**ZIRCO ROODE HEUWEL (PTY) LTD, NORTHERN CAPE**

**KAMIESBERG PROJECT, NAMAQUALAND, SOUTH AFRICA**

**TRAFFIC AND TRANSPORT IMPACT ASSESSMENT**

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**FINAL REPORT**

September 2014
# CES Report Revision and Tracking Schedule

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Bill joined CES as a Director in 2007, since when he has worked on a number of large ESIAs and ESHIAs, in South Africa and in other African countries, both as project manager and water resources specialist. He was the water specialist for the due diligence review of previous environmental assessments for a proposed peaking power station in the Kafue Gorge, Zambia, and has undertaken environmental and social compliance reviews for a large agro-industrial conglomerate, solar photovoltaic and solar concentrated power projects in South Africa, hydroelectric power projects in Zambia and Zimbabwe, a heavy minerals mine in Mozambique, and a copper mine in Zambia, and a corporate environmental and social review for an electrical power transmission and distribution corporation in the Copperbelt of Zambia.. He is currently engaged on a two-year programme of environmental and social monitoring for the rehabilitation of the Rift valley Railway in Kenya and Uganda.
EXECUTIVE SUMMARY

Background

Zirco Roode Heuwel (Pty) Ltd intends to establish and operate a heavy mineral sands mining operation on a west-coast site some 360km north of Cape Town. The mine is expected to yield an annual total of about 570 000 tonnes of the titanium minerals ilmenite, rutile and zircon, which will be transported by road to the port at Saldanha, about 110km north of Cape Town, from which it will be exported. Transport of the product from the mine to Saldanha, which will be via the District Road DR2938 from the mine site to the N7 highway, south along the N7 and thence along a series of provincial roads to the ore terminal, will generate significant numbers of trips via heavy goods vehicles, both loaded from the mine and empty returns. Other goods and materials required during operation, notably fuels and lubricants, will add to the product-related traffic volumes. The construction of the mine, including major infrastructural elements such as the ore processing plants, is also expected to generate considerable volumes of heavy traffic on public roads.

Risks and impacts

The risks and impacts related to project-generated traffic during construction and operation of the mine were identified as:

- Increased traffic on DR2938 between the N7 highway and the mine site:
  - Increased risk of vehicle collisions and personal injuries;
  - Increased dust generation;
- Increased traffic and disruption of traffic flows on the N7 highway and provincial roads between the N7 and the port at Saldanha.

An additional construction-phase impact was identified as the transport of large items of equipment requiring abnormally large vehicles.

The rating of all identified impacts, before any mitigation measures are implemented and with mitigation measures in place, is summarised in the table below. The most significant impacts relate to project-related traffic using the DR2938 to access the mine site from the N7 highway, a distance of about 51km. This road is currently unpaved, and is used to access farms and the coast at Groenriviermond. The impacts are most significant during the operational phase, when large volumes of mine product will be transported every day, by heavy, multi-axle vehicles, from the mine to the N7 en route to the port at Saldanha.

There will be traffic-related impacts on the N7 and the provincial roads, but these roads are designed for large volumes of traffic, and are already trafficked by heavy goods vehicles. Available data indicates that project-related traffic will not significantly affect existing traffic flows.

Two impacts (one for construction and one for operation) were rated as High without mitigation, and one (operation) was rated Very High without mitigation. With diligent and sustained implementation of mitigation measures all identified impacts can be reduced to Moderate or Low.

If the project does not proceed – the No-Go Alternative - there will be no increase in traffic on DR2938, the N7 highway or provincial roads between the port at Saldanha and the N7, and no project-related impacts in respect of traffic and transport.

With regard to cumulative impacts the Frontier Rare Earths mine at Zandkopsdrift, situated some 35km south-east of the Kamiesburg project, is expected to commence production in 2015. The annual production from the mine, about 20 000 tonnes of mixed rare earth carbonate to be transported to a separation plant at Saldanha, is very small compared to the annual tonnage of product from Kamiesburg – approximately 570 000 tonnes - and the cumulative impact of traffic from the two projects on the N7 and provincial roads is expected to be negligible.
### Summary of traffic-related impacts

#### Construction

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<th>Impact</th>
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### Recommendations

Measures proposed to mitigate the identified impacts are summarised as follows:

**Traffic management**

**DR 2938**
- Develop and implement a Traffic Management Plan for construction and operation.
- Develop and implement an Emergency Preparedness and Response Plan for construction and operation, including provisions to deal with traffic accidents, particularly accidents involving personal injuries. All drivers must be made aware of the procedures to be followed.
- Establish and rigorously enforce a speed limit appropriate to the design and construction factors and characteristics of the road (such as width, horizontal and vertical alignment, grade, sightlines and surfacing material) for all project-related traffic.
- Erect speed limit signage at regular intervals along the road, and other appropriate warning signage, including at intersections with farm access and other roads.
- Prohibit heavy vehicle trips between 10pm and 6am unless it is absolutely unavoidable. Vehicle trips between 10pm and 6am should be minimised, concomitant with operational requirements.
- Schedule deliveries by heavy vehicles to avoid the formation of convoys. Sufficient distance must be maintained between heavy vehicles to allow light vehicles to overtake safely.
- Provide regular information to the local community and individuals on the volumes of traffic, particularly heavy vehicles, anticipated on the road during construction and operation.

**N7 and provincial roads**
- Heavy vehicle deliveries and vehicle returns during construction should be scheduled to avoid, as far as possible, morning and evening periods where roads pass through urban areas, or other stretches of road known to carry large volumes of morning and evening traffic. (It is acknowledged that this will not be practicable during operation, when materials haulage will take place for 10 hours a day.)
- Extreme care must be exercised when travelling through urban areas (Piketburg on the N7; Moorreesburg and Hopefield on the provincial roads), especially during morning and evening peak hour traffic, and speed limits must be strictly observed.
- The formation of convoys must be avoided.
- Sufficient distances between heavy vehicles must be maintained to allow light vehicles to overtake safely.
- An Emergency Preparedness and Response Plan must be developed to deal with accidents and incidents en route.

**Abnormal loads**
- Arrangements must be made with the provincial traffic authorities – Western Cape and Northern Cape - for abnormal loads, and their requirements strictly adhered to.
- Speed limits must be strictly observed.
- As far as possible deliveries of abnormal loads should be scheduled to avoid periods when significant volumes of construction traffic are making deliveries to site.
**Driver and vehicle management**

- All drivers must be properly licensed for the class of vehicles they drive.
- All drivers must be made aware of the provisions in the Construction Emergency Preparedness and Response that deal with traffic accidents, particularly accidents involving personal injuries, of the procedures to be followed.
- All aspects of all vehicles must be in a good state of repair at all times, especially the exhaust system.
- Vehicle horns / hooters should be used only when absolutely necessary.
- A mechanism should be established, as part of the Stakeholder Engagement Plan, for recording traffic- and transport-related complaints from residents alongside the road.

**Road upgrades**

- District Road DR2938 must be upgraded to ensure that it is wide enough to allow two heavy vehicles to pass safely. The carriageway may need to be widened in places, and realigned at sharp bends (particularly where the road crosses the Groenrivier). Construction work on the road upgrade must be done in such a way as to minimise disruption to local traffic.
- The upgrade of DR2938 must include measures to reduce the generation of fugitive dust, preferably by means of a bituminous sealing / wearing course, but otherwise by regular and frequent application of dust suppressant and/or water.
- To the extent practicable, concomitant with the requirements for durability and skid resistance, the surface of DR2938 should be designed to minimise rolling noise.
- The N7 at its intersection with DR2938 must be upgraded as required by SANRAL, which may include the construction of an auxiliary acceleration lane south from the intersection, and upgrading the DR2938 bellmouth entrance.
# TABLE OF CONTENTS

1. Introduction ........................................................................................................................... 1
   1.1. Project Background ........................................................................................................ 1
   1.2. Terms of Reference ....................................................................................................... 3
   1.3. Approach to the Study ................................................................................................ 3
   1.4. Assumptions and Limitations ....................................................................................... 4

2. Data and Information .............................................................................................................. 5
   2.1. Construction of the Mine ............................................................................................. 5
       2.1.1. Major infrastructural elements .......................................................................... 5
       2.1.2. Major materials and equipment requirements .................................................. 5
       2.1.3. Miscellaneous materials and goods .................................................................... 5
       2.1.4. Personnel .......................................................................................................... 6
       2.1.5. Anticipated construction period ......................................................................... 6
       2.1.6. Assumptions ...................................................................................................... 6
   2.2. Operation of the Mine .................................................................................................. 6
       2.2.1. Product ............................................................................................................. 6
       2.2.2. Miscellaneous materials and goods .................................................................... 6
       2.2.3. Personnel .......................................................................................................... 7
       2.2.4. Assumptions ...................................................................................................... 7

