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assisted by : MONARE CONSULTING

TRAFFIC AND TRANSPORTATION

TRAFFIC IMPACT STUDY

PROPOSED MINING DEVELOPMENT ON FARM

VYGENHOEK 10JT

(SYLVANIA MINE DEVELOPMENT)

FINAL REPORT

JULY 2012

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CESA

CONFIGURATION CONTROL

CLIENT : Digby Wells Environmental

PROJECT NAME : Sylvania Mine Development **PROJECT No. :** 11024

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1 INTRODUCTION

Impofu Engineering Services are appointed by Digby Wells Environmental to conduct a traffic impact study for the proposed mining development on the farm Vygenhoek 10 JT near Lydenburg in the Mpumalanga Province, in support to their Environmental Impact Assessment. Impofu have employed the assistance of Monare Consulting to visit the site, do traffic counts and to compile the report.

This traffic impact study is submitted in support of the planning and mining rights application to the relevant authorities i.e. national, provincial and municipal.

1.1 Project Brief

The traffic investigation is motivated by the need to evaluate the impact that the proposed development will have on existing road network and also to determine what measures will be required to improve the performance of the road network due to the additional vehicle trips generated by the development. The report describes the following:

- The trip generation and distribution profile
- Evaluates the impact on the road system at key intersections
- Investigates mitigating measures where necessary

1.2 Objectives of the Study

The objectives is to investigate access points to the major network, assess the impact of the proposed mining develop as well as to develop a supporting road network for the proposed development area, if any required.

1.2 Description of Study Area

Sylvania is planning to develop a new platinum mine on the farm Vygenhoek 10 JT near Lydenburg in the Mpumalanga Province. The proposed project, called Everest North Mine, will be located within the Groot Dwars River valley, approximately 28 km north east of Roossenekal and 30 km west of Lydenburg.

Figure 1-1 of Annexure A.

1.4 Study Method

We employed the following methodology in the completion of the study report:

- **Site Visit -** A site visit was undertaken to record the existing functional layout of key intersections and obtain an indication of the geometry to allow for further investigation into potential solutions
- **Collection of Traffic Data** - The collection of traffic data was conducted at key intersection in close proximity to the proposed development site, i.e. Intersection counts at critical intersections

- **Assessment of Existing Road Network** – this approach considered the condition of existing road network and assessment of proposed development access point(s), also highlighting on possible and/or alternative access proposals and considerations
- **Projected Traffic Volumes –** determine the extent of traffic to be generated by the development. This also included the distribution and assignment of additional trips to alternate modes, access routes and critical intersections. Estimate the background traffic growth factor and its incorporation into the traffic forecasting
- **Traffic Analysis and Transportation Assessment –** this incorporates the use of traffic simulation software to determine the capacity and level of service (LOS) of access intersections and also taking into consideration future road network, evaluation of site access, assessment of public transport operations and provision for pedestrian facilities

2 DEVELOPMENT CONTEXTS

The proposed project will involve both opencast and underground mining, waste rock and topsoil stockpiles and infrastructure at the Everest North Mine site. It will also involve an upgrade to the front end of the existing mineral processing plant at Everest South with possible future expansion of the existing Everest South mine residue disposal facilities. The project will include supporting services and facilities at the mining area and an upgraded interface between Everest North and Everest South Mines.

The main aim of the project is to exploit the UG2 Reef on the farm Vygenhoek 10 JT using a combination of underground and opencast mining methods. The main product of the mine will be a platinum group metal concentrate that will be sold with the existing product from the Everest South Mine. The estimated life of mine (LoM) is 8 years.

2.1 Land Ownership

Landowner information of the six farms constituting the proposed project area is indicated in Table 2.1

Table 2.1: Land Tenure Information for the Project Area

Farm Name and Portion	Land Owner	Infrastructure
Vygenhoek Portion 3	Claimant Applicant is M S Choma	Mining
Vygenhoek Portion 7	Republic of South Africa	Mining
Vygenhoek Portion 2	Republic of South Africa	Access Road
Vygenhoek Portion 4	Republic of South Africa	Access Road
Vygenhoek Portion 5	Republic of South Africa	Access Road
Vygenhoek Portion 8	Mr Anton Charl Le Roux	Access Road

2.2 Project Description

2.2.1 Processing

Ore produced by the mine will be processed at the existing Everest South UG2 concentrator plant. An upgrade of the front end of the plant may be required to blend the ore from Everest South with that of Everest North after accounting for the metal content in each. Co-processing of the ores will result in co-deposition of the mine residue on the existing Everest South mine residue disposal facilities.

