MOGARA SOLAR PV FACILITY
NORTHERN CAPE

TRAFFIC IMPACT & ROUTE ASSESSMENT

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Issue

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SYNOPSIS

Conduct a Traffic Impact and Route Assessment for the proposed Mogara Solar PV Facility in the Northern Cape, close to Kathu, pertaining to all relevant traffic and transportation engineering aspects.

KEY WORDS:

Traffic Impact and Route Assessment, Renewables

QUALITY VERIFICATION

This report has been prepared under the controls established by a quality management system that meets the requirements of ISO9001: 2008 which has been independently certified by DEKRA Certification under certificate number 90906882

Verification	Capacity	Name	Signature	Date
By Author	Associate	Iris Wink		10/07/2018
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Mogara Solar PV Facility
Traffic Impact and Route Assessment

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1 INTRODUCTION & SCOPE OF WORK

JG Afrika was appointed to conduct a Transport Impact Assessment (TIA) for the proposed solar farm located on Farm Portion 1 and 2 (Legoko 460), approximately 5 km south-east of Kathu in the Northern Cape (see Figure 1-1).

The report deals with the items as listed below and focuses on the surrounding road network near the site:

- Extent of the traffic study and study area,
- The proposed development,
- Trip generation for the solar farm during construction and operation,
- Traffic impact on external road network,
- Accessibility and circulation requirements,
- National and local haulage routes between port of entry/manufacturer and site,
- Assessment of internal roads and site access,
- Assessment of freight requirements and permitting needed for any abnormal loads and
- Traffic accommodation during construction.

