JERSEY SOLAR POWER PLANT (RF) (PTY) LTD

TRAFFIC IMPACT ASSESSMENT FOR THE TRANSPORTATION OF SOLAR ENERGY EQUIPMENT TO THE JERSEY PHOTOVOLTAIC SOLAR POWER PROJECT LOCATED NEAR VENTERSDORP, NORTH WEST PROVINCE

32745.08C-REP-001-00

TRAFFIC IMPACT ASSESSMENT

DECEMBER 2022

PREPARED FOR:

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EXECUTIVE SUMMARY

BVi Consulting Engineers Western Cape (Pty) Ltd was appointed by *Jersey Solar Power Plant (RF) (Pty) Ltd* to conduct a Traffic Impact Assessment (TIA) for the proposed development of a 350 MW photovoltaic solar power plant located near Ventersdorp, North West Province. This specialist study forms part of the Environmental Impact Assessment (EIA) application to the *Department of Environment, Forestry and Fisheries* (DEFF).

For the traffic assessment, regional and local transport routes were investigated:

- For regional routes, haulage routes from various ports of entry (Durban Harbour and Richards Bay Harbour) were investigated.
- For the assessment of local routes, routes close to the site were assessed for impact of local trips on the local network.
- The existing traffic volumes on the transportation routes were sourced and used to calculate the current background traffic, the expected background traffic during construction and, thereby, the Level of Service. The number of trips generated from the construction period were estimated and the impact of these additional trips on the regional and local transport routes were also investigated.

The following conclusions can be drawn from the traffic and transportation study:

- The major traffic impact occurs during the construction phase of the project. The impact of the construction trip generation, on the predicted traffic volumes on the local and the regional transportation routes are expected to be low. No mitigation measures for these routes will be necessary.
- Two possible ports of entry have been identified from where the solar panel technology and large electrical components will be transported, namely: Durban (704 km) and Richards Bay (723 km). It is recommended that the Port of Durban is the preferred port of entry as this route is the shorter of the two routes. The regional routes indicated in the analysis would need to be confirmed by freight carriers as suitable for the sensitive normal loads. The final decision on the selected route would be based on a combination of cost, distance and road condition at the time of transport.
- Transformer and substation components will be transported via abnormal loads. An abnormal load will necessitate an application to the *Department of Transport and Public Works* for a permit. A permit is required for each province that the transportation route traverses. Only one to two abnormal load trips is expected for the Jersey PV SPP development. Abnormal load transportation is therefore considered to be isolated and would have a negligible impact on traffic over the construction phase of the project.
- In terms of impact on roads infrastructure:
  - Access to the site is proposed via a Class 4 Rural local connector road, D1822.
  - Three different access alignment alternatives are proposed and are spaced approximately 30 m apart.

- Proposed Access Alignment Alternative 1 and 2 require varying amounts of horizontal deflection between the D1822 and the proposed site access road, while Proposed Access Alignment Alternative 3 has a straight connection.
- All three proposed alignment alternatives satisfy the minimum access spacing requirements as per *TRH26*.
- The positioning of the preferred alignment should, however, consider the placement of opposing accesses as *TRH26* states that access points are preferred opposite each other (instead of a series of staggered intersections).
- All three proposed access alignment alternatives are considered viable and a final decision on the positioning of the access can therefore include consideration for various other (potential) aspects e.g. operational, planning, and cost, etc.
- The formalisation of the site access point will likely be a requirement as part of the wayleave approval of the local and provincial roads authorities.
- Adequate traffic accommodation signage must be erected and maintained on either side of the access throughout the construction period of the project.

- In terms of impact on traffic:
  - The regional construction trips generated by the proposed development are not considered significant in comparison to the Average Daily Traffic (ADT) and will not affect the existing Level of Service. In terms of estimated traffic volumes, no mitigation measures will be necessary. Mitigation measures, such as staggered trips and reduced peak time travel are proposed if needed.
- In terms of cumulative impact:
  - The concurrent construction of one other solar farm (Nguni PV SPP) in a 30 km radius of the site has also been considered and is deemed to have a low impact as summarised in the table below. Mitigation measures that may be considered, should concurrent construction occur, include the staggering of trips at the site and the implementation of a roads maintenance programme.

Table: Impact significance ratings of Jersey PV SPP

PHASE OF PROJECT	SIGNIFICANCE RATING
Construction – Haulage traffic	**Low (24)**
Construction – Local traffic	**Low (15)**
Construction – Site traffic	**Low (12)**
Operation and maintenance	**Low (18)**
Decommissioning	**Low (12)**
Cumulative Impact – Haulage traffic	**Low (5)**
Cumulative Impact – Local traffic	**Low (5)**

The development of the Jersey PV SPP, located on the remaining extent of portions 1 and 2 of the farm Illmasdale No. 70 forming part of the *JB Marks Local Municipality* in the North West Province is therefore supported from a traffic and transportation perspective.

Locality Plan

ISSUE AND REVISION RECORD

QUALITY APPROVAL

	Capacity	Name	Signature	Date
Authored by	Professional Engineer	Adrian Tarrant Pr Eng: 201705088		01/12/2022
Reviewed by	Professional Engineering Technologist	Jacques Nel Pr Tech Eng: 200770131		01/12/2022
Approved by Design Centre Leader	Director	Dirk van der Merwe Pr Eng: 20120186		01/12/2022

This report has been prepared in accordance with BVi Consulting Engineers Quality Management System. BVi Consulting Engineers is ISO 9001: 2015 registered and certified by NQA Africa.

REVISION RECORD

Revision number	Objective	Change	Date
0	Issue to Client for comments	None	01/12/2022

TRAFFIC IMPACT STUDY COVER PAGE

INFORMATION ITEM	DETAILS/ DESCRIPTION
Municipality Name	JB Marks Local Municipality; and Dr Kenneth Kaunda District Municipality
Type of Assessment	Traffic Impact Assessment
Erf Numbers/ Farm Names	Portion 1 of the farm Illmasdale No. 70 Portion 2 of the farm Illmasdale No. 70
Date of Report	01 December 2022
Details of Assessor	DJP van der Merwe Pr Eng
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DJP van der Merwe Pr Eng

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CHAPTER 1 INTRODUCTION

1.1 TERMS OF REFERENCE

BVi Consulting Engineers Western Cape (Pty) Ltd was appointed by *Jersey Solar Power Plant (RF) (Pty) Ltd* to conduct a Traffic Impact Assessment (TIA) for the proposed development of a 350 MW photovoltaic solar power plant located near Ventersdorp, North West Province. This specialist study forms part of the Environmental Impact Assessment (EIA) application to the *Department of Environment, Forestry and Fisheries* (DEFF).

1.2 OBJECTIVES

The objectives of this specialist traffic and transportation study are:

- Identify the shipping port(s)-of-entry to which the generator and large components (e.g., main power transformer) should be delivered for subsequent distribution to the proposed site.
- Assess the feasibility of the transport routes (including consideration of route lengths and the identification of potential constraints along the route) and subsequently identify the optimal port of transfer;
- Establish the third-party consent requirements for the proposed transport route(s) and assess the related regional permit conditions or restrictions;
- Evaluate the possible accesses to the site and identify the preferred site access road, including a high-level assessment of any expected conditioning works;
- Estimate the type and volume of new vehicle trips that are expected to be added to the road during the construction, operations and decommissioning phases of the site;
- Undertake a risk assessment of the traffic impact during the construction, operations and decommissioning phases of the proposed development on regional and access roads (as applicable), including a description of the existing road conditions:
    - Determine the potential environmental and social (including labour, health and safety) indirect, direct and cumulative risks/ impacts to receptors from a traffic and transport perspective; and
    - Propose mitigation measures for the identified significant risks / impacts and enhance the expected positive risks / impacts.

1.3 APPROACH AND METHODOLOGY

The traffic and transportation study deals with the traffic impact on the surrounding road network during three distinct phases: construction, operational and decommissioning. The study considered and assessed the following:

Site layout, access points and internal roads assessment:

- Description of the surrounding road network;
- Description of site layout;
- Assessment of proposed access points; and
- Assessment of proposed internal roads.

Traffic and transportation assessment

- Estimation of trip generation;
- Discussion of potential traffic impacts;
- Assessment of possible transportation routes; and
- Construction and operational (maintenance) vehicle trips.

1.4 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations apply to this traffic and transportation study:

- This study is based on the project information provided by Jersey Solar Power Plant (RF) (Pty) Ltd;
- Typical Eskom specifications for power transformers were used and the following dimensional limitations need to be adhered to when transporting the transformers:
    - Height: 5000 mm;
    - Width: 4300 mm; and
    - Length: 10 500 mm.
- Photovoltaic (PV) power plant components will be transported from the most feasible port of entry, which is deemed to be either the Port of Durban or the Port of Richards Bay, both located in the KwaZulu-Natal Province;
- All other construction materials, for concrete and wearing course, would be sourced from a local licensed quarry (off-site);
- Maximum vertical height clearances along the transportation route is 5.2 m for abnormal loads.

1.5 REFERENCE DOCUMENTATION

The following documents were used in compiling this report and will be referenced as required:

- *Project Description Document: The Development of the Jersey Solar Power Plant near Ventersdorp, North West Province*, prepared by Environamics, 18 November 2022.
- *Highway Capacity Manual (HCM) 2010*, published by the Transportation Research Board, December 2010.

- *TRH 11: Dimensional and Mass Limitations and Other Requirements for Abnormal Load Vehicles*, published by the Department of Transport (DoT), August 2009.
- *TRH 17: Geometric Design of Rural Roads*, published by the Department of Transport (DoT), 1988.
- *TRH 26: South African Road Classification and Access Management Manual*, published by the Committee of Transport Officials (COTO), August 2012.

CHAPTER 2 PROJECT PARTICULARS

2.1 PROJECT DESCRIPTION AND SITE LOCATION

The proposed Jersey Photovoltaic Solar Power Plant (PV SPP) development site is located on portions 1 and 2 of the farm Illmasdale No. 70, approximately 45 km northeast of Ventersdorp, North West Province and forms part of the *JB Marks Local Municipality*. The proposed site has an overall development footprint of approximately 600ha and a locality plan is shown in *Figure 2.1*.

Figure 2.1: Location of the proposed Jersey PV SPP

It is expected that the Jersey PV SPP will have a maximum production capacity of 415 MW, with a reduced generational capacity of 350 MW will be supplied to the existing national (Eskom) electricity grid. A summary of the key components of the proposed project is provided below:

- PV panel array – Maximum production of 350 MW. The PV panels will be tilted at a northern angle in order to capture the most sun or using one-axis tracker structures to follow the sun to increase the yield
- Wiring to inverters - Sections of the PV array will be wired to inverters.
- Connection to the grid - Connecting the array to the electrical grid requires transformation of the voltage from 480 V to 33 kV to 132 kV to 275 kV. An onsite substation will be required to step the voltage up to 132 kV, after which the

power will be evacuated into the national grid via the proposed power line. It is expected that generation from the facility will tie in with the Hera / Watershed 275 kV HV Feeder Overhead Line to the existing Eskom Pluto 400 kV / 275 kV/ 22 kV MTS Substation. Connection options will be assessed within the same 200m wide (up to 550m wide in some instances) grid connection corridor.

- Electrical reticulation network - An internal electrical reticulation network will be placed as required.
- Supporting infrastructure - Auxiliary buildings and laydown areas will be located within an area with a maximum size of 3.5 ha.
- Battery storage - Facility with a maximum height of 8m and a maximum volume of 1 740m^3 of batteries and associated operational, safety and control infrastructure.
- Roads – Primary access to the site from the surrounding road network will be via the N14 (south of site) or R30 (north of site) and will make use of the existing unsurfaced road (D1822). Site access will be discussed in detail in *Chapter 2.5* and *Chapter 3*.
- An internal site road network will also be required to provide access to the solar field and associated infrastructure.
- Fencing - The facility will be required to be fenced off from the surrounding farm, for health, safety and security reasons. Fencing with a height of 2.5 meters will be used.

Furthermore, a basic internal road network will be established to provide access to the solar field and associated infrastructure. Based on exposure to similar-sized projects located within the general study area, it is assumed that the construction phase of the Jersey PV SPP is expected to take place over a period of 18 to 24 months, during which regional and local traffic will be affected. The expected traffic and trip generation figures are addressed in *Chapter 6*.

2.2 EXISTING EXTERNAL ROAD NETWORK

The existing external road network, in the vicinity of the Jersey PV SPP development site, is shown in *Figure 2.2*. An overview of the road classification for the major roads has been undertaken and was derived from the S*outh African Classification and Access Management Manual (TRH 26)*.

