard to the potential risks to farm animals, the farmers interviewed indicated that these risks could be effectively mitigated. The mitigation measures are listed below.

Table 4.5: Assessment of risk to safety, livestock and damage to farm infrastructure

Nature: Potential risk to safety of farmers and farm workers, livestock and damage to farm infrastructure associated with the movement of construction workers on and to the site						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Short Term	Study Area	Moderate	Negative	Probable	Moderate (-)
With Mitigation/ Enhancement	Short Term	Study Area	Slight	Negative	Probable	Low (-)

Comment on No-Go option
There is no impact as it maintains the current status quo.

Recommended mitigation measures
Key mitigation measures include:

- The proponent should enter into an agreement with the landowners on whose property the WEF is located, whereby damages to farm property etc. during the construction phase that are proven to be associated with the construction activities for the WEF will be compensated for. The agreement should be signed before the construction phase commences;
-
- The movement of construction workers on the site should be confined to regulated areas;
- Mr Kriel and le Roux should be contacted to discuss timing of construction related activities in the vicinity for his cropping areas;
- Contractors appointed by the proponent should provide daily transport for workers to and from the site. This would reduce the potential risk of trespassing onto adjacent properties;
- Movement of vehicles should be confined to designated roads and construction workers must be informed of the need to keep farm gates closed;
- The relevant owners should be consulted prior to the commencement of the construction phase to identify the location of the irrigation infrastructure so as to ensure that it is not damaged during the construction phase;
- Damage to irrigation infrastructure caused by construction related activities should be repaired within 24 hours by the contractor;
- The proponent should consider the option of establishing a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site;
- The proponent should hold contractors liable for compensating farmers in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors and neighbouring landowners.

The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below);
- The Environmental Management Programme (EMP) should outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested;
- Contractors appointed by the proponent must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.
- Contractors appointed by the proponent must ensure that construction workers who are found guilty of trespassing, stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;
- No construction staff, with the exception of security staff, to be accommodated on site overnight.

4.3.6 Increased risk of grass fires

The presence of construction workers and construction-related activities on the site poses an increased risk of grass fires that could in turn pose a threat to livestock, crops, and farmsteads in the area. In the process, farm infrastructure may also be damaged or destroyed and human lives threatened. The issue of fire risks was raised by a number the local farmers in the area. In this regard they pointed out that grazing is the main productive resource in the study area. For some operations it provides crucial seasonal grazing. As is the case in arid areas, the study area veld is vulnerable to disturbances and can take decades to recover. The local farmers also indicated that grass fires resulted in change in the composition of the veld, favouring the establishment of less palatable grazing. Given the very slow rate of succession, grass fires may therefore significantly diminish the grazing resource for a period of decades.

However, the local farmers did indicate that measures should be implemented to reduce the potential risk of fires developing. This included the provision of fire-fighting equipment on the site during the construction phase. They also indicated that the potential risk of grass fires was heightened by the windy conditions in the area, specifically during the dry, summer months from October to April.

Table 4.6: Assessment of impact of increased risk of grass fires

Nature: Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of grass fires						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Short Term	Study Area	Moderate	Negative	Probable	Moderate (-)
With Mitigation/ Enhancement	Short Term	Study Area	Slight	Negative	Probable	Low (-)

Comment on No-Go option
There is no impact as it maintains the current status quo.

Recommended mitigation measures
The mitigation measures include:

- The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase proven to be associated with the construction activities for the WEF will be compensated for. The agreement should be signed before the construction phase commences;
- Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas;
- Contractor should ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy summer months;
- Contractor to provide adequate fire fighting equipment on-site;
- Contractor to provide fire-fighting training to selected construction staff;
- No construction staff, with the exception of security staff, to be accommodated on site overnight;
- As per the conditions of the Code of Conduct, in the event of a fire proven to be caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire fighting costs borne by farmers and local authorities.

4.3.7 Impacts associated with construction vehicles

The movement of heavy construction vehicles during the construction phase has the potential to damage local farm roads and create dust and safety impacts for other road users in the area and also impact on farming activities. As indicated above, the vegetable seed operations on Vogelstruisfontein (Mr Kriel) and Fortuin (Mr le Roux) may also be impacted by dust generated by construction vehicles. The seed crops rely on bees for pollination and only flower for a few weeks of the year. Bees are susceptible to dust, and any excessive dust generated by construction vehicles may impact on the pollination process. Mr Kriel and le Roux and should be contacted to discuss timing of construction related activities in the vicinity for his cropping areas.

Construction traffic and other dust generating activities on Vogelstruisfontein, Dwars in die Weg, Fortuin, and Hartjieskraal should ideally be phased to not coincide with flowering times. The relevant owners should also be consulted closer to the time, i.e. at the start of the construction phase.

The project components will be transported to the site via the N1. The N1 provides the key link between the Western Cape and Gauteng and is an important commercial and tourist route. The transport of components of the WEF to the site therefore has the potential to impact on other road users travelling along the N1. Measures will need to be taken to ensure that the potential impact on motorist using the N1 is minimised. The recommended mitigation measures are listed below.

In terms of access the site from the N1, construction traffic would make use of the R354 (Matjiesfontein-Sutherland tar road) and the internal farm roads, including the

semi-circular gravel road which intersects with the R354 at Kruispad in the north, just to the south of Dwars-in-die Weg ("Ou Mure road") and the north-south aligned gravel road witch intersects with the Ou Mure Road at Ou Mure farmstead in the south, and runs all the way north to the Tuinplaas gravel road (linking the R354 and the R356). The western sections of the site may be accessed via the R356 (Ceres road).

In terms of impacts along the R354, the winter months are of key importance to Sutherland tourism (snow and star-gazing). This should be taken into account when planning the construction phase. The R354 is the only access road from the south leading into Sutherland. The road is a relatively narrow 2-lane road and passes over the Verlatenkloof Pass. Construction related traffic on the R345 over winter weekends or school holidays has the potential to impact on visitors travelling to and from Sutherland.

Experience from other projects also indicates that the transportation of construction workers to and from the site can result in the generation of waste along the route (packaging and bottles etc. thrown out of windows etc.). These wastes, specifically plastic wastes, pose a threat to livestock and wildlife if they are ingested.

Table 4.7: **Assessment of the impacts associated with construction vehicles**

Nature: Potential dust and safety impacts and damage to road surfaces associated with movement of construction related traffic to and from the site						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Short Term	Study Area	Moderate	Negative	Probable	Moderate (-)
With Mitigation/ Enhancement	Short Term	Study Area	Slight	Negative	Probable	Low (-)

Comment on No-Go option
There is no impact as it maintains the current status quo.

Recommended mitigation measures
The potential impacts associated with heavy vehicles can be effectively mitigated. The mitigation measures include:

- As far as possible, the transport of components to the site along the N1, R354 and R356, should be planned to avoid weekends and holiday periods;
- Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis, adhering to speed limits and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers;
- Steps must be taken to minimise the potential impact of dust generated by construction vehicles on the vegetable seed cropping operations on Vogelstruisfontein and Fortuin. These include regular wetting of the section of road adjacent to the seed cropping area and strict enforcement of speed limits.

The timing of the movement of construction vehicles should be discussed with the owners of Vogelstruisfontein (Mr Kriel) and Fortuin (Mr le Roux);
- All workers should receive training/ briefing on the reasons for and importance of closing farm gates and driving slowly;
- The contractor must ensure that damage caused by construction related traffic to local farm roads is repaired on a regular basis throughout the construction phase. The costs associated with the repair must be borne by the contractor;
- All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits;
- The Contractor should ensure that workers are informed that no waste can be thrown out of the windows while being transported to and from the site. Workers who throw waste out windows should be fined;
- The Contractor should be required to collect waste along access roads to the site on a weekly basis;
- Waste generated during the construction phase should be transported to the local landfill site.
- EMP measures (and penalties) should be implemented to ensure farm gates are closed at all times;
- EMP measures (and penalties) should be implemented to ensure speed limits are adhered to at all times.

4.3.8 Impacts associated with loss of farmland

Grazing is the main productive resource in the study area. For some operations it provides crucial seasonal grazing. As generally the case in arid areas, the study area veld is very vulnerable to disturbance, and takes decades to recover. The high clay content of the shale-derived soils makes them vulnerable to compaction and erosion.

The key construction phase related issues are linked to the movement of heavy construction vehicles on the site, establishment of laydown areas, construction camps and roads and trenching in cultivated areas. All of these activities would impact on productive soils and grazing. As indicated in Table 1.1, Overview of properties comprising the WEF site, the main land use in the area is winter grazing. The key concern is therefore to avoid or minimize the potential loss of grazing areas. Areas used for vegetable seed cropping should also be avoided.

In terms of impact on farming operations, the location of construction camps was raised as a key concern by a number of landowners. Concerns were raised by the owners of Fortuin (Andries le Roux), Hartjieskraal (Ernst Marais) and Nuwerus (Ziegfried Loots). The relevant owners indicated that the proposed sites are too close to the farm yard (Fortuin), would damage good grazing areas (Nuwerus) or damage a potential cropping area (Hartjieskraal). All three owners have proposed alternative locations. The construction area on Fortuin is located in close proximity to the workers houses.

