SCOPING REPORT: PROPOSED MERINO WIND FARM AND ASSOCIATED INFRASTRUCTURE, NORTHERN CAPE PROVINCE

TRANSPORT STUDY

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Final Issue

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SYNOPSIS

Preparation of a Transport Study for the proposed Merino Wind Farm and associated infrastructure, located approximately 35km south-west of Richmond and 80km south-east of Victoria West, in the Northern Cape Province, pertaining to all relevant traffic and transportation engineering aspects.

KEY WORDS:

Wind Farm, Transport Study

QUALITY VERIFICATION

This report has been prepared under the controls established by a quality management system that meets the requirements of ISO 9001: 2015 which has been independently certified by DEKRA Certification.

Verification	Capacity	Name	Signature	Date
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PROPOSED MERINO WIND FARM AND ASSOCIATED INFRASTRUCTURE TRANSPORT STUDY

TABLE OF CONTENTS

TABLES

FIGURES

ANNEXURES

PROPOSED MERINO WIND FARM
AND ASSOCIATED INFRASTRUCTURE, NORTHERNCAPE
TRANSPORT STUDY

1 INTRODUCTION AND METHODOLOGY

1.1 Scope and Objectives

Great Karoo Renewable Energy (Pty) Ltd is proposing the development of a commercial wind farm and associated infrastructure on a site located approximately 35km south-west of Richmond and 80km south-east of Victoria West, within the Ubuntu Local Municipality and the Pixley Ka Seme District Municipality in the Northern Cape Province, as shown in **Figure 1-1.**

A preferred project site with an extent of ~29 909ha and a development area of ~5 516ha within the project site has been identified by Great Karoo Renewable Energy (Pty) Ltd as a technically suitable area for the development of the Merino Wind Farm with a contracted capacity of up to 140MW that can accommodate up to 45 turbines.

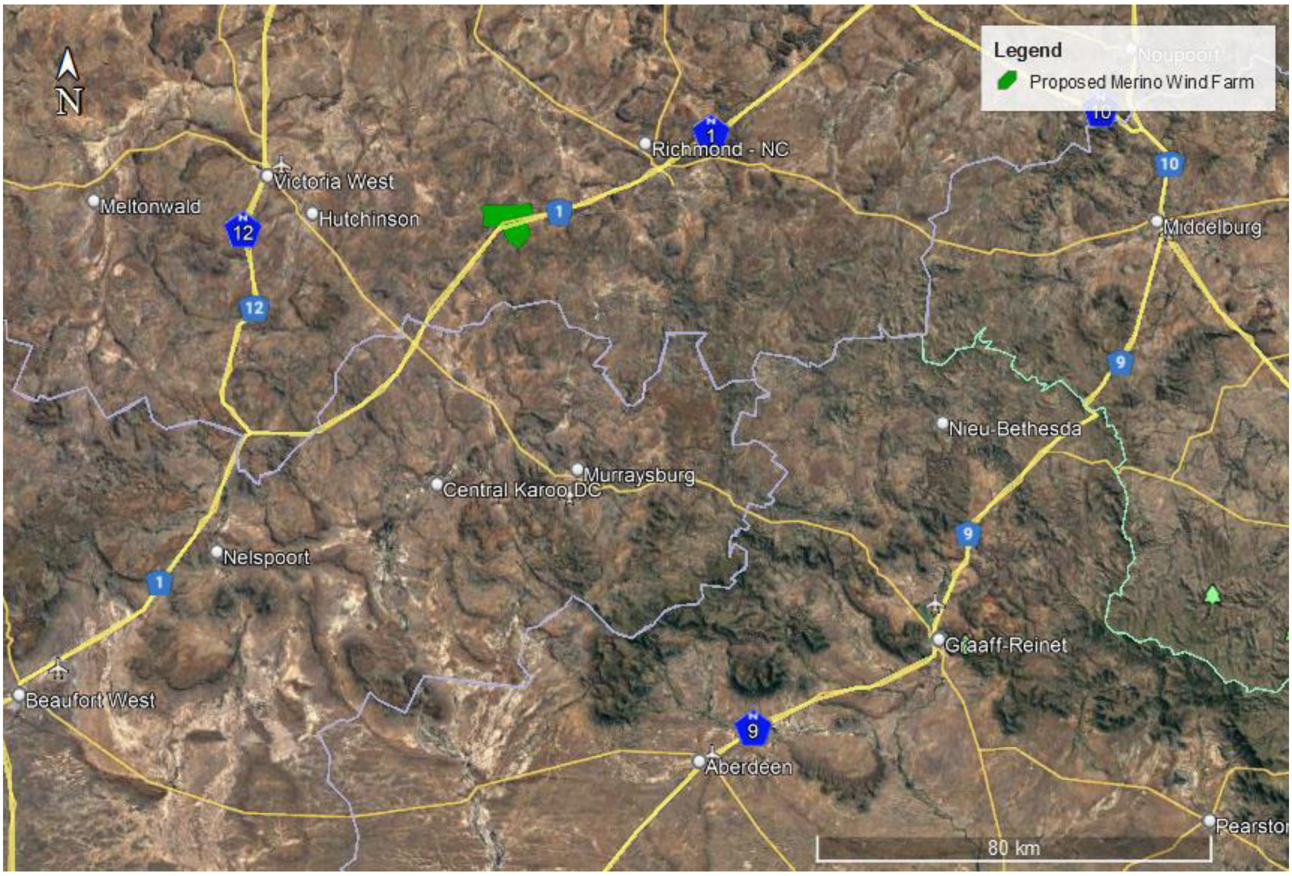

Figure 1-1: Locality Plan

As part of the environmental impact process, the services of a Transportation Specialist are required to conduct the Transport Study for the proposed facility.