3. Transport and Route Options ............................................................................................... 8
   3.1. Construction materials and equipment ........................................................................ 8
   3.2. Mine product ................................................................................................................ 8
       3.2.1. Product Option 1: Road transport ..................................................................... 8
       3.2.2. Product Option 2: Road and rail transport ......................................................... 9
   3.3. Route Descriptions .................................................................................................... 9
       3.3.1. District Road 2938 ............................................................................................ 9
       3.3.2. N7 highway ....................................................................................................... 11
       3.3.3. N7 to Port at Saldanha ..................................................................................... 12
   3.4. Services ....................................................................................................................... 14
       3.4.1. Water ............................................................................................................... 14
       3.4.2. Electricity ......................................................................................................... 14

4. Analysis of Project-Related Traffic .................................................................................... 15
   4.1. Construction of the Mine ............................................................................................ 15
       4.1.1. Construction materials ...................................................................................... 15
       4.1.2. Miscellaneous materials and goods .................................................................... 15
       4.1.3. Personnel .......................................................................................................... 15
   4.2. Operation of the Mine ................................................................................................ 15
       4.2.1. Product ............................................................................................................. 15
       4.2.2. Fuel and lubricants ............................................................................................ 16
       4.2.3. Miscellaneous materials and goods .................................................................... 16
       4.2.4. Personnel .......................................................................................................... 16
   4.3. Traffic Summary .......................................................................................................... 17
       4.3.1. Construction ....................................................................................................... 17
       4.3.2. Operation .......................................................................................................... 17

5. Assessment of impacts ......................................................................................................... 19
   5.1. Construction phase impacts ......................................................................................... 19
       5.1.1. Issue 1: Increased volume of construction traffic on DR2938 ......................... 19
       5.1.2. Issue 2: Increased construction traffic on the N7 highway .............................. 21
       5.1.3. Issue 3: Increased construction traffic on provincial roads ............................. 21
       5.1.4. Issue 4: Abnormal loads .................................................................................... 22
   5.2. Operational phase impacts ........................................................................................... 23
5.2.1. Issue 5: Increased operational traffic on DR2938 .......................................................... 23
5.2.2. Issue 6: Increased operational traffic on the N7 highway ............................................. 24
5.2.3. Issue 7: Increased operational traffic on provincial roads ............................................. 25
5.3. No-Go Alternative .............................................................................................................. 25
5.4. Cumulative Impacts .......................................................................................................... 25

6. Conclusions and recommendations ....................................................................................... 27
6.1. Conclusions ....................................................................................................................... 27
6.2. Recommendations ........................................................................................................... 29
6.2.1. Traffic management ...................................................................................................... 29
6.2.2. Driver and vehicle management .................................................................................... 30
6.2.3. Road upgrades ............................................................................................................. 30

7. References ............................................................................................................................. 31

LIST OF TABLES

Table 2.1: Estimated annual fuel and lubricant requirements .................................................... 7
Table 3.1: Traffic data for the N7 highway ................................................................................. 11
Table 3.1: Traffic Summary - Construction .............................................................................. 17
Table 3.2: Traffic Summary - Operation .................................................................................... 17
Table 8.1: Summary of traffic-related impacts .......................................................................... 28

LIST OF FIGURES

Figure 1:1 - Locality map of the Kamiesberg Project ................................................................. 2
Figure 3.1: The Kamiesberg project in relation to local towns, the N7 highway and rail routes ..... 9
Figure 3.2 Route of DR 2938 from the N7 highway to the mine site ..................................... 10

LIST OF PLATES

Plate 1.1: A typical dry mining operation ................................................................................. 1
Plate 3.1: District Road DR 2938 .......................................................................................... 10
Plate 3.2: N7 highway approaching the Groenrivier turn-off from the south ......................... 11
Plate 3.3: N7 highway approaching Bitterfontein from the north ......................................... 12
Plate 3.4: N7 highway approaching Van Rynesdorp from the north .................................... 12
Plate 3.5: N7 approaching the traffic circle in Piketburg from the north ......................... 12
Plate 3.6: N7 approaching turning to Moorreesburg from the north ............................... 12
Plate 3.7: R311 through Moorreesburg ................................................................................ 13
Plate 3.8: R311 Moorreesburg to Hopefield ........................................................................ 13
Plate 3.9: R45 through Hopefield ......................................................................................... 13
Plate 3.10: R45 intersection with R27 ................................................................................... 13
Plate 3.11: R27 intersection with un-numbered road to Saldanha ....................................... 13
Plate 3.12: Un-numbered road towards Saldanha ............................................................... 13
Plate 3.13: Un-numbered road approaching turn-off to ore terminal .............................. 14
Plate 3.14: Road to ore terminal ......................................................................................... 14
1. INTRODUCTION

1.1. Project Background

Zirco Roode Heuwel (Pty) Ltd (Zirco) currently holds the prospecting rights to the Roode Heuvel and Leeuvlei areas, located approximately 500km north of Cape Town in the Northern Cape Province of South Africa. Zirco is also in the process of acquiring prospecting rights for a further area immediately east of and adjacent to Roode Heuwel, referred to as Sabies. This report deals with all three areas, which together comprise Zirco’s Kamiesberg Project (Figure 1:1).

Based on the drilling programme completed thus far mineral resource estimates and mining studies indicate that the Roode Heuvel deposit alone has an estimated heavy mineral reserve of 253 million tonnes at 4.8% Total Heavy Minerals (THM) content, which could support 20 years of mining at a rate of between 1 000 and 2 300 tonnes per hour (tph). Mining operations are planned to cover a total area of approximately 3 500 hectares.

The most likely operational scenario is dry mining using front end loaders / face shovels to excavate an advancing face on a predetermined mine path. It is a relatively low risk option compared with open-pond dredge mining, and does not require as much water. Dredge mining could also be unsuitable because of the high amounts of very fine material - slimes - in the deposit. Initial mining will target the higher grade areas at an initial mining rate of 1 000 to 1 500 tph. After Year 6 the operation will move to the lower grade areas and the mining rate will increase to 1 800 to 2 300 tph to maintain an average output of about 570 000 tonnes per annum (tpa) of heavy mineral concentrate.

Dry mining comprises excavating mineralised sand and feeding it into a slurry hopper, where it is mixed with water and pumped to the Primary Concentrator Plant (PCP) to produce a Heavy Mineral Concentrate (HMC). The HMC is then processed in the Mineral Separation Plant (MSP), where the HMC is separated into the final products - ilmenite, rutile, zircon and monazite - which are stored and transported to the market (Plate 1.1).

Plate 1.1: A typical dry mining operation

CES, January 2014

A detailed project description is included in Chapter 2 of the Environmental Impact Assessment Report (EIAR).
Figure 1:1 - Locality map of the Kamiesberg Project.
1.2. Terms of Reference

This study addresses the potential environmental impacts of that may arise from issues related to transport and infrastructure developments associated with the mine development.

In particular this study will examine the following specific issues:

- Describe the mining process as it relates to traffic and transport issues, including estimates of the volumes of traffic expected to be generated by the project during the construction and operational phases.
- Assess the potential traffic impacts on the existing District Road 2938 leading from the mine site to the N7 highway.
- Assess the impacts of increased traffic volumes on the N7 highway:
  - between its junction with District Road 2938 and the town of Bitterfontein; and
  - between Bitterfontein and the Port at Saldanha Bay.
- Examine the traffic issues related to the establishment of a services servitude from Khnyp Punt to the mine site.

1.3. Approach to the Study

A stepwise approach was adopted for the traffic study, as follows:

**Trip generation:** Estimate the number of vehicle trips generated by the mining operation to transport construction materials, goods, equipment, personnel and products to and from the site.

**Modal split:** Determine the mode of transport, vehicle type and size for each trip or category of trip.

**Trip distribution:** Determine the origin and destination of each trip or category of trips.

**Trip assignment:** Select a route, or routes, for each trip or category of trips.

**Impact assessment:** Assess the significance and severity of mine-related traffic on existing public roads. Where possible compare the volumes of traffic generated by the mine with non-mine-related traffic and the capacity of the roads.

**Impact rating:** Rate the significance of potential transport and infrastructure development impacts using the standard CES rating system, in which five factors are considered, taking into account the specific context and characteristics of the proposed project: (A detailed description of the CES impact rating methodology is provided in Appendix 1 of the Environmental Impact Assessment Report (EIAR)).

(i) *The relationship of the impact to temporal scales:*

The temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.

(ii) *The relationship of the impact to spatial scales:*

The spatial scale defines the physical extent of the impact.

(iii) *The severity of the impact:*

The severity/beneficial scale is used in order to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on a particular affected system (for ecological impacts) or a particular affected party.

(iv) *The severity of impacts is evaluated with and without mitigation in order to demonstrate how serious the impact is when nothing is done about it. The word ‘mitigation’ means not just ‘compensation’, but includes concepts of containment and remedy. For beneficial impacts, optimization means anything that can enhance the benefits. However, mitigation or optimization must be practical, technically feasible and economically viable.*
(v) **The likelihood of the impact occurring:**

The likelihood of impacts taking place as a result of project actions differs between potential impacts. There is no doubt that some impacts will occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.