The owners of Fortuin and Nuwerus have proposed sites located in the extreme north of their properties at the intersection of the Ou Mure road with the R354. This area has been identified as a site for a construction camp for the adjacent Brandvalley WEF by Mr Le Roux (Figure 4.1) (Alternative 1, Brandvalley WEF).

Mr Marais has indicated that the proposed site would damage the best potential cropping area on his property, namely a large flat area to the south of the Voetpadskloof stream, a tributary of the Barendskloof River. Mr Marais has proposed a site located to the west of the Barendkloof River, on slightly uneven terrain (Figure

4.2). The owners of Snyderskloof (Dr Jaco Terblanche) and Vogelstruisfontein (Mr Johan Kriel) also indicated that they would prefer not to have any borrow pits on their properties, and would only agree to borrow pits that were not readily visible from the farmstead or roads on the properties (Kriel, pers. comm).

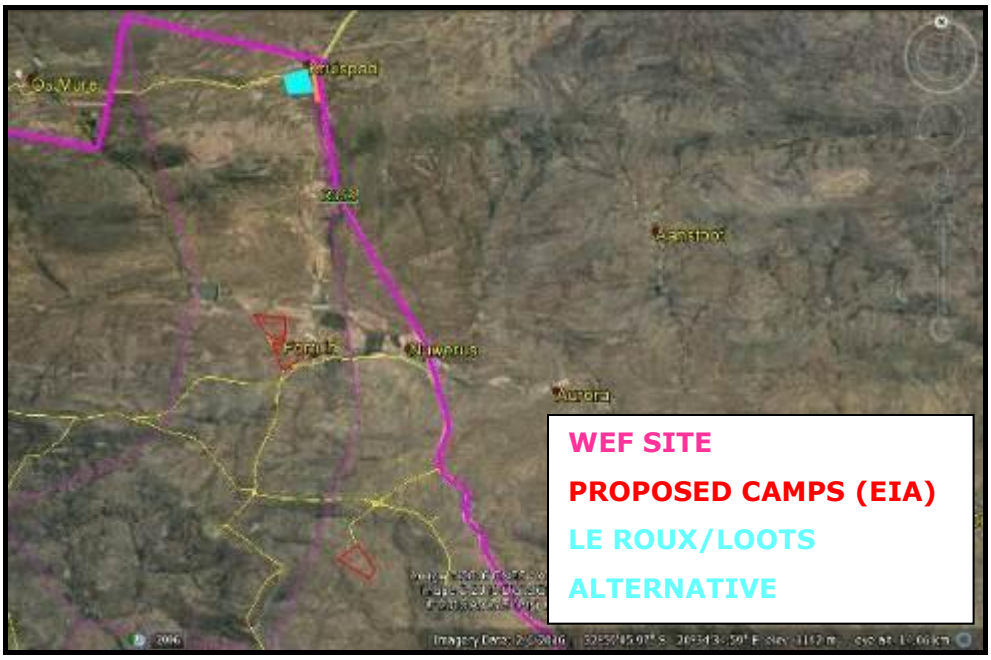

Figure 4.1: Construction camp location proposed by Fortuin and Nuwerus owners

Figure 4.2: Construction camp alternative proposed by owner of Hartjieskraal

Table 4.8: Assessment of impact on farmland due to construction related activities

Nature: The activities associated with the construction phase, such as establishment of access roads and the construction camp, movement of heavy vehicles and preparation of foundations for the WEF and power lines will damage farmlands and result in a loss of farmlands for grazing						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Short Term	Study Area	Moderate	Negative	Probable	Moderate (-)
With Mitigation/ Enhancement	Short Term	Study Area	Slight	Negative	Probable	Low (-)

Comment on No-Go option
There is no impact as it maintains the current status quo.

Recommended mitigation measures
The potential impacts associated with damage to and loss of farmland can be effectively mitigated. The aspects that should be covered include:

- The location of construction camp, wind turbines, access roads, laydown areas etc. should be informed by the findings of a soil study. In this regard high potential grazing and seed cropping areas should be avoided;
- The location of construction camps, borrow pits, access roads, and laydown areas etc. should be discussed with the locally affected landowners. In this regard the proponent should consider the construction camp alternative identified by the owners of Fortuin (Andries le Roux), Hartjieskraal (Ernst Marais) and Nuwerus (Ziegfried Loots);
- The footprint areas for the establishment of individual wind turbines should be clearly demarcated prior to commencement of construction activities. All construction related activities should be confined to the demarcated areas and minimised where possible;
- An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase;
- All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase. The rehabilitation plan should be informed by input from a botanist with experience in arid regions;
- The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be drawn up the Environmental Consultants appointed to undertake the EIA;
- The implementation of the Rehabilitation Programme should be monitored by the ECO;
- All workers should receive training/ briefing on the reasons for and importance of not driving in undesignated areas;
- EMP measures (and penalties) should be implemented to strictly limit all vehicle traffic to designated roads and construction areas. Under no circumstances should vehicles be allowed to drive into the veld;

- Disturbance footprints should be reduced to the minimum.

4.3.9 Potential impact on tourism

The potential impact on tourism during the construction phase is likely to be largely linked to the movement of construction related vehicles along the R354. As indicated above, the winter months are of key importance to Sutherland tourism (snow and star-gazing). This should be taken into account when planning the construction phase. Construction related traffic on the R345 over winter weekends or school holidays has the potential to impact on visitors travelling to and from Sutherland. The construction phase will also create opportunities for tourist facilities in the area linked to the accommodation of staff as discussed and assessed in Section 4.3.1. This would represent a positive impact.

Table 4.9: Potential impact on tourism

Nature: Potential impact of the WEF on local tourism						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Short Term	Study Area	Slight	Negative	Probable	Low (-)
With Mitigation/ Enhancement	Short Term	Study Area	Slight	Negative	Probable	Low (-)

Comment on No-Go option
There is no impact as it maintains the current status quo.

Recommended mitigation measures
The recommendations associated with managing the impacts associated with construction related traffic, specifically heavy, abnormal loads, as listed in Section 4.3.7 should be implemented.

4.3 OPERATIONAL PHASE SOCIAL IMPACTS

The following key social issues are of relevance to the operational phase:

Potential positive impacts
- Creation of employment and business opportunities. The operational phase will also create opportunities for skills development and training;
- Generation of income for local landowners and farmers;
- Benefits associated with the establishment of a Community Trust; and
- The establishment of renewable energy infrastructure.

Potential negative impacts
- Impact on productive farmland;
- The visual impacts and associated impact on sense of place; and
- Potential impact on tourism.

4.4.1 Creation of employment and business opportunities and support for local economic development

Based on information from other wind projects the establishment of a 140 MW WEF would create ~ 20 employment opportunities for over a 20 year period. Of this total approximately 4 will be low skilled, 10 semi-skilled and 6 high skilled positions. The annual wage bill for the operational phase would be ~ R 2 million. The majority of employment opportunities associated with the operational phase is likely to benefit HD members of the community.

It will also be possible to increase the number of local employment opportunities through the implementation of a skills development and training programme linked to the operational phase. Such a programme would support the strategic goals of promoting employment and skills development contained in the HKLM and LLM. However, as indicated above, the experience with the SALT project was that there the commitment to the implementation of a skills development was limited (Allistar Gibbons pers. comm.).

Given the location of the proposed facility the majority of permanent staff is likely to reside in Sutherland and or Laingsburg. In terms of accommodation options, a percentage of the non-local permanent employees may purchase houses in one of these towns, while others may decide to rent. Both options would represent a positive economic benefit for the region. In addition, a percentage of the monthly wage bill earned by permanent staff would be spent in the regional and local economy, which will benefit local businesses in these towns. The benefits to the local economy will extend over the 20 year operational lifespan of the project. The local hospitality industry in Sutherland and Laingsburg is also likely to benefit from the operational phase. These benefits are associated with site visits by company staff members and other professionals (engineers, technicians etc.) who are involved in the company and the project but who are not linked to the day-to-day operations.

Table 4.10: Impact assessment of employment and business creation opportunities

Nature: Creation of employment and business opportunities associated with the operational phase						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Medium Term	Regional	Slightly Beneficial	Positive	May Occur	Low (+)
With Mitigation/ Enhancement	Medium Term	Regional	Slightly Beneficial	Positive	Probable	Moderate (+)

Comment on No-Go option
There is no impact as it maintains the current status quo. However, the potential opportunity costs in terms of the loss of employment and skills and development training would be lost which would represent a negative impact.

Recommended enhancement measures
The enhancement measures listed in Section 4.4.1, i.e. to enhance local employment and business opportunities during the construction phase, also apply to the operational phase. In addition:

- The proponent should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project;
- The proponent, in consultation with the KHLM and LLM, should investigate the options for the establishment of a Community Development Trust (see below).

4.4.2 Generation of income for farmers

The bona fide farmers in the study area, which make up the bulk of the relevant landowners, currently face a number of significant challenges, which all impact on the economic viability of their farming operations. These include increasing wage bills, progressive price hikes by Eskom (affecting irrigated cropping operations), and the weakening of the Rand (more expensive agri-inputs). These cost increases in combination with low stocking levels has resulted in the size of commercially viable farms in the study area increasing to around 10 000 ha and more. Land owners with smaller properties are finding it increasing difficult to farm productively. Added to this the area is affected by periodic droughts and is anticipated to become progressively more drought-prone as a result of long-term climate change. Stock losses to black backed jackal, baboons, caracal and African wild cats are described as epidemic in scale, with cumulative losses described as crippling. This is largely linked to the sparse and intermittent human presence, the broken nature of the terrain, and the fact that nightly kraaling has largely disappeared on commercial farms.

