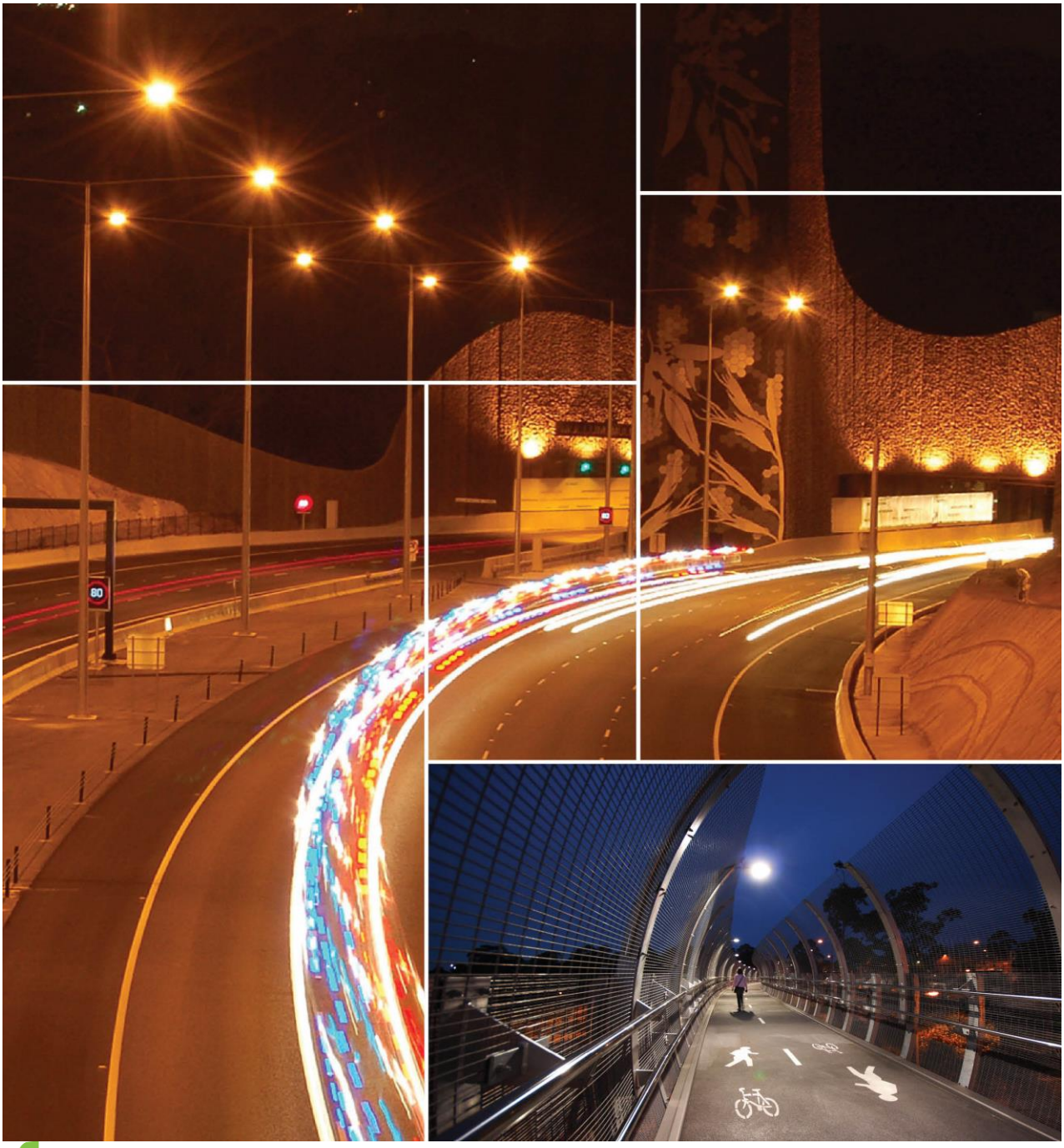

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Traffic Impact Assessment

Client: Royal Haskoning DHV

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Contents

Appendices

1 Introduction

Electricity production by means of coal-fired power plants is largely responsible for global warming emissions. These global warming emissions trap heat thereby increasing the planet's temperature resulting in several negative externalities on our environment and climate. In contrast, most renewable energy sources produce little to no global warming emissions and therefore have a negligible impact on the environment.

Whilst South Africa relies heavily on coal to meet its energy needs, the country is well endowed with renewable energy resources that offer sustainable alternatives to fossil fuels. Renewable energy harnesses naturally occurring sources of energy, such as solar, wind, biomass, hydro, tidal, wave, ocean current and geothermal, to produce electricity, gaseous and liquid fuels, heat or a combination of these energy types. The successful use of renewable energy technology in South Africa still requires extensive investigation, however, Concentrating Solar Power (CSP) and Photovoltaic (PV) technologies have been demonstrated to be economically and environmentally viable and capable of being employed on a large scale (Royal Haskoning DHV, 2015). In light of the above, Solafrica Energy (Pty) Ltd (Solafrica) is currently assessing the feasibility of constructing a Concentrating Solar Power (CSP) plant based on Central Receiver technology plant including all associated infrastructure with a maximum generation capacity of 150 MW. Their rationale for undertaking this major endeavor can be largely attributed to the fact that South Africa experiences some of the highest levels of solar radiation in the World. The average daily solar radiation in South Africa varies between 4.5 and 6.5 kWh/m2 (16 and 23 MJ/m2)3, compared to about 3.6 kWh/m2 for parts of the United States and about 2.5 kWh/m2 for Europe and the United Kingdom. Figure 1 below shows the annual solar radiation (direct and diffuse) for South Africa, which reveals considerable solar resource potential for solar water heating applications, solar photovoltaic and solar thermal power generation (Royal Haskoning DHV, 2015).