**Impact mitigation:** Propose, as far as possible, measures to mitigate the impacts of mine-related traffic on existing public roads.

1.4. **Assumptions and Limitations**

It was assumed that all data and information provided by Zirco and their technical consultants concerning the materials and personnel required for the construction of the mine, and material produced by the mine is reliable, and sufficiently accurate to make reasonable estimates of the road traffic generated by the mine.

Other assumptions are described in the parts of the report that deal with the individual aspects of the study.

Assessment of impacts relates to the impacts of project-related traffic on public road systems and the users of those systems. Risks and impacts associated with loading or offloading vehicles at the mine site or at associated facilities are not addressed, since these will be dealt with in general terms in the Environmental Management Programmes, and in greater detail in Standard Operating Procedures developed by the Engineering, Procurement, Construction and Management (EPCM) Contractor for the construction phase and by Zirco for the operational phase.
2. DATA AND INFORMATION

2.1. Construction of the Mine

Project implementation will be undertaken by an Engineering, Procurement, Construction and Management (EPCM) Contractor, who will be appointed by Zirco to manage and supervise the engineering design, equipment and material supply, and complete the construction of the mine.

2.1.1. Major infrastructural elements

The major infrastructural elements at the mine site, for which civil engineering and building materials and equipment will be transported to the mine site, are:

- Slurry hopper
- Primary Concentrator Plant
- Mineral Separation Plant
- Product storage facilities
- Seawater intake, pumping station and pipeline
- Reverse osmosis (seawater desalination) plant
- Water storage dams
- Wastewater treatment works
- Fuel depot
- Workshop, stores and administration buildings
- Temporary construction accommodation on site
- Permanent construction accommodation off site
- Access roads, internal roads and airstrip

2.1.2. Major materials and equipment requirements

The main items of materials and equipment transported to site will be:

- Structural steelwork and cladding
- Ready-mixed concrete, or aggregate, sand and cement for on-site batching, and reinforcing steel.
- General civils and building materials (falsework, bricks, cement)
- Pre-assembled items of equipment for the processing plant, electricity distribution system, desalination and wastewater treatment plants.
- Pumps and pipes for the water supply system.
- Surfacing material for the site access road(s) and airstrip
- Construction plant and machinery.
- Building materials / prefabricated units for temporary construction accommodation at the mine site.

2.1.3. Miscellaneous materials and goods

A range of consumables - diesel, oils; spare parts, food and general consumables – will be delivered to site.

It will be necessary to remove general and hazardous solid and liquid wastes from the site during the construction of the mine.

Although the majority of the components of the mine structures will be fabricated on site there will be certain large items, such as transformers and storage tanks, which will be fabricated off site. It is probable that the dimensions and mass of some these items and the delivery vehicle will exceed the limitations specified in the National Road Traffic Regulations, 1999, and will constitute abnormal loads.

---

1 If no suitable material is available on or in the near vicinity of the site it may be necessary to import material for the sub-base and base course.
2.1.4. Personnel
An estimated maximum 240 staff and workers will be on site at any one time during the construction phase. They will be accommodated on site in temporary housing.

2.1.5. Anticipated construction period
The construction period is estimated to be 18 months.

2.1.6. Assumptions

Materials and equipment:
A detailed construction plan is not yet available, and it is not possible at this stage to quantify the volumes and masses of materials to be delivered to site, nor the volume of traffic generated to deliver it, with any precision. However, in order to make an indicative estimate of the possible maximum construction traffic volumes it is assumed that:

- A total of 45 000 tonnes of materials and equipment will be delivered to the site during the construction period.
- Two-thirds of the total – 30 000 tonnes – will be delivered to site in a 16-week period when construction activity is at its peak.
- The average payload will be 25 tonnes.
- Deliveries will be made for 10 hours a day in a six-day working week.

Miscellaneous materials and goods:
It is not possible to quantify the tonnages or volumes of these materials at this stage. For the purposes of this study it is assumed that the impacts of traffic generated by the delivery of miscellaneous goods and materials, including the removal from site of waste materials, will be relatively small compared to the impacts of heavy goods traffic generated by the transport of materials and equipment required to construct the mine and associated infrastructure.

Personnel:
The majority of the workforce will be accommodated on site. Traffic entering and leaving the site will be limited to a few light vehicles a day for, for instance, supervisory visits, inspections and specialist sub-contractors.

2.2. Operation of the Mine

2.2.1. Product
The total annual production of the mine is anticipated to be approximately 570 000 tonnes of product for transport off site, made up as follows:

- Ilmenite: 500 000 tonnes
- Rutile / zircon: 62 500 tonnes
- Monazite: 5 000 tonnes

2.2.2. Miscellaneous materials and goods
There will be deliveries of production-related and domestic materials and goods to the workshops, stores and offices on the site, such as:

- Production consumables; diesel, oils; chemicals, and spare parts.
- Domestic consumables: items such as mosquito spray, soap and medical supplies, stationary, and office equipment and furniture replacements.

It will be necessary to remove general and hazardous solid and liquid wastes from the site, but it is not possible to estimate the quantities at this stage.

The non-product commodities that will generate the most traffic to the site will be fuel and lubricants, estimated annual requirements of which, for the first three years of operation, are shown
in Table 2.1.

**Table 2.1: Estimated annual fuel and lubricant requirements**

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Estimated Quantity (litres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel</td>
<td>4 000 000</td>
</tr>
<tr>
<td>Paraffin</td>
<td>5 500 000</td>
</tr>
<tr>
<td>Engine Oil</td>
<td>22 000</td>
</tr>
<tr>
<td>Transmission Oil</td>
<td>8 000</td>
</tr>
<tr>
<td>Differential Oil</td>
<td>25 000</td>
</tr>
<tr>
<td>Hydraulic Oil</td>
<td>10 000</td>
</tr>
<tr>
<td>Other</td>
<td>2 200</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>9 567 200</strong></td>
</tr>
</tbody>
</table>

With the exception of deliveries of fuels and lubricants the transport requirements for miscellaneous materials and goods to the site during construction are unlikely to add significantly to the traffic volumes generated by the transport of product off site.

**2.2.3. Personnel**

Approximately 340 staff and workers, including up to 20 visiting contractors at any given time, will be employed on the site during the first three years of operation. They will mostly be accommodated in the town of Garies, 35km north-east from of the mine site, and transported 60km to and from the site daily.

**2.2.4. Assumptions**

**Product:**
- Product will be transported off site during seven 10-hour working days every week throughout the year.
- Transport will be in multi-axle articulated vehicles with a payload of 35 tonnes (GVM not exceeding 56 tonnes, the maximum allowed on South African roads.)

**Fuel and lubricants:**
- Deliveries will be made for 10 hours a day in over a six-day working week.
- The average capacity of tankers will be 22 000 litres.

**Personnel:**
- Workers’ transport will be provided by the mine operator.
- The workforce will be transported to and from the mine site daily in single decker buses, light passenger vehicles or cars, depending on the nature of their work.
- Management, supervisory and administrative staff, and visiting contractors will travel in cars or double-cab bakkies.
- The labour force will travel in buses of similar passenger vehicles, with an average seating capacity of 30.
  - Management, supervisory and administrative staff comprise 10% of workforce, plus visiting contractors: Total 50 No
  - The labour force comprises 90% of workforce: 270 No.
- Three shifts a day will be worked: buses to and from the site will always be full: buses bringing workers to site to commence their shifts will take workers finishing their shifts off site.
3. TRANSPORT AND ROUTE OPTIONS

3.1. Construction materials and equipment

It is probable that the majority of materials and equipment required for construction will be transported by road.

Materials from the industrial and manufacturing areas of the Highveld will travel via highways and major provincial roads, converging on Springbok via the N14 from Upington and then south on the N7 for around 120km.

Materials from Cape Town area will travel north on the N7. Some items may be imported by sea to Saldanha, then by truck on provincial roads on to the N7 north to the site. It is possible (although at this stage it is considered unlikely) that some items may be carried from Saldanha by rail to Bitterfontein and thence to the mine site via the N7.

Irrespective of the origins of their trips all vehicles carrying construction materials and equipment will converge on the N7, either from the north or south of the site, and then to the site via DR2938.

3.2. Mine product

Two options are being considered for transporting mine products to the port at Saldanha Bay for storage and subsequent export: these are road transport only (Option 1 in section 3.3.1 below) and combination of road and rail (Option 2 in section 3.3.2). The N7 highway and rail routes between the project site and Saldanha Bay are shown on Figure 3.1.

Both options will require the construction of a new haul road – the Mine Access Road - approximately 6.5km long from the mine site to the existing District Road 2938. This is an on-site road exclusively for the use of the mine and is not considered further in this report. On-site traffic-related safety issues will be addressed in Standard Operating Procedures (SOPs) developed by the EPCM contractor (construction) and Zirco (operation).