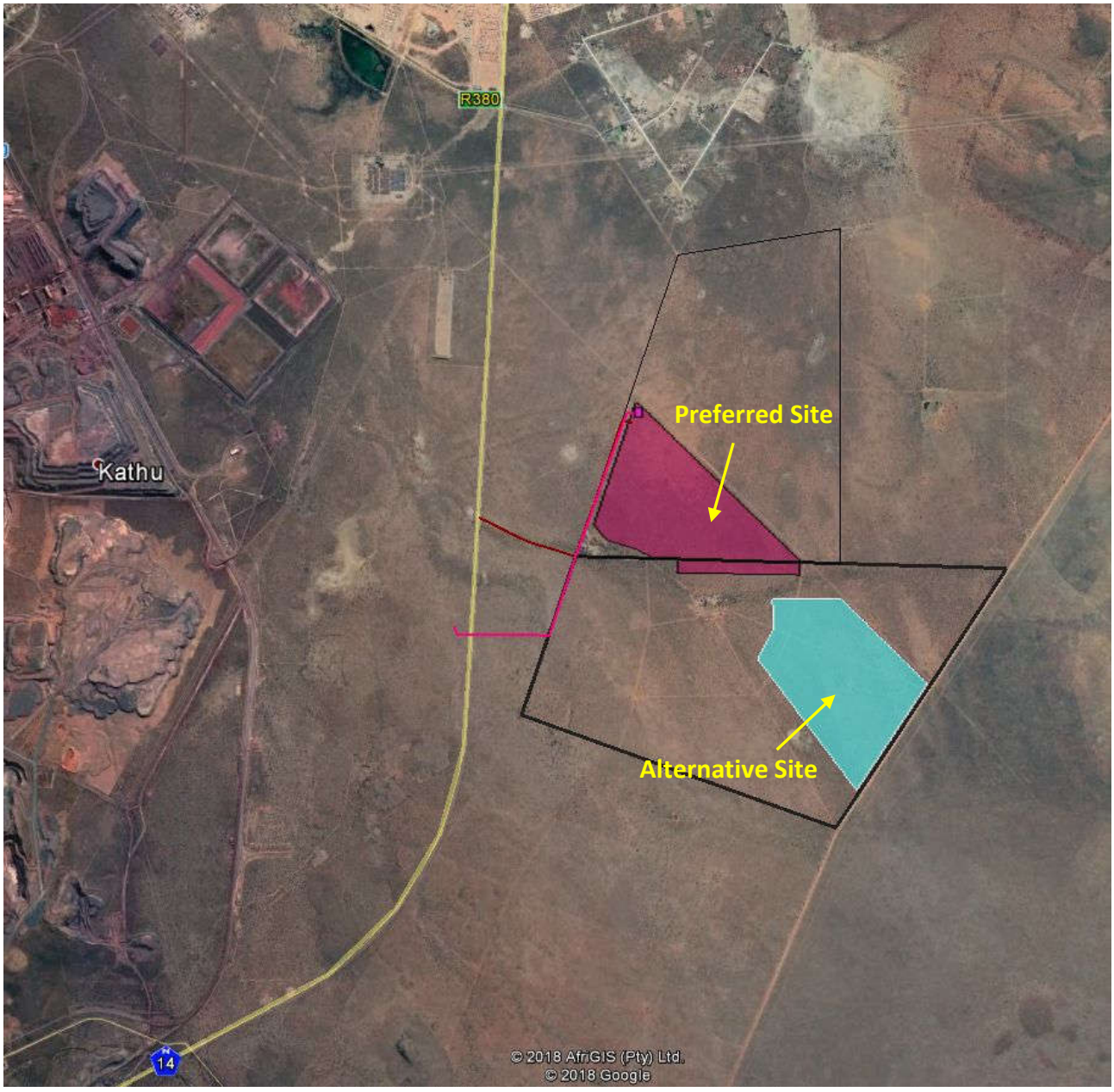
Figure 1-1 Locality Plan of Site

2 THE SITE

2.1 General

It is proposed to develop the Mogara Solar PV Facility on a site located approximately 5km south-east of the town of Kathu in the Northern Cape (See Figure 2-1). The developable area is shown in Figure 2-1 below – purple the preferred site and light blue an alternative site option.

Figure 2-1 Aerial View of Site Location



The solar facility will have a net output of 75MWAC (Megawatts – Alternating Current) installed. The PV Facility will consist of the following elements:

- On-site switching station / substation,
- Photovoltaic (PV) solar panels,
- Mounting structures to support the PV panels,
- On-site inverters (possibly string inverters),
- Transformer and internal electrical reticulation (underground cabling),
- Auxiliary buildings (such as gate house and security, control centre, office, warehouse, canteen and visitors centre),
- Temporary laydown areas,
- Internal and perimeter access roads and fencing,
- Rainwater tanks and
- Security infrastructure.

