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Bon Espirange – Komsberg
132kV POWERLINE
TRANSPORT MANAGEMENT PLAN

November 2021
REVISION 0

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SYNOPSIS

Preparation of a Traffic Management Plan for the proposed Bon Espirange – Komsberg 132kV Powerline to be located in the Laingsburg Municipality (LM), Western Cape Province, and Karoo Hoogland Municipality (KHM), Northern Cape Province.

KEY WORDS:

Wind Energy Facility, WEF, Transport Management Plan, TMP

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.

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Bon Espirange – Komsberg
132kV POWERLINE
TRANSPORT MANAGEMENT PLAN

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1 INTRODUCTION

WSP appointed JG Afrika Pty (Ltd) to provide a Traffic Management Plan for the development of the Bon Espirange – Komsberg 132kV overhead powerline. The overhead power line is approximately 3 km long and is located in the Laingsburg Municipality (LM), Western Cape Province, and in the Karoo Hoogland Municipality (KHM), Northern Cape Province. No alternative routes are associated with the powerline as it follows existing powerlines from the Bon Espirange substation to the Komsberg substation. The powerline is required in order to evacuate the power generated by the Rietkloof and Brandvalley Wind Energy Facilities (WEFs) to the National Grid.

The following properties are affected:

- Bon Espirange 73 Portion 1 and Remainder.
- Aprils Kraal 105 Remainder
- Standvastigheid 210 Portion 2 (Komsberg Substation).

The powerline will be a 132kV steel single or double structure with kingbird conductor (between 15 and 20m in height – above ground level). Standard overhead line construction methodology will be employed – drill holes (typically 2 – 3m in depth), plant poles, string conductor. The construction phase will extend over a period of 12 months and create ~30-50 employment opportunities.

This study will provide input into the basic assessment process. The location of the powerline is shown in **Figure 1.1** below.

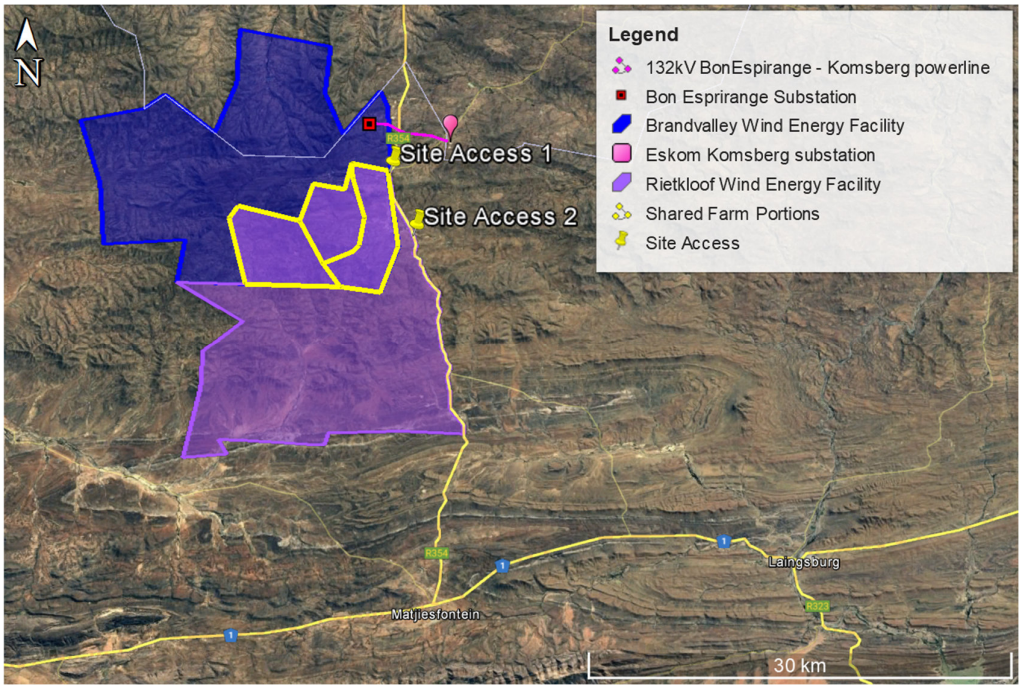

Figure 1-1:Locality Map

2 PURPOSE OF THE TRAFFIC MANAGEMENT PLAN

A Traffic Management Plan is required to ensure that the trips generated by the construction and operational activities associated with the proposed facility are mitigated as far as possible to:

