iWink Consulting
Traffic & Transport Engineering
Road Safety

NOTSI SOLAR PV CLUSTER
NOTSI PV 3
Transport Impact Assessment

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Issue 01

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NOTSI PV 3
TRANSPORT IMPACT STUDY

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EXECUTIVE SUMMARY

This report serves as the Transport Impact Assessment aimed at determining the traffic impact of the proposed Notsi PV 3 solar facility, which forms part of the Notsi Solar PV Cluster near Dealesville in the Free State Province, which comprises of five solar PV projects, namely Notsi PV 1 to Notsi PV 5.

All solar projects are proposed to be located within the Lejweleputswa District Municipality within the Tokologo Local Municipality in the Free State Province of South Africa. The sites will respectively accommodate solar PV Energy facilities including associated support structures and facilities to allow for the generation and evacuation of electricity. Each solar project is addressed in a separate report.

The proposed respective access points were assessed considering sight lines, access spacing requirements and road safety aspects. All five sites can be accessed via an existing access from the R64, which is located to the north-east of the project sites.

In general, non-motorised transportation (NMT), to which pedestrians belong, is a dominant mode of transportation in rural areas of South Africa, 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 sites. However, generally the appointed contractor of a renewable energy project will provide shuttle buses or minibus taxis for workers during the construction phase.

The highest trip generator for the site 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, operational 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 sites are expected to have a negative low significance during the construction and decommissioning stage.

NOTSI PV 3 SOLAR FACILITY
TRANSPORT IMPACT ASSESSMENT

1 INTRODUCTION

1.1 Project Description

Notsi Solar (Pty) Ltd is proposing the development of the 100MW Notsi PV 3 solar energy facility and associated infrastructure on Farm Welgeluk 1622 with an extent of 246ha.

The site is located approximately 17km South-west of Dealesville in the Lejweleputswa District Municipality within the Tokologo Local Municipality of the Free State Province (see **Figure 1-2**).

The Notsi PV 3 project forms part of a proposed cluster of five solar PV projects (namely, Notsi PV 1 to Notsi PV 5 – see **Figure 1-2**). Development areas have been identified for each of the five proposed solar PV facilities. Within the respective development area, a development footprint has been defined in a manner which has considered the environmental sensitivities present on the affected properties and intentionally remains outside highly sensitive areas.

