Appendix H.9

TRAFFIC ASSESSMENT

Dalmanutha Wind (Pty) Ltd

DALMANUTHA WIND ENERGY FACILITY, MPUMALANGA

Transport Impact Assessment

41103722 DALMANUTHA TIA
MAY 2023

PUBLIC

Dalmanutha Wind (Pty) Ltd

DALMANUTHA WIND ENERGY FACILITY, MPUMALANGA

Transport Impact Assessment

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Dalmanutha Wind (Pty) Ltd

DALMANUTHA WIND ENERGY FACILITY, MPUMALANGA

Transport Impact Assessment

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CONTENTS

1	**INTRODUCTION**	**1**
1.1	**BACKGROUND**	**1**
1.2	**SCOPE**	**1**
1.3	**PREVIOUS SUBMISSIONS**	**2**
2	**PROJECT DESCRIPTION**	**4**
2.1	**TYPE AND EXTENT OF THE DEVELOPMENT**	**4**
2.2	**PROJECT INFRASTRUCTURE**	**5**
	ALTERNATIVE 1 WEF	5
	ALTERNATIVE 2 WEF & SEF	7
2.3	**PHASING OF THE DEVELOPMENT**	**10**
2.4	**APPROVAL OF SUBMISSIONS**	**10**
3	**DATA COLLECTION**	**12**
3.1	**SITE VISITS**	**12**
3.2	**ROAD NETWORK & MASTER PLANNING**	**12**
3.3	**LATENT DEVELOPMENTS**	**12**
4	**SITE LOCATION & SURROUNDING ROAD NETWORK**	**14**
4.1	**SITE LOCATION**	**14**
4.2	**EXTERNAL ROAD NETWORK**	**17**
4.3	**SITE ACCESS**	**18**
	GENERAL NOTES	20
5	**PARKING ASSESSMENT**	**23**
6	**PUBLIC & NON-MOTORISED TRANSPORT ASSESSMENT**	**25**

7 TRAFFIC FLOWS & TRIP GENERATION 27

7.1 EXISTING TRAFFIC FLOWS 27

7.2 LATENT TRAFFIC 27

7.3 ALTERNATIVE 1 - DEVELOPMENT TRIP GENERATION 28

CONSTRUCTION PHASE TRAFFIC 28

Trip generation summary – Construction Phase 31

OPERATIONAL PHASE TRAFFIC 32

DECOMMISIONING PHASE TRAFFIC 32

7.4 ALTERNATIVE 2 - DEVELOPMENT TRIP GENERATION 32

CONSTRUCTION PHASE TRAFFIC 32

Trip generation summary – Construction Phase 37

OPERATIONAL PHASE TRAFFIC 37

DECOMMISIONING PHASE TRAFFIC 38

7.5 CAPACITY ANALYSIS 38

7.6 INTERSECTION SAFETY ASSESSMENT 39

N4 / D1039 39

N4 / D2524 39

N4 / Berg-en-Dal Memorial access 40

8 ENVIRONMENTAL IMPACT ASSESSMENT: TRANSPORT 43

8.1 IMPACT ASSESSMENT METHODOLOGY 43

INTRODUCTION 43

ASSESSMENT OF IMPACTS AND MITIGATION 43

IMPACT MITIGATION 45

8.2 ASSESSMENT RESULTS 46

8.3 SUMMARY 51

Construction phase 51

Operation phase 51

9 CUMULATIVE TRANSPORT IMPACT ASSESSMENT 53

9.1 BACKGROUND 53

9.2 POTENTIAL DEVELOPMENTS 53
9.3 CUMULATIVE TRANSPORT IMPACTS 55
10 CONCLUSIONS & RECOMMENDATIONS 57
BIBLIOGRAPHY 61

TABLES

Table 2-1: Affected Farm Portions 4
Table 2-2: Alternative 1 WEF - technical details and associated Infrastructure 5
Table 2-3: Alternative 2 WEF & SEF - technical details and associated Infrastructure 7
Table 7-1: Total peak hour trip generation construction staff – Dalmanutha WEF Alternative 1 29
Table 7-2: Estimated maximum material delivery trip generation – Dalmanutha WEF Alternative 1 31
Table 7-3: Total maximum peak hour trip generation – Dalmanutha WEF Alternative 1 31
Table 7-4: Total peak hour trip generation construction staff - Dalmanutha Alternative 2 WEF & SEF 33
Table 7-5: Estimated maximum material delivery trip generation – Alternative 2 WEF 35
Table 7-6 Estimated maximum material delivery trip generation - Alternative 2 SEF 37
Table 7-7: Total max. peak hour trip generation – Dalmanutha Alternative 2 WEF & SEF 37
Table 8-1: Impact assessment criteria and scoring system 44
Table 8-2: Impact assessment results – Construction phase Alternative 1 and Alternative 2 47
Table 8-3: Impact assessment results – Operation phase Alternative 1 and Alternative 2 49

FIGURES

Figure 4-1 Locality map – Alternative 1 & 2 15
Figure 4-2 Alternative 1 - Affected farm portions & turbine locations (No. 70) 15

Figure 4-3 Alternative 2 - Affected farm portions, turbine locations (No. 44) & solar fields 16
Figure 4-4 National and Provincial road network & site location 17
Figure 4-5 Alternative 1 - On-site access roads (provisional alignments) & farm portions 19
Figure 4-6 Alternative 2 - On-site access roads (provisional alignments) & farm portions 20
Figure 4-7 Access via Berg-en-Dal memorial access road 21
Figure 7-1 Traffic count locations 27
Figure 7-2 N4 westbound approach to the D1039 junction 39
Figure 7-3 N4 westbound approach to the D2524 junction 40
Figure 7-4 N4 eastbound approach to the Berg-en-Dal junction 41
Figure 8-1 Impact mitigation sequence 46
Figure 9-1 Location of the Dalmanutha West WEF and Dalmanutha Facility 54
Figure 9-2 Location of the proposed Elispec prospecting site 55

1

INTRODUCTION

1 INTRODUCTION

1.1 BACKGROUND

WSP Group Africa (Pty) Ltd (WSP) has been appointed by Dalmanutha Wind (Pty) Ltd to undertake a Transport Scoping Report and Transport Impact Assessment (TIA) for the proposed Dalmanutha Wind Energy Facility (WEF) ('Project'), to be located south-east of Belfast, in the eMakhazeni Local Municipality, Mpumalanga Province.

The developer is considering two layout and technology alternatives for the Project, namely:

- Alternative 1: WEF: 300 megawatts (MW) with a maximum of 70 turbines.
- Alternative 2: WEF & Solar Energy Facility (SEF): 300 megawatts (MW) with a maximum of 44 turbines and a solar PV field of 160ha.

This report is the full Transport Impact Assessment in support of the Environmental Impact Assessment for the Dalmanutha WEF: Alternative 1 and Alternative 2.

1.2 SCOPE

The Scope of the TIA is broadly based on the requirements of the South Africa Committee of Transport Officials, South African Traffic Impact and Site Traffic Assessment Manual, TMH16, Vol. 1, Version 1, August 2012. Note that a full TIA, including traffic surveys and capacity analysis of affected intersections, is excluded.

The scope covers the following:

- Previous traffic related studies, submissions and approvals (if relevant).
- Description of the extent of the development, including location and land-use/s.
- Description of the phased development of the facility (if applicable).
- Record of site visits.
- Description of the local and potentially affected road network, including planning and comment on the road condition, where information is available.
- Assessment of the required site access, parking and internal circulation.
- Assessment of expected trip generation (construction & operational phases).
- Assessment of public transport and non-motorised transport needs
- Recommendations and conclusions with regards to the required traffic and transport related mitigation required.
- Assessment of the transport related environmental impacts and proposed mitigation required.
- Description of latent development in the vicinity of the facility that may also have an impact on the local road network.

- Assessment of the cumulative transportation impact of the latent developments in the study area.

Note that a Traffic Impact Assessment of the associated electrical grid infrastructure has been excluded from this study, as it does not require a separate transportation assessment. The reason for this is that the expected trip generation to construct this infrastructure will be negligible, and the traffic related impact will therefore also be negligible.

1.3 PREVIOUS SUBMISSIONS

The Transport Scoping Report for the combined Dalmanutha WEF, dated 1 December 2022, has been made public for comment as part of the Project's Environmental Scoping phase.

2

PROJECT DESCRIPTION

2 PROJECT DESCRIPTION

2.1 TYPE AND EXTENT OF THE DEVELOPMENT

The Dalmanutha WEF or WEF & SEF will be located approximately 7km southeast of Belfast in the Emakhazeni Local Municipality, Mpumalanga Province. Site access is proposed via National Road N4, which is located along the northern border of the site. The Dalmanutha WEF or WEF & SEF will be located over eighteen farm portions covering approximately 8 000ha. The portions are listed in Table 2-1.

Table 2-1: Affected Farm Portions

Farm No.	Portion No.	Farm name
378	1	Berg-en-Dal
378	9	Berg-en-Dal
384	7	Vogelstruispoort
385	6	Waaikraal
385	7	Waaikraal
385	8	Waaikraal
385	10	Waaikraal
385	12	Waaikraal
385	13	Waaikraal
385	24	Waaikraal
403	3	Leeuwkloof
403	4	Leeuwkloof
412	1	Welgevonden
404	1	Leeuwkloof
404	2	Leeuwkloof
405	3	Geluk
467	0	Camelia

2.2 PROJECT INFRASTRUCTURE

ALTERNATIVE 1 WEF

A summary of the details of the WEF only and associated infrastructure is included in Table 2-2.

Table 2-2: Alternative 1 WEF - technical details and associated Infrastructure

Component	Description / Dimensions
Extent	8 000ha
Buildable area	400 ha
Capacity	Up to 300MW
Number of turbines	Up to 70
Turbine hub height	Up to 200m
Rotor Diameter	Up to 200m
Tip Height	Up to 300m
Foundation	• Approximately 25m diameter x 3m deep = +/- 1500m³ concrete. A maximum of 2500m³ of concrete per foundation was used in this assessment, as the diameter and depth may vary due to soil conditions. • Dimensions may vary as required by the geotechnical conditions. • Excavation approximately 2 200m^3, in sandy soils due to access requirements and safe slope stability requirements.
Turbine Hardstand	• Hardstand does not require concrete. Area needed will be approximately 50mx40m = 2000m^2.
Tower Type	• Steel or concrete towers can be utilised at the site. Alternatively, the towers can be of a hybrid nature, comprising concrete towers and top steel sections.
Operations and Maintenance (O&M) building footprint:	• Located near the on-site substation. • Typical areas include: o Operations building – 20m x 10m = 200m² o Workshop – 15m x 10m = 150m² o Stores - 15m x 10m = 150m² o Refuse area for temporary waste storage and septic/conservancy take with portable toilets to service the ablution facility. • The total combined area of the buildings will not exceed 5 000m^2.
Construction camp laydown and temporary cement batching plant, wind tower factory and yard:	• Temporary laydown or staging area -Typical area 220m x 100m = 22000m².

Component	Description / Dimensions
	• Laydown area could increase to 30 000m² for concrete towers, should they be required. • Sewage: septic and/or conservancy tanks and portable toilets. • Temporary cement batching plant, wind tower factory & yard of approximately 7ha, comprising amongst others, a concrete storage area, batching plant, electrical infrastructure and substation, generators and fuel stores, gantries and loading facilities, offices, material stores (rebar, concrete, aggregate and associated materials), mess rooms, workshops, laydown and storage areas, sewage and toilet facilities, offices and boardrooms, labour mess and changerooms, mixers, moulds and casting areas, water and settling tanks, pumps, silos and hoppers, a laboratory, parking areas, internal and access roads. • Gravel and sand will be stored in separate heaps whilst the cement will be contained in a silo. • The maximum height of the silo will be 20m.
Internal and Access Roads:	• The Project site can be accessed via either the tarred R33 or the N4 national road which run along the northern and western boundaries of the site respectively. • There is an existing road that goes through the land parcels to allow for direct access to the project development area. • Internal and access roads with a width of between 8m and 10m, which can be increased to approximately 12m on bends. • The roads will be positioned within a 20m wide corridor to accommodate cable trenches, stormwater channels and bypass /circles of up to 20m during construction. • Length of the internal roads will be approximately 60km.
Cables	• The medium voltage collector system will comprise of cables up to and including 33kV that run underground, except where a technical assessment suggests that overhead lines are required, connecting the turbines to the on-site IPP substation. • Over the fence 132kV cable to connect the onsite IPP substation to the Common Collector Switching Station.
Independent Power Producer (IPP) site substation and battery energy storage system (BESS):	• IPP portion on-site substation of up to 4ha. The substation will consist of a high voltage substation yard to allow for multiple up to 132kV feeder bays and transformers, control building, telecommunication infrastructure, access road, etc. • The BESS storage capacity will be up to 300MW/1200 megawatt-hour (MWh) with up to four hours of storage. It is proposed that Lithium Battery Technologies, such as Lithium Iron Phosphate, Lithium Nickel Manganese Cobalt oxides or Vanadium Redox flow technologies will be considered as the preferred battery technology; however, the specific technology will only be determined following Engineering, Procurement, and Construction (EPC) procurement. • The main components of the BESS include the batteries, power conversion system and transformer which will all be stored in various rows of containers.

