

TRANSPORT STUDY:
**Basic Assessment for the Proposed Development of
the 325MW Kudusberg Wind Energy Facility and
associated infrastructure, between Matjiesfontein
and Sutherland in the Western and Northern Cape
Provinces: BA REPORT**

Report prepared for:

CSIR – Environmental Management Services

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SYNOPSIS
 Preparation of a Transport Study for the Basic Assessment for the proposed development of the 325 MW Kudusberg Wind Energy Facility near Sutherland, in the Northern Cape, pertaining to all relevant traffic and transportation engineering aspects.

KEY WORDS:
 Wind Energy Facility, Transport Study

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QUALITY VERIFICATION

This report has been prepared under the controls established by a quality management system that meets the requirements of ISO9001: 2008 which has been independently certified by DEKRA Certification under certificate number 90906882



Verification	Capacity	Name	Signature	Date
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Checked by:	Associate	Iris Wink		
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Filename:	X\4880\04\4880 Kudusberg WEF TIA JG Afrika
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SPECIALIST EXPERTISE

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Qualifications	PrEng, MSc Eng (Civil & Transportation)
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Years with Firm	6 Years

SUMMARY OF EXPERIENCE

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- SARF** - South African Road Federation: Committee Member of Council

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JG Afrika (Pty) Ltd (Previously Jeffares & Green (Pty) Ltd)

2016 – Date

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- **Traffic and Parking Audits** for the Suburb of Groenvallei in Cape Town – Client: City of Cape Town Department of Property Management.

- **Road Safety Audit** for the Upgrade of N1 Section 4 Monument River – Client: Aurecon on behalf of SANRAL
- **Sonop Windfarm** – Traffic Impact Assessment for the Sonop Windfarm, Coega, Port Elizabeth – Client: Founders Engineering
- **Universal Windfarm** - Traffic Impact Assessment for the Universal Windfarm, Coega, Port Elizabeth – Client: Founders Engineering
- **Road Safety Audit** for the Upgrade of N2 Section 8 Knysna to Wittedrift – Client: SMEC on behalf of SANRAL
- **Road Safety Audit** for the Upgrade of N1 Section 16 Zandkraal to Winburg South – Client: SMEC on behalf of SANRAL
- **Traffic and Road Safety Studies** for the Improvement of N7 Section 2 and Section 3 (Rooidraai and Piekenierskloof Pass) – Client: SANRAL
- **Road Safety Appraisals** for Northern Region of Cape Town – Client: Aurecon on behalf of City of Cape Town (TCT)
- **Traffic Engineering Services** for the Enkanini Informal Settlement, Kayamandi - Client: Stellenbosch Municipality
- **Lead Traffic Engineer** for the Upgrade of a 150km Section of the National Route N2 from Kangelala to Pongola in KwaZulu-Natal, Client: SANRAL
- **Traffic Engineering Services** for the Kosovo Informal Settlement (which is part of the Southern Corridor Upgrade Programme), Client: Western Cape Government
- **Traffic and Road Safety Studies** for the proposed Kosovo Informal Housing Development (part of the Southern Corridor Upgrade Program), Client: Western Cape Government.
- **Road Safety Audit** Stage 3 – Upgrade of the R573 Section 2 between Mpumalanga/Gauteng and Mpumalanga/Limpopo, Client: AECOM on behalf of SANRAL
- **Road Safety Audit** Stage 1 and 3 – Upgrade of the N2 Section 5 between Lizmore and Heidelberg, Client: Aurecon on behalf of SANRAL
- **Traffic Safety Studies** for Roads Upgrades in Cofimvaba, Eastern Cape – Client: Cofimvaba Municipality
- **Road Safety Audit** Stage 1 and 3 – Improvement of Intersections between Olifantshoek and Kathu, Northern Cape, Client: Nadeson/Gibb on behalf of SANRAL
- **Road Safety Audit** Stage 3 – Upgrade of the Beacon Way Intersection on the N2 at Plettenberg Bay, Client: AECOM on behalf of SANRAL
- **Traffic Impact Assessment** for a proposed Primary School at Die Bos in Strand, Somerset West, Client: Edifice Consulting Engineers
- **Road Safety Audit** Stage 1 and 3 – Improvement of R75 between Port Elizabeth and Uitenhage, Eastern Cape, Client: SMEC on behalf of SANRAL

SPECIALIST DECLARATION

I, IRIS WINK, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist: _____  _____

Name of Specialist: IRIS WINK

Date: 13 September 2018

EXECUTIVE SUMMARY

This transport study was commissioned to assess the potential impact of activities related to the delivery of the turbine components and associated supporting infrastructure to site for the construction, operation and decommissioning phases of the proposed Kudusberg Wind Energy Facility (WEF).

It is assumed that the wind turbine components will be imported to South Africa via the Port of Saldanha, although the Port of Ngqura is a viable alternative. The preferred route from the Port of Saldanha utilizes existing National and Provincial Roads as far as possible, Alternative routes were assessed but these routes have geometrical constraints and includes large sections of gravel roads that will require upgrading.

Two site access routes have been proposed and both alternatives were considered acceptable. However, the access road alternative 1 is the preferred access alternative as it is an existing jeep track.

The main transport impacts will be during the construction and decommissioning phases of a WEF where the delivery of the infrastructure will generate significant traffic. The duration of these phases is short term i.e. the impact of the traffic on the surrounding road network is temporary and when the WEF is operational, do not add any significant traffic to the road network. The traffic impact on the surrounding network is therefore deemed low.

Traffic generated by the construction activities of the WEF will have a significant impact on the road infrastructure, albeit of a short-term nature. Additionally, the construction of the WEF will create dust and noise pollution that will have a moderate (short term) impact during the construction and decommissioning phases. Proposed mitigation measures include:

- Staggered delivery and trips can be scheduled to occur outside of peak traffic periods in line with the prevailing legislation for transportation of abnormal loads;
- Dust suppression during the construction and decommissioning phases, as required;
- Regular maintenance of gravel roads during the construction and decommissioning phases by the Contractor;
- The use of mobile batching plants, or a batching plant in close proximity to the site and quarries in close proximity to the site would decrease the impact on the surrounding road network; and
- Staff and general trips should occur outside of peak traffic periods as far as possible.

The no-go alternative implies that the proposed development of the Kudusberg WEF will not proceed. This would mean that there will be no negative environmental impacts and no traffic impact on the surrounding network. However, this would also mean that there would be no socio-economic benefits to the surrounding communities and it will not assist government in meeting the targets for renewable energy. Hence, the no-go alternative is not a preferred alternative.

The development is supported from a transport perspective provided that the recommendations and mitigations are adhered to.

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain-	Yes. See attached CV
a) details of-	
i. the specialist who prepared the report; and	
ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Yes. See attached declaration
c) an indication of the scope of, and the purpose for which, the report was prepared;	Yes. See section 1.1
(cA) an indication of the quality and age of base data used for the specialist report;	n/a
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Yes. See section 1.6
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	n/a
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Yes. See section 1.1
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Yes. Section 1.3
g) an identification of any areas to be avoided, including buffers;	Yes. Section 1.3
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	n/a
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Yes. Section 1.1
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment or activities;	Yes. Section 1.5
k) any mitigation measures for inclusion in the EMPr;	Yes. Section 1.6
l) any conditions for inclusion in the environmental authorisation;	n/a
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	n/a
n) a reasoned opinion-	Yes. Section 1.6
i. as to whether the proposed activity, activities or portions thereof should be authorised;	
(iiA) regarding the acceptability of the proposed activity or activities; and	
ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	n/a
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	n/a
q) any other information requested by the competent authority.	n/a
2) Where a government notice <i>gazetted</i> by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	n/a

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1 TRANSPORT STUDY

1.1 INTRODUCTION AND METHODOLOGY

1.1.1. Scope and Objectives

Kudusberg Wind Farm (Pty) Ltd (hereafter “Kudusberg”) is proposing to develop the 325 MW Kudusberg Wind Energy Facility (WEF) between Sutherland and Matjiesfontein in the Northern Cape and Western Cape Provinces. The site is envisaged to accommodate a maximum of 56 wind turbines.

As part of the Basic Assessment (BA) undertaken by the Council for Scientific and Industrial Research (CSIR), the services of a Transportation Specialist are required to conduct a respective Transportation Study.

The main objective of this report is to undertake the Transport Impact Assessment (TIA, including the traffic and transport risk assessments and a route investigation) for the proposed Kudusberg WEF site.

The following two main transportation activities will be investigated:

- Abnormal load vehicles transporting wind turbine components to the site.
- The transportation of construction materials, equipment and people to and from the site/facility.

