RED CAP ENERGY
IMPOFU WEST WIND FARM
TRAFFIC IMPACT ASSESSMENT

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1 EXECUTIVE SUMMARY

Red Cap is proposing to develop three wind farms and associated infrastructure, north of Oyster Bay within the Sarah Baartman District Municipality of the Eastern Cape. These proposed wind farms are; the Impofu North Wind Farm, the Impofu East Wind Farm and the Impofu West Wind Farm and are collectively referred to as the Impofu Wind Farms.

The consolidated site of the Impofu Wind Farms is bounded by the operational Tsitsikamma Community Wind Farm to the west, the Gibson Bay Wind Farm to the south-west, and the Kouga Wind Farm to the south-east. Oyster Bay Wind Farm is due to be constructed and will be operational by the time Impofu Wind Farms are to be constructed.

As part of the Environmental Impact Assessment process, a Traffic Impact Assessment for each of the proposed developments are to be provided. This Traffic Impact Assessment is for Impofu West Wind Farm (hereafter referred to as the development). Based on the latest available information, the development will consist of twenty-nine wind turbine generators, the generating capacity of which is undefined as the appointment of turbine supplier has not been finalised.

A Transport Impact Assessment was undertaken by Mr A. Schwarz, in accordance with the relevant guidelines, to provide a technical appraisal of the traffic impact of the development on the existing road network, during the construction, operation and decommissioning phases of the development. The four-day site visit was conducted in January 2019 and forms the basis of this assessment.

The proposed transportation access routes that are to be used for the transportation of equipment and material, including abnormal loads, for this development, are well established transportation routes. As these are the same routes that were previously used during the construction of the existing wind farms, within the study area.

Traffic generation estimates used in this assessment is based on experience of similar projects. The cumulative impact, a worst-case scenario, assumes all three of the wind farms are constructed simultaneously, over a two-year period. The most significant increase in traffic will result from the daily transportation of personnel, to and from site during peak traffic. The projected increase in traffic on specific roads is less than fifty vehicles per hour, the threshold as 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 this development, and less conspicuous during the operational phase. This report has assessed the impact of the additional traffic on the surrounding road network and found that the existing road network is currently operating at well below its capacity and provides an adequate level of service. The increase in traffic volumes will lead to greater wear and tear especially during construction but will not have undue detrimental impact on the structure of the roads within the study area. Due to budgetary constraints within various spheres of government, nominal maintenance is undertaken on the road network. To this end, it is strongly suggested that the developer contribute towards the ongoing maintenance of the road network associated with the development, during all phases of the development.

It should be noted that it is not possible to determine the expected traffic volumes that will be generated during the decommissioning phase. It can however be expected that these 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.

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 LIST OF ABBREVIATIONS

Abbreviation	Meaning
AADT	Average Annual Daily Traffic
ADT	Average Daily Traffic
DEA	Department of Environmental Affairs
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
PrDP	Professional Driving Permit
SANRAL	South African National Roads Agency SOC Ltd
TMP	Traffic Management Plan
vph	Vehicle per hour
WTG	Wind Turbine Generator

3 GLOSSARY

Definitions	
Average Annual Daily Traffic	is the total traffic volume in a year, including school and public holidays and weekends, divided by the number of days in the year
Average Daily Traffic	is the total traffic count in a twenty-four-hour period, on a typical working weekday
Diurnal	means happening or active during the daytime
Peak Traffic	traffic at the time it is most busy
Traffic Density	is the number of vehicles occupying a given distance of road, expressed in vehicles per kilometer, and is calculated as follows $\frac{Traffic\ Volume\ (vph)}{Speed\ (km/h)}$
Traffic Volume	is the number of vehicles passing a specific point in a given time, expressed in vehicles per hour
Trip	is defined as a single (one-directional) movement with either the destination or the origin of the trip at a development.

4 INTRODUCTION

4.1 TERMS OF REFERENCE

Red Cap appointed Mr A. Schwarz, to provide a Traffic Impact Assessment (TIA) for the proposed Impofu West Wind Farm, located in the Sarah Baartman Municipality District of the Eastern Cape, within the Republic of South Africa. The extent of the site on which the wind farm is to be constructed is shown in Figure 1, hereafter referred to as the 'site'.

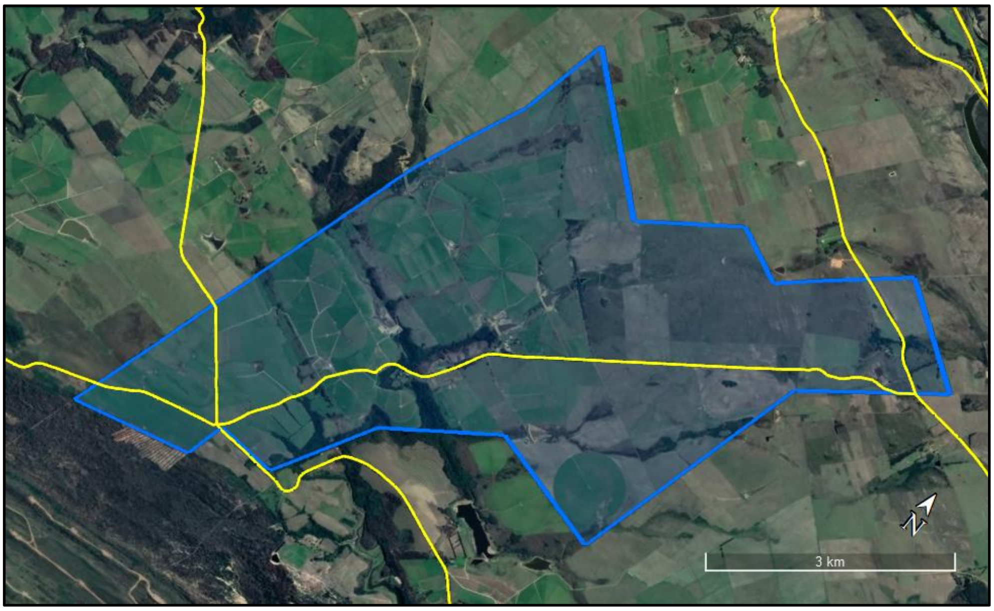


Figure 1 - Boundary of the Site

This Traffic Impact Assessment forms an integral part of the supporting documentation required for the Environmental Impact Assessment application to the Department of Environmental Affairs.

4.2 SCOPE AND OBJECTIVES

4.2.1 Scope

Red Cap propose developing a wind farm, called Impofu West Wind Farm. The wind farm shall consist of approximately twenty-nine Wind Turbine Generators (WTG).

The scope of this report includes, inter alia:

- *Identify the potential road network that could be affected by the development of this project;*
- *Determine a traffic baseline against which the potential traffic impacts can 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 applicable).*

4.2.2 Objectives

The objective of this report is to determine the potential traffic impact, that the proposed development will have on the existing road network.

4.3 LEGISLATION AND PERMIT REQUIREMENTS

The overarching environmental legislation for management of 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.

Traffic impacts are therefore an important aspect to be considered in the decision-making of developments.

4.3.1 Roads

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

- *National Water Act (Act 36 of 1998), with regards to all crossings of water courses;*
- *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 certain urban areas 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 erection of structures near certain roads,*
    - *Section 9A: Prohibition of erection of structures or construction of other things near intersections of certain roads,*
    - *Section 10: Restriction of access to land through 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.*

4.3.2 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:

- *rigid vehicle shall not exceed 12.5 m;*
- *articulated motor vehicle and semi-trailers shall not exceed 18.5 m;*
- *other combination 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, vehicles with a gross mass of 12 000 kilograms or more, shall not exceed 2.6 m.

Regulation 224: Define the legislation 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.

4.3.3 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, 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, 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, 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 which 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.

4.3.4 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 limitations are exceeded, these loads are classified as an abnormal load. Provision for such abnormal vehicles and loads are made in Section 81 of the National Road Traffic, as substituted by Section 23 of National Road Traffic Amendment Act (Act 64 of 2008).

The requirements and procedures for transporting of abnormal loads are contained in the follow 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".*

4.4 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:

- *Road network: Identify the road network which will be used by vehicles associated with the development of the project, and other projects in the area;*
- *Traffic volume: Establish the number of vehicle trips generated during the construction, operation and decommissioning of the project;*
- *Modal split: Determine the mode of transport, vehicle type and size for each trip or category of trip generated during the construction, operational and decommissioning of the project;*
- *Peak Hour Rate: Established the peak hour vehicle trip rate generated during the construction, operation and decommissioning of the project;*
- *Impact assessment: Identify and assess the significance and severity of project related traffic on the existing road network. Where possible comparing the existing traffic volumes on the roads with the traffic generated by the project;*
- *Impact mitigation: Propose practical measures to mitigate the impacts of project related traffic on existing road network.*

4.5 ASSUMPTIONS

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

- *Red Cap propose developing three separate wind farms in the Sarah Baartman District of the Eastern Cape. The cumulative impact shall assume that all three wind farms are constructed, operated and decommissioned simultaneously, together with any other projects in the area with valid Environmental Authorisation;*
- *Jeffreys Bay Wind Farm (2012-2014), Kouga Wind Farm (2013-2015), Tsitsikamma Community Wind Farm (2014-2016) and Gibson Bay Wind Farm (2015-2017), are all operating in the area of the proposed development. This indicates that the access from the harbour onto the N2 national motorway is well defined and adequate. Thus, this report only considers the road network from the N2 to the site;*
- *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 site from other centres within South Africa;*
- *The assumptions regarding the distribution of personnel is detailed in this report. Construction equipment and materials (other than aggregates) for this development, like the other developments in the area, will be transported to site from various centres within South Africa;*
- *The supply of raw material for the manufacture of concrete and road construction, as worst-case scenario, will be sourced from commercial sources outside the development area;*

- *No accommodation is provided on site. The construction staff is drawn from the entire area and not just from one specific town in the area. The percentage is based on the demographics within the area;*
- *A single batching plant will be provided for each of the developments, this is based on the assumption that each of the three developments will be a separate entity, each constructed by different contractors.*

4.6 LIMITATIONS

This report excludes the following:

- *The Site Development Plan of the infrastructure within the site boundary that do not affect the public road network;*
- *The geometric details of intersections and entrances onto the site from public road network, as this will be finalised during the detailed design phase, which will require approval from the relevant roads' authorities;*
- *Assessment of risks and impacts associated with loading or off-loading of the vehicles at the site or at 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.*

4.7 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 Pavement for Interurban and Rural Roads, 1996;*
- *TRH 26, South African Road Classification and Access Management Manual, 2012;*
- *Average Daily Traffic (ADT) values for paved and unpaved provincial roads was provided by the District Roads Engineer, Department of Transport, Sarah Baartman Region, Mr Randall Moore (via email), 24 January 2019;*
- *Final Environmental Impact Assessment for a Wind Farm in the Kouga Local Municipality. Compiled by Arcus GIBB (Pty) Ltd, Reference Number 12/12/20/1756, March 2011;*
- *Final Environmental Impact Assessment Report for the Proposed Wind Energy Facility and Associated Infrastructure on the north of Oyster Bay, compiled by Savanna Environmental (Pty) Ltd, Reference Number 12/12/20/1585, November 2011;*
- *Final Environmental Impact Assessment Report for the Tsitsikamma Community Wind Energy Facility, compiled by Savanna Environmental (Pty) Ltd, Reference Number 12/12/20/2209, October 2011;*
- *Final Environmental Impact Assessment Report for the Jeffreys Bay Wind Farm, compiled by the CSIR, Reference Number 12/12/20/1718, August 2010;*

- CSIR (2012): Environmental Impact Assessment for the Banna Ba Pifhu Wind Energy Project near Humansdorp, Eastern Cape. Final Environmental Impact Assessment Report. (CSIR Report Number: GWDS Stel General: 11347);
- CSIR (2011): Environmental Impact Assessment for the proposed Ubuntu Wind Energy Project for WKN-Windcurrent SA (Pty) Ltd: Final Environmental Impact Assessment Report. (CSIR Report Number: GWDMS STEL GEN 9716);
- Road related information was obtained from www.roadclass.co.za;
- Satellite imagery of the site available on Google Earth was also used for evaluation.

5 DESCRIPTION OF THE AFFECTED ENVIRONMENT

5.1 ROAD NETWORK

The public road network, consisting of the more prevalent roads within the study area, is shown in Figure 2. The National and Main Provisional Roads are paved, while the district roads, which services the agricultural community, are unpaved.

The National Route (N2-NR00210) and Provincial Routes (R62-TR04403 and R102-DR01779), transverse the study area. The National Route by-passes the towns of Humansdorp and Jeffreys Bay, while Provisional Routes passes through these towns.

The main district road, through the study area, include the DR01763, DR01774 and DR01776.

Figure 2 - Road Network

5.1.1 National Roads

The National Road N2 (NR00210) is a national freeway in South Africa, under the jurisdiction of the South African National Road Agency, which transverses the Eastern Cape.

This is a Class 1 road, consisting of a single paved carriageway, with one lane in each direction and paved shoulders, as shown in Figure 3.

Figure 3 - National Road (N2)

5.1.2 Main Roads

All Main Roads, within the study area, fall under the jurisdiction of the Provincial Roads Department, except for the R62 (TR04403) which falls under the jurisdiction of the South African National Road Agency. The general condition of these roads is fair.

The R62, between Kareedouw and R102 intersection Humansdorp, is a Trunk Route (TR04403), and is a Class 2 road, consisting of a single paved carriageway, with one lane in each direction and paved shoulders.

The R102 west of the intersection with the R62 is a district road (DR01779). This is a Class 4 road, consisting of a narrow single paved carriageway, with one lane in each direction, without any shoulders, resulting in vegetation growing on the verge of the road, as shown in Figure 4.

Figure 4 - Section of the DR01779-3 (R102)

The R102, east of the intersection with the R62 to Humansdorp is a Trunk Route (TR04403), and is a Class 2 road, consisting of a single paved carriageway, with one lane in each direction, with paved shoulders.

The R102, between Humansdorp and the traffic circle at Jeffreys Bay is MR00389, which is a Class 4 road, consisting of a single paved carriageway, with one lane in each direction, with paved shoulders.

The R102, east of the traffic circle at Jeffreys Bay is DR01778. This is a Class 4 road, consisting of a single paved carriageway, with one lane in each direction, with paved shoulders.

The R330 between Humansdorp and Cape St Francis, is MR00381. This is a Class 3 road, consisting of a single paved carriageway, with one lane in each direction and paved shoulders.

The MR00392, links the N2 to the traffic circle (on the R102) at Jeffreys Bay, is a Class 3 road, consisting of a single paved carriageway, with one lane in each direction and paved shoulders.

5.1.3 District Roads

All District Roads, within the study area, fall under the jurisdiction of the Provincial Roads Department. Majority of these roads are; unpaved, undulating, passing over numerous water-courses, six-metre-wide gravel roads. The general condition of these unpaved roads is poor to very poor.