- reduce the traffic impact on the surrounding road network;
- reduce potential conflicts that may results from the development traffic and the general traffic/public; and
- to identify potential routes for vehicles travelling to the site, particularly heavy and abnormal load vehicles.

This Traffic Management Plan has been prepared to enable the identification and implementation of all legal and best practice requirements in respect of the management of traffic associated with the construction and operation of the facility.

3 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations apply:

- This TMP is based on the project information provided by the Client.
- Maximum vertical height clearances along the haulage route are at least 5.2m to be able to accommodate abnormal loads.
- The imported elements will be transported from the most feasible port of entry, which is deemed to be Richards Bay.
- All haulage trips will occur on either surfaced national and provincial roads or existing gravel roads.
- Material for the construction will be sourced locally as far as possible.

4 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
- Chief surveyor general website
- 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

- Manual for Traffic Impact Studies, Department of Transport, 1995
- TRH26 South African Road Classification and Access Management Manual, COTO
- TMH 16 South African Traffic Impact and Site Traffic Assessment Manual (Vol 1), COTO, August 2012
- TMH 16 South African Traffic Impact and Site Traffic Assessment Manual (Vol 2), COTO, February 2014

5 SITE DESCRIPTION

5.1 General

The site is located approximately 49 km north of Matjiesfontein in the Laingsburg Municipality (LM), Western Cape Province, and in the Karoo Hoogland Municipality (KHM), Northern Cape Province. The powerline will connect from the Bon Espirange substation to the Komsberg substation. This will allow for the connection of the Rietkloof and Brandvalley WEFs to the National Grid.

5.2 Site access points

The proposed powerline can be accessed from the Rietkloof and Brandvalley WEF site access points closest to the powerline. The closest site access roads are the OP08042 and OP08044 which connect to the R354 located at the eastern end of the site. The R354 is a Class 2 minor arterial route running in a north-south- direction from Matjiesfontein to the R356 in the Northern Cape. The road is a surfaced single carriageway with one lane per direction.

Since the access roads are located along existing registered roads, access spacing restrictions are not envisaged. It should be noted that road upgrades may be required along the existing access roads to accommodate expected vehicles. Additional roads may need to be established to access the full powerline route.

