EIA REPORT:

UMMBILA EMOYENI SOLAR ENERGY FACILITY
MPUMALANGA PROVINCE

TRANSPORT STUDY

September 2022
Final Issue

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SYNOPSIS

Preparation of a Transport Study for the EIA stage of the proposed Ummbila Emoyeni Solar Energy facility near Bethal in the Mpumalanga Province, pertaining to all relevant traffic and transportation engineering aspects.

KEY WORDS:

EIA Report, Solar Energy, Transport Study, Photovoltaic, PV

QUALITY VERIFICATION

This report has been prepared under the controls established by a quality management system that meets the requirements of ISO 9001: 2015 which has been independently certified by DEKRA Certification.

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1 INTRODUCTION AND METHODOLOGY

1.1 Scope and Objectives

Emoyeni Renewable Energy Farm (Pty) Ltd is proposing the development of a solar energy facility, known as the Ummbila Emoyeni Solar Energy Facility, consisting of a solar PV facility and associated infrastructure, located approximately six (6) kilometers southeast of Bethal and one (1) kilometer east of Morgenzon in the Mpumalanga Province of South Africa. The project site is located across the Govan Mbeki, Lekwa, and Msukaligwa Local Municipalities within the Gert Sibande District

The proposed solar PV facility will have a contracted capacity of 150MW and is planned to be part of a larger cluster of renewable energy projects (to be known as the Ummbila Emoyeni Renewable Energy Farm), which include one 666MW Wind Energy Facility and one 150MW Solar Energy Facility (see **Figure 1-1**).

The Ummbila Emoyeni Solar Energy Facility is proposed in response to the identified objectives of national and provincial government and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the developer's intention to bid the Ummbila Emoyeni Solar Energy Facility under the Department of Mineral Resources and Energy's (DMRE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme or a similar programme, with the aim of evacuating the generated power into the national grid. This will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP), with the Ummbila Emoyeni Solar Energy Facility set to inject up to 150MW of electricity into the national grid. Similarly, the location of the new generation in the Mpumalanga Province is important in the context of the Just Energy Transition (JET). The Ummbila Emoyeni Solar Energy Facility will provide valuable jobs and socio-economic benefits that are required in an area where coal fired generation will be phased out over the next 10 years. This will be vitally important if the JET is to be successfully implemented and is a transition for everyone.

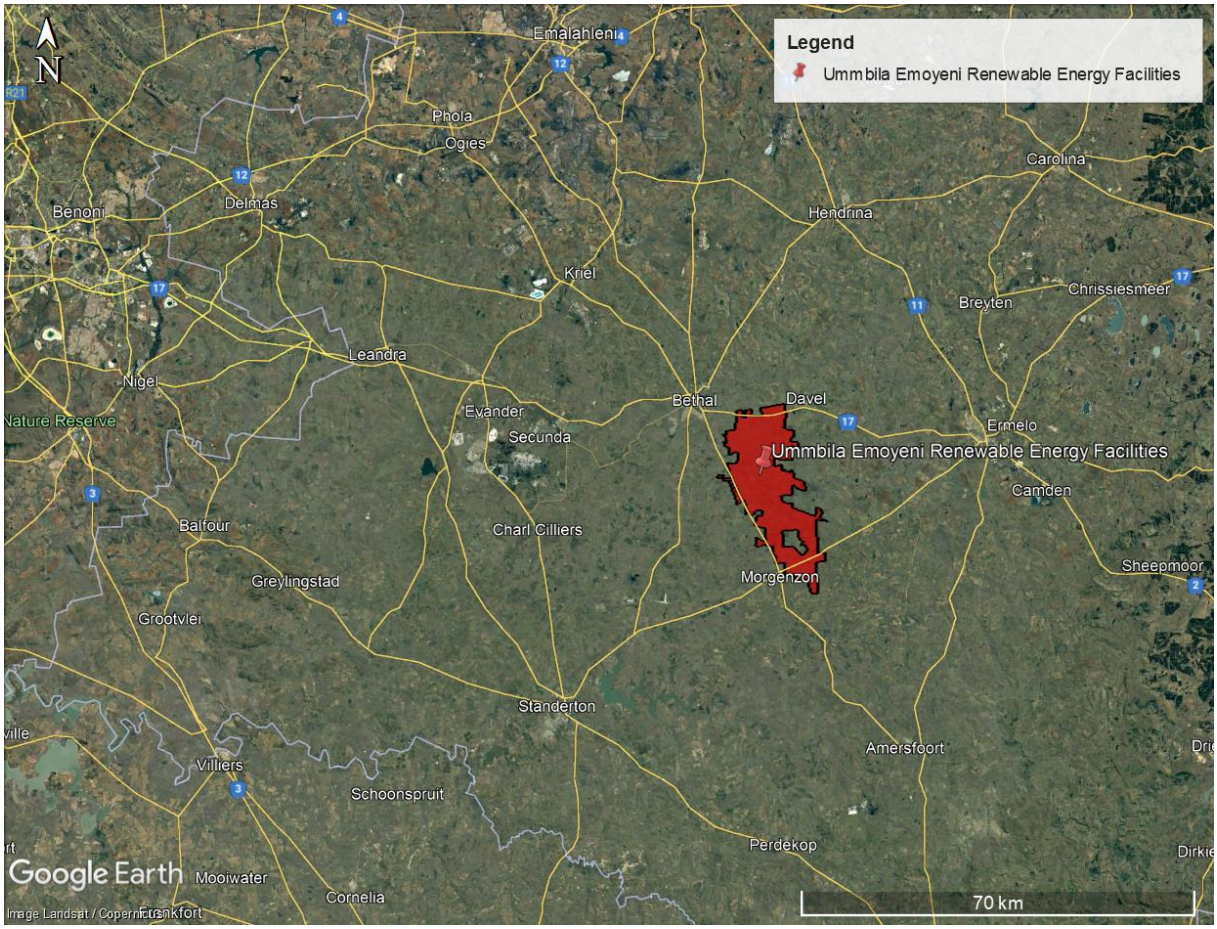

Figure 1-1: Proposed Ummbila Emoyeni Renewable Energy Facilities

As part of the Environmental Impact Assessment (EIA) process undertaken, the services of a Transportation Specialist are required to conduct a Transport Study.

The following two main transportation activities will be investigated:

- Abnormal load vehicles transporting components to the site.
- The transportation of construction materials, equipment and people to and from the site/facility.

The transport study will aim to provide the following objectives:

- Assess activities related to traffic movement for the construction and operation (maintenance) phases of the facility.
- Recommend a preliminary route for the transportation of the components to the proposed site.
- Recommend a preliminary transportation route for the transportation of materials, equipment and people to site.
- Recommend alternative or secondary routes where possible.

1.2 Terms of Reference

General:

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 accesses;
- Assessment of freight requirements and permitting needed for abnormal loads; and
- Traffic accommodation during construction.

1.3 Approach and Methodology

The report deals with the traffic impact on the surrounding road network in the vicinity of the proposed sites:

- during the construction of the access roads;
- construction of the facility; and
- operation and maintenance during the operational phase.

This transport study was informed by the following:

Project Assessment

- Overview of project background information including location maps, component specs and any possible resulting abnormal loads to be transported.
- Research of all available documentation and information relevant to the proposed facility; and

The transport study considered and assessed the following:

Traffic and Haul Route Assessment

- Estimation of trip generation;
- Discussion on potential traffic impacts;
- Assessment of possible haul routes; and
- Construction and operational (maintenance) vehicle trips.

Site layout, Access Points and Internal Roads Assessment per Site

- Description of the surrounding road network;
- Description of site layout; and
- Assessment of the proposed access points.

1.4 Assumptions and Limitations

The following assumptions and limitations apply:

- This study is based on the project information provided by Savannah Environmental (Pty) Ltd.
- 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 000mm, total maximum width 4 300mm and total maximum length 10 500mm.

- Maximum vertical height clearances along the haulage route is 5.2m for abnormal loads.
- Imported elements will be transported from the most feasible port of entry, which is deemed to be the Port of Richards Bay.
- If any elements are manufactured within South Africa, these will be transported from their respective manufacturing centres, which would be either in the greater Johannesburg area for the transformer, inverter and the support structures and in Pinetown/Durban, Cape Town or Johannesburg for the PV modules.
- All haulage trips will occur on either surfaced national and provincial roads or existing gravel roads.
- Construction materials will be sourced locally as far as possible.
- Approximately 30 full-time employees will be stationed at each of the four sites during the operational phase.

1.5 Source of Information

Information used in a transport study includes:

- Project Information provided by the Client;
- Google Earth.kmz files 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; and
- Project research of all available information.

