GEELSTERT 1

PHOTOVOLTAIC FACILITY AND ASSOCIATED INFRASTRUCTURE

TRAFFIC AND TRANSPORTATION ASSESSMENT

AUGUST 2020

Knight Piésold CONSULTING

P O Box 381

Century City

7441

Tel. +27 21 555 0400

Rev	Description	Date
0	Issued in Draft	July 2020
1	Revised in accordance with client's comments	August 2020

This report was prepared and reviewed by the undersigned.

Prepared:

Amory Le Roux-Arries
Civil Engineer

Reviewed:

Andrew Cleghorn,
Principal Civil Engineer

This report was prepared by Knight Piésold Ltd. for the account of Geelstert Solar Facility 1 (Pty) Ltd). Report content reflects Knight Piésold's best judgement based on the information available at the time of preparation. Any use a third party makes of this report, or any reliance on or decisions made based on it is the responsibility of such third parties. Knight Piésold Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. Any reproductions of this report are uncontrolled and might not be the most recent revision.

SPECIALIST EXPERTISE

AMORY LE ROUX-ARRIES

Profession:	Civil Engineer
Position in Firm:	Civil Engineer
Qualifications:	MEng (Civil)
Years of Experience:	10 years

Summary of Experience: Ms. Amory Le Roux-Arries has approximately nine years of engineering experience in contract administration, business development (specifically in feasibility studies), tendering, compiling business proposals and overseeing business development in West Africa. She has gained experience in the private sectors and is familiar with contractual obligations and client requirements. She has gained practical experience on road construction obligations and client requirements. She has gained practical experience on road construction and traffic engineering. Amory has recently achieved her master's degree in engineering with specialization in Traffic and Transportation Engineering.

Specialist Experience:

Various Traffic Impact Assessments: Amory has completed traffic impact assessments (TIA) both in South Africa and cross border. TIAs were completed for the Gautrain Mbombela Hatfield Station, Edenburg Church rezoning, Lichtenburg Solar Farms, Hotazel Solar Farm, Augeigas Development (Namibia), Motse Development (Botswana), Lobatse Taxi rank and bus depot and Richards Bay Steelbridge.

City of Cape Town Facilities Management Project: This project is for the duration of 3 years on an as and when required basis, for the upgrading, construction, installations for Facilities Management Department in the City of Cape Town region. She is responsible for the Project Management and Civil works design on various projects.

R53 road upgrade: Assistant Engineer's Representative Upgrading between Parys and Potchefstroom. She was responsible for Traffic Engineering, Contract Administration, Site Supervision of this project.

The City Deep Kazerne Freight Hub Upgrade Programme: Assistant Engineer's Representative Widening of Rosherville Road and the Extension of Bonsmara Road to Heidelberg Road. She was responsible for Tender Evaluation, Contract Administration, Site Supervision.

The Democratic Republic of Congo,Mokambo to Kasumbalesa: she was responsible for the feasibility study, concept design of the 87km road complete with border posts and warehouses. The feasibility study included financial proposals as well as technical aspects.

Aveng Africa Limited – Nuclear Division: Civil Engineer: Overseeing business development in West Africa. She was responsible for writing procedures and doing business proposals. She prepared estimation proposals of new businesses and tendering, as well as business cases for new business constructability, analysis and estimations.

Aveng Grinaker-LTA: Site Engineer: Growth department and business intelligence: summaries of future projects and possible investment opportunities and Competitor analysis.

Grinaker-LTA Nelson Mandela Bay Soccer Stadium: Student Engineer – Vacation Training: Verification of drawings. She was responsible for the liaison between technical manager and subcontractors and inspection checks.

Grinaker-LTA (Port of Ngqura Project-Coega): Student Engineer – Vacation Training: Assisting with bridge construction. Amory handled the survey and levelling of abutments, foundation supervisor and concrete quality inspections.

SPECIALIST DECLARATION

I, **Amory Le Roux-Arries**, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favorable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing – any decision to be taken with respect to the application by the competent authority; and – the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable on terms of section 24F of the Act.

Signature of Specialist:

Name of Specialist: Amory Le Roux-Arries

Date: 03 August 2020

Table of Contents

List of Figures

List of Tables

1. INTRODUCTION

Knight Piésold (Pty) Ltd was appointed by Geelstert Solar Facility 1 (Pty) Ltd (further herein referred to as the applicant) to undertake a Transport Study and Traffic Impact Assessment for the proposed 125MW Geelstert 1 photovoltaic (PV) solar energy facility on the Remaining Extent of Farm Bloemhoek 61, near Aggeneys in the Northern Cape.

1.1 Objectives of the Study

The objectives of this traffic and transportation study are to:

a. Review the study area and describe the baseline traffic conditions;
b. Determine the suitability of access to and egress from the site;
c. Evaluate the safety of the proposed accesses;
d. Address the impact of traffic generated by the proposed development, with specific reference to traffic safety, operations and road condition;
e. Propose mitigation measures for any identified significant risks or impacts and enhance positive risks or impacts of the project.

1.2 Study Area

The site is situated approximately 11km south-east of Aggeneys, 116km south-east of Springbok and 57km south-west of Pofadder in the Northern Cape Province of South Africa. It falls within the Namakwa District and the Khâi-Ma Local municipality.

1.3 Locality

The full extent of the property (12 379ha) was assessed for the proposed project. An approximate area of 245ha is required for the development of the proposed 125MW Geelstert 1 facility. The photovoltaic structures will occupy an approximate area of 195ha, whilst the supporting infrastructure inclusive of the internal roads (12ha), temporary laydown area (5ha), auxiliary buildings (1ha), and an on-site substation (up to 1ha) will occupy the remainder. A conceptual layout of the proposed facility is graphically illustrated in *Figure 1-1*, locality plan.

