

RED CAP ENERGY

HOOGLAND NORTHERN CLUSTER WIND FARMS

TRAFFIC IMPACT ASSESSMENT



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1 EXECUTIVE SUMMARY

Red Cap Energy (Pty) Ltd aims to develop four Wind Farms and associated Grid Connections north of Beaufort West within the Central Karoo District Municipality of the Western Cape. The proposed wind farms are the Hoogland Wind Farm 1 and Hoogland 2 Wind Farm, constituting the Northern Cluster, and Hoogland 3 Wind Farm and Hoogland 4 Wind Farm, constituting the Southern Cluster. Collectively referred to as the Hoogland Wind Farms. The Northern Wind Farms share a grid connection termed the Hoogland Northern Grid Connection, and similarly, the Southern Cluster Wind Farms share a grid connection termed the Hoogland Southern Grid Connection.

A Traffic Impact Assessment for each proposed development and grid connection is provided as part of the Environmental Impact Assessment process. This Traffic Impact Assessment is for the Northern Cluster of the Hoogland Wind Project, hereafter referred to as 'the proposed development'. Based on the latest available information, each of the proposed developments within the cluster will consist of up to a maximum of 60 wind turbine generator units, with a total maximum generating capacity in the order of 420 MW, this will be finalised once the turbine supplier has been appointed.

Mr A. Schwarz compiled this combined Traffic Impact Assessment, in line with the relevant guidelines that were followed to provide a technical appraisal of the traffic impact of the proposed developments on the existing road network during the construction, operation and decommissioning phases of the projects. A site visit was conducted in September 2021.

The only other renewable energy project earmarked for development in the adjacent area is the Nuweveld Wind Project. However, based on the wind measurement masts erected in the area, it is evident that more renewable projects are currently being planned for the region.

The proposed road network used to commute personnel and transportation of equipment and material, including abnormal loads, to the proposed development are well-established.

Traffic generation estimates used in this assessment is based on the experience of similar projects. The worst-case scenario for the cumulative impact has been adopted, which assumes all four Hoogland Wind Farms are constructed simultaneously over a period of two years, together with the operational phase of the three Nuweveld Wind Farms. The most significant increase in traffic will result from the daily commuting of personnel to and from the proposed development. The projected increase in traffic on the TR05801 exceeds 50 vehicles per hour, the threshold stipulated in the South African Traffic Impact and Site Traffic Assessment Manual (2012).

There will be a notable increase in traffic volumes on the road network during the construction phase of the proposed developments and less conspicuous during the operational phase. This report has assessed the cumulative impact of the additional traffic on the surrounding road network and found that the level of service (LOS) on these roads is acceptable (LOS A). The increase in traffic volumes will lead to more significant wear and tear, especially during the construction phase of the proposed developments, but will not have an undue detrimental impact on the structural integrity of the roads within the study area. Due to budgetary constraints within

various spheres of government, only minor maintenance is undertaken on the road network. To this end, it is strongly suggested that the developer contributes towards the ongoing maintenance of the road network associated with the various phases of the proposed development.

In addition, several gravel sections through mountain passes are extremely treacherous and pose a potential risk to road users transporting staff to and from the proposed development. With the approval of the local road authorities, these areas will have to be addressed by the developer.

Due to the constraints of the mountain passes, most of the traffic delivering equipment and material, including abnormal loads, to the proposed development is anticipated to be via the town of Loxton.

It should be noted that it is not possible to determine the expected traffic volumes generated during the decommissioning phase. It can be assumed that these volumes will be lower than during the construction phase as much of the infrastructure (e.g., roads, platforms, etc.) will be retained by the landowners. As part of the decommissioning process, a separate traffic impact assessment should be undertaken since many of the characteristics related to the traffic impact assessment, i.e., access routes, road geometry, traffic volumes, etc., would have changed over the operational life of the development.

A range of management and mitigation strategies are identified for implementation during the construction and operation phases of the development to minimise traffic impacts, reduce community disruption and the risk of traffic incidents.

Thus, from a traffic and transportation perspective, there are no constraints or notable impacts that would jeopardise the implementation of this development.

2 PROJECT SPECIFICATIONS

A synopsis of the project specification for the Northern Cluster of the Hoogland Wind Farms Project is provided in Table 1.

Table 1 - Synopsis of Project Specifications

Project Components Description	Specifications & Footprint areas	Estimated Footprint (ha)	
		HL 1	HL 2
Location	Hoogland Wind Farms 1 and 2 are approximately 80 km north of Beaufort West and about 20 km south of Loxton along the TR05801, within the Central Karoo District Municipality of the Western Cape.		
Access	Access to both wind farms is via the TR05801 (R381). Commuter traffic and some small loads will be from Beaufort West in the south. While, abnormal loads the main access routes to each wind farm, will be from Loxton in the north		
Land Use	The land use of the site and surrounding properties comprise low-density livestock farming (grazing).		
Extent	The total area of the site being considered for developing each wind farm	16,772 ha*	17,832 ha*
Number of wind turbines and generation capacity	Up to a maximum of 60 wind turbines per wind farm will be developed. The targeted nameplate generation capacity for each wind farm is up to a maximum of 420 MW	60	60
	However, the number of turbines included in the layout for approval for each wind farm is as follows:	87	80

Project Components Description	Specifications & Footprint areas	Estimated Footprint (ha)	
		HL 1	HL 2
Number of wind turbines and generation capacity	<p>The specifications for the Wind Turbine are as follows:</p> <ul style="list-style-type: none"> • Rotor diameter: 100 m to 195 m (50 to 97.5 m blade/radius) • Hub height: 80 m to 150 m • Rotor top tip height: 130 m to 247.5 m (maximum based on 150 m hub + 97.5 m blade = 247.5 m) • Rotor bottom tip height: minimum of 20 m (and not lower). • Generation capacity: up to a maximum of 7 MW output per turbine. 		
Turbine Foundations	Each turbine will have a circular foundation with a diameter of up to 32 m.	8.4 ha*	8.4 ha*
Turbine Hardstands and Laydown Area	Adjacent to each turbine will be a hardstand area of 80 m x 40 m.	19.2 ha*	19.2 ha*
	<p>An additional 20 m x 40 m of temporary hardstand area will also be required near each of the crane pads. Further, a blade laydown area of 104 m x 20 m and an additional embankment area (where necessary due to slopes) of approximately 104 m x 5 m will be required. A temporary crane boom assembly area of 120 x 15 m will also be accommodated.</p> <p>Temporary areas are up to a maximum of a maximum of 5,200 m² per turbine</p>	31.2 ha*	31.2 ha*
Cabling	<p>Turbines to be connected to on-site substation via up to 66 kV cables. Cables to be laid underground in trenches mainly adjacent to proposed wind farm roads (as part of the temporary impact of 'Site roads' below) but in some instances the cables will deviate from the road.</p>	10.7 km 6.4 ha [#]	7.6 km 3.2 ha [#]
	<p>Where it has been possible, cables have been routed along existing local roads.</p> <p>Note that cables running next to public roads will not be able to run within the road reserve, but as close as possible to the road reserve in the adjacent private owned land.</p>	0.5 km 0.3 ha [#]	18.8 km 11.3 ha [#]
Internal WEF overhead powerlines	<p>In limited instances, overhead monopole lines will be used where burying is not possible due to technical, geological, environmental or topographical constraints. Up to 66 kV overhead power lines supported by 132 kV monopole style pylons of approx. 22 m high will be required, as well as tracks for access to the pylons.</p>	0.2 km 0.1 ha*	0.5 km 0.3 ha*
	Where possible, to reduce areas of new impact, sections of overhead line have been routed next to proposed Eskom overhead lines	3.2 km 1.9 ha*	10.2 km 6.1 ha*
Site roads	The total road network for each wind farm is as follows:	122.2 km	110.8 km
	Permanent roads will be 6 m wide and over above this may require side drains on one or both sides depending on the topography. Many roads will have underground cables running next to them.	@97.7 ha*	@88.7 ha*
	An up to 15 m wide road corridor may be temporarily impacted during construction and rehabilitated to allow for a 6 m road surface after construction	@110 ha*	@99.7 ha*
	This total road network also includes upgrades to sections of public roads, to the following extent:	*4.7 km	*3.6 km
	This total road network also includes shared road infrastructure with the other wind farm in the respective cluster:	*16.9 km	*16.9 km
	This total road network also includes shared road infrastructure with Nuweveld North and West Wind Farms as follows:	N/A	*11.6 km
Wind farm Substations	<p>Each wind farm will have two 150 m x 75 m substation yards that will include an Operation and Maintenance (O&M) building, Substation building and a High Voltage Gantry.</p> <p>The area for the two substation yards per wind farm are as follows:</p>	*2.3 ha	*2.3 ha
Battery energy storage system (BESS)	<p>Each wind farm will also potentially have two ±3.5 ha areas for a battery energy storage system (BESS) which may be adjacent or slightly removed from each of the two substations depending on the local constraints.</p> <p>Each BESS may either be connected to the wind farm substation by an underground or overhead cable or may require its own substation which would be located within the BESS footprint and would be connected directly to the Eskom switching station via a short 132 kV overhead line.</p>	*7 ha	*7 ha
Operations and maintenance (O&M) area	<p>The O&M area will include all offices, stores, workshops and laydown area.</p> <p>The substation building will be housed in the substation yard.</p>	Forms part of substation yard	

Project Components Description	Specifications & Footprint areas	Estimated Footprint (ha)	
		HL 1	HL 2
Security	Security gate and hut to be installed at most entrances to each wind farm site (estimated as 4 entrances each at 20 m ²). No fencing around individual turbines, existing fencing shall remain around perimeter of properties. Temporary and permanent yard areas to be enclosed (with access control) with an up to 2.4 m high fence.	80 m ²	80 m ²
Temporary areas required for the construction / decommissioning phase	Each wind farm have the following temporary construction areas: <ul style="list-style-type: none"> Temporary site camp/s areas: 20 000 m² Batching plant area of approximately 2 000 m² Each wind farm will have a bunded fuel & lubricants storage facility on-site in fixed tanks not exceeding 80 m³ (situated at the site camp). Individual turbine temporary laydown areas, including crane boom laydown areas, blade laydown areas and other potential temporary areas, will be up to a maximum of 5 000 m ² .	6.0 ha [#]	6.0 ha [#]
Social and Employment	The envisaged employment opportunities that each of the proposed development will create are as follows: Approximately 260 employees during the peak construction phase comprise approximately 90% low-skilled and semi-skilled individuals and 10% highly skilled individuals. Approximately 40 employees during the operational phase, comprising approximately 90% low-skilled and semi-skilled individuals and 10% highly skilled individuals.- Employees for the proposed development will commute daily from the surrounding towns.		
Shared infrastructure: Bypass Road	As part of the Nuweveld Wind Farms, a temporary bypass road is required on the N1 to avoid the town of Beaufort West with the major Wind Farm components. The road surface will be up to 6 m wide, with side drains, but a 12 m wide road corridor may be temporarily impacted during construction and rehabilitated once construction is complete. The length of the temporary road will be about 5.6 km of which about 2.5 km is along an existing track. It is planned that this road will also be used by the Hoogland Wind Farms and this is why it is a shared infrastructure between the Nuweveld projects and these projects	6.8 ha [#]	6.8 ha [#]
Other shared infrastructure	Stream crossings upgrades along the TR05801 (R381) to the north of the project area and along the DR02314 to the northwest of the project area are required.	4.4 ha* 5.0 ha [#]	4.4 ha* 5.0 ha [#]
Total disturbance footprint		165.7 ha temporary and 141 ha permanent	164.6 ha temporary and 136.3 ha permanent

Note these areas represent more than will be impacted given the road values are based on all the turbines shown in the layout for each wind farm being constructed wherein reality only 60 of these turbines will be developed per wind farm

*Permanent installation

#Temporary installation

3 ABBREVIATIONS

The following abbreviations have been used in this document.

Table 2 - List of Abbreviations

Abbreviation	Meaning
AADT	Average Annual Daily Traffic
ADT	Average Daily Traffic
BA	Basic Assessment
BESS	Battery Energy Storage System
COTO	Committee of Transport Officials

Abbreviation	Meaning
DFFA	Department of Forestry, Fishing and the Environment
EIA	Environmental Impact Assessment
EPCM	Engineering, Procurement, Construction and Management
IAP	Interested and Affected Parties
km/h	Kilometre per hour
LOS	Level of Service
MW	Megawatt
NEMA	National Environmental Management Act
O&M	Operation and Maintenance
PDP	Professional Driving Permit
RCAM	Road Classification Asset Management system
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RNIS	Road Network Information System
SANRAL	South African National Roads Agency SOC Ltd
TMP	Traffic Management Plan
vph	Vehicle per hour
v/km	Vehicle per kilometre
WEF	Wind Energy Facility
WTG	Wind Turbine Generator

4 GLOSSARY

The following definitions apply to these words, which have been used in this document.

Table 3 - Definitions

Word/Phrase	Definitions
Average Annual Daily Traffic	An Average Annual Daily Traffic is the total traffic volume (in both directions) generated in a year, including school and public holidays and weekends, divided by the number of days in the year.
Average Daily Traffic	An Average Daily Traffic is the total traffic (in both directions) generated in a twenty-four-hour period on a typical working weekday.
Diurnal	Diurnal means happening or active during the daytime.
Follower density	Follower density is defined as the number of vehicles per kilometre per lane
Level of Service	The level of service in this document is based on the follower density and expressed as LOS A to LOS F.
Peak Traffic	Traffic at the time it is most busy.
Traffic Volume	Traffic Volume is the number of vehicles passing a specific point in a given time, expressed in vehicles per hour.
Trip	A Trip is defined as a single (one-directional) movement of vehicles, with either the destination or the origin at the proposed development.

5 INTRODUCTION

5.1 TERMS OF REFERENCE

Red Cap Energy (Pty) Ltd and their affiliated companies appointed Mr A. Schwarz to provide a combined Traffic Impact Assessment (TIA) for the proposed Northern Cluster of the Hoogland Wind Farm Project consisting of Hoogland 1 Wind Farm and Hoogland 2 Wind Farm. The proposed developments fall within the Central Karoo Municipality District of the Western Cape. The properties on which the proposed developments are to be constructed are shown in Figure 1.

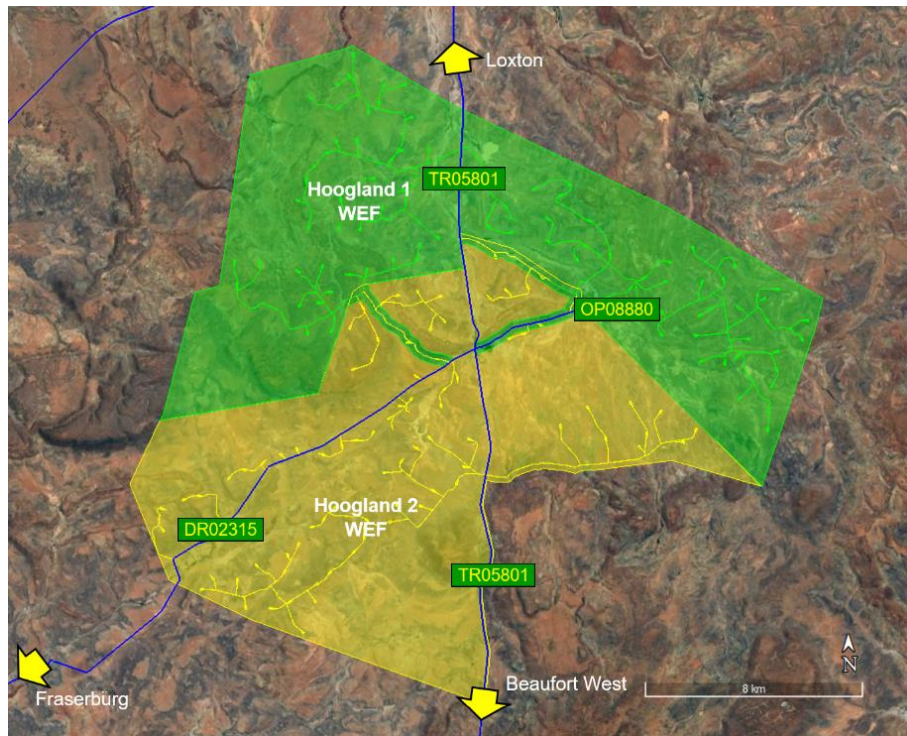


Figure 1 - Northern Cluster of the Hoogland Wind Farm Project

This Traffic Impact Assessment forms an integral part of the supporting documentation required for the Environmental Authorisation application to the Department of Forestry, Fisheries and the Environment (DFFE).

5.2 SCOPE AND OBJECTIVES

5.2.1 Scope

Red Cap Energy (Pty) Ltd propose developing Hoogland 1 Wind Farm and Hoogland 2 Wind Farm, collectively referred to as the Northern Cluster of the Hoogland Wind Farm Project.

The proposed developments shall each consist of up to a maximum of 60 WTG, selected from the potential turbine locations identified.

The scope of this report includes, inter alia:

- *Identify the potential road network that could be affected by this development;*
- *Determine a traffic baseline against which the potential traffic impacts are to be measured;*
- *Identify potential impacts and cumulative impacts that may occur during the construction, operational and decommissioning phases of the development;*
- *Determine mitigation and/or management measures which could be implemented to, as far as possible, reduce the effect of negative impacts; and*
- *Incorporate and address all issues and concerns raised by Interested and Affected Parties (if and when applicable).*

5.2.2 Objectives

This report aims to determine the potential traffic impact the proposed developments will have on the existing road network.

5.3 LEGISLATION AND PERMIT REQUIREMENTS

The overarching environmental legislation for managing the environment in South Africa is the National Environmental Management Act, 1998 (Act 107 of 1998 “NEMA”). Its preamble states that sustainable development requires the integration of social, economic and environmental factors in the planning, implementation and evaluation of environmental decisions to ensure that the development serves present and future generations.

The DFFE Screening Tool and Report that was generated for the site (as per Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended) concluded that based on the selected classification of activity along with the environmental sensitivities of the proposed development footprint, a traffic impact assessment is identified for inclusion in the assessment report.

5.3.1 Roads

The relevant legislation associated with the road (infrastructure), transportation and traffic include, inter alia:

- *National Water Act (Act 36 of 1998), with regards to all crossings of watercourses;*
- *National Road Traffic Act (Act 93 of 1996);*
- *Advertising on Road and Ribbon Development Act (Act 21 of 1940):*
 - *Regulates the display of advertisements outside some urban regions at places visible from public roads, and the depositing or leaving of disused machinery or refuse and the erection, construction or laying of structures and other things near certain public roads, and the access to certain land from such roads;*
 - *Section 9: Prohibition of the erection of structures near-certain roads;*
 - *Section 9A: Prohibition of the erection of structures or construction of other things near intersections of certain roads;*
 - *Section 10: Restriction of access to land through a fence, etc., along certain roads.*
- *Roads Ordinance Number 19 of 1976:*
 - *Consolidate and amend the law relating to public roads and public paths and to provide for matters incidental thereto;*
 - *Section 13: Erection of gates across public roads and public paths;*
 - *Section 17: Erection of structures on or near public roads;*
 - *Section 18: Access to and exit from certain public roads and public paths.*

5.3.2 Vehicle Dimensions

Regulations 221 to 230 of the National Road Traffic Act relates to vehicle dimensions, the most salient points are summarised below.