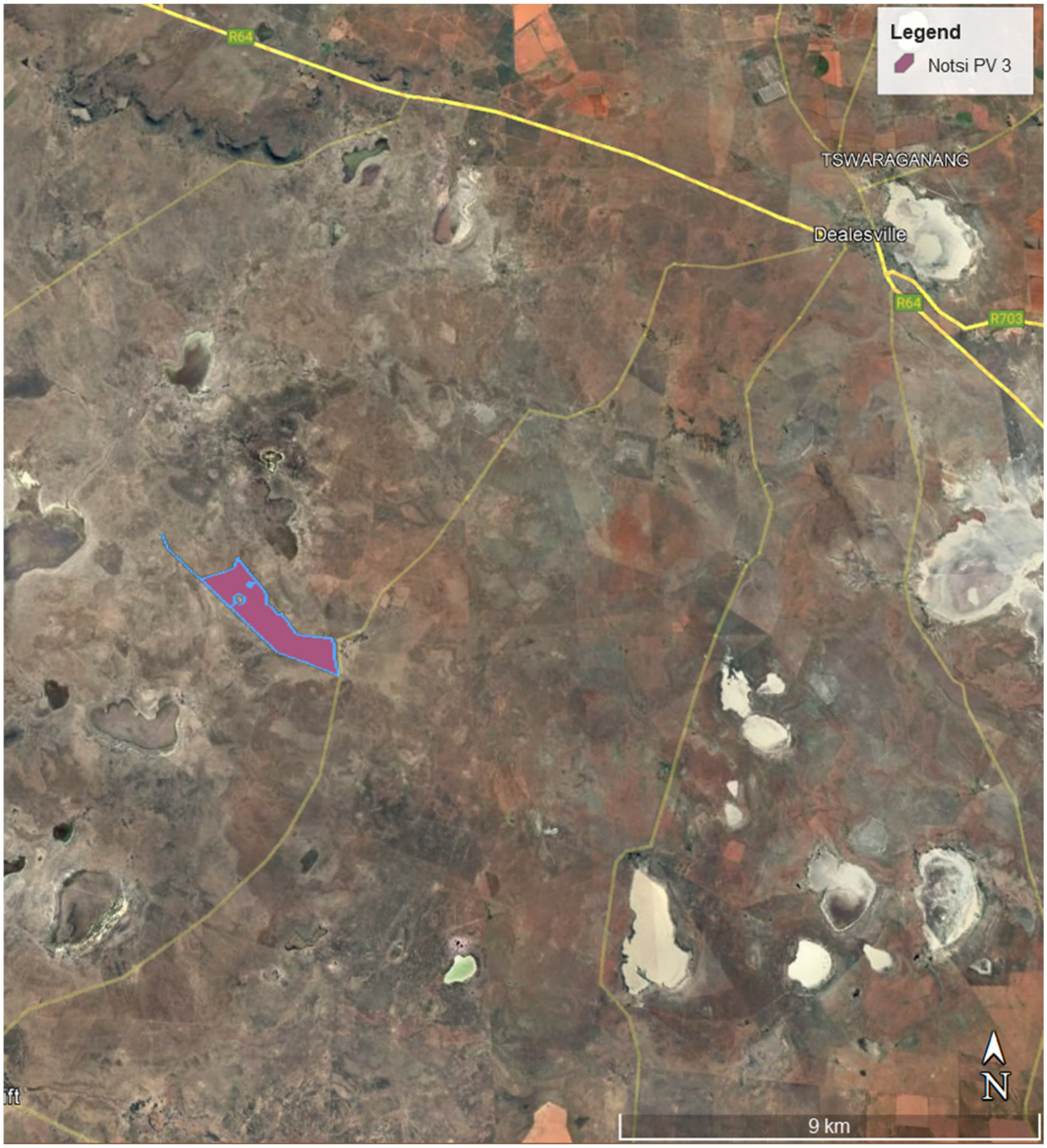

Figure 1-1: Aerial View of Notsi PV 3 Site

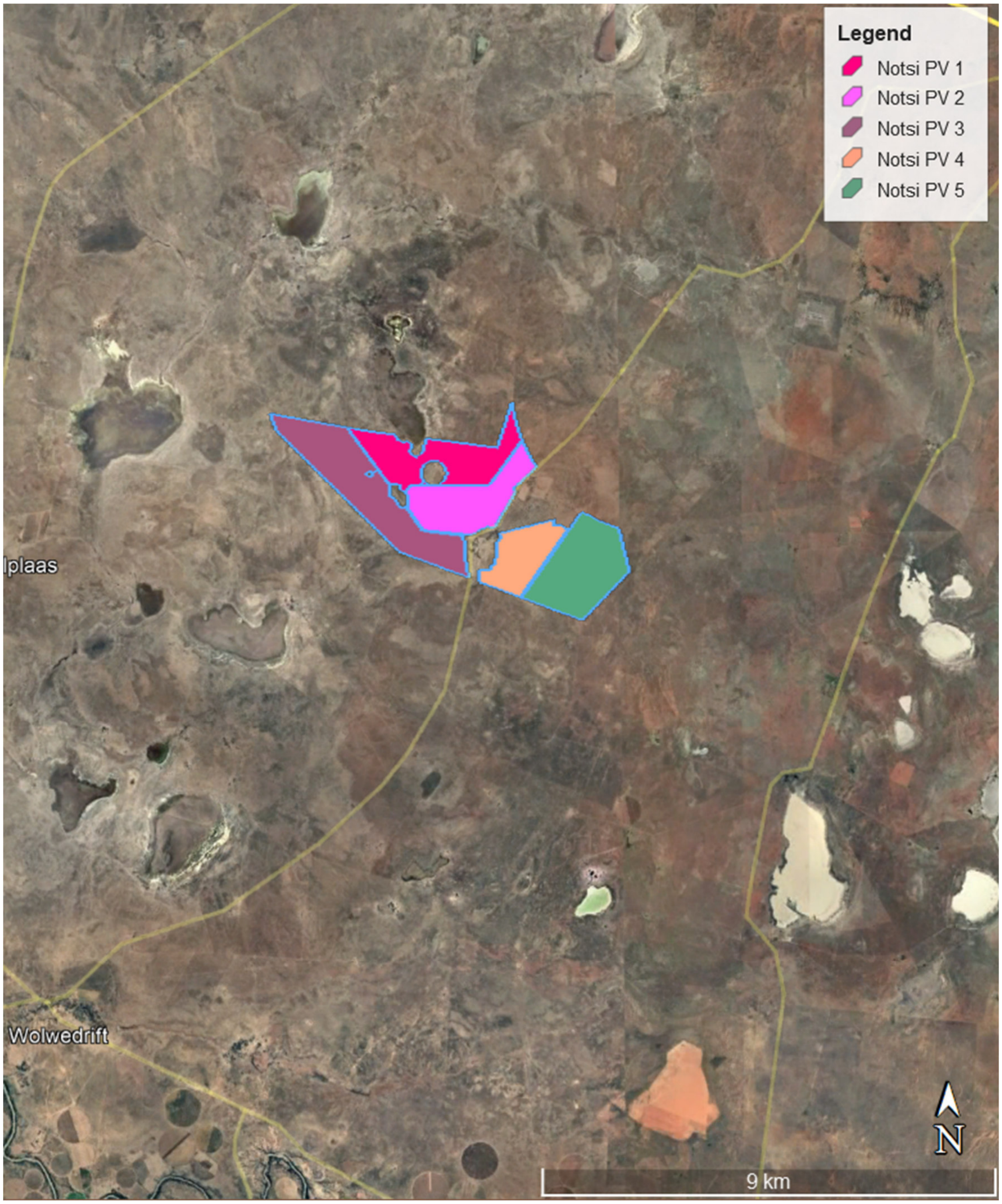

Figure 1-2: Aerial View of Location of Notsi Solar PV Cluster

1.2 Scope, Purpose 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 project,
- The existing road network and future road planning proposals,
- Trip generation for the proposed development during the construction, operation, and decommissioning phases of the facility,
- Traffic impact of the proposed development,
- Access requirements and feasibility of 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.
- Public Transport access,
- Non-motorised Transport facilities, and
- Recommended public transport and NMT upgrades, 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 consolidated Transport Impact Assessment for the Notsi Solar PV Cluster project. Iris Wink registered with the Engineering Council of South Africa (ECSA), with Registration Number 20110156. A curriculum vitae is included in Appendix A of this report.

In addition, a signed specialist statement of independence is included in Appendix B.

1.4 Terms of Reference

A specialist report prepared in terms of the Regulations must 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.

The details for the proposed Notsi PV 3 development and the associated infrastructure are summarized in **Table 1-1**.

Table 1-1:Project information

Facility Name:	Notsi PV 3
Applicant:	Notsi Solar (Pty) Ltd
Municipality:	Lejweleputswa District Municipality Tokologo Local Municipality
Affected Farms:	Farm Welgeluk 1622
Extent:	246ha
Capacity:	Up to 100 MW
Number of panels:	Tbc, estimated ~200 000 panels per site
Type of Technology:	Photovoltaic
PV Panel Array:	The proposed facility will require numerous linked rows of PV (single axis) modules placed behind a protective glass sheet to form a panel. Multiple panels will be required to form the solar PV arrays which will comprise the PV facility with associated support infrastructure (concrete footings, below ground electrical cables) to produce up to 100MW electricity.
Structure height:	PV Panels: up to 4.5 m Battery Energy Storage System (BESS): ≤ 8m Buildings: up to 4 m On site Substation: < 30 m
Structure orientation:	Tracking PV with mono- or bi-facial panels. Bi-facial panels with single axis tracking is preferred over fixed-axis or double axis tracking systems and mono-facial panels due to the potential to achieve higher annual energy yields whilst minimising the balance of system (BOS) costs and maximizing the efficiency of land use, resulting in the lowest levelized cost of energy (LCOE). The preference for single axis tracking is also based on the economic viability, water requirements, land requirements, efficiency and potential environmental impacts of the proposed solar panel mounting types. The development of the PV facility will take into consideration during the final design phase the use of either mono-facial or bi-facial PV panels as well as tracker vs fixed- tilt mounting structures. Both options are considered feasible for the site.
Area for Inverter / Transformer / BESS:	Approximately 3 ha
BESS:	The battery energy storage system will make use of solid state or flow battery technology and will have a capacity of up to

	400MWh. Both lithium-ion and Redox-flow technology are being considered for the project, depending on which is most feasible at the time of implementation. The containers may be single stacked only to reduce the footprint. The containers will include cells, battery charge controllers, inverters, transformers, HVAC, fire, safety and control systems.
Inverter:	Sections of the PV array will be wired to inverters. The inverter is a pulse width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency.
Operations and Maintenance (O&M) building footprint:	Operation and Maintenance buildings (with a combined footprint of up to 4 ha) including: ▪ Temporary Laydown Areas; (~ 20000 m^2) and construction site camp/site office; ▪ Site Administration Office (~500m^2); ▪ Switch gear and relay room (~400m^2); ▪ Staff lockers and changing room (~200m^2); ▪ Security control (~60m^2); ▪ Operations & Maintenance (O&M) building (~ 500 m^2); and ▪ Warehouse
Batching plant (temporary):	It is expected that gravel and sand will be stored in separate heaps whilst the cement will be contained in a silo.
Internal Roads:	Access roads to the site and between project components inclusive of stormwater infrastructure. Widths of internal roads will be between 6 m and 8 m. Length of internal roads not known at present. Where required for turning circle/bypass areas, access or internal roads need to be up to 20 m to allow for larger component transport.
Fencing height:	Approximately 2.4 m height
Grid infrastructure / Substation:	Onsite substation to be confirmed Capacity of 33 kV / 132 kV overhead powerline
Site access	Via the S322 secondary road and various gravel farm roads within the area and affected properties.

2 APPROACH AND METHODOLOGY

The report deals with the traffic impact on the surrounding road network in the vicinity of the project 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 project.
- 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 sites 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 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;
- TMH 16 South African Traffic Impact and Site Traffic Assessment Manual (Vol 1), COTO, August 2012; and
- TMH 16 South African Traffic Impact and Site Traffic Assessment Manual (Vol 2), COTO, February 2014.

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 as available at commencement of the Scoping Phase.
- 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. A mobile crane and the transformer transport are the only abnormal load envisaged for the site. The crane will be utilised for offloading equipment, such as the transformers.
- 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 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.
- Projects in the vicinity of the site to be considered as part of the EIA cumulative impacts are listed in **Table 6-3**.
- An 18-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 development 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 TRANSPORT ROUTES TO PROJECT SITE

4.1 Port of Entry

It is envisaged that the components will be imported to South Africa via the Port of Durban or the Port of Ngqura as the closest ports to the site.

4.2 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 710 km from the proposed project sites (travel route via N3 and N5 – see **Figure 4-1**).

