iWink Consulting
Traffic & Transport Engineering
Road Safety

QUANTUM 1 SOLAR ENERGY FACILITY
KRUGERSDORP
GAUTENG PROVINCE

Transport Impact Assessment

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Final Issue

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QUANTUM 1 SOLAR ENERGY FACILITY
TRANSPORT IMPACT ASSESSMENT

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This report serves as the Transport Impact Assessment aimed at determining the traffic impact of the proposed Quantum 1 Solar Energy Facility near Krugersdorp in the Gauteng Province. The proposed project is located approximately 10 km west of Krugersdorp.

The project site will be located within the Mogale City Local Municipality in the West Rand District Municipality of Gauteng. The site will accommodate a solar energy facility and associated support structures and facilities to allow for the generation and evacuation of electricity.

Feasible accessibility to the site was assessed considering sight lines, access spacing requirements and road safety aspects, which is discussed in this report. It is recommended to ensure that the access point onto the external road is kept clear of vegetation and any other obstructions to ensure sight lines are kept.

In general, non-motorised transportation (NMT) is a dominant mode of transportation in rural areas, with private cars and minibus/taxis being the second-most used mode of transport, followed by buses. Currently, there are no known future planned public transport facilities in the vicinity of the site. However, generally the developer or appointed contractor of a renewable energy project will provide shuttle busses for workers during the construction phase.

The highest trip generator for the project is expected during the construction phase. The actual construction stage peak hour trips are dependent on the construction period, construction programming, material availability, component delivery, abnormal load permitting etc. The decommissioning phase is expected to generate similar trips as the construction phase. The traffic impact during the operational phase is considered negligible.

For the construction and decommissioning phases, the impact expected to be generated by the vehicle trips is an increase in traffic and the associated noise, dust, and exhaust pollution. Based on the high-level screening of impacts and mitigation, the project is expected to have a negative low impact during the construction and decommissioning stages including the recommended mitigation measures.

1 INTRODUCTION

1.1 Project Description

South Africa Mainstream Renewable Power Developments (Pty) Ltd. is proposing the development of a commercial solar energy generation facility, namely Quantum 1 Solar Energy Facility (SEF), and associated infrastructure on a farm portion located near Krugersdorp in the Gauteng Province. The proposed project will be located in a rural environment around 10 km west of Krugersdorp (see **Figure 1-1**) and comprise of a contracted capacity of up to 10 MW.

A development area has been identified and within this identified development area, the development footprint has been defined in a manner which has considered the environmental sensitivities present on the affected property and intentionally remains outside of highly sensitive areas. The proposed development area is ~94.15 ha and the affected farm property is Portion 285 (a Portion of Portion 19) of the Farm Vlakplaats No. 160.

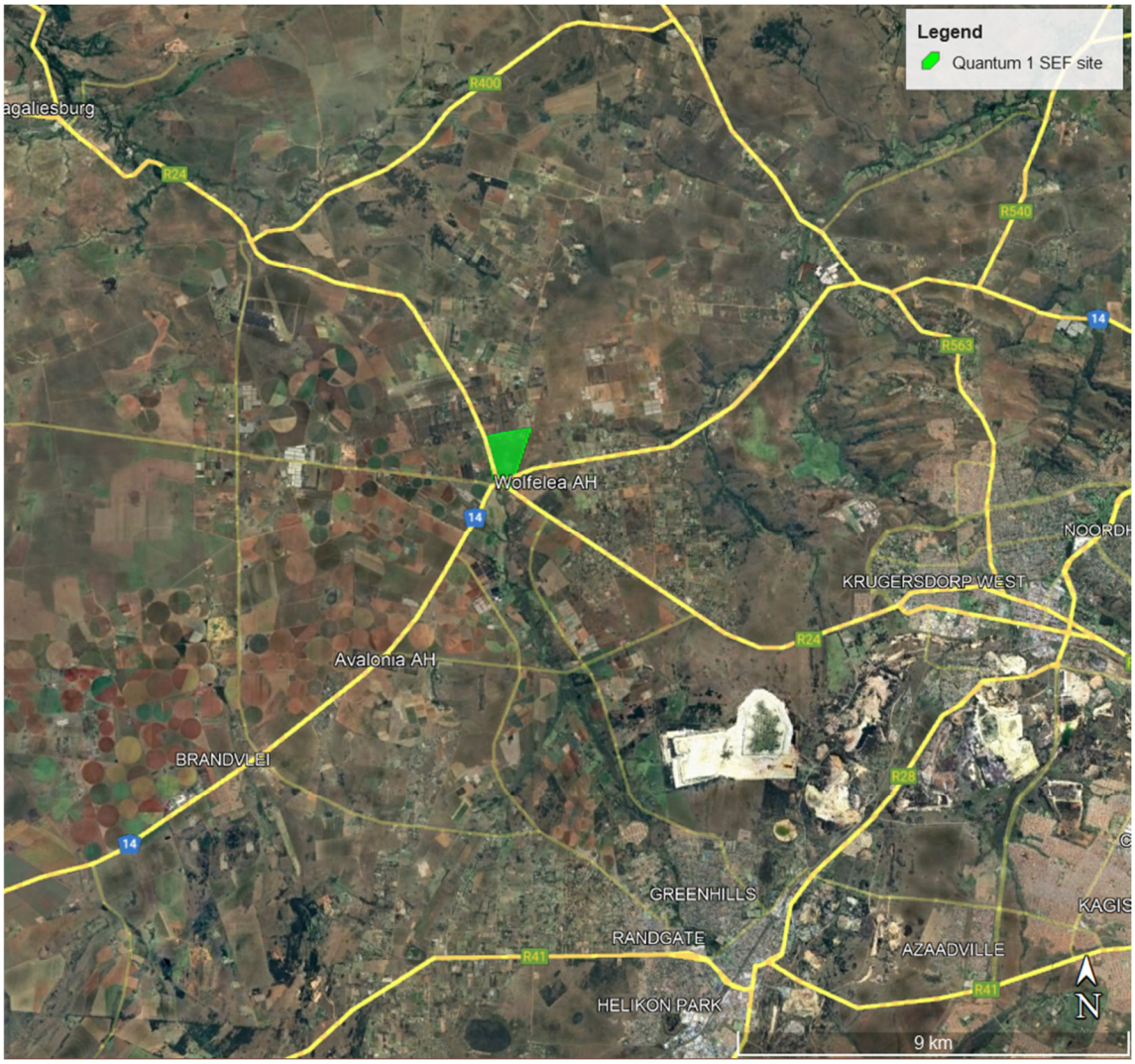

Figure 1-1: Aerial View of location of the Quantum 1 project site

The proposed project details are summarized in **Table 1-1.**

Table 1-1:Project information

Facility Name:	Quantum 1 Solar Energy Facility
Applicant:	South Africa Mainstream Renewable Power Developments (Pty) Ltd.
Farm property:	Portion 285 (a Portion of Portion 19) of the Farm Vlakplaats No. 160
Municipality:	Mogale City Local Municipality West Rand District Municipality
Province:	Gauteng
Extent:	~19.148 ha solar PV development area
Capacity:	Up to 10 MW
Number of panels:	Estimated 20 000 panels
Height of Panels:	Up to 5 m
Type of Technology:	Photovoltaic
Structure orientation:	It is expected that the panels will be fixed to either fixed-tilt, single-axis tracking and/or double-axis tracking structures with the orientation of the panel varying according to the time of the day, as the sun moves from east to west or tilted at a fixed angle towards North with the angle of tilt optimised for cost and system performance.
BESS:	Generally, either Lithium Battery (such as Lithium Iron Phosphate or Lithium Nickel Manganese Cobalt oxides) or Vanadium Redox technology is considered for a project of this nature. The main components of the BESS include the batteries, power conversion system and transformer which is assumed to be stored in various rows of containers. The footprint for the BESS will form part of the 1.5ha area allocated for other supporting infrastructure.
Inverter:	Sections of the PV array will need to be wired to inverters. The inverter is generally a pulse width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency. Cabling comprises of communication, AC and DC cables.
Operations and Maintenance (O&M) building footprint:	O&M area to be up to 1.5 ha (within the development area), needs to include security gate house, ablutions, workshops, storage and warehousing areas, site offices, Switch gear, control and relay room.
Laydown area:	A typical construction camp area is around 100 m x 50 m (~5 000m^2). Typical laydown areas are 100 m x 200 m (~2 000m^2). Sewage - portable toilets and septic tanks are recommended. It is expected

	that a permanent laydown area will be located within the area demarcated for the temporary laydown area.
Internal Roads:	Internal roads need to be provided to the site and between project components inclusive of stormwater infrastructure. As far as possible, internal roads will follow existing gravel roads and paths, of which some may require widening/upgrading. Further internal roads may need to be constructed with a width of 6 m. The length of internal roads needs to be confirmed. The main site access roads are advised to be up to 8 m wide. Where/if required, turning circle/bypass areas will need to be constructed.
Fencing height:	Up to 3.5 m (tbc)
Grid infrastructure / Substation:	The generated electricity will be evacuated from the on-site substation via 11kV monopole or lattice structure pylons to the Eskom Tarlton 132/44/11kV substation located on the same land parcel as the proposed Quantum 1 SEF.
Site access:	Via R24 and farm road

1.2 Scope and Objectives

The Transport Impact Assessment is aimed at determining the traffic impact of the proposed land development proposal and whether such development can be accommodated by the external transportation system.

The report deals with the items listed below and focuses on the surrounding road network in the vicinity of the site:

- The proposed development;
- The existing road network and any future road planning proposals;
- Trip generation for the proposed development during the construction, operation, and decommissioning phases of the facility;
- Anticipated traffic impact of the proposed development;
- Access requirements and feasibility of proposed access points;
- Determine a main route for the transportation of components to the proposed project site;
- Determine a preliminary transportation route for the transportation of materials, equipment and people to site;
- Recommend alternative or secondary routes, where possible and required;
- Assess Public Transport accessibility;
- Assess Non-motorised Transport availability; and
- Recommended high-level upgrades to the road network, if necessary.

1.3 Details of Specialist

Iris Sigrid Wink of iWink Consulting (Pty) Ltd. is the Traffic & Transportation Engineering Specialist appointed to provide a Transport Impact Assessment for the proposed Quantum 1 SEF Project. Iris

Wink is registered with the Engineering Council of South Africa (ECSA), with Registration Number 20110156. A curriculum vitae is included in **Appendix A** of this report.

A signed Specialist Statement of Independence is included in **Appendix B**.

1.4 Terms of Reference

There is no protocol relevant to traffic impact assessments and therefore the specialist study is undertaken according to Appendix 6 of the EIA Regulations (GNR 982, as amended). A transport specialist report should contain the following:

(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;

(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;

(c) an indication of the scope of, and the purpose for which, the report was prepared;
  (cA) an indication of the quality and age of base data used for the specialist report
  (cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;

(d) the duration date and season of the site investigation and the relevance of the season to the outcome of the assessment;

(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;

(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;

(g) an identification of any areas to be avoided, including buffers;

(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;

(i) a description of any assumptions made and any uncertainties or gaps in knowledge;

(j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;

(k) any mitigation measures for inclusion in the EMPr;

(l) any conditions for inclusion in the environmental authorisation;

(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;

(n) a reasoned opinion-
  (i) whether the proposed activity, activities or portions thereof should be authorised; and (considering impacts and expected cumulative impacts).
  (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;

(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;

(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and

(q) any other information requested by the competent authority.

Specific:

- Extent of the transport study and study area;
- The proposed development;
- Trip generation for the facility during construction and operation;
- Traffic impact on external road network;
- Accessibility and turning requirements;
- National and local haulage routes;
- Assessment of internal roads and site access;
- Assessment of freight requirements and permitting needed for abnormal loads; and
- Traffic accommodation during construction**.**

2 APPROACH AND METHODOLOGY

The report deals with the traffic impact on the surrounding road network in the vicinity of the site during the:

- Construction phase;
- Operational phase; and
- Decommissioning phase.

