BRANDVALLEY & RIETKLOOF WIND ENERGY FACILITIES
TRAFFIC IMPACT ASSESSMENT

Reference: BV/RK-WEF
Prepared for: G7 Renewable Energies (Pty) Ltd
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EXECUTIVE SUMMARY

This report details the investigation of the transport needs for the proposed Brandvalley and Rietkloof Wind Energy Facilities, located on the border between the Western Cape and Northern Cape Provinces, on the farms Barendskraal 76, Brandvalley 75, Fortuin 74, Kabeltouw 160, Muishond Rivier 161, Rietfontein 197 B, Hartjieskraal 77, Nuwerus 284, Rietkloof Annexe 88, Snyders Kloof 80, Vogelstruisfontein 81, and Wilgehout Fontein 87. The purpose of the investigation is to identify potential access routes, including site access, for the development of the facility. The general freight for the wind farm will comprise building materials, blades, nacelles, towers, hubs, cables and transformers.

The imported freight will preferably be transported from Saldanha Port to the site. The preferred freight route from Saldanha Port, via Moorreesburg (a distance of 342km), comprises surfaced roads for the majority of the way (only the final road section to the site consists of gravel roads). This route is predominantly on National or Provincial Roads, with suitable conditions for the transport of normal freight, or abnormal loads with permits. No toll fees are required on this route, however, abnormal permits will be required for the transport of the transformers and turbine components, irrespective of the final route determined by the logistics contractor.

Building materials will most likely be transported from Worcester, while certain elements will be transported from various manufacturing centres in South Africa - most likely Cape Town for tower sections and Johannesburg for transformers. The transport of elements from these manufacturing centres will be predominantly on National and Provincial roads, which presents no limitations for normal freight.

Due to the distance from Worcester to site (approximately 155km), significant reductions in heavy vehicle trips could be achieved by sourcing road building materials and concrete aggregate from new quarries or borrow pits in proximity to the site, provided that it is a feasible with respect to the target implementation programme. The possible siting of quarries and/or borrow pits will be confirmed prior to construction, once a geotechnical investigation has been conducted.

There is a limited risk of delays to the various deliveries required for the construction of the facility, due to potential routine maintenance works (such as repairs and reseals). The impact of such activities is dependent on the scheduling of deliveries and of roads contracts, and may be mitigated by the use of the alternative routes proposed in this report.

In general, no obvious problems were identified associated with the transport of freight along the proposed routes to the site, nor for the accesses required for the construction and maintenance of the facility. It will, however, be necessary to confirm certain aspects such as clearances, bridge capacities, etc., by the logistics contractor as part of their preparation as this will be dependent on the actual vehicles configuration used.

1 INTRODUCTION

G7 Renewable Energies (Pty) Ltd., has engaged Aurecon to prepare a Traffic Impact Assessment, with particular focus on the access to the site, for the proposed Brandvalley and Rietkloof Wind Energy Facilities (WEFs), in support of the environmental approval application. The sites are situated approximately 25km north of Matjiesfonein, on the border between the Western Cape and Northern Cape Provinces.

The site locations are indicated on the key and locality plan details for the Brandvalley and Rietkloof WEFs shown in Figure 1 and Figure 2 respectively:

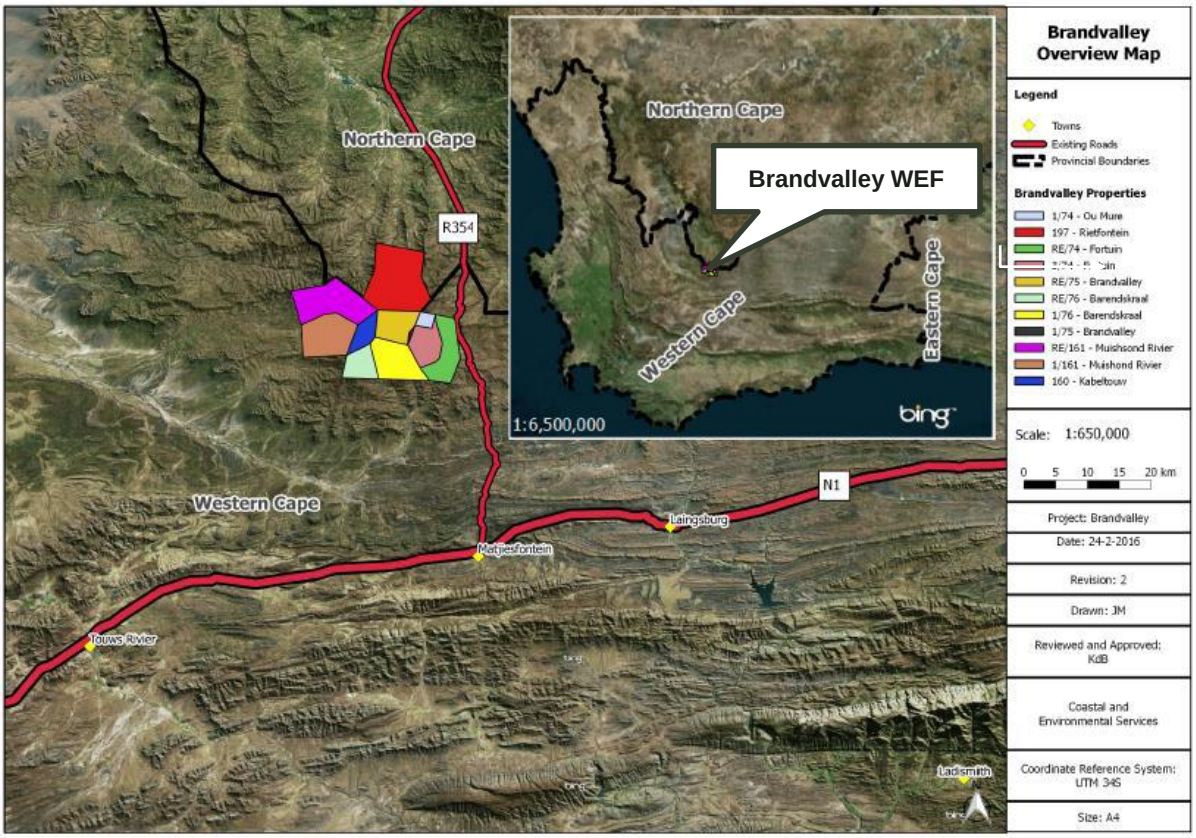


Figure 1: Brandvalley WEF Key Plan and Locality Plan detail (EOH Coastal & Environmental Services, 2016)