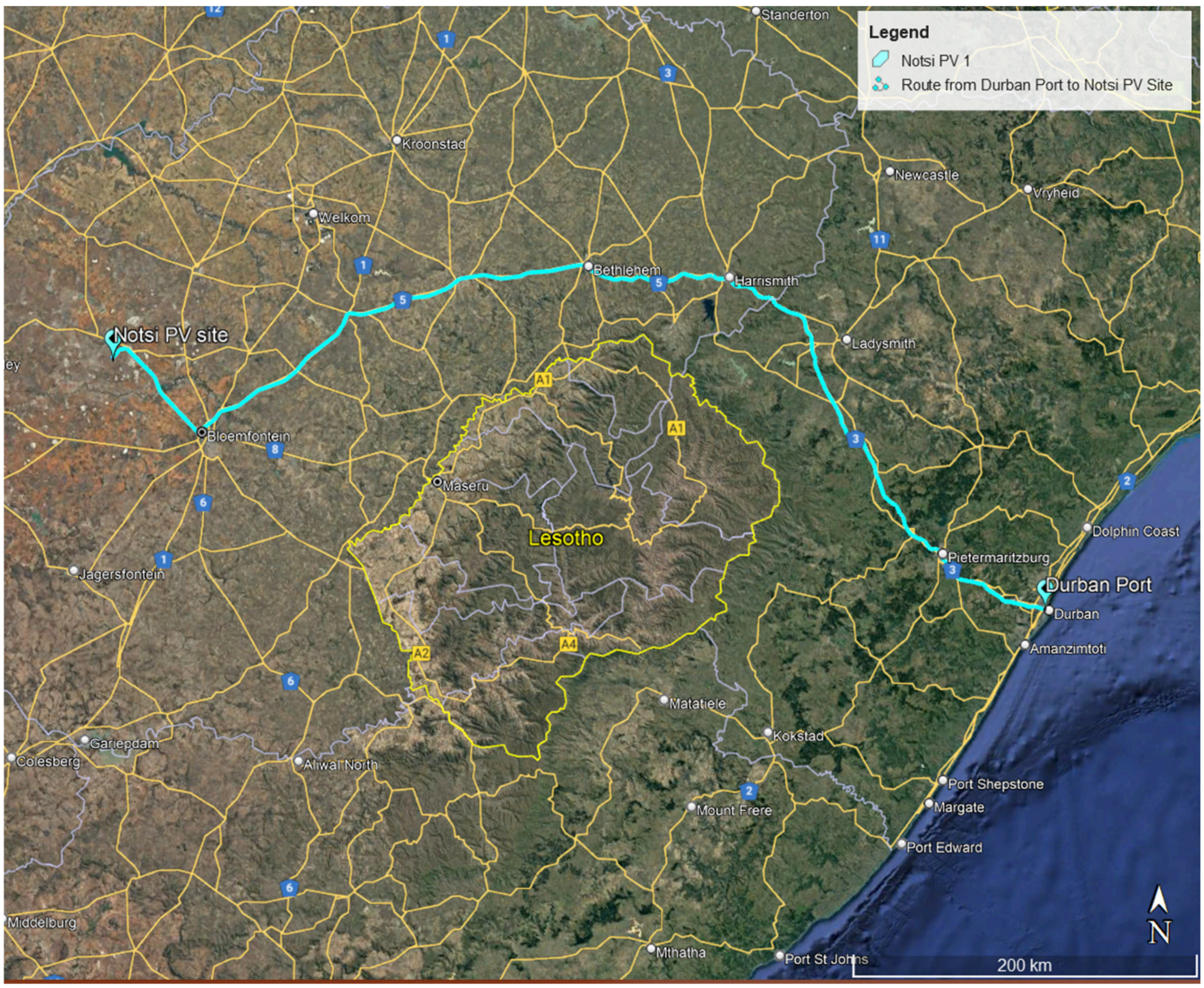

Figure 4-1: Route from Port of Durban to proposed Notsi PV1 site

4.3 The Port of Ngqura

The Port of Ngqura is a world-class deep-water trans-shipment hub offering an integrated, efficient, and competitive port service for containers on transit. The Port forms part of the Coega Industrial Development Zone (CIDZ) and is operated by Transnet National Ports Authority. The Port of Ngqura is located approximately 710 km from the proposed sites (travel route via N1 and N10 – see **Figure 4-2**).

Figure 4-2: Route from the Port of Ngqura to Project Sites

4.4 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
- The transformers will be transported as abnormal loads.

Grid/power Line:

- Conventional trucks within the freight limitations to transport building material to the site,
- Light vehicles and buses 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,
- The transformer transported in an abnormal load,
- Abnormal mobile crane for assembly on site, and
- Transmission tower sections transported by abnormal load.

4.5 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.

The expected abnormal load trip generator is the transport of the transformer.

4.6 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.

4.7 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 or permits. Embargo lists are compiled annually and are obtainable from the Issuing Authorities.

4.8 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.

4.9 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.

4.9.1 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.

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

Cape Town has a large manufacturing sector with 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 length will be similar to the routes considered for the haulage of imported materials and equipment (approximately 1 070 km along the National Route 1). No road limitations are envisaged along the route for normal load freight (see **Figure 4-3**).

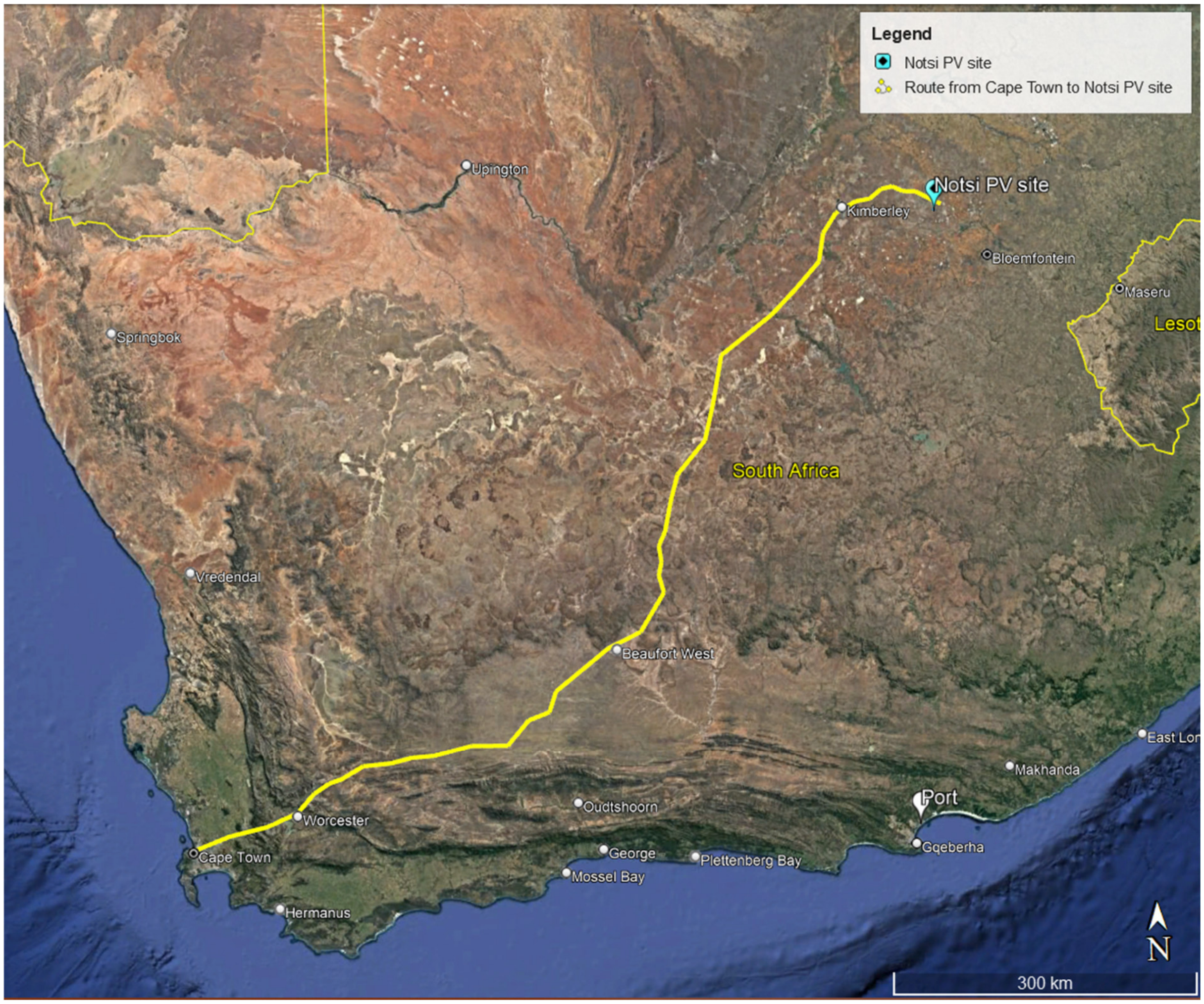

Figure 4-3: Route from Cape Town area to proposed Notsi PV 3 site

4.9.1.2 Route from Johannesburg Area to Site – Locally sourced materials and equipment

If components from Johannesburg are considered, normal loads from Johannesburg to the site can be transported via the route as shown in **Figure 4-4** below. No road limitations are envisaged along the route for normal load freight. The distance from the Johannesburg area to the site is approximately 410 km.