- N14 is a surfaced two lane, two-way roadway and is classified as a Class 2 Rural Major Arterial in the vicinity of the proposed development site. The full section of the road is classified as a Class 1 Principal Arterial and serves to connect Pretoria (to the northeast of the site) to Springbok (to the southwest of the site) and is approximately 1 200km long.
- R30 is a two lane, two-way (undivided) surfaced roadway and in classified as a Class 3 Rural Minor Arterial. The portion of this roadway located in the vicinity of the proposed site connects Rustenburg (north) to Ventersdorp (southwest).

Figure 2.2: Existing external road network surrounding the Jersey PV SPP

- D1822 is a two-way unsurfaced roadway that can accommodate two vehicles passing by one another simultaneously (no lane markings) and is classified as a Class 4 Rural Collector Road. The roadway primarily has a north-south orientation, is located immediately west of the proposed site and serves to connect the N14 (in the south) to the R30 (in the north).
- Unnamed Access Road is a two lane, two-way roadway that can accommodate two vehicles passing by one another simultaneously (no lane markings) and is classified as a Class 5 Rural Local Road. The road serves to provide direct access to the existing surrounding farms.

It should be noted that the majority of the other immediately surrounding the proposed project site (as shown in *Figure 2.2*) are unsurfaced (i.e., gravel or sand-based) roadways classified as Class 5 Local Roads and primarily fulfil an access function for the neighbouring farms.

2.3 PROPOSED SITE ACCESS

Access to the Jersey PV SPP is proposed via the existing access road shown in *Figure 2.3* and is via an existing farm access road that intersects with the adjacent unsurfaced roadway D1822.

It should be noted that a formal assessment of the proposed access alternatives and typical access road requirements will be undertaken in *Chapter 3*.

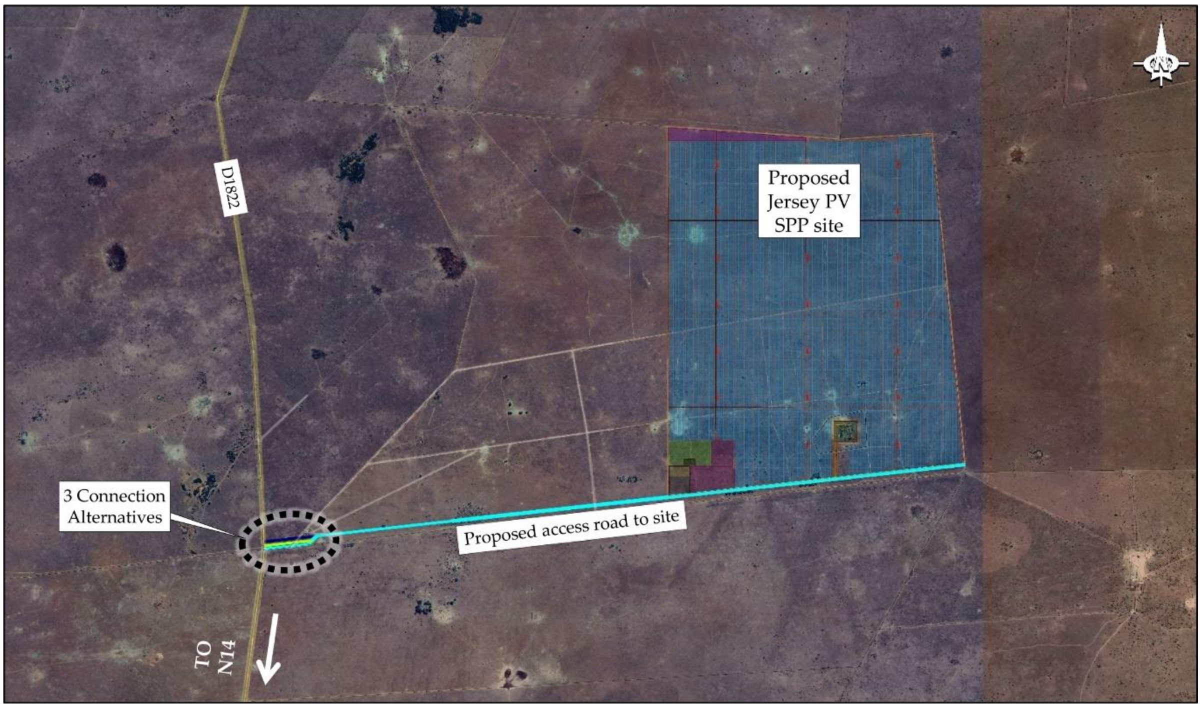


Figure 2.3: Proposed site access – via existing D1822

2.4 SITE LAYOUT AND INTERNAL ROAD NETWORK

The preliminary site layout will be developed in further phases of the project and additional comment will be provided in *Chapter 3*.

2.5 AFFECTED COMMUNITIES

It is expected that primarily communities from the nearby areas of Ventersdorp, Carletonville and (even) Krugersdorp will participate in the construction of the Jersey PV SPP. The development of this solar plant and other renewable energy projects create an opportunity for temporary employment and economic upliftment for these surrounding communities. The location of these communities relative to the proposed Jersey PV SPP is shown in *Figure 2.4*.

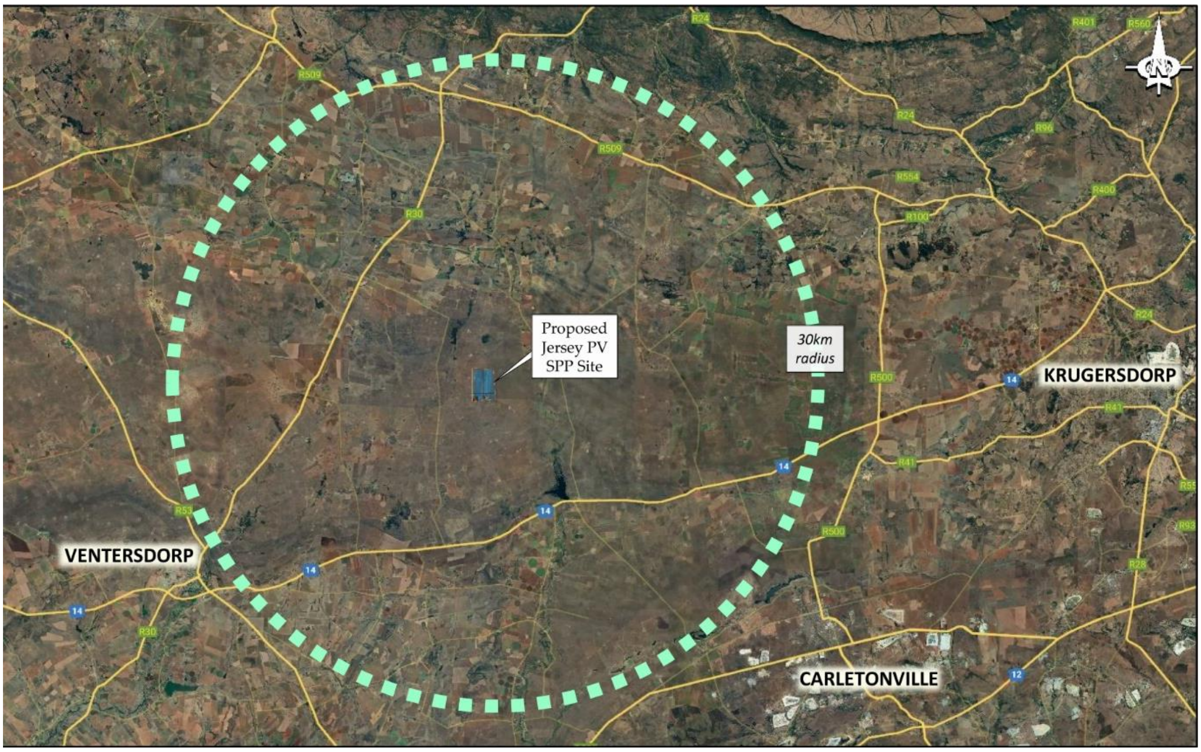


Figure 2.4: Affected communities

CHAPTER 3 SITE ACCESS AND INTERNAL ROAD NETWORK

3.1 PROPOSED ACCESS ALTERNATIVES

Access to the proposed Jersey PV SPP site will be via a new 5 km section of roadway that connects to the south-western corner of the site. Three different alignments for the connection of this proposed road to the external road network i.e., D1822 have been identified by the developer and these are shown in *Figure 3.1* below.

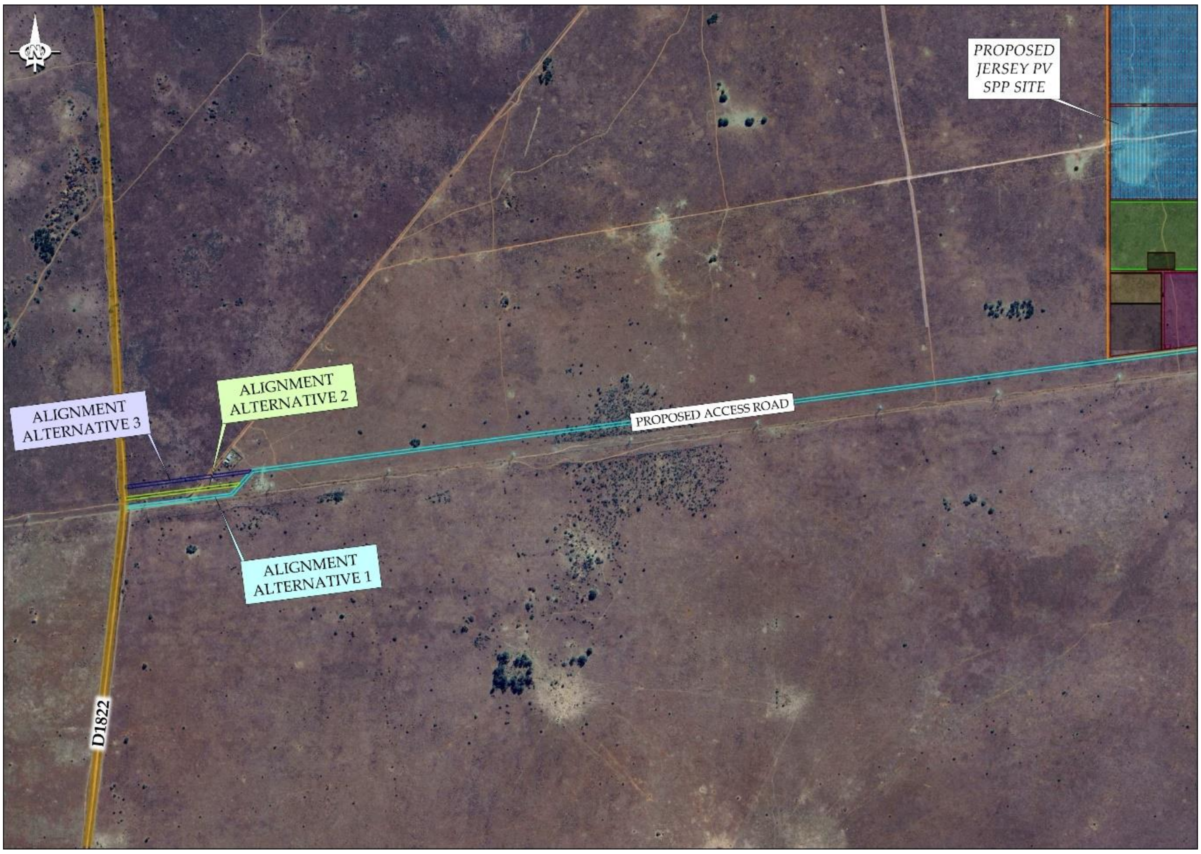


Figure 3.1: Proposed site access road and three alignment alternatives

The bulk (or all) of the access road to the site will be new gravel road construction (existing unsurfaced roadways are located approximately 60m to the south). Furthermore, it is recommended that this road is between 6 m and 8 m wide. Though there are existing access roads at *Alternative 1* and *Alternative 2*, the intersection with the adjacent D1822 (for the constructed alignment option) will need to be formalised and upgraded to the minimum required standards as detailed in *Appendix A*. This may likely be a requirement as part of the wayleave application approval of the *JB Marks Local Municipality*, *Dr Kenneth Kaunda District Municipality* and / or *North West: Department of Public Works and Roads*.

3.1.1 Alignment Alternative 1

This proposed alignment alternative is via an existing unsurfaced farm access road located to the west of the site. It should be noted that there is also an existing farm access located immediately south (approximately 10m) of this alignment alternative, on the opposite (western) side of D1822. In comparing the three alignment alternatives, this option was identified as having the greatest offset (alignment) from the proposed access road and requires a horizontal shift of approximately 60 m.