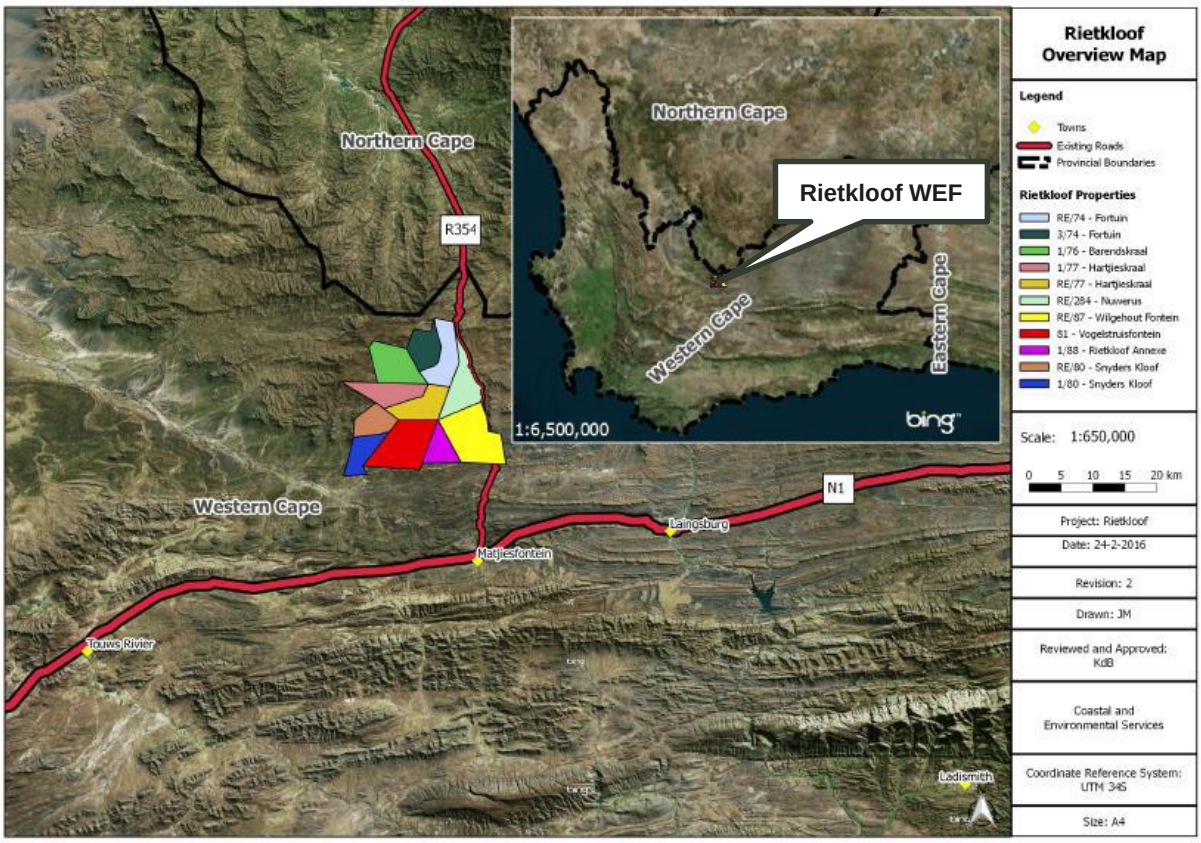


Figure 2: Rietkloof WEF Key Plan and Locality Plan detail (EOH Coastal & Environmental Services, 2016)

The proposed Brandvalley and Rietkloof WEFs is expected to comprise:

- Up to 70 Wind Turbine Generators (WTG's) per site
- Between 1.5 and 4MW per WTG
- Hub height of up to 120m
- Rotor diameter of up to 140m
- Capacity of up to 140MW per site

The scope of the study is to evaluate the transport requirements to implement the development of the Brandvalley and Rietkloof WEFs, with particular focus on the access to site from the N1.

The scope of the Transport Assessment Study includes, inter alia:

- Determine the access freight routes between point of delivery (i.e. the preferred port) and the wind farm, for the wind turbine generator (WTG) components.
- Confirm the associated clearances required for the necessary equipment to be transported from the point of delivery to the wind farm.
- Confirm freight requirements.
- Determine (abnormal) permit requirements, if any.
- Consider feasibility of alternative accesses to the site from the N1
- Propose traffic accommodation measures during potential upgrading of the access on the Provincial or National Roads.
- Determine the environmental effect of steel and/or concrete towers

2 BASIS AND ASSUMPTIONS

The following parameters have been defined / assumed, based on Aurecon's domain knowledge and relevant experience:

- Imported elements, including major turbine components, are shipped to and transported from the nearest or most practical South African Port to the site.
- Certain elements are transported from manufacturing centres within South Africa.
- Materials for concrete foundation structures and road construction are obtained locally from closest available commercial source, but could also be sourced from new borrow pits and quarries on the site, to limit carting of materials over long distances and at steep grades.
- The largest potential loads with respect to weight will be:
  - Transformer(s) with a payload of approximately 85t
  - Nacelle for each turbine – up to approx. 100t
- Long distance freight will be transported predominantly on surfaced roads.
- The geometric standards applied are such that blades up to 70m in length can be accommodated on the access roads to the proposed development.

Foundations will ultimately be dictated by site geotechnical conditions but generally comprise of large diameter (in the order of 15m to 22m) concrete bases supported on rock or suitable strata.

- The standard vehicle for the transportation of said turbine blades was assumed to have a wheel base of approximately 45m.
- A minimum road width of 4.5m with 0.25m rounding each side was assumed.
- The preliminary alignments were based on satellite imagery as the only available topographical information.
- The turbines will ultimately be removed from the site during the de-commissioning stage, while the turbine bases will be partially demolished to 1m below natural ground level.

3 ASSESSMENT

3.1 General Freight Requirements

3.1.1 Legislation

Currently, the general limitations on road freight transport are:

- Axle load limitation of 7.7t on front axle and 9.0t on single rear axles.
- Axle unit limitations are 18t for dual axle units and 24t for 3 axle units.
- Bridge formula requirements to limit concentration of loads and to regulate load distribution on the vehicle.
- Gross vehicle mass of 56t. This means a typical payload of about 30t.
- Maximum vehicle length of 22m for interlinks, 18.5m for horse and trailers and 13.5m for single units.
- Width limit of 2.6m.
- Height limit 4.3m with a 0.3m tolerance.

Abnormal permits are required for vehicles exceeding these limits, which will be required for this project.

3.1.2 Facility Freight

Materials and equipment transported to the site will comprise:

- Building materials (concrete aggregates, cement, reinforcement and gravel).
- Construction equipment such as road building equipment, excavators and cranes.
- Turbine components (blades, towers and nacelles).
- Transformers and cables.

A breakdown of transport requirements for the respective phases of the project follows:

3.1.2.1 During the Construction Phase:

- Building materials, comprising reinforced concrete materials for turbine foundations and gravel materials for road layer works. These materials will be transported using conventional trucks, which are expected to adhere to legal limits.
- WTG components will most likely be transported by abnormal vehicles from the nearest suitable South African port, which is Saldanha Port (Section 3.3 refers). The number of loads will be a function of the number of turbines to be constructed.
- WTG towers will be manufactured locally, with steel towers shipped from Atlantis or Port Elizabeth, and concrete towers manufactured on site, or in Cape Town and transported to site in segments. Concrete towers can typically require 18 truckloads per turbine, whereas steel towers only require 4 truckloads.
- Power transformers will most probably be transported by abnormal vehicles from manufacturing centres in Johannesburg.

- 33/132kV OHL components will be transported from various manufacturing centres as well as ports for some the components. However all components will be transported by means of general freight. The number of loads will be a function of the final configuration.

3.1.2.2 During the Operational Phase:

- Potential replacement of WTG elements, which would require employment of cranes and transport equipment. However, this is expected to have a low probability of occurrence.