This transport study includes the following tasks:

Project Assessment

- Communication with the project team to gain sound understanding of the projects.
- Overview of available project background information including, but not limited to, location maps, site development plans, anticipated vehicles to the site (vehicle type and volume), components to be transported and any resulting abnormal loads.
- Research of all available documentation and information relevant to the proposed facility.

Access and Internal Roads Assessment

- Assessment of the proposed access points including:
    - Feasible location of access points
    - Motorised and non-motorised access requirements
    - Queuing analysis and stacking requirements, if required
    - Access geometry
    - Sight distances and required access spacing
    - Comments on internal circulation requirements and observations

Haulage Route Assessment

- Determination of possible haulage routes to site regarding:
    - National routes
    - Local routes
    - Site access points
    - Road limitations due to abnormal loads

Traffic Estimation and Impact

- Construction, operational, and decommissioning phase vehicle trips
    - Generated vehicles trips
    - Abnormal load trips
    - Access requirements
- Investigation of the impact of the development traffic generated during construction, operation, and decommissioning.

Report (Documentation)

- Reporting on all findings and preparation of the report.

2.1 Information Sources

The following guidelines have been used to determine the extent of the traffic study:

- Project Information provided by the Client;
- Google Earth.kmz provided by the Client;
- Google Earth Pro Satellite Imagery;
- Road Traffic Act, 1996 (Act No. 93 of 1996)
- National Road Traffic Regulations, 2000
- SANS 10280/NRS 041-1:2008 - Overhead Power Lines for Conditions Prevailing in South Africa
- The Technical Recommendations for Highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads
- Manual for Traffic Impact Studies, Department of Transport, 1995;
- TRH26 South African Road Classification and Access Management Manual, COTO; and
- TMH 16 South African Traffic Impact and Site Traffic Assessment Manual (Vol 1/Vol2), COTO, August 2012.

2.2 Assumptions, Knowledge Gaps and Limitations

The following assumptions and limitations apply:

- This study is based on the project information provided by the client.
- According to the Eskom Specifications for Power Transformers (Eskom Power Series, Volume 5: Theory, Design, Maintenance and Life Management of Power Transformers), the following dimensional limitations need to be kept when transporting the transformer – total maximum height 5 000 mm, total maximum width 4 300 mm and total maximum length 10 500 mm.
  It is envisaged that for this project the inverter, transformer, and switchgear will be transported to site in containers on a low bed truck and trailer. The transport of a mobile crane and the transformer are the only abnormal loads envisaged. The crane will be utilised for offloading equipment, such as the transformer.
- Maximum vertical height clearances along the haulage route are 5.2 m for abnormal loads.
- If any elements are manufactured within South Africa, these will be transported from their respective manufacturing centres, which would be either in the greater Cape Town area, Johannesburg, or possibly in Pinetown/Durban.
- All haulage trips will occur on either surfaced national and provincial roads or existing gravel roads.
- Material for the construction of internal access roads will be sourced locally as far as possible.
- The final access points are to be determined during the detailed design stage. Only recommended access points at conceptual level can be given at this stage.
- Planned or approved projects in the vicinity of the site to be considered as part of the cumulative impacts.
- An 18 to 24-months construction period is assumed with some of the construction period dedicated to site prep and civil works.

2.3 Consultation Processes Undertaken

The Transport Impact Assessment is based on available project information and consultation with the developer.

3 LEGISLATIVE AND PERMIT REQUIREMENTS

Key legal requirements pertaining to the transport requirements for the proposed project are:

- Abnormal load permits, (Section 81 of the National Road Traffic Act 93 of 1996 and National Road Traffic Regulations, 2000),
- Port permit (Guidelines for Agreements, Licenses and Permits in terms of the National Ports Act No. 12 of 2005), and
- Authorisation from Road Authorities to modify the road reserve to accommodate turning movements of abnormal loads at intersections.

4 DESCRIPTION OF THE PROPOSED DEVELOPMENT

4.1 General Description

The proposed Quantum 1 SEF site is located in a rural environment near Krugersdorp in the Gauteng Province (see **Figure 4-1**). The affected farm portion is Portion 285 (a Portion of Portion 19) of the Farm Vlakplaats No. 160.

Figure 4-1: Aerial View of the proposed Quantum 1 SEF development area

The development footprint will contain the following infrastructure to enable the Quantum 1 SEF facility to generate up to 10 MW:

- Solar PV array comprising solar modules;
- Mounting System Technology ;
- Inverters and transformers;
- Low voltage cabling between the PV modules to the inverters;
- Overhead and underground power lines;
- Onsite substation, switching substation and laydown areas;
- Battery Energy Storage System (BESS) and associated infrastructure;
- Internal access roads; and
- Fence around the project development areas.

4.2 Alternatives

The Department of Environmental Affairs and Tourism (DEAT) 2006 guidelines on 'assessment of alternatives and impacts' proposes the consideration of four types of alternatives, namely, the no-go, location, activity, and design alternatives. It is, however, important to note that the regulation and guidelines specifically state that only 'feasible' and 'reasonable' alternatives should be explored. It also recognizes that the consideration of alternatives is an iterative process of feedback between the developer and EAP, which in some instances culminates in a single preferred project proposal. An initial site assessment was conducted by the developer and the farm portion was found favorable due to its proximity to grid connections, solar radiation, site access and relative flat terrain. The greater area was considered based on these factors. However, environmentally sensitive and "no-go" areas, as identified by the specialists, were considered and avoided as far as possible, where required.

The following alternatives were considered in relation to the proposed activity:

Location Alternatives

The site selection process for a PV facility is almost always underpinned by a good solar resource. Other key considerations include environmental and social constraints, proximity to various planning units and strategic areas, terrain and availability of grid connection infrastructure.

Based on the above site-specific attributes, the study area is considered to be highly preferred in terms of the development of a solar PV facility. As such, no property / location alternatives will be considered.

BESS

As technological advances within battery energy storage systems (BESS) are frequent, two BESS technology alternatives are considered: Solid state battery electrolytes and Redox-flow technology. Solid state battery electrolytes, such as lithium-ion (Li-ion), zinc hybrid cathode, sodium ion, flow (e.g., zinc iron or zinc bromine), sodium sulphur (NaS), zinc air and lead acid batteries, can be used for grid applications. Compared to other battery options, Li-ion batteries are highly efficient, have a high energy density and are lightweight. As a result of the declining costs, Li-ion technology now accounts for more than 90% of battery storage additions globally (IRENA, 2019). Flow batteries use

solid electrodes and liquid electrolytes. The most used flow battery is the Vanadium Redox Flow Battery (VRFB), which is a type of rechargeable flow battery that employs vanadium ions in different oxidative states to store chemical potential energy.

Design and layout alternatives

It is customary to develop the final/detailed construction layout of the solar PV facility only once an Independent Power Producer (IPP) is awarded a successful bid under the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) or an alternative programme, after which major contracts are negotiated and final equipment suppliers identified.

For the purpose of the application process, site layout alternatives will not be comparatively assessed, but rather a single layout will be refined as additional information becomes available throughout the Basic Assessment (BA) process (e.g., specialist input, additional site surveys, ongoing stakeholder engagement).

The development area has been selected as a practicable option for the facility, considering technical preference and constraints, as well as initial No-Go layers informed by specialist site surveys. The layout presented in this report avoids all no-go-high-sensitivity areas identified by all the specialists.

Technology alternatives: Solar panels

There are several types of semiconductor technologies currently available and in use for PV solar panels. Two, however, have become the most widely adopted, namely crystalline silicon (Mono-facial and Bi-facial) and thin film. The technology that (at this stage) proves more feasible and reasonable with respect to the proposed solar facility is crystalline silicon panels, due to it being non-reflective, more efficient, and with a higher durability.

Due to the rapid technological advances being made in the field of solar technology the exact type of technology to be used, such as bifacial panels, will only be confirmed at the onset of the project.

No-go alternative

This alternative considers the option of 'do nothing' and maintaining the status quo. The site is currently zoned for agricultural land uses. Should the proposed activity not proceed, the site will remain unchanged and will continue to be used for agricultural purposes. The potential opportunity costs in terms of alternative land use income through rental for energy facility and the supporting social and economic development in the area would be lost if the status quo persist.

4.2.1 Specialist comment regarding alternatives

From a transport engineering perspective, the alternatives listed above (i.e., electrical infrastructure location alternatives and the technology options for the BESS) are equally acceptable as it does have a nominal impact on the traffic on the surrounding road network.

4.3 Proposed Access

The proposed access road towards the site is shown in **Figure 4-2** and will turn off the R24 onto an existing farm road which runs along the northern boundary of the project site (see **Figure 4-3** and **Figure 4-4**). The site access will need to be upgraded to cater for all construction vehicles.

The access road has been assessed in line with access spacing requirements, required sight lines and road safety considerations.

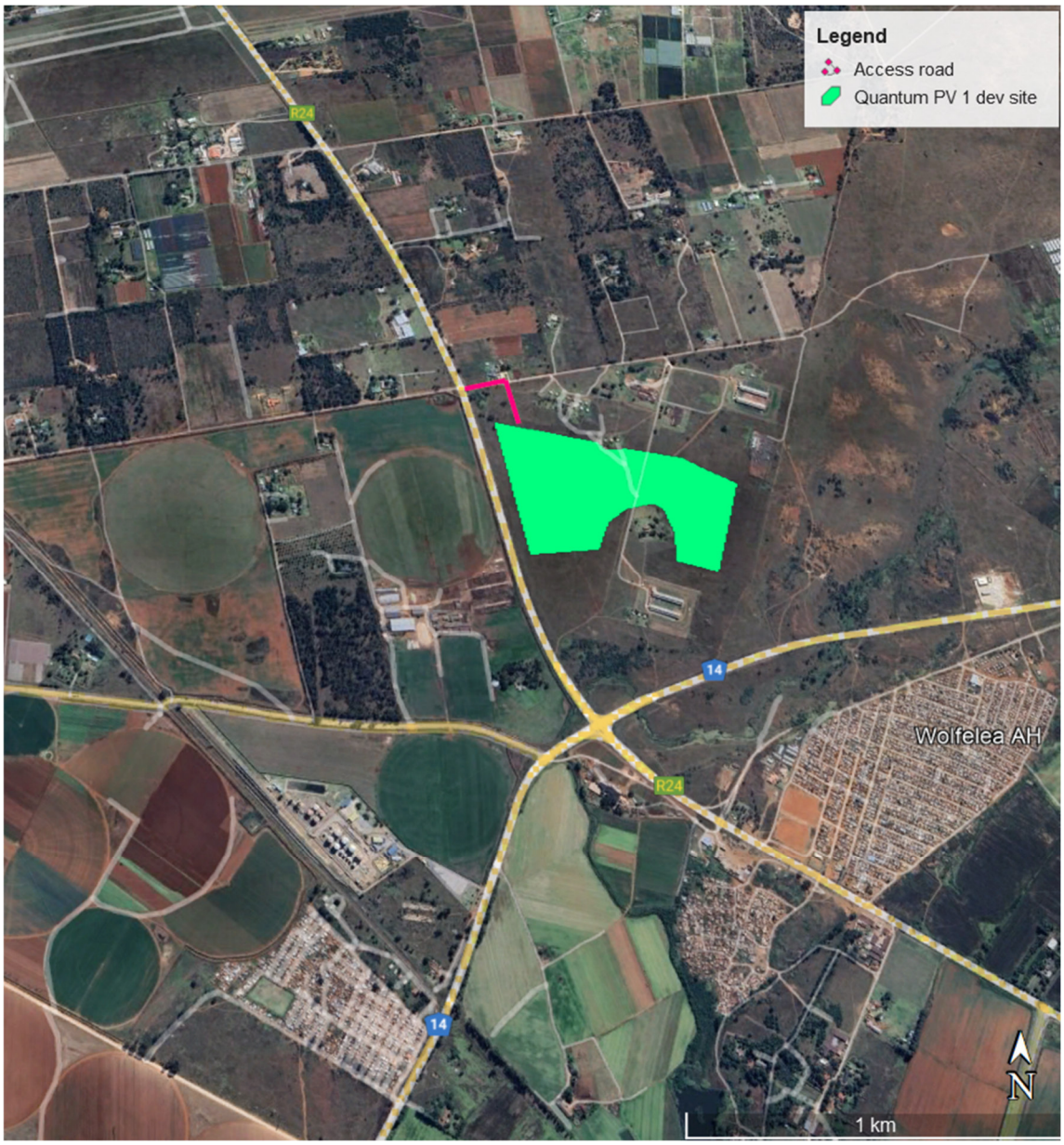

Figure 4-2 Aerial view of proposed Access road to the project site

As visible in **Figure 4-3**, there is a telephone line crossing the farm road at a height that may be required to be lifted if abnormal loads vehicle(s) (i.e., a larger transformer) need to travel

underneath towards the site. The appointed haulage company will in this case get in contact with the respective service provider of the Overhead Lines (OHL).