Regulation 221: Defines the legislation requirements regarding the overall length of vehicles, and is summarised as follows:

- *a rigid vehicle shall not exceed 12.5 m;*
- *articulated motor vehicle and semi-trailers shall not exceed 18.5 m;*
- *other combinations of motor vehicles (including interlinks, multiple trailers, etc.) shall not exceed 22.0 m;*

Regulation 223: Defines the legislation requirements regarding the overall width of vehicles with a gross mass of 12 000 kilograms or more, shall not exceed 2.6 m.

Regulation 224: Define the legislative requirements regarding the overall height of a vehicle and transported load, which shall not exceed 4.3 m.

Regulation 225: Defines the legislation requirements regarding the maximum turning radius and wheelbase, which shall not exceed 13.1 m or 10.0 m (for a semi-trailer), respectively.

5.3.3 Vehicle Loads

Regulations 231 to 249 of the National Road Traffic Act relates to vehicles loads. The most salient points are summarised below.

Regulation 240: Defines the legislation requirements regarding the mass load carrying capacity on roads. The most relevant points are summarised below:

- The mass load of a wheel fitted to a steering axle shall not exceed 3 850 kg, and others shall not exceed 4 000 kg;*
- The mass load of an axle fitted with two wheels, which is the steering axle, shall not exceed 7 700 kg, others shall not exceed 8 000 kg;*
- The mass load of an axle fitted with four wheels shall not exceed 9 000 kg;*
- The mass load of an axle unit, which consists of two axles, each of which are fitted with two wheels, acting as a steering axle unit shall not exceed 15 400 kg, and other axle units shall not exceed 16 000 kg;*
- The mass load of an axle unit, which consists of two axles, each of which are fitted with four wheels, shall not exceed 18 000 kg;*
- The mass load of an axle unit, which consists of three or more axles, each of which are fitted with two wheels, acting as a steering axle unit shall not exceed 23 100 kg, and other axle units shall not exceed 24 000 kg;*
- The mass load of an axle unit, which consists of three or more axles, each of which are fitted with four wheels, shall not exceed 24 000 kg;*
- The axle mass load of an axle unit consists of two axles, one of which is a drive axle with four wheels and the other is an axle with two wheels, the sum of the two axles shall not exceed 18 200 kg.*

Regulation 241: Defines the legislation requirements regarding the mass load-carrying capacity of bridges.

5.3.4 Abnormal Loads

The National Road Traffic Act (Act 93 of 1996) and the National Road Traffic Regulations (2000) prescribe certain limitations on vehicle dimensions and axle and vehicle masses that a vehicle using a public road must comply with. Where the prescribed limits are exceeded, these loads are classified as abnormal loads. Provision for such abnormal vehicles and loads are made in Section 81 of the National Road Traffic, as substituted by Section 23 of the National Road Traffic Amendment Act (Act 64 of 2008).

The requirements and procedures for transporting abnormal loads are contained in the following two documents:

- “TRH 11 - Dimensional and Mass Limitations and Other Requirements for Abnormal Load Vehicles”; and*
- “Administrative Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads”.*

5.4 METHODOLOGY

The South African Traffic Impact and Site Traffic Assessment Standards (2014), and the Manual for Traffic Impact Studies (1995), form the basis for this traffic impact assessment.

The methodology adopted in the compilation of this report includes, inter alia:

- Identify the road network which will be used by vehicles associated with this development and other developments in the area;
- Establish the number of vehicle trips generated during the construction, operation and decommissioning of this development;
- Determine the mode of transport, vehicle type and size for each trip or category of trip generated during the construction, operational and decommissioning of this development;
- Establish peak-hour vehicle trip rate generated during the construction, operation and decommissioning of this development;
- Identify and assess the significance and severity of development-related traffic on the existing road network. Where possible comparing the existing traffic volumes on the roads with the traffic generated by this development;
- Propose practical measures to mitigate the impacts of development-related traffic on the existing road network.

5.5 ASSUMPTIONS

The compiling of this report is based on the following assumptions:

- Red Cap Energy (Pty) Ltd and their affiliate companies propose developing four separate Wind Farms and two Grid Connections in the Central Karoo Municipality District of the Western Cape;
- The simultaneous development of both Hoogland 1 Wind Farm and Hoogland 2 Wind Farm, constituting the Northern Cluster, is assumed. This, will provide a worst-case scenario for the assessment;
- The cumulative impact shall assume that all four Wind Farms and both Grid Connections are constructed, operated and decommissioned simultaneously, together with any other projects in the area with valid Environmental Authorisation. Nuweveld Wind Farms are included but considered to be operational, and there are no other renewable projects with valid EAs at present;
- A project duration of 30 months is expected for both Hoogland 1 and Hoogland 2 Wind Farms assuming they are constructed simultaneously. However, an active construction phase of 24 months has been assumed, providing six months for site establishment and final commissioning of the proposed developments;
- The workforce complement during peak construction is assumed to be in the order of 600 individuals for the Northern Cluster, consisting of the two Wind Farm and Grid Connection. Thus, a combined workforce complement for all four Wind Farms and two Grid Connection during peak constructions is assumed to be in the order of 1 200;
- The combined operational phase workforce complement for the four wind farms is assumed to be in the order of 160;
- Although most of the WTG components are imported into South Africa via one of the South African ports, some of the WTG components are fabricated and

transported to the proposed development from other commercial centres within South Africa;

- The tower sections for the WTG can be fabricated from either concrete or steel. The tower section for this development is assumed to be steel elements;*
- The switching stations and BESS are assumed to be constructed one after the other, not simultaneously. Since the construction of the BESS generates more trips than the traffic volume generated by the construction of the switching stations, the traffic volume for the construction of the BESS shall be applied to the construction of the switching station;*
- Molteno Pass and Theekloof Pass shall not be used to transport large construction equipment and materials. The gross vehicle mass of all construction-related vehicles using the pass shall be restricted to ten tonnes;*
- Construction equipment and materials (other than aggregates) for this development will be transported to the proposed development from various commercial centres within South Africa;*
- The supply of raw material for the manufacture of concrete and road construction, as a worst-case scenario, will be sourced from commercial sources outside the proposed development;*
- No accommodation is provided on-site. The construction staff is drawn from the entire area, not just one specific town. The distribution of personnel is based on the working population within a defined radius of the development;*
- A single batching plant will be provided for each of the proposed developments. This is based on the assumption that each development will be a separate entity constructed by different contractors. However, it is more probable that a single contractor will be appointed to develop the cluster and possibly all the proposed developments. In which case, a single batching plant might be provided for all WTG foundations. This assumption would constitute a worst-case scenario in terms of traffic impacts on the public road network and is the basis of the assessment.*

Due to the proposed layout, as a mitigation measure, the Contractor might elect to install a batch plant in various areas of the proposed development to avoid the interaction with other road users on the public roads.

5.6 LIMITATIONS

This report excludes:

- A Traffic Management Plan for the development;*
- Site Development Plan of the infrastructure, including roads, stormwater drainage, amenities, batching plant, etc. within the site boundary that does not affect the public road network;*
- The geometric details of intersections and entrances onto the proposed developments from the public road network, as this will be finalised during the detailed design phase, which will require approval from the relevant roads' authorities;*
- The transportation route from the Port Terminals or Commercial Centres to the proposed development is the responsibility of the logistics company that will be appointed;*

- *Assessment of risks and impacts associated with loading or off-loading of the vehicles at the site or associated facilities are not addressed since these will be addressed in the Standard Operating Procedures developed by the Engineering, Procurement, Construction and Management (EPCM) contractor for the construction and decommissioning of the development.*

5.7 SOURCE OF INFORMATION

Information used in compiling this report was drawn from the following sources:

- *Manual for Traffic Impact Studies, Department of Transport, RR 93/635, 1995;*
- *TMH 16, Volume 1 - South African Traffic Impact and Site Traffic Assessment Manual, COTO 2012;*
- *TMH 16, Volume 2 - South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual, COTO 2014;*
- *TMH 17 - The South African Trip Data Manual, COTO 2012;*
- *TRH 4 - Structural Design of Flexible Pavements for Interurban and Rural Roads, 1996;*
- *TRH 26 - South African Road Classification and Access Management Manual, 2012;*
- *All information relating to the roads within the Western Cape were obtained from the Western Cape Government Road Network Information System (https://rnis.westerncape.gov.za/rnis/rnis_web_reports.main.null);*
- *All data relating to traffic volumes on the roads within the Western Cape were obtained from the Western Cape Government Road Network Information System (https://rnis.westerncape.gov.za/rnis/rnis_web_reports.main.null);*
- *Traffic volumes on the roads within the Northern Cape and the national roads were obtained, from Mikros Traffic Monitoring (Pty) Ltd, with approval from the required authorities;*
- *The number of working-age was obtained from the Department of Statistics South Africa (http://www.statssa.gov.za/?page_id=964);*
- *Information regarding mountain passes was obtained from Mountain Passes of South Africa (<https://mountainpassessouthafrica.co.za/>);*
- *Distance and estimated travelling times were obtained using Garmin BaseCamp software (version 4.7.4);*
- *Satellite imagery of the site available on Google Earth was also used for evaluation;*
- *The author took the majority of the photographs used in this report during the site visit.*

6 DESCRIPTION OF THE AFFECTED ENVIRONMENT

6.1 ROAD NETWORK

The existing road network adjacent to the proposed developments is well established. Consisting of a combination of national roads, first, second and third-order roads, which provides the proposed development accessibility to local towns and the major commercial centres within South Africa.

The most relevant roads, which provide access to the proposed developments from the surrounding towns, are shown in Figure 2 and are delineated below.

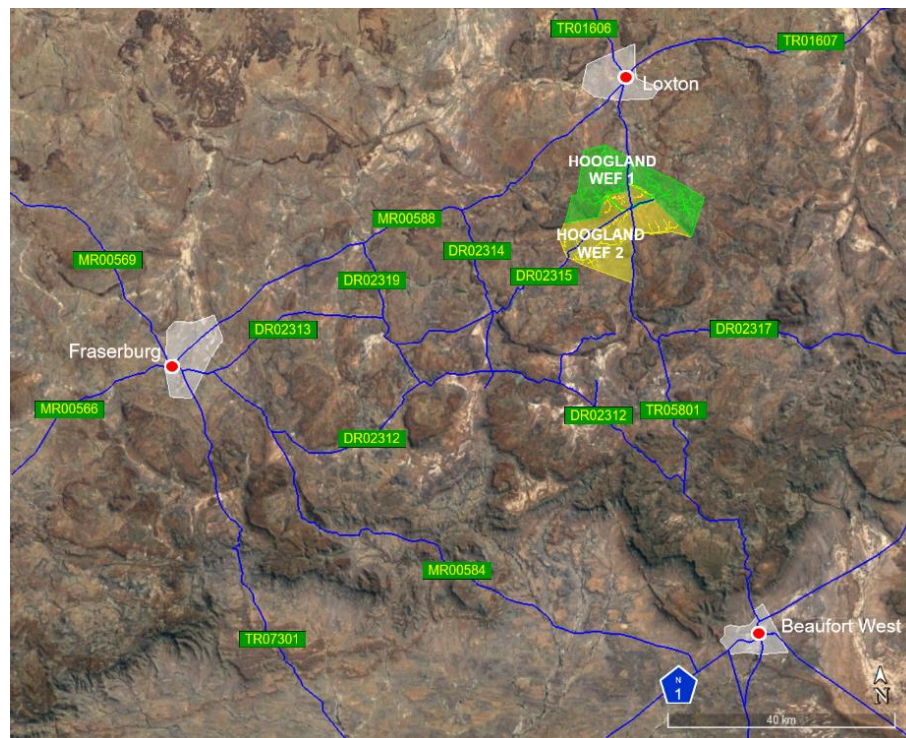


Figure 2 - Road Network

6.1.1 National Road - N1 (NR001)

The N1 is a Principal Arterial providing high mobility between provinces, regions and towns, and falls under the jurisdiction of the South African National Road Agency. The N1 starts at the M6 (western Boulevard) in Cape Town and ends at Beit Bridge Border Post at the Zimbabwe border, passing through or bypassing many towns on route. The N1 and N12 merge approximately seven kilometres west of Beaufort West before splitting again at Three Sisters.

The N1 is a Class 1 road, generally consisting of a single paved carriageway, with one lane in each direction and paved shoulders, as shown in Figure 3. Climbing lanes are provided along various sections of the road, and there are turning lanes at major intersections. In many cases, the shoulder is wide enough to allow yellow-line driving. The road is in good condition with a speed limit of 120 km/h.



Figure 3 - N1 - East of Beaufort West

6.1.2 Trunk Roads

The Trunk Roads in the area are very diverse, from the first world paved roads to third world gravel roads. There is a noticeable difference in the condition of the roads in the Northern Cape and Western Cape.

N12 (TR03305)

The N12 is a Principal Arterial providing high mobility between provinces, regions and towns, and falls under the jurisdiction of the South African National Road Agency. The N12 starts at the N2/N9 (Kraaibosch Interchange) approximately 5 km south of George and ends at eMalahleni, passing through or bypassing many towns on-route. The N1 and N12 merge approximately seven kilometres west of Beaufort West before splitting again at Three Sisters.

This Class 2 road generally consists of a single paved carriageway, with one lane in each direction and a combination of paved (Figure 4) and gravel shoulders. Climbing lanes are provided along various sections of the road, and there are turning lanes at major intersections. In many cases, the paved shoulders are wide enough to allow yellow-line driving. The road is in good condition with a speed limit of 120 km/h.



Figure 4 - N12 - South of Victoria West

R63 (TR016)

The TR016 (R63) is a Minor Arterial providing mobility between provinces, regions, and towns. The maintenance and management of this road fall under the jurisdiction of the Provincial Roads Department, in which the roads are located. The TR016 (R63) starts at the R27 approximately 23 km east of Calvinia and ends at N2 north of East London. The overall length of the road is split into several sections. TR01606 represents section 6 of TR016, which lies between Carnarvon and Loxton, while TR01607 represents section 7 of TR016, which lies between Loxton and Victoria West.

According to the Western Cape Road Information System, the Functional Class of section 9 of the TR016 (R63), the road is a Class 2, with RCAM classification of R2c. The road is situated in a 30 m wide servitude consisting of a single paved carriageway, 6.8 m wide, with one lane in each direction and gravel shoulders, as shown in Figure 5. The road is in fair condition with a speed limit of 120 km/h.



Figure 5 - R63 - East of Loxton

TR05801 (R381)

The TR05801 is a Minor Arterial providing mobility between provinces, regions, and towns. The management and maintenance of this road fall under the jurisdiction of the Provincial Roads Department, in which the road is located. The TR05801 starts at the N1, north of Beaufort West (Western Cape) and ends at R63 in Loxton (Northern Cape).

According to the Western Cape Road Information System, the Functional Classification of this road is a Class 2, with an RCAM classification of R2b. The road is situated in a 20 m wide servitude, sections of the road are paved, the surfacing and width details of this road are provided in Table 4.

Table 4 - TR05801 - Road Details

Start km	End km	Surface Type	Width	Shoulder Width	Shoulder Type
0	10.07	Surfaced	7.20	2.00	Unsurfaced
10.07	13.28	Surfaced	8.60	2.00	Unsurfaced
13.28	23.80	Gravel	7.00		
23.80	32.96	Surfaced	7.20	0.9	Unsurfaced
32.96	38.20	Surfaced	6.80	0.9	Unsurfaced
38.20	95.75	Gravel	8.50		
95.75	111.00	Gravel			

The paved sections of the TR05801 consist of a single paved carriageway, with one lane in each direction and unpaved shoulders, as shown in Figure 6.



Figure 6 - TR05801 - Paved Section

Several sections of the road through the Molteno Pass are extremely treacherous, with no barriers and steep drop-offs, very tight corners, negative banking and loose gravel. At a distance of 19.5 km from Beaufort West, there is a sharp bend in the road, a very tight bend with poor sighting distance, and is the site of numerous fatalities. A mirror has been installed to mitigate collision at this point. However, the mirror does not prevent single-vehicle incidents. The sharp bend is shown in Figure 7.



Figure 7 - TR05801 - Treacherous Bend on Molteno Pass

TR07301 (R353)

The TR07301 is a Minor Arterial providing mobility between provinces, regions, and towns. The management and maintenance of this road fall under the jurisdiction of the Provincial Roads Department, in which the roads are located. The TR07301 starts at the N1, at Leeu Gamka (Western Cape) and ends at R357 at Brandvlei (Northern Cape).

According to the Western Cape Road Information System, the Functional Classification of this road is a Class 2, with RCAM classification of R2a. The road is situated in a 30 m wide servitude. The road consists of a single paved carriageway, with one lane in each direction, with both paved and unpaved shoulders, as shown in Figure 8.



Figure 8 - TR07301

The TR07301 passes over the “Theekloof Pass”, a significant pass in the area providing access between Leeu Gamka and Fraserburg, on the Northern and Western Cape border.

6.1.3 Main Road

MR00588 (R356)

The MR00588 is an Access Collector providing mobility between towns. The management and maintenance of this road fall under the jurisdiction of the Northern Cape Provincial Roads Department. The MR00588 starts at the R354 in Sutherland, passing through Fraserburg, before ending at the TR016 (R63) at Loxton.

The road consists of a gravel carriageway within a 30 m wide servitude, as shown in Figure 9. The condition of the road is good and allows for dual-directional traffic at speed.



Figure 9 - MR00588

6.1.4 District Roads

The district roads in the area are level 4 roads and are classified as Resident Access Collector roads, providing accessibility to nearby towns and main roads. The management and maintenance of this road fall under the jurisdiction of the Provincial Roads Department, in which the roads are located. The minimum required level of service on these roads is a LOS C.

Most of these roads consist of a gravel carriageway, approximately 7 m wide, within a 20 m wide servitude. As a result of the width, road users have to reduce speed when passing oncoming vehicles. Although most of these roads are suitable for light vehicles, the use of these roads by heavy vehicles is not recommended.

The condition of these roads are not consistent and vary from very poor to satisfactory. However, several sections of these roads are very stony, which could result in mechanical damage to vehicles.

Three common phenomena were observed on many of the district roads are:

- Cattle Gates, as shown in Figure 10.



Figure 10 - Cattle Gates

- Drifts or Low-Level Bridges, as shown in Figure 11.



Figure 11 - Drift

- District roads pass through homesteads, as shown in Figure 12



Figure 12 - Homestead

DR02312

The DR02312 starts at the TR05801 (R381) and ends at the TR07301 (R353). The condition of this road is adequate, as shown in Figure 13. Road users need to slow down when passing oncoming vehicles.



Figure 13 - DR02312

DR02313

The DR02313 is a link road that starts and ends on the DR02312 and provides access to the DR02315 and the DR02319. The condition of this road is adequate, as shown in Figure 14. This road passes through numerous homesteads.



Figure 14 - DR02313

DR02314

The DR02314 starts at the MR00588 and intersects with the DR02315 before ending at the DR02312. The road's width is significantly less than the required 7 m, making passing other vehicles very difficult, as shown in Figure 15. Travelling at high speed on this road is not advisable.



Figure 15 - DR02314

DR02315

The DR02315 starts at the DR02313 and intersects with the DR02314 before ending at the TR05801 (R381). The section of the road between the DR02315 and TR05801 passes through a ravine, which requires a significant speed reduction. The road's width is significantly less than the required 7 m, making passing other vehicles very difficult, as shown in Figure 16. Travelling at high speed on this road is not advisable.



Figure 16 - DR02315

DR02317

The DR02317 is 68 km long, starts at the TR05801, and intersects with the DR02311 (at 30.7 km) and DR02318 (at 40.5 km) before ending at the NR00108 (N1). Over the majority of the length, the road is undulating, as shown in Figure 17.



Figure 17 - DR02317

At approximately 8 km from the TR05801, the DR02317 passes through an existing homestead, as shown in Figure 18.