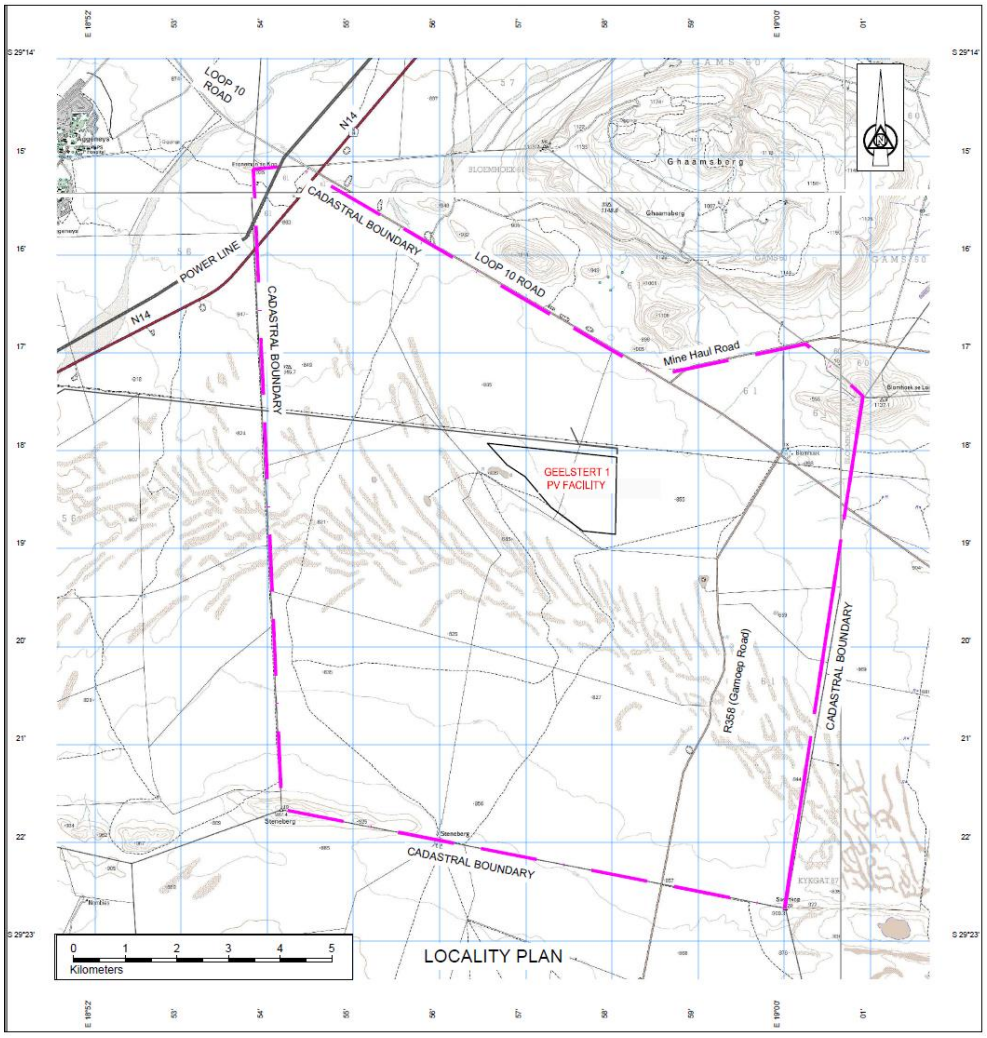

Figure 1-1: Locality Plan

1.4 Approach and Methodology

The purpose of this study is to assess the possible impacts that the development might have on the surrounding road/traffic network. The following tasks were undertaken to complete this study:

Site Visit and Project Initiation:

- The site visit took place between the dates of the 21st to 23rd of January 2019, during the day with sunny and hot weather conditions;
- An overview of the project information was obtained, which included location maps, component specifications and the surrounding road network information;
- Available documentation and information relevant to the proposed solar farm was reviewed.

Traffic and Route Assessment:

- Trip generation and potential traffic impacts were determined;
- Possible haul routes between the potential port of entry and the site were identified. The following was considered:
    - National routes;
    - Local routes;
    - Site access roads (internal roads); and
    - Road limitations due to abnormal loads.
- The number of vehicle trips, expected during both the construction and operational phase, have been calculated. These include:
    - Vehicular trips generated;
    - Abnormal load trips; and
- The impacts of the development were investigated.

Access Assessment:

- Feasibility of the location of access points were assessed;
- Motorised and non-motorised access requirements were determined;
- Queuing analysis was compiled;
- Access geometry was investigated; and
- Site distances and spacing requirements were determined.

Report:

- A traffic impact assessment (TIA) report was compiled, for comments.

1.5 Assumptions

The following assumptions were made:

- Maximum vertical clearances along the haul route is 5.2m for abnormal loads;
- The imported elements will be transported from the most feasible port viz. Saldanha Bay Port;
- All haulage will occur on either surfaced national and provincial routes or existing gravel roads; and
- Construction materials will be sourced locally, where possible.