Figure 4-3: Existing farm road towards site from R24

Figure 4-4: Farm road towards site access

For the site access, is recommended to allow for a minimum stacking space of 25 m between the road edge of an external road and the site access control (i.e., the access boom) to ensure that least one large construction vehicle can stack in front of the security control without obstructing other vehicles traveling on the shared farm road.

In accordance with *Figure 2.5.5(a) of the TRH17 Guidelines for the Geometric Design of Rural Roads* (see **Figure 4-6**), the shoulder sight distance for a stop-controlled condition on a road with a speed limit of 80 km/h, needs to be a minimum of 330 m for the largest vehicle (5m set back from the intersecting road).

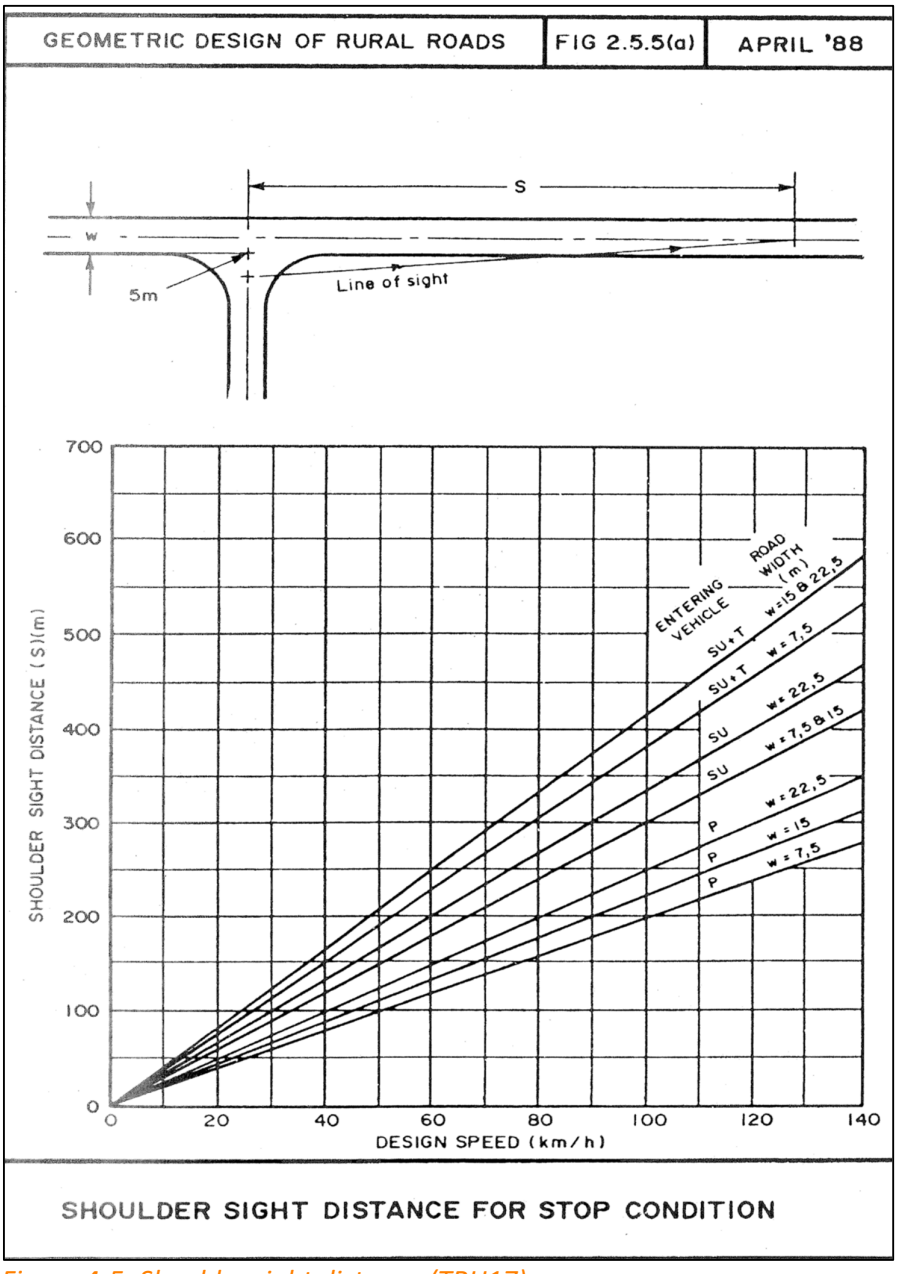

Figure 4-5: Shoulder sight distance (TRH17)

The required minimum shoulder sight distances are met in both directions accessing the R24 from the farm road (see **Figure 4-7**). **Figure 4-7** and **Figure 4-8** show the respective view in each direction of the R24 from the farm road.

Figure 4-6: Required Sight distances at access road to Quantum 1 SEF

Figure 4-7: View from Farm road at intersection with R24 in a southern direction

Figure 4-8: View from Farm road at intersection with R24 in a northern direction

4.3.1 General

The access roads leading from the surrounding road network towards the site need to be maintained if damaged by haulage vehicles. The radii at the accesses onto the site need to be large enough to allow for all construction vehicles to turn safely.

During the construction phase, temporary road signage in line with *South African Road Signs Manual (SARTSM*) will need to be erected along the R24 in the vicinity of the intersection with the farm road to alert drivers that construction vehicles turn into and out of the farm road.

4.4 Internal Roads

The geometric design and layout for the internal roads from the recommended access points need to be established at detailed design stage. Existing structures and services, such as drainage structures, signage and pipelines will need to be evaluated if impacting on the roads. It needs to be ensured that the gravel sections remain in good condition and will need to be maintained during the additional loading of the construction phase and then reinstated after construction is completed.

The geometric design constraints encountered due to the terrain should be taken into consideration by the geometric designer. Preferably, the internal roads need to be designed with smooth, relatively flat gradients (recommended to be no more than 8%) to allow a larger transport load vehicle to ascend to the respective laydown areas.

4.4.1 Transportation of Materials, Plant and People to the proposed site

It is assumed that the materials, plant, and workers will be sourced from the surrounding towns as far as possible, such as Krugersdorp.

4.4.2 Public Transport and Non-Motorised Transport

In terms of the National Land Transport Act (NLTA) (Act No.5 of 2009), the assessment of available public transport services is included in this report. The following comments are relevant in respect to the public transport availability for the proposed developments.

It is expected that minibus taxis travel along the R24, which is in close proximity to the project site. However, in many cases, the developer or appointed contractor of a large-scale project, such as many renewable energy projects, provides shuttle buses or similar for workers during the construction phase.

5 DESCRIPTION OF THE TRANSPORT ROUTES TO SITE

5.1 Port of Entry

The proposed Quantum 1 SEF project will be located in fairly similar travel distances from the Port of Durban and the Port of Richards Bay (see **Figure 5-1**) and therefore both have been taken into consideration in this study.

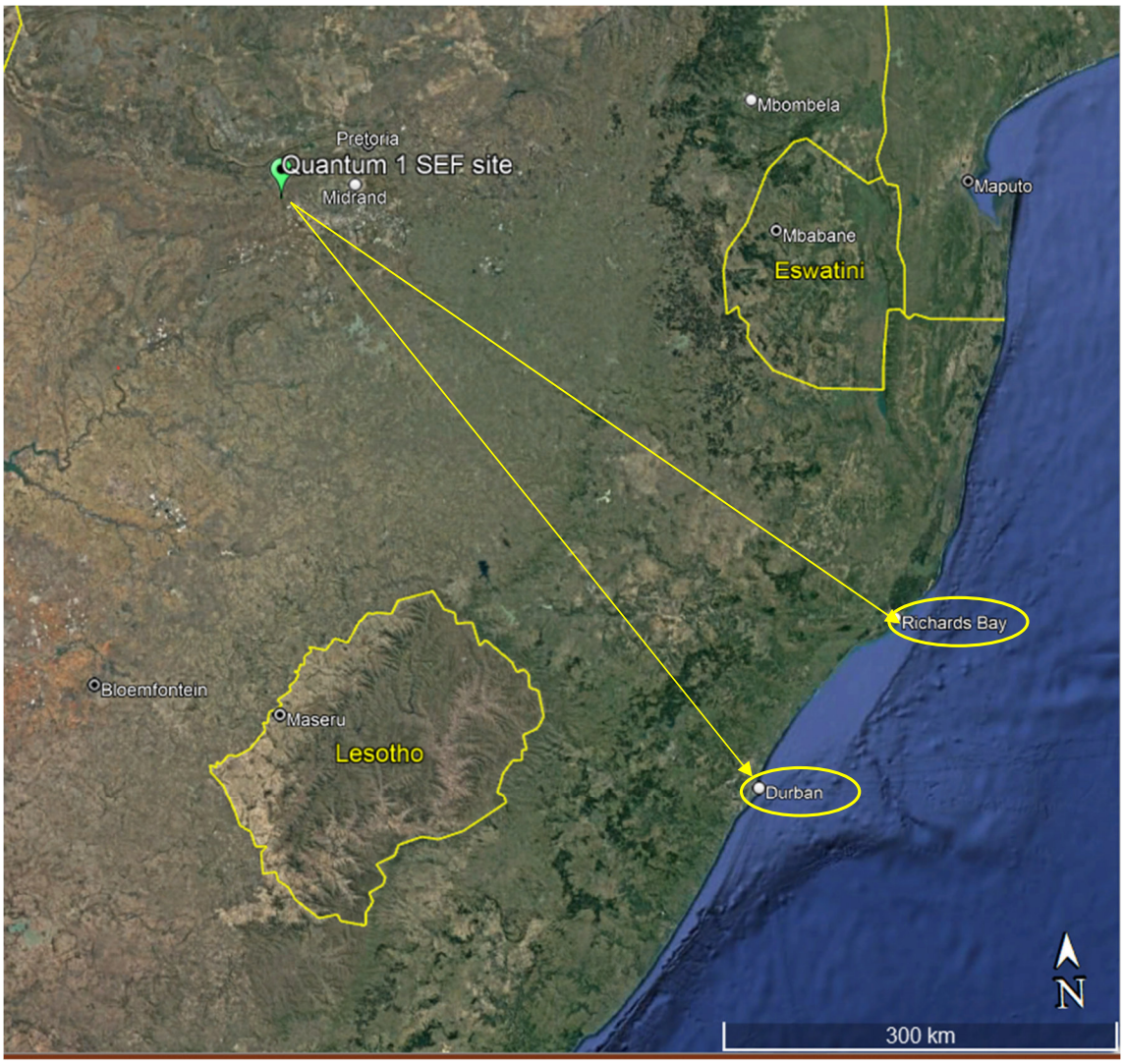

Figure 5-1: Possible Ports of Entry

5.1.1 Port of Richards Bay

The Port of Richards Bay is situated on the coast of KwaZulu-Natal and is a deep-sea water port boasting 13 berths. The terminal handles dry bulk ores, minerals and break-bulk consignments with a draft that easily accommodates Cape size and Panamax vessels. The Port is operated by Transnet National Ports Authority. The Port of Richards Bay is located approximately 660 km from the proposed Quantum 1 SEF site traveling via the R34 and R54 (see **Figure 5-2**).