3.1.2.3 During the De-commissioning Phase:

- The removal of turbine components from the site to a suitable spoil / recovery / recycling site, which could potentially imply shipping items out of the country, and which would require abnormal transport to the approved recovery sites.
- Re-instatement of the disturbed areas, such as ripping of access roads and reinstating of vegetation, by use of suitable construction equipment.
- The turbine bases will have to be demolished partially, which will require heavy demolishing equipment.

Examples of the abnormal loads, which are most pertinent to the wind farm logistics, are illustrated in Figure 3 and Figure 4:

Figure 3: Abnormal freight (tower section in low-load configuration (top), and blade (bottom))

Figure 4: Minor wind farm components delivered to a wind farm site with normal freight

3.2 Traffic Statement

The traffic volumes will have three different patterns for the construction, operational and de-commissioning stages of the project, respectively.

3.2.1 Traffic during the Construction Phase

3.2.1.1 Traffic during the Construction of the Wind Energy Facility

Based on Aurecon's experience with similar projects, it is estimated that the number of expected trips per turbine would be:

- Abnormal vehicles: 10 (turbine components)
- Heavy vehicles: 60 (reinforcement and concrete)
- Heavy Vehicles: 90 (road layer works)
- **TOTAL: 150 / 10 (Heavy / Abnormal) per turbine**

The wind farm capacity and the specific WTG model to be used has not yet been confirmed and it is therefore not possible to accurately calculate the total expected trips for the construction of the facility. However, the range of potential configurations for the wind farm, provides a basis for the estimation of the total trips that will be required. 140MW are considered to be the possible site capacity, while the options of 1.5-4 MW WTGs are considered as representing the outer limits of the range of possible machines to be utilised.

Based on the above, the total trips for one ultimate 70 turbine facility is estimated to be 700 abnormal and 10500 heavy vehicle trips, over an estimated period of 18-24 months. Should concrete towers be used, the number of abnormal loads would decrease, with heavy loads increasing substantially.

If the concrete and road building materials could be sourced from newly developed sources in proximity to the site, the number of heavy vehicles on the access roads could be reduced substantially.

In the worst case, the number of heavy vehicle trips per day would be in the order of 15 to 20 round trips. The impact of this on the general traffic would therefore be of low significance, as the peak time traffic would be increased by 5 trips at most.

Based on previous experience, the personnel during construction is estimated to total 250 - 350 persons. The personnel will most likely reside in Sutherland, Matjiesfontein or Laingsburg as the closest communities. It is recommended that the majority of construction personnel be transported to and from site by means of busses.

This personnel transport will total approximately 15 to 25 daily trips. The impact of this on the general traffic would therefore also be considered to be of low significance, as the peak hour traffic would be increased by 10 trips at most.

3.2.1.2 Traffic during the Construction of Grids/Power lines

The grids/power lines to be constructed during the project will be 33/132kV power lines. The main components being the support mast, cables, connectors, transformers, etc. All the components will be transported by means of general freight. Aurecon is of opinion that the traffic impact for this construction activity will be minimal and that the additional generated traffic is negligible.

3.2.2 Traffic during the Operational Phase

After construction, the generated site traffic would be limited to maintenance support, with only a few light vehicles, transporting approximately 20 employees, will be accessing the site per day. Maintenance activities will be executed as and when required, but is not expected to have a low traffic impact.

3.2.3 Traffic during the De-commissioning Phase

Traffic is expected to be very similar to the construction phase. The impact of this on the general traffic would therefore also be considered to be of low significance.

3.2.4 Traffic Impact Rating

This technical study of traffic during the construction phase also has to inform the EIA phase, where an environmental significance scale is used to evaluate the importance of a particular impact. Table 1 below indicates the original identified impacts associated with the traffic and how their significance ratings have been affected by the respective impacts.

Table 1: Significance Statement Table

Impact	Mitigation	Effect			Likelihood	Significance
		Temporal	Spatial	Severity		
Traffic impact as a result of Concrete Towers	Without mitigation	Short term	Regional	Moderate	May Occur	Low (8)
	With mitigation	Short term	Regional	Slight	May Occur	Low (7)
Traffic impact as a result of Steel Towers	Without mitigation	Short term	Regional	Slight	May Occur	Low (7)
	With mitigation	Short term	Regional	Slight	May Occur	Low (7)
Traffic impact as a result of Operations	Without mitigation	Medium term	Localised	Slight	Definite	Low (8)
	With mitigation	Medium term	Localised	Slight	Definite	Low (8)
Traffic impact as a result of Maintenance	Without mitigation	Short term	Regional	Slight	May Occur	Low (7)
	With mitigation	Short term	Regional	Slight	May Occur	Low (7)

When looking at Table 1, it can be concluded that all impacts will have a “Low” significance. According to the significance rating scale, a low significance can be defined as: “*An acceptable impact for which*

mitigation is desirable but not essential. The impact itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in either positive or negative medium to short term effects on the social and/or natural environment" Except for the additional trips induced by using concrete towers, the difference in impact between using steel or concrete towers can be considered to be of low significance.

3.2.5 Summary of Traffic Statement

Current traffic volumes on N1 near Matjiesfontein (Between Laingsburg and Touwsrivier) are estimated from the most recent SANRAL yearbook at about 3834 ADT (Average Daily Traffic), 1497 ADTT (Average Daily Truck Traffic) (both directions with a 50/50 split) and a maximum hourly flow of about 800 veh/h for this section of road.

The current traffic volumes on the R354 (Western Cape Provincial Road: Trunk Road 20/1) is in the order of 140 vehicles per day with a 13% heavy vehicle component.

It can therefore be stated that the construction traffic and the post construction traffic would be low without any significant impact on the existing traffic flows on the N1 or provincial roads. It will also have a negligible impact on the pavement structures. Furthermore, the impact of the traffic on the provincial gravel access roads will also be of low significance with respect to service levels.

3.3 Access Route

3.3.1 Site Description

A summary of the site descriptions, as provided in Section 1, is given in Table 2 and Table 3:

Table 2: Summary of Brandvalley WEF Site Description

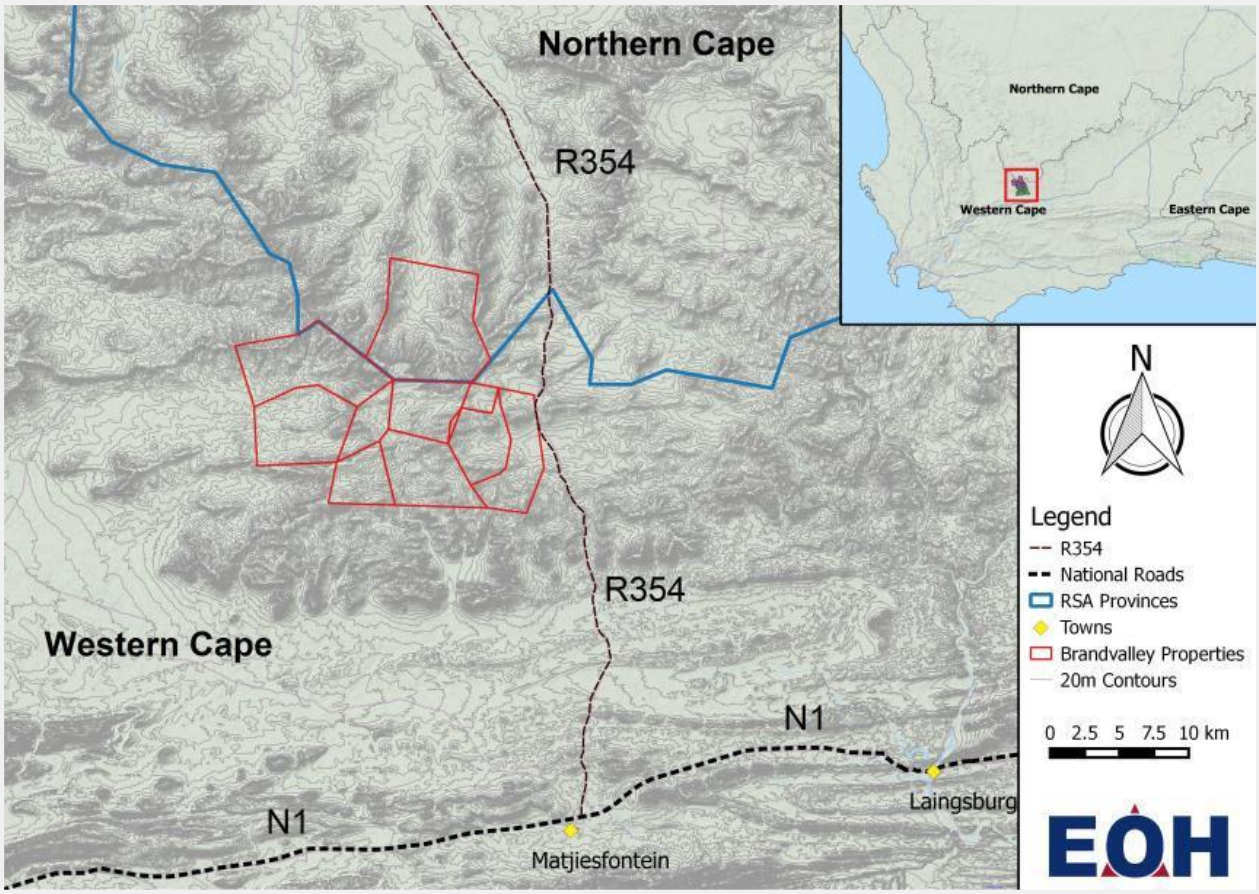


Figure 5: Brandvalley WEF (EOH Coastal & Environmental Services, 2016)

Location (Centre Point)	32° 58' 42.4" S 20° 28' 35.34" E
Distance of Centre Point N of Matjiesfontein	45km
Generation Capacity	140MW
Distance from Ports **Saldanha** **Cape Town** **Port Elizabeth**	 362km 279km 610km
Farms (farm/portion)	Barendskraal 76, Brandvalley 75, Fortuin 74, Kabeltouw 160, Muishond Rivier 161, Rietfontein 197

Table 3: Summary of Rietkloof WEF Site Description

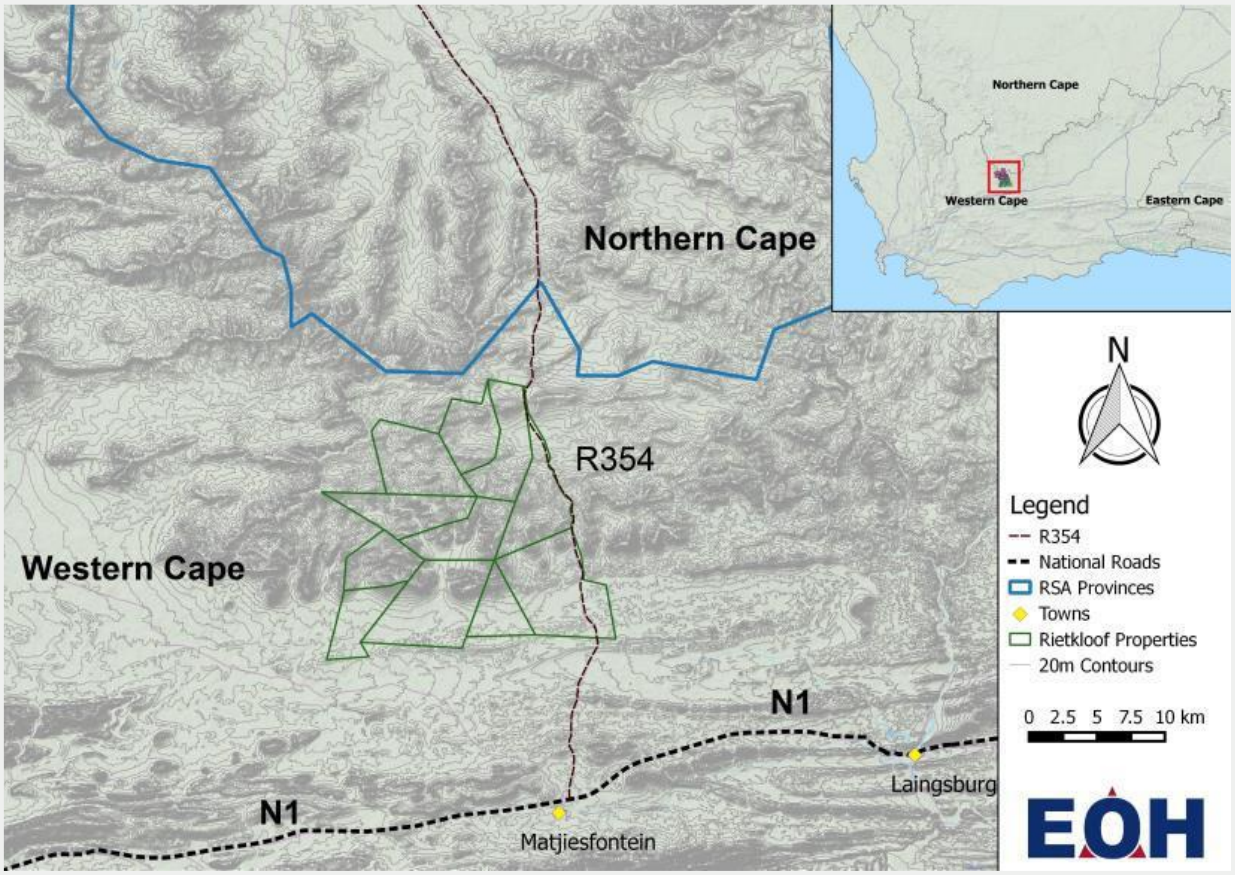


Figure 6: Rietkloof WEF (EOH Coastal & Environmental Services, 2016)

Location (Centre Point)	33° 02' 29.6" S 20° 30' 09.3" E
Distance of Centre Point N of Matjiesfontein	25km
Generation Capacity	140MW
Distance from Ports **Saldanha** **Cape Town** **Port Elizabeth**	 342km 259km 590km
Farms (farm/portion)	Barendskraal 76, Fortuin 74, Hartjieskraal 77, Nuwerus 284, Rietkloof Annexe 88, Snyders Kloof 80, Vogelstruisfontein 81, Wilgehout Fontein 87

3.3.2 Preferred Route from Port

The starting point of the route for the transportation of imported equipment is the port at either Saldanha, Cape Town or Port Elizabeth. Of these, Saldanha is the preferred port, with a route length of 342km, as indicated in Figure 7. Section views of the roads along the preferred route are shown in Appendix A, while urban section views along this route are shown in Appendix B.

It should be noted that the Ports Authority also has preferences on freight imports, which should be respected.

