PROPOSED ZONNEQUA WIND FARM
NORTHERN CAPE PROVINCE

TRAFFIC IMPACT ASSESSMENT (TIA)

September 2018

Issue

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TITLE:

PROPOSED ZONNEQUA WIND FARM NEAR KLEINSEE IN THE NORTHERN CAPE – TRAFFIC IMPACT ASSESSMENT

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CARRIED OUT BY:	COMMISSIONED BY:
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SYNOPSIS

Preparation of a Traffic Impact Assessment for the proposed Zonnequa Wind Farm near Kleinsee in the Northern Cape, pertaining to all relevant traffic and transportation engineering aspects.

KEY WORDS:

Wind Farm, Traffic Impact Assessment

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
By Author	Engineer	A Ramawa	[signature]	13/09/18
Checked by:	Associate	I Wink	[signature]	13/09/18
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Filename:	4840 ZONNEQUA WEF TIA JG Afrika

I. 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	15 Years
Years with Firm	5 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

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

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

2016 – Date
Position – Associate

- **Coega West Windfarm** – Transportation and Traffic Management Plan for the 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 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 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

II. 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 favorable 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: I Wink

Name of Specialist: IRIS WINK

Date: 13 September 2018

PROPOSED ZONNEQUA WIND FARM
Traffic Impact Assessment

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1 INTRODUCTION & SCOPE OF WORK

1.1 Terms of reference

Genesis Zonnequa Wind (Pty) Ltd appointed JG Afrika (Pty) Ltd to prepare a Traffic Impact Assessment for the proposed 140 MW Zonnequa Wind Farm (WF). The facility is to be located on Farm portions 1/328 and RE/326 and is approximately twenty-two kilometres (22 km) south-east of Kleinsee in the Northern Cape Province. The WF will be situated in the Nama Khoi Municipality and will have an anticipated life span of 20 to 25 years.

This report needs to be read in conjunction with the Site Development Report prepared by JG Afrika.

The proposed WF is envisaged to accommodate a maximum of fifty-six (56) wind turbines and will include associated infrastructure such as a 132kV power line to connect the wind farm to the existing Gromis Substation. The location of the proposed WF is shown in Figure 1.1 below.

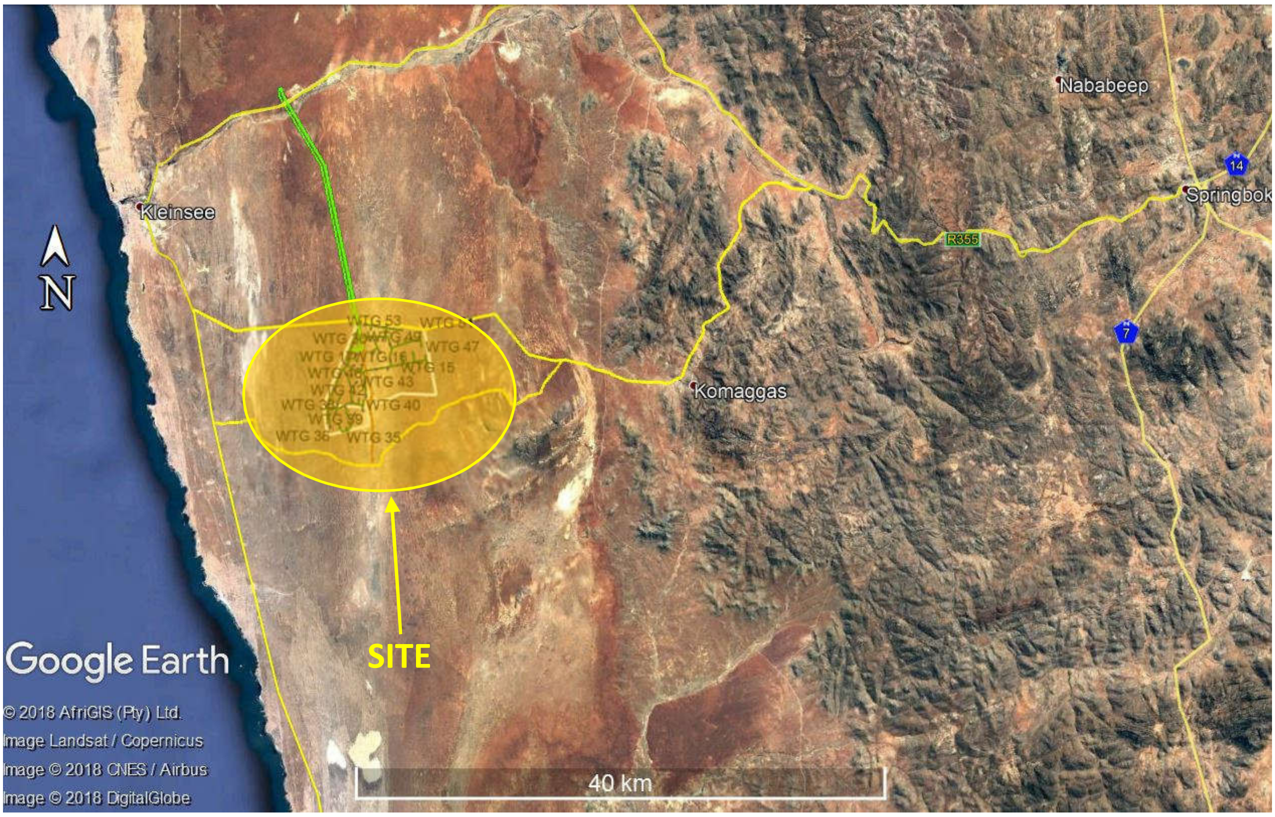


Figure 1-1: Aerial View of Site location

1.2 Scope of work

The aim of the Transport Impact Assessment (TIA) is to determine the transport impact of the development on the existing transport network during the construction, operation, and decommissioning phases of the development.

The report will deal with the items listed below and focuses on the surrounding road network that may be impacted by construction and maintenance of the site:

Traffic and Route Assessments

- The proposed development;
- Extent of the traffic study and study area;
- Assumptions concerning candidate turbines;
- Trip generation and potential traffic impact (construction and maintenance phase):
  - Abnormal load trips
  - Construction vehicles trips
  - Maintenance vehicle trips
- Possible haul routes between the port of entry / manufacturing locations and the site regarding National and local routes;
- Identification of the preferred routes for the construction and operation phases for the wind farm;
- High-level input into site access route (internal roads);
- Road limitations due to abnormal loads for both national and local routes;
- Access requirements;
- High-level input into scheduling of transport (i.e. during night);
- Investigation of the impact of the development traffic generated during construction and operation; and
- Traffic impact mitigation measures during the construction and decommissioning phase.

Access and Internal Roads Assessments

- Assessment of the proposed access(es) and intersection with the existing road network, based on the Draft SDP layout including:
  - Feasible location of access points;
  - Motorised and non-motorised access requirements;
  - Queuing analysis and stacking requirements for access controls;
  - Access geometry and control options;
  - Sight distances and required access spacing;
  - Assessment of the proposed access roads on site; and
  - Assessment of internal circulation of abnormal trucks and proposed roads layout regarding turbine positions and turbine laydown areas.

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 and during maintenance.

This transport study includes the following tasks:

<u>Site Visit and Project Assessment</u>

- Site visit and initial meeting with the client to gain sound understanding of the project
- Overview of project background information including location maps, component specs and any resulting abnormal loads to be transported
- Research of all available documentation and information relevant to the proposed windfarm and substations

Dashcam video footage, and Gramin GPS data points will be taken during the site visit to help gather the necessary information needed for conducting the TIA report.

<u>Correspondence with Authorities</u>

- Correspondence with the relevant Authorities dealing with the external road network, such as SANRAL and the Northern Cape Province route authorities

<u>Traffic and Route Assessment</u>

- Trip generation and potential traffic impact
- Possible haul routes between port of entry / manufacturing location and sites in regards of
    - National route
    - Local route
    - Site access route (internal roads)
    - Road limitations due to abnormal loads
- Construction and maintenance (operational) vehicle trips
    - Generated vehicles trips
    - Abnormal load trips
    - Access requirements
- Investigation of the impact of the development traffic generated during construction and operation.

<u>Access and Internal Roads Assessment</u>

- Assessment of the proposed access points including:
    - Feasible location of access points
    - Motorised and non-motorised access requirements
    - Queuing analysis and stacking requirements if required
    - Access geometry
    - Sight distances and required access spacing
    - Comments on internal circulation requirements and observations

<u>Report (Documentation and Figures)</u>

- Reporting on all findings and preparation of the report.

1.4 General assumptions

The following assumptions were made:

- According to the Eskom Specifications for 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 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.
- 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.
- The decommissioning phase will have similar transport impact as the construction Phase

1.5 Source of information

Information used in a transport study includes:

- Project information provided by the Client
- Google Earth. kmz provided by the Client
- Google Earth Satellite Imagery
- Site visit images and dashcam video footage
  The site visit was conducted outside the school holiday period, on the 20th to 21st June 2018. The visits occurred during the day under sunny weather conditions.
- TRH11, Dimensional and mass limitations and other requirements for abnormal loads, August 2009
- 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", 2000
- National Road Traffic Act, Act 93 of 1996
- National Department of Transport (NDoT), Manual for Traffic Impact Studies, October 2005
- Department of Transport (DoT), Geometric Design of Rural Roads, 1988
- SANS 10280/NRS 041-1:2008 Overhead Power Lines for Conditions Prevailing in South Africa

2 SITE DESCRIPTION

2.1 General

It is proposed to develop the Zonnequa Wind Farm near Kleinsee and Springbok in the Northern Cape (see *Figure 2-1*).