The transport study plan will aim to provide the following objectives:

- Activities related to traffic movement for the construction, operation (maintenance) and decommissioning phases of the WEF.
- Provide a main route for the transportation of the wind turbine components from the entry point to the proposed site.
- Provide a preliminary transportation route for the transportation of materials, equipment and people to site.

A revised layout was provided by G7 on 15 October 2018 which contained minor changes to the turbine layout, access road alternative 1, construction camps and crane pads. The small changes in the layout, specifically the small change in the alignment of access road alternative 1 as this is related to the Transport Study, does not have any impact on the finding of the original report.

1.1.1 Terms of Reference

The Terms of Reference for this Transport Study include the following:

- Adhere to the requirements of specialist studies in terms of Appendix 6 of the NEMA EIA Regulations (2014), as amended;
- Identify and assess the potential impacts of the proposed Kudusberg WEF project and its associated infrastructure by assessing the impacts during the construction, operational and decommissioning phases;
- Identify and assess cumulative impacts from other Wind and Solar PV projects located within a 50 km radius from the Kudusberg WEF that already have received Environmental Authorisation (EA), are preferred bidders and/or may still be identified as having received a positive Environmental Authorisation at the start of this BA process;
- Propose mitigation measures to address possible negative effects and to enhance positive impacts to increase the benefits derived from the project;
- Use the Impact Assessment Methodology as provided by the CSIR;
- Assess the project alternatives and the no-go alternative; and

- Provide a recommendation as to whether the project must receive Environmental Authorisation of not and Identify any aspects which are conditional to the findings of the assessment which are to be included as conditions of the Environmental Authorisation.

Specific Terms of Reference:

- Description of the local and potentially affected road network, including planning and comment on the road condition, where information is available;
- Description of latent developments in the vicinity of the facility that may also have an impact on the local road network;
- Assessment of the required site access, parking and internal circulation;
- Assessment of expected trip generation (construction & operational phases);
- Capacity analysis (construction & operational phases);
- An assessment of the expected total E80's (heavy axle loading) for the life cycle of the facility;
- Assessment of public transport and non-motorised transport;
- Traffic impact on external road network;
- Accessibility and turning requirements;
- National and local haulage routes between port of entry/manufacturer and site;
- Assessment of internal roads and site access;
- Assessment of freight requirements and permitting needed for abnormal loads; and
- Traffic accommodation during construction.

1.1.2 Approach and Methodology

The report deals with the traffic impact on the surrounding road network in the vicinity of the site during the construction of the access roads, construction and installation of the turbines, during maintenance in the operational phase as well during the decommissioning phase.

This transport study was informed by the following:

Site Visit and Project Assessment

- Site visit and initial meeting with the client to gain sound understanding of the project and
- Research of all available documentation and information relevant to the proposed facility.

Correspondence with Authorities

- Correspondence with the relevant Authorities dealing with the external road network, such as SANRAL and the relevant provincial government departments.

The transport study considered and assessed the following:

Traffic and Haul Route Assessment

- Estimation of trip generation;
- Discussion on potential traffic impacts;
- Assessment of possible haul routes between port of entry / manufacturing location; and
- Construction, operational (maintenance) and decommissioning vehicle trips.

Site layout, Access Points and Internal Roads Assessment per Site

- Description of the surrounding road network;
- Description of site layout;
- Assessment of the proposed access points;
- Assessment of the proposed internal roads on site; and
- Assessment of internal circulation of trucks and proposed roads layout regarding turbine positions and turbine laydown areas.

The findings of this transport assessment are detailed in this report prepared as part of the BA process for the proposed Kudusberg WEF.

1.1.3 Assumptions and Limitations

The following assumptions and limitations apply:

- This study is based on the project information provided by G7/CSIR and the subsequent site visit.
- Due to access constraints during the site visit and the topography of the area, certain sections of the proposed WEF development could not be assessed and reasonable assumptions were hence made.
- It is assumed that the turbine positions would be optimized in the future and that the exact and final turbine locations have not been provided. Therefore, turbine corridors were used as an indication of the possible location.
- According to the Eskom Specifications for Power Transformers (Eskom Power Series, Volume 5: Theory, Design, Maintenance and Life Management of Power Transformers), the following dimensional limitations need to be kept when transporting the transformer – total maximum height 5 000mm, total maximum width 4 300 mm and total maximum length 10 500 mm.
- Maximum vertical height clearances along the haulage route is 5.2 m for abnormal loads.
- The imported elements will be transported from the most feasible port of entry, which is deemed to be Port of Saldanha. It is expected that the inverter will be imported and shipped.
- All haulage trips will occur on either surfaced national and provincial roads or existing gravel roads.
- Material for the construction of internal access roads will be sourced locally as far as possible.

1.1.4 Source of Information

Information used in a transport study includes:

- Project Information and report template provided by the G7 and CSIR;
- Google Earth.kmz provided by G7;
- Google Earth Satellite Imagery; and
- Information gathered during site visit.

1.2 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO THE TRANSPORT STUDY

1.2.1 Port of Entry

It is assumed that the wind turbine components will be imported to South Africa via the Port of Saldanha, which is located in the Western Cape. The Port of Saldanha is the largest and deepest natural port in the Southern Hemisphere able to accommodate vessels with a draft of up to 21.5 meters. The port covers a land and sea surface of just over 19,300 hectares within a circumference of 91 kilometer with maximum water depths of 23.7 meters. Unique to the port is a purpose-built rail link directly connected to a jetty bulk loading facility for the shipment of iron ore. The Port is operated by Transnet National Ports Authority.

Alternatively, wind turbine components could be imported via the Port of Ngqura in Coega, Port Elizabeth. The Port of Ngqura is a world class deep water transshipment hub offering an integrated, efficient and competitive port service for containers on transit. The Port forms part of the Coega Industrial Development Zone and is operated by Transnet National Ports Authority.

1.2.2 Selected Candidate Turbine

The possible range of wind turbines varies widely with various wind turbine manufacturers operating worldwide. The project information states that a turbine with a maximum hub height of up to 140 m and a blade length of approximately 90 m (rotor diameter up to 180 m) is to be considered.

In general, each turbine unit consists of a tower, a Nacelle (final weight dependent on the supplier and whether the nacelle has gears or not) and three rotor blades.

The transport impact is also dependent on the type of turbine namely steel towers vs concrete towers. The steel and concrete towers generally consist of 20m sections. Steel cylindrical tower sections are delivered to the site and do not require on site assembly to form the sections. The concrete tower sections, however, are delivered in 2 – 4 precast segments which are assembled on site to form a 20m tower section. Concrete towers can require 18 truckloads per turbine, whereas steel towers can require four truckloads per turbine.

1.2.3 Transportation requirements

1.2.4 Abnormal Load Considerations

Abnormal permits are required for vehicles exceeding the following permissible maximum dimensions on road freight transport in terms of the Road Safety Act (Act No. 93 of 1996) and the National Road Traffic Regulations, 2000:

- Length: 22 m for an interlink, 18.5 m for truck and trailer and 13.5 m for a single unit truck
- Width: 2.6 m
- Height: 4.3 m measured from the ground. Possible height of load – 2.7 m.
- Weight: Gross vehicle mass of 56 t resulting in a payload of approximately 30t
- Axle unit limitations: 18 t for dual and 24 t for triple-axle units
- Axle load limitation: 7.7t on front axle and 9t on single or rear axles

Any dimension / mass outside the above will be classified as an Abnormal Load and will necessitate an application to the Department of Transport and Public Works for a permit that will give authorisation for the conveyance of said load. A permit is required for each Province that the haulage route traverses.

1.2.4.1 Further Guideline Documentation

The Technical Recommendations for Highways (TRH 11): “Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads” outlines the rules and conditions that apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges and culverts.

The general conditions, limitations and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power / mass ratio, mass distribution and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the Road Traffic Act and the relevant regulations.

1.2.4.2 Permitting – General Rules

The limits recommended in TRH 11 are intended to serve as a guide to the Permit Issuing Authorities. It must be noted that each Administration has the right to refuse a permit application or to modify the conditions under which a permit is granted. It is understood that:

- a) A permit is issued at the sole discretion of the Issuing Authority. The permit may be refused because of the condition of the road, the culverts and bridges, the nature of other traffic on the road, abnormally heavy traffic during certain periods or for any other reason.
- b) A permit can be withdrawn if the vehicle upon inspection is found in any way not fit to be operated.
- c) During certain periods, such as school holidays or long weekends an embargo may be placed on the issuing of permits. Embargo lists are compiled annually and are obtainable from the Issuing Authorities.