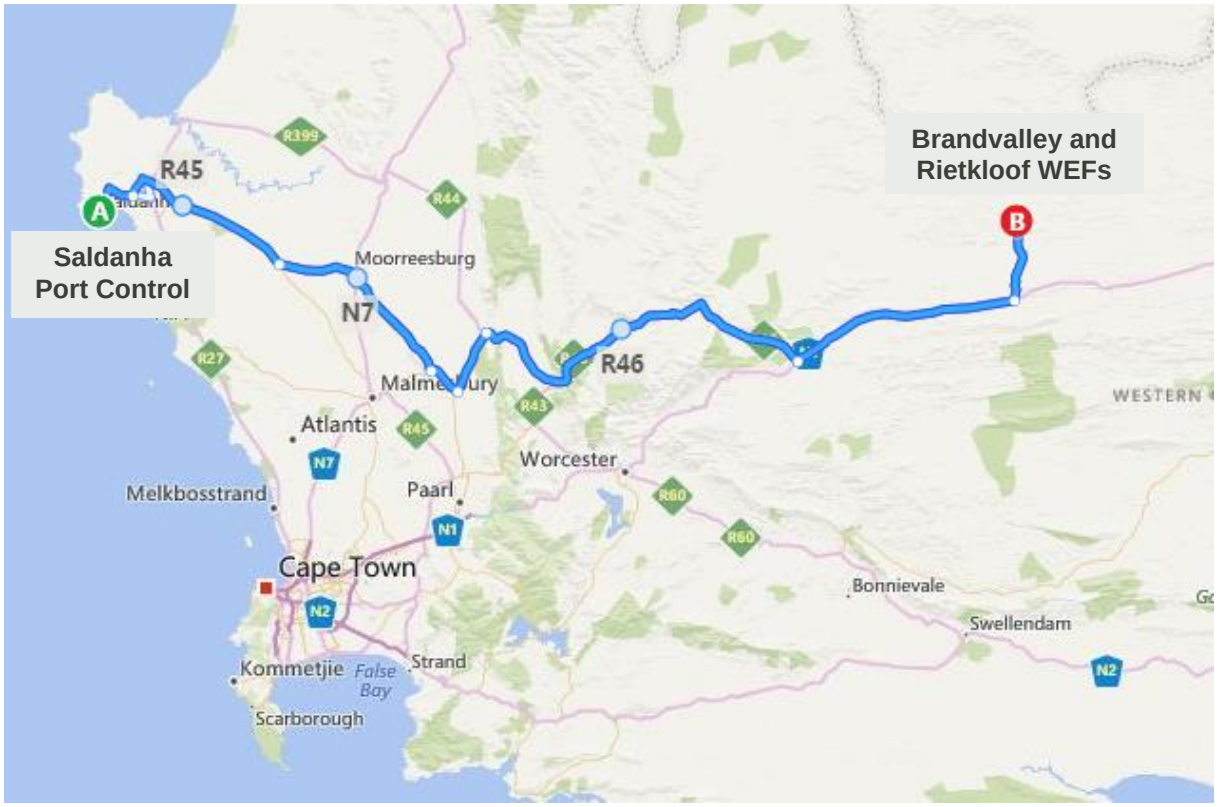


Figure 7: Preferred Freight Route

The route from the alternative port of Port Elizabeth is about 590km and is the least preferred route; however, it still offers an alternative, should Saldanha Port not be available for any reason. While Cape Town Port is the closest port to the site, it would most probably not be able to accommodate the imported turbine elements, due to current activities.

Alternatives to the preferred route exist and are shown in Figure 8.

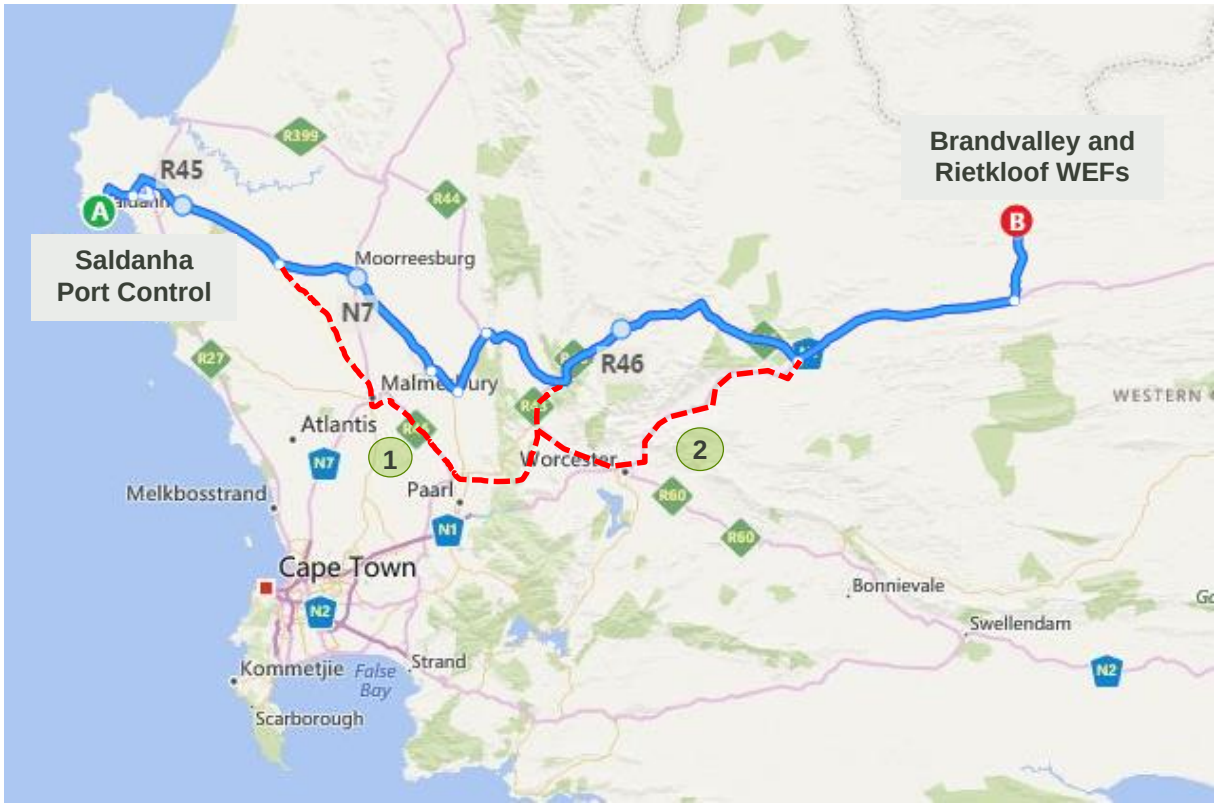


Figure 8: Alternative Freight Routes from Saldanha Port

The following is noted regarding deviations from the preferred route:

1. This alternative passes through the town of Malmesbury, where an urban intersection limits the maximum turning radius. This alternative will be restricted for abnormal loads that require a large turning radius (e.g. vehicles transporting wind turbine blades).
2. This alternative passes through Worcester and De Doorns, along the N1. However, one of the bridges over the N1, between Worcester and De Doorns, is of concern. It is estimated that the bridge is lower than 5m, limiting the maximum height of freight that can be transported along this route.