Against this background, most of farm owners interviewed indicated that the steady income from wind turbines on their properties would make a significant contribution towards keeping their farming operations viable and productive. This would also assist to reduce and or prevent job losses in the farming sector.

The owner of Snyderskloof (Dr. Terblanche), also indicated that he intend to share the income from the wind turbines on his property with his farm workers (Terblanche, pers. comm).

Table 4.11: Generation of income for farmers

Nature: Creation of an alternative income source for farmers, which in turn can assist to reduce and or prevent job losses in the farming sector						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Medium Term	Study Area	Slightly Beneficial	Positive	Probable	Low (+)
With Mitigation/ Enhancement	Medium Term	Study Area	Moderately Beneficial	Positive	Probable	Moderate (+)

Comment on No-Go option
There is no impact as it maintains the current status quo. However, the potential alternative income generation for local farmers would be lost which would represent a negative impact.

Recommended enhancement measures
The local landowners have entered into agreements with the applicant regarding revenue streams generated from wind turbines located on their properties.

4.4.3 Benefits associated with the establishment of a Community Trust

In terms of the Request for Proposal document prepared by the Department of Energy all bidders for operating licences for renewable energy projects must demonstrate how the proposed development will benefit the local community. This can be achieved by establishing a Community Trust which is funded by revenue generated from the sale for energy.

Community Trusts and other socio-economic investments provide an opportunity to generate a steady revenue stream that is guaranteed for a 20 year period. This revenue can be used to fund development initiatives in the area and support the local community. The long term duration of the revenue stream also allows local municipalities and communities to undertake long term planning for the area. In terms of the requirement the minimum ownership percentage for local community is 2.5 %. However, projects generally exceed this figure in order to increase the competitiveness of the project. The revenue for the Community Trusts is via dividend pay-outs once the wind farm is fully operational and revenue generating.

The revenue from the proposed WEF plant can be used to support a number of social and economic initiatives in the area, including:

- Creation of jobs;
- Education;
- Support for and provision of basic services;
- School feeding schemes;
- Training and skills development;
- Support for SMME's.

Based on the findings of the site visit there are limited economic and associated employment opportunities in Laingsburg and Sutherland. There is a high dependency on social grants, including child support grants. Given these conditions the benefits associated with the establishment of a Community Trust funded by revenue from the proposed WEFs represents a significant positive socio-economic opportunity for Laingsburg and Sutherland.

The owner of Dwars-in-die-Weg, who is also the mayor of Laingsburg, Mr Wilhelm Theron, indicated that the project would generate development capital for a cash-strapped Laingsburg LM via the Community Trust (Theron, pers. comm).

In addition, the establishment of the WEFs is not likely to have a significant impact on the current agricultural land uses that underpin the local economic activities in the area. The loss of this relatively small area will not impact on the current and future farming activities. Experience has however also shown that Community Trusts can be

mismanaged. This issue will need to be addressed in order to maximise the potential benefits associated with the establishment of a Community Trust.

Table 4.12: Assessment of benefits associated with establishment of community trust

Nature: Creation of employment and business opportunities associated with the operational phase						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Medium Term	Regional	Moderately Beneficial	Positive	May Occur	Moderate (+)
With Mitigation/ Enhancement	Medium Term	Regional	Severely Beneficial	Positive	Definite	High (+)

Comment on No-Go option
There is no impact as it maintains the current status quo. However, the potential opportunity costs in terms of the supporting the social and economic development in the area would be lost. This would also represent a negative impact.

Recommended enhancement measures
In order to maximise the benefits and minimise the potential for corruption and misappropriation of funds the following measures should be implemented:

- The KHLM and LLM should be consulted as to the structure and identification of potential trustees to sit on the Trust. The key departments in the KHLM and LLM that should be consulted include the Municipal Managers Office, IDP Manager and LED Manager.
- Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community;
- Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the WEF.

4.4.4 Development of infrastructure for the generation of clean, renewable energy

South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result South Africa is the nineteenth largest per capita producer of carbon emissions in the world, and Eskom, as an energy utility, has been identified as the world's second largest single producer of carbon emissions.

The overall contribution to South Africa's total energy requirements of the proposed WEF is relatively small. However, the development of a single 140 MW produced will help to offset the total carbon emissions associated with energy generation in South Africa. Given South Africa's reliance on Eskom as a power utility the benefits associated with an IPP based on renewable energy are regarded as an important contribution.

Table 4.13: Implementation of clean, renewable energy infrastructure

Nature: Promotion of clean, renewable energy						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Medium Term	National	Moderate	Negative	Probable	Moderate (-)[23]
With Mitigation/ Enhancement	Medium Term	National	Moderately Beneficial	Positive	Probable	Moderate (+)

Comment on No-Go option
The No-Development option would represent a lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. This would represent a negative opportunity cost.

Recommended mitigation measures
The establishment of the proposed facility is a mitigation measure in itself. In order to maximise the benefits of the proposed project the proponent should:

- Use the project to promote and increase the contribution of renewable energy to the national energy supply;
- Implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's employed during the operational phase of the project.

4.4.5 Impact on sense of place and rural character of the landscape

The components associated with the proposed facility will have a visual impact and, in so doing, impact on the landscape and rural sense of the place of the area. A Visual Impact Assessment (VIA) has been undertaken as part of the EIA. Based on the findings of the VIA the significance of the visual impact was rated as High Negative. While the SIA does not dispute the findings of the VIA, the potential visual impacts associated with the proposed WEF were not raised as a key concern during the interviews with the affected landowners in the area and local municipal officials. It should however be borne in mind that the local landowners stand to benefit from the proposed WEF. However, this also applies to other landowners in the vicinity of the site on whose properties other proposed WEFs are located. As indicated below, visual impact and the significance thereof will vary from individual to individual and is not simply linked to visibility.

The findings of the SIA indicated that all of the affected landowners have been consulted by the applicant with regard to the location of wind turbines on their properties and are satisfied that is reflected in the proposed layout. The turbines are largely proposed on higher-lying terrain in more inaccessible portions of the relevant properties. With the exception of two substations, namely one located approximately 600m to the east of Hartjieskraal farmstead (Alternative 7), and one 1.4 km to the south of that on Fortuin (Alternative 1), substations (5 remaining) are proposed on the more inaccessible portions of farms, at some distance from the relevant

[23] Assumes that the proposed WEF will not be established

farmsteads. None of the owners – including those of Hartjieskraal or Fortuin – have raised any concerns or issues with regard to the proposed location of turbines or substations. A number of interviewees, have however, indicated that they would only allow supporting for the establishment of infrastructure on their properties, such as access roads and borrow pits, if turbines are in fact developed on their properties. This is motivated by the perception that the impact on the areas sense of place would be off-set by the revenue generated from wind turbines on their farms.

While some wind turbines will be visible from the R 354 and properties in the vicinity of the site, the issue of visual impact is a complex issue and is not simply linked to visibility, but also to individual perceptions. It is unlikely that any turbines will be visible from the N1 to the south. While some may view the turbines as a negative impact on the existing landscape, others may perceive them as a positive addition to the landscape. The authors experience in this regard is that a number of people have commented positively on a number of wind energy facilities that have been established in the last 12-24 months, such as the facilities located near Vredenburg, Caledon and Humansdorp in the Western and Eastern Cape respectively (Photograph 4.1). These facilities are clearly visible from the N2 and local roads in the area. A number of people that the authors have spoken to indicated that they did not feel that the turbines had a negative impact on the visual quality of the landscape. The visual impact and the significance thereof associated with the proposed Rietkloof WEF on the areas sense of place is therefore likely to vary from individual to individual. The potential visual impact on the areas sense of place should also be viewed within the context of the area being identified as a Renewable Energy Development Zone by the Strategic Environmental Assessment (SEA) for Wind and Solar PV energy in South Africa undertaken by the CSIR (2015). The area has therefore been identified as an area where renewable energy should be concentrated. In this regard in the region of 12-14 renewable energy projects, including ~ 12 WEFs, area located in the study area.

Photograph 4.1: Wind turbines associated with West Coast 1 WEF near Vredenburg

Table 4.14: Visual impact and impact on sense of place

Nature: Visual impact associated with the proposed WEF and the potential impact on the areas rural sense of place						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Medium Term	Study Area	Moderate	Negative	Probable	Moderate (-)
With Mitigation/ Enhancement	Medium Term	Study Area	Moderate	Negative	Probable	Moderate (-)[24]

Comment on No-Go option
There is no impact as it maintains the current status quo.

Recommended mitigation measures
- The final placement of wind turbines associated with the Rietkloof WEF should be discussed with the affected landowners;
- The recommendations of the VIA should be implemented.

4.4.6 Potential impacts on tourism

The N1 is an important tourism route linking Cape Town with Gauteng. However the area is not a tourism destination in itself and it none of the turbine structures will be visible from the N1 due to the distance of the site from the N1 (~ 30km). Based on the findings of the SIA there appear to be no major tourism activities and or destinations in the immediate vicinity of the site that would potentially be impacted by the proposed WEF, such as game lodges etc. The impact on tourism in the area is therefore likely to be limited.

