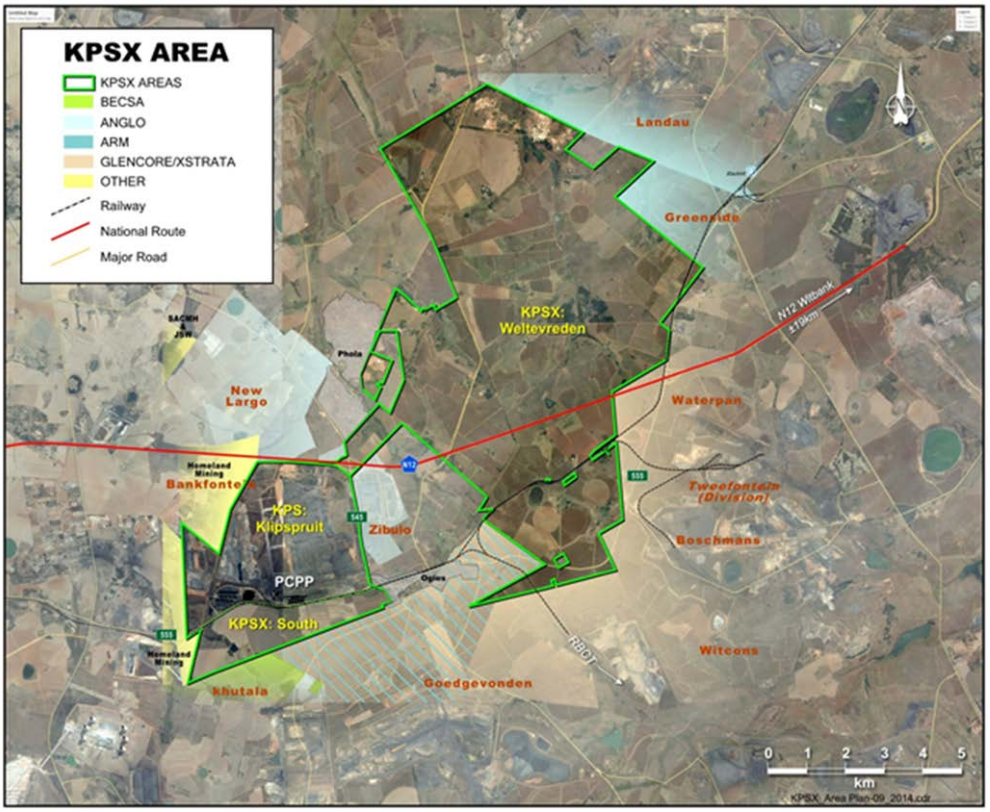

TRAFFIC IMPACT ASSESSMENT FOR THE PROPOSED KLIPSPRUIT MINE EXTENSION

DRAFT
FEBRUARY 2015

ABSTRACT

As part of the development of the proposed Klipspruit Mine Extension, one of the required studies is a determination of the expected transport related impacts of the proposed power station on the surrounding road network and proposals for any road and/or intersection improvements where necessary to ensure sustainable and safe functionality of development trips on the network.

IMPOFU ENGINEERS

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PROPOSED KLIPSPRUIT MINE EXTENSION, MPUMALANGA

TRAFFIC IMPACT ASSESSMENT REPORT

1. INTRODUCTION

As part of the development of the proposed Klipspruit mine extension, one of the required studies is a determination of the expected transport related impacts of the proposed mine on the surrounding road network and proposals for any road and/or intersection improvements where necessary to ensure sustainable and safe functionality of development trips on the network. To this end, **IMPOFU** Engineers has been appointed to carry out a traffic impact assessment, to inform authorisation processes required with any related applications.

Reference was made to the following documents in the preparation of this traffic study:

- Manual for Traffic Impact Study;
- South African Trip Generation Manual;
- Klipspruit Extension Project Report : Identification Phase Chapter 3 – Mining
- Klipspruit Extension Project Report : Identification Phase Chapter 5 – Infrastructure, Transport and Logistics
- Klipspruit Extension Report - Statement of Requirements
- Project Terms of Reference
- Institute of Transportation Engineering, Transportation and Traffic Engineering
- Road Design Manual

1.1 Definitions

The following definitions from the Highway Capacity Manual 2000 are applicable to this report:

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 intersections are defined in the Highway Capacity Manual 2000 as shown in Table 1 below.

Capacity

The maximum hourly rate at which vehicles can reasonably be expected to traverse a lane or roadway during a given period under prevailing roadway, traffic and control conditions.

Volume

The hourly rate (vehicles/hour), the actual flow rate for an approach or lane.

Volume to Capacity ratio (V/C)

The ratio of the existing lane volume to the expected capacity on an individual lane.

Annual Average Daily Traffic (AADT)

The average daily traffic count at a given point over a 24 hour period based on a one year count.

Table 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

2. LOCATION AND LAND USE

2.1 Locality

The mining reserve area lies approximately 40 km west of Witbank (eMalahleni). The N12 highway bounds the reserve to the south, the R547 to the east and Phola Township to the west (Figure 1.). The mining area is situated on the main railway route from Johannesburg to Maputo, the railway line to Richards Bay, the freeways from Pretoria (Tshwane) and Johannesburg to the Kruger National Park and Mozambique. It is approximately 150 km northeast of Johannesburg and 100 km east of Pretoria. The project falls within the eMalahleni Local Municipality (ELM) which in turn falls in the Nkangala District Municipality (NDM).