Component	Description / Dimensions
Associated Infrastructure	• Fencing of up to 4m high around the construction camp and lighting. • Lightning protection. • Telecommunication infrastructure. • Stormwater channels. • Water pipelines. • Offices. • Operational control centre. • Operation and Maintenance Area / Warehouse/workshop. • Ablution facilities. • A gatehouse. • Control centre, offices, warehouses. • Security building. • A visitor's centre. • Substation building.

ALTERNATIVE 2 WEF & SEF

A summary of the details of the WEF and SEF and associated infrastructure is included in Table 2-3.

Table 2-3: Alternative 2 WEF & SEF - technical details and associated Infrastructure

Component	Description / Dimensions
Extent	8 800ha
Buildable area	400 ha (WEF) and 160ha (SEF)
Capacity	Up to 300MW
Number of turbines	Up to 44
Turbine hub height	Up to 200m
Rotor Diameter	Up to 200m
Tip Height	Up to 300m
Foundation	• Approximately 25m diameter x 3m deep = +/- 1500m^3 concrete. A maximum of 2500m^3 of concrete per foundation was used in this assessment, as the diameter and depth may vary due to soil conditions. • Dimensions may vary as required by the geotechnical conditions. • Excavation approximately 2 200m^3, in sandy soils due to access requirements and safe slope stability requirements.
Turbine Hardstand	• Hardstand does not require concrete. Area needed will be approximately 50mx40m = 2000m^2.

Component	Description / Dimensions
Tower Type	• Steel or concrete towers can be utilised at the site. Alternatively, the towers can be of a hybrid nature, comprising concrete towers and top steel sections.
Solar PV fields	• Solar PV array comprising PV modules (solar panels), which convert the solar radiation into direct current (DC). • PV panels will be up to a height of 6m (when the panel is horizontal) and will be mounted on fixed tilt, single axis tracking or dual axis tracking mounting structures. • Monofacial or bifacial Solar PV Modules are both being considered. • Inverters, transformers and other required associated electrical infrastructure and components.
Operations and Maintenance (O&M) building footprint:	• Operations and maintenance (O&M) building infrastructure will be required to support the functioning of the WEF and SEF and for services required by operations and maintenance staff. The O&M building infrastructure will be near the on-site substation and will include: o Operations building of approximately 200m² o Workshop and stores area of approximately 150m² each o Stores area of approximately 150m². o Refuse area for temporary waste and septic/ conservancy tanks with portable toilets to service ablution facilities. • The total combined area of the buildings will not exceed 5 000m².
Construction camp laydown and temporary cement batching plant, wind tower factory and yard:	• Temporary laydown or staging area -Typical area 220m x 100m = 22000m². • Laydown area could increase to 30 000m² for concrete towers, should they be required. • Sewage: septic and/or conservancy tanks and portable toilets. • Temporary cement batching plant, wind tower factory & yard of approximately 7ha, comprising amongst others, a concrete storage area, batching plant, electrical infrastructure and substation, generators and fuel stores, gantries and loading facilities, offices, material stores (rebar, concrete, aggregate and associated materials), mess rooms, workshops, laydown and storage areas, sewage and toilet facilities, offices and boardrooms, labour mess and changerooms, mixers, moulds and casting areas, water and settling tanks, pumps, silos and hoppers, a laboratory, parking areas, internal and access roads. • Gravel and sand will be stored in separate heaps whilst the cement will be contained in a silo. • The maximum height of the silo will be 20m.
Internal and Access Roads:	• The Project site can be accessed via either the tarred R33 or the N4 national road which run along the northern and western boundaries of the site respectively. • There is an existing road that goes through the land parcels to allow for direct access to the project development area.

Component	Description / Dimensions
	• For the WEF, internal and access roads with a width of between 8m and 10m, which can be increased to approximately 12m on bends. • The roads will be positioned within a 20m wide corridor to accommodate cable trenches, stormwater channels and bypass /circles of up to 20m during construction. • Length of the internal roads will be approximately 60km. • For the SEF, internal gravel roads will be established between the arrays and will be up to 4m wide.
Cables	• WEF: The medium voltage collector system will comprise of cables up to and including 33kV that run underground, except where a technical assessment suggests that overhead lines are required, connecting the turbines to the on-site IPP substation. • SEF: Low and medium voltage cabling between components (above or below ground as needed). • Over the fence 132kV cable to connect the onsite IPP substation to the Common Collector Switching Station.
Independent Power Producer (IPP) site substation and battery energy storage system (BESS):	• IPP portion on-site substation of up to 4ha. The substation will consist of a high voltage substation yard to allow for multiple up to 132kV feeder bays and transformers, control building, telecommunication infrastructure, access road, etc.; and • The BESS storage capacity will be up to 300MW/1200 megawatt-hour (MWh) with up to four hours of storage. It is proposed that Lithium Battery Technologies, such as Lithium Iron Phosphate, Lithium Nickel Manganese Cobalt oxides or Vanadium Redox flow technologies will be considered as the preferred battery technology; however, the specific technology will only be determined following Engineering, Procurement, and Construction (EPC) procurement. • The main components of the BESS include the batteries, power conversion system and transformer which will all be stored in various rows of containers.
Associated Infrastructure	• Fencing of up to 4m high around the construction camp and lighting. • Lightning protection. • Telecommunication infrastructure. • Stormwater channels. • Water pipelines. • Offices. • Operational control centre. • Operation and Maintenance Area / Warehouse/workshop. • Ablution facilities. • A gatehouse. • Control centre, offices, warehouses. • Security building. • A visitor's centre. • Substation building.

2.3 PHASING OF THE DEVELOPMENT

For the purpose of the impact assessment, it was assumed that the facility will be developed in a single phase with an estimated construction period of 2 years.

2.4 APPROVAL OF SUBMISSIONS

This report will be subject to approval from the relevant authorities and will be submitted as part of the Environmental Impact Assessment process.

3

DATA COLLECTION

3 DATA COLLECTION

3.1 SITE VISITS

Site visits were undertaken by WSP staff to assess the local road network and potential vehicle access intersections from the primary road network. Traffic surveys were undertaken at the affected intersections, refer to Section 7.1. No other specific transport related site visits were required.

3.2 ROAD NETWORK & MASTER PLANNING

There are no known local, provincial or national roads planned in the vicinity of the site or the greater study area that will be impacted by the WEF or WEF and SEF or vice-versa.

3.3 LATENT DEVELOPMENTS

Refer to Section 9: Cumulative Transport Impact Assessment.

4

SITE LOCATION & SURROUNDING ROAD NETWORK

4 SITE LOCATION & SURROUNDING ROAD NETWORK

4.1 SITE LOCATION

The WEF or WEF and SEF is located over eighteen farm portions, as detailed in Section 2.1. Refer to the following maps:

- Figure 4-1: Locality map
- Figure 4-2: Alternative 1 aerial image of the farm portions and 70 turbine locations.
- Figure 4-3: Alternative 2 aerial image of the farm portions, 44 turbine locations and solar fields.