The surrounding area is not cultivated and consists of sparse vegetation. The site is currently used to farm sheep and it accommodates farm houses.

The site can be accessed from the north via a farm road from a secondary road (i.e. DR2964). The public roads surrounding the site consist of:

1. The DR2964 gravel road, which is well maintained and shows signs of frequent blading; and
2. The MR751 surfaced road, which used to be a private road with checkpoint access and maintained by the De Beers Mining company, however when the mine was shut down, the route was converted into a public road.

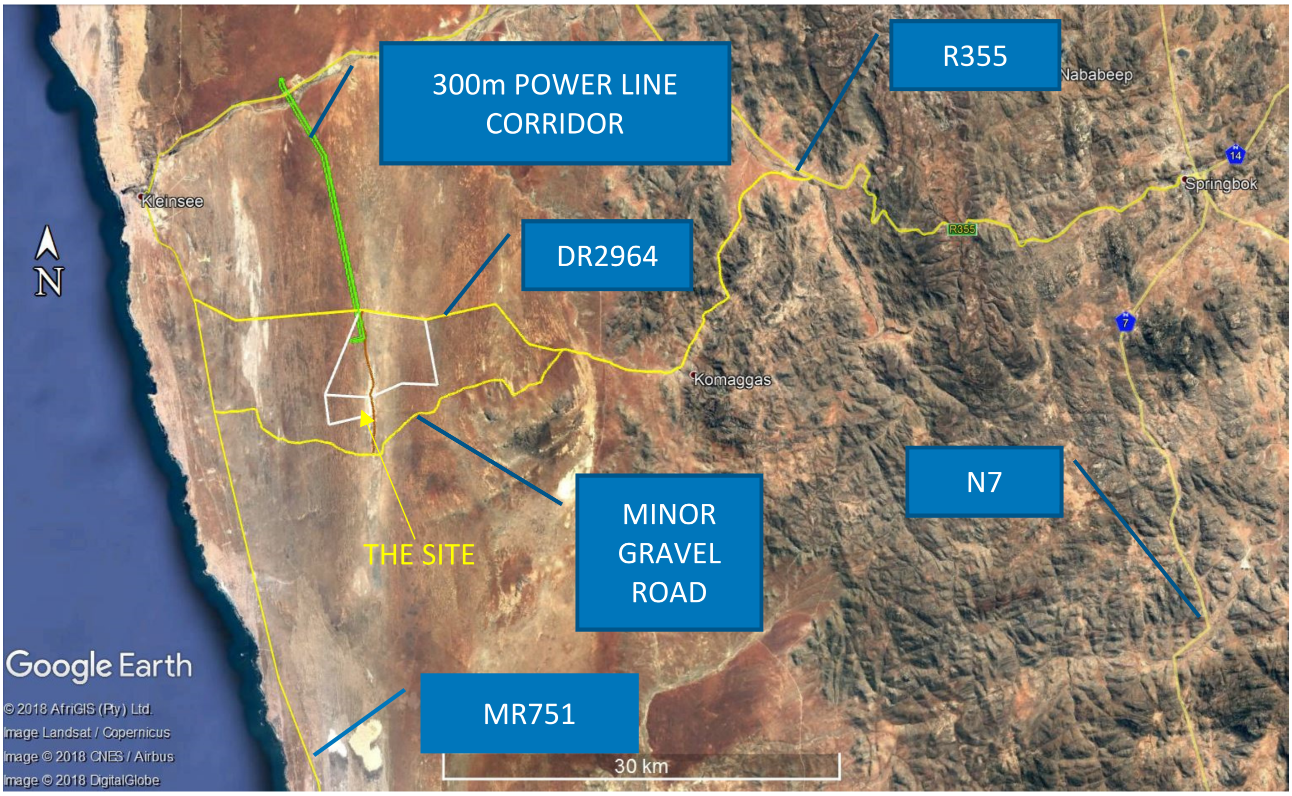


Figure 2-1: Overview of Site Boundaries

Zonnequa Wind Farm is envisaged to have a contracted capacity of up to 140MW, with a maximum of fifty-six (56) wind turbines. An aerial view with the proposed turbine layout arrangement is shown in *Figure 2-2*. The proposed WF is located within a radius of 359 kilometres from the Port of Saldanha.

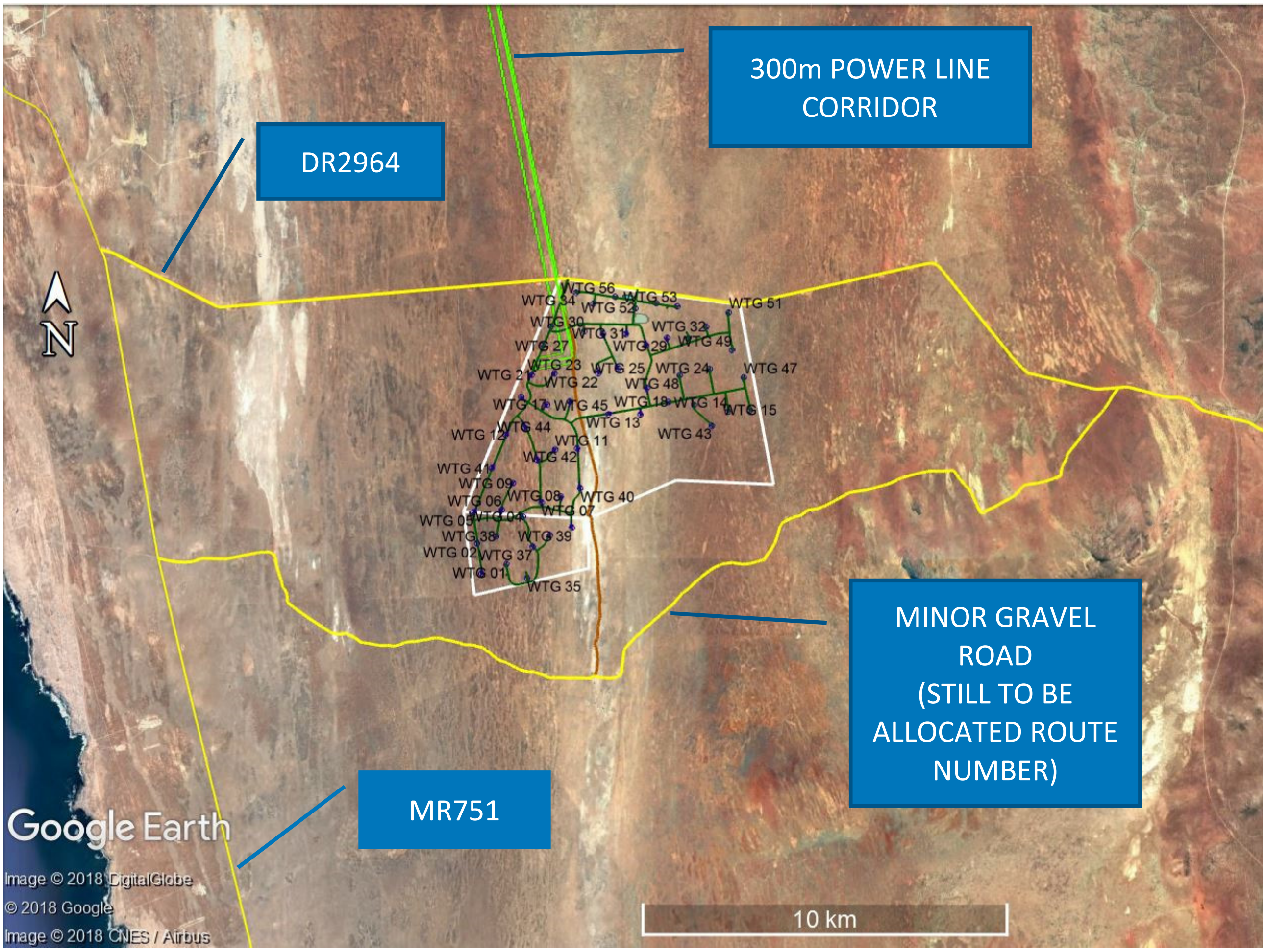


Figure 2-2: Aerial View of Proposed Turbine Layout Arrangement

The infrastructure and structures required for this type of facility includes:

- A maximum of fifty-six (56) wind turbines with a maximum of 140 MW contracted capacity;
- Operational and maintenance buildings such as a control centre, offices, warehouse, workshop, canteen, visitors centre and staff lockers. –Gross Leasable area (GLA) unknown at this stage;
- Temporary construction hardstand area (assembly area, storage area);
- Temporary construction laydown areas;
- A gate house with security;
- An overhead 132kV power line (assessed as a 300m power line corridor), with a servitude of 32m, to connect the wind farm to the existing Gromis Substation;
- An onsite substation, which all the turbines will connect to via underground MV cabling (buried along the road servitude); and
- Access roads to the site (with a width of up to 10m) and between project components (with a width of approximately 8m).

2.2 Site access

2.2.1 Access Location

The current formal site access is a farm road that connects from DR2964 located to the north of the site. This current access road provides access to the farmer's house. However, during construction and decommissioning phases, it is recommended that a private access be utilised for the development of the WF. In addition:

- Having two access points would allow for evacuation and congestion control when/if necessary.
- The current access road falls under an Eskom servitude with a planned overhead cable line. Due to the height of the equipment and components required in establishing a wind farm, Eskom may prohibit the use of the access road.