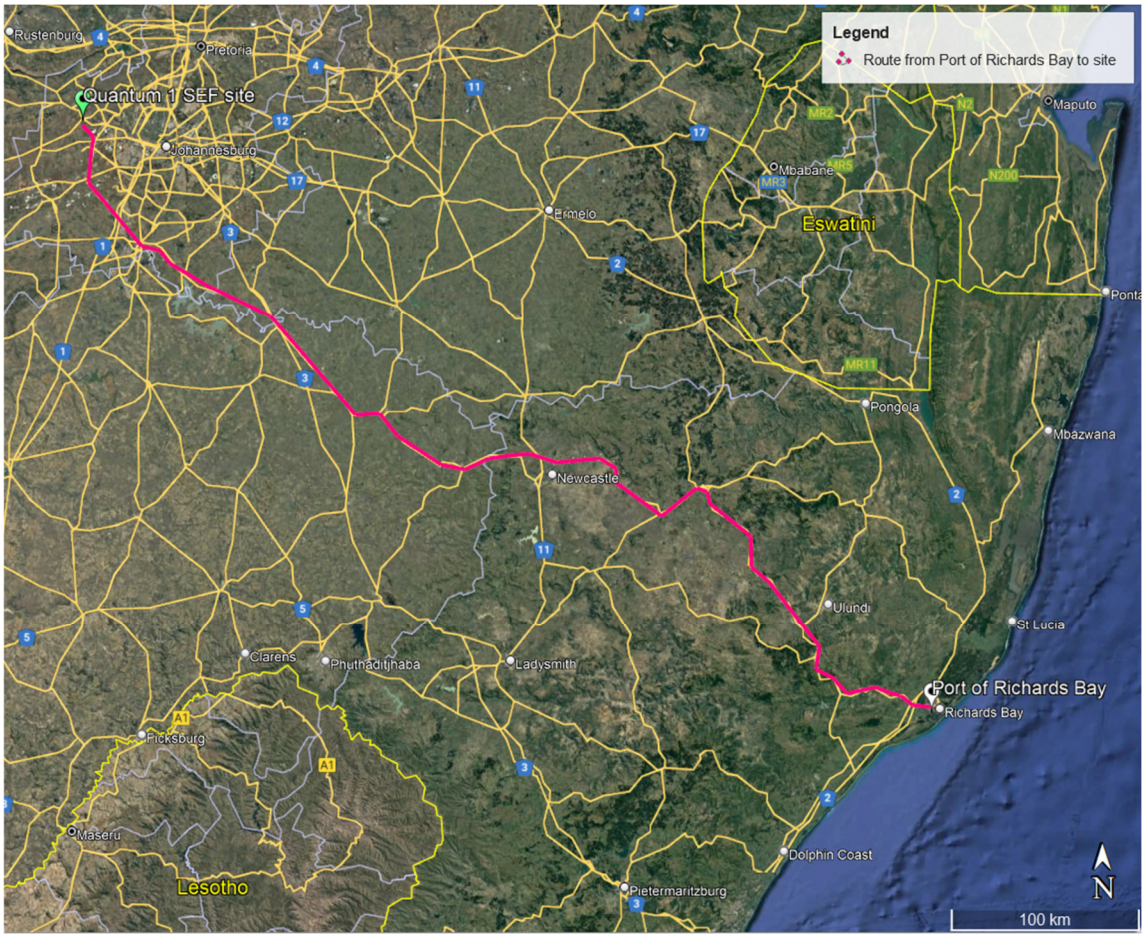

Figure 5-2: Route from Port of Richards Bay to project site

5.1.2 The Port of Durban

The Durban container terminal is one of the largest container terminals in the African continent and operates as two terminals Pier 1 and Pier 2. It is ideally located to serve as a hub for containerized cargo from the Indian Ocean Islands, Middle East, Far East and Australia. Various capacity creation projects are currently underway, including deepening of berths and operational optimization. The terminal currently handles 65% of South Africa's container volumes. (Transnet Port Terminals, n.d).

The Port of Durban is located approximately 620 km via the N3 from the proposed project (**Figure 5-3**).

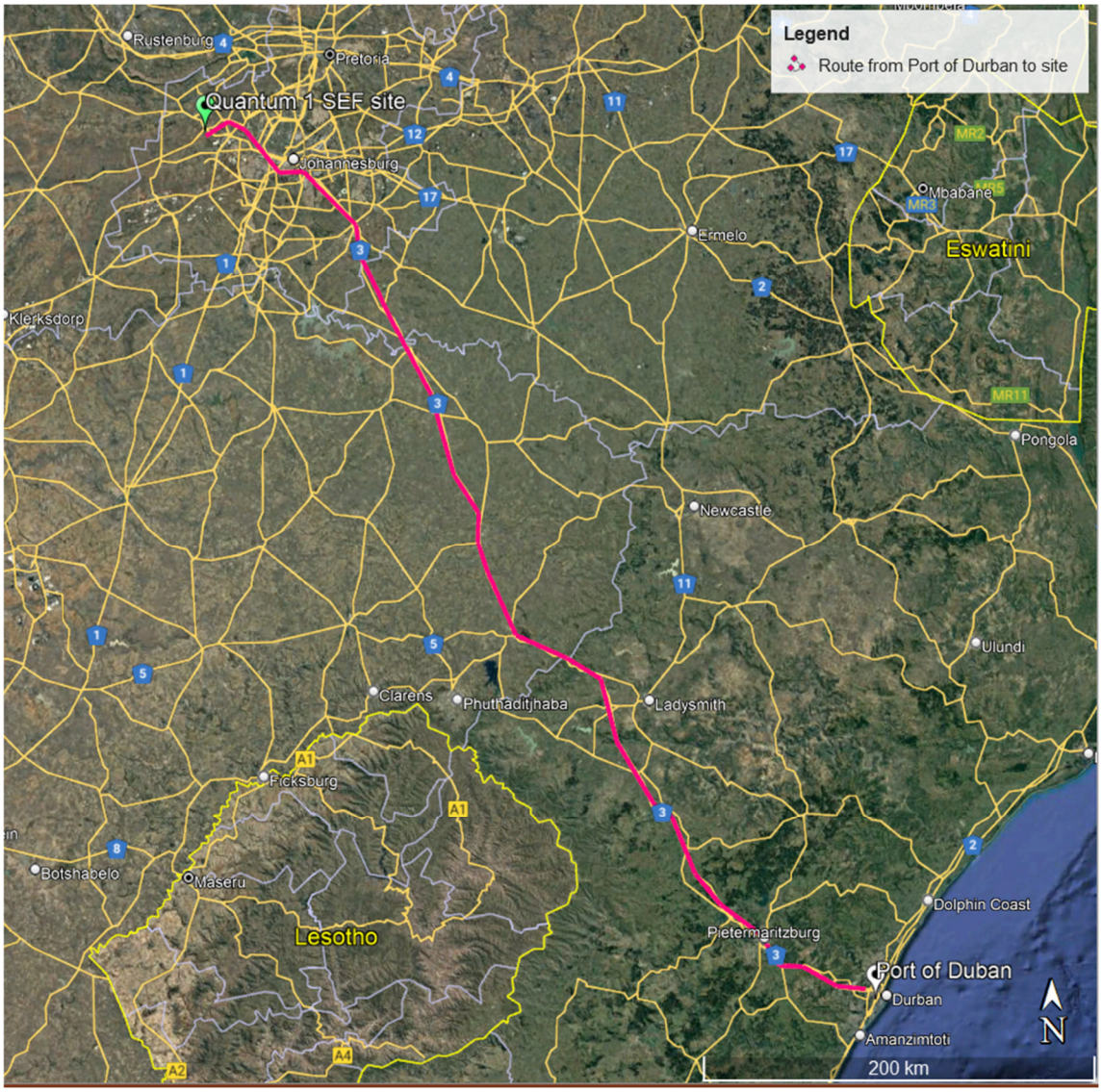

Figure 5-3: Route from Port of Durban to the project site

5.2 Transportation requirements

It is anticipated that the following vehicles will access the site during construction:

Solar PV:

- Conventional trucks within the freight limitations to transport building material to the site;
- 40ft container trucks transporting solar modules, frames, and the inverter, which are within freight limitations;
- Flatbed trucks transporting the solar modules and frames, which are within the freight limitations;
- Light Differential Vehicle (LDV) type vehicles transporting workers from surrounding areas to site;
- Drilling machines and other required construction machinery being transported by conventional trucks or via self-drive to site; and
- At present it is not planned to make use of large transformers, which would need to be transported as an abnormal load. However, for the completeness of this report, it needs to be highlighted that if larger (i.e., 500mva) transformers are selected, an abnormal loads vehicle and permission will be required.

5.3 Abnormal Load Considerations

Abnormal permits are required for vehicles exceeding the following permissible maximum dimensions on road freight transport in terms of the Road Traffic Act (Act No. 93 of 1996) and the National Road Traffic Regulations, 2000:

- Length: 22 m for an interlink, 18.5 m for truck and trailer and 13.5 m for a single unit truck
- Width: 2.6 m Height: 4.3m measured from the ground. Possible height of load – 2.7 m.
- Weight: Gross vehicle mass of 56t resulting in a payload of approximately 30t
- Axle unit limitations: 18t for dual and 24t for triple-axle units
- Axle load limitation: 7.7t on the front axle and 9t on the single or rear axles

Any dimension / mass outside the above will be classified as an Abnormal Load and will necessitate an application to the Department of Transport and Public Works for a permit that will give authorisation for the conveyance of said load. A permit is required for each Province that the haulage route traverses.

In addition to the above, the preferred routes for abnormal load travel should be surveyed prior to construction to identify any problem areas, e.g., intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients, which may require modification. After the road modifications have been implemented, it is recommended to undertake a “dry-run” with the largest abnormal load vehicle, to ensure that the vehicle can travel without disruptions. It needs to be ensured that gravel sections (if any) of the haulage routes remain in good condition and will need to be maintained during the additional loading of the construction phase and reinstated after construction is completed.

There are bridges and culverts along the National and Provincial routes, which need to be confirmed for load bearing capacity and height clearances. However, there are alternative routes which can be investigated if the selected route or sections of the route should not be feasible.

Any low hanging overhead lines (lower than 5.1 m), e.g., Eskom and Telkom lines, along the proposed routes will have to be moved to accommodate the abnormal load vehicles.

5.4 Further Guideline Documentation

The Technical Recommendations for Highways (TRH) 11: "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outlines the rules and conditions that apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts.

The general conditions, limitations and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power / mass ratio, mass distribution and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the Road Traffic Act and the relevant regulations.

5.5 Permitting – General Rules

In general, the limits recommended in TRH 11 are intended to serve as a guide to the Permit Issuing Authorities. It must be noted that each Administration has the right to refuse a permit application or to modify the conditions under which a permit is granted. It is understood that:

a) A permit is issued at the sole discretion of the Issuing Authority. The permit may be refused because of the condition of the road, the culverts and bridges, the nature of other traffic on the road, abnormally heavy traffic during certain periods or for any other reason.
b) A permit can be withdrawn if the vehicle upon inspection is found in any way not fit to be operated.
c) During certain periods, such as school holidays or long weekends an embargo may be placed on the issuing of permits. Embargo lists are compiled annually and are obtainable from the Issuing Authorities.

5.6 Load Limitations

The maximum load that a road vehicle or combination of vehicles will be allowed to carry legally under permit on a public road is limited by:

- the capacity of the vehicles as rated by the manufacturer,
- the load which may be carried by the tyres,
- the damaging effect on pavements,
- the structural capacity on bridges and culverts,
- the power of the prime mover(s),
- the load imposed by the driving axles, and
- the load imposed by the steering axles.