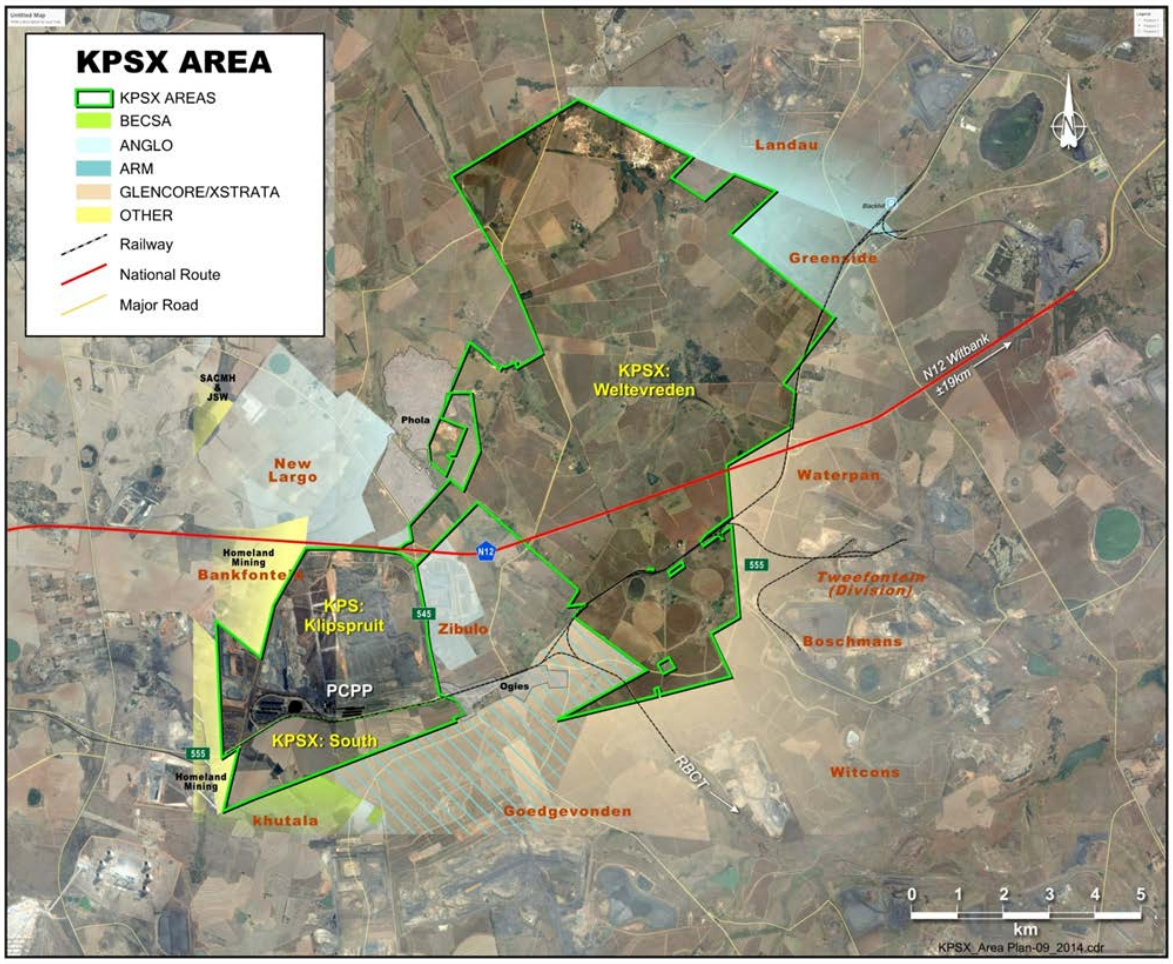


Figure 1: Locality plan

2.2 Existing and Proposed Land use

Currently the area earmarked for the Klipspruit extension is zoned Agricultural. The proposed Klipspruit extension: Weltevreden Project area is 7 353.9 ha in size and is situated to the north of the town of Ogies, as well as east of the township of Phola. The N12 national road transects the southern third of the Project site. As indicated in figure 1 above it is expected that mining will take place at the KPSX Weltevreden (upper part of site) with the resulting coal been hauled to KPS Klipspruit for processing.

The KPS operations are located towards the southwest of KPSX: Weltevreden, with the northeast of KPS sharing the Project boundary, alongside the N12. Below is a brief description of the activities involved in the construction and operation of the Klipspruit mine, both of which will have an effect on traffic volumes.

Activities will include:

- All surface infrastructure will be located in the on the Klipspruit mine (refer to Annexure A1 for an indication of the location of the surface infrastructure)
    1. Administrative buildings, stores and workshops
    2. Product stockpiling and loading facilities;
    3. Services such as substation, pipelines, conveyors, roads, sewage treatment plant, telephone lines, communication and lighting masts.
- The development of haul roads (access and service roads);

2.3 Proposed Access to KPSX and KPS

It is proposed that the Klipspruit mine extension will get northern access off a gravel road **(Road A)** north of the Phola Township, this will be a new access point serving the north section of the expansion. Although no specific access point has been allocated for the KPSX all geometric considerations (i.e. vertical and horizontal sight distance etc.) must be taken into consideration

An additional access will be provided via the gravel **Road C**, this access will connect from the R545 and feed into the identified haul routes within the KPSX site. The access routes are indicated in figure 2 below, showing the extent of the development area as well as the road network proposals.

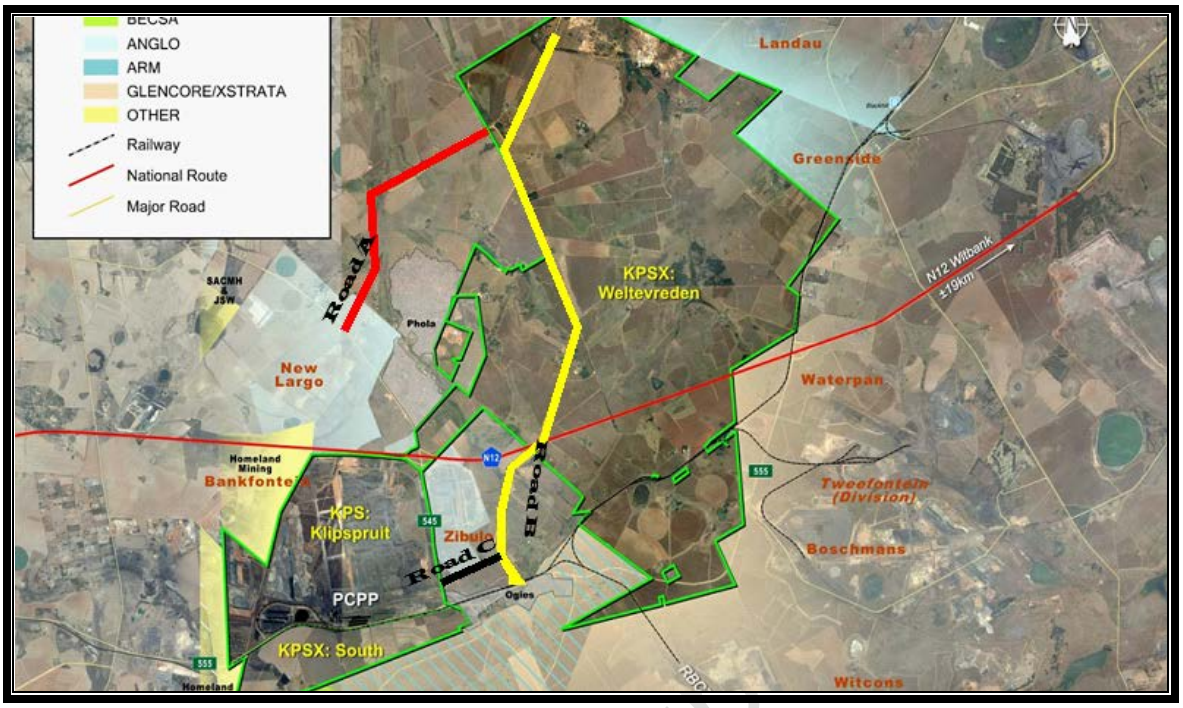


Figure 2: Access Routes

Although the exact access points for the KPSX have not been allocated the design will take into account geometric considerations (i.e. vertical and horizontal sight distance etc.)

The two access routes are depicted Road A in red and Road C in black. The Traffic impact assessment is based on the road network associated these access routes.