Figure 18 - DR02317 - 8 km from TR05801

Another farming community straddles the DR02317 at approximately 22 km from the TR05801, as shown in Figure 19



Figure 19 - DR02317 - 22 km from TR05801

DR02319

The DR02319 starts at the MR00588 before ending at the DR02313. The condition of this road is adequate, as shown in Figure 20.



Figure 20 - DR02319

6.1.5 Minor Roads

Minor roads in the area, have a functional classification of level 5, and are categorised as a Local Access road, providing direct access to properties. The management and maintenance of this road fall under the jurisdiction of the Provincial Roads Department, in which the roads are located. The minimum required level of service on these roads is a LOS C.

Most of these roads consist of a gravel carriageway, within a 20 m wide servitude.

OP08880

The OP08880 is 9.08 km long, starting at the TR05801 before ending at the farm Slangfontein. The road is narrow and not well utilised, as shown in Figure 21.



Figure 21 - OP08880

6.2 SITE ACCESS

The envisaged access points for each proposed development have been identified but have not yet been designed. The design of these access points will be conducted during the design phase of the project.

The feasibility of the envisaged access points for each proposed development is assessed as part of this report.

HOOGLAND 1 WIND FARM

The potential location of the WTG's and internal road network for the proposed development are shown in Figure 22.

The potential location of the WTG's and internal road network create four distinct zones, as delineated below:

- *Zone 1 - is accessed from the TR05801 (R381) at 1A, an existing access point;*
- *Zone 2 - is accessed from the TR05801 (R381) at 1A, an existing access point. The site office, batching plant and substation (indicated by the Yellow block) are located in this Zone. It is also the Zone with the least number of potential WTG's;*
- *Zone 3 – is accessed via Hoogland 2 Wind Farm from the DR02315. There is no internal road linking Zone 1 and Zone 3;*
- *Zone 4 – is accessed from OP08880. There is no internal road linking Zone 2 and Zone 4.*

This development can only be approached from the following three directions

- *All abnormal and heavy transportation, as well as personnel from Carnarvon, Fraserburg, Loxton and Victoria West, will be via the TR05801/B (R381);*
- *Light transportation (less than 10 tons) and personnel vehicles from Beaufort West and Nelspoort will be via the TR05801/D (R381),*
- *Personnel from Fraserburg could use the DR02315/A. However, this route is very stoney and treacherous in specific areas and is not recommended to novice drivers.*

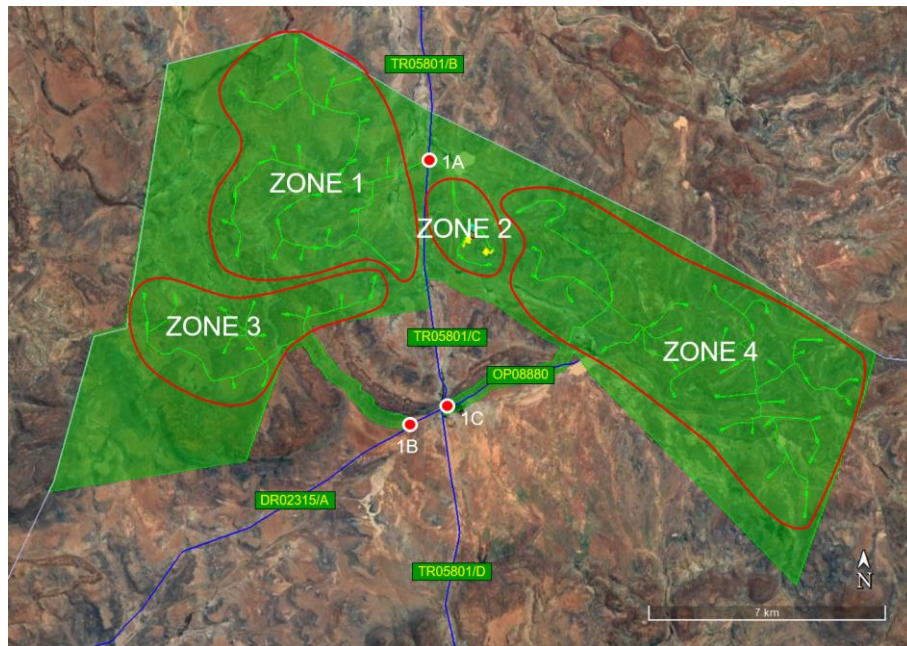


Figure 22 - Hoogland 1 - Access Points

Access to Zone 1 and Zone 2 is from the TR05801/B, while access to Zone 3 is from the DR02315/1 and Zone 4 is via the OP08880.

Access 1A

Access 1A is from the TR05801, as shown in Figure 23.



Figure 23 - Access Point 1A

The only obstruction at this location is the powerline at the access point to the west and will have to be taken into account when designing the entrance, if this point is to be used, to this portion of the development.

Access 1B

Access 1B is from the DR02315/A. However, there is no existing access at the point and a new intersection will have to be constructed.

Access 1C

Access 1C is from the OP08880, as shown in Figure 24.



Figure 24 - Access Point 1C

HOOGLAND WIND FARM 2

The potential location of the WTG's and internal road networks for the proposed development are shown in Figure 25.

The potential location of the WTG's and internal road network create seven distinct zones, delineated below.

- *Zone 1 - is accessed from the TR05801/C (R381) at 2A, an existing access point;*
- *Zone 2 – is accessed from the DR02315/A at 2C. This also provides access to Zone 3 of Hoogland 1;*
- *Zone 3 - is accessed from the OP08880 at various points, see access 2L;*
- *Zone 4 – is accessed from the TR05801/D (R381) at 2B;*
- *Zone 5 – is accessed from the DR02315/A at 2C*
- *Zone 6 - is accessed from various points along DR02315/A. The proposed WTG are scattered on either side of the road, with various access points along the road, giving access to individual WTG's or groups of WTG's. The site office and batching plant and the substations are located in this Zone.*
- *Zone 7 – is accessed from the TR05801/D (R381) at 2B;*

This development can only be approached from the following three directions

- *All abnormal and heavy transportation, as well as personnel from Carnarvon, Fraserburg, Loxton and Victoria West, will be via the TR05801/C,*
- *Light transportation and personnel from Beaufort West and Nelspoort will be via the TR05801/E (R381),*

- Personnel from Fraserburg could use the DR02315/B or TR05801/C. However, the DR02315/B route is very stoney and treacherous in specific areas and is not recommended to novice drivers.

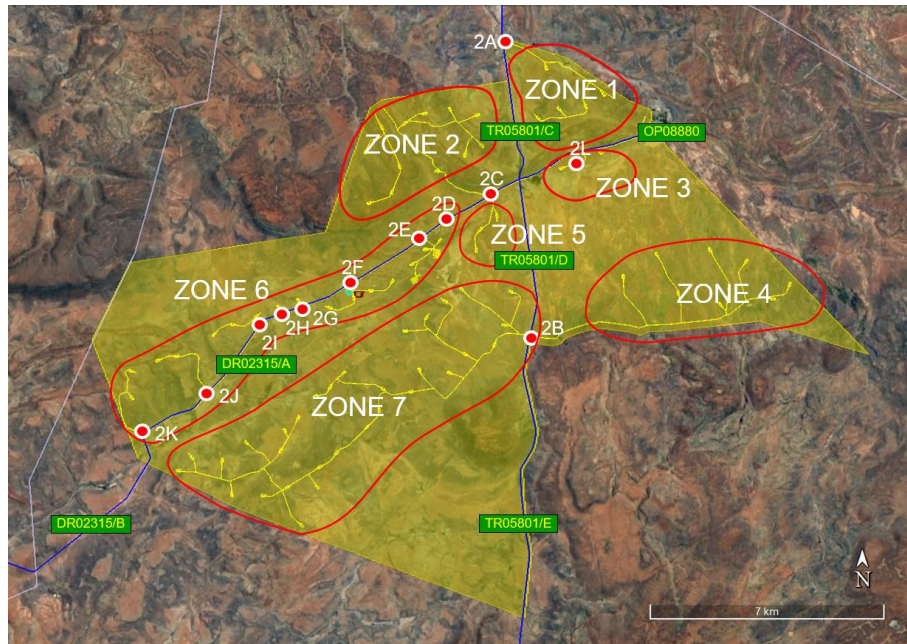


Figure 25 - Hoogland 2 - Access Points

Access 2A

Access at 2A is from the TR05801/C (R381), as shown in Figure 26.



TR05801/C - North



TR05801/C - South



Access Point to the East

Figure 26 - Access Point 2A

Access 2B

Access at 2B is from the TR05801/D (R381), as shown in Figure 27.



Figure 27 – Access Point 2B

Access 2C

Access points to the North and South of the DR02315/A are required for the proposed development. However, there are no existing access points at this location.

Access 2D

Access at 2D is required for a single WTG. However, no existing access points are provided at this point of the DR02315/A, as shown in Figure 28.

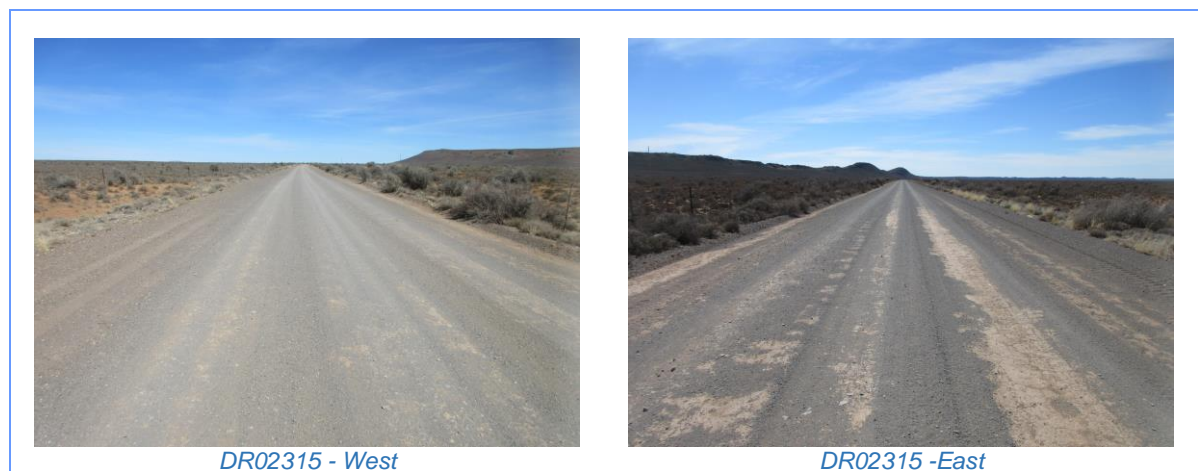


Figure 28 - Access Point 2D

Access 2E

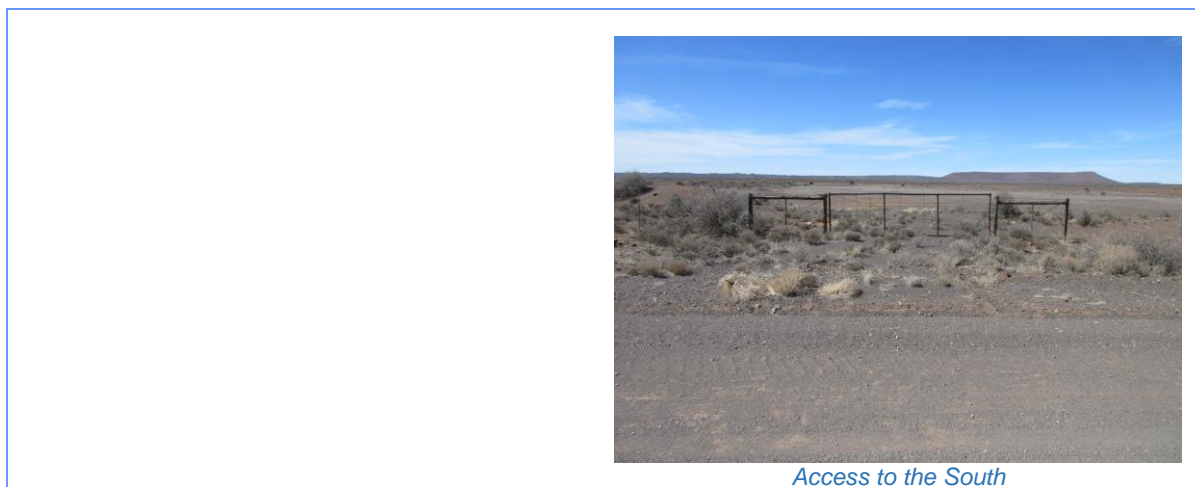
Access point to the South of the DR02315/A is required for the proposed development, to access WTG and substations. There are no existing access points at the required location.

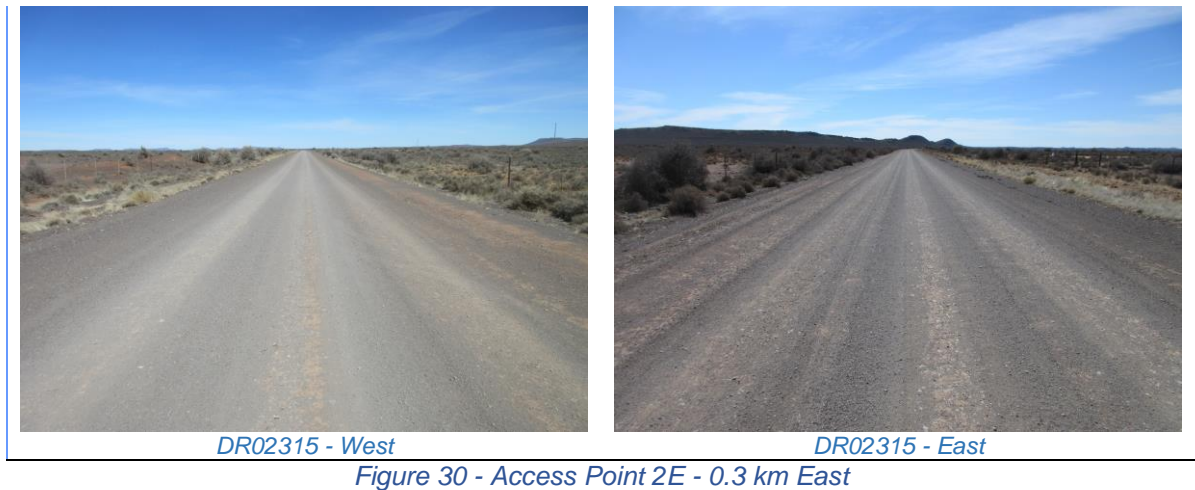
However, 500 m to the West, there is an access point, as shown in Figure 29.



Figure 29 - Access Point 2E - 0.5 km West

There is another access point 300 m to the East, as shown in Figure 30.





Access 2F

An access point to the South of the DR02315/A is required at this location for access to WTG, batching plant and laydown area. There are no access points to the South as required. There is only an access point to the North, as shown in Figure 31.



Figure 31 - Access Point 2F

Access 2G

An access point to the North of the DR02315/A is required at this location to access a WTG. There is no existing access point at this location.

Access 2H

Access to the North of DR02315/A is required to access a WTG. The existing access at this location is shown in Figure 32.



Access to the North



DR02315 - West



DR02315 - East

Figure 32 - Access Point 2H

Access 2I

Access to the North of DR02315/A is required to access WTG's. The existing access at this location is shown in Figure 33.



Access to the North



DR02315 - West



DR02315 - East

Figure 33 - Access Point 2I

Access 2J

Access to the North of DR02315/A is required to access WTG's. The existing access at this location is shown in Figure 34.



Access to the North



DR02315 - West



DR02315 - East

Figure 34 – Access Point 2L

Access 2K

Access to the North of DR02315/A is required to access WTG's. Existing access at this location is shown in Figure 35.



Access to the North



DR02315 - West



DR02315 - East

Figure 35 - Access Point 2K

Access 2L

Access to the proposed WTG from the OP08880 is shown in Figure 36.



OP08880 - West



OP08880 - East

Figure 36 - Access Point 2L

6.3 TRANSPORTATION ROUTES

6.3.1 Commuter Routes

The towns in this part of the country are few and far apart. There are several towns within a 150 km radius of the proposed development. The most relevant are shown in Figure 37, and include Beaufort West, Carnarvon, Fraserburg, Loxton, Nelspoort, and Victoria West.

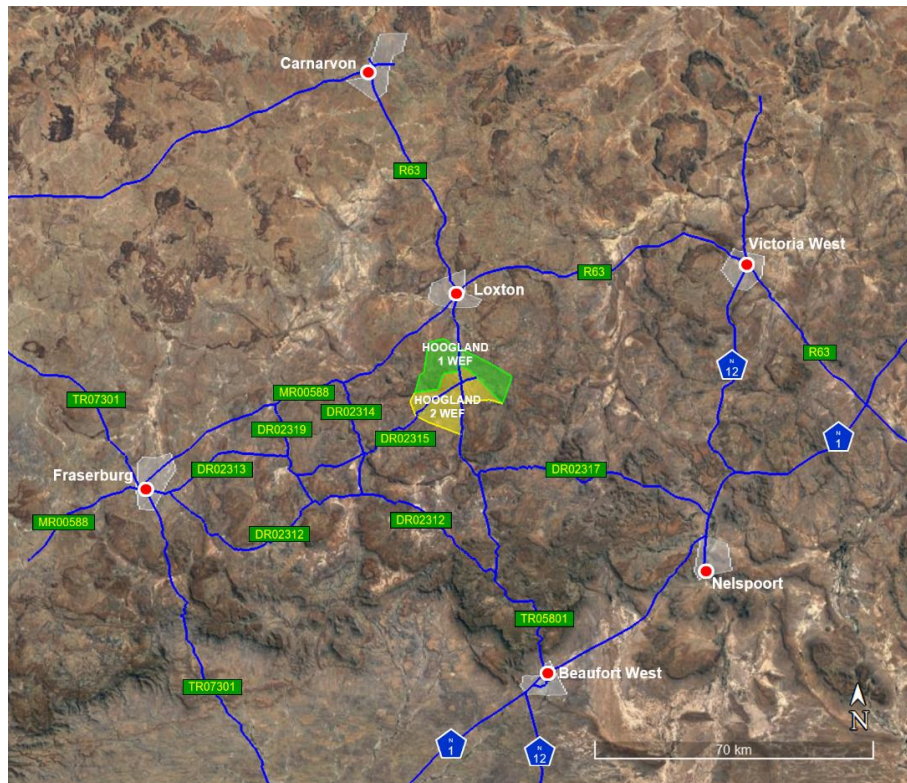


Figure 37 - Surrounding Towns

The proposed development can only be approached from the following directions

- All abnormal and heavy transportation, including busses and mini-buses, will be via TR05801 (R381) and DR02315;
- Personnel travelling to the proposed development from Carnarvon, Loxton and Victoria West, will be via the TR05801 (R381) and DR02315;
- Personnel travelling to the proposed development from Fraserburg, will be via the DR02315;
- Personnel and light transportation (less than 10 tons) travelling to the proposed development from Beaufort West, will be via the TR05801 (R381) and DR02315;
- Personnel travelling to the proposed development from Nelspoort, will be via the DR02317, TR05801 (R381) and DR02315;

The distance from the proposed developments to the surrounding towns and the estimated travelling time and “working age” population in the various towns are shown in Table 5.