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 will aim to provide the following objectives:
- Recommend a preliminary route for the transportation of the components to the proposed site.
- Recommend a preliminary transportation route for the transportation of materials, equipment and people to site.
- Recommend alternative or secondary routes where possible.

1.2 Terms of Reference

General:

A specialist report prepared in terms of the Regulations must contain the following:

(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;
(c) an indication of the scope of, and the purpose for which, the report was prepared;
  (cA) an indication of the quality and age of base data used for the specialist report
  (cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;
(d) the duration date and season of the site investigation and the relevance of the season to the outcome of the assessment;
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;
(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;
(g) an identification of any areas to be avoided, including buffers;
(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;
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;
(k) any mitigation measures for inclusion in the EMPr;
(I) any conditions for inclusion in the environmental authorisation;
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;
(n) a reasoned opinion-
  (i) whether the proposed activity, activities or portions thereof should be authorised; and (considering impacts and expected cumulative impacts).
  (iA) 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;

(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and

(q) any other information requested by the competent authority.

Specific:

- Extent of the transport study and study area;
- The proposed development;
- Trip generation for the facility during construction, operation and decommissioning;
- Traffic impact on external road network;
- Accessibility and turning requirements;
- National and local haulage routes;
- Assessment of internal roads and site access;
- Assessment of freight requirements and permitting needed for abnormal loads; and
- Traffic accommodation during construction.

1.3 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;
- operation and maintenance during the operation phase; and
- the decommissioning phase.

This transport study was informed by the following:

Site Visit and Project Assessment

- Site visit to gain good understanding of the location;
- An initial meeting with the client;
- Overview of project background information including location maps, component specifications and any resulting abnormal loads to be transported; and
- Research of all available documentation and information relevant to the proposed facility.

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.

<u>Site layout, Access Points and Internal Roads Assessment per Site</u>

- Description of the surrounding road network;
- Description of site layout;
- Assessment of the possible access points onto the site; and
- Assessment of the proposed internal roads.

1.4 Assumptions and Limitations

The following assumptions and limitations apply:

- This study is based on the project information provided by the Client.
- 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 300mm and total maximum length 10 500mm.
- Maximum vertical height clearance along the haulage route is 5.2m for abnormal loads.
- The imported elements will be transported from the most feasible port of entry, which is deemed to be the Port of Ngqura in the Eastern Cape Province.
- If any elements are manufactured within South Africa, these will be transported from their respective manufacturing centers, which would be either in the greater Johannesburg, Cape Town or Pinetown/Durban.
- All haulage trips on the external road network 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.

1.5 Source of Information

Information and software used in the transport study includes:

- Project Information provided by the Client;
- Google Earth.kmz provided by the Client;
- Google Earth Satellite Imagery;
- Road Traffic Act, 1996 (Act No. 93 of 1996)
- National Road Traffic Regulations, 2000
- SANS 10280/NRS 041-1:2008 - Overhead Power Lines for Conditions Prevailing in South Africa
- 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
- Information gathered during the site visit; and
- Project research of all available information.

2 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO THE STUDY

2.1 Port of Entry

It is assumed that if components are imported to South Africa, it will be via the Port of Ngqura, which is located in the Eastern Cape. The Port is located approximately 425km from the proposed site. 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 (CIDZ) and is operated by Transnet National Ports Authority.

Alternatively, components can be imported via the Port of Saldanha in the Western Cape. The Port of Saldanha, located 675km from the proposed site, is the largest and deepest natural port in the Southern Hemisphere able to accommodate vessels with a draft of up to 21.5m.

2.2 Selected Candidate Turbine

The possible range of wind turbines varies largely with various wind turbine manufacturers operating worldwide. The project information states that a turbine with a hub height of up to 170m and a tip height of up to 250m 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 rotor blades.

2.3 Transportation requirements

2.3.1 Abnormal Load Considerations

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

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

2.3.2 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.

2.3.3 Permitting – General Rules

The limits recommended in the TRH 11 guideline document 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.

2.3.4 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.

2.3.5 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.

2.3.6 Transporting Wind Turbine Components

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

2.3.6.1 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 average vehicle mass of approximately 145 000kg for a 100-ton unit. For larger turbines, the maximum weight can even increase to around 180 tons. Route clearances and permits will therefore be required for transporting the nacelle by road-based transport. The unit will require a minimum height clearance of 5.2m.

Figure 2-1: Example - Transporting the Nacelle

2.3.6.2 Blades

These are the longest and possibly most vulnerable components of a wind turbine and hence need to be transported with utmost care. The blades need to be transported on an extendible blade transport trailer or in a rigid container with rear steerable dollies. The blades can generally 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.

For the candidate turbines of this study, the blades will be up to 80m long and will need to be transported individually (see example in **Figure 2-2** and **Figure 2-3**). At present, there are no suitable abnormal load trucks available within South Africa to transport such large blades and suitable trucks will therefore need to be sourced from overseas and shipped to South Africa.

