LESAKA 1 SOLAR ENERGY FACILITY (PTY) LTD

Lesaka 1 Solar Energy Facility

Transportation Study

Issue Date: 19 July 2023
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	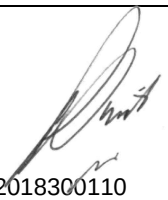 Pr. No: 2018300110	Date: 19 July 2023
Client:	Lesaka 1 Solar Energy Facility (Pty) Ltd	

This report is prepared in line with the Requirements for Specialist Reports (Appendix 6) of the Environmental Impact Assessment Regulations, 2014 (as amended).

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	**Section of Report**
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Refer Section 1.3 and Appendix A
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Refer Page iv
c) an indication of the scope of, and the purpose for which, the report was prepared;	Refer Section 1.2
(cA) an indication of the quality and age of base data used for the specialist report;	Refer Section 4.2
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Refer Section 6 and Section 6.2
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Refer Section 4.3
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Refer Section 4
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Refer Section 6.3
g) an identification of any areas to be avoided, including buffers;	N/A
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Refer Figure 5-5
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Refer Section 4.3
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, (including identified alternatives on the environment) or activities;	Refer Section 6 and Section 6.3
k) any mitigation measures for inclusion in the EMPr;	Refer Section 6
l) any conditions for inclusion in the environmental authorisation;	Refer Section 6
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Refer Section 6
n) a reasoned opinion- i. (as to) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Refer Section 9
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Refer Section 4.1

p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
q) any other information requested by the competent authority.	N/A
2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

LESAKA 1 SOLAR ENERGY FACILITY (PTY) LTD
LESAKA 1 SOLAR ENERGY FACILITY

EXECUTIVE SUMMARY

Objective

Lesaka 1 Solar Energy Facility (Pty) Ltd proposes to construct and operate the Lesaka 1 Solar Energy Facility (SEF) approximately 35 km north of the town of Loeriesfontein in the Northern Cape province. The proposed facility will have a combined maximum export capacity of up to 240 MW. The overall objective is to generate electricity by means of renewable energy technology capturing solar energy to feed into the national grid.

The main objective of the 'Transportation Study' is to determine the impact/s of the proposed development on the area with respect to transportation and include these findings in an Environmental Impact Assessment (EIA) process. The study includes a site assessment and encompasses preliminary transportation-related matters pertaining to the construction phase, the operation & maintenance phase, as well as the decommissioning phase of the development. The assessment of these phases takes into account the transportation of normal and abnormal vehicles, which are made up of inter alia; - SEF components, construction materials, equipment, construction workers and employees.

Key Findings

The development is located in close proximity to national and provincial roads. It is reachable from likely points of supply through an existing road network that is in good and suitable condition, including for the transportation of abnormal loads.

An access to the facility already exists in the form of a farm access point but may require minor upgrades in order to accommodate the proposed adjusted land use.

The construction phase of this development will typically generate the highest number of additional vehicle trips. They will however be temporary and the impacts are considered to be nominal.

A number of mitigation measures are proposed to accommodate the development and to reduce the impact to the surrounding road network.

Recommendation

With reference to this report, associated assessment and the findings made within, it is SiVEST's opinion that the Beaufort West Solar PV Energy Facility will have a nominal impact on the existing traffic network. The project is therefore deemed acceptable from a transport perspective, provided the recommendations and mitigations measures in this report are implemented, and hence the Environmental Authorisation (EA) should be granted for the EIA application.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

LESAKA 1 SOLAR ENERGY FACILITY (PTY) LTD

LESAKA 1 SOLAR ENERGY FACILITY

1. INTRODUCTION

1.1. BACKGROUND

SiVEST Civil Engineering Division was appointed by Lesaka 1 Solar Energy Facility (Pty) Ltd to undertake transportation studies for the proposed Lesaka Solar Energy Facility Cluster. The cluster comprises two (2) adjacent Solar Energy Facilities (SEF), with each facility having a separate EIA application.

This Transportation Study is undertaken for one of the two facilities in the cluster, namely the **Lesaka 1 Solar Energy Facility** (the proposed facility/development). The proposed facility will be situated approximately 34 km north of the town of Loeriesfontein in the Northern Cape and will have an export capacity of up to 240 MW.

1.2. OBJECTIVE AND SCOPE OF WORK

The main objective of the Transportation Study is to determine the impact of the proposed development on the immediate and greater transportation systems and whether it can be accommodated, with or without mitigations, on the existing transportation network. The study includes a site assessment and encompasses preliminary transportation-related matters pertaining to the construction phase, the operation & maintenance phase, as well as the decommissioning phase of the development. The assessment of these phases considers the transportation of normal and abnormal loads, which are made up of, among others; solar energy components, construction materials, equipment, construction workers and employees.

1.3. SPECIALIST DETAILS

The Transportation Study is undertaken by Ntuthuko Hlanguza of the civil engineering division of SiVEST SA (Pty) Ltd. Ntuthuko is a professionally registered civil engineer with a BSc.Eng (Civil) qualification and a post-graduate certificate in Energy Efficiency and Sustainability (UCT). He has over 7 years' experience in a wide range of civil engineering applications including specialist studies in the renewable energy sector. His experience in the different facets of Civil Engineering means he can advise clients in the renewable energy sector in transportation studies, access and internal road layouts and designs, glint and glare assessments, water demand and stormwater management. Ntuthuko Hlanguza's credentials are summarised in Table 1-1 while his full curriculum vitae is included in Appendix A.

Table 1-1 Specialist Credentials and Experience

Company	SiVEST (Pty) Ltd
Contact Details	ntuthukoh@sivest.co.za
Qualifications	BSc.Eng (Civil) (UKZN) Cert. Energy Efficiency & Sustainability (UCT)
Professional Registrations & Memberships	• Pr. Eng – Engineering Council of South Africa • MSAICE – Member of South African Institute of Civil Engineers
Expertise to carry out the Transportation Study	• Mierdam PV • Karee WEF • Koup 1 & 2 WEF • Platsjambok West PV • Platsjambok East PV • Patatskloof WEF

2. PROJECT DESCRIPTION

2.1. LOCATION

Lesaka 1 Solar Energy Facility will be developed on Farm Kluitjes Kraal No. 264 Portion 0, which is situated approximately 35 km north of the town of Loeriesfontein within the Hantam Local Municipality in the Namakwa District Municipality, Northern Cape Province. The farm is approximately 4 895 ha in area.

Access to the development area can be obtained via the AP2972, which is approximately 7 km east of the proposed development area.

Figure 2-1 and Figure 2-2 below depict the regional context and site locality of the proposed development.

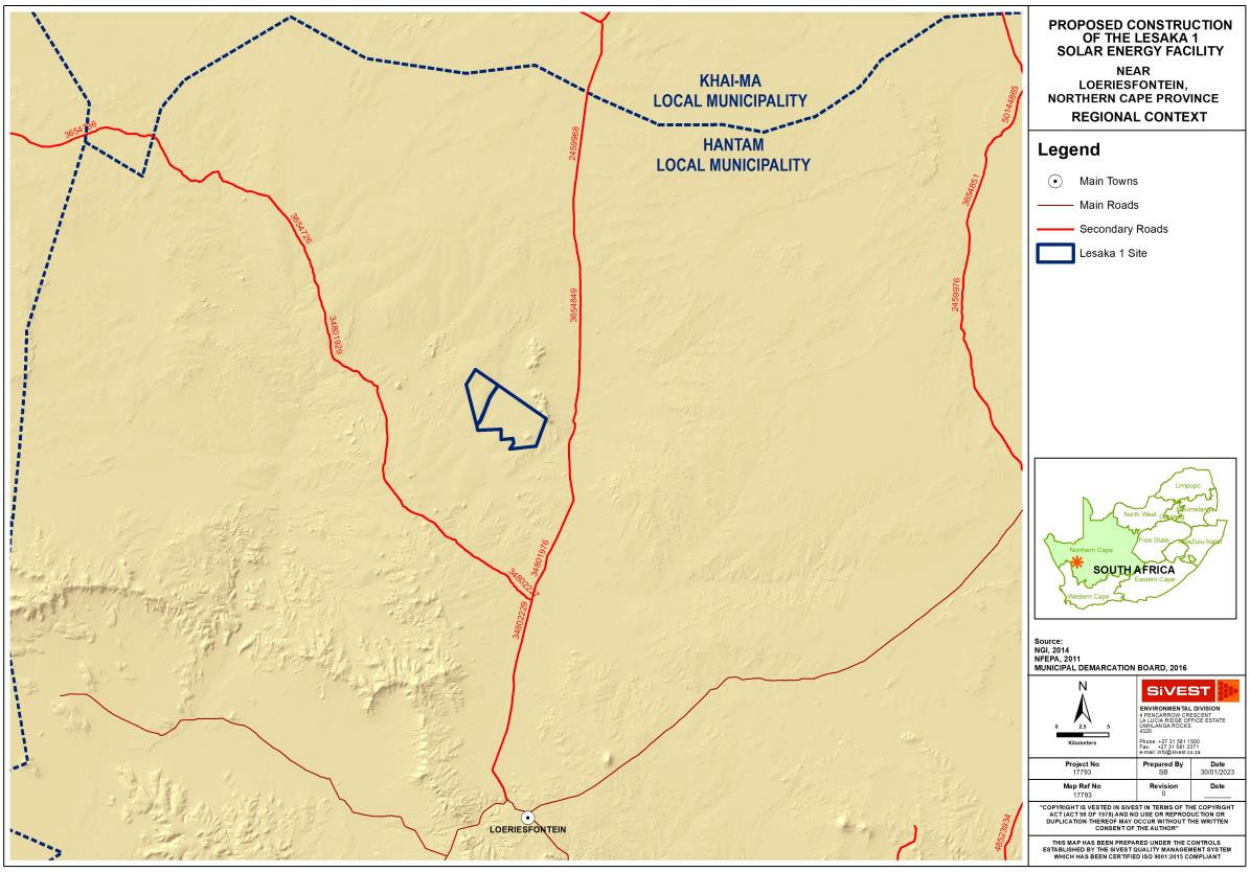

Figure 2-1 Regional Context (SEF)

