

TRAFFIC IMPACT ASSESSMENT

TSHIPI BORWA MINE EMP AMENDMENT TO CATER FOR INFRASTRUCTURE LAYOUT CHANGES NORTHERN CAPE PROVINCE



JUNE 2017

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Declaration of Independence

I, Leon Roets, hereby declare that Siyazi Transportation Services Limpopo (Pty) Ltd, an independent consulting firm, has no interest or personal gains in this project whatsoever, except receiving fair payment for rendering an independent professional service.

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Date: 08 June 2017

This traffic impact assessment has been compiled in accordance with requirements of the National Environmental Management Act, 107 of 1998 (NEMA) and Appendix 6 of the Environmental Impact Assessment Regulations (GN R982), which outline the specific requirements for specialist reports. The table below indicates the location of each requirement in this report.

	NEMA Regs (2014) - Appendix 6	Reference to section of specialist report or justification for not meeting requirement
1	A specialist report or a report on a specialised process prepared in terms of these Regulations must contain -	
(a) i	the person who prepared the report; and	Declaration of independence, page II.
(a) ii	the expertise of that person to carry out the specialist study or specialised process including a curriculum vitae;	Appendix G.
(b)	a declaration that the person is independent in a form as may be specified by the competent authority;	Declaration of independence, page II.
(c)	an indication of the scope of, and the purpose for which, the report was prepared;	Section 1, Introduction, page 1
(d)	the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	3 February 2017, wet season, no impact in terms of traffic impact assessment.
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process;	Section 1, Introduction, Page 1 and throughout the report.
(f)	the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 3, Point 2.4, Page 20.
(g)	an identification of any areas to be avoided, including buffers;	Section 3, Point 2.4, Page 20.
(h)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 3, Page 21, Figures 2.3 and 2.4.
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2, Point 2.1.1. Assumption in terms of traffic growth percentage

	NEMA Regs (2014) - Appendix 6	Reference to section of specialist report or justification for not meeting requirement
(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	Section 3, from Page 25.
(k)	any mitigation measures for inclusion in the EMPr	Section 3, from Page 25.
(l)	any conditions for inclusion in the environmental authorisation	Section 3, from Page 25.
(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 3, from Page 25.
(n)	a reasoned opinion -	Section 3, Point 3.2.3, Page 31.
i.	as to whether the proposed activity or portions thereof should be authorised and	Section 3, Point 3.2.3, Page 31.
ii.	if the opinion is that the activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 3, Point 3.2.3, Page 31.
(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	No specific consultation was undertaken as part of the traffic study. A public consultation process was undertaken as part of the Management Programme (EMPr) amendment process undertaken by SLR. Comments received during the EMPr amendment process are included in Section 2.6.
(p)	a summary and copies if any comments that were received during any consultation process, and where applicable any responses thereto -	Section 2.6, Page 22.
(q)	Any other information requested by the competent authority.	None received

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Section 1

INTRODUCTION

Siyazi Transportation Services Limpopo (Pty) Ltd was appointed by SLR Consulting (South Africa) (Pty) Ltd to conduct a Traffic Impact Assessment (TIA) to form part of the Environmental Management Programme (EMPr) Amendment of the existing Tshipi Borwa Mine in the Northern Cape Province.

Tshipi é Ntle Manganese Mining (Pty) Ltd (Tshipi) currently operates the Tshipi Borwa Mine located on the farms Mamatwan 331 (mining right and surface use areas) and Moab 700 (surface use area), approximately 18 km to the south of Hotazel in the John Taolo Gaetsewe District Municipality in the Northern Cape Province. Tshipi currently holds a mining right issued by the Department of Minerals and Energy (currently known as the Department of Mineral Resources), as well as an approved EMPr, and an environmental authorisation (EA) issued by the Department of Tourism, Environment and Conservation (currently known as the Department of Environment and Nature Conservation).

Tshipi is currently in the process of amending its approved EMPr to cater for changes to its approved infrastructure layout.

The purpose of this report is therefore to investigate the changes between the original layout that was assessed (for which authorisation was issued) and the current layout for which authorisation is now applied for. The changes to the authorised layout and operations are as follows:

- a) an increase in the number, position, volume and layout of waste rock dumps;
- b) a change to the design, capacity and position of the sewage treatment plant;
- c) a change to the stormwater management system, position including additional storage;
- d) a change to the potable water storage facilities capacity and position;
- e) a change to the position of the office, plant, workshop and related infrastructure;
- f) a change to the number, position, volume and layout (footprint) of the ore stockpiles;
- g) a change to the design of the railway line and an increase in length;
- h) the establishment of an additional temporary run-off-mine (ROM) stockpile area;
- i) the establishment of a tyre bays;
- j) the establishment of additional weighbridges;
- k) the establishment of an additional topsoil stockpile area (No. 2); and
- l) a change in the position secondary crushing and screening plant.

Additional proposed facilities are also included in the EMPr amendment which is as follows:

- a) Expansion of the approved topsoil stockpile areas;
- b) Change in the position of the approved 78MI storm water dam; and
- c) To mine the barrier pillar between the Tshipi Borwa Mine and South 32.

Figure 1.1 provides the locality of the existing mining development in relation to other activities in the vicinity, including the location of the intersections under investigation as part of this report.

Figure 1.2 provides the mine infrastructure layout of the mining development for which authorisation was issued while **Figure 1.3** provides the mine infrastructure layout for which authorisation is applied for.

Important: From a traffic engineering point of view, the amendment to the infrastructure layout for which authorisation was issued and the proposed additional changes are all mine infrastructure related and all changes lie within the existing mining development boundaries and therefore no changes to the production capacity of the mining development occurred. The infrastructure changes are therefore seen as isolated within the mining development boundaries and have a negligible change and impact on vehicular traffic and road safety on public roads when comparing the original assessed mining development layout and the revised existing layout.

The Traffic Impact Assessment therefore focused on the following:

- a) Status quo of the adjacent road network in order to assess the current situation; and
- b) Provide recommendations and mitigation measures to improving road safety from a traffic engineering point of view.

POINT	INTERSECTION STATUS	INTERSECTION	GPS CO-ORDINATES	
			LATITUDE	LONGITUDE
A	Existing	Road R380 and Road R31	S 27°13'56.42"	E 22°58'27.36"
B	Existing	Road R380 and Mamatwan Trail Station Access Road	S 27°17'50.87"	E 22°58'57.41"
C	Existing	Road R380 and Road D3457	S 27°24'26.17"	E 22°59'44.66"
D	Existing	Road D3457 and Mamatwan Mine Access Road	S 27°24'26.02"	E 22°59'19.96"
E-1	Existing	Road D3457 and Tshipi Borwa Mine Access Gate 1	S 27°24'23.63"	E 22°58'53.85"
E-2	Existing	Road D3457 and Tshipi Borwa Mine Access Gate 2	S 27°24'23.63"	E 22°58'53.85"