Table 5 - Distance to Surrounding Towns

Town	Travel Distance*	Estimated Travel Time**	Population
Beaufort West	105 km	1:47	21 608
Carnarvon	88 km	1:05	4 107
Fraserburg	100 km	1:45	1 854
Loxton	25 km	0:25	604
Nelspoort	108 km	1:42	1 212
Victoria West	106 km	1:13	4 978

* Distance from the intersection at TR05801/DR02315 to the main intersection in the Town

** Obtained using Garmin Software

In light of the current economic situation in the country and REIPPPP requirements, it is assumed that the workforce will be drawn from surrounding communities. The proportions are based on a 'working-age' population, modified by a 'weighted factor', calculated based on the distance travelled to the proposed development from the relevant town. The expected proportion of the workforce from the surrounding communities is depicted in Table 6.

Table 6 - Proportions

Town	Proportion (%)
Beaufort West	58.2%
Carnarvon	13.2%
Fraserburg	5.2%
Loxton	6.9%
Nelspoort	3.2%
Victoria West	13.3%

6.3.2 Freight Routes

Container Terminals

Transnet Port Terminals is a division of Transnet SOC Limited, South Africa's state-owned freight transport company, which owns and operates the terminal at several Ports in South African. Operations are divided into the major market sectors: containers, bulk, breakbulk, and automotive, organised into three geographical regions – Eastern Cape, Western Cape, and Kwa-Zulu Natal.

The port of entry into South Africa for all import WTG components is limited to Ngqura (located close to Gqeberha) or Saldanha Terminals. The possible routes from these terminals to the proposed developments are via Victoria West and Loxton, shown in Figure 38.

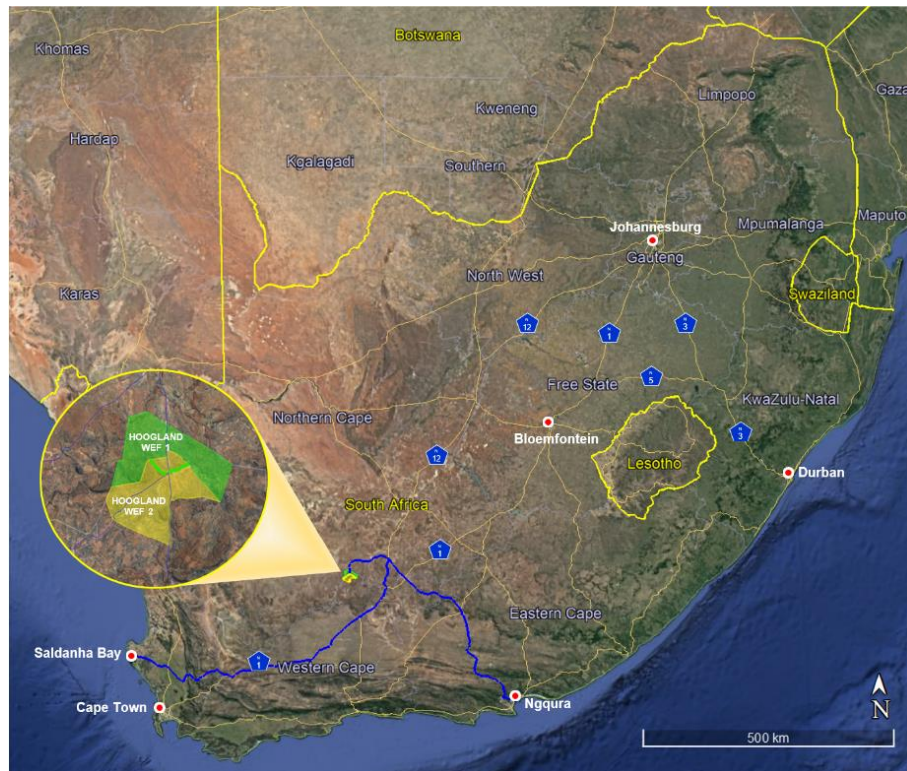


Figure 38 - Freight Routes - Port Terminals

The potential transportation routes from the various Port Terminals in South Africa, with the capability to import wind turbine components, to the proposed development, are detailed in Table 7.

Table 7 - Distance - Port Terminals

Container Terminals	Distance
Ngqura	537 km
Saldanha	770 km

The closest terminal to the proposed developments is the Ngqura Port Terminal (close to Gqeberha) based on the information provided above.

However, the length and weight of the various WTG components will only be available once the turbine supplier has been appointed. There is a strong possibility that the length of the blades for the WTG units could exceed 95 m.

Each of the proposed transportation routes has challenges that the logistics company appointed will need to address. In some cases, the challenges can be easily overcome, and for others, alternative routes will have to be considered. To this extent, the following have been considered for the transportation of WTG components for this project.

- In Beaufort West, the traffic circle in Donkin Street poses a significant challenge for the transportation of the blades. However, a potential by-pass route to the north of Beaufort West, as shown in red in Figure 39, has been identified for the possible transportation of the WTG components through Beaufort West if the components are imported into South Africa via one of the ports in the Western Cape. Sections of the existing track along the identified by-pass route would need to be upgraded, and new sections would have to be constructed to complete the route. From a traffic impact perspective, this by-pass route is an acceptable

route that will help reduce potential traffic impacts for the proposed transportation of the WTG components as it will ensure that the abnormal loads can bypass the centre of the town.



Figure 39 - Potential By-Pass of Beaufort West

- The trio of passes on the TR05801 (R381) between Beaufort West and the proposed developments pose constraints that will not easily be overcome with the current transportation equipment available in South Africa without significant intervention;
- Transporting the components through towns is always a challenge. Most are conquered with a bit of ingenuity. At Loxton, the TR016 (R63)/TR05801 intersection will have to be redesigned and upgraded. However, this may have already been undertaken as part of the Nuweveld Wind Farm Project. The route through the town should avoid the commercial centre of town if possible however will need to be identified by the appointed logistics company transporting the WTG components.
- The route from Ngqura Container Terminal to the proposed development via Loxton is feasible. This route has been used to transport WTG components for Noblesfontein, Loeriesfontein and Khobab Wind Farms. Construction of Noblesfontein Wind Farm commenced in March 2013.

The WTG components were transported from the Ngqura Container Terminal to the site. Loeriesfontein and Khobab Wind Farms commenced with the transportation of wind turbine tower components on 20 June 2016. Over 300 wind turbine tower sections, which were fabricated in Atlantis, were transported on the N1 (via Worcester, Laingsburg and Beaufort West), N12 (to Victoria West), R63 (to Carnarvon, Williston and Calvinia) to the site.

The 53 m long wind turbine blades, nacelles and hubs were transported via Uitenhage, Graaff-Reinet, Beaufort West, Three Sisters, Victoria West and Carnarvon onto Loeriesfontein.

- The geometric design and gradient of the Theekloofpas on the TR07301 (R353) could pose constraints that would inhibit the use of this road with the current transportation equipment available in South Africa, and this route is not recommended at this point.

The preferred transportation route would ultimately be identified by the logistic company appointed to transport the various WTG components from the port of entry to the proposed development.

Commercial Centres

The most likely transportation routes for domestically supplied and manufactured components from the major commercial centres to the proposed developments are either Cape Town or Johannesburg (or any supplier along these routes), as shown in Figure 40.

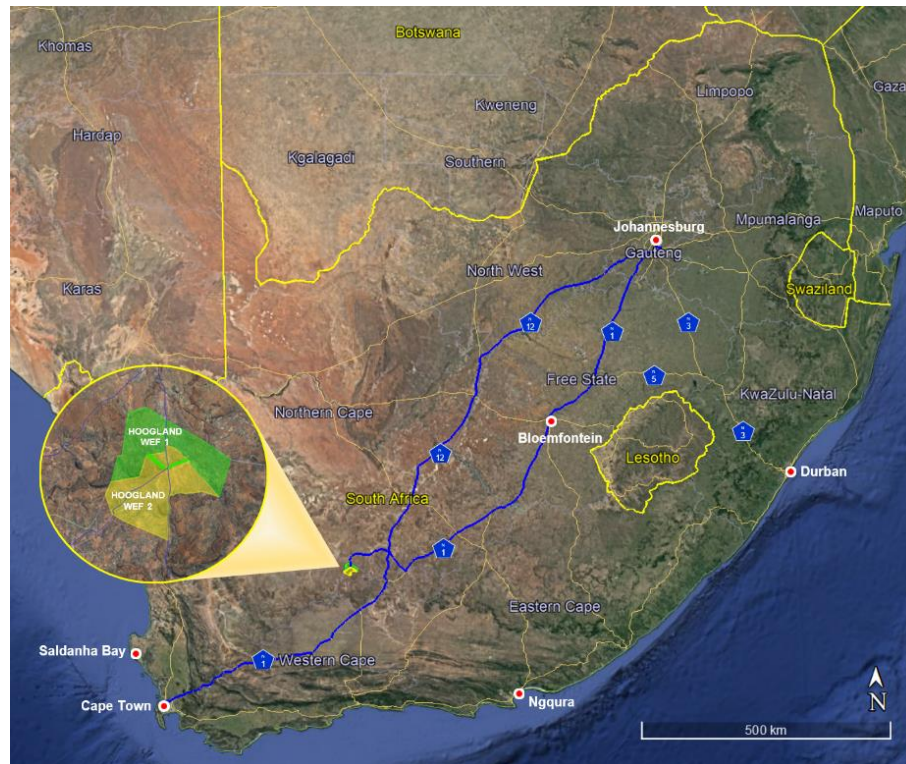


Figure 40 - Freight Routes - Commercial Centres

The distances from the proposed developments to the major commercial centres in South Africa are shown in Table 8.

Table 8 - Distance - Major Commercial Centres

Commercial Centres	Distance
Cape Town	696 km
Johannesburg (via N1)	1003 km
Johannesburg (via N12)	968 km

Although the closest major commercial centre to the proposed developments is located in the greater Cape Town area, many components will be fabricated in Johannesburg and transported to the proposed development.

6.4 RENEWABLE DEVELOPMENTS

According to the Screening Tool provided by SLR Consulting (Pty) Ltd, for the proposed developments, there are no other renewable developments with an approved Environmental Authorisation or applications under consideration within 30 km of the proposed development.

However, for the cumulative impacts, in addition to the proposed developments Hoogland developments, the author has considered the proposed development on the Nuweveld Wind Farms, as shown in Figure 41.

For the purpose of this report, it has been assumed that Nuweveld Wind Farms would be in the operational phase before the construction of Hoogland Wind Farm commences.

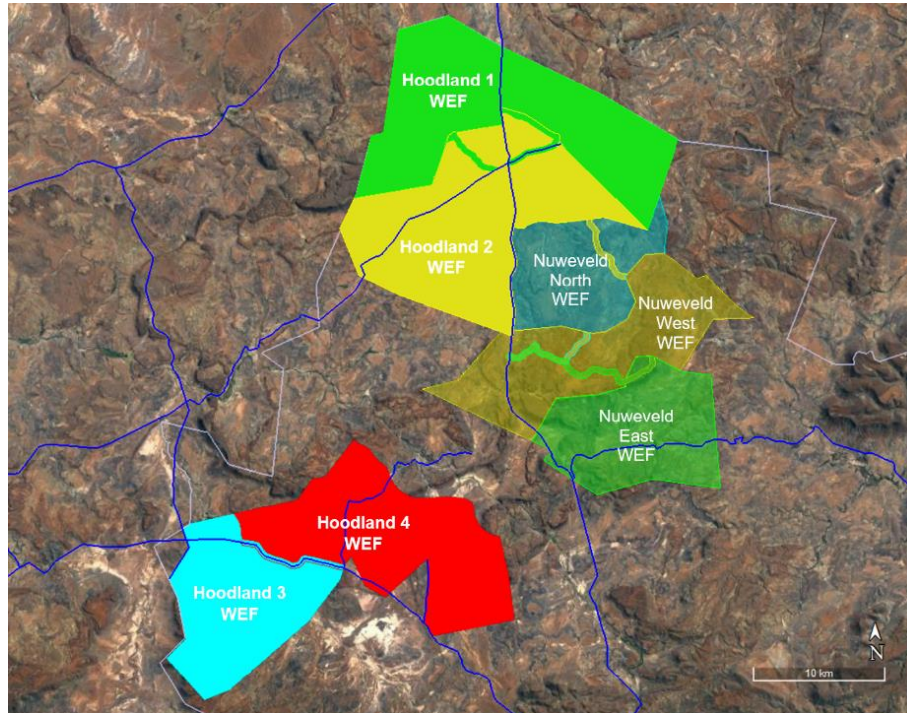


Figure 41 - Adjacent Proposed Renewable Energy Project

7 TRAFFIC VOLUMES

The South African Trip Data Manual (TMH 17), as provided by COTO, does not make provision for expected trip generation for the construction, operation and decommissioning phases of a wind farm. Thus, the traffic trip generation for the construction, operation and decommissioning phrases used in this document is based on data provided by the client and obtained for similar projects. The estimated traffic generation detailed below represents a worst-case scenario.

7.1 STATUS QUO

The current traffic volumes on the public road network in the Western Cape are based on information extracted from the Western Cape Road Information System. The data is obtained from counting stations and strip charts.

However, traffic volumes on the public road network in the Northern Cape is not that freely available. The Northern Cape roads authorities have been requested to provide information pertaining to the traffic counts on the relevant roads in the area. No information has been provided.

7.1.1 Counting Stations

The counting stations on the roads network adjacent to the proposed developments were obtained from the Western Cape Road Information System and Northern Cape Roads Authorities, these counting stations are shown in Figure 42.

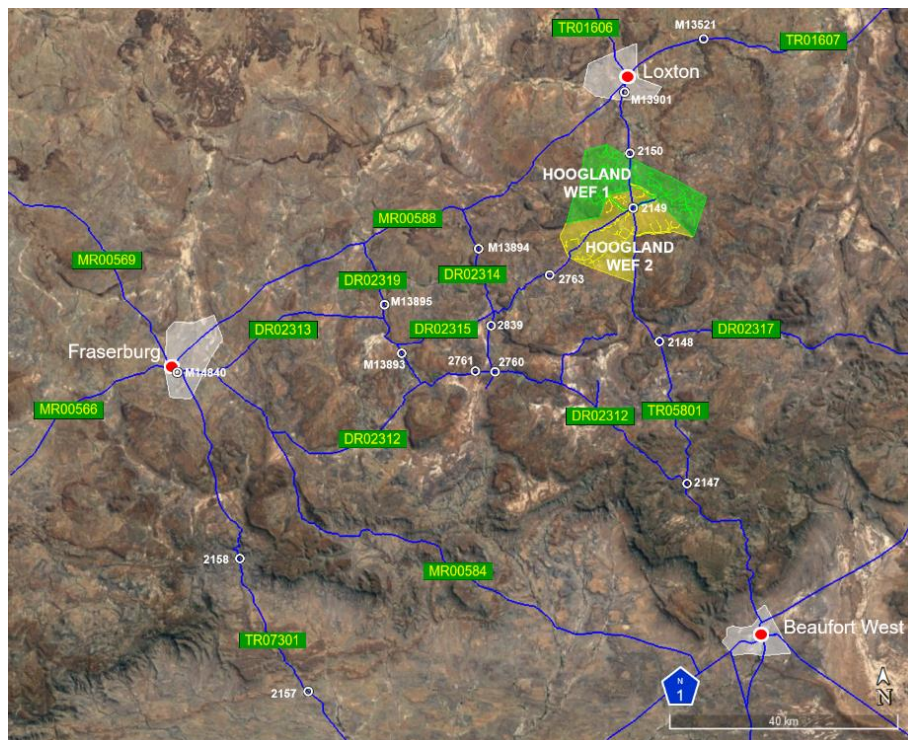


Figure 42 - Counting Station

7.1.2 Baseline Traffic Volumes

The baseline traffic volumes for the road network adjacent to the proposed developments are based on the AADT values obtained from the various counting stations. The values used are the average values between intersections, which have been adjusted by a growth factor relevant to the road. The adjusted AADT values used in this assessment are provided in Figure 43.

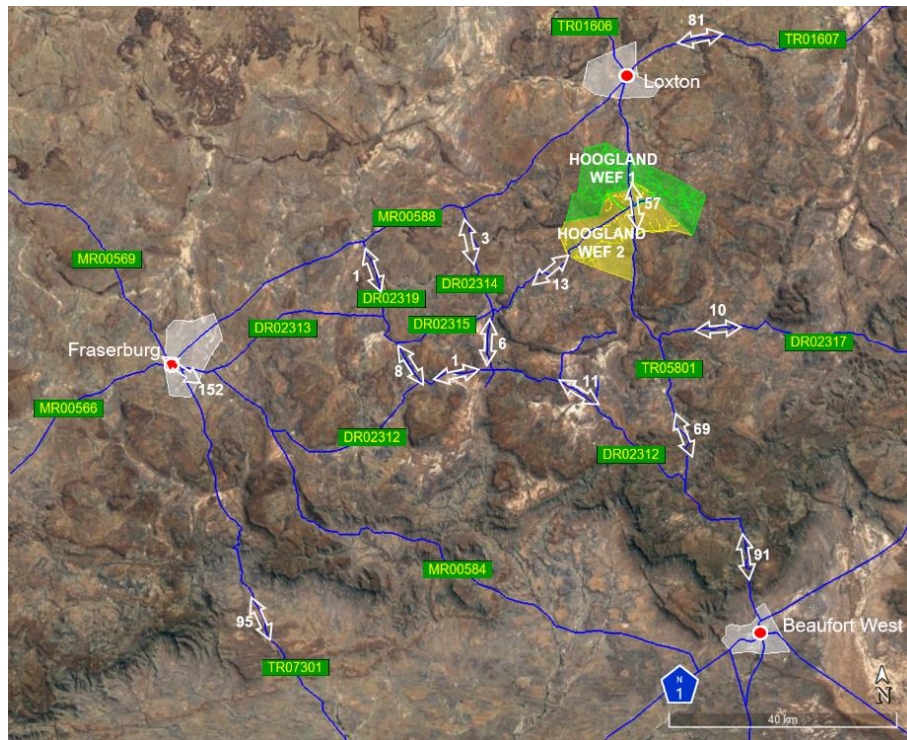
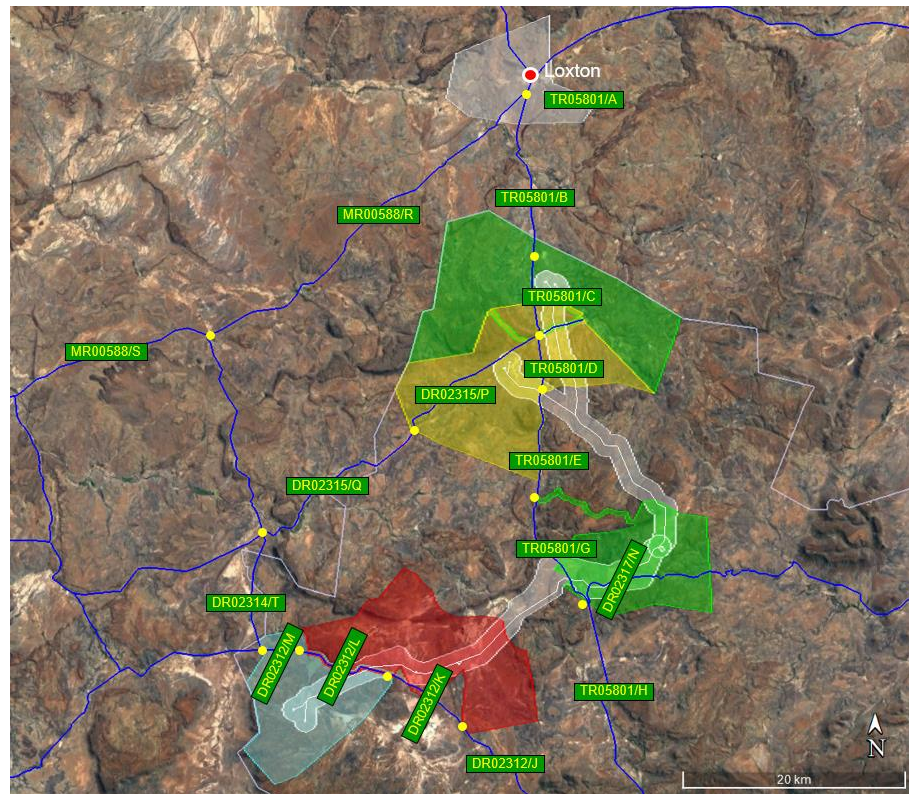


Figure 43 - Baseline AADT

7.2 ROAD NETWORK

The road network has been comprehensively delineated in section 6.1 above. For modelling and analysis purposes, the TR05801 (R381), DR02312, DR02315 and DR02317 were subdivided into shorter lengths, as shown in Figure 44. Intersections form the boundaries of the subdivisions. Figure 44 is the primary reference for the balance of this report.