The project will investigate the feasibility of expanding these facilities for the combined future requirements of Everest North and Everest South, while confirming an alternative site for final deposition. The project will describe the supporting services and facilities for the Everest North mine only, as it is assumed that existing facilities and infrastructure at the Everest South concentrator plant will remain largely unaffected.

2.2.2 Infrastructure

Other associated support facilities identified to date include:

- temporary construction facilities and infrastructure;
- waste management: temporary handling and storage of general and hazardous waste, on-site change houses/ablution facilities with sewage treatment plant, possible incinerator for treating sewage screenings;
- surface water management: water supply dams, mine residue facility return water dams, pollution control dams, clean and dirty storm water controls, river crossings;
- storage and handling of hazardous substances: fuel, lubricants, various process input chemicals, raw material stockpiles/bunkers, gas, burning oils, explosives;
- services: power lines, pipelines, conveyors, roads, telephone lines, communication and lighting masts, helipad;
- security and access control;
- lay down and storage yard areas;
- compressor house;
- stores, lamp rooms, workshops and wash bays;
- offices, control rooms;
- contractor camps; and
- medical station.

The exact placement of infrastructure has not been identified however, a preliminary mine plan indicating the proposed mining areas and access road are indicated in ***Figure2-2.***

2.3 Mining Activities

2.3.1 Waste Disposal

Waste rock from the open pit will be used for backfilling and rehabilitating the open pit. The remaining waste rock from the open pit and that from the development of the underground mine will be stockpiled on site and used for construction and/or the rehabilitation of areas such as screening berms, roads and the tailings dam. The option of a dedicated waste rock dump is also being considered.

It is proposed that there will be a sewage treatment facility located on site to cater for the proposed project. This plant will emit an inert and safe waste product in small quantities which can be stockpiled or returned to the environment. There could also be an incinerator located at the sewage treatment plant for treating sewage screenings. The location, design and capacity of this facility will be determined during the planning and design phase of the project.

The types of waste that will be generated by the project include: hazardous industrial waste (such as packaging for hazardous materials, used oil, grease), general industrial waste (such as scrap metal and building rubble) and domestic waste (such as packaging and office waste). These wastes will be temporarily handled and stored on site before being removed for recycling by suppliers, reuse by scrap dealers or final disposal at permitted waste disposal facilities. No on-site landfill (waste disposal) facilities are planned. A waste management procedure will be developed for these wastes.

2.3.2 Open Cast Mining

A strip mining approach will be followed. Topsoil, overburden and excess rock will be removed and stockpiled adjacent to the pit. Ore will be blasted, stockpiled and loaded onto trucks. Mined ore will be transported to the concentrator plant and stockpiled on site. The open pit will be backfilled and rehabilitated, on a continuous basis, by replacing the rock followed by the subsoil followed by topsoil.

The open pit operation will extend along the outskirts of the ore body on the farm Vygenhoek (approximately 5 km of the strike). The current plan is to start the open pit mine in the south and advance to the north over a one year period. The approximate depth of the proposed pit will be 70m.

2.3.3 Underground Mining

There will be two declines to access the underground workings. The declines will be placed in the initial open pit boxcut. The underground mine will extend in a northerly direction to the boundary of the Vygenhoek farm. Ore and waste will be separated underground. Ore will be transported to the run-of-mine stockpile via trucks.

2.4 Project Alternatives

2.4.1 Alternative Land Uses

In accordance with the current land uses in the vicinity of the proposed project, parts of the proposed project site could, as an alternative to mining in the project area, be used for

conservation (maintain the natural habitat where possible) and agriculture or small scale farming. Although it is recommended that areas not used for mining be utlised or conserved, alternative land uses in some areas is limited by the relatively steep terrain and rockiness of the area. When considering the post rehabilitation land use alternatives, the only option considered to date is rehabilitation back to the current land use capability.

2.4.2 Project Alternatives

Alternatives are being considered for a number of the project components. For each component a set of selection criteria will be used to optimise environmental, technical and economic factors. The selection criteria for the various components are outlined below.

This alternative selection process cannot be completed without more detailed input from certain specialist investigations still to take place in the EIA phase of this project.

