

NHLABATHI MINERALS (PTY) LTD
PROPOSED RIETKOL MINING OPERATION
LOCATED WITHIN THE
VICTOR KHANYE LOCAL MUNICIPALITY,
NKANGALA DISTRICT MUNICIPALITY

TRAFFIC IMPACT ASSESSMENT



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AvzconS

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TRAFFIC IMPACT ASSESSMENT

1. INTRODUCTION

This report was prepared for **Jacana Environmental cc**, and compiled by Abraham Albertus van Zyl in his capacity as director of AvzconS (Pty) Ltd.

PROFESSIONAL REG. : 920506-12-11-1992
PRESENT POSITION : Director of AvzconS (Pty) Ltd, Transportation and Civil Engineers and Project Managers.
SPECIALISATION : Traffic impact studies, Roads design, Contract Documentation & Project management
QUALIFICATIONS : BSc Eng, University of Pretoria

PROFESSIONAL MEMBERSHIP :
Registered Engineer, Engineering Council of South Africa.
Member of the South African Institute of Civil Engineers.
Member of the Institute of Municipal Engineers of South Africa.

KEY EXPERIENCE :
Since 1974, Abraham A van Zyl was involved in the planning, design and construction of roads and civil services projects as well as management of multi-disciplinary projects. He was employed by BKS Inc for a period of 19 years, when he was appointed as Town Engineer of Montagu in 1993. He joined the practice of Dr AJ Kruger and Partners as full partner in October 1995 and established the company "AvzconS (Pty) Ltd" during 2006.

His experience obtained during the more than 40 years of practice includes the planning, design, documentation, supervision, quality control, budgets and project management for projects from property and township developments, provincial roads and freeways as well as airports, traffic impact analysis and the management of municipal engineering services, all with the required and applicable computer knowledge.

For 4,5 years he was also deployed by SAICE and the DBSA, on a part time basis, to attend to all transportation related aspects (traffic studies, access applications, geometric standards, master plans, etc.) in the Metsweding District Municipality.

Clients include international and national governments, provincial and local authorities, authorities of national states and a variety of private developers. Projects are handled worldwide with special attention to the market throughout South Africa and neighbouring states, serving both public and private clients.

DECLARATION OF INDEPENDENCE :
I, Abraham Albertus van Zyl, the author of this report, hereby declare my independence as a practicing transportation engineer, with no interest in the Rietkol Mining Operation or Nhlabathi Minerals (Pty) Ltd.

1.1 Purpose of this study

The mining project is being planned on various land portions (Holdings 209 – 224 of the Modder East Agricultural Holdings on the farm Olifantsfontein 196-IR, Portion 71 and a portion of Remaining Extent of Portion 31 of the farm Rietkol 237-IR) and referred to as the Rietkol Project, which is situated approximately 6 km west of Delmas and 2.5 km south of the National Route N12 in the Nkangala District of Mpumalanga. AvzconS (Pty) Ltd were appointed to conduct a traffic impact study to assess the expected traffic implications of the planned future mining operations on the surrounding road network.

Figure RSM-TA-01R is a cadastral locality map and **Figure RAM-TA-02R** is an aerial photo key plan which shows the locality of the proposed Rietkol Project in relation to the surrounding region and the existing road network serving the area, as well as the various route numbers of all the roads within the scope of the study area. Detail of the specific area related to the Rietkol Project is provided in **Annexure A** of this report.

1.2 Study approach/Methodology

In order to make recommendations to the relevant roads authority on the feasibility of the proposed trucking transport mode for the future mining operations, the study is structured as follows:

- Determine the scope/boundaries of the required survey field and study area in terms of the road sections involved with the possible alternative routes available to the transport of production by truck. (see paragraph 3.4 a))
- Identify all possible factors and elements which might influence the adjudication of the planned transport mode such as possible congestion of traffic by on-site inspection and evaluation of the area of interest.
- Discuss existing standards which are normally applied and which are to be satisfied, in relation to applicable norms experienced at similar developments.
- Compile a database of the latest available information which might influence the decision of the relevant authorities.
- Discuss the expected traffic impact of the proposed Rietkol Project on the regional road network.