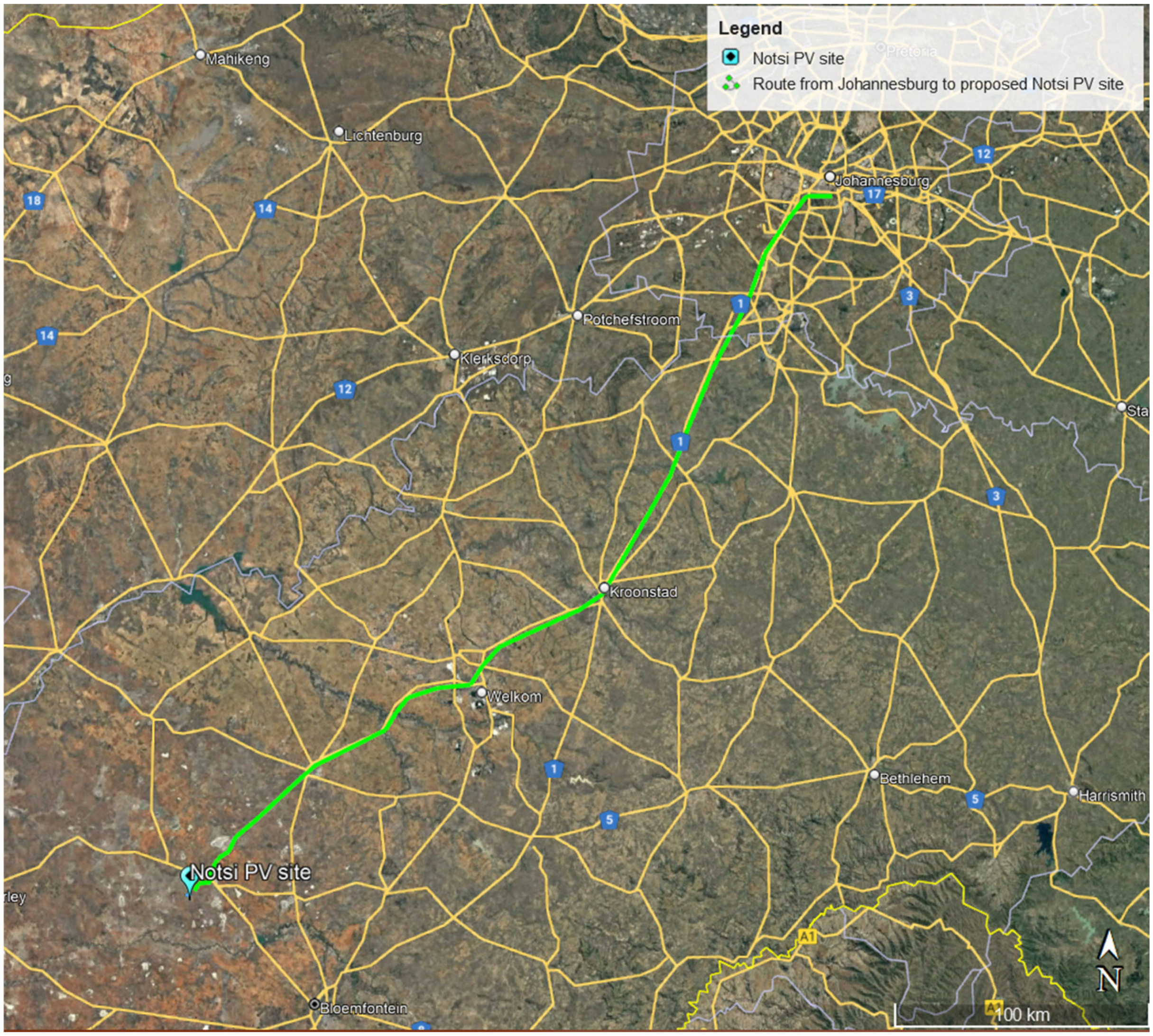

Figure 4-4: Route from Johannesburg Area to proposed Notsi PV Sites

4.9.1.3 Route from Pinetown / Durban 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 shortest distance from Pinetown to the site is via the National Routes N3 and N5 with approximately 690 km as shown in **Figure 4-5** below.

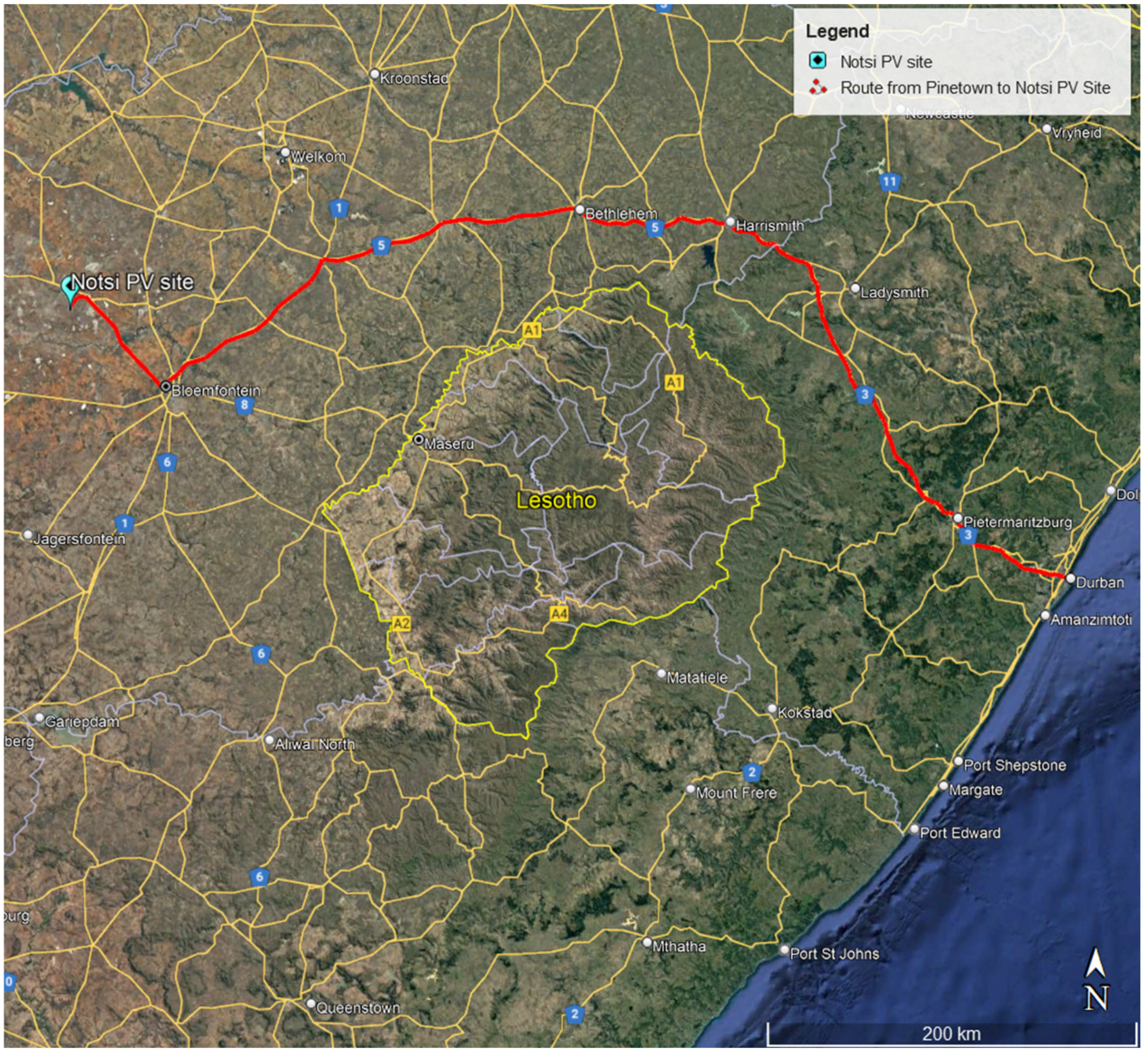

Figure 4-5: Route from Pinetown to the Project Sites

4.9.2 Surrounding road network

The proposed Notsi PV 3 site is located near Dealesville in the Free State Province. According to the road classification of the surrounding road network as per the Road Infrastructure Strategic Framework for South Africa (RISFSA), the R64, from which the development trips will take access, can be classified as follows:

Rural Class 3 route is major arterial roads that typically carry inter-district traffic between:

- Small towns, villages, and larger rural settlements,
- Smaller commercial areas and transport nodes of local importance that generate relatively high volumes of freight;
- 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; and Smaller centres than the above when travel distances are relatively long (longer than 50 to 100 km).

