ATLANTIC RENEWABLE ENERGY PARTNERS (PTY) LIMITED

Traffic Impact Assessment and Management Study

On behalf of Humansrus Solar 3 (Pty) Ltd

Contact Person:
B. Rabbitte
Atlantic Energy Partners
101, Block A, West Quay
Building 7 West Quay Road
Waterfront, 8000
F: + 27 (0) 86 611 0894
L: +27 (0) 21 418 2596
M: + 27 (0) 72 855 3420
E: bradley@atlanticep.com

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Name	**Title**	**Signed**
D. Peinke	Director	

DISTRIBUTION

Name	**Designation**	**Company**
D. Holder	Consultant	Cape EAPrac
S. Miszczak	Project Developer	AEP

ABBREVIATIONS AND ACRONYMS

AEP	Atlantic Renewable Energy Partners (Pty) Ltd
ADT	Average Daily Traffic
CSP	Concentrated Solar Power
DTPW	Department of Transport and Works
EIA	Environmental Impact Assessment
KZN	Kwa-Zulu Natal
MW	Megawatts
PV	Photovoltaic
P.E.	Port Elizabeth
TIA	Traffic Impact Assessment

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1. INTRODUCTION

Humansus Solar 3 (Pty) Ltd appointed Atlantic Renewable Energy Partners (Pty) Ltd to prepare a Traffic Impact Assessment (TIA) and Management Study for the proposed Humansrus Solar 3 (Pty) Ltd solar photovoltaic (PV) facility (hereinafter referred to as '**Humansrus 3**'). Humansrus 3 is situated on the Humansrus Farm 147, 10km South-East of Copperton and 50km South-West of Prieska in the Northern Cape (as seen in Figure 1). The coordinates for Humansrus 3 are provided in Table 1, below:

Table 1: Humansrus 3 locality

Latitude	Longitude
29°58'51.57"S	22°23'15.12"E

Humansrus 3 is proposed to have a contracted capacity totaling 75 MW and an estimated footprint of 226ha.

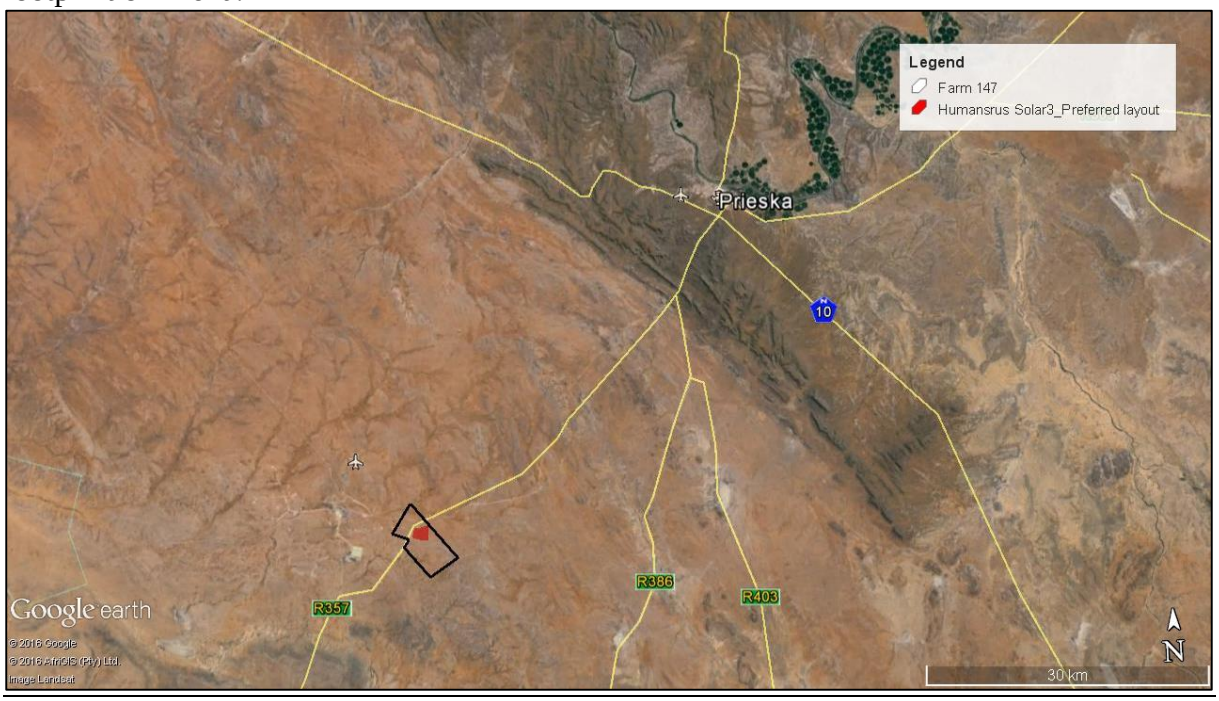


Figure 1: Google Map depicting the location of Humansrus 3 (Google Maps, 2016)

1.1 Scope of the Report

The scope of this report is to analyses all transport requirements needed to support the construction and development of the proposed Humansrus 3 solar facility.

In order for this study to be completed, the following procedures were followed:

1. All knowledge was gathered pertaining to freight transport routes throughout the country;
2. Confirmation of all permits required for uninterrupted travel to and from site;

3. Confirmation of all freight and transport requirements during construction and maintenance;
4. Provision of a primary freight route with auxiliary routes as standbys; and
5. Provision all necessary traffic accommodation measures during construction of the access to site off the Provincial road (R357).

1.2 Key Considerations for the Traffic Impact Assessment and Management Study

The following main considerations have been devised in order to facilitate the development of this study:

- All local elements sourced within South Africa will be transported from the manufacturing centres (Johannesburg, Gauteng; Pinetown, KZN);
- All international elements required for development will be imported via the most feasible South African Port;
- The largest component to be transported will be 1 x 70t transformer (80MVA);
- The maximum vertical clearance will not exceed 4.2m for abnormal loads;
- All routes will follow national and provincial roads;
- All basic materials such as concrete and other road materials will be sourced from nearby towns; and
- Traffic accommodation measures will be taken during construction.