Careful placing would reduce the overall visual impact of the proposed WEF on the areas sense of place. However, this is unlikely to change the significance rating in terms of impact on tourism. The proposed WEF may also attract visitors to the area. However, the significance of this positive impact is also likely to be minor.

Table 4.15: Potential impact on tourism

Nature: Potential impact of the WEF on local tourism						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Medium Term	Study Area	Slight	Negative	Probable	Low (-)
With Mitigation/ Enhancement	Medium Term	Study Area	Slight	Negative	Probable	Low (-)[25]

[24] Assessment rating should be viewed within the context of area being identified as a renewable energy development area.
[25] Assessment rating should be viewed within the context of area being identified as a renewable energy development area.

Comment on No-Go option
There is no impact as it maintains the current status quo.

Recommended mitigation measures
The recommendations contained in the VIA should be implemented.

4.4 ASSESSMENT OF POWER LINES AND SUBSTATIONS

33kV overhead power lines linking groups of wind turbines to onsite 33/132kV substation(s). A number of potential electrical 33kV power lines will be required in order to connect wind turbines to the preferred onsite substation. The facility will consist of both above and below ground 33kV electrical infrastructure depending on what will require the shortest distance and result in the least amount of impacts to the environment. A total of seven substation alternatives have been identified, Alternative 1-7. The total footprint of the substation will be ~ 200mx200m.

With the exception of two substations sites, namely one located approximately 600m to the north east of Hartjieskraal farmstead (Alternative 7), and one 1.4 km to the south of Fortuin (Alternative 1), the remaining five substation sites are proposed on the more inaccessible portions of farms, at some distance from the relevant farmsteads. While none of the owners – including those of Hartjieskraal or Fortuin – raised any concerns or issues with regard to the proposed location of turbines or substations, it is recommended that substation site should not be located near existing dwellings. Alternative 1 and 7 are therefore not supported. In terms of access Alternative 2 appears to be the best option.

Based on the findings of the SIA the potential social impacts associated with the overhead power lines and substations will therefore be limited, specifically within the context of the establishment of the wind turbines associated with the proposed WEF. In addition the majority of the power lines are confined to the site. The connection to the Eskom grid form part of separate Basic Assessment process and it not assessed as part of the SIA.

However, the final route selection of the power lines and location of the substation should be informed by current location of farm dwellings on the site and the findings of the VIA, and the botantical and agricultural assessments.

Table 4.16: Potential impacts associated with power lines and substation

Nature: Potential visual impacts associated with power lines and substation						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Medium Term	Study Area	Slight	Negative	Probable	Low (-)
With Mitigation/ Enhancement	Medium Term	Study Area	Slight	Negative	Probable	Low (-)

Comment on No-Go option
There is no impact as it maintains the current status quo.

Recommended mitigation measures
- The final route selection of the power lines and location of the substation should be informed by current location of farm dwellings on the site and the findings of the VIA and soil study.

4.5 ASSESSMENT OF ACCESS ROADS AND CONSTRUCTION CAMPS

Three access road alternatives, namely alternative 1, 2 and 3, and thirteen construction camp alternatives, namely alternative 1-4 and 6-14, have been identified. Based on the findings of the SIA none of the local farm owners raised any concerns regarding the proposed access road alternatives. However, Access Road Alternative 1 is the preferred access for the Brandvalley WEF. In addition Alternative 1 also provides access for the shared construction camp proposed by Mr le Roux, the owner of Fortuin. This site is located near the intersection of the R354 and the Ou Mure Road and corresponds to Alterative 3 associated with the Brandvalley WEF (see Figure 4.1). The proposal by Mr le Roux is also supported by the owner of Nuwerus, Mr Loots. The disturbance associated with the establishment of a construction camp for the proposed Brandvalley and Rietkloof WEFs projects would therefore be confined to a single area. In addition, the location of Alternative 3 close to the R354 reduces the movement of traffic and construction workers into relatively remote areas.

The owner of Hartjieskraal, Mr Marais, indicated that Alternative 1 and 14 would damage the best potential cropping area on his property, namely a large flat area to the south of the Voetpadskloof stream, a tributary of the Barendskloof River. Mr Marais has proposed a site located to the west of the Barendkloof River, on slightly uneven terrain (Figure 4.2). This area corresponds to Alternative 11. Based on the findings of the SIA Construction Camp Alternative Areas 4, 6, 7, 8, 9 and 10 are not supported. It would appear that Construction Camp Alternative Areas 2, 3, 11 and 13 are suitable site alternatives. Alternative 12 is, however, located adjacent to the R 354 and has the potential to create visual impacts for passing motorists. The option of establishing a shared site with the Brandvalley WEF near the intersection of the R354 and the Ou Mure Road that corresponds to Alterative 3 associated with the Brandvalley WEF should also be considered.

Table 4.17: Potential impacts associated with access roads and construction camps

Nature: Potential visual impacts associated with access roads and construction camps (all alternative locations)						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Medium Term	Study Area	Slight	Negative	Probable	Low (-)
With Mitigation/ Enhancement	Medium Term	Study Area	Slight	Negative	Probable	Low (-)

Comment on No-Go option
There is no impact as it maintains the current status quo.

Recommended mitigation measures
The final selection of a site for the establishment of a construction camp and the associated access road/s should be informed by the other specialist studies and consultations with the affected landowners.

4.6 ASSESSMENT OF DECOMMISSIONING PHASE

Typically, the major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. After 20-25 years of operations, the WEF would either be decommissioned and the area rehabilitated or the structures would be replaced with more modern technology (referred to as refurbishment or re-powering). Both options would create temporary employment opportunities. In the case of refurbishment the permanent jobs would be retained. There would therefore be no job losses. In the case of decommissioning the 20 permanent jobs associated with the operational phase would be lost. The potential impacts associated with the decommissioning phase can however be effectively managed with the implementation of a retrenchment and downscaling programme.

Table 4.18: Impacts associated with decommissioning

Nature: Social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Short Term	Study Area	Moderate	Negative	Probable	Low (-)
With Mitigation/ Enhancement	Short Term	Study Area	Slight	Negative	Probable	Low (-)

Comment on No-Go option
There is no impact as it maintains the current status quo.

Recommended mitigation measures
The following mitigation measures are recommended:

- The proponent should ensure that all retrenchments conform with South African Labour Law legislation, including provision of retrenchment packages where applicable, when the WEF is decommissioned;
-
- All structures and infrastructure associated with the proposed facility should be dismantled and transported off-site on decommissioning;
- The proponent should investigate the option of establishing an Environmental Rehabilitation Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Trust Fund should be funded by a percentage of the revenue

generated from the sale of energy to the national grid over the 20 year operational life of the facility. The rationale for the establishment of a Rehabilitation Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure. Alternatively, the funds from the sale of the WEF as scrap metal should be allocated to the rehabilitation of the site.

4.7 POTENTIAL HEALTH IMPACTS

The potential health impacts typically associated with WEFs include, noise, shadow flicker and electromagnetic radiation. As indicated above, the findings of a literature review undertaken by the Australian Health and Medical Research Council published in July 2010 indicate that there is no evidence of wind farms posing a threat to human health. The research also found that wind energy is associated with fewer health effects than other forms of traditional energy generation, and may therefore in fact result in the minimization of adverse health impacts for the population as a whole (WHO, 2004).

Based on these findings it is assumed that the significance of the potential health risks posed by the proposed WEF is of low significance. However, potential noise impacts generated by the movement of the turbines have been raised as concern by a number of adjacent landowners. While adjacent landowners can choose not to look at the wind turbines, they cannot choose not to listen to them.

The noise produced by wind turbines is associated with their internal operation and the movement of the turbine blades through the air. The noise levels are dependent on a number of factors, including, the number of turbines operating, wind speed and direction. Noise levels diminish with distance from the WEF. However, while noise emissions increase with increasing wind speed, this is often, but not always, accompanied by an increase in the background noise environment. The background noise is associated with wind blowing past or through objects, such as trees or buildings. As a result, the background noise near a dwelling may be high enough to 'mask' the sound of the turbines. This may not, however, always be the case.

Concerns have also been raised regarding the potential health impacts associated with low frequency noise (rumbling, thumping) and infrasound (noise below the normal frequency range of human hearing) from wind farms. Research undertaken in Australia indicates that low frequency noise and infrasound levels generated by wind farms are normally at levels that are well below the uppermost levels required to cause any health effects. However, this does not mean that the low, subliminal noise levels that are associated with WEFs do not impact on the psychological well-being of affected parties.

The potential impacts associated with noise form the basis for a separate noise study. The SIA is therefore not in position to assess the significance of noise impacts. However, as indicated above, sensitivity to noise impacts will differ from individual to individual.

4.8 CUMULATIVE IMPACT ON SENSE OF PLACE

The Australian Wind Farm Development Guidelines (Draft, July 2010) indicate that the cumulative impact of multiple wind farm facilities is likely to become an increasingly important issue for wind farm developments in Australia. The key concerns in terms of cumulative impacts are linked to visual impacts and the impact on rural, undeveloped landscapes.

The Scottish Natural Heritage (2005) describes a range of potential cumulative landscape impacts associated with wind farms on landscapes. The relevant issues raised by the Scottish Natural Heritage Report include:

- Combined visibility (whether two or more wind farms will be visible from one location).
- Sequential visibility (e.g. the effect of seeing two or more wind farms along a single journey, e.g. road or walking trail).
- The visual compatibility of different wind farms in the same vicinity.
- Perceived or actual change in land use across a character type or region.
- Loss of a characteristic element (e.g. viewing type or feature) across a character type caused by developments across that character type.