2.4.3 Alternative Mining Methods

In the proposed project area the target orebody outcrops on the surface and extends underground in a westerly direction. Both open pit and underground mining methods can be used to access the ore body. A significant portion of the mineable ore reserve (approximately 30%) is located within the top 40 m of the orebody, around the outskirts of the ore body. Due to the small nature of the orebody and for the proposed mine to be feasible, a combination of open pit and underground mining methods are being proposed to exploit the full extent of the ore body. It has been reported that no other feasible mining methods exist for this orebody.

2.4.4 Alternative Processing Options

Two options were considered for processing mined ore.

- **Option 1 :** Develop a new site on the farm Vygenhoek 10JT for the mineral processing plant, mine residue disposal facilities, and supporting services and facilities; and
- **Option 2 :** Transporting the mined ore to a nearby mining facility where existing processing, residue disposal and support facilities will be used. This option may require the upgrading of existing infrastructure and/or additional infrastructure at the mine depending on available capacities. Any environmental authorisation required for this option will form part of a separate application by the relevant mine operators to the relevant government departments.

Option 2 was chosen as the preferred option due to the following selection criteria:

- Technical considerations;
- Capacity issues;
- Environmental protection (air, soils, water, surrounding communities, visual aspects, and biodiversity); and
- Affordability.

2.4.5 Alternative transport options

As option 2 above was chosen as the preferred option, two alternative transport options have been identified for transporting mined ore to EPM. These include:

- Transport by road using the existing road network; or
- Establishing a conveyor system between the project area and EPM.

Transport by road was chosen as the preferred alternative, based on the following criteria:

- Ecology and archaeology/heritage issues;
- Hydrology issues;
- Land use and land capability issues
- Long term visual impact issues;
- Proximity to residential areas/ dust issues;
- Public safety issues;
- Access to property and space availability;
- Operating, capital and closure costs; and
- Emergency management.

2.5 Proposed Haulage Route

The proposed material haulage route is indicated on ***Figure 2-3*** of Annexure A. The proposed haulage route will not impact on the existing road network as it is expected that all haulage trucks will utilise the proposed haulage route as a connecting route between the proposed Sylvania Mine Development and the existing Everest North Platinum Mine.

This route will affect the intersection of Gravel Road D and Gravel Road C (Oshoek Road) and the intersection of Boschfontein Road and the Gravel Road C (Oshoek Road), see ***Figure 3-2.***

3 LOCAL TRANSPORT NETWORK

3.1 Adjacent Road Network

The proposed development is located in close proximity of the following Class 2 roads as indicated in

Figure 3-1 and Figure 3-2.

- **Road R577 -** a provincial road connecting Lydenburg and the surrounding areas such as Mashishing. The road is designed to carry an Average Daily Traffic (ADT) of 10,000 vehicles. The road is a two lane road with gravel shoulders on both sides of the road. The road is currently carries low vehicular trips with peak hour trips of less than 400 vehicles during the AM and PM periods.
- **Sekhukhune Road –** runs north south on the eastern side of the proposed mining development site. The road is also a two lane road with gravel shoulders on both sides of the road. The road was also designed to carry an Average Daily Traffic (ADT) of 10,000 vehicles. The road currently carries low vehicular trips with peak hour trips of less 420 vehicular trips during the AM and PM periods

3.2 Development Access

In the long term, the site will be bounded by two major provincial routes Road R577 south of the proposed development site and Sekhukhune Road to the east. This will be followed by construction of Road C, an existing gravel road in good condition and Road D which is not constructed.

In order to achieve a practical intersection layout no more than two left turn lanes and two right turn lanes per approach can be allowed. Dual right turn and left turn lanes can only be provided when the cross road has at least two lanes per direction of travel.

3.3 Access Management Considerations

The status of Road R577 and Sekhukhune Road dictates the access positions at which can be provided on these routes. Provision for access to adjacent land uses from K-routes is necessary and must comply with relevant access management standards. The “Guidelines for Human Settlement Planning and Design, Department of Housing” provides guidelines in this regard.

A preferable minimum intersection spacing of 600m is required in order to achieve acceptable two way progression in a network that is controlled by traffic signals. The design speed of both the R577 and Sekhukhune Road is estimated at 100km/h, with the following design parameters:

- Site distance : 155m
- shoulder/barrier sight distance : 300m
- Passing sight distance : 680m
- stopping sight distance : 155m
- decision sight distance : 300m to 395m

3.4 Access Proposal

The site will be accessible using Road R577, Sekhukhune Road, Road C and Road D, as indicated on ***Figure 3-3***. The current intersection is a three leg intersection thus the proposal to establish the development access at this point will convert the current intersection to a four leg intersection with introduction of the south approach as the main access to the development. The propose access road will have a road reserve (Road D) of 32m to 40m.