As part of this project, two access points are investigated, both of which connect from the DR2964 gravel road located north of the site (see *Figure 2-3*), namely:

- Access alternative 1 (i.e. current existing formal access to site), and
- Access alternative 2 (proposed main wind farm access).

Access alternative 2 is the preferred main access point and would need to be established as it currently does not exist. Alternative 1 is an existing access and can be used for evacuation purposes.

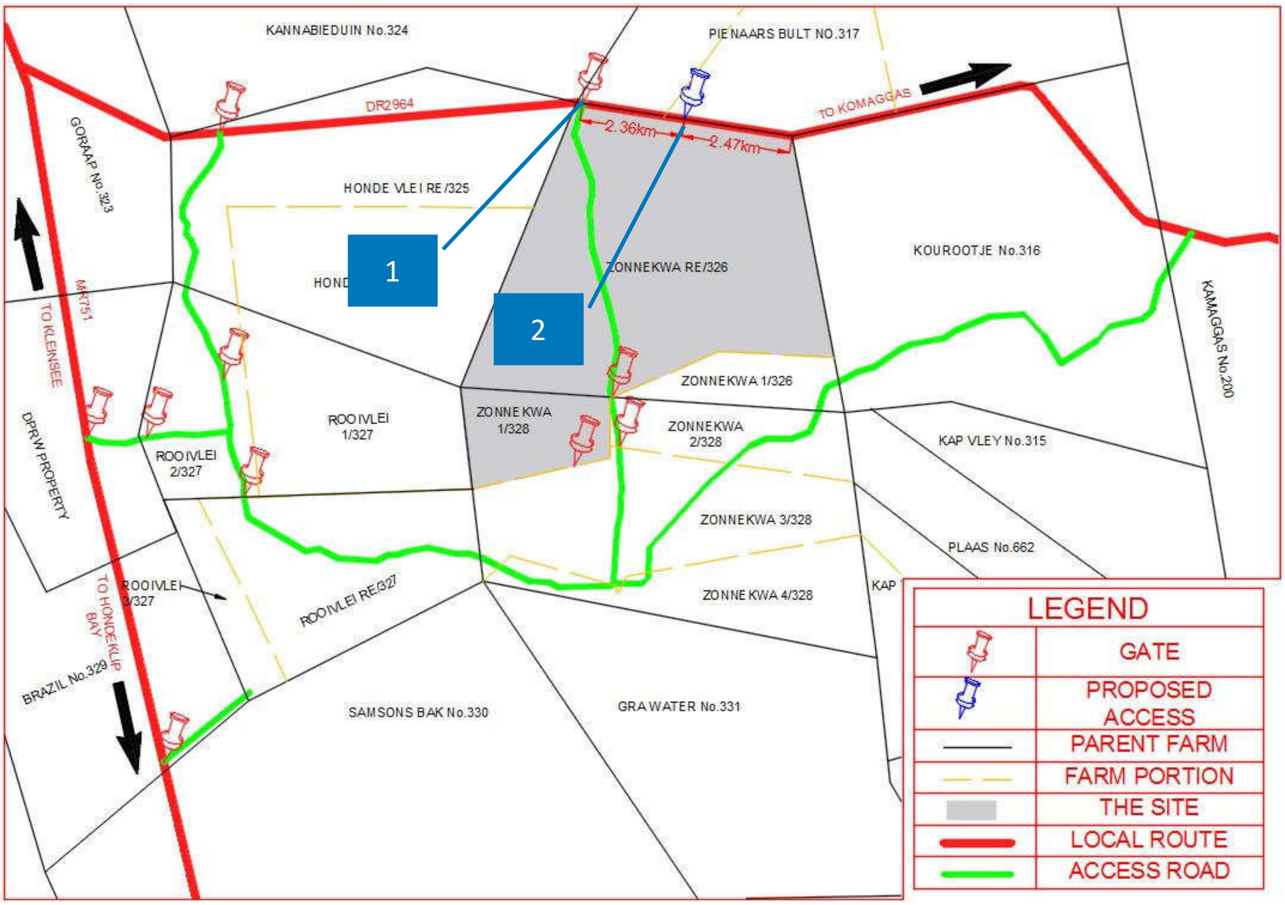


Figure 2-3: Site Access points

2.2.2 Access spacing

There are no access spacing guidelines available specifically for the Northern Cape Province. The province utilises TRH26 (i.e. Road classification and Access Management manual) for their spacing requirements. Based on TRH26, DR2964 can be classified as a Class 3 road and as such the access spacing requirement on the route is 1.6 km.

The access spacing between the site accesses (i.e. both current access (Access Alternative 1) and recommended additional access (Access Alternative 2)) and the neighbouring site accesses fall well within the 1.6 km recommended access spacing as shown in *Figure 2-4* below.

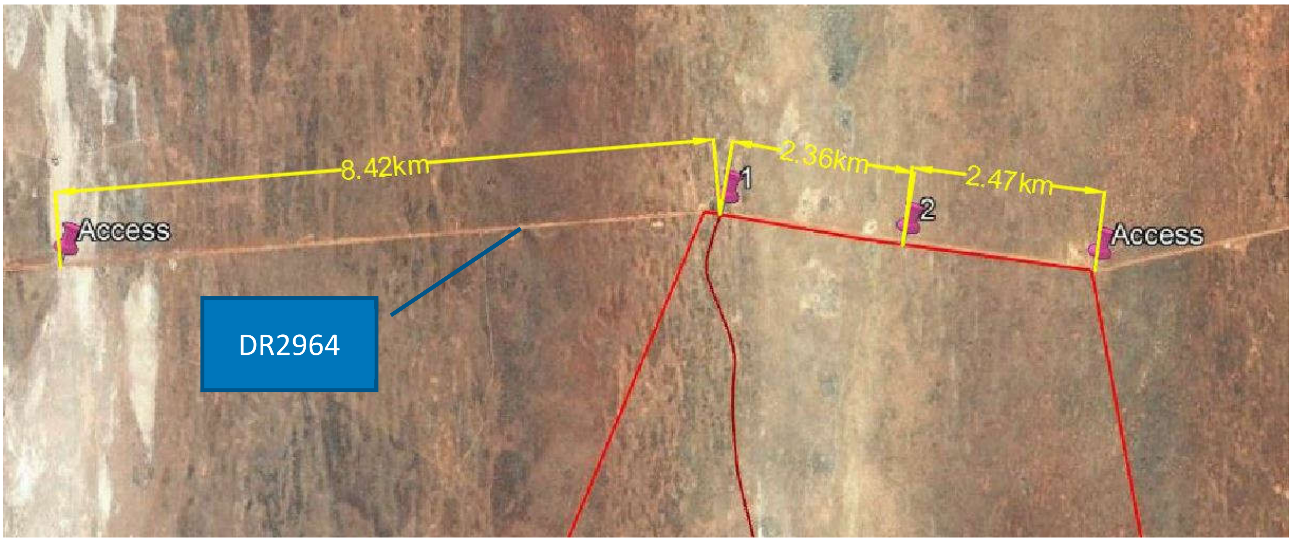


Figure 2-4: Access spacing

2.2.3 Sight Distance

According to TRH17 (DoT, 1988), the recommended shoulder sight distances for stop-controlled intersections for single unit truck and trailers on roads with a width of 7.5 metres are tabulated below.

Table 2-1: Shoulder Sight Distances TRH17

Design speed (km/h)	Shoulder Sight Distance (metres)
60	228
80	306
100	384
120	456

Access alternative 1 (the existing access) is located just after a 50km/h posted speed sign and as such a 228 metres shoulder sight distance is required. Access alternative 1, however, is located on a horizontal curve and in addition it is located between two vertical crests (one on each side). These road geometry features reduce the sight distance available at the access and as a result the

228 metres shoulder sight distance is not met. It is recommended that the 228 metres sight triangle area be kept clear of obstructions (see *Figure 2-5).*