3.2.1. Product Option 1: Road transport

This is the preferred option for transporting product from the mine site to the port at Saldanha.

Trucks will travel along the existing unpaved road - DR2938 – from the mine to National Route 7 (N7), a distance of about 51km, turning right onto the highway about 22km south of the town of Garies.

On the N7 vehicles will travel south for approximately 325km, before turning right onto the highway about 22km south of the town of Garies.

On the N7 vehicles will travel south for approximately 325km, before turning right onto provincial roads for the remaining 90km or so to the port. On the N7 trucks will not pass through any of the built-up areas of the several small towns (Bitterfontein, Nuwerus, Vanrhynsdorp, Klawer, Clanwilliam and Citrusdaal), that the N7 bypasses between Garies and Piketberg.

All trucks will pass through Piketburg, through which the N7 is routed along a distinct road corridor, with access to roads exiting the highway into the urban areas via a large traffic circle.

The probable route from the N7 to the port is:

- Turn right onto the R311, through Moorreesburg.
- Turn right onto the R45 through Hopefield to the R45 / R27 intersection.
- Turn left on the R27, then left onto an unnumbered road towards the R399.
- Turn left onto the road to Saldanha Ore Terminal.
3.2.2. **Product Option 2: Road and rail transport**

Product will be transported by truck from the mine to the railhead at Bitterfontein, and then to the port by rail via a purpose-built transfer station in the existing station yard.

As before trucks will travel along the existing unpaved road - DR2938 - to the N7, a distance of about 51km. Once on the N7 trucks will travel south for about 55km to Bitterfontein, where product will be transferred to railway goods wagons. Trucks will not pass through the built-up areas in Bitterfontein.

3.3. **Route Descriptions**

3.3.1. **District Road 2938**

Access to the mine from the N7 highway will be via the existing unpaved District Road, DR2938, which runs from an intersection on the N7 about 22km south of Garies, past the mine site to the mouth of the Groenrivier (Figure 3.2). The distance from the N7 to the Mine Access Road along DR2938 is approximately 51km.
Figure 3.2 Route of DR 2938 from the N7 highway to the mine site

DR2938 is constructed from local gravel sources (Plate 2.1), and while it is adequate for current trafficking levels it will need to be upgraded in order to cope with mine traffic, a significant proportion of which will be large trucks. The upgrade will also have to include replacing or upgrading the existing concrete drift crossing of Groenrivier (approximately 11km from the N7) with a low-level crossing designed to allow overtopping from the occasional flash floods that occur after heavy rainfall events (WSP 2013).

Plate 3.1: District Road DR 2938

WSP (2013) recommended that the road should be upgraded using a single-seal layer of bitumen for waterproofing with an aggregate topping to provide a skid resistant wearing course. It is possible that parts of the road will have to be widened to allow large vehicles to pass safely.
DR 2938 is currently used to access farms and the coast at Groenriviermond, and is maintained by the Kamiesberg Local Municipality, which lacks the capacity to maintain the road beyond the local farm access roads. Zirco will therefore take responsibility for upgrading and maintain the road (Pers Comm, M McKinney, Zirco, March 2014).

3.3.2. N7 highway

The DR2938 / N7 intersection will also require upgrading to accommodate the heavily-loaded trucks exiting the mine site and turning south onto the N7 (Plate 3.2).

![Plate 3.2: N7 highway approaching the Groenrivier turn-off from the south](Source: Google Earth™)

The sight distances on the N7 to the intersection from both directions are sufficient to meet the minimum standards for sight distances approaching a T-Junction intersection along a National Route. However, the trucks approaching the intersection from the mine site will be fully laden with mine product, and will take some time to accelerate away from the stop line and turn through the junction to move clear of the through traffic. WSP (2013) have proposed the construction of an auxiliary accelerating lane on the southbound carriageway. Any alterations to the N7 must be approved by the South African National Roads Agency (SANRAL), who may also require alterations to the DR2938 bellmouth entrance from the south.

The N7 is the main north-south road link between Cape Town and the Vioolsdrif border post into Namibia. Traffic data for two counting stations on the N7 provides average daily traffic (ADT) and average daily truck traffic (ADTT) data, as shown in Table 3.1, are as follows:

<table>
<thead>
<tr>
<th>Counting Station</th>
<th>Average Daily Traffic (ADT)</th>
<th>Average Daily Truck Traffic (ADTT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vanrhynsdorp</td>
<td>956</td>
<td>240</td>
</tr>
<tr>
<td>Springbok</td>
<td>1 032</td>
<td>240</td>
</tr>
</tbody>
</table>

*Source: SANRAL 2011, quoted in WSP 2013*

These figures are considered low compared to the national average for highways similar to the N7 (SANRAL 2011).

The free flow capacity of the N7 depends on a number of factors (such as grade, number, frequency and types of intersections, and traffic controls) but is likely to be around 1 200 vehicles per hour at maintained speeds of 120km/hr, and 1 500 vehicles per hour at maintained speeds of 100km/hr.
No improvements will be required to the N7 south towards Saldanha Bay, as the road provides suitable conditions for heavy vehicle movement (WSP 2013). See plates 3.3 – 3.6.

3.3.3. **N7 to Port at Saldanha**

The most probable route is:

- Turn right onto the R311, through Moorreesburg.
- Turn right onto the R45 through Hopefield to the R45 / R27 intersection.
- Turn left on the R27, then left onto an unnumbered road towards the R399.
- Turn left onto the road to Saldanha Ore Terminal.

The carriageway of the R311 between Moorreesburg and its junction with the R45 (approximately 25km) is relatively narrow, with no surfaced shoulders (Plate 3.8).

The carriageways for the remainder of the route to the port access road are relatively wide with paved shoulders (Figures 3.9 to 3.14).
Plate 3.7: R311 through Moorreesburg
Source: Google Earth™

Plate 3.8: R311 Moorreesburg to Hopefield
Source: Google Earth™

Plate 3.9: R45 through Hopefield
Source: Google Earth™

Plate 3.10: R45 intersection with R27
Source: Google Earth™

Plate 3.11: R27 intersection with un-numbered road to Saldanha
Source: Google Earth™

Plate 3.12: Un-numbered road towards Saldanha
Source: Google Earth™
No measured traffic data is available for these roads, but it is clear that they are adequately sized to rake heavy vehicles.

3.4. Services

3.4.1. Water

Although a dry mining process is anticipated the proposed operation will require considerable volumes of water, since the HMC is separated from the sand tailing by a wet process.

Sea water will be pumped from an intake on the coast, between 10 and 25km from the mine site (the distance depends on the location of the site selected for the intake) via a 1-metre diameter above-ground pumping main. About 94% of the water will be used without treatment as process water, while the remainder will be desalinated in an on-site by reverse osmosis plant for washing the HMC prior to processing in the MSP, and to provide a supply for drinking, cooking and sanitary purposes.

The pipeline will be constructed in a servitude that will include a service road alongside the pipeline to facilitate access for construction, and subsequently for maintenance / repair work.

Depending on the pumping station site the pipeline will have to cross the Groenrivier, probably via a suspended pipe bridge.

Use of groundwater to supply the mine is a possible alternative, but preliminary investigations indicate that the sustainable supply not be adequate to meet all the mine’s requirements. Detailed investigations to firm up the preliminary estimates of sustainable yield are in progress.

3.4.2. Electricity

The power requirements of the mining and processing operation are estimated to be 15MW. Diesel powered generators may be required in the initial stages of the project, but the ultimate intention is to source power from the national grid.

The current proposal is to construct a high voltage transmission line as an extension of the proposed power line to Frontier Rare Earths’ project at Zandkopsdrift, some 35km south-east of the Kamiesburg project. The new line from Frontier to Roode Heuwel will be subject to a separate environmental assessment undertaken directly for Eskom.
4. ANALYSIS OF PROJECT-RELATED TRAFFIC

Estimates of the numbers of vehicle trips account for loaded vehicles entering the site and leaving empty (for materials, equipment and goods delivered to the site), and loaded vehicles leaving the site and returning empty (for product and other loads being removed from the site).

4.1. Construction of the Mine

4.1.1. Construction materials

<table>
<thead>
<tr>
<th>Quantity of materials:</th>
<th>45 000 tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumptions:</td>
<td>Two-thirds of total (± 30 000 tonnes) delivered to site during a 16-week period</td>
</tr>
<tr>
<td></td>
<td>Trips evenly distributed evenly over 6-day working week, 10-hour working day</td>
</tr>
<tr>
<td></td>
<td>“Clumping” in convoys will increase hourly frequency but not daily totals.</td>
</tr>
<tr>
<td></td>
<td>Average payload 25 tonnes</td>
</tr>
<tr>
<td></td>
<td>All assumed to come from / depart to / towards the Highveld or Cape Town</td>
</tr>
<tr>
<td>Trip generation:</td>
<td>24 vehicle trips per day – 12 trips per day in each direction</td>
</tr>
<tr>
<td></td>
<td>2.4 vehicle trips per hour – 1.2 trips per day in each direction</td>
</tr>
<tr>
<td></td>
<td>A heavy vehicle passes a given point on DR2938 every 21 minutes.</td>
</tr>
<tr>
<td>Trip distribution:</td>
<td>Origin: From the direction of the Highveld and Cape Town</td>
</tr>
<tr>
<td></td>
<td>Destination: Mine site</td>
</tr>
<tr>
<td>Trip assignment:</td>
<td>N7 from the north and south / Groenrivier Road (DR2938)</td>
</tr>
<tr>
<td>Modal split:</td>
<td>Heavy goods vehicles – 4 / 5 E80 axles</td>
</tr>
</tbody>
</table>

4.1.2. Miscellaneous materials and goods:

Deliveries assumed to be in 2-axle light delivery vehicles and 2-3 axle medium-weight goods vehicles. Daily number of trips (loaded and unloaded) assumed to be 2 to 4 per day.