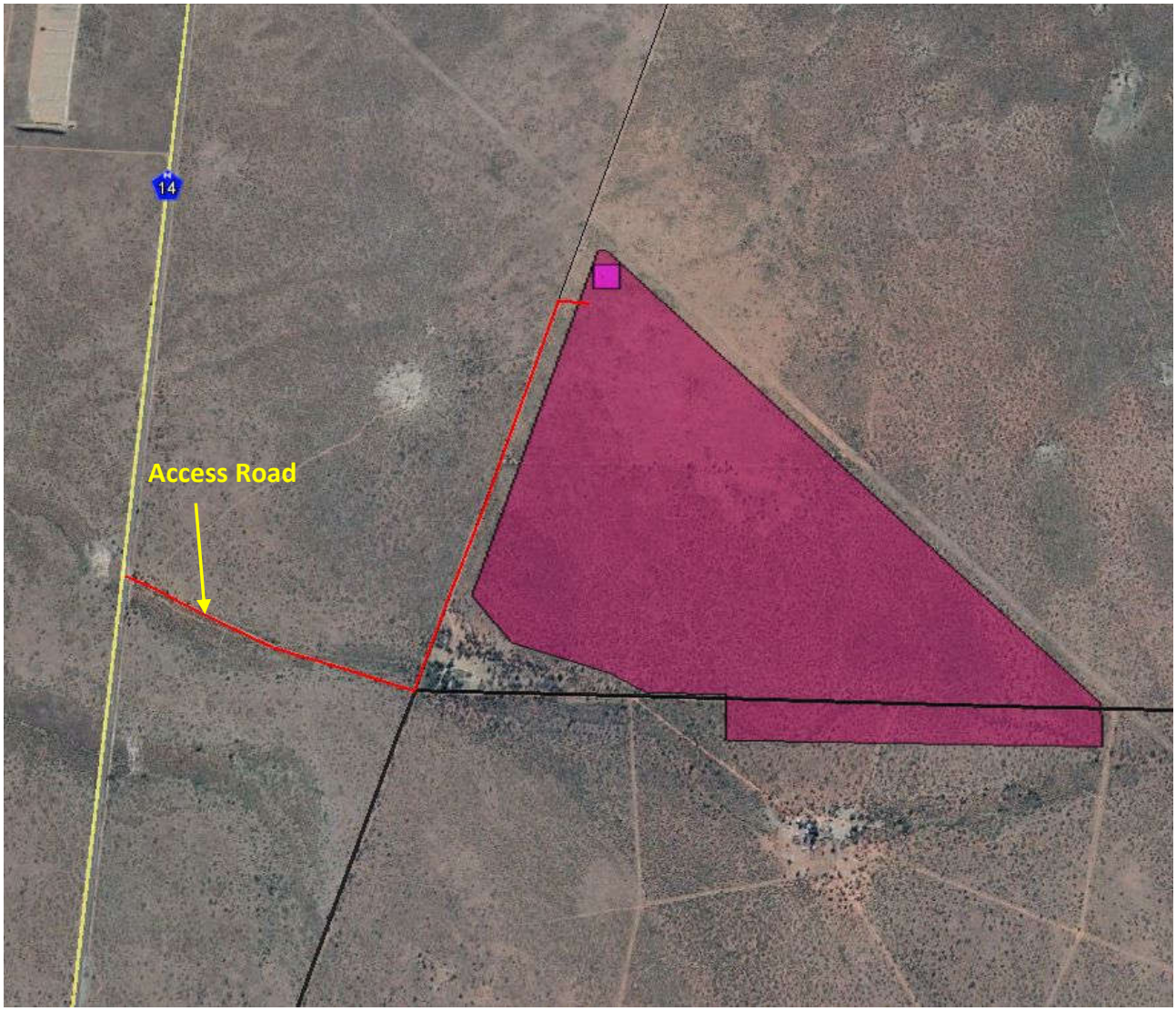
2.2 Site Access

2.2.1 General

The preferred access to the site from the N14 is via T442, which is an existing gravel road as shown in Photograph 2-1 and Figure 2-2.

Photograph 2-1 Preferred Access Point to Site from N14

Figure 2-2 Aerial View of proposed Access to Site



The access road to the site passes over flat terrain and would have a length of approximately 3km to the preferred site location. The access road will need to be maintained during construction, as the road also serves as an access to an adjacent farm. There is a culvert at the access point (see Photograph 2-1), which requires protection during the construction phase and reinstated if damaged.

The road width at the bellmouth of the access point needs to be a minimum of 6.8 metres wide and the access roads on site a minimum of 4 metres, preferably 5 metres. The radius at the access point needs to be large enough to allow for all construction vehicles to turn safely onto the access road. The exact location and design of the internal access roads need to be established at detailed design stage.

It is assumed that access control will be provided directly at the entrance to the site. Generally, security staff and a gate house are implemented during the construction phase and electronic number plate readers can be implemented during operation.

3 FREIGHT REQUIREMENTS & TRIP GENERATION

3.1 General Freight Requirements

Abnormal permits are required for vehicles exceeding the following permissible maximum dimensions on road freight transport in terms of the Road Safety Act (Act No. 29 of 1989):

- 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 front axle and 9t on 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 load must transit.

It is expected that all components for the PV facility will be transported with haulage vehicles that will not exceed the normal load limitations. However, any factors limiting transport, such as height clearances and load bearings of road infrastructure along the routes, need to be considered.

3.2 Solar Components

The following components and materials will need to be transported to the site:

- Solar panels (PV panels and frames)
- Inverter stations and electrical equipment for substation
- Cabling and further electrical elements
- Building material (such as gravel, concrete aggregates, cement)
- Transformer (the largest potential load will be a single 80MVA transformer)
- Vehicles transporting workers from surrounding areas to site
- Drilling machines and other construction machinery

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 (Superlinks) transporting the solar panels and frames, which are within the freight limitations,
- LDV (Light Differential Vehicle)-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 transformer will be transported as an abnormal load as discussed in the remainder of the report.

3.3 Trip Generation

During Construction

The current traffic volumes on the N14 north of the site are at about 4 000 vehicles per day (Average Daily Traffic – ADT) between Kuruman and Kathu according to the SANRAL Yearbook.

From experience on other projects of similar nature, the number of heavy vehicles per 7MW installation is estimated to range between 300 and 400 trips depending on the site conditions and requirements. For the 75MW, the total trips can therefore be estimated to be between 3 000 and 4 000 heavy vehicle trips, which will generally be made over a 12-month construction period. Choosing the worst-case scenario of 4 000 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 15. 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 3-6 trips. The impact on general traffic on the N14 is therefore deemed nominal.