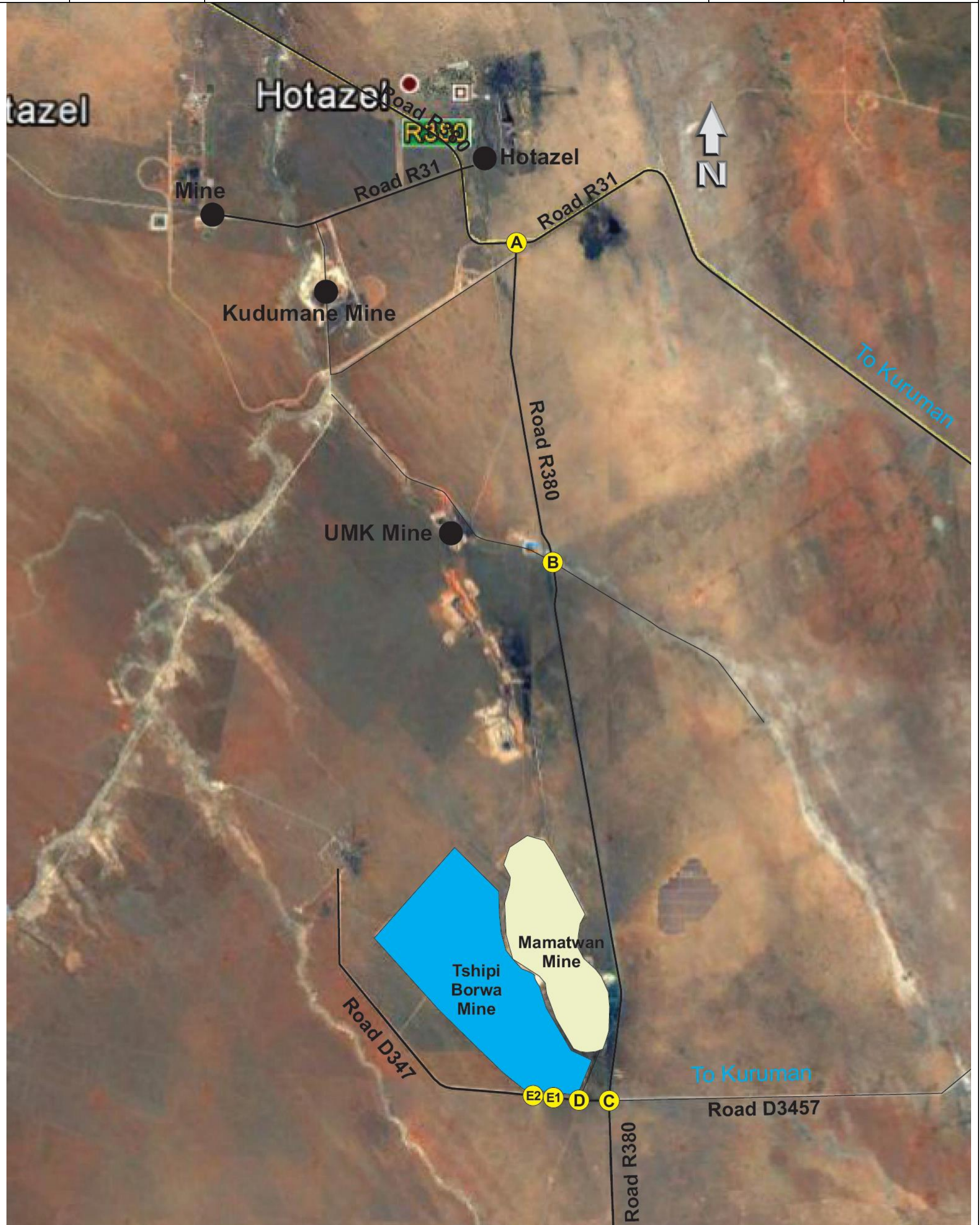


FIGURE 1.1: LOCALITY OF THE EXISTING MINING DEVELOPMENT AND RELEVANT INTERSECTIONS

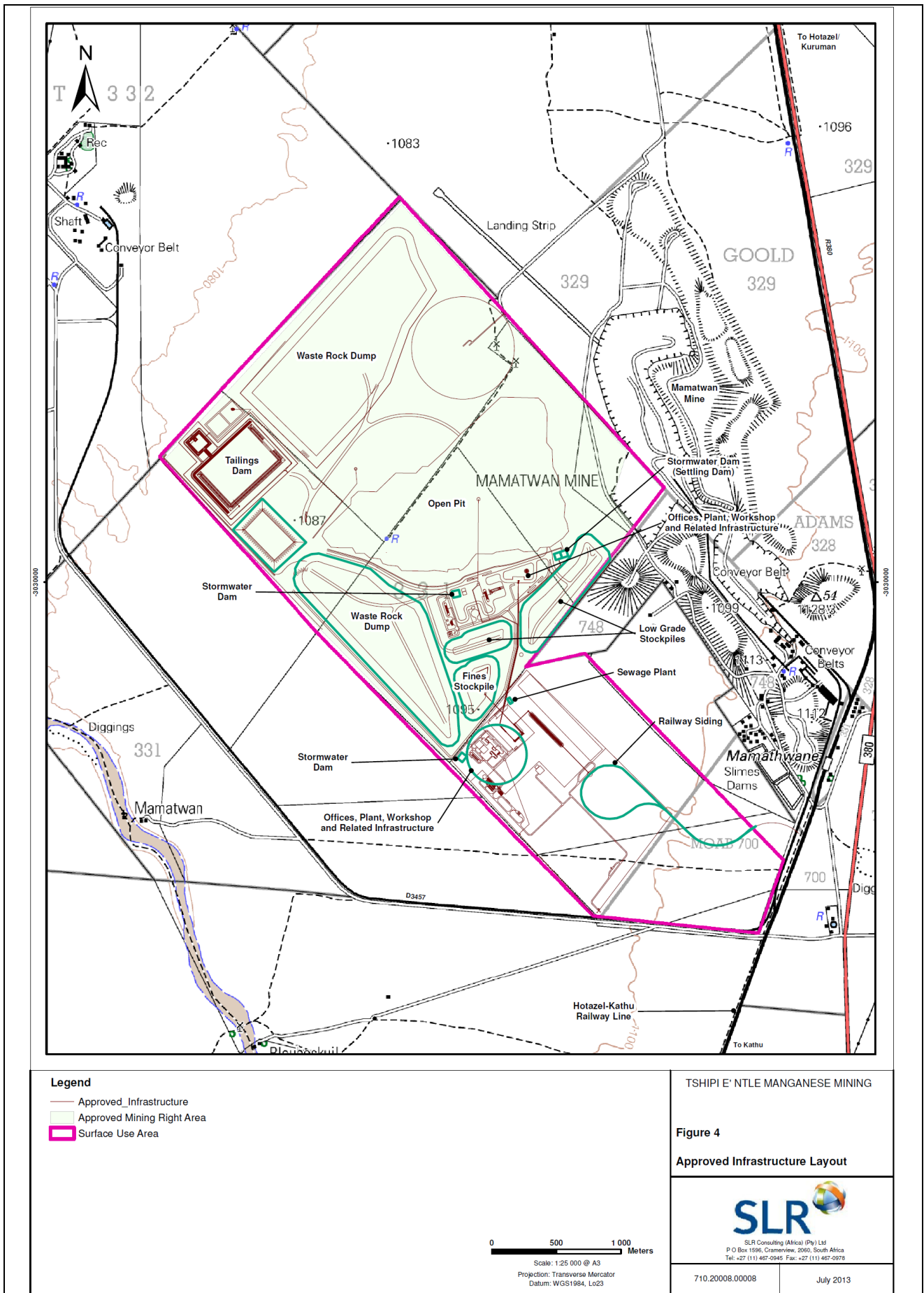
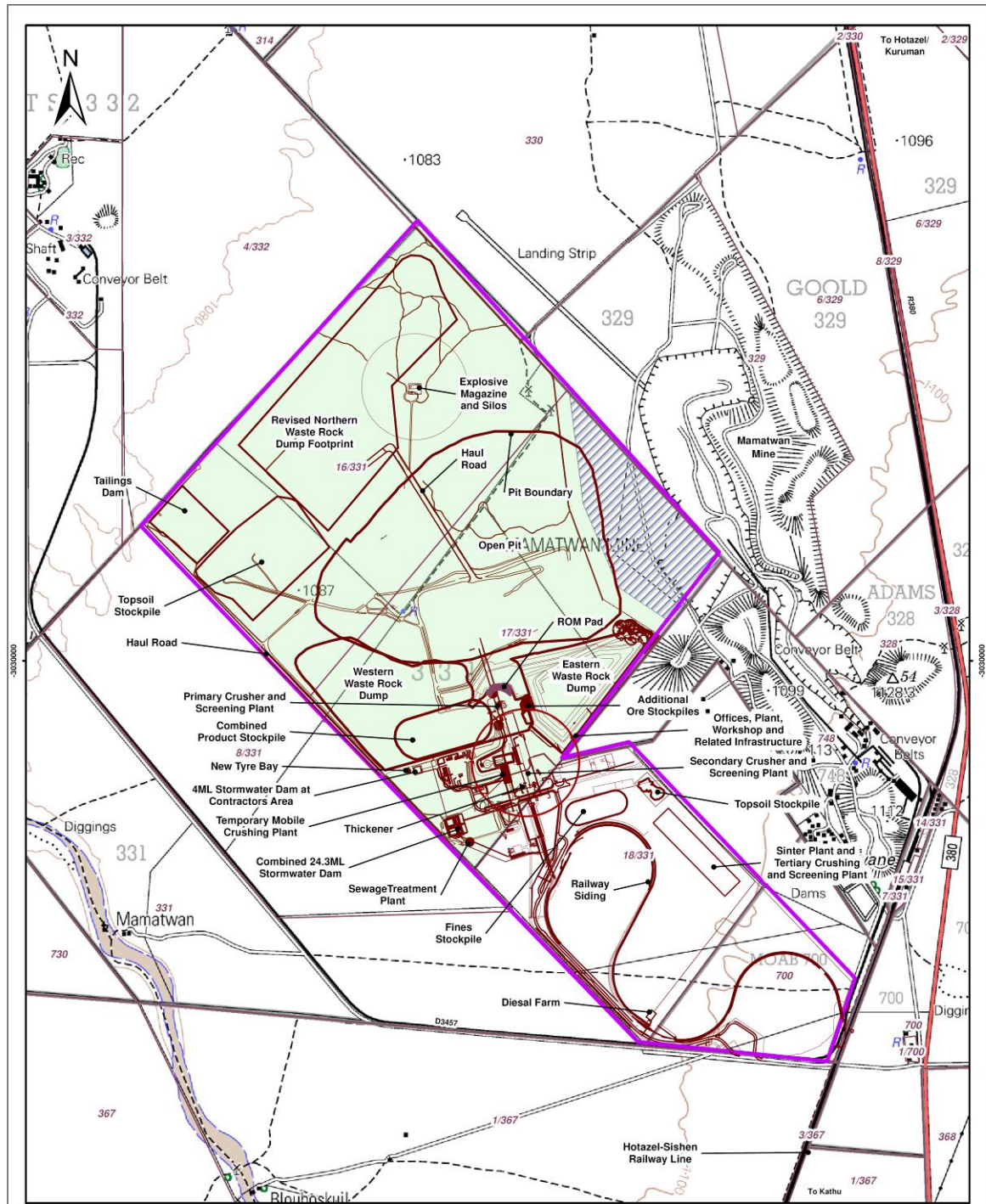


FIGURE 1.2: MINE INFRASTRUCTURE LAYOUT FOR WHICH AUTHORISATION WAS ISSUED

Source: SLR Consulting (South Africa) (Pty) Ltd



- Legend**
- Surface Use Area
 - Approved Mining Right Area
 - Boundary Mining Venture Area
 - Mine Infrastructure

0 500 1 000 Meters
 Scale: 1:25 000 @ A3
 Projection: Transverse Mercator
 Datum: WGS1984, Lo23

TSHIPI E' NTLE MANGANESE MINING

Figure 2
Infrastructure Layout



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FIGURE 1.3: MINE INFRASTRUCTURE LAYOUT FOR WHICH AUTHORISATION IS APPLIED

Source: SLR Consulting (South Africa) (Pty) Ltd

The following scenarios were investigated as part of the TIA:

- a) **Scenario 1:** 2017 peak hour traffic without background traffic growth with the mining development;
- b) **Scenario 2:** 2027 peak hour traffic with background traffic growth, with the mining development

The Northern Cape Provincial Government, Department of Transport, Roads and Works is the relevant road authority related to the adjacent road network of the existing mining development.

The following sections of the memorandum elaborate on the:

- a) **Section 2:** Detailed Information Related to Data Collected and Investigations.
- b) **Section 3:** Findings and Recommendations.

Section 2

DETAILED INFORMATION RELATED TO DATA COLLECTED AND INVESTIGATIONS

The purpose of **Section 2** is to provide the detailed information related to the data collected and investigations and consists of:

- a) The *status quo* of the land use and the road characteristics of roads relevant to the existing mining development;
- b) The future land use, as well as the road characteristics;
- c) The current and future levels of service at the relevant intersections under investigation; and
- d) Other traffic-related issues.

The following subsection elaborates on the above mentioned.

2.1 STATUS QUO OF LAND USE, AS WELL AS ROAD CHARACTERISTICS

The following information is discussed in terms of the *status quo* of the existing land use and road characteristics:

- a) Existing land use information;
- b) Existing road characteristics and modal distribution; and
- c) Traffic counts conducted as a basis for making traffic calculations.

2.1.1 EXISTING LAND USE INFORMATION

The relevant property of the existing mining development is currently zoned for mining purposes. For the purpose of this TIA, the following assumptions are made:







- a) That the average rate of growth of vehicle traffic in the area under investigation that is not relevant to the existing mining development (background traffic) between the 2017 manual traffic counts and the 2027 scenarios was anticipated at 3% per annum;
- b) That the vehicle traffic absorption rate (rate at which existing developments attract vehicular traffic) by all other types of completed developments will maintain the same status for the next ten years; and
- c) That vehicle traffic currently generated by the existing mining development will remain unchanged.

2.1.2 EXISTING ROAD CHARACTERISTICS AND MODAL DISTRIBUTION

The following are relevant as part of this section:

- a) **Table 2.1** contains information related to the existing intersections under investigation.
- b) **Figure 2.1** provides the existing road layout for the area under investigation.
- c) **Table 2.2** provides information concerning the relevant road sections under investigation and includes the following:
 - i) Relevant road section;
 - ii) Picture of road section;
 - iii) Existing class of road;
 - iv) Proposed class of road;
 - v) Road reserve widths;
 - vi) Lane widths; and
 - vii) Median widths.
- d) **Tables 2.3** and **2.4** provide a copy of the Guidelines (COTO TRH26 “*South African Road Classification and Access Management Manual, Version 1.0, August 2012*” Rural areas) of typical road characteristics and access management requirements.