4.1.3. Personnel

Since the majority of the construction workforce is to be accommodated on site vehicular traffic to and from the site will be limited to site supervisory trips and visiting contractors in light vehicles. Daily number of trips assumed to be 10 – 20 per day.

4.2. Operation of the Mine

4.2.1. Product

<table>
<thead>
<tr>
<th>Quantity of materials:</th>
<th>570 000 tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumptions:</td>
<td>Trips evenly distributed over 7-day working week, 10-hour working day</td>
</tr>
<tr>
<td></td>
<td>“Clumping” in convoys will increase hourly frequency but not daily total</td>
</tr>
<tr>
<td></td>
<td>Average payload 35 tonnes</td>
</tr>
<tr>
<td>Trip generation:</td>
<td>90 vehicle trips per day – 45 trips per day in each direction</td>
</tr>
<tr>
<td></td>
<td>9 vehicle trips per hour – 4.5 trips per hour in each direction</td>
</tr>
<tr>
<td>Trip distribution:</td>
<td>Origin: Mine site</td>
</tr>
<tr>
<td></td>
<td>Destination: Port at Saldanha or Bitterfontein</td>
</tr>
<tr>
<td>Trip assignment:</td>
<td>Groenrivier Road (DR2938) / N7 south</td>
</tr>
<tr>
<td>Modal split:</td>
<td>Heavy goods vehicle – 7 E80 axles</td>
</tr>
</tbody>
</table>
### 4.2.2. Fuel and lubricants

<table>
<thead>
<tr>
<th>Quantity of materials:</th>
<th>9.6 million litres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumptions:</td>
<td></td>
</tr>
<tr>
<td>• Trips evenly distributed over 6-day working week, 10-hour working day</td>
<td></td>
</tr>
<tr>
<td>• “Clumping” in convoys will increase hourly frequency but not daily total</td>
<td></td>
</tr>
<tr>
<td>• Average payload 22 000 litres</td>
<td></td>
</tr>
<tr>
<td>Trip generation:</td>
<td></td>
</tr>
<tr>
<td>3 vehicle trips per day – 1.5 trips per day in each direction</td>
<td></td>
</tr>
<tr>
<td>0.3 vehicle trips per hour – 0.15 trips per hour in each direction</td>
<td></td>
</tr>
<tr>
<td>Trip distribution:</td>
<td></td>
</tr>
<tr>
<td>Origin:</td>
<td>From the direction of Cape Town</td>
</tr>
<tr>
<td>Destination:</td>
<td>Mine site</td>
</tr>
<tr>
<td>Trip assignment:</td>
<td>Groenrivier Road (D2938) / N7 south</td>
</tr>
<tr>
<td>Modal split:</td>
<td>Road tanker – 3 / 4 E80 axles</td>
</tr>
</tbody>
</table>

### 4.2.3. Miscellaneous materials and goods

Deliveries assumed to be in 2-axle light delivery vehicles and 2&3 axle medium-weight goods vehicles. Daily number of trips (loaded and unloaded) assumed to be 6 to 8 per day.

### 4.2.4. Personnel

| Number of people: | Total number of employees: 320 plus 20 visiting contractors: |
|                   | - Management, supervisory and administrative – 30 |
|                   | - Visiting contractors - 20 |
|                   | - Labour force - 270 |

<table>
<thead>
<tr>
<th>Assumptions:</th>
<th>General:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Mine will be operated 365 days a year, 7 days a week, 3 shifts a day</td>
</tr>
<tr>
<td></td>
<td>- Maximum traffic volumes at start and end of shifts</td>
</tr>
<tr>
<td></td>
<td>- Incidental trips will be made throughout the working day.</td>
</tr>
</tbody>
</table>

| Management, supervisory, administrative and visiting contractors: |
| All travel by car or bakkie, average occupancy 3 per vehicle |

| Labour force: |
| All travel by bus, average occupancy 30 per vehicle |

| Trip generation: |
| Number of daily vehicle trips - |
| Management, supervisory and administrative: 34 light vehicles – 17 inward trips in the morning, 17 outward trips in the evening |
| Labour force: 18 buses per day – 3 trips in each direction three times a day at shift changeovers |

| Trip distribution: |
| Origin: Garies |
| Destination: Mine site |

| Trip assignment: |
| Groenrivier Road (DR2938) |

| Modal split: |
| Car, bakkie; passenger bus |
4.3. Traffic Summary

4.3.1. Construction

Table 3.1: Traffic Summary - Construction

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Vehicle Type(s)</th>
<th>Number of trips</th>
<th>Route</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction materials</td>
<td>HGV: 4 – 5 E80 axles</td>
<td>24</td>
<td>N7 south / N7 north / DR2938</td>
<td>Max volumes during a 16-week period</td>
</tr>
<tr>
<td>Miscellaneous goods and materials</td>
<td>2-axle LDV 2&amp;3-axle MDV</td>
<td>2 - 4</td>
<td>N7 south / N7 north / DR2938</td>
<td>Throughout the construction period</td>
</tr>
<tr>
<td>Personnel</td>
<td>Car; bakkie</td>
<td>10 - 20</td>
<td>DR2938 / N7 north</td>
<td>Throughout the construction period</td>
</tr>
</tbody>
</table>

Number of daily trips is total for loaded and unloaded trips, half the total in each direction.

- Construction traffic will significantly increase traffic on DR2938, both in volume and type of vehicle.
- During the peak period of delivery of construction materials and equipment heavy goods vehicles on the N7 will increase average daily truck traffic (ADTT - measured in 2011) by approximately 10%.
- Total construction traffic on the N7 will increase average daily traffic (ADT - measured in 2011) by about 5%.
- Construction traffic will not significantly prejudice the free-flow traffic capacity of the N7.
- Construction traffic will have limited impacts on traffic flows on the provincial roads from the port at Saldanha to the N7.

4.3.2. Operation

Table 3.2: Traffic Summary - Operation

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Vehicle Type(s)</th>
<th>Number of trips</th>
<th>Route</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>HGV: 7 E80 axles</td>
<td>90</td>
<td>DR2938 / N7 south</td>
<td></td>
</tr>
<tr>
<td>Fuel and lubricants</td>
<td>HGV: Road tanker av capacity 22 000 litres</td>
<td>3</td>
<td>N7 south / DR2938</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>2-axle LDV 2&amp;3-axle MDV</td>
<td>6 - 8</td>
<td>N7 south / DR2938</td>
<td></td>
</tr>
<tr>
<td>Personnel</td>
<td>Bus / Car / bakkie</td>
<td>20</td>
<td>DR2938</td>
<td>At shift change, 6-7am, 6-7pm</td>
</tr>
</tbody>
</table>

Number of daily trips is total for loaded and unloaded trips, half the total in each direction, with the exception of bus transport for workers (five loaded trips in and out twice a day at shift changeover), and personnel transport (17 trips in and out at the beginning and end of the working day).

- Operational traffic will very significantly increase traffic on DR2938, both in volume and type of vehicle.
- A heavy vehicle carrying product or fuels / lubricants passes a given point on DR2938 on average every 6½ minutes during the working day.
During operation heavy goods vehicles on the N7, particularly product delivery vehicles, will increase average daily truck traffic (ADTT - measured in 2011) by approximately 40%.

Total operational traffic on the N7 may increase average daily traffic (ADT - measured in 2011) by approximately 10%.

Operational traffic will not significantly prejudice the free-flow traffic capacity of the N7.

If the Road-only Option is adopted (that is, no rail transport of product) operational traffic on provincial roads on the provincial roads from the port at Saldanha to the N7 could have significant impacts. If product is transported by rail from Bitterfontein the impacts on provincial roads will not occur.
5. ASSESSMENT OF IMPACTS

During all phases of the project’s lifetime considerable numbers of large vehicles will travel on the DR2938, N7 highway and, particularly if the Road-only Option is adopted for product transport, on provincial roads between the port at Saldanha and the N7; loaded and empty, to and from the site. Light and medium-heavy vehicles will also use these routes. It is probable that a small number of deliveries during construction will be classified as abnormal loads.