2 THE DEVELOPMENT

2.1. Proposed project layout:

The development area of Geelstert 1 is proposed to accommodate the following infrastructure, which will enable the solar photovoltaic facility to generate a contracted capacity of up to 125MW:

- Bifacial or monofacial PV panels, mounted on fixed-tilt or tracking mounting structures with a maximum height of 3.5m;
- Centralised inverter stations or string inverters;
- A temporary laydown area;
- Cabling between the panels, to be laid underground where practical;
- An on-site facility substation stepping up from 22kV or 33kV to 132kV or 220kV, with an extent of up to 1ha to facilitate the connection between the solar PV facility and the grid connection solution;
- An access road to the development with a maximum width of 8m;
- Internal access roads within the PV panel array area with a maximum width of 5m; and
- Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses, a workshop and visitors centre.

The proposed site layout plan is illustrated in *Figure 2.1* below.

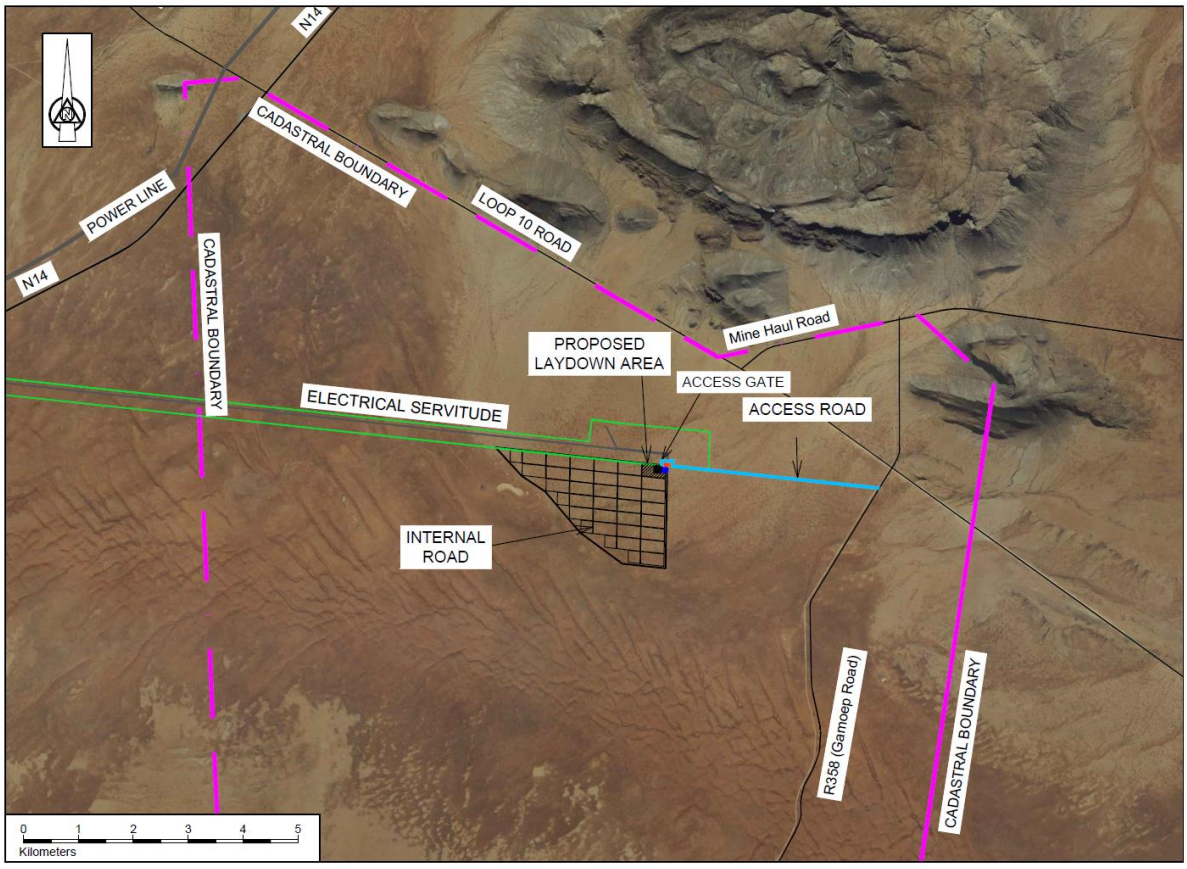

Figure 2-1: Conceptual layout of the solar facility

3 ROAD NETWORK ASSESSMENT

Roads of various classifications will be utilised to transport the components and equipment required for the construction of the solar facility. Some components (such as the substation transformer) may be defined as abnormal loads in terms of the National Road Traffic Act's (No.93 of 1996), presiding dimensional limitations.

The routes to the site, from either the preferred or alternative ports, are Provincial and National Roads.

3.1. Current Legislation on Road Freight

The current general limitations on road freight transport are:

a. Axle load limitation of 7.7 ton on front axle and 9.0 ton on single rear axles;
b. Axle unit limitations of 18t for dual axle unit and 24t for 3 axle unit
c. The bridge formula requirements to limit load concentration and to regulate load distribution on the vehicle is as follows:
   - Permissible mass = (L * 2 100) + 18 000 kilogram
   - With L = the distance from the first axle of any axle or axle unit to the last axle of any consecutive axle or axle unit (in meters).
d. Gross vehicle mass limited to 56t. This equates to a typical payload of approximately 30t;
e. Maximum vehicle length of 22m for interlinks; 18.5m for horse and trailer and 13.5m for a single unit;
f. Width limit of 2.6m; and
g. A height limit of 4.3m.

Abnormal permits are required for vehicles exceeding any of the above limits. If, for any one of the above reasons, the equipment cannot be delivered along the preferred route, the alternate route should be considered.