4 BACKGROUND TRAFFIC

4.1 Extent of the Study Area

The Sylvania Mine Development study area includes the following:

- All intersection adjacent to accesses to the development
- All road elements on which the trip assignment is the largest

The above being subject to the following maximum distance limits:

- 0.5km for small-scale developments
- 1.0km for medium scale developments
- 1.5km for large-scale developments

The study area for the traffic impact assessment also includes elements of the road network required by the authorities, whether or not these elements require improvement. Thus the limitation distance for the proposed development is taken as 1.5km as the development as the proposed mine is regarded as a large-scale development.

4.2 Traffic Counts/Surveys

Given the type of the development detailed traffic counts were carried out during the peak period of a normal weekday, i.e. on Thursday 26 April 2012 during the AM and PM peak period from 06h00 to 18h00 of a normal week day.

It is pertinent to take note the present operations on the key elements of the road network likely to be affected, as neither existing road nor the local authority would want the level of amenity or service to significantly deteriorate. If anything, it should rather improve as a result of the development related traffic and arising there from, appropriate road upgrading. Traffic counts were conducted at the following intersections, see ***Figure 4-1, and Figure 4-2*** highlight the existing intersection lane configurations at the above intersections:

- R577 and Boschfontein Road – priority stop controlled intersection with north-south traffic having priority over east-west traffic
- Sekhukhune Road and R577– priority stop controlled intersection with east-west traffic having priority over north-south traffic
- Sekhukhune Road and Road C - priority stop controlled intersection with north-south traffic having priority over east-west traffic
- Boshfontein Road and Road C - priority stop controlled intersection with north-south traffic having priority over east-west traffic

4.3 Existing Traffic

The traffic counts were used to determine the background traffic volumes in the vicinity of the proposed Sylvania Mine development. The results of the 2012 AM and PM peak hour background traffic counts are shown in ***Figure 4-3.***

4.4 Traffic Growth

An annual growth rate of 5.0% was assumed and applied to the 2012 background traffic volumes to estimate the future background traffic, i.e. 2014, as is expected that the mine development will commence during the said year, these are indicated as ***Figure 4-4.***

5 DEVELOPMENT TRAFFIC

5.1 Trip Generation Rates

There is no standard formula on the South African Trip Generation Manual (SATGM) of 1992 for Mine Development and Hazardous Waste Facility. The following assumptions were made in order to determine the expected generated trips:

- General Hazardous Waste Facility
  - ±20 people including the foreman, supervisor etc. will be working on site during construction
  - Most of the trips will be site bound during the construction period
  - A total of 10 trucks will be operating and transporting construction materials during the construction phase
  - The landfill is expected to accommodate 1 ,000,000m³of both hazardous and general waste over a period of 08 years:

$$\text{Trips} = \frac{1000{,}000\ m3}{6m3}$$

$$= 166{,}667 \text{ one-way trips}$$

$$= 333{,}333 \text{ two-way trips}$$

$$\text{Daily Trips} = \frac{333{,}333 \text{ trips}}{2920 \text{ days}}$$

$$= 166{,}667 \text{ one-way trips}$$

$$= 114 \text{ trips/day}$$

  - 80% of the people working on the project both during construction and post construction will be transported to site by the contractor or staff bus.
  - 80% of the trips will happen during the off peak hours for both during construction and post construction
  - Cover material will be imported to site using trucks
  - Trucks bringing in GCL were taken into consideration
  - High hazardous waste will have to be transported to a permitted H:H hazardous disposal facility. Temporary storage of hazardous waste may not exceed three months.
  - The material excavated will be stockpiled within the site.

- ❖ Mine Development
  - Utilised 620 employment opportunities during construction
  - The road passenger transport modes considered for this development are as follows
    - 18 seater recapitalised taxi
    - 35 seater recapitalised taxi
    - 65 seater bus
    - 4 seater private car
- ❖ The generated trips are summarized as follows:

Type of Vehicle	Estimated % Split (of 620)		Vehicle Capacity	Estimated Vehicle trips at 80% of Vehicle Capacity
18 Seater Taxi	45%	279	18	19
35 Seater Taxi	20%	124	35	4
65 Seater Bus	20%	124	65	2
4 Seater Car	15%	93	4	58
Total	100%	620		**84**

It is assumed that 70% of the vehicular trips will operate during the peak periods and 30% during the off-peak period. This results in 59 vehicular trips expected to operate during the peak periods. The distribution of development trips is summarised in Table 5.1 below.