Project-related traffic will result in very significant increases in the number of vehicles using DR2938, the frequency of vehicle trips, and the sizes of vehicles using the road. Project-related traffic, especially heavy vehicle traffic, will also significantly alter the noise regime on this road: noise-related impacts are addressed in a separate specialist report.

Zirco intends to modify the DR2938 / N7 intersection, in accordance with SANRALs requirements, to ensure safe entry and exit conditions for project-related traffic. Zirco also intends to upgrade DR2938 to improve the structural integrity of the road where necessary, its surface, and to increase its capacity to safely carry two-way traffic.

5.1. Construction phase impacts

5.1.1. Issue 1: Increased volume of construction traffic on DR2938

Population density in the predominantly rural Kamiesberg LM area is about one person per square kilometre, and is similarly low in the project area. Mining activities will directly affect 11 landowners on seven farms, each farm typically comprising the home / homes to the resident land owners and one or two families of resident farm workers. The DR2398 is used for access by the 21 farmsteads and other buildings along the road, five of which are less than 50m from the road (see Table 5.7). The road is also used by recreational visitors to Groenriviermond. Vehicular traffic is mainly bakkies and cars, with the occasional medium-heavy or heavy delivery vehicle. Current volumes of traffic are very low, and pedestrian use is infrequent. The condition of the existing unpaved road is adequate for current levels of traffic.

Anticipated impacts relate to:

a) Increased likelihood of vehicle collisions resulting in personal injuries.
b) Increased generation of traffic-related dust.

The impacts are closely related, since fugitive dust from vehicle wheels decreases visibility and increases the likelihood of collisions on a heavily trafficked road.

Impact 1a: Increased risk of vehicle collisions and personal injuries

Cause and comment

The addition of an estimated 28 trips per day by heavy and medium goods vehicles during the peak of construction activity, and an estimated 20 light vehicle trips per day to the existing low levels of local traffic has the potential to increase the incidence of vehicle-to-vehicle and vehicle-to-pedestrian collisions, with the possibility of personal injuries, if appropriate mitigations measures are not implemented.

Mitigation and management

- The road must be upgraded to ensure that it is wide enough to allow two heavy vehicles to pass safely. The carriageway may need to be widened in places, and realigned at sharp bends (particularly where the road crosses the Groenrivier). Construction work on the road upgrade must be done in such a way as to minimise disruption to local traffic.
- A speed limit appropriate to the design and construction factors and characteristics of the road (such as width, horizontal and vertical alignment, grade, sightlines and surfacing material) must be specified for all construction vehicles, and strictly enforced. Signage must be erected at frequent intervals along the road.
• Warning signage must be erected at all intersections, including at the intersections with farm access roads.
• Heavy vehicles should not travel the road between 10pm and 6am unless it is absolutely unavoidable. Vehicle trips of any kind between 10pm and 6am should be minimised, concomitant with operational requirements
• Deliveries by heavy vehicles must, as far as possible, be scheduled to avoid the formation of convoys. Sufficient distance must be maintained between heavy vehicles to allow light vehicles to overtake safely.
• A Construction Traffic Management Plan must be developed and implemented.
• The Construction Emergency Preparedness and Response Plan must include provisions to deal with traffic accidents, particularly accidents involving personal injuries, and all drivers must be made aware of the procedures to be followed.
• Communication with the local community and individuals must provide regular information on the volumes of traffic particularly heavy vehicles, anticipated on the road during the construction period.

Significance statement

### Issue 1: Increased construction traffic on DR2938

#### Impact 1a: Increased risk of vehicle collisions and personal injuries

<table>
<thead>
<tr>
<th>Impact</th>
<th>Effort</th>
<th>Risk or Likelihood</th>
<th>Overall Significance</th>
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</thead>
<tbody>
<tr>
<td>Without Mitigation</td>
<td>Short Term</td>
<td>Study Area</td>
<td>Severe</td>
</tr>
<tr>
<td>With Mitigation</td>
<td>Short Term</td>
<td>Study Area</td>
<td>Severe</td>
</tr>
</tbody>
</table>

#### Impact 1b: Increased dust generation

**Cause and comment**

The generation of fugitive dust from vehicle wheels depends, among other things, on the speed of the vehicle and the nature of the road surface. The extent to which dust is distributed beyond the road corridor depends on wind speed.

Construction traffic will generate considerable volumes of dust, particularly from multi-axle heavy vehicles, which will reduce visibility and increase the risk of vehicle collisions, and will also create a nuisance for the several residences that are situated close to the road.

**Mitigation and management**

• The upgrade of the road must include measures to reduce the generation of fugitive dust, preferably by means of a bituminous / aggregate sealing / wearing course, but otherwise by regular and frequent application of dust suppressant, including water if it is available in sufficient quantities.

Significance statement

### Issue 1: Increased construction traffic on DR2938

#### Impact 1a: Increased dust generation

<table>
<thead>
<tr>
<th>Impact</th>
<th>Effort</th>
<th>Risk or Likelihood</th>
<th>Overall Significance</th>
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<tbody>
<tr>
<td>Without Mitigation</td>
<td>Short Term</td>
<td>Study Area</td>
<td>Severe</td>
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<tr>
<td>With Mitigation</td>
<td>Short Term</td>
<td>Study Area</td>
<td>Slight</td>
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</tbody>
</table>

**Note:** The impacts of project-related dust generation (“vehicle particulate entrainment from unpaved and paved roads”) is addressed in detail in Air Quality Specialist Report for the proposed Zirco Kamiesberg Project in the Namakwa Local Municipality, Northern Cape Province, Airshed
Planning Professionals (Pty) Ltd, 13th August 2014 (Airshed 2014). In the report the significance of the construction-phase impacts are assessed for the combined effects of airborne particulate matter (Total Suspended Particulates), PM$_{10}$ and PM$_{2.5}$, as well as gaseous emissions (SO$_2$ and NO$_X$)) in the study area.

5.1.2. **Issue 2: Increased construction traffic on the N7 highway**

**Impact 2: Disruption of traffic flows on the N7**

**Cause and comment**

The N7 highway is designed for large volumes of traffic than were recorded by the traffic counts undertaken by SANRAL in 2011, when traffic volumes were noted as being low in comparison to similar highways.

Estimates of the volumes of heavy vehicles indicate that 24 trips a day by construction traffic will increase the average daily truck traffic (ADTT) measured in 2011 by approximately 10%. Total volumes of all types of construction traffic on the N7 may increase total average daily traffic (ADT) volumes measured in 2011 by about 5%. It is unlikely that construction traffic will significantly prejudice the free-flow traffic capacity of the N7.

The South African National Roads Agency will require the N7 / DR2938 to be upgraded to accommodate the anticipated volumes of heavy vehicles turning onto and from the N7, which may include the construction of an auxiliary acceleration lane on the N7 south of the intersection, and alterations to the DR2938 bellmouth entrance from the south.

**Mitigation and management**

The impacts of construction traffic on the N7 should be managed by:

- Upgrade the N7 at its intersection with DR2938 as required by SANRAL, which may include the construction of an auxiliary acceleration lane south from the intersection, and upgrading the DR2938 bellmouth entrance.
- Schedule heavy vehicle deliveries and vehicle returns to avoid, as far as possible, morning and evening periods in urban areas (where the N7 passes through Piketburg) and stretches of the N7 known to carry large volumes of morning and evening traffic.
- Extreme care must be exercised when travelling through urban areas, especially during morning and evening peak hour traffic, and speed limits must be strictly observed.
- Avoid the formation of convoys.
- Maintain sufficient distances between heavy vehicles to allow light vehicles to overtake safely.
- Develop and implement an Emergency Preparedness and Response Plan to deal with accidents and incidents en route.

**Significance statement**

<table>
<thead>
<tr>
<th>Issue 2: Increased construction traffic on the N7 highway</th>
<th>Impact 2: Disruption of traffic flows on the N7</th>
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<td>Impact</td>
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<td>Without Mitigation</td>
<td>Short Term</td>
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<td>With Mitigation</td>
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</tbody>
</table>

5.1.3. **Issue 3: Increased construction traffic on provincial roads**

**Impact 3: Disruption of traffic flows on provincial roads**

**Cause and comment**
It is possible that some materials and equipment will be delivered by road from the port at Saldanha Bay. The urban areas through which vehicles will travel en route (will carry commuter traffic during morning and evening periods. The roads are already trafficked by heavy vehicles, but additional heavy goods vehicles will result in some impacts on existing traffic flows.

Mitigation and management

- Heavy vehicle deliveries and vehicle returns should be scheduled to avoid, as far as possible, morning and evening periods in urban areas (Moorreesburg, Hopefield) and stretches of the provincial roads that carry significant volumes of morning and evening traffic.
- Extreme care must be exercised when travelling through urban areas, especially during morning and evening peak hour traffic, and speed limits must be strictly observed.
- The formation of convoys must be avoided.
- Sufficient distances must be maintained between heavy vehicles to allow light vehicles to overtake safely.
- An Emergency Preparedness and Response Plan must be in place to deal with incidents en route.