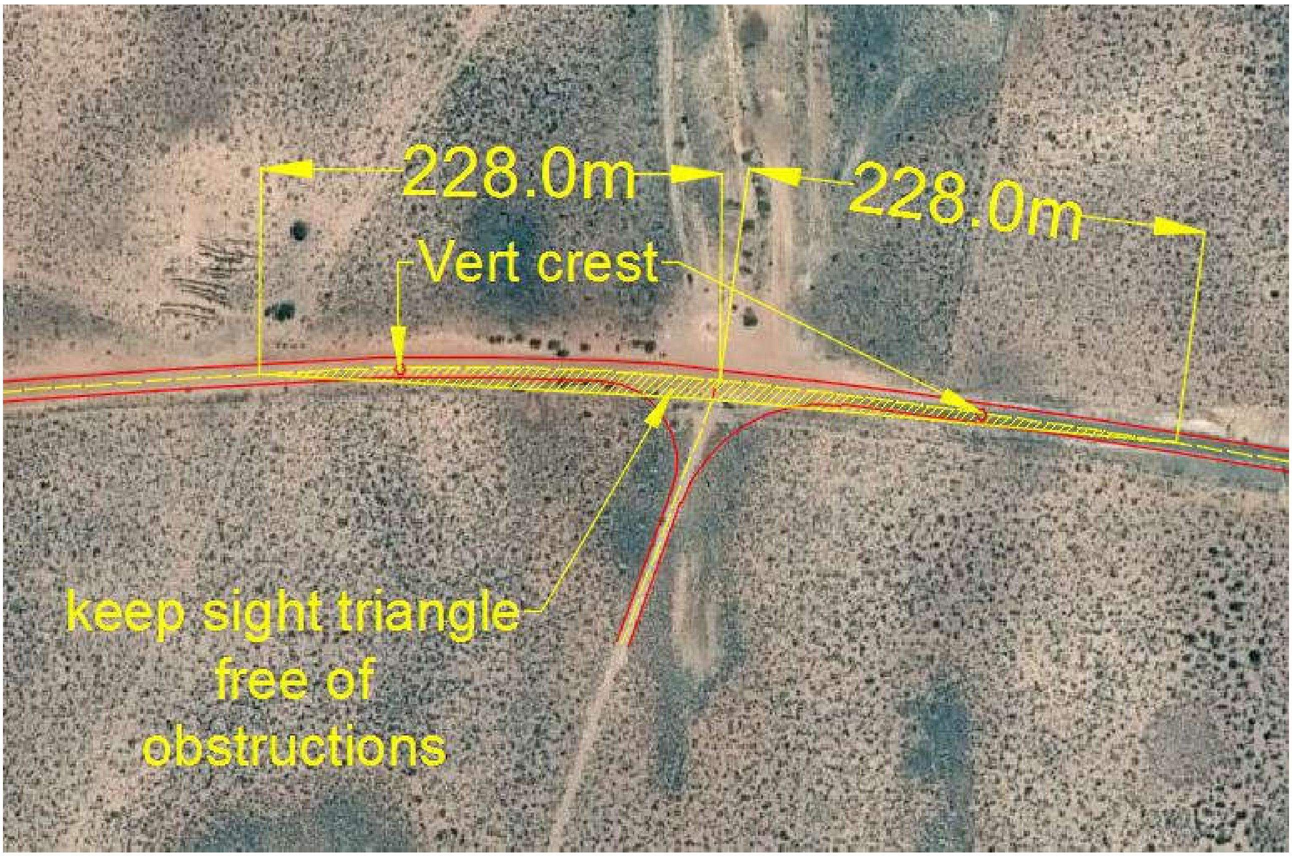


Figure 2-5: Access 1 recommended sight distance triangles

The recommended additional access (Access Alternative 2) is located on a straight and flat section of road with shoulder sight distances greater than 228 metres. Access Alternative 2 therefore meets the requirements in term of shoulder sight distance as is well within the TRH17 guidelines.
Access alternative 2 is thus recommended as the preferred main access point to the site.

2.2.4 General notes and considerations

It needs to be noted that all access and internal roads should be investigated for their topographical suitability, i.e. feasibility for haulage trucks and especially abnormal loads to navigate and have sufficient height clearance for any Eskom lines, Telkom lines or similar.

According to *SANS 10280/NRS 041-1:2008 Overhead Power Lines for Conditions Prevailing in South Africa,* the minimum vertical clearances as per Table C.1 is 6.3 metres for a 132kV power line, 7 metres for a 220kV power line outside townships and 8.1 metres for a 400kV power line outside townships. Furthermore, any sensitive environmental features and other environmental limitations need to be taken into consideration when constructing the internal access roads.

The internal roads between the turbines need a minimum width of 4 metres, and a maximum width of 8 meters, and existing gravel roads should be used as far as possible.

All bellmouths along the chosen site accesses to the wind turbine locations need to be in line with the required geometric standards to accommodate abnormal haulage vehicles. The exact location and upgrades of the internal access roads will need to be established at detailed design stage.

2.3 Port of entry

It is assumed that the blades and nacelle components will be imported to South Africa via the Port of Saldanha Bay. The Port of Saldanha Bay is South Africa's largest natural anchorage and port with the deepest water. It is located 60 nautical miles northwest of Cape Town (Longitude 17^0 58' E and Latitude 33^0 02' S) and is operated by Transnet National Ports Authority.

The Port offers an integrated, efficient and competitive port service for containers on transit. Containers handled include imports and exports from across the globe as well as trans-shipment cargoes. 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 tower sections can either be imported, or alternatively be manufactured locally. This depends on the type of turbine and tower. There are several types of towers available on the market, i.e. concrete, steel or hybrid concrete-steel towers. It needs to be investigated which companies can manufacture tower sections within South Africa.

2.4 Main route for the transportation of the wind turbine components

The preliminary investigation showed that it will be possible to transport the imported wind turbine components by road to the proposed wind farm site. Two alternative routes were assessed and are discussed hereafter. The routes were identified to maximise the use of higher order routes which are designed to handle / accommodate larger vehicles and minimise travelling through towns as far as possible. This was deemed important to minimise congestion and avoid disruptions to communities in these towns.

2.4.1 Alternative 1

One haulage route would be to travel from the Port of Saldanha:

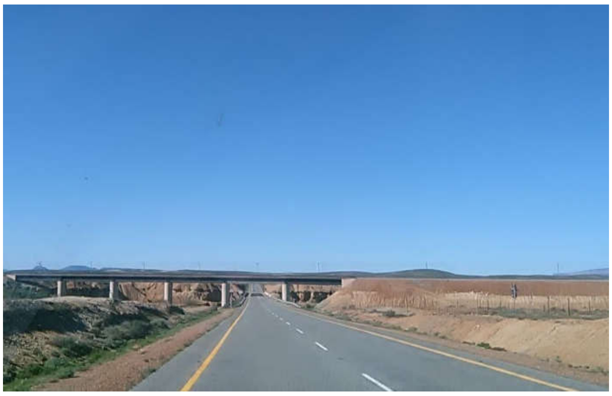
- head north on the Saldanha Bay Rd;
- turn right and then left onto the R27;
- head north east towards Velddrif;
- turn left onto the R399;
- turn left onto the N7 heading northwards towards Piketberg;
- continue north on the N7 towards Springbok;
- turn left onto the R355 driving west towards Kleinsee;
- turn left onto MR751 (surface road) and continue in a south-easterly direction; and
- turn left onto the DR2964 gravel road and continue in a north-eastern direction and the current farm access will be to your right (see *Annexure 1*).

The Saldanha Bay Road, R27, R399, N7, R355 and the MR751 sections of the route are surfaced (see *Photograph 2-1 to 2-8*). All access alternatives to the site are currently gravel access roads or vehicle tracks. The chosen access and circulation roads will have to be upgraded to suit abnormal load vehicle requirements. It needs to be ensured that if the access and circulation roads to the site are to remain as gravel roads, the routes need to be maintained during the additional loading experienced during the construction phase and be reinstated once construction is complete.

Photograph 2-1: Saldanha Bay Rd

Photograph 2-2: R27

Photograph 2-3: R399



Photograph 2-4: N7

Photograph 2-5: R355

Photograph 2-6: MR751

Photograph 2-7: DR2964

Photograph 2-8: Site Access

2.4.2 Alternative 2: Preferred Route

The second haulage route option (and considered to be the preferred option). This option provides the shortest route to the site that maximises the use of higher order routes and minimises traveling through towns.

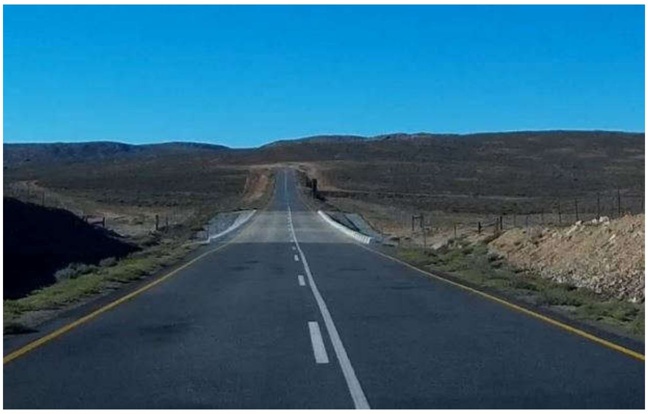
The route would comprise of travel from the Port of Saldanha:

- head north on Saldanha Bay Rd;
- turn right and then left onto the R27;
- head North East towards Velddrif;
- turn left onto the R399;
- turn left onto the N7;
- heading northwards towards Piketberg;
- continue north on the N7 towards Garies;
- turn left onto the MR739 connecting Garies to Hondeklip;
- turn right onto the MR751;
- continue on the MR751 and turn left towards Koingnass;

- continue travelling in a north-western direction on the MR751;
- turn right onto DR2964 road; and
- continue north east and the current farm access will be to your right (see *Annexure 2*).

The Saldanha Bay Rd, R27, R399, N7 and sections of MR751 are surfaced. Sections of the MR739 and MR751 (between Hondeklip and Koingnass) are wide gravel roads that show signs of frequent blading as a maintenance routine (see *Photograph 2-9 to 2-12*).

All access alternatives to the site are currently gravel access roads or vehicle tracks. The chosen access and circulation roads will have to be upgraded to suit abnormal load vehicle requirements. It needs to be ensured that if the access and circulation roads to the site are to remain as gravel roads, the routes need to be maintained during the additional loading experienced during the construction phase and be reinstated once construction is complete.



Photograph 2-9: MR739 Surfaced Section

Photograph 2-10: MR739 Gravel section

Photograph 2-11: MR751 Gravel Section

Photograph 2-12: MR751 Surfaced Section

Sections of both haulage routes consists of:

1. Mountain passes and steep slopes that may need to be traversed via a push and pull system.
2. Overhead cable restrictions that may require temporary raising of the cables or the relocation of the cable underground as a long-term solution.
3. Minor intersections that will need temporary widening to allow for the abnormal load turning movement. Sign posts may also need to be temporarily relocated.
4. The N7 is currently undergoing upgrades. Construction works may affect the transport of wind turbine components and as such it is recommended that contact be made with the construction company and relevant permitting authorities to determine the best travel times.