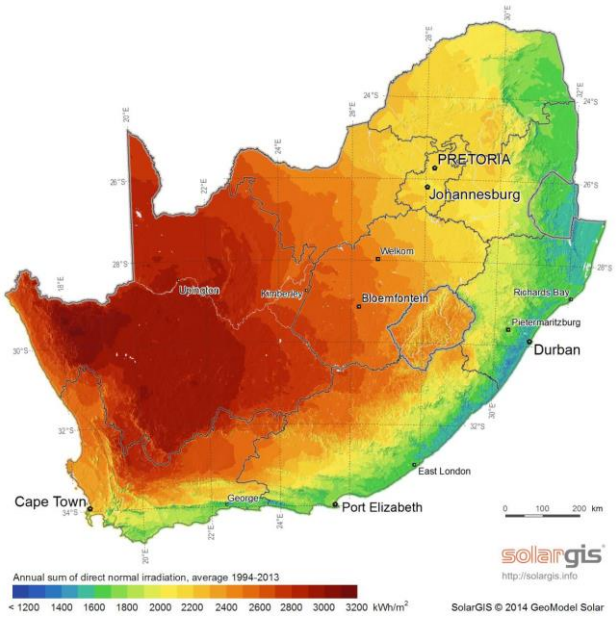


Figure 1: Annual incoming short wave radiation for South Africa (Courtesy: DME, Eskom, CSIR)

The professional environmental team from Royal Haskoning DHV have been appointed as the Environmental Assessment Practitioner (EAP) by Solafrica, to undertake the appropriate environmental studies for this proposed project. Royal Haskoning DHV have in turn appointed Aurecon (Pty) Ltd to undertake the Specialist Traffic and transportation as part of the EIA application.

1.1 Objectives of the Specialist Traffic and Transportation Study

The objectives of this specialist traffic and transportation study are as follows:

- To undertake a review of all relevant literature and a field study to describe the baseline traffic conditions.
- To determine the potential environmental and social (including labour, health and safety) indirect, direct and cumulative risks / impacts to receptors from a traffic and transportation perspective for this project.
- To propose mitigation measures for identified significant risks / impacts and enhance positive risks / impacts of the project.
- To identify monitoring and capacity requirements, and costs for implementing the suggested mitigation measures.
- To ensure that the project operations are in compliance with relevant social and environmental standards, policies, laws, regulations.

The Scope of Work for the specialist traffic and transportation study is as follows:

- Undertake a study as indicated in the terms of reference;
- Prepare a specialist report which includes the following:
    - Executive summary;
    - Scope of work undertaken and assumptions / limitations;
    - Methodology used to obtain supporting information;
    - Overview of relevant legislation;
    - Results of all investigations;
    - Interpretation of information;
    - Assessment of impacts (including cumulative impacts) associated with all stages of the project (construction, operation, closure and post-closure) in accordance with the impact assessment methodology provided by Royal Haskoning DHV

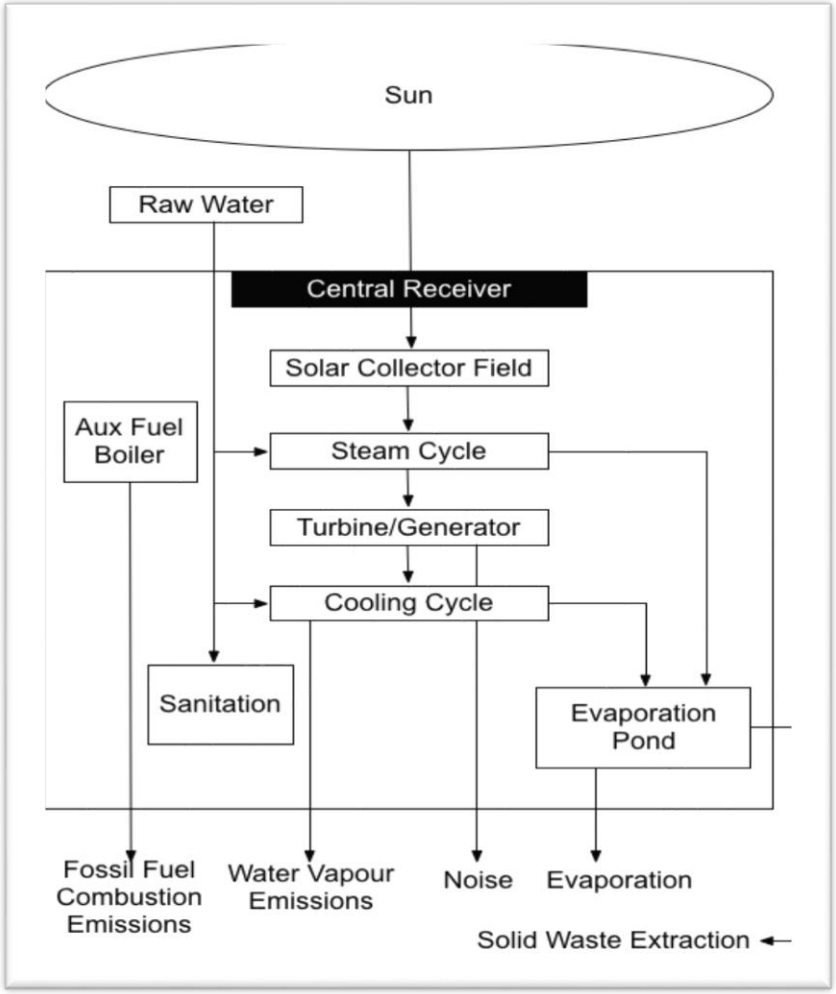
The specialist traffic and transportation study has been completed in accordance with these Terms of Reference.