5 DESCRIPTION OF THE PROJECT DEVELOPMENT

5.1 General Description

The Notsi PV 3 site is located south-west of Dealesville in the Lejweleputswa District Municipality within the Tokologo Local Municipality of the Free State Province as shown in **Figure 5-1**.

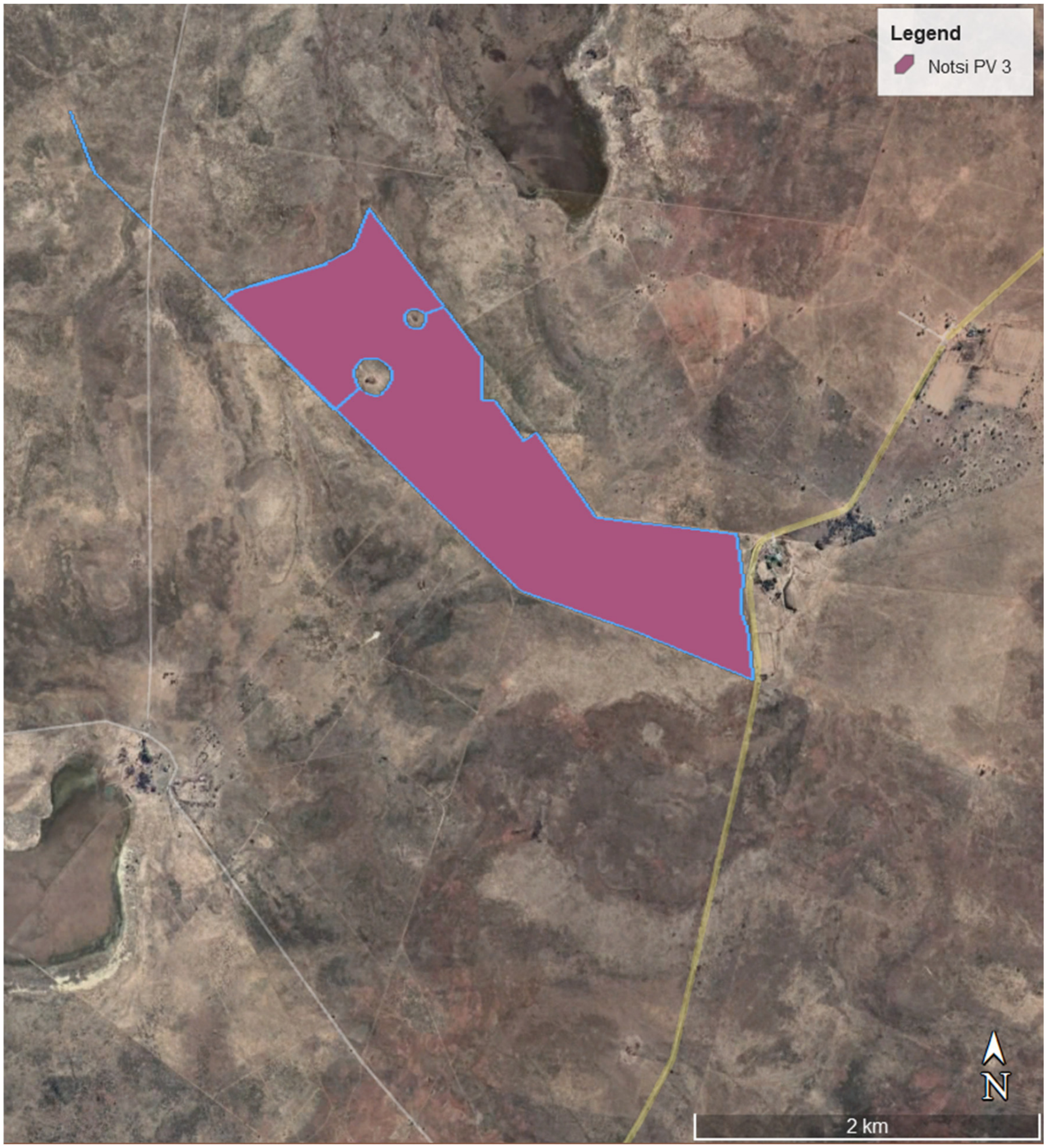

Figure 5-1: Aerial View of the proposed Notsi PV 3 site

The development footprint will contain the following infrastructure to enable the Notsi PV 3 facility to generate up to 100 MW:

- Solar field/solar arrays (note that the foundations, mounting structures and module types would be confirmed during detail design, however, would remain within the proposed development footprint and be up to approximately 4.5m in height);
- Internal access roads (noting that existing farm roads would be used as far as possible, and the road width would be up to approximately 6-8m);
- Main access road (noting that existing farm roads would be used as far as possible, and the road width would be up to approximately 8m);
- Specific grid connection infrastructure which includes a network of infrastructure including 1-2 switching substation/s and 132kV overhead power line that will connect the proposed solar energy facilities to the national grid via a loop-in loop-out connection to an existing 132kV overhead power line which traverse the affected property;
- Perimeter fencing of up to 2 m height; and
- Auxiliary buildings (including, but not limited to, Operation and Maintenance (O&M) buildings, admin buildings, workshops, gatehouse, security building, control centre, offices, warehouse, etc.).

5.2 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 portions were found favorable due to its proximity to grid connections, solar radiation, site access and relatively flat terrain. These factors were then taken into consideration and avoided as far as possible, where required. The following alternatives were considered.

- <u>Location Alternatives</u>:
  The location identified for the development is based on various aspects considered by the Applicant from a technical, economic, and environmental perspective. This includes the solar radiation values of the area, proximity to the national grid, available grid connection capacity in the national grid, readily available access to the development, landowner support, terrain characteristics and the absence of potentially sensitive environmental features and areas. The properties proposed are considered suitable for the development by the Applicant and therefore the area has been demarcated and indicated as being preferred. No other properties have been identified for the development in the Dealesville area.

- <u>Technical Alternatives</u>: BESS
  Three types of battery technologies are being considered for the proposed project: Lithium-ion (Lithium-Phosphate), Sodium-sulphur or Vanadium Redox flow battery. While there are various battery storage technologies available, Li-ion batteries have emerged as the leading technology

in utility-scale energy storage applications because it offers the best mix of performance specifications, such as high charge and discharge efficiency, low self-discharge, high energy density, and long cycle life (Divya KC et al., 2009). Both lithium-ion and Redox-flow technology are being considered for the project, depending on which is most feasible at the time of implementation.

Battery storage offers a wide range of advantages to South Africa including renewable energy time shift, renewable capacity firming, electricity supply reliability and quality improvement, voltage regulation, electricity reserve capacity improvement, transmission congestion relief, load following and time of use energy cost management. In essence, this technology allows renewable energy to enter the baseload and peak power generation market and therefore can compete directly with fossil fuel sources of power generation and offer a truly sustainable electricity supply option.

- Design and layout alternatives
  Design alternatives will be considered at planning and design stage.

- Technology alternatives
  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. 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.

- The No-go alternative has also been assessed. 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 these purposes. The potential opportunity costs in terms of adding solar energy generation to the current land use, would be lost if the status quo persist, and therefore all positive socio-economic opportunities and associated growth will also be lost.

5.2.1 Specialist comment regarding alternatives

From a transport engineering perspective, the alternatives listed above (i.e., electrical infrastructure compound location alternatives and the technology options for the BESS) are equally acceptable as it does not have any impact on the traffic on the surrounding road network.

5.2.2 Proposed Access Points

Notsi PV 3 can be accessed via an existing access from the R64 (see **Figure 5-2**), which is located to the north-east of the proposed site. Suitable access points were assessed in line with access spacing requirements, sight lines and road safety considerations. The four access roads, shown in pink in **Figure 5-3** below, are recommended. All access points need to be kept clear of any vegetation to prevent obstructing sight lines.

Sight distances in both directions from the S322 onto the R34 are acceptable (see **Figure 5-4** and **Figure 5-5**).