2 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO THE TRANSPORT STUDY

2.1 Port of Entry

It is assumed that if components are imported to South Africa, it will be via the Port of Richards Bay, which is located in KwaZulu-Natal. The Port is located approximately 460km from the proposed site. The Port of Richards Bay is a deep-sea water port boasting 13 berths. The terminals handle abnormal loads and among others dry bulk ores, minerals and break-bulk consignments. The terminal exports over 30 varied commodities from magnetite to ferrochrome, woodchips to aluminium and steel. A large percentage of dry bulk commodities are handled via a computer-controlled network of conveyor belts extending 40 km to seven harbour bound industries. The Richards Bay Port is operated by Transnet Port Terminal.

Alternatively, components can be imported via the Port of East London, located approximately 1 130km from the proposed site, or from the Port of Ngqura, approximately 1 200km from the proposed site, both being located in the province of the Eastern Cape. Please note that shorter routes exist between the Port of East London and the proposed site, but the poor condition of these roads are not suitable for transport with heavy and/or abnormal vehicles.

2.2 Transportation requirements

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

- Conventional trucks within the freight limitations to transport building material to the site;
- 40ft container trucks transporting solar panels, frames and the inverter, which are within freight limitations;
- Flatbed trucks transporting the solar panels 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.

2.3 Abnormal Load Considerations

It is expected that the transformers will be transported with an abnormal load vehicle. 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: 22m for an interlink, 18.5m for truck and trailer and 13.5m for a single unit truck
- Width: 2.6m
- Height: 4.3m measured from the ground. Possible height of load – 2.7m.
- 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.

2.4 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.

2.5 Permitting – General Rules

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.

2.6 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.

2.7 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.

2.8 Transporting Other Plant, Material and Equipment

In addition to transporting the specialised equipment, the normal Civil Engineering construction materials, plant and equipment will need to be transported to the site (e.g., sand, stone, cement, gravel, water, compaction equipment, concrete mixers, etc.). Other components, such as electrical cables, pylons and substation transformers, will also be transported to site during construction. The transport of these items will generally be conducted with normal heavy loads vehicles, except for the transformer which requires an abnormal load vehicle.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 Description of the site

The proposed Ummbila Emoyeni Renewable Energy Farm, consisting of a commercial wind farm and solar PV facility, will be located approximately 6km southeast of Bethal in the Mpumalanga Province, as shown in **Figure 3-1**. The proposed site is bounded by the N17 to the north, the R39 to the east and south and the R35 to the west.

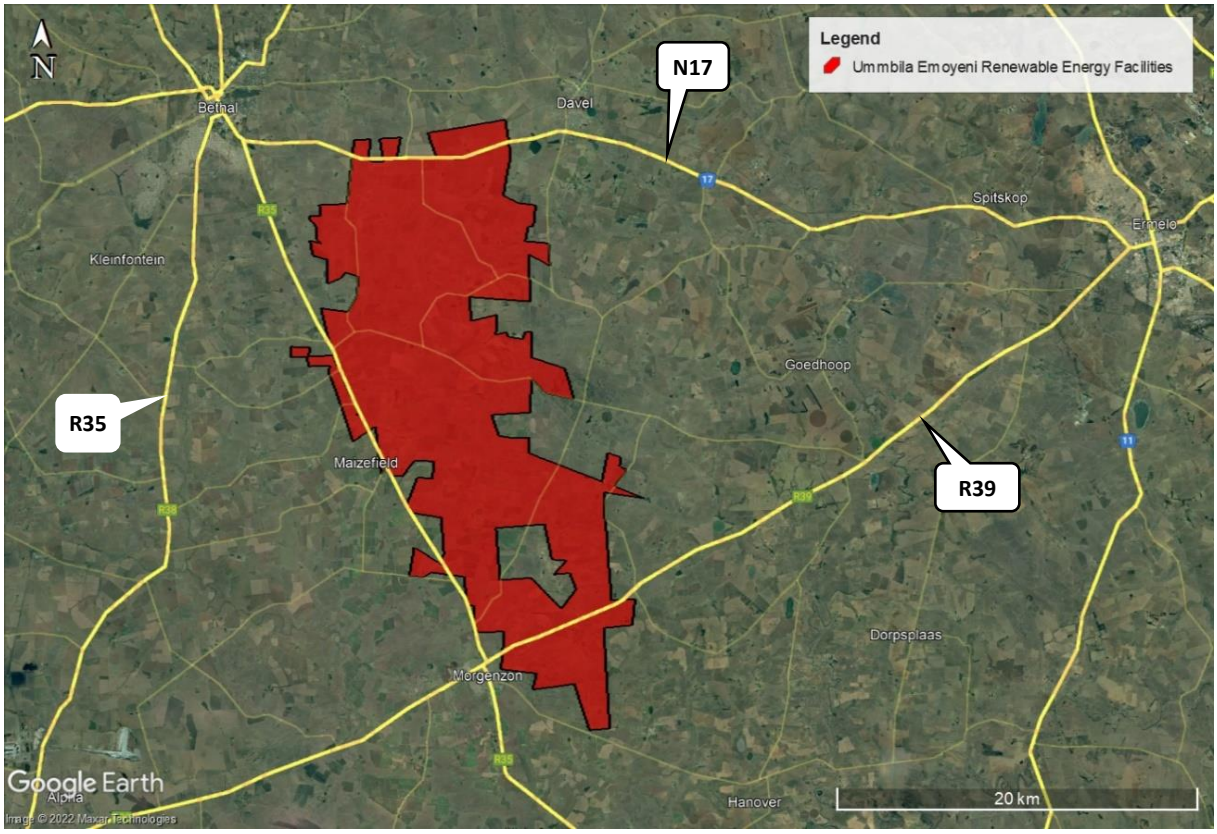

Figure 3-1: Aerial View of the proposed Ummbila Emoyeni Renewable Energy Farm

This report focuses on the Ummbila Emoyeni Solar Energy Facility with a contracted solar energy capacity of 150MW (see **Figure 3-2**).

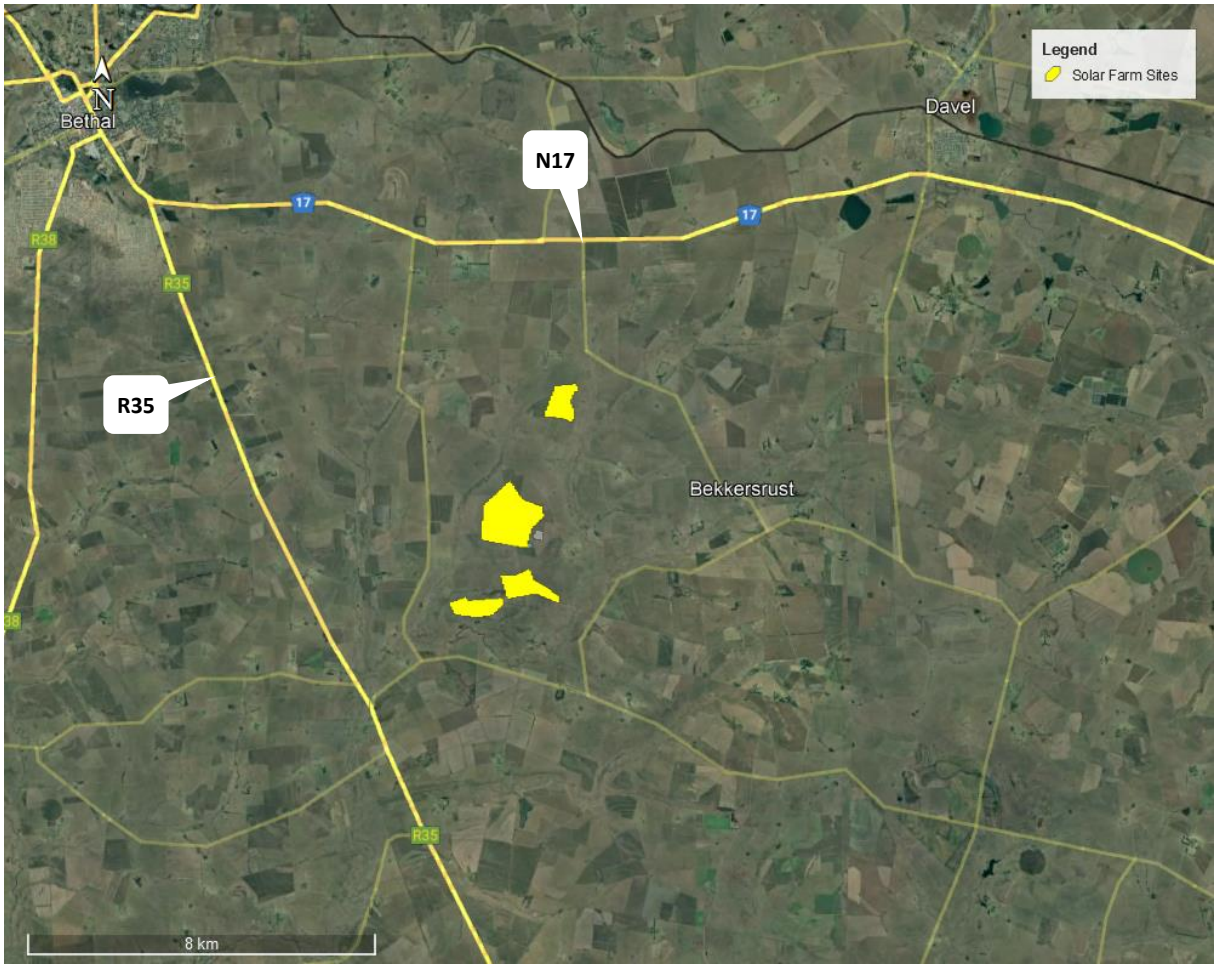

Figure 3-2: Aerial of Solar Site locations

The solar project site comprises the following farm portions as shown in **Table 3-1**:

Table 3-1: Farm Portions comprising the project site

Parent Farm Number	Farm Portions
Farm 264 – Geluksplaats	0, 11
Farm 423 – Bekkerust	0 R/E, 1, 5 R/E, 22,
Farm 420 – Rietfontein	8,9,10, 32

Infrastructure associated with the Ummbila Emoyeni Solar Energy Facility will include:

- PV modules in the range of 330Wp to 450Wp mounted on either a fixed tilt or single axis tracker structure, dependent on optimisation, technology available and cost.
- Inverters and transformers.
- 33kV cabling to connect to the onsite collector substation, to be laid underground where practical.
- 33kV/132kV onsite collector substation (IPP Portion).
- Battery Energy Storage System (BESS).
- Cabling between project components.

- Laydown and O&M hub (approximately 300m x 300m):
  - Construction compound (temporary).
  - Maintenance office.
- Access roads (up to 12m wide) and internal distribution roads (up to 12m wide).

The project will include associated grid infrastructure that is required to connect the Ummbila Emoyeni Renewable Energy Facility to the national grid. The grid connection solution entails establishing a 400/132 kV MTS, between Camden and SOL Substations, which will be looped in and out of the existing Camden-Sol 400 kV transmission line, on-site switching stations (132kV in capacity) at each renewable energy facility (Eskom Portion) and 132kV power lines from the switching stations at each renewable energy facility to the new 400/132Kv MTS. The location of the MTS will be refined through an ongoing process of communication with Eskom Planning but will be within close proximity to the 400kV line in order to cut into this line.

3.2 National Route to Site for Imported Components

There are three viable options for the port of entry for imported components - the Port of Richards Bay in KwaZulu-Natal, and the ports of East London and Ngqura in the Eastern Cape.

The Port of Richards Bay is located approximately 460km travel distance from the proposed site whilst the Port of East London and Ngqura is respectively located approximately 1 130km and 1 200km travel distance from the proposed site. The Port of Richards Bay is the preferred port of entry, however, the Ports of East London and Ngqura can be used as alternatives should the Port of Richards Bay not be available.

The preferred route from the Port of Richards Bay is shown in yellow in **Figure 3-3**. The route follows the N2 north, passing through Pongola and Piet Retief before turning off on to the N17 in Ermelo that leads to an unnumbered gravel road towards the proposed site.

The alternative route from the Port of East London, shown in green in **Figure 3-3**, will follow the N6 north-west to Bloemfontein before taking the N1 north-east to Johannesburg. Vehicles will head east on the N12 and N17, passing through Bethal before turning off onto an unnumbered gravel road that leads to the proposed site.

The Port of Ngqura can also be considered as an alternative and the route is shown in blue in **Figure 3-3**. The route is approximately 1 200km long and follows the N10 north up to Cradock before taking the R390 further north, passing through the town of Steynsburg and turning onto the N1 at Gariep. The route will continue north-east along the N1, through Bloemfontein, up to Johannesburg. Vehicles will head east on the N12 and N17, passing through Bethal before turning off onto an unnumbered gravel road that leads to the proposed site.

It should be noted that, although shorter routes exist, travel on national routes are proposed as the condition of some of the roads on the shorter routes are poor and not deemed suitable for hauling with heavy vehicles. There are also a number of toll plazas located on the national routes, but alternative roads can be considered in order to bypass these toll roads. This can however only be done at a later stage when more information is available regarding the type of heavy/abnormal vehicles, number of trips, etc.

Figure 3-3: Preferred and Alternative Routes

It is critical to ensure that the abnormal load vehicle will be able to move safely and without obstruction along the preferred route. The preferred route 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, prior to the transportation of any components, to ensure that the delivery will occur without disruptions.

It needs to be ensured that the gravel sections 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.

3.3 Route for Components manufactured locally

As mentioned in Section 1.4 (Assumptions and Limitations), it is anticipated that elements manufactured within South Africa will be transported to the site from the Cape Town, Johannesburg and Pinetown/Durban areas. It is also assumed that the transformer, which will be transported with an abnormal load vehicle, will be transported from the Johannesburg area and therefore it needs to be verified that the route from the manufacturer to the site does not have any load limitations for abnormal vehicles. At this stage, only a high-level assessment can be undertaken as no information of the exact location of the manufacturer is known and all road

structures (such as bridges and culverts) need to be confirmed for their load bearing by SANRAL or the respective Roads Authority.

3.4 Route from Cape Town to proposed solar site

Components, such as PV modules, manufactured in Cape Town will be transported to site via road as shown in **Figure 3-4**. Haulage vehicles will travel from Cape Town on the N1 to Johannesburg, passing through Beaufort West and Bloemfontein. Vehicles will continue east on the N12 and N17 before turning off on to an unnumbered gravel road that leads to the proposed site.

Haulage vehicles will mainly travel on the national highway and the total distance to the proposed site is approximately 1 570km.

Figure 3-4: Route from Cape Town to Proposed Site

3.5 Route from Johannesburg to Proposed Site

It is assumed that the inverters and support structure will be manufactured in the Johannesburg area and transported to site via the N12 and N17. The travel distance is around 185km, and no road limitations are expected on this route for normal loads vehicles as it will mainly follow national and provincial roads. The route is shown in **Figure 3-5**.