The broad methodology used for this specialist study is as follows:

- Site visit
- Literature review and internet research
- Data collection and observation of existing traffic conditions

- Data analysis
- Liaison with client and project team
- Fine tune analysis
- Preparation of report and drawings
- Review comments on report
- Amend report and finalise

1.2 Project Description



1.3 Description of the Study Area

In 2006, Eskom Holdings Limited conducted an Environmental Impact Assessment (EIA) Study for a pilot CSP plant with an installed capacity of approximately 100 MW. Through a series of feasibility and high-level screening studies undertaken by Eskom, the Northern Cape Province ranked as the most favourable area for the establishment of a new CSP plant. Within the Northern Cape Province, Upington and Groblershoop were identified as preferred sites for the establishment of this CSP plant.

The Siyanda District Municipality is the backdrop for this particular project which is located in the Northern Cape Province. More specifically, the site is located in the vicinity of the Groblershoop Village which traverses adjacent to the Orange River.

The Siyanda District Municipality covers an area of 103 771 square kilometres with its northern borders aligned with Botswana and Namibia. The district is split by the Orange River from the east to west. Along the banks of the Orange River intensive agricultural activities are prevalent including vineyards and domestic food farms. Upington town is the main urban area for the region and serves as both an administrative and commercial centre as well as a stopover into the area's hinterland. This region attracts tourists travelling to Namibia and local reserves, such as Witsand (approximately 40 km north of Sand Draai) and the Augrabies National Park west of Upington.

The N14 and the N10 are the primary roads in the region and are the main links between the economic centres in Gauteng and Namibia. The population distribution is primarily concentrated in and around the small towns along the Orange River, and specifically in Upington. Other towns/settlements in relatively close proximity to the proposed farms are, Keimoes, Kanoneiland, Louisvale, Oranjevallei, Klippunt, Grootdrink, Groblershoop, Hendriksdal and Boegoeberg.

2 OVERVIEW OF THE SURROUNDING ROAD NETWORK

The purpose of this Chapter is to provide an overview of the road network that will be used to access the proposed site. The sections that follow in this chapter will elaborate on the following:

- General description of each road within the surrounding road network.
- Existing Pedestrian and Bicycle Activity
- Existing Animal Activity
- Existing Road Safety Conditions

The immediate road network is shown on the Figure hereafter.

2.1 General Description of the Surrounding Road Network.

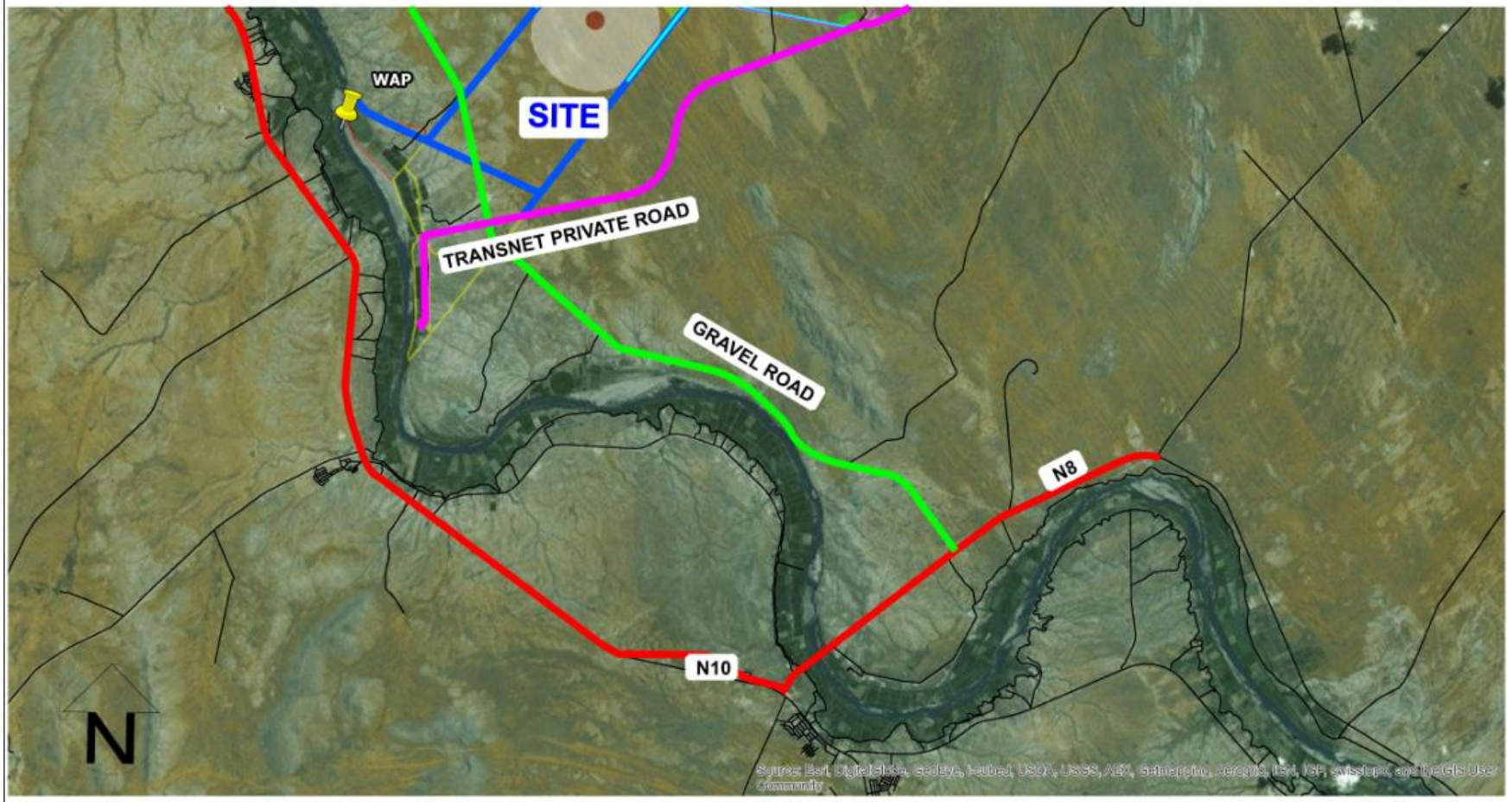
2.1.1 National Route 10 (N10)

The National Route 10 (N10) is a national freeway in South Africa under the jurisdiction of the South African National Roads Agency (SANRAL) which connects Port Elizabeth on the Eastern Cape coast with the Namibian border at Nakop. The N10 traverses through the towns of Cradock, De Aar and Upington as it journeys from the eastern seaboard to the Namibian border. The N10 traverses on the eastern side of Upington in the Northern Cape, where it crosses the Orange River, and then traverses to south-east through Prieska and De Aar. The N10 is a vital link to the success of this project as it will be extensively used to transport materials, equipment and personnel to the proposed site during the construction and operational phases.