The District Roads, within the study area, includes DR01761, DR01762, DR01763, DR01764, DR01765, DR01774 and DR01776. Intersections along these roads divides the roads into separate sectors. Details of these roads and sectors (where applicable) are provided below:

- *DR01761: Connects Oyster Bay to the DR01763;*
- *DR01762: Connects the MR00381 to the DR01763;*
- *DR01763: Consists of five sectors, that connects the DR01774 to the MR00381 (in Humansdorp). There are several sections along this road where the layer-work has failed, resulting in very poor road condition;*
  - *DR01763-1: Section between DR01774 and DR01761,*
  - *DR01763-2: Section between DR01761 and the entrance to Kouga Wind Farm,*
  - *DR01763-3: Section between the entrance to Kouga Wind Farm and DR01762,*
  - *DR01763-4: Section between DR01762 and DR01765,*
  - *DR01763-5: Section between DR01765 and MR00381(refer to Figure 5).*

Figure 5 - Section of the DR01763-5

- *DR01764: Connects the DR01774 to the southern portion of Gibson Bay Wind Farm;*
- *DR01765: Consists of three sectors, that connects the DR01763 to the DR01774;*
  - *DR01765-1: Section between DR01779 and MR50032;*
  - *DR01765-2: Section between MR50032 and DR01774;*
  - *DR01765-3: Section between DR01774 and DR01763;*
- *DR01774: Consists of five sectors, that connects the DR01765 to the DR01776. There are several sections along this road where the layer-work has failed, resulting in very poor road condition;*
  - *DR01774-1: Section between DR01776 and MN50032,*
  - *DR01774-2: Section between MN50032 and MN50092,*
  - *DR01774-3: Section between MN50092 and DR01763,*
  - *DR01774-4: Section between DR01763 and the entrance to Oyster Bay Wind Farm,*
  - *DR01774-5: Section between the entrance to Oyster Bay Wind Farm and DR01765.*
- *DR01776: Section between the DR01774 and DR01779. The northern portion of this road, between the intersection with DR01779 and a point approximately 500 m south of the N2, is paved. The rest of the road are unpaved.*

The main corridor through the community, is on the DR01763 (sectors 1 to 5) and DR01774 (sectors 1 to 3).

5.1.4 Minor Roads

All Minor Roads, within the study area are unpaved roads and fall under the jurisdiction of the Provincial Roads Department.

The Minor Roads, within the study area, includes MN50032, MN50076 and MN50092:

- *MN50032: Is the road associated with the development of Impofu West Wind Farm;*
- *MN50076: Is the road passes through the Tsitsikamma Community Wind Farm;*
- *MN50092: Is the road associated with the development of Impofu East Wind Farm.*

It should be noted that the current condition of the MN50032 is irrelevant at present, as this road is due to be upgraded by the developers of Gibson Bay Wind Farm, in the imminent future.

5.2 SITE ACCESS

The development falls within an area that is traversed by national and provincial roads. This section outlines various possibilities of accessing site from the national road.

Access from the N2, to site is via one of four existing interchanges, the details of which are provided below and are indicated in Figure 6:

- *Interchange 1: Exit 632 – Palmietvlei off ramp onto DR01776;*
- *Interchange 2: Exit 647 – Kareedouw off ramp onto TR04403;*
- *Interchange 3: Exit 665 – Hankey/Humansdorp off ramp onto MR00391;*
- *Intersection 4: Exit 676 – Jeffreys Bay off ramp onto MR00392.*

Figure 6 - Interchanges on the N2

Due to the distance from the site and the complexities of moving traffic through build-up areas, the use of interchanges 3 and 4, as indicated in Figure 6, shall be excluded from this report. No vehicles related to this development, including abnormal loads, shall use these interchanges.

The distribution of the twenty-nine WTG on site, divides the site into five distinct zones, each independent of the other. Access to each of these zones are provided from the public road network. The public road network which traverses the site and the various zones are shown in Figure 7.

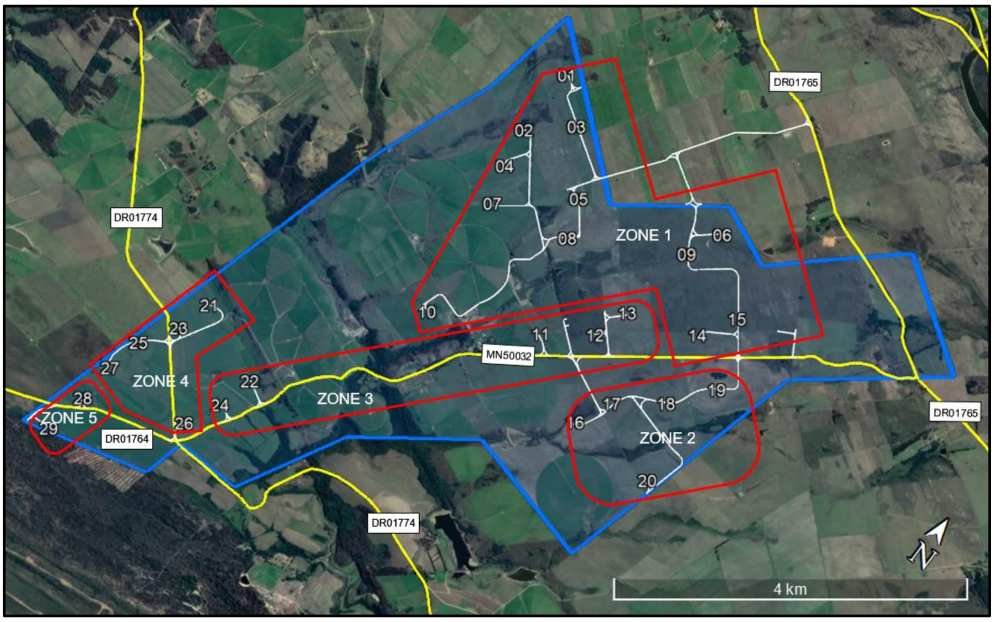


Figure 7 - Zones and Road Network

- *Zone 1: Consisting of twelve WTG's (1 to 10, 14 & 15), this zone is accessed via two entrances as shown in Figure 8, and described below:*
  - *Northern entrance is from the DR01765-1, this is an existing informal farm entrance that will have to be upgraded to accommodate the delivery of the relevant abnormal loads, the details of which will be finalised during the design stage of the internal road network;*
  - *Southern entrance is from the MN50032, this is a new intersection, the details of which will be finalised during the design stage of the internal road network.*

Figure 8 - Entrances to Zone 1

- *Zone 2: Consisting of five WTG's (16 to 20), this zone is accessed via two entrances from the MN50032, as shown in Figure 9, and described below:*
  - *Northern entrance, this is a new intersection, the details of which will be finalised during the design stage of the internal road network;*
  - *Southern entrance, this is an existing informal farm entrance that will have to be upgraded to accommodate the delivery of the relevant abnormal loads, the details of which will be finalised during the design stage of the internal road network.*

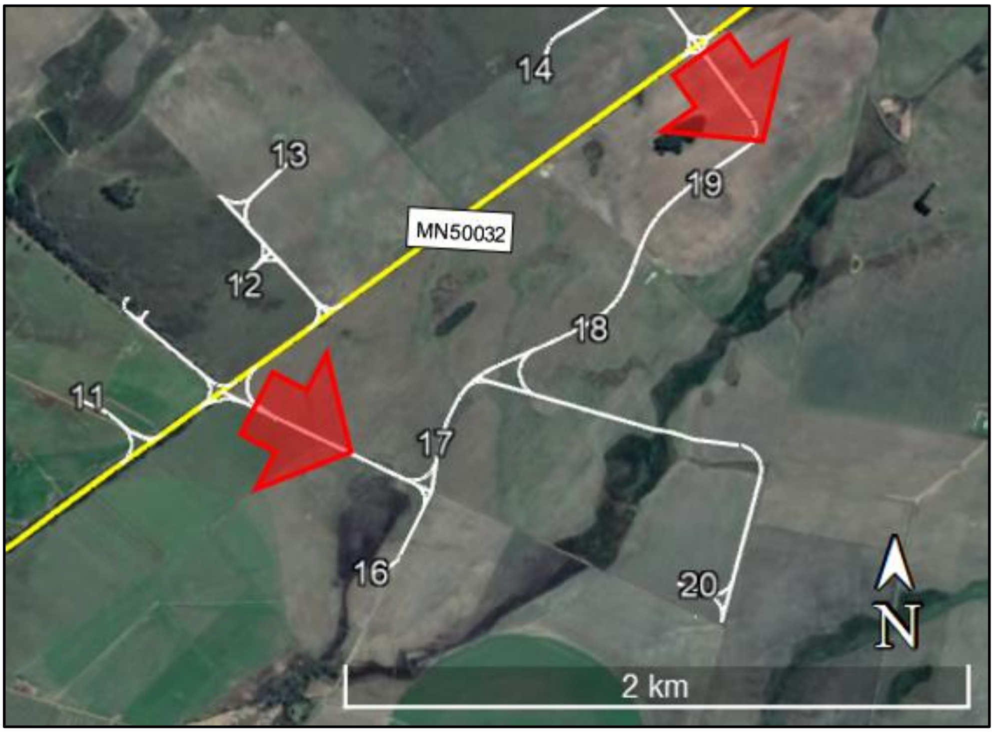


Figure 9 - Entrance to Zone 2

- *Zone 3: Consisting of five WTG's (11 to 13, 22 & 24), this zone is accessed via four entrances, from the MN50032, as shown in Figure 10. These are all new* intersections, the details of which will be finalised during the design stage of the internal road network;

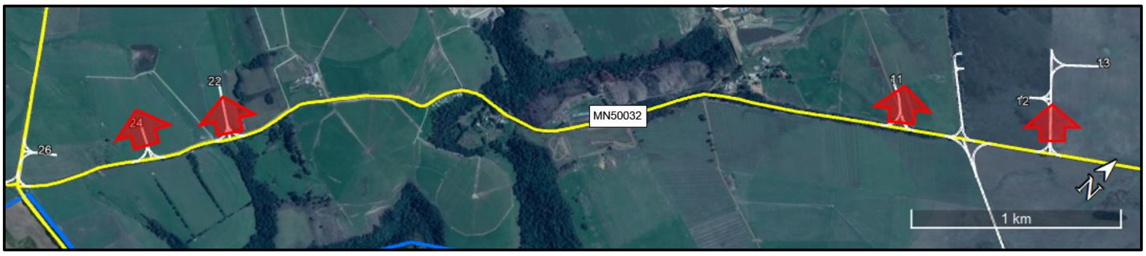


Figure 10 - Entrances to Zone 3

- *Zone 4: Consisting of five WTG's (21, 23 and 25 to 27), this zone is accessed via three entrances, from the DR01774, as shown in Figure 11. These are all new intersections, the details of which will be finalised during the design stage of the internal road network;*

Figure 11 - Entrances to Zone 4

- *Zone 5: Consisting of two WTG's (28 and 29), this zone is accessed via two entrances, from the DR01764, as shown in Figure 12. These are all new intersections, the details of which will be finalised during the design stage of the internal road network.*

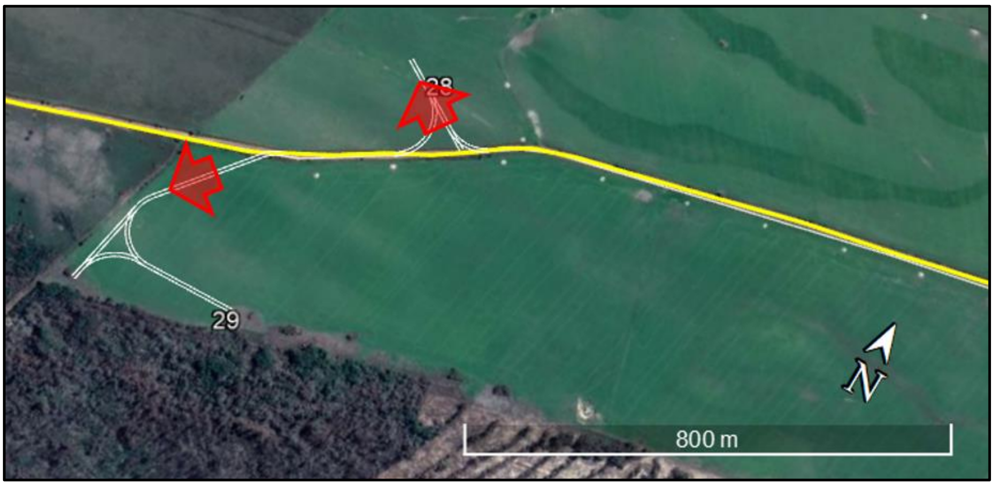


Figure 12 - Entrances to Zone 5

The transport route/s of the construction equipment, materials, components and any oversized/weight components will be along National, Provincial or Local roads, and approval will have to be obtained from each authority for the transportation of any abnormal loads. This is normally the responsibility of the logistics company in charge of these deliveries. A description of the most pertinent elements, together with the proposed transportation routes are summarised below:

- *Abnormal loads, including WTG components and transformers, shall be delivered to predefined areas in each zone.*

  There are several possible routes that could be considered for the delivery of the abnormal loads. These routes are described below:

  - *Zone 1: Twelve WTG and transformers for both the Impofu West Substation and Impofu Collector Substation (as part of Grid Connection Application). The transportation from the N2 via;*
    - *exit 647 (interchange 2), south along TR04403, right onto the DR01779-3, left onto DR01765-1, right onto site; or*
    - *exit 647 (interchange 2), south along TR04403, right onto the DR01779-3, left onto DR01765-1, right onto MN50032, right onto site.*
  - *Zone 2: Five WTG are transported from the N2 either via;*
    - *exit 632 (interchange 1), south onto DR01776, left onto DR01774-1, left onto MN50032 then right onto the site, or*
    - *exit 647 (interchange 2), south onto TR04403, right onto the DR01779-3, left onto DR01765-1, right onto MN50032 then left onto site.*
  - *Zone 3: via exit 632 (interchange 1), south onto DR01776, left onto DR01774-1, left onto MN50032 then left onto the site;*
  - *Zone 4: via exit 632 (interchange 1), south onto DR01776, left onto DR01774-1, site is on both sides of the road (two on the right and three on the left), before the intersection with MN50032;*
  - *Zone 5: via exit 632 (interchange 1), south onto DR01776, left onto DR01774-1, right onto DR01764, there is one WTG on either side of the road.*

  It should be noted, that most of these routes have or would have been used for the transportation of equipment and material for either the Gibson Bay Wind Farm or Oyster Bay Wind Farm.

- *Site deliveries, excluding abnormal loads, emanating from major commercial centres within South Africa. The transportation routes from the N2 is to be the same as used by the abnormal loads.*
- *Transportation route of the aggregate for the batching of concrete is based on the assumption that the batching plant will be erected in the zone which contains the most WTG for the development. In this case the concrete batching plant is assumed to be installed in Zone 1. Thus, the transportation route of all aggregate for the batching of concrete will be to Zone 1. The preferred route from the N2 will be via exit 647 (interchange 2), south along TR04403, right onto the DR01779-3, left onto DR01765-1 then right onto site, through a section of Impofu North Wind Farm;*
- *The transportation route adopted by the abnormal loads, as described above will be the same routes used for delivery of aggregate for road and platforms construction, in the various zones;*
- *Personnel access routes, emanating from the local community will use either the DR01779 (for personnel originating from Humansdorp, Jeffreys Bay and Paradise*

Beach) and DR01765 (for personnel origination from Cape St Francis, St Francis Bay and Oyster Bay);

- *Movement of material on site. The most prevalent site activity that will affect the TIA will be the batching and dispatching of concrete. To minimise the impact on the public roads, it is envisaged that a central concrete batching plant may be erected (most likely located somewhere in zone 1). The internal road network shall be designed to minimise the use of public roads. However, due to the nature of the road network, construction vehicles will inevitablyeither cross or travel on MN50032, DR01764 and DR01774.*

Upgrades to the vertical or horizontal alignment of the local access roads and intersections may be required depending on the length and width of abnormal vehicles. These alignments and grades cannot be determined at this stage, as the abnormal vehicle dimensions can only be determined once the WTG has been selected.