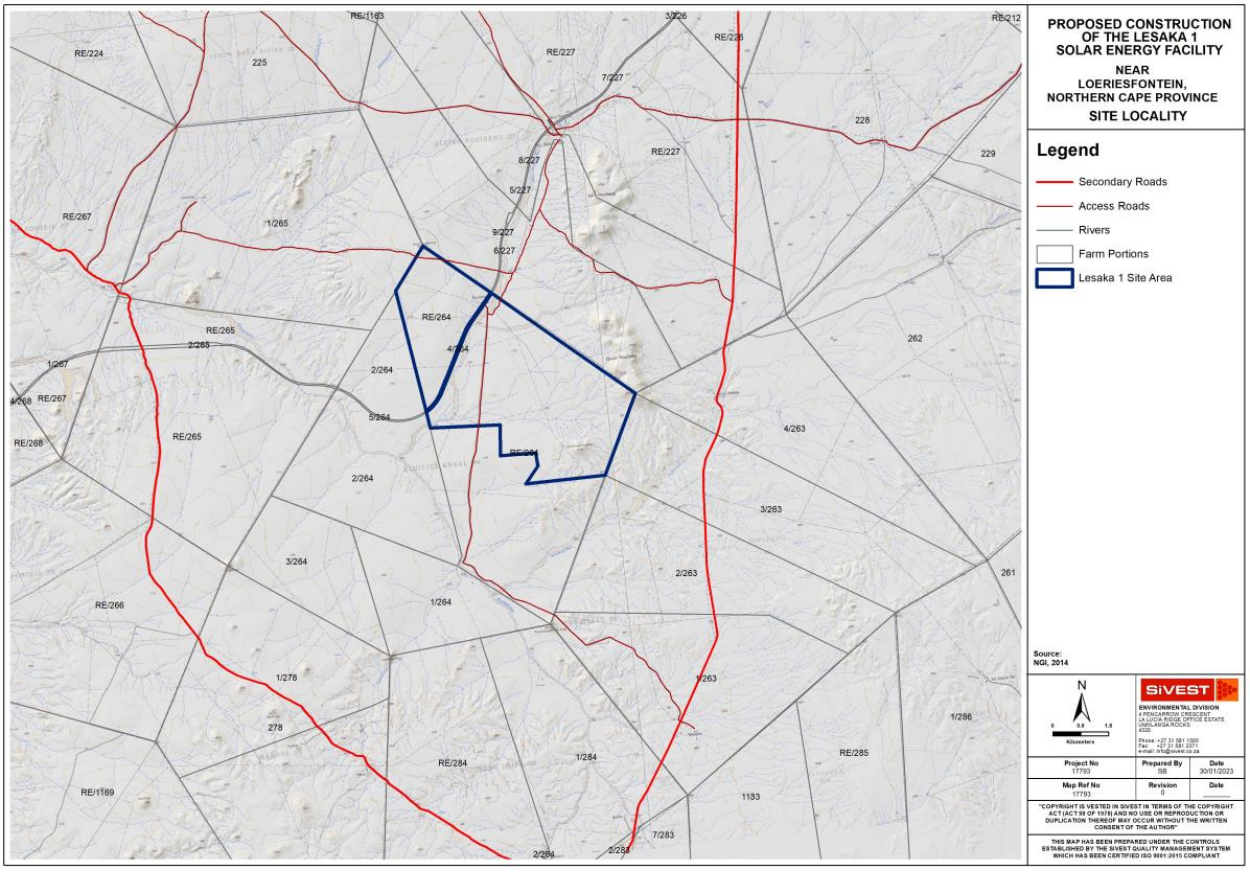

Figure 2-2 Site Locality

2.2. DEVELOPMENT COMPONENTS

The components of the proposed development are summarised below, with emphasis on aspects that are relevant to the Transportation Study.

2.2.1. Solar Energy Components

2.2.1.1 Solar PV Panels

- Monofacial and/or bifacial, monocrystalline or polycrystalline photovoltaic panels
- Approximately 2.4 m x 1.3 m in size, arranged in arrays with a north-south orientation
- Combined export capacity of up to 240 MW.

2.2.1.2 Panel Mounting Structures

- Fixed, single-axis tracking or dual axis tracking technology
- Foundations of either predrilled and filled piles or rammed piles

2.2.1.3 Electrical Reticulation

- Underground LV and MV cables of up to 33 kV linking the various PV arrays to the on-site IPP substation (overhead cables may be used where necessary).

2.2.1.4 On-Site IPP Substation

- A 33/132 kV onsite IPP substation utilised for collection and connection of the internal LV and MV reticulation

2.2.1.5 Electrical Transformer(s)

- Various 33/132 kV transformers housed at the IPP substation for stepping up medium voltage to high voltage

2.2.1.6 Battery Energy Storage System (BESS)

- An on-site BESS of up to 120 MW / 480 MW capacity and up to 4-hour storage, located at the IPP substation

2.2.2. Site Facilities and Services

2.2.2.1 Operation and Maintenance (O&M) Centre

- An Operation and Maintenance (O&M) Centre will be located near the IPP Substation and will include offices, an operations centre, a workshop, stores, and ablution facilities

2.2.2.2 Security Guardhouse

- A security guardhouse will be constructed at the entrance to the facility

2.2.2.3 Water and Sanitation

- Septic tanks with soakaways or conservancy tanks with portable toilets will be installed
- Water will be provided from on-site boreholes

2.2.2.4 Laydown Area

- A temporary laydown area / construction camp of approximately 6.5 ha will be set up during the construction phase, a portion of which will subsequently become a permanent maintenance area (section 2.2.3.1 above) during the operational phase

2.2.2.5 Associated Infrastructure

- Fencing and lighting, lightning protection system (LPS), telecommunication infrastructure, batching plant if required

2.2.3. Access and Internal Roads

- Access and internal roads with a width of 5-6 m and up to 8 m at bends, and a road reserve width of 20 m to accommodate cable trenches, stormwater channels (as required), and turning circle/bypass areas. (Note: the layout and design of internal roads is yet to be finalized.)
- Internal roads of approximately 16 ha total footprint, consisting of existing gravel roads wherever possible and new roads where required

2.3. DEVELOPMENT LAYOUT

2.3.1. Facility Areas

The areas of the various components of the proposed facility are tabulated below.

Table 2-1 Facility Area

Aspect	Description	Area
Farm Area	Total area of farm	4894.93 ha
Buildable Area	Area cleared for development after sensitivity mapping	591 ha
O&M Centre	Includes all offices, workshop, stores and ablutions	500 m²
Laydown Area / Construction Camp	A portion of this area will become the O&M centre while the balance will be rehabilitated	6.5 ha
BESS		4 ha
On-site Substation	Including all substation equipment such as transformers	2.5 ha
On-Site Switching Station		Included above
Access and Internal Roads		TBC

2.3.2. Site Layout

The proposed layout of the Lesaka 1 SEF is shown in **Figure 2-3** below.