Figure 5-2: Access towards Sites (S322)

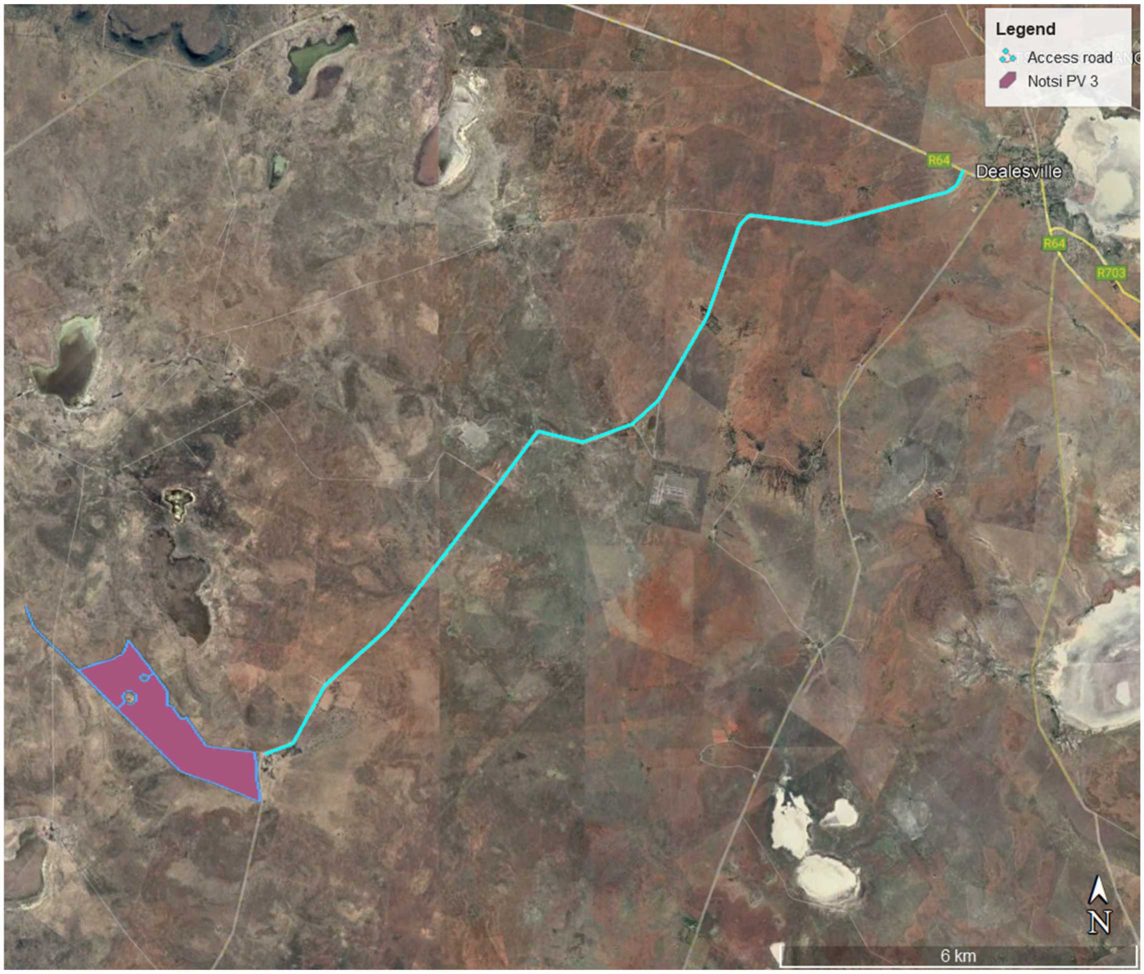

Figure 5-3: Aerial view of proposed access road to Notsi PV 3

Figure 5-4: R34 in eastern direction from intersection with S322

Figure 5-5: R34 in western direction from intersection with S322

The access point to the Notsi PV 3 site will need to accommodate construction and abnormal load vehicles. A minimum road width of 8 m is recommended for the access points and the internal roads can have a minimum width of 5 m. The radius at the access point needs to be large enough to allow for all construction vehicles to turn safely.

It is recommended that the site accesses be access controlled. It is also recommended that security staff be stationed on site at the accesses during construction. A minimum stacking distance of 25 m is recommended between the road edge of the external road and the boom.

Any road markings and signage need to be in accordance with the South African Road Traffic Signs Manual (SARTSM).

5.2.3 Internal Roads

The geometric design and layout for the internal roads from the access points needs to be established at detailed design stage. Existing structures and services, such as drainage structures, signage, street lighting and pipelines will need to be evaluated if impacting on the roads. It needs to be ensured that 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.

5.2.4 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. These town include for example Bloemfontein and Soutpan.

5.2.5 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 development.

It is expected that non-motorised transportation (NMT), to which pedestrians belong, is a dominant mode of transportation in the rural parts of the Lejweleputswa District Municipality and Tokologo Local Municipality, with private cars and minibus/taxis being the second-most used mode of transport, followed by busses. Currently, there are no known future planned public transport facilities in the vicinity of the site. However, generally the developer of a large-scale project, such as many renewable energy projects, will provide shuttle buses or similar for workers during the construction phase.

6 ISSUES, RISKS AND IMPACTS

6.1 Identification of Potential Impacts/Risks

The potential impacts to the surrounding environment expected to be generated form the development traffic is traffic congestion and associated noise, dust, and exhaust pollution. This will be true for the construction, operation, and decommissioning phase. It must be noted that significance of the impact is expected to be higher during the construction and decommissioning phase because these phases generate the highest development traffic.

6.1.1 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 PV facilities, including construction of footings, roads, excavations, trenching, and ancillary construction works. This phase will temporarily generate the most development traffic.

Nature of impact:

The nature of the impact expected to be generated at this stage 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.

Significance of impact without mitigation measures:

Traffic generated by the construction of the facility will have a significant impact on the surrounding road network. The exact number of trips generated during construction will be determined by the contractor, the haulage company transporting the components to site, the staff requirements and where equipment is sourced from.

Estimated peak hour traffic generated by the proposed Notsi PV 3 facility:

From experience with renewable energy projects of similar nature, the number of heavy vehicles per 7MW installation is estimated to range between 200 and 300 trips depending on the site conditions and requirements. For each 100 MW site, the total trips can therefore be estimated to be between 2 857 and 4 286 heavy vehicle trips, which will generally be made over an estimated 18-months construction period. Choosing the worst-case scenario of 4 286 heavy vehicles trips over an 18-months period travelling on an average of 22 working days per month, the resulting daily number of vehicle trips is 11. Considering that the number of vehicle trips during peak hour traffic in a rural environment can roughly be estimated at around 20-40% of the average daily traffic, the resulting peak hour vehicle trips for the construction phase are approximately 3-5 trips per site. The total number of trips for all five sites will then be between 30-50 trips.

If the panels are imported instead of manufactured within South Africa, the respective shipping company will be able to indicate how the panels can be packed (for example using 2 MW packages and 40 ft containers). These can then be stored at the port and repacked onto flatbed trucks.

It is further assumed that during the peak of the construction period, around 300 employees will be active per site. Staff trips are assumed to be:

Table 6-1: Estimation of daily staff trips for Notsi PV 3

Vehicle Type	Number of vehicles	Number of Employees
Car	13	13 (assuming single occupant)
Bakkie	18	27 (assuming 1.5 occupants)
Taxi – 15 seats	12	180
Bus – 80 seats	1	80
Total	**44**	**300**

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 200 construction vehicle trips will access the site per day.

The total estimated daily site trips, at the peak of construction, are shown in **Table 1-1** below.

Table 6-2: Estimation of daily site trips for Notsi PV 3

Activity	Number of trips
Component delivery	11
Construction trips	200
Total	**211**

The impact on the surrounding road network and the general traffic is therefore deemed nominal, with mitigation, as the 211 trips will be distributed across a 9-hour working day. 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.

6.1.2 Combined trips for the Notsi PV Cluster

Due to the similarity of the five proposed project and assuming that the Notsi PV Cluster will be developed simultaneously over an 18-months period, it can be estimated that a similar number of trips will be generated by Notsi PV 1 to Notsi PV 5.