3.1.2 Alignment Alternative 2

This proposed alignment alternative is via an existing unsurfaced farm access road located to the west of the site and is north of *Alternative 2*. There is also an existing farm access located immediately north (approximately 20m) of this alignment alternative, on the opposite (western) side of D1822. In comparison to *Alternative 1*, this option has a straighter alignment to the proposed access road, although still requires a horizontal shift of approximately 30 m.

3.1.3 Alignment Alternative 3

This proposed alignment alternative will be via a new unsurfaced road located to the west of the site and is north of *Alternatives 1* and *2*. It should be noted that there is also an existing farm access located north (approximately 50m) of this alignment alternative, on the opposite (western) side of D1822. In comparison to the other two alternatives, this option has the straightest alignment to the proposed access road and does not require a horizontal shift.

3.2 MINIMUM ACCESS SPACING REQUIREMENTS

Access to the proposed Jersey PV SPP site is via an existing lower order road, D1822 that is classified as a Class 4 Rural Local Connector. The prevailing minimum access spacing requirements for the proposed access road are therefore considered less restrictive.

The *TRH26* manual states "*…direct and full access to property on Class 4, 5 and 6 streets is the norm, but nevertheless subject to the requirements of this manual*." The proposed access alternatives are positioned a significant distance away from the nearest adjacent intersections with higher order roads: ≈ 13.5 km north of the N14 and ≈ 17km south of the R30. This therefore satisfies the minimum access spacing requirement.

Furthermore, *TRH26* explains that "*…rural collectors and local roads have intersections with all road classes and access to adjacent land uses is to be permitted; in fact the major purpose is to give property access from these roads*". All three of the proposed accesses / alignment alternatives are therefore considered viable. It should, however, be noted that *TRH26* does require consideration for the placement of opposing accesses and states that access points are preferred opposite each other (instead of a series of staggered intersections).

3.3 POSITIONING OF SITE ACCESS ROAD FOR PROPOSED DEVELOPMENT SITE - DISCUSSION

A high-level assessment (as per *Chapter 3.1* and *Chapter 3.2*) of the proposed access alignment alternatives did not reveal any significant transportation engineering-related concerns. Though proposed Alignment Alternative 3 is practically straight (no horizontal diversion) and could therefore represent the preferred option, all three alignments are viable. A final decision on the positioning of the access can therefore include consideration for various other (potential) aspects e.g. operational, planning, and cost, etc.

It must also be noted that adequate traffic accommodation signage must be erected and maintained on either side of the future access throughout the construction phase of the plant, in accordance with *Volume 2* of the *South African Road Traffic Signs Manual* (May 2012). Furthermore, in general, the proposed gravel access road to the site will need to be suitably maintained. Re-gravelling may be necessary as a maintenance measure, from time to time, throughout the operational life of the project.

3.4 INTERNAL ROAD NETWORK

The initial technical information received indicates that the site will have an internal road network with proposed roadway widths of between 4 m and 6 m. This is considered acceptable and a gravel road structure would be suitable for this development.

A high-level conceptual layout (see *Figure 3.2*) shows that a series of north-south and east-west oriented roads are proposed within the site boundaries, with a grid-pattern arrangement. The total length of the internal road network is calculated at 30 km.

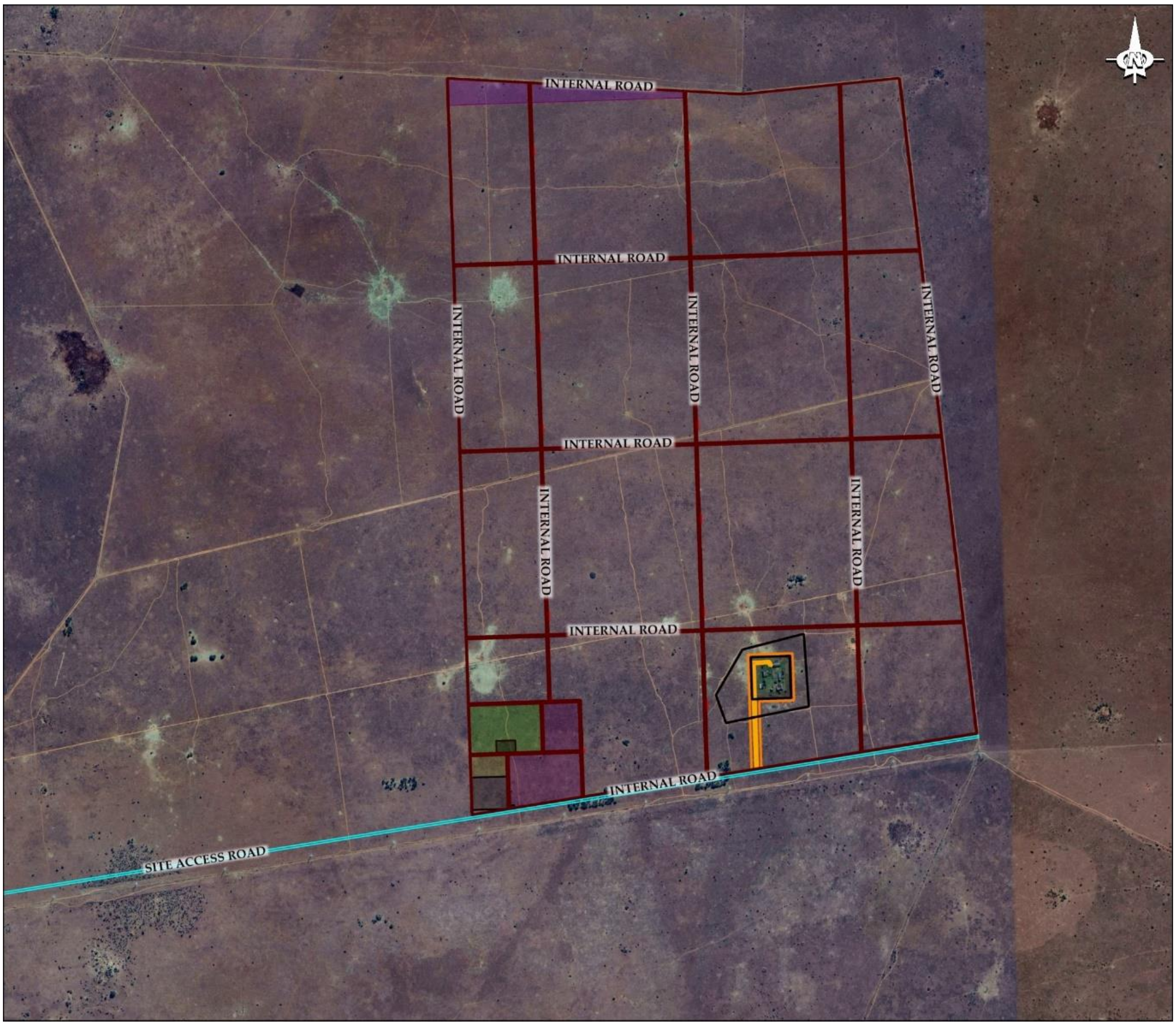


Figure 3.2: Conceptual layout of Jersey PV SPP showing proposed internal road network

CHAPTER 4 TRANSPORTATION ROUTES

4.1 OVERVIEW

Transportation routes affected by the construction and operation of the Jersey PV SPP have been investigated and will be discussed in this section. It is anticipated that the solar panel technology and large electrical components will be imported and arrive at ports of entry via sea. It is therefore necessary to identify the optimal shipping port(s) from which large components could be delivered to the region. Furthermore it is necessary to undertake as assessment of these identified feasible transportation routes, route lengths and potential constraints that may be encountered during future phases of the project.

4.2 HAULAGE FROM SHIPPING PORT(S) - NORMAL LOADS

A high-level assessment of the distances between the proposed development site and all seven ports-of-entry located within South Africa is provided in *Table 4.1* below

Table 4.1: Location of ports of entry relative to proposed development site

PORT	SHORTEST DISTANCE BETWEEN PORT AND SITE
Durban	*700km*
Richards Bay	*723km*
East London	956km
Coega (Ngqura)	1026km
Gqeberha	1044km
Cape Town	1367km
Saldanha	1387km

Due to their proximity to the proposed development site, two possible ports-of-entry have been identified from where the solar panel technology and large electrical components will be transported: Durban and Richards Bay.

A brief explanation of the four alternative routes is described in *Table 4.2* and *Table 4.3* and shown in *Figure 4.1* and *Figure 4.2* respectively:

- Durban Port
  - Alternative 1 via the N3, comprising a total distance of 704 km; and
  - Alternative 2: via the N3 and the R76, comprising a total distance of 734 km.

- Richards Bay Port
  - Alternative 3: via the R34 comprising a total distance of a 751 km; and
  - Alternative 4: via the N4 and R34, comprising a total distance of 820 km.

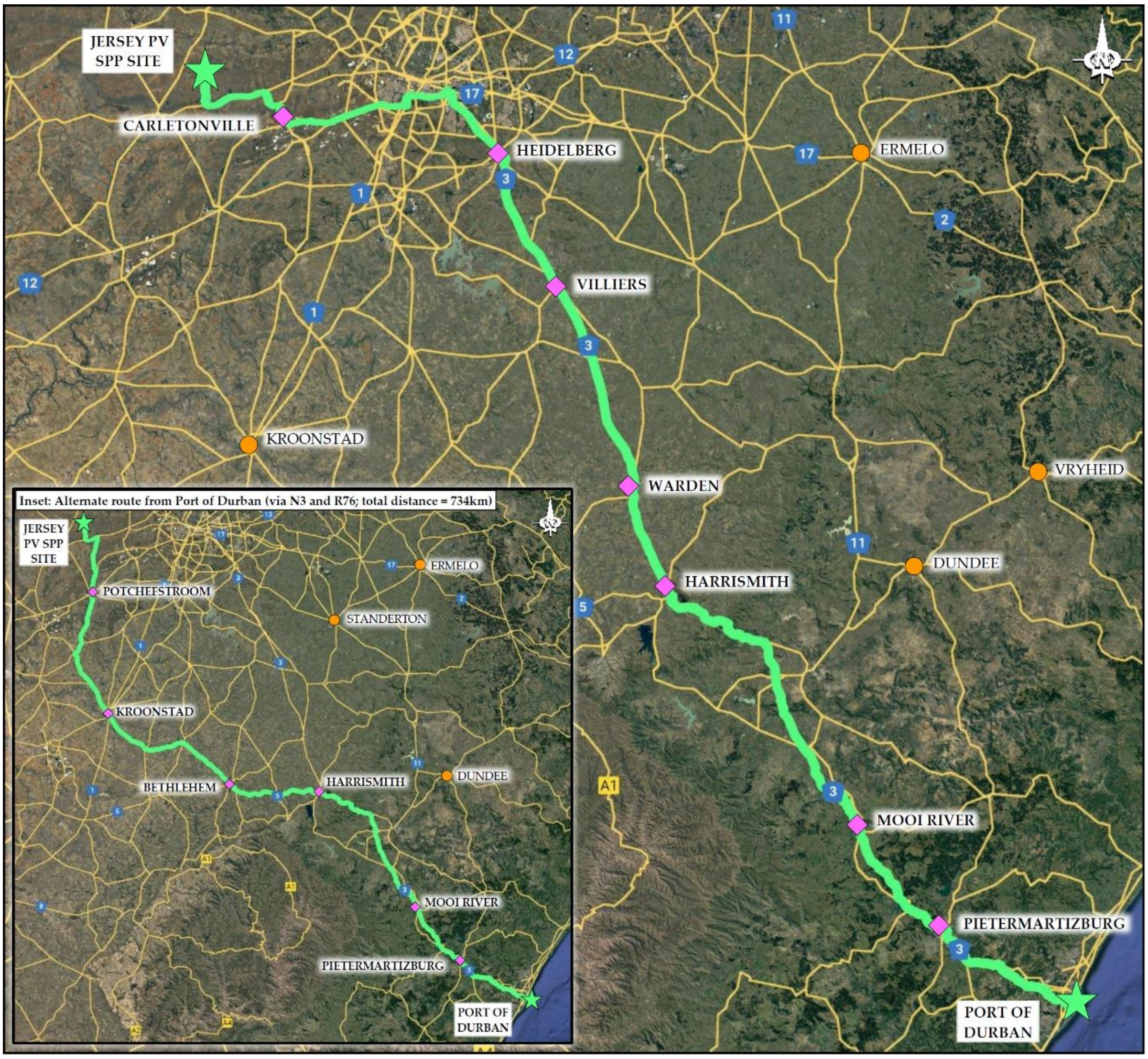


Figure 4.1: Shortest haulage route from Port of Durban to Jersey PV SPP (via N3 – total distance = 700 km)