The N10 is a single carriageway road with one lane in each direction. The lanes on this road are approximately 3.7m wide with gravel shoulders present on both sides of this road. The vehicle speed limits on this section of the N10 oscillates between 100km/hr and 120km/hr. The horizontal alignment of this road within the study area ranges from fairly gentle to moderately winding in some sections. The vertical alignment of this road ranges from fairly flat in some sections to rolling in other sections. As such, the general geometric design of this road is conducive to the movement of heavy vehicle traffic.

Since this road is a national road, it is prudent to assume that this road was built to fairly high structural standard. As such, the road pavement will have the structural strength to convey the additional volumes of heavy vehicles that will be generated by this project without showing signs of any major structural distress. The current pavement condition on the N10 within the study area ranges from good to fair throughout its length within the study area.

The general road safety conditions on the N10 within the study area is good as no road safety hazards were observed during the site visit. There was very little pedestrian activity and no cyclist activity observed this section of the N10.



aurecon	Existing Road Network SAND DRAAI CSP	PROJECT: 112399 FIGURE:
MARCH 2016	AURECON (PTY) LTD	NOT TO SCALE

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2.1.2 National Route 8 (N8)

The National Route 8 (N8) is also a national freeway that falls under the jurisdiction of SANRAL. The N8 commences at Groblershoop in the Northern Cape, at an intersection with the N10. It traverses in an easterly direction towards Griquastown and Kimberley. From Kimberley it traverses in a south-easterly direction into the Free State province, on a recently upgraded stretch of road, to Bloemfontein. From Bloemfontein, the N8 traverses through Thaba Nchu and Ladybrand until it reaches the Lesotho border at Maseru Bridge where it ends. The N8 is also a vital link to the success of this project as it will be extensively used to transport materials, equipment and personnel to the proposed site during the construction and operational phases.

The N8 freeway within the study area is a single carriageway road with one lane in each direction. The lanes on this road are approximately 3.7m wide with paved shoulders present on both sides of this road. The vehicle speed limits on this section of the N8 fluctuates between 100km/hr and 120km/hr. The horizontal and vertical alignments of this road within the study area is generally good and therefore is conducive to the movement of heavy vehicle traffic. This road also was built to a fairly high structural standard and as such the road pavement will have the structural strength to convey the additional volumes of heavy vehicles that will be generated by this project without suffering any major degradation. The current pavement condition on the N8 within the study area ranges from good to fair.

The general road safety conditions on the N8 within the study area is good as during the site visit no road safety hazards were observed. There was no pedestrian activity and no cyclist activity observed on this section of the N8. Although no animals were observed during the site visit, motorists still need to be aware of stray animals and wild game which are known to roam these parts of the province.

2.1.3 Gravel Road

Approximately 3km from the start of the N8, there is an existing gravel road that commences at the intersection with the N8. This road falls under the jurisdiction of the Northern Cape Department of Transport. This gravel road is approximately 10m wide for most of its length. This road is in a fair to poor condition for most its length. The horizontal alignment is moderately winding in some sections but can be described as gentle for most other sections. The vertical alignment can described as rolling given the topography of the area however no excessively steep slopes were encountered that will hinder the movement of heavy vehicles. The riding quality of this road is poor as there is a lot of loose gravel lying on the surface of the road which poses traction problems for vehicles using this road. It is recommended that this road is re-bladed by the road authority to remove the loose gravel from the surface of the road. In the absence of speed restriction signs on this road, it is envisaged that the speed limit on this road is 60km/hr as speeds beyond this will be dangerous to motorists. There was no pedestrian activity and nor any cyclist activity observed on this road.

2.1.4 Private Transnet Road

The final leg of the journey to the proposed site is via a private gravel road that belongs to Transnet. This road traverses parallel to the rail line for its entire length. It is apparent that the intended purpose of this road is to provide access for Transnet Freight Rail staff to access the rail line to undertake maintenance and repairs to the line. This gravel road is approximately 10m to 11m wide for most of

length. The horizontal alignment is fairly gentle for most of its length. The vertical alignment can be described as fairly flat with slight gradients encountered on some sections of this road. This road is in a relatively poor condition for most its length as there is a lot of loose gravel lying on the surface of the road which significantly reduces the riding quality of this road. It is recommended that this road is re-bladed to remove the loose gravel from the surface of the road. In the absence of speed restriction signs on this road, it is envisaged that the speed limit on this road is 60km/hr. There was no pedestrian activity and nor any cyclist activity observed on this road.

2.1.5 Existing Pedestrian and Cyclist Activity

Only a few pedestrians were observed on the surrounding during the site visit. These pedestrians were observed using the wide verges which adequately accommodate pedestrian movements within the study area. Pedestrians do not impede on the flow of traffic as no conflicts between pedestrians and vehicles were observed during the site visit. No cyclists were observed on the road network in the immediate vicinity of the plant.

2.1.6 Existing Road Safety Conditions

The observed road safety conditions within the study area are generally acceptable. The observed vehicle speeds and driver behaviour within the study area are generally good, with the occasional vehicle exceeding the speed limit on the N10. No inherent road safety hazards were observed on the road network within the study area.