Significance statement

<table>
<thead>
<tr>
<th>Issue 3: Increased construction traffic on provincial roads</th>
<th>Impact 3: Disruption of traffic flows on provincial roads</th>
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<tbody>
<tr>
<td><strong>Impact</strong></td>
<td><strong>Effect</strong></td>
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<td>Without Mitigation</td>
<td>Temporal Scale</td>
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<td>Short Term</td>
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<td>With Mitigation</td>
<td>Short Term</td>
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</tbody>
</table>

5.1.4. Issue 4: Abnormal loads

**Impact 4: Disruption of traffic flows on the N7 and provincial roads**

Cause and comment

It is probable that some items of off-site fabricated equipment such as transformers and storage tanks will be sufficiently large to require delivery vehicles that exceed the limits specified in the National Road Traffic Regulations, 1999, and will constitute abnormal loads. The traffic authorities usually require guard vehicles to precede and follow such vehicles to warn other motorists of their approach, and often specify times when large, slow-moving vehicles should travel.

Mitigation and management

- Arrangements must be made with the provincial traffic authorities – Western Cape and Northern Cape - for abnormal loads, and their requirements strictly adhered to.
- Speed limits must be strictly observed.
- As far as possible deliveries of abnormal loads should be scheduled to avoid periods when significant volumes of construction traffic are making deliveries to site.

Significance statement

<table>
<thead>
<tr>
<th>Issue 4: Abnormal loads</th>
<th>Impact 4: Disruption of traffic flows on the N7 and provincial roads</th>
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<tbody>
<tr>
<td><strong>Impact</strong></td>
<td><strong>Effect</strong></td>
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<tr>
<td>Without Mitigation</td>
<td>Temporal Scale</td>
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<tr>
<td>Very Short Term</td>
<td>Regional</td>
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<td>With Mitigation</td>
<td>Very Short Term</td>
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</tbody>
</table>
5.2. Operational phase impacts

5.2.1. Issue 5: Increased operational traffic on DR2938

Impact 5a: Increased risk of vehicle collisions and personal injuries

Cause and comment

The addition of an estimated 94 trips per day by heavy goods vehicles (product and fuels / lubricants), and up to 50 light vehicle and bus trips per day, to the existing low levels of local traffic has the potential to significantly increase the incidence of vehicle-to-vehicle and vehicle-to-pedestrian collisions, with the strong possibility of personal injuries, if appropriate mitigations measures are not implemented.

Mitigation and management

- The road must be upgraded to ensure that it is wide enough to allow two heavy vehicles to pass safely. The carriageway may need to be widened in places, and realigned at sharp bends. Construction work on the road upgrade must be done in such a way as to minimise disruption to local traffic.
- A speed limit appropriate to the design and construction factors and characteristics of the road (such as width, horizontal and vertical alignment, grade, sightlines and surfacing material) must be specified for all construction vehicles, and strictly enforced. Signage must be erected at frequent intervals along the road.
- Warning signage must be erected at all intersections, including at the intersections with farm access roads.
- Operational trips must be minimised during the hours of darkness. Trips by heavy vehicles must, as far as possible, be avoided during the hours of darkness.
- Deliveries by heavy vehicles must, as far as possible, be scheduled to avoid the formation of convoys. Sufficient distance must be maintained between heavy vehicles to allow light vehicles to overtake safely.
- An Operational Construction Traffic Management Plan must be developed and implemented.
- The Operational Emergency Preparedness and Response Plan must include provisions to deal with traffic accidents, and particularly accidents involving personal injuries, and all drivers must be made aware of the procedures to be followed.
- Communication with the local community and individuals must provide regular information on the volumes of traffic particularly heavy vehicles, anticipated on the road during the operation of the mine.

Significance statement

<table>
<thead>
<tr>
<th>Issue 5: Increased operational traffic on DR2938</th>
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<tr>
<td>Impact 5a: Increased risk of vehicle collisions and personal injuries</td>
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<td>Without Mitigation</td>
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Impact 5b: Increased dust generation

Cause and comment

The generation of fugitive dust from vehicle wheels depends, among other things, on the speed of the vehicle and the nature of the road surface. The extent to which dust is distributed beyond the road corridor depends on wind speed.

Operational traffic will generate considerable volumes of dust, particularly from multi-axle heavy vehicles, which will reduce visibility and increase the risk of vehicle collisions, and will also create a
nuisance for the several residences that are situated close to the road.

Mitigation and management

- The upgrade of the road must include measures to reduce the generation of fugitive dust, preferably by means of a bituminous / aggregate sealing / wearing course, but otherwise by regular and frequent application of dust suppressant, including water if it is available in sufficient quantities.

Significance statement

<table>
<thead>
<tr>
<th>Issue 5: Increased operational traffic on DR2938</th>
<th>Impact 5b: Increased dust generation</th>
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<td>With Mitigation</td>
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Note: The impacts of project-related dust generation (“vehicle particulate entrainment from unpaved and paved roads”) is addressed in detail in Air Quality Specialist Report for the proposed Zirco Kamiesberg Project in the Namakwa Local Municipality, Northern Cape Province, Airshed Planning Professionals (Pty) Ltd, 13th August 2014 (Airshed 2014). Dustfall rates were modelled in the 40km x 35km project domain, which included approximately 18km of DR2938, and the results compared with the National Ambient Air Quality Standards (DEA 2013). Modelling indicated that paving of the district road surface would reduce PM$_{10}$ concentrations near to the road to within the NAAQS daily standard. In the report the significance of the construction-phase impacts are assessed for the combined effects of airborne particulate matter (Total Suspended Particulates, PM$_{10}$ and PM$_{2.5}$, as well as gaseous emissions (SO$_2$ and NO$_X$)) in the study area.

5.2.2. Issue 6: Increased operational traffic on the N7 highway

Impact 6: Disruption of traffic flows on the N7

Causes and comment

The N7 highway is designed for large volumes of traffic than were recorded by SANRAL’s 2011 traffic counts undertaken by SANRAL in 2011, when traffic volumes were noted as being low in comparison to similar highways.

Heavy vehicles carrying product will operate on the stretch of the N7 between Garies and Moorreesburg, a distance of about 325km.

Estimates of the volumes of heavy vehicles indicate that the addition of an estimated 94 heavy vehicles will increase the average daily truck traffic (ADTT) measured in 2011 by approximately 40%. Total volumes of all types of construction traffic on the N7 may increase average daily traffic (ADT) volumes measured in 2011 by approximately 10%. It is unlikely that construction traffic will significantly prejudice the free-flow traffic capacity of the N7.

Mitigation and management

- Upgrade the N7 at its intersection with DR2938 as required by SANRAL, which may include the construction of an auxiliary acceleration lane south from the intersection, and upgrading the DR2938 bellmouth entrance.
- Extreme care must be exercised when travelling through the urban areas of Piketburg, especially during morning and evening peak hour traffic, and speed limits must be strictly observed.
- Avoid the formation of convoys.
• Maintain sufficient distances between heavy vehicles to allow light vehicles to overtake safely.
• Develop and implement an Emergency Preparedness and Response Plan to deal with incidents en route.

Significance statement

<table>
<thead>
<tr>
<th>Issue 6: Increased operational traffic on the N7 highway</th>
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<tr>
<td>Impact 6: Disruption of traffic flows on the N7 – Garies to Moorreesburg</td>
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<th>Impact</th>
<th>Effect</th>
<th>Risk or Likelihood</th>
<th>Overall Significance</th>
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<td>With Mitigation</td>
<td>Long Term</td>
<td>Regional</td>
<td>Slight</td>
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</table>

5.2.3. Issue 7: Increased operational traffic on provincial roads

Impact 7: Disruption of traffic flows on provincial roads

Cause and comment

Product will be delivered from the N7 to the port at Saldanha Bay via provincial roads that pass through the urban areas of Moorreesburg and Hopefield en route to the ore terminal at the port of Saldanha. These areas will generate commuter traffic, both in town and from outlying areas, during morning and evening periods. The roads are already trafficked by heavy vehicles, but the addition of a significant number of additional heavy goods vehicles has the potential to result in significant impacts on existing traffic flows, residents and pedestrians if not properly managed.

Mitigation and management

• Extreme care must be exercised when travelling through the urban areas of Moorreesburg and Hopefield, especially during morning and evening peak hour traffic, and speed limits must be strictly observed.
• The formation of convoys must be avoided.
• Sufficient distances must be maintained between heavy vehicles to allow light vehicles to overtake safely.
• An Emergency Preparedness and Response Plan must be in place to deal with incidents en route.

Significance statement

<table>
<thead>
<tr>
<th>Issue 7: Increased operational traffic on provincial roads</th>
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<tr>
<td>Impact 7: Disruption of traffic flows on provincial roads</td>
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<td>Long Term</td>
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</table>

5.3. No-Go Alternative

If the project does not proceed there will be no increase in traffic on DR2938, the N7 highway or provincial roads between the port at Saldanha and the N7.