The guidelines also note that cumulative impacts need to be considered in relation to dynamic as well as static viewpoints. The experience of driving along a tourist road, for example, needs to be considered as a dynamic sequence of views and visual impacts, not just as the cumulative impact of several developments on one location. The viewer may only see one wind farm at a time, but if each successive stretch of the road is dominated by views of a wind farm, then that can be argued to be a cumulative visual impact (National Wind Farm Development Guidelines, DRAFT - July 2010).

Research on wind farms undertaken by Warren and Birnie (2009) also highlights the visual and cumulative impacts on landscape character. The paper notes that given that aesthetic perceptions are a key determinant of people's attitudes, and that these perceptions are subjective, deeply felt and diametrically contrasting, it is not hard to understand why the arguments become so heated. Because landscapes are often an important part of people's sense of place, identity and heritage, perceived threats to familiar vistas have been fiercely resisted for centuries. The paper also identifies two factors that are important in shaping people's perceptions of wind farms' landscape impacts. The first of these is the cumulative impact of increasing numbers of wind farms (Campbell, 2008). The research found that if people regard a region as having 'enough' wind farms already, then they may oppose new proposals. The second factor is the cultural context. This relates to people's perception and relationship with the landscape. In the South African context, many South Africans have a strong connection with and affinity for the large, undisturbed open spaces that are characteristic of the South African landscape.

As indicated in Figure 4.1 there are 18 renewable energy projects, including 14 WEFs and associated power lines, located in the Komsberg REDZ area. These include the proposed Komsberg East and West WEF with a combined capacity of 280 MW that are located immediately to the east of the proposed Rietkloof WEF. The potential for cumulative impacts associated with combined visibility (whether two or more wind facilities will be visible from one location) and sequential visibility (e.g. the effect of

seeing two or more renewable energy facilities along a single journey, e.g. road or walking trail) is therefore high. In this regard Barbour and van der Merwe undertook the SIAs for the Suurplaat WEF (2010) and Hidden Valley WEF (2012). The cumulative impact of both of these WEFs was assessed to be High. However, both of these assessments were undertaken prior to the area being identified as a Renewable Energy Development Zone by the CSIR in 2015.

The assessment of cumulative impacts on the areas sense to place for the Rietkloof WEF therefore takes into account that the area has been identified as a Renewable Energy Development Zone by the CSIR as part of the DEAs SEA process. The area has therefore been identified as an area where renewable energy should be concentrated. The identification of the area as a Renewable Energy Development Zone was also taken into account by Barbour and van der Merwe in the SIA for the Gunstfontein SIA (2016).

In addition, due to the proximity of the different sites the various WEFs and associated power lines could potentially be viewed as a single large WEF as opposed to a number of separate WEFs. While viewing these WEFs as a single large facility, as opposed to separate facilities, does not reduce the overall visual impact on the scenic character of the area, it does reduce the potential cumulative impact on the landscape. Viewing each of the proposed WEFs as a single, large WEF may, some extent, reduce the cumulative impacts associated with combined visibility (whether two or more wind farms will be visible from one location) and sequential visibility (e.g. the effect of seeing two or more wind farms along a single journey, e.g. road or walking trail). The proximity of the WEFs also has the benefit of concentrating the visual impacts on the areas sense of place in to one area as opposed to impacting on a number of more spread out areas.

However, the potential impact of wind energy facilities on the landscape is an issue that does need to be considered, specifically given South African's strong attachment to the land and the growing number of wind facility applications. With regard to the area, a number of WEFs have been proposed in the Western Cape Province. The Environmental Authorities should therefore be aware of the potential cumulative impacts when evaluating applications. However, as indicated above, the proposed site falls within a Renewable Energy Development Zone (CSIR, 2015) and has therefore been identified as suitable for the establishment of WEFs.

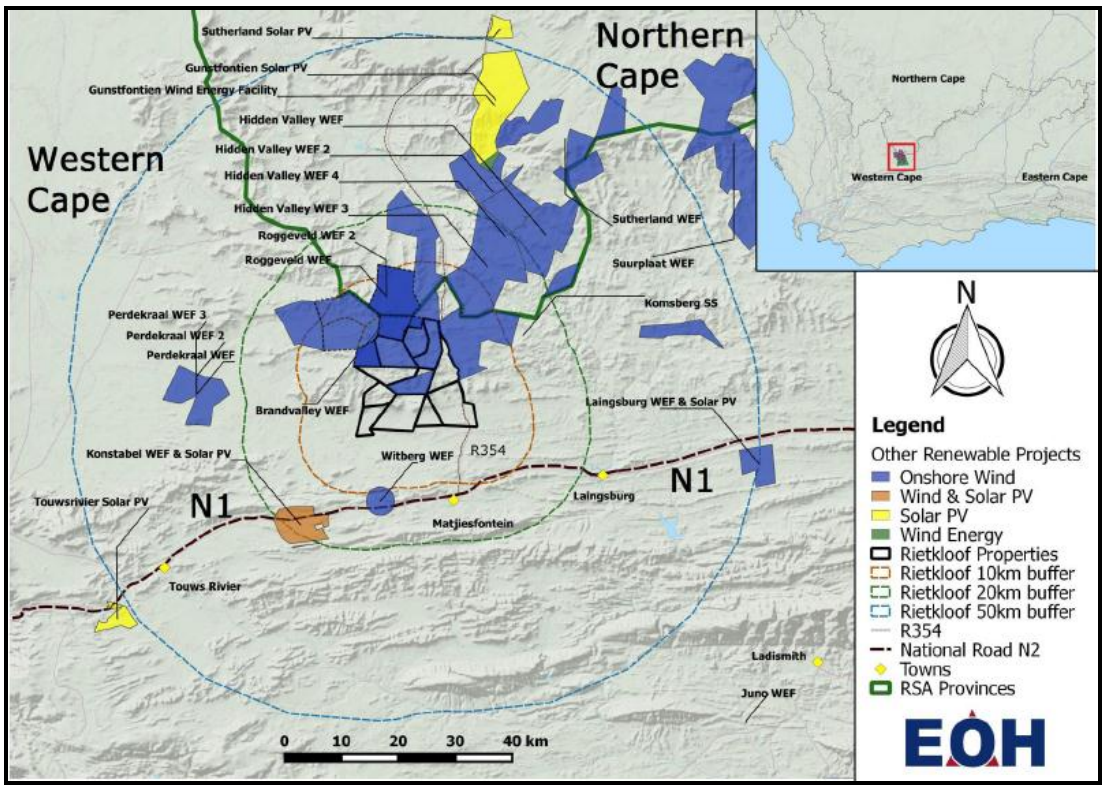

Figure 4.1: Location of approved and planned WEFs in the study area

Table 4.19: Cumulative impacts on sense of place and the landscape

Nature: Cumulative visual impacts associated with the establishment of a number of WEFs on the on the areas rural sense of place and character of the landscape						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Medium Term	Study Area	Moderate	Negative	Probable	Moderate (-)
With Mitigation/ Enhancement	Medium Term	Study Area	Moderate	Negative	Probable	Moderate (-)[26]

Comment on No-Go option
There is no impact as it maintains the current status quo.

Recommended mitigation measures
- The findings of the VIA should be implemented;
- The environmental authorities should consider the overall cumulative impact on the rural character and the areas sense of place before a final decision is taken with regard to the optimal number of such facilities in an area.

[26] The significance should be viewed within the context of area being identified as a renewable energy development area.

4.9 CUMULATIVE IMPACT ON LOCAL SERVICES AND ACCOMMODATION

The establishment of the proposed 140 MW Rietkloof WEF and the other renewable energy facilities in the Komsberg REDZ will place pressure on local services, specifically medical, education and accommodation. This pressure will be associated with the influx of workers to the area associated with the construction and operational phases of renewable energy projects proposed in the area, including the proposed Rietkloof WEF. The potential impact on local services can be mitigated by employing local community members. However, due to the low education and skills levels in the area there is likely to be a need to implement a training and skills development programme to ensure that local employment opportunities are maximised. The presence of non-local workers during both the construction and operation phase will also place pressure on property prices and rentals. As a result, local residents, such as government officials, such as municipal workers, school teachers, and the police, may no longer be able to buy or afford to rent accommodation in towns such as Sutherland and Laingsburg. However, as indicated below, this impact should also be viewed within the context of the potential positive cumulative impacts for the local economy associated with the establishment of a renewable energy hub in the area. These benefits will create opportunities for investment in Laingsburg and Sutherland, including the opportunity to up-grade and expand existing services and the construction of new houses. In this regard the establishment of a renewable energy hub will create a unique opportunity for these towns to develop.

The Community Trusts associated with each project will generate revenue that can be used by the KHLM and LLM in consultation with the Northern and Western Cape Provincial Government, to invest in up-grading local services where required (see below). In should also be noted that it is the function of national, provincial and local government to address the needs created by development and provide the required services. The additional demand for services and accommodation created by the establishment of development renewable energy projects in the Komsberg REDZ should therefore be addressed in the Integrated Development Planning process undertaken by the KHLM and LLM.