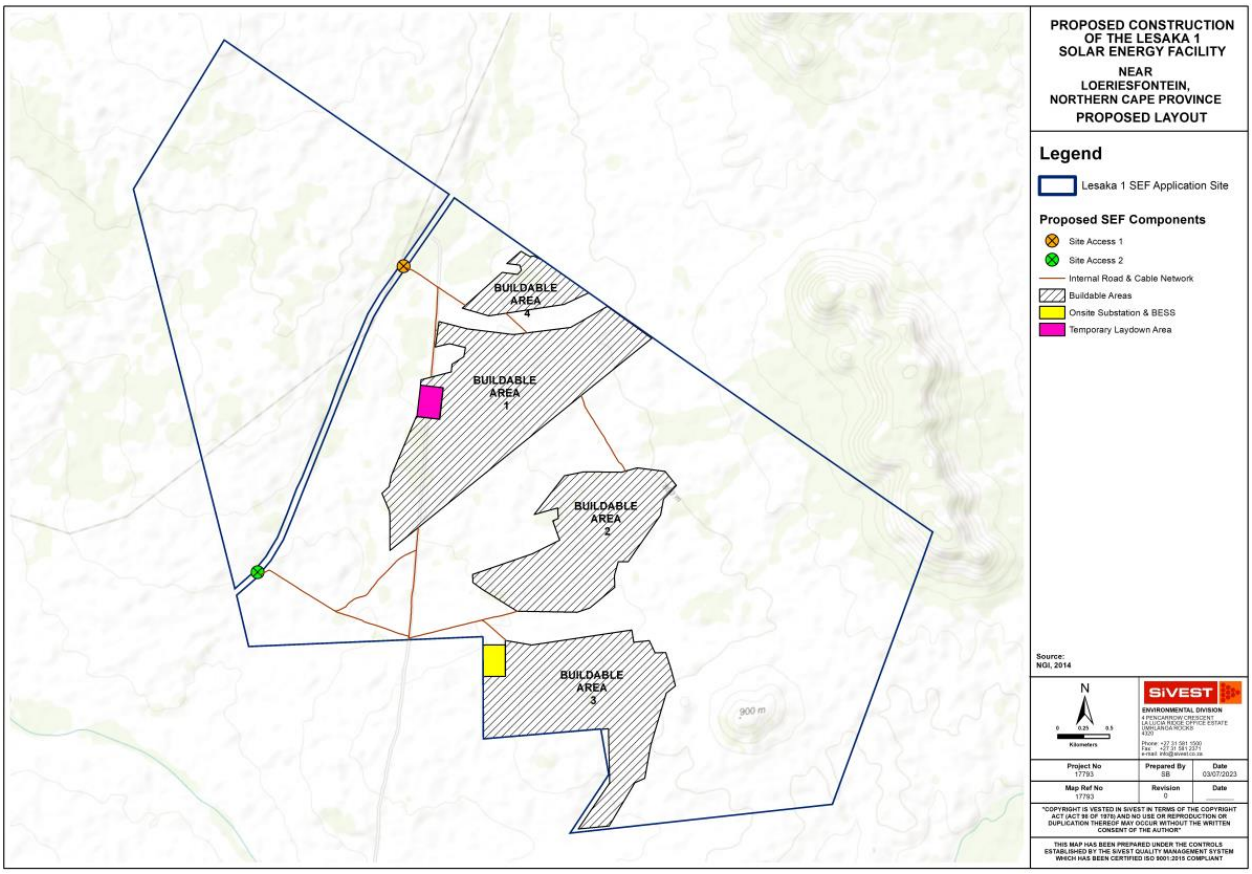

Figure 2-3 Proposed Layout of Proposed Facility

3. REGULATORY FRAMEWORK

3.1. LEGAL REQUIREMENTS

Key legal requirements for studies of this nature in relation to the proposed development are as follows:

- Government Notice 509 (GN509), as published in Government Gazette 40229 of 2016 with reference to the National Water Act, 1998 (Act No. 36 of 1998)
- National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA)
- National Water Act, 1998 (Act No 36 of 1998) (NWA)
- Road Safety Act (Act No 93 of 1996)
- National Road Traffic Regulations, 2000

3.2. GUIDELINES

Key guidelines for studies of this nature in relation to the proposed development are as follows:

- TMH 15: South African Engineering Service Contribution Manual for Municipal Road Infrastructure
- TMH 16 Vol 1: South African Traffic Impact and Site Traffic Assessment Manual
- TMH 16 Vol 2: South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual
- TMH 17: South African Trip Data Manual
- TRH 11: Dimensional and Mass Limitations and Other Requirements for Abnormal Load Vehicles
- TRH 26: South African Road Classification and Access Management Manual

4. METHODOLOGY

4.1. ADOPTED APPROACH

The approach and methodology followed in undertaking the Transportation Study is outlined below.

a) Desktop Assessment

Available project-related information was reviewed for the study, including master plans, municipal integrated development plans, previous TIAs, the project's terms of reference and project specific maps and layout drawings.

b) Consultations

An in-person consultation was held with a representative of the Hantam Local Municipality on 21 September 2022. Telephonic consultations were also held with representatives of the Northern Cape Roads Department, Western Cape Roads Department, SANRAL and Transnet. The purpose of the consultations was to understand the state and suitability of the transport infrastructure affected by the proposed development, and the requirements of the respective entities for the use of said infrastructure.

c) Site Investigation

A site investigation was conducted on 22 September 2022 wherein the geometric and traffic characteristics of the road network around the proposed development was assessed, including existing and potential site access alternatives.

d) Route and Trip Projections

The nature, origin and transportation of project-specific construction plant, materials, equipment, staff and labour were considered, including abnormal load requirements.

e) Assessment of Impacts

The traffic impacts of the proposed development were explicitly identified, assessed and rated using the stipulated impact rating system. Recommendations were made to mitigate the identified impacts at all stages of the development, namely the construction phase, operation phase and decommissioning phase.

f) Presentation of Findings

The outcomes of the specialist study were collated, synthesised and presented in a report.

4.2. BASE INFORMATION

Below is the primary base information utilised for the Transportation study:

- Namakwa District Municipality Spatial Development Framework (2021)
- Northern Cape Province Strategic Plan 2020-2025 (2019)
- Record Traffic Data (2016)
- TIAs for relevant proposed developments (2022)
- GIS Information (2011-2017)

4.3. ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations are to be noted:

- The analysis is based on the information provided at the time by Lesaka 1 Solar Energy Facility (Pty) Ltd and their representatives.
- The design horizon for the proposed facility is assumed to be 20 years.
- The study and its findings are limited to the technical specifications described in Section 2.2 as provided by the client.
- Traffic Station Data / Counts and trip generation calculations are for one direction only and do not include return trips, unless indicated.
- This assessment is limited to the impact the development traffic will have on the network and not on the wider traffic known as background traffic. Such impacts can only be addressed in a detailed Traffic Impact Study which takes into account actual traffic counts undertaken during the peak periods.
- The information provided in this report is an informed estimate. Construction related traffic may however vary as a result of supplier delivery schedule changes.
- Some of the figures provided are indicative figures as many of the components are still at design stage and will only be confirmed closer to construction.
- Seasonal impacts do not affect the assessment.

5. SPECIALIST FINDINGS

5.1. TRANSPORTATION

5.1.1. Ports of Entry

Various renewable energy components and equipment are available within South Africa, particularly at the country's major economic centres of Johannesburg, Durban, Gqeberha and Cape Town. However, due to the scale, logistics and technological requirements of industrial renewable energy developments, it is necessarily common to import many renewable energy components.

The recommended port of entry for the proposed facility is the Port of Saldanha, located 140 km north west of Cape Town and 370 km south west of the proposed facility. The Port of Saldanha, operated by Transnet National Ports Authority, is South Africa's largest natural anchorage and is the port with the deepest water. It is also one of only two ports that are not encompassed by a city (the other being Port of Ngqura), making mobility more efficient.

Alternative ports of entry are the Port of Cape Town (± 470 km south of the proposed facility) and the Port of Ngqura (± 940 km south east of the proposed facility).

5.1.2. Abnormal Loads

Abnormal loads are described as loads that, for all practical purposes, cannot be transported on a vehicle without exceeding the limitations described in the National Road Traffic Regulations (2000). These loads are defined and identified in the technical guideline document titled TRH16: Dimensional and Mass Limitations and Other Requirements for Abnormal Load Vehicles.

A vehicle (or combination of load and vehicle) can exceed stipulated limitations and hence be deemed an abnormal load as a result of one or more of the following:

- **Dimension Abnormality**
  - Length
    - Single vehicle - 12.5 m
    - Articulated vehicle - 18.5 m
    - Combination vehicle - 22.0 m
  - Width
    - General vehicles - 2.5 m
    - Goods vehicles - 2.6 m
    - Construction vehicles - 3.5 m
    - Agricultural vehicles - 4.5 m
  - Height
    - All vehicles - 4.3 m
  - Front Overhang
    - Vehicle front-end ≤ 1.7 m: 60% of wheelbase or 6.2 m less half of wheelbase
    - Vehicle front-end > 1.7 m: 60% of wheelbase or 5.8 m less half of wheelbase
    - Semi-trailer - 1.8 m
  - Rear Overhang
    - All goods vehicles - 60% of wheelbase
  - Front Load Projection
    - All vehicles - 300 mm
  - Rear Load Projections
    - All vehicles - 1.8 m
  - Wheelbase
    - Bus-trains - 15.0 m
    - Semi-trailers - 10.0 m
    - All other vehicles - 8.5 m
  - Turning Radius
    - Bus-trains - 17.5 m
    - Twin-steer vehicles - 17.5 m
    - All other vehicles - 13.1 m
  - Stability
    - Height/wheel track ratio: 2.0
    - Load width/wheel track ratio: 1.8
  - Ground Clearance
    - All vehicles: - 150 mm

- **Mass Abnormality**
    - Loads on Tyres
    - Manufacturer's Ratings
    - Carrying Capacity of Roads
    - Carrying Capacity of Bridges and Culverts
    - Drawing Vehicle Limitations (Power to Mass Ratio)
    - Massloads on Drive Axles (Traction Ratio)
    - Massloads on Steering Axles (Steering Ratio)

In the development of solar energy facilities, abnormal loads can arise from the transportation of electrical components such as OHL pylons; construction plant such as graders, compactors and cranes; and site facilities such as prefabricated offices.

Examples of such abnormal loads are depicted below.