Table 5.1 : Summary of Development Trips

Description of Proposed Land Use	AM			PM		
	TRG-In	TRG-out	Total	TRG-In	TRG-out	Total
Waste Management and Disposal	34	23	57	23	34	57
Total	**34**	**23**	**57**	**23**	**34**	**57**
Mine Development	41	18	59	18	41	59
Total Trips	**41**	**18**	**59**	**18**	**41**	**59**
Total Development Trips	**76**	**41**	**116**	**41**	**76**	**116**

In conclusion, it is expected that the development will generate a total of 116 peak hour vehicular trips.

5.2 Trip Distribution

The distribution of the development trips, as determined in Table 5.1 above, is highlighted in Figure 5-1.

5.3 Traffic Assignment

The development trips were assigned to the road network based on the trip distribution percentages as indicated in ***Figure 5-1***. The assignment of development trips for the AM and PM peak hour traffic for 2014, are shown in ***Figure 5-2. Figure 5-3*** indicate the summary of 2014 background and development trips.

6 INTERSECTION CAPACITY ANALYSIS

6.1 Definition Relevant to the Capacity Analysis

The following definitions from the 2000 Highway Capacity Manual are used in this report:

- Capacity - The maximum hourly rate at which vehicles can reasonably be expected to traverse a lane or roadway during a given period under prevailing traffic and control conditions.
- Volume - The hourly rate of vehicle arrivals at an intersection.
- Volume to capacity ratio (v/c) - Is the ratio of volume to capacity.
- Level of service (LOS) - Level of service is defined in terms of delay. Delay is a measure of driver discomfort, frustration, fuel consumption and lost travel time. The levels of service for signalised and unsignalised intersections as defined in the 2000 Highway Capacity Manual are shown in ***Table 6.1*** below.

Table 6.1: Level of Service Definitions

Level of Service	Signalised Intersections Stopped delay (seconds)	Unsignalised intersections Total Delay (seconds)
A	<10	<10
B	>10 and <20	>10 and <15
C	>20 and <35	>15 and <25
D	>35 and <55	>25 and <35
E	>55 and <80	>35 and <50
F	>80	>50

An intersection is deemed to be operating acceptably at levels of service A to D. If an intersection operates at a level of service E or F or has a volume to capacity ratio higher than 0.95 the intersection is considered to be operating at capacity.

6.2 Scenario Analysed

The following background traffic scenarios were analysed:

- Scenario 1 – Analysis of current/existing 2012 traffic including escalation using 5% traffic growth to estimate the 2014 AM and PM background traffic to determine current and future intersection capacities without development traffic.
- Scenario 2 – adding the development traffic to the above estimated traffic to determine the future intersection capacities for 2014 and require road upgrades to mitigate the capacity problems at key intersection.

6.3 Existing and Future Intersection Capacity Analysis

The capacity of individual intersections was undertaken using the existing peak hour traffic volumes without development and intersection layout. Capacity analysis was undertaken using aaSidra Intersections Version 3.2 for Windows.

6.3.1 2012 Background Traffic

The results for the analysed scenarios for the intersection are summarised in **Table 6.2** below.

Table 6.2: Capacity Analysis – 2012 Background Traffic

Approach	AM Peak Hour				PM Peak Hour			
	Average Delay (sec)	Volume/ Capacity (v/c)	Average Queue (m)	LOS	Average Delay (sec)	Volume/ Capacity (v/c)	Average Queue (m)	LOS
Roosekenkal Road (R577) and Boschfontein Road								
South : Vermont Rd	11.0	0.007	0	**B**	10.8	0.003	0	**B**
East : R577	6.4	0.035	1	**A**	3.6	0.011	0	**A**
North : Boschfontein Rd	10.7	0.021	1	**B**	10.7	0.044	1	**B**
West : R577	3.2	0.005	0	**A**	1.9	0.004	0	**A**
Total	**7.3**	**0.035**	**1**	**A**	**8.1**	**0.044**	**1**	**A**
Boschfontein Road and Road C (Oshoek Road)								
South : Boschfontein Rd	0.5	0.023	1	**A**	3.5	0.003	0	**A**
East : Road C (Oshoek)	8.3	0.002	0	**A**	8.2	0.003	0	**A**
North : Boschfontein Rd	0.6	0.014	0	**A**	0.3	0.025	0	**A**
West :								
Total	**0.8**	**0.024**	**1**	**A**	**1.3**	**0.025**	**0**	**A**