TABLE 2.1: SUMMARY OF INTERSECTION CONTROL AT EXISTING INTERSECTIONS UNDER INVESTIGATION

POINT	DESCRIPTION	INTERSECTION CONTROL	PEDESTRIAN ACTIVITIES	INTERSECTION PHOTO
A	Road R380 and Road R31	Free-flow on Road R31	Limited pedestrian activity observed	
B	Road R380 and UMK Mine Access Road	Free-flow on Road R380	Limited pedestrian activity present	
C	Road R380 and Road D3457	Free-flow on Road R380	Limited pedestrian activity present	
D	Road D3457 and Mamatwan Mine Access Road	Free-flow on Road D3457	Limited pedestrian activity present	
E-1	Road D3457 and Tshipi Borwa Mine Access Gate 1	Free-flow on Road D3457	Pedestrian activity present	
E-2	Road D3457 and Tshipi Borwa Mine Access Gate 2	Free-flow on Road D3457	Pedestrian activity present	

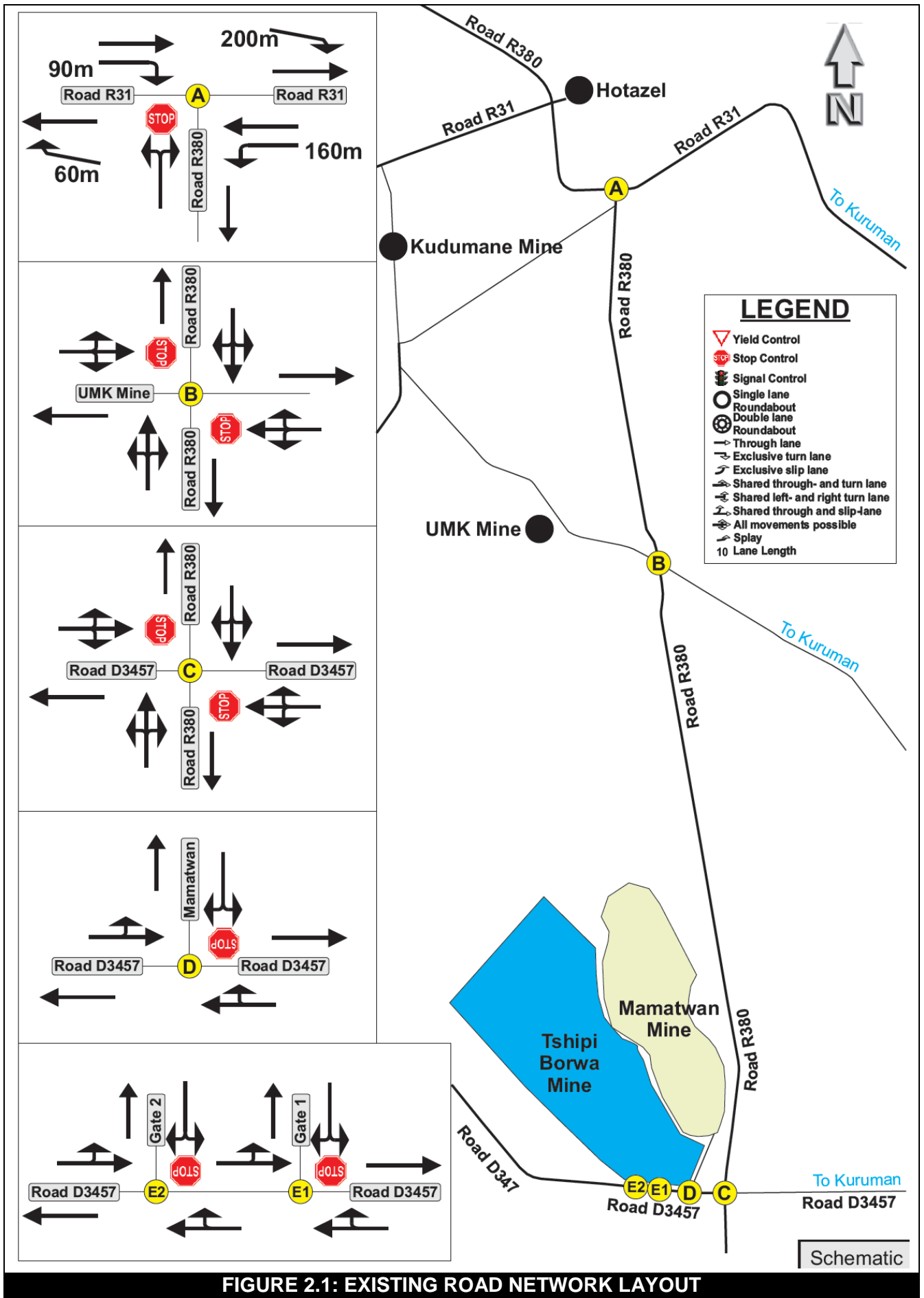


TABLE 2.2: SUMMARY OF ROAD CHARACTERISTICS




RELEVANT ROAD SECTION	PICTURE OF ROAD SECTION	ASSUMED EXISTING CLASS OF ROAD			POSSIBLE FUTURE CLASS OF ROAD			Road Authority	Road Reserve (M)	Number of Lanes	Lane Width	Type of Surface	Median	Anticipated Traffic Growth per Annum over 10 Years	Speed Limit
Road Section 1 Road R31 Road link between Hotazel and Kuruman		Primary Function: Mobility			Proposed Function: Mobility			Northern Cape Provincial Government, Department of Transport, Roads and Works	±40m	One lane per direction	3.7m wide	Asphalt	None	3%	80 km/h at intersections
		Class	Class No.	Route No.	Class	Class No.	Route No.								
		Minor arterial	R3	R	Minor arterial	R3	R								
		Description: Main Road			Description: Main Road										
		Access spacing: 1.6km			Access spacing: 1.6km										
Road Section 2 Road D380 Road link between Kathu and Hotazel		Primary Function: Mobility			Proposed Function: Mobility			Northern Cape Provincial Government, Department of Transport, Roads and Works	±40m	One lane per direction	3.7m wide	Asphalt	None	3%	80 km/h at intersections
		Class	Class No.	Route No.	Class	Class No.	Route No.								
		Minor arterial	R3	R	Minor arterial	R3	R								
		Description: Main Road			Description: Main Road										
		Access spacing: 1.6km			Access spacing: 1.6km										
Road Section 3 Road D3457 Access from mines and farms to main roads		Primary Function: Activity / Access			Primary Function: Activity / Access			Northern Cape Provincial Government, Department of Transport, Roads and Works	±40m	One lane per direction	3.7m wide	Gravel	None	3%	60 km/h
		Class	Class No.	Route No.	Class	Class No.	Route No.								
		Collector Road	R4	R	Collector Road	R4	R								
		Description: Collector			Description: Collector										
		Access spacing: 600m to 800m			Access spacing: 600m to 800m										

TABLE 2.3: RURAL FUNCTIONAL ROAD CLASSIFICATION
 (COTO TRH26 - SOUTH AFRICAN ROAD CLASSIFICATION AND ACCESS MANAGEMENT MANUAL VERSION 1.0 AUGUST 2012)

FUNCTION			DESCRIPTION		MOBILITY				
BASIC FUNCTION	ALTERNATE FUNCTIONAL DESCRIPTION	DETERMINING FUNCTION	CLASS NO (R_)	CLASS NAME	ORIGIN / DESTINATION	THROUGH TRAFFIC COMPONENT	REACH OF CONNECTIVITY	% OF BUILT KM	AADT (AVERAGE ANNUAL DAILY TRAFFIC)
Mobility	Vehicle priority, vehicle only, long distance, through, high order, high speed, numbered, commercial, economic, strategic, route, arterial road or highway	Movement is dominant, through traffic is dominant, the majority of traffic does not originate or terminate in the immediate vicinity, the function of the road is to carry high volumes of traffic between urban areas.	R 1	Principal arterial*	Metro areas, large cities, large border posts, join national routes.	Exclusively	> 50km	2 - 4% Classes 1 and 2	1 000 - 100 000+
			R 2	Major arterial*	Cities and large towns, transport nodes (harbour and international airports), smaller border posts, join major routes.	Exclusively	> 25km		500 - 25 000+
			R 3	Minor arterial*	Towns, villages and rural settlements, tourist destinations, transport nodes (railway sidings, seaports, landing strips), small border posts, other routes.	Predominant	> 10km	6 - 12% Classes 1, 2 and 3	100 - 2 000+
Access / Activity	Access, mixed pedestrian and vehicle traffic, short distance, low order, lower speed, community / farm, road or street.	Access, turning and crossing movements are allowed, the majority of traffic has an origin or destination in the district, the function of the road is to provide a safe environment for vehicles and pedestrians using access points.	R 4	Collector road	Connect farming districts, rural settlements, tourist areas, national and private parks and mines to mobility routes.	Minimal	< 10km	20 - 25%	< 1 000
			R 5	Local road	Farm or property access, connection to other routes.	Nil Discontinued	< 5km	65 - 75%	< 500
			R 6	Walkway (path or track)	Settlements, farms, transport nodes, water points.	n/a	n/a	n/a	n/a

* In rural areas, the term *distributor* may be preferred to *arterial*.

TABLE 2.4: RURAL ACCESS MANAGEMENT REQUIREMENTS AND FEATURES
(COTO TRH26 - SOUTH AFRICAN ROAD CLASSIFICATION AND ACCESS MANAGEMENT MANUAL VERSION 1.0 AUGUST 2012)

BASIC FUNCTION	DESCRIPTION		REQUIREMENTS				TYPICAL FEATURES (Use appropriate context sensitive standards for design)									
	CLASS NO (R)	CLASS NAME	DESIGN TOPOLOGY	ROUTE NO.	ACCESS TO PROPERTY	PARKING	SPEED km/h	INTERSECTION CONTROL	TYPICAL CROSS SECTION	INTERSECTION SPACING	ROADWAY / LANE WIDTH	ROAD RESERVE WIDTH	PUBLIC TRANSPORT AND PEDESTRIAN CROSSINGS	PEDESTRIAN FOOTWAYS (CONSTRUCTED)	CYCLE LANES	ANIMAL DRAWN VEHICLES
Mobility	R 1	Principal arterial	Expressway	Yes (N)	Not allowed*	No (off road rest stops allowed)	120	Grade separated or priority to through	2/3/4 lane, surfaced shoulders, climbing lanes	8.0KM	3.5 - 3.7m	60 - 80m (62m)	No	No	No	No
	R 2	Major arterial	Highway	Yes (R: 2 or 3-digit; or N)	Not allowed **	No (off road rest stops allowed)	120	Priority or grade separated	2/3 lane, surfaced shoulders, climbing lanes	5.0KM	3.5 - 3.7m	40-70m (48m)	As required	Isolated	Recreational on shoulder	No
	R 3	Minor arterial	Main road	Yes (R: 3 or 2-digit)	Not allowed **	No (off road rest stops allowed)	100 - 120	Priority, roundabout	2 lane surfaced, gravel shoulders	1.6KM	4.0m	30-50m (30m)	As required	Isolated	Recreational widen roadway both sides	Widen shoulder
Access / Activity	R 4	Collector road	Collector	Allowed, T (tourist) or D (district)	Yes	No (off road edge or in lay byes / viewpoints)	80 - 100	Priority	2 lane surfaced or gravel, gravel shoulders	600m – 800m	3.5m	25m	As required	Rare, isolated	Widen roadway	Widen shoulder
	R 5	Local road	Farm road	Allowed, T (tourist) or L (local)	Yes	No (on verge or shoulder)	60 - 80	Priority	1/2 lane gravel, 600mm concrete strips in environmental areas	450m – 600m	-	20m	As required	Rare	Use roadway	Use roadway
	R 6	Walkway	Track or pathway	No	Yes	n/a	-	-	-	-	-	-	-	Not constructed, formed by use	-	-

* Access to properties sufficiently large to warrant a private intersection / interchange which can be considered if access spacing requirements are met and there is no future need for public road.