5.7 Dimensional Limitations

A load of abnormal dimensions may cause an obstruction and danger to other traffic. For this reason, all loads must, as far as possible, conform to the legal dimensions. Permits will only be considered for indivisible loads, i.e., loads that cannot, without disproportionate effort, expense, or risk of damage, be divided into two or more loads for the purpose of transport on public roads. For each of the characteristics below there is a legally permissible limit and what is allowed under permit:

- Width,
- Height,

- Length,
- Front Overhang,
- Rear Overhang,
- Front Load Projection,
- Rear Load Projection,
- Wheelbase,
- Turning Radius, and
- Stability of Loaded Vehicles.

5.7.1 Route for Components manufactured within South Africa

In South Africa, more than half (52%) of the manufacturing industry's national workforce resides in three metros - Johannesburg, Cape Town, and eThekwini. It is therefore anticipated that elements ,that can be manufactured within South Africa, will be transported to the site from the Cape Town, Johannesburg, or Pinetown/Durban areas. Components will be transported to site using appropriate National and Provincial routes. It is expected that the components will generally be transported to site with normal heavy load vehicles.

5.7.1.1 Route from Cape Town Area to Site – Locally sourced materials and equipment

Cape Town has a large manufacturing sector with twenty-six (26) industrial areas located throughout the metro. The proposed industrial hubs being considered to source the required materials and components is currently unknown. With quite an extensive and widespread industrial market, a specific route to the site cannot be considered at this point in time, but it is expected that a majority of the route lengths will be similar to the routes considered for the haulage of imported materials and equipment. No road limitations are envisaged along the route for normal load freight. The estimated travel distance is around 1 420 kms via the N1 and N12 (see **Figure 5-4**).

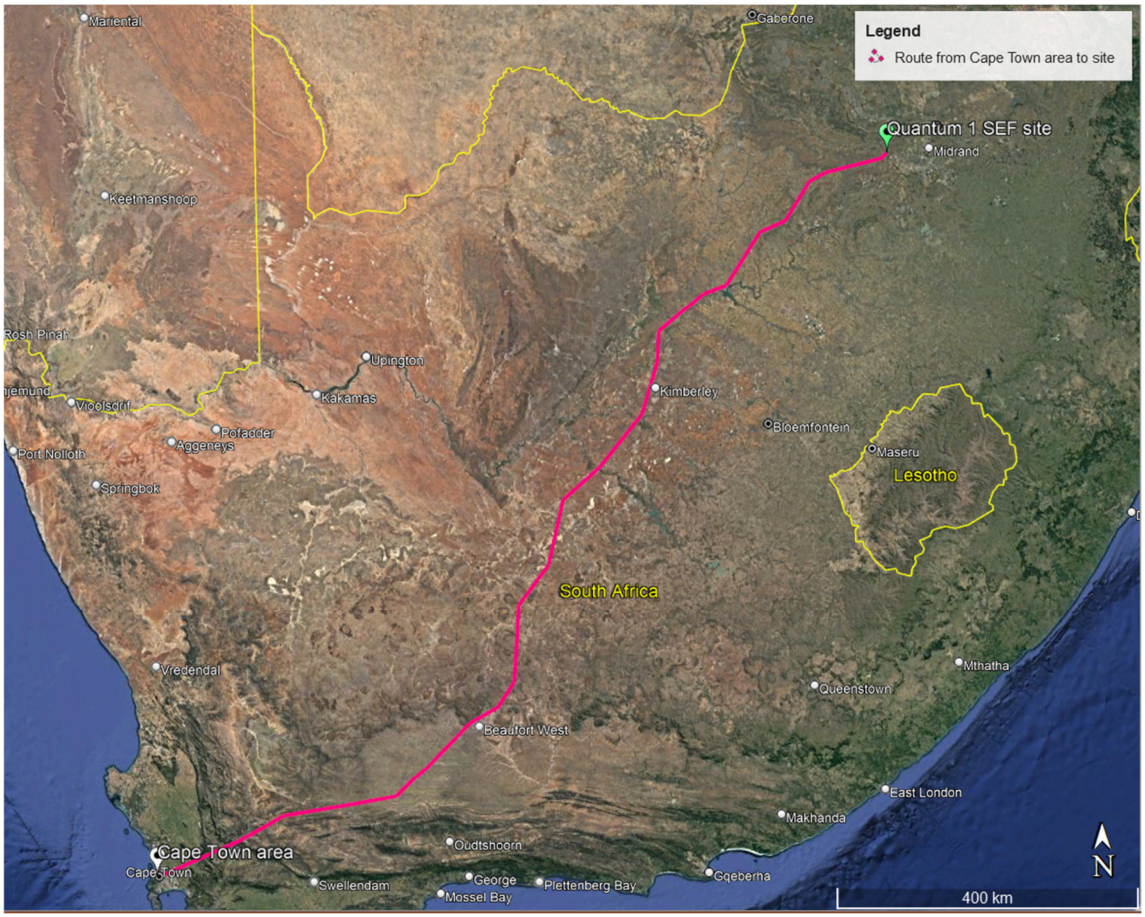

Figure 5-4: Route from Cape Town area to project site

5.7.1.2 Routes from Johannesburg Area to Site – Locally sourced materials and equipment

If components will be delivered from the Johannesburg area, normal loads can be transported via several routes to site as the project will be located a mere ~30 km from Johannesburg. The exact route will be established by the appointed haulage company. No road limitations are envisaged along the route for normal load freight.

5.7.1.3 Route from Pinetown area to Site - Locally sourced materials and equipment

Normal loads can transport elements via two potential routes from Durban and Pinetown to the site. No road limitations are envisaged along the route for normal load freight. The travel distance from Pinetown to the site via the N3 is approximately 600 km (see **Figure 5-5**).

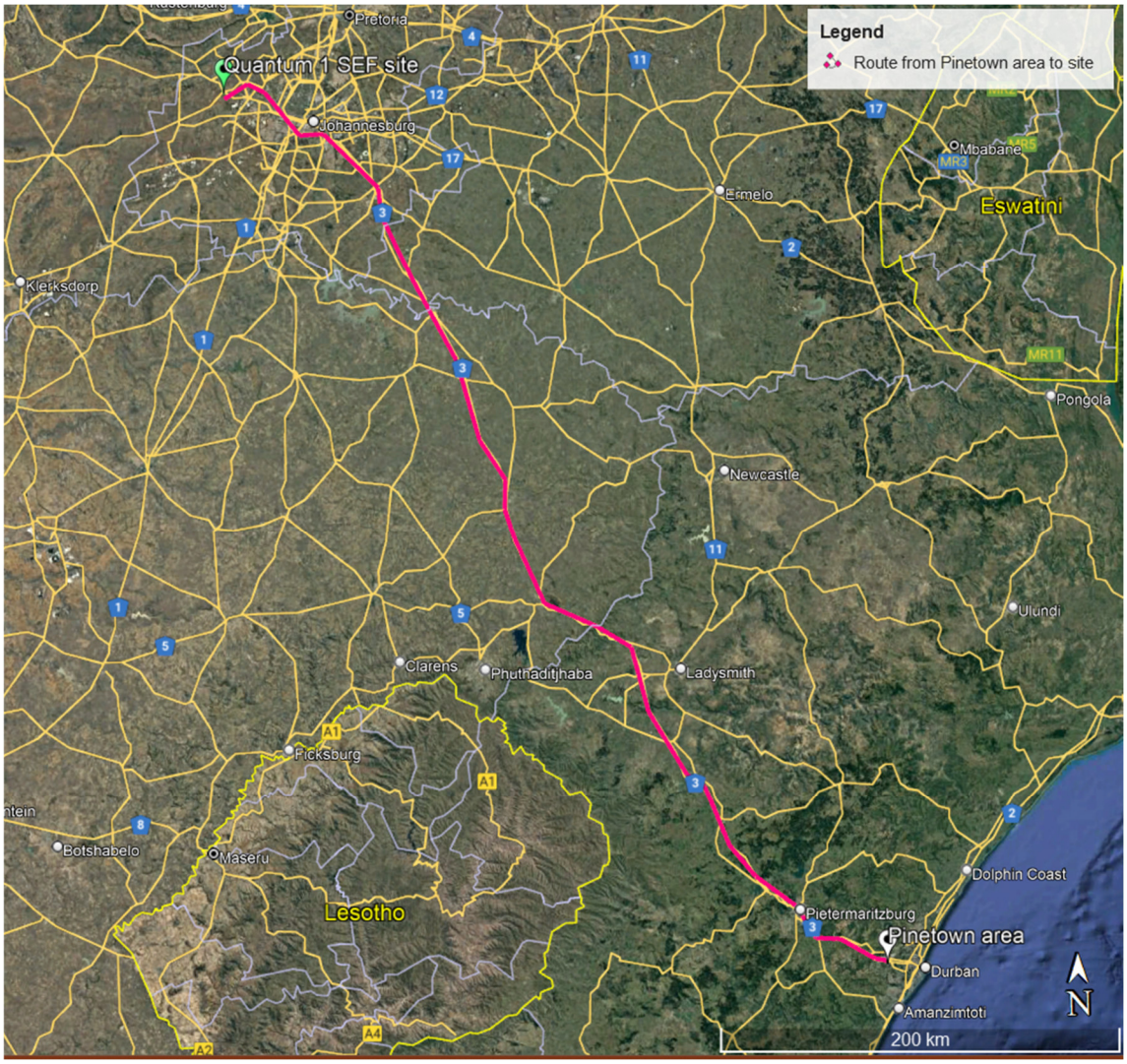

Figure 5-5: Route from Pinetown area to the project site

5.7.2 Surrounding road network

The construction vehicles for the proposed Quantum 1 SEF Facility will take access from an existing farm road that connects with the R24 on the northern side of the project site as described under 4.3. The R24 runs from Magaliesburg past the site and traverses Krugersdorp into the Johannesburg area and has a length of around 50 km (see **Figure 5-6**). According to the road classification of the surrounding road network as per the *Road Infrastructure Strategic Framework for South Africa (RISFSA)* and *COTO's TRH26 South African Road Classification and Access Management Manual*, the R24 can be classified as **Class 2 rural minor arterial**, which typically carries inter-district traffic between:

- Small towns, villages and larger rural settlements (population typically less than about 25 000);
- Smaller commercial areas and transport nodes of local importance that generate relatively high volumes of freight and other traffic in the district (public transport and freight terminals, railway sidings, small seaports and landing strips);
- Very small or minor border posts;
- Tourist destinations;
- Other Class 1, 2 and 3 routes.
- Smaller centres than the above when travel distances are relatively long (longer than 50 to 100 km).