The existing access for KPS of the R555 will not be changed.

3. ROAD NETWORK AND TRAFFIC SITUATION

3.1 Existing Road Network

This site enjoys very good regional accessibility in that it is located within an area with existing road network. The national highway N12 offers regional connectivity to Pretoria, Johannesburg, eMalahleni (Witbank) and Maputo.

The existing provincial roads R545 and R555 offer a high order linkage from the N12 and ensures connectivity to the wider surrounding areas as they tie in to the further

lower road classes

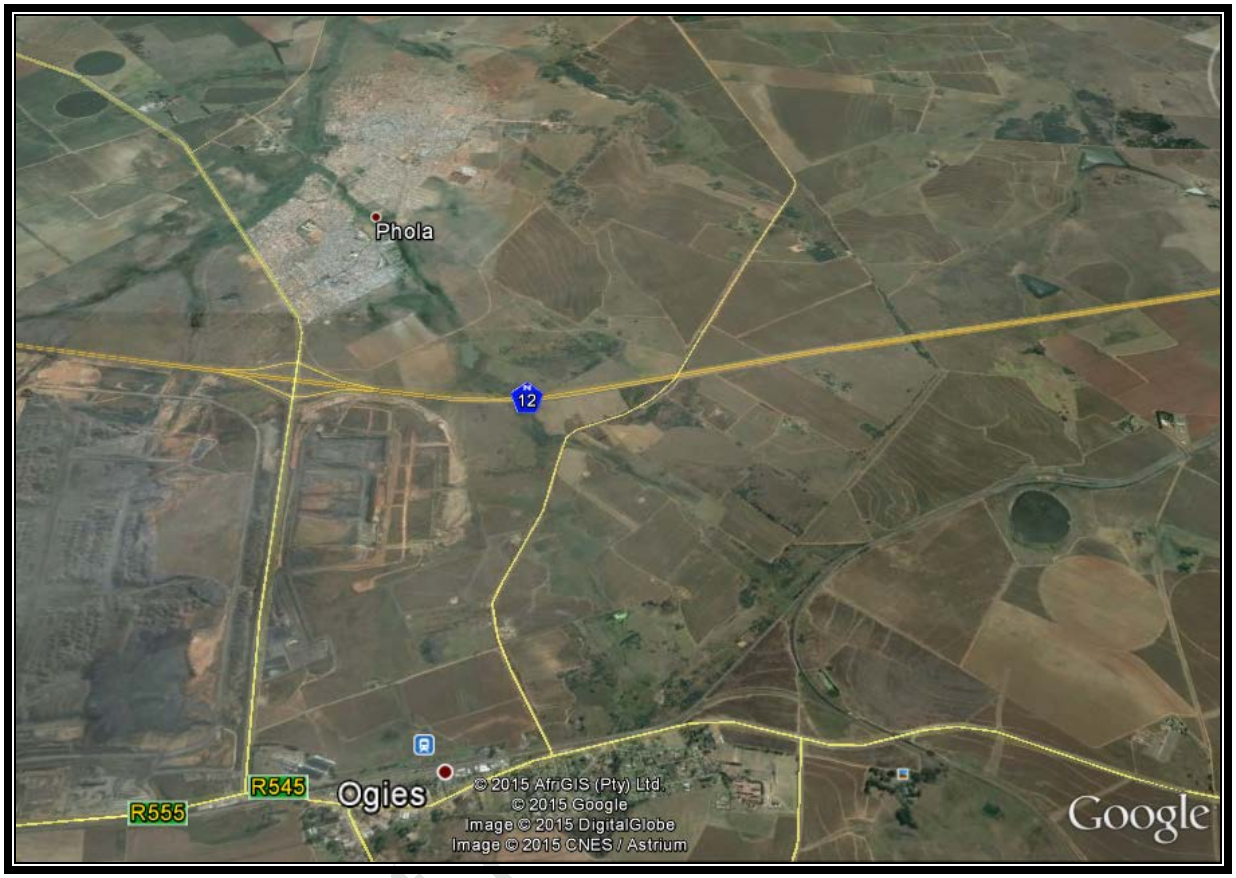


Figure 3: Surrounding Road Network

Road Classification

The Road Classification and Access Management (RCAM) guideline 2010 provides for roads classification into the following six class system:

- Class 1 Principal arterial
- Class 2 Major arterial
- Class 3 Minor arterial
- Class 4 Collector
- Class 5 Local Street
- Class 6 Walkway

The first three classes (the arterials) are mobility roads, the second three classes are activity / access streets.

In order to obtain a realistic picture of the traffic flow along the surrounding main routes Annual Average Daily Traffic (AADT) i.e. the average daily traffic count at a given point over a 24 hour period based on a one year count, where sourced from the South African National Roads Agency Limited (SANRAL) as well as the Mpumalanga Provincial Roads Department. The counts give a reflection of the traffic flow pattern of the major routes within the proposed Power Station's vicinity.

The proposed development area is serviced well with a class 3 network which feeds onto the surrounding major Class 2 and Class 1 network. The N12, is a principal arterial i.e. a road that

"...principal arterials serve the major economic activity centres of an urban area and often serve as connectors to the rural Class 1 routes. They are the highest trafficked roads and have the longest trip lengths. The routes are typically characterised by high through traffic volumes, long travel distances or both. Some routes can reach from one side of the country to the other, and they are seldom less than 50 km in length. Average annual daily traffic (AADT) would in most cases exceed 1 000 vehicles per day on the long distance routes, 5 000 veh/day on the medium distance routes and can reach 100 000 veh/day or more on shorter routes

The R545 and R555 are Class 2/3 routes, rural arterials and act as primary distributors i.e. a road that:

"...arterials are continuous routes that would typically serve several nodes (typically in a province). The nodes do not have to be located on the route, but should be located within a reasonable distance from the routes.
The routes are characterised by relatively high traffic volumes, relatively long travel distances or both. They often start and end within the provincial boundaries, but can cross into adjoining provinces. Some routes can reach from one side of a province to the other, and they are seldom less than 25 km in length. AADT would typically exceed about 500 vehicles per day on the long distance routes, 2 000 veh/day on medium distance routes but on shorter routes the volumes could exceed 25 000 veh/day."

N12 is a national road, which can be classified as a Class 1 principal arterial. It links up long distance destinations such as Pretoria, Johannesburg and Maputo and provides connection to the surrounding local road network. Data obtained from SANRAL count station indicates an Average Daily Traffic (ADT) of 19,590 vehicles and an Average Daily Truck Traffic (ADTT) of 5,157 trucks. The road is a dual carriageway past the R545 interchange with a posted speed limit of 120km/hr.

Figure 4: Road R545 across the N12 freeway

Road R545 is a provincial road, which can be classified as a Class 2/3 arterial. It links up the surrounding local and regional road network. No AADT data was readily available for the road but from on-site observation medium traffic volumes were observed on the road. The road is a single carriageway, has paved shoulders at certain section. The section across the N12 has right turn lane provision for turning into the N12.