Figure 2-2: Example -Transport of Blades on extendible trailers

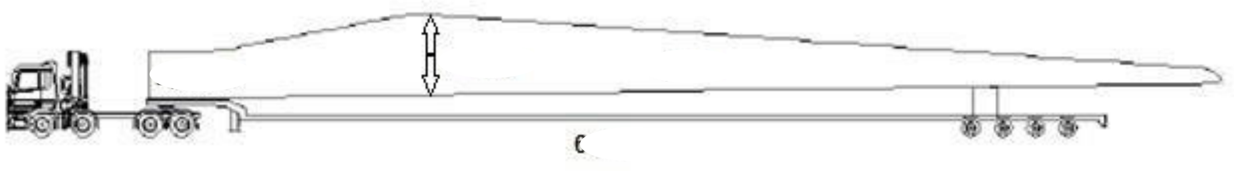

Figure 2-3: Example of Blade Transport

Due to the abnormal length, special attention needs to be given to the route planning, especially to suitable turning radii and adequate sweep clearance. Vegetation or/and road signage may have to be removed before transportation commences. Once transported to site, the blades need to be carefully stored at the respective laydown area before being installed onto the rotary hub.

2.3.6.3 Tower Sections

Steel towers generally consist of 20m long sections, the number of sections being dependent on the selected hub height. A hub height of 170 metres would therefore consist of approximately nine (9) tower sections. Each section is transported separately to site 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.

Figure 2-4: Example – Transportation of Tower Sections

2.3.6.4 Turbine Hub and Rotary Units

These components need to be transported separately, due to their significant weights – a hub unit weighs between 45 and 60 tons and the rotary unit weighs over 90 tons.

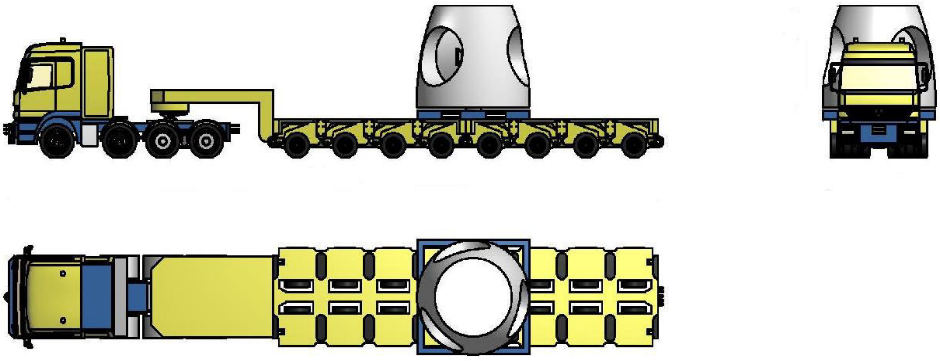

Figure 2-5: Transporting the Hub and Rotary Units

2.3.6.5 Transporting Cranes, Mobile Crane and other Components

One main crane and at least one supporting crane are required per wind turbine erection, with the auxiliary crane able to change position several times during the turbine erection.

This technology has developed rapidly, and several different heavy lifting options are available on the market. Costs involved to hire cranes or import suitable cranes (if necessary) vary and should therefore be compared in advance. For this assessment, possible crane options are discussed hereafter.

2.3.6.6 Cranes for Assembly and Erection on Site

Option 1: Crawler Crane & Assembly Crane

One possible option is that the main crane 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 sections 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 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.

<u>Option 2: GTK 1100 Crane & Assembly Crane</u>

The GTK 1100 hydraulic crane was used for the assembly of the single wind turbine at Coega (see example in picture below). The GTK 1100 was designed to lift ultra-heavy loads to extreme heights.

Figure 2-6: Example - Cranes at work

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

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.

2.3.6.7 Cranes at Port of Entry

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

Figure 2-7: Example - 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.

2.3.6.8 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 transportation of these items will generally be undertaken with normal heavy load vehicles.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 Description of the site

The proposed Merino Wind Farm will be located south-west of Richmond, as shown in **Figure 3-1**. The proposed site is bounded by the N1, located to the south of the proposed site.

The project site comprises the following farm portions:

» Portion 1 of Farm Rondavel 85
» Portion 0 of Farm Rondavel 85
» Portion 9 of Farm Bult & Rietfontein 96
» Portion 0 of Farm Vogelstruisfontein 84