If the panels get shipped 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.

During Operation

During operation, it is assumed that approximately five 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.

As the development will need to transport all water used for the cleaning of the PV panels, the following assumptions have been made to estimate the resulting trips generated:

- 5 000 litre bowsers to be used for transporting the water
- Approximately 5 litres of water needed per panel
- Total number of trips is therefore approximately 28 vehicles
- Panels will be cleaned four times a year.

It is expected that these trips will not have a significant impact on external traffic. However, to limit the impact, it is recommended to schedule these trips outside of peak traffic periods. Additionally, it is intended to provide rainwater tanks at the site, which would decrease the number of trips slightly.

4 HAULAGE ROUTES

A visual, Google Earth review and desktop assessment was undertaken to identify the most suitable haulage routes for the respective components to be transported to site. For a comprehensive approach, the option of using manufacturers within South Africa and shipping the panels from overseas were investigated. It is understood that all components will be transported via road from either the manufacturing centre within South Africa or the Port of Saldanha.

4.1 General Assumptions

The following assumptions are made when establishing the suitable haulage routes:

- According to the Eskom Specifications for 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.
- The imported elements will be transported from the most feasible port of entry, which is deemed to be the Port of Saldanha. It is expected that the inverter will be imported and shipped.
- 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 (KwaZulu Natal), East London, Cape Town or Johannesburg for the PV modules.
- All haulage trips will occur mainly on surfaced national and provincial roads.
- Material for the construction of internal access roads will be sourced locally as far as possible.

4.2 Route to Site

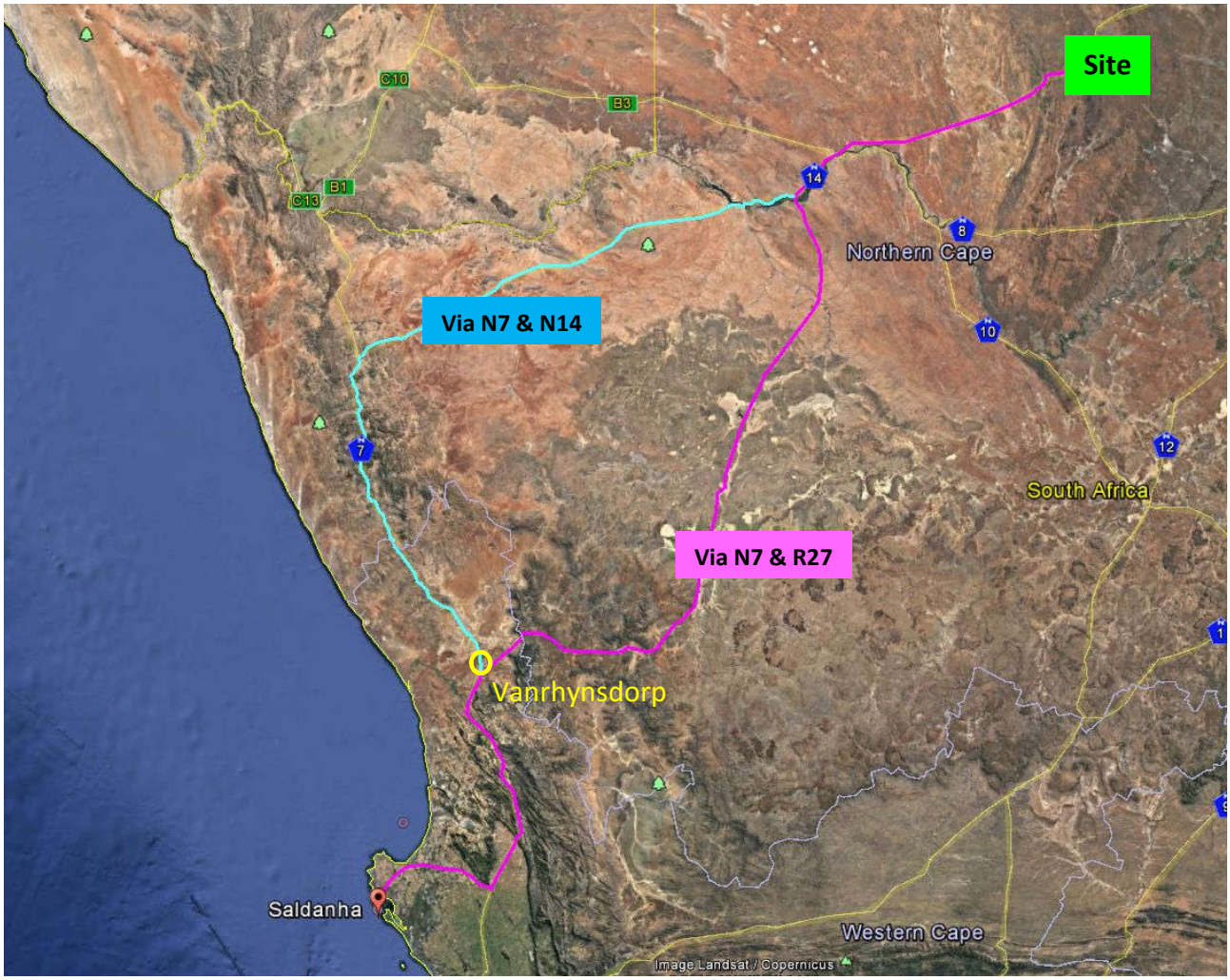
The two possible ports of entry to receive the imported parts are Saldanha and Ngqura (Port Elizabeth). As the distance from Port Elizabeth to the site via road is approximately 940km and from Saldanha to the site approximately 763km via the N7 and R27 (shown in purple in Figure 4-1) and approximately 880km via the N7 and N14, the preferred port of entry is Saldanha.