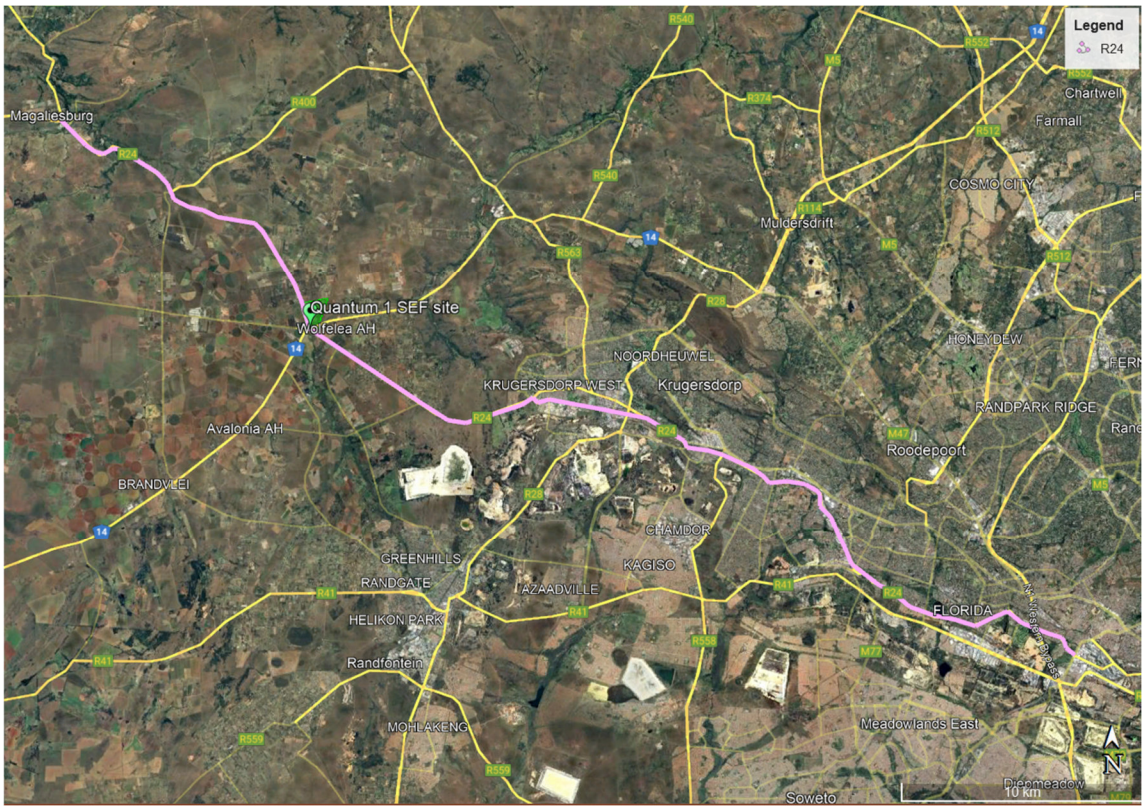

Figure 5-6: Aerial view of R24

6 ISSUES, RISKS AND IMPACTS

6.1 Identification of Potential Impacts/Risks

The potential impact on the surrounding environment is expected to be generated by the development traffic, of which traffic congestion and associated noise, dust, and exhaust pollution form part of. It must be noted that the significance of the impact is expected to be higher during the construction and decommissioning phases because these phases generate the highest development traffic.

6.2 Construction phase

This phase includes the transportation of people, construction materials and equipment to the site. This phase also includes the construction of the solar power facility and associated infrastructure, including grid connections, construction of footings, roads, excavations, trenching, and ancillary construction works. This phase will temporarily generate the most development traffic.

6.2.1 Nature of impact

The nature of the impact expected to be generated at this phase would be traffic congestion and delays on the surrounding road network as well as the associated noise, dust, and exhaust pollution due to the increase in traffic.

6.2.2 Significance of impact without mitigation measures

Traffic generated by the construction of the solar facility will have a notable impact on the surrounding road network. The exact number of trips generated during construction can only be determined later in the project when the contractor and the haulage company are appointed and once more detail is available regarding the staff requirements and where equipment is sourced from. In the interim, an estimate will be made as follows for the purpose of this report.

6.2.3 Estimated peak hour traffic for the solar panel components

At present, solar panels are locally produced in South Africa by only a few select firms. The largest of them is located in Pinetown, Kwa-Zulu Natal. Owing to their limited annual production capacity of approximately 325MW, the bulk of solar modules being deployed on South African PV projects are imported, primarily from the Far East. Where panels are sourced locally, these are typically delivered to site via flatbed trucks.

For the purpose of the Transport study and calculation of trips, it is assumed that all panels will be imported. Considering a loading capacity of around 600 solar panels per 40tf container, the total number of trips will result in approximately 34 trips for a 10 MW development. If these trips are distributed over a couple of days, the **estimated daily trips are 11** (i.e., over three days). Looking at approximately 30% of these trips occurring during the peak traffic periods, the number of trips for the delivery of the panels during peak traffic is estimated to be around 4 trips, which can be accommodated by the external road network.

6.2.4 Estimated staff trips

From experience with similar projects, around 100 workers are estimated to be active on-site during construction and **the resulting daily staff trips are then 30** (shown in **Table 6-1**).

Table 6-1: Estimation of daily staff trips

Vehicle Type	Number of vehicles	Max. Number of Employees
Car	5	5 (assuming 1 occupant)
Bakkie	10	20 (assuming 2 occupants)
Taxi – 15 seats	15	75
Total	***30***	***100***

6.2.5 Estimated material trips

The exact number of vehicle trips for the transportation of materials during the construction phase depends on the type of vehicles, planning of the construction, source/location of construction material, etc. However, for the purpose of this study, it was estimated that at the peak of construction, **approximately 50 construction vehicle trips will access the site per day**.

The total estimated daily site trips, at the peak of construction, are shown in **Table 6-2** below.

Table 6-2: Estimation of daily site trips

Activity	Number of daily trips
Solar panel component delivery	11
Staff transport	30
Material delivery	50
Total	**91**

With the recommended mitigations in this report, the impact on the surrounding road network and the general traffic is deemed acceptable, as the 91 trips will be distributed over a 9-hour workday. It is expected that the majority of the trips will occur outside the peak hours.

It must also be noted that vehicle trips from material delivery vary depending on the construction task/program, fuel supply arrangements, as well as distance from the material source to the site. Project planning can be used to reduce material delivery during peak hours.

The development traffic impact during the construction phase can be assessed as manageable, considering that the construction phase is temporary in nature and mitigation measures, mentioned in this report, are adhered to and keep the impact level low.

6.3 Operational Phase

This phase includes the operation and maintenance of the Quantum 1 SEF Facility throughout its life span.

6.3.1 Nature of impact

The nature of the impact expected to be generated at this phase would be traffic and the associated noise, dust and exhaust pollution due to the operational traffic trips.

6.3.2 Estimated peak hour traffic generated during operation

The exact number of permanent staff expected for the operational phase is still unknown. Based on similar studies, it can be estimated that approximately 5 full-time employees will be stationed on site. Assuming a worst-case scenario of 30% of the trips occurring during peak traffic periods, approximately 2 peak hour trips are estimated for the operational phase, which will have a nominal impact on the external road network.

It is assumed that the solar modules would need to be cleaned twice a year. No further information on which cleaning method and technology will be used is available at this point in time. The following assumptions have been made to estimate the resulting trips generated from transporting water to the site:

- 5 000-liter water bowsers to be used for transporting the water (water bowsers between 5 000-litre and 20 000-litre are available in South Africa. For the purpose of this study, the smallest bowser was chosen);
- Approximately 5 litres of water needed per panel;
- Assuming that a maximum of 20 000 panels are used, this would amount to approximately 20 vehicle trips; and
- Solar modules will be cleaned twice a year.

To limit any traffic impact on the surrounding road network, it is recommended to schedule these trips outside of peak traffic periods and to clean the solar modules over the course of a few days i.e., spread the trips over a two days, which would reduce the daily trips to 20 and the peak hour trips to max 7 (i.e., max ~30%). Additionally, the provision of rainwater tanks on site or borehole water would decrease the number of trips.

6.3.3 Proposed general mitigation measures

The following are general mitigation measures to reduce the impact that the additional traffic will have on the road network and the environment:

- The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- Dust suppression of gravel roads located within the site boundary, including the main access road to the site and the site access roads, during the construction phase, if required.
- Regular maintenance of gravel roads located within the site boundary, including the access roads to the site, by the Contractor during the construction phase and by the Owner/Facility Manager during the operational phase, if required.
- The use of quarries near the site would decrease the traffic impact on the surrounding road network, if available and feasible.
- Staff and general trips should occur outside of peak traffic periods as far as possible.
- The Contractor should ensure that all drivers, entering the site, adhere to the traffic laws.
- Vehicular movements within the site boundary are the responsibility of the respective Contractor and the Contractor must ensure that all construction road traffic signs and road markings (where applicable) are in place. It should be noted that traffic violations on public roads are the responsibility of Law Enforcement, and the public should report all transgressions to Law Enforcement and the Contractor.

- If required, low hanging overhead lines (lower than 5.1m) e.g., Eskom and Telkom lines, along the proposed routes will have to be moved (to be arranged by the haulage company and communicated beforehand with the service provider of the OHL) to accommodate the abnormal load vehicles. The Contractor and the Developer are to ensure that the haulage company is aware of this requirement.
- The haulage company is to provide evidence to the Contractor and the Developer that any affected overhead lines have been moved or raised.
- The preferred route should be surveyed by the developer to identify problem areas (e.g., intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients, which may require modification). After the road modifications have been implemented, it is recommended to undertake a "dry-run" with the largest abnormal load vehicle, prior to the transportation of any components, to ensure that delivery will occur without disruptions. This process is to be undertaken by the haulage company transporting the components and the contractor, who will modify the road and intersections to accommodate abnormal vehicles. The "dry-run" should be undertaken within the same month that components are expected to arrive. The haulage company is to provide evidence that the route has been surveyed and deemed acceptable for the transportation of the abnormal load.
- The Contractor needs to ensure that the gravel sections of the haulage routes (i.e., the site access road and the main access road to the site) remain in good condition and will need to be maintained during the additional loading of the construction phase and reinstated after construction is completed.
- Design and maintenance of internal roads. The internal gravel roads will require grading with a grader to obtain a camber of between 3% and 4% (to facilitate drainage) and regular maintenance blading will also be required. The geometric design of these gravel roads needs to be confirmed at detailed design stage. This process is to be undertaken by a civil engineering consultant or a geometric design professional.

6.3.4 Significance of impact with mitigation measures

It should be noted that the construction phase is temporary and short term in nature and the associated impacts can be mitigated to an acceptable level.

The proposed mitigation measures for the construction traffic will result in a reduction of the impact on the surrounding road network and the impact on the local traffic will be low as the existing traffic volumes are deemed to be low. Dust suppression will result in significantly reducing the impact.

6.3.5 Decommissioning phase

This phase will have similar impacts and generated trips as the Construction Phase.

6.3.6 Cumulative Impacts

To assess a cumulative impact, it is generally assumed that all currently approved and authorized projects within a 30 km radius would be constructed at the same time. At the time of preparing this report, two approved solar energy developments were shown on the *DFFE Renewable Projects Database* (see **Figure 6-1**):

- 12/12/20/2330: 15 MW Magalies Solar Energy Farm (near Vlakdrift approximately 20km north-west of the Quantum 1 SEF site); and
- 12/12/20/2539: 70 MW Solar Farm (near Krugersdorp approximately 3 km south-east of the Quantum 1 SEF site).

It is a precautionary approach to evaluate all planned and authorized projects simultaneously as in reality, these projects would be subject to a highly competitive bidding process and not all the projects may be selected to enter into a Power Purchase Agreement. Even if all the facilities are constructed and/or decommissioned at the same time, the roads authority will consider all applications for abnormal loads and work with all project companies to ensure that loads on the public roads are staggered and staged to ensure that the impact will be acceptable.

The construction and decommissioning phases of a renewable energy project are the only significant traffic generators. The duration of these phases is short term, i.e., the potential impact of the traffic generated during the construction and decommissioning phases on the surrounding road network is temporary and solar projects, when operational, do not add any significant traffic to the road network.