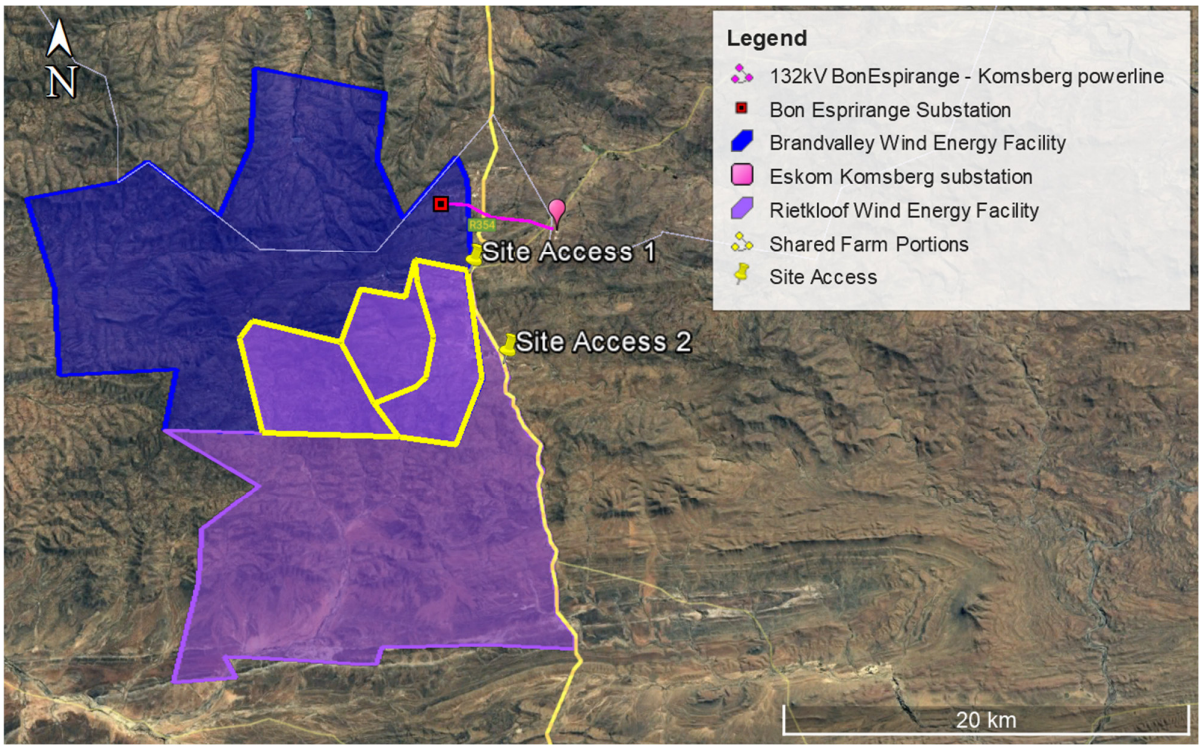

Figure 5-1:The Proposed Site

6 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO THE TRAFFIC MANAGEMENT PLAN

6.1 Components

Powerlines are a system of overhead transmission lines and underground cables. Their main function is to transfer power from an electrical generation source to a substation from which distribution to the consumer will occur.

The materials/components required for powerlines include:

- Towers/poles to support the electrical cables. These can be made from wood, steel, aluminium, concrete or reinforced plastic options,
- Wire conductors typically made of aluminium,
- foundations for towers/poles,
- Dampers,
- Ground wires,
- Insulators, and
- Transformer.

Components are expected to be locally sourced and transported to site using appropriate National and Provincial routes. It is expected that the components will generally be transported to site with normal heavy load vehicles. The expected abnormal vehicles will comprise of lifting equipment required to off-load and assemble the components.

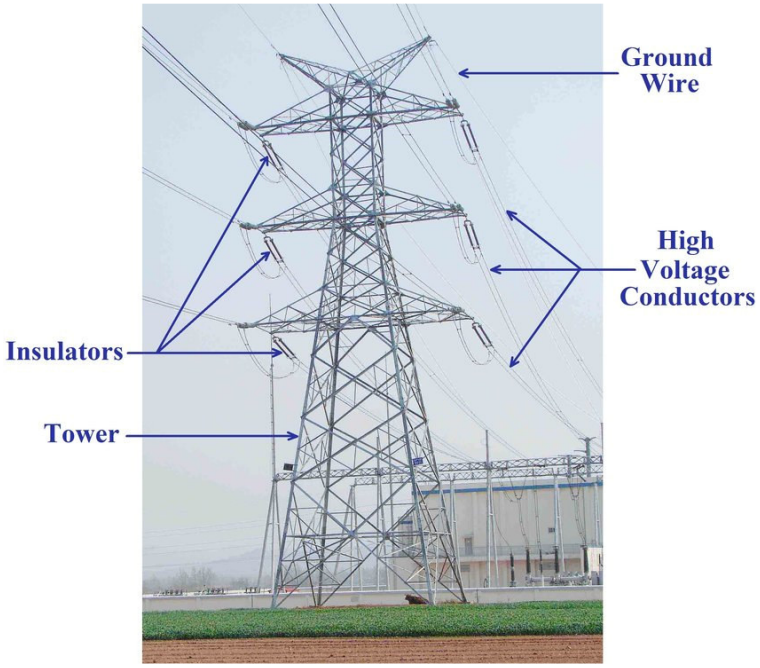

Figure 6-1: Typical High voltage Power Transmission system (Chakraborty, 2017)

6.2 Applicable Legislation and Permit Requirements

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

- Abnormal load permits, (Section 81 of the National Road Traffic Act), and
- Authorisation from Road Authorities to modify the road reserve to accommodate turning movements of abnormal loads at intersections.