5.3 EXISTING WIND FARMS

There are four existing wind farms within the study area. The existing wind farms, together with the proposed development are indicated in Figure 13.

Figure 13 - Existing Wind Farms

These existing wind farms were constructed over a period of four years. A high-level construction schedule is provided in Table 1.

Table 1 - Construction Schedule of Existing Wind Farms

	2012	2013	2014	2015	2016
Jeffreys Bay Wind Farm					
Kouga Wind Farm					
Tsitsikamma Wind Farm					
Gibson Bay Wind Farm					

An overview of these four wind farms, currently operating in this area, together with a brief description of the access routes are provided in the sub sections below.

5.3.1 Jeffreys Bay Wind Farm

Is located approximately 10 km north-east of Humansdorp and consists of sixty Siemens 101, 2.3 MW Wind Turbines. Construction activities commenced in December 2012 and reached Commercial Operation by June 2014.

Majority of equipment and material required on site was delivered use of interchange 4 (as described above).

5.3.2 Kouga Wind Farm

Is located approximately 15 km south of Humansdorp and consists of thirty-two Nordex N90, 2.5 MW Wind Turbines. Construction activities commenced in March 2013 and reached Commercial Operation by March 2015.

The DR01763 (sectors 3 to 5), from Humansdorp to the development, was the main access route for all equipment and material. This is the same route that is currently used by the operating staff to commute daily to and from work.

5.3.3 Tsitsikamma Community Wind Farm

Is located approximately 25 km west of Humansdorp and consists of thirty-one Vestas V112, 3.0 MW Wind Turbines. Construction activities commenced in September 2014 and reached Commercial Operation by March 2016.

The DR01776, DR01779-1 and MN50076 from the N2 was the access route for all equipment and material. This is the same route that is currently used by the operating staff to commute daily, to and from work, from Humansdorp.

5.3.4 Gibson Bay Wind Farm

Is located approximately 30 km south west of Humansdorp and consists of thirty-seven Nordex N117, 3.0 MW Wind Turbines. Construction activities commenced in August 2014 and reached Commercial Operation by August 2016.

The DR01776, DR01774 and DR01764. from the N2 was the access route for all equipment and material.

It should be noted that a portion of the transportation route identified above, is the same route proposed for the delivery of equipment and material to selected zones of the Impofu West Wind Farm.

The operating staff travel from Humansdorp to the wind farm via the DR01763, DR01765, DR01774 and DR01764.

5.4 FUTURE WIND FARMS

Due to the favourable wind condition in the area, numerous environmental impact assessments were undertaken for other wind farms.

The proposed development Impofu West Wind Farm, the subject of this report, together with all wind farms with valid Environmental Authorisations, within the study area are indicated in Figure 14.

Figure 14 - Future Wind Farms

A brief description of the all known future wind farms, are provided in the sub sections below.

5.4.1 Oyster Bay Wind Farm

Oyster Bay Wind Farm is an Enel Green Power development, consisting of forty-one Vestas V117 3.45 MW turbines. Construction is due to commence in early 2019. Turbine delivery and installation is planned for 2020 and will be operational in the first half of 2021.

The proposed access route from the N2, as identified by the contractor is as follows:

- *Route starts at the interchange 2 (Kareedouw interchange, as defined above);*
- *Travel in a southerly direction on the TR04403;*
- *At the T-junction, turn right onto the DR01779-3;*
- *Travel approximately 6.2 km on the DR01779-3;*
- *At the DR01779/DR01765 intersection, turn left onto the DR01765-1 (unpaved road);*
- *Travel approximately 12.4 km on the DR01765-1;*
- *At the DR01765/DR01774 intersection, turn right onto the DR01774-5 (unpaved road);*
- *Travel approximately 3.8 km on the DR01774-5, entrance to the wind farm is on the left.*

It should be noted that a portion of the transportation route identified above, is the same route proposed for the delivery of equipment and material to selected zones of the Impofu West Wind Farm.

5.4.2 Impofu North Wind Farm

Impofu North Wind Farm is a Rep Cap development. The proposed development is due to consist of thirty-three WTG and is the subject of a separate report.

5.4.3 Impofu East Wind Farm

Impofu East Wind Farm is a Rep Cap development. The proposed development is due to consist of thirty-three WTG and is the subject of a separate report.

5.4.4 Banna ba Pifhu Wind Farm

According to the CSIR (2012): Environmental Impact Assessment for the Banna Ba Pifhu Wind Energy Project near Humansdorp, Eastern Cape. Final Environmental Impact Assessment Report. (CSIR Report Number: GWDS Stel General: 11347). WKN Windcurrent SA (Pty) Ltd is proposing the construction of a wind energy project on the Broadlands and Saragossa Farms in the Kouga Municipal Area, approximately 3.5 km south of the town of Humansdorp. The proposed project is referred to as the Banna Ba Pifhu Wind Energy Project.

Due to the location of the Banna Ba Pifhu Wind Energy Project with regards to the N2, it is envisaged that all deliveries from the N2 to this project will be via interchange 3 or 4 (as defined above). Both these interchanges will not be used for the transportation of any equipment and material to Impofu West Wind Farm, and as such fall outside the study area.

Traffic generated during the construction, operational and decommissioning phase, of the Banna Ba Pifhu Wind Energy Project, will have no discernible impact on the access roads associated with the Impofu West Wind Farm. Thus, traffic volumes resulting from the Banna Ba Pifhu Wind Energy Project will be excluded from the cumulative assessment of Impofu West Wind Farm.

5.4.5 Ubuntu Wind Farm

According to the CSIR (2011): Environmental Impact Assessment for the proposed Ubuntu Wind Energy Project for WKN-Windcurrent SA (Pty) Ltd: Final Environmental Impact Assessment Report. (CSIR Report Number: GWDMS STEL GEN 9716). WKN-Windcurrent SA (Pty) Ltd is proposing the construction of a wind energy facility on the Farms Zuurbron and Vlakteplaas near Jeffrey's Bay in the Kouga Municipal area, Eastern Cape Province. The proposed project is referred to as the Ubuntu Wind Energy Project.

The proposed Ubuntu Wind Energy Project is situated north of the N2, the envisaged access routes from the N2 would be via interchange 4 (as defined above), which falls outside the study area of Impofu West Wind Farm.

Since all traffic generated during the construction, operational and decommissioning phase, of the Ubuntu Wind Energy Project, will have no discernible impact on the access roads associated with the Impofu West Wind Farm. The traffic volumes resulting from the Ubuntu Wind Energy Project will be excluded from the cumulative assessment of Impofu West Wind Farm.

6 TRAFFIC VOLUMES

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

6.1 STATUS QUO

The functional classification for the roads, as provided by www.roadclass.co.za, within the study area, is summarised in Figure 15.

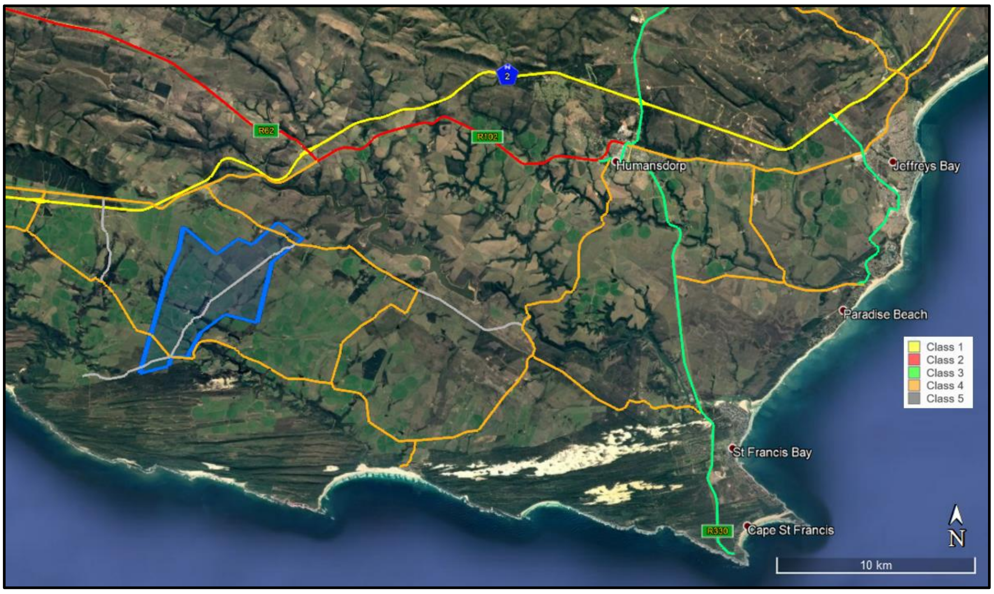


Figure 15 - Road Classification

Accordance with TRH 26 the annual average daily traffic (AADT) for the various Rural Functional Road Classifications, for which the various roads are to be design are as follows:

- *Class 1 road (principal arterial road) is in the order of 1000 to 100 000;*
- *Class 2 road (major arterial road) is in the order of 500 to 25 000;*
- *Class 3 road (minor arterial road) is in the order of 100 to 2 000;*
- *Class 4 roads (collector roads) is less than a 1 000;*
- *Class 5 roads (local roads) is less than 500.*

The District Roads Engineer, Mr Randall Moore, provided average daily traffic (ADT) counts on the provincial roads as assessed during 2017, for both the paved and unpaved roads within the study area. This information was provided on the understanding that traffic volumes on the lower order roads are determined by algorithms and are not necessarily based on actual traffic volumes.

The traffic volumes on these unpaved roads are low and are predominantly associated with agricultural activities, which include inter alia:

- *collection of milk, there are four companies operating in the area, each collect twice a day;*
- *delivery of feed, due to the drought in the area, farms are forced to import feed for the livestock, this constitutes one trip a farmer per month.*

The traffic generated by the operation and maintenance of the existing wind farms in the area is included in the ADT, as provided by the District Roads Engineer, and forms part of the baseline traffic.

There is a distinct change in traffic volumes, on specific routes over weekends and during holidays.

The average daily traffic on the provincial paved roads, within the study area, are shown in Figure 16, are all below 500 (indicated in green). Except for two roads, *which have an average daily traffic of between 500 and 2 000 (indicated in blue), these are:*

- *TR04403 (East of Humansdorp, between DR01774 and MR00381);*
- *MR00391 (North of the N2).*

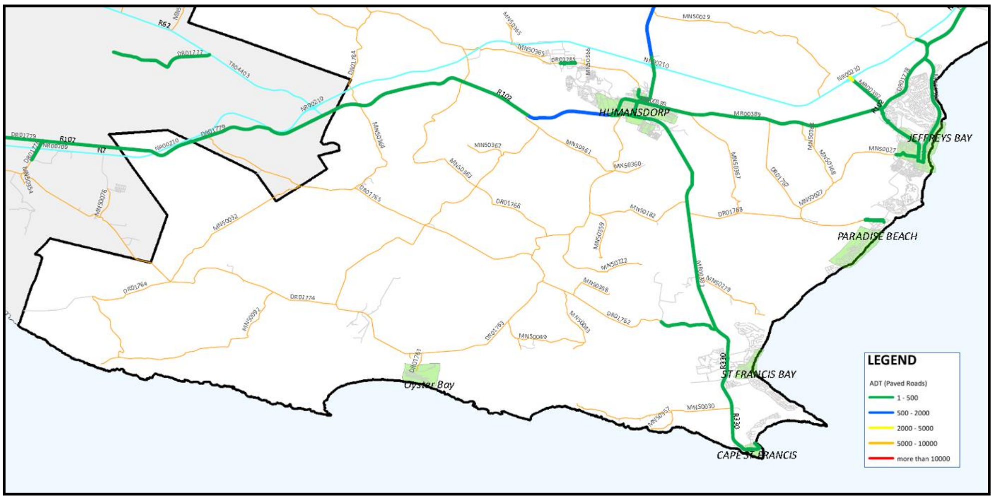


Figure 16 - ADT of Provincial Paved Roads

The TR04403 is a class 2 road which is designed to carry an AADT of up to 25 000. While the DR00391 is a class 3 road which is designed to carry an AADT of up to 2 000. Both of which are within the design limits.

The average daily traffic on the provincial unpaved roads, within the study area, are shown in Figure 17, are all below 100 (<50 indicated in green, 50 to 100 indicated in blue). Except for two areas, these are:

- *Section of DR01774-2, DR01774-3 and MN50092, on which the average daily traffic was found to be between 100 and 250 (indicated in yellow);*
- *Section of DR01763-5 (between MR00381 and MN50361), on which the average daily traffic was found to be more than 500 (indicated in red).*

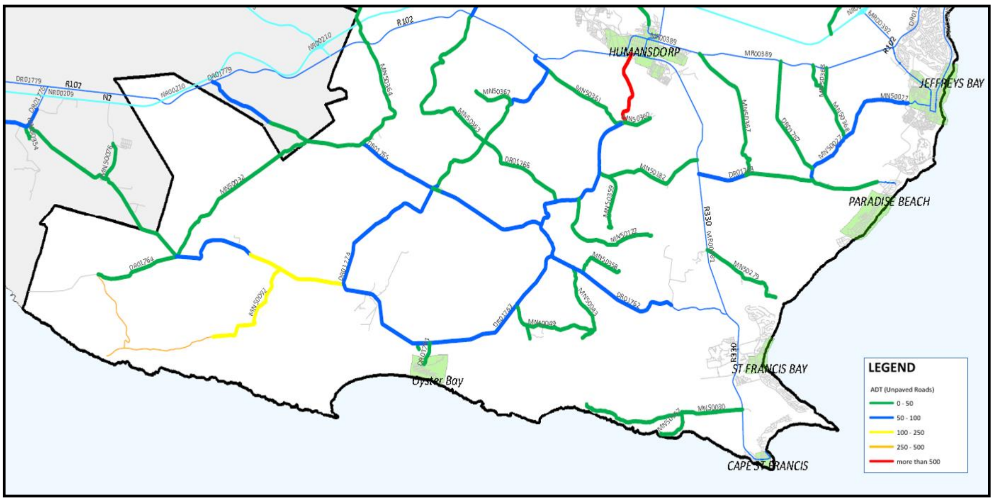


Figure 17 - ADT of Provincial Unpaved Roads

The DR01763 and DR01774 are both Class 4 road which are designed to carry an AADT of up to 1 000. While, the MN50092 is a Class 5 road, which is designed to carry an AADT of up to 500.

Thus, although the actual traffic counts along the various roads was not provided, it is safe to assume that the existing traffic on the road network is well below the design capacity of the road network.

In the absence of more detailed information, the baseline traffic volumes on the road network shall be based on the eightieth percentile of the average daily traffic values provide by the District Roads Engineer. With the following exceptions:

- *Where, only an upper limited is provided the upper limited shall be used;*
- *Where, a sector of the road has two or more average daily traffic values, the highest value shall be used.*

Thus, the baseline traffic volumes for selected road associated with the development are provided in Table 2.