** Low volume farm gate and tourist access (less than 10 vehicles per day) can be considered if no alternative exists.

2.1.3 TRAFFIC COUNTS AS BASIS FOR MAKING TRAFFIC-ENGINEERING CALCULATIONS

In order to gain a better understanding of the existing traffic patterns and movements adjacent to the existing mining development, 12-hour manual traffic counts were conducted at the existing intersections that are potentially affected by the mining development.

It is standard traffic engineering practice to conduct at least 12-hour manual traffic counts, as close as possible to a month-end Friday when traffic movement is expected to be at its highest.

The relevant 12-hour manual traffic counts were conducted on Friday 03 February 2017 at the following intersections under investigation:

- a) **Point A**: Intersection of Road R380 and Road R31;
- b) **Point B**: Intersection of Road R380 and UMK Mine Access Road;
- c) **Point C**: Intersection of Road R380 and D3457;
- d) **Point D**: Intersection of Road D3457 and Mamatwan Mine Access Road;
- e) **Point E-1**: Intersection of Road D3457 and Tshipi Borwa Mine Access Gate 1;
and
- f) **Point E-2**: Intersection of Road D3457 and Tshipi Borwa Mine Access Gate 2.

The combined hourly totals of all the vehicle types for the traffic survey conducted on Friday 03 February 2017 between 06:00 and 18:00 are indicated in **Tables A-1 to A-6** of **Appendix A** of this report. The description of the relevant vehicle movements at the relevant intersections appears in **Figure A-1** of **Appendix A**.

The respective peak-hour flows for the traffic counts at the relevant intersections were identified as indicated in **Table 2.5** below.

TABLE 2.5: PEAK HOUR PERIODS AT THE RELEVANT INTERSECTIONS					
POINT	INTERSECTION	AM PEAK		PM PEAK	
		TIME INTERVAL	NUMBER OF VEHICLES	TIME INTERVAL	NUMBER OF VEHICLES
A	Road R380 and Road D31	06:00 to 07:00	466	15:30 to 16:30	378
B	Road R380 and UMK Mine Access Road	06:15 to 07:15	133	13:15 to 14:15	142
C	Road R380 and Road D3457	06:00 to 07:00	258	13:00 to 14:00	193
D	Road D3457 and Mamatwan Mine Access Road	06:00 to 07:00	181	13:00 to 14:00	112
E-1	Road D3457 and Tshipi Borwa Mine Access Gate 1	06:00 to 07:00	141	13:00 to 14:00	76
E-2	Road D3457 and Tshipi Borwa Mine Access Gate 2	06:00 to 07:00	53	13:00 to 14:00	43

Figure 2.2 indicates the hourly traffic pattern, per 15-minute interval, for all modes of vehicles at the relevant intersections between 06:00 and 18:00 on Friday 03 February 2017.

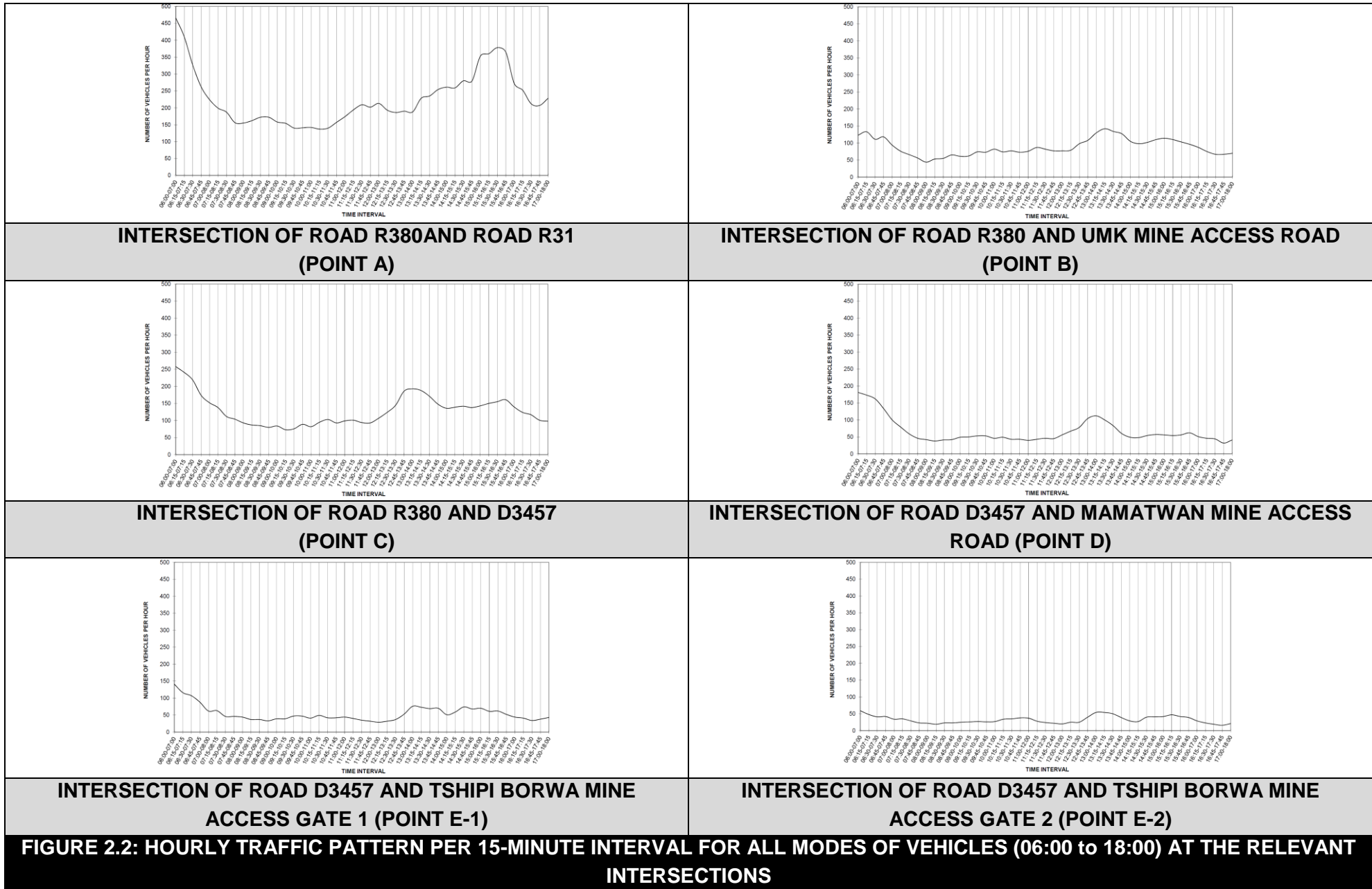


FIGURE 2.2: HOURLY TRAFFIC PATTERN PER 15-MINUTE INTERVAL FOR ALL MODES OF VEHICLES (06:00 to 18:00) AT THE RELEVANT INTERSECTIONS

2.2 FUTURE LAND USE AND ROAD CHARACTERISTICS

The following are relevant:

- a) Land use information, including possible future developments in the area; and
- b) Determination of the vehicle trips anticipated to be generated due to the mining development..

The subsections below elaborate on the above mentioned future land use and road characteristics.

2.2.1 LAND USE INFORMATION, INCLUDING POSSIBLE FUTURE DEVELOPMENTS IN THE AREA

No latent approved developments were known of at the time of preparing this TIA.

2.2.2 DETERMINATION OF VEHICLE TRIPS EXPECTED TO BE GENERATED DUE TO THE MINING DEVELOPMENT

The Tshipi Borwa mining development is an existing mining development and the changes to the mining development layout plan and proposed amendments are not expected to generate additional vehicle trips on the relevant road network and therefore no calculations were conducted.

2.2.3 CURRENT AND FUTURE TOTAL TRAFFIC AT THE RELEVANT INTERSECTIONS

The following figures are relevant:

- a) **Figure B-1:** 2017 peak hour traffic (background traffic) with the existing mining development (**Scenario 1**); and
- a) **Figure B-2:** Projected 2027 peak hour traffic (background traffic) with the existing mining development (**Scenario 2**).

2.3 DETERMINATION OF THE LEVELS OF SERVICE AT THE RELEVANT INTERSECTIONS

The “**SIDRA Intersection**” software was used as an aid for the design and evaluation of the relevant intersections. The following intersections were evaluated for levels of service:

- a) **Point A:** Intersection of Road R380 and Road R31;
- b) **Point B:** Intersection of Road R380 and UMK Mine Access Road;
- c) **Point C:** Intersection of Road R380 and D3457;
- d) **Point D:** Intersection of Road D3457 and Mamatwan Mine Access Road;
- e) **Point E-1:** Intersection of Road D3457 and Tshipi Borwa Mine Access Gate 1; and
- f) **Point E-2:** Intersection of Road D3457 and Tshipi Borwa Mine Access Gate 2.

In **Appendix C Tables C-1** and **C-2** indicates the levels of service and the degree of saturation calculated for the relevant intersections for the respective scenarios:

- a) **Table C-1:** Levels of service for various approaches for the year 2017 (background traffic) **with** the mining development (**Scenario 1**);
- b) **Table C-2:** Levels of service for various approaches for the year 2027, with background traffic growth, **with** the mining development (**Scenario 2**).

From **Tables C-1** and **C-2** it is possible to note that:

- a) Road infrastructure improvements are recommended from a road safety point of view. Refer to **Section 3** for recommended intersection geometric layout; and
- b) The existing intersections under investigation will operate at acceptable levels of services for the relevant time frame for which the TIA was prepared with and without the recommended intersection upgrading implemented from a road safety perspective.

Refer to **Table D-1** and **D-2** of **Appendix D** for level of service criteria description respectively for unsignalised and signalised intersections.

Table 2.6 provides a summary of the available reserve capacity on the various sections of roads that had been investigated. The assumed free-flow capacity of individual lanes is relevant provided that the relevant intersections have reserve capacity available for the relevant lanes of the intersections.

TABLE 2.6: AVAILABLE RESERVE CAPACITY FOR RELEVANT ROAD SECTION

Point	Intersecti on	Direction of Road Section	Capacity per Lane	Number of Lanes	Total Capacity	Actual Number of Vehicles (2022)		Reserve Capacity Available (2022)	
						AM	PM	AM	PM
A	Intersection of Roads R380 and R31	East (Road R31)	1100	1	1100	101	370	999	730
		South (Road R380)	1100	1	1100	213	57	887	1043
		West (Road R31)	1100	1	1100	315	85	785	1015
B	Intersection of Road R380 and UMK Mine Access Road	North (Road R380)	1100	1	1100	78	87	1022	1013
		East (Local Road)	700	1	700	0	0	700	700
		South (Road R380)	1100	1	1100	97	104	1003	996
		West (UMK Mine Access Road)	700	1	700	9	3	691	697
C	Intersection of Roads R380 and D3457	North (Road R380)	1100	1	1100	99	88	1001	1012
		East (Road D3457)	700	1	700	2	18	698	682
		South (Road R380)	700	1	700	33	103	667	597
		West (Road D3457)	700	1	700	155	14	545	686
D	Intersection of Road D3457 and Mamatwan Mine Access Road	North (Mamatwan Mine Access Road)	Access Road						
		East (Road D3457)	700	1	700	29	93	671	607
		West (Road D3457)	700	1	700	111	13	689	687
E-1	Intersection of Road D3457 and Tshipi Mine Access Gate 1	North (Tshipi Mine Access Gate 1)	Access Road						
		East (Road D3457)	700	1	700	24	59	676	641
		West (Road D3457)	700	1	700	82	13	618	687
E-2	Intersection of Road D3457 and Tshipi Mine Access Gate 2	North (Tshipi Mine Access Gate 2)	Access Road						
		East (Road D3457)	700	1	700	14	41	686	659
		West (Road D3457)	700	1	700	35	7	665	693

2.4 SENSITIVE ROAD SECTIONS AND INTERSECTIONS RELATED TO EXISTING AND PROPOSED CONDITIONS

Sensitive road sections and intersections related to existing conditions and future conditions in terms of vehicular traffic are evaluated taking into consideration the following:

- a) Vehicular traffic volumes;
- b) Where residents and schools are located (vehicle / pedestrian conflict);
- c) Free-flow legs of intersections where right turning movements take place where no dedicated right-turn lanes are provided;
- d) Intersections with high volumes of vehicular traffic conflicts; and
- e) Speeding.