The combined number of developments trips will then be 1 055 (peak period ~211), which are expected to be accommodated by the surrounding road network, provided that delivery management planning will assist in reducing the impact on the road network (i.e., reduce development trips to outside traffic peak periods).

6.1.3 Operational Phase

This phase includes the operation and maintenance of Notsi PV 3 throughout its life span.

Nature of impact:
The nature of the impact expected to be generated at this stage would be traffic congestion and delays on the surrounding road network, and the associated noise, dust, and exhaust pollution due to the operational traffic trips.

Estimated peak hour traffic generated per the site:
The number of permanent staff expected for the operational phase is still unknown. Based on similar projects, it can be estimated that approximately 10 full-time employees will be stationed on the site, which would result in 50 full-time employees in total for the five projects. Assuming 40% of trips occur during the peak hour, approximately 4 peak hour trips are estimated for the operational phases of Notsi PV 3 and 20 peak hour trips for the five solar projects. Both are expected to have negligible 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 cleaning methods and technology is known at present. The following assumptions have been consequently 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;
- Approximately 5 litres of water needed per panel;
- Assuming that a maximum of 200 000 solar modules are used per site, this would amount to approximately 200 vehicle trips; and
- Solar modules will be cleaned twice a year.

The total of trips for all five sites would sum up to 2 000. However, it is expected that these trips will be made over the course of several days. Furthermore, the cleaning of the respective sites can be scheduled to not take place at the same time to further alleviate any potential traffic congestion. Rainwater tanks or on-site borehole water can further assist in reducing the number of trips. The resulting estimated trips will then not have a significant impact on external traffic.

6.1.4 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 road, during the construction phase, if required.
- Regular maintenance of gravel roads located within the site boundary, including the access road to the site, by the Contractor during the construction phase and by the Owner/Facility Manager during the operation phase, if required.
- The use of mobile batch plants and 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 is to 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 agreed on with the service provider of the OHL) to accommodate the abnormal load vehicles. The Contractor and the Developer is 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 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 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.

6.1.5 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. The dust suppression will result in significantly reducing the impact.

6.1.6 Decommissioning phase

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

6.1.7 Cumulative Impacts

To assess a cumulative impact, it is assumed that all renewable energy projects within a 30 km radius, currently proposed and authorized, would be constructed at the same time (see **Figure 6-1**).

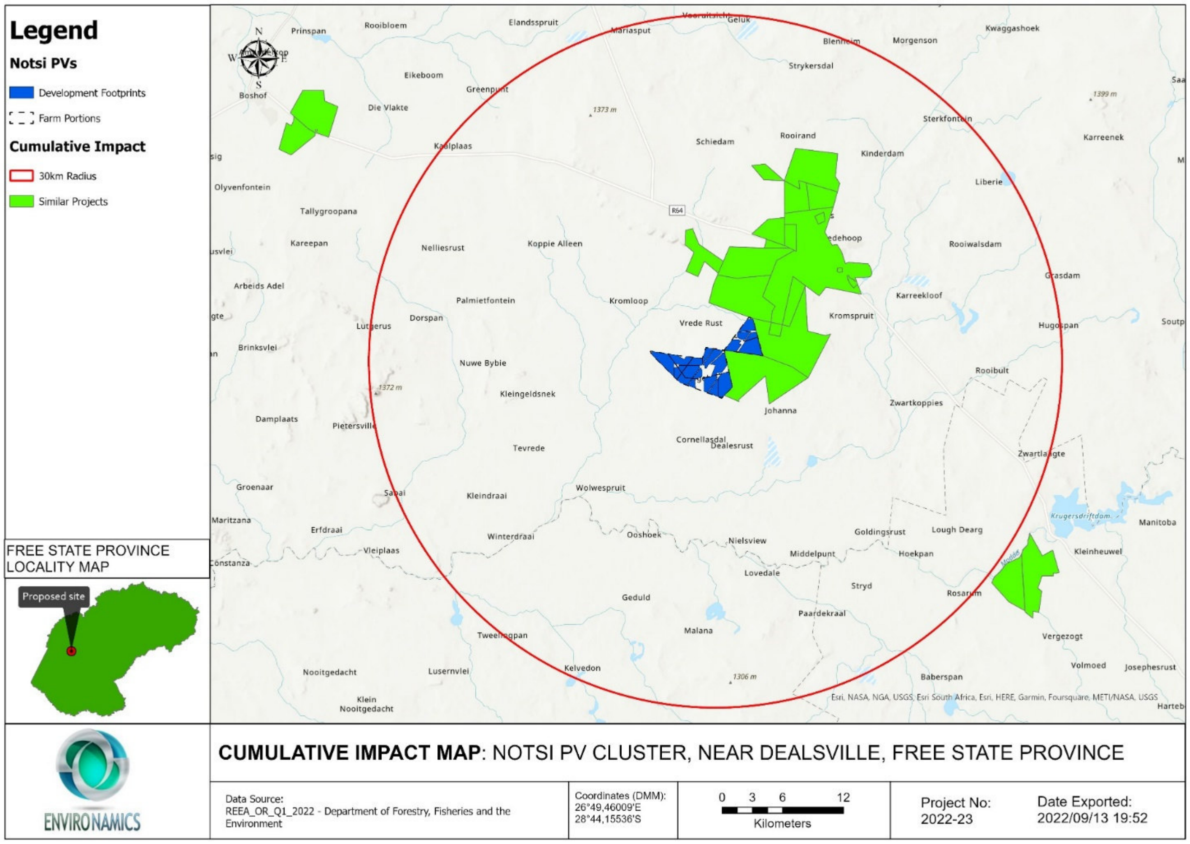

Figure 6-1: Geographic area showing 30 km radius around the Notsi Solar PV Cluster

This is a precautionary approach 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.

At the time of preparing this report, the following projects were known and considered:

Table 6-3: Proposed renewable energy projects in the vicinity of the proposed Notsi PV project

Site name	Distance from study area	Proposed generating capacity	DEFF reference	EIA process	Project status
Visserpan PV 2	~5km	75MW	14/12/16/3/3/1/2154	Basic Assessment	Approved
Visserpan PV 3	~5km	75MW	14/12/16/3/3/1/2155	Basic Assessment	Approved
Visserpan PV 4	~5km	75MW	14/12/16/3/3/1/2156	Basic Assessment	Approved
Keren Klipbult Solar Plant	~7km	75MW	14/12/16/3/3/2/432	Scoping and EIA	Withdrawn/Lapsed
Eleven Kentanie PV Solar	<1km	75MW	14/12/16/3/3/2/717 14/12/16/3/3/2/718 14/12/16/3/3/2/719 14/12/16/3/3/2/720 14/12/16/3/3/2/721 14/12/16/3/3/2/722 14/12/16/3/3/2/723 14/12/16/3/3/2/724 14/12/16/3/3/2/725 14/12/16/3/3/2/726 14/12/16/3/3/2/728	Scoping and EIA	Approved (6 of these projects are preferred bidders in REIPPPP round 5 and will commence construction in early 2023 – currently in financial close phase)
Sebina Letsatsi Solar PV	~12km	75MW	14/12/16/3/3/2/755	Basic Assessment	Approved
Edison PV Solar	~15km	100MW	14/12/16/3/3/2/851	Scoping and EIA	Approved
Maxwell PV Solar	~17km	100MW	14/12/16/3/3/2/852	Scoping and EIA	Approved
Marconi PV Solar	~16km	100MW	14/12/16/3/3/2/853	Scoping and EIA	Approved
Watt PV Solar	~18km	100MW	14/12/16/3/3/2/854	Scoping and EIA	Approved
Farday PV Solar	~18km	100MW	14/12/16/3/3/2/855	Scoping and EIA	Approved

Springhaas Solar Facility 1	~ 8 km	250 MWac	14/12/16/3/3/1/2523	Basic Assessment	Approved
Springhaas Solar Facility 3	~ 8 km	150 MWac	14/12/16/3/3/1/2524	Basic Assessment	Approved
Springhaas Solar Facility 4	~ 8 km	150 MWac	14/12/16/3/3/1/2525	Basic Assessment	Approved
Springhaas Solar Facility 5	~ 8 km	150 MWac	14/12/16/3/3/1/2526	Basic Assessment	Approved
Springhaas Solar Facility 6	~ 8 km	250 MWac	14/12/16/3/3/1/2527	Basic Assessment	Approved
Springhaas Solar Facility 8	~ 8 km	150 MWac	14/12/16/3/3/1/2528	Basic Assessment	Approved
Springhaas Solar Facility 9	~ 8 km	150 MWac	14/12/16/3/3/1/2529	Basic Assessment	Approved

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). It is therefore expected that both these phases are similar in nature of the traffic demand expected. The exact number of trips generated will be determined by appointed the haulage company. Based on the high-level screening of impacts, a negative low significance rating can be expected during the construction stage (see **Table 7-1**).