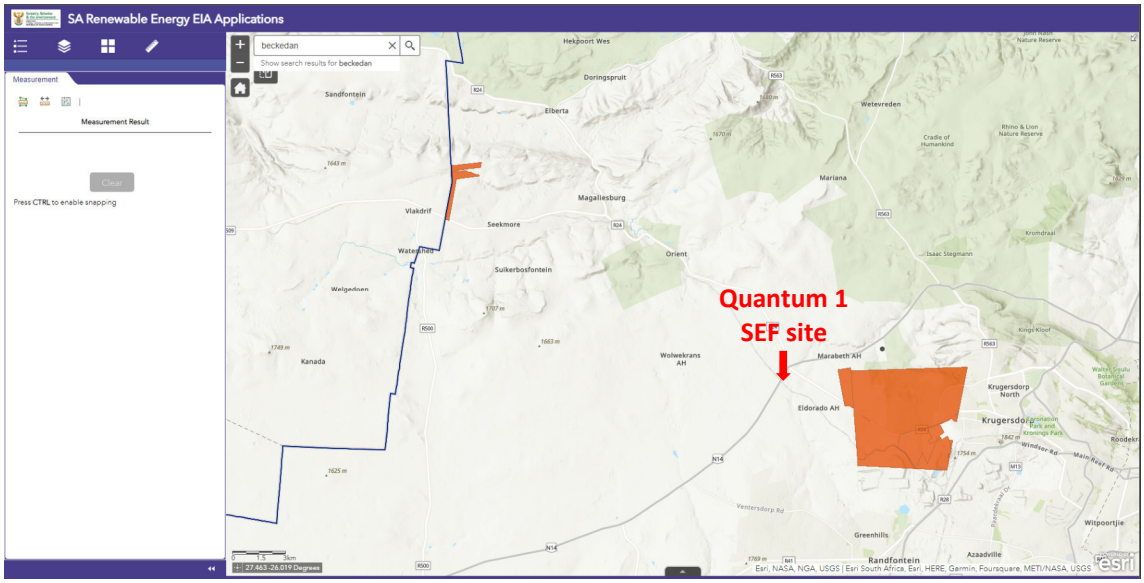

Figure 6-1: DFFE Renewable Projects Database – Projects in 30km radius from project site

It is noted that it is unlikely that Quantum PV 1 and the other authorized will be constructed at the same time. However, for the event that the two developments have similar construction periods, it is recommended to agree on a delivery schedule between them to reduce development trips and consequently the impact on the external road network.

7 IMPACT ASSESSMENT

7.1 Potential Impact during the Construction Phase

The construction phase will generate traffic including transportation of people, construction materials, water, and equipment (abnormal trucks transporting the transformers). The exact number of trips generated will be determined at a later stage. Based on the high-level screening of impacts, a negative low impact rating can be expected during the construction phase with mitigation measures (see **Table 7-2**).

Nature of the impact

- Temporary increase in traffic, noise and dust pollution associated with potential traffic.

The impact methodology as provided by the client was utilised (see **Annexure C**).

7.2 Potential Impact (Operational Phase)

Nature of the impact

- Noise and dust pollution associated with potential traffic.

The traffic generated during this phase will have a nominal impact on the surrounding road network. The impact evaluation is shown in **Table 7-3**.

7.3 Potential Impacts during the Decommissioning Phase

This phase will have a similar impact as the construction phase (i.e., traffic congestion, air pollution and noise pollution) as similar trips/movements and associated noise and pollution are expected (see **Table 7-2**).

7.4 Cumulative Impacts during the Construction Phase

For the cumulative impact during the construction phase, any planned or approved projects in a 30km radius are considered. At the time of preparing this report, there were two known approved solar energy developments within the 30 km radius as mentioned under 6.3.6. The resulting rating is shown in **Table 7-4**.

7.5 Impact Assessment Summary

The overall impact significance findings, following the implementation of the proposed mitigation measures, are shown in **Table 7-1** below.

Table 7-1: Summary of overall Impact Significance

Quantum 1 SEF Project	Overall Impact Rating
Construction (Pre-mitigation measures)	Negative Medium
Operational (Pre-mitigation measures)	Negative Low
Construction (Post-mitigation measures)	Negative Low
Operational (Post-mitigation measures)	Negative Low

Table 7-2: Impact Table – Construction Phase / Decommissioning Phase

Nature: **Increase in trips on external roads due to transport of components, material and labour to site** **Noise/dust pollution during transport and construction activities on site**		
TYPE OF IMPACT	**WITHOUT Mitigation**	**WITH Mitigation**
Extent (E)	National (4)	National (4)
Duration (D)	Short term (2)	Short term (2)
Magnitude (M)	Moderate (6)	Low (4)
Probability (P)	Probable (3)	Improbable (2)
Significance (S) S=(E+D+M) x P	**Medium (36)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation: ▪ Source equipment, machinery and material locally as far as possible. ▪ Stagger deliveries of components to site and scheduled to occur outside of peak traffic periods as much as possible. ▪ Dust suppression of gravel roads close to and on site. ▪ Regular maintenance of gravel roads located within the site boundary, including the access road to the site. ▪ The use of quarries near the site as much as possible. ▪ Staff trips to occur outside of main peak traffic periods as far as possible. ▪ Delivery Management Plan		
Residual Risk: Low		

Table 7-3: Impact Table – Operational Phase

Nature: **Slight increase of vehicle trips due to permanent staff traveling to site, periodically (bi-annual) trips to site for transport of water and irregular maintenance trips.**		
TYPE OF IMPACT	**WITHOUT Mitigation**	**WITH Mitigation**
Extent (E)	Local (2)	Local (2)
Duration (D)	Long term (4)	Long term (4)
Magnitude (M)	Low (4)	Minor (2)
Probability (P)	Improbable (2)	Improbable (2)
Significance (S) S=(E+D+M) x P	**Low (20)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation: Source on-site water supply if possible and use cleaning systems for the panels needing less vehicle trips. Schedule trips for the provision of water for the cleaning of panels outside peak traffic times as much as possible.		
Residual Risk: Low		

Table 7-4: Cumulative Impact (Construction Phase)

Nature: **Increase in trips on external roads due to transport of components, material and labour to site** **Noise/dust pollution during transport and construction activities on site**		
TYPE OF IMPACT	**Overall impact of the proposed project considered in isolation**	**Cumulative impact of the project and other projects in the area**
Extent (E)	National (4)	National (4)
Duration (D)	Short term (2)	Short term (2)
Magnitude (M)	High (8)	High (8)
Probability (P)	Probable (3)	Probable (3)
Significance (S) S=(E+D+M) x P	**Medium (42)**	**Medium (42)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Same as Table 7-2. However, it is noted that it is deemed unlikely that both developments will be constructed at the exact same time. However, for the event that the developments have similar construction periods, it is recommended to agree on a delivery schedule and stagger deliveries of components to outside of peak traffic periods as much as possible.		
Residual Risk: Low		

8 NO-GO ALTERNATIVE

The no-go alternative implies that the proposed Quantum 1 SEF project as well as the associated infrastructure do not proceed. This would mean that there will be no negative environmental impacts and no traffic impact on the surrounding network during the construction and decommissioning phases. However, this would also mean that there would be no socio-economic benefits to the surrounding communities, and it will not assist government in meeting its targets for renewable energy. Hence, the no-go alternative is not a preferred alternative.

9 CONCLUSION AND RECOMMENDATIONS

The potential traffic and transport related impacts for the construction, operation and decommissioning phases of the proposed Quantum 1 SEF project were identified and assessed.

- The main impact on the external road network will be during the construction phase. This phase is temporary in comparison to the operational period. The number of abnormal loads vehicles was estimated and to be found to be able to be accommodated by the road network including the recommended mitigation measures.
- During operation, it is expected that maintenance and security staff will periodically visit the facility and water be transported to site possibly twice a year for the cleaning of panels. The generated trips can be accommodated by the external road network and the impacts are rated **negative low** with mitigation measures.
- The traffic generated during the construction phase, although significant, will be temporary and impacts are considered to be of medium negative impact. However, *after mitigation* a rating of **negative low** impact can be given.
- The traffic generated during the decommissioning phase will be similar to or even less than the construction phase traffic and the impact on the surrounding road network will also be considered to be of **negative low** impact after mitigation.
- Two other projects within a 30 km radius from the project site were taken into consideration for the cumulative impact. With mitigation, the cumulative impact ca be rates as **negative low**.

The potential mitigation measures mentioned in the construction and decommissioning phases are:

- Dust suppression of internal gravel roads and the access roads.
- Component delivery to/ removal from the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- The use of mobile batching plants and quarries near the site would decrease the impact on the surrounding road network, if available and feasible.
- Staff and general trips should occur outside of peak traffic periods.
- A “dry run” of the preferred route by the haulage company. Should the haulage company be familiar with the route, evidence is to be provided to the Client and the Contractor.
- Design and maintenance of the internal gravel roads and maintenance of the access roads.
- If required, any low hanging overhead lines (lower than 5.1m) e.g., Eskom and Telkom lines, along the proposed routes will have to be moved (to be arranged by haulage company and agreed on with the service provider of the OHL) or raised to accommodate the abnormal load vehicles.

The construction and decommissioning phases of a solar power facility are the only significant traffic generators and therefore noise and dust pollution will be higher during these phases. The duration of these phases is of temporary nature, i.e., the impact of the solar power facility on the external traffic on the surrounding road network is temporary and solar facilities, when operational, do not add any significant traffic to the road network.

The proposed development of the Quantum 1 SEF Energy Facility is supported from a traffic engineering perspective provided that the recommended mitigation measures are adhere to.

10 REFERENCES

- Road Traffic Act, 1996 (Act No. 93 of 1996)
- National Road Traffic Regulations, 2000
- SANS 10280/NRS 041-1:2008 - Overhead Power Lines for Conditions Prevailing in South Africa
- Transnetportterminals.net. n.d. *Transnet Port Terminals*. [online] Available at: <https://www.transnetportterminals.net/Ports/Pages/default.aspx>
- The Technical Recommendations for Highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads

Annexure A: Specialist Expertise

SUMMARY OF EXPERIENCE

Iris is a Professional Engineer registered with ECSA (20110156) and obtained her Master of Science degree in Civil Engineering in Germany in 2003. She has more than 20 years of experience in a wide field of traffic and transport engineering projects.

Iris left Germany in 2003 and has gained work experience as a traffic and transport engineer in South Africa and Germany. She has technical and professional skills in traffic impact studies, public transport planning, non- motorised transport planning and design, design and development of transport systems, project planning and implementation for residential, commercial, and industrial projects.

Her passions are the renewable energies and road safety, and she is highly experiences in providing traffic and transport engineering advise.

Iris is registered with the International Road Federation as a Global Road Safety Audit Team Leader and is a regular speaker at conferences, seminars and similar.

PROFESSIONAL REGISTRATIONS & INSTITUTE MEMBERSHIPS

PrEng	Registered with the Engineering Council of South Africa No. 20110156 Registered Mentor with ECSA
MSAICE	Member of the South African Institution of Civil Engineers
ITSSA	Member of ITS SA (Intelligent Transport Systems South Africa)
SAWEA	Member of the South African Wind Energy Association
SARF	South African Road Federation: Committee Member of Council
SARF WR	South African Road Federation Western Region – Chair
SARF RSC	South African Road Federation National Road Safety Committee
IRF	Registered as International Road Safety Audit Team Leader

EDUCATION

1996 – Matric (Abitur)	Carl Friedrich Gauss Schule, Hemmingen, Germany
1998 - Diploma (Draughtsperson)	Lower Saxonian State Office for Road Engineering
2002 – BSc Eng (Civil)	Leibniz Technical University of Hannover, Germany
2003 - MSc Eng (Civil & Transpt)	Leibniz Technical University of Hanover, Germany

Master Thesis on the Investigation of the allocation of access rights *to the European rail network infrastructure - Research of the feasibility of the different bidding processes to allocate access rights of railway operators in the European railway market. Client: Technical University of Berlin and German Railway Company.*

SUMMARY OF EXPERIENCE

iWink Consulting (Pty) Ltd – Independent Consultant

2022 – present
Position: Independent Consultant – working as an independent Specialist in the field of Traffic & Transport Engineering, Renewable Energies and Road Safety.