1.2.4.3 Load Limitations

The maximum load that a road vehicle or combination of vehicles will be allowed to carry legally under permit on a public road is limited by:

- the capacity of the vehicles as rated by the manufacturer;
- the load which may be carried by the tyres;
- the damaging effect on pavements;
- the structural capacity on bridges and culverts;
- the power of the prime mover(s);
- the load imposed by the driving axles; and
- the load imposed by the steering axles.

1.2.4.4 Dimensional Limitations

A load of abnormal dimensions may cause an obstruction and danger to other traffic. For this reason, all loads must, as far as possible, conform to the legal dimensions. Permits will only be considered for indivisible loads, i.e. loads that cannot, without disproportionate effort, expense or risk of damage, be divided into two or more loads for the purpose of transport on public roads. For each of the characteristics below there is a legally permissible limit and what is allowed under permit:

- Width;
- Height;
- Length;
- Front Overhang;
- Rear Overhang;
- Front Load Projection;
- Rear Load Projection;
- Wheelbase;
- Turning Radius; and
- Stability of Loaded Vehicles.

1.2.4.5 Transporting Wind Turbine Components

Wind turbine components can be transported in a number of ways with different truck / trailer combinations and configurations, which will need to be investigated at a later stage when the transporting contractor and the plant hire companies apply for the necessary permits from the Permit Issuing Authorities. All required permits will be obtained prior to the commencement of construction.

1.2.4.6 Nacelle

The heaviest component of a wind turbine is the Nacelle (approximately 100 tons depending on manufacturer and design of the unit). Combined with road-based transport, it has a total vehicle mass of approximately 145 000 kg for a 100-ton unit. Thus, route clearances and permits will be required for transporting the Nacelle by road-based transport (see example of a road-based transport below). The unit will require a minimum height clearance of 5.1metres.



Figure 1: Transporting the Nacelle

1.2.4.7 Blades

These are the longest and possibly most vulnerable components of a wind turbine and hence needs to be transported with utmost care. The set of three blades will have a rotor diameter of up to 180 m (~90 m per blade) and they need to be transported on an extendible blade transport trailer or in a rigid container with rear steerable dollies. The blades can be transported individually, in pairs or in three's; although different manufacturers have different methods of packaging and transporting the blades. It should be noted that larger blades are transported individually. The transport vehicle exceeds the dimensional limitation (length) of 22m and will only be allowed under permit, provided the trailer is fitted with steerable rear axles or dollies.



Figure 2: Example: 3 x 45m Blades on extendible trailers

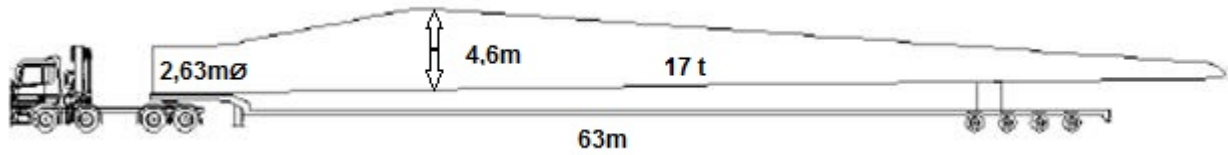


Figure 3: Example of Blade Transport

Turbine blades of up to 90m in length have been proposed. Due to this abnormal length, special attention needs to be given to the route planning, especially to suitable turning radii and adequate sweep clearance. Therefore, vegetation or road signage may have to be removed before transport. Once transported to site, the blades need to be carefully stored in their respective laydown areas before being installed onto the rotary hub.

1.2.4.8 Tower Sections

Steel tower sections generally consist of sections of around 20 metres in length and hence the number of tower sections required depends on the selected hub height. For a hub height of 140 metres, it is assumed that seven tower sections are required. Each section is transported separately on a low-bed trailer. Depending on the trailer configuration and height when loaded, some of these components may not meet the dimensional limitations (height and width) but will be permitted under certain permit conditions (see examples below).

Concrete tower sections or keystones might also be considered. Concrete tower sections will, however, add to additional traffic as tower sections are delivered to the site in smaller sections that require on-site assembly.

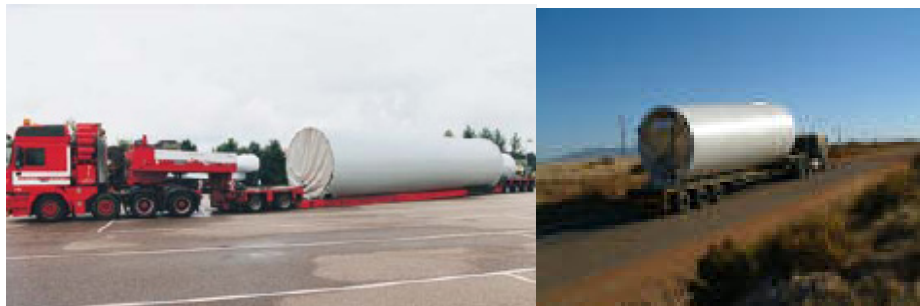


Figure 4: Transporting the Tower Sections



Figure 5: Concrete Tower Sections

1.2.4.9 Turbine Hub and Rotary Units

These components need to be transported separately, due to their significant weights - a hub unit weighs around 45 tons and the rotary unit weighs over 90 tons.

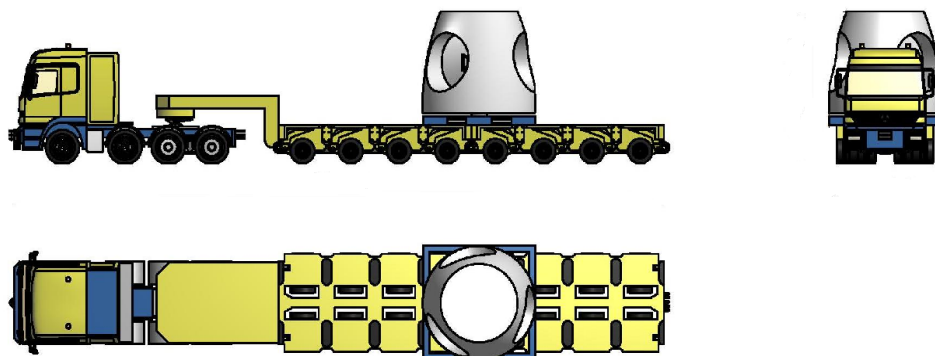


Figure 6: Transporting the Hub and Rotary Units

1.2.5 Transporting Cranes, Mobile Crane and other Components

This technology has developed rapidly, and a number of different heavy lifting options are available on the market. Costs involved to hire cranes vary and hence should be compared beforehand. For this assessment, some possible crane options are outlined as follows.

1.2.5.1 Cranes for Assembly and Erection on Site

Option 1: Crawler Crane & Assembly Crane

One possible option is that the main lift crane that would be capable of performing the required lifts, i.e. lifting the tower sections into position, lifting the Nacelle to the hub height and lifting the Rotor and Blades into place, needs to be similar to the Liebherr Crawler Crane LR1750 with a SL8HS (Main Boom and Auxiliary Jib) configuration. A smaller 200-ton Liebherr Mobile Crane LTM 1200-5.1 is also required to lift the components and assist in the assembly of the crawler crane at each turbine location.

- **Crawler Crane LR1750 with the SL8HS boom system (Main Lifting Crane):**

The Crawler Crane will be transported to site in components and the heaviest load will be the superstructure and crawler centre section (83 tons). The gross combination mass (truck, trailer and load) will be approximately 133 000 kg. The boom sections, counterweights and other equipment will be transported on conventional tri-axle trailers and then assembled on site. It will require a number of truckloads of components to be delivered for assembly of the Crawler Crane before it can be mobilised to perform the heavy lifts.

- **Mobile Crane LTM 1200-5.1 (Assembly Crane):**

The Liebherr LTM 1200-5.1 crane is a 5-axle vehicle with rubber tyres, which will travel to site on its own. However, the counterweights will be transported on conventional tri-axle trailers and then assembled on site. The assembly crane is required to assemble the main lift crane as well as assist in the installation of the wind turbine components.

Option 2: GTK 1100 Crane & Assembly Crane

For the single wind turbine at Coega, the GTK 1100 hydraulic crane was used (see example in picture below). The GTK 1100 was designed to lift ultra-heavy loads to extreme heights and its potential lies in being deployed on facilities such as wind turbine farms.



Figure 7: Cranes at work

- **Mobile Crane LTM 1200-5.1 (Assembly Crane):**

As above - a smaller 200-ton Liebherr Mobile Crane LTM 1200-5.1 is also required to lift the components and assist in the assembly of the hydraulic crane at each turbine location.