3 Traffic Generation

The proposed Solafrica plant will generate additional traffic on the surrounding road network in two distinct phases, namely the construction phase and the operational phase. It must be noted that these two phases will generate traffic consecutively and not simultaneously and therefore the traffic volumes generated by each phase will be considered separately from each other.

3.1 Construction Phase

The developers of this project anticipate that the construction stage and it's associated infrastructure provision will take approximately 30 to 34 months to complete. The construction phase will generate traffic onto surrounding road network through two distinct sources as follows:

- The construction workforce
- The delivery of materials and equipment to site

These two sources of traffic generation are elaborated on hereafter.

3.1.1 Construction Workforce

It has been estimated that the construction of the Solafrica Plant will require a construction workforce of approximately 1300 -1500 workers during the peak of the proposed construction. The developers of this project have indicated that accommodation will be provided on site for roughly 800 workers. The remaining 700 workers will reside in the neighbouring town of Groblershoop which is within a reasonable proximity to the plant for the sake of convenience.

It is assumed that many of the unskilled workers will travel to the site by public transport either by bus or mini-bus taxi while the skilled workers will travel to the proposed site by private vehicles. Given, the distance from the site to the residential areas, it is unlikely that any of the workers will commute to work on foot.

Based on previous experience on similar projects, the developers have the made the following assumptions with the regard to the workforce and their probable travel patterns:

- It assumed that the average daily workforce will constitute approximately 60% of the total workforce.
- It is assumed that the construction managers, supervisor and other key staff will constitute ±20% of the construction workforce. This sector of the workforce will travel to work by private vehicles.
- As a maximum impact scenario, the remaining 80% of the workforce, which will predominantly comprise of semi-skilled and unskilled workers. These workers are expected to travel to the site by public transport, either by bus or mini-bus taxi (60% by buses and 40% taxis). The average occupancy rate of 60 persons per bus and 10 people per taxi were used in the trip generation calculations.

- Based on the above assumptions the developers for this project have supplied Aurecon with the expected number of trips that the workforce will probably generate during the AM and PM peak hours, as a worst case scenario. These trips are shown in Table 1 hereafter.

Table 1: Trips Generated by the Workforce

	Estimated Vehicle Trips					
	AM (veh/h)		PM (veh/h)		Daily (veh/d)	
	In	Out	In	Out	In	Out
Management / Key Staff						
Peak hour	68	0	0	68		
Daily (24hr)					68	68
Labour by Buses						
Peak hour	6	0	0	6		
Daily (24hr)					8	8
Labour by minibus taxis						
Peak hour	15	0	0	15		
Daily (24hr)					31	31
Delivery Vehicles						
Peak hour	1	1	1	1		
Daily (24hr)					9	9
Total Trips	**90**	**1**	**1**	**90**	**115**	**115**

It is evident from Table 1, that the construction workforce for the proposed plant is therefore expected to generate approximately 90 veh/h during the AM and PM peak hours, which is considered to be low in traffic capacity terms.

3.1.2 Delivery of Materials and Equipment to Site

Heavy delivery vehicles will be used to transport the equipment and construction materials to the proposed plant during the construction phase. According to the developers, the following core equipment and materials will be delivered to the site throughout the construction period:

3.1.2.1. Heliostats

It is estimated that approximately 11 619 heliostats will be required for the construction of the solar power plant. The dimensions of each heliostat is 12.2 m x 12.2 m. Each heliostat will contain 12 mirrors (1m x1m) in size. Assuming that all the mirrors will be shipped precut, then a total of 139 428 mirrors will be required. The mass of each mirror is 10kg (mirror density 2.47 kg/cm3) therefore the total weight of all the mirrors will equate to 1380 tons. Assuming that the payload for the delivery trucks that will be used to transport the mirrors is approximately 21, 5 tons, then approximately 64 truck trips will be made to the site for the delivery of the mirrors. It is envisaged that the delivery of these mirrors will span roughly over a 150 day period as that is an approximation of the time required to complete heliostat field.

From a traffic generation perspective, the delivery of the mirrors for the heliostats to site will generate less than 1 vehicle trip to the site on a daily basis.

3.1.2.2. Raw Materials for Concrete

Concrete will be required for the construction of several key elements of the proposed solar power plant. These elements along with their required volume of concrete is shown hereafter:

	Cubic meters
Solar Tower	6970
Tower Base	1 920
Heliostat Pads	59 110
Other Buildings and Structures	19 130
Total	**87 120**

The concrete will be mixed on site. Based on the total required volume of concrete as shown above, the following volumes of Sand, Stone and Cement will be required to create the concrete mixture on site are shown hereafter.

	Cement	Sand	Stone
Tons	26 755	80 730	82 800

It is assumed by the developers that the payload for the delivery trucks that will be used to transport the raw materials for the concrete is approximately 22 tons and that the delivery of these materials will span over a 320 day period. Therefore, the following truck trips will be made to site on a daily basis during the peak of the construction period:

	Cement	Sand	Stone
Daily Truck Trips (veh/day)	4	12	12

By virtue of the size and slow operating speed of a heavy vehicle, it is generally accepted that the road space in time required by a truck is equivalent to 3 passenger car units. Therefore, the volume of truck trips shown above is converted to an equivalent number of passenger car units (pcu) by multiplying the volume of truck trips by a factor of 3 (evu). Therefore, the equivalent number pcu trips for the construction vehicles is shown in the table below.

	Cement	Sand	Stone
Equivalent No. of PCU/day	12	36	36

Assuming an even spread of these trips over an 8 hour day, the total number of construction vehicle trips per hour is shown below.

	Cement	Sand	Stone
Equivalent No. of PCU/hour	1.5	4.5	4.5

Therefore the total number vehicle trips that can be expected for the concrete raw materials is 10.5 trips per hour.