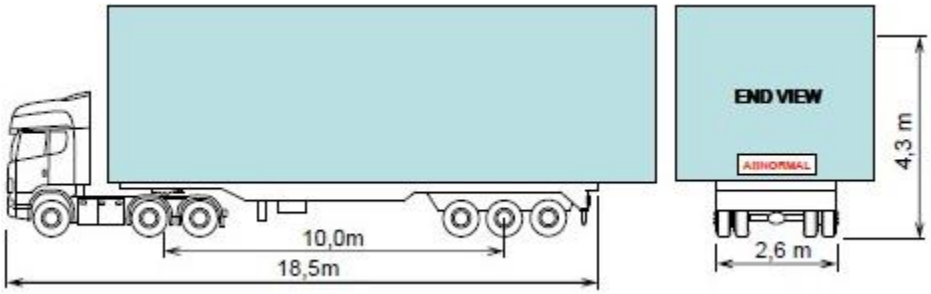

Figure 5-1 Abnormal Load Example - Prefabricated Offices

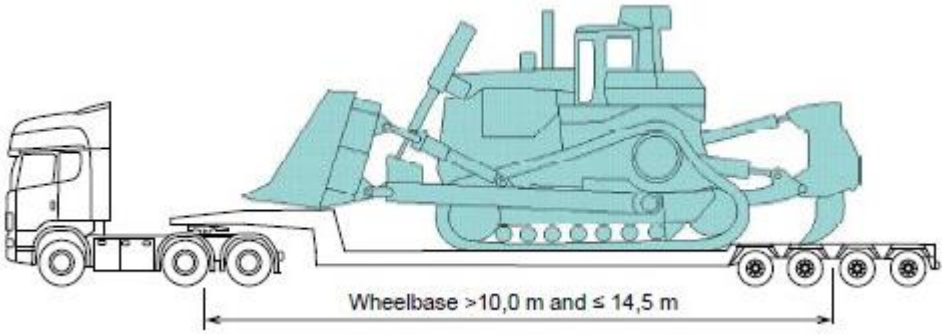

Figure 5-2 Abnormal Load Example – Plant

Prior to transporting abnormal loads, approval must be obtained in the form of a permit from all the provincial departments of transport associated with the transportation route. The permit application is completed by specialists in the transportation of abnormal loads and must conform to 'The Road Traffic Act, 1996 (Act No 93 of 1996)'. The application includes route clearances from local, provincial and national road and transport authorities, as well as from utilities such as Telkom, Eskom and Transnet.

It is recommended that an Abnormal Load Study be undertaken once the (i) detail design, (ii) construction programme, and (iii) logistics plan are available.

The suitability of routes to the proposed facility for abnormal loads is considered in Section 5.1.3 below.

5.1.3. Long Haulage Routes

Solar energy components and construction equipment are assumed to come from the Port of Saldanha and from Cape Town. The town of Upington and the Port of Ngqura are also considered as alternative trip origins. Based on consultations with local authorities, local labour is expected to come from Loeriesfontein and Brandvlei. It is assumed that general construction material is obtainable locally.

Table 5-1 presents the expected/assumed trip origins for long haulage transportation. The trip destination for all trips is the site of the proposed facility some 34 km north of Loeriesfontein. The long haulage routes are further depicted in Figure 5-3 and discussed thereafter.

Table 5-1 Long Haulage Routes

TRIP ORIGIN	ROUTE DETAILS			
	Load	**Distance**	**Province**	**Abn. Load Capability**
Saldanha	Components, plant, equipment	± 380 km	WC , NC	Moderate
Cape Town	Components, plant, equipment	± 470 km	WC , NC	Good/Moderate
Ngqura	Components, plant, equipment	± 1020 km	EC , WC , NC	Good/Moderate
Upington	Plant and equipment	± 330 km	NC	Moderate
Brandvlei	Labour	185 km	NC	Moderate

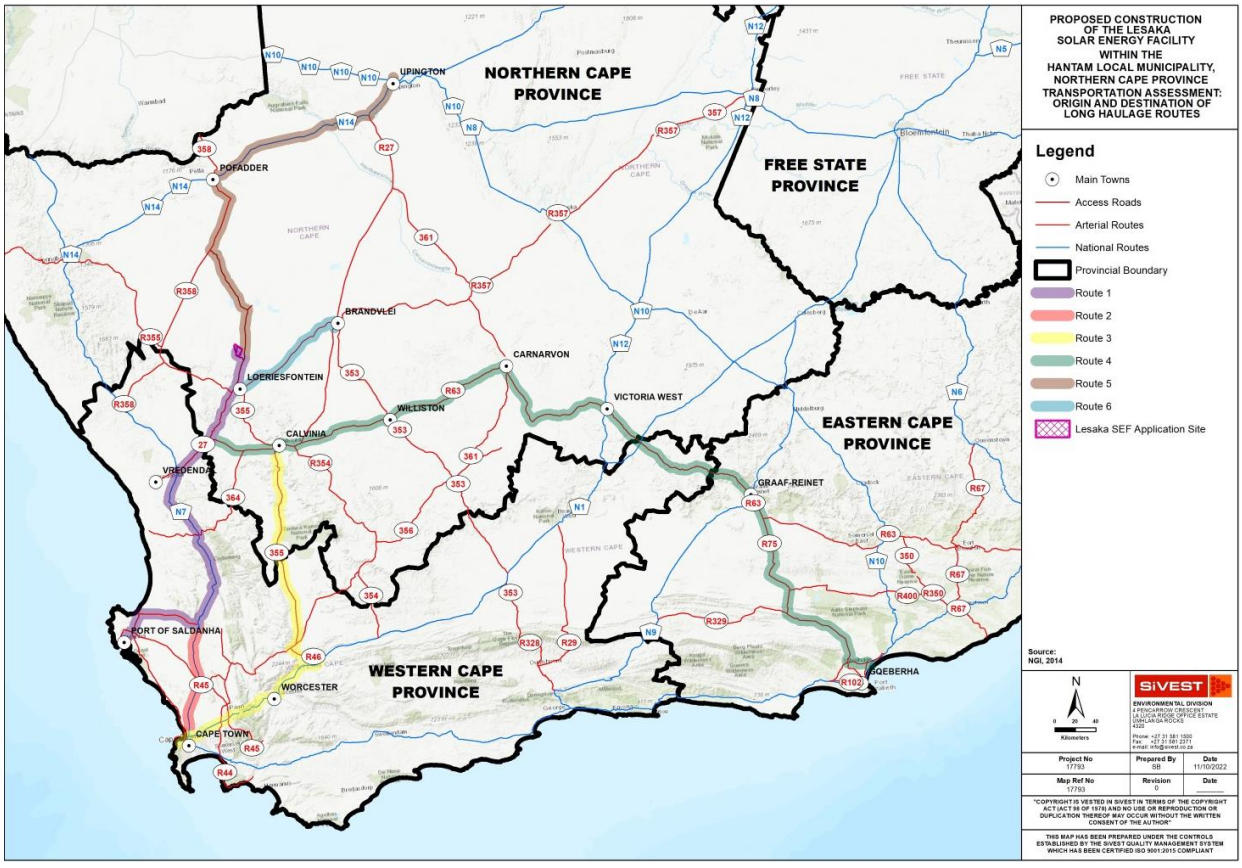

Figure 5-3 Long Haulage Routes

5.1.3.1 Route 1: Port of Saldanha to Proposed SEF (Preferred)

This route consists of regularly maintained national and provincial asphalt roads that are in good condition and are approximately 9 m wide with paved or gravel shoulders. The last 40 km of the route to the proposed facility is a gravel road. The route features two notable mountain passes. The first is Piekenierskloof Pass on the N7 national route which surmounts the Olifantsrivier mountains in Citrusdal. The pass has a maximum grade of 1:16 and features a number of three-lane sections for ease of passing. It is congenial to abnormal loads. The second is Vanrhyns Pass on the R27 which negotiates the Great Escarpment outside Nieuwoudtville. It is approximately 9 km long and climbs 595 m at an average gradient of 1:15, with the steepest sections being at 1:12. The pass features two hairpins which make it unsuitable for loads with an extreme length abnormality.

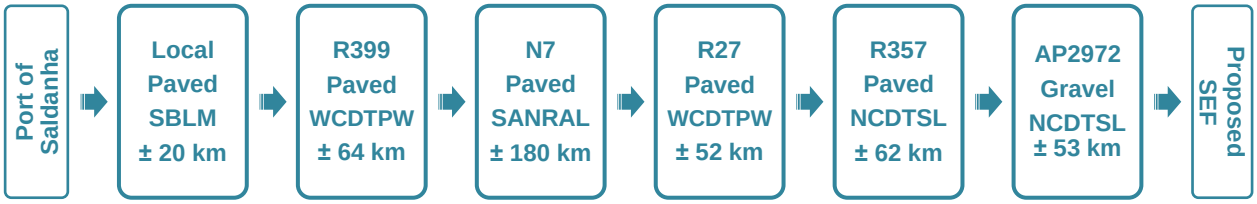

Figure 5-4 Preferred Importation Route

5.1.3.2 Route 2: Cape Town to Proposed SEF

This route consists of good quality roads but includes highly trafficked sections at the start. It merges with Route 1 above at approximately 120 km and includes the two passes discussed above.

5.1.3.3 Route 3: Cape Town to Proposed SEF (Abnormal Load Alternative)

This route is recommended for abnormal loads that cannot traverse Vanrhyns Pass due to an extreme length abnormality, although such a scenario is not envisaged for the proposed development. The route is approximately 600 km long, 55% of which is gravel. Both asphalt and gravel sections of the route are in good condition and are suitable for purposes of transportation for the proposed solar energy facility.

5.1.3.4 Route 4: Port of Ngqura to Proposed SEF

This route also consists of regularly maintained national and provincial asphalt roads that are in good condition and are at least 8 m wide with paved or gravel shoulders. Once more, the last 40 km of the route is a gravel road. The route is suitable for abnormal loads, subject to a detailed Abnormal Load Study.

5.1.3.5 Route 5: Upington to Proposed SEF

In the event that some construction material, plant and facility components are obtained from Upington, this route may be used. Upington also contains the closest regional airport to the proposed facility, with flights between Cape Town and Johannesburg. The route is approximately 330 km long, 75% of which is gravel road. The entire route is in decent condition and features sufficiently wide road reserves.

5.1.3.6 Route 6: Brandvlei to Proposed SEF

Consultations with local authorities suggested that a considerable compliment of the required labour may come from Brandvlei. This route is predominantly gravel.

5.1.4. External Transportation Network

Figure 5-5 shows the external road network in the immediate vicinity of the proposed Lesaka 1 SEF including existing and/or proposed site access points.