From a traffic point of view the Access Alternative 2 is the preferred alternative as it minimises the sections of mountain passes and avoids going through developed areas. It is recommended that the respective haulage company conducts a route test to determine the restrictions relevant to the haulage vehicle to be utilised.

2.5 Main route for the transportation of materials, equipment and people to the proposed WF

The nearest towns in relation to the proposed WEF site are shown in *Figure 2-6*. The site is located approximately: 22km south-east of Kleinsee, 62km south west of Springbok, and 22 km south west of Komaggas. The main routes from the nearest towns are the R335, MR751 surface road and the DR2964 gravel road section.

Transformers could be transported from the Johannesburg area. Based on observations of calcrete material on farms near the site, it needs to be investigated if the establishment of a local borrow pit is feasible, and the relevant licencing must be obtained to make use of the material. For concrete towers, there is also an existing batching plant at Fishwater Flats close to Port Elizabeth, which can be investigated for possible use. The construction of tower sections with batching plants on site can be investigated.

Alternatively, mobile concrete batching plants and temporary construction material stockpile yards could be commissioned on vacant land near the proposed WEF site, provided environmental permits are in place. Delivery of materials to the mobile batching plant and the stockpile yard could be staggered to minimise traffic disruptions.

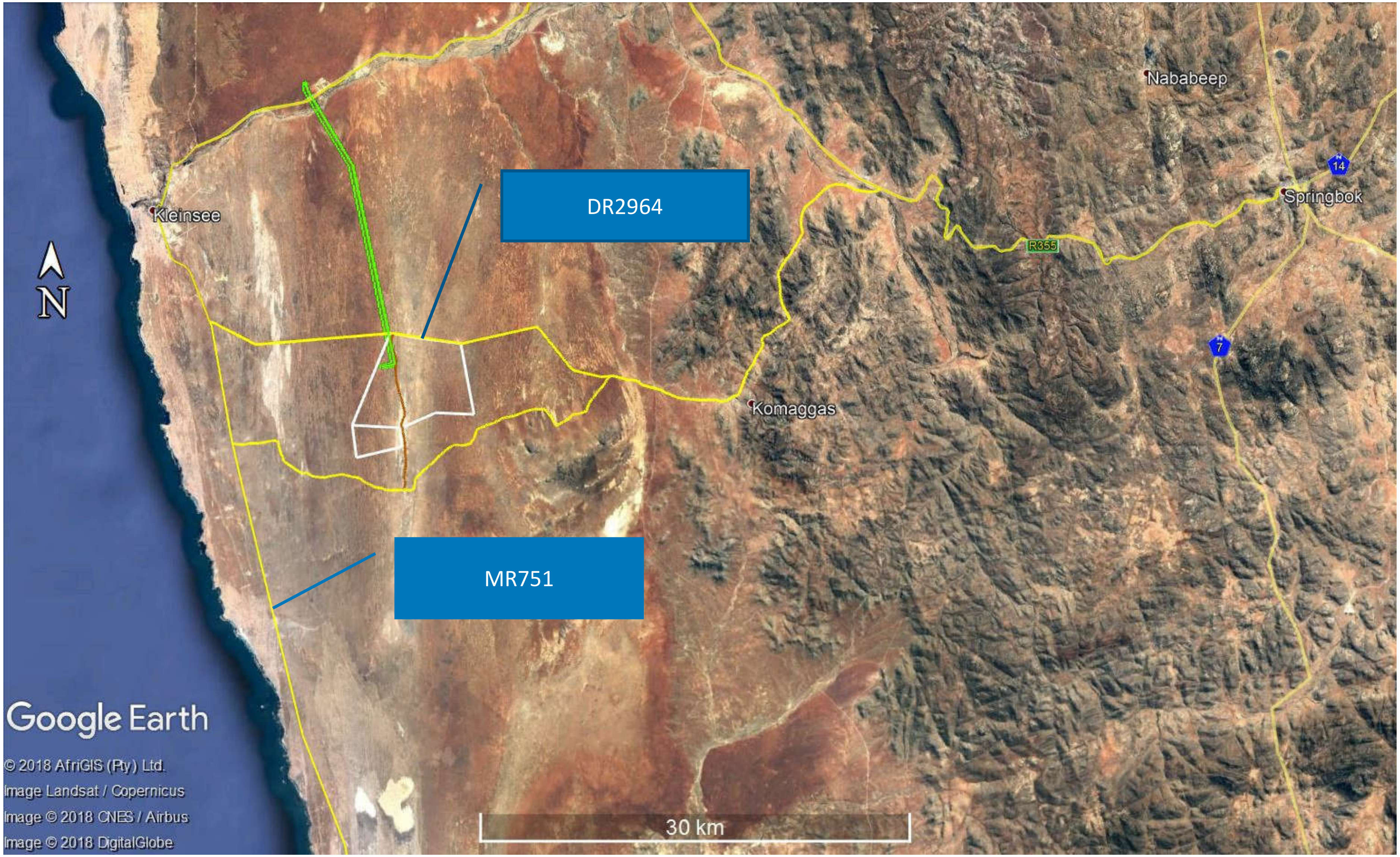


Figure 2-6: Ariel View of Nearest Towns

3 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO THE TRANSPORT STUDY

3.1 Selected Candidate Turbine

The possible range of wind turbines varies largely with various wind turbine manufacturers operating worldwide. At this point in time, the exact wind turbines to be used on site have not been finalised yet. For the purpose of this study, the Vestas V136-4.2 MW turbine was chosen with a hub height of 130 metres and a blade length of up to 75 metres.

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. It is assumed that all turbine parts will either be imported and shipped via the Port of Sadhana or manufactured in South Africa.

3.2 Transportation requirements

3.2.1 Abnormal Load Considerations

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

- 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 front axle and 9t on single or rear axles

Any dimension / mass exceeding 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.

3.2.2 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”[1] 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.

[1] 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”

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.

3.2.3 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.

3.2.4 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.

3.2.5 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 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
- Stability of Loaded Vehicles

3.3 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 investigated at a later stage when the transporting contractor and the plant hire companies apply for the necessary permits from the Permit Issuing Authorities (below pictures are privately taken or from the document *Transport Vehicles for Wind Power Plant, Goldhofer*).

3.3.1 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 vehicle mass of approximately 145 000kg for a 100-ton unit. Therefore, 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 5.1 metres.

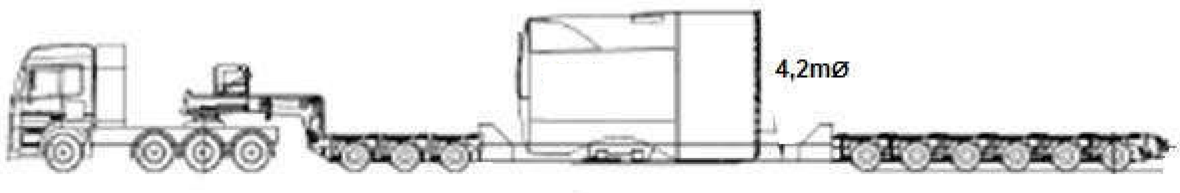


Figure 3-1: Transporting the Nacelle

3.3.2 Blades

These are the longest and possibly most vulnerable components of a wind turbine and therefore needs to be transported with utmost care. The set of three blades will at most have a length of 75 meters each 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 threes, although different manufacturers have different methods of packaging and transporting the blades. The transport vehicle exceeds the dimensional limitation (length) of 22 metres and will only be allowed under permit, provided the trailer is fitted with steerable rear axles or dollies.

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

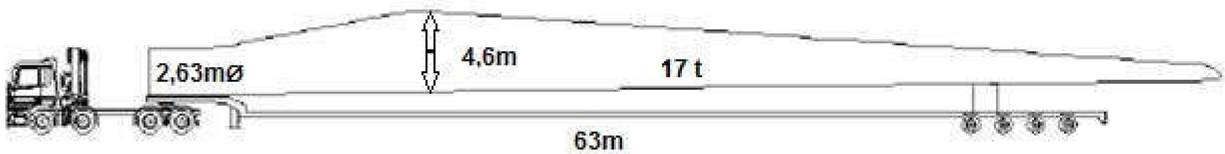


Figure 3-3: Example of Blade Transport

Turbine blades of a maximum length of 75 metres have been considered. 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.

3.3.3 Tower Sections

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 and type of tower (the chosen candidate turbine has either tubular steel or hybrid steel/concrete tower). For the Vestas V136-4.2 MW turbine, with a hub height of 130 metres, a maximum of 7 tower sections are required. Each section is transported separately on a low-bed trailer. Depending on the trailer configuration and

[2] Transport Vehicles for Wind Power Plant, Goldhofer

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 Figure 3-4 below).

Figure 3-4: Transporting the Tower Sections (Source: Author's photograph)

3.3.4 Turbine Hub and Rotary Units

Turbine Hub and Rotary Unit components need to be transported separately, due to their significant weights - a hub unit weighs around 45 tons and the rotary unit weighs almost 95 tons.