3.1.3 Total Volume of Construction Traffic Expected

Based on the discussions from the preceding two sections, the total volume of traffic that can be expected during the peak of the construction period can be calculated as follows:

	Peak Hour Trips
Workforce	90
Heliostat Mirrors	1
Raw Materials for Concrete	10.5
Total	**101.5**

Therefore, the total number of trips that can be expected during the peak hour is 101.5 trips which is considered to be low in traffic capacity terms.

3.2 Operational Phase

The purpose of this section is to estimate the volume of additional traffic the proposed solar plant will generate once it is completed and fully operational. These plants could generate additional traffic in two possible ways as discussed hereafter.

3.2.1 Employees Working at the Solar Power Plant

It is envisaged that once the construction of the plant is complete and it is fully operational it will employ a staff compliment of approximately 60 permanent workers.

It is assumed that the construction managers, supervisors and other key staff will constitute ±20% of the permanent workforce. This sector of the workforce will travel to work by private vehicles. Assuming a vehicle occupancy 1.2 persons per vehicle, then the total trips that will be generated by this sector of the workforce can be calculated as follows:

= (60 employees x 20%) / 2 persons per vehicle

= 6 veh/hour

The unskilled workforce will constitute approximately 80% of the total workforce. It is envisaged that these workers will travel to the plant by bus or taxis. Assuming a vehicle occupancy of 15 persons per taxi, then the total trips that will be generated by this sector of the workforce can be calculated as follows:

= (60 employees x 80%) / 15 persons per taxi

=3.2 veh/hour ~~ 4veh/hour

Therefore, it is expected that the total number of trips that will be generated by the permanent workforce during the operational phase in the AM and PM peak hours is 10 veh/hr.

No other trips are expected to be generated during the operation of the solar power plant.

4 Traffic Analysis – Traffic Engineer's Professional Opinion

In accordance with the Department of Transport's Manual on Traffic Impact Studies (RR93/365), developments that generate over 150 vehicles per hour, in the peak hours, require a full Traffic Impact Assessment (TIA), while those developments that generate less than 150 vehicles per hour only require a Traffic Impact Statement (TIS). The difference between these two documents is that the TIA must contain recent traffic counts and the analysis of both existing and future traffic flows, whereas in a TIS, no analysis is required, instead the Traffic Engineer's professional opinion is given more emphasis.

Since the constructional and operational phases of the Solafrica plant both do not generate more than 150 vehicles per hour in the peak hour, a detailed traffic analysis is not required in this study. Therefore, a traffic analyses of the surrounding road network will not be undertaken in this study.

The Traffic Engineer will instead provide his professional opinion based a qualitative assessment of his observations and calculations as follows:

> ***It was observed during the site visit that the road network within the study area is operating at an acceptable level of service as no congestion problems, excessive queue lengths and delays were evident on the surrounding road network. The surrounding road network has capacity to handle the additional volumes of traffic that will be generated by the construction and operational phases of this proposed project without imposing any undue stress onto the road network.***
>
> ***Given the low volumes of traffic that the proposed development will generate, the traffic engineer is of the opinion that the proposed Solafrica Plant will have a negligible impact on the surrounding road network in the future. In the opinion of the Traffic Engineer, this project should be approved from a traffic and transportation perspective.***

5 Risk / Impact Assessment

The envisaged impacts of the proposed construction and operations of the proposed Sand Draai CSP Solafrica in the Northern Cape Province on the surrounding road network are quantitatively evaluated in this chapter of the study, according to the methodology prescribed by NEMA. The purpose of this evaluation is to assign relative significance to the predicted impacts associated with the project and to determine the manner in which these impacts are to be avoided, mitigated or managed, if need be. A detailed description of each criterion used in this evaluation and its associated weighting is described in Appendix A.

1.1 Potential deterioration of existing traffic conditions on the external road network

The proposed Sand Draai CSP once fully operational is expected to generate additional volumes of traffic on the surrounding road network. Whilst there will be an increase in traffic flows along these roads, the road network can easily accommodate the increased traffic flows due to the low existing volumes of traffic that utilise the road network. As observed during the site visit, the surrounding road network is operating at well below its capacity and at a good level of service. Therefore, the additional volume of traffic that will be imposed onto the road network as a direct result of this project will not cause the current operating conditions to deteriorate as there is sufficient spare capacity to handle the envisaged volumes of traffic.

The impact of the additional traffic that will be generated by this proposed project on the existing traffic conditions (road capacity and congestion) on the road network is likely to be minimal.

1.1.1 Construction Phase

Likelihood		**Consequence**			
Frequency of Activity	**Probability of Occurrence**	**Severity of Impact**	**Extent**	**Duration**	**Rating**
5 Daily	1 Almost Never	1 Insignificant	4 Regional	2 One Month to One Year	**Low**
SCORE	6	7			**42**

1.1.2 Operation Phase

Likelihood		Consequence			
Frequency of Activity	**Probability of Occurrence**	**Severity of Impact**	**Extent**	**Duration**	**Rating**
5 Daily	1 Almost Never	1 Insignificant	4 Regional	4 Life of Operation	**Medium - Low**
SCORE	6	9			**54**

Table 1: Impact of generated traffic on the existing traffic conditions (road capacity and congestion) on the surrounding external road network

1.2 Reduction of existing road space available for pedestrian and cyclists

The increase in light and heavy vehicles generated by the proposed project will not impact on the existing road space available for pedestrians and cyclists as there are minimal pedestrians and no cyclists using this cordon of the road network. Given that Groblershoop is the closest village to the proposed site and that it is located a substantial distance away from this village, it is very unlikely that any of the workers from the CSP will attempt to commute to work on foot. Therefore, this project will not generate any pedestrian traffic to and from the site.