1.3 Proposed development

The main reason for this particular MRA is for the supply of silica sand to various markets including the glass, foundry and filtration industries in the Gauteng and Mpumalanga regions. The total in-situ resource is estimated to be 29.75 Mt, and the predominant minerals to be mined are:

- Glass Sand (Silica) QG Type Q
- Silica sand (general) Q Type Q
- Sand (general) QY Type I
- Silica Sand QD Type Q

Roughly 95% of the products will be distributed within the region while the remaining 5% is destined for the remainder of South Africa and surrounding African countries. The main industries that make use of the products are as follow:

<u>Product:</u>	<u>Industry:</u>
River Sand	Construction and road works
Amber Sand	Container glass industry
Flint Glass	Flat glass industry
Chemical Sand	Sodium Silicate
Filter Sand	Water Purification

The future mining operations, aiming towards producing $\pm 390,000$ ton per year, will be within the mining right application area (MRA) of the Rietkol Project. The purpose of this planned future mining project will be to establish new mining operations, which in turn is coupled to major regional benefits of which the most important are sustained employment opportunities and extended foreign revenue generation.

The current operational planning, with regard to the distribution of the expected monthly production of $\pm 32,500$ ton, is that the product is to be transported via the existing road infrastructure network towards Wadeville, Clayville and Nigel as the primary market areas (see **Figure RSM-TA-04R**).

2. PRESENT SITUATION

Figures RSM-TA-01R and **-02R** indicate the location of the Rietkol Project in relation to its surroundings. The proposed mining area is situated almost directly west of Road D1550, approximately 6km west of Delmas and 2.5 km south of the National Route N12 in the Nkangala District of Mpumalanga.

All planned future mining operations will be conducted in accordance with the future mining rights applicable to the properties within the mine boundary and no public road route-alignments will be affected by the first 20 years of mining.

The different roads involved with the planned transport route are:

- **National Route N12** is a major transport corridor between Johannesburg and Emalahleni. Detail regarding the locality of the planned mining area in relation to this route is available on **Figure RSM-TA-01R**.

This is a well maintained paved road under jurisdiction of SANRAL. As part of the planned transport route, some additional new traffic due to this future mining project, is expected to distribute along the National Route N12. However, access to/from the N12 will be via an existing diamond interchange which will be able to accommodate the entrance/exit of new transport traffic at an acceptable and safe level of service.



- **Provincial Road P36/1 (R50)** is a paved primary provincial road, running from Pretoria in the north-west, past Delmas up to Standerton in the south-east. As Indicated on **Figure RSM-TA-02R**, the Rietkol Mining Area is situated ± 2 km south of Road P36/1 (R50). This is a fairly maintained paved road under the jurisdiction of the Mpumalanga Provincial Government. However, the road edges are in need of some maintenance. Some additional new traffic due to this future mining project, is expected to distribute along Road P36/1 (R50) for a distance of ± 7.3 km.



- **Provincial Road D1550** is a southbound paved secondary provincial road, starting from Road P36/1 (R50), $\pm 500\text{m}$ south-east of the N12.

As a vital part of the planned future transport route, by providing access to the Rietkol Project via an existing low order gravel access road, all additional new traffic due to this future mining project, is expected to distribute along Road D1550. This road is currently in a fair condition, but there is a total lack of the necessary road markings and lines on Road D1550 and should be attended to.

Further, the unknown structural capacity in view of the expected heavily loaded trucks is in question and should, as part of the establishment process of the Rietkol Project be verified by a professional geotechnical engineer.



- **The access road off Road D1550** is an existing informal gravel road, currently providing access to various agricultural holdings and land portions which in future will act as the primary access to the planned Rietkol Mining Area. In view of this future function, the relevant section ($\pm 560\text{m}$) will have to be upgraded to a standard suitable to accommodate the future high volume of loaded trucks expected to operate from the planned mining area.



3. TRAFFIC ASPECTS

3.1 Present traffic volumes

The Friday afternoon traffic movements are considered the worst-case scenario and in view of this assumption, some traffic volumes were obtained from manual traffic counts during November 2017.

These available traffic counts, together with data obtained from the provincial data base were then converted to average daily trips to reflect the current daily traffic movement on each road link (i.e. section between each pair of intersections). These average daily trips are indicated on **Figure RSM-TA-03R** and the most relevant are recorded in **Table 1** below.

This reflection of the average daily traffic volumes on **Figure RSM-TA-03R**, provides a clear indication of the current relative priority of the various road links within the area of interest.