2. PROJECT SITE CHARACTERISTICS

Humansrus 3 is situated near the town of Copperton in the Central Karoo Region, Northern Cape. The farm Humansrus 147 is intersected by the R357, with the R386, R403 and N10 feeding onto the road (depicted in Figure 2). Economic activities in the surrounding area are primarily mining and renewable energy developments (PV, Concentrated Solar Power (CSP), and wind).

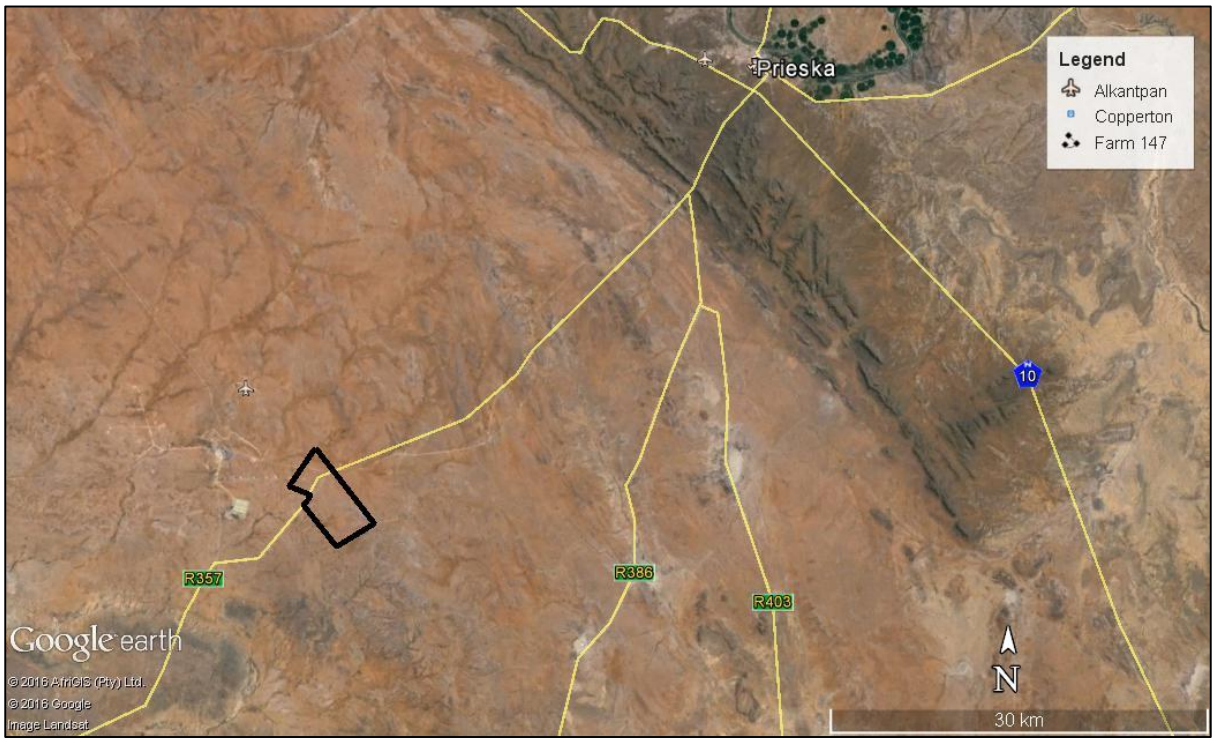


Figure 2: Locality map of Farm 147 (Google Maps, 2016)

Humansrus 3 is proposed to have a maximum contracted capacity of 75MW and consist of the following elements:

- Photovoltaic (PV) panels;
- Mounting structures on which the solar modules will be connected;
- Inverters and a facility substation;
- Connection from the facility substation to Eskom's injection point (assumed to be Kronos MTS);
- Site offices and ablution facilities (both temporary and permanent depending of stage of project development);
- Access roads and fencing; and
- Cabling and pipe networks situated underground.

The following Assumptions are made for materials during the construction of Humansrus 3:

- All basic building materials comprising concrete, road materials, etc., will be supplied out

of local towns (Prieska and Kimberley) near to the site;

- All inverters and other locally assembled equipment will be delivered from the manufacturing centres, either out of Johannesburg, Gauteng, or Pinetown, KZN;
- All supplementary materials will be imported to nearby Ports and delivered to site via heavy vehicles with legal limits; and
- The 70t transformer that will be imported will require an Abnormal Load permit prior to transportation.

2.1 Access Points to Site

The Department: Roads & Public Works (DRPW) has granted a no objection to road access to Humansrus 3 facility off the R357- further details can be seen in Appendix 4. Two potential access options are proposed:

- Road Access alternative 1 (Alternative) sits close to the boarder of Farm 147 (29°58'1.58"S; 22°23'21.78"E). The access route feeds directly onto the most Northern corner of Humansrus 3 preferred layout - as shown in Figure 3.
- Road Access alternative 2 (Preferred) is 2,39km South-West of Road Access alternative 1 and feeds directly onto the Western corner of Humansrus 3 preferred layout (29°58'53.77"S; 22°22'25.91"E) - as shown in Figure 3. This option runs adjacent to an existing Eskom line where the already existing road will be used for access to the site. It is furthermore understood that Eskom plans to decommission this line.
- Road Access Alternative 3 (alternative) is positioned directly opposite Road Access alternative 2. It feeds onto the Southern portion of Humansrus 3 alternative site- as seen in Figure 3.