1.2.5.2 Cranes at Port of Entry

Most shipping vessels importing the turbine components will be equipped with on-board cranes to do all the safe off-loading of WTG components to the abnormal transport vehicles, parked adjacent to the shipping vessels.



Figure 8: Cranes at Port of Entry

The imported turbine components may be transported from the Port of Entry to the nearby turbine laydown area. Mobile cranes will be required at these turbine laydown areas to position the respective components at their temporary storage location.

1.2.6 Transporting Other Plant, Material and Equipment

In addition to transporting the specialised lifting equipment, the normal Civil Engineering construction materials, plant and equipment will need to be brought to the site (e.g. sand, stone, cement, concrete batching plant, gravel for road building purposes, excavators, trucks, graders, compaction equipment, cement mixers, transformers in the sub-station, cabling, transmission pylons etc.). Other components, such as electrical cables, pylons and substation transformers, will also be transported to site during construction. The transport of these items will generally be conducted with normal heavy loads vehicles.

1.3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

1.3.1 Description of the site

The proposed Kudusberg WEF will be located off the R356 between Matjiesfontein in the Western Cape Province and Sutherland in the Northern Cape Province, as shown below.

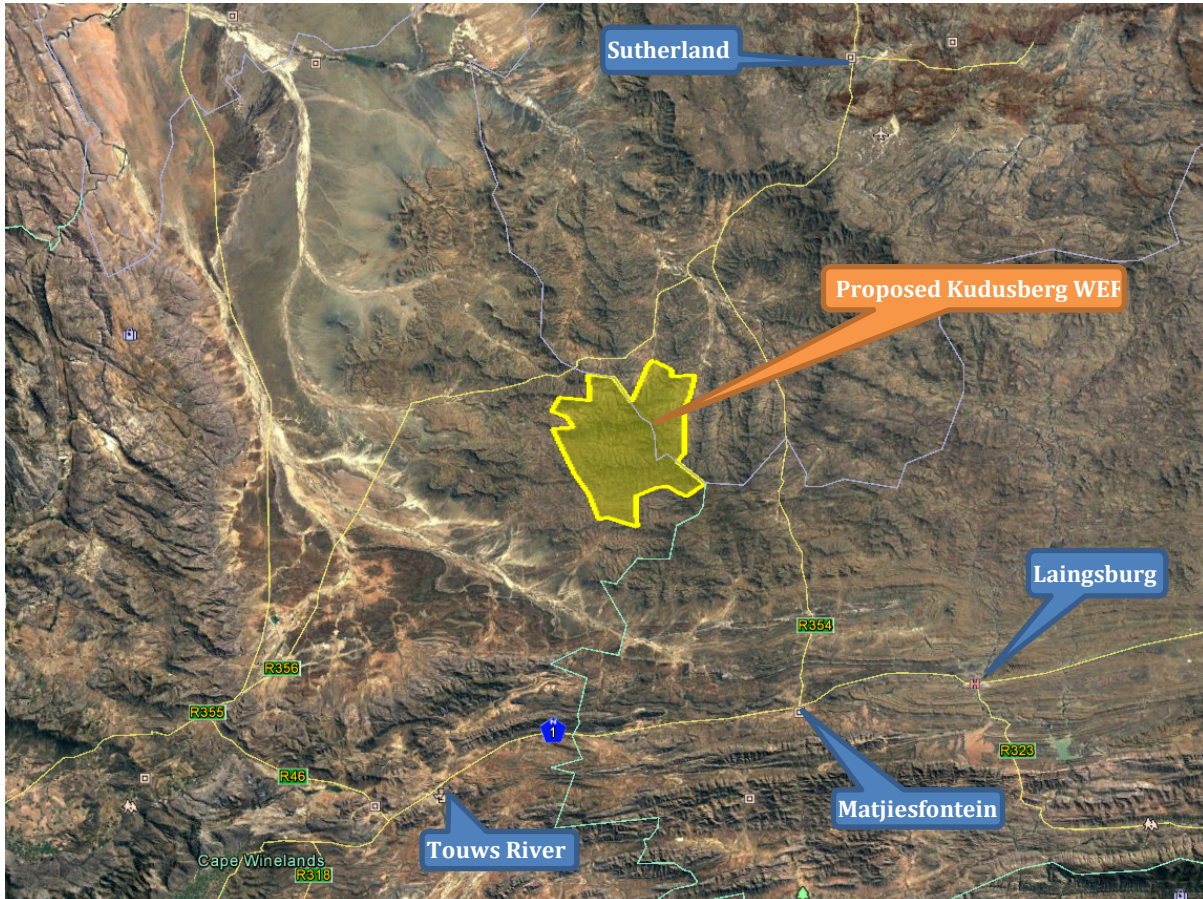


Figure 9: Aerial View of Proposed Kudusberg WEF

The Kudusberg WEF will have an energy generation capacity of up to 325 megawatt (MW), and will include the following as per the CSIR Terms of Reference for Specialists:

- Up to 56 wind turbines, each between 3 MW and 6.5 MW in nameplate capacity with a foundation of up to 30 m in diameter and up to 5 m in depth.
- The hub height of each turbine will be up to 140 m and its rotor diameter up to 180 m.
- Permanent compacted hardstanding laydown areas for each wind turbine of 90 m x 50 m during construction and for ongoing maintenance purposes for the lifetime of the turbines.
- Electrical transformers (690V/33kV) adjacent to each turbine.
- Underground 33kV cabling and overhead 33kV lines.
- Internal access roads up to 12 m wide.
- One 33/132kV onsite substation.
- Up to 4 x 140m tall (depending on the final hub height) wind measuring lattice masts strategically placed within the wind farm development footprint to collect data on wind conditions during the operational phase.
- Fencing (4 m high) will be limited to around the construction camp, batching plant and substation.

- Temporary infrastructure to obtain water from available local sources/ new or existing boreholes including a potential temporary above ground pipeline (approximately 35cm diameter) to feed water to the on-site batching plant. Water will potentially be stored in temporary water storage tanks.
- Temporary infrastructure including a construction camp which includes an on-site concrete batching plant and various buildings e.g. maintenance building.

It should be noted that there is no preference between the construction camp and substation alternatives presented as these do not affect or have any impact on the traffic on the surrounding road network.

1.3.2 National Route to Site

The most suitable port is the Port of Saldanha, which is located 392 km travel distance from the site. However, the Port of Ngqura in Coega, Port Elizabeth can be considered as an alternative.

The preferred route for abnormal load vehicles will be from the port, heading east on the R45 to Hopefield and onto the R311 at Moorreesburg (see Figure 9). At Hermon, the abnormal load vehicle will travel on the R46 to Ceres, passing Gouda and Tulbagh. The abnormal load vehicle will turn right at the R355/R46 intersection and continue on the R46 towards the N1. At Matjiesfontein on the N1, the vehicle will turn north onto the R354, left at DR02249, left at R356 and west onto MN04469.



Figure 10: Preferred route from Port to WEF site

An alternative route exists along the R27/N1, as shown in Figure 11 below. This route, however, has geometrical constraints (mountain pass, tunnel, steep gradients etc.) that would negatively impact the transportation of the components.



Figure 11: Alternative Route 1

An alternative option exists to access the proposed site via the R355, avoiding the N1 highway, as shown in the Figure 11 below. This route follows the same alignment as the Preferred Route to the R46, turning right onto the R355 and then heading east on the R356 to the R356/MN04469 intersections. The section of R356 would require upgrading of the road and an assessment of the drainage structures along the route. This route, however, would require extensive upgrading and there is a significant number of drainage structures located along the route. Although the upgrade work would be extensive, this is a potential viable alternative.