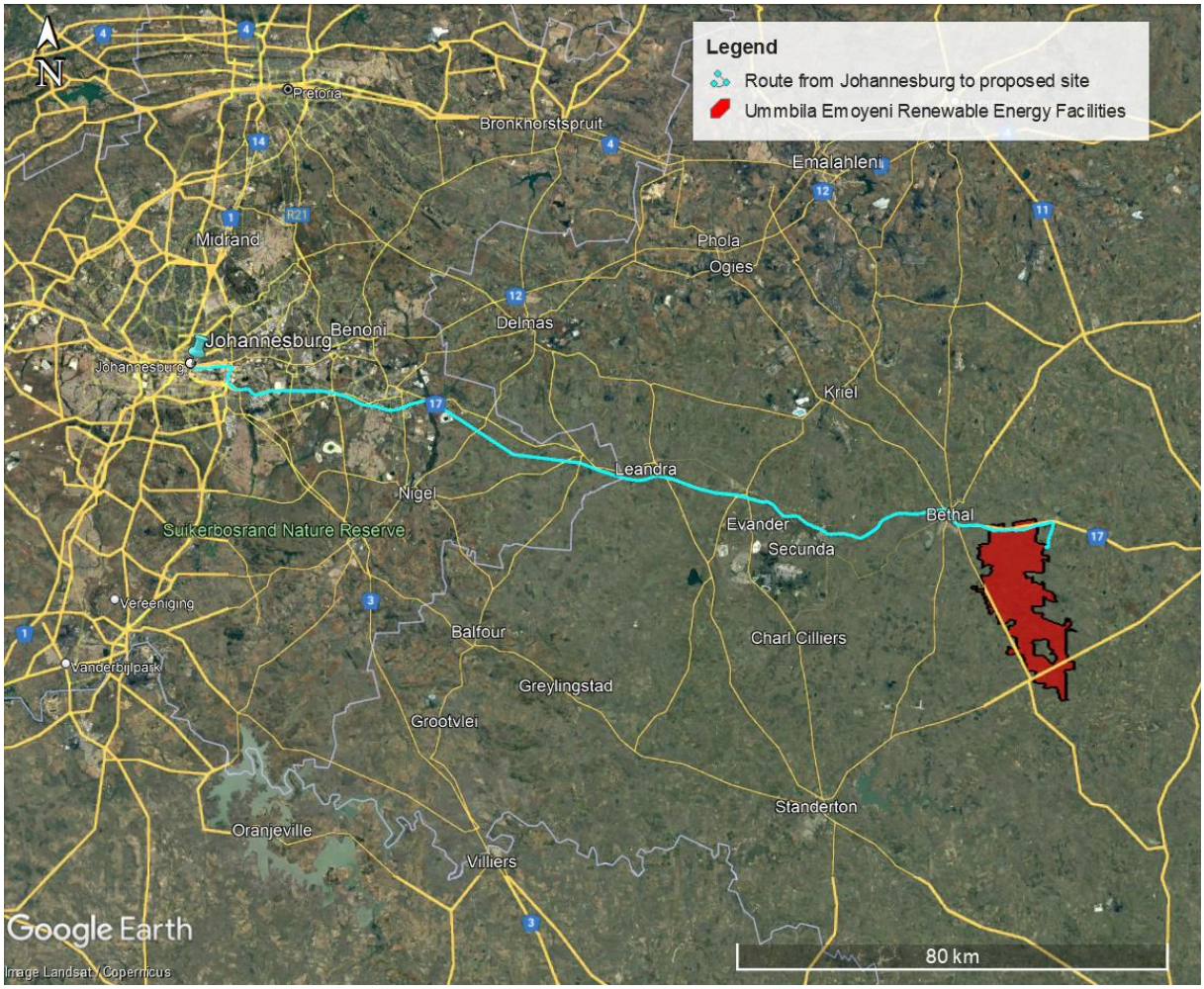

Figure 3-5: Route from Johannesburg to Proposed Site

3.6 Route from Pinetown / Durban to Proposed Site

If the PV modules are manufactured in South Africa, they could possibly be manufactured in the Pinetown area, close to Durban and transported to site via road. These elements are normal loads, and no road limitations are expected along the routes, which is shown in **Figure 3-6**. Haulage vehicles will mainly travel on national and provincial roads and the total distance to the proposed site is approximately 540km.

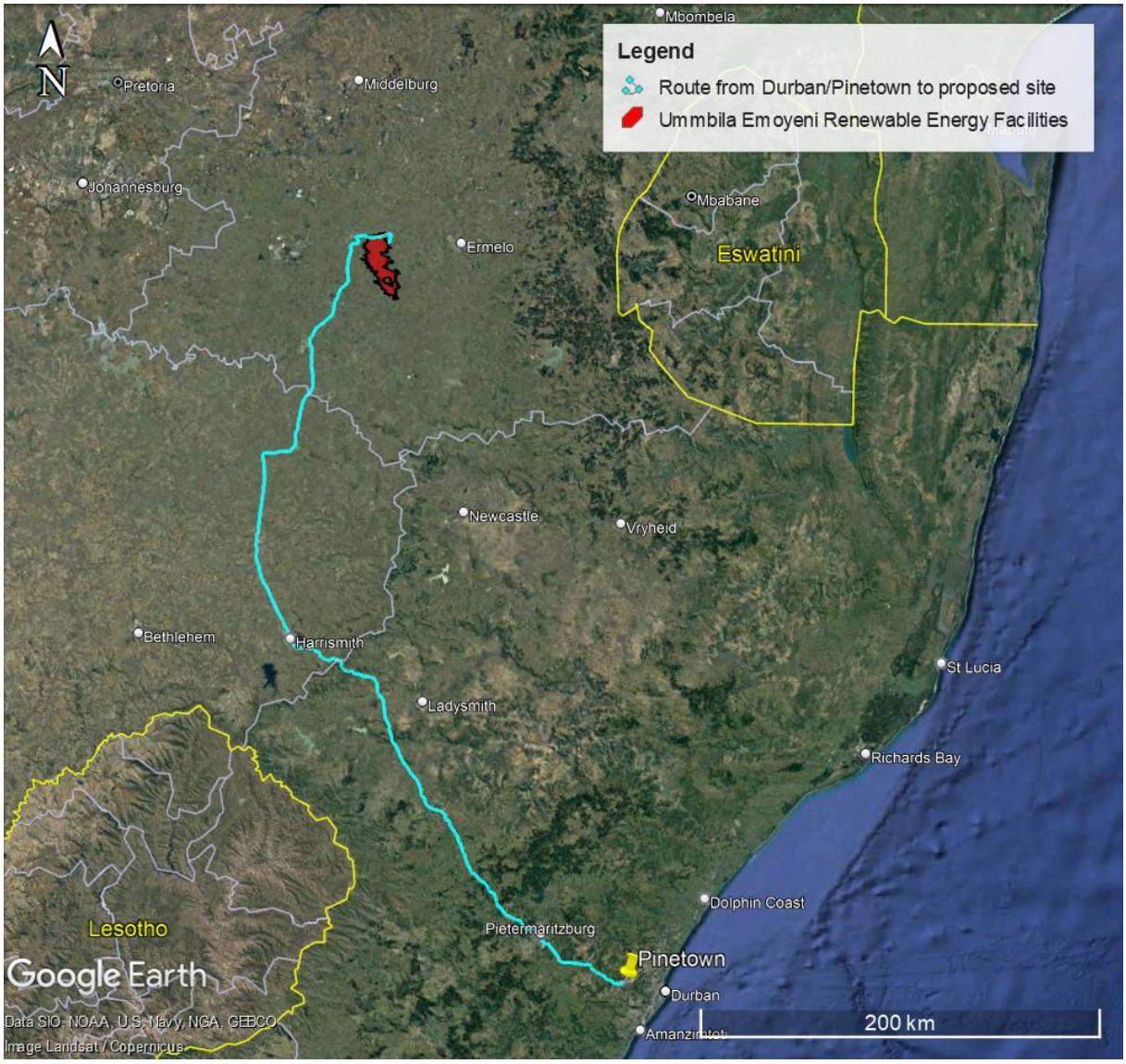

Figure 3-6: Route from Durban / Pinetown to Proposed Site

3.7 Route from Johannesburg Area to Site – Abnormal Load

It is assumed that the transformer will be manufactured locally in South Africa and be transported from the Johannesburg area to site. As the transformer will be transported with an abnormal load vehicle, the route planning needs a more detailed investigation of the feasible routes considering any limitations due to existing road features. Furthermore, a load of abnormal dimensions may cause an obstruction and danger to other traffic and therefore the transformers need to be transported as far as possible on roads that are wide enough for general traffic to pass. It is expected that the transformers can be transported to site via the same route used for normal loads.

There are several bridges, culverts and toll plazas along this route, which need to be confirmed for load bearing and height clearances. The road is fairly straight and will pass through the town of Bethal en route to the site. According to the desktop study, all turning movements along the route are manageable for the abnormal vehicle.

However, there are a number of alternative routes which can be investigated if the above route or sections of the route should not be feasible.

3.8 Proposed main access routes to the solar sites

The proposed solar sites are located to the south of the N17 and to the east of the R35, as shown in **Figure 3-7**. National route access to the sites can be obtained from either the N17 or R35.