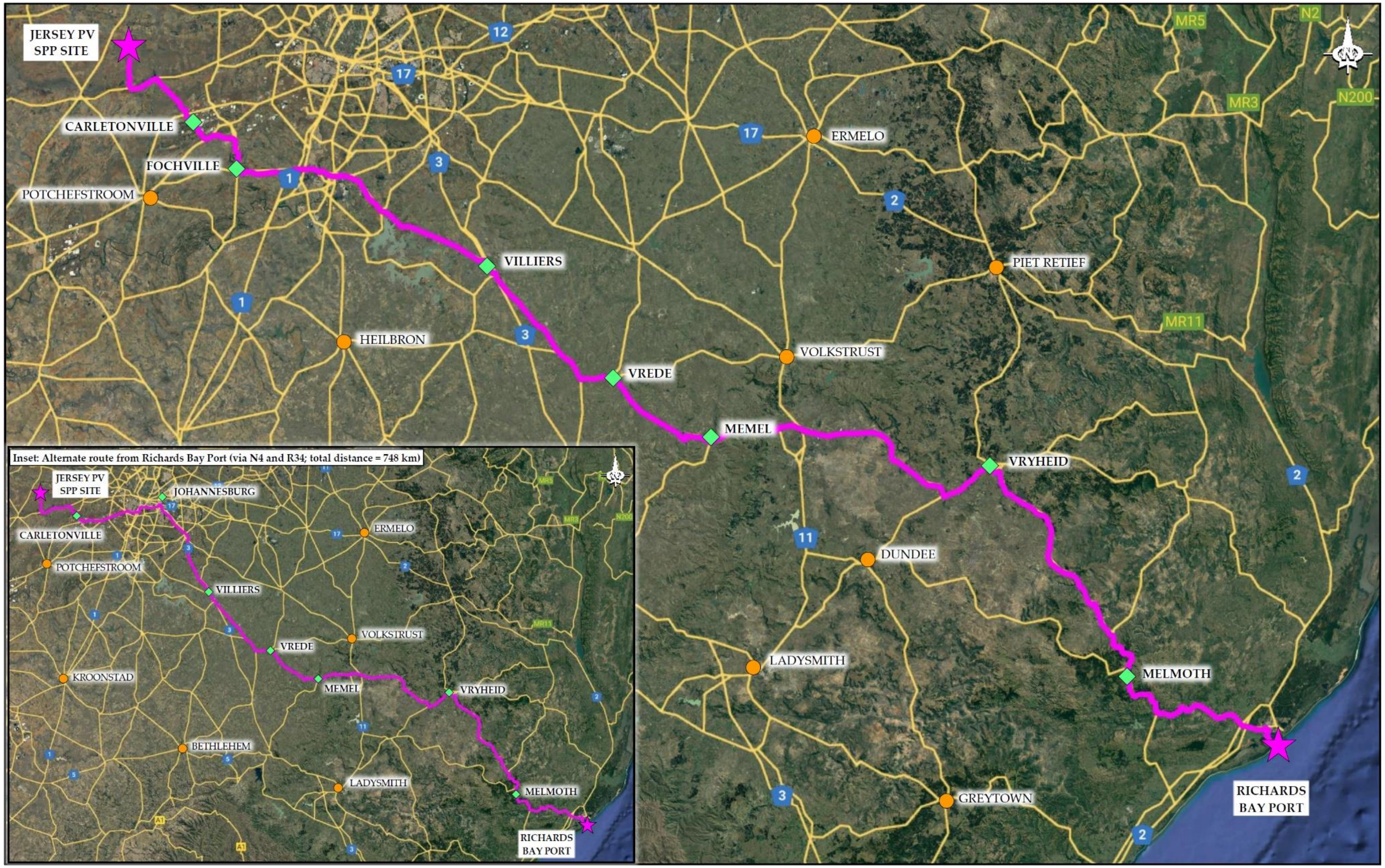


Figure 4.2: Shortest haulage route from Richards Bay Port to Jersey PV SPP (via R34 – total distance = 723 km)

Table 4.2: Route overview – Port of Durban origin

ALTERNATIVE ROUTE 1 (VIA THE N3) – 701 km	ALTERNATIVE ROUTE 2 (VIA THE N3 AND R76) – 734 km
• Head northeast on the M7, merging onto the N3 at Pinetown. • Continue on the N3 and pass through Pietermaritzburg, Howick, Mooi River and Estcourt. • Remain on the N3 and pass through Harrismith, Warden, Villiers and Heidelburg. • Just after passing through Vosloorus, take the exit onto the N12 (in the direction of Bloemfontein / Kimberley). • Take Exit 67 for the M68 towards Soweto, keeping left at the fork on the M12. Follow signage to Potchefstroom / Kimberley. • Turn right onto the R501, then turn right onto W Drie Road and travel through Carletonville to connect to the N14. • Travel for approximately 27.5km and then turn right onto D1822. • Proceed northbound for 13.5km and turn right onto the proposed Jersey PV SPP site access road.	• Head northeast on the M7, merging onto the N3 at Pinetown. • Continue on the N3 and pass through Pietermaritzburg, Howick, Mooi River and Estcourt. • At Harrismith, merge onto the N5 via the ramp to the N1 / Bloemfontein. • Continue on the N5 through Kestell, and at Bethlehem turn onto the R76. • Continue northbound on the R76, passing through Lindley (and then travelling westbound). • Pass through Kroonstad and turn right onto the R59 at Viljoenskroon, befrore turning left onto the R501. • Travel northbound on R501 through Potchefstroom. • Turn left to join the N14 after passing by Boskop Dam Nature Reserve. • Turn left onto the N14 and travel for approximately 10.7km before turning right onto the D1822. • Proceed northbound for 13.5km and turn right onto the proposed Jersey PV SPP site access road.

Table 4.3: Route overview – Port of Richards Bay origin

ALTERNATIVE ROUTE 3 (VIA THE R34) – 723 km	ALTERNATIVE ROUTE 4 (VIA THE N4 AND R34) – 748 km
• Travel northbound to connect onto the R34, and continue westbound, performing a right-turn onto R66 (near Covington). • Continue on the R66 through Melmoth before merging onto the R34 (by keeping in the left-most lane). • Continue on the R66 through Melmoth before merging onto the R34 (by keeping in the left-most lane). • Travel northbound on the R34, passing through the Dwarsrivier. • On approach to Vryheid, perform a left-turn to remain on the R34.	• Travel northbound to connect onto the R34, and continue westbound, performing a right-turn onto R66 (near Covington). • Continue on the R66 through Melmoth before merging onto the R34 (by keeping in the left-most lane). • Continue on the R66 through Melmoth before merging onto the R34 (by keeping in the left-most lane). • Travel northbound on the R34, passing through the Dwarsrivier. • On approach to Vryheid, perform a left-turn to remain on the R34.

• Continue on the R34 and travel through Utrecht, Memel and Vrede. • Perform a right-turn onto the R103 and continue through Cornelia. • After passing through the town of Villiers, merge onto the R54. • Continue travelling north-west bound in the direction of Vereeniging and pass through Vlakplaas. • Perform a right-turn onto the R500 and travel in the direction of Fochville. • Just before entering Fochville, turn left onto Loopspruit Avenue and travel north-west bound in the direction of the N12. • Turn left onto the N12 and after travelling approximately 5 km perform a right-turn and travel past Wedela. • After travelling 11km perform a left-turn to travel in the direction of the N14. Continue onto 11th Avenue until reaching the N14 intersection. • Turn left onto the N14 and travel for approximately 12.6 km before turning right onto the D1822. • Proceed northbound for 13.5 km and turn right onto the proposed Jersey PV SPP site access road.	• Continue on the R34 and travel through Utrecht, Memel and Vrede. • Perform a right-turn onto the R103 and continue through Cornelia. • At the town of Villiers merge onto the N3 (towards Johannesburg). • Travel northbound on the N3 through Heidelberg. • Just after passing through Vosloorus, take the exit onto the N12 (in the direction of Bloemfontein / Kimberley). • Take Exit 67 for the M68 towards Soweto, keeping left at the fork on the M12. Follow signage to Potchefstroom / Kimberley. • Turn right onto the R501, then turn right onto W Drie Road and travel through Carletonville to connect to the N14. • Travel for approximately 27.5km and then turn right onto D1822. • Proceed northbound for 13.5km and turn right onto the proposed Jersey PV SPP site access road.

It should be noted that the Port of Durban is South Africa's main cargo and container port, handling the largest volume of sea-going traffic of any port in southern Africa. It is ideally placed on major shipping routes and have excellent rail and road links. Furthermore, based on the shortest travel distance, it is recommended that the Port of Durban is the preferred port of entry and thus Alternative 1 is the recommended haulage route.

4.3 HAULAGE FROM LOCAL MANUFACTURERS - ABNORMAL LOADS

Transformer and substation components are envisaged to form part of the local trips. It is anticipated that these components would be imported and transported from the preferred harbour (Durban Port is recommended) as abnormal loads. It would then be assembled in Johannesburg and transported to the proposed development site (also as abnormal loads). The distance from Johannesburg to the Jersey PV SPP is approximately 136 km, via the N1.

4.4 HAULAGE OF OTHER CONSTRUCTION MATERIALS, EQUIPMENT AND PERSONNEL

It is assumed that cement will be sourced from local manufacturers within the towns of Ventersdorp and Carletonville. All other civil construction materials, needed for concrete and wearing course, will be obtained commercially. Furthermore, it is anticipated that construction personnel and labour would originate from the neighbouring towns such as Ventersdorp and Carletonville (as well as the smaller villages located within a maximum 50 km radius such as Goedgevonden, Ga-Magopa, etc.). These trips are classified as local trips as vehicles will not be travelling over a (comparably) long distance.

4.5 ROUTE CLEARANCE

It is anticipated that some route clearing may be needed with certain portions of the route already cleared for other renewable energy projects. In addition, temporary widening of intersections along the route may also be required in order to simplify the turning movements of the abnormal load vehicles.

The vehicles used to transport the photovoltaic (PV) equipment are standard container trucks and not abnormal load vehicles. No obstacles (e.g. low overhead services, cattle grids, narrow bridges, etc.) are expected, as these routes are travelled by the same type of vehicle throughout.

4.6 LEGISLATION AND PERMIT REQUIREMENTS

The overarching environmental legislation for management environmental management in South Africa, is the *National Environmental Management Act*, 1998 (Act 107 of 1998 “NEMA”). The foreword of this document states that sustainable development requires the integration of social, economic, and environmental factors in the planning, implementation and evaluation of environmental decisions to ensure that the development serves present and future generations. Traffic impacts are therefore an important aspect to consider in the decision-making process of developments.

4.6.1 Roads

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

- *National Water Act* (Act 36 of 1998), with regards to all crossings of water courses;
- *National Road Traffic Act* (Act 93 of 1996);
- *Advertising on Road and Ribbon Development Act* (Act 21 of 1940), particularly:
  - Section 9: Prohibition of erection of structures or construction of other things near intersections of certain roads; and

- Section 10: Restriction of access to land through fence along certain roads.
- *Roads Ordinance Act* (Act 19 of 1976), particularly:
  - Section 13: Erection of gates across public roads and public paths;
  - Section 17: Erection of structures on or near public roads; and
  - Section 18: Access to and exit from certain public roads and public paths.

4.6.2 Vehicle dimensions

In terms of vehicle dimensions, the relevant rules are defined in Regulations 221 to 230 of the *National Road Traffic Act*. The most important of these are summarised below:

- Regulation 221: Defines the legislation requirements regarding the overall length of vehicles. The following lengths shall not be exceeded:
  - Rigid vehicle: 12.5 m;
  - Articulated vehicle and semi-trailer: 18.5 m; and
  - Combination vehicle (interlinks, multiple trailers etc.): 22.0 m
- Regulation 223: Defines the legislation requirements regarding the overall width of vehicles. Vehicles with a gross mass of 12 000 kg or more, shall not exceed 2.6 m.
- Regulation 224: Define the legislation requirements regarding the overall height of a vehicle and transported load, which shall not exceed 4.3 m.
- Regulation 225: Defines the legislation requirements regarding the maximum turning radius and wheelbase, which shall not exceed 13.1 m or 10.0 m (semi-trailer) respectively.

4.6.3 Vehicle loads

In relation of vehicle loads, applicable rules are stipulated in Regulations 231 to 249 of the *National Road Traffic Act*. The most pertinent of these are provided below:

- Regulation 240: Defines the legislation requirements regarding the mass load carrying on roads.
- Regulation 241: Defines the legislation requirements regarding the mass load carrying capacity of bridges.