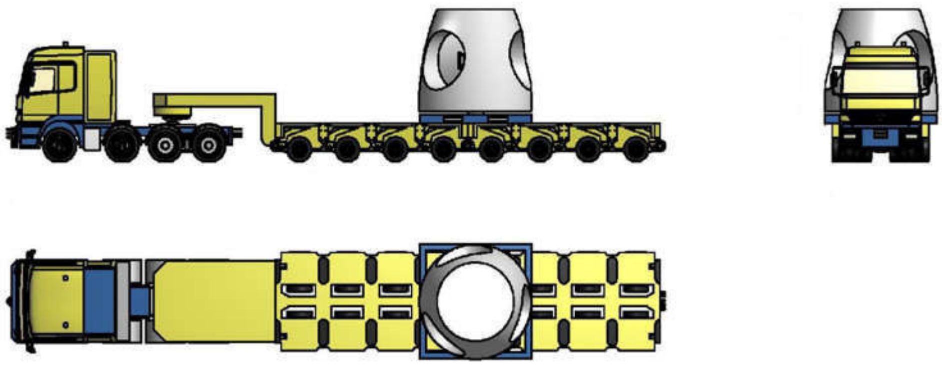


Figure 3-5: Transporting the Hub and Rotary Units (Source: Google)

3.4 Transporting Cranes, Mobile Cranes and other Components

Crane 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 the purpose of this assessment, some possible crane options are outlined as follows.

3.4.1 Examples of Cranes for Assembly and Erection on Site

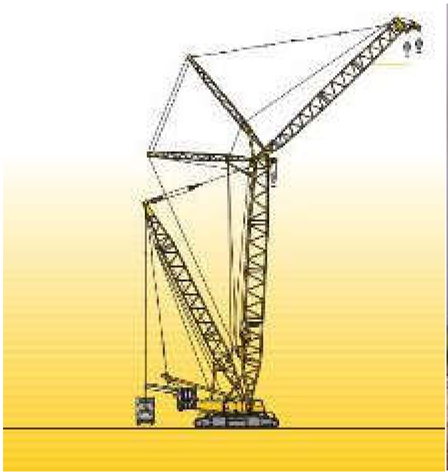
Option 1: Crawler Crane and Assembly Crane

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 (see example from Liebherr Manual for the LR1750 below).



- **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 *Figure 3-6*). 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 farms.

Figure 3-6: Cranes at work (Source: Author's photograph)

- **Hydraulic GTK 1100 Crane**

A key benefit of the GTK 1100 is its quick set-up due to the vertical rigging of the self-erecting tower and it can be operational in four to six hours. The crane has a small footprint of 18x18m (including the boom set-up) for a restricted job site area and its self-levelling function results in minimal ground preparation. In addition, the crane can operate at these heights with very heavy loads of up to 100 tons without a counterweight. The GTK 1100 can be transported on four truckloads including two abnormal trailers (for the Boom and Crane).

- **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.

3.4.2 Cranes at the 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 the wind turbine components to the abnormal transport vehicles, parked adjacent to the shipping vessels.

Figure 3-7: Cranes at Port of Entry (Source: Author's photograph)

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.

3.5 Transporting Other Material and Equipment

In addition to transporting the specialised lifting equipment, the normal Civil Engineering construction materials and equipment will need to be brought to the site (e.g. sand, stone, cement, gravel for road building purposes, excavators, trucks, graders, compaction equipment, cement mixers, transformers in the substation, 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.

4 IDENTIFICATION OF TRAFFIC IMPACT

4.1 Activities with potential traffic impact

The traffic expected to be generated by the proposed WF can be divided into three phases outlined as follows.

4.1.1 Construction phase

The construction phase includes the transportation of people, construction materials and equipment to the site. This phase also includes the construction of roads, excavation of turbine footings, trenching for electrical cables and other ancillary construction works that will temporarily generate the largest amount of traffic.

4.1.2 Operation and maintenance phase

The operation and maintenance phase include the operation and maintenance of the WF. During operation, it is expected that staff and security will periodically visit the turbines. Based on a study conducted on a similarly sized site, up to five full time employees can be expected to be stationed on site. The traffic generated during this phase will be minimal and will not have a significant impact on the surrounding road network.

The maintenance or replacement of wind turbine components would require a crane and abnormal vehicles. Although abnormal load vehicles would be required, the maintenance or replacement of components can be staggered, and the transportation of the components would therefore take place over a short period of time, presumably delivered in one day. Furthermore, traffic disruptions can be minimised by transporting the components during off-peak hours. This phase is therefore expected to generate minimal traffic.

4.1.3 Decommissioning phase

The decommissioning phase includes, but is not limited to, the dismantling of wind turbine components (blades, nacelle and tower), removal of electrical systems and substation, dismantling and removal of the operations and maintenance buildings, removal of wind turbine pads and removal of access/ service roads.

The decommissioning phase will generate construction related traffic including transportation of people, construction materials, water and equipment (abnormal trucks transporting turbine components). It is therefore expected that the decommissioning phase will generate the same impact as that of the construction phase.

4.1.4 Cumulative impacts

To assess the cumulative impact, it will be assumed that all wind farms within 50km currently proposed and/or approved, 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. Only a handful of projects would be selected to enter into a power purchase agreement with Eskom.

4.2 Trip generation and impact assessment

4.2.1 Current traffic volumes

The Current traffic volumes on the routes are deemed to be very low due to:

- low development density;
- the fact that historically the development in the area was created and/or stimulated by the presence of the De Beers mine. Since the mine was shut down, the population of the town dropped drastically due to lack of job opportunities; and
- due to observations made on a site visit conducted 20 to 22 June 2018.
- Lack of schools in the area. Upon conversations with farm owners, it was established that most of the locals send their kids to boarding schools out of town.

4.2.2 During Construction

The exact number of trips generated during construction will be determined by the haulage company transporting the components to site. Below is a summary of the activities that create the worst-case scenario with respect to trip generation.

<u>Abnormal loads:</u>

For this study and to consider a worst-case scenario, it was assumed that the blades will be transported separately to site. Consequently, for each 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 eleven abnormal loads trips, the total for a maximum of fifty-six (56) turbines will be around 616 trips. These trips are expected to be staggered and will not arrive at once.

<u>Construction vehicles and staff:</u>

The construction 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 m^3) adds over 80 trips by concrete trucks to the surrounding road network.

Table 4-1: Impact assessment summary table for the Construction Phase

Construction Phase Impacts		
	Without Mitigation	**With Mitigation**
Extent	Regional (3)	Regional (2)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Very likely (4)	Very likely (4)
Significance	**Medium (44)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation/Enhancement: - Stagger turbine component delivery to site- - Stagger the construction of the turbines - 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		
Residual impacts: Impact on local traffic will remain moderate		

4.2.3 During operation and maintenance

During operation, it is assumed that between three and ten full-time employees will be stationed on site, therefore vehicle trips generated are low and will have a negligible impact on the external road network.

Table 4-2: Impact assessment summary table for the Operation and maintenance Phase

Operation and maintenance Phase Impacts		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Small (0)	Small (0)
Probability	Very likely (4)	Very likely (4)
Significance	**Low (24)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation/Enhancement: - Staff and general trips can occur outside of peak traffic periods		
Residual impacts: None		

4.2.4 Decommissioning phase

The decommissioning phase will result in the same impact as the Construction Phase as similar vehicles and trips are expected to demolish and appropriately dispose of the components of the facility.

Table 4-3:Impact assessment summary table for the Decommissioning phase

Regional Decommissioning Phase Impacts		
	Without Mitigation	**With Mitigation**
Extent	Regional (3)	Regional (2)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Very likely (4)	Very likely (4)
Significance	**Medium (44)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation/Enhancement: - Stagger the removal of turbines, foundations, crane pads etc - Staff and general trips should occur outside of peak traffic periods		
Residual impacts Impact on local traffic will remain moderate		

4.2.5 Cumulative Impacts

The construction and decommissioning phases of a WEF are the only significant 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 WEF's, when operational, do not add any significant traffic to the road network.

Even if all wind farms are constructed and decommissioned on 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.

Below is a summary of the approved and proposed wind farm developments within a 50km radius of the project site:

- Currently there is an approved Eskom WF proposed just west of the Zonnequa WF. It will be located approximately 6 km south-east of Kleinzee in the Northern Cape. The Eskom WF is proposed to accommodate between 150 and 200 turbines. The project will be phased with each project phase aimed to construct between 75 and 100 turbines.

  For the cumulative impact analysis, it will be assumed that one phase of the project (i.e. 100 turbines) will be constructed at the same time as the Zonnequa proposed WF.

- A Genesis Namas WF is being proposed just south of the Zonnequa wind farm. It is to be located approximately 20km south- east of Kleinzee. The proposed WF is envisaged to accommodate a maximum of 43 wind turbines.

- The Juwi Kap Vley WEF is proposed just East of the Zonnequa site. It will be located approximately 30 km south-east of Kleinzee in the Northern Cape. The project will consist of 20-45 turbines.

Including the Zonnequa site a maximum of 244 wind turbines are expected.