Figure 5: Road R545

Road R555 can be classified as a Class 2/3 road, which act as collectors linking up to the surrounding road network. The road is a single carriageway, surfaced road with gravel shoulders. The existing road surfaces indicate that the road currently has a good riding surface and is being maintained.

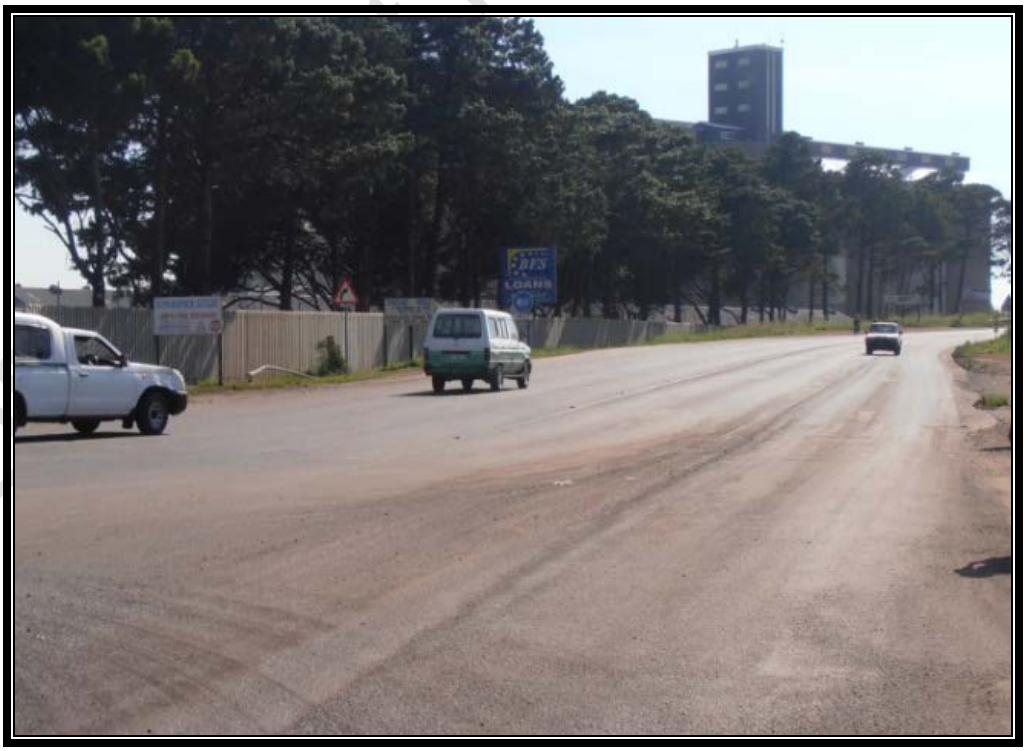


Figure 6: R555

Road A can be classified as a Class 4 road. It is a gravel road which can be; it provides connectivity between the surrounding farm areas to the R545 which links to the N12. The intersection control with the R545 is a yield/give way.

Figure 7: Road A

Road B can be classified as a Class 4 road. It is a gravel road which can be; it provides connectivity between the surrounding farm areas to the R555

Figure 8: Road B

Road C can be classified as a Class 4 road. The existing gravel surfaces indicates that the road currently is being used in coal haulage from Zibulo to the KPS site where the PCPP is located. The intersection of Road C has connectivity to R545.

Figure 9: Road C

3.2 Status Quo and Study Area

The following intersections forms part of the study area:

1. Intersection of Road R545 and Gravel Road A
2. Intersection of Gravel Road A and Gravel Road B
3. Intersection of Road R545 and On ramp to eMalahleni
4. Intersection of Road R545 and On ramp to Johannesburg
5. Intersection of Road R545 and Gravel Road C
6. Intersection of Road R555 and Road R545 (3-way stop)
7. Intersection of Road R555 and Road R545 (T-junction)
8. Intersection of Gravel Road B and Gravel Road C
9. Intersection of Gravel Road A and proposed Mine Access

The following is evident from visual observations and traffic survey data (see Section 5 of report):

- Low volumes of traffic were observed on Road 545 and R555 during both the peak hours, with significantly lower volumes on the gravel roads.
- Overall no capacity problems were evident in the AM and PM peaks at the intersections.

4. TRIP GENERATION

4.1 Background

Trip generation is a critical step in the determination of traffic impact from proposed developments and therefore plays a key role in this study.

However, the new COTO manual as well as the previous South African Trip Generation Manual (SATGM) (2nd Edition 1995) by the Department of Transport do not provide rates for Mining Operations. In this study literature from past studies as well as operations data from KPSX have been used in estimating the expected trip generation of the proposed mine.

4.2 Mine Operations

The expected total number of existing employees will not change as this are already employed as part of the KPS operations. In this regard the trips associated with the employees are already on the road network.
It is therefore apparent that mostly the haul traffic from the KPSX operations to the KPS site will mainly constitute the new trips on the road network as a result of the expansion. It is anticipated that these trips will have interactions with the normal AM and PM peak hours.

Transport Tonnage Calculations

It is anticipated that production at KPSX will start at 800 000 tonnes and will pick up to an optimum production of 4 million tonnes of coal by year 5. It should be noted that the mine will employ at least two options to transport coal from the KPSX to the PCPP. A conveyor and road haulage are the options under consideration and in this regard. It is assumed that 50% of the production will be transported by conveyor with the balance being hauled

by road traffic. In this regard the tonnage calculations based on the ultimate scenario are calculated as below:

Annual production	2 million tonnes
Haul Days per Year	320
Tons per day	6 250t
Tons per Truck	32
Truck loads per day	195
Truck loads per hour (over 12hr haul period)	16

It is assumed that 16 haul trips will be generated within the peak hour. It is therefore expected the hourly haul traffic shall be 16 trips per hour with a 50:50 directional split and thus will be evaluated in this report.

This amount of haulage trucks per hour is not anticipated to have that much impact from a traffic engineering point of view, however a review of the existing road network capacity will be done to determine if new network trips can be accommodated.

4.3 Trip Generation Rates

Based on the above information and the proposed development trips will be calculated as follows:

Table 2: Trip Generation of the Proposed KPSX

Directional Split				Number of Trucks
Directional Split AM (50:50)	**IN 8**	**OUT 8**	Total Peak hour trips	16
Directional Split PM (50:50)	**IN 8**	**OUT 8**	Total Peak hour trips	16

Latent Trips

No information of any known latent rights is readily available, however a growth rate of 2% has been assumed for the study area.

5.0 DATA COLLECTION

Data was sourced from local and provincial authorities by Impofu Professional Services.

Classified traffic counts were undertaken by Impofu Professional Services on the 18th of February 2015 between: 06h00 hrs to 18h00 hrs. Annexure C shows the existing trip volumes and distribution.