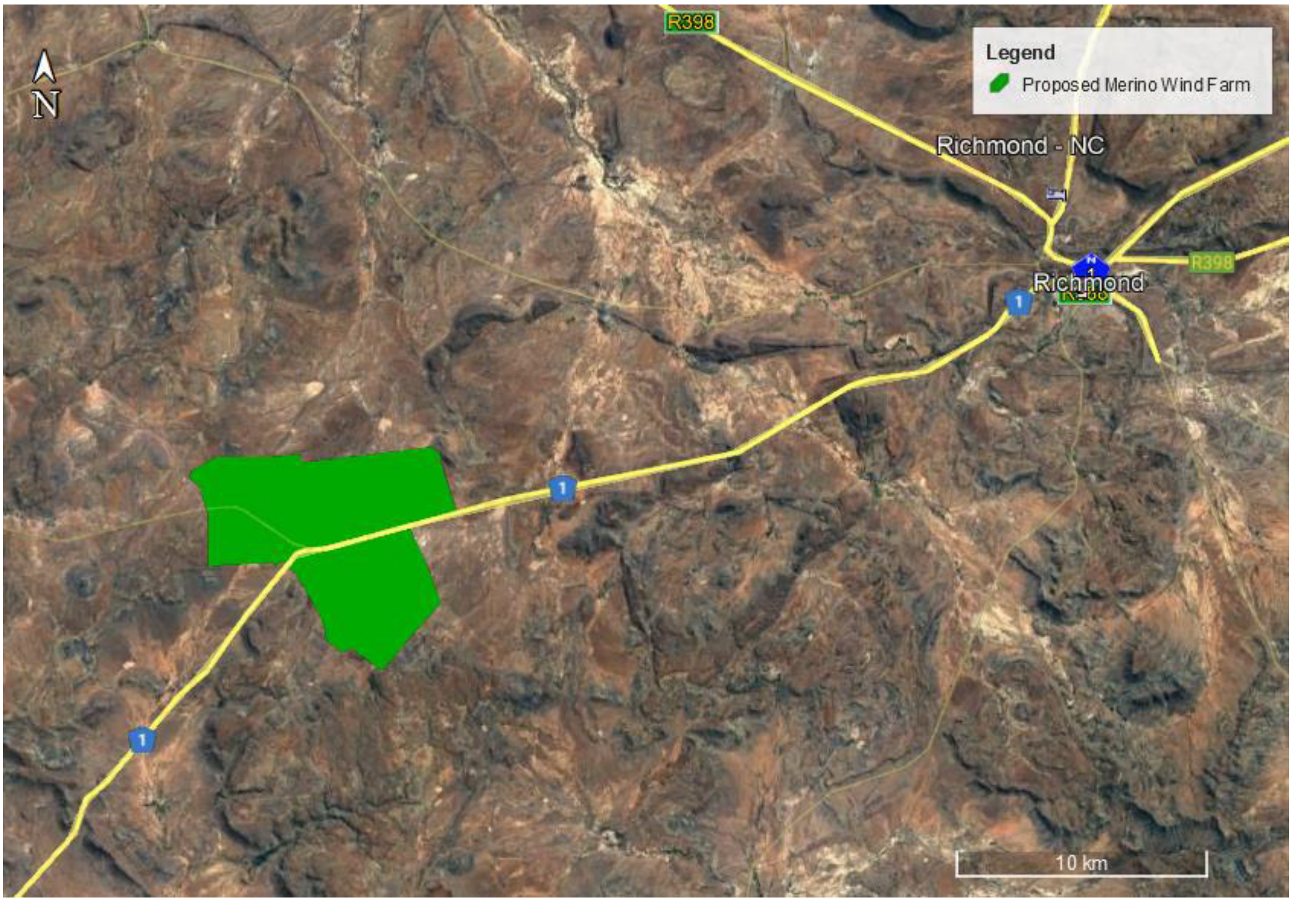

Figure 3-1: Aerial View of Proposed Merino Wind Farm

The Merino Wind Farm project site is proposed to accommodate the following infrastructure, which will enable the wind farm to supply a contracted capacity of up to 140MW:

- Up to 45 wind turbines with a maximum hub height of up to 170m. The tip height of the turbines will be up to 250m.
- Concrete turbine foundations to support the turbine hardstands.
- Inverters and transformers.
- Temporary laydown areas which will accommodate storage and assembly areas.
- Cabling between the turbines, to be laid underground where practical.
- A temporary concrete batching plant.

- 33/132kV onsite facility substation.
- Underground cabling from the onsite substation to the 132kV collector substation.
- Electrical and auxiliary equipment required at the collector substation that serves that wind energy facility, including switchyard/bay, control building, fences, etc.
- Battery Energy Storage System (BESS).
- Access roads and internal distribution roads.
- Site offices and maintenance buildings, including workshop areas for maintenance and storage.

The wind farm is proposed in response to the identified objectives of the national and provincial government and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the developer's intention to bid the Merino Wind Farm under the Department of Mineral Resources and Energy's (DMRE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme, with the aim of evacuating the generated power into the national grid. This will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP) with the Merino Wind Farm set to inject up to 140MW into the national grid.

3.2 National Route to Site

The most suitable port is the Port of Ngqura in Coega, which is located approximately 425km travel distance from the proposed development site. However, the Port of Saldanha can also be considered as an alternative. The Port of Saldanha is located approximately 675km travel distance from the proposed development site.

The preferred route for abnormal load vehicles will be from the port, heading north on the R75, passing Wolwefontein and Jansenville, and onto the R63 at Graaf-Reinet. The vehicles will travel on the R63 to the N1, passing Murraysburg, and continue on the N1 to the proposed site. (see **Figure 3-2**).

Figure 3-2: Preferred route from the Port to the Proposed Site

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, sections of the road with sharp horizontal curves or steep gradients and drainage structures, 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 components, to ensure that the delivery 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.

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

3.3 Main Route to the Proposed Site

The site and route investigation showed that it will be possible to transport the imported wind turbine components by road to the proposed site. The site is accessed via the N1, shown in **Figure 3-3** and **Figure 3-4.**