Table 2 - ADT Baseline

Road	Road Class	ADT	80th % ADT	AADT design limits
DR01761	Class 4	1 - 50	40	<1 000
DR01762	Class 4	50 - 100	90	<1 000
DR01763-1 to 4	Class 4	50 - 100	90	<1 000
DR01763-5	Class 4	> 500	500	<1 000
DR01764	Class 5	1 - 50	40	< 500
DR01765-1 and 2	Class 4	50 - 100	90	<1 000
DR01765-3	Class 5	50 - 100	90	< 500
DR01774-1	Class 4	1 - 50	40	<1 000
DR01774-2 and 3	Class 4	100 - 250	220	<1 000
DR01774-4 and 5	Class 4	50 - 100	90	<1 000
DR01776	Class 4	50 - 100	90	<1 000
DR01779-1 to 3	Class 4	1 - 500	400	<1 000
MR00389	Class 4	1 - 500	400	<1 000
MN50032-1 and 2	Class 5	0 - 50	40	< 500
MN50092	Class 5	100 - 250	220	< 500
TR04403	Class 2	1 - 500	400	500 – 25 000

6.2 CONSTRUCTION PHASE

The construction phase of the development will generate the largest increase in traffic volumes. Construction traffic will include vehicles for equipment, materials, component deliveries, construction staff and all other associated personnel. Trips will include the delivery of over-sized components such as rotor blades, mast sections and generators.

A construction period of twenty-four months is anticipated for this development. The construction activities and duration will vary according to the construction schedule.

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

- *The movement of personnel, to and from site; and*
- *The delivery of equipment and material to site.*

The simultaneous occurrence of these two activities are highly unlikely. The movement of personnel, to and from site, are two distinct 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 that there is a noticeable difference between morning and afternoon traffic peaks, although the same number of trips are generated during the peaks the morning peak is more concentrated than afternoon peaks, as the afternoon peak is spread over a longer time 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 site is envisaged to occur during normal working hours, through-out the day. No night deliveries are anticipated and is strongly discouraged. Given the distance from origin of the material and components and the development, it is assumed that most deliveries will only start arriving at site 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 time-frames for these activities, as adopted in this document, are:

- *Peak Traffic (morning): between 6:30 to 7:30;*
- *Diurnal Traffic: between 7:30 to 16:30;*
- *Peak Traffic (afternoon): between 16:30 to 17:30.*

6.2.1 Peak Traffic

It has been estimated that during peak construction of the development, a total manpower complement of approximately two-hundred site personnel will be required. Since no accommodation is to be provided on site, the personnel will have to be accommodated in surrounding area and commute to site.

Based on similar projects, the anticipated breakdown of the manpower is as follows:

- *Senior Staff, i.e. construction managers, supervisor and other key staff, constitute 10% of the total manpower. The senior staff will reside within the community and will commute to site in pairs, using light vehicles. This equates to approximately eleven light vehicles;*
- *Workforce, comprise of semi-skilled and unskilled workers, will constitute the remaining 90% of the total manpower. The workforce is drawn from the local communities and will travel to the site either by light vehicle/mini-bus (20%) or bus (80%). The average occupancy rate of, 2 people per light vehicle, 14 people per mini-bus and 65 people per bus have been used in the trip generation calculations. This equates to approximately five light vehicles, four mini-buses and two buses. It is assumed that the transport vehicles will remain on-site during the workday.*

Demographic

The transportation of site personnel, to and from site, from the various communities within a thirty-five-kilometre radius of the development is based on the availably accommodation, which is assumed to be proportional to the population in the area. The population figures presented in Table 3, are based on 2011 Census.

Table 3 - Population Demographics

Community	Population	
	Number	Percentage
Humansdorp and surrounds	28 990	42%
Jeffreys Bay and surrounds	27 107	39%
Clarkson and Kareedouw	6 809	10%
Cape St Francis and surrounds	5 316	8%
Oyster Bay and surrounds	674	1%

Senior Staff

Most of the senior staff, will be migrants into the local community, the distribution into the community will be dictated by the availability of accommodation, available schools, and personal preferences. The distribution of senior staff into the community is assumed to be as follows:

- *Humansdorp (40%): To transport the senior staff to site, four light vehicles will be required, the most direct route to site will be via the TR04403 and DR01779(west);*
- *Jeffreys Bay (40%): To transport the senior staff to site, four light vehicles will be required to, the most direct route to site will be through Humansdorp, via the MR00389, TR04403 and DR01779(west);*
- *St Francis (14%): To transport the senior staff to site, two light vehicles will be required, the most direct route to site will be via the DR01762, DR01763 and DR01765;*
- *Oyster Bay (6%): To transport the senior staff to site, one light vehicle will be required the most direct route to site will be via the DR01761, DR01763, DR01774 and DR01765.*

Workforce

Most of the workforce shall be drawn from the local community, within a 35 km radius of the development. The distribution of the workforce is based on the population demographics of the five main centres in the area. The distribution and route details are provided below:

- *Humansdorp (42%): To transport the workforce to site, one light vehicle, one mini-bus and one bus will be required. The most direct route to site will be via the TR04403 and DR01779(west);*
- *Jeffreys Bay (39%): To transport the workforce to site, one mini-bus and one bus will be required. The most direct route to site will be through Humansdorp, via the MR00389, TR04403 and DR01779(west);*
- *Clarkson/Kareedouw (10%): To transport the workforce to site, two light vehicles and one mini-bus will be required. The most direct route to site will be via the DR01779(east);*
- *St Francis (8%): To transport the workforce to site, one light vehicle and one mini-bus will be required. The most direct route to site will be via the DR01762, DR01763 and DR01765;*
- *Oyster Bay (1%): To transport the workforce to site, one light vehicle will be required. The most direct route to site will be via the DR01761, DR01763, DR01774 and DR01765.*

Summary

Based on the information above, a summary of the trip per mode generated by personnel, during the morning peak, on the various roads, during peak construction is provided in Table 4. The afternoon peak will consist of the same number of trips as the morning peak.

Table 4 - Construction Phase – Peak Traffic

Roads	Number of trips generated by the various modes of transport			Total Traffic Volume (vph)
	Light Vehicles	Mini-Buses	Buses	
DR01761	2	0	0	2 (vph)
DR01762	3	1	0	4 (vph)
DR01763-1	2	0	0	2 (vph)
DR01763-4	3	1	0	4 (vph)
DR01765-1	11	3	2	16 (vph)
DR01765-2	3	1	0	4 (vph)
DR01765-3	3	1	0	4 (vph)
DR01774-2	2	0	0	2 (vph)
DR01774-3	2	0	0	2 (vph)

Roads	Number of trips generated by the various modes of transport			Total Traffic Volume (vph)
	Light Vehicles	Mini-Buses	Buses	
DR01779-1	2	1	0	3 (vph)
DR01779-2	7	2	1	10 (vph)
DR01779-3	9	2	2	13 (vph)
MR00389	4	1	1	6 (vph)
MN50032-1	2	0	0	2 (vph)
MN50032-2	14	4	2	20 (vph)
TR04403	9	2	2	13 (vph)

Peak traffic (single direction) is generated by only twenty-two vehicles used to commuting personnel to site. These vehicles are distributed over the various roads, with varying concentration. The maximum number of additional vehicles on any one road, within a given hour, will never exceed twenty.

Based on the information tabled above (as highlighted in yellow), the most significant increase in traffic volumes resulting from the morning and evening peaks on the various roads are as follows:

- *an increase of twenty vehicles per hour on MN50032-2;*
- *an increase of sixteen vehicles per hour on DR01765-1;*
- *an increase of thirteen vehicles per hour on DR01779-3 and TR04403.*

6.2.2 Diurnal Traffic

The construction phase of the development consists of several activities, some occur sequentially while others occur concurrently. Thus, not all the traffic volumes detailed 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 and sub-station platforms;*
  - *raw material (i.e. cement, sand, stone) for batching of concrete;*
  - *construction material (i.e. scaffolding, formwork, reinforcing steel, brick, roof sheeting, fencing, transformers, switch gear, cables, etc.);*
- *Delivery of the WTG components (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.*

Traffic volumes generated by site establishment will tend to decrease towards the end of the activity, during which the delivery of construction equipment and material will commence. Thus, for analysis purposes a constant value for each of these activities has been assumed.

To prevent excessive increase in traffic volumes on the road network, a Traffic Management Plan will have to be compiled and managed. This is described in more detail in Section 10.

The traffic volumes generated by these activities are addressed below.

Site Establishment

Site establishment is the first activity undertaken within the construction phase, of the development.

Various types of vehicles will be involved with site establishment, the duration of which is assumed to be in the order of six weeks. The increase in traffic volume for this activity is conservatively estimated to be in the order of eight return trips per day, which equates to 1 vehicle per hour.

The most likely route for these deliveries, from the N2, is provided in Table 5.

Table 5 - Site Establishment – Traffic Volumes

Road	Traffic Volume (vph)
TR04403, DR01779-3, DR01765-1 & MN50032	1 (vph)

This activity does not coincide with any other activity during the construction phase of the development and will be excluded from the cumulative assessment.

Construction Equipment and Materials

Once 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 site at the commencement of the construction and will be gradually removed from site as construction draws to an end. Materials, such as reinforcing steel, brick, roof sheeting, fencing, transformers, switch gear, cables, etc. will be delivered to site as an on-going activity, slowly ramping-up to constant deliveries during the construction phase, before tapering-off of construction. It is assumed that these deliveries will be distributed through-out the site.

Various types of vehicles will be used to deliver the construction equipment and materials to site. The increase in traffic volume for this activity is conservatively estimated to be in the order of four return trips per day. This equates to 0.5 vehicles per hour.

The most likely route for the delivery of construction equipment and materials to various zones on site from the N2, is provided in Table 6.

Table 6 - Construction Equipment and Materials – Traffic Volumes

Road	Traffic Volume (vph)
Zone 1 - TR04403, DR01779-3 & DR01765-1	0.5 (vph)
Zone 2 - TR04403, DR01779-3, DR01765-1 & MN50032-2	0.5 (vph)
Zone 3 - DR01776, DR01774 & MN50032-1	0.5 (vph)
Zone 4 - DR01776 & DR01774	0.5 (vph)
Zone 5 - DR01776, DR01774 & DR01764	0.5 (vph)

Gravel – Roads

The sub-station platforms, roads and hardstand platforms adjacent to the WTG are to be constructed from suitable gravels. Suitable material excavated from the WTG foundation shall, where possible, be used for the construction of roads and hardstand platforms. Worst-case scenario assumes that all material required is sourced from commercial quarries, outside the study area. The volume of material required is in the order of 58 000 m^3.

The gravel is assumed to be delivered to site in 20 m^3 heavy duty rear tippers, over a fourteen months period. The increase in traffic volume resulting from this activity is estimated to be in the order of nine return trips per day. Over an eight-hour day, this equates to 1.125 vehicles per hour.

The most likely route for the delivery of gravel for the construction of the roads and hard stand platforms to the various zones on site from the N2, is provided in Table 7.

Table 7 - Gravel – Traffic Volumes

Road	Traffic Volume (vph)
Zone 1- TR04403, DR01779-3 & DR01765-1	1.125 (vph)
Zone 2 - TR04403, DR01779-3, DR01765-1 & MN50032-2	1.125 (vph)
Zone 3 - DR01776, DR01774 & MN50032-1	1.125 (vph)
Zone 4 - DR01776 & DR01774	1.125 (vph)
Zone 5 - DR01776, DR01774 & DR01764	1.125 (vph)

Raw Material – Concrete

The concrete foundations for the twenty-nine WTG, are to be batched from an on-site batching plant. The raw material for the concrete is to be delivered to site from commercial sources. The raw material to be delivered to site for manufacturing the concrete, is in the order of; 4 600 tons of cement, 7 900 m^3 of sand, and 9 200 m^3 of stone.

The cement is assumed to be delivered to site by means pneumatic bulkers, with a 40 m^3 tridem semi (pay load 32 000 kg) and 15 m^3 pup (payload of 10 000 kg), as shown in Figure 18.

Figure 18 - Bulk Cement Tanker and Pup

While the aggregate is assumed to be delivered to site in 20 m^3 heavy duty rear tippers, as shown in Figure 19, over a period of eight-months.

Figure 19 - Rear Tipper

The increase in traffic volume resulting from this activity is estimated to be in the order of eight return trips per day.

The most likely route for the delivery of raw material for the fabrication of concrete to site from the N2, is provided in Table 8.

Table 8 - Raw Materials – Traffic Volumes

Road	Traffic Volume (vph)
Zone 1 - TR04403, DR01779-3 & DR01765-1	1.0 (vph)

WTG Components

Each WTG consists of approximately thirteen components, i.e. tower sections, blades (as shown in Figure 20), gearbox, nacelle (as shown in Figure 21), generator, nose cone, hub, etc., each of which are to be individually transported to site, most of which are abnormal loads.

Figure 20 - Turbine Blade

Figure 21 - Nacelle

Most of the components are imported in to South Africa and will be delivered from Port Elizabeth. Except for the tower sections which are fabricated locally and could be transported to site from Cape Town. However, for analysis purposes it shall be assumed that all the components are delivered to site from Port Elizabeth.

Due to the transportation of the components for the twenty-nine WTG, will amount to three-hundred-and -seventy-seven trips over an eight-month period. The increase in traffic volume resulting from this activity is estimated to be in the order of four trips per day. Over an eight-hour day, this equates to 0.5 vehicles per hour. Based on past experience the abnormal loads are delivered to site on predetermined days, *normally Monday, Wednesday and Friday, thus the lighter components will be delivered on the other days, as per the permit requirements.*

The most likely route for the delivery of the WTG components to the individual zones on site from the N2, is provided in Table 9.

Table 9 - WTG Components – Traffic Volumes

Road	Traffic Volume (vph)
Zone 1 *- TR04403, DR01779-3 & DR01765-1*	*0.5 (vph)*
Zone 2 *- TR04403, DR01779-3, DR01765-1 & MN50032-2*	*0.5 (vph)*
Zone 3 *- DR01776, DR01774 & MN50032-1*	*0.5 (vph)*
Zone 4 *- DR01776 & DR01774*	*0.5 (vph)*
Zone 5 *- DR01776, DR01774 & DR01764*	*0.5 (vph)*

Concrete

The concrete for the WTG foundations is batched on-site and transported to each foundation. Each foundation consists of approximately 450 m^3 of concrete and takes up to eight hours to cast. The contractor is most likely to use a 6 m^3 concrete mix truck to transport concrete. Thus, to cast a WTG foundation, approximately seventy-seven trips will be generated (including 2.5% wastage) over an eight-hour period, thus the expected increase in traffic (in one direction) will be approximately ten vehicles per hour (one every six minutes). If the vehicles are using the same return route there will be an increase in the traffic by the same volume.

The layout of the wind farm infrastructure is so designed to minimise the need for construction vehicles to travel on the public roads, thus reducing traffic impacts on public roads. This includes, concrete delivery trucks that transport mixed concrete from the batching plant to the WTG foundations. The site, on which the WTG are to be installed, is traversed by the public road network, resulting in WTG been constructed on both sides of the public rods. This implies that concrete delivery trucks either need to cross the public roads at selected locations or need to travel along the public roads for a short distance.

To minimise the impact of the public roads the batching plant is located on the zone demanding the most concrete, in this case the batching plant is to be located within Zone 1. This implies that concrete required in:

- *Zone 2: Concrete delivery trucks will cross the MN50032-1, for the casting of the five WTG foundations in this zone;*
- *Zone 3: Concrete delivery trucks will travel along the MN50032-1, for the casting of the five WTG foundations in this zone;*
- *Zone 4: Concrete delivery trucks to travel along the MN50032-1 and DR01774-1, for the casting of the five WTG foundations in this zone;*
- *Zone 5: Concrete delivery trucks to travel along the MN50032-1, cross the DR01774, and along DR01764, for the casting of the two WTG foundations in this zone;*

The expected trip generated on specific roads by the concrete delivery trucks are provided in Table 10.