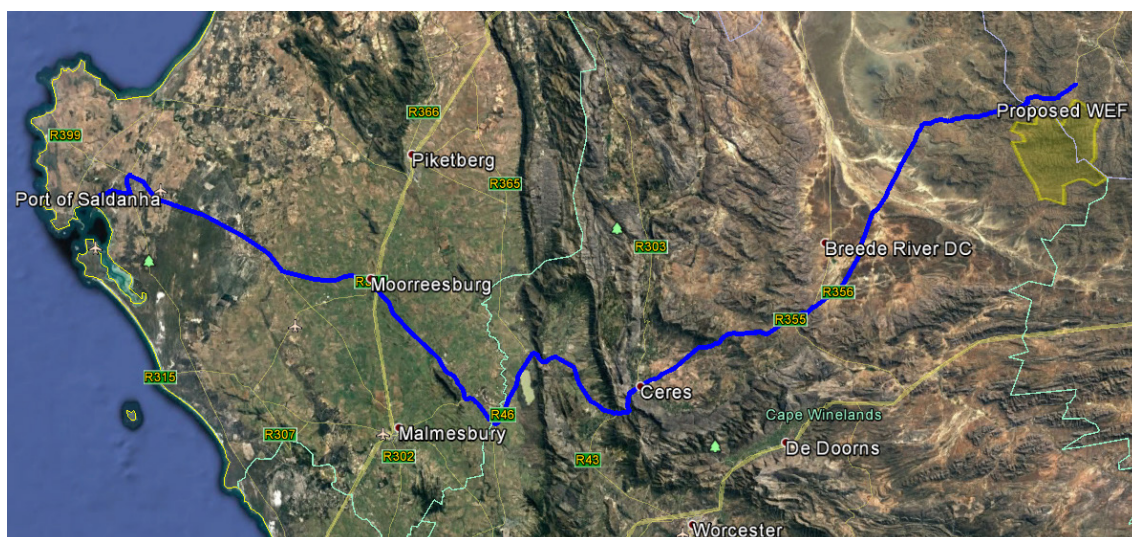


Figure 12: Alternative Route 2

It is critical to ensure that the abnormal load vehicle will be able to move safely and without obstruction along the preferred routes. The preferred route should be surveyed to identify problem areas e.g. intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients, that may require modification. After the road modifications have been

implemented, it is recommended to undertake a “dry-run” with the largest abnormal load vehicle, prior to the transportation of any turbine components, to ensure that the delivery of the turbines will occur without disruptions.

It needs to be ensured that the gravel sections of the haulage routes remain in good condition and will need to be maintained during the additional loading of the construction phase and reinstated after construction is completed.

1.3.3 Main Route for the Transportation of the Wind Turbine Components

The investigation showed that it will be possible to transport the imported wind turbine components by road to the proposed site. The proposed main route will be along the surfaced R354, which connects Matjiesfontein and Sutherland, turning west onto the district gravel road DR02249 and then turning left onto the R356 to the main access road (MN04469) to the Kudusberg WEF (see Figure 13). Two access road alternatives branch off the MN04469.

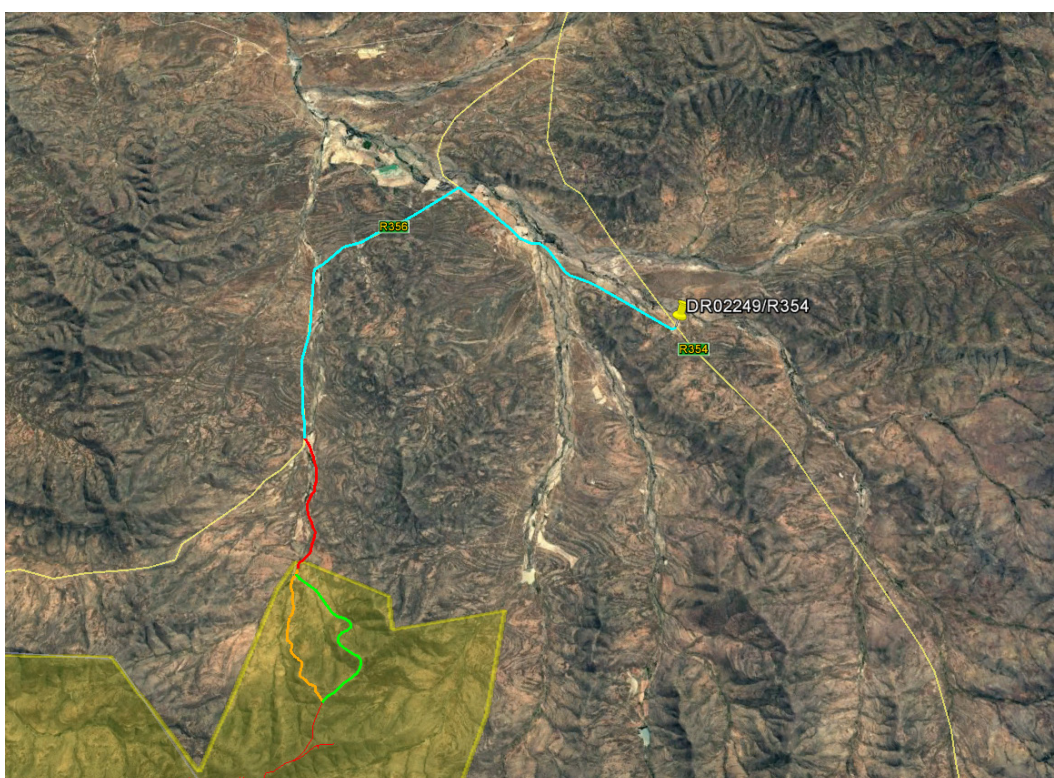


Figure 13: Proposed Main Route

For this option, DR02249 would require upgrading and intersections would have to be widened to accommodate the turning movements of heavy vehicles. The watercourse structures along the route are in a poor condition and the load bearing capacity of these structures would need to be assessed. In all likelihood these structures would have to be replaced or upgraded. In addition, farm gates and cattle grids would have to be widened to accommodate abnormal loads.



Figure 14: Narrow bridge on DR02249



Figure 15: Narrow cattle grid

The R356 could be accessed off the R354, which is approximately 10.8km from the DR02249/R354 intersection, as shown in Figure 16 below. The section of R356 between the R354/R356 intersection and the R356/DR02249 intersection, however, would also require significant upgrading of the road and of the drainage structures along the route. The route was therefore deemed unsuitable as an alternative as the required upgrading would be too extensive.

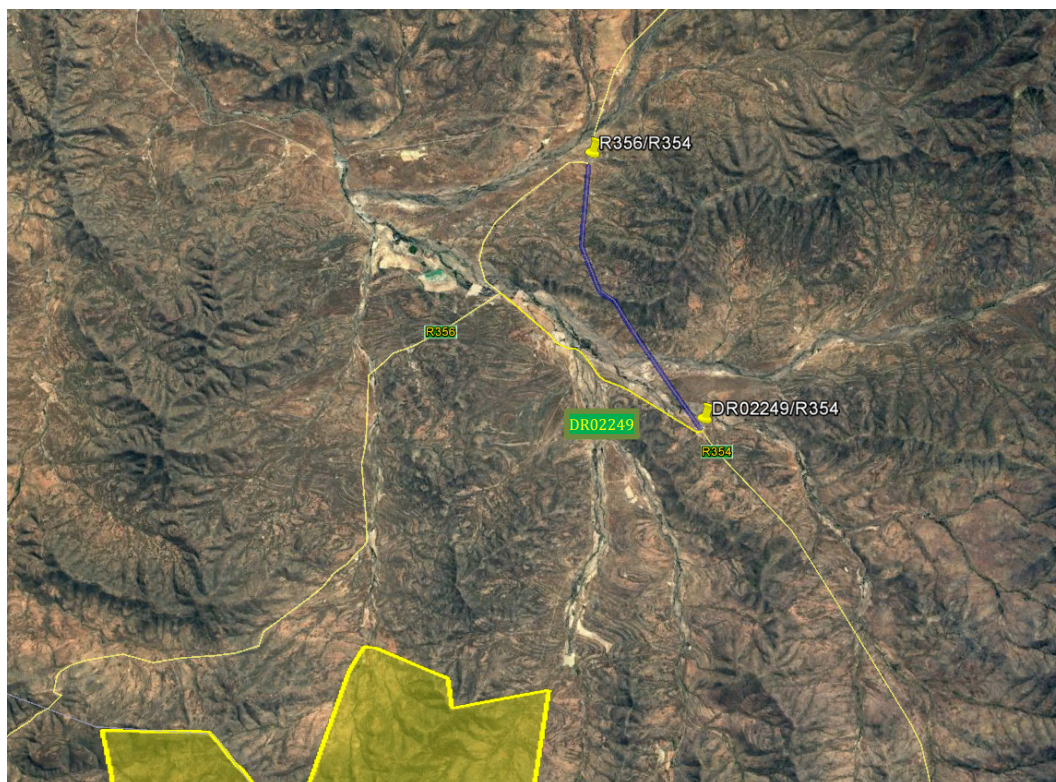


Figure 16: Alternative access off R354

It should be noted that any low hanging overhead lines (lower than 5.1m) e.g. Eskom and Telkom lines, along the proposed routes will have to be moved to accommodate the abnormal load vehicles.