7.3 CONSTRUCTION PHASE

The construction phase of the proposed development will generate the most significant increase in traffic volumes on the local road network. Construction traffic will include vehicles transporting equipment, material and personnel. The trips will include the delivery of abnormal and oversized components such as rotor blades, tower sections, transformers and generators.

A construction period of 30 months is anticipated for the proposed development of Hoogland 1 and Hoogland 2 when assumed to be constructed simultaneously. The construction activities and duration will vary according to the construction schedule.

The two most significant activities, that impact traffic volumes during the construction phase, are:

- The commuting of personnel, to and from the proposed development; and
- The delivery of equipment and material to the proposed development.

The simultaneous occurrence of these two activities is improbable.

The commuting of personnel to and from the proposed development are two different activities, one occurring at the beginning of the working day (constituting the morning peak) and the other occurring at the end of the working day (constituting the afternoon peak). These activities contribute to Peak Traffic. Traffic movement statistics have shown a noticeable difference between morning and afternoon traffic peaks. Although the same number of trips are generated during these peaks, the morning peak is more concentrated, and the afternoon peak is spread over a longer period. Thus, for analysis purposes, the morning traffic shall be adopted for both morning and afternoon peaks to demonstrate a worst-case scenario.

The delivery of equipment and materials to the proposed developments is envisaged to occur during normal working hours throughout the day. No night deliveries are anticipated and are strongly discouraged. Given the distance from the origin of the material and components and the development, it is assumed that most deliveries will only start arriving at the proposed development an hour or two after work on site commences and will stop an hour or two before work on site concludes for the day. These activities contribute to Diurnal Traffic.

The envisaged timeframes for these activities, as adopted in this document, are:

- Morning Peak Traffic - between 6:30 to 7:30;
- Diurnal Traffic - between 7:30 to 16:30;
- Afternoon Peak Traffic - between 16:30 to 17:30.

7.3.1 Peak Traffic

It has been estimated that a total workforce complement of approximately 260 personnel will be required during the peak construction for each of the proposed developments. Since no accommodation is provided on-site, the personnel will have to be accommodated in the surrounding towns and commute to the proposed development. As identified in section 6.3.1, all the personnel on the proposed development will be drawn from surrounding towns.

Based on the project specification for each of the proposed development, the anticipated breakdown of the site personnel is as follows:

- Senior Staff, consisting of Construction managers, supervisors and other key staff, constitute 10% of the site personnel, equating to approximately 26 persons. It is assumed that senior staff will reside within the community and will commute to the site in pairs, using light vehicles. A fleet of 15 vehicles is envisaged.
- Workforce, consisting of semi-skilled and unskilled workers, will constitute 90% of the site personnel, equating to 234 persons. It is assumed that the workforce will reside within the community and will commute to the site using mini-buses and buses. A fleet of mini-buses and various sizes of buses are envisaged, equating to approximately 12 vehicles.

It is assumed that the transport vehicles will remain on-site during the workday.

The maximum traffic volumes on the road network during the Peak Traffic of the proposed developments for the Northern Cluster is depicted in Table 9.

Table 9 - Construction Phase - Peak Traffic

Road	Number of Vehicles
TR05801/A	20.0 vph
TR05801/B	23.0 vph
TR05801/C	24.0 vph
TR05801/D & G	28.0 vph
TR05801/H & I	24.0 vph
DR02315/P	24.0 vph
DR02315/Q	3.0 vph
DR02317/N	4.0 vph

Based on the information provided above, the maximum number of vehicles on the public road network during the Peak Traffic is in the order of 28 vph.

7.3.2 Diurnal Traffic

The construction phase of the proposed development consists of several activities, and some occur sequentially while others occur concurrently. Thus, not all the traffic volumes estimated in this document for the various activities are cumulative.

The construction phase activities, which will increase the traffic volumes include, *inter alia*:

- *Site establishment: the initial activity of the development, the increase in traffic volumes resulting from this activity is not cumulative;*
- *Delivery of material and equipment to site: the traffic volumes resulting from these activities are cumulative and include the delivery of;*
 - *gravel for the construction of the roads, terraces, battery storage facility and substation platforms;*
 - *raw material (i.e. cement, sand, stone) for batching of concrete;*
 - *construction material (i.e. scaffolding, formwork, reinforcing steel, brick, roof sheeting, fencing, etc.);*
 - *construction vehicles and equipment (i.e. earthmoving equipment, batching plant, etc.)*
 - *substation components (i.e. steel gantries, transformers, switchgear, cables, circuit breakers, surge arresters, lightning conductor masts, etc.)*
 - *components for the battery storage facility (i.e. containers and equipment such as Lithium-ion batteries, inverters, transformers, HVAC equipment, switchgear, etc.)*
- *Delivery of the WTG components are cumulative (i.e. tower sections, blades, nacelle, gearbox, generator, nose cone, hub, etc.). Due to the physical characteristics of most of these components, they will be transported as abnormal loads.*

The diurnal traffic volumes for the proposed developments are based on the cumulative volumes generated by the following activities.

The various freight transportation routes to the proposed developments have been addressed in Section 6.3.2 above. However, this report assumes that 80% of all Freight Traffic will be transported to the proposed developments via Loxton, which constitutes a worst-case scenario. While the remaining 20% is assumed to be transported on vehicles with a gross vehicle mass of less than ten tonnes, equally between the Molteno Pass and Theekloof Pass.

The traffic volumes generated for each proposed development by the various construction activities are defined and detailed below.

Construction Equipment and Materials

Once the site has been established, the delivery of construction equipment and materials will commence. Equipment, such as tools, machinery, scaffolding, formwork, etc., will be delivered to the proposed developments at the commencement of the construction and will be gradually removed from the proposed developments as construction draws to an end. Materials, such as reinforcing steel, brick, roof sheeting, fencing, transformers, switchgear, cables, etc., will be delivered to the proposed development as an ongoing activity. These deliveries will start increasing

during the early stages of the construction phase, ramping up to maximum deliveries, before tapering off again close to the end of the construction phase

Various types of vehicles will be used to deliver the construction equipment and materials to the site. The increase in traffic volume for this activity is conservatively estimated to be in the order of seven return trips per day, which equates to approximately 1.75 vph.

Due to the size of the vehicles delivering the construction equipment and material, the most likely route for the majority of these deliveries to the proposed developments will be on the TR05801 (R381) via Loxton.

Earthworks

The construction of the sub-station platforms, battery storage area, roads and hardstand platforms adjacent to the WTG units will be constructed from suitable gravels. To minimise the unnecessary importing of suitable material, cut and fill operations shall be adopted as far as possible for these elements. It is envisaged that material excavated from the WTG foundations will also be used to augment any potential shortfall of material required for the earthworks.

However, provision has been made to source approximately 125 000 m³ of suitable material from commercial quarries outside the study area. The gravel is assumed to be delivered to the proposed developments in 20 m³ articulated rear tippers, over a period of 18 months. The increase in traffic volume for this activity is estimated to be in the order of 15 return trips per day, which equates to 3.75 vph.

Due to the size of the vehicles delivering this material, the most likely route for these deliveries to the proposed development will be the TR05801 (R381) via Loxton.

Raw Material – Concrete

It is estimated that approximately 52 500 m³ of concrete will be mixed and placed on each of the proposed developments, over a period of 18 months. The majority will be for the WTG foundations and the balance for the sub-stations and battery storage facilities.

Although each proposed development includes an on-site batching plant to mix the concrete for the development, for this assessment and as a worst-case scenario in terms of traffic, it is assumed that both developments will share a single plant. The raw material for the concrete is to be delivered for each of the proposed development from commercial sources and includes 18 500 tonnes of cement, 31 500 m³ of sand, and 36 500 m³ of stone.

The cement is assumed to be delivered to the proposed development using pneumatic bulkers, with a 40 m³ tridem semi (payload 32 000 kg) and 15 m³ pup (payload of 10 000 kg), as shown in Figure 45.



Figure 45 - Bulk Cement Tanker and Pup

The aggregate is assumed to be delivered to the proposed development in 20 m³ articulated rear tippers.

The increase in traffic volume resulting from this activity is estimated to be in the order of eight return trips per day. Over an eight-hour day, this equates to 2.0 vph.

Due to the size of the vehicles delivering this material, the most likely route for these deliveries to the proposed development will be the TR05801 (R381) via Loxton.

WTG Components

The type and number of WTG components to be transported to the proposed developments for each WTG are listed in Table 10

Table 10 - Components per Wind Turbine

Components	Size	Weight	Number
Nacelle	13 x 4.3 x 4 m	± 120 000 kg	1
Blades	90 m (length)	± 25 000 kg	3
Tower Section (Steel)	4.2 m Ø x 30 m (length)	± 51 500 kg	5
Hub/Nose Cone	20' ICC Container	± 40 000 kg	1
Cables	40' IAA Container	max 32 500 kg	1
Generator	40' IAA Container	max 32 500 kg	1
Foundation Insert	4.7 m Ø x 2.5 m (length)	± 27 500 kg	1
Sundries	40' IAA Container	max 32 500 kg	1

The information provided in Table 10, is based on steel tower section. The number of tower sections could increase in concrete tower sections are used.

Approximately 14 components are to be transported to the proposed development for each WTG to be installed. Of these 14 components, only nine are considered abnormal loads, and the rest are deemed normal loads. It must be noted that this information is generic as the details of the WTG components will only be available once the supplier has been appointed.

Based on the information provided in Table 1, 60 WTG are to be installed per proposed development over a period of 24 months. The increase in traffic volume resulting from this activity is estimated to be in the order of less than two return trips per day. Over an eight-hour day, this equates to less than 0.5 vph.

Due to the size of the vehicles delivering this material, the most likely route for these deliveries to the proposed development will be the TR05801 (R381) via Loxton.

Battery Energy Storage System

A Battery Energy Storage System (BESS) is to be constructed as part of the proposed development. The facility takes excess power generated by the wind farm, converts and stores it in batteries. The BESS technology may be either Lithium Ion or Redox Flow, as a worst-case in terms of deliveries, Lithium-Ion has been assumed. In this case, the BESS consists mainly of purpose-made steel containers, in which the batteries are stored and managed, together with inverters and transformers.

Since very little information is available regarding the number of trips generated for installing this equipment, the number of trips is based on how many containers can fit in the allocated area, considering fire and access requirements. Approximately 640 trips will be required over a period of four months. The increase in traffic volume resulting from this activity is estimated to be in the order of eight return trips per day. Over an eight-hour day, this equates to 2 vph.

Due to the size of the vehicles delivering this equipment, the most likely route for these deliveries to the proposed development will be the TR05801 (R381) via Loxton.

Concrete

The concrete for the WTG foundations is batched on-site and transported to each foundation. Each foundation consists of approximately 750 m³ of concrete and takes up to 12 hours to cast. The contractor is most likely to use 8 m³ concrete mix trucks to transport concrete. Thus, to cast a WTG foundation, approximately 97 trips will be generated (including 2.5% wastage) over a period of 12 hours. Therefore the expected increase in traffic (in one direction) will be approximately eight vehicles per hour (one every eight minutes). Based on a speed of 60 km/h, the volume of concrete trucks on the public road network will result in a Following Density of 0.133 v/km, equating to a LOS A. If the vehicles are using the same return route, the traffic will increase by the same volume.

The internal road network of the proposed development is such that the delivery of concrete will result in interaction on the public road network.

Summary

Based on the above information, a summary of the expected Diurnal Traffic on the various roads for the proposed developments are provided in Table 11.

Table 11 - Construction Phase - Diurnal Traffic

Road	Construction Equipment and Material	Earthworks	Raw Material for Concrete	WTG Components	Battery Energy Storage System	Total
TR05801/A	2.40 vph	8.00 vph	4.00 vph	1.00 vph	4.00 vph	19.40 vph
TR05801/B	2.70 vph	8.00 vph	4.00 vph	1.00 vph	4.00 vph	19.70 vph
TR05801/C	1.50 vph	4.00 vph	2.00 vph	0.50 vph	2.00 vph	10.00 vph
TR05801/D to I	0.30 vph					0.30 vph
DR02315/P	1.50 vph	4.00 vph	2.00 vph	0.50 vph	2.00 vph	10.00 vph
MR00588/R	0.30 vph					0.30 vph

Table 11, excludes the movement of concrete delivery trucks on the public road network during the casting of the WTG foundations.

An argument could be made that all earthwork activities would be complete by the time the BESS is installed. However, as a worst-case scenario, it shall be assumed that these activities occur concurrently.

The information provided above is an informed estimate. Construction-related traffic may vary and be different from the information provided above due to the availability of contractors' resources and schedules.

7.4 OPERATIONAL PHASE

The operational life of the proposed development is expected to be approximately 20 years. The proposed development will operate on a 24-hour basis, except when there is a mechanical breakdown, extreme weather conditions or maintenance activities. Wind turbines will be subject to regular maintenance and inspection (i.e. routine servicing) to ensure the optimum performance of the turbine components.

The only on-site activities related to the development will be monitoring, routine servicing and unscheduled maintenance of the WTG units.

7.4.1 Peak Traffic

It is envisaged that each of the two proposed developments are maintained and operated by a team of approximately 40 personnel, with a combined total of 80 personnel for the Northern Cluster.

Thus, the envisaged traffic volumes on the various public roads for both the proposed developments for the Northern Cluster are depicted in Table 12.

Table 12 - Operational Phase - Peak Traffic

<i>Road</i>	<i>Number of Vehicles</i>
<i>TR05801/A</i>	<i>8.0 vph</i>
<i>TR05801/B</i>	<i>9.0 vph</i>
<i>TR05801/C</i>	<i>7.0 vph</i>
<i>TR05801/D & G</i>	<i>6.0 vph</i>
<i>TR05801/H & I</i>	<i>4.0 vph</i>
<i>DR02315/P</i>	<i>7.0 vph</i>
<i>DR02315/Q</i>	<i>1.0 vph</i>
<i>DR02317/N</i>	<i>2.0 vph</i>

Peak traffic is generated by commuting personnel to and from the proposed developments in the morning and afternoon. The maximum number of additional vehicles on the public road network is in the order of 9 vph.

7.4.2 Diurnal Traffic

Two possible activities contribute to the Diurnal Traffic on the public roads. These include commuting between WTG on the Northern Cluster site and delivery of goods and materials.

Daily inspections and periodic maintenance of the Hoogland 1 and 2 WTG units and associated infrastructure will generate several trips per day on or across the public roads. It has been assumed that each proposed development will have four teams that will conduct at least two daily inspections of the WTG. Thus, assuming all the teams from both wind farms depart simultaneously, there will be eight vehicles on the public road network at the same time. However, it is unlikely they will all return at the same time.

The servicing, delivery of goods and visitors to the proposed developments are assumed to be in the order of two vehicles per day, servicing both proposed developments in a single trip. It is assumed that this traffic will travel to the proposed development from both Beaufort West and Loxton.

Based on the information provided above, the maximum number of vehicles that could travel on the same section of the road (not necessary in the same direction) would be in the order of 10.

Thus, the envisaged traffic volumes on the various public roads during the operational phase for both the proposed developments for the Northern Cluster are depicted in Table 13.

Table 13 - Operational Phase - Diurnal Traffic

Road	Number of Vehicles/Hour
TR05801/A & B	0.3 vph
TR05801/C	4.3 vph
TR05801/D	2.3 vph
TR05801/G to I	0.3 vph
DR02315/P	2.3 vph

Based on the information provided above, the maximum number of vehicles on the road network contributing to the Diurnal Traffic is in the order of 4.3 vph.

7.5 DECOMMISSIONING PHASE

At the end of the operational phase, the development may be decommissioned, or its continued economic viability may be investigated. If the development is still deemed economically viable, the development could be re-engineered, and the operational life may be extended. If the development is not financially viable, then the development shall be decommissioned. The components will be disassembled, reused, recycled or disposed of in accordance with the relevant regulatory requirements. The turbines may also be traded or sold as there is an active second-hand market for wind turbines, or they may be used as scrap metal. The decommissioning procedures will be undertaken in line with an Environmental Management Plan, and the site will be rehabilitated and returned to its pre-construction state.

The decommissioning phase of the development is expected to create skilled and unskilled employment opportunities. The traffic impacts on the public roads during the decommissioning phase of the site will be significantly less than the traffic impact determined during the construction phase, as much of the internal infrastructures (i.e. roads, buildings, etc.) will be retained by the landowners.

As part of the decommissioning process, a separate traffic impact assessment should be undertaken since many of the characteristics related to the traffic impact assessment, i.e. access routes, road geometry, traffic volumes, etc., would have changed over the operational life of the development. Thus, a specific decommissioning assessment has not been undertaken at this stage.

8 ASSESSMENT OF IMPACTS

As described in section 6.2, the proposed developments are primarily accessed from the TR05801 (R381) via Loxton. Access on the TR05801 (R381) via the Molteno Pass is limited to light vehicles only. No vehicles with a gross vehicle mass of more than 10 tonnes should be permitted on this road due to the constraints through the pass.

Thus, for this report, it shall be assumed that 80% of all construction and equipment and material delivered to the proposed developments shall be on the TR05801 (R381) via Loxton, and the remaining 20%, split equally between the Molteno and Theekloof passes.

8.1 CONSTRUCTION PHASE

The duration of the active construction phase is estimated to be in the order of 24 months. During the construction phase, traffic will be generated through two distinct sources:

- The commuter traffic, getting personnel to and from the proposed developments (Peak Traffic); and
- The freight traffic, the delivery of materials and equipment to the proposed developments (Diurnal Traffic).

It is envisaged that the transportation of the site personnel will result in Peak Traffic, while the delivery of equipment and materials to the site will be distributed throughout the day.

The traffic volumes generated, for both Peak Traffic and Diurnal Traffic, resulting from the proposed developments has been addressed in Section 7. Thus, the combined expected increase in the traffic volumes on the road network during the peak construction phase of the proposed developments is summarised in Table 14.

Table 14 - Construction Phase - Traffic Volumes

Roads	Day (divided into three-time frames)			
	06:30 Morning Peak Traffic (vph)	07:30 Diurnal Traffic (vph)	16:30 Afternoon Peak Traffic (vph)	17:30
TR05801/A	20.0 vph	19.4 vph	20.0 vph	
TR05801/B	23.0 vph	19.7 vph	23.0 vph	
TR05801/C	24.0 vph	10.0 vph	24.0 vph	
TR05801/D	28.0 vph	0.3 vph	28.0 vph	
TR05801/G	28.0 vph	0.3 vph	28.0 vph	
TR05801/H	24.0 vph	0.3 vph	24.0 vph	
TR05801/I	24.0 vph	0.3 vph	24.0 vph	
DR02317/N	4.0 vph	0.0 vph	4.0 vph	
DR02315/P	24.0 vph	10.0 vph	24.0 vph	
DR02315/Q	3.0 vph	0.0 vph	3.0 vph	

Based on the information provided in the table above, no traffic volumes are increased by more than 50 trips per hour, for the Northern Cluster. Thus negating the requirement for a TIA as specified in section 2.6 of the "South African Traffic Impact and Site Traffic Assessment Manual", which reads as follows; "A Traffic Impact Assessment shall be undertaken and submitted when an application is made for a change in land use and when the highest total additional hourly vehicular trip generation (including pass-by and diverted trips) as a result of the application exceeds 50 trips per hour".