Figure 5-5 External Road Network

5.1.4.1 Existing Roads

The proposed facility can be approached using public gravel roads R355 and AP2972, private roads PR1 and PR2, and Transnet service road (TR1). The condition and suitability of these roads is discussed below and summarised in Table 5-2.

Road R355 is a Class 3 distributor gravel road with an average width of 6.6 m, a road reserve of approximately 20 m and moderate corrugations. It gives access to TR1 approximately 55 km west of the proposed facility. TR1 then gives direct access to the site at Site Access 1 (SA1) and SA2.

Image 5-1 R355 at intersection with R357

Image 5-2 Typical condition of R355

Road AP2972 is a Class 3 distributor gravel road with an average width of 8 m, a wide road reserve of approximately 30 m and mild corrugations. At its starting point (intersection with R357) a weight limit of 12 tonnes is displayed; however, the road has been upgraded and successfully used for the construction and ongoing operation of a nearby wind energy facility. It gives access to TR1 approximately 17 km east of the proposed facility. TR1 then gives direct access to the site at SA1 and SA2. There is however an overhead railway bridge just before the intersection of AP2972 and TR1, which places a height limit of 4.7 m on this access route Road.

AP2972 gives access to two other roads which may be used to access the proposed facility – PR1 which then accesses TR1 approximately 12 km west of the proposed facility and avoids the overhead bridge mentioned above, and PR2 which gives direct access to the proposed site through SA3.

Image 5-3 AP2972 (to the left) at intersection with R357

Image 5-4 AP2972 at KM 0.5

Image 5-5 Typical condition of AP2972

Image 5-6 Railway bridge over AP2972 before TR1

Road TR1 is a Class 5 local collector service road running along a Transnet railway line and also providing access to several farms. The road has an average width of 6.6 m and a narrow road reserve of approximately 10 m. TR1 features numerous undulating sections along its vertical alignment which may hinder the transportation of heavy and abnormal loads. It is therefore recommended that a detailed analysis of TR1's vertical alignment be carried out during the design phase of the proposed facility. It is further noted that the use of TR1 for the purposes of the proposed development will require the approval of Transnet

Image 5-7 TR1 (to the left) at intersection with AP2972

Image 5-8 TR1 (ahead) at intersection with AP2972

Image 5-9 Undulating section of TR1

Image 5-10 Typical Condition of TR1

Road PR1 is an access-controlled private road which has an approximate width of 6 m and is in suitable condition for use for the proposed development. The road accesses TR1 approximately 12 km west of the proposed facility, which then gives direct access to the site at SA1 and SA2. The use of PR1 for the purposes of the proposed development will require the approval of local farmer(s).

Image 5-11 PR1 controlled access

Image 5-12 Typical condition of PR1

Road PR2 is a private access road that gives direct access to the proposed facility from AP2972 at SA3. It is considered an informal road (gravel track) with a narrow, inconsistent width and an inconsistent riding surface, and features a low-level drainage line crossing. The road would require upgrading in order to be used for the purposes of the proposed development. Its use would also require the approval of local farmer(s) on whose land the road traverses.

Table 5-2 summarises the details of the existing road network in the vicinity of the proposed facility. Reference is also made to Figure 5-5 above.

Table 5-2 Existing Road Network

Road	RCAM Class	Surface	Average Width	Road Reserve	Authority	Condition
R357	R3	Asphalt	8 m	30	SANRAL	Excellent
R355	R3	Gravel	6.6 m	20	SANRAL	Good
AP2972	R3	Gravel	8 m	30	NCDTSL	Excellent
TR1	R5	Gravel	6.6 m	10	Transnet	Good
PR1	N/A	Gravel	6 m	10	Pvt	Good

PR2	N/A	Gravel	4 m	N/A	Pvt	Poor

SANRAL: South African National Roads Agency Limited
NCDTSL: Northern Cape Department of Transport, Safety and Liaison
Pvt: Privately Owned

5.1.4.2 Public Transportation

Formalised public transportation around the Loeriesfontein area is very limited. Most travel by non-vehicle owners is in the form of hiking. Privately arranged group travel to and from areas of employment is common. It was gathered from a local transport official that two buses would transport workers from Brandvlei to the construction site of the wind energy facility located approximately 15 km from the proposed facility.

5.1.4.3 Non-Motorised Transportation

Commuting by foot is common in and around the local town of Loeriesfontein. However, the proposed facility is approximately 30 km from the closest residential areas, making walking to the proposed facility unreasonable. Notwithstanding the above, the surrounding road network features sufficiently wide and clear verges for safe commuting by foot, and the road widths are sufficient to accommodate cyclists.

5.1.5. Site Access

5.1.5.1 Existing Access Points

Three existing site accesses were assessed, which are herein referred to as SA1, SA2 and SA3 respectively. These are depicted in Figure 5-5 above. SA1 and SA2 are situated on TR1 and feature a railway crossings which allow access to the proposed site. SA3 is situated on PR2.

Images of the access are provided below.

Image 5-13 SA1 off TR1

Image 5-14 SA1 off TR1

Image 5-15 SA2 off TR1

Image 5-16 SA2 from within site

Image 5-17 Start of road PR3 off road AP2972, leading to SA3

Image 5-18 Start of road PR3 off road AP2972, leading to SA3

5.1.5.2 Access Design Considerations

The nature of the proposed development requires that the following access design standards be satisfied. It is noted that these standards are formulated with dimensional abnormal loads in mind and may be relaxed for normal-load applications.

Table 5-3 Access Design Considerations

Design Element	Minimum	Recommended	SA1	SA2	SA3
Sight Distance	250 m	300 m	✓	✓	✓
Turning Radii	14 m	18 m	×	×	N/A
Access Width Clearance	6 m	10 m	✓	✓	×
Access Height Clearance	4 m	6 m	×	×	✓

Sight Distance

Both existing accesses provide the required site distance of 300 m from all approach directions.

Turning Radii

SA1 and SA2 do not meet the minimum required turning radii. For large vehicles such as trucks and construction plant to access the site though SA1 and SA2, an upgrade to the accesses would be required. Due to the close proximity of the railway line, such an upgrade would require a localised re-alignment of TR1 into the northern portion of Farm Kluitjes Kraal.

Access Width Clearance

SA1 and SA2 meet the required minimum access width of 4 m but not the recommended width of 10 m. This should nonetheless be sufficient. It is advised however that the upgrade necessitated by the turning radii requirement incorporate the widening of the access. SA3 is approximately 4 m wide and will hence require an upgrade should this access be adopted. There is sufficient space at SA3 to accommodate the required upgrade.

Access Height Clearance

SA1 and SA 2 have a height restriction of 4.5 m imposed by the railway overhead power lines. This should be sufficient for normal loads but will need to be confirmed for abnormal loads once an Abnormal Load Study has been undertaken. SA3 has no height restriction and is therefore suitable for all applications.

Based on our recent discussions with the Northern Cape Department of Roads and Public Works, access designs must be undertaken by an ECSA registered engineer and submitted for approval to their department. The expected traffic during the construction and O&M phases, the available sight distances including photographs, and the affected stormwater structures are to be included in the application.

5.1.5.3 Access Alternatives

The existing access points described above can be accessed in a number of ways from the Loeriesfontein direction. Specifically, SA1 and SA2 can be accessed in three ways while SA3 can be accessed in one way. Table 5-4 below shows the access alternatives with their advantages and disadvantages.

Table 5-4 Access Route Alternatives

Access Option	Access Point	Roads	Advantages	Disadvantages
1	SA1, SA2	• AP2972 • TR1	• AP2972 in excellent condition • TR1 in fair condition	• Overhead bridge • TR1 vertical alignment may require upgrade • Requires railway crossing • Permission of Transnet required
2	SA1, SA2	• R355 • TR1	• R355 in fair condition • TR1 in fair condition	• Furthest route (recommended as emergency alternative only) • TR1 vertical alignment may require upgrade • Requires railway crossing • Permission of Transnet required
3	SA1, SA2	• AP2972 • PR1 • TR1	• AP2972 in excellent condition • PR1 in fair condition • TR1 in fair condition	• TR1 vertical alignment may require upgrade • Requires railway crossing • Permission of Transnet required • Permission of farmer(s) required
4	SA3	• AP2972 • PR2	• AP2972 in excellent condition • Shortest route • No Transnet permissions	• Permission of farmer(s) required • PR2 will require upgrade

5.1.6. Internal Transportation Network

The site contains some existing internal gravel tracks which are approximately 4 m wide. These existing gravel tracks are will be incorporated into the proposed internal road network as far as possible.

An internal road network will need to be designed in accordance with the final site development plan. Gravel roads of 5 m widths are proposed. The network layout ought to provide efficient access to all elements of the facility and effective accommodation of the anticipated internal traffic.

The geometrics of the roads must be designed to accommodate all normal and abnormal vehicles anticipated within the facility. The internal roads must further take into account the facility's stormwater management plan so as to reduce the risks of possible erosion.

It is the requirement of the provincial roads authority that all internal access roads be designed according to TRH 17[1] and TRH 20[2].

5.2. TRAFFIC

The prescribed study area for direct traffic impact due to a proposed development includes accesses to the site and external roads in the immediate vicinity of the site, generally limited to Class 4 and 5 roads up to their first intersections with higher order roads, within a maximum distance of 1.5 km from all site accesses.

The traffic impact of the proposed solar energy facility on the external road network identified in Section 5.1.4 is herein assessed for the various stages of development.