1.3.4 Proposed main access road to the proposed WEF

Access to the proposed WEF will be provided via the MN04469. Two access road alternatives would connect MN04469 to the new wind farm road network between the turbines. These roads are shown in Figure 17 below and described below:

- Access road alternative 1 – An existing jeep track. Approximately 4.6 km in length.
- Access road alternative 2 – New road. Approximately 5.7 km in length.

Both access road alternatives are considered suitable. However, access road alternative 1 is deemed the preferred access road as it is an existing jeep track.

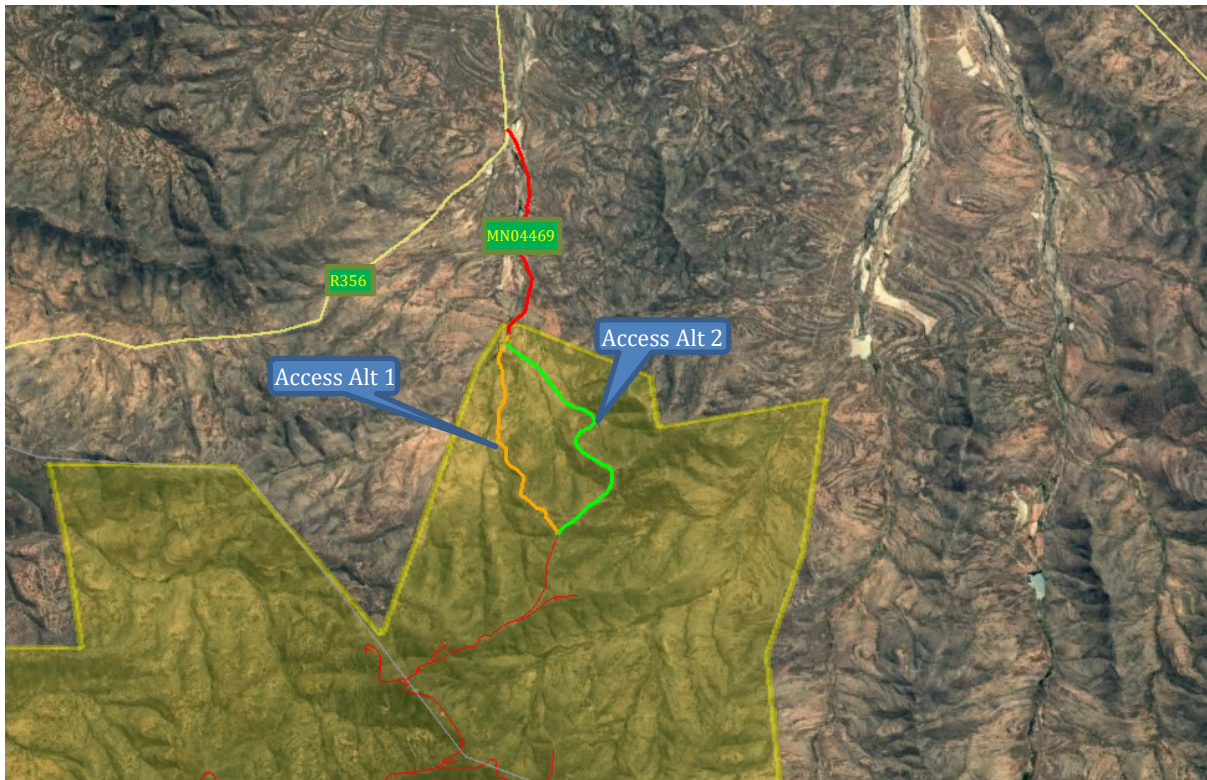


Figure 17: Access Roads

A minimum required road width of 4 meters needs to be kept and all turning radii must conform with the specifications needed for the abnormal load vehicles and haulage vehicles. It needs to be ensured that the gravel sections of the haulage routes remain in good condition and will hence need to be maintained during the additional loading of the construction phase and then reinstated after construction finishes. The gravel roads will require grading with a road grader to obtain a flat even surface and the geometric design of these gravel roads needs to be confirmed at detailed design stage. Geometric design constraints might be encountered due to the rolling, hilly topography of the area, as shown in the photographs below. The road designer should take cognizance that the turbines are to be positioned at the top of the hills, therefore roads need to be designed with smooth, relatively flat gradients to allow an abnormal load vehicle to ascend to the top of the hill.



Figure 18: MN0449



Figure 19: Hills at proposed WEF site

1.3.5 Main Route for the Transportation of Materials, Plant and People to the proposed WEF

The nearest towns in relation to the proposed WEF sites are Sutherland, Touws River and Laingsburg. It is envisaged that the majority of materials, plant and labour will be sourced from these towns and transport to the WEF will be via the N1 and R354.

Concrete batch plants and quarries in the vicinity could be contracted to supply materials and concrete during the construction phase, which would reduce the impact on traffic on the surrounding road network. Alternatively, mobile concrete batch plants and temporary construction material stockpile yards could be commissioned on vacant land near the proposed WEF site. Delivery of materials to the mobile batch plant and the stockpile yard could be staggered to minimise traffic disruptions.

It is envisaged that most materials, water, plant, services and people will be procured within a 100 km radius from the proposed WEF, however, this would be informed by the REIPPPP requirements.

1.4 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

Key legal requirements pertaining to the transport requirements for the proposed WEF development are:

- Abnormal load permits, (Section 81 of the National Road Traffic Act)
- Port permit (Guidelines for Agreements, Licences and Permits in terms of the National Ports Act No. 12 of 2005), and
- Authorisation from Road Authorities to modify the road reserve to accommodate turning movements of abnormal loads at intersections.

1.5 IDENTIFICATION OF KEY ISSUES

1.5.1 Identification of Potential Impacts

The potential transport related impacts are described below.

1.5.2 Construction Phase

- *Potential impact 1*
 - Construction related traffic.
 - The construction traffic would also lead to noise and dust pollution.
 - This phase also includes the construction of roads, excavations of turbine footings, trenching for electrical cables and other ancillary construction works that will temporarily generate the most traffic.

1.5.3 Operational Phase

During operation, it is expected that staff and security will periodically visit the turbines. It is assumed that approximately less than ten full-time employees will be stationed on site. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.

1.5.4 Decommissioning Phase

- *Potential Impact 2*
 - Construction related traffic
 - Noise and dust pollution

1.5.5 Cumulative impacts

- Traffic congestion/delays on the surrounding road network.
- Noise and dust pollution.

1.6 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

1.6.1 Potential Impact 1 (Construction Phase)

- *Nature of the impact*
 - Potential traffic congestion and delays on the surrounding road network and associated noise and dust pollution.
- *Significance of impact without mitigation measures*
 - Traffic generated by the construction of the WEF will have a significant impact on the surrounding road network. The exact number of trips generated during construction will be determined by the haulage company transporting the components to site, the turbine model, the staff requirements and where equipment is sourced from.

For the transportation of the turbines to the WEF site, it was assumed that the turbine blades will be transported to site individually due to the size of the blades being 90 m. Consequently, for each steel wind turbine three abnormal loads will be required for the blades, seven abnormal loads for the tower sections and another abnormal load for the nacelle. All further components will be transported with normal limitations haulage vehicles. With approximately 11 abnormal loads trips, the total trips to deliver the components of 56 turbines to the WEF site will be around 616 trips. This would amount to less than 2 vehicle trips per day for a typical construction period of 18-24months.

As concrete towers required up to 18 abnormal load trips per turbine, the total number of abnormal load trips for a concrete turbine is approximately 22 trips. The total trips to deliver the components of 56 turbines to the WEF site will be around 1 232 trips.

This would amount to approximately 3 vehicle trips per day for a typical construction period of 18-24months.

The constructions of roads and concrete footings will also have a significant impact on the surrounding road network as vehicles deliver materials to the site. A concrete footing (approximately 500 m³) adds over 80 trips by concrete trucks to the surrounding road network.

The significance of the transport impact without mitigation measures during the construction and decommissioning phases can be rated as high. However, considering that this is temporary and short term in nature, the impact can be mitigated to an acceptable level.