There will therefore be no project-related impacts in respect of traffic and transport for the No-Go Alternative.

5.4. Cumulative Impacts

The only known development in the general project area that could contribute significant additional
volumes of road traffic is the Frontier Rare Earths mine at Zandkopsdrift, situated some 35km south-east of the Kamiesburg project.

Frontier plans to commence production from Zandkopsdrift in 2015 at a rate of 20 000 tonnes of separated rare earths per annum. Ore will be processed at Zandkopsdrift and the resulting 99% pure mixed rare earth carbonate transported by road to a separation plant to be constructed at Saldanha. The tonnage of mixed rare earth carbonate to be transported between the mine and Saldanha will be slightly more than 20 000tpa. This is a small fraction – around 4% - of the 570 000tpa of product from the Kamiesberg project, and the cumulative impacts of heavy vehicles on the N7 and provincial roads is expected to be negligible.
6. CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions
The risks and impacts related to project-generated traffic during construction and operation of the mine were identified as:

- Increased traffic on DR2938
  - Increased risk of vehicle collisions and personal injuries
  - Increased dust generation
- Increased traffic and disruption of traffic flows on the N7 highway, and on provincial roads between the N7 and the port at Saldanha

An additional construction-phase impact was identified as the transport of large items of equipment requiring abnormally large vehicles.

The rating of all identified impacts, before any mitigation measures are implemented and with mitigation measures in place, is summarised in Table 8.1. The most significant impacts relate to project-related traffic using the DR2938 to access the mine site from the N7 highway, a distance of about 51km. This road is currently unpaved, and is used to access farms and the coast at Groenriviermond. The impacts are most significant during the operational phase, when large volumes of mine product will be transported every day, by heavy, multi-axle vehicles, from the mine to the N7 en route to the port at Saldanha.

There will be traffic-related impacts on the N7 and the provincial roads, but these roads are designed for large volumes of traffic, and are already trafficked by heavy goods vehicles. Available data indicates that project-related traffic will not significantly affect existing traffic flows.

Two impacts (one for construction and one for operation) were rated as High without mitigation, and one (operation) was rated Very High without mitigation. With diligent and sustained implementation of mitigation measures all identified impacts can be reduced to Moderate or Low.

If the project does not proceed – the No-Go Alternative - there will be no increase in traffic on DR2938, the N7 highway or provincial roads between the port at Saldanha and the N7, and no project-related impacts in respect of traffic and transport.

With regard to cumulative impacts the Frontier Rare Earths mine at Zandkopsdrift, situated some 35km south-east of the Kamiesburg project, is expected to commence production in 2015. The annual production from the mine, about 20 000 tonnes of mixed rare earth carbonate to be transported to a separation plant at Saldanha, is very small compared to the annual tonnage of product from Kamiesburg – approximately 570 000 tonnes - and the cumulative impact of traffic from the two projects on the N7 and provincial roads is expected to be negligible.

Recommended mitigation measures are summarised in the next section.
Table 8.1: Summary of traffic-related impacts

<table>
<thead>
<tr>
<th>Impact</th>
<th>Effect</th>
<th>Risk or Likelihood</th>
<th>Overall Significance</th>
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<td></td>
<td>Temporal Scale</td>
<td>Spatial Scale</td>
<td>Severity of Impact</td>
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<tr>
<td><strong>Construction Phase Impacts</strong></td>
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<tr>
<td><strong>Issue 1: Increased construction traffic on DR2938</strong></td>
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<tr>
<td><strong>Impact 1a: Increased risk of vehicle collisions and personal injuries</strong></td>
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<td>Study Area</td>
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<tr>
<td><strong>Impact 1b: Increased dust generation</strong></td>
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<tr>
<td>Without Mitigation</td>
<td>Short Term</td>
<td>Study Area</td>
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<tr>
<td>With Mitigation</td>
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<td>Study Area</td>
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<tr>
<td><strong>Issue 2: Increased construction traffic on the N7 highway</strong></td>
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<td><strong>Impact 2: Disruption of traffic flows on the N7</strong></td>
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<tr>
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<tr>
<td><strong>Issue 3: Increased construction traffic on provincial roads</strong></td>
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<td><strong>Issue 4: Abnormal loads</strong></td>
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<td><strong>Impact 4: Disruption of traffic flows on the N7 and provincial roads</strong></td>
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<td><strong>Operational Phase Impacts</strong></td>
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<tr>
<td><strong>Issue 5: Increased operational traffic on DR2938</strong></td>
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<td><strong>Impact 5a: Increased risk of vehicle collisions and personal injuries</strong></td>
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<td><strong>Impact 5b: Increased dust generation</strong></td>
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<td><strong>Issue 6: Increased operational traffic on the N7 highway</strong></td>
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<td><strong>Issue 7: Increased operational traffic on provincial roads</strong></td>
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6.2. Recommendations

Measures proposed to mitigate the identified impacts are summarised as follows:

6.2.1. Traffic management

DR 2938

- Develop and implement a Traffic Management Plan for construction and operation.
- Develop and implement an Emergency Preparedness and Response Plan for construction and operation, including provisions to deal with traffic accidents, particularly accidents involving personal injuries. All drivers must be made aware of the procedures to be followed.
- Establish and rigorously enforce a speed limit appropriate to the design and construction factors and characteristics of the road (such as width, horizontal and vertical alignment, grade, sightlines and surfacing material) for all project-related traffic.
- Erect speed limit signage at regular intervals along the road, and other appropriate warning signage, including at intersections with farm access and other roads.
- Prohibit heavy vehicle trips between 10pm and 6am unless it is absolutely unavoidable. Vehicle trips between 10pm and 6am should be minimised, concomitant with operational requirements.
- Schedule deliveries by heavy vehicles to avoid the formation of convoys. Sufficient distance must be maintained between heavy vehicles to allow light vehicles to overtake safely.
- Provide regular information to the local community and individuals on the volumes of traffic particularly heavy vehicles, anticipated on the road during construction and operation.

N7 and provincial roads

- Heavy vehicle deliveries and vehicle returns during construction should be scheduled to avoid, as far as possible, morning and evening periods where roads pass through urban areas, or other stretches of road known to carry large volumes of morning and evening traffic. (It is acknowledged that this will not be practicable during operation, when materials haulage will take place for 10 hours a day.)
- Extreme care must be exercised when travelling through urban areas (Piketburg on the N7; Moorreesburg and Hopefield on the provincial roads), especially during morning and evening peak hour traffic, and speed limits must be strictly observed.
- The formation of convoys must be avoided.
- Sufficient distances between heavy vehicles must be maintained to allow light vehicles to overtake safely.
- An Emergency Preparedness and Response Plan must be developed to deal with accidents and incidents en route.

Abnormal loads

- Arrangements must be made with the provincial traffic authorities – Western Cape and Northern Cape - for abnormal loads, and their requirements strictly adhered to.
- Speed limits must be strictly observed.
- As far as possible deliveries of abnormal loads should be scheduled to avoid periods when significant volumes of construction traffic are making deliveries to site.
6.2.2. **Driver and vehicle management**

- All drivers must be properly licensed for the class if vehicles they drive.
- All drivers must be made aware of the provisions in the Construction Emergency Preparedness and Response that deal with traffic accidents, particularly accidents involving personal injuries, of the procedures to be followed.
- All aspects of all vehicles must be in a good state of repair at all times, especially the exhaust system.
- Vehicle horns / hooters should be used only when absolutely necessary.
- A mechanism should be established, as part of the Stakeholder Engagement Plan, for recording traffic- and transport-related complaints from residents alongside the road.

6.2.3. **Road upgrades**

- District Road DR2938 must be upgraded to ensure that it is wide enough to allow two heavy vehicles to pass safely. The carriageway may need to be widened in places, and realigned at sharp bends (particularly where the road crosses the Groenrivier). Construction work on the road upgrade must be done in such a way as to minimise disruption to local traffic.
- The upgrade of DR2938 must include measures to reduce the generation of fugitive dust, preferably by means of a bituminous sealing / wearing course, but otherwise by regular and frequent application of dust suppressant and/or water.
- To the extent practicable, concomitant with the requirements for durability and skid resistance, the surface of DR2938 should be designed to minimise rolling noise.
- The N7 at its intersection with DR2938 must be upgraded as required by SANRAL, which may include the construction of an auxiliary acceleration lane south from the intersection, and upgrading the DR2938 bellmouth entrance.
7. REFERENCES


CES 2013: Environmental and Pre-feasibility Scoping Study and Terms of Reference, Coastal and Environmental Services (Pty) Ltd, June 2013.


DEA 2013: List of activities which result in atmospheric which have or may have a significant effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage, Department of Environmental Affairs, GN 893. 22nd November 2013.

WSP 2013: Kamiesberg Mineral Sands, Pre-Feasibility Study - Transportation Logistics, (Access Roads and Rail Siding), WSP, August 2013.