4.6.4 Abnormal load considerations

It is expected that the transformers will be transported with an abnormal load vehicle. Abnormal permits are required for vehicles exceeding the permissible maximum dimensions on road freight transport.

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

The requirements and procedures for transporting of abnormal loads are contained in the following two documents: (i) *TRH 11: Dimensional and Mass Limitations and Other Requirements for Abnormal Load Vehicles*; and (ii) *Administrative Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads*.

The specific permits and consents that may be required from the relevant authorities, for the transportation of abnormal loads, are summarised in *Table 4.4* below.

Table 4.4: Permits and consent requirements

PERMIT / CONSENT TYPE	RELEVANT AUTHORITY	STRATEGY
Abnormal Load / Vehicle Permit in terms of *National Road Traffic Act* (93 of 1996), Section 81	• Department of Public Works, Roads and Transport: *Mpumalanga Province;* • Department of Transport: *Kwa-Zulu Natal Province;* • Department Of Police, Roads and Transport: *Free State Province;* • Department of Transport, Roads and Community Safety: *North West Provincial Government*; and • Department of Roads and Transport: *Gauteng Provincial Government.*	The contractor will obtain the necessary road transportation permits.
The South African National Roads Agency Limited and *National Roads Act* (Act 7 of 1998)	South African National Roads Agency SOC Limited (SANRAL): *Eastern Region*	The contractor will obtain clearance from *SANRAL*.

Embargo days for transportation of abnormal loads generally coincide with public holidays, start and end of school holidays and extended year-end periods. These dates are updated regularly for each provincial roads department.

As discussed later on in the report, the number of abnormal load trips per site is considered negligible and does not have an impact on traffic, but the abovementioned permits will still be required. <u>It is important to note that a permit is required for each province that the transportation route traverses</u>. As such, the list of relevant authorities listed above may change, depending on the preferred route to the Jersey PV SPP site.

CHAPTER 5 BACKGROUND TRAFFIC VOLUMES

5.1 INTRODUCTION

Background traffic volumes from various traffic recording stations located on major roadways and major transportation routes were identified and acquired from *Mikros Traffic Monitoring (Pty) Ltd*, with permission of *SANRAL* and *N3TC* as owners of the data. These traffic volumes serve to establish the status quo traffic conditions and historic traffic trends. The traffic count data was sourced from permanent counting stations only, as this represents the most reliable and accurate data.

Though some of the traffic data obtained for specific stations contained information from the past two years (i.e., January 2020 to August 2022), this data was not used as it is assumed that traffic volumes were influenced by the COVID-19 pandemic and prevailing lockdown travel restrictions that were imposed. As such, a trendline analysis of the historic data was applied to determine background traffic for the years 2020 to 2025.

The resulting level of service (LOS) of these roads for the existing background traffic (2023) and calculated future background traffic (2025) scenarios was calculated (i.e., excluding trips estimated to be generated by the Jersey PV SPP).

5.2 TRAFFIC RECORDING STATION DATA

The traffic counting stations for the various haulage routes were identified for investigation and are summarised in *Figure 5.1* and a brief description is provided in *Table 5.1* below.

Table 5.1: Traffic counting stations identified

SITE ID	SITE NAME	SITE DESCRIPTION	ROUTE DESCRIPTION
1990	Estcourt I/C	Southern side of Giants Castle I/C	N003-05 (km 24.2)
3024	N3TC Harrismith WIM	Between Harrismith and Warden	N003-07X (km 40.1)
1591	Grootvlei I/C	Southern side of Grootvlei I/C	N003-10 (km 28.1)
1044	Lebanon	Between Potchefstroom and Westonaria	N012-17 (km 68.2)
19215	Wildfontein	Between Krugersdorp and Ventersdorp	N014-13 (km 49.4)

Note: Traffic data along provincial routes could not be obtained.

The selection of traffic counting stations were based on haulage routes that are envisaged for the site as well as its location. It is expected that sites close to urban areas are deemed to be the critical sites as these sections of the routes may experience lower level of service (LOS) due to expected higher traffic volumes.

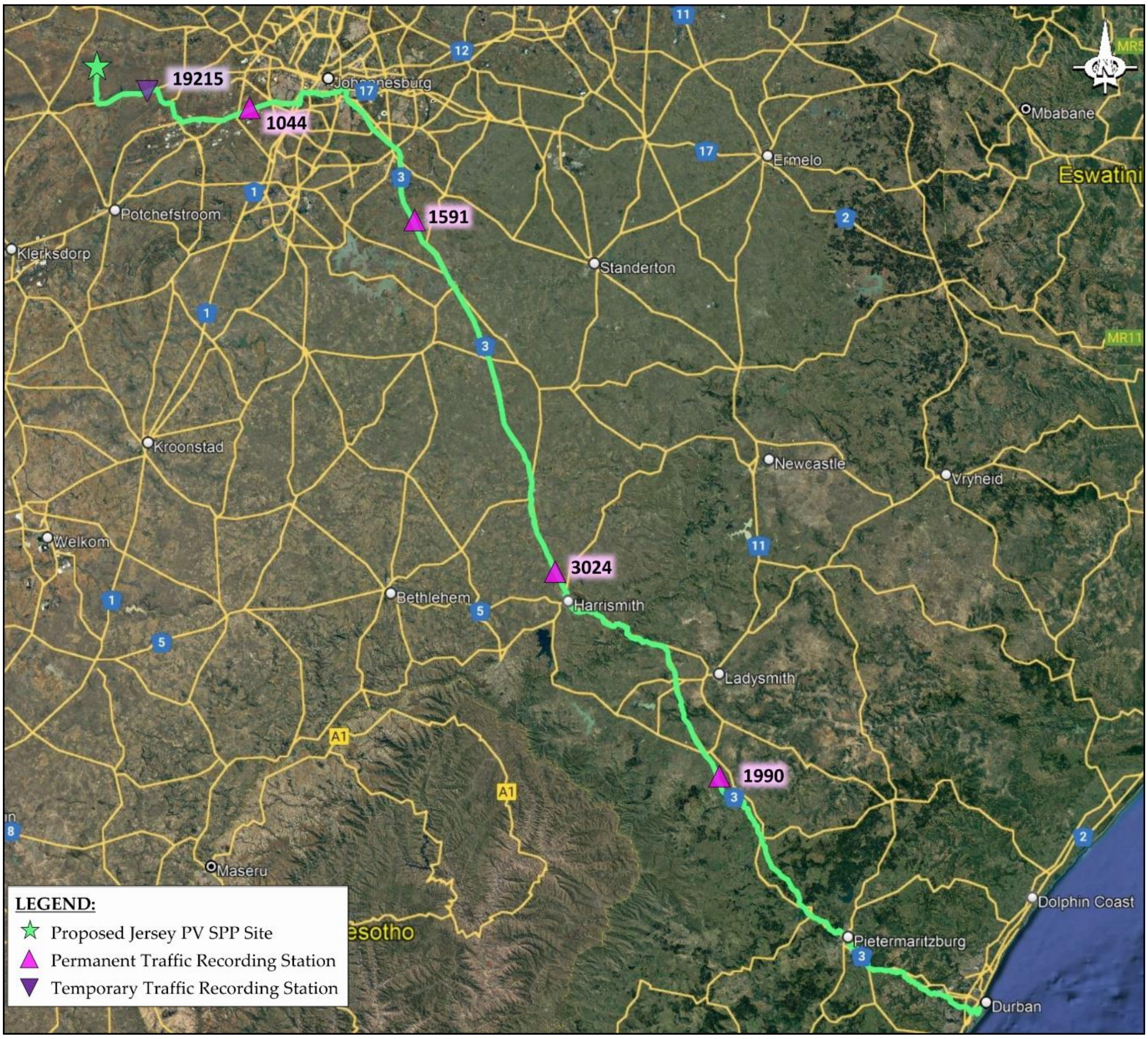


Figure 5.1: Overview of traffic recording station locations

It should be noted that no permanent traffic count stations could be identified on the N14, within the vicinity of the proposed site. Notwithstanding, traffic volumes from a temporary station (19215) were obtained and represent data recorded over a two week period at the end of August 2019. Though 19215 is a temporary station, no significant variations in traffic volumes recorded are expected, given the overall function of the road in terms of the greater road network and surrounding land uses. Due to the lack of any count data from permanent stations in the immediate vicinity of the site, data from temporary station 19215 will therefore be used to provide a general indication on traffic operations on the N14 (adjacent to the site).

5.3 BACKGROUND TRAFFIC CALCULATIONS AND LEVEL OF SERVICE

A summary of the available background traffic volume data (for the years 2015 to 2019) is attached as *Annexure B*. A trendline analysis of the historic traffic count data was subsequently performed for each permanent traffic recording station to determine the background traffic volumes for the previous three-to-four year period (2020 to 2023) and this same projection model was used to forecast the traffic volumes for the next two years (i.e., over the construction period for the proposed site). Traffic data recorded at the temporary count station was escalated with 1.0% per annum to estimate the background traffic for the same years. This information is also included as *Annexure B*. The subsequent LOS calculations have been based on *TRH 17*.

A summary of the background traffic volumes (i.e., 2023 projected) and the future 2025 (also projected) volumes as well as the associated levels of service for these road links is provided in *Table 5.2*.

Table 5.2: 2023 and 2025 background traffic volumes and associated LOS

SITE ID	FUTURE 2023			FUTURE 2025	
	ADT (vpd)	%HV	LOS	ADT (vpd)	LOS
1990	17 105	50.7%	B	17 105	B
3024	12 382	45.2%	A	12 382	A
1591	12 243	38.2%	B	12 243	B
1044	20 719	16.3%	B	20 723	B
19215*	3 519	21.5%	B	3 590	B

* LOS A: 2200 vpd; LOS B: 4900 vpd; LOS C: 8800 vpd; LOS D: 14 100 vpd and LOS E: 24 600 vpd

The ADT growth rate (from 2019 to 2025) was applied to calculate the 2023 background traffic and 2025 background traffic volumes. In instances where the ADT showed negative projection, design volumes for 2023 and 2025 were not adjusted.

As expected, the urban nodes indicate lower percentages of heavy vehicles on the road and lower levels of service. This is due to the higher volumes of light vehicles in the urban environment, with higher percentage of ADT travelling in the peak hour. A mitigating measure that would lessen the impact on haulage would be to avoid passing through urban areas during peak hours.

The LOS for the stations selected indicate an acceptable LOS (in these circumstances, LOS D represents the threshold for operations being considered acceptable, with capacity defined as LOS E) for the calculated future background traffic and the capacities of the roadways should not be exceeded.

CHAPTER 6 TRIP GENERATION

The proposed *Jersey PV SPP* site will generate additional traffic on the surrounding road network in three distinct phases, namely: (i.) construction, (ii.) operational and (iii.) decommissioning. It should be noted that the three phases will generate traffic consecutively and not simultaneously, and therefore will be considered separately from one another.

6.1 CONSTRUCTION PHASE

Trips generated during the construction phase will primarily comprise the transportation of: equipment, power plant components, personnel, construction and other facility materials. These trips will comprise of normal, medium and heavy vehicles. The number of new vehicle trips estimated to be generated during the construction phase of the proposed project are based on the following assumptions:

- It is estimated that the construction period will last for a total period of 18 months to 24 months, with 22 working days per month. As a worst-case scenario, the shorter (i.e., more intense) construction period of 18 months was used in the calculations.
- This results in approximately 396 working days over the 18-month period.
- The *Jersey PV SPP* will most likely be constructed from components that will be shipped to South Africa via the Port of Durban. Local transport impacts are, however, expected to be similar irrespective of the selected port-of-entry, due to the surrounding local road network. These components will be transported to site via road transport using medium and heavy vehicles.
    - The solar energy facility will produce a maximum of 415 MW electrical power.
    - Approximately 945 000 PV modules of approximately 300 – 550 W each will be delivered to site and 660 of these units can fit into one container (30 units per pallet; 22 pallets per container). This results in approximately 1 430 container loads in total being delivered to site.
- Other plant, materials and equipment will be sourced from the nearest towns. An average of 200 – 300 vehicle trips per 7 MW is assumed based on experience working on similar projects. For this site, this has been assumed to be 40 trips per MW. This results in approximately 16 600 trips over the 18-month construction period.

Another contributor to trips generated during the construction phase will be daily commuters/ workers. The following assumptions were made in this regard:

- Due to the proximity of the site to the neighbouring towns of Ventersdorp, Carletonville and (even) Krugersdorp, the construction labour force will be mostly local.