3.2. Authority and Permit Requirements

For authority and permit requirements, the following should be noted:

a. Toll fees are payable on routes from the port. Toll fees for heavy vehicles with five or more axles are estimated to be R850 per trip, on the alternative route from Durban.

b. A separate abnormal load permit will be required for each Provincial Authority that the abnormal load passes through. The estimated fee of these permits' ranges between R10 000 and R 17 500 per trip. The application process for these permits takes approximately four weeks to complete.

4 TRAFFIC GENERATION

4.1. Existing Traffic

The affected property borders the Loop 10 Road to the north, which is a gravel road that also provides access to an existing mine. The mine maintains the road by grading it regularly. The condition of the road would need to be maintained once construction starts. The resultant traffic from the mine is on average 14 heavy vehicle trips per day.

Photograph 4.1: Loop 10 Road during site inspection

4.2. Construction Phase

Imported elements are shipped to, and transported from, the nearest and most practical South African port, to site. The largest potential load will be a single 125MVA transformer, with a payload of approximately 90 tons. Freight will be transported predominantly on surfaced National and Provincial roads.

Typical civil engineering construction plant, as well as other specialist equipment, will be required for site preparation, construction of the substation and mounting of the PV support structures. A temporary laydown area will be required during construction. Storage areas will be required for typical construction equipment.

4.3. Construction Phase Traffic Statement

It is estimated that the total number of heavy vehicle trips for a 125MW installation would vary between 4 500 and 6 000. These trips would be made over an estimated construction period of between 12 and 18 months. During the peak construction period, the calculated number of heavy vehicle trips range between 15 and 25 per day. The impact on the existing road network is deemed negligible with an additional peak hourly traffic estimated to increase by a maximum of 2 additional trips. It is suggested that the low volume of construction traffic will have no significant impact on the existing traffic service levels.

During the peak of the construction phase, it is estimated that approximately 400 employees would be employed on the project site. Where possible, these employees will come from the towns of Pofadder (57.5km) or Springbok (116km). Staff employed will be required to be transported from the towns to site by bus or taxi. This equates to 5-7 additional trips during peak periods, if transported using 60-seater busses, or alternatively 20-27 additional trips if a 15-seater minibus is utilised for this purpose. The traffic model suggests that minor delays may be experienced at the entrance to the proposed site.

4.4. Operational Phase Traffic Statement

The proposed solar facility is anticipated to be in operation for a minimum period of 20 years and will operate 7 days a week, during daylight hours. It is assumed that once the plant is fully operational, it will employ a staff compliment of approximately 60 workers. It is also assumed that the managers, supervisors, and skilled staff will constitute 30% of the permanent workforce. This workforce will travel to work by means privately owned vehicles. Assuming a vehicle occupancy of 1.2 persons per vehicle, the total trips generated per peak hour have been determined as displayed below:

Trips per peak hour = (60 employees x 30%) / 1.2 persons per vehicle = 15 trips per peak hour.

The total trips per day will be up to 30.

Unskilled personnel are reasonably assumed to constitute 70% of the total workforce. These employees are likely to travel to work either by bus or by minibus taxi. Assuming a vehicle occupancy of 15 persons per taxi, the total trips generated has been determined as follows:

Trips per peak hour = (60 employees x 70%) / 15 persons per vehicle = 3 trips per peak hour.

The total trips per day will be up to 6.

During the operational phase, the total number of trips generated by the permanent workforce during the AM and PM hourly peak periods have been respectively determined to be 18 trips per peak hour. No additional daily trips are anticipated during the operation phase.

4.5. Impact and Risk Rating

The traffic impact significance rating has been determined according to criteria for impact assessment which is detailed below.

The first stage of impact assessment is the identification of activities, traffic aspects and impacts as well as the likelihood of that impact occurring.

The significance is assessed as either low, medium or high based on a combination of characteristics including extent of the risk, duration of the risk, magnitude and probability of occurrence.

The significance is determined as the product of the following formula:

S = (E+D+M) x P

S = Significance weighting;
E = Extent;
D = Duration;
M = Magnitude; and
P = Probability.

The risk rating is calculated based on the input from assessments listed above. The incidence of occurrence is calculated by adding the extent of the impact to the duration of the impact.
The significance of the risk based on the identified impacts can be qualitatively expressed as follows:

- Low – the impact is of little importance/ insignificant but may/ may not require minimal management.
- Medium – the impact is important; management is required to reduce the negative impacts to acceptable levels
- High – the impact is of great importance, negative impacts could render development options or the entire project unacceptable if they cannot be reduced to acceptable levels and/or if they are not balanced by significant positive impacts, management of negative impacts are essential.

Low risk	0-30
Medium risk	31 – 60
High risk	61 - 100

The impacts during the various phases of the project have been listed in *Table 4.1* to *Table 4.5* in the sub-sections that follow.

4.5.1. Construction Phase Impact

The construction phase Traffic Impact of Geelstert 1 is summarised in *Table 4-1* below:

Table 4-1: Construction Phase Impacts

Nature: Construction Phase Impacts		
	Without Mitigation	**With Mitigation**
Extent	Regional (2)	Regional (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (3)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (21)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation/Enhancement: - Stagger infrastructure delivery to site. - Staff and general trips should occur outside of peak traffic periods. - Where possible, construction materials should be sourced from local suppliers to limit the impact on the regional network.		
Residual impacts: Impact on local traffic will remain low		

4.5.2. Operational Phase Impact

The operational phase Traffic Impact of Geelstert 1 is summarised in *Table 4-2* below.