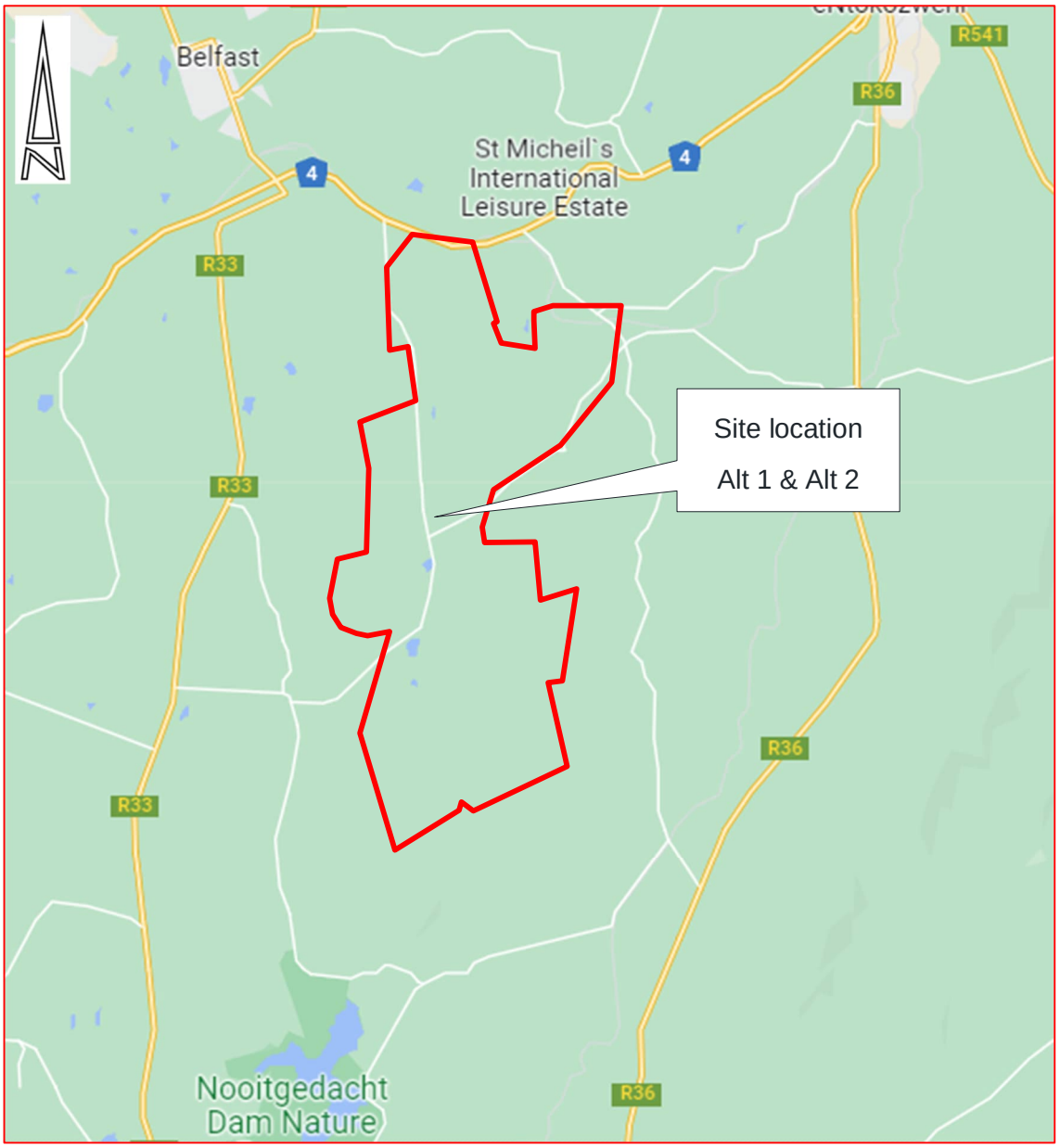

Figure 4-1 Locality map – Alternative 1 & 2

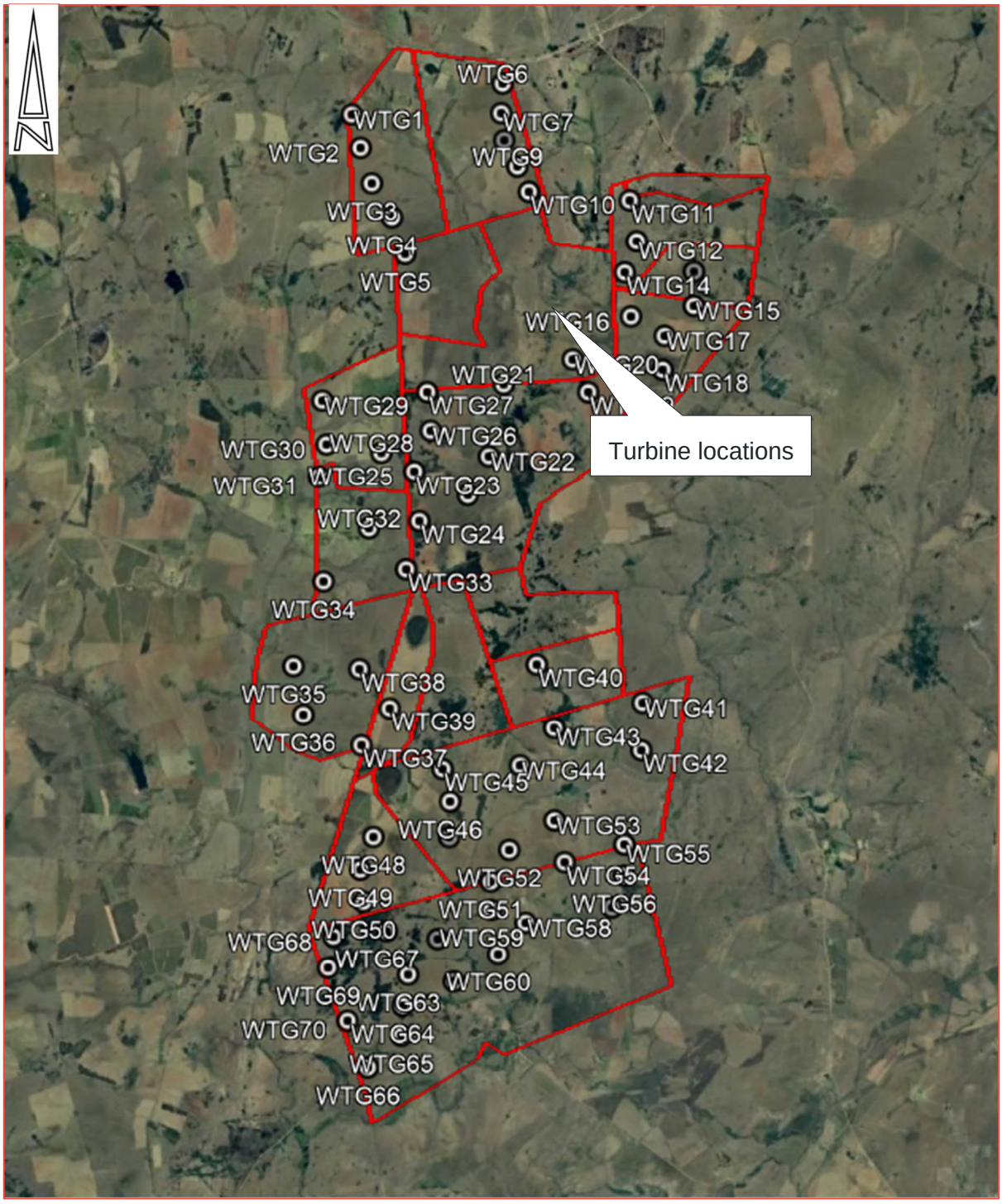

Figure 4-2 Alternative 1 - Affected farm portions & turbine locations (No. 70)

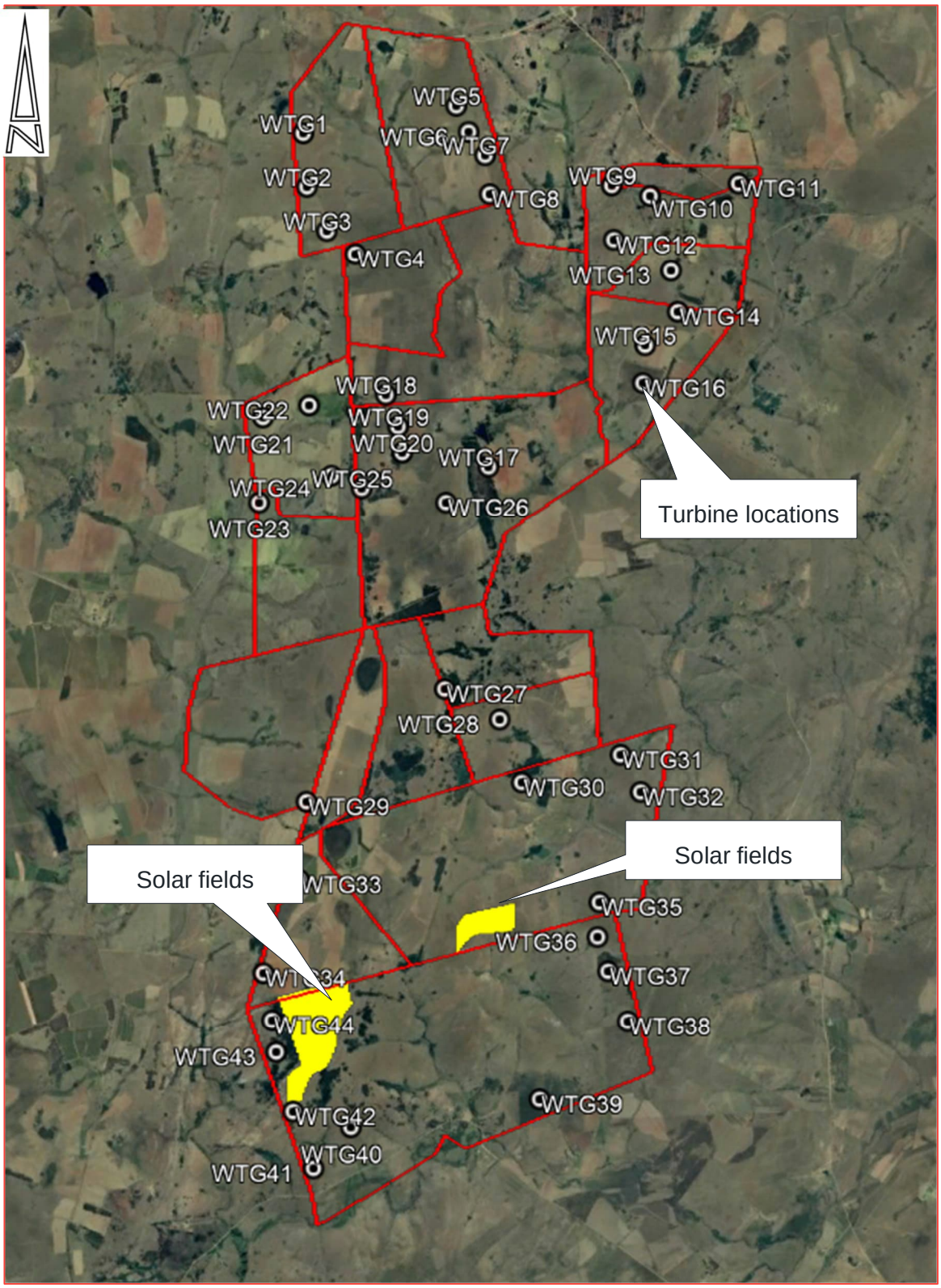

Figure 4-3 Alternative 2 - Affected farm portions, turbine locations (No. 44) & solar fields

4.2 EXTERNAL ROAD NETWORK

The public roads and accesses in the vicinity of the site that may be impacted by the WEF are briefly described herewith.

The site is located directly south of National Road N4, and in between the Provincial Road R33 to the west and the R36 to the east. The N4 is the primary east-west road link from the Botswana border via Pretoria and Mbombela to the Mozambique border. In the vicinity of the site, the N4 is a single carriageway road with 1 lane per direction and gravel shoulders. It should be noted that the section of the National Road N4 in the vicinity of the Dalmanutha Project is operated by TRAC under a concession agreement. Refer to Figure 4-4 for the National and Provincial Road network located in the greater site area.

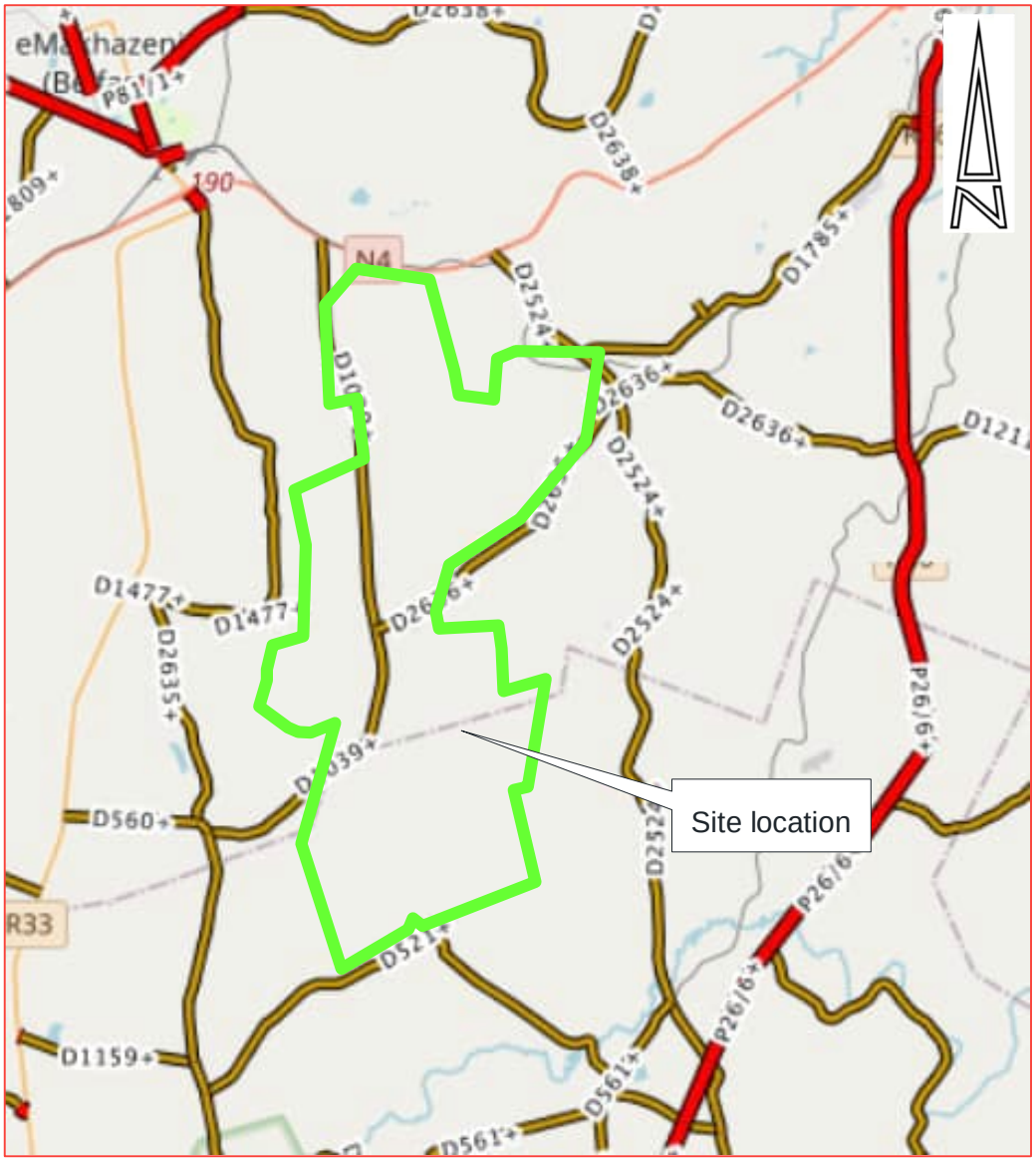

Figure 4-4 National and Provincial road network & site location

4.3 SITE ACCESS

Refer to Figure 4-5 for the Alternative 1 provisional alignment of the site access roads, and to Figure 4-6 for the Alternative 2 provisional alignment of the site access roads. The planned site accesses are as follows:

- Site access roads off the D1039, a district unsurfaced road that takes access off the N4 at a formal junction.
- Site access roads off the D2636, a district unsurfaced road that connects to the D2524, which takes direct access off the N4 at a formal junction.
- A site access road that will connect to the access road to the Berg-en-Dal memorial. This road takes direct access off the N4 at a formal junction. The provisional site access roads indicate a new direct access off the N4 west of the Berg-en-Dal memorial. This proposed access will not be utilised. Refer to Figure 4-7.