7 TRAFFIC MANAGEMENT PLAN

This Traffic Management Plan has been prepared in respect of the planning phase of the proposed facility. The Traffic Management Plan should be updated prior to the commencement of the construction phase, when detailed information regarding the delivery of components, traffic data and construction activities are available. A designated personnel member of the Contractor's team will be the custodian of the plan and the custodian will ensure that all personnel and subcontractors are trained to ensure compliance. The requirements of the Traffic Management Plan shall apply to all construction personnel and subcontractors appointed to provide vehicles, machinery or drivers. The Plan needs to be reviewed every four months or immediately after an incident, when corrective measures will be incorporated into the Plan.

Prior to the commencement of the operational phase, the plan should be updated to include the operational traffic requirements. A copy of the TMP should be kept at the facility. A designated employee should ensure that the plan is enforced and will make sure that the Plan is available to all relevant personnel and external maintenance/repair teams. The Plan should be reviewed annually or immediately after an incident, when corrective measures will be incorporated into the Plan.

7.1 Preliminary Transport Requirements

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. Abnormal vehicle trips are limited to the lifting equipment required to offload components and to assemble the powerline. The abnormal vehicle trips are expected to be low, and these trips are expected to arrive early in the construction phase to prepare for the construction of the powerline. Component and equipment delivery can be staggered and planned to occur outside of the peak traffic periods (peak traffic periods for rural areas are assumed to be 6:30am – 8am and 4pm-6pm). This will assist in mitigating the impact on the surrounding road network.

7.1.1 Construction traffic

Construction traffic will include vehicles for deliveries, removal of materials and construction staff.

1. **Material and component delivery:** Vehicle trips from material and component delivery vary depending on the construction task/program, fuel supply arrangements, as well as distance from the material source to the site. Not enough detail about the powerline is known at this stage to provide an estimated trip generation volume for material and component traffic.

   The materials and components expected for the powerline construction can generally be transported by normal heavy load vehicles. Project planning can be used to reduce delivery trips during peak hours. In addition to this, using a mobile batch plant as well as temporary construction material stockpile yards near the proposed site can also reduce peak hour trips.

2. **Construction machinery:** Cranes for pylon/tower assembly, heavy vehicles required for earthworks etc. These vehicles are expected to have negligible traffic impact as they will arrive on site in preparation for construction. Once on site, these vehicles will produce internal site traffic with minimal effect on the external road network.

3. **Site personnel and workers:**

Based on information obtained from similar projects, the following trip generation assumptions are made for construction personnel:

	Activity	**traffic comments**	**Approx. team size**	**Approx. duration at a point (i.e., tower location)**
1	Centre line pegging and identification of new gates	(light vehicle access)	3	1 day
2	Access Negotiations	(light vehicle access)	1	1 day
3	Tower Pegging	(light vehicle access)	5	1 days
4	New gate installation	(light vehicle access)	5	1 days
5	Foundation nominations (for main structure and anchors)	(heavy vehicle access)	5	2 days
6	Excavation of foundation	(heavy vehicle access)	10	2 days
7	Foundation steelwork (reinforcing)	(heavy vehicle access)	10	2 days
8	Foundation (concrete) pouring	(heavy vehicle access)	20	2 days
9	Delivery of tower steelwork	(heavy vehicle access)	5	1 day
10	Assembly team / Punching and painting	(light vehicle access)	10	3 days
11	Erection	(abnormal load vehicle access)	20	2 days
12	Stringing	(abnormal load vehicle access) (intensive vehicle activity likely within the working area)	50	7 days
13	Sag and tension	(heavy vehicle access)	10	3 days
14	Rehabilitation	(heavy and light vehicle access)	5 to 15	2 – 10 days

It is assumed that the same team numbers will move from point to point of the powerline construction to another. Based on this assumption a maximum of 50 to 70 workers can be expected on site a day.