The Port of Saldanha Bay is South Africa's largest natural anchorage and port with the deepest water. It lies approximately 60 nautical miles northwest of Cape Town and accepts vessels of up to 21.5m draught and is a common user port (Iron Ore Terminal).

4.3 Preferred Route from Saldanha to Site

The preferred route will be the shortest route to the site shown in purple below and haulage vehicles will travel via the R27, R399 and N7 to site, passing Veldrift, Piketberg, Vanrhynsdorp, Calvinia, Kenhardt and Keimoes on their way. All the roads along this route are bitumen surfaced and have either black top or gravel shoulders, and are single carriageways with one lane per direction. The roads along this route are surfaced up to the gravel road leading to the primary access to the site. It needs to be ensured that the gravel section of the haulage route remains in good condition and will need to be maintained during the additional loading during the construction phase, and then reinstated after construction finishes.

Figure 4-1 Haulage Route – Saldanha to Site



4.4 Alternative Routes

As an alternative, the route as shown in blue in Figure 4-1 above can be chosen. This route remains the same as the preferred route until Vanrhynsdorp, but from here it differs by remaining on the N7 until Springbok, where a turn-off will be taken onto the N14 towards Kathu. This route is approximately 120 km longer than the preferred route.

4.5 Summary

On both the routes discussed, there are several passes, bridges and other road structures, which the haulage vehicles will pass over, but none of the goods transported from Saldanha will require abnormal loads and there are no limitations for normal heavy vehicles using these routes.
According to feedback from SANRAL, there are no road construction projects planned for the N7 at present, besides the daily Routine Road Maintenance. Various projects on the N14 from Springbok to Kathu have been completed.