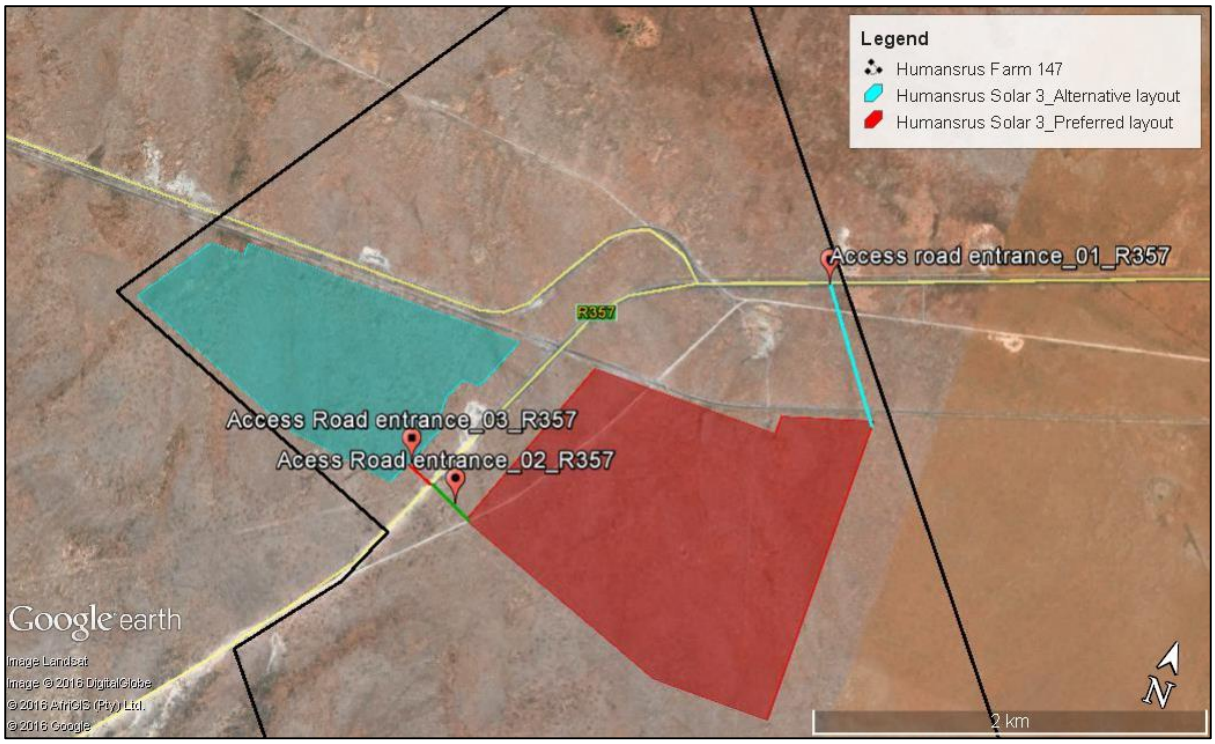


Figure 3: Access points off the R357 (Google Maps, 2016)

3. LEGISLATION

In terms of the Road Safety Act (No. 29 of 1989), a freight transport vehicle that exceeds the following permissible maximum specifications will require an Abnormal Permit:

- 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 around 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.

The application for an Abnormal Permit must be submitted to the Department of Transport and Public Works (DTPW) for all vehicles that exceed these specifications. An Abnormal Permit is required per province that the freight will transit through, and an escort car is required to accompany the abnormal load vehicle to site.

4. TRIP GENERATION

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

- Conventional heavy vehicles within legal limits.
- 40ft container trucks transporting solar panels and frames as well as the inverters, which are within the freight limitations.
- Pickup vehicles transporting light loads.
- All earth work vehicles (J.C. Bamford Excavator's (JCB), bulldozers, diggers, etc.)
- Heavy vehicles requiring abnormal permits for transportation.

4.1 Traffic Volumes

It is estimated from previous projects (Humansrus Solar 1 Pty (Ltd) and Humansrus Solar 2 Pty (Ltd)) that the number of heavy vehicles per 7MW installation would be between 300 and 400 heavy vehicle trips depending on the site condition and founding requirements.

The project has a total capacity of 75MW which would therefore require 3000 to 4000 heavy vehicle trips. The estimated time period for construction is nine months to a year, averaging 15-20 trips/ day, which is not expected to have a significant effect on peak hour traffic.

According to the previous projects, the N10 experiences an Average Daily Traffic (ADT) of between 200-400 vehicles with a maximum hourly flow of 25 veh/hr.

As for the R357, a study was performed by Proman, which registered an ADT of 141 vehicles with a peak daily flow of 18 veh/hr (as seen in Appendix 1). Therefore, it can safely be concluded that the increase in traffic flow due to the heavy vehicles travelling to site will not significantly increase congestion on either of the roads.

4.2 Access Route from Port

The Ports considered to be the most practical for the imported elements were Port Elizabeth (P.E.)/Coega and Saldanha Bay, with P.E. being the preferred port. There are multiple routes that can be taken in order to transport elements to site. However, in accordance with the considerations outlined in Section 1, as well as the Ports Authority's preferences for freight transport, the following two transport routes were assessed.

4.2.1 Access Route 1 (Preferred)

Access Route 1, shown in Figure 4, was selected as it is the shortest and most practical from a port to the site. The route starts at P.E. Port/Coega and is a total distance of **695km**. Table 2 provides a brief description of the main roads that will be travelled as well as the traffic congestion during peak hours.