The alternatives shown in Figure 8 are presented for the cases where the preferred route of travel is unavailable due to maintenance, or any other reason. The alternatives that are presented have certain constraints (as mentioned) and may not be able to accommodate all of the abnormal loads. An alternative of accessing the site from Laingsburg was not considered, due to the excessive length of gravel roads along the route.

It is suggested that the transporting contractor executes a more detailed study before transporting any of the components, to confirm the preferred and alternative routes for each type of load configuration. Should any of the preferred sections be unavailable for any reason, a combination of routes should also be considered.

3.3.3 Route for Construction Materials

Material sources for road building and concrete works are available in Worcester and all material will most likely be transported from this town on the N1 and the R354. As stated earlier, to reduce traffic on the access roads, consideration could be given to sourcing material for road building and concrete

aggregate from new quarries/sources in the vicinity of the site, provided that it is feasible with respect to the target implementation programme. It is noted that the approval period for such quarries/sources is typically 12 to 18 months. The possible siting of quarries and/or borrow pits will be confirmed prior to construction, once a geotechnical investigation has been conducted.

The closest manufacturing centre will most likely be Cape Town, which is situated 256km from the site. For the largest part of the route from Cape Town, the N1 (which is surfaced) will be used. There are, however, toll fees present on this specific route, which can be avoided by use of alternatives.

3.3.4 Authority and Permit Requirements

The following is noted:

a) No toll fees are required on the routes from the Saldanha Port. On the routes from the other manufacturing centres, certain portions of the National Roads are tolled, but the related fees can be avoided by use of alternatives.

b) Abnormal permits will be required for the transport of the transformer and the turbine elements by the logistics contractor. The estimated permit value will be a function of the actual vehicle configuration, but is estimated at R9000 – R15000 per trip (dependent on the weight of the load and escorting requirements by Provincial Traffic). In extreme cases, permits could cost as much as R50 000 per trip. The abnormal application process would take approximately one month to complete and should be applied for, by the logistics contractor, once the project is awarded preferred bidder status.

3.3.5 Route Limitations of the Preferred Route from the Port

The identified route has possible limitations that will necessitate more detailed investigations to determine the level of upgrading that will be required (if any) to accommodate the abnormal loads. All the possible limitations (apart from the capacity of the bridges on the R354, discussed in Section 3.3.6) will potentially be encountered on the gravel roads from the R354 intersection to the prospective site. Possible limitations, other than capacity of the bridges on the R354, that require investigation may include: motor grid gates with loading constraints, overhead power and telecommunication lines with an insufficient ground clearance, substandard geometry of roads and bridges, and drainage issues.

3.3.6 Capacity of Bridges

The section of the preferred route along the R354 between Matjiesfontein (N1) and Sutherland does not form part of a heavy freight route. Several bridges exist along this road that will have to be crossed by abnormal loads. Elevation and approach views of a typical bridge on the R354 are shown in Figure 9 and Figure 10.

Figure 9: Elevation View of Typical Bridge on R354

Figure 10: Approach View of Typical Bridge on R354

A high order investigation was performed to identify limitations on the loading capacity of the existing bridges along this section of road. Aurecon believes it is unlikely that there would be any problems with the loading capacity of these bridges with regards to the delivery of abnormal loads (provided the requirements of the Bridge Formula are met). However, a detailed investigation should be undertaken by the transport contractor, to confirm that the vehicle configuration is suited to the maximum axle loading for the bridges.

3.3.7 Site Access Road

Four viable alternatives for the final section of the route to the site exist for both Brandvalley WEF and Rietkloof WEF. These to the proposed site access point(s) are shown in Figure 11.

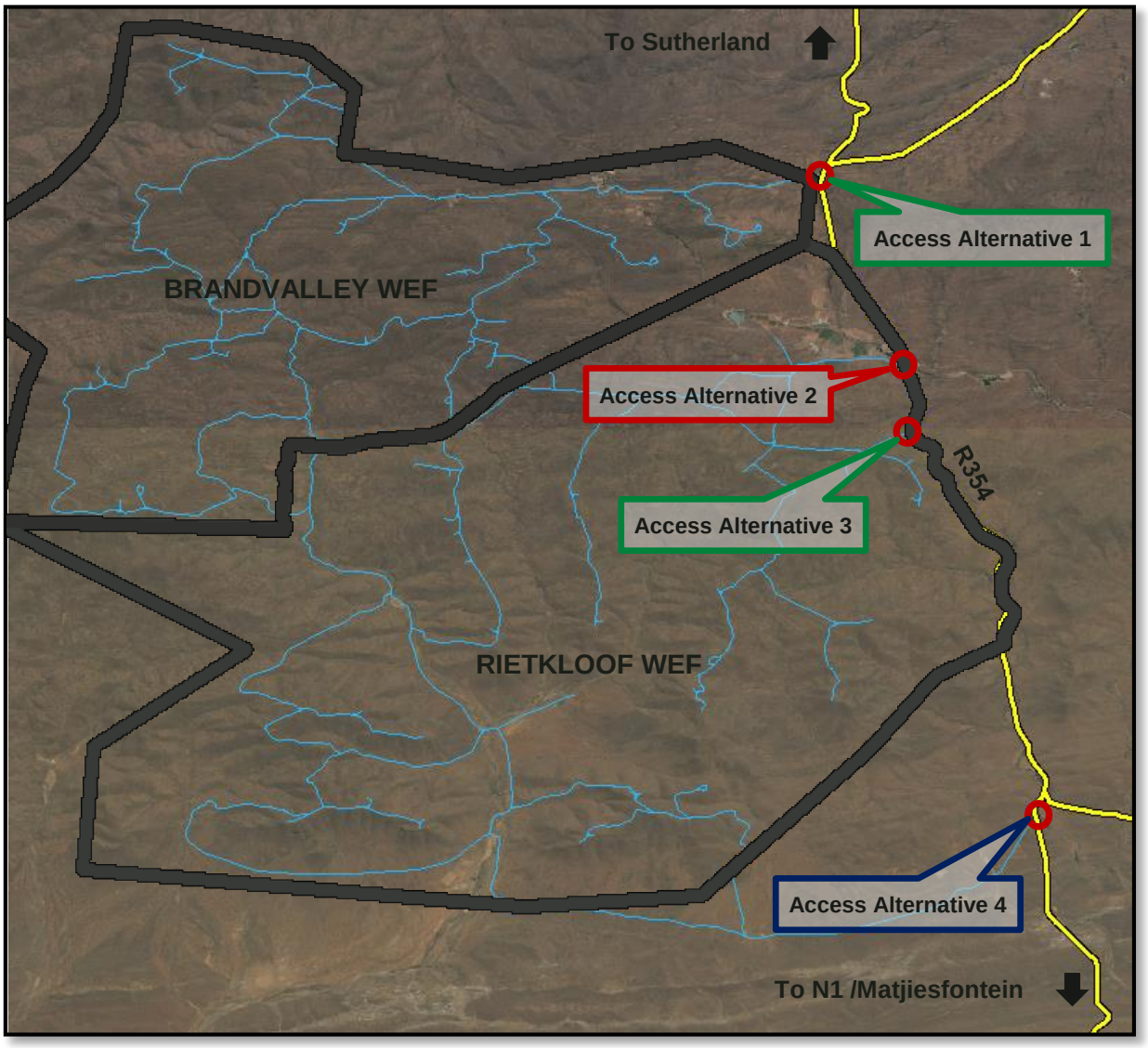


Figure 11: Access Positions to Brandvalley & Rietkloof WEF

The proposed site access positions are all situated on the R354 and close to the border between the Northern Cape and Western Cape and are to be approved by the Western Cape Provincial Government. The sufficiency of the sight distances (stopping and shoulder) at the proposed site entrance is to be reviewed and approved by the local authority. The four alternative routes from the R354 are discussed in the subsequent sections.