5.1 Counted Traffic Volumes

Traffic counts were conducted (refer to Figure 10) at the following locations:

1. Intersection of Road R545 and Gravel Road A
2. Intersection of Gravel Road A and Gravel Road B
3. Intersection of Road R545 and On ramp to eMalahleni
4. Intersection of Road R545 and On ramp to Johannesburg
5. Intersection of Road R545 and Gravel Road C
6. Intersection of Road R555 and Road R545 (3-way stop)
7. Intersection of Road R555 and Road R545 (T-junction)
8. Intersection of Gravel Road B and Gravel Road C

The counts were undertaken at 15-minute intervals and included turning movements at intersections and vehicles classification information. The reduced data for the traffic counts undertaken is included as shown in Appendix C.

Figure 10: Intersections Surveyed

5.1 Background Traffic Volumes

ADT data was obtained from SANRAL for the N12, however no readily available information was obtained for the R545 and the R555 which are the arterials linking surrounding areas to the road network within the proposed development extent. The detailed traffic counts on the intersections were undertaken so as to model the existing capacity and the ability to absorb the expected development traffic. However from visual observations on site most of the intersections seem to operate with spare capacity.

5.2 Impact of the Latent rights on road network

No information of any known latent rights is readily available, however a growth rate of 2% has been assumed for the study area

5.4 Growth Rate

The study area is fairly developed, it is therefore assumed that not much further development will be realised as a result of the KPSX. The existing traffic volumes have been projected for the future 2020 scenario taking into consideration an annual growth rate of 2.0 % in the traffic volumes.

5.5 Expected Trip Distribution

Assumptions about the expected trip distribution were based on the proposed/preferred haul route for the Klipspruit mine as discussed in Section 2.3. Based on these, it is assumed that most of the mine traffic would most likely distribute as below:

- **40 % on** Road A and then onto R545;
- **60 % on** proposed haul route and then onto R545;

This traffic will then be connect to the R555 and get access to the KPS site where the processing plant is and the link to the railway network is available.

6.0 CAPACITY ANALYSIS

6.1 Intersections and Accesses Evaluated

Based on a consideration of the likely impact of the proposed access into the development, the following intersections were evaluated:

1. Intersection of Road R545 and Gravel Road A
2. Intersection of Gravel Road A and Gravel Road B
3. Intersection of Road R545 and On ramp to eMalahleni
4. Intersection of Road R545 and On ramp to Johannesburg
5. Intersection of Road R545 and Gravel Road C
6. Intersection of Road R555 and Road R545 (3-way stop)
7. Intersection of Road R555 and Road R545 (T-junction)
8. Intersection of Gravel Road B and Gravel Road C
9. Intersection of Gravel Road A and proposed KPSX Mine Access

Based on the counting stations indicated in Figure 5, it can be successively argued that this report has provided an adequate traffic evaluation of the study area.

6.2 Relevant Peak Hours

The critical peak hour from a road capacity point of view, occurs when the traffic generated by the development is at a maximum or when the highest combination of existing road traffic and traffic generated by the development occurs.

Based on a consideration of the relevant land use, it was decided to consider the following peak hours for analyses:

- Weekday AM Peak hour
- Weekday PM Peak hour

6.3 Assessment Years

The assessment years that was considered relevant for the type of development and the area within which it is located is:

- **Status Quo 2015:** This assessment will represent an indication of what the current traffic operations within the vicinity of this development are including the access conditions.

- **2015 with the proposed development:** The expected traffic demand and possible impact of the proposed Klipspruit mine.

- **2020 traffic demand with the proposed development:** The expected future traffic demand plus development and the expected traffic operations within the next five years.

In terms of the guideline document, no additional forecasting is warranted and has not been considered.

Assessment Scenarios

The traffic scenarios that were considered relevant in order to determine the expected traffic impact of the proposed development are as indicated in **Table 4** below.

Table 4: Assessment Scenarios

SCENARIO	ASSESSMENT YEAR AND TRAFFIC DEMAND	ROAD NETWORK	LOCATION OF INFORMATION
1	Status Quo 2015	Existing 2015 road layout.	**Traffic Count data**
2	2015 traffic demand with the proposed development plus latent	**Existing 2015 road layout PLUS the proposed development**	**Annexure D**
3	2020 traffic demand with the proposed development	**Horizon Year 2020 PLUS the proposed development**	**Annexure D**

Determination of Road upgrading

The National Department of Transport (NDoT) guidelines for Traffic Impact Studies stipulates that:

"The determination of the necessary upgrading and improvement of the road infrastructure needs to be determined for both the "with" and "without development" scenarios for the opening year and horizon year. The following should be followed to

determine the necessary road upgrading:

- Calculate the LOS, v/c ratio and the site traffic as a percentage of the critical flows at the critical nodes for every scenario.
- If the LOS is worse than D for the with-development scenario but not for the without-development scenario, the developer is responsible for all the required road upgrading.
- If the LOS is worse than D for both the with and without-development scenarios, then the developer is responsible for the incremental road upgrading due to the development's impact to obtain the same LOS and v/c ratio as for the without-development scenario.

6.4 CAPACITY ANALYSIS SUMMARY

The performance of intersections in urban road networks is defined by the level of service (LOS) for each approach to the intersection. These levels of service have been defined in the Highway Capacity Manual (HCM) as shown in **Table 5** below. During the peak hours, the road infrastructure capacity provided should ensure that the intersection approach level of service should ideally not exceed LOS D; for example the average delay for a signalised intersection should not exceed 52 seconds as predicted by the model.

Table 5: Level of Service Criteria (HCM)

Level of Service	Average Approach Delay for Signalised Intersections (seconds)	Rounded	Average Approach Delay for Priority Intersections (seconds)	Rounded
A	< 6.5	6	< 5.0	4
B	6.6 to 19.5	7 – 19	5.0 to 10.0	5 – 10
C	19.6 to 32.5	20 – 32	10.1 to 20.0	11 – 20
D	32.6 to 52.0	33 – 52	20.1 to 30.0	21 – 30
E	52.1 to 78	53 – 78	30.1 to 45.0	31 – 45
F	> 78.0	79 +	> 45	46 +

The intersection approach performance for the intersections within the study area was determined using the Sidra Intersection 5.1 software.

The detailed capacity analyses results for the four intersections analysed during the three scenarios (as described in **Section 6.3**) are shown in the tables below.