Nature of the impact: Temporary increase in traffic, noise and dust pollution associated potential traffic

As per the Impact Methodology attached (Annexure 3), the calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

7.2 Potential Impact (Operation Phase)

Nature of the impact

- Noise and dust pollution associated potential traffic

The traffic generated during this phase will have a nominal impact on the surrounding road network (see **Table 7-2**).

The following items need to be clarified:

- The number of permanent employees
- Water source to be clarified – borehole or transported to site
- Size of water tankers if water is to be delivered on site

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 7-1** above).

7.4 Cumulative Impacts during the Construction Phase

For the cumulative impact during the construction phase, the projects as per Table 6-1 have been considered. However, it is unlikely that these developments and the proposed Notsi PV Cluster will exactly overlap with their construction period but for the purpose of this assessment, the cumulative impact was assessed and is shown in **Tables 7-1** and **7-2**.

Table 7-1: Impact Summary Table (Construction Phase/Decommissioning Phase)

Type of Impact	Impact Criteria	Criteria Description	Rating	Significance (Pre-Mitigation)	Potential mitigation measures	Criteria Description	Rating	Significance (Post-Mitigation)
Temporary increase of trips on the external roads Increase in noise and dust pollution	*Geographical Extent*	Regional	3	**Negative medium impact - 30**	▪ Stagger component delivery to site ▪ Reduce the construction period ▪ Stagger the construction phase ▪ The use of mobile batch plants and quarries in close proximity to the site would decrease the impact on the surrounding road network. ▪ Staff and general trips should occur outside of peak traffic periods as much as possible ▪ Maintenance of haulage routes ▪ Design and maintenance of internal roads	Regional	3	**Negative Low -26**
	Probability	Definite	4			Definite	3	
	Duration	Medium-term	2			Medium-term	2	
	Reversibility	Completely reversible	1			Completely reversible	1	
	Irreplaceable Loss of Resources	No loss of resources	1			No loss of resources	1	
	Cumulative Impact	High cumulative impact	4			Medium cumulative impact	3	
	Intensity/ Magnitude	Medium	2			Medium	2	

Table 7-2: Impact Summary Table (Operational Phase)

Type of Impact	Impact Criteria	Criteria Description	Rating	Significance (Pre-Mitigation)	Potential mitigation measures	Criteria Description	Rating	Significance (Post-Mitigation)
Temporary increase of trips on the external roads due to permanent staff and maintenance visits	*Geographical Extent*	Local	2	**Negative low impact - 14**	▪ Source on-site water supply if possible. ▪ Utilise 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.	Local	2	**Negative Low -13**
	Probability	Definite	4			Definite	3	
	Duration	Long-term	3			Long-term	3	
	Reversibility	Completely reversible	1			Completely reversible	1	
	Irreplaceable Loss of Resources	No loss of resources	1			No loss of resources	1	
	Cumulative Impact	Medium cumulative impact	3			Medium cumulative impact	3	
	Intensity/ Magnitude	Low	1			Low	1	

8 NO-GO ALTERNATIVE

The no-go alternative implies that the proposed Notsi PV 3 project does 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 IMPACT ASSESSMENT SUMMARY

The overall impact significance findings, following the implementation of the proposed mitigation measures, are shown in **Table 9-1**.

Table 9-1: Overall Impact Significance for Construction Phase

Notsi Solar PV Cluster	**Overall Impact Significance**
Construction (Pre-mitigation measures)	Negative Medium Impact
Operational	Low
Construction (Post-mitigation measures)	Negative Low Impact
All projects as per Table 6-3	**Overall Impact Significance**
Cumulative – Construction (Pre-mitigation measures)	Negative high impact
Cumulative - Operational	Low
Cumulative – Construction (Post-mitigation measures)	Negative medium impact

10 LEGISLATIVE AND PERMIT REQUIREMENTS

Key legal requirements pertaining to the transport requirements for the proposed renewable energy development 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.

11 CONCLUSION AND RECOMMENDATIONS

The potential traffic and transport related impacts for the construction, operation and decommissioning phases of the proposed Notsi PV 3 project was 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.
- During operation, it is expected that maintenance and security staff will periodically visit the facility and the generated trips can be accommodated by the external road network.
- The traffic generated during the construction phase, although significant, will be temporary and impacts are considered to be **negative low significance** after mitigation.
- The traffic generated during the decommissioning phase will be less than to similar to the construction phase traffic and the impact on the surrounding road network will also be considered to be of **negative low significance** after mitigation.
- For the cumulative impact, it was assumed that all proposed renewable energy projects in a radius of 30 km from the site will be developed at the same time (which will in reality be unlikely). After mitigation, a rating of **negative medium significance** is given.

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

- Dust suppression of internal gravel roads and the access road.
- 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. 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 road.
- 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 PV 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 short term, i.e., the impact of the solar PV facility on the traffic on the surrounding road network is temporary and solar facilities, when operational, do not add any significant traffic to the road network.

From a transport engineering perspective, the proposed development alternatives (i.e., electrical infrastructure location alternatives and the technology options for the BESS) are acceptable as they do not have any impact on the traffic on the surrounding road network.

The proposed access point towards the project site has been assessed and was found to be acceptable from a traffic engineering perspective.

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.

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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:

- 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

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:
- 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: I Wink

Name of Company: iWink Consulting (Pty) Ltd

Date: 20-04-2023

Appendix Annexure C: Impact Assessment Methodology

1.1 METHOD OF ENVIRONMENTAL ASSESSMENT

The environmental assessment aims to identify the various possible environmental impacts that could results from the proposed activity. Different impacts need to be evaluated in terms of its significance and in doing so highlight the most critical issues to be addressed.

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e., site, local, national or global whereas intensity is defined by the severity of the impact e.g., the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table 5.1.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

1.1.1 Impact Rating System

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

- *planning*
- *construction*
- *operation*
- *decommissioning*

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

***Table 5.1:** The rating system*

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

2	*Possible*	*The impact may occur (Between a 25% to 50% chance of occurrence).*
3	*Probable*	*The impact will likely occur (Between a 50% to 75% chance of occurrence).*
4	*Definite*	*Impact will certainly occur (Greater than a 75% chance of occurrence).*
DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	*Short term*	*The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).*
2	*Medium term*	*The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).*
3	*Long term*	*The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).*
4	*Permanent*	*The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.*
INTENSITY/ MAGNITUDE		
Describes the severity of an impact.		
1	*Low*	*Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.*
2	*Medium*	*Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).*
3	*High*	*Impact affects the continued viability of the system/ component, and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.*
4	*Very high*	*Impact affects the continued viability of the system/component, and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired.*

		Rehabilitation and remediation often impossible. If possible, rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
REVERSIBILITY		
This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		
1	*Completely reversible*	*The impact is reversible with implementation of minor mitigation measures.*
2	*Partly reversible*	*The impact is partly reversible but more intense mitigation measures are required.*
3	*Barely reversible*	*The impact is unlikely to be reversed even with intense mitigation measures.*
4	*Irreversible*	*The impact is irreversible, and no mitigation measures exist.*
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	*No loss of resource*	*The impact will not result in the loss of any resources.*
2	*Marginal loss of resource*	*The impact will result in marginal loss of resources.*
3	*Significant loss of resources*	*The impact will result in significant loss of resources.*
4	*Complete loss of resources*	*The impact is result in a complete loss of all resources.*
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	*Negligible cumulative impact*	*The impact would result in negligible to no cumulative effects.*
2	*Low cumulative impact*	*The impact would result in insignificant cumulative effects.*
3	*Medium cumulative impact*	*The impact would result in minor cumulative effects.*
4	*High cumulative impact*	*The impact would result in significant cumulative effects*
SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity. *The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.*		

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