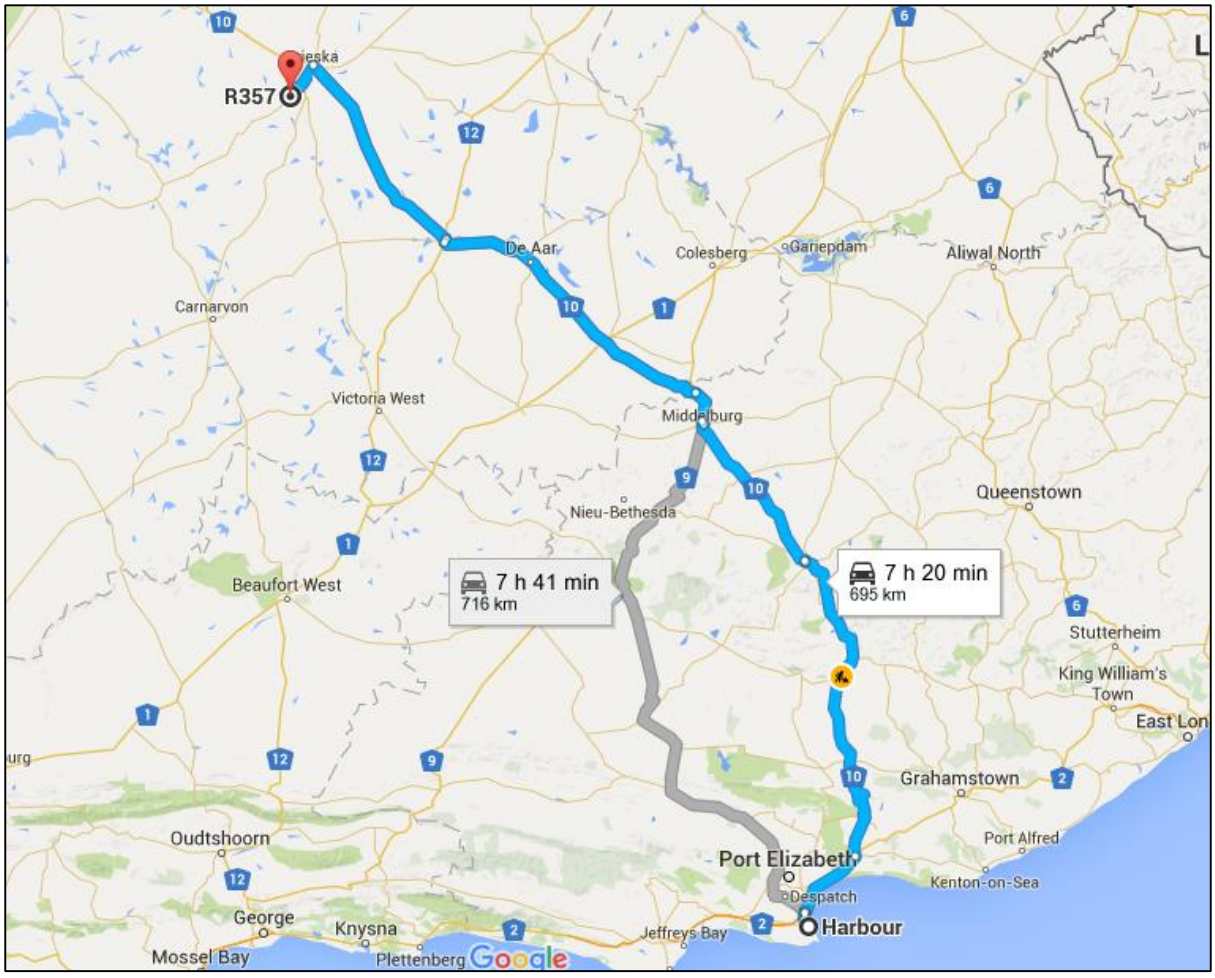


Figure 4: Access Route 1: PE Port to site (Google Maps, 2016)

Table 2: Preferred route characteristics

Roads Used	Distance	Description	
M4	2.7km P.E. Port to N2	• Metropolitan highway • Urban traffic • Constant/fast traffic flow during rush hours	
N2 and N10	671km N2 onto N10 to R357 in Prieska	• National road • Two lane road with surfaced shoulders in place • Constant/fast traffic flow during rush hours	
R357	22km R357 to site entrance	• Provincial(Route) • Single lane carriageway • Minor main route • Constant/fast traffic flow during rush hours	

4.2.2 Access Route 2 (Alternative)

Should the P.E. Port be inaccessible for any reason, Saldanha Bay Port would be used for all imported elements needed. The Saldanha Bay route to site has two main options to follow; the preferred route is shown in blue in Figure 5, and the alternative shown in grey. The blue route is preferred as the congestion on this route will be less, consequently decreasing the chance of collision when large freight is being hauled. Table 3 provides further information on the route which has a total distance of **964km**. The alternative route (grey route) contains a large section of gravel road from Brandvlei up until the Kronos Substation positioned opposite the site. It is therefore recommended that this option be avoided for all transit of large/fragile freight.