Table 4-2: Operational Phase impact

Nature: Operational Phase Impacts		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Minor (1)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (14)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation/Enhancement: - Staff and general trips are anticipated to take place outside of peak traffic periods.		
Residual impacts: No residual impacts were foreseen at the time of compiling this report.		

4.5.3. Cumulative Impacts

Several renewable energy developments are proposed for the Northern Cape region by several applicants as illustrated in *Figure 4-1* and further described in *Table 4-3*. Even though the capacity of the applications on the list is extensive, not all the proposed projects on the list will be approved in the next round of REIPPP approvals.

Figure 4-1 graphically displays all nearby renewable energy projects which have received Environmental Authorisation or are currently following the EIA process.

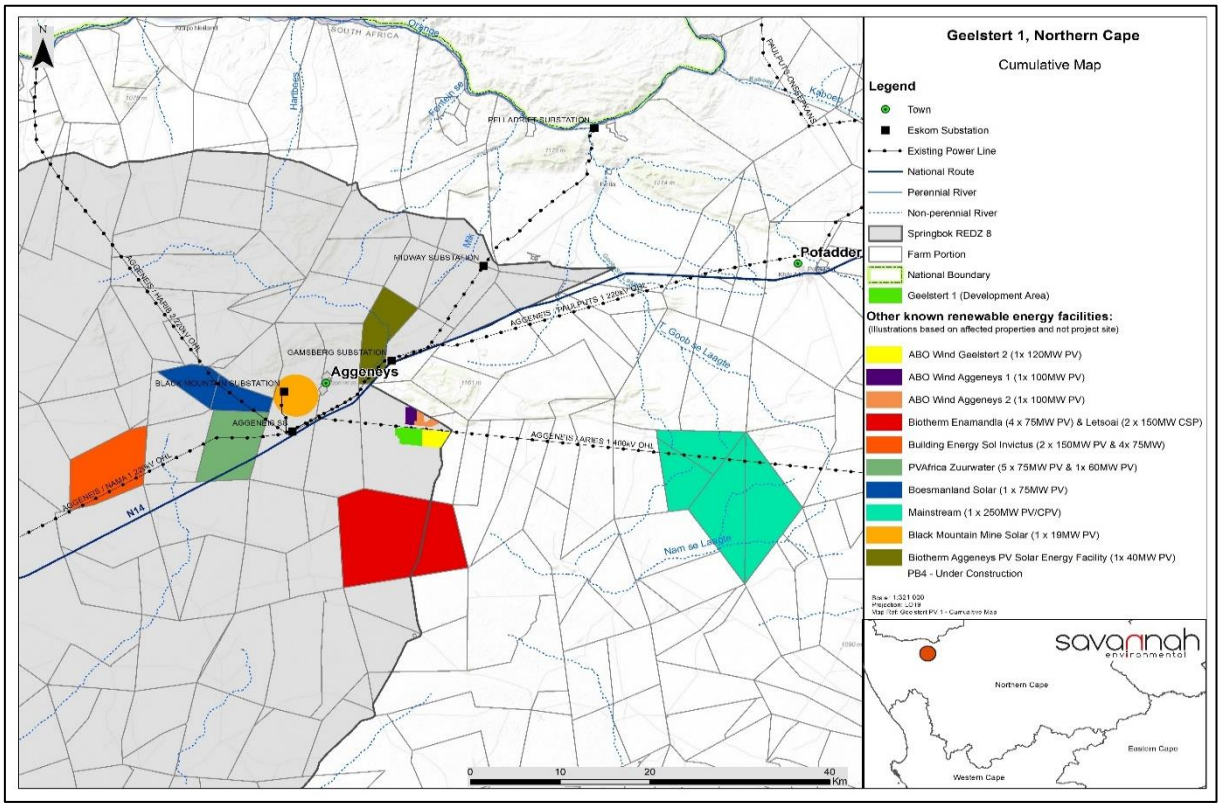

Figure 4-1: Cumulative Map of nearby projects

Table 4-3: List of proposed renewable energy projects in the vicinity

Project Name	Location	Approximate distance from Geelstert 1	Project Status
Geelstert 2 (1 x 125MW PV)	Remaining Extent of the Farm Bloemhoek 61	Adjacent to the development area of Geelstert 1 to the east.	EIA in process
ABO Wind Aggeneys 1 (1 x 100MW PV)	Remaining Extent of the Farm Bloemhoek 61	~1km north of Geelstert 1 within the same study area and/or affected property.	EA Approved
ABO Wind Aggeneys 2 (1 x 100MW PV)	Remaining Extent of the Farm Bloemhoek 61	~1km north-east of Geelstert 1 within the same study area and/or affected property.	EA Approved
Biotherm Aggeneys PV Solar Energy Facility (1 x 40MW PV)	Portion 1 of the Farm Aroams 57	~5km to the north west	Facility constructed and Operational
Biotherm Enamandla (4 x 75MW PV)	Remaining Extent of the Farms Hartebeest Vlei 86	~15km to the south	EA Approved
Building Energy Sol Invictus (2 x 150MW PV and 4 x 75MW PV)	Portion 5 of the Farm Ou Taaibosmond	~30km to the west	EA Approved
PVAfrica Zuurwater (5 x 75MW PV and 1 x 60MW PV)	Portion 3 of the Farm Zuurwater 62	~20km to the west	EA Approved
Boesmanland Solar (1 x 75MW PV)	Portion 6 of the Farm Zuurwater 62	~15km to the west	EA Approved
Mainstream Solar (1 x 250MW PV/CPV)	Portion 2 of the Farm Namies South 212	~25km to the east	EA Approved
Black Mountain Mine Solar (1 x 19MW PV)	Portion 1 of the Farm Aggeneys 65	~10km to the west	EA Approved

The construction phase cumulative traffic impact of Geelstert 1 being constructed concurrently with any of the proposed or approved developments in the surrounding area has been summarised in *Table 4-4*.