Figure 2.3 provide a presentation of the sensitive road sections and intersections indicating existing sensitive areas and intersections (**Figure 2.3**).

It can be concluded from **Figure 2.3** that a manageable traffic impact between and including **Points C** to **E-2** is anticipated. The impact at **Point C** will be neutralised due to the implementation of the recommended intersection upgrades.

It is anticipated that the sensitivity for all other road sections and intersections are not directly affected by the mining development.

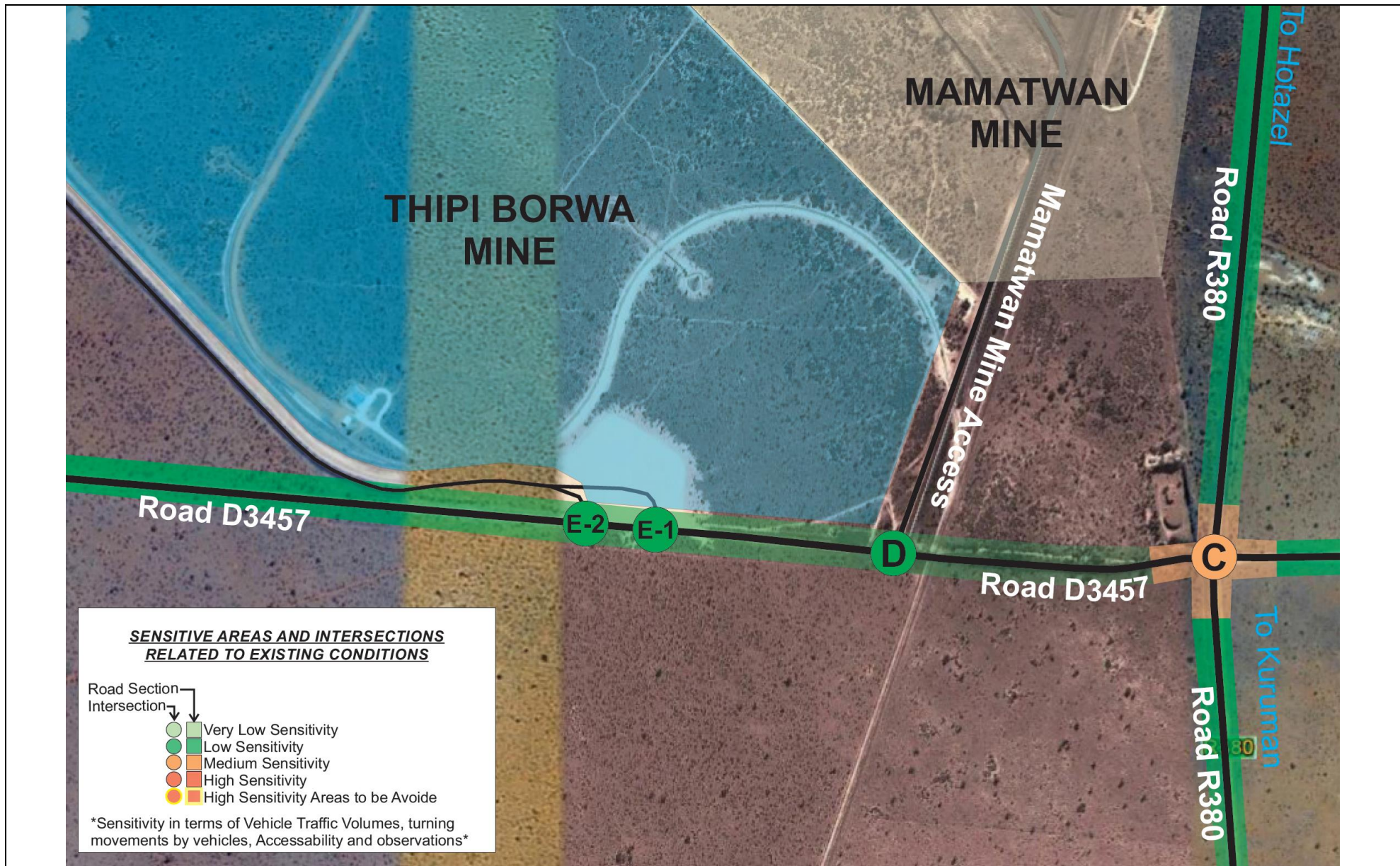


FIGURE 2.3: SENSITIVE ROAD SECTIONS AND INTERSECTIONS RELATED TO EXISTING CONDITIONS

2.5 INFORMATION REQUESTED BY RELEVANT ROAD AUTHORITY

Input will be provided as part of EIA process.

2.6 CONSULTATION WITH INTERESTED AND AFFECTED PARTIES (IAP)

Table 2.7 provides input related to interested and affected parties.

TABLE 2.7: COMMENTS BY IAP			
INTERESTED AND AFFECTED PARTIES	DATE COMMENTS RECEIVED	ISSUES RAISED	REPLIES
Machiel Andries Kruger	05 July 2013 as part of a social scan	The conditions of the roads are unacceptable.	The result of this traffic study indicates that road infrastructure improvements are currently required from a road safety point of view. This includes providing a 60 m dedicated right-turn lane on the northern approach and reflective road studs on the R380. It is proposed that these upgrades are discussed in collaboration with neighbouring mines and the relevant roads department.

2.7 OTHER TRAFFIC-RELATED MATTERS

Table 2.8 provides a summary of the following:

- a) Access-related matters in terms of access to the existing mining development which include:
 - i) Sight distances;
 - ii) Intersection spacing; and
 - iii) Access to the existing mining development;
- b) Road safety;
- c) Non-motorised transport; and
- d) Public transport.

TABLE 2.8: SUMMARY OF OTHER TRAFFIC-RELATED MATTERS

Item	Description of Element	General Comments	Specific Issues	Actions Required
1.	ACCESS-RELATED ISSUES			
1.1	Access to the existing mining development from Road D3457			
1.1.1	Access-related issues	a) Access to the existing mining development will remain unchanged.	a) None.	a) None.
1.1.2	Sight distances	a) All relevant intersections under investigation are existing intersections. Sight distances was assessed visually were deemed be acceptable.	a) None.	a) None.
1.1.3	Intersection spacing	a) All relevant intersections under investigation are existing intersections and are assumed to comply with the required intersection spacing requirements.	a) None.	a) None.
2.	ROAD SAFETY ISSUES			
2.1	General road safety	<p>The following are typical elements related to the road network, which cause road safety problems in rural and urban areas and which need to be addressed on a continuous basis:</p> <ul style="list-style-type: none"> a) Intersection layout, with specific reference to dedicated right turn lanes, where there is heavy vehicle movement; b) Pedestrian movements (road crossings); c) Intersection alignment, such as staggered intersections; d) Insufficient public transport facilities; e) Access control for vehicle movement; f) Fencing to control animal movement; g) Lack of or deterioration of reflective road studs for visibility during the night at strategic points; h) Lack of pedestrian walkways to separate pedestrian and vehicle movements at strategic points; i) Lack of provision and quality of road markings; j) Lack of provision and quality of road signs; and k) Improper road safety training for workers as well as adjacent communities. 	<ul style="list-style-type: none"> a) Need for reflective road studs at strategic points; b) Road markings are fading; and c) Need for relevant road traffic signs. 	<p>In general the report was compiled so as to address the road safety issues as far as practically possible.</p> <ul style="list-style-type: none"> a) Refer to Table 3.1 and Figures 3.1 and 3.2 for the recommended intersection improvements. b) Collaborate with relevant road authority to set up a road maintenance plan to maintain the relevant road network on which heavy vehicle movement is anticipated; c) Provide reflective road studs at strategic points (LED if possible) to ensure the safe operation of the relevant intersections under investigation at night time; d) Provide required road traffic signs for the relevant intersections; e) Provide relevant road markings at relevant intersections under investigation (highway paint recommended); f) Provide mine and contractor workers with training on road safety; and g) Road safety and awareness campaigns should be run at the mine.
3.	NON-MOTORISED TRANSPORT			
3.1	Non-motorised transport	a) In general pedestrians do not walk along the relevant road sections under investigation. All pedestrian movement occur within the mining development boundaries.	a) None.	a) None.
4.	PUBLIC TRANSPORT			
4.1	Public transport	<ul style="list-style-type: none"> a) Two types of public transport commuters are relevant: <ul style="list-style-type: none"> i) Firstly, workers who travel to and from the mining development; ii) Secondly, visitors to the mining development. <p>Workers and visitors are loaded and off loaded within the mining development boundaries at dedicated loading areas.</p>	a) None.	a) None.

FINDINGS AND RECOMMENDATIONS

Based on a site inspection of the existing road network adjacent to the site under investigation, traffic surveys, calculations and reference to the relevant Traffic Impact Assessment guideline documents, the following findings and recommendations were made:

3.1 FINDINGS

3.1.1 TRAFFIC IMPACT

From a traffic engineering point of view, the amendment to the mining development infrastructure layout for which authorisation was issued and the proposed additional changes are all mine infrastructure related and all changes are within the existing mining development boundaries.

The Tshipi Borwa mining development is an existing mining development and the changes to the mining development layout plan and proposed amendments are envisaged to not generate additional vehicle trips on the relevant road network. The infrastructure changes are therefore seen as isolated within the mining development boundaries and have a negligible change and impact on vehicular traffic and road safety on public roads when comparing the original assessed mining development layout and the revised existing layout.

The capacity calculations for the TIA were conducted for the years 2017 and 2027 respectively and represent the existing traffic situation which includes the Tshipi Borwa Mine traffic. The last mentioned time frame is in line with traffic engineering guidelines and practice.

Table E-1 of **Appendix E** provides a summary of the impact ratings respectively before and after recommended mitigating measures as presented in **section 3.2** are implemented. **Table E-1** of **Appendix E** was derived from **Table F-1** of **Appendix F** of the report that provides the criteria in terms of the environmental assessments process.

3.2 RECOMMENDATIONS

The following are discussed in terms of the recommendations:

- a) Improvements required from a road safety perspective
- b) Institutional arrangements; and
- c) Reasoned opinion for authorisation.