Table 4.20: Cumulative impacts on local services

Nature: The establishment of a number of renewable energy facilities in the KHLM and LLM will place pressure on local services, specifically medical, education and accommodation						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Long Term	Regional	Moderate	Negative	Probable	Moderate (-)

With Mitigation/ Enhancement[27]	Long Term	Regional	Slight	Negative	Probable	Low (-)

Comment on No-Go option
There is no impact as it maintains the current status quo.

Recommended mitigation measures
The Western and Northern Cape Provincial Governments, in consultation with the KHLM, LLM and WLM and the proponents involved in the development renewable energy projects in the Komsberg REDZ, should consider establishing a Development Forum to co-ordinate and manage the development and operation of renewable energy projects in the Komsberg REDZ, with the specific aim of mitigating potential negative impacts and enhancing opportunities. This would include identifying key needs, including capacity of existing services, accommodation and housing and the implementation of an accredited training and skills development programmes aimed at maximising the opportunities for local workers to be employed during the construction and operational phases of the various proposed projects. These issues should be addressed in the Integrated Development Planning process undertaken by the KHLM and LLM.

4.10 CUMULATIVE IMPACT ON LOCAL ECONOMY

In addition to the potential negative impacts, the establishment of the proposed 140 MW Rietkloof WEF and the other renewable energy facilities in the area has the potential to result in significant positive cumulative socio-economic opportunities for the region, which, in turn, will result in a positive social benefit. As indicated above, there are 18 renewable energy projects proposed in the study area. The positive cumulative impacts include creation of employment, skills development and training opportunities, and downstream business opportunities. The Community Trusts associated with each project will also create significant socio-economic benefits. These benefits should also be viewed within the context of the limited socio-economic opportunities in the area.

Table 4.21: Cumulative impacts on local economy

Nature: The establishment of a number of renewable energy facilities in the KHLM and LLM will create employment, skills development and training opportunities, creation of downstream business opportunities						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Long Term	Regional	Moderately Beneficial	Positive	Probable	Moderate (+)
With Mitigation/ Enhancement	Long Term	Regional	Severely Beneficial	Positive	Definite	High (+)

[27] The mitigation measures are linked to initiatives undertaken by Provincial and Local Government to address the additional demand for services and accommodation etc. created by the establishment of development renewable energy projects in the Komsberg REDZ.

Comment on No-Go option
There is no impact as it maintains the current status quo. This would represent a lost socio-economic opportunity for the KHLM and LLM.

Recommended mitigation measures
The proposed establishment of suitably sited renewable energy facilities within the KHLM and LLM should be supported.

4.11 ASSESSMENT OF NO-DEVELOPMENT OPTION

As indicated above, 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 producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer carbon emissions. The No-Development option would represent a lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producer of carbon emissions in the world, this would represent a negative social cost. However, at a provincial and national level, it should be noted that the proposed WEF development is not unique. In this regard, a significant number of other renewable energy developments are currently proposed in the Western Cape and other parts of South Africa. Foregoing the proposed establishment of WEFs would therefore not necessarily compromise the development of renewable energy facilities in the Western and Northern Cape Provinces and or South Africa. However, the socio-economic benefits for local communities in the KHLM and LLM would be forfeited. This loss should also be viewed within the context of the limited socio-economic opportunities in the area.

Table 4.22: Assessment of no-development option

Nature: The no-development option would result in the lost opportunity in terms of job and business creation and also the opportunity for South Africa to supplement is current energy needs with clean, renewable energy						
Impact	**Effect**				**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**	**Status**		
Without Mitigation/ Enhancement	Medium Term	National and Regional	Slight	Negative	Probable	Moderate (-)[28]
With Mitigation/ Enhancement	Medium Term	National and Regional	Moderate	Positive	Probable	Moderate (+)[29]

Recommended enhancement measures
The proposed WEF should be developed and the mitigation and enhancement measures identified in the SIA and other specialist studies should be implemented. However, the impact of large WEFs on the sense of place and landscape are issues that need to be addressed in the location, design and layout of the proposed facility.

[28] Assumes No Development takes place
[29] Assumes establishment of a well-managed Community Trust

SECTION 5: KEY FINDINGS AND RECOMMENDATIONS

5.1 INTRODUCTION

Section 5 lists the key findings of the study and recommendations. These findings are based on:

- A review of the issues identified during the Scoping Process;
- A review of key planning and policy documents pertaining to the area;
- Semi-structured interviews with interested and affected parties;
- A review of social and economic issues associated with similar developments;
- A review of selected specialist studies undertaken as part of the EIA;
- A review of relevant literature on social and economic impacts; and
- The experience of the authors with other wind energy projects in South Africa.

5.2 SUMMARY OF KEY FINDINGS

The key findings of the study are summarised under the following sections:

- Fit with policy and planning;
- Construction phase impacts;
- Operational phase impacts;
- Cumulative Impacts;
- Decommissioning phase impacts; and
- No-development option.

5.2.1 Policy and planning issues

The findings of the review indicated that renewable energy is strongly supported at a national, provincial and local level. At a national level the White Paper on Energy Policy (1998) notes:

- Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future; and
- The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind and that renewable applications are in fact the least cost energy service in many cases; more so when social and environmental costs are taken into account.

The IRP 2010 also allocates 43% of energy generation in South Africa to renewables. The development of and investment in renewable energy is also supported by the National Development Plan (NDP), New Growth Path Framework and National Infrastructure Plan, which all make reference to renewable energy. At a provincial level the development of renewable energy is supported by the Northern Cape Provincial Growth and Development Strategy, Northern Cape Provincial Spatial Development Framework, White Paper on Sustainable Energy for the Western Cape, Climate Change Strategy and Action Plan for the Western Cape and Western Cape Growth and Development Strategy. With regard to local level policy documents, the

Namakwa DM and Laingsburg IDP make positive reference to the potentially viable development of renewable energy sources. In addition, economic diversification, employment creation and skilling are identified in both the Hoogland Karoo and Laingsburg IDPs as urgent, crucial needs.

The findings of the review of the relevant policies and documents pertaining to the energy sector therefore indicate that the renewable energy is supported at a national, provincial and local level. It is therefore the opinion of the authors that the establishment of the proposed wind energy facility is supported by relevant policies and planning documents.

The provincial and local policy and planning documents also make reference to the importance of tourism and the region's natural resources. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as the proposed facility, does not impact on the region's natural resources and the tourism potential of the Province. However, it should be noted that the proposed Rietkloof WEF is located in an area that has been identified as a Renewable Energy Development Zone by the CSIR under the DEAs SEA process. The area has therefore been identified as an area where renewable energy should be concentrated.

5.1.1 Construction phase impacts

The key social issues associated with the construction phase include:

Potential positive impacts

- Creation of employment and business opportunities, and opportunity for skills development and on-site training;
- Benefits associated with providing technical advice on wind energy to local farmers and municipalities;
- Improved cell phone reception.

The construction phase for a single 140 MW WEF is expected to extend over a period of 20-24 months and create approximately ~ 250 (full-time equivalent) employment opportunities. It is anticipated that approximately 55% (136) of the employment opportunities will be available to low skilled workers (construction labourers, security staff etc.), 30% (76) to semi-skilled workers (drivers, equipment operators etc.) and 15% (38) for skilled personnel (engineers, land surveyors, project managers etc.). The majority of the low and semi-skilled employment opportunities will be available to local residents in the area, specifically residents from Sutherland and Laingsburg. The majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community. This would represent a significant positive social benefit in an area with limited employment opportunities. In order to maximise the potential benefits the developer should commit to employing local community members to fill the low and medium skilled jobs.

The capital expenditure associated with the construction phase for a 140 MW WEF will be in the region of R 2.5 billion (2016 Rand value). The total wage bill for a 140 MW WEF will be in the region of R 69 million (2016 Rand value). A percentage of the wage bill will be spent in the local economy which will create opportunities for local businesses in the towns of Sutherland and Laingsburg. The sector of the local economy that is most likely to benefit from the proposed development is the local service industry. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport and security, etc. associated

with the construction workers on the site. The benefits to the local economy will be confined to the construction period (20-24 months).

Local farmers and municipalities would also benefit from advice on wind energy provided by technical experts involved in the establishment of the WEF. This could assist to reduce reliance on coal generated energy and increase the use of renewable energy.

Potential negative impacts

- Impacts associated with the presence of construction workers on local communities;
- Impacts related to the potential influx of job-seekers;
- Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site;
- Increased risk of grass fires associated with construction related activities;
- Noise, dust, waste and safety impacts associated with construction related activities and vehicles;
- Impact on grazing and productive farmland.
- Impact on tourism.

The findings of the SIA indicate that the significance rating for all of the potential negative impacts with mitigation is **Low Negative**. All of the potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. However, in order to effectively mitigate the impact of construction workers on the local community of Laingsburg and Sutherland will require a commitment to employing local community members.

Table 5.1 summarises the significance of the impacts associated with the construction phase.