Based on traffic station data sourced from the Western Cape Government Road Network Information System, there are no taxis or busses operating along the R354. It is recommended that the majority of construction personnel be transported to and from site by means of busses or minibus taxis.

Busses have an average of 60 passenger capacity while minibus taxis have an average passenger capacity of 15. Assuming approximately 20% highly skilled personnel will travel by means of passenger vehicles the following trips are assumed:

- for the skilled personnel a maximum of 14 trips are expected.
- The remaining 56 workers can travel by bus (i.e., 1 bus trip) or 4 (four) minibus taxi trips.

Depending on the construction schedule, a maximum of 18 peak hour site personnel trips is assumed for the purposes of this assessment. This volume is deemed to generate an insignificant traffic impact.

The potential transport impacts imposed by the construction traffic are temporary, short term in nature, and can be mitigated to an acceptable level.

7.1.2 Operational traffic

Traffic during the operational phase will consist of maintenance staff maintaining the development. The trips generated during this phase is low as trips will only be for occasional maintenance requirements. A conservative worst-case estimate of between5 to 15 peak hour staff trips are assumed at this stage.

7.1.3 Decommissioning phase

The decommissioning phase will generate construction related traffic including transportation of people, construction materials, water and equipment. It is therefore expected that the decommissioning phase will generate the same impact as that of the construction phase.

Proposed mitigation measures during the construction, operational and maintenance, and decommissioning phase include:

- The delivery of components and construction materials to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- The use of batch plants (if required) and quarries near the site would decrease the impact on the surrounding road network.
- Stockpiling of materials near the site can also help reduce peak hour trips.
- Staff and general trips should occur outside of peak traffic periods as far as possible.

7.2 Transport Coordinator

It is recommended that a transport coordinator (or similar designation) be appointed to ensure compliance of the TMP. The coordinator shall make all the necessary arrangements to maintain the required traffic measures for the duration of the construction period.

7.3 Stakeholder Engagement

Interested and affected parties are to be informed of all transport activities taking place that may affect them or require approval (e.g., local community, the local authorities, law enforcement and affected landowners.)

Stakeholder engagement should address and provide information to stakeholders regarding general construction activities, construction vehicles routes, projected timelines, procedures for complaints and emergency procedures.

7.4 Licensing

All construction vehicles shall have the necessary licences, a valid roadworthy certificate and shall comply with the relevant traffic and transport licencing requirements (such as abnormal loads or hazardous materials).

All drivers of vehicles shall have the requisite licences to operate any vehicle (or machinery) operated by them on site or on any public roads. A professional driving permit (PrDP) is required if any of the following vehicles are operated:

- Goods vehicles, (more than 3 500 kg).
- Breakdown vehicles.
- Buses (any bus).
- Minibus taxis (more than 3 500 kg), transporting 12 or more people, including the driver.
- Vehicles used to transport people for payment.
- Goods vehicle carrying dangerous goods (more than 3 500 kg).
- Road tank vehicles for petroleum-based flammable liquids.
- Motor vehicles transporting 12 or more people, including the driver.

7.5 Construction Staff

All staff shall be transported safely to site in appropriate vehicles. Staff shall not be allowed to be transported to site on the back of open trucks. Passenger vehicles shall not exceed the carrying capacity of the vehicle.
Collections/Drop-off points for staff shall be located at a safe distance from traffic and construction activities. Roads and areas used by construction vehicles shall, as far as possible be avoided by all personnel. Designated pedestrian pathways shall be demarcated where appropriate.

All staff shall receive the appropriate site safety induction training. Drivers shall be adequately trained in the identification and avoidance of road hazards, vehicle maintenance and care and safety

requirements. All staff shall be informed of the construction site risks and training shall include appropriate precautionary measures required to be undertaken to facilitate safe and efficient traffic management (e.g., understanding signage, crossing roadways and utilising designated pedestrian pathways, reporting incidents).