Approach	AM Peak Hour				PM Peak Hour			
	Average Delay (sec)	Volume/ Capacity (v/c)	Average Queue (m)	LOS	Average Delay (sec)	Volume/ Capacity (v/c)	Average Queue (m)	LOS
Road C (Oshoek Road) and Sekhukhune Road								
South : Sekhukhune Road	0.0	0.212	0	**A**	0.5	0.024	0	**A**
East :								
North : Sekhukhune Road	2.0	0.025	2	**A**	0.3	0.216	13	**A**
West : Road C (Oshoek)	14.7	0.006	0	**B**	13.3	0.003	0	**B**
Total	**0.3**	**0.212**	**2**	**A**	**0.3**	**0.222**	**13**	**A**
Roosekenkal Road (R577)) and Sekhukhune Road								
South : Vermont Rd	14.2	0.005	0	**B**	12.8	0.004	0	**B**
East : R577	7.9	0.318	16	**A**	5.9	0.037	1	**A**
North : Sekhukhune Road	11.8	0.052	2	**B**	11.0	0.365	17	**B**
West : R577	1.1	0.017	1	**A**	1.5	0.023	1	**A**
Total	**7.8**	**0.333**	**16**	**A**	**9.5**	**0.400**	**17**	**A**

The following comments are made in relation to the above results:

- All intersection operates at acceptable level of service, at LOS A during both the AM and the PM peak hour periods
- No intersection upgrades required

6.3.2 2014 Background Traffic

The results for the analysed scenarios for the intersection are summarised in ***Table 6.3*** below.

Table 6.3: Capacity Analysis - 2014 Background Traffic

Approach	AM Peak Hour				PM Peak Hour			
	Average Delay (sec)	Volume/ Capacity (v/c)	Average Queue (m)	LOS	Average Delay (sec)	Volume/ Capacity (v/c)	Average Queue (m)	LOS
Roosekenkal Road (R577) and Boschfontein Road								
South : Vermont Rd	11.0	0.007	0	**B**	10.8	0.003	0	**B**
East : R577	6.4	0.037	1	**A**	3.6	0.012	1	**A**
North : Boschfontein Rd	10.7	0.023	1	**B**	10.7	0.048	2	**B**
West : R577	3.0	0.005	0	**A**	1.7	0.005	0	**A**
Total	**7.3**	**0.037**	**1**	**A**	**8.1**	**0.048**	**2**	**A**
Boschfontein Road and Road C (Oshoek Road)								
South : Boschfontein Rd	0.4	0.026	1	**A**	3.5	0.003	0	**A**
East : Road C (Oshoek)	8.3	0.002	0	**A**	8.2	0.003	0	**A**
North : Boschfontein Rd	0.6	0.015	0	**A**	0.3	0.028	0	**A**
West :								
Total	**0.8**	**0.026**	**1**	**A**	**1.2**	**0.028**	**0**	**A**

Approach	AM Peak Hour				PM Peak Hour			
	Average Delay (sec)	Volume/ Capacity (v/c)	Average Queue (m)	LOS	Average Delay (sec)	Volume/ Capacity (v/c)	Average Queue (m)	LOS
Road C (Oshoek Road) and Sekhukhune Road								
South : Sekhukhune Road	0.0	0.233	0	**A**	0.4	0.027	0	**A**
East :								
North : Sekhukhune Road	2.2	0.028	2	**A**	0.3	0.238	15	**A**
West : Road C (Oshoek)	15.3	0.006	0	**C**	13.7	0.003	0	**B**
Total	**0.3**	**0.233**	**2**	**A**	**0.4**	**0.250**	**15**	**A**
Roosekenkal Road (R577)) and Sekhukhune Road								
South : Vermont Rd	14.8	0.006	0	**B**	13.1	0.005	0	**B**
East : R577	7.9	0.351	18	**A**	5.9	0.040	2	**A**
North : Sekhukhune Road	11.9	0.059	2	**B**	11.0	0.404	19	**B**
West : R577	1.0	0.018	1	**A**	1.5	0.025	1	**A**
Total	**7.8**	**0.352**	**18**	**A**	**9.6**	**0.400**	**17**	**A**

The following comments are made in relation to the above results:

- All intersection operates at acceptable level of service, at LOS A during both the AM and the PM peak hour periods
- No intersection upgrades required

6.3.3 2014 Background Traffic and Development Traffic

The results for the analysed scenarios for the intersection are summarised in ***Table 6.4*** below.