Table 5.1: Summary of social impacts during construction phase

Impact	Significance No Mitigation/ Enhancement	Significance With Mitigation/ Enhancement
Creation of employment and business opportunities	Low (+)	Moderate (+)
Benefits associated with providing technical advice to local farmers and municipalities	N/A	Moderate (+)
Presence of construction workers and potential impacts on family structures and social networks	Low (-)	Low (-)
Influx of job seekers	Low (-)	Low (-)
Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site	Moderate (-)	Low (-)
Increased risk of grass fires	Moderate (-)	Low (-)
Impact of heavy vehicles and construction activities	Moderate (-)	Low (-)
Loss of productive farmland	Moderate (-)	Low (-)
Impact on tourism	Low (-)	Low (-)

5.2.2 Operational phase

The key social issues affecting the operational phase include:

Potential positive impacts
- Creation of employment and business opportunities. The operational phase will also create opportunities for skills development and training;
- Generation of income for local landowners and farmers;
- Benefits associated with the establishment of a Community Trust; and
- The establishment of renewable energy infrastructure.

The total number of permanent employment opportunities associated with a 140 MW WEF would be ~ 20. Of this total ~ 4 are low skilled workers, 10 semi-skilled and 6 skilled. The annual wage bill for the operational phase will be ~ R 2 million (2016 Rand value). The majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community. Given the location of the proposed facility the majority of permanent staff is likely to reside in Sutherland and or Laingsburg.

The proposed WEF will also generate revenue for the local farmers on whose land the turbines are located. This will represent a valuable source of income for these landowners, specifically given the challenges faced by farming in the area.

The establishment of a Community Trust also creates an opportunity to support local economic development in the area. Community Trusts provide an opportunity to generate a steady revenue stream that is guaranteed for a 20 year period. The revenue from the proposed WEF can be used to support a number of social and economic initiatives in the area, including:

- Creation of jobs;
- Education;
- Support for and provision of basic services;
- School feeding schemes;
- Training and skills development; and
- Support for SMME's.

The long term duration of the revenue stream associated with a WEF linked Community Trust also enables local municipalities and communities to undertake long term planning for the area. Experience has however also shown that Community Trusts can be mismanaged. This issue will need to be addressed in order to maximise the potential benefits associated with the establishment of a Community Trust.

The proposed development also represents an investment in infrastructure for the generation of clean, renewable energy, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.

Potential negative impacts
- Loss of productive agricultural land;
- The visual impacts and associated impact on sense of place; and
- Potential impact on tourism.

The findings of the SIA indicate that the significance of the majority of potential negative impacts with mitigation were **Low Negative**. The majority of potential negative impacts can therefore be effectively mitigated if the recommended

mitigation measures are implemented. The significance of the visual impact was rated **Medium Negative.** The visual impacts on landscape character associated with large renewable energy facilities, such as WEFs, are highlighted in the research undertaken by Warren and Birnie (2009). In the South African context, many South Africans have a strong connection with and affinity for the large, undisturbed open spaces that are characteristic of the South African landscape. The impact of large, WEFs on the landscape is therefore likely to be a key issue in South Africa, specifically given South African's strong attachment to the land and the growing number of renewable energy applications. However, it should be noted that the proposed Rietkloof WEF is located in an area that has been identified as a Renewable Energy Development Zone by the CSIR under the DEAs SEA process. The area has therefore been identified as an area where renewable energy should be concentrated.

Table 5.2 summarises the significance of the impacts associated with the operational phase.

Table 5.2: Summary of social impacts during operational phase

Impact	Significance No Mitigation/ Enhancement	Significance With Mitigation/ Enhancement
Creation of employment and business opportunities	Low (+)	Moderate (+)
Generation of income for landowners	Low (+)	Moderate (+)
Establishment of Community Trust	Moderate (+)	High (+)
Promotion of renewable energy projects	Moderate (-)	Moderate (+)
Visual impact and impact on sense of place	Moderate (-)	Moderate (-)[30]
Impact on tourism	Low (-)	Low (-)

5.2.3 Assessment of cumulative impacts

Cumulative impact on sense of place

In the region of 18 renewable energy projects, including 14 WEFs, are proposed in the Komsberg REDZ area. The potential for cumulative impacts associated with combined visibility (whether two or more wind energy facilities will be visible from one location) and sequential visibility (e.g. the effect of seeing two or more renewable energy facilities along a single journey, e.g. road or walking trail) is therefore high. However, this should be viewed within the context of the identification of the area as a renewable energy development zone. The area has therefore been identified as an area where renewable energy should be concentrated.

In addition, due to the proximity of the different sites the various WEFs could be viewed as a single large WEF as opposed to a number of separate WEFs. While viewing these WEFs as a single large facility, as opposed to separate facilities, does not reduce the overall visual impact on the scenic character of the area, it does reduce the potential cumulative impact on the landscape. Viewing each of the proposed WEFs as a single, large WEF has the potential to reduce the cumulative impacts associated with combined visibility (whether two or more wind farms will be visible from one location) and sequential visibility (e.g. the effect of seeing two or more wind farms along a single journey, e.g. road or walking trail). The proximity of

[30] The significance should be viewed within the context of area being identified as a renewable energy development area.

the WEFs also has the benefit of concentrating the visual impacts on the areas sense of place in to one area as opposed to impacting on a number of more spread out areas. Despite this the cumulative impact on the areas sense of place is rated as **Moderate Negative**. This significance rating should be viewed within the context of the proposed Rietkloof WEF location within an area that has been identified as a Renewable Energy Development Zone by the CSIR under the DEAs SEA process. The area has therefore been identified as an area where renewable energy should be concentrated.

Cumulative impact on services
The establishment of the proposed Rietkloof WEF and the other renewable energy facilities in the Komsberg REDZ will place pressure on local services in the townsw of Sutherland and Laingsburg, specifically medical, education and accommodation. This pressure will be associated with the influx of workers to the area associated with the construction and operational phases of the renewable energy projects proposed in the area, including the proposed Rietkloof WEF. The potential impact on local services can be mitigated by employing local community members. The presence of non-local workers during both the construction and operation phase will also place pressure on property prices and rentals. As a result, local residents, such as government officials, such as municipal workers, school teachers and the police, may no longer be able to buy or afford to rent accommodation in towns such as Sutherland and Laingsburg. With effective mitigation the impact is rated as **Low Negative.**

However, as indicated below, this impact should also be viewed within the context of the potential positive cumulative impacts for the local economy associated with the establishment of a renewable energy hub in the area. These benefits will create opportunities for investment in Laingsburg and Sutherland, including the opportunity to up-grade and expand existing services and the construction of new houses. In this regard the establishment of a renewable energy hub will create a unique opportunity for these towns to develop. In should also be noted that it is the function of national, provincial and local government to address the needs created by development and provide the required services. The additional demand for services and accommodation created by the establishment of development renewable energy projects in the Komsberg REDZ should therefore be addressed in the Integrated Development Planning process undertaken by the KHLM and LLM.

Cumulative impact on local economies
In addition to the potential negative impacts, the establishment of the proposed WEF and other renewable energy projects in the area also has the potential to create a number of socio-economic opportunities for the Karoo Hoogland Local Municipality (KHLM) and Laingsburg Local Municipality (LLM), which, in turn, will result in a positive social benefit. The positive cumulative impacts include creation of employment, skills development and training opportunities, creation of downstream business opportunities. This benefit is rated as **High Positive** with enhancement.

5.2.4 Power line and substation options

With the exception of two substations sites, namely one located approximately 600m to the north east of Hartjieskraal farmstead (Alternative 7), and one 1.4 km to the south of Fortuin (Alternative 1), the remaining five substation sites are proposed on the more inaccessible portions of farms, at some distance from the relevant farmsteads. While none of the owners – including those of Hartjieskraal or Fortuin – raised any concerns or issues with regard to the proposed location of turbines or

substations, it is recommended that substation site should not be located near existing dwellings. Alternative 1 and 7 are therefore not supported. In terms of access Alternative 2 appears to be the best option.

Based on the findings of the SIA the potential social impacts associated with the overhead power lines and substations will be limited, specifically within the context of the establishment of the wind turbines associated with the proposed WEF. In addition the majority of the power lines are confined to the site. The connection to the Eskom grid form part of separate Basic Assessment process and it not assessed as part of the SIA.

The final route selection of the power lines and location of the substation should be informed by current location of farm dwellings on the site and the findings of the VIA, and the botanical and agricultural assessments.

5.2.5 Access road and construction camps

Three access road alternatives, namely alternative 1, 2 and 3, and 13 construction camp alternatives, namely alternative 1-4 and 6-14, have been identified. Based on the findings of the SIA none of the local farm owners raised any concerns regarding the proposed access road alternatives. However, Access Road Alternative 1 is the preferred access for the Brandvalley WEF. In addition Alternative 1 also provides access for the shared construction camp proposed by Mr le Roux, the owner of Fortuin as discussed below.

The location of construction camps was however raised as a key concern by a number of landowners. Concerns were raised by the owners of Fortuin (Andries le Roux), Hartjieskraal (Ernst Marais) and Nuwerus (Ziegfried Loots). The relevant owners indicated that the proposed sites are too close to the farm yard (Fortuin), would damage good grazing areas (Nuwerus) or damage a potential cropping area (Hartjieskraal). All three owners proposed alternative locations. This site is located near the intersection of the R354 and the Ou Mure Road and corresponds to Alterative 3 associated with the Brandvalley WEF. The proposal by Mr le Roux is also supported by the owner of Nuwerus, Mr Loots. Based on this information Construction Camp Alternative Areas 4, 6, 7, 8, 9 and 10 are not supported by the findings of the SIA.