▪ *Proposed mitigation measures*

- The delivery of wind turbine components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- Dust suppression of gravel roads during the construction and decommissioning phases, as required.
- Regular maintenance of gravel roads by the Contractor during the construction and decommissioning phases.
- The use of mobile batch plants and quarries in close proximity to the site would decrease the impact on the surrounding road network.
- Staff and general trips should occur outside of peak traffic periods as far as possible.
- Any low hanging overhead lines (lower than 5.1m) e.g. Eskom and Telkom lines, along the proposed routes will have to be moved to accommodate the abnormal load vehicles.
- The preferred route should be surveyed to identify problem areas e.g. intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients, that may require modification. After the road modifications have been implemented, it is recommended to undertake a “dry-run” with the largest abnormal load vehicle, prior to the transportation of any turbine components, to ensure that the delivery of the turbines will occur without disruptions. This process is to be undertaken by the haulage company transporting the components and the contractor, who will modify the road and intersections to accommodate abnormal vehicles. It needs to be ensured that the gravel sections of the haulage routes remain in good condition and will need to be maintained during the additional loading of the construction phase and reinstated after construction is completed.
- Design and maintenance of internal roads. The internal gravel roads will require grading with a road grader to obtain a flat even surface and the geometric design of these gravel roads needs to be confirmed at detailed design stage. This process is to be undertaken by a civil engineering consultant or a geometric design professional. Geometric design constraints might be encountered due to the rolling, hilly topography of the area, as shown in the photographs below. The road designer should take cognizance that the turbines are to be positioned at the top of the hills,

therefore roads need to be designed with smooth, relatively flat gradients to allow an abnormal load vehicle to ascend to the top of the hill.

- *Significance of impact with mitigation measures*

The proposed mitigation measures for the construction traffic will result in a minor reduction of the impact on the surrounding road network, but the impact on the local traffic will remain moderate as the existing traffic volumes are deemed to be low. The dust suppression, however, will result in significantly reducing the impact.

1.6.2 Potential Impact 2 (Decommissioning Phase)

This phase will result in the same impact as the Construction Phase as similar trips are expected. The significance of the transport impact without mitigation measures during the construction and decommissioning phases can be rated as high. However, considering that this is temporary and short term in nature, the impact can be mitigated to an acceptable level.

1.6.3 Cumulative Impacts

To assess the cumulative impact, it was assumed that all wind farms within 50 km currently proposed and authorized, would be constructed at the same time (see Appendix 1). This is the precautionary approach as in reality these projects would be subject to a highly competitive bidding process. Only a handful of projects would be selected to enter into a power purchase agreement with Eskom.

The construction and decommissioning phases of a WEF are the only traffic generators. The duration of these phases is short term i.e. the impact of the WEF traffic on the surrounding road network is temporary and WEFs, when operational, do not add any significant traffic to the road network. Even if all wind farms are constructed and decommissioned at the same time, the roads authority will consider all applications for abnormal loads and work with all project companies to ensure that loads on the public roads are staggered and staged to ensure that the impact will be acceptable.

1.6.4 No-go alternative

The no-go alternative implies that the proposed development of the Kudusberg WEF will not proceed. This would mean that there will be no negative environmental impacts and no traffic impact on the surrounding network. However, this would also mean that there would be no socio-economic benefits to the surrounding communities and it will not assist government in meeting the targets for renewable energy. Hence, the no-go alternative is not a preferred alternative.

1.7 IMPACT ASSESSMENT SUMMARY

The assessment of impacts and recommendation of mitigation measures as discussed above are collated in the tables below.

Table 1. Impact assessment summary table for the Construction Phase

Impact pathway	Nature of potential impact/risk	Status ¹	Extent ²	Duration ³	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated ?	Potential mitigation measures	Significance of residual risk/ impact (after mitigation)	Ranking of impact/ risk	Confidence level
TRANSPORT															
CONSTRUCTION PHASE															
Direct Impacts															
Transport of equipment, material and staff to site	Traffic congestion Noise and dust pollution	Negative	Local	Short-term	Moderate	Very likely	High	N/A	High	No	Yes	<ul style="list-style-type: none"> ▪ Dust Suppression ▪ Stagger turbine component delivery to site ▪ Reduce the construction period ▪ The use of mobile batch plants and quarries in close proximity to the site would decrease the impact on the surrounding road network. ▪ Staff and general trips should occur outside of peak traffic periods ▪ Dry Run of preferred route 	Moderate	4	High

¹ Status: Positive (+); Negative (-)

² Site; Local (<10 km); Regional (<100); National; International

³ Very short-term (instantaneous); Short-term (<1yr); Medium-term (1-10 years); Long-term (project duration); Permanent (beyond project decommissioning)

Impact pathway	Nature of potential impact/risk	Status ¹	Extent ²	Duration ³	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated ?	Potential mitigation measures	Significance of residual risk/ impact (after mitigation)	Ranking of impact/ risk	Confidence level
												<ul style="list-style-type: none"> ▪ Design and maintenance of internal roads. ▪ Overhead Lines to be moved 			
Indirect Impacts															
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 2. Impact assessment summary table for the Operational Phase

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/ impact (after mitigation)	Ranking of impact/ risk	Confidence level
TRANSPORT															
OPERATIONAL PHASE															
Direct Impacts															
The traffic generated during this phase will be minimal and will have very little, if any impact on the surrounding road network.															
Indirect Impacts															
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 3. Impact assessment summary table for the Decommissioning Phase

Impact pathway	Nature of potential impact/risk	Status ⁴	Extent ⁵	Duration ⁶	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/impact (after mitigation)	Ranking of impact/risk	Confidence level	
TRANSPORT																
DECOMMISSIONING PHASE																
Direct Impacts																
Vehicle Trips	Noise and dust pollution	Negative	Local	Short-term	Moderate	Very likely	High	N/A	High	No	Yes	<ul style="list-style-type: none"> ▪ Maintenance of gravel roads ▪ Dust Suppression ▪ Stagger turbine component removal from the site. ▪ Reduce the construction period ▪ Staff and general trips should occur outside of peak traffic periods 	Moderate	4	High	
Indirect Impacts																
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

⁴ Status: Positive (+); Negative (-)

⁵ Site; Local (<10 km); Regional (<100); National; International

⁶ Very short-term (instantaneous); Short-term (<1yr); Medium-term (1-10 years); Long-term (project duration); Permanent (beyond project decommissioning)

Table 4. Cumulative impact assessment summary table

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated ?	Potential mitigation measures	Significance of residual risk/ impact (after mitigation)	Ranking of impact/ risk	Confidence level
TRANSPORT															
CUMULATIVE IMPACTS															
Delivery of equipment, material and staff to site.	Noise and dust pollution	Negative	Local	Short-term	Moderate	Very likely	High	N/A	High	No	Yes	<ul style="list-style-type: none"> ▪ Dust Suppression ▪ Stagger turbine component delivery to site ▪ Reduce the construction period ▪ The use of mobile batch plants and quarries in close ▪ Staff and general trips should occur outside of peak traffic periods ▪ Dry Run of preferred route ▪ Design and maintenance of internal roads. ▪ Overhead lines to be moved. 	Moderate	4	High

1.8 INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAM

It is recommended that dust suppression and maintenance of gravel roads form part of the EMPr. This would be required during the Construction and Decommissioning phases where an increase in vehicle trips can be expected. No traffic related mitigation measures are envisaged during the Operation phase due to the negligible traffic volume generated during this phase.

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
A. CONSTRUCTION PHASE					
A.1. TRAFFIC IMPACTS					
Dust and noise pollution Transportation of material, components, equipment and staff to site	Minimize impacts on road network.	<ul style="list-style-type: none"> ▪ Stagger turbine component delivery to site ▪ The use of mobile batch plants and quarries in close proximity to the site would decrease the impact on the surrounding road network ▪ Dust suppression ▪ Maintenance of gravel roads ▪ Apply for abnormal load permits prior to commencement of construction ▪ Assess the preferred route and undertake a 'dry run' to test ▪ All low hanging overhead lines to be moved ▪ Road design engineer to be consulted regarding design of internal roads 	<ul style="list-style-type: none"> ▪ Regular monitoring of road surface quality. ▪ Apply for required permits prior to commencement of construction 	<ul style="list-style-type: none"> ▪ Before construction commences and regularly during construction phase. 	<ul style="list-style-type: none"> ▪ Holder of the EA

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
B. DECOMMISSIONING PHASE					
A.1. TRAFFIC IMPACTS					
Dust and noise pollution	Avoid or minimize impacts on road network.	<ul style="list-style-type: none"> ▪ Dust suppression ▪ Maintenance of gravel roads 	<ul style="list-style-type: none"> ▪ Regular monitoring of road surface quality. 	<ul style="list-style-type: none"> ▪ Before and during the decommissioning phase. 	<ul style="list-style-type: none"> ▪ Contractor

1.9 CONCLUSION AND RECOMMENDATIONS

The potential transport related impacts for the construction, operation and decommissioning phases for the proposed Kudusberg WEF were assessed.