3.2.1 IMPROVEMENTS RECOMMENDED FROM A ROAD SAFETY PERSPECTIVE

Table 3.1 provides a short summary of the intersection improvements recommended, and whether the improvements are required from an intersection performance point of view (technical / capacity) or a road safety point of view.

TABLE 3.1: SUMMARY OF INTERSECTION IMPROVEMENTS RECOMMENDED IN TERMS OF ROAD / EARTH WORKS			
Point	Intersection Description	Intersection Performance Perspective	Road Safety Perspective
A	Roads R380 and R31	No additional improvements recommended.	
B	Road R380 and UMK Mine Access Road	No additional improvements recommended.	
C	Roads R380 and D3457	None	<ul style="list-style-type: none"> • Provide 60 meters dedicated right-turn lane on northern approach. • Provide reflective road studs. • Update road markings.
D	Road D3457 and Mamatwan Mine Access Road	No additional improvements recommended.	
E-1	Road D3457 and Tshipi Borwa Mine Access Gate 1	No additional improvements recommended.	
E-2	Road D3457 and Tshipi Borwa Mine Access Gate 2	No additional improvements recommended.	

Figures 3.1 and **3.2** furthermore provide detailed information in terms of the following related to the Intersections:

- a) Schematic presentation of the recommended road network layout (**Figure 3.1**);
and
- b) Graphical presentation of the recommended layout of the intersection of Roads R380 and D3457 (**Point C**) (**Figure 3.2**).

The TIA does not comment on pavement layer attributes in terms of the relevant road sections. The last mentioned need to be based on recommendations to be made by pavement design specialist input.

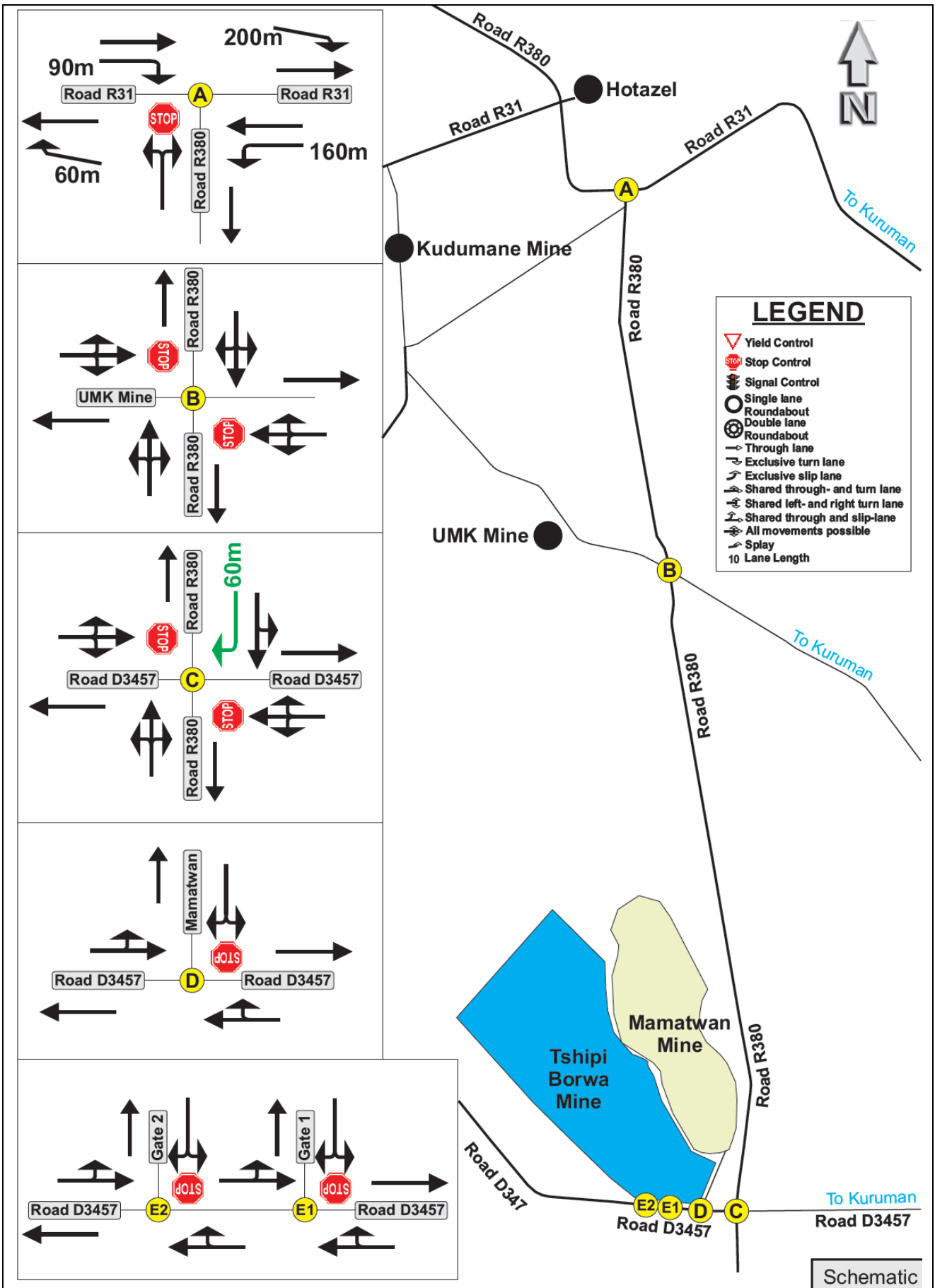


FIGURE 3.1: SCHEMATIC PRESENTATION OF THE RECOMMENDED ROAD NETWORK LAYOUT

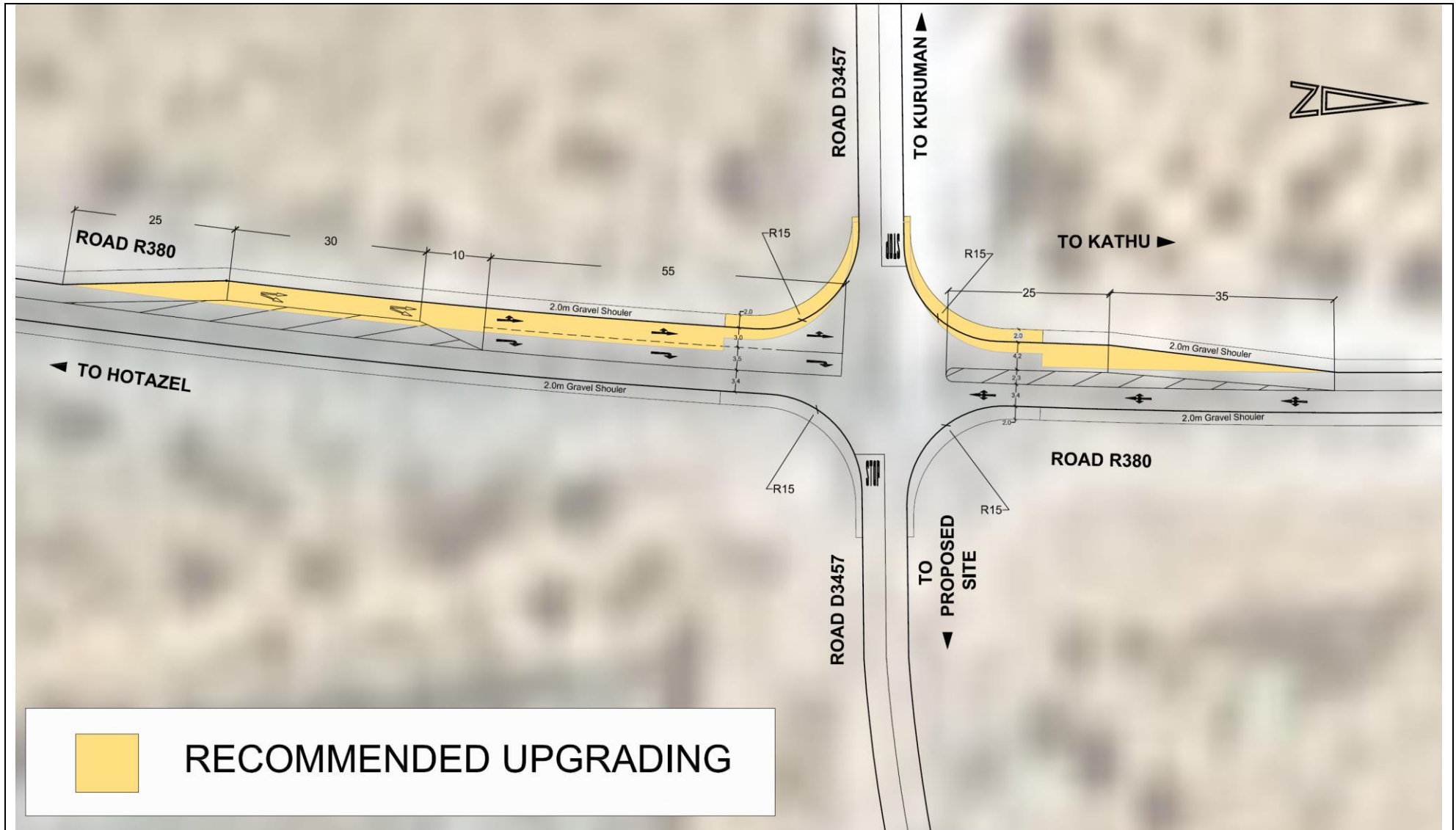


FIGURE 3.2: GRAPHICAL PRESENTATION OF THE RECOMMENDED LAYOUT OF THE INTERSECTION OF ROADS R380 AND D3457 (POINT C)

3.2.2 INSTITUTIONAL ARRANGEMENTS

The following recommendations are made in terms of the detailed design phase of roads:

- a) Detailed investigations should be conducted in conjunction with the relevant road authority in terms of the existing quality and potential life span of the existing road surface layers of the roads where consumables and workers will be transported; and
- b) A road maintenance plan needs to be prepared in conjunction with the relevant road authority on public roads where trucks will operate as soon as the project has been approved in order to ensure that the consumables and workers can be transported at all times.

3.2.3 REASONED OPINION FOR AUTHORISATION

In conclusion of the findings as part of the investigations, Siyazi Transportation Services Limpopo (Pty) Ltd is of the opinion that the change in the mining development infrastructure layout has a manageable impact on the relevant road network as long as the mitigating measures are implemented as recommended as part of **Section 3** of this report and should thus be granted authorisation.

It is therefore also recommended that the Northern Cape Department of Roads and Transport should approve the TIA based on the recommendations of this report.