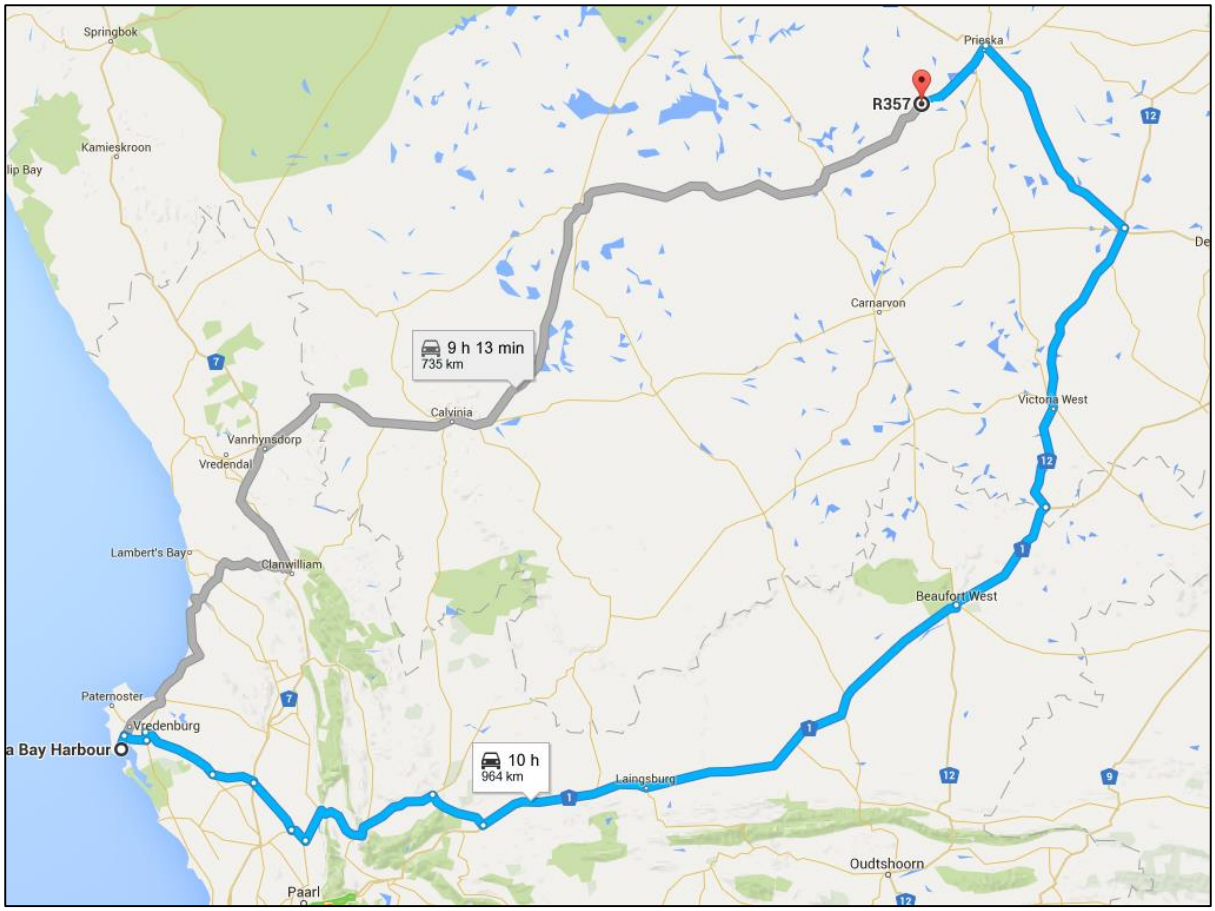


Figure 5: Access Route 2: Saldahna Bay Port to site (Google Maps, 2016)

Table 3: Alternative route from Saldanha Port

Main Roads Used	Distance	Description	
R45 and R311	89km Saldanha Bay Port to N7	• Major main route (R45) • Minor main route (R311) • Moderate-fast traffic flow during rush hours	
R46	168km From R311 on N1	• Major main route • Single lane road • Constant/fast traffic flow during rush hours	
N1	658km From N1 to Prieska	• National route • Constant/fast traffic flow during rush hours	

R357	48.9km	• Provincial(Route) • Single lane carriageway • Minor main route • Constant/fast traffic flow during rush hours	

For locally sourced material, a number of towns throughout South Africa are available. Basic materials, such as concrete and road building material, can be sourced from the nearby towns of Prieska and Kimberley. Other, more complex, materials will need to be sourced further from site from larger centres.

4.3 Routes from Manufacturing Centres

The two main manufacturing centres to supply materials to site are Johannesburg, Gauteng and Pinetown, KZN.

Johannesburg (Gauteng), will be used in order to provide all inverters and support structures. As shown in Figure 6, there are multiple routes to travel to site with all having relatively the same estimated time of arrival (ETA). The preferred route, shown in blue, has a total distance of 763km while travelling mainly along the N12. It must also be noted that traffic within the Johannesburg region can become congested on all main roads during rush hour times (7-8:30am). Therefore, alterations in route choice may be necessary depending on what time freight is in transit.

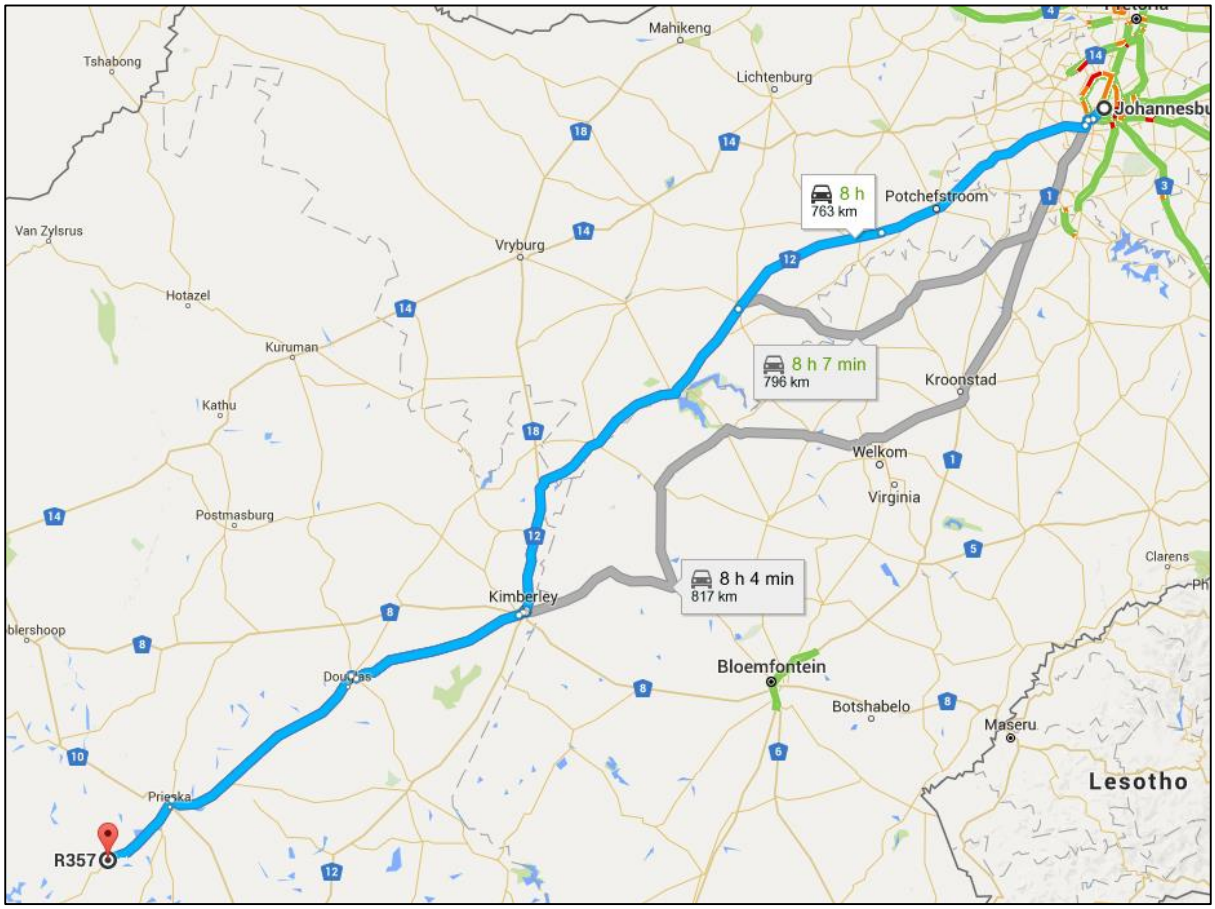


Figure 6: Potential routes from Johannesburg (Google Maps, 2016)