Scenario 1

Table 6: Status Quo 2015

INTERSECTION (APPROACH)		SCENARIO 1 – BASE YEAR (2015) Weekday AM Peak Hour			SCENARIO 1 – BASE YEAR (2015) Weekday PM Peak Hour		
		Av Delay (sec)	V/C	LOS	Av Delay (sec)	V/C	LOS
R545 / Gravel Road A (Yield)	South Approach	-	-	-	-	-	-
	East Approach	0.7	0.07	N/A	0.7	0.07	N/A
	North Approach	9.5	0.009	A	9.5	0.009	A
	West Approach	0.1	0.005	N/A	0.1	0.05	N/A
OVERALL (LOS)		0.8	0.07	N/A	0.8	0.07	N/A
Gravel Road A/Gravel Road B (2 WayStop)	South Approach	4.1	0.001	N/A	6.5	0.003	N/A
	East Approach	-	-	-	-	-	-
	North Approach	1.7	0.003	N/A	4.2	0.001	N/A
	West Approach	10.6	0.002	B	10.6	0.002	B
OVERALL (LOS)		4.2	0.003	N/A	6.9	0.003	N/A
R545/ On Ramp to eMalahleni (1 Way Stop)	South Approach	0.8	0.126	N/A	1.5	0.22	N/A
	East Approach	-	-	-	-	-	-
	North Approach	5.5	0.199	N/A	2.8	0.145	N/A
	West Approach	15.5	0.311	C	19.9	0.414	C
OVERALL (LOS)		6.1	0.311	N/A	5.4	0.414	N/A
R545/ On Ramp from eMalahleni (1 Way Stop)	South Approach	3.2	0.108	N/A	2.0	0.206	N/A
	East Approach	16.7	0.461	C	18.4	0.315	C
	North Approach	2.2	0.133	N/A	1.7	0.089	N/A
	West Approach	-	-	-	-	-	-
OVERALL (LOS)		7.4	0.461	N/A	5.0	0.315	N/A
R545/ Gravel Road C (Yield)	South Approach	1.6	0.115	N/A	1.3	0.225	N/A
	East Approach	14.6	0.018	B	13.5	0.031	B
	North Approach	0.2	0.164	N/A	0.1	0.124	N/A
	West Approach	-	-	-	-	-	-
OVERALL (LOS)		1.0	0.164	N/A	1.1	0.225	N/A
R555/ R545 (All Way Stop)	South Approach	-	-	-	-	-	-
	East Approach	21.1	0.463	C	20.6	0.584	C
	North Approach	25.4	0.583	D	45.4	0.747	E
	West Approach	21.8	0.243	C	18.4	0.266	C
OVERALL (LOS)		23.3	0.583	C	26.7	0.747	D
R555/ R545 (Two Way Stop)	South Approach	12.0	0.178	B	13.1	0.312	B
	East Approach	1.2	0.096	N/A	1.5	0.126	N/A
	North Approach	-	-	-	-	-	-
	West Approach	5.2	0.156	N/A	5.3	0.169	N/A
OVERALL (LOS)		5.8	0.178	N/A	6.6	0.312	N/A
Gravel Road B/ Gravel C (2 Way Stop)	South Approach	2.0	0.004	N/A	2.5	0.007	N/A
	East Approach	-	-	-	-	-	-
	North Approach	0.9	0.006	N/A	2.9	0.002	N/A

	West Approach	10.6	0.004	B	10.6	0.002	B
OVERALL (LOS)		3.1	0.006	N/A	3.5	0.007	N/A

The following is summarised from the above table:-

Intersection 1: R545 and Gravel Road A

The intersection currently is yield controlled and as indicated by the AM and PM results all of the approaches are operating at acceptable Level of Service. The v/c ratios are very low and indicate spare capacity within the existing road infrastructure.

Intersection 2: Gravel Road A and Gravel Road B

The intersection currently is a 1 way stop on Gravel Road A, with free flow movements on the Road B. The AM and PM capacity results indicate that all of the approaches are operating at acceptable Level of Service. There is very low delays on all approaches. The v/c ratios are very low and indicate spare capacity within the existing road infrastructure.

Intersection 3: R545 and On Ramp to eMalahleni

The intersection currently is a 1way stop and as indicated by the AM and PM results all of the approaches experience little delays and are operating at acceptable Level of Service. The v/c ratios are low and indicate spare capacity on the network.

Intersection 4: R545 and On Ramp from eMalahleni

The intersection currently is a 1way stop and as indicated by the AM and PM results all of the approaches experience little delays and are operating at acceptable Level of Service. The v/c ratios are low and indicate spare capacity on the network.

Intersection 5: R545 and Gravel Road C

The intersection currently is yield controlled and as indicated by the AM and PM results all of the approaches are operating at acceptable Level of Service. The v/c ratios are very low and indicate spare capacity within the existing road infrastructure.

Intersection 6: R545 and R555 (all way stop)

The intersection is an all way stop and as indicated by the AM and PM results all of

the approaches experience acceptable delays and are operating at acceptable Level of Service. The v/c ratios are acceptable and indicate spare capacity on the network.

Intersection 7: R555 and R545 (one way stop)
The intersection currently is a 1way stop and as indicated by the AM and PM results all of the approaches experience little delays and are operating at acceptable Level of Service. The v/c ratios are low and indicate spare capacity on the network.

Intersection 8: Gravel Road B and Gravel Road C
The intersection currently is a 1way stop and as indicated by the AM and PM results all of the approaches experience little delays and are operating at acceptable Level of Service. The v/c ratios are low and indicate spare capacity on the network.

Scenario 2: 2015 Traffic Volumes +Development

The expected peak hour generation of 16 haul trucks by KPSX operations is not expected to have any significant impact on the capacity evaluation on road network. In this regard no assignment of the development trips have been done as the results of the 2015 road network indicates sufficient and sustainable road capacity to accommodate the expected development traffic.

The notable consideration for the road network will be the expected loading as a result of the proposed development and haul trips, this impact is discussed in section 7 under road network proposals.