Traffic volume generated during the peak construction phase of both proposed developments of the Northern Cluster is in the order of:

- **Peak Traffic:** The maximum number of vehicles on the road network within a given hour is estimated to be in the order of 28 vph.
- **Diurnal Traffic:** The maximum number of vehicles on the road network within a given hour is estimated to be in the order of 19.7 vph. Which equates to approximately 158 vehicles, over an eight-hour period.

The ADT generated during the peak construction phase on the roads, expressed as an "Increased ADT", are shown in Table 15.

Table 15 - Construction Phase - Traffic Assessment

Road	ADT Baseline*	Additional Traffic Generated**	Increased ADT
TR05801/A	57	(40+155) = 195	252
TR05801/B	57	(46+158) = 204	261
TR05801/C	57	(48+80) = 128	185
TR05801/D & G	57	(56+2) = 58	115
TR05801/H	69	(48+2) = 50	119
TR05801/I	91	(48+2) = 50	141
DR02317/N	10	(8+0) = 8	18
DR02315/P	13	(48+80) = 128	141
DR02315/Q	13	(6+0) = 6	19

* Average AADT of the legs along the section of road

** The first value represents the Peak Traffic and the second value represents the Diurnal Traffic

The most significant expected Peak Traffic increase is on TR05801/D and G, which increases the Baseline ADT by 28 vph in one direction. Based on a speed of 80 km/h, the traffic volume will result in a Following Density of 0.388 v/km, equating to a LOS A. The most significant expected Diurnal Traffic of 158 v/d equates to a traffic volume of approximately 20 vph, in both directions, based on a speed of 80 km/h, the traffic volume will result in a Following Density of 0.138 v/km, equating to a LOS A.

The additional traffic volumes on the road network, does not compromise the level of service for these roads. Thus, even when the additional worst-case traffic volumes are applied, the road network is deemed acceptable.

Concrete Transportation

Due to the proposed layout of the WTG, there are going to be significant interactions with road users when casting the WTG foundation. These are additional to the volumes calculated above.

The duration of this activity will be dependent on the contractors' program and available resources. A period of 15 months is assumed for this report. This value is based on the assumption the two WTG foundations, one from each development, are cast every week.

The interaction of the concrete trucks on the public road network will be directly related to the number of and the position of the batch plants on the proposed developments.

Mitigation measures for the Contractor to consider that will minimise the interaction of concrete delivery trucks with other road users on the public road network include but are not limited to;

- Provide interlinking internal road network on the proposed developments;
- Provide additional batching plants on each portion of the proposed developments that negates the need for concrete trucks to travel on or cross the public roads.

Without implementing mitigation measures, there will be a significant impact on the public road network due to concrete delivery from a single batching plant. This needs to be addressed by the developer.

8.2 OPERATIONAL PHASE

The duration of the operational phase of the proposed developments is estimated to be in the order of 20 years. During this phase, traffic will be generated through two distinct sources:

- The commuter traffic, getting personnel to and from the proposed developments (Peak Traffic); and
- The daily inspections, periodical maintenance, delivery of goods and servicing of the proposed developments (Diurnal Traffic).

It is envisaged that the transportation of the site personnel will result in Peak Traffic, while daily inspections, periodical maintenance, delivery of goods and servicing of the proposed developments will be distributed throughout the day.

The traffic volumes generated, for both Peak Traffic and Diurnal Traffic, resulting from both the proposed development's operational phases, have been addressed in Section 7. Thus, the expected increase in the traffic volumes on the various roads during the operational phase of the proposed developments are summarised in Table 16.

Table 16 - Operational Phase - Traffic Volumes

Roads	Day (divided into three-time frames)					
	06:30	Morning Peak Traffic (vph)	07:30	Diurnal Traffic (vph)	16:30	Afternoon Peak Traffic (vph)
TR05801/A		8.0 vph		0.250 vph		8.0 vph
TR05801/B		9.0 vph		0.250 vph		9.0 vph
TR05801/C		7.0 vph		4.250 vph		7.0 vph
TR05801/D		6.0 vph		2.250 vph		6.0 vph
TR05801/G		6.0 vph		0.250 vph		6.0 vph
TR05801/H & I		4.0 vph		0.250 vph		4.0 vph
DR02317/N		2.0 vph		0.000 vph		2.0 vph
DR02315/P		7.0 vph		2.250 vph		7.0 vph
DR02315/Q		1.0 vph		0.000 vph		1.0 vph

Based on the information provided in the table above, no traffic volumes are increased by more than 50 trips an hour, for the Northern Cluster. Thus negating the requirement for a TIA as specified in section 2.6 of the "South African Traffic Impact and Site Traffic Assessment Manual", which reads as follows; "A Traffic Impact Assessment shall be undertaken and submitted when an application is made for a change in land use and when the highest total additional hourly vehicular trip generation (including pass-by and diverted trips) as a result of the application exceeds 50 trips per hour".

Traffic volume generated during the operational phase of the two proposed developments are as follows:

- **Peak Traffic:** The maximum number of vehicles on the road network within a given hour is estimated to be in the order of 9 vph.
- **Diurnal Traffic:** The maximum number of vehicles on the road network within a given hour is estimated to be in the order of 4.25 vph. Which equates to approximately 34 vehicles, over an eight-hour period.

The ADT generated during the operational phase of the two proposed developments on the public road network, expressed as an "Increased ADT", are shown in Table 17.

Table 17 - Operational Phase - Traffic Assessment

Road	ADT Baseline*	Additional Traffic Generated**	Increased ADT
TR05801/A	57	(16+2) = 18	75
TR05801/B	57	(18+2) = 20	77
TR05801/C	57	(14+34) = 48	105
TR05801/D	57	(12+18) = 30	87
TR05801/G	57	(12+2) = 14	71
TR05801/H	69	(8+2) = 10	79
TR05801/I	91	(8+2) = 10	101
DR02315/P	13	(14+18) = 32	45
DR02315/Q	13	(2+0) = 2	15
DR02317/N	10	(4+0) = 4	14

* Average AADT of the legs along the section of road

** The first value represents the Peak Traffic and the second value represents the Diurnal Traffic

The most significant expected Peak Traffic increase is on TR05801/B, which increases the Baseline ADT by 9 vph in one direction. Based on a speed of 80 km/h, the traffic volume will result in a Following Density of 0.150 v/km, equating to a LOS A. The most significant expected Diurnal Traffic of 34 v/d equates to a traffic volume of approximately 4 vph, in both directions, based on a speed of 80 km/h, the traffic volume will result in a Following Density of less than 0.100 v/km, equating to a LOS A.

The additional traffic volumes on the road network, does not compromise the level of service for these roads and is deemed insignificant.

8.3 DECOMMISSIONING PHASE

As described in Section 7.4 above, a separate traffic impact assessment should be undertaken as part of the decommissioning process since many of the characteristics related to the traffic impact assessment, i.e. access routes, road geometry, traffic volumes, etc., would have changed over the operational life of the development. Thus, no traffic assessment for the decommissioning phase has been undertaken in this report.

9 ASSESSMENT OF CUMULATIVE IMPACTS

The assessment of the cumulative increased traffic volumes on the road network within the study area during this proposed development's construction, operational and decommissioning phases are delineated below.

The construction of the Hoogland Northern Wind Farm Cluster is subject to the relevant approval by the various authorities.

In addition to these two proposed developments, several other wind farm developments and grid connections are proposed within the study area, as detailed in Section 6.4.

It is unclear whether the Northern and Southern Cluster of the Hoogland Wind Project will be constructed concurrently or sequentially. As a worst-case scenario, concurrent construction of these two developments and the operation of the three Nuweveld

Wind Farms have been assumed for evaluation. The traffic volumes generated for the construction and operational phase of the other Southern Cluster of the Hoogland Wind Farm Project have been independently calculated. They are the subject of a separate report.

To summarise:

- The cumulative construction phase assessment includes the simultaneous construction of the Northern and Southern Cluster of the Hoogland Wind Farm Project and associated Grid Connections, together with the operational phase of the three Nuweveld Wind Farms;
- The cumulative operation phase assessment includes the simultaneous operation of the Northern and Southern Cluster of the Hoogland Wind Project and the operation of the three Nuweveld Wind Farms. The only traffic associated with the Grid Connections during the operational phase is the line inspection, which does not adversely impact the traffic volumes, and has been excluded from this report.

9.1 CONSTRUCTION PHASE

The cumulative traffic volumes during the construction phase of the Northern and Southern Cluster of the Hoogland Wind Farm Project and the Grid Connections includes the traffic volumes resulting from the operational phase of the adjacent Nuweveld Wind Projects.

The peak traffic volumes are based on:

- A combined workforce complement of 1 040 for the Northern and Southern Cluster of the Hoogland Wind Farm Project, which includes the construction of the BESS and Substations. Plus, a further 160 are involved in constructing the two Grid Connections. Thus, the cumulative impact is based on a combined workforce of approximately 1 200; and
- A combined workforce complement of 96 for the operation of the three Nuweveld Wind Farm Projects.

Thus, the cumulative traffic volumes on the public road network related to the construction phase of the proposed developments are based on a combined workforce of 1 296, and the expected Peak Traffic and Diurnal Traffic is provided in Table 18.

Table 18 - Cumulative Constructional Phase - Traffic Volume

Roads	Day (divided into three-time frames)					
	06:30	Morning Peak Traffic (vph)	07:30	Diurnal Traffic (vph)	16:30	Afternoon Peak Traffic (vph)
TR05801/A		57.0 vph		40.6 vph		57.0 vph
TR05801/B		49.0 vph		40.9 vph		49.0 vph
TR05801/C		51.0 vph		31.3 vph		51.0 vph
TR05801/D		55.0 vph		21.6 vph		55.0 vph
TR05801/G		53.0 vph		21.6 vph		53.0 vph
TR05801/H		52.0 vph		20.8 vph		52.0 vph
TR05801/I		68.0 vph		0.8 vph		68.0 vph
DR02312/J		50.0 vph		20.7 vph		50.0 vph
DR02312/K		39.0 vph		11.0 vph		39.0 vph
DR02312/L		19.0 vph		0.3 vph		19.0 vph
DR02312/M		7.0 vph		0.3 vph		7.0 vph

Roads	Day (divided into three-time frames)					
	06:30	Morning Peak Traffic (vph)	07:30	Diurnal Traffic (vph)	16:30	Afternoon Peak Traffic (vph)
DR02317/N		33.0 vph		2.0 vph		33.0 vph
DR02315/P		24.0 vph		10.0 vph		24.0 vph
DR02315/Q		3.0 vph		0.0 vph		3.0 vph
MR00588/R		16.0 vph		0.3 vph		16.0 vph
DR02314/T		12.0 vph		0.0 vph		12.0 vph

Based on the information provided in the table above, there are several sections on the TR05801 (R381) where the traffic volumes increased by more than 50 trips an hour, thus requiring a TIA, as per section 2.6 of the "South African Traffic Impact and Site Traffic Assessment Manual", which reads as follows; "A Traffic Impact Assessment shall be undertaken and submitted when an application is made for a change in land use and when the highest total additional hourly vehicular trip generation (including pass-by and diverted trips) as a result of the application exceeds 50 trips per hour".

The maximum cumulative traffic volumes generated on the various roads during the construction phase of the proposed Hoogland Northern and Southern Wind Farms and the operational phase of adjacent developments (Nuweveld Wind Farms) are in the order of:

- **Peak Traffic:** The maximum number of vehicles on any one section of the public road network within a given hour is estimated to be in the order of 68 vph.
- **Diurnal Traffic:** The maximum number of vehicles on the road network within a given hour is estimated to be in the order of 40.9 vph. Which equates to approximately 327 vehicles, over an eight-hour period.

The assessment of the cumulative traffic impact generated during the peak construction phase expressed as an "Increased ADT" is provided in Table 19.

Table 19 - Cumulative Constructional Phase - Traffic Assessment

Road	ADT Baseline*	Additional Traffic Generated**	Increased ADT
TR05801/A	57	(114+325) = 439	496
TR05801/B	57	(98+327) = 425	482
TR05801/C	57	(102+250) = 352	409
TR05801/D	57	(110+173) = 283	340
TR05801/G	57	(106+173) = 279	336
TR05801/H	69	(104+166) = 270	339
TR05801/I	91	(136+6) = 142	233
DR02312/J	11	(100+166) = 266	277
DR02312/K	11	(78+88) = 166	177
DR02312/L	11	(38+2) = 40	51
DR02312/M	1	(14+2) = 16	17
DR02317/N	10	(66+16) = 82	92
DR02315/P	13	(48+80) = 128	141
DR02315/Q	13	(6+0) = 6	19
MR00588/R	69	(32+2) = 34	103
DR02314/T	6	(24+0) = 24	30

* Average AADT of the legs along the section of road

** The first value represents the Peak Traffic and the second value represents the Diurnal Traffic

The maximum expected increase in Peak Traffic is on TR05801/I, with an expected 68 vph, in one direction. Based on a speed of 80 km/h, the traffic volume will result in a Following Density of 0.963 v/km, equating to a LOS A.

The maximum expected increase in Diurnal Traffic is on TR05801/B, with an expected 327 v/d, which equates to approximately 41 vph, in both direction. Based on a speed of 80 km/h, the traffic volume will result in a Following Density of 0.269 v/km, equating to a LOS A.

Concrete Transportation

The transportation of concrete delivery for the casting of the WTG foundations, on or over the public roads, is an issue and will need to be addressed, as discussed in section 8.1. The traffic volumes resulting from the moving of concrete from the batch plant to the WTG foundation, would occur over specific sections of the road network on specific days and is in addition to the volumes calculated above. Depending on the mitigation measures adopted by the contractor.

9.2 OPERATIONAL PHASE

The cumulative traffic volumes during the operational phase of the Northern and Southern Cluster of the Hoogland Wind Farm Project includes the traffic volumes resulting from the operational phase of the adjacent Nuweveld Wind Farm Project.

Thus the cumulative traffic volumes on the road network related to the proposed developments are based on a combined workforce of 256. The Peak Traffic and Diurnal Traffic is provided in Table 20.

Table 20 - Cumulative Operational Phase - Traffic Volumes

Roads	Day (divided into three-time frames)					
	06:30	Morning Peak Traffic (vph)	07:30	Diurnal Traffic (vph)	16:30	Afternoon Peak Traffic (vph)
TR05801/A		25.0 vph		0.8 vph		25.0 vph
TR05801/B		22.0 vph		0.8 vph		22.0 vph
TR05801/C		20.0 vph		4.8 vph		20.0 vph
TR05801/D		19.0 vph		2.8 vph		19.0 vph
TR05801/G		17.0 vph		0.8 vph		17.0 vph
TR05801/H		16.0 vph		0.8 vph		16.0 vph
TR05801/I		14.0 vph		0.8 vph		14.0 vph
DR02312/J		10.0 vph		0.5 vph		10.0 vph
DR02312/K		8.0 vph		4.3 vph		8.0 vph
DR02312/L		6.0 vph		0.0 vph		6.0 vph
DR02312/M		2.0 vph		0.0 vph		2.0 vph
DR02317/N		9.0 vph		0.2 vph		9.0 vph
DR02315/P		7.0 vph		2.3 vph		7.0 vph
DR02315/Q		1.0 vph		0.0 vph		1.0 vph
MR00588/R		5.0 vph		0.0 vph		5.0 vph
DR02314/T		4.0 vph		0.0 vph		4.0 vph

Based on the information provided in the table above, there are no traffic volumes that are increased by more than 50 trips an hour, thus negating the requirement for a TIA as specified in section 2.6 of the "South African Traffic Impact and Site Traffic Assessment Manual", "A Traffic Impact Assessment shall be undertaken and submitted when an application is made for a change in land use and when the highest total additional hourly vehicular trip generation (including pass-by and diverted trips) as a result of the application exceeds 50 trips per hour".

The cumulative traffic volumes generated on the road network within the study area during the combined operational phase of all seven wind farms are in the order of:

- **Peak Traffic:** The maximum number of vehicles on the road network within a given hour is estimated to be in the order of 25 vph;

- *Diurnal Traffic:* The maximum number of vehicles on the road network within a given hour is estimated to be in the order of 4.8 vph. Which equates to approximately 38 vehicles, over an eight-hour period.

The assessment of the cumulative traffic impact generated during the operational phase expressed as an "Increased ADT" is provided in Table 21.

Table 21 - Cumulative Operational Phase - Traffic Assessment

Road	ADT Baseline*	Additional Traffic Generated**	Increased ADT
TR05801/A	57	(50+6) = 56	113
TR05801/B	57	(44+6) = 50	107
TR05801/C	57	(40+38) = 78	135
TR05801/D	57	(38+22) = 60	117
TR05801/G	57	(34+6) = 40	97
TR05801/H	69	(32+6) = 38	107
TR05801/I	91	(28+6) = 34	125
DR02312/J	11	(20+4) = 24	35
DR02312/K	11	(16+34) = 50	61
DR02312/L	11	(12+0) = 12	23
DR02312/M	1	(4+0) = 4	5
DR02317/N	10	(18+2) = 20	30
DR02315/P	13	(14+18) = 32	45
DR02315/Q	13	(2+0) = 2	15
MR00588/R	69	(10+0) = 10	79
DR02314/T	6	(8+0) = 8	14

* Average AADT of the legs along the section of road

** The first value represents the Peak Traffic and the second value represents the Diurnal Traffic

The maximum expected increase in Peak Traffic is on TR05801/A, with an expected 25 vph, in one direction. Based on a speed of 80 km/h, the traffic volume will result in a Following Density of 0.311 v/km, equating to a LOS A.

The maximum expected increase in Diurnal Traffic is on TR05801/C, with an expected 38 v/d, which equates to approximately 5 vph, in both directions. Based on a speed of 80 km/h, the traffic volume will result in a Following Density is less than 0.100 v/km, equating to a LOS A.

9.3 DECOMMISSIONING PHASE

As described in Section 7.4 above, a separate traffic impact assessment should be undertaken as part of the decommissioning process since many of the characteristics related to the traffic impact assessment, i.e. access routes, road geometry, traffic volumes, etc., would have changed over the operational life of the developments. Thus, no cumulative traffic assessment for the decommissioning phase has been undertaken in this report.

10 RISKS AND IMPACTS

Developments within an established environment can cause a significant impact on the road network, mainly when new developments are introduced into the environment, which leads to an increase in traffic on the existing public roads. The traffic volume will vary depending on the phase of the development. More traffic is

envisaged during the construction and decommissioning phases of the proposed developments, while traffic volumes during the operational phase of the proposed developments are deemed insignificant.

With the increase of traffic on the roads comes the potential increase in incidents. The incidents could vary from minor damage to the vehicle due to the road conditions to fatal collisions with other vehicles, pedestrians or even animals.

Traffic safety is directly related to the attitude of the drivers using the roads. The road condition will dictate the safe speed limit a responsible driver will travel. However, not all road users are responsible, resulting in frustrated drivers taking unnecessary chances, many of which involve excessive speeding.