The other main centre, Pinetown (Kwazulu-Natal), will be used to assemble all modules required. As shown in Figure 7, there are multiple routes for transit. However, the preferred route (shown in blue), was chosen as this has the smallest ETA with a total distance of 1055km. Alternative routes, shown in grey, can be used as standby in case of unforeseen events occurring. It must also be noted that all three route options have toll segments.

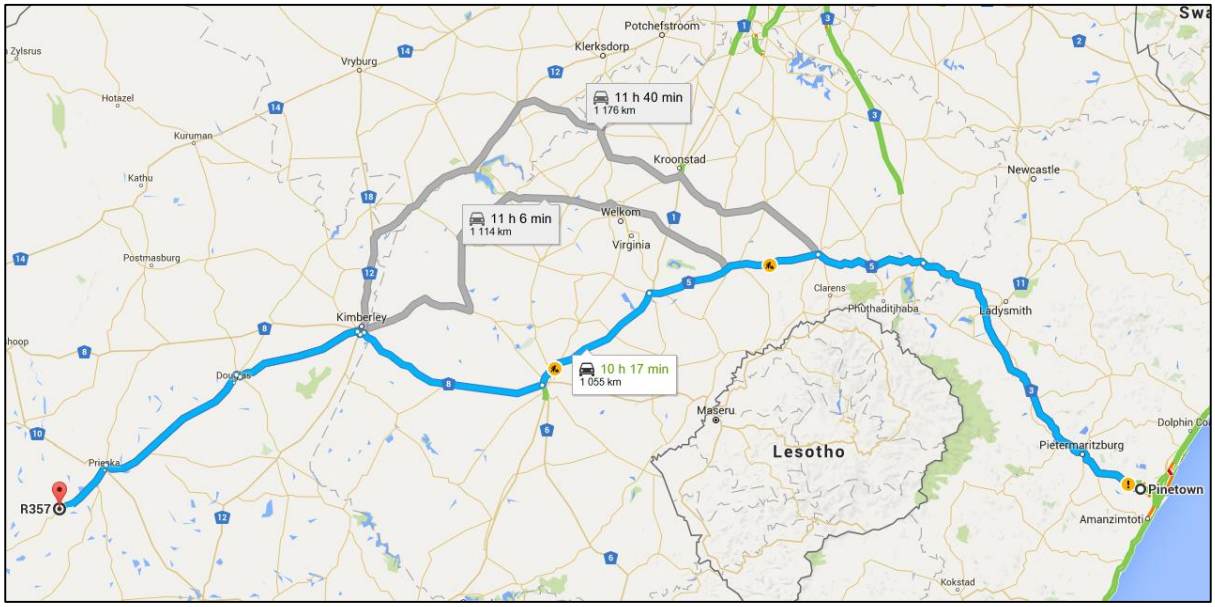


Figure 7: Transport route from Pinetown, KZN (Google Maps, 2016)

5. PERMITTING AND LIMITATIONS

- Toll segments are on all 3 routes from Pinetown's manufacturing centre.
- An Abnormal permit will be required for the transport of the transformer from P.E. Port/Coega. Estimated cost of this permit is R7000-R9000/trip depending on what vehicle configuration will be used.
- Maximum vertical clearance for most routes is 5,2m for abnormal load. However, if the elements imported comes close to this height (exceeds 4,2m), a permit will need to be issued where a preferred route will be stated in the permit conditions.
- Possible periodic maintenance roadworks by SANRAL could occur, particularly on the N10 and R357. However, no contracts to do so are currently in circulation.
- The current limitations on road freight transport are:
    - Axle load limitation of 7,7t on front axle, 9,0t on single rear axles.
    - Axle unit limitations are 18t for dual axle unit and 24t for 3 axle unit.
    - Bridge formula requirements to limit concentration of loads and to regulate load distribution on the vehicle.
    - Gross vehicle mass of 56t. This means a typical payload of about 30t.
    - Maximum vehicle length of 22m for interlinks, 18,5m for horse and trailer and 13,5m for a single unit.
    - Width limit of 2,6m.

- Height limit 4,3m.

6. TRAFFIC ACCOMMODATION DURING CONSTRUCTION

During the construction of the access points to site, the route off the R357 will need to be upgraded in order to meet SANRAL standards. A T-Junction, like the one shown in Appendix 2, will need to be constructed at the access point. This construction will need to adhere to Traffic Accommodation as per Standards set by the Department of Transport and Public Works (as seen in Appendix 3). All temporary road signs will need to comply with that of the South African Road Traffic Signs Manual.

7. CONCLUSIONS AND RECOMMENDATIONS

It can be concluded that there are no evident problems to be expected while hauling freight along any of the transport routes to site. However, it is advised that routes must be adapted in situations of unforeseen events occurring.