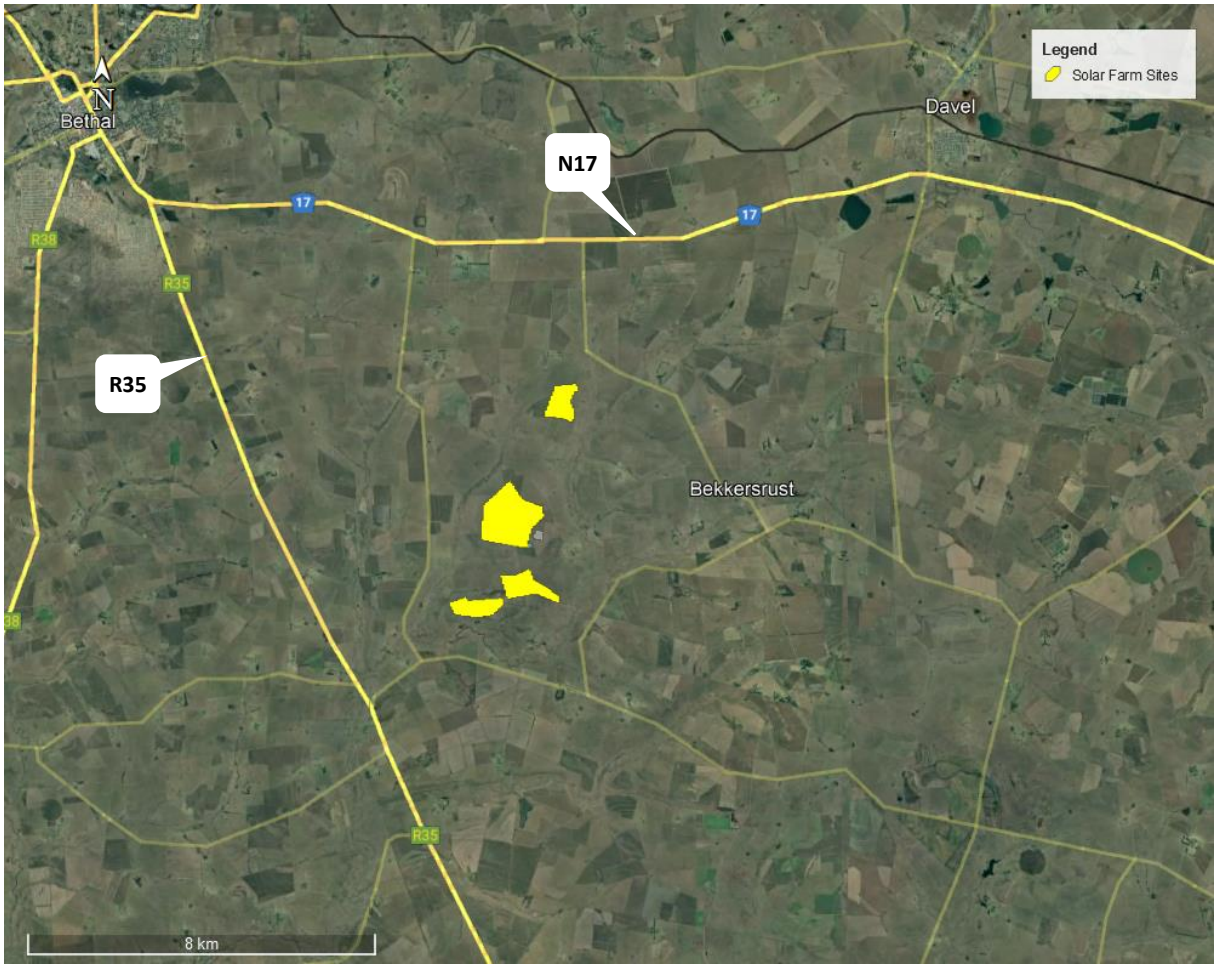

Figure 3-7: Location of the Solar sites

There is an existing network of unnumbered gravel roads that might be suitable as access roads to the proposed sites. The northern and central sites can be accessed via two routes shown in green and pink in **Figure 3-8**. The two southern sites can be accessed via the route shown in blue, which connects to the R35. However, this route crosses the Kwaggalaagte river course, which runs along the southern side and part of the western sides of the proposed site. Further investigations would be required to ascertain if the bridges/watercourse crossings on the gravel roads could accommodate heavy and abnormal load vehicle.

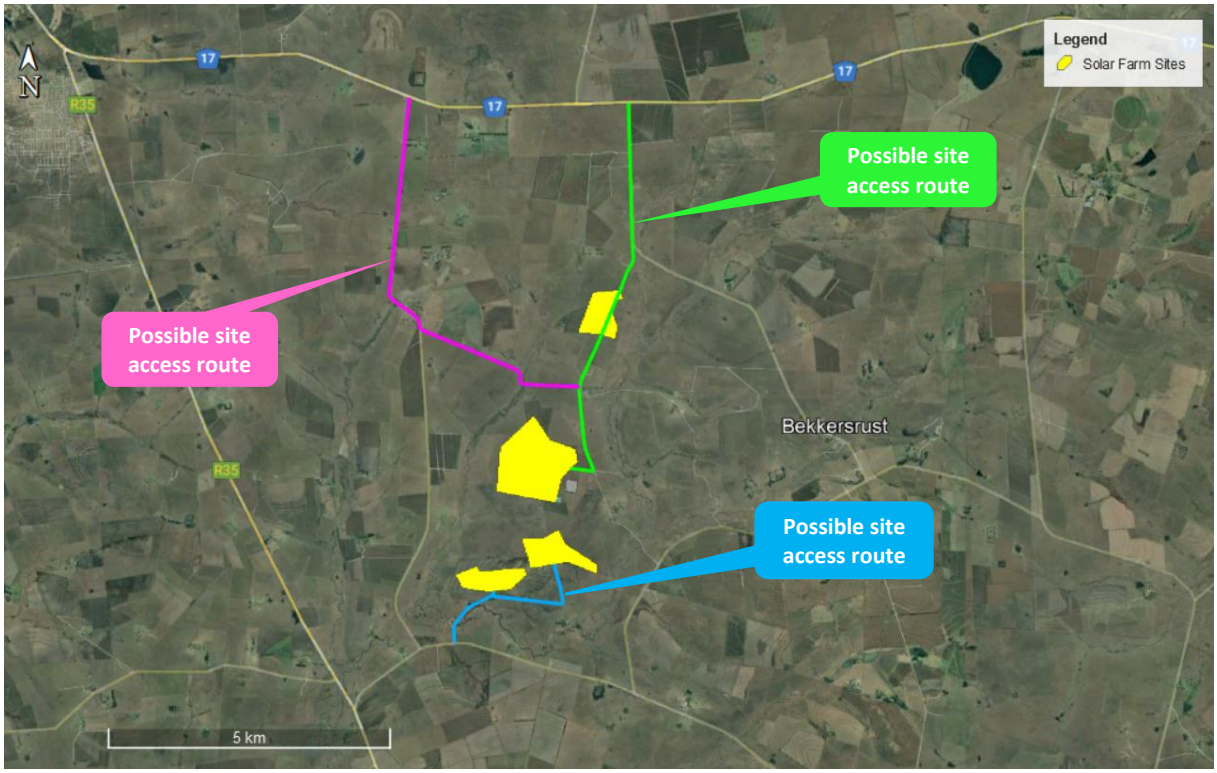

Figure 3-8: Possible site access routes

3.9 Main Route for the Transportation of Materials, Plant and People to the proposed site

The nearest towns in relation to the proposed development site are Standerton, Secunda, Bethal and Kriel. It is envisaged that most materials, water, plant, services and people can be procured within an 60km radius of the proposed facility. However, this would be informed by the REIPPPP requirements. The nearest city, Johannesburg, is located approximately 180km from the proposed development site.

Concrete batch plants and quarries in the vicinity could be contracted to supply materials and concrete during the construction phase, which would reduce the impact on traffic on the surrounding road network. Alternatively, mobile concrete batch plants and temporary construction material stockpile yards could be commissioned on vacant land near the proposed site. Delivery of materials to the mobile batch plant and the stockpile yard could be staggered to minimise traffic disruptions.

4 APPLICABLE LEGISLATION 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)
- 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.

5 IDENTIFICATION OF KEY ISSUES

5.1 Identification of Potential Impacts

The potential transport related impacts are described below.

5.1.1 Construction Phase

Potential impact

- Construction related traffic
- The construction traffic would also lead to noise and dust pollution.
- This phase also includes the construction of roads, excavations, trenching for electrical cables and other ancillary construction works that will temporarily generate the most traffic.

5.1.2 Operational Phase

During operation, it is expected that staff and security will periodically visit the facility. It is assumed that approximately 30 full-time employees will be stationed on the site. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.

5.1.3 Cumulative Impacts

- Traffic congestion/delays on the surrounding road network.
- Noise and dust pollution

6 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

6.1 Potential Impact (Construction Phase)

6.1.1 Nature of the impact

- Potential traffic congestion and delays on the surrounding road network and associated noise and dust pollution.

6.1.2 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.

6.1.3 Trip generation - Construction Phase

From experience on other 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 the proposed 150MW solar energy facility, the respective total trips can therefore be estimated to be between 4 286 and 6 429 heavy vehicle trips, which will generally be made over a 12-month construction period. Choosing the worst-case scenario of 6 429 heavy vehicles over a 12-month period travelling on an average of 22 working days per month, the resulting daily number of vehicle trips is 25. 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 vehicle trips for the construction phase are approximately 5-10 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 2MW packages and 40ft containers). These can then be stored at the port and repacked onto flatbed trucks.

As no specific information was available at the time of preparing this report, it was assumed that during the peak of the construction period, 200 employees will be active on site.

Staff trips are assumed are shown in **Table 6-1**:

Table 6-1: Estimation of daily staff trips per site

Vehicle Type	Number of vehicles	Number of Employees
Car	10	15 (assuming 1.5 occupants)
Bakkie	20	30 (assuming 1.5 occupants)
Taxi – 15 seats	5	75
Bus – 80 seats	1	80
Total	**36**	**200**

It is difficult to accurately estimate the construction traffic for the transportation of materials as it depends on the type of vehicles, tempo of the construction, source/location of construction material etc. However, it is assumed that at the peak of construction, approximately 150 construction vehicle trips will access the site per day.

The total estimated daily site trips for each of the three sites are shown in **Table 6-2** below.