3.3.7.1 Road to Site Access Alternative 1

For this option, the site access point is located approximately 34 km from the R354 turn, shown in Figure 12. Following this turn-off, the remainder of the route to site consists of gravel roads.

Figure 12: Access Alternative 1

This access alternative is considered for both sites – Brandvalley and Rietkloof WEF – as a possible access point. It will also be considered in conjunction with the proposed Access Alternative 4 for Rietkloof WEF. Even though this alternative access is situated further away when compared to the proposed access alternative 4, it will be beneficial for Brandvalley WEFs seeing that trucks will not have to travel as long sections along gravel roads. Upgrades in the form of a bridge widening, addressing drainage issues and the widening of cattle grid gates are potentially required on this alternative.

3.3.7.2 Road to Site Access Alternative 2

A potential turn-off on to a newly proposed road is located approximately 26 km from the R354 turn-off. The location of the newly proposed road is shown in Figure 13.

Figure 13: Access Alternative 2

This access alternative is considered for both sites – Brandvalley and Rietkloof WEF – as a possible access point. It will also be considered in conjunction with the proposed Access Alternative 4 for

Rietkloof WEF. The proposed access road to be constructed is approximately 1 km in length before it joins up with an existing road. The benefit this option holds is that it does not pass any farm houses and that it can easily be utilised for both WEFs. Allowance for adequate turning radii are to be made, along with sufficient sight distances.

3.3.7.3 Road to Site Access Alternative 3

For this option, the site access point is located approximately 29 km from the R354 turn-off, shown in Figure 14. Existing roads will be utilised as far as possible, with upgrades to be performed where necessary. The possibility of a bypass has to be considered, seeing that the road passes a farm house. This will obviously have extra cost associated with it. This access alternative is considered for Rietkloof WEF only as a possible main access point. It will also be considered in conjunction with the proposed Access Alternative 4.

Figure 14: Access Alternative 3

3.3.7.4 Access Alternative 4

The proposed access position considered for Rietkloof WEF is located approximately 18 km from the R354 turn-off from the National Road 1 (N1). Figure 15 shows the turn-off from the R354. This access will be used in conjunction with the other preferred access alternatives to each site. The remainder of the route to site from this point consists of gravel roads. The Rietkloof road is planned to be upgraded.

Figure 15: Access Alternative 4

3.3.7.5 Preferred Access to Site – Brandvalley WEF

The preferred access to the proposed Brandvalley WEF is Access Alternative 1 for the more direct route to site.

3.3.7.6 Preferred Access to Site – Rietkloof WEF

The preferred access to the proposed Rietkloof WEF is Access Alternative 3 for the more direct route in conjunction with Access Alternative 4.

3.3.7.7 Internal Access Roads

Access roads between the turbines will be required for construction, and later for maintenance purposes. The internal access roads will be confirmed once the final positioning of the wind turbines are available and a more detailed design is required.

3.3.8 Accommodation of Traffic during Construction

SANRAL and Provincial Authority may require upgrading of the access intersection to the site from National or Provincial Roads. During upgrading of the access, traffic will have to be accommodated, as per SADC Road Traffic Signs Manual requirements. The typical minimum signage requirements, shown in Figure 16, will have to be implemented to ensure safety, should the closure of the road be required during construction.

The accommodation of traffic on the proposed access road, from the gravel road leading to the site, would require consultation with the farm users. As only one-way traffic is likely to be possible on this road, it will likely have to be closed to local traffic at times.