Table 6.4: Capacity Analysis - 2014 Background and Development Traffic

Approach	AM Peak Hour				PM Peak Hour			
	Average Delay (sec)	Volume/ Capacity (v/c)	Average Queue (m)	LOS	Average Delay (sec)	Volume/ Capacity (v/c)	Average Queue (m)	LOS
Roosekenkal Road (R577) and Boschfontein Road								
South : Vermont Rd	11.4	0.007	0	**B**	11.0	0.003	0	**B**
East : R577	7.2	0.060	2	**A**	5.3	0.020	1	**A**
North : Boschfontein Rd	10.8	0.035	1	**B**	10.7	0.078	3	**B**
West : R577	3.9	0.005	0	**A**	2.8	0.005	0	**A**
Total	**7.9**	**0.060**	**2**	**A**	**8.8**	**0.078**	**3**	**A**
Boschfontein Road and Road C (Oshoek Road)								
South : Boschfontein Rd	7.9	0.027	1	**A**	7.2	0.012	0	**A**
East : Road C (Oshoek)	8.4	0.022	0	**A**	8.3	0.040	0	**A**
North : Boschfontein Rd	4.7	0.034	0	**A**	2.8	0.042	0	**A**
West :								
Total	**6.6**	**0.034**	**1**	**A**	**5.6**	**0.042**	**0**	**A**

Approach	AM Peak Hour				PM Peak Hour			
	Average Delay (sec)	Volume/ Capacity (v/c)	Average Queue (m)	LOS	Average Delay (sec)	Volume/ Capacity (v/c)	Average Queue (m)	LOS
Road C (Oshoek Road) and Sekhukhune Road								
South : Sekhukhune Road	0.2	0.233	0	**A**	0.8	0.027	0	**A**
East :								
North : Sekhukhune Road	2.6	0.030	2	**A**	0.3	0.240	15	**A**
West : Road C (Oshoek)	15.4	0.017	1	**B**	15.4	0.025	1	**C**
Total	**0.7**	**0.233**	**2**	**A**	**7.5**	**0.400**	**20**	**A**
Roosekenkal Road (R577)) and Sekhukhune Road								
South : Vermont Rd	15.4	0.006	0	**C**	13.6	0.005	0	**B**
East : R577	7.5	0.376	20	**A**	5.3	0.049	2	**A**
North : Sekhukhune Road	12.1	0.064	2	**B**	11.3	0.424	20	**B**
West : R577	0.9	0.023	1	**A**	1.0	0.041	2	**A**
Total	**7.5**	**0.400**	**20**	**A**	**9.2**	**0.500**	**20**	**A**

The following comments are made in relation to the above results:

- All intersection operates at acceptable level of service, at LOS A during both the AM and the PM peak hour periods.
- No intersection upgrades required .

7 GENERAL CONSIDERATIONS

7.1 Construction Vehicles on the Surrounding Road Network

7.1.1 General Traffic Impact Regarding Construction Activities

The impact on the road network relating to construction activities mainly concerns Road C (Oshoek Road). It is expected that construction vehicles will use Oshoek Road to haul construction materials.

The lesser impact expected will be slowing down of traffic flows along R577 and Sekhukhune Road due to the trucks transporting construction material from a Quarry or a Borrow Pitt or even the transportation of big heavy construction equipment by road.

Most of the trips due to construction will travel during off peak hours. The impact due to construction is temporal and minimal. The impact on the pavement loading will be moderate.

All approaches of the proposed haulage road are operating at acceptable LOS A during both AM and PM Peak hours. No road improvements required at major intersections along this route.

7.2 Impacts on Traffic Safety

7.2.1 Construction related traffic

The impact of construction traffic is normally high due to high differences in the travelling speeds of each associated vehicle. This means that the probability of accidents occurring is significantly increased and therefore must be adequately addressed as part of the construction management process in order to minimise the probability of potential accidents occurring. Construction vehicles on the surrounding road network do not generally require special mitigating measures except the make sure that these vehicles are properly road worthy and display the regulated vehicle related signage.

The reason for addressing the traffic safety of construction vehicles and pedestrians is that there is normally traffic-related conflicts between the two modes of transport that require control if serious, if not fatal accidents, are to be prevented. Similarly, the conflict between construction related traffic and new bridges require management to prevent serious and fatal accidents from occurring.