Table 10 - Concrete Delivery – Traffic Volumes

Zone	Road	Traffic Volume (vph)
Zone 2 (5 days)	*Traverses MN50032*	*10 (vph)*
Zone 3 (5 days)	*MN50032-1*	*10 (vph)*
Zone 4 (5 days)	*MN50032-1 & DR01774-1*	*10 (vph)*
Zone 5 (2 days)	*MN50032-1, Traverses DR01774-1 & DR01764*	*10 (vph)*

Summary

Based on the information above, a summary of the traffic generated by the delivery of equipment and material to site, on the various roads, is provided in Table 11.

Table 11 - Construction Phase – Diurnal Traffic

Road	Site Establishment	Construction Equipment and Materials	Gravel for Road Construction	Raw Material for Concrete	WTG Components	Concrete	Total Traffic Volume[#](vph)		
							1[##]	2[##]	3[##]
DR01764		0.5	1.125		0.5	10		2.125	10
DR01765-1	1.0	0.5	1.125	1.0	0.5		1.0	3.125	
DR01774-1		0.5	1.125		0.5	10		2.125	10
DR01776		0.5	1.125		0.5			2.125	
DR01779-3	1.0	0.5	1.125	1.0	0.5		1.0	3.125	
MN50032-1		0.5	1.125		0.5			2.125	
MN50032-2		0.5	1.125		0.5	10		2.125	10
TR04403	1.0	0.5	1.125	1.0	0.5		1.0	3.125	

[#] Total Traffic Volumes indicate single directional traffic, for the total affect these values will have to be doubled.
[##] 1 – Site Establishment, 2 – Construction Related Deliveries, 3 – Concrete Deliveries.

Diurnal Traffic (dual direction) is produced by less than seven vehicles per hour, which are distributed over the various roads, with varying concentration. The maximum additional vehicles on any one road, within a given hour, will never exceed seven.

Based on the information tabled above:

- *a maximum dual traffic volume, of fifty vehicles per day, will occur on the DR01765-1/2, DR01774-5, DR01779-3 and TR04403; and*
- *a traffic volume of thirty-four vehicle per day, will occur on the balance of the roads listed in Table 11.*

Traffic (concrete delivery trucks), resulting from placing of concrete is in the order of 20 vehicles per hour (dual direction). Thus, over an eight-hour period, 160 trips will be generated on selected roads.

The movement of concrete delivery trucks across and along public roads are limited to:

- *The delivery of concrete to Zone 2, requires concrete delivery trucks to transvers the MN50032. This activity occurs on five individual days of the project;*
- *The delivery of concrete to Zone 3, requires concrete delivery trucks to travel along the MN50032-1. This activity occurs on five individual days of the project;*
- *The delivery of concrete to Zone 4, requires concrete delivery trucks to travel on the MN50032-1 and DR01774. This activity occurs on five individual days of the project;*
- *The delivery of concrete to Zone 5, requires concrete delivery trucks to travel on the MN50032-1, traverses DR01774 and DR01764. This activity occurs on two individual days of the project.*

6.3 OPERATIONAL PHASE

The operational life of the proposed development is expected to be approximately twenty-years. The development will operate on a twenty-four-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.

6.3.1 Peak Traffic

It is envisaged that the development is maintained and operated by a team of approximately thirty-two personnel. It is envisaged that the operational and maintenance staff are transported to and from site by means of, five light vehicles and two mini-buses.

The proposed route from Humansdorp would be via the TR04403, DR01779-3, DR01765-1 and MN50032.

The daily trips generated by personnel commuting, to and from site, is summarised in Table 12.

Table 12 - Operational Phase – Peak Traffic

Roads	Number of trips generated by the various modes of transport			Total Traffic Volume (vph)
	Light Vehicles	Mini-Buses	Buses	
DR01765-1	5	2	0	7 (vph)
DR01779-3	5	2	0	7 (vph)
MN50032-2	5	2	0	7 (vph)
TR04403	5	2	0	7 (vph)

Peak traffic (single direction) is generated by seven vehicles used to commute personnel to site. These vehicles are distributed over the various roads, with varying concentration. The maximum number of additional vehicles on any one road, within a given hour, will never exceed seven.

6.3.2 Diurnal Traffic

Daily inspections and periodical maintenance of the WTG and associated infrastructure in each zone is envisaged. Based on a rate of one vehicle per zone per day, a traffic volume of 0.125 vehicles per hour is used in the analysis.

Vehicles related to servicing and delivery of goods to site, is expected to originate from Humansdorp at a rate of one vehicle per day, which equates to 0.125 vehicles per hour.

The proposed increase in daily traffic on the public roads during the operational phase is provided in Table 13.

Table 13 - Operational Phase – Diurnal Traffic

Road	Traffic Volume (vph)
DR01764	0.125 (vph)
DR01765-1	0.125 (vph)
DR01774-1	0.125 (vph)
DR01779-3	0.125 (vph)
MN50032-1	0.125 (vph)
MN50032-2	0.375 (vph)
TR04403	0.125(vph)

Diurnal Traffic two vehicles generated approximately four trips per day. This traffic is distributed over the various roads, with varying concentration. The maximum number of additional vehicles on any one road, within a given hour, will never exceed two.

6.4 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 maybe re-engineered and the operational life may be extended. If the development is not economically 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 it may be used as scrap metal. The decommissioning procedures will be undertaken in line with the 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 many of the internal infrastructure will be retained by the land owners.

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.

7 ASSESSMENT OF IMPACTS

The assessment of the increased traffic volumes on the road network within the study area during the construction and operational phases of this development is addressed in the sub-sections.

In the assessment reference is made to "'Traffic Density", this is normally expressed in "the number of vehicles on a road in a kilometre". However, in this document "Traffic Density" is expressed in "distance between vehicles".

The relevance of which is important when considering overtaking manoeuvres on the road. The overtaking distance, assuming a chase vehicle is 100 m behind a lead vehicle, for various speeds is provided in the Table 14.

Table 14 - Overtaking Distance

Speed of lead vehicle	40 km/h	45 km/h	50 km/h	55 km/h	60 km/h
Speed of chase vehicle	50 km/h	55 km/h	60 km/h	65 km/h	70 km/h
Overtaking distance	0.5 km	0.55 km	0.6 km	0.65 km	0.7 km

The purpose of the table is to provide the reader with a reference to the term "Traffic Density".

According to the Traffic Impact Study Manual, the acceptable level of service (LOS) for rural roads (Classes 3 to 5) is LOS C. The threshold for the "follower density" for the various level of service is provided in Table 15.

Table 15 - Level of Service

Level of Service (LOS)	Follower Density (vehicles per kilometre per lane)	Traffic Density (distance between vehicles) in km
A	0.0 – 1.0	> 1.0
B	1.0 – 2.5	1.0 – 0.4
C	2.5 – 4.5	0.4 – 0.25
D	4.5 – 7.5	0.25 – 0.15
E	7.5 – 12.5	0.15 – 0.08
F	> 12.5	< 0.08

The road network within the study area are classified as either Class 4 or Class 5 roads. Thus, the acceptable distance between vehicles for a LOS C is between 250 and 400 metres.

7.1 CONSTRUCTION PHASE

The duration of the construction phase of this developer is estimated to be in the order of twenty-four months. During the construction phase traffic will be generated through two distinct sources:

- *The transportation of the site personnel (Peak Traffic); and*
- *The delivery of materials and equipment to site (Diurnal Traffic).*

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

The traffic volumes generated, for both Peak Traffic and Diurnal Traffic, resulting from this development has been addressed in Section 6. Thus, the combined expected increase in the traffic volumes on the various roads during the construction phase of this development are summarised in Table 16.

Table 16 - Construction Phase – Traffic Volume

Roads	Day (broken into three-time frames)		
	06:30 Morning Peak Traffic (vph) 07:30	Diurnal Traffic (vph) 16:30	Afternoon Peak Traffic (vph) 17:30
DR01761	2 (vph)		2 (vph)
DR01762	4 (vph)		4 (vph)
DR01763-1	2 (vph)		2 (vph)
DR01763-4	4 (vph)		4 (vph)
DR01764		2.125 (vph)	
DR01765-1	16 (vph)	3.125 (vph)	16 (vph)
DR01765-2	4 (vph)		4 (vph)
DR01765-3	4 (vph)		4 (vph)
DR01774-1		2.125 (vph)	
DR01774-2	2 (vph)		2 (vph)
DR01774-3	2 (vph)		2 (vph)
DR01776		2.125 (vph)	
DR01779-1	3 (vph)		3 (vph)
DR01779-2	10 (vph)		10 (vph)
DR01779-3	13 (vph)	3.125 (vph)	13 (vph)
MR00389	6 (vph)		6 (vph)
MN50032-1	2 (vph)	2.125 (vph)	2 (vph)
MN50032-2		2.125 (vph)	
TR04403	13 (vph)	3.125 (vph)	13 (vph)

The table above excludes:

- *deliveries to site during site establishment, as this activity occur prior to the construction activities and is less onerous than the cumulative traffic generated during the construction of the infrastructure;*
- *trips generated by the concrete trucks during the casting of WTG foundations, as this is a sporadic activity. In order to minimise congestion on the public roads during these periods, all non-essential deliveries should be re-scheduled for a later date. Thus, once the construction schedule is finalised, the Traffic Management Plan will have to be revised and will have to be managed accordingly.*

Based on the information provided in the table above there are no traffic volumes that are increased by more the fifty trips per hour, thus satisfying 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 peak construction phase of the development is in the order of:

- *Peak Traffic: Twenty-two vehicles generate forty-four trips a day on the road network. These trips are distributed over the various roads, with varying concentration. The maximum number of vehicles on any road, within a given hour, will never exceed twenty.*
- *Diurnal Traffic: Approximately fifty-two trips a day are generated on the road network. These trips are distributed over the various roads, with varying concentration. The maximum number of vehicles on any road, within a given hour, will never exceed seven.*

The average daily traffic generated during the construction phase on selected roads adjacent to the site are assessed in Table 17

Table 17 - Construction Phase - Traffic Assessment

Road	AADT Design Basis	ADT Baseline	ADT Generated	Increased ADT in % of Baseline
DR01761	1 000	40	(4+0) = 4	10.0%
DR01762	1 000	90	(8+0) = 8	8.9%
DR01763-1	1 000	90	(4+0) = 4	4.4%
DR01763-4	1 000	90	(8+0) = 8	8.9%
DR01764	500	40	(0+34) = 34	85.0%
DR01765-1	1 000	90	(32+50) = 82	91.1%
DR01765-2	1 000	90	(8+0) = 8	8.9%
DR01765-3	500	90	(8+0) = 8	8.9%
DR01774-1	1 000	40	(0+34) = 34	85.0%
DR01774-2	1 000	220	(4+0) = 4	1.8%
DR01774-3	1 000	220	(4+0) = 4	1.8%
DR01776	1 000	90	(0+34) = 34	37.8%
DR01779-1	1 000	400	(6+0) = 6	1.5%
DR01779-2	1 000	400	(20+0) = 20	5.0%
DR01779-3	1 000	400	(26+50) = 76	19.0%
MR00389	1 000	400	(12+0) = 12	3.0%
MN50032-1	500	40	(4+34) = 38	95.0%
MN50032-2	500	40	(40+34) = 74	185.0%
TR04403	500-25 000	400	(26+50) = 76	19.0%

The above table excludes the traffic volumes generated by the concrete delivery trucks required for the casting of WTG foundations, these are addressed in more detail below.

The increased ADT on the paved roads (DR01779-3 and TR04403) is in the order of 19% (as highlighted in yellow). The existing traffic density on this road is one vehicle every 3 km (based on a speed of 100 km/h). The expected peak traffic density is one vehicle every 2.2 km, while the expected diurnal traffic is one vehicle every 2.5 km.

The maximum increased ADT on the unpaved roads is in the order of 185% (as highlighted in blue), this is on the MN50032-2. The existing traffic density on this road is one vehicle every 15 km (based on a speed of 100 km/h). The expected peak traffic density is one vehicle every 2.1 km (based on a speed of 50 km/h), while the expected diurnal traffic density is one vehicle every 6.6 km.

Based on the traffic density provided above for the construction phase of the development, the traffic density on the paved roads is no worse than one vehicle every 2.2 km, while the traffic density on the unpaved roads is no worse than one vehicle every 2.1 km.

The transportation of concrete, on the public roads, required for the casting of the WTG foundations, has been minimised as far as possible. These are isolated activities, that occur over a defined period that does not extend more than eight-hours. The hourly trips generated by the concrete trucks are in the order of ten return trips per hour. The interaction between public and construction vehicles will be addressed in a Traffic Management Plan that is to be compiled by the contractor on the contract has been finalised. The activities for this development are individually addressed below.

- *Zone 2: There are five WTG in this zone. The transportation of the concrete requires the concrete delivery trucks to cross the MN50032. The existing traffic density on this road is in the order of one vehicle every 15 km (based on speed of 50 km/h). The traffic density generated by the concrete trucks is in the order of one truck every 5 km (based on a speed of 30 km/h), the return truck will cross the road at the same time the delivery truck crosses the road;*
- *Zone 3: There are five WTG in this zone. The transportation of the concrete requires the concrete trucks to travel along MN50032-1. The existing traffic density on this road is in the order of one vehicle every 15 km (based on speed of 50 km/h). The traffic density generated by the concrete trucks is in the order of one truck every 2.5 km;*
- *Zone 4: There are five WTG in this zone. The transportation of the concrete requires the concrete trucks to travel along MN50032-1 and DR01774-1. The traffic density for MN50032-1 is discussed above. The traffic density for DR01774-1 is the same as that for MN50032-1.*
- *Zone 5: There are two WTG in this zone. The transportation of the concrete requires the concrete trucks to travel along MN50032-1 and DR01764. The traffic density for MN50032-1 is discussed above. The traffic density for DR01764 is the same as that for MN50032-1.*

Based on the traffic density, resulting from the delivery of concrete during the casting of the WTG foundation, the theoretical distance between vehicles on the road network is no worse than one vehicle every 2.5 km.

Casting of the concrete foundations for WTG are infrequent activities, the duration of which is limited to approximately eight-hours. Thus, traffic issues associated with these activities that impact traffic on the public road network will have to be addressed in the Transportation Management Plan. To minimise public and construction interaction on public roads the temporary closure of selected roads could be considered, where this is not feasible other management interventions could be considered, i.e. speed reduction measures together with maned crossings.

7.2 OPERATIONAL PHASE

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

- The transportation of the site personnel (Peak Traffic); and
- The delivery of materials and equipment to site (Diurnal Traffic).

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

The traffic volumes generated, for both Peak Traffic and Diurnal Traffic, resulting from this phase of the development has been addressed in Section 6. Thus, the combined expected increase in the traffic volumes on the various roads during the operational phase of the development is summarised in Table 18.

Table 18 - Operational Phase - Traffic Volume

Roads	Day (broken into three-time frames)		
	06:30 Morning Peak Traffic (vph) 07:30	Diurnal Traffic (vph) 16:30	Afternoon Peak Traffic (vph) 17:30
DR01764		0.125 (vph)	
DR01765-1	7 (vph)	0.125 (vph)	7 (vph)
DR01774-1		0.125 (vph)	
DR01779-3	7 (vph)	0.125 (vph)	7 (vph)
MN50032-1		0.125 (vph)	
MN50032-2	7 (vph)	0.375(vph)	7 (vph)
TR04403	7 (vph)	0.125 (vph)	7 (vph)

Based on the information provided in the table above there are no traffic volumes that are increased by more the fifty trips and hour, thus satisfying 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 development, for peak traffic and diurnal traffic is detailed below:

- Peak Traffic: seven vehicles generated fourteen trips per day, which are distributed over the various roads, with varying concentration. The maximum number of vehicles on any one road, within a given hour, will never exceed seven;
- Diurnal Traffic: two vehicles generated approximately four trips per day. This traffic is distributed over the various roads, with varying concentration. The maximum number of additional vehicles on any one road, within a given hour, will never exceed two.