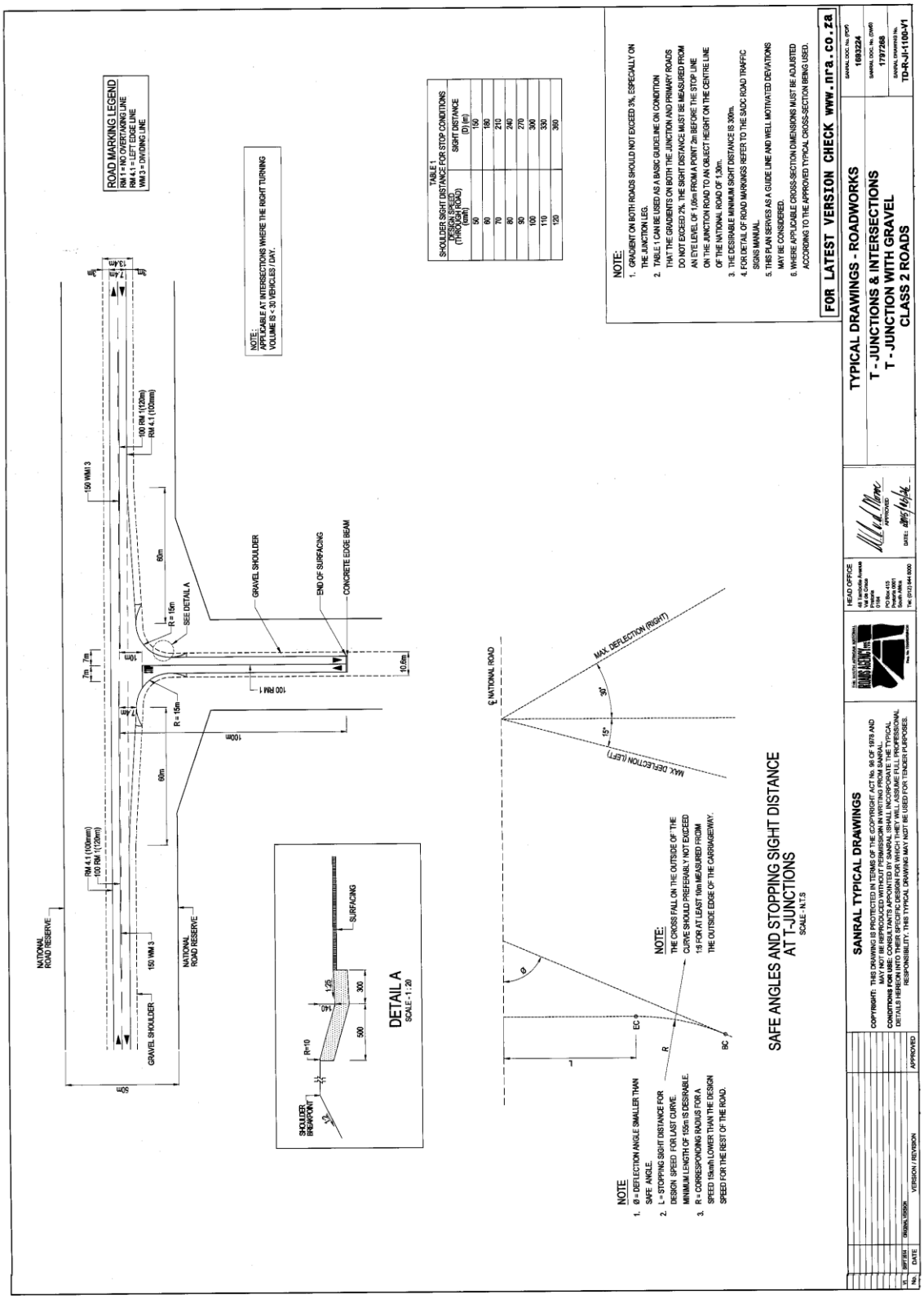
The following recommendations were drawn according to the investigation on the Traffic Impact Assessment and Management Study for Humansrus 3:

- 'Access Road Entrance_Preferred' shall be considered the preferred option to site unless stated otherwise;
- Legal limits for normal heavy Vehicle freight will be required;
- All imported elements shall be delivered to the P.E. Port/Coega and transported to site. However, if this Port is unavailable, Saldanha Bay Port will be used as back up;
- All basic materials (concrete, road materials, etc.) shall be provided from nearby towns such as Prieska or Kimberley;
- All material required for transport from the manufacturing centres will occur predominately from Pinetown, KZN and Johannesburg, Gauteng;
- All permitting for abnormal loads, vertical height clearance, etc. shall be acquired prior to transit of elements;
- Toll fees will need to be met on particular transport route coming mainly from Pinetown, KZN;
- Routes will predominately occur on National and Provincial Roads with suitable standards for transport of container freight;
- There is limited risk of delays for normal routine pending maintenance work of the time of transit and scheduling of road contract.