Scenario 3

Table 7: HORIZON Year 2020 + Development + Latent

INTERSECTION (APPROACH)		SCENARIO 1 – BASE YEAR (2020) Weekday AM Peak Hour			SCENARIO 1 – BASE YEAR (2020) Weekday PM Peak Hour		
		Av Delay (sec)	V/C	LOS	Av Delay (sec)	V/C	LOS
R545 / Gravel Road A (Yield)	South Approach	-	-	-	-	-	-
	East Approach	0.7	0.07	N/A	0.7	0.07	N/A
	North Approach	9.5	0.009	A	9.5	0.009	A
	West Approach	0.1	0.005	N/A	0.1	0.05	N/A
OVERALL (LOS)		0.8	0.07	N/A	0.8	0.07	N/A
Gravel Road A/Gravel Road B (2 WayStop)	South Approach	-	-	-	-	-	-
	East Approach	-	-	-	-	-	-
	North Approach	-	-	-	-	-	-
	West Approach	-	-	-	-	-	-
OVERALL (LOS)		-	-	-	-	-	-
R545/ On Ramp to eMalahleni (1 Way Stop)	South Approach	0.8	0.126	N/A	1.5	0.22	N/A
	East Approach	-	-	-	-	-	-
	North Approach	5.5	0.199	N/A	2.8	0.145	N/A
	West Approach	15.5	0.311	C	19.9	0.414	C
OVERALL (LOS)		6.1	0.311	N/A	5.4	0.414	N/A
R545/ On Ramp from eMalahleni (1 Way Stop)	South Approach	3.2	0.108	N/A	2.0	0.206	N/A
	East Approach	16.7	0.461	C	18.4	0.315	C
	North Approach	2.2	0.133	N/A	1.7	0.089	N/A
	West Approach	-	-	-	-	-	-
OVERALL (LOS)		7.4	0.461	N/A	5.0	0.315	N/A
R545/ Gravel Road C (Yield)	South Approach	1.6	0.115	N/A	1.3	0.225	N/A
	East Approach	14.6	0.018	B	13.5	0.031	B
	North Approach	0.2	0.164	N/A	0.1	0.124	N/A
	West Approach	-	-	-	-	-	-
OVERALL (LOS)		1.0	0.164	N/A	1.1	0.225	N/A
R555/ R545 (All Way Stop)	South Approach	-	-	-	-	-	-
	East Approach	21.1	0.463	C	20.6	0.584	C
	North Approach	25.4	0.583	D	45.4	0.747	E
	West Approach	21.8	0.243	C	18.4	0.266	C
OVERALL (LOS)		23.3	0.583	C	26.7	0.747	D
R555/ R545 (Two Way Stop)	South Approach	12.0	0.178	B	13.1	0.312	B
	East Approach	1.2	0.096	N/A	1.5	0.126	N/A
	North Approach	-	-	-	-	-	-
	West Approach	5.2	0.156	N/A	5.3	0.169	N/A
OVERALL (LOS)		5.8	0.178	N/A	6.6	0.312	N/A
Gravel – C	South Approach	-	-	-	-	-	-

	East Approach	-	-	-	-	-	-
	North Approach	-	-	-	-	-	-
	West Approach	-	-	-	-	-	-
OVERALL (LOS)		-	-	-	-	-	-

The following is summarised from the above table:-

Intersection 1: R545 and Gravel Road A

The intersection in the 2020 scenario continues to operate at acceptable levels of service as indicated by the AM and PM results all of the approaches are operating at acceptable Level of Service. The v/c ratios are very low and indicate spare capacity within the existing road infrastructure.

Intersection 2: Gravel Road A and Gravel Road B

The proposed KPSX operations will be undertaken along the section of gravel road Band in this regard the intersection of Road A and Road B will not exist and hence has not been evaluated.

Intersection 3: R545 and On Ramp to eMalahleni

The future AM and PM results all of the approaches experience little delays and are operating at acceptable Level of Service. The v/c ratios are low and indicate spare capacity on the network.

Intersection 4: R545 and On Ramp from eMalahleni

The 2020 AM and PM results all of the approaches experience little delays and are operating at acceptable Level of Service. The v/c ratios are low and indicate spare capacity on the network.

Intersection 5: R545 and Gravel Road C

The intersection in the 2020 scenario continues to operate at acceptable levels of service as indicated by the AM and PM results all of the approaches are operating at acceptable. All of the approaches are operating at acceptable Level of Service. The v/c ratios are very low and indicate spare capacity within the existing road infrastructure.

Intersection 6: R545 and R555 (all way stop)

In 2020 the intersection continues to operate sustainably as indicated by the AM

and PM results all of the approaches experience acceptable delays and are operating at acceptable Level of Service. The v/c ratios are acceptable and indicate spare capacity on the network.

Intersection 7: R555 and R545 (one way stop)

The 2020 AM and PM results all of the approaches experience little delays and are operating at acceptable Level of Service. The v/c ratios are low and indicate spare capacity on the network

Intersection 8: Gravel Road B and Gravel Road C

The intersection will not exist due to the realigned haul road

7.0 PROPOSED ROAD NETWORK PROPOSALS

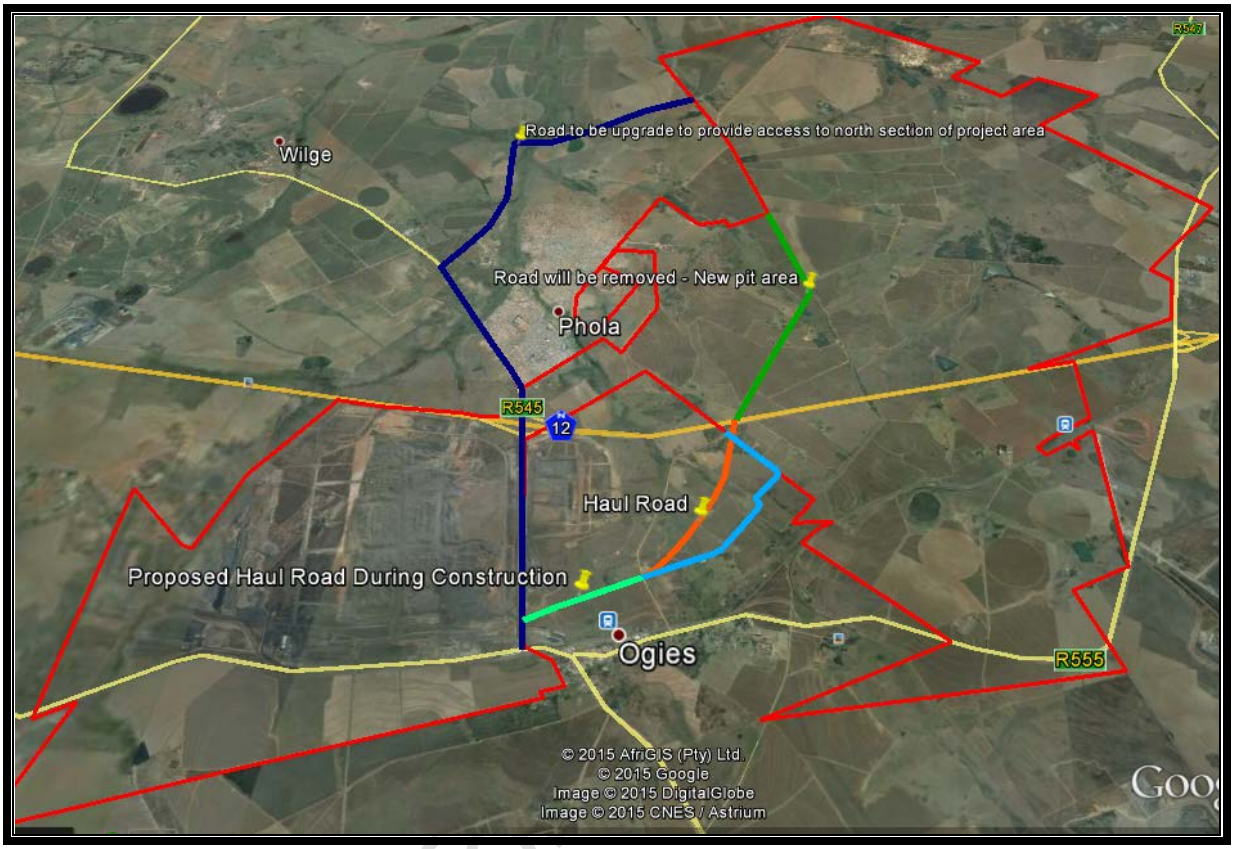


Figure 11: Road Network Proposal

As discussed earlier in this report, access routes for the coal haul from the KPSX to the KPS site have been identified.