5.2.1. Pre-development Phase

The proposed development is situated in a farming area with little commercial and industrial activity. Engagements with the Northern Cape Roads and Public Works department confirmed that no recent traffic records exist for the proposed facility's immediate road network. Existing traffic conditions were however surmised through consultation with the department as well as on-sight observations. These are presented in Table 5-5 below. It is noted that the depicted traffic data is crude but indicative. Should more accurate traffic data be required, a traffic count undertaken in accordance with TMH14[3] is recommended.

Table 5-5 Existing Traffic Conditions

Road	Position	Morning 07:00-08:00			Weekday Midday 09:00-15:00			Afternoon 16:00-17:00		
		LV	HV	**T**	LV	HV	**T**	LV	HV	**T**
R357	Intxn with AP2972	12	4	16	8	9	17	10	2	12
R355	Intxn with R357	4	0	4	3	0	3	4	0	4
AP2972	Intxn with R357	5	2	7	7	5	12	5	1	6
TR1	Intxn with AP2972	3	0	3	3	1	4	3	0	3
PR1	Intxn with AP2972	1	0	1	2	0	2	1	0	1
PR2	Intxn with AP2972	1	0	1	2	0	2	1	0	1

Intxn: Intersection

5.2.2. Construction Phase

The construction phase will generate the highest number of trips for the proposed facility. Construction will typically involve earthworks, access roads, foundations, trenching, on-site buildings, electrical cables, transformers, switch gears, substations, battery energy storage systems and pylons. The traffic impact on the surrounding road network will result from the delivery of abnormal loads, plant, materials, equipment, and the commuting of construction labour. The nature of the impact will be an increase in vehicle and

[1] TRH 17: Geometric Design of Rural Roads
[2] TRH 20: The Structural Design, Construction and Maintenance of Unpaved Roads

[3] TMH 14: South African Standard Traffic Data Collection Format

pedestrian traffic, an increase in potential incidents with pedestrians and livestock, and an increase in road maintenance.

Based on calculations and experience from previous solar energy facilities, an 18-month construction period has been estimated and is expected to generate a daily maximum of ±33 additional vehicle trips on the surrounding road network.

Of the total maximum daily vehicle trips, ±14 will be transporting staff and labour and will typically occur in the morning between 07:00 – 08:00 and in the afternoon between 16:00 – 17:00. These trips will therefore coincide with the morning and afternoon peak periods. Given the remote locality of the proposed development, it is anticipated that a fair amount of labour will travel to and from site in group transportation.

The remaining ±19 vehicle trips are expected to occur over the 6-hr period between the morning and afternoon peaks for the delivery of construction plant, material and equipment; and include both normal and abnormal loads. These equate to ±4 vehicle trips / hour.

Table 5-6 below shows the additional traffic on the affected roads during the construction phase.

Table 5-6 Additional Traffic During Construction Phase

Road	Morning 07:00-08:00			Weekday Midday 09:00-15:00			Afternoon 16:00-17:00		
	LV	HV	T	LV	HV	T	LV	HV	T
R357	14	0	14	3	16	19	14	0	14
R355 / AP2972	14	0	14	3	16	19	14	0	14
TR1 / PR1 / PR2	14	0	14	3	16	19	14	0	14

In terms of TMH 16[4], developments that generate less than 50 peak hour trips are not required to undertake a detailed Traffic Impact Assessment (TIA). This development is estimated to generate ±14 peak hour trips during the construction phase. The resulting traffic impact on the surrounding road network during this phase is therefore seen as nominal.

The proposed mitigation measures for the traffic impacts of this phase of the development are:

- Stagger the construction of the various PV Facilities rather than constructing them simultaneously;
- Group transportation of construction labour;
- Off-peak scheduling of plant, material and equipment deliveries;
- Reduction in vehicle speed at and approaching the development access;
- Maintenance of farm fences;
- Erection of appropriate road signage informing motorists of property accesses and designated animal road crossings;
- Maintenance of road verges to provide safe walking space for pedestrians for the duration of the construction period;
- Appropriate, timely and high-quality maintenance of internal and external gravel roads; and
- Continuous engagement with the Northern Cape Department of Roads & Public Works (NCDRPW).

5.2.3. Operation and Maintenance Phase

The Lesaka 1 Solar Energy Facility is assumed to have a design horizon of 20 years, which can be increased if financially viable. Based on similar existing facilities, the operation and maintenance of the proposed facility will be undertaken by a staff compliment of approximately 5-15 people. The traffic impact

[4] TMH 16: South African Traffic Impact and Site Traffic Assessment Manual

during this phase will result from employees commuting to and from the development, the occasional repair vehicle, and the occasional delivery of replacement components.

The development is estimated to add 10 vehicle trips per hour onto the surrounding road network during the morning and afternoon peaks over the life-span of the facility, while the occasional maintenance-related trips are deemed negligible. The overall traffic impact for this phase is therefore seen as nominal.

Table 5-7 below shows the additional traffic on the affected roads during the O&M phase.

Table 5-7 Additional Traffic During O&M Phase

Road	Morning 07:00-08:00			Weekday Midday 09:00-15:00			Afternoon 16:00-17:00		
	LV	HV	T	LV	HV	T	LV	HV	T
R357	10	0	10	0	0	0	10	0	10
R355 / AP2972	10	0	10	0	0	0	10	0	10
TR1 / PR1 / PR2	10	0	10	0	0	0	10	0	10

The proposed mitigation measures for the traffic impacts of this phase of the development are:

- Group transportation of facility staff;
- Off-peak scheduling of maintenance-related traffic;
- Appropriate, timely and high-quality maintenance of internal gravel roads; and
- Continuous engagement with the NCDRPW.

5.2.4. Decommissioning Phase

The decommissioning of the proposed facility and associated infrastructure will generate considerably less trips than the construction phase. It is estimated that the decommissioning phase will generate an additional ±16 vehicles / day over a period of 8 months, ±6 of which will occur during the peak periods and ±10 during the off-peak period. It is assumed that the material removed will be transported to Cape Town for recycling or disposal. The impact of this phase is considered to be low.

Table 5-8 below shows the additional traffic on the affected roads during the O&M phase.

Table 5-8 Additional Traffic During Decommissioning Phase

Road	Morning 07:00-08:00			Weekday Midday 09:00-15:00			Afternoon 16:00-17:00		
	LV	HV	T	LV	HV	T	LV	HV	T
R357	6	0	6	2	8	10	6	0	6
R355 / AP2972	6	0	6	2	8	10	6	0	6
TR1 / PR1 / PR2	6	0	6	2	8	10	6	0	6

The proposed mitigation measures for the traffic impacts of this phase of the development are:

- Group transportation of staff and labour;
- Off-peak scheduling of plant, material and equipment haulage;
- Reduction in vehicle speed at and approaching the development access;

- Maintenance of farm fences;
- Erection of appropriate road signage informing motorists of property accesses and designated animal road crossings;
- Maintenance of road verges to provide safe walking space for pedestrians for the duration of the decommissioning period;
- Appropriate, timely and high-quality maintenance of gravel roads; and
- Continuous engagement with the NCDRPW.

6. ASSESSMENT OF IMPACTS

6.1. IMPACT RATING ASSESSMENT (IRA)

The 'Impact Rating System' takes into account the nature, scale and duration of the effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- Planning
- Construction
- Operation
- Decommissioning

A rating points-based system is applied to the potential impacts on the environment and includes objective evaluations of the mitigation of the impact. Table 6-1 contains the assessment for the SEF. An assessment of the cumulative impacts discussed in Section 6.2 is also included in the tables.

Table 6-1 SEF Impact Rating Table

LESAKA 1 SEF																				
ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
A) CONSTRUCTION PHASE																				
a1) Additional Traffic Generation	Increase in traffic	2	4	1	2	1	3	30	-	Medium	• Group transportation of staff • Stagger material, component and abnormal loads deliveries • Schedule deliveries for off-peak times • Adequate enforcement of traffic laws • Construct on-site concrete batching plant to reduce trips	2	4	1	2	1	2	20	-	Low
	Increase of Incidents with pedestrians and livestock	2	4	2	4	1	2	26	-	Medium	• Upgrade of existing / new access points • Reduce and control speed of vehicles • Safe accommodation of pedestrians • Implement pedestrian safety initiatives • Regularly maintain farm fences & access cattle grids	2	3	2	4	1	1	12	-	Low
	Increase in road maintenance	2	3	2	2	2	2	22	-	Low	• Avoid deliveries in wet weather • Implement a road maintenance program under the auspices of the respective transport department.	2	3	2	2	1	2	20	-	Low
a2) Abnormal Loads	Additional abnormal loads	3	2	1	2	1	1	9	-	Low	• Stagger abnormal load deliveries • Schedule abnormal load deliveries for off-peak times • Ensure compliance with permits • Adequate enforcement of the law	3	2	1	2	1	1	9	-	Low