Thus, to improve traffic safety on the roads, it is strongly suggested that all key personnel, including mini-bus and bus drivers, be provided with advanced driver training.

10.1 RISKS

The existing road network has numerous intrinsic risks, which could be exacerbated by the traffic generated due to the development. The most pertinent risks are briefly discussed below and need to be considered by the developer during the various phases of the proposed developments.

10.1.1 Traffic Volumes

The traffic volumes on the road network will be significantly more during the construction phase than expected during the proposed developments' operational phase.

During the construction phase of the proposed developments, a significant increase in traffic is anticipated during the morning and afternoon peaks. The diurnal traffic related to this development is less significant as it is spread over the entire day.

The casting of the WGT foundation could result in a significant number of concrete delivery vehicles travelling or crossing the public roads if the contractor does not implement mitigation measures.

During the operational phase of the development, there will be a nominal increase in traffic on the local road network. The increase in traffic volumes will be limited to peak traffic with negligible diurnal traffic generated.

The increased traffic volumes will increase the potential of incidents on the roads within the study area, specifically at intersections and through urban areas.

A Transport Management Plan will need to be compiled to identify and manage mitigation measures for the construction phase of the Hoogland Northern Cluster Wind Farms. Refer to Section 11 for more detail.

10.1.2 Road Condition

The majority of the roads in the study area are gravel, and the structure varies from wide, well-maintained gravel roads to narrow, poorly maintained gravel paths. The passes through the Nuweveld Mountains are extremely treacherous, with very few barriers, steep drop-offs, very tight corners, negative banking and loose gravel.

Many roads pass over drifts or low-level bridges that are impassable in heavy rains or flash floods.

During the construction phase of the proposed developments, there will be an increase in the traffic volumes on the local road network. The increased traffic volumes will place an additional burden on the roads within the study area. The movement of concrete delivery trucks used during the casting of the WTG foundation on the public road network immediately adjacent to the proposed developments is an issue that will need to be addressed.

Mitigation of this impact is regular maintenance of the roads by the local roads' authorities, both the Northern Cape and Western Cape. However, it is unlikely that the local authorities will undertake the necessary road maintenance due to budget constraints. As is standard practice and customarily enforced as part of the planning approval for the development, the developer undertakes to contribute towards or conducts regular maintenance of the roads network used by the developer.

10.1.3 Reduced Visibility

Numerous natural phenomena could compromise the road user's visibility, thus increasing the road network's potential for accidents. These include inter alia:

- Sun glare: When driving on the road into the sun, there is a high probability of being blinded by the sun, not being able to observe activities along the road and intersections, which could result in an incident;*
- Inclement weather: Visibility is the primary concern when driving in inclement weather. Reduced visibility resulting from either the rain itself or from the spray of the vehicles travelling on the road. Skidding and aquaplaning resulting from water on the road surface is a probable risk;*
- Dust: The generation of dust when travelling on unpaved roads is inevitable. The larger the vehicle, the more dust is generated. This dust hinders the drivers wishing to over-take with a clear view for over-taking, resulting in drivers taking unnecessary chances, with unfavourable consequences.*

Mitigation measures to consider include

- Compile a Transport Management Plan, sections of which to be part of induction training for all personnel travelling to the development during the construction phase.*

10.1.4 Pedestrians and Animals

The development is to be constructed in a rural area, including mountainous terrain. Large portions of the area are undeveloped and are home to various species of antelope.

Many roads pass through homesteads on routes to the proposed developments, which is a concern. Drivers need to be aware of the importance of reducing speed when approaching and passing through these establishments.

Stray livestock, wild animals and pedestrians are all potential risks to road users. If drivers take evasive action at high speed, there is a strong probability that the vehicle could roll, resulting in severe injuries or even fatalities. Failing to take evasive action will result in the inevitable fatality of the animal or pedestrian.

During all phases of the project, mitigation measures are limited to providing drivers with advanced driver training and training on how to handle a vehicle in the event of

a tire blow-out or an antelope jumping in the road, as the incorrect evasive action could have dire consequences.

10.2 IMPACTS

The road network within the study area is limited, offering very little opportunity of selecting alternative routes. All routes evaluated for the development are existing roads, and no new roads need to be constructed, apart from sections of the proposed by-pass around Beaufort West (if required). However, remedial action on various sections of the transportation routes will be required before executing the works.

Traffic-related risks and impacts on the road network within the study area have been assessed using an assessment methodology provided by SLR Consulting South Africa (Pty) Ltd for various phases of this development.

10.2.1 Construction Phase

During the peak construction phase of the development, the following safety and road network integrity impacts have been assessed.

Increased Road Incidents

The impact of increased traffic volumes on the public roads, which will increase the potential of incidents on the road network within the study area, is provided in Table 22

Table 22 - Construction Phase - Increased Road Incidents

Table 22 – Construction Phase – Increased Road Incidents		
Issue	Increased Road Incidents	
Description of Impact		
The increased traffic volumes on the public roads will increase the potential of incidents on the road network within the study area		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Construction	
Criteria	Without Mitigation	With Mitigation
Intensity	Very High	Very High
Duration	Short-term	Short-term
Extent	Local	Local
Consequence	Medium	Medium
Probability	Definite / Continuous	Conceivable
Significance	Medium -	Low-
Degree to which impact can be reversed	The resource is irreparably damaged and is not represented elsewhere	
Degree to which impact may cause irreplaceable loss of resources	The resource is irreparably damaged and is not represented elsewhere	
Degree to which impact can be mitigated	Mitigation does not exist, or mitigation will slightly reduce the significance of impacts	
Mitigation actions		
The following measures are recommended:	Post relevant road signage along affected routes; Create local WhatsApp Group, notifying other road users of expected deliveries and associated routes; Transport Management Plan(TMP) is to be compiled once the contractor has been appointed and all the relevant details of the construction process are known. Refer to Section 11. The TMP needs to address, inter alia: - clearly defined route/s to the site for specific vehicles needed to transport equipment and materials - scheduled deliveries to avoid local congestion; Ensure all vehicles are roadworthy, visible, adequately marked, and operated by an appropriately licenced operator.	

Monitoring		
The following monitoring is recommended:	Incident register and ongoing road safety awareness training	
Cumulative impacts		
Nature of cumulative impacts	The cumulative impact resulting from the traffic volumes on the road network	
Rating of cumulative impacts	Without Mitigation	With Mitigation
	Medium -	Low -

Road Degradation

The impact of increased traffic volumes on the public roads, which will increase the potential for localised road network degradation within the study area, is presented in Table 23

Table 23 - Construction Phase - Road Degradation

Issue	Road Degradation	
Description of Impact		
The increased traffic volumes on the public roads will increase the potential for localised road network degradation within the study area.		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Construction	
Criteria	Without Mitigation	With Mitigation
Intensity	Medium	Low
Duration	Short-term	Short-term
Extent	Local	Local
Consequence	Medium	Medium
Probability	Definite / Continuous	Conceivable
Significance	Medium -	Low -
Degree to which impact can be reversed	The affected environment will be able to recover from the impact	
Degree to which impact may cause irreplaceable loss of resources	The resource is not damaged irreparably or is not scarce	
Degree to which impact can be mitigated	Mitigation exists and will notably reduce the significance of impacts	
Mitigation actions		
The following measures are recommended:	Create a local WhatsApp Group for local community and post notices of road conditions and proposed alternatives. Developer to contribute to the maintenance of the public roads in the area during construction phase of the development/s. A photographic record of the road condition should be maintained throughout the various phases of the development/s. This provides an objective assessment and mitigates any subjective view from road users. Upgrade unpaved roads to a suitable condition for proposed construction vehicles; Ensure that the roads are left in the same or better condition, post-construction.	
Monitoring		
The following monitoring is recommended:	Weekly inspection,	
Cumulative impacts		
Nature of cumulative impacts	The cumulative impact resulting from the traffic volumes on the road network	
Rating of cumulative impacts	Without Mitigation	With Mitigation
	Medium -	Low -

Dust

The larger the vehicle, the more dust is likely to be generated. This dust hinders the drivers wishing to over-take without a clear view for over-taking, resulting in drivers taking unnecessary chances, which could result in unfavourable consequences. The

impact of increased traffic volumes on the unpaved public roads that will generate dust is presented in Table 24.

Table 24 - Construction Phase – Dust

Issue	Dust	
Description of Impact		
The increased traffic volumes on the unpaved public roads will generate more dust. The larger the vehicle, the more dust is likely to be generated. This dust hinders the drivers wishing to over-take without a clear view for over-taking, resulting in drivers taking unnecessary chances, which could result in unfavourable consequences		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Construction	
Criteria	Without Mitigation	With Mitigation
Intensity	High	High
Duration	Medium-term	Short-term
Extent	Regional	Regional
Consequence	High	Medium
Probability	Possible / frequent	Conceivable
Significance	Medium -	Low -
Degree to which impact can be reversed	The affected environment will not be able to recover from the impact - permanently modified	
Degree to which impact may cause irreplaceable loss of resources	The resource is irreparably damaged and is not represented elsewhere	
Degree to which impact can be mitigated	Mitigation does not exist, or mitigation will slightly reduce the significance of impacts	
Mitigation actions		
The following measures are recommended:	Reduce travel speed for construction vehicles on the gravel road to reduce dust Dust suppression of the roads in the immediate vicinity of the site where feasible Regular preventative maintenance of roads within the immediate vicinity of the site should be conducted over weekends to minimise the impact on the average construction period.	
Monitoring		
The following monitoring is recommended:	Continues observation, remedial action needs to be taken as and when required	
Cumulative impacts		
Nature of cumulative impacts	The cumulative impact resulting from the traffic volumes on the road network	
Rating of cumulative impacts	Without Mitigation	With Mitigation
	Medium -	Low -

Intersection Safety

The impact due to the increased traffic volumes at intersections, which will increase the potential risk of accidents at the intersections, resulting in serious injuries or even fatalities, is presented in Table 25, especially at the intersection on the main roads, when vehicles from the site needing to cross over oncoming traffic.

Table 25 - Construction Phase - Intersection Safety

Table 20 Construction Phase Intersection Safety	
Issue	Intersection Safety
Description of Impact	
The increased traffic volumes at intersections will increase the potential risk of accidents at the intersections, resulting in serious injuries or even fatalities, especially at the intersection on the main roads, when vehicles from the site need to cross over oncoming traffic.	
Type of Impact	Indirect
Nature of Impact	Negative
Phases	Construction

Criteria	Without Mitigation	With Mitigation
Intensity	High	High
Duration	Short-term	Short-term
Extent	Site	Site
Consequence	Medium	Medium
Probability	Definite / Continuous	Definite / Continuous
Significance	Medium -	Medium -
Degree to which impact can be reversed	The affected environment will not be able to recover from the impact - permanently modified	
Degree to which impact may cause irreplaceable loss of resources	The resource is irreparably damaged and is not represented elsewhere	
Degree to which impact can be mitigated	Mitigation exists and will notably reduce significance of impacts	
Mitigation actions		
The following measures are recommended:	Compile TMP, refer to Section 11 of the Traffic Report. Reduce speed at intersections and use appropriate traffic warning signs Identify alternative routes where possible Request the assistance of local law enforcement Ensure that all construction vehicles are roadworthy, visible, adequately marked, and operated by an appropriately licenced operator.	
Monitoring		
The following monitoring is recommended:	Incident register and ongoing road safety awareness training	
Cumulative impacts		
Nature of cumulative impacts	The cumulative impact due to the increased traffic volumes at intersections, which will increase the potential risk of accidents at the intersections, resulting in serious injuries or even fatalities, especially at the intersection on the main roads, when vehicles from the site need to cross over oncoming traffic.	
Rating of cumulative impacts	Without Mitigation	With Mitigation
	Medium -	Medium -

10.2.2 Operational Phase

During the operational phase of the development, the traffic volumes are considerably less than during the construction phase of the proposed development. Thus all impacts associated with increased traffic volumes have been omitted. Therefore, the only impact deemed essential during the operational phase of the proposed development is addressed below.

Intersection Safety

The cumulative impact due to the increased traffic volumes at intersections, which will increase the potential risk of accidents at the intersections, resulting in serious injuries or even fatalities, is presented in Table 26, especially at the intersection on the main roads, when vehicles from the site need to cross over oncoming traffic.

Table 26 - Operational Phase - Intersection Safety

Issue	Intersection Safety	
Description of Impact		
The increased traffic volumes at intersections will increase the potential risk of accidents at the intersections, resulting in serious injuries or even fatalities, especially at the intersection on the main roads, when vehicles from the site need to cross over oncoming traffic.		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Operation	
Criteria	Without Mitigation	With Mitigation
Intensity	High	High
Duration	Short-term	Short-term
Extent	Site	Site

Consequence	Medium	Medium
Probability	Definite / Continuous	Definite / Continuous
Significance	Medium -	Medium -
Degree to which impact can be reversed	The affected environment will not be able to recover from the impact - permanently modified	
Degree to which impact may cause irreplaceable loss of resources	The resource is irreparably damaged and is not represented elsewhere	
Degree to which impact can be mitigated	Mitigation exists and will notably reduce the significance of impacts	
Mitigation actions		
The following measures are recommended:	Compile TMP, refer to Section 11 of the Traffic Report. Reduce speed at intersections and use appropriate traffic warning signs Identify alternative routes where possible Request the assistance of local law enforcement Ensure that all site vehicles are roadworthy, visible, adequately marked, and operated by an appropriately licenced operator.	
Monitoring		
The following monitoring is recommended:	Incident register and ongoing road safety awareness training	
Cumulative impacts		
Nature of cumulative impacts	The cumulative impact due to the increased traffic volumes at intersections, which will increase the potential risk of accidents at the intersections, resulting in serious injuries or even fatalities, especially at the intersection on the main roads, when vehicles from the site need to cross over oncoming traffic.	
Rating of cumulative impacts	Without Mitigation	With Mitigation
	Medium -	Medium -

10.2.3 Decommissioning Phase

As part of the decommissioning process, a separate traffic impact assessment should be undertaken since many of the characteristics related to the traffic impact assessment, i.e. access routes, road geometry, traffic volumes, etc., would have changed over the operational life of the development. Thus, the impact assessment for the decommissioning phase has not been provided.

10.2.4 No-go Alternative

If the proposed development does not materialise, the increase in the traffic volume will not transpire, resulting in the following impacts:

Road Degradation

Less traffic on the roads means that the rate of degradation to the roads will be less. However, the maintenance of the roads will not be augmented by the proposed development. Improved maintenance of the roads will improve the quality of life for the road users and could increase the economic opportunities in the area. The status quo is therefore rated as of low negative significance.

Road Safety

Less traffic on the roads means less probability of an incident, reducing the likelihood of a fatality. Therefore the impact is neutral.

Statement

The improved road maintenance counteracts the negative impacts on the road network due to the development and economic prospects the development will bring to the local community and the impact the development has on a national scale.

11 TRANSPORT MANAGEMENT PLAN

As recommended in section 10, a Transport Management Plan (TMP) for the project needs to be developed by the construction contractor appointed to execute the proposed developments. The TMP must consider all the potential risks along the access routes and the roads on the site.

The main objectives of a TMP are to identify potential risks and mitigation measures to be implemented to negate the potential risks as far as reasonably possible. When compiling the TMP, preventing traffic congestion and minimising impacts to existing users on public roads needs to be a key consideration. Although the TMP needs to cover all phases of the development, the focus of the TMP will be the construction phase since this is when the traffic movements and risks are most significant.

The TMP shall therefore be developed once the construction contractor has been appointed. The implementation of the TMP needs to be vigorously managed.

A description of the most pertinent elements of the construction phase, together with the proposed transportation routes, are summarised below:

- Abnormal loads, including WTG components and transformers for the development, emanating from one of the Terminal is expected to be via Loxton, as the Molteno Pass and Theekloof Pass, will prevent these vehicles from approaching the development from Beaufort West and Fraserburg;*
- Site deliveries emanating from major commercial centres within South Africa is expected to be via Loxton;*
- Aggregate and cement for the concrete batching plant is envisaged to be transported to site from commercial sources via Loxton;*
- Personnel commuting routes originating from the local community will access the proposed developments either via the TR05801 or DR02315;*
- Movement of material on site. Due to the layout of the proposed development, the interaction of site vehicles with vehicles on the public road network is inevitable, and this will need to be appropriately managed.*

Other key points include, inter alia:

- Inclusion of section of the TMP in the induction training for all personnel travelling to the proposed developments;*
- Outlining of specific traffic management measures across all phases of the proposed developments;*
- Identification of specific routes for each type of vehicle needed to transport equipment and materials to the proposed developments;*
- Identification of mitigation measures to minimise impacts on existing road users;*
- Reduction of the number of private and individual vehicles travelling to the proposed developments;*
- Provision of minibuses/buses for personnel commuting to the proposed developments;*
- Scheduling of deliveries by heavy vehicles to avoid the formation of convoys. Sufficient distance must be maintained between heavy vehicles to allow light vehicles to overtake safely;*

- Avoidance of routes which pass through homesteads and / or dangerous intersections;
- Alternative routes to and from the proposed development are to be identified and used as far as possible, thus spreading the traffic on the public road network; and
- Identification of the repair and maintenance strategy to be adopted during the various phases of the development.

12 CONCLUSION AND RECOMMENDATIONS

Red Cap Energy (Pty) Ltd and their affiliate companies propose developing four Wind Farms and associated Grid Connections, North of Beaufort West within the Central Karoo District Municipality of the Western Cape. The proposed Wind Farms are the Hoogland 1 Wind Farm and Hoogland 2 Wind Farm, constituting the Northern Cluster, and Hoogland 3 Wind Farm and Hoogland 4 Wind Farm, constituting the Southern Cluster. Collectively referred to as the Hoogland Wind Farms.

This report represents the traffic impact assessment for the Northern Cluster of the Hoogland Wind Farm project.

12.1 CONCLUSION

Based on the information provided in this document, the following conclusions can be drawn:

Assessment Assumptions

- *Hoogland 1 Wind Farm and Hoogland 2 Wind Farm as the Northern Cluster will be developed simultaneously so as to present the highest possible peak traffic volumes as a worst-case scenario for the assessment.*
- *A project duration of 30 months is expected, which relates to an active construction phase of 24 months;*
- *During the peak construction phase, cumulative impact, worst-case scenario, includes simultaneous construction of the four Hoogland Wind Farms and Grid Connections and the operational phase of the three Nuweveld Wind Farms. The combined workforce complement is assumed to be in the order 1 336;*
- *Cumulative impact during the operational phase includes the simultaneous operation of all seven Wind Farms in the area. The traffic volume generated during the operational phase of the Grid Connections are extremely low and, as such, have been excluded;*
- *It is not possible to determine the volume of traffic that will be generated during the decommissioning phase. It can, however, be expected that the volumes will be lower than during the construction phase. As part of the decommissioning process, a separate traffic impact assessment should be undertaken, since many of the characteristics related to the traffic impact assessment, i.e. access routes, road geometry, traffic volumes etc., would have changed over the operational life of the development.*

Road Conditions

- *The majority of the roads in the study area are gravel roads. Some of the roads are in better condition than others. There is a higher level of maintenance on the roads in the Western Cape than there is in the Northern Cape. All roads adjacent*

to the proposed development are expected to deteriorate due to the increased traffic volumes. Thus, the developer would have to assist local roads authorities with regular maintenance of these roads;

- Some roads can be used by light vehicles but are not conducive to busses or delivery vehicles. The TMP needs to prescribe which roads are to be used.
- The gravel section of the TR05801 (R381), between Beaufort West and the development, traverses Nuweveld Mountains through a trio of passes, which are extremely treacherous, with very few barriers, steep drop-offs, very tight corners, negative banking and loose gravel. The developer, in consultation with the local roads' authorities, shall undertake remedial action required to improve the integrity and safety of this route that is to be used to commute personnel to and from the proposed development on a daily basis and the delivery of equipment and material;
- It is proposed that the majority of the deliveries to the proposed developments will be transported via the TR016 (R63) onto the TR05801 (R381). While all vehicles delivering equipment and material to the proposed development using the TR05801 (R381), via the Molteno Pass, shall be limited to a gross vehicle mass not exceeding ten tonnes;
- It is envisaged that access into Loxton from the TR016 (R63) will be required if this has not already been done as part of the Nuweveld Wind Farm Project. However, if the Nuweveld Wind Farm Project does not materialise, the developer, in consultation with the local roads' authorities, would need to investigate upgrading the access into Loxton from the TR016 (R63) to accommodate the expected transportation requirements. This upgrade would need to be implemented to facilitate the delivery of abnormal loads to the proposed development;
- To minimise the impact on urban communities along the transportation routes, the developer must, in consultation with the local roads' authorities, investigate the upgrading requirements of the existing road network;
- The expected traffic increase on the road network during the peak construction phase will lead to more significant wear and tear of the roads but will not have an undue detrimental impact on the structure of the roads if the roads are properly maintained. The developer shall contribute to maintaining the public road network affected by the development as identified by the local roads' authorities. It is proposed that the developer contribute to the maintenance of the road network during the construction and the operational phases, commencing the year after successfully achieving Commercial Operation;
- Additional ongoing funding from the wind farms towards the maintenance of the roads will have a positive impact on the local road conditions and community.