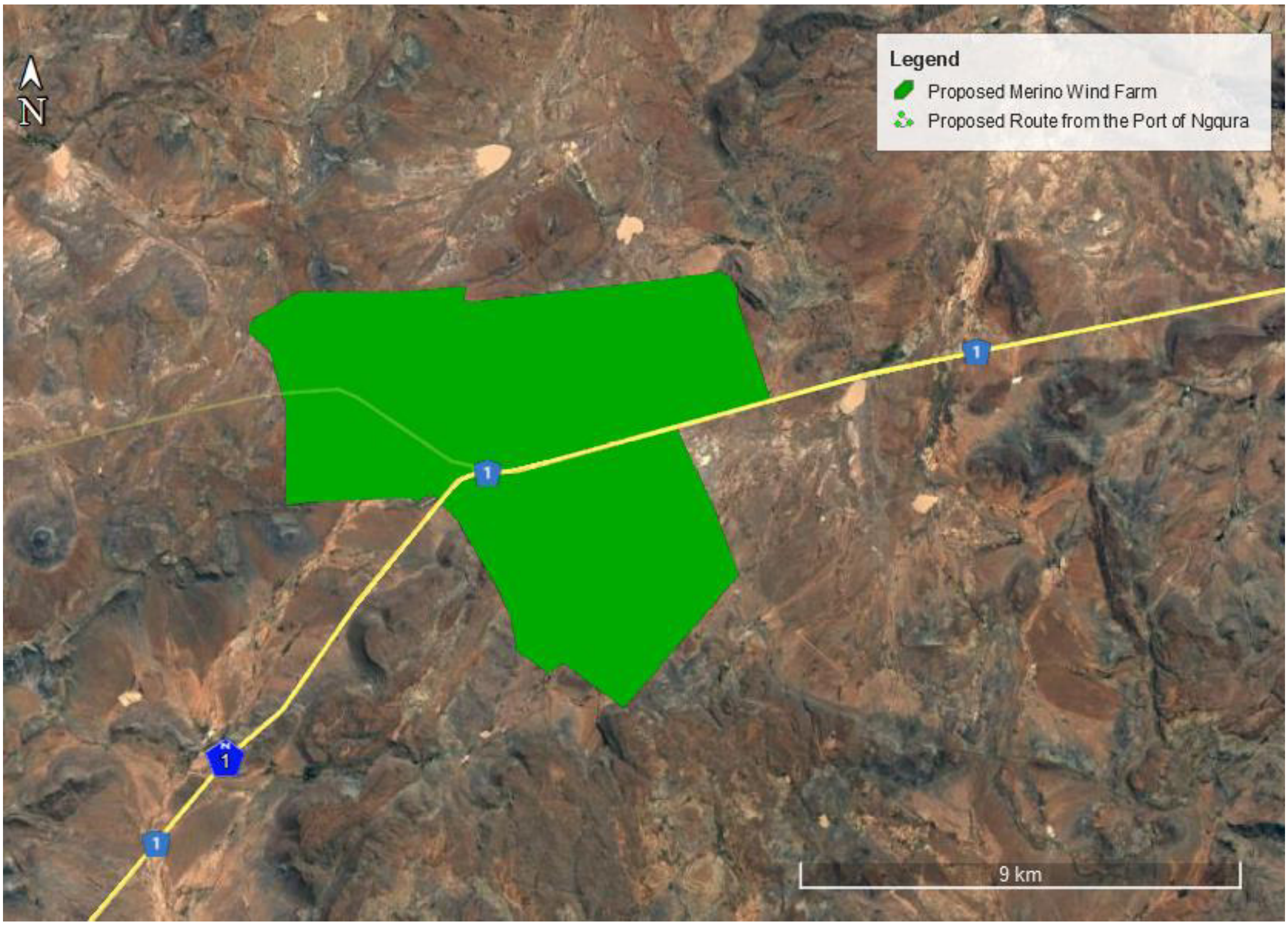

Figure 3-3: Proposed Main Route to the Proposed Site

Figure 3-4: N1 at the Proposed Site

3.4 Proposed Access Points to the Proposed Facility

The proposed access points are located on the N1, as shown in **Figure 3-5** and **Figure 3-6**. Proposed Access Point 1 has a surfaced bellmouth which leads to the existing gravel road to the Hutchinson railway station. Proposed Access Point 2 is an existing gravel farm access road with an unsurfaced bellmouth.

Generally, the road width at the access points needs to be a minimum of 8m and the access roads on site a minimum of 4.5m (preferably 5m). The radius at the access points needs to be large enough to allow for all construction vehicles to turn safely. It is recommended that the access points be surfaced and the internal access roads on site remain gravel.

The type of access control will determine the required stacking distance. The stacking distance is measured between the access boom and the kerb/road edge of the external road. For example, for a boom-controlled access, this boom will need to be moved sufficiently into the site to allow for at least one abnormal vehicle to stack in front of the boom without impeding on external traffic. It is recommended that the site access be controlled via a boom and gatehouse. It is also recommended that security staff be stationed on site at the access booms during construction. A minimum stacking distance of 25m should be provided between the road edge of the external road and the boom.

Geometric design constraints encountered due to the rolling, hilly topography of parts of the area should be taken into consideration by the geometric designer. The internal roads need to be designed with smooth, relatively flat gradients (recommended to be no more than 8%) to allow an abnormal load vehicle to ascend to the respective turbine locations.