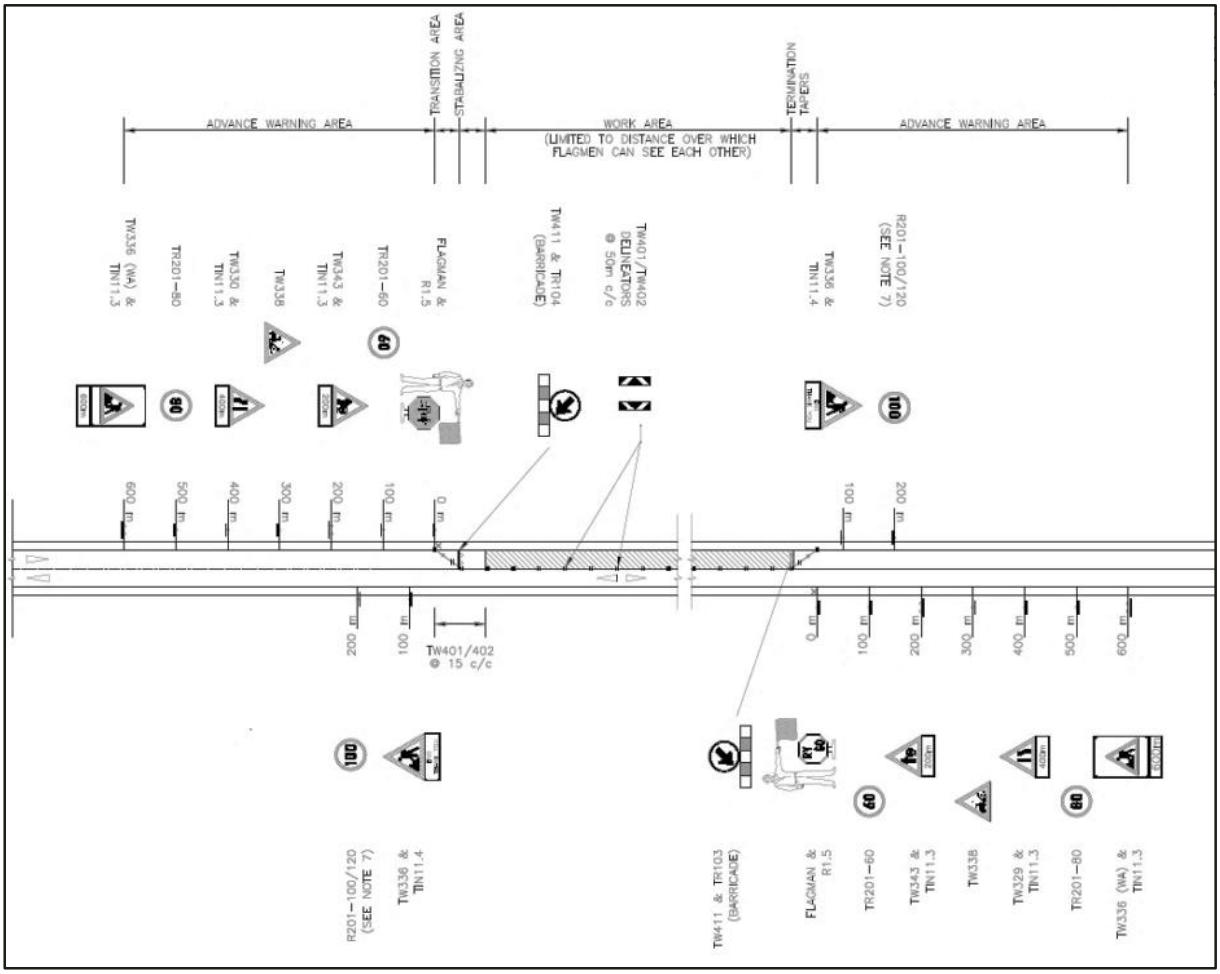


Figure 16: Accommodation of Traffic - Typical Layout

4 CONCLUSION

This report details the investigation of the transport needs for the proposed Brandvalley and Rietkloof Wind Energy Facilities, located on the border between the Western Cape and Northern Cape Provinces, on the farms Barendskraal 76, Brandvalley 75, Fortuin 74, Kabeltouw 160, Muishond Rivier 161, Rietfontein 197 B, Hartjieskraal 77, Nuwerus 284, Rietkloof Annexe 88, Snyders Kloof 80, Vogelstruisfontein 81, and Wilgehout Fontein 87. The purpose of the investigation is to identify potential access routes, including site access, for the development of the facility. The general freight for the wind farm will comprise building materials, blades, nacelles, towers, hubs, cables and transformers.

The imported freight will preferably be transported from Saldanha Port to the site. The preferred freight route from Saldanha Port, via Moorreesburg (a distance of 342km), comprises surfaced roads for the majority of the way (only the final road section to the site consists of gravel roads). This route is predominantly on National or Provincial Roads, with suitable conditions for the transport of normal freight, or abnormal loads with permits. No toll fees are required on this route, however, abnormal permits will be required for the transport of the transformers and turbine components, irrespective of the final route determined by the logistics contractor.

Building materials will most likely be transported from Worcester, while certain elements will be transported from various manufacturing centres in South Africa - most likely Cape Town for tower sections and Johannesburg for transformers. The transport of elements from these manufacturing centres will be predominantly on National and Provincial roads, which presents no limitations for normal freight.

Due to the distance from Worcester to site (approximately 155km), significant reductions in heavy vehicle trips could be achieved by sourcing road building materials and concrete aggregate from new quarries or borrow pits in proximity to the site, provided that it is a feasible with respect to the target implementation programme. The possible siting of quarries and/or borrow pits will be confirmed prior to construction, once a geotechnical investigation has been conducted.

There is a limited risk of delays to the various deliveries required for the construction of the facility, due to potential routine maintenance works (such as repairs and reseals). The impact of such activities is dependent on the scheduling of deliveries and of roads contracts, and may be mitigated by the use of the alternative routes proposed in this report.

In general, no obvious problems were identified associated with the transport of freight along the proposed routes to the site, nor for the accesses required for the construction and maintenance of the facility. It will, however, be necessary to confirm certain aspects such as clearances, bridge capacities, etc., by the logistics contractor as part of their preparation as this will be dependent on the actual vehicles configuration used.

5 REFERENCES

EOH Coastal & Environmental Services. (2016). *EIA FOR THE PROPOSED BRANDVALLEY WIND ENERGY FACILITY, NORTHERN AND WESTERN CAPE PROVINCES, SOUTH AFRICA.* Cape Town: EOH Coastal & Environmental Services.

EOH Coastal & Environmental Services. (2016). *EIA FOR THE PROPOSED RIETKLOOF WIND ENERGY FACILITY, WESTERN CAPE PROVINCE, SOUTH AFRICA.* Cape Town: EOH Coastal & Environmental Services.

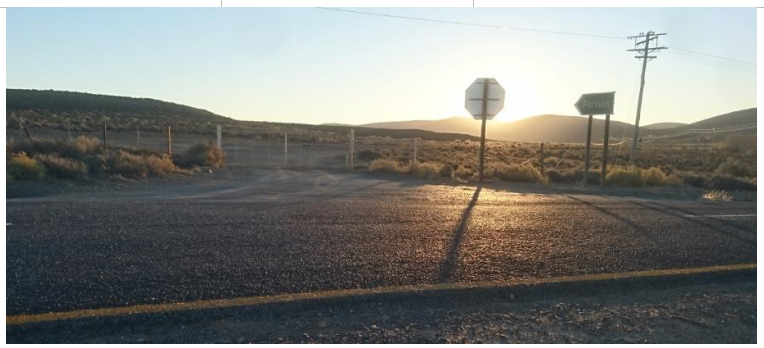
Appendix A: Elements of Preferred Route

Table 4: Elements of preferred route

Element	Route Name	From	To	Distance [km]	Type
1	R45	Saldanha	Moorreesburg	84.9	Surfaced Provincial Road
				The R45 is a single carriageway, two lane road with surfaced shoulders.	
2	R311	Moorreesburg	Riebeeck Kasteel	35.4	Surfaced Provincial Road
				The R311 is a single carriageway, two lane road with surfaced shoulders.	
3	R46	Riebeeck Kasteel	Hermon	9.9	Surfaced Provincial Road
				The R46 is a single carriageway, two lane road with surfaced shoulders.	

Element	Route Name	From	To	Distance [km]	Type
4	R46	Hermon	Wolseley	42.6	Surfaced Provincial Road
				The R46 is a single carriageway, two lane road with surfaced shoulders. There are mountain passes along this section of the route.	
5	R46	Wolseley	Ceres	16.6	Surfaced Provincial Road
				The R46 is a single carriageway, two lane road with surfaced shoulders. There are mountain passes along this section of the route.	
6	R46	Ceres	Touwsrivier	80.6	Surfaced Provincial Road
				The R46 is a single carriageway, two lane road with gravel shoulders. There are mountain passes along this section of the route.	

Element	Route Name	From	To	Distance [km]	Type
7	N1	Touwsrivier	Matjiesfontein	56.7	Surfaced National Road
				The N1 is a single carriageway, two lane road with surfaced shoulders.	
8	R354	Matjiesfontein	Rietkloof Turn-Off	18.26	Surfaced Provincial Road
			New Proposed Road	26.0	
			Fortuin Turn-Off	29.47	
			Brandvalley/ Ou Mure Turn-Off	34.29	
				The R354 is a single carriageway, two lane road with gravel shoulders (surfaced shoulders in places). There are mountain passes along this section of the route.	
9A	OP06161	Rietkloof Turn-Off	Site	-	Gravel Road
				Provincial gravel road potentially requiring minor upgrades (improvement of vertical alignment, drainage, gate widenings, etc.) and routine maintenance.	

Element	Route Name	From	To	Distance [km]	Type
9B	-	New Proposed Road	Site	-	None
					
9C	OP08044	Fortuin Turn-Off	Site	-	Gravel Road
				Provincial gravel road potentially requiring minor upgrades (widening of bridges and cattle grids) and routine maintenance	
9D	OP08042	Brandvalley/Ou Mure Turn-Off	Site	-	Gravel Road
				Provincial gravel road potentially requiring minor upgrades (widening of bridges and cattle grids) and routine maintenance	

Appendix B: Urban Sections along the Preferred Route

Table 5: Urban sections on preferred route

Element	Route Name	Town	Type
2	R311	Moorreesburg	Surfaced Provincial Road
			
3	R46	Riebeeck Kasteel	Surfaced Provincial Road
			

Element	Route Name	Town	Type
6	R46	Ceres	Surfaced Provincial Road

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