4.6 Route for Components manufactured within South Africa

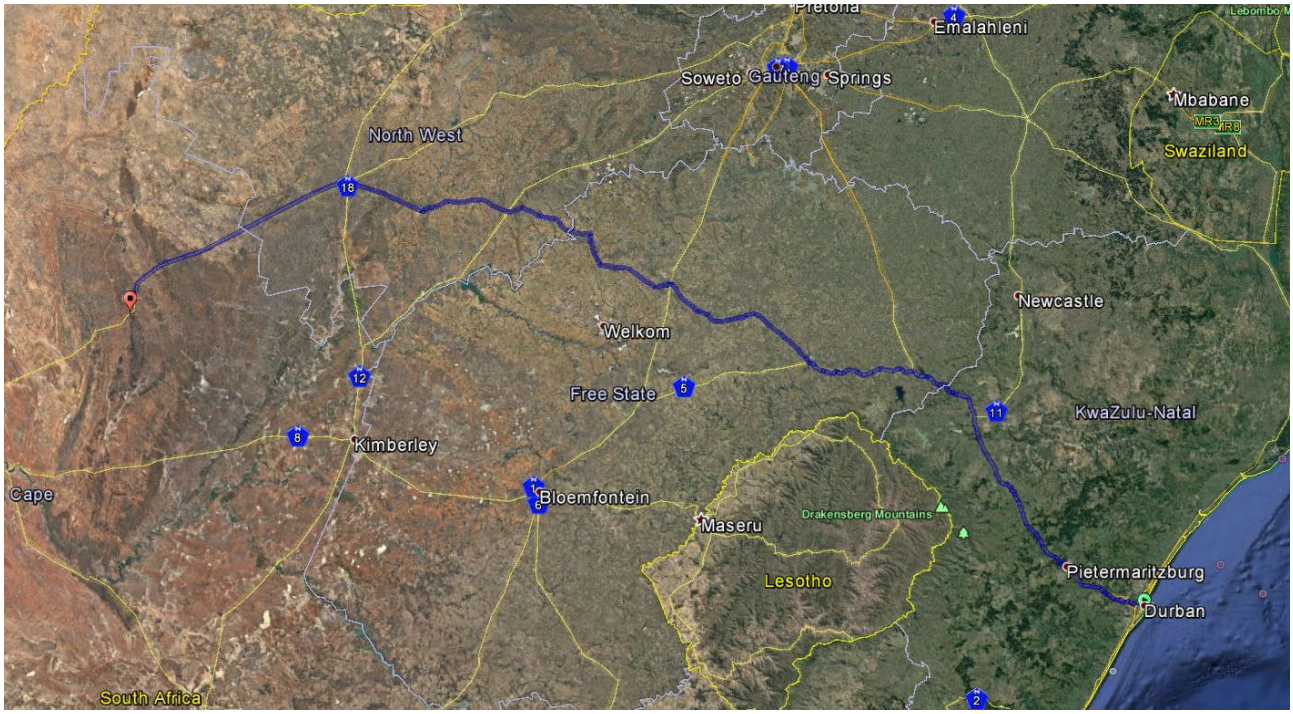
As mentioned before, it is anticipated that elements manufactured within South Africa will be transported to the site from the Cape Town, Johannesburg and Pinetown/Durban areas.

It is furthermore assumed that the transformer, which will be transported with an abnormal load vehicle, will be transported from the Johannesburg area and hence it needs to be ensured that the route from the manufacturer to the site doesn't have load limitations for abnormal vehicles. At this stage, only a high-level assessment can be conducted 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.

4.7 Route from Pinetown / Durban to Site

If the PV panels 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 will occur along the route, which is shown in Figure 4-2 below. Haulage vehicles will mainly travel on national and provincial roads and the total distance is approximately 1 200km.

Figure 4-2 Haulage Route from Pinetown Area to Site



4.7.1 Route from Johannesburg Area to Site – Normal Loads

It is assumed that the inverter and support structure will be manufactured in the Johannesburg area and transported to site via road. The general route distance is around 800km and no road limitations are expected on this route for normal loads vehicles as it will mainly follow national and provincial roads. The haulage route is shown in the following Figure 4-3.

Figure 4-3 Haulage Route from Johannesburg Area to Site for Normal Loads

1.1.1 Route from Johannesburg Area to Site – Abnormal Load

As mentioned previously, it is assumed that the 80MVA 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 structures. Furthermore, a load of abnormal dimensions may cause an obstruction and danger to other traffic and therefore the transformer needs to be transported as far as possible on roads that are wide enough for general traffic to pass. It is expected that the transformer can be transported to site via the same route used for normal loads as shown in Figure 4-3.

There are several bridges and culverts along this route, which need to be confirmed for load bearing and height clearances. There will be several turns along the way and a couple of small towns to pass through, such as Delareyville and Vryburg. According to the desktop study, all turning movements along the route are manageable for the abnormal vehicle.

However, there are many alternative routes, which can be investigated if the above route or sections of the route should not be available for whatever reason.