The proposed haul of the coal mine using heavy trucks will most likely result in an impact on the degradation of the existing roads due to the increased E80 loads.In this regard this section discusses the recommended road network improvements in order to sustainably accommodate the mine operations.

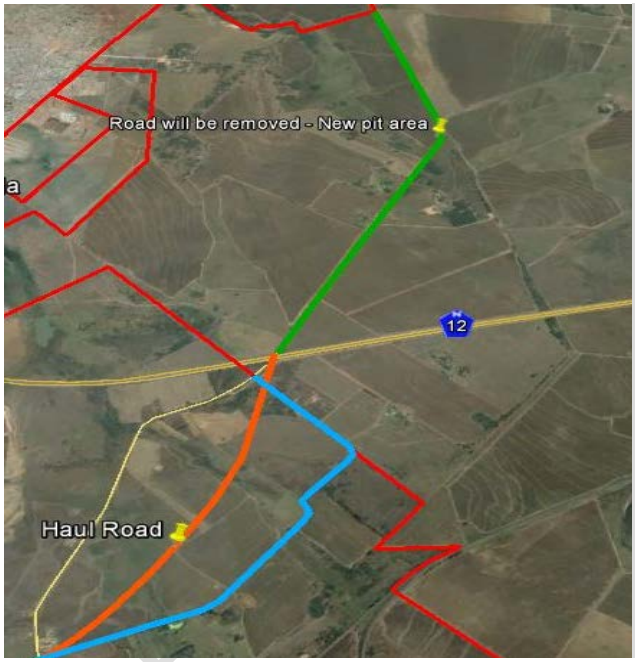
7.1 Roads

Road A

It is proposed that the KPSX mine implement an adequately designed pavement structure which can accommodate the increased axial loading.

The gravel road be must graded and re-compacted every three months

Road B



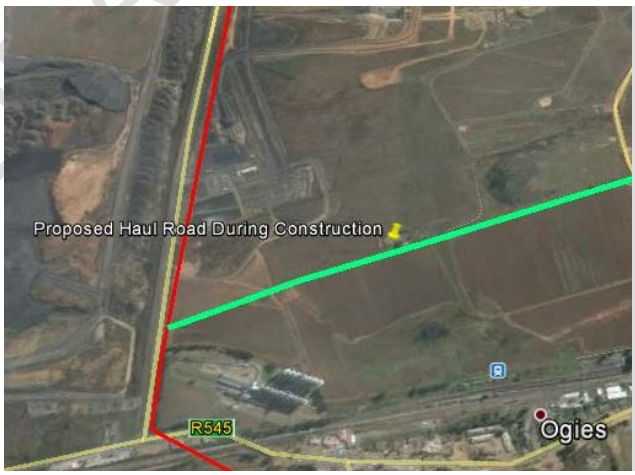
A section of Road B will be removed as part of the KPSX operations as a new pit area has been identified on the alignment.

The road section shall be realigned to form a haul road linking to Road C and with access to the R545.

An adequately designed pavement structure which can accommodate the increased axial loading as well as applicable road width depending on the chosen dump trucks must be implemented.

The gravel road be must graded and re-compacted every three months

Road C



An adequately designed pavement structure which can accommodate the increased axial loading as well as applicable road width depending on the chosen dump trucks must be implemented

The gravel road be must graded and re-compacted every three months.

7.2 Bridges

In light, of the increased axial loading expected from the haul traffic detailed bridge tests for structural strength must be conducted on:

1. The R545 bridge over the N12
2. Road B bridge over the N12

The bridges are important as they facilitate the linkage of the KPSX site to the KPS site as well as the PCPP.

7.3 Internal Roads

The mine shall construct internal service roads with adequate geometric considerations for the movement of tipper trucks, tankers, low bed carriers and flat-bed trucks.

8.0 PUBLIC TRANSPORT ASSESSMENT

8.1 Background

In terms of the National Land Transport Act (NLTA) (Act No 5 of 2009) Section 35, it is requirement that assessment of public transport be included in traffic impact assessments. The following comments are relevant in respect to the public transport availability at the proposed development.

8.2 Availability of Public Transport

With the development of the KPSX, it is not anticipated that there will be a lot of Public transport demand, as per this applications' assumption a high percentage of the employees are already employed by the KPS site and this will merely be an expansion. However in order to cater for employee movement via buses to the work, it is recommended that

- Bus laybys be provided on internal as well external roads offering access to the KPSX site and operations.

9.0 CONCLUSIONS AND RECOMENDATIONS

The objective of the report was to assess the traffic impact on the surrounding road network due to the proposed Klipspruit extension (KPSX) mine in Mpumalanga. From the traffic impact investigation and discussions in the report the following conclusion can be made, the proposed KPSX and the expected increase in traffic due to the development can be accommodated on the road network from a capacity point of view. However, the expected effect of the axial loading as a result of haul traffic will need to be further examined.

In view of the traffic impact investigation and discussion in the report, it is recommended that the proposed Klipspruit mine be approved from a Traffic Engineering point of view, subject to the following;

- The upgrading of Road A, Road B and Road C to an adequately designed pavement structure that can accommodate the expected axial loading from the haul traffic. The haul routes must be graded and re-compacted every three months;
- Structural strength tests of the existing bridges on the N12

    1. The R545 bridge over the N12
    2. Road B bridge over the N12

- Provision of Public Transport lay-bys on internal as well external roads offering access to the KPSX site and operations.

From a traffic engineering point of view, <u>it is recommended that</u>:

(i) Based on the contents and findings contained in this report, the responsible Road Agency approve the recommendations in this report, pertaining to the proposed extension of the Klipspruit mine in Mpumalanga from a Traffic Engineering point of view.

10. REFERENCES

1. Klipspruit mine Project Terms of Reference report

2. Road Design Manual 2001

3. Klipspruit Extension Project Report : Identification Phase Chapter 3 – Mining

4. Klipspruit Extension Project Report : Identification Phase Chapter 5 – Infrastructure, Transport and Logistics

5. Klipspruit Extension Report - Statement of Requirements

6. Institute of Transportation Engineering, Transportation and Traffic Engineering Handbook, 2nd Edition

7. Manual for Traffic Impact Studies, Department of Transport, October1995.

8. Road Classification and Access Management guideline, COTO, June 2010.

9. South African Trip Generation Manual (2nd Edition) by the Department of Transport, 1995.

ANNEXURE A

A1: INFRASTRUCTURE PLAN

ANNEXURE B

DEVELOPMENT TRIP VOLUMES AND DISTRIBUTION

ANNEXURE C

TRAFFIC COUNTS

ANNEXURE D

SIDRA RESULTS