APPENDIX A

INFORMATION RELATED TO STATUS QUO

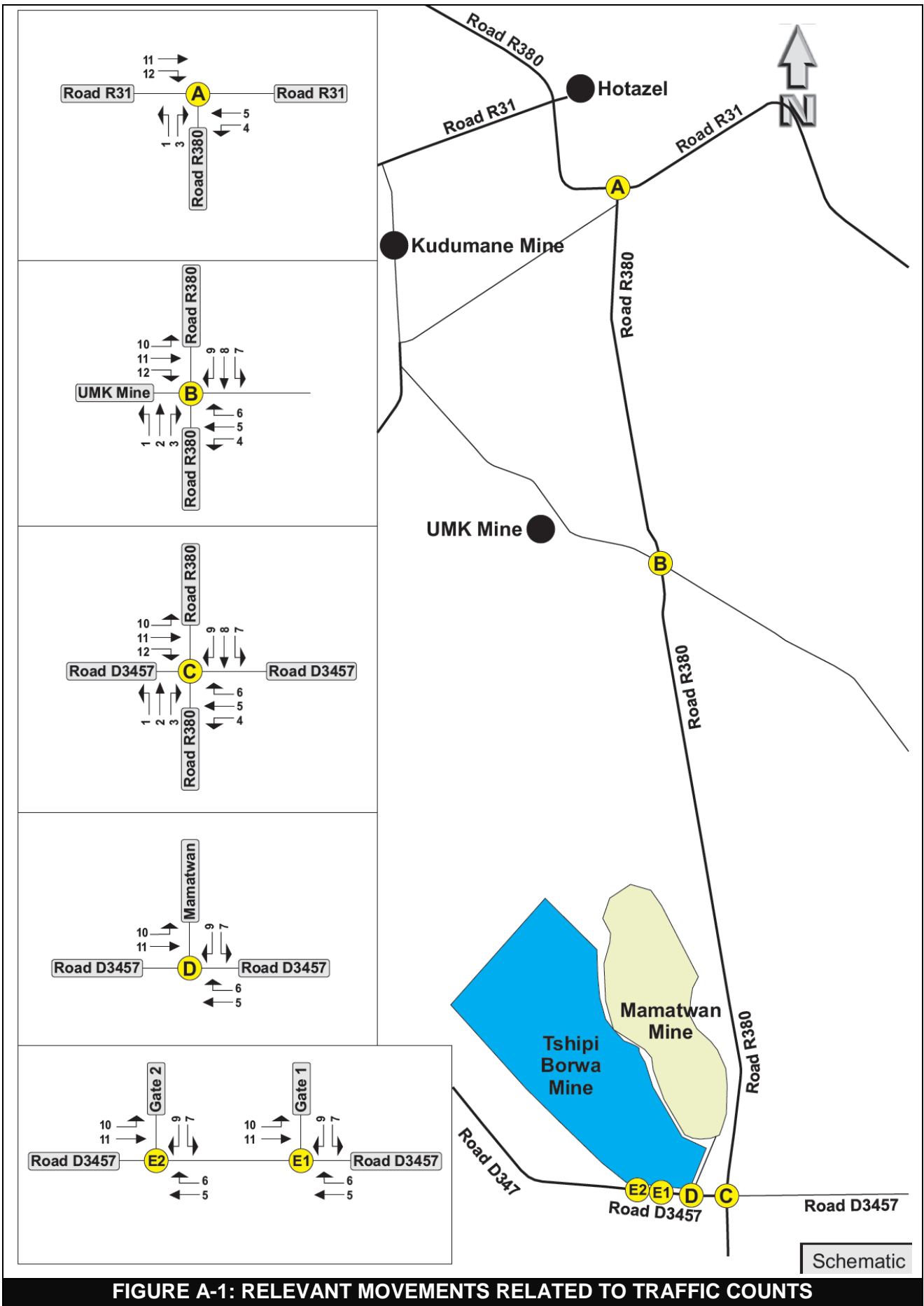


FIGURE A-1: RELEVANT MOVEMENTS RELATED TO TRAFFIC COUNTS

TABLE A-1: HOURLY TRAFFIC COUNTS FOR ALL VEHICLES SIMULTANEOUSLY AT THE INTERSECTION OF ROAD R380 AND ROAD R31 (3rd FEBRUARY 2017)

TIME INTERVALS	MOVEMENTS						TOTAL
	1	3	4	5	11	12	
06:00-07:00	77	10	104	158	64	53	466
06:15-07:15	68	12	85	145	52	48	410
06:30-07:30	49	18	58	105	50	47	327
06:45-07:45	39	29	32	86	43	33	262
07:00-08:00	32	28	18	71	42	33	224
07:15-08:15	25	25	11	62	50	26	199
07:30-08:30	26	19	9	60	52	21	187
07:45-08:45	15	7	5	58	53	18	156
08:00-09:00	17	7	6	50	58	17	155
08:15-09:15	21	6	7	44	61	23	162
08:30-09:30	26	4	6	58	56	22	172
08:45-09:45	27	4	7	55	52	27	172
09:00-10:00	25	4	7	45	51	26	158
09:15-10:15	22	4	10	46	48	24	154
09:30-10:30	16	6	16	30	51	21	140
09:45-10:45	19	8	15	25	55	19	141
10:00-11:00	15	8	14	29	57	19	142
10:15-11:15	15	12	12	21	61	16	137
10:30-11:30	14	10	7	31	57	21	140
10:45-11:45	14	10	11	44	54	24	157
11:00-12:00	19	14	17	47	52	25	174
11:15-12:15	23	16	17	54	46	38	194
11:30-12:30	31	18	18	51	53	38	209
11:45-12:45	34	17	13	41	57	40	202
12:00-13:00	39	13	8	38	66	49	213
12:15-13:15	32	19	6	30	63	43	193
12:30-13:30	26	25	3	34	54	44	186
12:45-13:45	23	30	3	38	56	40	190
13:00-14:00	16	39	1	38	59	35	188
13:15-14:15	21	41	2	45	85	34	228
13:30-14:30	19	34	5	37	107	33	235
13:45-14:45	19	33	5	36	127	34	254
14:00-15:00	20	23	7	34	147	30	261
14:15-15:15	21	14	9	35	144	36	259
14:30-15:30	25	23	8	35	152	37	280
14:45-15:45	24	24	9	33	154	35	279
15:00-16:00	26	34	9	41	204	39	353
15:15-16:15	23	34	8	40	217	38	360
15:30-16:30	19	24	6	44	250	35	378
15:45-16:45	16	18	4	47	249	31	365
16:00-17:00	15	14	2	41	171	29	272
16:15-17:15	18	12	2	51	150	19	252
16:30-17:30	18	16	4	65	94	15	212
16:45-17:45	20	15	7	77	69	19	207
17:00-18:00	27	16	13	91	64	17	228

TABLE A-2: HOURLY TRAFFIC COUNTS FOR ALL VEHICLES SIMULTANEOUSLY AT THE INTERSECTION OF ROAD R380 AND UMK MINE ACCESS ROAD (3rd FEBRUARY 2017)

TIME INTERVALS	MOVEMENTS												TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	
06:00-07:00	6	59	0	2	0	2	0	52	0	0	0	2	123
06:15-07:15	7	52	0	2	0	2	0	63	0	2	0	5	133
06:30-07:30	3	32	0	2	0	2	0	63	2	2	0	5	111
06:45-07:45	3	48	0	2	0	1	0	52	3	3	0	6	118
07:00-08:00	3	50	0	1	0	0	0	30	3	3	0	4	94
07:15-08:15	1	43	0	1	0	0	0	26	3	1	0	1	76
07:30-08:30	0	31	0	1	0	0	0	31	1	1	0	1	66
07:45-08:45	0	22	0	1	0	0	0	33	0	0	0	0	56
08:00-09:00	0	18	0	0	0	0	0	26	0	0	0	0	44
08:15-09:15	1	23	0	0	0	0	0	28	0	0	0	1	53
08:30-09:30	1	27	0	0	0	0	0	25	0	1	0	1	55
08:45-09:45	3	31	0	0	0	0	0	24	0	3	2	2	65
09:00-10:00	3	25	0	0	0	0	0	26	0	3	2	2	61
09:15-10:15	3	24	2	0	0	0	0	25	0	5	2	1	62
09:30-10:30	3	27	3	0	0	0	0	30	0	5	3	3	74
09:45-10:45	1	27	8	0	0	0	0	28	0	5	1	3	73
10:00-11:00	1	32	10	0	0	0	0	30	0	5	1	3	82
10:15-11:15	0	28	8	0	0	0	0	30	0	4	1	3	74
10:30-11:30	0	33	7	0	0	0	0	33	0	3	0	1	77
10:45-11:45	2	29	2	0	0	0	1	36	1	1	0	1	73
11:00-12:00	2	27	0	0	0	0	1	43	1	1	0	1	76
11:15-12:15	2	34	0	0	0	0	1	47	1	1	0	1	87
11:30-12:30	4	28	0	0	0	1	1	44	1	2	0	1	82
11:45-12:45	2	25	0	0	0	1	0	47	0	2	0	0	77
12:00-13:00	2	30	0	1	0	1	0	40	0	3	0	0	77
12:15-13:15	2	27	0	1	0	1	0	43	0	5	0	0	79
12:30-13:30	2	38	0	1	0	1	0	49	0	6	0	1	98
12:45-13:45	2	54	0	1	0	1	0	43	0	6	0	1	108
13:00-14:00	2	62	0	1	0	1	0	57	0	6	0	1	130
13:15-14:15	2	59	0	1	0	1	0	72	0	4	0	3	142
13:30-14:30	0	55	0	1	0	0	0	73	0	3	0	2	134
13:45-14:45	0	46	0	1	0	0	0	74	0	3	0	3	127
14:00-15:00	0	36	0	0	0	0	0	64	0	2	0	3	105
14:15-15:15	0	45	0	0	0	1	0	48	0	1	0	3	98
14:30-15:30	0	48	1	0	0	1	0	48	0	1	0	3	102
14:45-15:45	0	48	1	0	0	1	0	54	0	1	0	5	110
15:00-16:00	0	52	1	0	1	1	0	52	0	2	0	5	114
15:15-16:15	0	41	1	0	1	0	0	60	0	3	0	4	110
15:30-16:30	0	39	0	1	1	0	0	56	0	2	0	4	103
15:45-16:45	0	33	0	1	1	0	0	58	0	2	0	1	96
16:00-17:00	0	27	0	1	0	0	0	56	0	1	0	2	87
16:15-17:15	0	32	0	1	0	0	0	40	0	0	0	2	75
16:30-17:30	0	27	0	0	0	0	0	37	0	1	0	2	67
16:45-17:45	0	39	0	0	0	0	0	25	0	1	0	2	67
17:00-18:00	0	43	0	0	0	0	0	24	0	2	0	1	70

TABLE A-3: HOURLY TRAFFIC COUNTS FOR ALL VEHICLES SIMULTANEOUSLY AT THE INTERSECTION OF ROAD R380 AND D3457 (3rd FEBRUARY 2017)