7.6 Inspection of all Routes

A dry run of all routes (see **section 8**) is to be undertaken to identify any areas to avoid or obstacles that might disrupt the movement of the construction vehicles. All issues affecting the movement of construction vehicles are to be addressed immediately by the Contractor and relevant stakeholders e.g., law enforcement, relevant roads department and authorities.

7.7 Maintenance of vehicles

All vehicles and construction plant shall be regularly maintained, repaired when necessary and inspected on a regular basis to ensure that the vehicles are in good working order. Construction and passenger vehicles shall be monitored to ensure that vehicles are not overloaded.

7.8 Maintenance of roads

The Contractor shall maintain the roads used by construction vehicles, repairing any damage caused by construction traffic to the surrounding road network. Where gravel roads are used, the roads shall be maintained, and dust control measures shall be implemented to avoid dust pollution.

Road verges at the site shall be regularly maintained to ensure that vegetation remains short and that the roads serve as an effective firebreak.

7.9 Signage

Signage, in accordance with the South African Road Traffic Signs Manual, will be required to be conspicuously placed at appropriate locations along all access roads, the internal roads to the site and public roads used by construction vehicles (in consultation with the relevant traffic authorities) to indicate the following:

- all road and pedestrian hazards;
- site access
- site offices
- wayfinding signs on internal roads e.g. parking, toilets, emergency assembly point
- crossing points;
- speed limits;
- turning traffic;
- dedicated routes for construction vehicles and staff
- no-go areas
- any traffic control information which may be relevant to the construction activity at the time.

It is recommended that flagmen be implement when high volumes of construction traffic are expected to help direct the traffic, thus ensuring the safe movement of the vehicles and reducing the potential conflicts.

7.10 Speed limit

All drivers operating vehicles shall comply with the posted speed limits (or the maximum allowable speed as per the permit for abnormal load vehicles) on public roads as well as a proposed 30km/h speed limit within the construction site and access roads.

The failure to adhere to the prescribed speed limits is an offence and disciplinary action may be taken by the Contractor.

7.11 Abnormal Loads/vehicle travel

The expected abnormal vehicles will comprise of lifting equipment required to off-load and assemble the components. Abnormal loads/vehicles will be transported to site as per the following:

7.11.1 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):

- 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 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.

7.11.2 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.

7.11.3 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 or permits. Embargo lists are compiled annually and are obtainable from the Issuing Authorities.

7.11.4 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.

7.11.5 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
- Stability of Loaded Vehicles

7.11.6 Preferred Abnormal load route

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 components, to ensure that the delivery will occur without disruptions. It needs to be ensured that gravel sections (if any) of the transport 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.

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

8 POTENTIAL ROUTES TO THE PROPOSED SITE

8.1 Proposed main access road to the proposed Facility

The main access roads to the site are located off the R354. A desktop study was undertaken using typical traffic data available on Google Maps. The typical traffic conditions in the area comprise mostly light traffic volumes. It is however still recommended to travel outside of peak hours (peak traffic periods for rural areas are assumed to be 6:30am – 8am and 4pm-6pm) to mitigate traffic disruptions as far as possible.