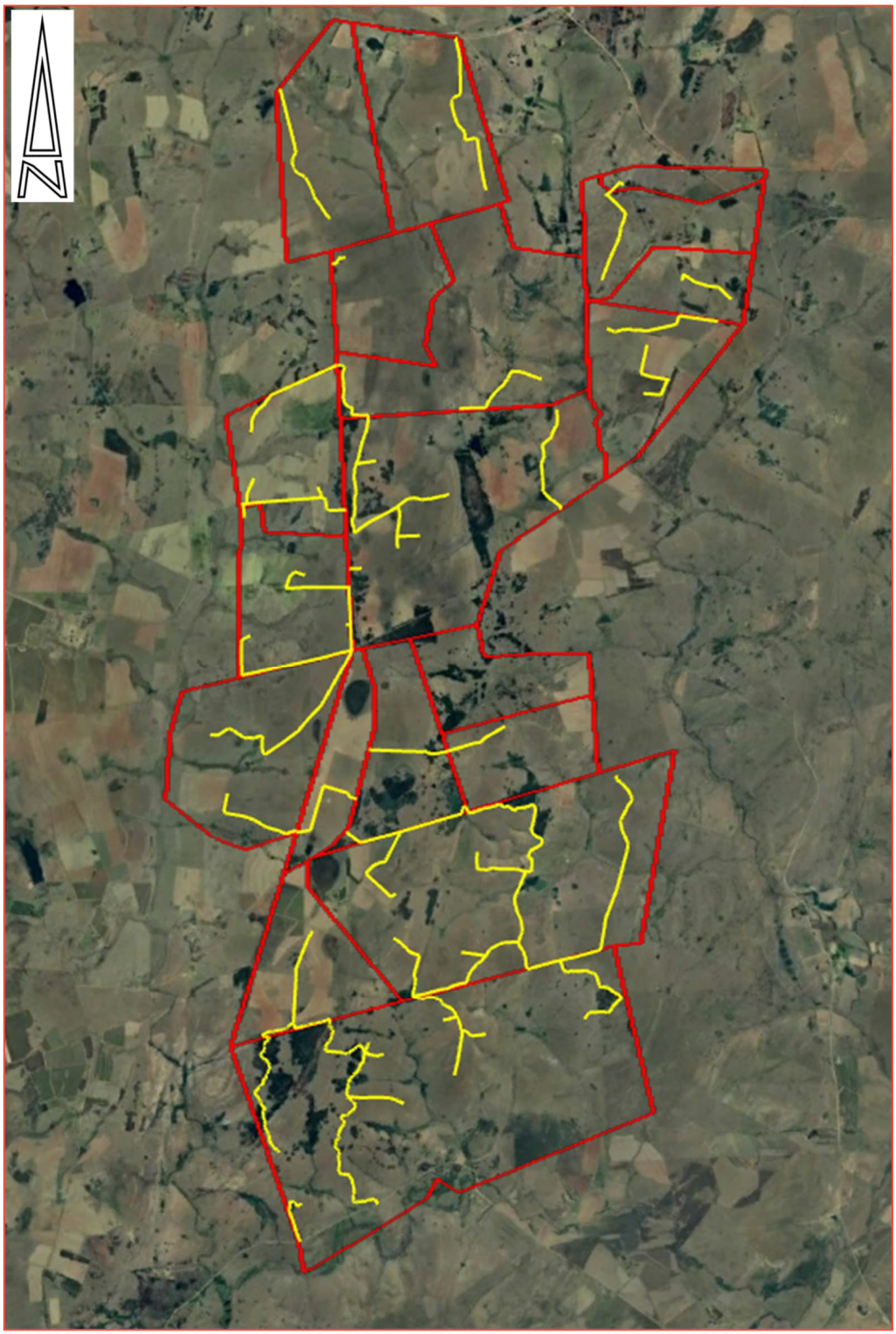

Figure 4-5 Alternative 1 - On-site access roads (provisional alignments) & farm portions

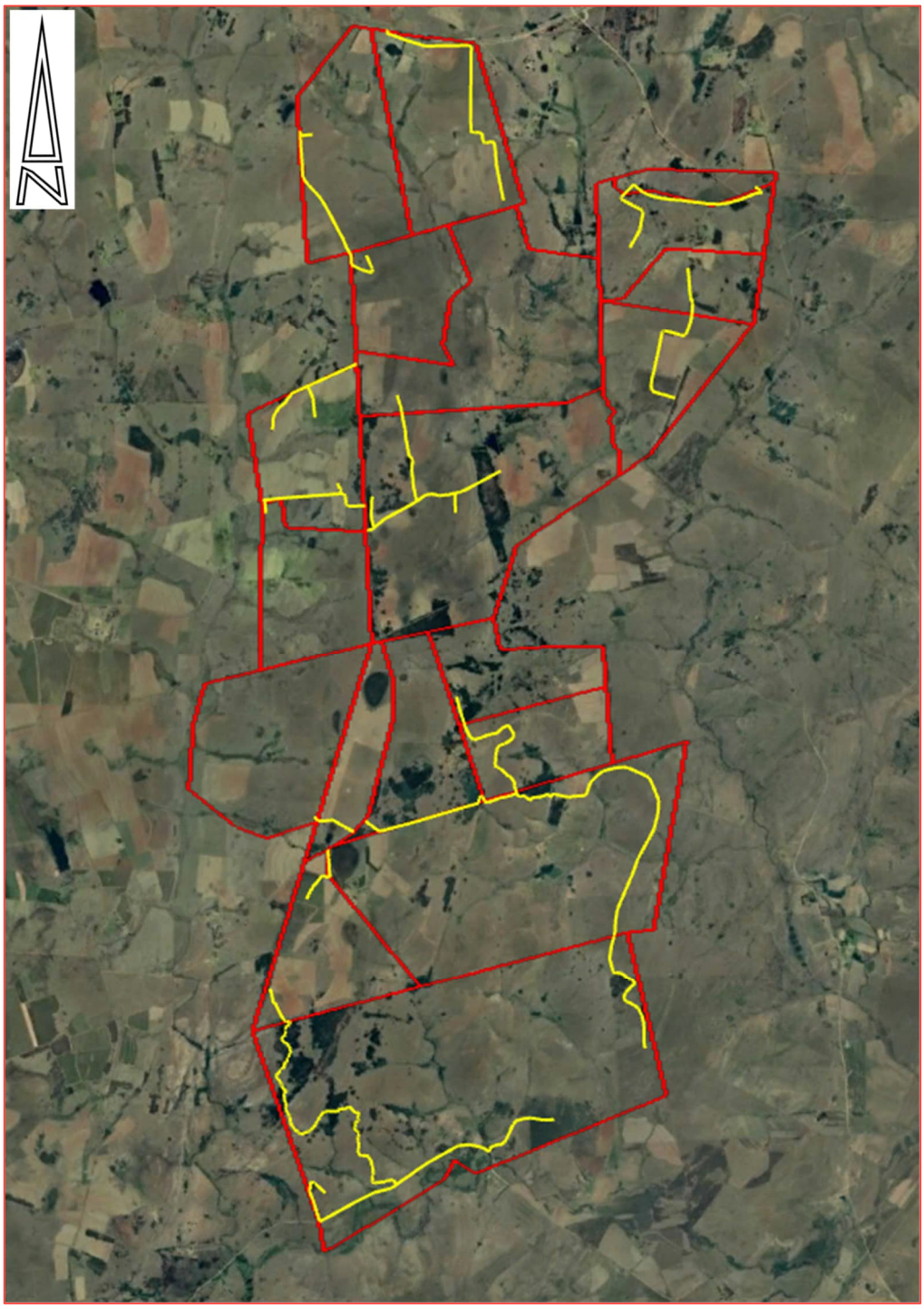

Figure 4-6 Alternative 2 - On-site access roads (provisional alignments) & farm portions

GENERAL NOTES

- The N4 is a single carriageway with 2 lanes per direction, surfaced with unmade shoulders in the vicinity of the access intersections detailed above.
- Due to the low expected construction traffic volumes, the intersections off the N4 do not require capacity analysis, refer to Section 7.3

- The expected traffic increase on the N4 during the construction and later operation phase is not expected to cause deterioration of the road, as it is surfaced and the abnormal and heavy vehicle volumes are expected to be low.
- The expected heavy and abnormal traffic on the unsurfaced district roads (D1039, D2524 and D2636) during the construction phase, may result in deterioration of the roads, as they are not designed for abnormal loads. The cost of maintaining and repairing these roads during the construction phase should be borne by the developer.

Figure 4-7 Access via Berg-en-Dal memorial access road

5

PARKING ASSESSMENT

5 PARKING ASSESSMENT

The proposed on-site parking provision will be limited to the following:

- Construction phase – temporary parking for construction staff and construction deliveries.
- Operational phase – parking for operational & maintenance staff vehicles.

All parking will be accommodated on-site, and no additional assessment is required.

6

PUBLIC & NON-MOTORISED TRANSPORT ASSESSMENT

6 PUBLIC & NON-MOTORISED TRANSPORT ASSESSMENT

In terms of the National Land Transport Transition Act (NLTTA) 22 of 2000, section 29, it is a requirement that an assessment of public and non-motorised transport be included in a transport impact assessment.

Due to the location of the site on private farms, public access will not be allowed or required during the construction or operational phases of the project. There is therefore no need for non-motorised transport infrastructure due to the location of the site.

There will be a need for limited public transport services for staff transport during the construction phase, refer to Section 7. These services can be provided by local operators from Belfast or other local towns as required.

7

TRAFFIC FLOWS & TRIP GENERATION

7 TRAFFIC FLOWS & TRIP GENERATION

7.1 EXISTING TRAFFIC FLOWS

The existing traffic volumes along the N4 were surveyed at the three existing formal intersections that will be utilised for access, as follows:

- Locations (Refer to Figure 7-1):
  - TC1 – N4/D1039
  - TC2 – N4/Access to Berg-en-Dal memorial
  - TC3 – N4/D2524
- Date: 19 October 2022
- Time: 06:00 – 18:00
- Type: Classified vehicle counts

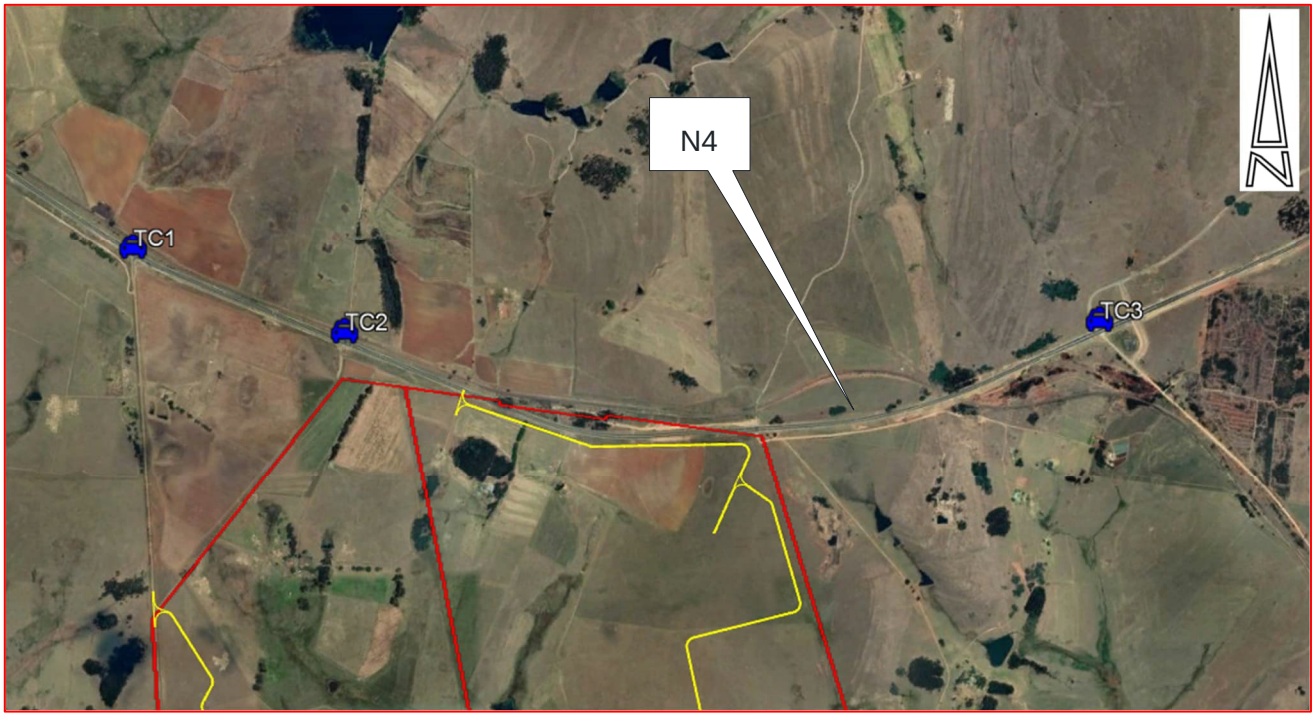

Figure 7-1 Traffic count locations

7.2 LATENT TRAFFIC

Refer to Section 8: Cumulative Transport Impact Assessment.