Table 1:

Road	Link	Ave. daily trips
Road P36/1 (R50)	Between D1349 and D1550	10,689
	Between D1550 and P95/2 (R42)	9,755
	Between P95/2 (R42) and Delmas	9,806
Road D1550	Between P36/1 (R50) and D2285	1,842
	Between D2285 and P29/1 (R555)	2,130

3.2 Expected future trip generation

According to the available information on the current planning for the proposed Rietkol Project, the transport related operational activities will consist of the following expected increase in peak hour traffic movements via the mine access as proposed to be off Road D1550:

a) Production transport by road:

The expected monthly production volume of silica, sand and other products transported by road relates to a daily number of 72 truck trips, which is equal to **7 trips during peak hour** on the surrounding road network.

b) Other trips (deliveries and staff vehicles):

The expected number of deliveries and staff movements to/from the site is estimated to generate 19 trips per day. Of these trips less than 50% is expected during the peak hour on the surrounding road network, resulting in **8 trips during peak hour**.

c) Staff mass transport trips:

Mass transport of staff and labourers to site is estimated to be equal to 12 trips per day of which 50% is estimated to take place during the peak hour on the surrounding road network resulting in **6 trips during peak hour**.

A summary of the new traffic calculations is shown on **Figure RSM-TA-05R**.

The various transport modes as identified above can therefore be expected to generate a total of 21 additional new trips during the peak operational hour of the surrounding road network. This is equal to 10 new trips inbound and 11 new trips outbound during the peak hour.

3.3 Accommodation of future activities

The proposed Rietkol Project will be a new operational mining development, which will require new infrastructure to support the planned mining operations. The construction work, that will be required in preparation towards the proposed new mining activities, can be expected to also generate new trips on the surrounding

road network very similar to the trips expected during the operational period, except for the trips generated by the production transport trucks.

In order to accommodate the future activities of the planned Rietkol Project, the following available information should be taken into account:

- The financial sustainability of the planned Rietkol Project.
- Regional benefits for the community due to this project.
- Traffic capacity constraints of existing roads impacted upon.
- Road safety aspects related to an area with active mining operations.
- The availability of road transport routes and their current conditions.

3.4 Trip distribution and assignment

Taking into account transportation related aspects such as current traffic patterns, current traffic volumes, route preferences by the current road users, road geometry and road safety, no reason, such as capacity constraints, could be identified that will cause any expected re-assignment of any current trips on the road network due to the mining operation of the proposed Rietkol Project.

The distribution of the expected additional new trips due to this proposed mining project and as recorded on **Figure RSM-TA-06R**, in terms of the planned route was all done by taking the following highly relevant aspects into account:

a) The most obvious route towards the identified destinations of the products produced by the proposed mining operation, with specific reference to the following aspects regarding the routes as identified in **Figure RSM-TA-04R**:

- The only practical alternative route to/from the current known destinations in Clayville and Wadeville is via Road D1550, the R50 and the National Route N12.
- The route to/from the current known destination in Nigel can be either:
 - Northbound on Road D1550 for 1,9km and then the R50 towards Delmas and from there along the R555; or
 - Southbound on Road D1550 for 5,2km towards Eloff and from there along the R555.

However, the structural capacity of Road D1550 in view of the expected future loaded trucks is seriously in question and the longer distance along Road D1550 via Eloff is not preferred due to the potential high cost to ensure the required structural capacity.

- Additionally: In view of the planned location of the future operational area the preference to access Road D1550 via the access road along the northern boundary of Holding 276 (see **Figure RSM-TA-05R**) instead of via the access road along the southern boundary of Holdings 283 is purely based on travel distance.

b) The expected origin and destination of staff, labourers and service deliveries.

4. TRAFFIC IMPACT ANALYSIS

4.1 Level of service (LOS)

In terms of available capacity, the surrounding roads of a new development should cater for the traffic demand as determined in the previous section, and road improvements for the account of the developer must be done to enable the existing road infrastructure to function effectively, given the additional traffic caused by the development.