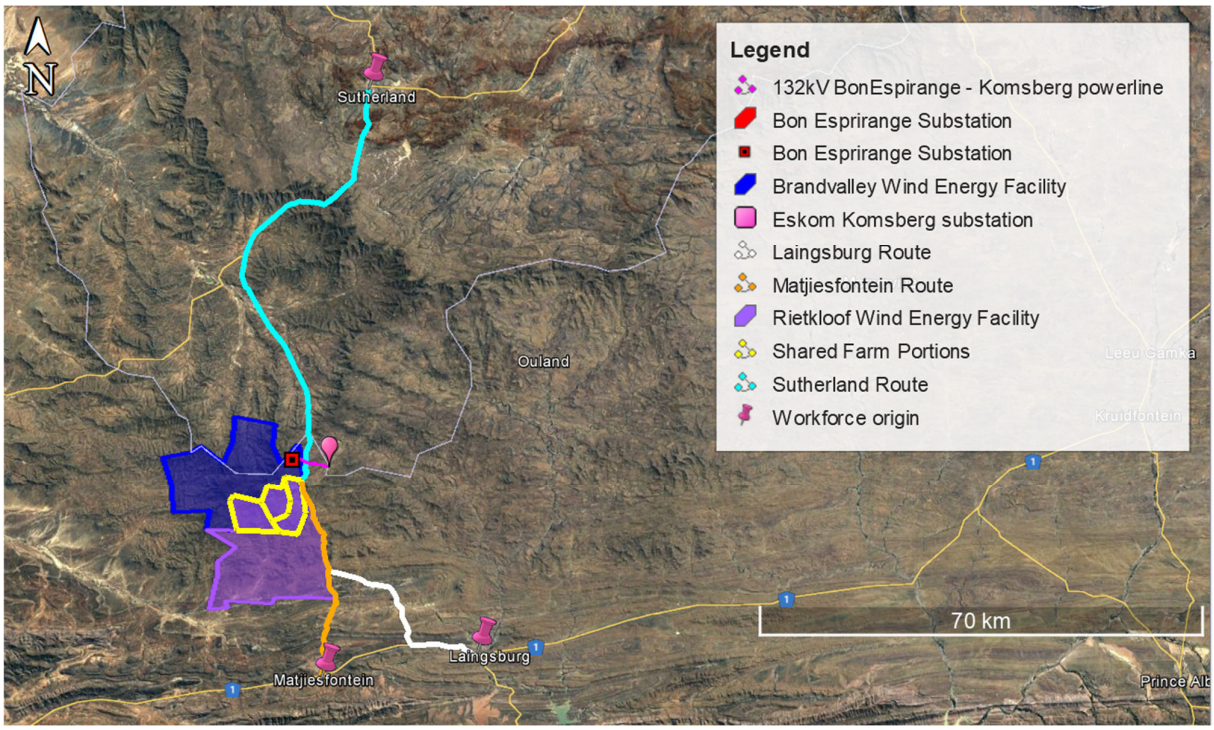

Figure 8-1: Routes from the nearest towns to site

8.2 Main Route for the Transportation of Materials, Plant and People to the proposed site

It is envisaged that the workforce will most likely reside in Sutherland, Matjiesfontein ,Touws River or Laingsburg as the closest communities. These towns connect to the site via the N1 and the R354.Due to a lack of public transport near the site it is recommended that the majority of construction personnel be transported to and from the site by means of busses. This will reduce the number of trips bound for the site.

Building materials will most likely be sourced from Worcester approximately 160km form the site or alternatively from Cape Town approximately 300 km from the site. A significant reduction in heavy vehicle trips can be achieved by using mobile batch plants. In addition to this, temporary construction material stockpile yards could be commissioned on vacant land near the proposed site. Delivery of materials to the mobile batch plant and the stockpile yard could be staggered to minimise traffic disruptions.