7.3 ALTERNATIVE 1 - DEVELOPMENT TRIP GENERATION

The South African Trip Data Manual (TMH17) does not contain estimates for expected trip generation of a wind energy facility. The following sections estimate the expected trip generation from Client provided information and research.

CONSTRUCTION PHASE TRAFFIC

The construction phase of the WEF will generate low volumes of traffic. Construction traffic will include vehicles for material and component deliveries, construction staff and all other associated personnel.

The construction phase traffic was estimated based on the assumptions listed per traffic type below.

- Construction staff transport for the WEF An estimated construction period of 24 months, with a variable number of staff required depending on the construction phase.
- An absolute maximum of 250 workers could be on-site during the peak construction period, however the conservative estimate is 150 to 200 personnel per day. The maximum number was used for calculation purposes.
- 90% of the work force is expected to be unskilled and semi-skilled workers, and 10% will be skilled.
- The unskilled and semi-skilled workers are expected to utilise public transport to site from neighbouring towns, most notably Belfast which is located approximately 15km to the north-west.
- It is unlikely that bus transport will be available, therefore staff transport trips for unskilled staff will be via minibus taxi, with an average 16 person per vehicle occupancy.
- Staff will not utilise non-motorised transport (NMT), such as cycling or walking to site due to the excessive distances to the closest towns.
- The skilled work force is expected to travel to site by private car, with an average occupancy of 1.5 persons.
- It is assumed that the public transport vehicles will not remain on-site during the workday, therefore all these vehicles will arrive and depart during the AM and PM peaks.

Refer to Table 7-1 for the maximum trip generation for the construction staff for the WEF.

Table 7-1: Total peak hour trip generation construction staff – Dalmanutha WEF Alternative 1

Staff type	Total persons per day		
Unskilled/Semi-skilled staff (Maximum workers per day)	225		
Skilled staff (Maximum workers per day)	25		
Total (Maximum workers per day)	**250**		
Trip type	**Total (veh/hr)**	**In (veh/hr)**	**Out (veh/hr)**
AM Peak hour per mini-bus trips	30	15	15
AM Peak hour private vehicle trips	17	17	
Total AM peak hour trips	47	**32**	**15**

Construction material deliveries for the WEF

- It is proposed to construct a maximum of 70 wind turbines and support buildings.
- The turbine towers are expected to have a hub height of up to 200m, with a rotor diameter of up to 200m.
- Each 200m diameter turbine rotor will require 3 blades of up to 100m long each (maximum). Rotor blades will be manufactured abroad and imported via the most suitable Port. The point of origin and the resultant route between the Port and the site will determine the vehicle type and special permits that may be required for the transportation of these blades. The most feasible import point is the Port of Richards Bay, approximately 500km away. The route to site is via the N2, the R33, a portion of the N14, the R33, the D560, D1039 and the D2636, and via the R33 to the N4 to the local access road to Turbine 6 to 10.
- The tower masts may be constructed of tubular steel, concrete, and/or hybrid (steel/concrete) type.
- The trip generation of the steel mast option was assessed, as these will have the highest number of abnormal loads to site, and associated impact on the local road network.
- Steel mast components will be manufactured off-site in sections up to 30m and are lifted into place on site. Similar to the blades, the type of tower mast components (steel, concrete, hybrid) will determine their origin, port of entry (if imported) and delivery route to the site.
- The route/s between the origin (port of entry) of the oversize/weight components and the site may be National, Provincial or Local roads. The transportation of any oversized or overweight freight along these routes will require authorisation from all the relevant road authorities.

- It is recommended that an abnormal vehicle route management plan be undertaken when the port/s of entry are confirmed. This plan will cover all aspects such as horizontal and vertical vehicle requirements, bridges along the route, speed limits, etc. These plans and the application for the abnormal permits is normally the responsibility of the logistics company that will transport the components to site.
- The trip generation for the delivery of building materials for the operations and maintenance building will be negligible. These deliveries will occur throughout a normal working day and will not be concentrated during the workday peak hours. These trips were therefore not assessed due to their negligible impact.

Assumptions were made to estimate the expected trip generation of the WEF in the construction phase.

- For trip generation purposes, only the steel mast option was assessed, as these will have the highest number of abnormal loads to site, and associated impact on the local road network.
- Each mast will consist of 7 x 29 m steel segments. One segment can be delivered per vehicle trip.
- One rotor blade can be transported on an abnormal size vehicle.
- The foundation per tower will be approximately 25.0m diameter by 3.0m deep, which is approximately 1473m^3 of concrete reinforced with 100 tons of steel.
- The foundation dimensions may vary as required by the geotechnical conditions, therefore a volume of 2,500m^3 concrete per foundation was utilised for calculation purposes (a higher conservative maximum).
- Concrete foundation will be constructed to support a mounting ring.
- Excavation of approximately 2 200m^3 per foundation will be required due to access requirements and safe slope stability requirements.
- Concrete will be batched on-site at a temporary plant. Gravel, sand and cement will be transported to site via the local road network, in 45-ton loads per truck, and then stored on site until required.
- Steel is transported in 40-ton loads on standard flatbed vehicles.
- Component and material deliveries will take place over a period of 24 months. It is assumed that deliveries will take place on 80% of all working days for a conservative trip generation estimate.
- A total of 10 581 delivery trips (Total in & out) will be required during the 24 months of construction, which is approximately 28 trips a day (Total in & out).
- The delivery of materials during the AM and PM peak hours will therefore be negligible, as trucks will arrive and depart throughout the day. If a conservative maximum 10% of the daily trips are generated during the AM and PM peaks, a maximum of less than 3 trips (in & out) per peak hour is expected.

Table 7-2: Estimated maximum material delivery trip generation – Dalmanutha WEF Alternative 1

	Mast components (no.)	Rotor blades (no.)	Rotor	Nacelle	Generator	Foundation material	
						Concrete (m^3)	Steel (tons)
No. of turbines: 1	7 x max. 30m length steel sections	3 x 100m length	1	1	1	2500	100
No. of turbines: 70	490	210	70	70	70	175 000	7 000
No. of vehicle trips (in & out)	**980**	**420**	**140**	**140**	**140**	**8 411**	**350**
Total no. of trips: (in & out)	**10 581**						
Total no. of trips per workday (Total in & out)	28						
Total no. of trips per workday peak hour (Total in & out)	3						

Trip generation summary – Construction Phase

Refer to Table 7-3 for the expected combined construction phase trip generation for the Dalmanutha WEF.

Table 7-3: Total maximum peak hour trip generation – Dalmanutha WEF Alternative 1

Staff (veh/hr)			Material Deliveries (veh/hr)			Total (veh/hr)		
In	Out	Total	In	Out	Total	In	Out	Total
31	14	**45**	3	3	**6**	34	17	**51**

Engineer's opinion: The above trip generation estimate represents a conservative (high) calculation, from the available information.

Due to the numerous access points off the National and Provincial roads that can be utilised during construction, the traffic impacts during the workday AM and PM peak hours are expected to be negligible during the construction phase.

OPERATIONAL PHASE TRAFFIC

The operational phase of the WEF will require a low number of permanent staff. The vehicle trips that will be generated by the personnel accessing the site for maintenance and other purposes will therefore be low, and the associated transport impact on the surrounding road network will be negligible.

DECOMMISIONING PHASE TRAFFIC

Following the initial 20-year operational period of the facility, its continued economic viability will be investigated. If it is still deemed viable its life may be extended; if not, it will be decommissioned. If it is completely decommissioned, all the components will be disassembled, re-used and recycled or disposed of.

It is not possible to determine the volume of traffic that will be generated during the decommissioning phase. It is however expected that the volumes will be lower than during the construction phase, and the resultant transport impact on the local road network will be lower than during the Construction phase. Any damage to the unsurfaced access roads caused by the decommissioning phase traffic should be repaired at the cost of the developer.

7.4 ALTERNATIVE 2 - DEVELOPMENT TRIP GENERATION

The South African Trip Data Manual (TMH17) does not contain estimates for expected trip generation of a wind or solar energy facility. The following sections estimate the expected trip generation from Client provided information and research.

CONSTRUCTION PHASE TRAFFIC

The construction phase of the WEF and SEF facility will generate low volumes of traffic. Construction traffic will include vehicles for material and component deliveries, construction staff and all other associated personnel.

The construction phase traffic was estimated based on the assumptions listed per traffic type.

Construction staff transport for the WEF and SEF

- An estimated construction period of 24 months, with a variable number of staff required depending on the construction phase.
- An absolute maximum of 250 workers could be on-site during the peak construction period, however the conservative estimate is 150 to 200 personnel per day. The maximum number was used for calculation purposes.
- 90% of the work force is expected to be unskilled and semi-skilled workers, and 10% will be skilled.
- The unskilled and semi-skilled workers are expected to utilise public transport to site from neighbouring towns, most notably Belfast which is located approximately 15km to the north-west.
- It is unlikely that bus transport will be available, therefore staff transport trips for unskilled staff will be via minibus taxi, with an average 16 person per vehicle occupancy.
- Staff will not utilise non-motorised transport (NMT), such as cycling or walking to site due to the excessive distances to the closest towns.
- The skilled work force is expected to travel to site by private car, with an average occupancy of 1.5 persons.
- It is assumed that the public transport vehicles will not remain on-site during the workday, therefore all these vehicles will arrive and depart during the AM and PM peaks.

Refer to Table 7-4 for the maximum trip generation for the construction staff for the WEF and SEF facility.

Table 7-4: Total peak hour trip generation construction staff - Dalmanutha Alternative 2 WEF & SEF

Staff type	**Total persons per day**		
Unskilled/Semi-skilled staff (Maximum workers per day)	225		
Skilled staff (Maximum workers per day)	25		
Total (Maximum workers per day)	**250**		
Trip type	**Total (veh/hr)**	**In (veh/hr)**	**Out (veh/hr)**
AM Peak hour per mini-bus trips	30	15	15
AM Peak hour private vehicle trips	17	17	
Total AM peak hour trips	47	**32**	**15**

Construction material deliveries for the WEF

- It is proposed to construct a maximum of 44 wind turbines and supporting buildings.
- The turbine towers are expected to have a hub height of up to 200m, with a rotor diameter of up to 200m.
- Each 200m diameter turbine rotor will require 3 blades of up to 100m long each (maximum). Rotor blades will be manufactured abroad and imported via the most suitable Port. The point of origin and the resultant route between the Port and the site will determine the vehicle type and special permits that may be required for the transportation of these blades. The most feasible import point is the Port of Richards Bay, approximately 500km away. The route to site is via the N2, the R33, a portion of the N14, the R33, the D560, D1039 and the D2636, and via the R33 to the N4 to the local access road to Turbine 6 to 10.
- The tower masts may be constructed of tubular steel, concrete, and/or hybrid (steel/concrete) type.
- The trip generation of the steel mast option was assessed, as these will have the highest number of abnormal loads to site, and associated impact on the local road network.
- Steel mast components will be manufactured off-site in sections up to 30m and are lifted into place on site. Similar to the blades, the type of tower mast components (steel, concrete, hybrid) will determine their origin, port of entry (if imported) and delivery route to the site.
- The route/s between the origin (port of entry) of the oversize/weight components and the site may be National, Provincial or Local roads. The transportation of any oversized or overweight freight along these routes will require authorisation from all the relevant road authorities.
- It is recommended that an abnormal vehicle route management plan be undertaken when the port/s of entry are confirmed. This plan will cover all aspects such as horizontal and vertical vehicle requirements, bridges along the route, speed limits, etc. These plans and the application for the abnormal permits is normally the responsibility of the logistics company that will transport the components to site.
- The trip generation for the delivery of building materials for the operations and maintenance building will be negligible. These deliveries will occur throughout a normal working day and will not be concentrated during the workday peak hours. These trips were therefore not assessed due to their negligible impact.

Assumptions were made to estimate the expected trip generation of the WEF in the construction phase, refer to Table 7-5.

- For trip generation purposes, only the steel mast option was assessed, as these will have the highest number of abnormal loads to site, and associated impact on the local road network.
- Each mast will consist of 7 x 29 m steel segments. One segment can be delivered per vehicle trip.
- One rotor blade can be transported on an abnormal size vehicle.
- The foundation per tower will be approximately 25.0m diameter by 3.0m deep, which is approximately 1473m^3 of concrete reinforced with 100 tons of steel.
- The foundation dimensions may vary as required by the geotechnical conditions, therefore a volume of 2,500m^3 concrete per foundation was utilised for calculation purposes (a higher conservative maximum).
- Concrete foundation will be constructed to support a mounting ring.