Table 6-2: Estimation of daily trips per site

Activity	Number of trips
Staff trips	36
Component delivery	17
Construction trips	150
Total	**203**

The impact on general traffic is therefore deemed nominal as the 203 trips will be distributed across a 9hr working day. The majority of the trips will occur outside the peak hours.

The significance of the transport impact without mitigation measures during the construction phase can be rated as medium. However, considering that this is temporary and short term in nature, the impact can be mitigated to an acceptable level.

6.1.4 Significance of impact with mitigation measures

The proposed mitigation measures for the construction traffic will result in a minor reduction of the impact on the surrounding road network, but the impact on the local traffic will remain moderate as the existing traffic volumes are deemed to be low. The dust suppression, however, will result in significantly reducing the impact.

- 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 during the construction phase, as required.
- Regular maintenance of gravel roads by the Contractor during the construction phase and by the Owner/Facility Manager during the operation phase.
- The use of mobile batch plants and quarries near the site would decrease the traffic impact on the surrounding road network.
- Staff and general trips should occur outside of peak traffic periods as far as possible.
- 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 accommodate the abnormal load vehicles.
- 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. It needs to be ensured that the gravel sections 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.

- Design and maintenance of internal roads. The internal gravel roads will require grading with a grader to obtain a flat even surface and 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.

6.2 Potential Impact (Operational Phase)

6.2.1 Nature of the impact

- Potential traffic congestion and delays on the surrounding road network.

6.2.2 Significance of impact without mitigation measures

- Traffic during the operation phase will include occasional maintenance requirements and staff trips.
- The number of water tanks needed for cleaning the panels can be significant However, water related trips are expected to not occur more than four times a year.

6.2.3 Trip Generation – Operational Phase

During operation, it is assumed that approximately 30 full-time employees will be stationed on site and hence vehicle trips generated are low and will have a negligible impact on the external road network. Traffic during the operational phase will be low (less than 10 trips) as trips will only be for occasional maintenance requirements and staff trips (assumed at 30 permanent staff).

Trips generated by material delivery:

Aside from operational staff, cleaning of the solar panels is expected to generate trips. The following assumptions can be made to estimate the resulting trips generated from cleaning solar panels:

- On a commercial scale, solar panels are typically cleaned using special cleaning agents or treated water such as distilled, deionized (DI) or reverse osmosis (RO) water. The treated water can be transport to site via water bowsers or alternatively an onsite water treatment system can be installed to generate treated water.
- Using manpower to clean solar panels can be physically demanding, resulting in long hours and high staff demands for large volumes of panels (e.g., A 32 panel system on average takes 2 hours to clean (Sunpower, n.d.)).
- Manpower/manual cleaning has a disadvantage where uneven and inconsistent pressure applied to the panels can result in damage.
- Commercial and large solar facilities often employ mechanical cleaning systems because they have high power and efficiency, and the cleaning work has good consistency of pressure on solar panels drastically limiting solar panel damage. Mechanical systems can also work faster than manual cleaning. See **Figure 6-1** and **Figure 6-2** for examples of mechanical cleaning systems (Bluesun Solar Group, n.d.).

Figure 6-1: Mechanical Solar panel cleaning system

Figure 6-2: Cleaning robot

- The frequency at which solar panels are cleaned depends on the condition of the solar panels and the environment the solar panels are located in. On average solar panels can be expected be cleaned every six (6) months. As the system to be used for this project is not known at present, generated trips cannot be assumed. However, it is expected that the number of trips will be nominal.
- For the water delivery, domestic and industrial water bowsers vary in size. Typical water bowsers are available at capacities ranging from 5 000L to 30 000L. Due to the size of the solar project and to limit trips, it is recommended to use the large 30 000L water bowsers.
- Based on similar studies, approximately 5 litres of water per panel are needed to clean one panel. The exact number of panels still needed to be determined at the time of preparing this report and therefore the assumptions shown in **Table 6-3** were made to provide an indicative trip generation for the water provision. It is expected that the generated trips can be accommodated by the external road network.

Table 6-3: Assumption of Trips for Water delivery

Assumption	Resulting volumes
150MW – 500 000 panels	500 000 panels
5L per panel, 30 000L per water tanker	84 water tankers
Assumption 1: **Assuming water is delivered and stored on site. Limits down time.**	- 84 truck trips for delivery per day - Assumed peak hour trips of around 30% of the average daily traffic. - Max. 26 peak hour trips generated for water delivery periodically.
Assumption 2: **Assuming a 5-workday delivery period of water to the site.**	- 17 truck trips for delivery per day over 5 days - Assumed peak hour trips of around 30% of the average daily traffic. - Max. 5 peak hour trips generated for water delivery periodically.

6.2.4 Significance of impact with mitigation measures

The operational trips generated will be acceptable and will have a low to medium impact on the external road network. Further mitigation measure can reduce the trip generation:

- Staff and general (maintenance) trips should occur outside of peak traffic periods as far as possible.
- The provision of water storage tanks and/or boreholes.
- Water bowsers trips should occur outside of peak traffic periods as far as possible.
- Spread the cleaning of the panels over a week.
- Using a larger water bowser.

7 NO-GO ALTERNATIVE

The no-go alternative implies that the proposed Ummbila Emoyeni Solar PV facility does not proceed. This would mean that there will be no negative environmental impacts and no traffic impact on the surrounding network. 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 the targets for renewable energy. **Hence, the no-go alternative is not a preferred alternative.**

8 POTENTIAL IMPACT ASSESSMENT SUMMARY

The assessment of potential impacts discussed above are collated in the tables below.

8.1 Construction Phase

Table 8-1: Impact Rating - Construction Phase: Traffic Congestion

Nature: **Traffic congestion during the construction phase**			
Impact description: The impact will occur due to added pressure on the road network due to the increase in traffic associated with the transport of equipment, material and staff to site during the construction phase.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Short-term (2)	The construction period is expected to last between 1 – 2 years.	**Medium Negative (40)**
Extent	Local (2)	Pressure will be added on the local road network.	
Magnitude	Moderate (6)	The increase in traffic will have a moderate impact on traffic operations.	
Probability	Highly Probable (4)	The possibility of the impact on the traffic operations is highly probable.	
Mitigation/Enhancement Measures			
Mitigation: • Stagger component delivery to site • Reduce the construction period • Source mobile batch plants and quarries in close proximity to the site • Staff and general trips should occur outside of peak traffic periods as much as possible • Conduct regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase.			
Post Mitigation/Enhancement Measures			
Duration	Short-term (2)	The construction period is expected to last between 1 – 2 years.	**Low Negative (15)**
Extent	Local (2)	Pressure will only be added on the local road network.	
Magnitude	Low (2)	The increase in traffic will have a low impact on traffic operations.	
Probability	Probable (3)	The possibility of the impact on the traffic operations is probable.	
Cumulative impacts: The duration of the construction phase is short term (i.e., the impact of the generated traffic on the surrounding road network is temporary and renewable energy facilities, when operational, do not add any significant traffic to the road network). Even if all renewable energy projects within the area are constructed 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.			
Residual Risks: Traffic will return to normal levels after construction is completed.			

Table 8-2: Impact Rating - Construction Phase: Air Quality

Nature: **Air quality will be affected by dust pollution**			
Impact description: The impact will occur due to the increase in construction traffic associated with the transport of equipment, material and staff to site during the construction phase.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Short-term (2)	The construction period is expected to last between 1 – 2 years.	**Medium Negative (36)**
Extent	Local (2)	Pressure will only be added on the local road network.	
Magnitude	Moderate (5)	The increase in traffic will have a moderate impact on traffic operations.	
Probability	Highly Probable (4)	The possibility of the impact on the traffic operations is highly probable.	
Mitigation/Enhancement Measures			
Mitigation: • Dust suppression of gravel roads during the construction phase, as required. • Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase.			
Post Mitigation/Enhancement Measures			
Duration	Short-term (2)	The construction period is expected to last between 1 – 2 years.	**Low Negative (15)**
Extent	Local (2)	Pressure will only be added on the local road network.	
Magnitude	Low (2)	The increase in traffic will have a low impact on traffic operations.	
Probability	Probable (3)	The possibility of the impact on the traffic operations is probable.	
Cumulative impacts: The duration of the construction phase is short term (i.e., the impact of the generated traffic on the surrounding road network is temporary and renewable energy facilities, when operational, do not add any significant traffic to the road network). Even if all renewable energy projects within the area are constructed 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.			
Residual Risks: Traffic will return to normal levels after construction is completed. Dust pollution during the construction phase cannot be completely mitigated but mitigation measures will significantly reduce the impact. Dust pollution is expected to be limited to the construction period.			