The average daily traffic generated during the operational phase on selected roads adjacent to the site are assessed in Table 19.

Table 19 - Operational Phase - Traffic Assessment

Road	AADT Design Basis	ADT Baseline	ADT Generated	Increased ADT in % of Baseline
DR01764	500	40	(0+2) = 2	5.0%
DR01765-1	1 000	90	(14+2) = 16	17.8%
DR01774-1	1 000	40	(0+2) = 2	5.0%
DR01779-3	1 000	400	(14+2) = 16	4.0%
MN50032-1	500	40	(0+2) = 2	5.0%
MN50032-2	500	40	(14+6) = 20	50.0%
TR04403	500 – 25 000	400	(14+2) = 16	4.0

Operational phase related traffic on the paved roads will result in an increase of less than 4%. The existing peak traffic density on this road is one vehicle every 3 km (based on a speed of 100 km/h), the expected peak traffic density is one vehicle every 2.5 km.

The maximum increase on the unpaved road is in the order of 50%. The existing traffic density on this road is one vehicle every 15 km (based on a speed of 50 km/h). The expected peak traffic density is one vehicle every 4.8 km, and the expected diurnal traffic density is one vehicle every 12.2 km.

Based on the traffic density provided above, for the operational phase of the development, the traffic density on the paved roads is no worse than one vehicle every 2.5 km, while the traffic density on the unpaved roads is no worse than one vehicle every 4.8 km.

8 ASSESSMENT OF CUMULATIVE IMPACTS

The assessment of the cumulative increased traffic volumes on the road network within the study area during the construction and operational phases of this development is addressed in the following sub-sections.

The construction of this development is subject to the relevant approval by the various authorities, and will possibly be undertaken in 2021/2022, by which time there will be four operating wind farms within a twenty-kilometre radius of this development.

The traffic volumes resulting from the operation and maintenance of the; Kouga Wind Farm, Tsitsikamma Community Wind Farm and Gibson Bay Wind Farm, are all included in the 2017 baseline ADT. Thus, traffic volumes for the operation phase of these developments will not be included in the cumulative assessment.

However, Oyster Bay Wind Farm, is only due to commence construction in 2019, the traffic volumes resulting from the construction and operational phase of Oyster Bay Wind Farm will be included in the cumulative assessment.

In addition to this development, there are four other developments proposed within the study area, as detailed in section 5.4. The future developments within the study area include; Impofu North Wind Farm, Impofu East Wind Farm, Banna ba Pifhu Wind Farm and Ubuntu Wind Farm.

The Banna ba Pifhu Wind Farm is located five kilometres south of Humansdorp. Traffic generated from Banna ba Pifhu Wind Farm and Ubuntu Wind Farm will not affect the traffic volumes on the road network associated with the development of Impofu West Wind Farm, as described in section 5.4. Therefore, the traffic volumes due to Banna ba Pifhu Wind Farm and Ubuntu Wind Farm have not been included in the cumulative impacts.

It is unclear whether the Impofu Wind Farms will be constructed concurrently or sequentially. A worst-case scenario, concurrent construction of all three of the Impofu Wind Farms, has been adopted for evaluation. The traffic volumes generated for the construction and operational phase of Impofu North Wind Farm and Impofu East Wind Farm have been independently calculated and are contained in separate reports.

To summarise:

- *The cumulative construction phase assessment, includes the simultaneous construction of the three Impofu Wind Farms and the operation of Oyster Bay Wind Farm;*
- *The cumulative operation phase assessment includes the simultaneous operation of the three Impofu Wind Farms and the operation of Oyster Bay Wind Farm.*

8.1 CONSTRUCTION PHASE

The cumulative traffic volumes on specific roads, for both Peak Traffic and Diurnal Traffic, during the construction phase of this development are depicted in Table 20.

The cumulative traffic volumes, during the construction phase, adopted in this section is based on the following:

- *The simultaneous construction of; Impofu North Wind Farm, Impofu East Wind Farm and Impofu West Wind Farm; and*
- *The simultaneous operation and maintenance of the Oyster Bay Wind Farm.*

Table 20 - Cumulative Constructional Phase – Traffic Volumes

Roads	Day (broken into three-time frames)		
	06:30 Morning Peak Traffic (vph)	07:30 Diurnal Traffic (vph)	16:30 Afternoon Peak Traffic (vph) 17:30
DR01761	8 (vph)		8 (vph)
DR01762	14 (vph)		14 (vph)
DR01763-1	8 (vph)	2.250 (vph)	8 (vph)
DR01763-4	14 (vph)		14 (vph)
DR01763-5	23 (vph)	0.125 (vph)	23 (vph)
DR01764		2.125 (vph)	
DR01765-1	25 (vph)	8.875 (vph)	25 (vph)
DR01765-2	13 (vph)	3.250 (vph)	13 (vph)
DR01765-3	37 (vph)	0.125 (vph)	37 (vph)
DR01774-1		4.375 (vph)	
DR01774-2	2 (vph)	2.250 (vph)	2 (vph)
DR01774-3	2 (vph)	2.250 (vph)	2 (vph)
DR01774-4	6 (vph)		6 (vph)
DR01774-5	34 (vph)	3.375 (vph)	34 (vph)
DR01776		4.375 (vph)	
DR01779-1	9 (vph)		9 (vph)
DR01779-2	32 (vph)	3.500 (vph)	32 (vph)
DR01779-3	26 (vph)	9.875 (vph)	26 (vph)
MR00389	18 (vph)	0.500 (vph)	18 (vph)
MN50032-1	2 (vph)	2.125 (vph)	2 (vph)
MN50032-2	20 (vph)	2.125 (vph)	20 (vph)
TR04403	26 (vph)	9.875 (vph)	26 (vph)

The table above excludes:

- *deliveries to site during site establishment, as described in section 7.1.*

- *trips generated by the concrete delivery trucks during the casting of WTG foundations, as this is addressed more detail below.*

Based on the information provided in the table above there are no traffic volumes that are increased by more the fifty trips and hour, thus satisfying 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 cumulative traffic volumes generated on the road network, during the construction phase, is in the order of:

- *Peak Traffic: Eighty vehicles generate one-hundred-and-sixty trips a day on the road network. These trips are distributed over the various roads, with varying concentration. The maximum number of vehicles on any road, within a given hour, will never exceed thirty-seven.*
- *Diurnal Traffic: Approximately one-hundred-and-sixty-six trips a day are generated on the road network. These trips are distributed over the various roads, with varying concentration. The maximum number of trips on any road, within a given hour, will never exceed ten.*

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

Table 21 - Cumulative Constructional Phase – Traffic Assessment

Road	AADT Design Basis	ADT Baseline	ADT Generated	Increased ADT in % of Baseline
DR01761	1 000	40	(16+0) = 16	40%
DR01762	1 000	90	(28+0) = 28	31%
DR01763-1	1 000	90	(16+36) = 52	58%
DR01763-4	1 000	90	(28+0) = 28	31%
DR01763-5	1 000	500	(46+2) = 48	10%
DR01764	500	40	(0+34) = 34	85%
DR01765-1	1 000	90	(50+142) = 192	213%
DR01765-2	1 000	90	(26+52) = 78	87%
DR01765-3	500	90	(74+2) = 76	84%
DR01774-1	1 000	40	(0+70) = 70	175%
DR01774-2	1 000	220	(4+36) = 40	18%
DR01774-3	1 000	220	(4+36) = 40	18%
DR01774-4	1 000	90	(12+0) = 12	13%
DR01774-5	1 000	90	(68+54) = 122	136%
DR01776	1 000	90	(0+70) = 70	78%
DR01779-1	1 000	400	(18+0) = 18	5%
DR01779-2	1 000	400	(64+56) = 120	30%
DR01779-3	1 000	400	(52+158) = 210	53%
MR00389	1 000	400	(36+8) = 44	11%
MN50032-1	500	40	(4+34) = 38	95%
MN50032-2	500	40	(40+34) = 74	185%
TR04403		400	(52+158) = 210	53%

The "increased ADT" on the paved roads (i.e. DR01779-1, DR01779-2, DR01779-3, MR00389 and TR04403) resulting from the cumulative impact is less than 53% (as highlighted in yellow, above) and is summarised as follows:

- *Peak Traffic: On road DR01779-2, thirty-two trips generated during morning peak and afternoon peak, constituting approximately (64/120) 53% of the additional traffic on this road. The existing peak traffic density is one vehicle every 3 km (based on a speed of 100 km/h), the expected peak traffic density is one vehicle every 1.5 km.*
- *Diurnal Traffic: On roads DR01779-3 and TR04403, one-hundred-and-fifty-eight trips over an eight-hour period, constitutes (158/210) 75% of the additional traffic on these roads. The existing diurnal traffic density is one vehicle every 3 km (based on a speed of 100 km/h), the expected diurnal traffic density is one vehicle every 1.9 km.*

The "increased ADT", of the unpaved roads, greater than 70% (as highlighted in blue, in Table 21), is evaluated below;

DR01764: The increased ADT on this road comprises solely of Diurnal Traffic. The existing diurnal traffic density is one vehicle every 15 km (based on a speed of 50 km/h), the expected cumulative diurnal traffic density is one vehicle every 6.6 km.

DR01765-1: The increased ADT on this section of the road comprises of:

- *Peak Traffic: Resulting from twenty-five trips during the morning and afternoon peak, constitutes 26% of the additional traffic. The existing peak traffic density is one vehicle every 6.7 km (based on a speed of 50 km/h), the expected cumulative peak traffic density is one vehicle every 1.5 km;*
- *Diurnal Traffic: Resulting from one-hundred-and-forty-two trips over an eight-hour period, constitutes 74% of the additional traffic. The existing diurnal traffic density is one vehicle every 6.7 km (based on a speed of 50 km/h), the expected cumulative diurnal traffic density is one vehicle every 2.0 km.*

DR01765-2: The increased ADT on this section of the road comprises of:

- *Peak Traffic: Resulting from thirteen trips during the morning and afternoon peak, constitutes 33% of the additional traffic. The existing peak traffic density is one vehicle every 6.7 km (based on a speed of 50 km/h), the expected cumulative peak traffic density is one vehicle every 2.4 km;*
- *Diurnal Traffic: Resulting from fifty-two trips over an eight-hour period, constitutes 67% of the additional traffic. The existing diurnal traffic density is one vehicle every 6.7 km (based on a speed of 50 km/h), the expected cumulative diurnal traffic density is one vehicle every 3.6 km.*

DR01765-3: The increased ADT on this section of the road comprises of:

- *Peak Traffic: Resulting from thirty-seven trips during the morning and afternoon peak, constitutes 97% of the additional traffic. The existing peak traffic density is one vehicle every 6.7 km (based on a speed of 50 km/h), the expected cumulative peak traffic density is one vehicle every 1.1 km;*
- *Diurnal Traffic: Resulting from two trips over an eight-hour period, constitutes 3% of the additional traffic. The existing diurnal traffic density is one vehicle every 6.7 km (based on a speed of 50 km/h), the expected cumulative diurnal traffic density is one vehicle every 6.5 km.*

DR01774-1: The increased ADT on this road comprises solely of Diurnal Traffic. The existing diurnal traffic density is one vehicle every 15 km (based on a speed of 50 km/h), the expected cumulative diurnal traffic density is one vehicle every 4.1 km.

DR01774-5: The increased ADT on this section of the road comprises of:

- *Peak Traffic: Resulting from thirty-four trips during the morning and afternoon peak, constitutes 56% of the additional traffic. The existing peak traffic density is one vehicle every 6.7 km (based on a speed of 50 km/h), the expected cumulative peak traffic density is one vehicle every 1.2 km;*
- *Diurnal Traffic: Resulting from fifty-four trips over an eight-hour period, constitutes 44% of the additional traffic. The existing diurnal traffic density is one vehicle every 6.7 km (based on a speed of 50 km/h), the expected cumulative diurnal traffic density is one vehicle every 3.5 km.*

DR01776: The increased ADT on this road comprises solely of Diurnal Traffic. The existing diurnal traffic density is one vehicle every 6.7 km (based on a speed of 50 km/h), the expected cumulative diurnal traffic density is one vehicle every 3.1 km.

MN50032-1: The increased ADT on this section of the road comprises of:

- *Peak Traffic: Resulting from two trips during the morning and afternoon peak, constitutes 11% of the additional traffic. The existing peak traffic density is one vehicle every 15 km (based on a speed of 50 km/h), the expected cumulative peak traffic density is one vehicle every 9.4 km.*
- *Diurnal Traffic: Resulting from thirty-four trips over an eight-hour period, constitutes 89% of the additional traffic. The existing diurnal traffic density is one vehicle every 15 km (based on a speed of 50 km/h), the expected cumulative diurnal traffic density is one vehicle every 6.6 km.*

MN50032-2: The increased ADT on this section of the road comprises of:

- *Peak Traffic: Resulting from twenty trips during the morning and afternoon peak, constitutes 54% of the additional traffic. The existing peak traffic density is one vehicle every 15 km (based on a speed of 50 km/h), the expected cumulative peak traffic density is one vehicle every 2.1 km;*
- *Diurnal Traffic: Resulting from thirty-four trips over an eight-hour period, constitutes 46% of the additional traffic. The existing diurnal traffic density is one vehicle every 15 km (based on a speed of 50 km/h), the expected cumulative diurnal traffic density is one vehicle every 6.6 km.*

Based on the traffic density provided above, for the cumulative impact during the construction phase of the development, the traffic density on the paved roads is no worse than one vehicle every 1.5 km, while the traffic density on the unpaved roads is no worse than one vehicle every 1.1 km.

The transportation of concrete, on the public roads, required for the casting of the WTG foundations, has been minimised as far as possible. These are isolated activities, that occur over a defined period that does not extend more than eight-hours. The hourly trips generated by the concrete trucks are in the order of ten return trips per hour. The interaction between public and construction vehicles will be addressed in a Traffic Management Plan that is to be compiled by the contractor once the contract has been finalised. The cumulative activities for each zone of the three Impofu Wind Farms are individually addressed below.