The owner of Hartjieskraal, Mr Marais, indicated that Alternative 1 and 14 would damage the best potential cropping area on his property. Mr Marais has proposed a site located to the west of the Barendkloof River, on slightly uneven terrain. This area corresponds to Alternative 11.

Based on the findings of the SIA it would appear that Construction Camp Alternative Areas 2, 3, 11 and 13 are suitable site alternatives. However, Alternative 12 is located adjacent to the R 354 and has the potential to create visual impacts for passing motorists. The option of establishing a shared site with the Brandvalley WEF near the intersection of the R354 and the Ou Mure Road that corresponds to Alterative 1 associated with the Brandvalley WEF should be considered. The disturbance associated with the establishment of a construction camp for the proposed Brandvalley and Rietkloof WEFs projects would therefore be confined to a single area.

5.2.6 Potential health impacts

The potential health impacts typically associated with WEFs include, noise, shadow flicker and electromagnetic radiation. As indicated above, the findings of a literature review undertaken by the Australian Health and Medical Research Council published in July 2010 indicate that there is no evidence of wind farms posing a threat to human health. The research also found that wind energy is associated with fewer health effects than other forms of traditional energy generation (WHO, 2004). Based on these findings it is assumed that the significance of the potential health risks posed by the proposed WEF is of **Low Negative** significance.

5.2.7 Assessment of no-development option

The No-Development option would represent a lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producer of carbon emissions in the world, this would represent a High negative social cost. The no-development option also represents a lost opportunity in terms of the employment and business opportunities (construction and operational phase) associated with the proposed Rietkloof WEF, and the benefits associated with the establishment of a Community Trust. This also represents a negative social cost.

However, at a provincial and national level, it should be noted that the proposed WEF is not unique. In this regard, a significant number of renewable energy developments, including WEFs, are currently proposed in the Western Cape and South Africa. Foregoing the development of the proposed Rietkloof WEF would therefore not necessarily compromise the development of renewable energy facilities in the Western Cape and or South Africa. However, the socio-economic benefits the local communities in the KHLM and LLM would be forgone. The significance of this opportunity cost to the local communities is rated as **Moderate Negative.**

5.2.8 Decommissioning phase

Typically, the major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. After 20-25 years of operations, the WEF would either be decommissioned and the area rehabilitated or the structures would be replaced with more modern technology (referred to as refurbishment or re-powering). Both options would create temporary employment opportunities. In the case of refurbishment the permanent jobs would be retained. There would therefore be no job losses. In the case of decommissioning the 20 permanent jobs associated with the operational phase would be lost.

The potential impacts associated with the decommissioning phase can however be effectively managed with the implementation of a retrenchment and downscaling programme. With mitigation, the impacts are assessed to be **Low Negative.** The proponent should also investigate the option of establishing an Environmental Rehabilitation Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 20-25 year operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure. Alternatively, the funds from

the sale of the WEF as scrap metal should be allocated to the rehabilitation of the site.

5.3 CONCLUSIONS AND RECOMMENDATIONS

The findings of the SIA indicate that the development of the proposed Rietkloof WEF will create employment and business opportunities for locals during both the construction and operational phase of the project. The establishment of a Community Trust will also benefit the local community. The enhancement measures listed in the report should be implemented in order to maximise the potential benefits. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole. In addition, the majority of the potential negative impacts, including the impacts associated with construction workers and the influx of job seekers, can be effectively mitigated. It is therefore recommended that the Rietkloof WEF be supported, subject to the implementation of the recommended mitigation measures and management actions contained in the SIA report. In this regard it is recommended that the Western and Northern Cape Provincial Governments, in consultation with the KHLM and LLM and the proponents involved in the development of renewable energy projects in the Komsberg REDZ, consider the establishment of a Development Forum to co-ordinate and manage the development and operation of renewable energy projects in the Komsberg REDZ, with the specific aim of mitigating potential negative impacts and enhancing opportunities.

In terms of preferred layout alternatives, the alternative with the lowest potential visual impact on adjacent farms is regarded as the preferred alternative. The placement of turbines should therefore be informed by the findings of the other specialist studies, specifically the VIA and agricultural assessment.

5.4 IMPACT STATEMENT

The findings of the SIA undertaken for the proposed Rietkloof WEF indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project. The establishment of a Community Trust will also benefit the area. It is therefore recommended that the Rietkloof WEF be supported, subject to the implementation of the recommended mitigation measures and management actions contained in the report and other key specialist studies, specifically the VIA and agricultural assessments.

ANNEXURE A

INTERVIEWS

- Kriel, Mr. Johan (07-03-2016). Vogelstruisfontein 81.
- Le Roes, Mr. Jaco (telephonic 07-03-2016). Snyders Kloof 1/80.
- Le Roux, Mr Andries (08-03-2016; telephonic 10-03-2016). Fortuin RE/ 74; Fortuin 3/74.
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ANNEXURE B

METHODOLOGY FOR ASSESSING IMPACTS AND ALTERNATIVES

The relationship of the issue to the temporal scale, spatial scale and the severity are combined to describe the overall importance rating, namely the significance.

- Relationship of the impact to **temporal** scales - the temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact;
- Relationship of the impact to **spatial** scales - the spatial scale defines the physical extent of the impact;
- The severity of the impact - the **severity/beneficial** scale is used in order to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on a particular affected system (for ecological impacts) or a particular affected party. The severity of impacts can be evaluated with and without mitigation in order to demonstrate how serious the impact is when nothing is done about it. The word 'mitigation' means not just 'compensation', but also the ideas of containment and remedy. For beneficial impacts, optimization means anything that can enhance the benefits. However, mitigation or optimization must be practical, technically feasible and economically viable;
- The **likelihood** of the impact occurring - the likelihood of impacts taking place as a result of project actions differs between potential impacts. There is no doubt that some impacts would occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.

Each criterion is ranked with scores assigned as presented in Table 1 to determine the overall **significance** of an activity. The criterion is then considered in two categories, viz. effect of the activity and the likelihood of the impact. The total scores recorded for the effect and likelihood are then read off the matrix presented in Table 2, to determine the overall significance of the impact (Table 3). The overall significance is either negative or positive.

The ***environmental significance*** scale is an attempt to evaluate the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can either be ecological or social, or both. The evaluation of the significance of an impact relies heavily on the values of the person making the judgment. For this reason, impacts of especially a social nature need to reflect the values of the affected society.

Negative impacts that are ranked as being of "**VERY HIGH**" and "**HIGH**" significance will be investigated further to determine how the impact can be minimised or what alternative activities or mitigation measures can be implemented. These impacts may also assist decision makers i.e. lots of **HIGH** negative impacts may bring about a negative decision.

For impacts identified as having a negative impact of "**MODERATE**" significance, it is standard practice to investigate alternate activities and/or mitigation measures. The most effective and practical mitigations measures will then be proposed.

For impacts ranked as "**LOW**" significance, no investigations or alternatives will be considered. Possible management measures will be investigated to ensure that the impacts remain of low significance.

Table 1: Criterion used to rate the significance of an impact

EFFECT	**Temporal scale**			**Score**
	Short term	Less than 5 years		**1**
	Medium term	Between 5 and 20 years		**2**
	Long term	Between 20 and 40 years (a generation) and from a human perspective almost permanent.		**3**
	Permanent	Over 40 years and resulting in a permanent and lasting change that will always be there		**4**
	Spatial Scale			
	Localised	At localised scale and a few hectares in extent		**1**
	Study area	The proposed site and its immediate environs		**2**
	Regional	District and Provincial level		**3**
	National	Country		**3**
	International	Internationally		**4**
	Severity		**Benefit**	
	Slight / Slightly Beneficial	Slight impacts on the affected system(s) or party (ies)	Slightly beneficial to the affected system(s) or party (ies)	**1**
	Moderate / Moderately Beneficial	Moderate impacts on the affected system(s) or party(ies)	An impact of real benefit to the affected system(s) or party (ies)	**2**
	Severe / Beneficial	Severe impacts on the affected system(s) or party (ies)	A substantial benefit to the affected system(s) or party (ies)	**4**
	Very Severe / Very Beneficial	Very severe change to the affected system(s) or party(ies)	A very substantial benefit to the affected system(s) or party (ies)	**8**
LIKELIHOOD	**Likelihood**			
	Unlikely	The likelihood of these impacts occurring is slight		**1**
	May Occur	The likelihood of these impacts occurring is possible		**2**
	Probable	The likelihood of these impacts occurring is probable		**3**
	Definite	The likelihood is that this impact will definitely occur		**4**

Table 2: The matrix that will be used for the impacts and their likelihood of occurrence

Likelihood		Effect													
		3	4	5	6	7	8	9	10	11	12	13	14	15	16
	1	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	2	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	3	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	4	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Table 3: The significance rating scale

Significance Rate	Description	Score
Low	An acceptable impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in either positive or negative medium to short term effects on the social and/or natural environment.	4-8
Moderate	An important impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in either a positive or negative medium to long-term effect on the social and/or natural environment.	9-12
High	A serious impact, if not mitigated, may prevent the implementation of the project (if it is a negative impact). These impacts would be considered by society as constituting a major and usually a long-term change to the (natural &/or social) environment and result in severe effects or beneficial effects.	13-16
Very High	A very serious impact which, if negative, may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are unmitigatable and usually result in very severe effects, or very beneficial effects.	17-20