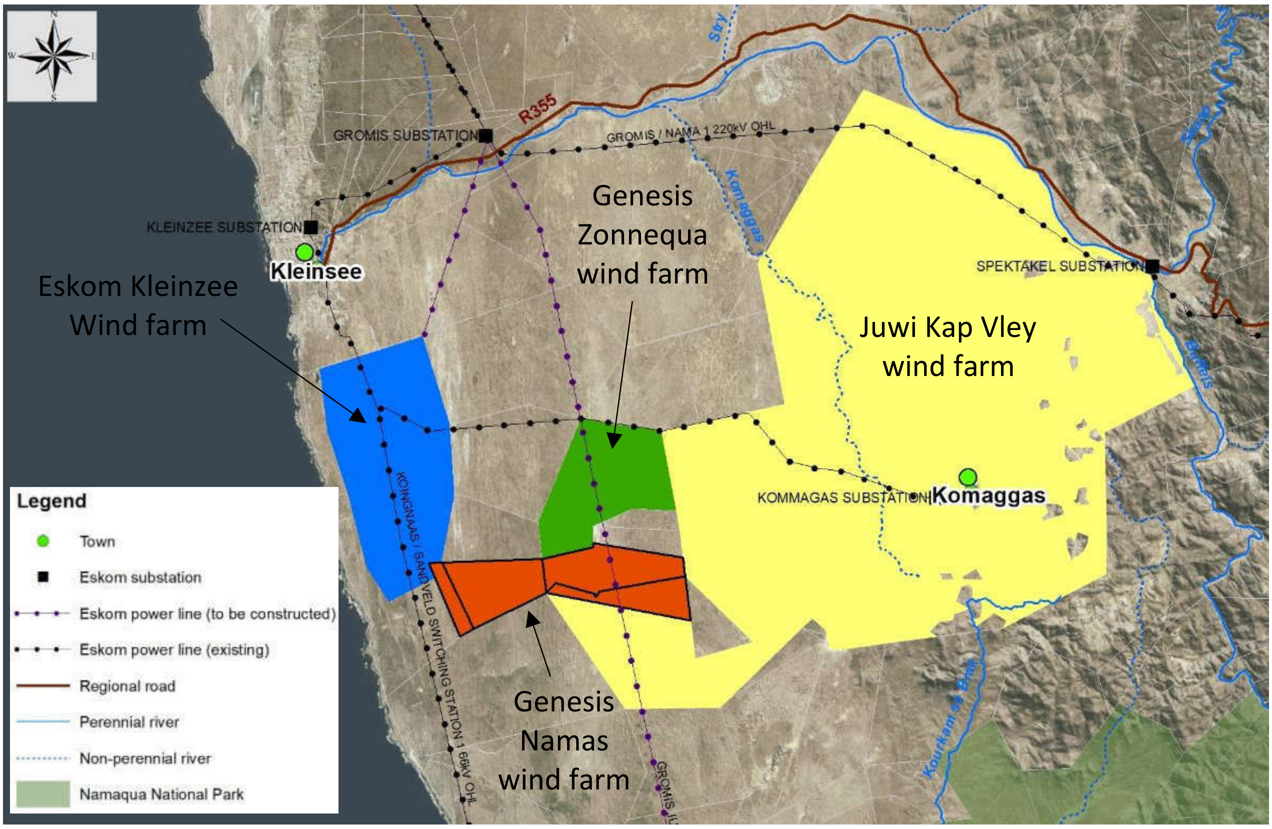


Figure 4-1:Wind farm projects in the vicinity of the project site

The cumulative impact of the sites is summarised in the table below:

Table 4-4: Cumulative impacts Construction Phase (with mitigation)

Construction Phase Impacts		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (2)	Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Moderate (6)
Probability	Very likely (4)	Very likely (4)
Significance	**Medium (32)**	**Medium (44)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?		
Mitigation/Enhancement: - Stagger turbine component delivery to site Stagger the construction of the turbines - 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		
Residual impacts: Impact on local traffic will remain moderate		

Table 4-5: Cumulative impacts Operation and maintenance Phase (with mitigation)

Operation and maintenance Phase Impacts		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Local (1)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Small (0)	Small (0)
Probability	Very likely (4)	Very likely (4)
Significance	**Low (20)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?		
Mitigation/Enhancement: - Staff and general trips should occur outside of peak traffic periods		
Residual impacts: None		

Table 4-6: Cumulative impacts Decommissioning Phase (with mitigation)

Decommissioning Phase Impacts		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (2)	Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Moderate (6)
Probability	Very likely (4)	Very likely (4)
Significance	**Medium (32)**	**Medium (44)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?		
Mitigation/Enhancement: - Stagger the removal of turbines, foundations, crane pads etc - Staff and general trips should occur outside of peak traffic periods		
Residual impacts: Impact on local traffic will remain moderate		

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Access and internal circulation

- For the access points, it is recommended that the 228 metres sight triangle area be kept clear of obstructions
- It needs to be noted that all access and internal roads should be investigated for their topographical suitability, i.e. feasibility for haulage trucks and especially abnormal loads to navigate and have sufficient height clearance for any Eskom lines, Telkom lines or similar.
- All bellmouths along the chosen site accesses to the wind turbine locations need to be in line with the required geometric standards to accommodate abnormal haulage vehicles. The exact location and upgrades of the internal access roads will need to be established at detailed design stage.
- The chosen access and circulation roads will have to be upgraded to suit abnormal load vehicle requirements. It needs to be ensured that if the access and circulation roads to the site are to remain as gravel roads, the routes need to be maintained during the additional loading experienced during the construction phase and be reinstated once construction is complete.

5.2 Haulage routes for wind turbine components

- The proposed haulage route is outlined in depth in section 2.4.2. The route was chosen as the preferred route because it provides the shortest route to the wind farm site, utilises higher order routes as far as possible and minimises travelling through towns.

- It is recommended that the respective haulage company conducts a route test to determine the restrictions relevant to the haulage vehicle to be utilised. With some routes road signs may need to be moved, overhead cables may need to be raised and bellmouths may need temporary widening to accommodate abnormal loads. A route test will help establish relevant changes specific to the abnormal load truck used to deliver the components and materials.

5.3 Traffic impact

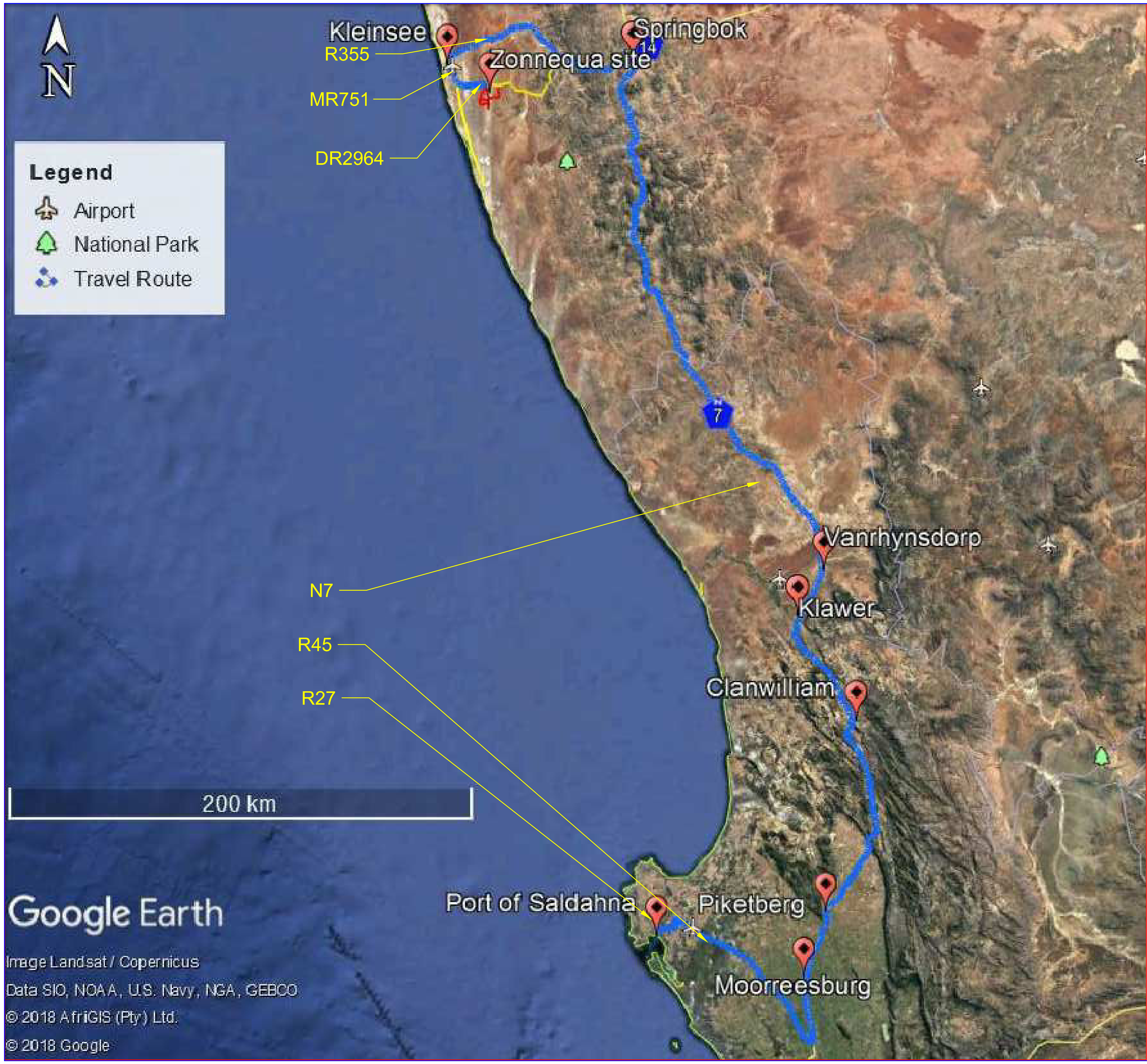
- No capacity improvements are considered necessary based on the following:
  - The Current traffic volumes on the routes are deemed to be very low due to:
  - Low development density;
  - The fact that historically the development in the area was created and/or stimulated by the presence of the De Beers mine. Since the mine was shut down, the population of the town dropped drastically due to lack of job opportunities;
  - Observations made on a site visit conducted 20 to 22 June 2018;
  - Lack of schools in the area. Upon conversations with farm owners, it was established that most of the locals send their kids to boarding schools out of town; and
  - The local routes in the vicinity of the site used to be managed by the De Beers mining company to support the mining operation. These routes can therefore be expected to be able to accommodate moderate to high traffic volumes. With the mine now non-operational, the routes are envisaged to adequately accommodate the generated development trips.