- *Impofu North Wind Farm (Zone 1): There are eleven WTG in this zone. The transportation of the concrete requires the concrete trucks to cross the DR01779-1/2. The existing traffic density is in the order of one vehicle every 3 km (based on speed of 100 km/h). The traffic density generated by the concrete trucks is in the order of one truck every 3 km (based on a speed of 30 km/h), the return truck will cross the road at the same time the delivery truck crosses the road. Speed reduction will be required on the DR01779 and a maned crossing is to be provided.*

- *Impofu North Wind Farm (Zone 3): There are ten WTG in this zone. The transportation of the concrete requires the concrete trucks to travel on DR01779-2 and DR01765-1. The traffic density on these roads are as follows:*
  - *DR01779-2: The existing traffic density on this road is one vehicle every 3 km (based on a speed of 100 km/h), the cumulative traffic density is expected to be one vehicle every 1.5 km;*
  - *DR01765-1: The existing traffic density on this road is one vehicle every 6.7 km (based on a speed of 50 km/h), the cumulative traffic density is expected to be one vehicle every 1.8 km.*
- *Impofu West Wind Farm (Zone 2): There are five WTG in this zone. The transportation of the concrete requires the concrete trucks to cross the MN50032. The existing traffic density on this road is one vehicle every 15 km (based on a speed of 50 km/h). The concrete trucks will cross the road at a traffic density of one vehicle every 4 km (based on a speed of 40 km/h), the return truck will cross the road at the same time the delivery truck crosses the road. A maned crossing is to be provided. At this intersection the impact on public traffic is categorised as a low impact.*
- *Impofu West Wind Farm (Zone 3): There are five WTG in this zone. The transportation of the concrete requires the concrete trucks to travel on MN50032-1. The existing traffic density on this road, is one vehicle every 15 km (based on a speed of 50 km/h), the cumulative traffic density is expected to be one vehicle every 2.1 km.*
- *Impofu West Wind Farm (Zone 4): There are five WTG in this zone. The transportation of the concrete requires the concrete trucks to travel on MN50032-1 and a portion of DR01774-1. The existing traffic density on these roads, is one vehicle every 15 km (based on a speed of 50 km/h), the cumulative traffic density is expected to be one vehicle every 2.1 km.*
- *Impofu West Wind Farm (Zone 5): There are two WTG in this zone. The transportation of the concrete requires the concrete trucks to travel on MN50032-1 and a portion of DR01764. The existing traffic density on these roads, is one vehicle every 15 km (based on a speed of 50 km/h), the cumulative traffic density is expected to be one vehicle every 2.1 km.*
- *Impofu East Wind Farm (portion of Zone 1): There are five WTG in this zone. The transportation of the concrete requires the concrete trucks to travel on a portion of DR01774-4. The existing traffic density on these roads, is one vehicle every 6.7 km (based on a speed of 50 km/h), the cumulative traffic density is expected to be one vehicle every 1.8 km.*
- *Impofu East Wind Farm (Zone 2 and 3): There are four WTG in zone 2 and seven WTG in zone 3. The transportation of the concrete requires the concrete trucks to travel on DR01774-4 and a portion of DR01763-1. The existing traffic density on these roads, is one vehicle every 6.7 km (based on a speed of 50 km/h), the cumulative traffic density is expected to be one vehicle every 1.8 km.*

Based on the traffic density, resulting from the delivery of concrete during the casting of the WTG foundation, the theoretical distance between vehicles on the road network is no worse than one vehicle every 1.5 km.

Traffic will be impacted on the individual days when the concrete foundations are to be cast. The total days affected by this activity, for all three of the Impofu Wind Farms, amounts to fifty-four days, which equates to approximately than 7% of the overall construction period of twenty-four months. If simultaneous casting of the WTG foundation on three Impofu Wind Farms occur the percentage would be reduced. The impact of this would have to be included in the TMP.

8.2 OPERATIONAL PHASE

The cumulative traffic volumes on specific roads, for both Peak Traffic and Diurnal Traffic, during the construction phase of this development are provided in Table 22.

The cumulative traffic volumes, during the operational phase, adopted in this document is based on the following:

- The simultaneous operation of; Impofu North Wind Farm, Impofu East Wind Farm and Impofu West Wind Farm; and
- The simultaneous operation and maintenance of the Oyster Bay Wind Farm.

Table 22 - Cumulative Operational Phase - Traffic Volumes

Roads	Day (split into three-time frames)		
	06:30 Morning Peak Traffic (vph)	07:30 Diurnal Traffic (vph)	16:30 Afternoon Peak Traffic (vph) 17:30
DR01761	2 (vph)		2 (vph)
DR01762	2 (vph)		2 (vph)
DR01763-1	2 (vph)	0.250 (vph)	2 (vph)
DR01763-4	2 (vph)		2 (vph)
DR01763-5	17 (vph)	0.250 (vph)	17 (vph)
DR01764		0.125 (vph)	
DR01765-1	7 (vph)	0.500 (vph)	7 (vph)
DR01765-3	19 (vph)	0.250 (vph)	19 (vph)
DR01774-1		0.125 (vph)	
DR01774-4	2 (vph)	0.375 (vph)	2 (vph)
DR01774-5	19 (vph)	0.250 (vph)	19 (vph)
DR01779-2	7 (vph)	0.500 (vph)	7 (vph)
DR01779-3	14 (vph)	0.250 (vph)	14 (vph)
MN50032-1		0.125 (vph)	
MN50032-2	7 (vph)	0.375 (vph)	7 (vph)
TR04403	14 (vph)	0.250 (vph)	14 (vph)

Based on the information provided in the table above there are no traffic volumes that are increased by more the fifty trips and hour, thus satisfying 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, during the operational phase, is in the order of:

- Peak Traffic: Thirty-five vehicles generate seventy trips a day on the road network. These trips are distributed over the various roads, with varying concentration. The maximum number of vehicles on any road, within a given hour, will never exceed nineteen.
- Diurnal Traffic: Approximately twenty-six trips a day are generated on the road network. These trips are distributed over the various roads, with varying concentration. The maximum number of trips on any road, within a given hour, will never exceed eight.

The assessment of the cumulative traffic impact generated during the construction phase, expressed as an "increase in ADT", is provided in Table 23.

Table 23 - Cumulative Operational Phase – Traffic Assessment

Road	AADT Design Basis	ADT Baseline	ADT Generated	Increased ADT in % of Baseline
DR01761	1 000	40	(4+0) = 4	10%
DR01762	1 000	90	(4+0) = 4	4%
DR01763-1	1 000	90	(4+4) = 8	9%
DR01763-4	1 000	90	(4+0) = 4	4%
DR01763-5	1 000	500	(34+4) = 38	8%
DR01764	500	40	(0+2) = 2	5%
DR01765-1	1 000	90	(14+8) = 22	24%
DR01765-3	500	90	(38+4) = 42	47%
DR01774-1	1 000	40	(0+2) = 2	5%
DR01774-4	1 000	90	(4+6) = 10	11%
DR01774-5	1 000	90	(38+4) = 42	47%
DR01779-2	1 000	400	(14+8) = 22	6%
DR01779-3	1 000	400	(28+4) = 32	8%
MN50032-1	500	40	(0+2) = 2	5%
MN50032-2	500	40	(14+6) = 20	50%
TR04403	1 000	400	(28+4) = 32	8%

The "increased ADT" on the paved roads (i.e. DR01779-1, DR01779-2, DR01779-3, MR00389 and TR04403) resulting from the cumulative impact is less than 8% (as highlighted in yellow, in Table 23) and is summarised as follows:

- Peak Traffic: On roads DR01779-3 and TR04403, fourteen trips generated during morning peak and afternoon peak, constituting approximately (28/32) 88% of the additional traffic on this road. The existing peak traffic density is one vehicle every 3 km (based on a speed of 100 km/h), the expected peak traffic density is one vehicle every 2.1 km.
- Diurnal Traffic: On road DR01779-2, eight trips over an eight-hour period, constitutes (8/22) 36% of the additional traffic on these roads. The existing diurnal traffic density is one vehicle every 3 km (based on a speed of 100 km/h), the expected diurnal traffic density is one vehicle every 2.9 km.

The "increased ADT", of the unpaved roads, greater than 40% (as highlighted in blue, in Table 23), is evaluated below;

DR01765-3 and DR01774-5: The increased ADT on these roads comprises of:

- Peak Traffic: Resulting from nineteen trips during the morning and afternoon peak, constituting approximately (38/42) 90% of the additional traffic. The existing peak traffic density is one vehicle every 6.7 km (based on a speed of 50 km/h), the expected cumulative peak traffic density is one vehicle every 1.9 km;
- Diurnal Traffic: Resulting from four trips over an eight-hour period, constituting approximately (4/42) 10% of the additional traffic. The existing diurnal traffic density is one vehicle every 6.7 km (based on a speed of 50 km/h), the expected cumulative diurnal traffic density is one vehicle every 6.3 km.

DR01765-3 and DR01774-5: The increased ADT on these roads comprises of:

- Peak Traffic: Resulting from nineteen trips during the morning and afternoon peak, constituting approximately (38/42) 90% of the additional traffic. The existing peak traffic density is one vehicle every 6.7 km (based on a speed of 50 km/h), the expected cumulative peak traffic density is one vehicle every 1.9 km;

- *Diurnal Traffic: Resulting from four trips over an eight-hour period, constituting approximately (4/42) 10% of the additional traffic. The existing diurnal traffic density is one vehicle every 6.7 km (based on a speed of 50 km/h), the expected cumulative diurnal traffic density is one vehicle every 6.3 km.*

MN50032-2: The cumulative increased ADT on this road comprises of:

- *Peak Traffic: Resulting from seven trips during the morning and afternoon peaks, constituting approximately (14/20) 70% of the additional traffic on this road. The existing peak traffic density is one vehicle every 15 km (based on a speed of 50 km/h), the expected cumulative peak traffic density is one vehicle every 4.8 km;*
- *Diurnal Traffic: Resulting from six trips over an eight-hour period, constituting approximately (6/20) 30% of the additional traffic on this road. The existing diurnal traffic density is one vehicle every 15 km (based on a speed of 50 km/h), the expected cumulative diurnal traffic density is one vehicle every 12.2 km.*

Based on the traffic density provided above, for the cumulative impact during the operational phase of the development, the traffic density on the paved roads is no worse than one vehicle every 2.1 km, while the traffic density on the unpaved roads is no worse than one vehicle every 1.9 km.

9 RISK AND IMPACTS

A development within an established environment can cause significant road impacts, particularly when a new development is introduced into the environment, which lead to an increase in traffic on public roads. The traffic volume will vary depending on the phase of the proposed development. More traffic is envisaged during the construction and decommissioning phases of a development, while an insignificant increase of traffic is envisaged during the operational phase of a development.

The more activities there are during any given period, the greater the possibility of an incident. Thus, there is more chance, that the identified risks will occur during the construction and decommissioning phase, than during the operational phase. However, the possibility of identified risks occurring during the operational phase must not be ruled-out.

With the increase of traffic along the roads, comes the potential increase in incidents. The incidents could vary from minor damage to 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 the 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.

9.1 RISKS

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

9.1.1 Reduced Visibility

There are numerous natural phenomena that could compromise the visibility of vehicle users, which increase the potential of accidents on the road network, 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, which could result in an incident;*
- *Inclement weather: Visibility is the main 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;*
- *Fog: Given the coastal conditions, the prevalence of coastal fog along the routes during the morning and afternoon peaks will occur and could lead to a road incident;*
- *Wind: Cross wind on large buses and transportation vehicles are susceptible to severe cross winds. The wind could either force the vehicle across the road into oncoming traffic or overturning the vehicle;*
- *Dust: 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, which could result in unfavourable consequences. The dust generated by road uses can adversely affect the quality of the milk generated by the farming community and needs to be avoided where possible.*

9.1.2 Pedestrians and Animals

The proposed development is to be constructed in the rural area, consisting predominately of dairy farms. Large portions of the area are undeveloped and is home to various species of antelope.

Stray livestock, wild animals and pedestrians are all potential risks to the road users. These threats are exacerbated by the uncontrolled growth of vegetation, along the verge of the various access routes. The thick vegetation along the verge of the road reduces the sight-distance of the driver and prevent the use of the road shoulder. The reduced sight-distance adversely affect the response time of drivers when an animal or pedestrian step into the road. If evasive action is taken by drivers, 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 certain fatality of the animal or pedestrian.

Mitigation measures are limited to provide drivers with advance driver training and train drivers 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.

9.2 IMPACTS

The road network within the study area is limited, offering very little opportunity of selecting alternative routes. All routes evaluated for this development are existing roads and no new roads need to be constructed.

The section addresses the impacts for the no-go scenario and the combined effect of the various phases of the wind farms within the study area.

The most significant impacts considered in this document is the:

- *Increased traffic volumes and associated incidents; and*
- *Increased traffic volumes resulting in deterioration of road conditions*

The impacts, as identified above, were assessed using an assessment tool provided by Aurecon South Africa (Pty) Ltd.

9.2.1 Status quo

If a no-go scenario was to be considered, given the current condition of the roads and lack of road maintenance due to budgetary constraints within various spheres of government, the community would be worse off.

The developer has a social obligation to maintain the roads used during the various phases of the development.

Thus, a no-go scenario would be a missed opportunity to uplift the community by maintaining the road network, used by the developer.

The assessment of this impact is contained in Table 24.

Table 24 - Impacts resulting from Road Condition – Status Quo

Impact Phase: *Status Quo*							
Potential impact description: *Deterioration of the road network due to existing traffic volumes.*							
Mitigation	***Nature***	***Duration***	***Extent***	***Intensity***	***Probability***	***Confidence***	***Significance***
Without	*Negative*	*Permanent*	*Regional*	*Low*	*Highly Probable*	*Medium*	*Moderate negative*
With	*Positive*	*Permanent*	*Local*	*Low*	*Probable*	*Medium*	*Minor positive*
Can the impact be reversed?			*Yes*				
Will the impact cause irreplaceable loss of resources?			*No*				
Can the impact be avoided manged or mitigated?			*Yes, impact can be avoided, manged and mitigated*				
Mitigation measures to reduce of enhance opportunities: *Regular maintenance of the road. However, due to budget constraints within various spheres of government, regular maintenance is not undertaken, and as such ongoing degradation of the road network will prevail.* ***The effects of mitigation assessment are only applicable if the project is approved and the developer contributes to ongoing maintenance of the local roads.***							
Comments: *The degradation of the road network will be retarded if the developer contributes to the maintenance of the local roads. The extent differs from regional to local for the following reason. The road authority is responsible for a entire area, while the developer would be committed to maintaining the local roads.*							

9.2.2 Construction Phase

The impact of the construction phase considers the cumulative impact of the simultaneous construction of the three Impofu Wind Farms and the operation of Gibson Bay Wind Farm, Kouga Wind Farm and Oyster Bay Wind Farm. The operation of the other wind farms in the area does not impact on the road network within the study area.

Road Condition

During the construction phase of the development, there will be an increase in the traffic volumes on the local road network. The increase traffic volumes will place an additional burden on the roads within the study area.

The paved roads, which service this development are narrow, with overgrown shoulders. The roads are overstressed with significant signs of degradation, including cracking and edge breaks.

The unpaved roads are in a poor to very poor condition, resulting from nominal to no maintenance been undertaken.

Mitigation of this impact is regular maintenance of the roads by the local roads' authorities. However, due to budget constraints it is unlikely that the necessary road maintenance will be undertaken.

The assessment of this impact is contained in Table 25.

Table 25 - Impacts resulting from Road Condition – Construction Phase

Impact Phase: Construction Phase							
Potential impact description: Deterioration of the road network due to the increase in traffic volumes.							
Mitigation	**Nature**	**Duration**	**Extent**	**Intensity**	**Probability**	**Confidence**	**Significance**
Without	Negative	Short term	Local	Moderate	Probable	Medium	Minor negative
With	Positive	Short term	Local	Low	Probable	Medium	Minor positive
Can the impact be reversed?			Yes				
Will the impact cause irreplaceable loss of resources?			No				
Can the impact be avoided manged or mitigated?			Yes, impact be avoided manged and mitigated				
Mitigation measures to reduce of enhance opportunities: Create local WhatsApp Group and post notices of road conditions and propose alternatives. Developer to contribute to the maintenance of the public roads in the area during construction phases of the development A photographic record of the road condition should be maintained throughout the various phases of the development. This provides an objective assessment and mitigates any subjective view from road users. Upgrade unpaved roads to suitable condition for proposed construction vehicles; Ensure that the roads are left in same or better condition, post-construction.							
Comments: Intensity: Moderate – due to risk of mechanical damage to vehicles. Low – due to the reduced risk of mechanical damage to vehicles.							

Traffic Volume

During the construction phase of the development, there will be traffic-related impacts on the local road network. The increase traffic volumes will increase the potential of incidents on the roads within the study area.