Table 4-4: Construction Phase Cumulative Impact

Nature: Construction Phase Impacts		
	Without Mitigation	**With Mitigation**
Extent	Regional (3)	Regional (3)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (5)	Moderate (5)
Probability	Very likely (4)	Probable (3)
Significance	**Medium (40)**	**Medium (30)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation/Enhancement: Vehicle trips to be staggered outside peak periods.		
Residual impacts: The impact on the local and regional traffic will be of medium significance.		

The operational phase cumulative traffic impact of Geelstert 1 being constructed concurrently with any of the proposed or approved developments in the surrounding area has been summarised in *Table 4-5*.

Table 4-5: Operation Phase Cumulative Impact

Nature: Operational Phase Impacts		
	Without Mitigation	**With Mitigation**
Extent	Regional (2)	Regional (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Minor (1)
Probability	Probable (3)	Improbable (2)
Significance	**Low (24)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation/Enhancement: Where possible, vehicle trips to be staggered outside peak periods.		
Residual impacts: The impact on the local and regional traffic will be of low significance.		

5 TRANSPORT STUDY

5.1. Proposed Access

A new site access road is proposed from the R358 (Gamoep Road), located to the east of the project site, see *Figure 5-1*. The R358 is a formal gravel road which is connected to the N14 by the Loop 10 Road.

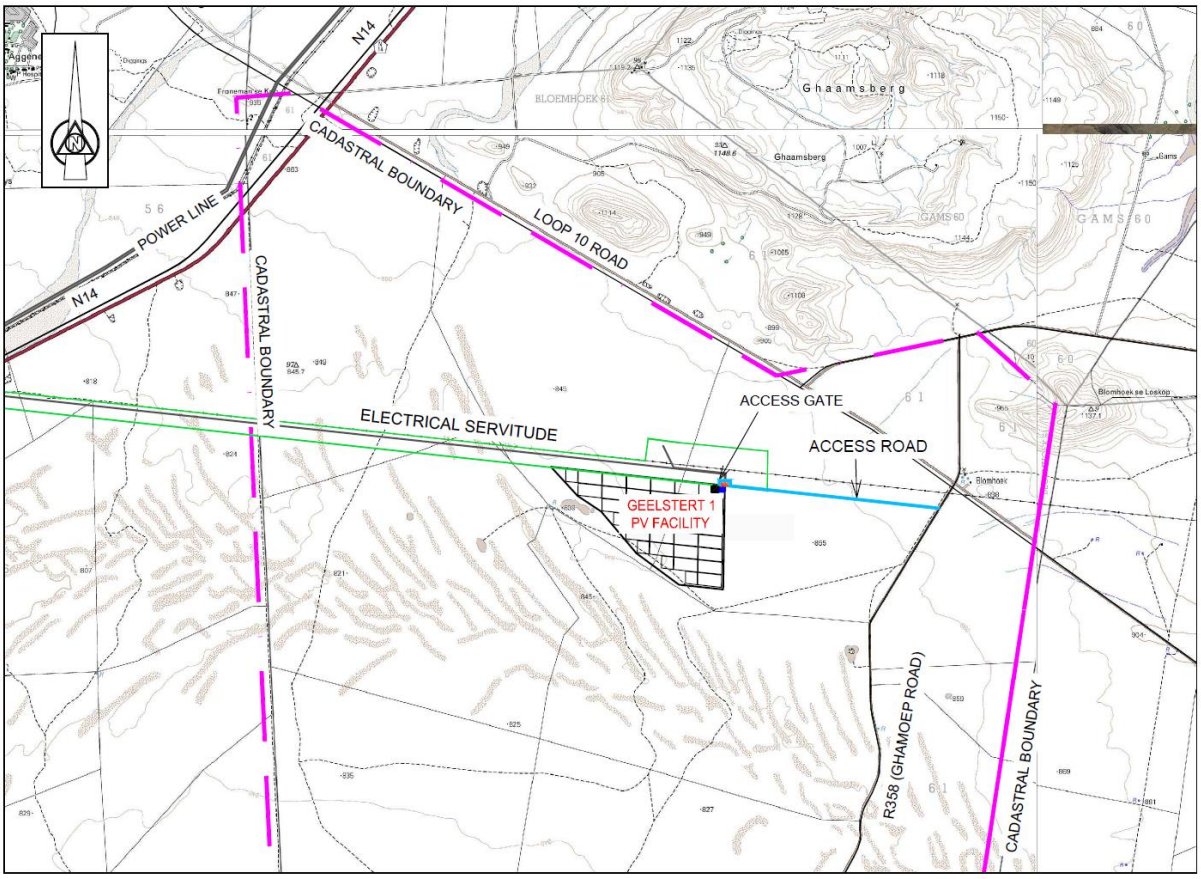

Figure 5-1: Site Access

During construction, the project site will be accessed via the new access gate, approximately 3.3km from the intersection of the proses access road and regional route R358. This access will be utilised for maintenance purposes during the operational phase. The final site layout will determine the exact extent of the internal roads.