- Excavation of approximately 2 2000 m³ per foundation will be required due to access requirements and safe slope stability requirements.
- Concrete will be batched on-site at a temporary plant. Gravel, sand and cement will be transported to site via the local road network, in 45-ton loads per truck, and then stored on site until required.
- Steel is transported in 40-ton loads on standard flatbed vehicles.
- Component and material deliveries will take place over a period of 24 months. It is assumed that deliveries will take place on 80% of all working days for a conservative trip generation estimate.
- A total of 6 652 delivery trips (Total in & out) will be required during the 24 months of construction, which is approximately 18 trips a day (Total in & out).
- The delivery of materials during the AM and PM peak hours will therefore be negligible, as trucks will arrive and depart throughout the day. If a conservative maximum 10% of the daily trips are generated during the AM and PM peaks, a maximum of less than 2 trips (in & out) per peak hour is expected.

Table 7-5: Estimated maximum material delivery trip generation – Alternative 2 WEF

	Mast components (no.)	Rotor blades (no.)	Rotor	Nacelle	Generator	Foundation material	
						Concrete (m³)	Steel (tons)
No. of turbines: 1	7 x max. 30m length steel sections	3 x 100m length	1	1	1	2 500	100
No. of turbines: 44	308	132	44	44	44	110 000	4 400
No. of vehicle trips (in & out)	**616**	**264**	**88**	**88**	**88**	**5 288**	**220**
Total no. of trips: (in & out)	**6 652**						
Total no. of trips per workday (Total in & out)	18						
Total no. of trips per workday peak hour (Total in & out)	2						

Construction material deliveries for the SEF

Assumptions were made to estimate the expected trip generation of the construction of the PV panel field, refer to Table 7-6 for the summary.

- A 100MW PV field is estimated form the field size estimate.
- A maximum of 200 000 PV panel modules will be transported to site via road in standard containers. 840 modules are loaded per container, therefore a total of 239 containers (number of vehicle trips inbound) will be delivered. Note this is a conservative estimate that may change, pending the final specifications of the panels. Note that up to 900 modules can be delivered on a standard open truck, therefore the more conservative containerised transport of 840 modules per truck was utilised.
- The concrete required for the solar PV panel module foundations was estimated from literature (Jean, Brown, Jaffe, Buonassisi and Bulovic, 2015) at approximately 60.7 tonnes per MW generation capacity. A total of 6 070 tonnes of concrete is required for the foundations for a 100 MW plant. Note this is a conservative estimate that may change, pending the final specifications of the panels, number and weight of the panels and the soil conditions for each foundation.
- Concrete for the foundations will be batched on-site at a temporary plant. Gravel, sand and cement will be transported to site via the local road network, in 45-ton loads per truck, and then stored on site until required.
- The steel frames required to mount the PV panel modules is estimated from literature (Jean, Brown, Jaffe, Buonassisi and Bulovic, 2015) at approximately 67.9 tonnes per MW, therefore an estimated total of 6 790 tonnes of steel will be required.
- Steel for the PV panel frames will be transported to site in 40-ton loads on standard flatbed vehicles.
- The battery requirement for the facility is approximately 1 pack of per 1.78MW, therefore 56 battery unit will be required for the 100 MW facility. Each battery unit weight up to 25,4 tonnes. It is assumed that a single battery unit per heavy vehicle will be delivered to site.
- The trip generation for the delivery of building materials for the operations and maintenance building will be negligible. These deliveries will occur throughout a working day and will not be concentrated during the workday peak hours. These trips were therefore not assessed due to their negligible impact.
- Component and material deliveries will take place over a period of 2 years. It is assumed that deliveries will take place on 80% of all working days for a conservative trip generation estimate.
- The total number of delivery trips for the 2-year period is 1 202 trips (Total in & out).
- The maximum number of delivery trips per day is only 4 trips (Total in & out).
- The delivery of materials during the AM and PM peak hours will therefore be negligible, as trucks will arrive and depart throughout the day. If a conservative maximum 10% of the daily trips are generated during the AM and PM peaks, a maximum of 1 trip per peak hour is expected.

Table 7-6 Estimated maximum material delivery trip generation - Alternative 2 SEF

	Component			
	PV Panels	**Concrete**	**Steel**	**Batteries**
Total trips (IN & OUT)	477	272	340	113
Total no. of trips: (in & out)	**1 202**			
Workdays over 2 years	**378**			
Total no. of trips per workday (Total in & out)	4			
Total no. of trips per workday peak hour (Total in & out)	0.32			

Trip generation summary – Construction Phase

Refer to Table 7-7 for the expected combined construction phase trip generation for the Dalmanutha WEF and SEF.

Table 7-7: Total max. peak hour trip generation – Dalmanutha Alternative 2 WEF & SEF

Staff (veh/hr)			Material Deliveries (veh/hr)			Total (veh/hr)		
In	**Out**	**Total**	**In**	**Out**	**Total**	**In**	**Out**	**Total**
31	14	**45**	3	3	**6**	34	17	**51**

Engineer's opinion: The above trip generation estimate represents a conservative (high) calculation, from the available information.

Due to the numerous accesses off the National and Provincial roads that can be utilised by the construction vehicles, the traffic impact during the workday AM and PM peak hours are expected to be negligible during the construction phase.

OPERATIONAL PHASE TRAFFIC

The operational phase of the WEF and SEF will require a low number of permanent staff. The vehicle trips that will be generated by the personnel accessing the site for maintenance and other

purposes will therefore be low, and the associated transport impact on the surrounding road network will be negligible.

DECOMMISIONING PHASE TRAFFIC

Following the initial 20-year operational period of the facility, its continued economic viability will be investigated. If it is still deemed viable its life may be extended; if not, it will be decommissioned. If it is completely decommissioned, all the components will be disassembled, re-used and recycled or disposed of.

It is not possible to determine the volume of traffic that will be generated during the decommissioning phase. It is however expected that the volumes will be lower than during the construction phase, and the resultant transport impact on the local road network will be lower than during the Construction phase. Any damage to the unsurfaced access roads caused by the decommissioning phase traffic should be repaired at the cost of the developer.

7.5 CAPACITY ANALYSIS

A capacity analysis of the three access intersections off the N4 were not undertaken due to the following:

- Alternative 1 WEF:
  - Construction phase trip generation: The expected maximum trip generation at each of the three intersections off the N4 will be very low at 51 veh/hr (maximum) during normal weekday peak periods, and therefore these intersections do not require a capacity analysis as per the requirements of TMH16.
  - Operation phase trip generation: Due to very low trip generation a capacity analysis of the affected intersections is not required.
  - Decommissioning phase trip generation: Expected lower trip generation than during the construction phase, therefore capacity analysis of the affected intersections is not required.
- Alternative 2 WEF & SEF:
  - Construction phase trip generation: The expected maximum trip generation at each of the three intersections off the N4 will be very low at 51 veh/hr (maximum) during normal weekday peak periods, and therefore these intersections do not require a capacity analysis as per the requirements of TMH16.
  - Operation phase trip generation: Due to very low trip generation a capacity analysis of the affected intersections is not required.
  - Decommissioning phase trip generation: Lower trip generation than the construction phase, therefore capacity analysis of the affected intersections is not required.

7.6 INTERSECTION SAFETY ASSESSMENT

The safety of the three intersections off the N4 may be affected due to the expected increase in vehicle volumes from the WEF or WEF and SEF during construction.

The following recommendations are made to improve the safety of the access intersections off the N4 during the construction phase. Note that these upgrades should be the responsibility of Trans African Concessions (TRAC), as these are general safety improvements. The developer has however stated that they will undertake these upgrades, if permitted to do so by TRAC.

N4 / D1039

Refer to Figure 7-2 for an image of the intersection. Should approval be granted by the relevant authority, provide additional warning signs as follows:

- Install a temporary truck crossing warning sign (TW345) and junction warning sign (W108) on the western approach of the N4.
- Install a temporary truck crossing warning sign (TW344) and junction warning sign (W107) on the eastern approach of the N4.

Figure 7-2 N4 westbound approach to the D1039 junction

N4 / D2524

Refer to Figure 7-3 for an image of the intersection. Should approval be granted by the relevant authority, provide additional warning signs as follows:

- Install a temporary truck crossing warning sign (TW345) and junction warning sign (W108) on the western approach of the N4.

- Install a temporary truck crossing warning sign (TW344) and junction warning sign (W107) on the eastern approach of the N4.

Note the intersection operates as two left-in left-out only side junctions with a median barrier, with a grade separated facility to support all movements to the north and south of the N4.

Figure 7-3 N4 westbound approach to the D2524 junction

N4 / Berg-en-Dal Memorial access

Refer to Figure 7-4 for an image of the intersection. Should approval be granted by the relevant authority, provide additional warning signs as follows:

- Install a temporary truck crossing warning sign (TW345) and a priority cross-road warning sign (W102) on the western approach of the N4.
- Install a temporary truck crossing warning sign (TW344) and a priority cross-road warning sign (W102) on the eastern approach of the N4.

Figure 7-4 N4 eastbound approach to the Berg-en-Dal junction

8

ENVIRONMENTAL IMPACT ASSESSMENT: TRANSPORT

8 ENVIRONMENTAL IMPACT ASSESSMENT: TRANSPORT

8.1 IMPACT ASSESSMENT METHODOLOGY

INTRODUCTION

The EIA for the proposed facility, of which this TIA is an informant, uses a methodological framework developed by WSP to meet the combined requirements of international best practice and NEMA, Environmental Impact Assessment Regulations, 2014 (GN No. 982) (the "EIA Regulations").

ASSESSMENT OF IMPACTS AND MITIGATION

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[1], indirect[2], secondary[3] as well as cumulative[4] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e. residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[5] presented in Table 8-1 .

[1] Impacts that arise directly from activities that form an integral part of the Project.
[2] Impacts that arise indirectly from activities not explicitly forming part of the Project.
[3] Secondary or induced impacts caused by a change in the Project environment.
[4] Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.
[5] The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

Table 8-1: Impact assessment criteria and scoring system

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
IMPACT SIGNIFICANCE RATING					
Total Score	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
Environmental Significance Rating (Negative (-))	**Very low**	**Low**	**Moderate**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Moderate**	**High**	**Very High**

IMPACT MITIGATION

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in Figure 8-1.