Based on experience of similar developments within the area, the peak traffic will be more affected than during the rest of the day.

Most of the traffic related to the proposed development is associated with the transportation of the site personnel to and from the site, making use of light vehicles. The traffic related to the delivery of material and equipment to site is larger but less frequent as this traffic is dispersed over a longer period. Traffic relating to the concrete pouring of the WTG foundation are addressed separately.

The assessment of this impact is contained in Table 26.

Table 26 - Impacts resulting from Traffic Volume – Construction Phase

Impact Phase: Construction Phases							
Potential impact description: The increase traffic volumes will increase the potential of incidents on the roads within the study area.							
Mitigation	**Nature**	**Duration**	**Extent**	**Intensity**	**Probability**	**Confidence**	**Significance**
Without	Negative	Short term	Local	Moderate	Probable	Medium	Minor - negative
With	Negative	Short term	Local	Moderate	Unlikely	Medium	Negligible - negative
Can the impact be reversed?			Yes				
Will the impact cause irreplaceable loss of resources?			No. Although there is always the possibility of a fatal accident.				

Can the impact be avoided manged or mitigated?	*Yes, impact can be avoided manged and mitigated*

Mitigation measures to reduce of enhance opportunities:

Post relevant road signage along affected routes;

Create local WhatsApp Group, notifying users of expected deliveries and propose alternative routes;

Transport Management Plan, this is to be compiled once the contractor has been appointed and all the relevant details of the construction process are known. The TMP needs to address, inter alia:

- clearly define route to site for specific vehicles needed to transport equipment and materials'

- schedule delivery to avoid local congestion;

Ensure all vehicles are roadworthy, visible, properly marked, and operated by an appropriate licenced operator.

Comments:

Intensity: Moderate – due to the negligible increase in traffic volumes

Delivery of Concrete

The transportation of concrete, on the public roads, required for the casting of the WTG foundations, has been minimised as far as possible. However, due to the layout of the WTG on the sites, traversing and travelling on the existing road network is unavoidable. The casting of the WTG foundations are isolated activities, that occur over a very short period, which normally does not extend more than eight-hours. The assessment of this impact is contained in Table 27.

Table 27 - Impacts resulting from Delivery of Concrete – Construction Phase

Impact Phase: *Construction Phase*

Potential impact description: *Increased traffic volumes resulting from the delivery of concrete for the casting of the WTG foundation.*

Mitigation	Nature	Duration	Extent	Intensity	Probability	Confidence	Significance
Without	Negative	Immediate	Local	Extremely High	Definite	High	Moderate - negative
With	Negative	Immediate	Local	Extremely High	Highly probable	High	Minor - negative

Can the impact be reversed?	*Yes*
Will the impact cause irreplaceable loss of resources?	*No. Although there is always the possibility of a fatal accident.*
Can the impact be avoided manged or mitigated?	*Yes, impact can be manged and mitigated*

Mitigation measures to reduce of enhance opportunities:

Transport Management Plan, this is to be compiled once the contractor has been appointed and all the relevant details of the construction process are known. The TMP needs to address, inter alia:

- clearly define route to site for specific vehicles needed to transport equipment and materials'

- schedule delivery to avoid local congestion;

Create local WhatsApp Group, notifying users of expected deliveries and propose alternative routes;

Minimise non-essential deliveries during the casting of WTG foundations.

Temporary close roads where possible.

Provide advance driver training to key personnel, including truck drivers.

Where trucks cross public roads, provide maned crossing, post relevant road signage along affected routes and reduce speed limit on the relevant section of the road.

Ensure all vehicles are roadworthy, visible, properly marked, and operated by an appropriate licenced operator.

Comments:

There is a notable increase in traffic along specific routes over a short period

9.2.3 Operational Phase

The impact of the operational phase considers the cumulative impact of the simultaneous operation of the three Impofu Wind Farms and the operation of Gibson Bay Wind Farm, Kouga Wind Farm and Oyster Bay Wind Farm. The operation of other wind farms in the area does not impact on the road network within the study area.

Road Condition

During the operational phase of the development, there will be a reduced increase in the traffic volumes on the local road network. The traffic volumes will be limited to peak traffic with nominal diurnal traffic generated. The size of the vehicle will be limited to light delivery vehicles with occasional heavy vehicles, which will induce a minor burden on the roads within the study area.

Mitigation of this impact would be regular maintenance of the roads by the local roads' authorities. However, due to budget constraints it is unlikely that the necessary road maintenance will be undertaken.

The assessment of this impact is contained in Table 28.

Table 28 - Impacts resulting from Road Condition – Operational Phase

Impact Phase: Operational Phase							
Potential impact description: Deterioration of the road network due to the increase in traffic volumes.							
Mitigation	**Nature**	**Duration**	**Extent**	**Intensity**	**Probability**	**Confidence**	**Significance**
Without	Negative	Permanent	Local	Moderate	Probable	Medium	Minor negative
With	Positive	Permanent	Local	Low	Probable	Medium	Minor positive
Can the impact be reversed?			Yes				
Will the impact cause irreplaceable loss of resources?			No				
Can the impact be avoided manged or mitigated?			Yes, impact be avoided manged and mitigated				
Mitigation measures to reduce of enhance opportunities: Create local WhatsApp Group and post notices of road conditions and propose alternatives. Developer to contribute to the maintenance of the public roads in the area during operation phases of the development A photographic record of the road condition should be maintained throughout the operational phase of the development. This provides an objective assessment and mitigates any subjective view from road users. Upgrade unpaved roads to suitable condition for proposed construction vehicles; Ensure that the roads are left in same or better condition, post-construction.							
Comments: Intensity: Moderate – due to risk of mechanical damage to vehicles. Low – due to the reduced risk of mechanical damage to vehicles.							

Traffic Volume

During the operational phase of the development, there will be a nominal increase in traffic on the local road network. The traffic volumes will be limited to peak traffic with minimal diurnal traffic generated. Although, there is a nominal increase in the traffic volumes there is always a potential of incidents on the roads within the study area.

The assessment of this impact is contained in Table 28.

Table 29 - Impacts resulting from Traffic Volume – Operational Phase

Impact Phase: Operational Phases							
Potential impact description: The increase traffic volumes will increase the potential of incidents on the roads within the study area.							
Mitigation	**Nature**	**Duration**	**Extent**	**Intensity**	**Probability**	**Confidence**	**Significance**
Without	Negative	Permanent	Local	Moderate	Probable	Medium	Minor - negative
With	Negative	Permanent	Local	Moderate	Unlikely	Medium	Negligible - negative
Can the impact be reversed?			Yes				
Will the impact cause irreplaceable loss of resources?			No. Although there is always the possibility of a fatal accident.				
Can the impact be avoided manged or mitigated?			Yes, impact can be avoided manged and mitigated				
Mitigation measures to reduce of enhance opportunities:							

Post relevant road signage along affected routes; *Create local WhatsApp Group, notifying users of expected deliveries and propose alternative routes;* *Transport Management Plan is to be revised for the operational phase of the development;* *Ensure all vehicles are roadworthy, visible, properly marked, and operated by an appropriate licenced operator.*
Comments: *Intensity: Moderate – due to the negligible increase in traffic volumes*

10 CONCLUSION AND RECOMMENDATIONS

Red Cap is proposing to develop three wind farms and associated infrastructure, north of Oyster Bay within the Sarah Baartman District Municipality of the Eastern Cape. These proposed wind farms are; the Impofu North Wind Farm, the Impofu East Wind Farm and the Impofu West Wind Farm and are collectively referred to as the Impofu Wind Farms.

This report represents the traffic impact assessment for Impofu West Wind Farm.

10.1 CONCLUSION

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

Assessment Assumptions

- *A twenty-four-month construction phase is expected.*
- *The traffic volumes resulting from the Operational Phase of the Kouga Wind Farm, Tsitsikamma Community Wind Farm and Gibson Bay Wind Farm, are all included in the 2017 baseline ADT.*
- *Construction phase of the Oyster Bay Wind Farm due to commence in 2019.*
- *Cumulative construction phase includes simultaneous construction phase of the three Impofu Wind Farms and operational phase of Oyster Bay Wind Farm.*
- *Cumulative operational phase includes simultaneous operation of the three Impofu Wind Farms and the Oyster Bay Wind Farm.*
- *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 existing condition of the paved roads are fair to poor, while the unpaved roads, are poor to very poor. The condition of these roads is expected to further deteriorate due to budgetary constraints within various spheres of government, nominal maintenance is undertaken on the road network.*
- *The expected traffic increase on the road network during the construction phase will lead to greater wear and tear of the roads but will not have undue detrimental impact on the structure of the roads. It is **strongly suggested** that the developer contribute towards the maintenance of the public road network affected by the development. It is proposed that the developer contribute to the maintenance of the road network, to the order of R 2 million during the construction period and R 1 million per year during operational phase, 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

- *Previously established transportation routes from the Ngqura Container Terminal, near Port Elizabeth, to the existing wind farms in the study area, will 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 transportation vehicles to be used by the appointed logistics company.*
- *All site entrances from public roads need to be in line with geometric standards and approved by the relevant road's authority.*
- *All 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 road's authorities.*
- *No anomalies associated with the proposed transportation routes were observed or identified that will compromise the proposed development. However, this will have to be confirmed by the logistics contractor once the preferred WTG has been selected.*

Traffic Volumes

- *The most significant impact on traffic volumes is as a result of commuting personnel to and from site, in the morning and in the afternoon;*
- *At no point during the construction or operational phases is the traffic volume on the various roads exceed fifty trips per hour, which is the threshold for a detailed Traffic Impact Assessment.*
- *The traffic volume generated during peak construction phase of the development is in the order of:*
  - *Peak Traffic: Twenty-two vehicles generate forty-four trips a day on the road network. These trips are distributed over the various roads, with varying concentration. The maximum number of vehicles on any road, within a given hour, will never exceed twenty.*
  - *Diurnal Traffic: Approximately fifty trips a day are generated on the road network. These trips are distributed over the various roads, with varying concentration. The maximum number of vehicles on any road, within a given hour, will never exceed seven.*
  - *The traffic flow, of concrete trucks, resulting from placing of concrete is in the order of twenty vehicles per hour (dual direction). Thus, over an eight-hour period, one-hundred and sixty trips will be generated.*
- *The cumulative traffic volume generated, during the construction phase, which includes the simultaneous construction of the three Impofu Wind Farms and operation of the Oyster Bay Wind Farm, is in the order of:*
  - *Peak Traffic: Eighty vehicles generate one-hundred-and-sixty trips a day on the road network. These trips are distributed over the various roads, with varying concentration. The maximum number of vehicles on any road, within a given hour, will never exceed thirty-seven.*
  - *Diurnal Traffic: Approximately one-hundred-and-sixty-six trips a day are generated on the road network. These trips are distributed over the various roads, with varying concentration. The maximum number of trips on any road, within a given hour, will never exceed ten.*

- *The cumulative traffic volume generated, during the operational phase, which includes the simultaneous operation of the three Impofu Wind Farms and the Oyster Bay Wind Farm, is in the order of:*
  - *Peak Traffic: Thirty-five vehicles generate seventy trips a day on the road network. These trips are distributed over the various roads, with varying concentration. The maximum number of vehicles on any road, within a given hour, will never exceed nineteen.*
  - *Diurnal Traffic: Approximately twenty-six trips a day are generated on the road network. These trips are distributed over the various roads, with varying concentration. The maximum number of trips on any road, within a given hour, will never exceed eight.*
- *Base on the Traffic Density, the theoretical distance between vehicles on the road network is never less than one kilometre, in the cumulative scenario (with construction being the worst-case scenario).*

Safety

- *Fog is a natural phenomenon that will reduce visibility of road users.*
- *This is an agriculture area, with many dairy farms, stray animals and cattle crossing the road, is a common occurrence, preventative measures will need to be taken to avoid casualties.*
- *Excessive fine and loose material was observed along the road creating visibility concerns in dry weather and slippery conditions in wet weather;*
- *Vegetation encroaching on the road along specific portions of the road network, concealing road traffic signage and restricting visibility. The vegetation needs to be cleared to ensure safety for vehicles approaching the access intersection.*
- *Additional vehicles on the road will be subject to these hazards, with a potential for an increase in incidents.*

10.2 RECOMMENDATIONS

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

- *The developer shall contribute to the maintenance of the road network, affected by the development, to the order of R 2 million during the construction period and R 1 million per year during operational phase, commencing the year after successfully achieving Commercial Operation.*
- *A Traffic Management Plan (TMP) is required. The TMP is to be compiled once the contractor has been appointed and all the relevant details of the construction process are known. The TMP needs to address:*
  - *outline specific traffic management measures across all phases of the development;*
  - *include measures to minimise impacts on existing road users;*
  - *define the repair and maintenance strategy to be adopted during the various phases of the development;*
  - *schedule 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.*
- *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.*
- *Temporary signs warning motorists of construction vehicles should be erected on the approaches to the access road.*
- *Vegetation should be cleared on the approaches to the intersections.*
- *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 implementation of the relevant transport impact mitigations measures. Which includes inter alia;*
  - *Provide regular information to the local community and individuals on the volumes of traffic particularly heavy vehicles, anticipated on the road during construction and operation phases.*

Taking the above findings into consideration it can be concluded that the development of the Impofu West Wind Farm will have a notable increase in traffic volumes on the road network during the construction phase of this development. However, this report has assessed the impact of this additional traffic on the surrounding road network and found that the existing road network is currently operating at well below its capacity and provides an adequate level of service, although the road network is not well maintained due to budgetary constraints within various spheres of government. The increase in traffic volumes will lead to a greater wear and tear, especially during construction, but will not have undue detrimental impact on the road network within the study area.

It is the reasoned opinion of the author that the development of the Impofu West Wind Farm can be approved, from a traffic and transportation perspective, since there are no constraints or notable impacts that would jeopardise the implementation of the development, subject to the specific requirements included within this report.

11 APPENDICES

Appendix 1: Declaration

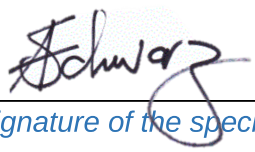
Appendix 2: NEMA Requirements for Specialist Reports

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 have 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 have 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:

27th February 2019
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 4.2.1
(cA)	an indication of the quality and age of the base data used for the specialist report;	Section 6.1
(cB)	a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 7 & 8
(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 4.4
(f)	details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 5.1
(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 4.5
(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity, or activities;	Section 9
(k)	any mitigation measures for inclusion in the EMPr;	Section 10.2
(l)	any conditions for inclusion in the environmental authorisation;	Section 10.2
(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	NA
(n)	a reasoned opinion-	Section 10.2
	(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

APPENDIX 3 – CURRICULUM VITAE

ATHOL SCHWARZ Pr Tech Eng

Independent Consultant

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 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 Consultant 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

- *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 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 consultant services and Traffic Impact Assessment*
- *juwi Solar ZA Construction 3 (Pty) Ltd - Konkoonsies, 9.7 MW PV Plan – Pofadder, Northern Cape - civil consultant services and Traffic Impact Assessment*
- *juwi Renewable Energies (Pty) Ltd - Namies Wind Energy Facility, near Aggeneys, Northern Cape, consist of between 46 and 58 wind turbine generators - transportation route assessment*
- *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*
-

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*

ATHOL SCHWARZ Pr Tech Eng

Independent Consultant

- *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 - consultant services regarding access and internal gravel roads*
- *Barrick Africa (Pty) Ltd - Buzwagi Gold Mine in Tanzania – 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*
- *IBERDROLA - Klip Heuwel 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 consultant 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*