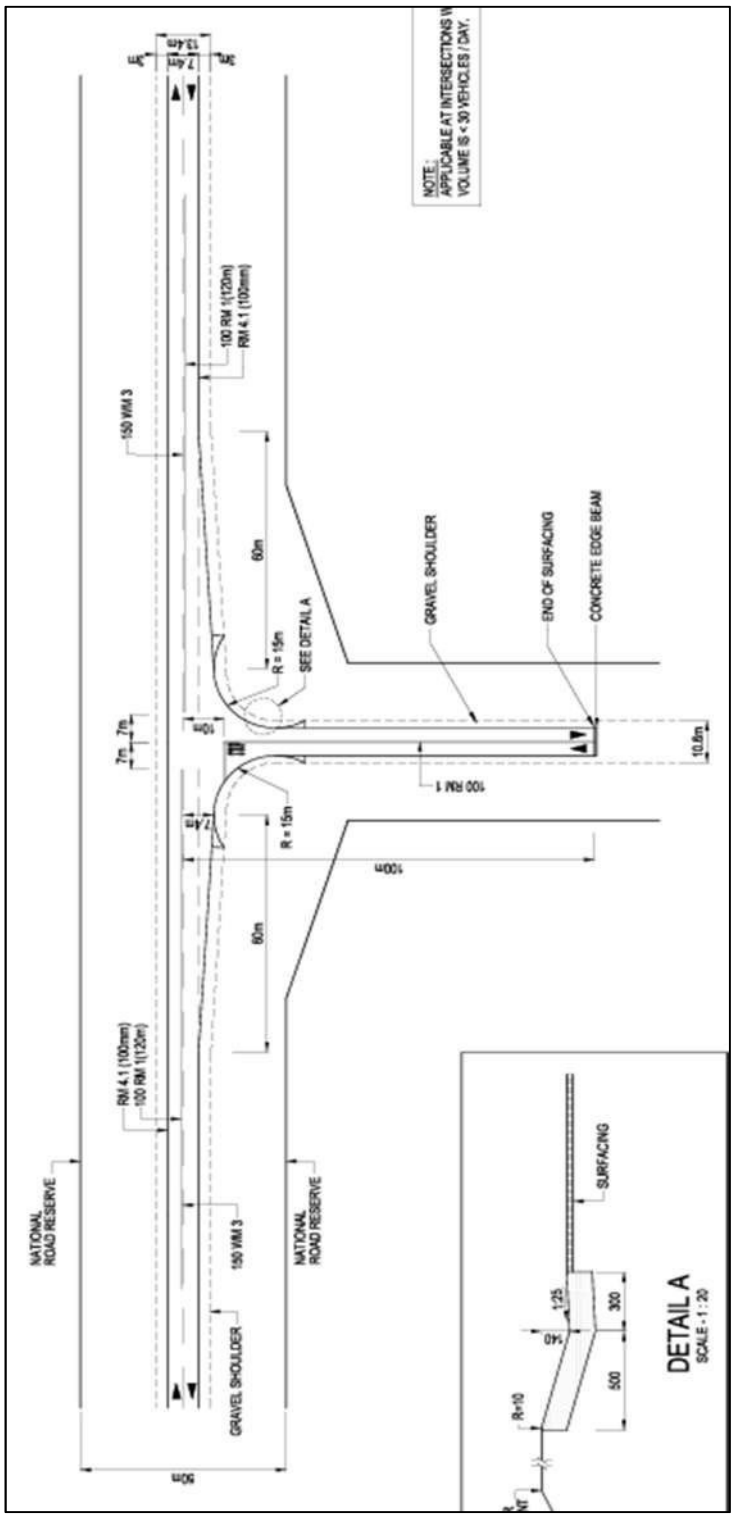
1.1.2 Route from Cape Town Area to Site

PV panels might be manufactured in the Cape Town area and transported to site. The recommended haulage route will follow National Road N7 from Cape Town to Vanrhynsdorp and from here it will be the same as the recommended routes described under 4.2. The general route distance is around 1010km and no road limitations are expected on this route for normal loads vehicles as it will mainly follow national and provincial roads.

5 TRAFFIC ACCOMMODATION DURING CONSTRUCTION

It is recommended to consider upgrading the existing gravel access on the N14 to the site as per SANRAL standard (see example Figure 5-1), the traffic will have to be accommodated during construction.