- It is estimated that approximately 750 workers will be on-site and this assumption is based on previous transport studies that BVi has undertaken for various-sized PV SPP developments.
  - Based on the composition it is assumed that 20% of the workers will make use of private or company vehicles (cars and LDVs). These workers will travel from their permanent or temporary residences to site on a daily basis.
  - Furthermore, it is assumed that the remainder of the workers (80%) will be transported to site with 15-seater minibus-taxis. The quantities of these vehicles will fluctuate and will depend on the number of labourers, costs, routes and operating hours.

The estimated total trips that will be generated during the construction phase of the project are summarised in *Table 6.1* below.

Table 6.1: Estimated trip generation (construction phase)

TRANSPORT TYPE	PARAMETER	AVERAGE DAILY TRAFFIC	MONTHLY TRAFFIC	TOTAL TRIPS (1.5 YEARS)
Normal heavy load (solar panels)	660 panels per container	4	81	1 430
Normal heavy load (construction materials)	40 trips/MW	42	924	16 600
Private vehicles (staff)	750 staff	190	4 180	75 240
TOTAL TRIPS FOR CONSTRUCTION PERIOD		**236**	**5 185**	**93 270**

The result from the above table shows that the construction phase of the *Jersey PV SPP* will generate approximately *93270 trips* over the 18-month period. As a worst case scenario, it can be assumed that approximately 20% of the average daily traffic volumes (usually 10%) will occur during the adjacent road network peak hour i.e., ≈ 50 vehicles per hour.

6.2 OPERATIONAL PHASE

The following assumptions were made with regards to the trip generation during the operational phase of the solar power plant:

- The *Jersey PV SPP* will be in operation between 20 and 30 years.
- The solar energy facility will be in operation 7 days a week, and personnel will therefore operate according to shifts.
- The operational team will consist of approximately fifty people:

The traffic impact during the operational phase will therefore be insignificant, as approximately only fifty people will work at the solar power plant.

6.3 DECOMMISSIONING PHASE

The decommissioning phase will start at the end of the *Jersey PV SPP* lifetime (20 to 30 years). It is assumed that the decommissioning phase will last approximately 12 months, involving a team of fifty workers. Similarly to the operational phase, associated traffic impacts are therefore not considered significant.

CHAPTER 7 TRAFFIC IMPACT ANALYSIS

The expected effects of traffic that would be generated by the proposed Jersey PV SPP site analysed as follows:

- Background traffic volumes were determined for the study network near the site, as well as along the transportation routes.
- Traffic volumes for the years 2020 to 2025 were estimated by performing trendline analyses on historic (typically between 2015 and 2019) data.
- Construction phase traffic (site-generated trips) for the proposed Jersey PV SPP was estimated and is based on experience of similar projects.
- Construction phase traffic was added to the 2025 background traffic volumes to determine the total traffic conditions i.e., at the start of the operational phase

The sub-chapters below provide the impact the development of the solar power plant will have on the transportation routes and local traffic respectively.

7.1 ASSESSMENT OF IMPACTS ON TRANSPORTATION ROUTE (HAULAGE TRIPS)

The longest portion of the roadways that will be travelled by the delivery trucks (during the construction phase) are two-lane rural highways and are classified as Class 1, Class 2 or Class 3. As such, the *HCM 6th Edition Chapter 15: Two Lane Highways* document was used to assess the impact these additional vehicle trips will have on roadway capacity. It should be noted that the trips generated by this development were evaluated relative to the quantum of trips required to change the LOS on a portion of the rural highway and the ultimate capacity of two-lane highways. The traffic impact on the recommended Port of Durban haulage route is summarised in *Table 7.1*.

Table 7.1: Traffic impact on recommended Durban route (haulage trips)

SITE ID	ROAD SECTION AND TYPE OF TRAFFIC		2025 BACKGROUND ADT VOLUME	NEW DAILY HAULAGE TRIPS	2025 TOTAL ADT VOLUME
1990	N3	All traffic	17 105	46	17 151
		Truck traffic	8314		8 360
3024		All traffic	12 382	46	12 428
		Truck traffic	5 395		5 441
1591		All traffic	12 243	46	12 289
		Truck traffic	4 488		4 534
1044	N12	All traffic	20 723	46	20 769
		Truck traffic	3 556		3 602

19215*	N14	All traffic	3 590	46	3 636
		Truck traffic	773		819

* LOS A: 2200 vpd; LOS B: 4900 vpd; LOS C: 8800 vpd; LOS D: 14 100 vpd and LOS E: 24 600 vpd

The traffic volume data summarised in *Table 7.1* suggests that the total 2025 ADT volumes will only comprise a minimal proportion (between 0.2% and 1.27%) of new vehicle trips that are estimated to be generated during the construction phase of the proposed Jersey PV SPP.

This estimated increase in ADT volumes is similar to other variations in ADT volumes that are typically caused by certain "seasonal" effects (e.g., day-of-week, month-of-year, etc.). The impact that this additional traffic will have on the existing LOS (along the identified road sections) is therefore not considered significant. It is therefore concluded that no mitigation measures will be required along this route.

It is acknowledged that the results of the above assessment are only linked to vehicle trips generated by the proposed Jersey PV SPP. Although not specifically identified in the technical report for this site, there is, however, one similar project that is located within close proximity (30 km) to the proposed site and may be constructed over the same period. This proposed PV SPP is referred to as the "Nguni" site and is located directly adjacent (westbound) to the Jersey PV SPP on the left over sections of portions 1 and 2 of the farm Illmasdale No. 70. The ultimate scenario for the cumulative impact of these facilities must therefore be considered and this is addressed in *Chapter 8*.

7.2 ASSESSMENT OF IMPACTS ON LOCAL TRAFFIC (WORKER TRIPS)

The available historic traffic count data indicates that the N14 (south of the proposed site) is currently operating well, under-capacity at an overall LOS B. The impact that new worker trips, estimated to be generated during the construction phase of the proposed project, will have on local traffic operations is summarised in *Table 7.2*.

Table 7.2: Local traffic impact on recommended Durban route (worker trips)

SITE ID	ROUTE		2025 ADT VOLUME	NEW WORKER TRIPS	2025 TOTAL ADT VOLUME
12915	N14	All traffic	3 590	190	3 780

Note: LOS A: 2200 vpd; LOS B: 4900 vpd; LOS C: 8800 vpd; LOS D: 14 100 vpd and LOS E: 24 600 vpd

This expected increase in traffic volumes (resulting from worker-generated trips during the construction phase) will not have a significant impact on the operation of the local road network. The existing road section has sufficient (and considerable) capacity to accommodate these new vehicle trips and therefore, no mitigation measures are required.

CHAPTER 8 CUMULATIVE TRAFFIC IMPACT

8.1 CUMULATIVE TRIP GENERATION

A summary of other similar renewable energy projects that have been proposed and are located within close proximity to the Jersey PV SPP are summarised in *Table 8.1*.

Table 8.1: Similar projects located within 30 km radius from study area

NO.	PROJECT NAME	DISTANCE FROM PROPOSED SITE	POWER-GENERATING CAPACITY
1	Nguni	Adjacent (borders western site boundary)	415 MW

It is unlikely that the construction phase of these projects will coincide, however, this project will be included to determine the cumulative trip generation and subsequent capacity analysis (as a worst-case scenario).

The power-generating capacity of the Nguni PV SPP is identical to the proposed Jersey PV SPP facility and a similar number of haulage-related trips, and vehicle trips generated during the construction phase of the project are estimated to be generated. The cumulative impact of these additional vehicle trips is summarised in the table below.

Table 8.2: Cumulative trip summary (Durban route)

TYPE OF TRIPS (vpd)	N3			N12	N14
	SITE ID: 1990	SITE ID: 3024	SITE ID: 1591	SITE ID: 1044	SITE ID: 12915
2025 ADT (including Jersey PV SPP trips)	17151	12 428	12 289	20 769	3 636
Haulage traffic	46	46	46	46	46
Worker traffic	-	-	-	-	190
TOTAL CUMULATIVE TRAFFIC	**17 197**	**12 474**	**12 335**	**20 815**	**3 872**

It can be seen from the tables above that the cumulative additional trips will have a very negligible impact on the immediate or wider road network. Along the long-distance haulage route, the maximum ADT of the major roadways are not exceeded and the cumulative additional trips will not initiate a change in the LOS. Furthermore, the local road network (i.e., adjacent N14) is expected to continue operate well under capacity, at a LOS B.

CHAPTER 9 ASSESSING IMPACTS USING STANDARDISED RATING SYSTEM

9.1 IMPACT RATING SYSTEM

As part of the Environmental Impact Assessment (EIA) process, standardised impact rating systems have been developed that allow for a more direct comparison / accumulation of all of the identified environmental impacts associated with the development of the specific site (e.g., traffic, hydrology, geotechnical, etc.).

The impact assessment method / rating system utilised for the Jersey PV SPP must take account of the nature, scale and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the four project phases: planning, construction, operation and decommissioning. A general overview of the rating system used is attached as *Annexure C.*

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity. The individual assessments for the various associated impacts are provided in the subsequent sub-sections.

9.2 CONSTRUCTION PHASE

9.2.1 Access requirements and internal road infrastructure

Nature: Construction and maintenance of gravel roads in vicinity of the site:

The construction traffic accessing the site would be traveling along roads that are proposed to be unsurfaced for the development. The movement of heavy vehicles along the gravel roads, especially close to the boundaries of the site, may cause excessive dust in the area. Deterioration of gravel roads may also occur after wet seasons, leading to poor road conditions for transportation on site.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Small (1)	Small (1)
Probability	Probable (3)	Probable (3)
Significance	**Low (12)**	**Low (12)**
Status (positive or negative)	Neutral	Neutral
Reversibility	Completely	Completely
Irreplaceable loss of resources?	No loss	No loss
Can impacts be mitigated?	Yes	

Mitigation: Maintenance to lower order roads can be incorporated into the schedule, especially the maintenance of the road accessing the site. The site access road would require construction at the start of the construction project to safely transport the sensitive cargo through the site. A gravel roads maintenance programme for the gravel roads on site is recommended.
Residual Impacts: A gravel roads maintenance programme will need to be developed and adhered to for the construction as well as operational phase of the development. Maintenance of the roads on the site need to be enforced to ensure deterioration is controlled.

9.2.2 Haulage traffic

Nature: Increased traffic on haulage routes: During the construction phase (maximum of 24 months), the road network leading to the Jersey PV SPP will include national and regional roads from the Port of Durban (recommended) and Johannesburg. There will be an increase in traffic volumes, for both light and heavy vehicles, influencing traffic congestion and road safety.		
	Without mitigation	**With mitigation**
Extent	National (5)	National (5)
Duration	Short-term (2)	Short-term (2)
Magnitude	Small (1)	Small (1)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (24)**
Status (positive or negative)	Neutral	Neutral
Reversibility	Completely	Completely
Irreplaceable loss of resources?	No loss	No loss
Can impacts be mitigated?	Yes, to a limited extent. The benefit of mitigation would not be viable for the project.	
Mitigation: The impact of the increased traffic on regional routes can be mitigated by staggering trips and scheduling so that peak hour traffic in local towns is not impacted by construction traffic.		
Residual Impacts: The magnitude of the increased traffic on regional routes is too small to solely attribute any negative impact on routes to the development's construction traffic.		

9.2.3 Localised traffic (construction workers)

Nature: Increased traffic on local routes: The road network, surrounding the proposed Jersey PV SPP site, will be affected. There will be an increase in traffic, influencing traffic congestion and road safety. However, vehicles used during the operations-and maintenance phases will be light vehicles. The extent of the road network that will be affected is small, as staff will be living in neighbouring towns, i.e., Ventersdorp, Carletonville and Krugersdorp. The new vehicle trips generated during the operations-and maintenance phases will only be temporary and no major traffic impact is anticipated on the road network.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Small (1)	Small (1)
Probability	Probable (3)	Probable (3)
Significance	**Low (15)**	**Low (15)**
Status (positive or negative)	Neutral	Neutral
Reversibility	Completely	Completely
Irreplaceable loss of resources?	No loss	No loss
Can impacts be mitigated?	Yes, the increased traffic can be mitigated to a limited extent. Mitigation in terms of road condition need to be addressed as part of the maintenance during construction.	
Mitigation: The impact of the increased traffic on local routes can be mitigated by staggering trips and scheduling so that peak hour traffic in local towns is not impacted by construction traffic.		
Residual Impacts: The magnitude of the increased traffic on local routes are minimal. Local traffic will mainly be impacted during peak hours.		