a3) Access and Internal Roads	New / larger access points	1	4	1	2	1	1	9	-	Low	• Adequate road signage according to the SARTSM • Approval from the respective roads department	1	4	1	2	1	1	9	-	Low
B) OPERATIONAL PHASE																				
b1) Additional Traffic Generation	Increase in Traffic	2	1	1	2	3	1	9	-	Low	• Group transportation of staff	2	1	1	2	3	1	9	-	Low
	Increase of Incidents with pedestrians and livestock	2	1	1	2	3	1	9	-	Low	• Safe accommodation of pedestrians • Reduce vehicle speed • Regularly maintain farm fences & access cattle grids	2	1	1	2	3	1	9	-	Low
b2) Abnormal Loads	Additional Abnormal Loads	3	1	1	2	3	1	10	-	Low	• Schedule abnormal load deliveries for off-peak times	3	1	1	2	3	1	10	-	Low
b3) Access and Internal Roads	New / Larger Access points	1	1	1	2	3	1	8	-	Low	• Adequate road signage according to the SARTSM	1	1	1	2	3	1	8	-	Low
C) DECOMMISSIONING PHASE																				
c1) Additional Traffic Generation	Increase in Traffic	2	4	1	2	1	3	30	-	Low	• Group transportation of staff • Stagger carting of material, components and plant • Schedule carting for off-peak times • Adequate enforcement of the law	2	4	1	2	1	2	20	-	Low
	Increase of Incidents with pedestrians and livestock	2	4	2	4	1	2	26	-	Medium	• Reduce and control speed of vehicles • Safe accommodation of pedestrians • Regularly maintain farm fences & access cattle grids	2	3	2	4	1	1	12	-	Low
	Increase in road maintenance	2	3	2	2	2	2	22	-	Low	• Avoid carting in wet weather • Implement a road maintenance program under the auspices of the respective transport department.	2	3	2	2	1	2	20	-	Low
c2) Abnormal Loads	Additional abnormal loads	3	2	1	2	1	1	9	-	Low	• Stagger carting of abnormal loads • Schedule carting of abnormal loads for off-peak times • Ensure compliance with permits • Adequate enforcement of the law	3	2	1	2	1	1	9	-	Low
c3) Access and Internal Roads	New / Larger Access points	1	4	1	2	1	1	9	-	Low	• Adequate road signage according to the SARTSM	1	4	1	2	1	1	9	-	Low
D) CUMULATIVE																				

	Increase in traffic	2	4	1	2	1	4	40	-	Medium	• Shared group transportation of staff/labour between developments • Adequate enforcement of the law • Construct local concrete batching plant for use by various developments • Coordination of transportation between all developments	2	4	1	2	1	3	30	-	Medium
d1) Additional Traffic Generation	Increase of Incidents with pedestrians and livestock	2	4	2	4	1	3	39	-	Medium	• Reduce and control speed of vehicles • Safe accommodation of pedestrians • Shared implementation of pedestrian safety initiatives • Regularly maintain farm fences & access cattle grids • Coordination of construction traffic accommodation among all developments	2	3	2	4	1	2	24	-	Medium
	Increase in road maintenance	2	3	2	2	2	2	22	-	Low	• Avoid transporting in wet weather • Implement a road maintenance program under the auspices of the respective transport department. • Coordination of road maintenance between all developments	2	3	2	2	2	2	22	-	Low
d2) Abnormal Loads	Additional Abnormal Loads	3	2	1	2	1	4	36	-	Medium	• Stagger abnormal load deliveries • Schedule abnormal load deliveries for off-peak times • Ensure compliance with permits • Adequate enforcement of the law • Coordination of abnormal load delivery schedules among all developments	3	2	1	2	1	2	18	-	Low
d3) Access and Internal Roads	New / Larger Access points	1	4	1	2	1	2	18	-	Low	• Adequate road signage according to the SARTSM • Approval from the respective roads department	1	4	1	2	1	1	9	-	Low

6.2. CUMULATIVE IMPACT ASSESSMENT

SiVEST undertook every effort to obtain the relevant information for the surrounding developments within 35 km of the proposed PV facility, however many of the documents are not currently publicly available. To this extent, the information that could be obtained from the surrounding, planned renewable energy developments was taken into account as part of the cumulative impact assessment. Ten (10) renewable energy projects were identified within a 35 km radius of the proposed development as shown in Table 6-2 and Figure 6-1

Table 6-2 Proposed Renewable Energy Developments within a 35 km Radius

	Facility Name / Description	Status	MW
1	Orlight SA SEF	Approved	22 MW
2	Mainstream SEF	Approved	50 MW
3	Solar Capital Orange 80 MW SEF	Approved and in construction phase	75 MW
4	Loeriesfontein 3 SEF	Approved	100 MW
5	Kokerboom 2 WEF	Approved	240 MW
6	Kokerboom 3 WEF	Approved	240 MW
7	Kokerboom 5 WEF	Approved	256 MW
8	Graskoppies WEF	Approved	235 MW
9	!XHA Boom WEF	Approved	235 MW
10	Dwarsrug WEF	Approved	140 MW
11	Loeriesfontein 2 WEF	Approved and in operational phase	140 MW
12	Khobab WEF	Approved and in operational phase	140 MW
			1 873 MW

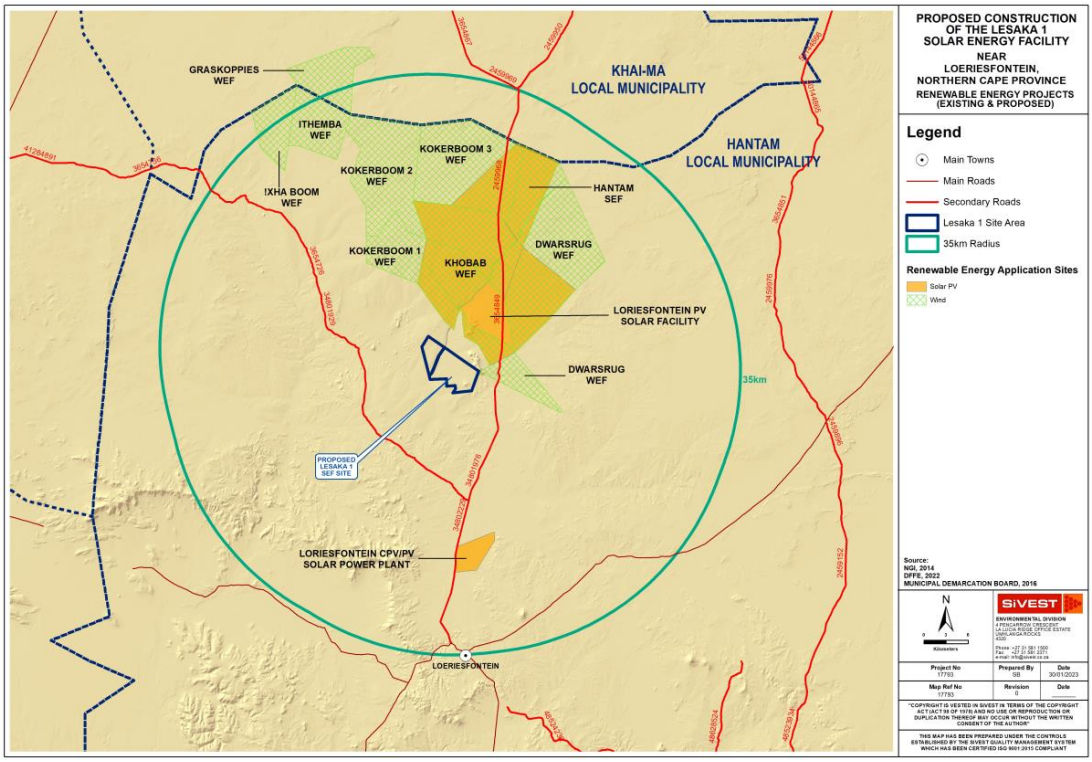

Figure 6-1 Proposed Renewable Energy Developments within a 35 km Radius

6.3. COMPARATIVE ASSESSMENT OF ALTERNATIVES

Various alternatives were assessed as part of the Transportation Study. These include facility layout alternatives. The assessments are reflected in Table 6-4 and discussed thereafter.

Table 6-3 Comparative Assessment Key

PREFERRED	The alternative will result in a low impact / reduce the impact / result in a positive impact
FAVOURABLE	The impact will be relatively insignificant
LEAST PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

Table 6-4 Comparative Assessment of Alternatives

Alternative	Preference	Reasons (Incl. Potential Issues)
SEF Layout Alternatives		
Substation location 1	No Preference	Will not have an effect on the transportation study
Substation location 2		
Construction/laydown area location 1	No Preference	Will not have an effect on the transportation study
Construction/laydown area location 2		

6.3.1. Substation Location Alternatives

Two alternative locations are considered for the substation of the Lesaka 1 SEF. In respect of this study, however; the exact location of the SEF substation has no bearing on the overall traffic impacts of the proposed development.

6.3.2. Laydown Area Alternatives

Two alternative locations are considered for the construction/laydown area of the Lesaka 1 SEF. In respect of this study, however; the exact location of the construction/laydown area has no bearing on the overall traffic impacts of the proposed development.

6.3.3. No-Go Alternative

The 'No-Go' alternative is the option of not undertaking the Lesaka 1 Solar Energy Facility. This alternative would result in no traffic impacts on the immediate or broader transport network. It would however mean forgoing the various benefits that the proposed facility offers, such as the creation of jobs, the boosting of the local economy, and primarily the sustainable generation of renewable energy. These benefits are considered to outweigh the avoidance of the traffic impacts associated with the proposed development, especially in light of the effective mitigation measures that have been advanced. The "No-Go" alternative is therefore not preferred.

7. INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME

Inputs to be included in the environmental management programme relating to this study are given in Table 7-1 below.