The intersection of the Loop 10 Road Road and the N14, as illustrated in *Photograph 5.1*, has been recently upgraded to a blacktop surfacing through the maintenance contract on the N14. The Loop 10 Road *(Photograph 5.2)* and the R358 Gamoep Road (Photograph 5.3) from the intersection towards the PV Facility's accesses are formal gravel graded roads with drainage provisions.

The proposed access point for Geelstert 1 off the R358 (Gamoep Road) is illustrated in *Photograph 5.4.* The soil conditions are soft sand, but with stabilisation, should be adequate to carry the low volume daily loads, with regular maintenance during the construction period. The minimum vertical clearances according to *SANS 10280/NRS 041-1:2008 Overhead Power Lines for Conditions Prevailing in South Africa* is 6.3m for a 132kV power line whether outside or inside townships. This needs to be noted and investigated for the internal road design as there are powerlines on the property under investigation and in the surrounding area. A minimum of 6.3m vertical clearance is to be considered for the internal project design.

Photograph 5.1: Access off N14

Photograph 5.2: Loop 10 Gravel road

Photograph 5.3: R358 Gamoep Gravel road

Photograph 5.4: Access point to Geelstert 1

5.2. Internal Roads

Permanent internal access roads will be constructed between clusters photovoltaic modules. These roads are generally stabalised gravel or informal tracks that are 4m to 5m wide. It is anticipated that the length of these roads will be approximately 23km.

5.3. Route from Preferred Port

The route for the transportation of imported equipment is either from Saldanha or Coega. Taking into consideration the length, width and road quality, the preferred delivery route for abnormal loads is from the Port of Saldanha to site, as is shown in *Figure 5-2.* This route is 582km in length. The route elements are visually illustrated in *Table 5-1* below.

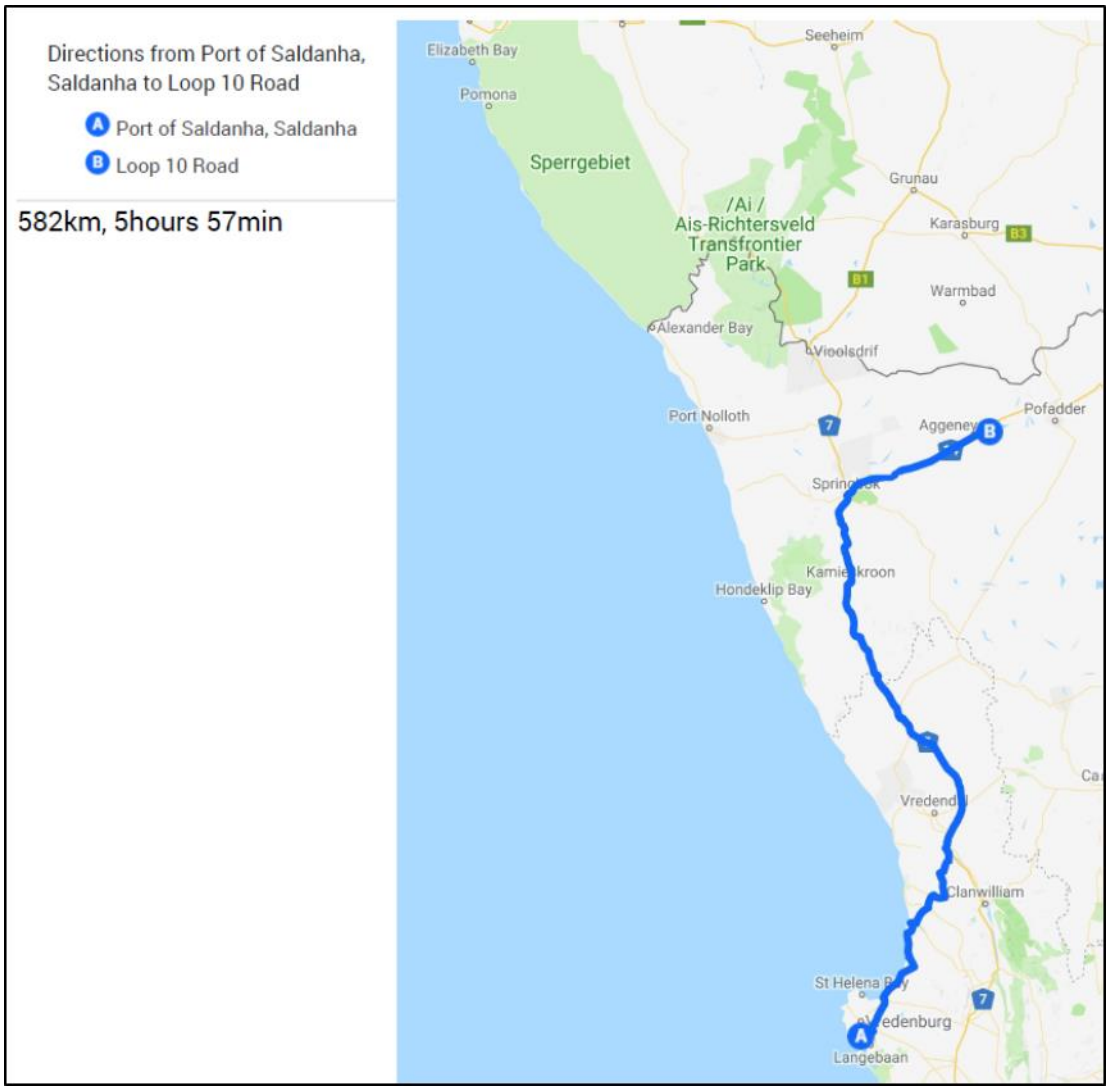

Figure 5-2: Preferred route from Saldanha Port

Table 5-1: Preferred Route Assessment

Section	Route Name	From	To	Distance (km)	Type
1	R27	Port	Graafwater	139	Surfaced Regional Road
				The R27 is a dual carriageway two lane road leaving the port with surfaced shoulders	
2	N7	Graafwater	Springbok	330	Surfaced National Road
				The N7 is a dual carriageway two lane road with gravel shoulders for the most part	
3	N14	Springbok	Aggeneys	116	Surfaced National Road
				The N14 is a dual carriageway two lane road with gravel shoulders for the most part	