Table 8-3: Impact Rating - Construction Phase: Noise Pollution

Nature: **Noise pollution due to the increase in traffic**			
Impact description: The impact will occur due to the increase in construction traffic associated with the transport of equipment, material and staff to site during the construction phase.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Short-term (2)	The construction period will last between 1 – 2 years.	**Medium Negative (36)**
Extent	Local (2)	Pressure will only be added on the local road network.	
Magnitude	Moderate (5)	The increase in traffic will have a moderate impact on traffic operations.	
Probability	Highly Probable (4)	The possibility of the impact on the traffic operations is highly probable.	
Mitigation/Enhancement Measures			
Mitigation: • Stagger component delivery to site • Reduce the construction period as far as possible • The use of mobile batch plants and quarries in close proximity to the site • Staff and general trips should occur outside of peak traffic periods			
Post Mitigation/Enhancement Measures			
Duration	Short-term (2)	The construction period will last between 1 – 2 years.	**Low Negative (15)**
Extent	Local (2)	Pressure will only be added on the local road network.	
Magnitude	Low (2)	The increase in traffic will have a low impact on traffic operations.	
Probability	Probable (3)	The possibility of the impact on the traffic operations is probable.	
Cumulative impacts: The duration of the construction phase is short term (i.e., the impact of the generated traffic on the surrounding road network is temporary and renewable energy facilities, when operational, do not add any significant traffic to the road network). Even if all renewable energy projects within the area are constructed 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.			
Residual Risks: Traffic will return to normal levels after construction is completed. Noise pollution during the construction phase cannot be completely mitigated but mitigation measures will significantly reduce the impact. Noise pollution is limited to the construction period.			

8.2 Operational Phase

Table 8-4: Potential Impact – Operational Phase

POTENTIAL IMPACT TABLE – OPERATION PHASE
The traffic generated during this phase is expected not to have a significant impact on the surrounding road network. However, regular maintenance of gravel roads should occur during the operation phase to minimise/mitigate dust pollution.

8.3 Decommissioning Phase

Table 8-5: Potential Impact - Decommissioning Phase

IMPACT TABLE – 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 are expected.

9 CUMULATIVE IMPACTS

The assessment of the potential cumulative impacts is shown in **Table 9-1** below.

To assess the cumulative impact, it was assumed that all renewable energy projects within 50km currently proposed and authorized, would be constructed at the same time. This is the precautionary approach as in reality; these projects would be subject to a highly competitive bidding process. Only a handful of projects would be selected to enter into a power purchase agreement with Eskom, and construction is likely to be staggered depending on project-specific issues.

The construction and decommissioning phases are the only significant traffic generators for renewable energy projects. The duration of these phases is short term (i.e., the impact of the generated traffic on the surrounding road network is temporary and renewable energy facilities, when operational, do not add any significant traffic to the road network). Even if all renewable energy projects within the area are constructed 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.

Table 9-1: Cumulative Impact rating

Nature: Traffic congestion and associated noise and dust pollution possible along the N17, R35, R39 and the existing gravel road network, depending on the main access route selected, will be the main impact.		
	Overall impact of the proposed project considered in isolation (post mitigation)	**Cumulative impact of the project and other projects in the area**
Extent	medium (2)	High (5)
Duration	Short term (2)	medium term (3)
Magnitude	minor (2)	High (8)
Probability	Probable (3)	Improbable (2)
Significance	**Low (18)**	**Medium (32)**
Status (positive/negative)	Negative	Negative
Reversibility	High	High
Loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Confidence in findings: High.		
Mitigation: • *Stagger component delivery to site* • *Dust suppression* • *Reduce the construction period* • *The use of mobile batch plants and quarries in close proximity to the site* • *Staff and general trips should occur outside of peak traffic periods* • *Should routes approaching the proposed site from the south be considered, further investigations would be required to ascertain if the bridges/watercourse crossings on the gravel roads could accommodate heavy and abnormal load vehicle., the bridges will need to be investigated for load bearing and width.*		

10 ENVIRONMENTAL MANAGEMENT PROGRAM INPUTS

OBJECTIVE: It is recommended that dust suppression and maintenance of gravel roads form part of the EMPr. This would be required during the Construction phase where an increase in vehicle trips can be expected. No traffic related mitigation measures are envisaged during the operational phase due to the low traffic volume generated during this phase.

Project component/s	Construction Phase traffic
Potential Impact	Dust and noise pollution due to increase in traffic volume
Activity/risk source	Transportation of material, components, equipment and staff to site
Mitigation: Target/Objective	Minimize impacts on road network and surrounding communities

Mitigation: Action/control	Responsibility	Timeframe
• Stagger component delivery to site • The use of mobile batch plants and quarries near the site would decrease the impact on the surrounding road network • Dust suppression • Reduce the construction period as far as possible • Maintenance of gravel roads • Apply for abnormal load permits prior to commencement of delivery via abnormal loads • Assess the preferred route and undertake a 'dry run' to test • Staff and general trips should occur outside of peak traffic periods as far as possible. • 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 accommodate the abnormal load vehicles, if required	• Holder of the EA	• Before construction commences and regularly during construction phase

Performance Indicator	Staggering or reducing the construction trips will reduce the impact of dust and noise pollution.
Monitoring	• Regular monitoring of road surface quality. • Monitoring congestion levels (increase in vehicle trips) • Apply for required permits prior to commencement of construction

11 CONCLUSION AND RECOMMENDATIONS

This Transport Study addressed key issues and alternatives to be considered for the proposed Ummbila Emoyeni Solar Energy Facility:

- The preferred Port of Entry for imported components is the Port of Richards Bay.
- There are several local gravel roads available to access the solar sites. The northern and central sites can be accessed via two routes whilst the two southern sites can be accessed via the route which connects to the R35. However, this route crosses the Kwaggalaagte river course, which runs along the southern part and parts of the western sides of the solar site. Further investigations would be required to ascertain if the bridges/watercourse crossings on the gravel roads could accommodate heavy and abnormal load vehicle.
- It needs to be ensured that the gravel sections of the haulage routes remain in good condition and will hence need to be maintained during the additional loading of the construction phase and then reinstated after construction is completed. The gravel roads will require grading with a grader to obtain a flat even surface and the geometric design of these gravel roads needs to be confirmed at detailed design stage.
- The construction phase traffic, although significant, will be temporary and can be mitigated to an acceptable level.
- During operation, it is expected that staff and security will periodically visit the facility. It is assumed that approximately 30 full-time employees will be stationed on the site. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.
- The construction and decommissioning phases of the development is the only significant traffic generator and therefore noise and dust pollution will be higher during this phase. The duration of this phase is short term i.e., the impact of the traffic on the surrounding road network is temporary and solar facilities, when operational, do not add any significant traffic to the road network.

The potential mitigation measures for the construction phase are:

- Dust suppression
- 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 batch plants and quarries near the site would decrease the impact on the surrounding road network.
- Staff and general trips should occur outside of peak traffic periods.
- A “dry run” of the preferred route.
- Design and maintenance of internal 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 accommodate the abnormal load vehicles.

The potential mitigation measures mentioned in the operational phase are:

- Staff and general (maintenance) trips should occur outside of peak traffic periods as far as possible.
- The provision of water storage tanks and/or boreholes to limit the periodic trips generated during the solar panel cleaning process.

- Water bowsers trips should occur outside of peak traffic periods as far as possible.
- Using a larger water bowser.

The development is supported from a transport perspective provided that the recommendations and mitigations contained in this report are adhered to.

12 REFERENCES

- Google Earth Pro
- SANS 10280/NRS 041-1:2008 - Overhead Power Lines for Conditions Prevailing in South Africa
- Road Traffic Act (Act No. 93 of 1996)
- National Road Traffic Regulations, 2000
- 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

IRIS SIGRID WINK

Profession	Civil Engineer (Traffic & Transportation)
Position in Firm	Associate
Area of Specialisation	Manager: Traffic & Transportation Engineering
Qualifications	PrEng, MSc Eng (Civil & Transportation)
Years of Experience	20 Years
Years with Firm	10 Years

SUMMARY OF EXPERIENCE

Iris is a Professional Engineer registered with ECSA (20110156). She joined JG Afrika (Pty) Ltd. in 2012. Iris obtained a Master of Science degree in Civil Engineering in Germany and has more than 20 years of experience in a wide field of traffic and transport engineering projects. Iris left Germany in 2003 and has worked 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 and providing conceptual designs for the abovementioned. She has also been involved with transport assessments for renewable energy projects and traffic safety audits.

Iris is registered with the International Road Federation as a Global Road Safety Audit Team Leader.