- The construction phase traffic, although significant, will be temporary and impacts are considered to have a moderate significance.
- During operation, it is expected that staff and security will periodically visit the facility. It is assumed that less than ten full-time employees will be stationed on site. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.
- The traffic generated during the decommissioning phase will be lower than the construction phase traffic and the impact on the surrounding road network will also be moderate.

The potential mitigation measures mentioned in the construction and decommissioning phases are:

- Dust suppression.
- Component delivery to/ removal from the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- The use of mobile batch plants and quarries in close proximity to the site would decrease the impact on the surrounding road network.
- Staff and general trips should occur outside of peak traffic periods.
- A “dry run” of the preferred route.
- Design and maintenance of internal roads.

The construction and decommissioning phases of a WEF are the only significant traffic generators and therefore noise and dust pollution will be higher during these phases. The duration of these phases is short term i.e. the impact of the WEF traffic on the surrounding road network is temporary and WEFs, when operational, do not add any significant traffic to the road network.

Based on the findings of this assessment, any access road alternative (alternative 1 and 2) considered by Kudusberg wind farm is considered acceptable. The impacts associated with Kudusberg wind farm are acceptable from a transport perspective and can therefore be authorised.

1.10 REFERENCES

- Google Earth Pro
- SANS 10280/NRS 041-1:2008 - Overhead Power Lines for Conditions Prevailing in South Africa
- Road Safety Act (Act No. 93 of 1996)
- The Technical Recommendations for Highways (TRH 11): “Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads
- S Gouws: “Concrete Towers – a business case for sustained local investment”, Concrete growth, www.slideshare.net/SantieGouws/concrete-towers-a-business-case-for-sustained-investmentrev-5

APPENDIX 1

OTHER RENEWABLE ENERGY PROJECTS WITHIN A RADIUS OF 50 KM FROM THE PROPOSED KUDUSBERG WEF SITE

DEA Reference Number	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MEGAWATT	STATUS
WIND PROJECTS							
14/12/16/3/3/2/967	Scoping and EIA	Biotherm Energy (Pty) Ltd	Proposed 140 MW Esizayo Wind Energy Facility and its associated infrastructure near Laingsburg within the Laingsburg Local Municipality in the Western Cape	WSP/Parsons Brinckerhoff	Wind	140 MW	Approved
East -14/12/16/3/3/2/962 West- 14/12/16/3/3/2/693	Scoping and EIA	Biotherm Energy (Pty) Ltd	East: Proposed 140 MW Maralla West Wind Energy Facility on the remainder of the farm Welgemoed 268, the remainder of the farm Schalkwykskraal 204 and the remainder of the farm Drie Roode Heuvels 180 north of the town of Laingsburg within the Laingsburg and Karoo Hoodland Local Municipalities in the Western and Northern Cape Provinces	WSP/Parsons Brinckerhoff	Wind	140 MW	Approved

DEA Reference Number	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MEGAWATT	STATUS
			West: Proposed 140 MW Maralla West Wind Energy Facility on the remainder of the Farm Drie Roode Heuvels 180, the remainder of the farm Annex Drie Roode Heuvels 181, portion 1 of the farm Wolven Hoek 182 and portion 2 of the farm Wolven Hoek 182 north of the town of Laingsburg within the Karoo Hoodland Local Municipality in the Northern Cape Province				
12/12/20/1966/AM5	Amendment	Witberg Wind Power (Pty) Ltd	Proposed establishment of the Witberg Wind Energy Facility, Laingsburg Local Municipality, Western Cape Province	Environmental Resource Management (Pty) Ltd / Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Approved
12/12/20/1783/2/AM1	Scoping and EIA	South Africa Mainstream Renewable Power Perdekraal West (Pty) Ltd	Proposed development of a Renewable Energy Facility (Wind) at the Perdekraal Site 2, Western Cape Province	Environmental Resource Management (Pty) Ltd	Wind	110 MW	Under construction
12/12/20/1783/1	Scoping and EIA	South Africa Mainstream Renewable Power Perdekraal East (Pty) Ltd	Proposed development of a Renewable Energy Facility (Wind) at the Perdekraal Site 2, Western Cape Province	Savannah Environmental Consultants (Pty) Ltd	Wind	150 MW	Approved
14/12/16/3/3/2/899	Scoping and EIA	Rietkloof Wind Farm (Pty) Ltd	Proposed Rietkloof Wind Energy (36 MW) Facility within the Laingsburg Local	EOH Coastal & Environmental Services	Wind	36 MW	Approved

DEA Reference Number	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MEGAWATT	STATUS
			Municipality in the Western Cape Province				
TBC	BA		Proposed Rietkloof Wind Energy Facility, Western Cape, South Africa	WSP	Wind	140 MW	In progress
14/12/16/3/3/2/826	Scoping and EIA	Gunstfontein Wind Farm (Pty) Ltd	Proposed 200 MW Gunstfontein Wind Energy Facility on the Remainder of Farm Gunstfontein 131 south of the town of Sutherland within the Karoo Hooglands Local Municipality in the Northern Cape Province, south of Sutherland.	Savannah Environmental Consultants (Pty) Ltd	Wind	200 W	Approved
12/12/20/1782/AM2	Scoping and EIA	Mainstream Power Sutherland	Proposed development of 140 MW Sutherland Wind Energy Facility, Sutherland, Northern and Western Cape Provinces	CSIR	Wind	140 MW	Approved
Karusa - 12/12/20/2370/1 Soetwater -12/12/20/2370/2	Scoping and EIA	African Clean Energy Developments Renewables Hidden Valley (Pty) Ltd	Proposed Hidden Valley Wind Energy Facility on a site south of Sutherland, Northern Cape Provinces (Karusa & Soetwater)	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW each	Preferred bidders. Construction to commence in 2019
12/12/20/2370/3	Scoping and EIA	African Clean Energy Developments Renewables Hidden Valley (Pty) Ltd	Proposed Hidden Valley Wind Energy Facility on a site south of Sutherland, Northern Cape Provinces (Greater Karoo))	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Approved
West -14/12/16/3/3/2/856 East - 14/12/16/3/3/2/857	Scoping and EIA	Komsberg Wind Farm (Pty) Ltd	Proposed 275 MW Komsberg West Wind Energy Facility near Sutherland within the Northern and Western Cape Provinces	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW each	Approved

DEA Reference Number	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MEGAWATT	STATUS
			Proposed 275 MW Komsberg East Wind Energy Facility near Sutherland within the Northern and Western Cape Provinces				
12/12/20/1988/1/AM1	Amendment	Roggeveld Wind Power (Pty) Ltd	Proposed Construction of the 140 MW Roggeveld Wind Farm within the Karoo Hoogland Local Municipality and the Laingsburg Local Municipality in the Western and Northern Cape Provinces	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Preferred bidders. Construction to commence in 2019.
14/12/16/3/3/2/807/AM1	Scoping and EIA Amendment	Karreebosch Wind Farm (Pty) Ltd	Proposed Karreebosch Wind Farm (Roggeveld Phase 2) and its associated infrastructure within the Karoo Hoogland and Laingsburg Local Municipalities in the Northern and Western Cape Provinces	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Approved
14/12/16/3/3/2/900	Scoping and EIA	Brandvalley Wind Farm (Pty) Ltd	Proposed 147 MW Brandvalley Wind Energy Facility North of the Town of Matjiesfontein within the Karoo Hoogland, Witzenberg and Laingsburg Local Municipalities in the Northern and Western Cape Provinces	EOH Coastal & Environmental Services	Wind	140 MW	Approved
TBA	Scoping and EIA	Rondekop Wind Farm (Pty) Ltd	Proposed establishment of the Rondekop WEF, south-west of Sutherland in the Northern Cape	SiVEST SA (Pty) Ltd	Wind	325 MW	In process
West 14/12/16/3/3/2/856 East 14/12/16/3/3/2/857	Scoping and EIA	Komsberg Wind Farms (Pty) Ltd	Komsberg East and West WEF	Arcus Consulting Services (Pty)	Wind	140 MW each	

DEA Reference Number	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MEGAWATT	STATUS
				Ltd			
TBC	BA	ENERTRAG SA (Pty) Ltd	Proposed Development of the Tooverberg Wind Energy Facility and the associated grid connection near Touws River, Western Cape Province)	SiVEST SA (Pty) Ltd	Wind	140 MW	In process
SOLAR PROJECTS							
12/12/20/2235	BA	Inca Sutherland Solar (Pty) Ltd	Proposed Photovoltaic (PV) Solar Energy Facility on A Site South Of Sutherland, Within The Karoo Hoogland Municipality Of The Namakwa District Municipality, Northern Cape Province	CSIR	Solar	10 MW	Approved