7.3 Emergency Management

All construction work activities would have an accompanying method statement and a designated evacuation plan for work place incidents. The evacuation plan will specify the assembly point for affected personnel and included in the Sylviana Mine Response Plan.

At the temporary traffic signs in the work zone, a right-of-way will be provided for emergency vehicle access and thoroughfare. Drivers responding to medical emergencies would be able to advise construction ground staff who would be able to override the traffic control signs during work hours. Ground staff would be available at each end of the one-way system and would be in two-way radio contact with each other.

This would enable one of the persons to assure the other that the traffic signals and direction could be switched. This would also provide more interface between the work crew and road users if members of the public needed to report incidents or report on deficiencies.

Emergency contact numbers are to be displayed at the traffic control locations.

7.4 Incident Management

All drivers and visitors to the site during the construction stage should be required to attend an induction at which time they will be provided with information regarding incident management. This will include how to respond in the event of incidents and who the incidents should be reported to. The close-out of incidents and complaints would be conducted as per agreed procedures.

Specific evacuation plans and assembly areas would be designated for all construction work activities. Also, the proposed access route would not impose any access restrictions for emergency vehicles (eg. ambulance, fire brigade or police) to various areas or the surrounding area.

7.5 Road Safety Concerns

The road safety concerns include clear zone hazards, deficiencies in pavement edge condition, intersection priority control, sight distance, public transport stop, horizontal curves, linemarking and delineation, and signage along the relevant section of the Access Road and Haulage Road

These issues would be addressed with the Oshoek Road (Road C) and Sylviana Mine Access Road (Road D). The speed limit on should remain at 80km/hr until the completion of construction phase of the project.

Furthermore, the abutments to bridges and culvert extensions should be scheduled to be completed as part of the upgrade work of all required road infrastructure.

Signs should be provided with adequate warning of changes in the road surface and in driving conditions and of personnel or plant engaged in work on the road. Signs should also include adequate instruction to road users and their safe guidance through, around or past the work site.

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

- ❖ Given the findings of the report, the following is concluded
- ❖ The mine will be developed on the farm Vygenhoek 10JT
- ❖ The proposed mine will have the following supporting infrastructure
  - temporary construction facilities and infrastructure;
  - waste management: temporary handling and storage of general and hazardous waste, on-site change houses/ablution facilities with sewage treatment plant, possible incinerator for treating sewage screenings;
  - surface water management: water supply dams, mine residue facility return water dams, pollution control dams, clean and dirty storm water controls, river crossings;
  - storage and handling of hazardous substances: fuel, lubricants, various process input chemicals, raw material stockpiles/bunkers, gas, burning oils, explosives;
  - services: power lines, pipelines, conveyors, roads, telephone lines, communication and lighting masts, helipad;
  - security and access control;
  - lay down and storage yard areas;
  - compressor house;
  - stores, lamp rooms, workshops and wash bays;
  - offices, control rooms;
  - contractor camps; and
  - medical station.
- ❖ The proposed mining development will generate a total of 116 vehicular trips during the AM and PM peak Periods
- ❖ The mining site will be accessible from the R557 and Sekhukhune Road on the south and east of the proposed development site respectively
- ❖ All existing intersections and access roads operate at acceptable level of service(LOS) and no intersection upgrades are required.
- ❖ All access roads, including the haulage roads need to be upgraded

8.2 Recommendations

Based on the conclusions of this report, the following recommendations are made:

- The proposed development should be considered favourably from a traffic engineering point of view by the relevant authorities given that the development will not affect existing road infrastructure

- The detailed design of the required road infrastructure should be designed by a professional engineer with suitable road design experience
- The trip generation rates for the Waste Management facility should be revised upon completion and approval of the Environmental Impact Assessment Report as this report provides estimated values
- At the time of construction and as a responsibility of the contractor, a traffic engineer draft a Traffic Management Plan (TMP) incorporating traffic safety issues. These plans will have to be directly linked to safety of pedestrians, construction vehicles, protection of the road network from damage, etc. Where possible construction vehicle should travel during off-peak periods to minimize potential congestion and excessive delays in traffic times.

REFERENCES

1. Highway Capacity Manual, Transportation Research Board, National Research Council, Washington D.C., 2000.
2. South African Road Traffic Signs Manual, 3rd Edition, Volume 3 Traffic Signal Design.
3. South African Trip Generation Rates, 2nd edition, Department of Transport, June 1995
4. Manual for Traffic Impact Studies, Department of Transport, October 1995

ANNEXURE A

REPORT FIGURES