9.3 OPERATIONAL PHASE

9.3.1 Traffic generated due to operations

Nature: Increased traffic on local routes:

The current traffic will increase slightly due to the employees on site during the operational phase. The traffic generated during this phase will be minimal and will have not have any impact on the surrounding road network.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Small (1)	Small (1)
Probability	Probable (3)	Probable (3)
Significance	**Low (18)**	**Low (18)**
Status (positive or negative)	Neutral	Neutral
Reversibility	Completely	Completely
Irreplaceable loss of resources?	No loss	No loss
Can impacts be mitigated?	Yes, to a limited extent	

Mitigation:
The impact of the increased traffic during the operational phase is negligible due to the expected number of employees. The shift work provides a mitigation and reduces the expected number of employees, especially during peak hours.

Residual Impacts:
The magnitude of the increased traffic is relatively small and is not likely to change during the operational phase of the development. These trips will become part of the network trips due to the development.

9.4 DECOMMISSIONING PHASE

9.4.1 Traffic generated due to decommissioning of site

Nature: Increased traffic during decommissioning phase:

The road network, surrounding the proposed Jersey PV SPP site, will be affected. There will be an increase in traffic influencing traffic congestion and road safety. However, the extent of the impact will be very small and local of nature. The traffic during the decommissioning phase will only be temporarily and have an insignificant impact on the road network.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Small (1)	Small (1)
Probability	Probable (3)	Probable (3)

Significance	**Low (12)**	**Low (12)**
Status (positive or negative)	Neutral	Neutral
Reversibility	Completely	Completely
Irreplaceable loss of resources?	No loss	No loss
Can impacts be mitigated?	Yes, to a limited extent	
Mitigation: The impact of the increased traffic during the decommissioning phase is negligible due to the expected number of employees.		
Residual Impacts: The magnitude of the increased traffic is relatively small and is not likely to change during the decommissioning phase of the development.		

9.5 CUMULATIVE IMPACT OF SIMILAR DEVELOPMENTS

9.5.1 Haulage traffic

Nature: Increased traffic on regional haulage routes: The haulage routes for heavy vehicles for the shipment of solar panels and major components include regional routes that would be impacted by the simultaneous construction of similar projects within 30 km of the development. This cumulative scenario is expected to slightly increase the average daily traffic of the routes used over the construction period.		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Short-term (2)	Short-term (2)
Magnitude	Small (0)	Small (0)
Probability	Very improbable (1)	Very improbable (1)
Significance	**Low (5)**	**Low (5)**
Status (positive or negative)	Neutral	Neutral
Reversibility	Completely	Completely
Irreplaceable loss of resources?	No loss	No loss
Can impacts be mitigated?	Yes, to a limited extent	
Mitigation: The cumulative impact would not require mitigation, as the regional routes would still operate at an acceptable level of service. Should mitigation be required, the staggering of trips would be encouraged to avoid platooning of heavy vehicles along regional routes. This would, however, require a degree of co-ordination between developments.		
Residual Impacts: The magnitude of the increased traffic on regional routes is too small to solely attribute any negative impact on routes to the development's construction traffic. The duration of the impact is also short-term and is reversed after the construction period.		

9.5.2 Localised traffic (construction workers)

Nature: Increased traffic on regional haulage routes:

The immediate road network, surrounding the proposed Jersey PV SPP site, will be by the proposed neighbouring Nguni PV SPP development. There will be a slight increase in traffic, influencing traffic congestion and road safety. However, the extent of the impact will be very small and local of nature. This cumulative scenario is expected to nominally increase the average daily traffic of the routes used over the construction period.

	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Short-term (2)	Short-term (2)
Magnitude	Small (0)	Small (0)
Probability	Very improbable (1)	Very improbable (1)
Significance	**Low (5)**	**Low (5)**
Status (positive or negative)	Neutral	Neutral
Reversibility	Completely	Completely
Irreplaceable loss of resources?	No loss	No loss
Can impacts be mitigated?	Yes, to a limited extent	

Mitigation:
The cumulative impact would not require mitigation, as the local route(s) would still operate at an acceptable LOS. Should mitigation be required, the staggering of work shifts would be encouraged to avoid platooning of vehicles in the immediate vicinity of the proposed site. This would, however, require a degree of co-ordination between the developments.

Residual Impacts:
The magnitude of the increased traffic on local routes is too small to solely attribute any negative impact on routes to the development's worker-based traffic.

CHAPTER 10 CONCLUSIONS

It is therefore concluded that:

- The major traffic impact occurs during the construction phase of the project. The impact of the construction trip generation, on the predicted traffic volumes on the local and the regional transportation routes are expected to be low. No mitigation measures for these routes will be necessary.
- Two possible ports of entry have been identified from where the solar panel technology and large electrical components will be transported, namely: Durban (704 km) and Richards Bay (723 km). It is recommended that the Port of Durban is the preferred port of entry as this route is the shorter of the two routes. The regional routes indicated in the analysis would need to be confirmed by freight carriers as suitable for the sensitive normal loads. The final decision on the selected route would be based on a combination of cost, distance and road condition at the time of transport.
- Transformer and substation components will be transported via abnormal loads. An abnormal load will necessitate an application to the *Department of Transport and Public Works* for a permit. A permit is required for each province that the transportation route traverses. Only one to two abnormal load trips is expected for the Jersey PV SPP development. Abnormal load transportation is therefore considered to be isolated and would have a negligible impact on traffic over the construction phase of the project.
- In terms of impact on roads infrastructure:
  - Access to the site is proposed via a Class 4 Rural local connector road, D1822.
  - Three different access alignment alternatives are proposed and are spaced approximately 30 m apart.
  - Proposed Access Alignment Alternative 1 and 2 require varying amounts of horizontal deflection between the D1822 and the proposed site access road, while Proposed Access Alignment Alternative 3 has a straight connection.
  - All three proposed alignment alternatives satisfy the minimum access spacing requirements as per *TRH26*.
  - The positioning of the preferred alignment should, however, consider the placement of opposing accesses as *TRH26* states that access points are preferred opposite each other (instead of a series of staggered intersections).
  - All three proposed access alignment alternatives are considered viable and a final decision on the positioning of the access can therefore include consideration for various other (potential) aspects e.g. operational, planning, and cost, etc.
  - The formalisation of the site access point will likely be a requirement as part of the wayleave approval of the local and provincial roads authorities.
  - Adequate traffic accommodation signage must be erected and maintained on either side of the access throughout the construction period of the project.

- In terms of impact on traffic:
  - The regional construction trips generated by the proposed development are not considered significant in comparison to the Average Daily Traffic (ADT) and will not affect the existing Level of Service. In terms of estimated traffic volumes, no mitigation measures will be necessary. Mitigation measures, such as staggered trips and reduced peak time travel are proposed if needed.
- In terms of cumulative impact:
  - The concurrent construction of one other solar farm (Nguni PV SPP) in a 30 km radius of the site has also been considered and is deemed to have a low impact as summarised in *Table 10.1*. Mitigation measures that may be considered, should concurrent construction occur, include the staggering of trips at the site and the implementation of a roads maintenance programme.

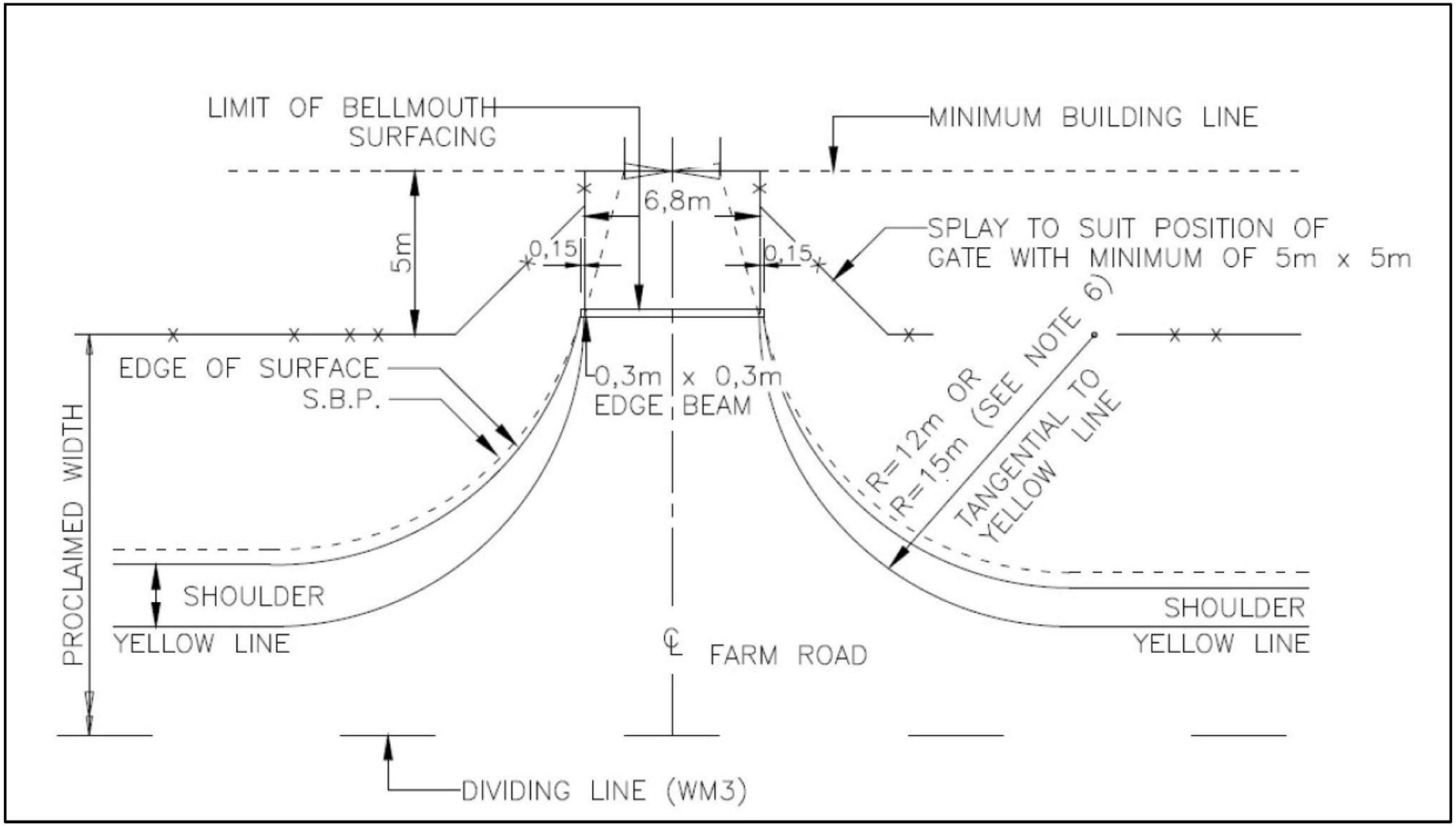
Table 10.1: Impact significance ratings of Jersey PV SPP

PHASE OF PROJECT	SIGNIFICANCE RATING
Construction – Haulage traffic	**Low (24)**
Construction – Local traffic	**Low (15)**
Construction – Site traffic	**Low (12)**
Operation and maintenance	**Low (18)**
Decommissioning	**Low (12)**
Cumulative Impact – Haulage traffic	**Low (5)**
Cumulative Impact – Local traffic	**Low (5)**

The development of the Jersey PV SPP, located on the remaining extent of portions 1 and 2 of the farm Illmasdale No. 70 forming part of the *JB Marks Local Municipality* in the North West Province is therefore supported from a traffic and transportation perspective.