- The only notable generated traffic would occur during the construction and decommissioning phases. The trips generated during these phases will only occur for short periods of time and the following mitigation measures are recommended for consideration:
  - The delivery of wind turbine components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods;
  - Stagger the construction of the turbines;
  - The use of mobile batching 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;
  - Staff can be shuttled on scheduled busses to minimise the number of trips; and
  - Stagger the removal of turbines, foundations, crane pads etc during the decommissioning phase.

6 SUMMARY

The aim of this study was to investigate all traffic and transportation related matters pertaining to the proposed Zonnequa Wind Farm to be located close to Kleinsee in the Northern Cape. As a final decision has not been made on the candidate turbine, the Vestas V136-4.2 MW turbine was considered for this study.

The development of this wind energy facility is supported from a traffic engineering point of view, provided that the recommendations in this report are adhered to and are read in conjunction with the road design and environmental reports completed for this site.



ALTERNATIVE ROUTE	
ROUTE DIRECTIONS	
	START AT THE PORT OF SALDANHA
1	HEAD NORTH ON SALDANHA BAY RD(3.7km)
2	TURN RIGHT(7.4km)
3	TURN LEFT ONTO R27(4.7km)
4	TURN RIGHT ONTO R45(82.4km)
5	TURN LEFT ONTO N7
6	HEAD NORTH ON N7(59km)
7	AT THE ROUNDABOUT,TAKE THE 2ND EXIT AND STAY ON N7 TO GET TO SPRINGBOK(430km)
8	TAKE THE RAMP TO KOKERBOOM RD/R355(603m)
9	TURN LEFT ONTO KOKERBOOM RD/R355(735m)
10	CONTINUE TO FOLLOW THE R355 PAST KLEINSEE(106km)
11	HEAD SOUTH ON THE MR751 SURFACED ROAD (8.3km)
12	TURN LEFT ONTO DR2964 GRAVEL ROAD
13	HEAD NORTH EAST ON THE DR2964 GRAVEL ROAD (13.3km)
14	THE CURRENT SITE ACCESS IS TO YOUR RIGHT

NOTE:THESE DIRECTIONS ARE FOR PLANNING PURPOSES ONLY.CONSTRUCTION PROJECTS OR OTHER EVENTS MAY CAUSE CONDITIONS TO DIFFER FROM THE RECOMMENDED ROUTE.THE SERVICE PROVIDER TASKED WITH TRANSPORTING THE TURBINES MUST CONDUCT A ROUTE TEST CLOSER TO THE TIME OF DELIVERY TO PLAN FOR ANY ROUTE CHANGES OR CHALLENGES.

OBSERVED ROUTE CONSTRAINTS FOR ABNORMAL LOADS:

1. MOUNTAIN PASS ON N7 (PIEKENIERSKLOOF) AND R355 (SPRINGBOK):MAY NEED PUSH AND PULL SYSTEM TO AID ABNORMAL LOAD TRUCK.
   THE R355 MOUNTAIN PASS MAY NOT BE VIABLE DUE TO SHARP HORIZONTAL CURVES AT THE PASS.
2. LOW LYING OVERHEAD CABLES :MAY NEED TO BE TEMPORARILY RAISED (NOTED ON KLEINSEE-HONDEKLIP SURFACED ROAD CLOSE TO KLEINSEE.)
3. ROUTE SECTION SLOPES/GRADES :NEEDS TO BE TESTED FOR VIABILITY THROUGH ROUTE TEST BY HAULAGE COMPANY. DEPENDING ON THE VEHICLE IT MAY BE POSSIBLE TO MANEUVER THE SLOPE IF THE VEHICLE MOVES SLOWLY, ELSE A PUSH AND PULL SYSTEM MAY NEED TO BE UTILISED.
4. ROAD SIGNS AT INTERSECTIONS:MAY NEED TO BE TEMPORARILY MOVED AND MUST BE IDENTIFIED BASED ON A ROUTE TEST BY HAULAGE COMPANY.
5. INSUFFICIENT BELL MOUTH RADII AT INTERSECTIONS:TEMPORARY WIDENING MAY BE REQUIRED
6. ROAD CONSTRUCTION MAY AFFECT ABNORMAL LOAD TRAVEL PERMITS:TRAVEL TIMES MAY BE RESTRICTED AS A CONDITION OF PERMIT APPROVAL OR PERMITS MAY NOT BE GRANTED AT ALL. (ROAD CONSTRUCTION WAS NOTED ON THE N7)

PROJECT **ZONNEQUA WIND FARM**

TITLE **NATIONAL ROUTE FROM THE PORT OF SALDANHA TO ZONNEQUA SITE ALTERNATIVE 1**

JG AFRIKA

DESIGNED AND DETAILED 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

ANNEXURE 1

RamawaA11.07.2018

X:\Projects - (In-progress)\4840 Nama & Zonnequa Windfarms TIAs (IW)\09 Traffic Data\Route Maps\Route mapsREV1.dwg

	PREFERRED ROUTE ROUTE DIRECTIONS
	START AT THE PORT OF SALDANHA
1	HEAD NORTH ON SALDANHA BAY RD(3.7km)
2	TURN RIGHT(7.4km)
3	TURN LEFT ONTO R27(4.7km)
4	TURN RIGHT ONTO R45(82.4km)
5	TURN LEFT ONTO N7
6	HEAD NORTH ON N7(59.3km)
7	AT THE ROUNDABOUT,TAKE THE 2ND EXIT AND STAY ON N7 TOWARDS GARIES(323km)
8	TURN LEFT ONTO MR739 (59km SURFACED + 20km GRAVEL)
9	STAY ON MR739 (79km)
10	TURN RIGHT ONTO THE MR751 GRAVEL ROAD
11	STAY ON THE MR751 GRAVEL ROAD (15.2km)
12	TURN LEFT TOWARDS KOINGNASS ON MR751(14.2km SURFACED +3.1km GRAVEL)
13	CONTINUE NORTH WEST ON THE MR751 SURFACED ROAD SECTION(39.9km)
14	TURN RIGHT ONTO THE DR2964 GRAVEL ROAD
15	HEAD NORTH EAST ON THE DR2964 GRAVEL ROAD (13.3km)
16	THE CURRENT SITE ACCESS IS TO YOUR RIGHT

NOTE:THESE DIRECTIONS ARE FOR PLANNING PURPOSES ONLY.CONSTRUCTION PROJECTS OR OTHER EVENTS MAY CAUSE CONDITIONS TO DIFFER FROM THE RECOMMENDED ROUTE.THE SERVICE PROVIDER TASKED WITH TRANSPORTING THE TURBINES MUST CONDUCT A ROUTE TEST CLOSER TO THE TIME OF DELIVERY TO PLAN FOR ANY ROUTE CHANGES OR CHALLENGES.

OBSERVED ROUTE CONSTRAINTS FOR ABNORMAL LOADS:

1. MOUNTAIN PASS ON N7 (PIEKENIERSKLOOF):MAY NEED PUSH AND PULL SYSTEM TO AID ABNORMAL LOAD TRUCK.
2. LOW LYING OVERHEAD CABLES :MAY NEED TO BE TEMPORARILY RAISED (NOTED ON GARIES-HONDEKLIP GRAVEL ROAD,HONDEKLIP GRAVEL ROAD INTERSECTION (RIGHT TURN TO KOINGNASS), AND KLEINSEE-HONDEKLIP SURFACED ROAD CLOSE TO KLEINSEE.)
3. ROUTE SECTION SLOPES/GRADES :NEEDS TO BE TESTED FOR VIABILITY THROUGH A ROUTE TEST BY HAULAGE COMPANY. DEPENDING ON THE VEHICLE IT MAY BE POSSIBLE TO MANEUVER THE SLOPE IF THE VEHICLE MOVES SLOWLY, ELSE A PUSH AND PULL SYSTEM MAY NEED TO BE UTILISED. (NOTED ON HONDEKLIP-GARIES ROAD AND KOINGNASS-HONDEKLIP GRAVEL ROAD)
4. KINK ON VERTICAL ALIGNMENT ON HONDEKLIP-GARIES ROAD:NEEDS TO BE TESTED FOR VIABILITY THROUGH AN ABNORMAL LOAD ROUTE TRIAL RUN BY HAULAGE COMPANY
5. ROAD SIGNS AT INTERSECTIONS:MAY NEED TO BE TEMPORARILY MOVED AND MUST BE IDENTIFIED BASED ON A ROUTE TEST BY HAULAGE COMPANY.
6. INSUFFICIENT BELL MOUTH RADII AT INTERSECTIONS:TEMPORARY WIDENING MAY BE REQUIRED
7. ROAD CONSTRUCTION MAY AFFECT ABNORMAL LOAD TRAVEL PERMITS:TRAVEL TIMES MAY BE RESTRICTED AS A CONDITION OF PERMIT APPROVAL OR PERMITS MAY NOT BE GRANTED AT ALL. (ROAD CONSTRUCTION WAS NOTED ON THE N7)

PROJECT

ZONNEQUA WIND FARM

TITLE

NATIONAL ROUTE FROM THE PORT OF SALDANHA TO ZONNEQUA SITE ALTERNATIVE 2: PREFERRED ROUTE

JG AFRIKA

DESIGNED AND DETAILED 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

ANNEXURE 2

RamawaA11.07.2018

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