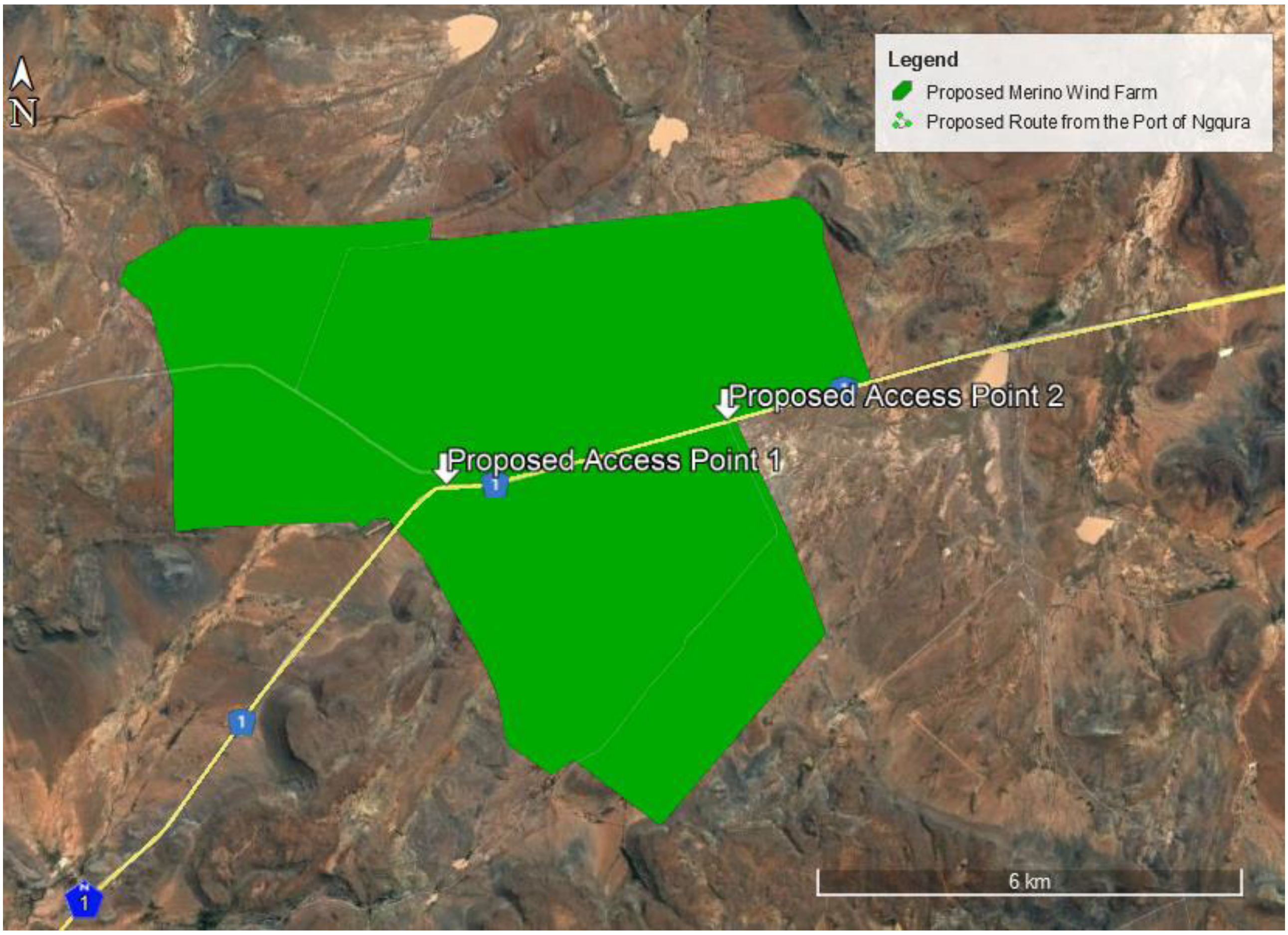

Figure 3-5: Proposed Access Points

Figure 3-6: Proposed Access Point 1

3.5 Internal Roads

The internal road geometric design and layout need to be established at detailed design stage. Existing structures and services, such as drainage structures, signage, street lighting and pipelines will need to be evaluated if impacting on the roads. It needs to be ensured that any gravel sections remain in good condition and will need to be maintained during the additional loading of the construction phase and then reinstated after construction is completed.

3.6 Main Route for the Transportation of Materials, Plant and People to the proposed facility

The nearest towns in relation to the proposed development site are Richmond and Victoria-West. It is envisaged that most materials, water, plant, services and people will be procured within a 50km radius of the proposed facility. The nearest major town, Beaufort West, is located approximately 140km from the proposed development site.

Concrete batching 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 batching plants and temporary construction material stockpile yards could be commissioned on vacant land near the proposed site. Delivery of materials to the mobile batching plant and the stockpile yard could be staggered to minimise traffic disruptions.

4 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

Key legal requirements pertaining to the transport requirements for the proposed Wind Energy Facility development are:

- Abnormal load permits (Section 81 of the National Road Traffic Act (Act 93 of 1996) and National Road Traffic Regulations, 2000);
- Port permit (Guidelines for Agreements, Licenses 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.

5 IDENTIFICATION OF KEY ISSUES

5.1 Identification of Potential Impacts

The potential transport related impacts are described below.

5.1.1 Construction Phase

Potential impact

- Construction related traffic
- The construction traffic would also lead to noise, dust and exhaust pollution.
- This phase also includes the construction of roads, excavations, trenching and ancillary construction works that will temporarily generate the most traffic.

5.1.2 Operation Phase

During operation, it is expected that staff and security will visit the facility. Approximately thirty (30) full-time employees will be stationed on site (subject to change). Based on experience with similar projects, the number of full-time employees is generally low and consequently, the associated trips are negligible. The traffic generated during this phase will be minimal and will have a nominal impact on the surrounding road network.

5.1.3 Decommissioning Phase

This phase will result in the same impact as the construction phase as similar trips are expected.

5.1.4 Cumulative Impacts

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

6 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

6.1 Potential Impact (Construction Phase)

Nature of the impact

- Potential traffic congestion and delays on the surrounding road network and associated noise, dust and exhaust pollution.

Significance of impact without mitigation measures

- Traffic generated by the construction of the facility will have a significant impact on the surrounding road network. The exact number of trips generated during construction will be determined by the contractor and the haulage company transporting the components to site, the staff requirements and where equipment is sourced from.