PROFESSIONAL REGISTRATIONS & INSTITUTE MEMBERSHIPS

PrEng - Registered with the Engineering Council of South Africa No. 20110156
Registered Mentor with ECSA for the Cape Town Office of JG Afrika
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 - Chairperson
SARF RSC - South African Road Federation National Road Safety Committee
IRF - Global Road Safety Audit Team Leader

EDUCATION

1996 - Matric – Matric (Abitur) – Carl Friedrich Gauss Schule, Hemmingen, Germany
1998 - Diploma as Draughtsperson – Lower Saxonian State Office for Road and Bridge Engineering
2003 - MSc Eng (Civil and Transportation) – Leibniz Technical University of Hanover, Germany

SPECIFIC EXPERIENCE (Selection)

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

2016 – Date
Position – Associate

- **Transport Impact Assessments and Management Plan** - Euronotus Wind&Solar Energy Cluster in the Western Cape, Client: WSP on behalf of G7 Energies
- **Transport Impact Assessment for De Aar Solarfarm** - Client: Mulilo
- **Transport Impact Assessments for the Mpumalanga Windfarms** - Client: Enertrag
- **Transport Impact Assessment for the Hyperion Thermal Plant** - Client: Red Rocket
- **Transport Impact Assessment for the Richards Bay Gas to Power Facility** - Client: Savannah
- **Transport Impact Assessment for the Pienaarspoort Wind Energy Facility** - Client: Savannah
- **Transport Impact Assessment for Oya Black Mountain Solar Farm** - Client: G7 Energies
- **Traffic Impact Assessment for the Nooiensfontein Housing Development** - Client: City of Cape Town
- **Kudusberg Windfarm** – Transport study for the proposed Kudusberg Windfarm near Sutherland, Northern Cape – Client: G7 Renewable Energies
- **Kuruman Windfarm –** Transport study for the proposed Kuruman Windfarm in Kuruman, Northern Cape – Client: Mulilo Renewable Project Developments
- **Coega West Windfarm** – Transportation and Traffic Management Plan for the proposed Coega Windfarm in Coega, Port Elizabeth – Client: Electrawinds Coega
- **Traffic and Parking Audits** for the Suburb of Groenvallei in Cape Town – Client: City of Cape Town Department of Property Management.
- **Road Safety Audit** for the Upgrade of N1 Section 4 Monument River – Client: Aurecon on behalf of SANRAL
- **Sonop Windfarm** – Traffic Impact Assessment for the proposed Sonop Windfarm, Coega, Port Elizabeth – Client: Founders Engineering
- **Universal Windfarm** - Traffic Impact Assessment for the proposed Universal Windfarm, Coega, Port Elizabeth – Client: Founders Engineering
- **Road Safety Audit** for the Upgrade of N2 Section 8 Knysna to Wittedrift – Client: SMEC on behalf of SANRAL
- **Road Safety Audit** for the Upgrade of N1 Section 16 Zandkraal to Winburg South – Client: SMEC on behalf of SANRAL
- **Traffic and Road Safety Studies** for the Improvement of N7 Section 2 and Section 3 (Rooidraai and Piekenierskloof Pass) – Client: SANRAL
- **Road Safety Appraisal**s for Northern Region of Cape Town – Client: Aurecon on behalf of City of Cape Town (TCT)
- **Traffic Engineering Services** for the Enkanini Informal Settlement, Kayamandi - Client: Stellenbosch Municipality

- **Lead Traffic Engineer** for the Upgrade of a 150km Section of the National Route N2 from Kangela to Pongola in KwaZulu-Natal, Client: SANRAL
- **Traffic Engineering Services** for the Kosovo Informal Settlement (which is part of the Southern Corridor Upgrade Programme), Client: Western Cape Government
- **Traffic and Road Safety Studies** for the proposed Kosovo Informal Housing Development (part of the Southern Corridor Upgrade Program), Client: Western Cape Government.
- **Road Safety Audit** Stage 3 – Upgrade of the R573 Section 2 between Mpumalanga/Gauteng and Mpumalanga/Limpopo, Client: AECOM on behalf of SANRAL
- **Road Safety Audit** Stage 1 and 3 – Upgrade of the N2 Section 5 between Lizmore and Heidelberg, Client: Aurecon on behalf of SANRAL
- **Traffic Safety Studies** for Roads Upgrades in Cofimvaba, Eastern Cape – Client: Cofimvaba Municipality
- **Road Safety Audit** Stage 1 and 3 – Improvement of Intersections between Olifantshoek and Kathu, Northern Cape, Client: Nadeson/Gibb on behalf of SANRAL
- **Road Safety Audit** Stage 3 – Upgrade of the Beacon Way Intersection on the N2 at Plettenberg Bay, Client: AECOM on behalf of SANRAL
- **Traffic Impact Assessment** for a proposed Primary School at Die Bos in Strand, Somerset West, Client: Edifice Consulting Engineers
- **Road Safety Audit** Stage 1 and 3 – Improvement of R75 between Port Elizabeth and Uitenhage, Eastern Cape, Client: SMEC on behalf of SANRAL

Annexure B – IMPACT ASSESSMENT METHODOLOGY

IMPACT ASSESSMENT METHODOLOGY

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:

1. The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.

2. 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).

3. 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;

4. The **magnitude**, quantified on a scale from0-10, where a score is assigned:
   - 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)
   - 10 is very high and results in complete destruction of patterns and permanent cessation of processes

5. 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).

6. the **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and

7. the **status**, which will be described as either positive, negative or neutral.

8. the degree to which the impact can be reversed.

9. the degree to which the impact may cause irreplaceable loss of resources.

10. 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 Scoping evaluation table summarising the impacts identified

Impact [description of the impact]			
Issue	Nature of Impact	Extent of Impact	No-Go Areas
Potential loss of faunal species	Direct impacts: » Loss of habitat will potentially lead to a loss faunal species Indirect impacts: » Minimal edge effects leading to loss of habitat outside development site, thus, loss of faunal species	Regional	None identified at this stage
Potential loss of Species of Special Concern	Direct impacts: » None Indirect impacts: » Loss of protected species in terrestrial habitat	National	None identified at this stage
Description of expected significance of impact The proposed development site has a long history of transformation and therefore the impacts on the terrestrial environment are likely to be limited as the species typically resident in and around urban and industrial areas are commonly generalists with a wide range of habitat types. Protected species such as *Crinum stuhlmannii* and *Zoothera guttata* have potential to occur on the proposed development site. However, no protected species			

were observed within the development areas during the previously conducted site visits. Impacts can be minimised through the implementation of appropriate mitigation measures.
Gaps in knowledge & recommendations for further study » Mapping of all protected species and species of special concern within the development footprint. » Mapping of known and potential habitats used in breeding, foraging, roosting, aestivation and hibernation. » Describing the condition of all habitats and clearly indicating these on an Ecological sensitivity map. » Indication of the potential of protected species to occur on the proposed development site. **Recommendations with regards to general field surveys** » Field surveys must include the proposed development site and adjacent surrounding areas with indigenous vegetation and habitats within a 500 m radius of the project footprint. » In season (November to April) follow-up terrestrial site visits to determine the diversity of resident fauna species » In season follow-up terrestrial site visits to determine the diversity of vegetation species. » A follow up site visit is to be undertaken for small mammal trapping. » Active search will be required for the protected species and species of concern that have a high probability of occurrence which will be impacted by the proposed facility.

EIA Report Requirements

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)

Nature: **[Outline and describe fully the impact anticipated as per the assessment undertaken]**			
Impact description: The impact will occur due to added pressure on the availability of housing located in the local community. This may contribute to increased levels of competition in the temporary housing market.			
	Rating	**Motivation**	Significance
Prior to Mitigation			
Duration	Short-term (1)	The construction period will last for less than one year	**Low Negative (18)**
Extent	Local (1)	Pressure will only be added on the local municipality to provide housing for outsourced construction workers	
Magnitude	Low (4)	The increase in demand for affordable accommodation should not be extensive as workers will primarily be sourced from	

		the local communities.	
Probability	Probable (3)	The possibility of the impact on the provision of affordable accommodation is very low	
Mitigation/Enhancement Measures			
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.			
Post Mitigation/Enhancement Measures			
Duration	Short-term (1)	Pressure will only be added on the local municipality to provide housing for outsourced construction workers.	**Low Positive (8)**
Extent	Local (1)	The increase in demand for affordable accommodation should be mitigated if external construction crews are provided with onsite accommodation.	
Magnitude	Minor (2)	The possibility of the impact on the provision of affordable accommodation is very low.	
Probability	Improbable (2)	A reduced amount of pressure will be added on the local municipality to provide housing for outsourced construction workers.	
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.			
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).			

Assessment of Cumulative Impacts

As per requirements of the EIA Regulations, 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.

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)

Nature: **[Outline and describe fully the impact anticipated as per the assessment undertaken]**		
	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 or negative)	Negative	Negative
Reversibility	High	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	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.		