In the unlikelihood that pedestrians do decide to use this cordon of the road network, then they could easily be accommodated as the existing road formation is very wide. Furthermore, there are constructed/hardened shoulders on these roads for pedestrians to walk on. The impact of the additional traffic generated by the proposed project for existing pedestrian traffic on the above roads is quantified in Table 4 below:

1.2.1 Construction Phase

Likelihood		Consequence			
Frequency of Activity	**Probability of Occurrence**	**Severity of Impact**	**Extent**	**Duration**	**Rating**
5 Daily	1 Almost Never	1 Insignificant	4 Regional	2 One Month to One Year	**Low**
SCORE	6	7			**42**

1.2.2 Operation Phase

Likelihood		Consequence			
Frequency of Activity	**Probability of Occurrence**	**Severity of Impact**	**Extent**	**Duration**	**Rating**
5 Daily	1 Almost Never	1 Insignificant	4 Regional	4 Life of Operation	**Low**
SCORE	6	9			**54**

Table 2: Impact of additional generated traffic on the road space available for existing pedestrians and cyclists on sections of road most likely to be affected

1.3 Deteriorating road safety conditions for all road users

The increase in light and heavy vehicles generated by the proposed project travelling along the local and regional road network will have minimal impact on the existing road safety conditions for all road users as the generated traffic will travel on roads that are very lightly trafficked from a vehicle and pedestrian perspective. The impact of the additional traffic generated by the proposed project on the existing road safety conditions on the above roads is quantified in Table 5 hereafter:

1.3.1 Construction Phase

Likelihood		Consequence			
Frequency of Activity	**Probability of Occurrence**	**Severity of Impact**	**Extent**	**Duration**	**Rating**
5 Daily	1 Almost Never	1 Insignificant	4 Regional	2 One Month to One Year	**Low**
SCORE	6	7			**42**

1.3.2 Operation Phase

Likelihood		Consequence			
Frequency of Activity	**Probability of Occurrence**	**Severity of Impact**	**Extent**	**Duration**	**Rating**
5 Daily	1 Almost Never	1 Insignificant	4 Regional	2 One Month to One Year	**Low**
SCORE	6	7			**42**

Table 3: Impact of additional operations generated traffic on existing road safety conditions for pedestrians on identified road

1.4 Deterioration of the existing condition of the surrounding road network

This project is expected to generate a fair volume of heavy vehicle traffic during the construction phase. This heavy vehicle traffic is unlikely to have any significant impact on the N10 and N8 as these roads are national freeways that have been built to a high structural standard to convey large volumes of heavy vehicle traffic. Therefore, these roads will not sustain any long term damage by the heavy vehicles. The two gravel roads on the other hand have not been designed to convey large volumes of heavy traffic over a lengthy period of time. Therefore, it is quite possible that these gravel roads will sustain damage during the construction period. The impact of the additional traffic generated by the proposed project during the construction phase on the two gravel roads mentioned above roads is quantified in Table 6 hereafter.

The operational phase of this project will not generate any heavy vehicle traffic as there will be no inputs and outputs for this proposed plant that will be transported by road during the operational phase. The only traffic that will be generated by the plant during the operational phase will be the trips made by

employees travelling to and from the site. It is very unlikely that these passenger vehicles will cause any long term damage to the road network.

1.4.1 Construction Phase

Likelihood		Consequence			
Frequency of Activity	**Probability of Occurrence**	**Severity of Impact**	**Extent**	**Duration**	**Rating**
5 Daily	4 Likely	2 Significant	4 Regional	4 Life of Operation	**Medium-High**
SCORE	9	10			**90**

1.4.2 Operation Phase

Likelihood		Consequence			
Frequency of Activity	**Probability of Occurrence**	**Severity of Impact**	**Extent**	**Duration**	**Rating**
5 Daily	1 Almost Never	1 Insignificant	4 Regional	2 One Month to One Year	**Low**
SCORE	6	7			**42**

Table 4: Impact of additional operations generated heavy vehicles on the existing condition of the road network listed above

Mitigation Measures:

It is recommended that the existing gravel roads are re-bladed on a regular basis to ensure that this road remains operational and maintains an acceptable level of safety for the duration of the project. Furthermore, to reduce the dust that will be generated on the gravel roads it is recommended that these roads are watered down on a regular basis.

The significance of the impact of this project on the existing condition of the gravel roads post implementation of the above mitigation measures is given in Table 8 hereafter.

Likelihood		Consequence			
Frequency of Activity	**Probability of Occurrence**	**Severity of Impact**	**Extent**	**Duration**	**Rating**
5 Daily	2 Very Seldom	1 Insignificant	4 Regional	4 Life of Operation	**Low**
SCORE	7	6			**42**

Table 5: Impact of additional operations generated heavy vehicles on the existing condition of the road network listed above after mitigation

6 Summary of Conclusions & Recommendations

Solafrica Energy (Pty) Ltd (Solafrica) is currently assessing the feasibility of constructing a Concentrating Solar Power (CSP) plant based on Central Receiver technology plant including all associated infrastructure with a maximum generation capacity of 150 MW. The proposed plant will be located within the Siyanda District Municipality in the Northern Cape Province near the Groblershoop Village.

The construction and operations of the plant will generate additional volumes of traffic on the existing road network within the study area. Therefore, the purpose of this study was to assess the impact of this additional traffic and pedestrians on the surrounding road network.

The site visit to the study area revealed that the surrounding road network is operating at well below its capacity and at a good level of service. This study showed that the construction and operational phases of the proposed solar power plant will generate negligible volumes of traffic during the AM and PM peak hours. The existing road network has sufficient capacity to accommodate these additional low volumes of traffic. The impact of the envisaged additional traffic on the surrounding road network is therefore expected to be negligible.

Similarly, whilst the construction and operational phases of the plant is expected to generate minimal pedestrians, the wide verges along the existing road network will be able to accommodate the additional pedestrians if required. Hence, no mitigation or remedial measures will be required with regard to pedestrians.

The traffic that will be generated by the new plant is not expected to have any adverse impact on the existing road safety conditions.