ANNEXURE A:

TYPICAL ACCESS GEOMETRY

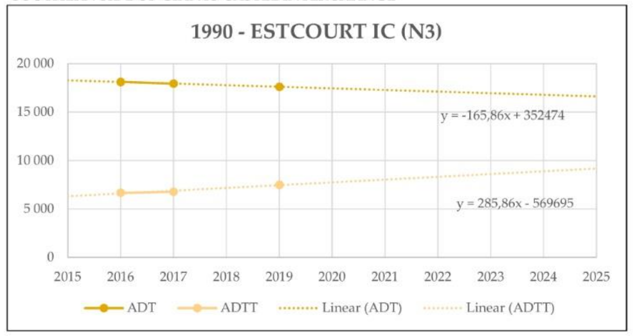

LIMIT OF BELLMOUTH
SURFACING
MINIMUM BUILDING LINE
6,8m
5m
0,15
0,15
SPLAY TO SUIT POSITION OF
GATE WITH MINIMUM OF 5m x 5m
EDGE OF SURFACE
S.B.P.
0,3m x 0,3m
EDGE BEAM
R=12m OR
R=15m (SEE NOTE 6)
TANGENTIAL TO
YELLOW LINE
PROCLAIMED WIDTH
SHOULDER
YELLOW LINE
℄ FARM ROAD
SHOULDER
YELLOW LINE
DIVIDING LINE (WM3)

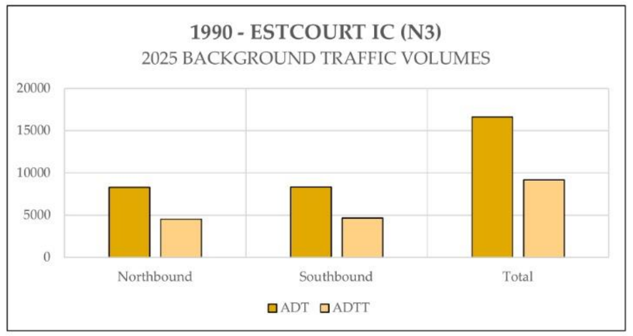
ANNEXURE B:

BACKGROUND TRAFFIC VOLUMES

1990 - ESTCOURT IC (N3)						
YEAR	AVERAGE DAILY TRAFFIC (ADT)			AVERAGE DAILY TRUCK TRAFFIC (ADTT)		
	NORTHBOUND	SOUTHBOUND	TOTAL	NORTHBOUND	SOUTHBOUND	TOTAL
2015						
2016	8 933	9 178	18 111	3 351	3 315	6 666
2017	9 022	8 911	17 933	3 375	3 394	6 769
2018						
2019	8 847	8 764	17 611	3 590	3 897	7 487
2020	8 710	8 727	17 437	3 818	3 925	7 742
2021	8 627	8 644	17 271	3 959	4 069	8 028
2022	8 544	8 561	17 105	4 100	4 214	8 314
2023	**8 461**	**8 478**	**16 939**	**4 241**	**4 359**	**8 600**
2024	**8 378**	**8 395**	**16 773**	**4 382**	**4 504**	**8 886**
2025	**8 295**	**8 312**	**16 608**	**4 522**	**4 649**	**9 172**

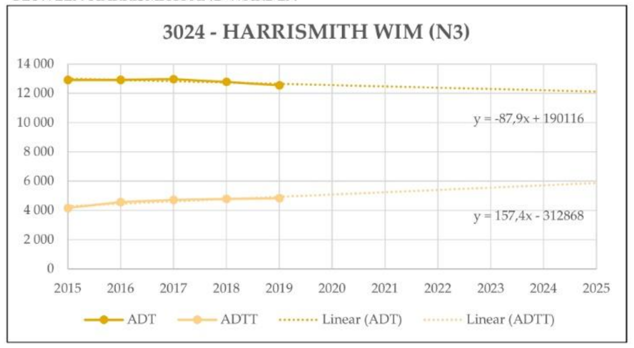
SOUTHERN SIDE OF GIANTS CASTLE INTERCHANGE

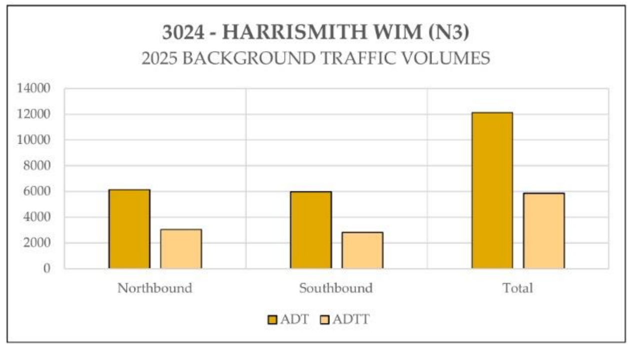




3024 - HARRISMITH WIM (N3)						
YEAR	AVERAGE DAILY TRAFFIC (ADT)			AVERAGE DAILY TRUCK TRAFFIC (ADTT)		
	NORTHBOUND	SOUTHBOUND	TOTAL	NORTHBOUND	SOUTHBOUND	TOTAL
2015	6 557	6 353	12 910	2 166	1 994	4 160
2016	6 560	6 358	12 918	2 389	2 167	4 556
2017	6 556	6 409	12 965	2 433	2 274	4 707
2018	6 480	6 295	12 775	2 481	2 303	4 784
2019	6 330	6 212	12 542	2 480	2 353	4 833
2020	6 363	6 195	12 558	2 634	2 446	5 080
2021	6 319	6 152	12 470	2 716	2 521	5 237
2022	6 274	6 108	12 382	2 798	2 597	5 395
2023	**6 230**	**6 065**	**12 294**	**2 879**	**2 673**	**5 552**
2024	**6 185**	**6 021**	**12 206**	**2 961**	**2 749**	**5 710**
2025	**6 140**	**5 978**	**12 119**	**3 043**	**2 824**	**5 867**

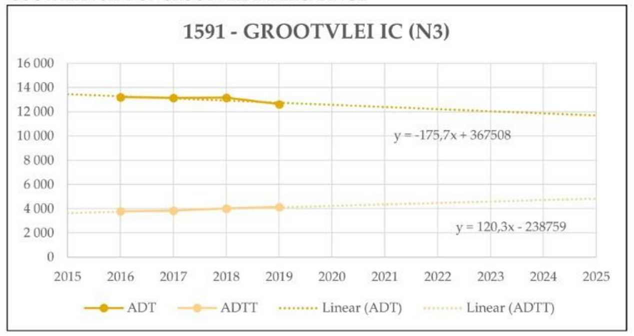
BETWEEN HARRISMITH AND WARDEN

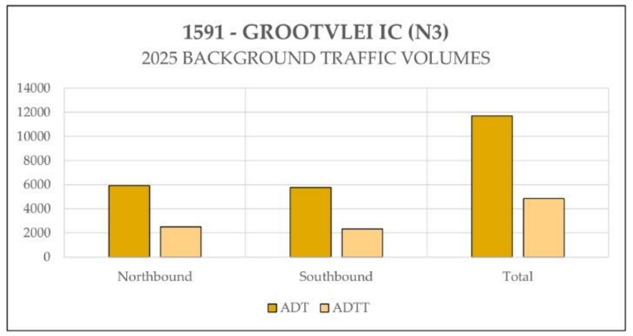




1591 - GROOTVLEI IC (N3)						
YEAR	AVERAGE DAILY TRAFFIC (ADT)			AVERAGE DAILY TRUCK TRAFFIC (ADTT)		
	NORTHBOUND	SOUTHBOUND	TOTAL	NORTHBOUND	SOUTHBOUND	TOTAL
2015						
2016	6 508	6 705	13 213	2 002	1 797	3 799
2017	6 684	6 458	13 142	2 016	1 816	3 832
2018	6 678	6 477	13 155	2 100	1 915	4 015
2019	6 443	6 180	12 623	2 148	1 991	4 139
2020	6 356	6 238	12 594	2 224	2 023	4 247
2021	6 268	6 151	12 418	2 287	2 080	4 367
2022	6 179	6 064	12 243	2 350	2 137	4 488
2023	**6 090**	**5 977**	**12 067**	**2 413**	**2 195**	**4 608**
2024	**6 001**	**5 890**	**11 891**	**2 476**	**2 252**	**4 728**
2025	**5 936**	**5 779**	**11 716**	**2 514**	**2 334**	**4 849**

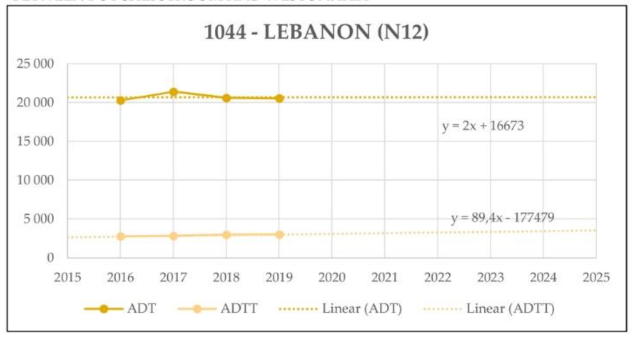
SOUTHERN SIDE OF GROOTVLEI INTERCHANGE

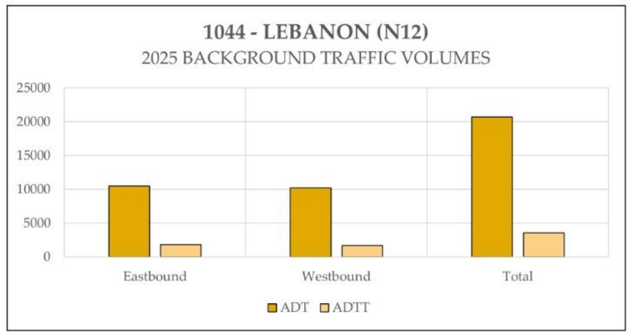




1044 - LEBANON (N12)						
YEAR	AVERAGE DAILY TRAFFIC (ADT)			AVERAGE DAILY TRUCK TRAFFIC (ADTT)		
	EASTBOUND	WESTBOUND	TOTAL	EASTBOUND	WESTBOUND	TOTAL
2015						
2016	10 209	10 070	20 279	1 379	1 375	2 754
2017	10 830	10 565	21 395	1 425	1 395	2 820
2018	10 423	10 185	20 608	1 501	1 466	2 967
2019	10 414	10 134	20 548	1 516	1 487	3 003
2020	10 472	10 241	20 713	1 568	1 541	3 109
2021	10 474	10 241	20 715	1 613	1 586	3 198
2022	10 475	10 242	20 717	1 658	1 630	3 288
2023	**10 476**	**10 243**	**20 719**	**1 703**	**1 674**	**3 377**
2024	**10 477**	**10 244**	**20 721**	**1 748**	**1 719**	**3 467**
2025	**10 500**	**10 223**	**20 723**	**1 844**	**1 712**	**3 556**

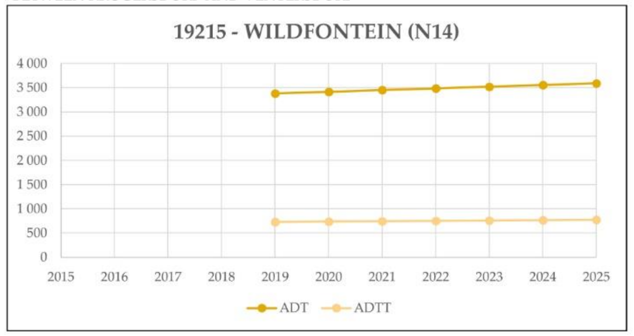
BETWEEN POTCHEFSTROOM AND WESTONARIA

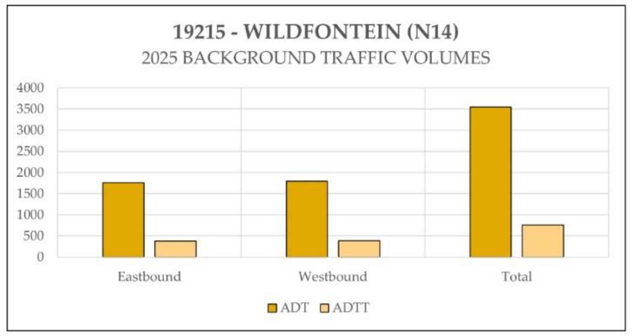




19215 - WILDFONTEIN (N14)						
YEAR	AVERAGE DAILY TRAFFIC (ADT)			AVERAGE DAILY TRUCK TRAFFIC (ADTT)		
	EASTBOUND	WESTBOUND	TOTAL	EASTBOUND	WESTBOUND	TOTAL
2015						
2016						
2017						
2018						
2019	1 674	1 708	3 382	360	368	728
2020	1 691	1 725	3 416	364	372	735
2021	1 708	1 742	3 450	367	375	743
2022	1 725	1 760	3 484	371	379	750
2023	**1 742**	**1 777**	**3 519**	**375**	**383**	**758**
2024	**1 759**	**1 795**	**3 555**	**378**	**387**	**765**
2025	**1 777**	**1 813**	**3 590**	**382**	**391**	**773**

BETWEEN KRUGERSDORP AND VENTERSDORP





ANNEXURE C:

ASSESSMENT METHODOLOGY

Impact assessment must take account of the nature, scale and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the project phases:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact, the following criteria is used:

Table 6.7: The rating system

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be experienced.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		
This describes the chance of occurrence of an impact.		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).

4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.
INTENSITY/ MAGNITUDE		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.

4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
REVERSIBILITY		
This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.
2	Low cumulative impact	The impact would result in insignificant cumulative effects.

3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects

SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.
74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive very high impact	The anticipated impact will have highly significant positive effects.

***Each specialist should use the rating system supplied to conduct their impact assessment*