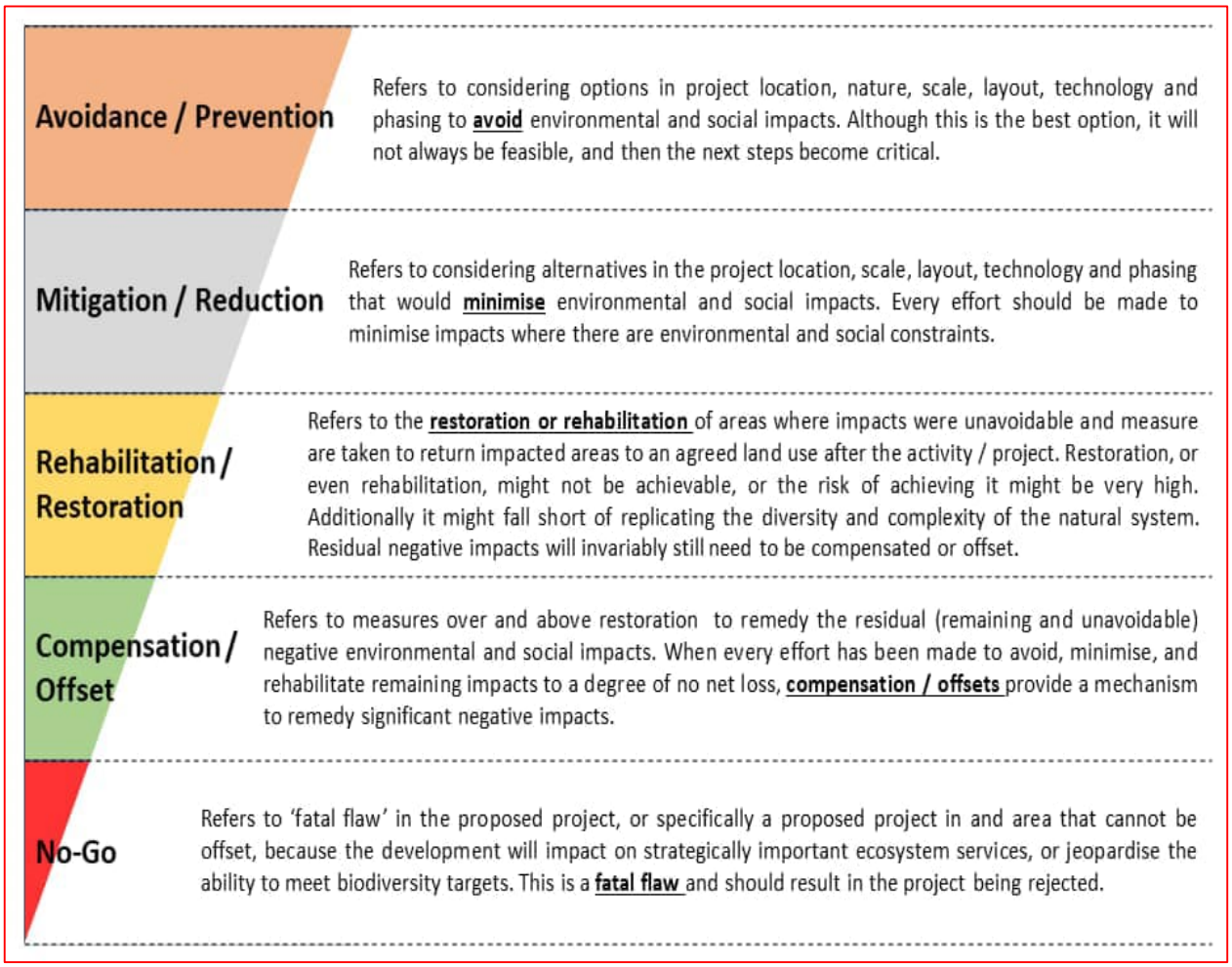

Figure 8-1 Impact mitigation sequence

8.2 ASSESSMENT RESULTS

- Due to the similar traffic generation of the Dalmanutha Alternative 1 WEF and Alternative 2 WEF & SEF during construction and operation, it is not required to undertake the impact assessments separately.
- Refer to Table 8-2 for the Construction Phase traffic related environmental impact assessment of the proposed Dalmanutha Alternative 1 WEF and Alternative 2 WEF & SEF.
- Refer to Table 8-3 for the Operation Phase traffic related environmental impact assessment of the proposed Dalmanutha Alternative 1 WEF and Alternative 2 WEF & SEF.
- The Decommissioning phase traffic impact for Alternative 1 and Alternative 2 will be similar to the Construction Phase traffic, and was not assessed separately.

Table 8-2: Impact assessment results – Construction phase Alternative 1 and Alternative 2

Impact No.	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation							Mitigation Measures
						(M+	E+	R+	D)x	P=	S	Rating	(M+	E+	R+	D)x	P=	S	Rating	
1:	Noise, dust & exhaust pollution due to vehicle trips on-site	• Vehicle engine noise • Vehicle tyre noise • Dust generation on unsurfaced site roads • Vehicle exhaust fumes	Construction	Negative	Easy	2	1	1	1	5	25	N2	1	1	1	1	2	8	N1	• All unsurfaced site roads must be regularly sprayed with water or dust suppression products to reduce dust generation. • All vehicles that travel on-site must be roadworthy to ensure noise and emission levels comply to national vehicle standards, thereby minimising noise & exhaust pollution. • All vehicles that travel on-site must not be overloaded, and abnormal vehicles must comply to relevant legislation for overweight loads, to ensure lowest possible road surface damage.
Significance						**N2 - Low**							**N1 - Very Low**							
2:	Noise, dust & exhaust pollution due to additional trips on unsurfaced district road D1039, D2524, D2636, D560	• Vehicle engine noise • Vehicle tyre noise • Dust generation on unsurfaced road • Vehicle exhaust fumes	Construction	Negative	Easy	2	3	1	1	5	35	N3	1	3	1	1	2	12	N1	• The D1039, D2524, D2636, D560 and site access roads must be regularly sprayed with water or dust suppression products to reduce dust generation. • All vehicles that travel on the D1039, D2524, D2636, D560 and site access roads must be roadworthy to ensure noise and emissions levels comply to national vehicle standards, thereby minimising noise & exhaust pollution. • All vehicles that travel on the D1039, D2524, D2636, D560 and site access roads must not be overloaded, and abnormal vehicles must comply to relevant legislation for overweight loads, to ensure lowest possible road surface damage.
Significance						**N3 - Moderate**							**N1 - Very Low**							

3:	Noise & exhaust pollution due to additional trips on the surfaced R33 and N4	• Vehicle engine noise • Vehicle tyre noise • Vehicle exhaust fumes	Construction	Negative	Easy	2	3	1	1	5	**35**	**N3**	1	3	1	1	2	**12**	**N1**	• All vehicles that travel on the R33 and N4 must be roadworthy to ensure noise and emissions levels comply to national vehicle standards, thereby minimising noise & exhaust pollution. • All vehicles that travel on the R33 and N4 must not be overloaded, and abnormal vehicles must comply to relevant legislation for overweight loads, to ensure lowest possible road surface damage.
						N3 - Moderate							**N1 - Very Low**							

Table 8-3: Impact assessment results – Operation phase Alternative 1 and Alternative 2

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation							Mitigation Measures
						(M+	E+	R+	D)x	P=	S	Rating	(M+	E+	R+	D)x	P=	S	Rating	
1:	Noise, dust & exhaust pollution due to vehicle trips on-site	• Vehicle engine noise • Vehicle tyre noise • Dust generation on unsurfaced site roads • Vehicle exhaust fumes	Construction	Negative	Easy	2	1	1	1	5	**25**	**N2**	1	1	1	1	2	**8**	**N1**	• All vehicles that travel on-site must be roadworthy to ensure noise and emissions levels comply to national vehicle standards, thereby minimising noise & exhaust pollution. • All vehicles that travel on-site must not be overloaded, and abnormal vehicles must comply to relevant legislation for overweight loads, to ensure lowest possible road surface damage.
Significance						**N2 - Low**							**N1 - Very Low**							
2:	Noise, dust & exhaust pollution due to additional trips on unsurfaced district road D1039, D2524, D2636, D560	• Vehicle engine noise • Vehicle tyre noise • Dust generation on unsurfaced road • Vehicle exhaust fumes	Construction	Negative	Easy	2	1	1	1	5	**25**	**N2**	1	3	1	1	2	**12**	**N1**	• All vehicles that travel on the D1039, D2524, D2636, D560 must be roadworthy to ensure noise and emissions levels comply to national vehicle standards, thereby minimising noise & exhaust pollution. • All vehicles that travel on the D1039, D2524, D2636, D560 must not be overloaded, and abnormal vehicles must comply to relevant legislation for overweight loads, to ensure lowest possible road surface damage.
Significance						**N2 - Low**							**N1 - Very Low**							

3:	Noise & exhaust pollution due to additional trips on the surfaced R33 and N4	• Vehicle engine noise • Vehicle tyre noise • Vehicle exhaust fumes	Construction	Negative	Easy	2	3	1	1	5	**35**	**N3**	1	3	1	1	2	**12**	**N1**	• All vehicles that travel on the R33 and N4 must be roadworthy to ensure noise and emissions levels comply to national vehicle standards, thereby minimising noise & exhaust pollution • All vehicles that travel on the R33 and N4 must not be overloaded, and abnormal vehicles must comply to relevant legislation for overweight loads, to ensure lowest possible road surface damage.
						N3 - Moderate							**N1 - Very Low**							

8.3 SUMMARY

Construction phase

The overall significance of each impact during the Construction Phase of the Alternative 1 WEF and Alternative 2 WEF & SEF as detailed in Table 8-2 is Moderate and Low without mitigation, and Very Low with mitigation. The impacts are limited to the peak construction period only, and are fully reversible.

It is also recommended that an abnormal vehicle route management plan be undertaken when the port/s of entry of any abnormal size or weight components, such as tower components (masts, blades, rotor nacelles, generators, etc.) are known. These route plans should include all aspects such as horizontal and vertical requirements along the routes, bridges along the route, speed limits, etc. These plans and the application for the abnormal transport permits is normally the responsibility of the logistics company that will transport the components to site.

The proposed mitigating measures are easy to implement and will assist to either prevent or reduce the impacts of increased vehicle engine and tyre noise, exhaust fumes and generation of dust on unsurfaced roads.

Operation phase

The overall significance of each impact during the Operation Phase of the Alternative 1 WEF and Alternative 2 WEF & SEF as detailed in Table 8-3 is Moderate without mitigation, and Very Low with mitigation. The impacts are for the duration of the Project life, site/local and regional, and is fully reversible.

The recommended mitigating measures with regards to vehicle operations (roadworthiness, loading) are standard requirements for all vehicles operating on public roads, and must always be adhered to. These measures will assist to either prevent or reduce the impacts of increased vehicle engine and tyre noise, exhaust fumes and road damage due to overloaded vehicles.

9

CUMULATIVE TRANSPORT IMPACT ASSESSMENT

9 CUMULATIVE TRANSPORT IMPACT ASSESSMENT

9.1 BACKGROUND

The DFFE requested that a cumulative transport impact assessment be undertaken of the latent power facilities in the vicinity of the Dalmanutha WEF (Alternative 1 and 2).

9.2 POTENTIAL DEVELOPMENTS

The known potential developments in the vicinity of the Dalmanutha WEF (Alternative 1 and 2) are the following:

- The Dalmanutha West WEF is planned to be located directly west of the Dalmanutha WEF (Alternative 1 and 2). It will take access off the D1477 and R33 during its construction and operational phases. Refer to the WSP report: Dalmanutha West WEF Transportation Impact Assessment, dated February 2023. Refer to Figure 9-1 for a location map.
- The proposed Elispec coal prospecting site will be located on the Farm Berg-en-Dal. Refer to Figure 9-2 for a location map.