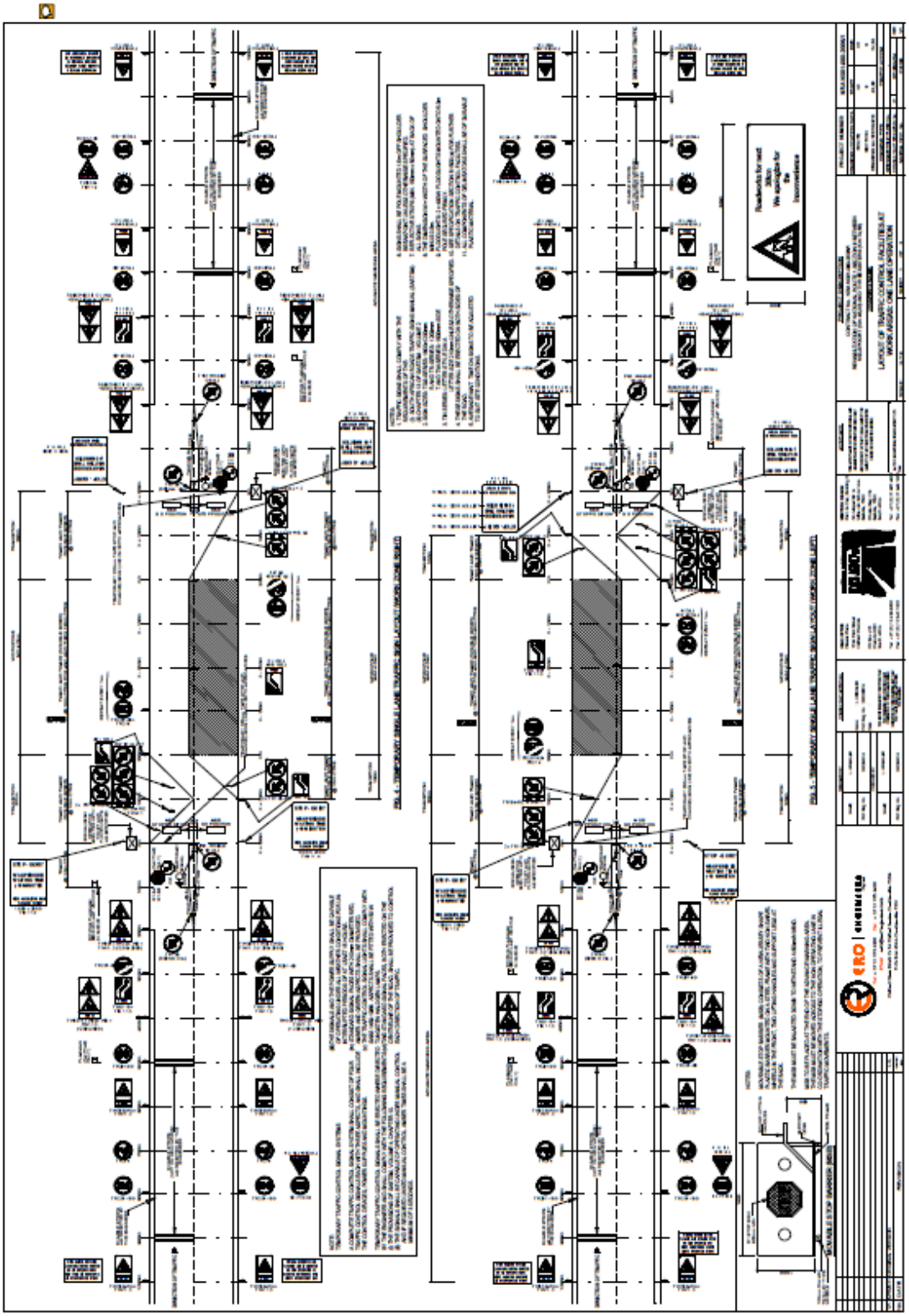
8. Appendix 1: Proman Traffic Summary

PROMAN - Summary (Traffic Volumes)									Page 1
Station No:	M10849								the dr&pw Department: Roads and Public Works NORTHERN CAPE PROVINCE REPUBLIC OF SOUTH AFRICA
Road No:	**MR771**	***Description:***							*generated by PROMAN developed by MicroZone*
Road Surface Type:		TARMAC	***Surfaced Shoulders:***		-				
At Road Km Distance:									
District Municipality:		Pixley Ka Seme							
Local Municipality		SIYATHEMBA							
GPS Longitude:		22.465138	***Latitude:***	-29.942601					
Lanes:		2				***Date From:***	*(Sun)*	09/10/2013	
Direction 1:		**EAST**	-			***Date To:***	*(Tue)*	22/10/2013	
Direction 2:		**WEST**	-			***Speed Limit (km/h):***		120	
Count Type:		TEMPORARY				***Days Counted:***		13	
	Dir 1	**Dir 2**	**Total**	**% Dir 1**		**% Dir 2**		**%**	
Light ADT	60	62	122	49%		51%		87%	
Heavy ADT	10	9	19	53%		47%		13%	
Total ADT	70	71	141	50%		50%		100%	

9. Appendix 2: T-Junction on Class 2 Roads (SANRAL, 2016)



10. Appendix 3: Traffic Accommodation (SANRAL,2016)



11. Appendix 4: Road Access Approval

thedr&pw

Department:
Roads & Public Works
NORTHERN CAPE PROVINCE
REPUBLIC OF SOUTH AFRICA

DIRECTOR: ROADS
PO Box 3132, KIMBERLEY, 8301
45 Schmidtsdrift Road
KIMBERLEY, 8301
Tel : 053 861 9600
Fax : 053 861 9626

Enquiries: M. Sithole
References:L2.1.2.9.5-MR771/MR773
Date: 04 March 2016

Humansrus Solar 3 (Pty) Ltd.
101, 1st Floor, West Quay Building
7 West Quay Road, Waterfront
Cape Town, 8000

Attention: Director

RE: Humansrus Solar 3 (Pty) Ltd: Development access from R357 (Prieska - Vanwyksvlei) onto the farm Humansrus 147, Prieska, Northern Cape

Refer to your application letter received by email on the 25 January 2016 with its attachments.

The Department of Roads and Public Works (DRPW) does not have objections against your application to gain access from the Provincial road indicated on your proposal. subject to the following standard conditions that must be complied with at all times in the case of any work undertaken within the statutory road reserve or within a distance of 95 meters from the centerline of any building restriction road (Advertising on Roads and Ribbon Development Act, No. 21 of 1940) and within the statutory road reserve or within 5 meters from the statutory boundary of any public road (Roads Ordinance, 19 of 1976).

1. The access roads proposed positions will only be assessed for approval on submission of the detailed designs produced by an ECSA registered engineer to the DRPW. The designs must clearly show the following but not limited to; sight clearance line survey, road's geometric, stormwater accommodation, and etc..)
2. The applicant will bear all costs in connection with their proposal.

3. Any alterations and/or additional proposals post this consent letter must be communicated to the DRPW for approval and be included on the final construction drawings.
4. The applicant must investigate all the existing services (sewer lines, pipelines, underground cables and overhead cables etc.) passing through or alongside that specific road/s prior to any activities.
5. The applicant must liaise with all affected authorities and service providers.
6. The applicant indemnifies the Department against, and holds it harmless from, any claim or damage which may be instituted or suffered by any person, including legal costs incurred, as a result of:
    - non-compliance of the applicant with any condition to which this approval relates;
    - The amendment or cancellation of any condition pertaining thereto or the imposition of any new condition;
    - Any alteration to the road.
7. This approval in principle does not exempt the applicant from complying with any other law that way be applicable to the proposed work and related activities.
8. The work shall only be carried out provided the foregoing conditions are accepted in full.

Yours sincerely.

.....

J Roelofse *(Director: Roads Planning and Design)*