JG Afrika (Pty) Ltd (Previously Jeffares & Green (Pty) Ltd)

2016 – 2022
Position: Associate / Division Head: Traffic & Transport Engineering

Jeffares & Green (Pty) Ltd

2012 – 2016
Position: Senior Traffic & Transport Engineer

Arup (Pty) Ltd

2010 - 2012
Position – Senior Traffic & Transport Engineer

Arup (Pty) Ltd

2004 - 2010
Position – Traffic & Transport Engineer

Schmidt Ingenieursbüro, Hannover, Germany

2000
Position – Engineering Assistant

Leibniz University of Hannover, Germany

2000 - 2003
Position – Engineering Researcher - Institute for Road & Railway Engineering

SELECTION OF PROJECTS

Please note: The below lists show only a *selection* of projects that Iris has been involved in over the last 20 years. More information and a complete Schedule of Experience can be made available on request.

RENEWABLE ENERGY PROJECTS

Transport Impact Assessments /Traffic Management Plans for:

- Mayogi Solar PV Project
- AGV Red Sands Solar Project
- Cradock – Kaladokhwe WEFs
- Britstown WEFs
- Highveld Solar Cluster
- Dealsville & Bloemfontein Solar PV
- Great Karroo Wind and Solar Cluster
- Ummbila Emoyeni Solar Project
- Poortjie Wind&Solar
- Hydra B Solar Cluster
- Choje Windfarm, Eastern Cape
- Richards Bay Gas to Power Project
- Oya Black Mountain Solar Project
- De Aar Solar Project
- Euronotus Wind & Solar Cluster
- Pienaarspoort Wind Energy Project
- Karreebosch Wind Energy Project
- Dyasonsklip Solar Project
- Kuruman Windfarm
- Bloemsmond Solar Farms
- Hendrina Wind Energy Project
- Orkney Solar Project
- Bulskop Solar Project
- Hyperion Solar & Thermal Project
- Gromis & Komas Wind Energy Projects
- Kudusberg & Rondekop Wind Energy Projects
- Bayview Windfarm
- Coega West Windfarm
- Suikerbekkie Solar Project
- Poortjie Solar Project
- Northam Solar Project

- Sibanye Solar Project
- Du Plessis Dam Solar Project
- Mercury Solar Project
- Aberdeen Wind Energy Project
- Saldanha Wind and Solar Projects
- Ummbila Emoyeni Wind Energy Project
- Springhaas Solar Project

Clients:

- G7 Energies
- ABO Wind Renewable Energies
- Atlantic Renewable Energy Partners
- Mulilo
- Acciona
- Enel
- Engie
- DNV GL
- Enertrag
- Scatec Solar
- Red Rocket Energies
- Windlab
- Mainstream
- Africoast
- Genesis

FURTHER PROJECTS

Traffic Impact Studies & Site Development Plan Input:

- Nooiensfontein Housing Development, City of Cape Town
- Belhar Housing Development, City of Cape Town
- Baredale Phase 7, City of Cape Town
- Beau Constantia Wine Farm
- Constantia Glen Wine Farm
- Eagles Nest Wine Farm
- Groenvallei Parking Audit, City of Cape Town
- Kosovo Housing Development, Western Cape Government
- Enkanini Housing Development, Stellenbosch
- Delft Housing Development, City of Cape Town
- Secunda Sasol, Free State
- Marula Platinum Mine
- InnerCity Transport Plan, City of Cape Town
- Stellenbosch Road Master Plan
- Nyanga Public Transport Interchange
- Crawford Campus Cape Town
- Durban RoRo Car Terminal, Transnet

- Durban Farewell Container Site
- Msunduzi Waterfront Housing Development
- Transnet Park Site – Traffic Management and Evacuation Plans
- UWC Bellville Medical Campus
- Bloekombos District Hospital
- Malabar Extension 3, Port Elizabeth

Traffic Engineering for Roads Projects:

- Ekhurhuleni Bus Stops and Intersection Safety Assessments
- Namibia Noordoewer to Rosh Pina, Road Agency Namibia
- N2 Section 19 Mthatha – NMT Studies
- R63 Alice to Fort Beaufort – NMT, Road Link and Intersection Studies
- N2 Kangela to Pongola Upgrade
- Cofimvaba Eastern Cape – NMT, Road and Intersection Upgrades
- Stellenbosch R44 Traffic Signals
- Secunda Traffic Signals
- Fezile Dabi District Gravel Roads Upgrade, Free State Province
- Zambia RD Rehabilitation Project
- R61 Eastern Cape – NMT Studies, SANRAL

CONTINUED PROFESSIONAL DEVELOPMENT (CPD)

*Last five years*full CPD list available*

2023 – International Traffic Safety Conference, Doha – Speaker

2022 – 7th Regional Conference for Africa & PIARC International Seminar on Rural Roads and Road Safety - Speaker

2022 – Non-motorised Transport Seminar (SARF) – Co-Organizer / Speaker

2021 – SARF KZN Road Safety Considerations (SARF) – Guest Speaker

2021 – Road Safety Audit Course (IRF) – Guest Speaker

2021 – Legal Obligations / Road Safety Act (SARF) – Presenter

2020 – Understanding Road Accidents (SARF)

2020 – Road Safety Auditor Course (SARF) – Co-Lecturer

2018 – African Road Conference (IRF/SARF/PIARC)

2018 – Road Safety in Engineering (SARF) – Presenter

2016 - SATC Road Safety Audit Workshop Pretoria (SARF)

2015 - Non-motorised Transport Planning (SARF

Annexure B: Specialist Statement of Independence

I, Iris Sigrid Wink, 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 favourable 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 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist: _____

Name of Company: iWink Consulting (Pty) Ltd

Date: 19-07-2023

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Quantum 1 Solar PV Facility, Mpumalanga Province

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	iWink Consulting (Pty) Ltd.			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100
Specialist name:	Iris Wink			
Specialist Qualifications:	MScEng (Civil)			
Professional affiliation/registration:	PrEng 20110156			
Physical address:	44 Plattekloof Street. Plattekloof Glen			
Postal address:	same			
Postal code:	7460	Cell:	082 691 9096	
Telephone:	n/a	Fax:	n/a	
E-mail:	iris@iwink.co.za			

2. DECLARATION BY THE SPECIALIST

I, IRIS WINK, 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 favourable 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 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

iWink Consulting (Pty) Ltd

Name of Company:

12/06/23

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, IRIS WINK, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

WiC

Signature of the Specialist

iWink Consulting (Pty) Ltd

Name of Company

12/06/23

Date

Signature of the Commissioner of Oaths

GUSTAV HEINRICH WEHMEYER
KOMMISSARIS VAN EDE 12/6/23
COMMISSIONER OF OATHS
PRAKTISERENDE PROKUREUR R.S.A.
PRACTISING ATTORNEY R.S.A.
MAHOGANYSINGEL 8, BELLVILLE
7530. R.S.A.

Date

Annexure C: Impact Rating Methodology

1. PROJECT SPECIFIC INFORMATION

Please use the information in the project descriptions provided for the individual projects.

The proposed development requires Environmental Authorisation in terms of the National Environmental Management Act (Act 107 of 1998) from the Department of Forestry, Fisheries, and the Environment (DFFE).

A detailed project description for each of the respective projects will be distributed following appointment.

2. REPORT FORMAT

Dependent on the information provided in the LOA.

Please submit your signed Specialist Declaration with your draft report.

Specialist reports will meet the requirements as per Appendix 6 of the 2014 EIA Regulations, as amended and/or the relevant specialist protocols of GNR320 of 20 March 2020 and GNR1150 of 30 October 2020.

(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;
- (b) a declaration that the specialist is independent in a form as may be specified by the competent authority;
- (c) an indication of the scope of, and the purpose for which, the report was prepared;
  - (cA) an indication of the quality and age of base data use for the specialist report;
  - (cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;
- (d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;
- (e) a description of the methodology adopted in preparing the report or carrying out the specialised process;
- (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;
- (g) an identification of any areas to be avoided, including buffers;
- (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;
- (i) a description of any assumptions made and any uncertainties or gaps in knowledge;
- (j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;
- (k) any mitigation measures for inclusion in the EMPr;
- (l) any conditions for inclusion in the environmental authorisation;
- (m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;
- (n) a reasoned opinion—
  - (i) whether the proposed activity, activities or portions thereof should be authorised; and
  - (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;

(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;

(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and

(q) any other information requested by the competent authority.

(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.

BASIC ASSESSMENT REPORTS

Assessment of Impacts

Direct, indirect and cumulative impacts of the issues identified through the scoping study, as well as all other issues identified in the EIA phase must be assessed in terms of the following criteria:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
- The **duration**, wherein it will be indicated whether:
  - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  - medium-term (5–15 years) – assigned a score of 3;
  - long term (> 15 years) - assigned a score of 4; or
  - permanent - assigned a score of 5;
- The **consequences (magnitude)**, quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
- the **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- the **status**, which will be described as either positive, negative or neutral.
- the degree to which the impact can be reversed.
- the degree to which the impact may cause irreplaceable loss of resources.
- the *degree* to which the impact can be *mitigated*.

The **significance** is calculated by combining the criteria in the following formula:

S=(E+D+M)P

S = Significance weighting

E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

» < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
» 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
» > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

Assessment of impacts must be summarised in the following table format. The rating values as per the above criteria must also be included. Complete a table and associated ratings for **each** impact identified during the assessment.

Example of Impact table summarising the significance of impacts (with and without mitigation)

Impact: **[Outline impact anticipated as per the assessment undertaken]** ***Nature:*** **[Describe fully the impact anticipated as per the assessment undertaken]**		
	Without mitigation	**With mitigation**
Extent	High (3)	Low (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Mitigation: "Mitigation", means to anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible. Provide a description of how these mitigation measures will be undertaken keeping the above definition in mind.		
Cumulative impacts: "Cumulative Impact" in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities[1].		
Residual Risks: "Residual Risk", means the risk that will remain after all the recommended measures have been undertaken to mitigate the impact associated with the activity (Green Leaves III, 2014).		

[1] Unless otherwise stated, all definitions are from the 2014 EIA Regulations, GNR 982

Assessment of Cumulative Impacts

As per DEA's requirements, specialists are required to assess the cumulative impacts. In this regard, please refer to the methodology below that will need to be used for the assessment of Cumulative Impacts.

"Cumulative Impact", in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities[2].

The role of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e. whether the addition of the proposed project in the area will increase the impact). This section should address whether the construction of the proposed development will result in:

- Unacceptable risk
- Unacceptable loss
- Complete or whole-scale changes to the environment or sense of place
- Unacceptable increase in impact

The specialist is required to conclude if the proposed development will result in any unacceptable loss or impact considering all the projects proposed in the area.

Example of a cumulative impact table:

Nature: Complete or whole-scale changes to the environment or sense of place (example)		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (1)	Low (1)
Duration	Medium-term (3)	Long-term (4)
Magnitude	Minor (2)	Low (4)
Probability	Improbable (2)	Probable (3)
Significance	**Low (12)**	**Low (27)**
Status (positive/negative)	Negative	Negative
Reversibility	High	Low
Loss of resources?	No	No
Can impacts be mitigated?	Yes	
Confidence in findings: High.		
Mitigation: "Mitigation", means to anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible. Provide a description of how these mitigation measures will be undertaken keeping the above definition in mind.		

[2] Unless otherwise stated, all definitions are from the 2014 EIA Regulations, GNR 982

Environmental Management Plan Table format

Measures for inclusion in the draft Environmental Management Programme must be laid out as detailed below:

OBJECTIVE: Description of the objective, which is necessary in order to meet the overall goals; these take into account the findings of the environmental impact assessment specialist studies

Project component/s	List of project components affecting the objective
Potential Impact	Brief description of potential environmental impact if objective is not met
Activity/risk source	Description of activities which could impact on achieving objective
Mitigation: Target/Objective	Description of the target; include quantitative measures and/or dates of completion

Mitigation: Action/control	**Responsibility**	**Timeframe**
List specific action(s) required to meet the mitigation target/objective described above	Who is responsible for the measures	Time periods for implementation of measures

Performance Indicator	Description of key indicator(s) that track progress/indicate the effectiveness of the management plan.
Monitoring	Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods and reporting