The level of service (LOS) of a traffic movement is recorded on the following scale on which the operational capability of a movement or collection of movements is judged, primarily according to the delay times experienced:

- A : *Very good*
- B : *Good*
- C : *Acceptable*
- D : *Poor*
- E : *Very poor*
- F : *Unacceptable*

4.2 Assessment

In accordance with the COTO TMH16, the "South African Traffic Impact and Site Traffic Assessment Manual", a level of service (LOS) analysis is required for the following situations:

- a) *Each intersection impacted upon which is already congested or experiencing a very poor level of service during peak hours.*
- b) *Each intersection impacted upon where 50 additional development trips are added to the sum of the critical lane volumes during peak hour.*

The following **Table 2** (on page 10 of this report) provides a summary of the expected additional new trips due to the Rietkol Project, expected to pass through the various intersections along the planned routes during the weekday afternoon peak hour of the surrounding road network:

Table 2: Planned Route - via D1550, R50, N12 and back

Intersection Number (See Figure RSM-TA-06)	Trips Through Intersections	
	Current Peak Hour Trips	Expected New Additional Trips
1	184	21
2	492	21
3 – Ramp terminal	612	9
4 – Ramp terminal	660	4

In view of the required standard of the COTO TMH16, the “*South African Traffic Impact and Site Traffic Assessment Manual*” and the fact, as calculated in Section 3.2 of this report and recorded in the above **Table 2**, that at none of the four relevant intersections more than 50 additional development trips will be added to the sum of the critical lane volumes during peak hour. In fact, the highest number of new trips that will be added to the sum of the critical lane volumes during peak hour is a mere 21 trips. Therefore, no intersection along the planned routes of the proposed mining operations, is required to be submitted to a detailed capacity analyses.

However, from a traffic point of view, the following additional road works are considered of vital importance and essential to accommodate the expected additional future traffic due to this proposed mining project at an acceptable level of service:

- i) The lane configurations to be provided as part of the upgrade of the current gravel road, as the new mine access, with Road P1550, should at least provide for a dedicated right turning lane on the northern approach of Road D1550, plus a left-turn slipway from the mine access onto Road D1550.
- ii) To properly address the speed difference between south-east bound commuters on the R50 (P36/1) passing by the intersection of Road D1550 and heavy trucks turning right onto Road D1550, the existing low order pass-by lane on the R50 should be upgraded to provide for a dedicated right turning lane on the north-western approach of Road R50, plus a left-turn slipway from the Road D1550 onto Road R50 ((P36/1) should be provided.

In addition to the above, there are two other very specific aspects that requires to be highlighted, namely road safety and current road condition:

a) Road safety:

While taking into account the previously mentioned required upgrade of the current gravel access road off Road D1550, all four identified intersections are situated along sections of road with acceptable sight distance and with acceptable operational conditions in terms of their respective operational classifications together with the above mentioned required improvements.

b) Current road condition:

The condition of the road sections identified in Section 2 of this report, in relation to the applicable status of each road, were obtained from the data base of the national and provincial road authorities and updated and verified with on-site surveys and evaluations during January 2018.

According to the recorded data and as supported by the on-site evaluations, the sections of road identified in Section 2 of this report are all paved roads and currently in a fair condition in relation to the design status thereof. The only exceptions in this regard are:

- Road R50 (P36/1) that require some maintenance to the road edges and shoulders.
- Road D1550 that is currently without any road markings and painted centre lines..
- The gravel access off Road D1550 that need to be upgraded to be able to accommodate the future truck movements.

Following on-site visual inspections and evaluations of the four intersections along the identified planned routes, the following conclusions were made:

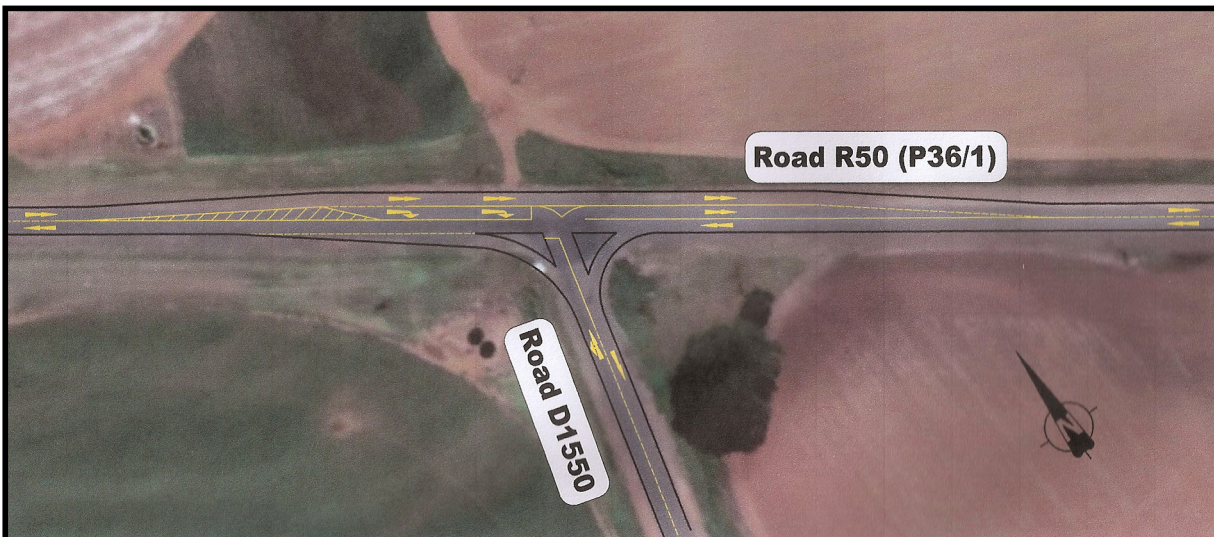
(i) Intersection 1: Access road with Road D1550

- This existing T-junction intersection will be able to accommodate the future new traffic due to the Rietkol Mining Project at an acceptable level of service on condition that the gravel access road is upgraded and a dedicated right-turn lane is provided on the northern approach of Road D1550, plus a left-turn slipway from the mine access onto Road D1550. (See example below)



(ii) **Intersection 2: Road D1550 with Road R50 (P36/1)**

- This existing T-junction intersection will be able to accommodate the future new traffic due to the Rietkol Mining Project at an acceptable level of service on condition that the right-turn lane on the north-western approach of Road R50 (P36/1) is improved in accordance with the current standards of the provincial authority, plus a left-turn slipway from the Road D1550 onto Road R50 ((P36/1) should be provided. (See example below)



(iii) **Intersection 3 and 4: Ramp terminals of the N12/R55 interchange**

- These two intersections will be able to accommodate the future new traffic due to the Rietkol Mining Project at an acceptable level of service.

4.3 Road improvements

Based on the following aspects, no road improvements or amendments, **other than those identified in Section 4.2 above is required:**

- a) All surrounding sections of road along the identified planned routes are currently in a fair structural condition in relation to the design status thereof. However, long sections of the road edges of Road R50 (P36/1) is in need of some maintenance, even without the additional traffic of this project.
- b) All existing paved intersections are expected to still operate at an acceptable level of service with the additional new trips. However, as a road safety measure, a revised lane configuration is proposed for Intersections 1 and 2, as identified in Section 4.2 i) and ii) of this report.

- c) All proposed road upgrades and improvements are to be designed by a professional engineer and submitted for official approval, by the Mpumalanga Provincial Roads Department, prior to implementation.

4.4 Economic evaluation

The on-site evaluations clearly indicate that from a traffic point of view there are no factors that could overshadow the positive impact of the Rietkol Project which will create benefits such as:

- New job opportunities for an extended period of time.
- Product end-users can be supported for an extended period of time.

5. CONCLUSIONS AND RECOMMENDATION

It is concluded that the road network, surrounding the Rietkol Project, will be able to handle the traffic, with the identified road improvements, with no detrimental impact on the traffic on any of the relevant roads.

It is hereby concluded that from a traffic perspective, there are no fatal flaws with the proposed identified required road works, including the new access onto Road D1550, on condition that all improvements be constructed to the applicable standards of the provincial authority.

It is recommended that specific commitments need to be included in the EMPr for the mine to address the following matters:

- a) Responsibility towards road maintenance, only when transport trucks serving the Rietkol Project are found to be overloaded in terms of the applicable standard and required axle loads of the specific trucks.
- b) Addressing and attending to possible spillage from loaded trucks between the mine area and the various destinations, such as suitable covering required for loads (tarpaulins) with a regular monitoring process.
- c) Speed and safety control of truck movements are necessary in line with the relevant speed limits for heavy trucks.

This report focussed on the initial 20 year operations of the Rietkol Project. For the extension of operations beyond the initial 20 years, the traffic related impact (for example on the current gravel access road off Road D1550, running along the southern boundary of Holdings 216 – 218) should at that stage be evaluated in terms of the operational activities to be applied.