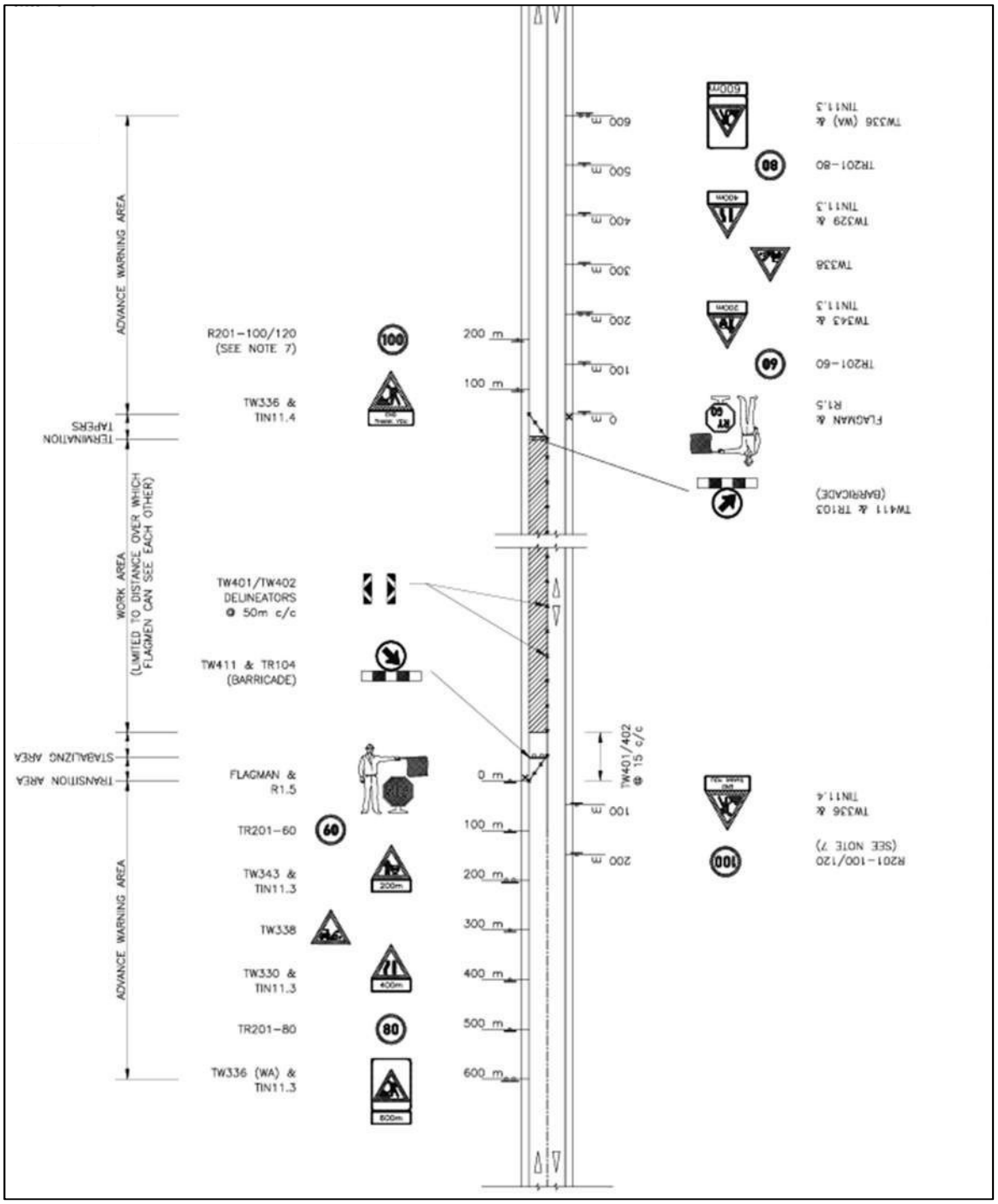
Figure 5-1 Example of Typical T-Junction on Class 2 Roads



Source: SANRAL Typical Drawings

Figure 5-2 shows a typical layout for Traffic Accommodation for two-way roads as per WCG Standard Plans by the Department of Transport and Public Works (March 2015). All temporary road signage and markings needs to be in line with the South African Road Traffic Signs Manual.

Figure 5-2 Typical Traffic Accommodation



Source: Western Cape Government – Standard Plans – Index No. WCS/15/1/D1

6 SUMMARY

The aim of this study was to investigate all traffic and transportation related matters pertaining to the proposed Legoko Mogara Solar PV Facility on Portion 1 and 2 of Farm Legoko 460 close to Kathu in the Northern Cape. As it had not been decided at the time of conducting this study, which manufacturers will be used for the solar PV components, all possible haulage routes were included into this study.

The development of a 75MW Solar PV facility is supported form a traffic engineering point of view, provided that the recommendations in this report are adhered to.