Transportation Route

- The development is accessed from well-established transportation routes between large commercial centres within South Africa;
- Previously established transportation routes from the Ngqura Container Terminal, near Gqeberha, to existing wind farms, could be used for the transportation of equipment and material, including abnormal loads;
- The final route selection is subject to the limitations specified in the transport permits and the vehicles to be used by the appointed logistics company;
- All site entrances from public roads, existing intersection and road alignments that require upgrading to accommodate the transportation requirements of equipment

and material are to comply with geometric standards and approved by the relevant roads' authorities;

- All equipment and material transported to the proposed developments on vehicles with a gross vehicle mass exceeding ten tonnes shall be on the TR05801 (R381) via Loxton;*
- All vehicles transporting equipment and material to the proposed developments via the Molteno Pass on the TR05801 (R381) or the Theekloof Pass on the TR07301 (R353) shall be limited to a gross vehicle mass of not exceeding ten tonnes due to the constraints imposed by the road geometry;*
- No anomalies associated with the proposed transportation routes were observed or identified that will compromise the development. However, this will have to be confirmed by the logistics contractor once the preferred WTG supplier has been selected;*

Traffic Volumes

- The most significant impact on traffic volumes result from the commuting of personnel, to and from the proposed developments, in the morning and the afternoon;*
- At no point during the construction or operational phases of the Hoogland Northern Wind Farm Cluster does the traffic volume on the various roads exceed 50 trips per hour, which is the threshold for a detailed Traffic Impact Assessment;*
- The traffic volume generated during the peak construction phase of the proposed developments is in the order of:*
 - Peak Traffic: The maximum number of vehicles on the road network within a given hour is estimated to be in the order of 28 vph;*
 - Diurnal Traffic: The maximum number of vehicles on the road network within a given hour is estimated to be in the order of 19.7 vph. Which equates to approximately 158 vehicles, over an eight-hour period.*
- The traffic volume generated during the operational phase of the proposed developments is in the order of:*
 - Peak Traffic: The maximum number of vehicles on the road network within a given hour is estimated to be in the order of 9 vph;*
 - Diurnal Traffic: The maximum number of vehicles on the road network within a given hour is estimated to be in the order of 4.25 vph. Which equates to approximately 34 vehicles, over an eight-hour period.*
- The cumulative traffic volume generated during the peak construction phase of the four Hoogland Wind Farms and Grid Connections, together with the operational phase of the three Nuweveld Wind Farms, is in the order of:*
 - Peak Traffic: The maximum number of vehicles on the road network within a given hour is estimated to be in the order of 68 vph;*
 - Diurnal Traffic: The maximum number of vehicles on the road network within a given hour is estimated to be in the order of 40.9 vph. Which equates to approximately 327 vehicles, over an eight-hour period.*
- The cumulative traffic volume generated during the operational phase of all seven Wind Farms is in the order of:*
 - Peak Traffic: The maximum number of vehicles on the road network within a given hour is estimated to be in the order of 25 vph;*

- *Diurnal Traffic: The maximum number of vehicles on the road network within a given hour is estimated to be in the order of 4.8 vph. Which equates to approximately 38 vehicles, over an eight-hour period.*
- *The minimum required level of service for gravel roads is LOS C. For the worst-case scenario, the additional traffic volume of the proposed developments results in a LOS A. Thus, the additional traffic volume does not compromise the level of service of the roads.*

Concrete Deliveries

- *Two WTG foundations are to be cast each week, over a period of 15 months.*
- *The additional traffic volume resulting from the concrete trucks for the casting of the WTG foundation, on the public road network of the proposed developments, results in a LOS A.*

Safety

- *The winding road through the trio of mountain passes on the TR05801 (R381) is a serious safety concern that needs to be addressed by the developer in consultation with the local roads' authority;*
- *This is an agricultural area, home to many species of small fauna, including livestock and wild animals. Stray animals on/crossing the road is a common occurrence that could result in a collision;*
- *Excessive fine and loose material was observed along the various roads creating visibility concerns in dry weather and slippery conditions in wet weather;*
- *Additional vehicles on the road will be subject to these hazards, with a potential for an increase in incidents;*
- *The use of the public road network by the concrete delivery trucks during the casting of WTG foundations is a concern that needs to be addressed by the developer through the provision of an interlinking road network and additional batching plants so that using the public roads is reduced where feasible;*
- *The passing through of homesteads that straddle the roads is a serious safety concern that needs to be included in the TMP;*
- *The area is prone to flash flooding, resulting in drifts being impassable. Road users need to be sensitised as to the intrinsic dangers of crossing these drifts when in flood.*

12.2 RECOMMENDATIONS

Based on the conclusions of this report, the following recommendations are made and should be included in the conditions of the environmental authorisation:

- *All remedial work or modifications to any of the public roads shall be done in consultation with and have the approval of the local road's authority (as is standard practice, this will be finalised during and be a requirement of the municipal planning approval process);*
- *The treacherous section of the gravel road, through the Molteno Pass on the TR05801, is to be upgraded by the developer to improve the safety of the road for all road users, including the personnel commuting to and from the site on a daily basis. This upgrade would need to be implemented prior to or during site establishment but before major earthworks commence on the development;*

- The access into Loxton from the TR016 (R63) is to be upgraded by the developer to accommodate the expected transportation requirements. This upgrade would need to be implemented to facilitate the delivery of abnormal loads to the proposed development. If this has not already been undertaken as part of the Nuweveld Wind Farm Project;
- The route for construction vehicles from the TR016 (R63) to the TR05801 should not unduly impact the local community of Loxton and should avoid the commercial centre of Loxton. In this regard, unless a technical issue is identified once the final turbine and abnormal trucks specifications are known, the route from R63 is via Auret Street, onto Fraserburg Street, onto the TR05801. If this has not already been undertaken as part of the Nuweveld Wind Farm Project;
- The developer shall contribute to the maintenance of all roads affected by the development, during the construction and operational phases of the development;
- A Traffic Management Plan (TMP) is required to outline specific traffic management measures across all phases of the development. The focus of the TMP will be the construction phase since this is when the traffic movements and risks are most significant. TMP be compiled once the contractor has been appointed and all the relevant details of the construction process are known;
- The TMP should consider the scope of the development and take cognisance of the existing condition of the road network at the time the project commences;
- The developer shall ensure that the contractor provides the necessary driver training to key personnel to minimise the potential of incidents on the public road network;
- The developer shall ensure that the contractor erects temporary signs warning motorists of construction vehicles on the approaches to the access road;
- The developer shall ensure that the condition of the roads impacted by construction of the development is left in a similar or better state once the construction phase is complete;
- The interaction of concrete delivery trucks on the public road network is a serious concern that needs to be mitigated prior to the approval of the proposed development;
- Implement the relevant transport impact mitigations measures as detailed in Section 10.2 above.

Considering the above findings, it can be concluded that the development of the Northern Cluster of the Hoogland Wind Farm Project (Hoogland 1 Wind Farm and Hoogland 2 Wind Farm) will have a notable increase in traffic volumes on the road network during the peak construction phase of the proposed developments. However, this report has assessed the impact of these additional traffic volumes on the surrounding road network will be well within the acceptable level of service. Noting that the road network is not well maintained due to budgetary constraints within various spheres of government. The increase in traffic volumes will lead to greater wear and tear, especially during construction, but will not have an undue detrimental impact on the road network within the study area if the mitigation measures are undertaken.

It is the reasoned opinion of the author that the proposed development of the Northern Cluster of the Hoogland Wind Farm Project (Hoogland 1 Wind Farm and Hoogland 2 Wind Farm) can be approved from a traffic and transportation perspective as there

are no constraints or notable impacts that would jeopardise the implementation of the development, subject to the specific requirements included within this report.

13 APPENDICES

Appendix 1: Declaration

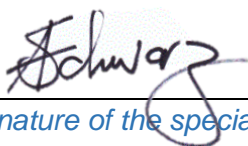
Appendix 2: NEMA Requirements for Specialist Reports

Appendix 3: Curriculum Vitae

APPENDIX 1 - DECLARATION

I, Athol Carl Schwarz, as the appointed specialist, hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I:

- *in terms of the general requirement to be independent:*
 - *other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or*
 - *am not independent, but another specialist that meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);*
- *in terms of the remainder of the general requirements for a specialist, am fully aware of and meet all of the requirements and that failure to comply with any the requirements may result in disqualification;*
- *have disclosed/will disclose, to the applicant, the Department and interested and affected parties, all material information that has or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application;*
- *have ensured/will ensure that information containing all relevant facts in respect of the application was/will be distributed or was/will be made available to interested and affected parties and the public and that participation by interested and affected parties was/will be facilitated in such a manner that all interested and affected parties were/will be provided with a reasonable opportunity to participate and to provide comments;*
- *have ensured/will ensure that the comments of all interested and affected parties were/will be considered, recorded and submitted to the Department in respect of the application;*
- *have ensured/will ensure the inclusion of inputs and recommendations from the specialist reports in respect of the application, where relevant;*
- *have kept/will keep a register of all interested and affected parties that participate/d in the public participation process; and*
- *am aware that a false declaration is an offence in terms of regulation 48 of the 2014 NEMA EIA Regulations.*



Signature of the specialist:

Athol Schwarz

Name:

8th June 2022

Date:

APPENDIX 2 - NEMA REQUIREMENTS FOR SPECIALIST REPORTS

Appendix 6	Specialist Report content as required by the NEMA 2014 EIA Regulations, as amended	Section
1 (1)(a)	(i) the specialist who prepared the report; and	Appendix 3
	(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	
(b)	a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix 1
(c)	an indication of the scope of, and the purpose for which, the report was prepared;	Section 5.2
(cA)	an indication of the quality and age of the base data used for the specialist report;	Section 7.1.2
(cB)	a description of existing impacts on the site, cumulative impacts of the development and levels of acceptable change;	Section 8 & 9
(d)	the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process, inclusive of equipment and modelling used;	Section 5.4
(f)	details of an assessment of the specifically identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 6.1
(g)	an identification of any areas to be avoided, including buffers;	NA
(h)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	NA
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5.5
(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity, or activities;	Section 10
(k)	any mitigation measures for inclusion in the EMPr;	Section 12.2
(l)	any conditions for inclusion in the environmental authorisation;	Section 12.2
(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	NA
(n)	a reasoned opinion-	Section 12.2
	(i) whether the proposed activity or portions thereof should be authorised; and	
	(iA) regarding the acceptability of the proposed activity or activities; and	
	(ii) if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	
(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	NA
(p)	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	NA
(q)	any other information requested by the competent authority.	NA

2	Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A
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APPENDIX 3 - CURRICULUM VITAE

ATHOL SCHWARZ Pr Tech Eng

Independent Author

Athol, is a Professionally Registered Civil Engineering Technologist with more than 35 years of experience, specialising in Civil and Structural Engineering services for renewable energy facilities and infrastructure. These services range from the concept phase all the way through to project close-out, including inter alia: design, contract and construction management phases.

Since 2010, Athol was employed by Hatch, as a Civil Engineering Author working on numerous infrastructure and renewable energy projects (including wind farms, fixed and rotating PV solar plants, CPV solar plants) for various Independent Power Producers (IPP) / Developers.



Athol has experience in traffic impact assessments, transportation route analysis, infrastructure development and design, construction and project management (NEC), with a keen eye for detail.

SPECIFIC RELEVANT EXPERIENCE

- Red Cap Energy (Pty) Ltd - Impofu Wind Farms consisting of Impofu North Wind Farm, Impofu West Wind Farm and Impofu East Wind Farm
- juwi Renewable Energies (Pty) Ltd – Paulputs Traffic Impact Assessment
- CPV1 Solar - Touwsriver Solar, Western Cape, 36 MW Concentrated Photovoltaic Plant (1500 trackers), supervised civil infrastructure activities
- juwi Renewable Energies (Pty) Ltd - Moorreesberg Wind Energy Facility, Moorreesberg, Western Cape, consisting of 25 wind Turbine Generators - feasibility study for the routing of the access roads.
- juwi Renewable Energies (Pty) Ltd - Garob Wind Farm, Copperton, Northern Cape, consists of 46 Acciona 3.0 MW Wind Turbine Generators - conducted a hydrological study to determine the potential impact of the flood levels on the development,
- juwi Renewable Energies (Pty) Ltd - Wolf Wind Farm, Kleinpoort, Eastern Cape, consisting of 28 Wind Turbine Generators - identify the most viable access point onto the property and internal access road.
- Scatec Solar AS (Norway) - Dreunberg Filter Yard (Capacitor bank), 75 MW Single-axis PV plant – Burgersdorp, Eastern Cape – Quality control of civil activities.
- Scatec Solar AS (Norway) - Linde Filter Yard (Capacitor bank), 36.8 MW Single-axis PV plant – Hanover, Northern Cape – Quality control of civil activities.
- Scatec Solar AS (Norway) - Kalkbult Filter Yard (Capacitor bank), 75 MW Single-axis PV plant – De Aar, Northern Cape – Quality control of civil activities.
- juwi Renewable Energies (Pty) Ltd - Keiskammahoek Wind Farm, King William's Town, Eastern Cape, consisting of 16 Wind Turbine Generators - feasibility study to minimise the impact on the commercial plantation due to the development of Keiskammahoek Wind Farm
- South Africa Mainstream Renewable Power De Aar PV (Pty) Ltd - 50 MW PV Plan – De Aar, Northern Cape – clients engineer
- South Africa Mainstream Renewable Power Droogfontein PV (Pty) Ltd – 50 MW PV Plan – Kimberly, Northern Cape – clients engineer
- juwi Solar ZA Construction 3 (Pty) Ltd - Aries, 9.7 MW PV Plant – Kenhardt, Northern Cape - civil author services and Traffic Impact Assessment
- juwi Solar ZA Construction 3 (Pty) Ltd - Konkoonsies, 9.7 MW PV Plan – Pofadder, Northern Cape - civil author services and Traffic Impact Assessment
- juwi Renewable Energies (Pty) Ltd - Namies Wind Energy Facility, near Aggeneys, Northern Cape, consists of between 46 and 58 wind turbine generators - transportation route assessment

ATHOL SCHWARZ Pr Tech Eng

Independent Author

EDUCATION

Master's Diploma in Technology – Civil: Structures (1989)

National Higher Diploma (1987)

National Diploma (1986)

LANGUAGES

- English
- Afrikaans
- French (limited)

PROF AFFILIATIONS

- ECSA - Professional Engineering Technologist,
- SAICE - South African Institution of Civil Engineering - Member

COMPETENCES

- Structural Design (concrete and steel),
- Project and Construction Management

SOFTWARE

- MS Office
- MS Projects
- Micro Station and Autocad
- Prokon
- Model Maker

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- juwi Renewable Energies (Pty) Ltd - Outeniqua Wind Farm (North), Uniondale, Western Cape - transportation route assessment
 - juwi Renewable Energies (Pty) Ltd - Wolf Wind Farm, Kleinpoort, Eastern Cape consisting of 25 Wind Turbine Generators - feasibility study for the access routes
 - juwi Renewable Energies (Pty) Ltd - Outeniqua Wind Farm (South), Uniondale, Western Cape, 16 Wind Turbine Generators - feasibility study for the access routes
 - UMOYA ENERGY (Pty) Ltd - Hopefield Wind Farm, approximately 6 km south-east of the town of Hopefield, Western Cape, consisting of 37, Vestas 1.8 MW WTG – ACS HV Yard and Substation.
 - South Africa Mainstream Renewable Power Jeffreys Bay (Pty) Ltd - Jeffreys Bay Wind Farm, Humansdorp, Eastern Cape, consists of 60 Siemens 2.3 MW WTG - review the foundation design for the wind towers - review the designs for compliance to the national standards.
 - juwi Solar ZA Construction 3 (Pty) Ltd - RustMo1, 6.8 MW PV Plant – Rustenburg, North-West - author services regarding access and internal gravel roads
 - Barrick Africa (Pty) Ltd - Buzwagi Gold Mine in Tanzania – a feasibility study.
 - juwi Renewable Energies (Pty) Ltd - Garob Wind Farm, Copperton, Northern Cape, consists of 46 Acciona 3.0 MW Wind Turbine Generators - transportation management plan.
 - Slim Sun Swartland Solar Park - SlimSun Solar - 5 MW PV Plant – Malmesbury, Western Cape – ACS for HV Yard and Substation.
 - Cennergi (Pty) Ltd - Kopleegte Switching Station at Amakhala Emoyen Phase 1, Bedford, Eastern Cape, consisting of 56 Nordex, 2,4 MW Wind Turbines Generators- ACS for HV Yard and Substation.
 - EXXARO Resources Ltd And Watt Energy (Pty) Ltd - Wittekleibosch Switching Station at Tsitsikamma Community Wind Farm, Tsitsikamma, Eastern Cape, consists of 31 Vestas 3.0 MW WTG - ACS for HV Yard and Substation.
 - Windlab Developments South Africa (Pty) Ltd - AMAKALA EMOYENI – Phase 2, Bedford, Eastern Cape, consisting of 66 WTG - feasibility study for access and internal road network
 - Windlab Developments South Africa (Pty) Ltd – Phase 1, Bedford, Eastern Cape, consisting of 56 Nordex, 2,4 MW Wind Turbines Generators - feasibility study for access and internal road network
 - IBEDRROLA - Klip Heuvel Switching Station at Caledon Wind Farm, Caledon, Western Cape, consisting of 9, Sinovel 3.0 MW Wind Turbines Generators – ACS for HV Yard and Substation.
 - EXXARO Resources Ltd - Lephalale 60 MW PV Plant, 13 km north-west of the town of Lephalale, Limpopo - ACS for HV Yard and Substation.
 - SASOL Technology - 3.6 MW PV Demonstration Plant – civil author services
 - Solafrica Pty (Ltd) - Bokpoort CSP Project, a 50 MW Concentrating Solar Thermal Power Station (CSP – parabolic trough) located approximately 80 km east-south-east of Upington, Northern Cape - prepared enquiry documentation for the geotechnical investigation and topographic survey