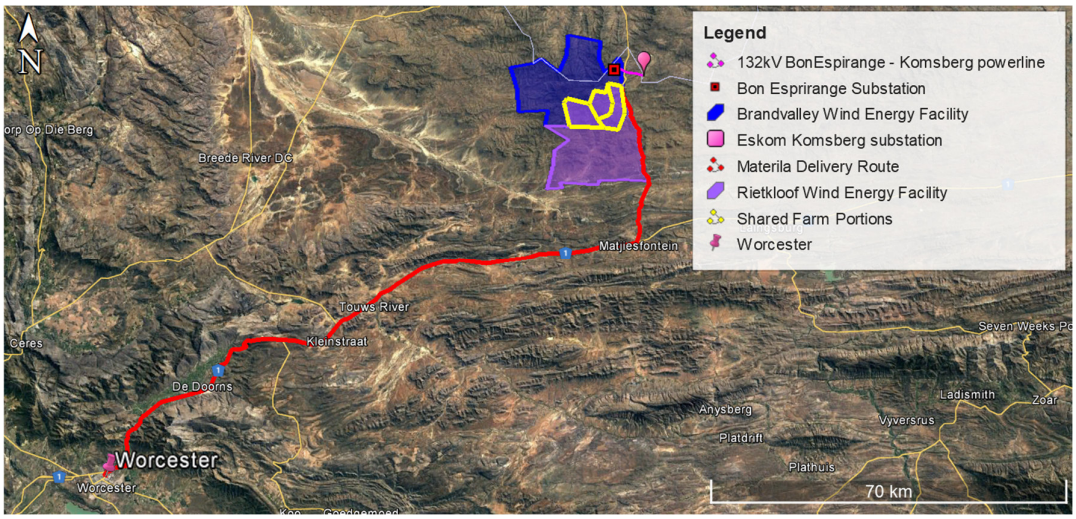

Figure 8-2: Envisaged route for material delivery

9 CONCLUSION

9.1 General

- It is proposed to construct a Bon Espirange – Komsberg 132 kV powerline to evacuate the power generated by the Rietkloof and Brandvalley Wind Energy Facilities (WEFs) to the National Grid. The facility will to be located in the northern Cape 49 km north of Matjiesfontein.

- No alternative routes are associated with the powerline as it follows existing powerlines from the Bon Espirange substation to the Komsberg substation.

9.2 Components

- Powerline systems comprise of components such as Towers/poles, conductors, foundations, Dampers, Ground wires, Insulators, and Transformer. These items can generally be transported by normal heavy load vehicles.

- The expected abnormal vehicles will comprise of lifting equipment required to off-load and assemble the components. Mobile cranes usually exceed mass and legal dimension limits and must therefore be operated under permit.

9.3 Traffic Management Plan

- This TMP has been prepared to enable the identification and implementation of all legal and best practice requirements in respect of the management of traffic associated with the construction and operation of the facility

- The Traffic Management Plan has been prepared in respect of the planning phase of the proposed facility. The Traffic Management Plan should be updated prior to the commencement of the construction phase and the operational phase.

- Not enough detail about the powerline is known at this stage to provide an estimated trip generation volume for material and component traffic. The potential transport impacts imposed by the construction traffic are temporary, short term in nature, and can be mitigated to an acceptable level.

Mitigation measures include:

✓ The delivery of components and construction materials to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.

- ✓ using a mobile batch plant as well as temporary construction material stockpile yards near the proposed site.

- ✓ Transporting site personnel to and from the site by means of busses. This will reduce the number of trips bound for the site.

- Traffic during the operational phase will be low (i.e., estimated 5-15 peak trips) as trips will only be for occasional maintenance requirements.

- For abnormal load vehicles, it is recommended to undertake a "dry-run" with the largest abnormal load vehicle, to ensure that the vehicle can access the site.

9.4 Access Road

- The proposed access roads to the site are located off the R354.The R354 travels through the eastern section of the site. These routes form part of the Karreebosch WEF.

- The typical traffic conditions in the area are that of light traffic volumes. It is however still recommended to mitigate any potential traffic impacts as much as possible.

- it is recommended that new access points be located at a minimum of 5 km from access points along the R354.This distance is measured between the centre lines of the access points.

Preferred Route for Materials, Plant and Labour

- It is envisaged that the majority of materials, will be sourced from Worcester approximately 160km form the site or alternatively from Cape Town approximately 300 km from the site. The route utilises the N1 and R354 to access the site.

- It is envisaged that the workforce will most likely reside in Sutherland, Matjiesfontein, Touws River or Laingsburg as the closest communities. The travel routes form these towns to the site include the N1 and the R354. These are higher order routes as such geometric limitations are not envisaged.

10 REFERENCES

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https://www.researchgate.net/publication/324703849_Studies_on_Silicone_Rubber_Insulators_used_for_High_Voltage_Transmission
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