Section	Route Name	From	To	Distance (km)	Type
4	Loop 10	N14 Intersection	Site Access	7	Servitude
				Loop 10 road is a single carriageway two lane gravel graded road with gravel shoulders	

5.4. Route from Alternative Port

The alternative port to have equipment delivered to is Coega, which is a distance of 1159km from site as shown in *Figure 5-3.* The existing road elements are visually illustrated in *Table 5-2* below:

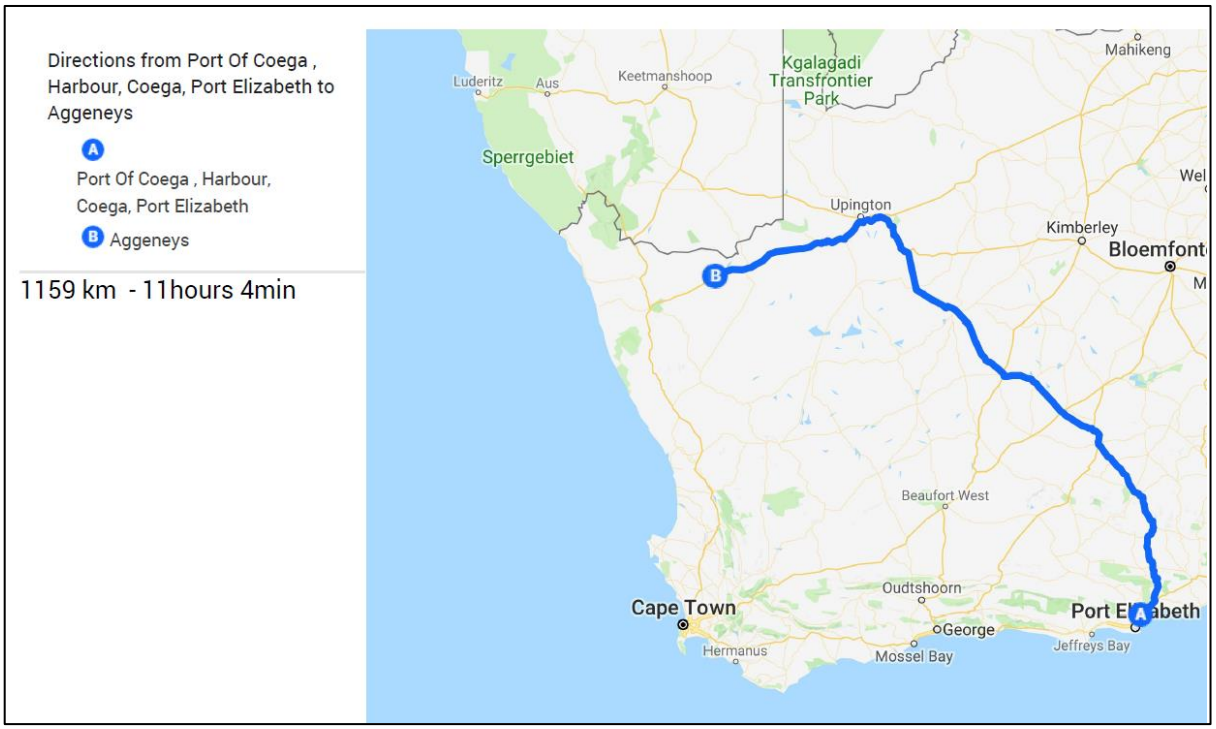

Figure 5-3: Route from alternative port

Table 5-2 Alternative Route Assessment

Section	Route Name	From	To	Distance (km)	Type
1	N10	Port Elizabeth	Upington	909	Surfaced National Road
				The N10 is a single carriageway with surfaced shoulders for some parts, but gravel shoulders for the most part.	
2	N14	Upington	Aggeneys	266	Surfaced National Road
				The N14 is a single carriageway two lane road with gravel shoulders	
3	Loop 10 road	N14 intersection	Site	7	Servitude
				Loop 10 road is a single carriageway two lane gravel graded road with gravel shoulders	

5.5. Route for Road Construction Materials

The materials required for road construction are available in the vicinity of the site and will be transported from nearby towns. All materials can be transported from surrounding towns, to site, on any of the National and Provincial roads. If any materials are not locally available, they would have to be sourced and transported from major centres such as Kimberley or Cape Town. These materials can be transported from any of the major cities on the National and Provincial roads, with no limitations imposed on normal freight.

6. CONCLUSIONS

It was observed during the site visit that the road network within the study area is operating at an acceptable level of service. No congestion problems, or delays were evident on the surrounding network.

The surrounding network has the capacity to accommodate the additional volumes of 2 trips per hour for the construction vehicles, as well 5 to 7 bus trips required to transport workers during peak hours.

If minibus taxis are used for the transportation of workers instead of buses, the additional trips generated will then increase to between 20 and 27 during the peak period, but the surrounding network should still have sufficient capacity to accommodate this. During the operational phase the additional 18 trips per hour during the AM and PM peak periods can also be accommodated.