It is expected that the delivery of the components to the site during the construction phase will not result in a significant increase in traffic.

For the transportation of the turbines to the proposed site, it was assumed that the turbine blades will be transported to site individually.

Consequently, for each steel wind turbine three (3) abnormal loads will be required for the blades, nine (9) abnormal loads for the tower sections and one (1) abnormal load for the nacelle. All further components will be transported with normal limitation haulage vehicles. With approximately thirteen (13) abnormal loads trips (3 trips for blades, 9 trips for tower sections and 1 trip for the nacelle), the total trips to deliver the components of 45 turbines to the proposed site will be around 585 trips (13 trips x 45 turbines). This would amount to 1.12 vehicle trips per day (585 trips / 24 months / 22 working days per month) for a construction period of 24 months. Should the turbines be delivered during an 18-month period, the vehicle trips would amount to 1.48 vehicle trips per day.

Several normal haulage vehicles will be required to transport materials, equipment, plant and staff to the site. The construction of roads and concrete footings will also have an impact on the surrounding road network as vehicles deliver materials to the site. A concrete footing (approximately 600 m^3) adds around 100 trips by concrete trucks to the surrounding road network. It is therefore advised to have concrete batching plants on site or in close vicinity to reduce trips.

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

- *Proposed mitigation measures*
  - The delivery of wind turbine components to the site must be staggered and trips must 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 batching plants and quarries near 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 5.1 m) 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. The road designer should take cognizance that roads need to be designed with smooth, relatively flat gradients to allow an abnormal load vehicle to ascend to the top of a 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 low as the existing traffic volumes are deemed to be low. The dust suppression, however, significantly reduces the impact.

6.2 Potential Impact (Decommissioning Phase)

The decommissioning phase will result in the same impact as the construction phase as similar trips are expected. The potential traffic impact will be of medium significance before mitigation measures during the construction and decommissioning phases. However, considering that this is temporary and short term in nature, the impact can be mitigated to an acceptable level of low significance.

6.3 Cumulative Impacts

To assess the cumulative impact, it was assumed that all renewable energy projects within 50km radius currently proposed and authorized, would be constructed at the same time. This is the precautionary approach as in reality; these projects would be subject to a highly competitive bidding process and not all the projects may be selected to enter into a Power Purchase Agreement with Eskom. Even if all the facilities 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.

The construction and decommissioning phases of a Wind Farm are the only significant traffic generators. The duration of these phases is short term i.e. the potential impact of the traffic generated during the construction and decommissioning phases of the proposed development on the surrounding road network is temporary and wind farms, when operational, do not add any significant traffic to the road network. Based on this low impact, traffic impacts during the operation phase are not being considered. The cumulative impacts were assessed to be of low significance.

6.4 No-Go Alternative

The no-go alternative implies that the proposed development of the Merino Wind Farm does not proceed. This would mean that there will be no negative environmental impacts and no traffic impact on the surrounding network during the construction and decommissioning phases of the facility. 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 its' targets for renewable energy. **Hence, the no-go alternative is not a preferred alternative.**

7 POTENTIAL IMPACT ASSESSMENT SUMMARY

The assessment of potential impacts discussed above are collated in the tables below.

7.1 Construction Phase

Table 7-1: Potential Impact - Construction Phase – Traffic Congestion

Impact: Traffic congestion due to an increase in traffic caused by the transportation of equipment, material and staff to site **Desktop Sensitivity Analysis of the Site:** Traffic congestion possible along the N1.			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Traffic congestion	Potential traffic congestion and delays on the surrounding road network. The associated noise, dust and exhaust pollution due to the increase in traffic.	Local	None identified
Description of expected significance of impact The significance of the transport impact during the construction phase can be rated as medium. However, considering that this is temporary and short term in nature, the impact can be mitigated to an acceptable level. Traffic will return to normal levels after construction is completed. Noise, dust and exhaust pollution during the construction phase cannot be completely mitigated but mitigation measures will significantly reduce the impact. These potential impacts will be limited to the construction period.			
Gaps in knowledge & recommendations for further study **Gaps** The following items need to be clarified: - Existing traffic volumes along the N1 - Local or imported components - Water source to be clarified – borehole or transported to site. - Number of components - Number of abnormal loads - Dimensions and weight of components - Size of water bowser to be used - Construction period - Number of site staff - Fleet size **Recommendations** - To clarify the items above, an additional site visit during the EIA phase is recommended. - Transport Specialist requires the above information when it becomes available.			

7.2 Operational Phase

Table 7-2: Potential Impact – Operational Phase

POTENTIAL IMPACT TABLE – OPERATION PHASE
The traffic generated during this phase will be negligible and will not have a significant impact on the surrounding road network. However, the Client/Facility Manager is to ensure that regular maintenance of gravel roads occurs during operation phase to minimise/mitigate dust pollution.
Gaps in knowledge - The number of permanent employees

7.3 Decommissioning Phase

Table 7-3: Potential Impact - Decommissioning Phase

IMPACT TABLE – DECOMMISSIONING PHASE
This phase will have a similar impact as the Construction Phase i.e. traffic congestion, air pollution and noise pollution, as similar trips/movements are expected.

8 CUMULATIVE IMPACTS

The assessment of the potential cumulative impacts is shown in the table below.

Table 8-1: Potential Cumulative Impact

<table>
<tr><td colspan="4">Impact:
Traffic congestion due to an increase in traffic.