Based on the above discussion, the Traffic Engineer's opinion is as follows:

> ***It was observed during the site visit that the road network within the study area is operating at an acceptable level of service as no congestion problems, excessive queue lengths and delays were evident on the surrounding road network. The surrounding road network has capacity to handle the additional volumes of traffic that will be generated by the construction and operational phases of this proposed project without imposing any undue stress onto the road network.***
>
> ***Given the low volumes of traffic that the proposed development will generate, the traffic engineer is of the opinion that the proposed Solafrica Plant will have a negligible impact on the surrounding road network in the future. In the opinion of the Traffic Engineer, this project should be approved from a traffic and transportation perspective.***

Appendix A
Risk / Impact Assessment Methodology

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Risk / Impact Assessment Methodology

Assessing the Significance of Impacts

The purpose of impact evaluation is to assign relative significance to predicted impacts associated with the project, and to determine the manner in which impacts are to be avoided, mitigated or managed. The accumulated knowledge and findings of the specialist studies inform the process of assessing the significance of the impacts identified according to the following criteria:

1.1 Description of aspects and impacts

1.1.1 Spatial scope

The geographical coverage (spatial scope) description will take account of the following factors:

The physical extent / distribution of the aspect and proposed impact; and

The nature of the baseline environment within the area of impact.

For example, the impacts of noise are likely to be confined to a smaller geographical area than the impacts of atmospheric emissions, which may be experienced at some distance. The significance of impacts also varies spatially. Many will be significant only within the immediate vicinity of the site or within the surrounding community, whilst others may be significant at a regional or national level.

The spatial scope of the impact will be rated on the following scale:

Activity specific	1
Area specific	2
Whole site	3
Regional / neighbouring areas	4
National	5

1.1.2 Duration

Duration refers to the length of time that the aspect may cause a change either positively or negatively on the environment[1]. The environmental assessment distinguishes between different time periods by assigning a rating to duration based on the following scale:

One day to one month	1
One month to one year	2
One year to ten years	3
Life of operation	4
Post closure	5

1.1.3 Severity

The severity of an environmental aspect is determined by the degree of change to the baseline environment and includes consideration of the following factors:

The reversibility of the impact;

The sensitivity of the receptor to the stressor;

The impact duration, its permanency and whether it increases or decreases with time;

Whether the aspect is controversial or would set a precedent;

and the threat to environmental and health standards and objectives.

The severity of each of the impacts will be rated on the following scale:

Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful	5

[1] This may take place without a receptor being impacted.

1.1.4 Frequency of the activity

The frequency of the activity occurring will be rated on the following scale:

Annually or less	1
6 monthly	2
Monthly	3
Weekly	4
Daily	5

1.1.5 Frequency of the impact

The frequency of the impact occurring refers to how often the aspect impacts or may impact either positively or negatively on the environment. After describing the probability, the findings will be described using the following scale:

Almost never / almost impossible	1
Very seldom / highly unlikely	2
Infrequent / unlikely / seldom	3
Often / regularly / likely / possible	4
Daily / highly likely / definitely	5

1.2 Significance determination

The environmental significance rating is an attempt to evaluate the importance of a particular impact, the consequence and likelihood of which has already been assessed by the relevant specialist. The description and assessment of the aspects and impacts undertaken as outlined in Section 4.2.1 above is presented in a consolidated table (Table 1) with the significance of the impact assigned using the process and matrix detailed below. The sum of the first three criteria (spatial scope, duration and severity) provides a collective score for the CONSEQUENCE of each impact. The sum of the last two criteria (frequency of activity and frequency of impact) determines the LIKELIHOOD of the impact occurring. The product of CONSEQUENCE and LIKELIHOOD leads to the assessment of the SIGNIFICANCE of the impact, shown in the significance matrix below. The model outcome is then assessed in terms of impact certainty and consideration of available information. Where a particular variable rationally requires weighting or an additional variable requires consideration the model outcome is adjusted accordingly. Arguments for such adjustments are presented in the text and associated table.

Table A: Framework for assessing environmental impacts

SPATIAL SCOPE	RATING	DURATION	RATING	SEVERITY	RATING
Activity specific	1	One day to one month	1	Insignificant / non-harmful	1
Area specific	2	One month to one year	2	Small / potentially harmful	2
Whole site / plant	3	One year to ten years	3	Significant / slightly harmful	3
Regional (neighbouring areas)	4	Life of operation	4	Great / harmful	4
National	5	Permanent	5	Disastrous / extremely harmful	5

FREQUENCY OF ACTIVITY	RATING	FREQUENCY OF IMPACT	RATING
Annually or less	1	Almost never / almost impossible	1
6 monthly	2	Very seldom / highly unlikely	2
Monthly	3	Infrequent / unlikely / seldom	3
Weekly	4	Often / regularly / likely / possible	4
Daily	5	Daily / highly likely / definitely	5

SIGNIFICANCE RATING OF IMPACT	TIMING
Very Low (1-25) **Low** (26-50) **Medium -Low** (51-75) **Medium-High** (76-100) **High** (101-125) **Very High** (126-150)	Pre-construction Construction Operation
ADJUSTED SIGNIFICANCE RATING	

1.3 Mitigation

In assessing the significance of the impact, natural and existing mitigation will be taken into account. Natural and existing mitigation measures are defined as natural conditions, conditions inherent in the project design and existing management measures that alleviate (control, moderate or curb) impacts.

In addition, where necessary measures to avoid, reduce or manage impacts consistent with best practice will be proposed and the effectiveness of such measures assessed in terms of their ability to avoid an impact, remove an impact entirely, render it insignificant or reduce its magnitude. The significance of impacts will therefore be determined both before and after mitigation.

An EMP will be prepared as part of the EIR prepared during the assessment phase. This plan will specify the methods and procedures for managing the environmental aspects of the proposed development. Monitoring requirements will also be detailed within the plan, particularly for those environmental aspects that give rise to potentially significant impacts.

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