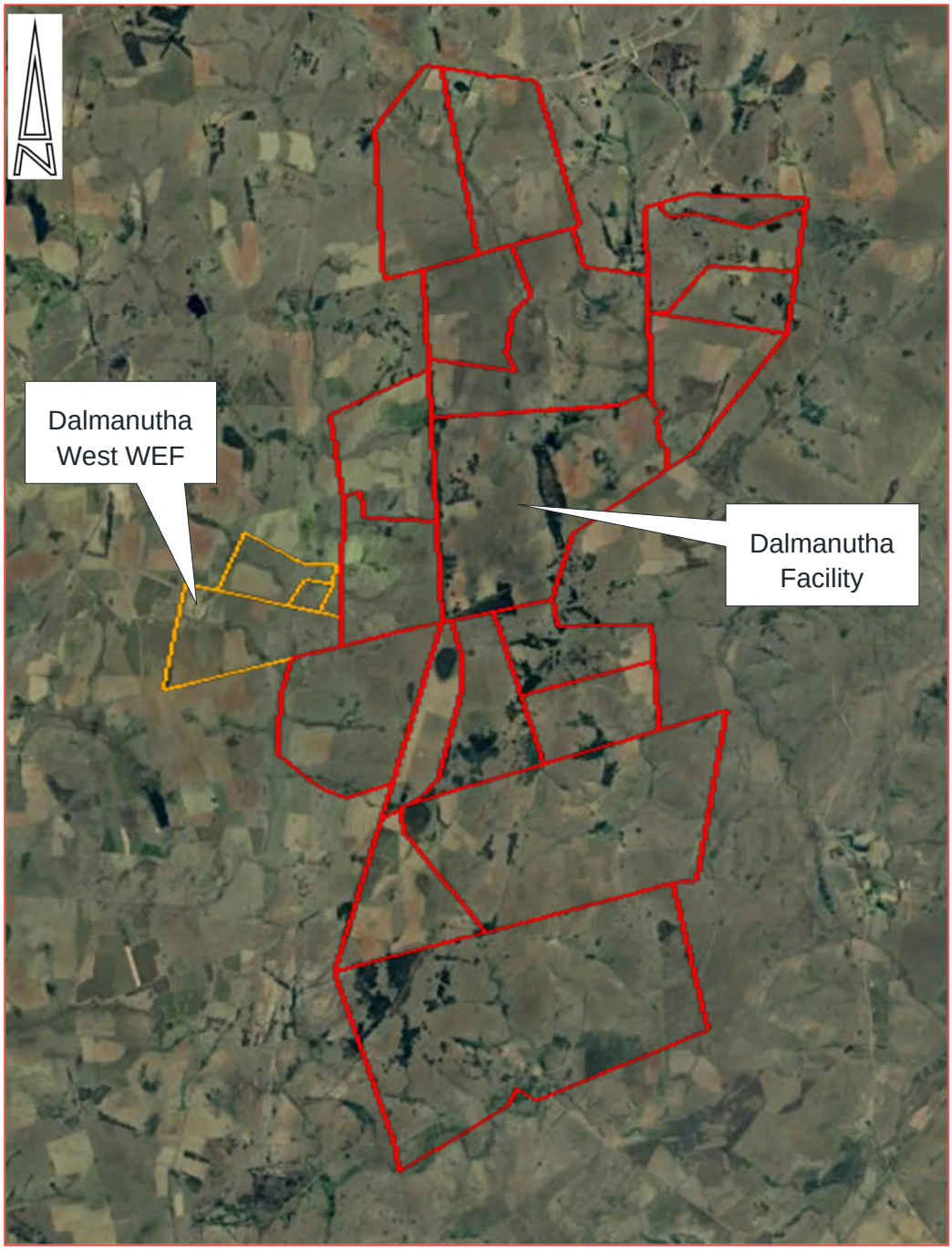

Figure 9-1 Location of the Dalmanutha West WEF and Dalmanutha Facility

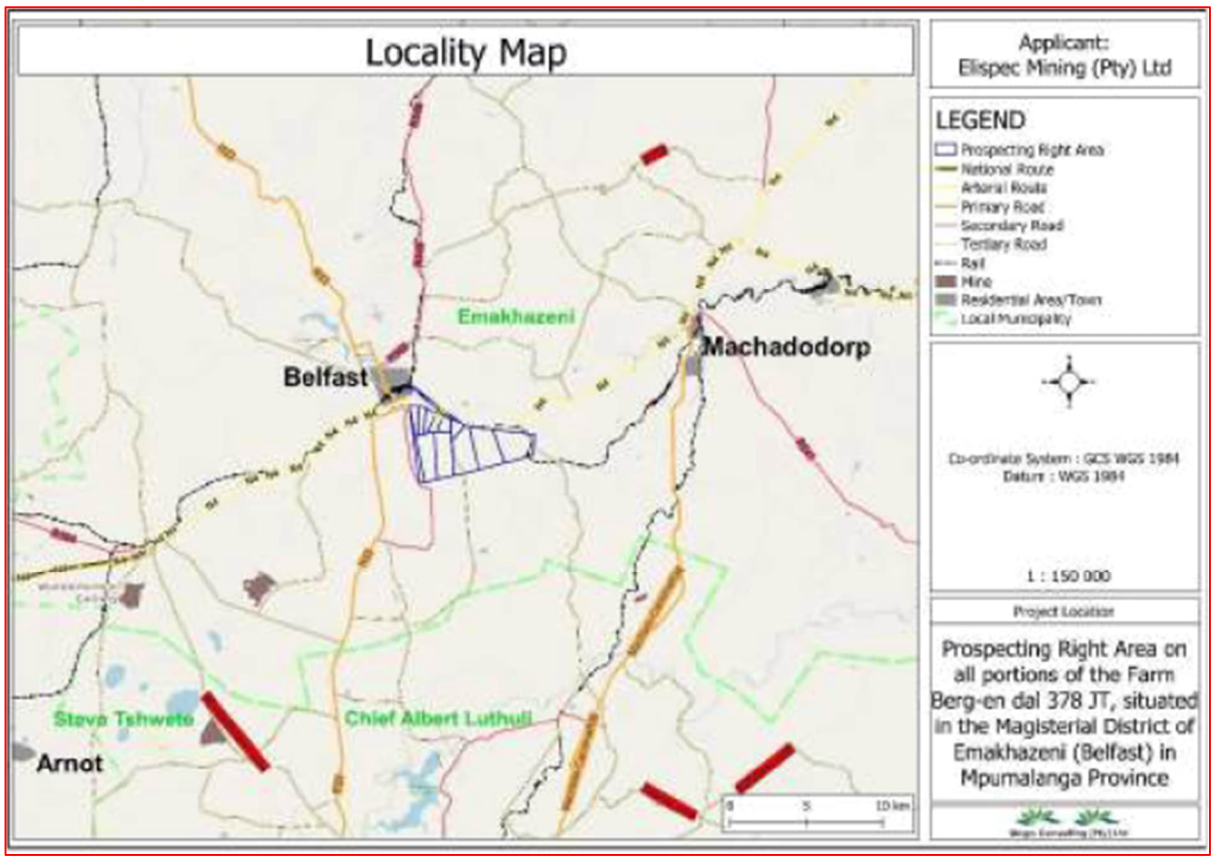

Figure 9-2 Location of the proposed Elispec prospecting site

Source: BA Report prepared by Singo Consulting (Pty) Ltd

9.3 CUMULATIVE TRANSPORT IMPACTS

- Access to the Dalmanutha West WEF will only be via the R33 and the D1477. The cumulative traffic impact of this facility during construction and operation on the Dalmanutha WEF (Alternative 1 & 2) is zero and was not assessed further as they do not share the local district roads for access.
- The cumulative impact of the prospecting site was not assessed as no traffic and access information was made available. Note that the prospecting site may take access off the same accesses of the N4 that the WEF will utilise, and this may have a cumulative impact.
- The cumulative impact of the decommissioning phases of the WEF and the potential developments were not assessed, as it cannot be determined if and when decommissioning will occur.

10

CONCLUSIONS & RECOMMENDATIONS

10 CONCLUSIONS & RECOMMENDATIONS

Based on this study, the following key conclusions and recommendations are relevant:

- Dalmanutha Wind (Pty) Ltd is proposing to develop the Dalmanutha Wind Energy Facility, to be located approximately 7km south-east of Belfast, within the eMakhazeni Local Municipality, in Mpumalanga Province.
- The developer is considering two alternatives (layout and technology) for Dalmanutha, briefly described herewith:
  - Alternative 1 Wind Energy Facility (WEF): maximum of 70 turbines.
  - Alternative 2: Wind Energy Facility (WEF) & Solar Energy Facility (SEF): maximum of 44 turbines and two solar PV fields.
- The Dalmanutha WEF or WEF and SEF will be located over eighteen farm portions, with a total area of 8 000 ha.
- The Alternative 1 WEF will have a 300MW capacity with a maximum of 70 turbines, each with a 200m diameter rotor, 3 x 100m long blades and a 200m hub height.
- The Alternative 2 WEF and SEF will have a 300MW capacity with a maximum of 44 turbines, each with a 200m diameter rotor, 3 x 100m long blades and a 200m hub height and two solar fields over an area of 160ha combined.
- The Scope of the TIA was informed by the Committee of Transport Officials' South African Traffic Impact and Site Traffic Assessment Manual, TMH16, Vol. 1, Version 1, August 2012.
- A 2-year construction phase was assumed for traffic generation and impact analysis.
- There are no known planned National or Provincial roads or road upgrades in the study area that will affect the site, or vice-versa.
- There are no known large scale latent developments in the vicinity of the site that may have a cumulative impact on the local road network, except for the proposed Dalmanutha West WEF and the proposed coal prospecting project by Elispec on the Farm Berg-en-Dal. The Dalmanutha West WEF was not assessed as part of the Cumulative Impact Assessment as it will not share local access roads. The cumulative impact of the proposed coal prospecting project was not assessed as no traffic and access information is available.
- Access to the Dalmanutha site will be via three existing accesses off National Road N4:
  - Site access roads off the D1039, a district unsurfaced road that takes access off the N4 at a formal junction.
  - Site access roads off the D2636, a district unsurfaced road that connects to the D2524, which takes direct access off the N4 at a formal junction.
  - A site access road that will connect to the access road to the Berg-en-Dal memorial. This road takes direct access off the N4 at a formal junction. The provisional site access roads indicate a new direct access off the N4 west of the Berg-en-Dal memorial. This proposed access will not be utilised.
- All construction and operational phase parking will be accommodated on-site.

- There is no need for dedicated public transport or non-motorised transport infrastructure to serve the site during the construction and operational phases.
- Alternative 1 WEF - The estimated peak construction trip generation will be 51 veh/hr during normal weekday AM and PM peaks. This trip generation estimate represents a conservative (high) calculation. Due to these low volumes distributed to three formal access points off the N4, the impact on these access points during the workday AM and PM peak hours are expected to be negligible and therefore do not require a capacity analysis as per the requirements of TMH16.
- Alternative 2 WEF and SEF - The estimated peak construction trip generation will be 51 veh/hr during normal weekday AM and PM peaks. This trip generation estimate represents a conservative (high) calculation. Due to these low volumes distributed to three formal access points off the N4, the impact on these access points during the workday AM and PM peak hours are expected to be negligible and therefore do not require a capacity analysis as per the requirements of TMH16.
- The expected traffic increase on the unsurfaced district roads during construction may result in the requirement for maintenance, as they are not designed for abnormal vehicles. The repairs, if required, should be the responsibility of the Contractor and the Provincial or Local road authority.
- The transport route/s of the wind turbine components between their origin of manufacture to the site may be National, Provincial or Local roads; and each authority will be required to provide the necessary permits for the transportation of any oversized or abnormally heavy components.
- It is also recommended that an abnormal vehicle route management plan be undertaken when the port/s of entry of any abnormal size or weight components, such as tower components (masts, blades, rotor nacelles, generators, etc.) are known. These route plans should include all aspects such as horizontal and vertical requirements along the routes, bridges along the route, speed limits, etc. These plans and the application for the abnormal transport permits is normally the responsibility of the logistics company that will transport the components to site.
- The Operational phase trip generation of the Alternative 1 WEF or Alternative 2 WEF and SEF is expected to be negligible due to the low number of daily permanent staff trips. The associated transport impact on the surrounding road network will be negligible.
- The safety of the intersections off the N4 may be compromised due to the increase in especially heavy vehicle volumes. It is recommended that additional temporary road signage is installed at the intersections of the N4 with the D1039, D2524 and Berg-en-Dal access roads to improve the safety of the intersections. The developer has undertaken to implement the required signage to the relevant Provincial, Local and National (SANRAL) standards, if allowed to do so. It should be noted that the section of the National Road N4 in the vicinity of the Dalmanutha Project is operated by TRAC under a concession agreement.
- It is not possible to determine the volume of traffic that will be generated during the decommissioning phases of the Alternative 1 WEF or Alternative 2 WEF and SEF. It can however be expected that the volumes will be lower than during the construction phase, these trips may not occur concurrently, and the resultant transport impact on the local access roads will therefore be lower than during the Construction phase of either of the two alternatives.

- The overall significance of each impact during the Construction Phase of the Alternative 1 WEF or Alternative 2 WEF and SEF is Moderate and Low without mitigation, and Very Low with mitigation. The impacts are limited to the peak construction period only and is fully reversible.
- The proposed mitigating measures are easy to implement and will assist to either prevent or reduce the impacts of increased vehicle engine and tyre noise, exhaust fumes and generation of dust on unsurfaced roads.
- The overall significance of each impact during the Operation Phase of the WEF or WEF and SEF is Moderate without mitigation, and Very Low with mitigation. The impacts are for the duration of the Project life, site/local and regional, and is fully reversible.
- The recommended mitigating measures with regards to vehicle operations (roadworthiness, loading, etc.) are standard requirements for all vehicles operating on public roads and must always be adhered to. These measures will assist to either prevent or reduce the impacts of increased vehicle engine and tyre noise, exhaust fumes and road damage due to overloaded vehicles.
- The known potential developments in the vicinity of the Dalmanutha facility are the Dalmanutha West WEF and the proposed coal prospecting project by Elipsec.
    - The Dalmanutha West WEF will be located directly adjacent to the west, and will take access off the D1477 via the R33 to the N4. The Dalmanutha West WEF will have no cumulative impact on the access roads to the Dalmanutha facility, as they are not shared.
    - The proposed coal prospecting project by Elispec will be located on the Farm Berg-en-Dal to the north of the Dalmanutha facility. The cumulative impact of the prospecting project was not assessed as no traffic and access information was made available. Note that the prospecting project may take access off the same accesses of the N4 that the Dalmanutha facility will utilise, and this may have a cumulative impact.
- The cumulative impact of the decommissioning phase of the WEF or WEF and SEF and the potential developments were not assessed, as it cannot be determined if or when the decommissioning phases will occur.

It is concluded that the proposed Dalmanutha Facility (Alternative 1 or 2) will have the same negligible transport impact on the adjacent road network and environment, if the recommended mitigation measures are implemented.

Due to this same expected peak traffic generation and associated traffic impact of the Dalmanutha Alternative 1 and Alternative 2, both options can be equally considered for authorisation from a transportation impact perspective.

It is recommended that the TIA should be accepted as part of the EIA application.

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BIBLIOGRAPHY

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