Desktop Sensitivity Analysis of the Site:
Traffic congestion and associated noise, dust and exhaust pollution possible along the N1.</td></tr>
<tr><th>Issue</th><th>Nature of Impact</th><th>Extent of Impact</th><th>No-Go Areas</th></tr>
<tr><td>Traffic congestion</td><td>Potential traffic congestion and delays on the surrounding road network and associated noise, dust and exhaust pollution.</td><td>Regional</td><td>None identified</td></tr>
<tr><td colspan="4">Description of expected significance of impact
The significance of the transport impact can be rated as high. The increase in traffic cannot be completely mitigated but mitigation measures will significantly reduce the impact. Noise, dust and exhaust pollution are limited to the construction and decommissioning periods.

It should be noted that even if all the facilities 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.</td></tr>
<tr><td colspan="4">Gaps in knowledge & recommendations for further study
- List of approved and planned renewable energy developments in the area/region.</td></tr>
</table>

9 CONCLUSION AND RECOMMENDATIONS

The potential traffic and transport related impacts for the construction, operation and decommissioning phases of the proposed Merino Wind Farm were identified and assessed.

- The main impact on the external road network will be during the construction phase. This phase is temporary in comparison to the operational period. The number of abnormal load vehicles was estimated and found to be able to be accommodated by the road network.
- During operation, it is expected that maintenance and security staff will periodically visit the facility. It is assumed that approximately thirty (30) full-time employees will be stationed on site (subject to change). Based on experience with similar projects, the number of full-time employees is generally low and consequently, the associated trips are negligible. 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 construction phase, although significant, will be temporary and impacts are considered to be negative and of medium significance before and of **low significance** after mitigation.
- The traffic generated during the decommissioning phase will be less than the construction phase traffic and the impact on the surrounding road network will also be considered negative and of medium significance before and of **low significance** after mitigation.

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 batching plants and quarries near 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.
- Any low hanging overhead lines (lower than 5.1m) e.g. Eskom and Telkom lines, along the proposed routes will have to be moved or raised to accommodate the abnormal load vehicles.

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

The proposed access points to the proposed site have been assessed and were found to be acceptable from a transport perspective.

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

The potential impacts associated with proposed Merino Wind Farm and associated infrastructure are acceptable from a transport perspective and it is therefore recommended that the proposed facility be authorised.

10 REFERENCES

- Google Earth Pro
- Gouws. S: "Concrete Towers – a business case for sustained local investment", Concrete growth, www.slideshare.net/SantieGouws/concrete-towers-a-business-case-for-sustainedinvestmentrev-5
- Road Traffic Act, 1996 (Act No. 93 of 1996)
- National Road Traffic Regulations, 2000
- SANS 10280/NRS 041-1:2008 - Overhead Power Lines for Conditions Prevailing in South Africa
- 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

11 ANNEXURES

Annexure A – SPECIALIST EXPERTISE

IRIS SIGRID WINK

Profession	Civil Engineer (Traffic & Transportation)
Position in Firm	Associate
Area of Specialisation	Manager: Traffic & Transportation Engineering
Qualifications	PrEng, MSc Eng (Civil & Transportation)
Years of Experience	19 Years
Years with Firm	9 Years

SUMMARY OF EXPERIENCE

Iris is a Professional Engineer registered with ECSA (20110156). She joined JG Afrika (Pty) Ltd. in 2012. Iris obtained a Master of Science degree in Civil Engineering in Germany and has more than 15 years of experience in a wide field of traffic and transport engineering projects. Iris left Germany in 2003 and has worked as a traffic and transport engineer in South Africa and Germany. She has technical and professional skills in traffic impact studies, public transport planning, non-motorised transport planning and design, design and development of transport systems, project planning and implementation for residential, commercial and industrial projects and providing conceptual designs for the abovementioned. She has also been involved with transport assessments for renewable energy projects and traffic safety audits.

PROFESSIONAL REGISTRATIONS & INSTITUTE MEMBERSHIPS

PrEng - Registered with the Engineering Council of South Africa No. 20110156
Registered Mentor with ECSA for the Cape Town Office of JG Afrika
MSAICE - Member of the South African Institution of Civil Engineers
ITSSA - Member of ITS SA (Intelligent Transport Systems South Africa)
SAWEA - Member of the South African Wind Energy Association
SARF - South African Road Federation: Committee Member of Council
IRF - Global Road Safety Audit Team Leader

EDUCATION

1996 - Matric – Matric (Abitur) – Carl Friedrich Gauss Schule, Hemmingen, Germany
1998 - Diploma as Draughtsperson – Lower Saxonian State Office for Road and Bridge Engineering
2003 - MSc Eng (Civil and Transportation) – Leibniz Technical University of Hanover, Germany

SPECIFIC EXPERIENCE (Selection)

JG Afrika (Pty) Ltd (Previously Jeffares & Green (Pty) Ltd)
2016 – Date
Position – Associate

- **Kudusberg Windfarm** – Transport study for the proposed Kudusberg Windfarm near Sutherland, Northern Cape – Client: G7 Renewable Energies

- **Kuruman Windfarm –** Transport study for the proposed Kuruman Windfarm in Kuruman, Northern Cape – Client: Mulilo Renewable Project Developments
- **Coega West Windfarm** – Transportation and Traffic Management Plan for the proposed Coega Windfarm in Coega, Port Elizabeth – Client: Electrawinds Coega
- **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 proposed Sonop Windfarm, Coega, Port Elizabeth – Client: Founders Engineering
- **Universal Windfarm** - Traffic Impact Assessment for the proposed 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 Appraisal**s 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 Kangela 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