Table 7-1 EMPr Inputs

Impact/Aspect	Mitigation/Management Actions	Responsibility	Methodology	Mitigation/Management Objectives and Outcomes	Frequency
PLANNING PHASE					
Increase in road traffic	Identify type and condition of affected roads	Developer	Transportation study	Establish baseline	Once-off
	Deduce current traffic	Developer	Transportation study	Establish baseline conditions	Once-off
	Deduce expected additional traffic		Transportation study	Understand extent of impact	Once-off
	Confirm ability of existing road network to absorb additional traffic	Developer	Transportation study	Ensure containment of impact	Once-off
Increase in traffic incidents with pedestrians and livestock	Assess current pedestrian conditions	Developer	Transportation study	Establish baseline	Once-off
	Confirm ability of existing road network to safely accommodate pedestrians	Developer	Transportation study	Ensure containment of impact	Once-off
Traffic disruptions and road damage due to abnormal loads	Identify required abnormal loads	Developer	Transportation study; Abnormal Load Study	Understand extent of impact	Once-off
	Identify suitable routes	Developer	Transportation study	Ensure containment of impact	Once-off
	Apply for abnormal load permits with the relevant authorities	Developer	Application	Ensure containment of impact	Once-off

Access and internal roads	Assess suitability of existing accesses and internal roads	Developer	Transportation study	Establish baseline	Once-off
	Design accesses and internal roads as per applicable criteria and standards	Developer	Civil engineering design	Ensure containment of impact	Once-off
	Design access and internal roads to minimise earthworks	Developer	Civil engineering design	Reduction of environmental disturbance	Once-off
	Design access and internal roads to minimise stormwater damage	Developer	Civil engineering design	Reduction of environmental disturbance	Once-off
	Submit access and road designs for approval with relevant authorities prior to construction	Developer	Application	Ensure compliance	Once-off
CONSTRUCTION PHASE					
Increase in road traffic	Group transportation of staff	Contractor	Planning	Reduce the magnitude of additional road traffic	Daily
	Stagger material, plant and equipment deliveries	Contractor	Programming of works	Reduce the concentration of additional road traffic	Weekly
	Schedule deliveries for off-peak times	Contractor	Programming of works	Reduce the concentration of additional road traffic	Weekly
	Adequate traffic law enforcement	Contractor	Traffic management plan	Safely manage additional road traffic	Daily

Increase in traffic incidents with pedestrians and livestock	Reduce and control speed of vehicles	Contractor	Traffic management plan	Avoid incidents with pedestrians and livestock	Daily
	Safe accommodation of pedestrians	Contractor	Traffic management plan	Avoid incidents with pedestrians	Daily
	Implement pedestrian safety initiatives	Contractor	Social facilitation	Avoid incidents with pedestrians	Monthly
	Regularly maintain farm fences & access cattle grids	Contractor	Inspections and communications	Avoid incidents with livestock	Monthly
Increase in road degeneration	Regularly conduct conditional assessments on gravel roads	Contractor	Visual inspections	Identify deterioration of local roads timeously	Monthly
	Implement a road maintenance program under the auspices of the respective transport department	Contractor, Local authority	Road maintenance	Reduce/address deterioration of local roads	Bi-annually
Addition of Abnormal Loads	Stagger abnormal load deliveries	Contractor	Programming of works	Reduce the disturbance of road users associated with the transporting of abnormal loads	
	Schedule abnormal load deliveries for off-peak time	Contractor	Programming of works	Reduce the disturbance of road users associated with the transporting of abnormal loads	
	Ensure compliance with permits	Contractor	Inspections	Safely manage abnormal loads	
	Adequate traffic law enforcement	Contractor	Traffic management plan	Safely manage abnormal loads	

OPERATIONAL PHASE					
Increase in road traffic	Group transportation of staff	Operator	Planning	Reduce the magnitude of additional road traffic	When required
Increase in traffic incidents with pedestrians and livestock	Safe accommodation of pedestrians	Operator	Monitoring	Avoid incidents with pedestrians	Weekly
	Reduce vehicle speed	Operator	Monitoring	Avoid incidents with pedestrians and livestock	Daily
	Regularly maintain farm fences & access cattle grids	Operator	Inspections and Reporting	Avoid incidents with livestock	Monthly
Addition of Abnormal Loads	Schedule abnormal load deliveries for off-peak time	Operator	Programming of maintenance	Reduce the disturbance of road users associated with the transporting of abnormal loads	When required
	Ensure compliance with permits	Contractor	Inspections	Safely manage abnormal loads	When required
	Adequate traffic law enforcement	Contractor	Traffic management plan	Safely manage abnormal loads	When required

8. RECOMMENDATIONS

Following the extensive study of the transportation and traffic related aspects of the proposed development and their impacts on the immediate and broader transportation system, the following are recommended:

- An Abnormal Load Study should be undertaken once the (i) detail design, (ii) construction programme, and (iii) logistics plan are available.
- Dry runs along abnormal load routes should be conducted prior to transporting abnormal loads
- Internal access roads should be constructed according to *TRH20 – Unsealed Roads: Design Construction and Maintenance*
- Traffic calming and speed reduction should be implemented at the approaches to the site access during construction
- Proper and adequate construction road signage should be used on the approach roads which complies with the South African Road Traffic Signage Manual (SARTSM).
- The condition and quality of the gravel roads used should be monitored closely during and after construction, and any required maintenance should be undertaken timeously under the auspices of the relevant transport department.
- Farm fences and access cattle grids should be maintained regularly.
- The implementation of the mitigation measures identified in the Impact Rating Table should be ensured and monitored.

9. CONCLUSION AND IMPACT STATEMENT

9.1. CONCLUSION

This Transportation Study assessed the anticipated traffic impact of the Lesaka 1 Solar Energy Facility.

It was found that the highest traffic impact of the proposed development would occur during the construction phases, which was estimated to generate an additional ±14 peak hour vehicle trips.

The existing site accesses are deemed sufficient for the proposed facility but may require some upgrades.

No fatal flaws or preferences were identified for any of the proposed site alternatives for construction laydown areas and access points.

No environmentally sensitive areas are required and therefore no areas are to be avoided from a Transportation perspective.

9.2. IMPACT STATEMENT

With reference to this report, associated assessment and the findings made within, it is SiVEST's opinion that the Lesaka 1 Solar Energy Facility has a nominal impact on the existing traffic network. The project is therefore deemed acceptable from a transport perspective, provided the recommendations and mitigations measures in this report are implemented, and hence the Environmental Authorisation (EA) should be granted for the EIA application.

10. REFERENCES

KZN Transport – *Concrete Causeway Details (1996)*

South African National Roads Agency Limited – *Drainage Manual (5th Edition)*

American Association of State Highway Transportation Officials - *Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400) (2001)*

Technical Recommendations for Highways (TRH11) – *Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads (7th Edition - 2000)*

Technical Recommendations for Highways (TRH17) – *Geometric Design of Rural Roads (1988)*

Technical Recommendations for Highways (DRAFT-TRH20) – *Unsealed Roads: Design, Construction and Maintenance (2013)*

Technical Recommendations for Highways (TRH26) – *South African Road Classification and Access Management Manual (2012)*

Northern Cape Government Department of Roads and Public Works – *Road Network Information System*

Northern Cape Cape Government Department of Roads and Public Works – *Gravel Roads Manual*

Annexure A:

Curriculum Vitae of Specialist

Name	Ntuthuko Hlanguza
Profession	Professional Civil Engineer
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Senior Civil Engineer SiVEST Civil Engineering Division
Years with Firm	8 years
Nationality	South African

Education

- Maritzburg College (2004): Grade 12 with Distinction

Professional Qualifications

- BSc.Eng (Civil) - University of KwaZulu-Natal (2014)
- Post Graduate Certificate in Energy Efficiency and Sustainability – University of Cape Town (2020)
- Professional Engineer (ECSA) – Registration No. 202202263

Membership in Professional Societies

- Engineering Council of South Africa (ECSA) – Pr Eng (Reg No. 202202263)
- South African Institution of Civil Engineering (SAICE)

Employment Record

Feb 2015 – current	SiVEST SA (Pty) Ltd – Civil Engineer
Dec 2013 – Jan 2014	Naidu Consulting, Durban – Student Engineer

Experience Overview

Ntuthuko is a Professional Civil Engineer with key experience in roads and transportation, water, sanitation, earthworks and construction monitoring. His achievements include SI instructor to junior students at UKZN and chairperson of UKZN's student chapter of the South African Institution for Civil Engineering (SAICE-UKZN).

Fields of Specialisation

- Engineering Feasibility Studies
- Road Geometrics and Pavement Design
- Stormwater Management
- Water Supply and Reticulation
- Sewer Reticulation
- Bulk Earthworks
- Construction Monitoring and Administration

Project Experience (by Sector)

RENEWABLE ENERGY

- Transportation Studies for Proposed Solar and Wind Energy Facilities
    - Karee WEF
    - Mierdam Solar PV
    - Patatskloof WEF
    - Platsjambok Solar PV

- Glint & Glare Assessments for Proposed Solar and Wind Energy Facilities
    - Beaufort West Solar PV

- Stormwater Management Plans for Proposed Solar and Wind Energy Facilities
    - Leeubosch Solar PV

ROADS AND STORMWATER

- Traffic Planning, Design and Contract Administration of Urban Roads (Class 3-5 roads)
- Traffic Planning, Design and Contract Administration of Internal Roads, Access Roads and Intersections of Large-Scale Residential Developments
- Design and Construction Monitoring of Bulk Stormwater Infrastructure
- Planning and Design of Storm Attenuation Features
- Undertaking of Flood Risk Assessments and Stormwater Management Plans

WATER AND SANITATION

- Feasibility Studies, Planning and Design of Community Water Supply Schemes
- Feasibility Studies, Planning and Design of Bulk Water Transfer Schemes
- Design of Water and Sanitation Services for Education Facilities
- Design of Water and Sanitation Services for Provincial Hospitals
- Design of Water and Sanitation Services for Residential, Commercial and Industrial Developments

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