TIME INTERVALS	MOVEMENTS												TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	
06:00-07:00	81	58	1	0	13	0	0	20	59	19	1	6	258
06:15-07:15	67	50	1	0	10	0	0	21	59	21	1	11	241
06:30-07:30	57	38	1	0	5	0	0	23	54	25	1	15	219
06:45-07:45	43	23	1	0	4	0	0	23	41	24	0	15	174
07:00-08:00	31	26	0	0	3	0	0	28	32	19	0	13	152
07:15-08:15	25	30	0	0	1	0	0	31	26	14	0	11	138
07:30-08:30	19	29	0	0	0	0	0	31	23	5	0	5	112
07:45-08:45	18	31	0	0	0	0	0	31	13	3	0	8	104
08:00-09:00	19	24	0	0	0	0	0	31	8	3	0	8	93
08:15-09:15	18	19	1	0	2	0	1	28	5	4	0	9	87
08:30-09:30	19	13	1	0	2	0	1	25	7	6	1	10	85
08:45-09:45	16	13	1	0	2	0	1	22	8	7	2	8	80
09:00-10:00	14	16	1	0	3	0	1	16	12	8	2	11	84
09:15-10:15	10	15	0	0	1	0	0	12	15	9	2	9	73
09:30-10:30	14	16	0	0	1	0	0	11	12	10	1	11	76
09:45-10:45	16	19	0	1	1	0	0	19	14	9	0	10	89
10:00-11:00	16	18	0	1	0	0	0	22	12	8	0	5	82
10:15-11:15	19	21	0	1	0	0	0	29	11	6	0	8	95
10:30-11:30	14	30	0	1	1	0	0	35	11	4	0	7	103
10:45-11:45	14	24	0	0	1	0	0	31	8	5	0	10	93
11:00-12:00	11	30	0	0	1	0	0	34	5	6	0	12	99
11:15-12:15	9	31	0	0	1	0	0	34	6	10	0	10	101
11:30-12:30	11	23	0	0	0	0	0	31	7	10	1	11	94
11:45-12:45	9	20	0	0	0	0	1	33	9	11	1	9	93
12:00-13:00	11	19	0	0	0	0	3	33	12	13	2	14	107
12:15-13:15	12	19	1	0	0	0	3	31	8	13	4	33	124
12:30-13:30	8	22	1	0	0	0	3	35	7	26	7	36	145
12:45-13:45	8	32	1	0	1	0	2	43	5	36	12	46	186
13:00-14:00	6	33	1	0	1	0	0	43	5	42	17	45	193
13:15-14:15	6	29	0	0	1	0	0	57	8	41	16	30	188
13:30-14:30	6	31	0	0	1	0	0	56	8	29	13	27	171
13:45-14:45	4	25	0	0	0	0	0	50	11	17	9	32	148
14:00-15:00	3	23	0	0	0	0	0	52	11	10	4	33	136
14:15-15:15	1	31	0	0	0	0	0	49	11	9	3	35	139
14:30-15:30	3	28	0	0	0	0	0	47	9	9	5	41	142
14:45-15:45	3	26	0	0	1	0	0	50	6	11	5	36	138
15:00-16:00	3	24	0	0	1	0	0	55	4	14	5	37	143
15:15-16:15	2	23	0	0	1	0	0	64	2	14	6	38	150
15:30-16:30	6	25	0	0	1	1	0	64	2	15	6	35	155
15:45-16:45	7	29	0	0	0	1	0	63	4	15	7	35	161
16:00-17:00	7	27	0	0	0	1	0	56	3	10	6	30	140
16:15-17:15	8	23	0	0	0	1	0	49	2	12	6	23	124
16:30-17:30	5	22	0	0	2	0	0	46	5	13	3	21	117
16:45-17:45	5	22	0	0	3	0	1	38	7	12	1	12	101
17:00-18:00	7	21	0	0	3	0	1	29	9	12	3	13	98

TABLE A-4: HOURLY TRAFFIC COUNTS FOR ALL VEHICLES SIMULTANEOUSLY AT THE INTERSECTION OF ROAD D3457 AND MAMATWAN MINE ACCESS ROAD (3rd FEBRUARY 2017)

TIME INTERVALS	MOVEMENTS						TOTAL
	5	6	7	9	10	11	
06:00-07:00	107	46	14	2	0	12	181
06:15-07:15	74	66	13	3	0	17	173
06:30-07:30	60	59	20	4	0	19	162
06:45-07:45	42	50	16	4	0	21	133
07:00-08:00	30	39	12	2	0	17	100
07:15-08:15	30	22	10	1	1	15	79
07:30-08:30	23	22	2	0	4	8	59
07:45-08:45	20	13	1	0	4	8	46
08:00-09:00	16	12	1	0	4	9	42
08:15-09:15	11	12	2	0	3	10	38
08:30-09:30	11	13	4	0	0	13	41
08:45-09:45	10	14	4	1	0	13	42
09:00-10:00	15	11	7	1	1	14	49
09:15-10:15	16	12	7	2	1	12	50
09:30-10:30	22	9	6	2	1	13	53
09:45-10:45	26	8	6	1	1	11	53
10:00-11:00	26	8	4	1	0	7	46
10:15-11:15	29	6	3	0	1	10	49
10:30-11:30	23	6	3	1	2	8	43
10:45-11:45	17	6	5	3	2	10	43
11:00-12:00	10	6	5	4	2	13	40
11:15-12:15	10	4	11	5	4	9	43
11:30-12:30	10	6	14	4	4	8	46
11:45-12:45	12	5	16	3	4	5	45
12:00-13:00	13	8	25	2	4	4	56
12:15-13:15	9	11	34	2	4	7	67
12:30-13:30	6	8	47	3	3	11	78
12:45-13:45	6	8	61	3	5	21	104
13:00-14:00	8	5	58	3	5	33	112
13:15-14:15	11	3	48	2	2	34	100
13:30-14:30	12	3	33	2	2	31	83
13:45-14:45	10	3	17	1	0	29	60
14:00-15:00	8	4	13	2	0	22	49
14:15-15:15	7	3	11	3	0	24	48
14:30-15:30	6	3	9	2	0	34	54
14:45-15:45	6	3	11	2	0	35	57
15:00-16:00	5	2	11	1	0	37	56
15:15-16:15	2	2	13	0	0	37	54
15:30-16:30	6	1	14	0	0	35	56
15:45-16:45	6	3	22	0	0	31	62
16:00-17:00	6	2	21	0	0	22	51
16:15-17:15	6	2	18	0	0	20	46
16:30-17:30	10	2	18	0	0	14	44
16:45-17:45	13	1	7	0	0	11	32
17:00-18:00	16	2	8	1	0	14	41

TABLE A-5: HOURLY TRAFFIC COUNTS FOR ALL VEHICLES SIMULTANEOUSLY AT THE INTERSECTION OF ROAD D3457 AND TSHIPI BORWA MINE ACCESS GATE 1 (3rd FEBRUARY 2017)

TIME INTERVALS	MOVEMENTS						TOTAL
	5	6	7	9	10	11	
06:00-07:00	81	33	10	4	1	12	141
06:15-07:15	50	31	12	5	1	17	116
06:30-07:30	41	27	16	3	1	19	107
06:45-07:45	23	25	16	3	0	21	88
07:00-08:00	19	13	9	4	0	17	62
07:15-08:15	19	13	10	4	1	16	63
07:30-08:30	16	8	5	4	1	12	46
07:45-08:45	12	9	10	2	1	12	46
08:00-09:00	7	11	11	1	1	13	44
08:15-09:15	5	9	10	0	0	13	37
08:30-09:30	3	10	10	1	0	13	37
08:45-09:45	2	10	6	2	0	13	33
09:00-10:00	8	8	5	3	0	15	39
09:15-10:15	11	7	3	4	1	13	39
09:30-10:30	17	8	3	4	1	14	47
09:45-10:45	18	11	2	3	1	12	47
10:00-11:00	17	12	2	2	1	7	41
10:15-11:15	17	14	5	2	0	11	49
10:30-11:30	14	11	5	2	0	10	42
10:45-11:45	13	8	6	2	1	12	42
11:00-12:00	7	10	9	2	1	15	44
11:15-12:15	9	7	8	2	2	12	40
11:30-12:30	9	6	6	1	2	11	35
11:45-12:45	10	7	5	1	1	8	32
12:00-13:00	10	5	3	1	3	7	29
12:15-13:15	6	6	8	0	3	9	32
12:30-13:30	4	8	9	1	3	12	37
12:45-13:45	6	5	12	2	4	24	53
13:00-14:00	8	5	21	3	3	36	76
13:15-14:15	12	3	17	3	2	36	73
13:30-14:30	11	3	18	2	2	33	69
13:45-14:45	8	4	25	3	1	29	70
14:00-15:00	8	3	15	3	0	22	51
14:15-15:15	7	6	19	3	0	24	59
14:30-15:30	7	4	25	4	0	34	74
14:45-15:45	7	3	21	2	0	35	68
15:00-16:00	5	3	24	1	0	37	70
15:15-16:15	2	0	21	1	0	37	61
15:30-16:30	6	0	21	0	0	35	62
15:45-16:45	5	1	15	0	0	31	52
16:00-17:00	5	1	16	0	0	22	44
16:15-17:15	4	2	15	0	0	20	41
16:30-17:30	8	2	10	0	0	14	34
16:45-17:45	8	5	13	0	1	11	38
17:00-18:00	8	9	10	1	1	14	43

TABLE A-6: HOURLY TRAFFIC COUNTS FOR ALL VEHICLES SIMULTANEOUSLY AT THE INTERSECTION OF ROAD D3457 AND TSHIPI BORWA MINE ACCESS GATE 2 (3rd FEBRUARY 2017)

TIME INTERVALS	MOVEMENTS						TOTAL
	5	6	7	9	10	11	
06:00-07:00	44	46	7	0	0	6	103
06:15-07:15	28	31	9	0	0	8	76
06:30-07:30	25	22	6	0	0	13	66
06:45-07:45	12	19	10	0	0	13	54
07:00-08:00	10	15	10	0	0	9	44
07:15-08:15	10	15	9	0	0	11	45
07:30-08:30	9	13	12	0	0	4	38
07:45-08:45	5	9	8	0	0	6	28
08:00-09:00	2	7	6	0	0	9	24
08:15-09:15	1	6	5	0	0	8	20
08:30-09:30	1	7	5	0	0	11	24
08:45-09:45	2	6	8	0	0	9	25
09:00-10:00	8	6	10	0	0	9	33
09:15-10:15	10	8	10	0	0	8	36
09:30-10:30	10	12	10	0	0	5	37
09:45-10:45	9	13	7	0	0	6	35
10:00-11:00	3	18	6	0	0	3	30
10:15-11:15	2	20	11	0	0	3	36
10:30-11:30	3	19	13	0	0	3	38
10:45-11:45	3	19	17	0	0	2	41
11:00-12:00	3	12	23	0	0	2	40
11:15-12:15	7	8	18	0	0	2	35
11:30-12:30	5	7	13	0	0	4	29
11:45-12:45	5	8	10	0	0	4	27
12:00-13:00	5	8	6	0	0	6	25
12:15-13:15	1	8	9	0	0	8	26
12:30-13:30	3	4	15	0	0	6	28
12:45-13:45	6	5	26	0	0	9	46
13:00-14:00	7	7	34	0	0	13	61
13:15-14:15	10	9	33	0	0	12	64
13:30-14:30	8	9	29	0	0	12	58
13:45-14:45	8	5	23	0	0	11	47
14:00-15:00	10	4	17	0	0	8	39
14:15-15:15	10	1	19	0	0	7	37
14:30-15:30	11	2	27	0	0	11	51
14:45-15:45	9	3	29	0	0	9	50
15:00-16:00	6	2	34	0	0	6	48
15:15-16:15	2	5	38	0	0	4	49
15:30-16:30	5	4	38	0	0	0	47
15:45-16:45	4	4	35	0	0	0	43
16:00-17:00	4	4	25	0	0	0	33
16:15-17:15	4	2	21	0	0	0	27
16:30-17:30	8	4	15	0	0	0	27
16:45-17:45	8	4	12	0	0	0	24
17:00-18:00	9	5	16	0	0	0	30

APPENDIX B

TRIP INFORMATION RELATED TO THE EXISTING DEVELOPMENT

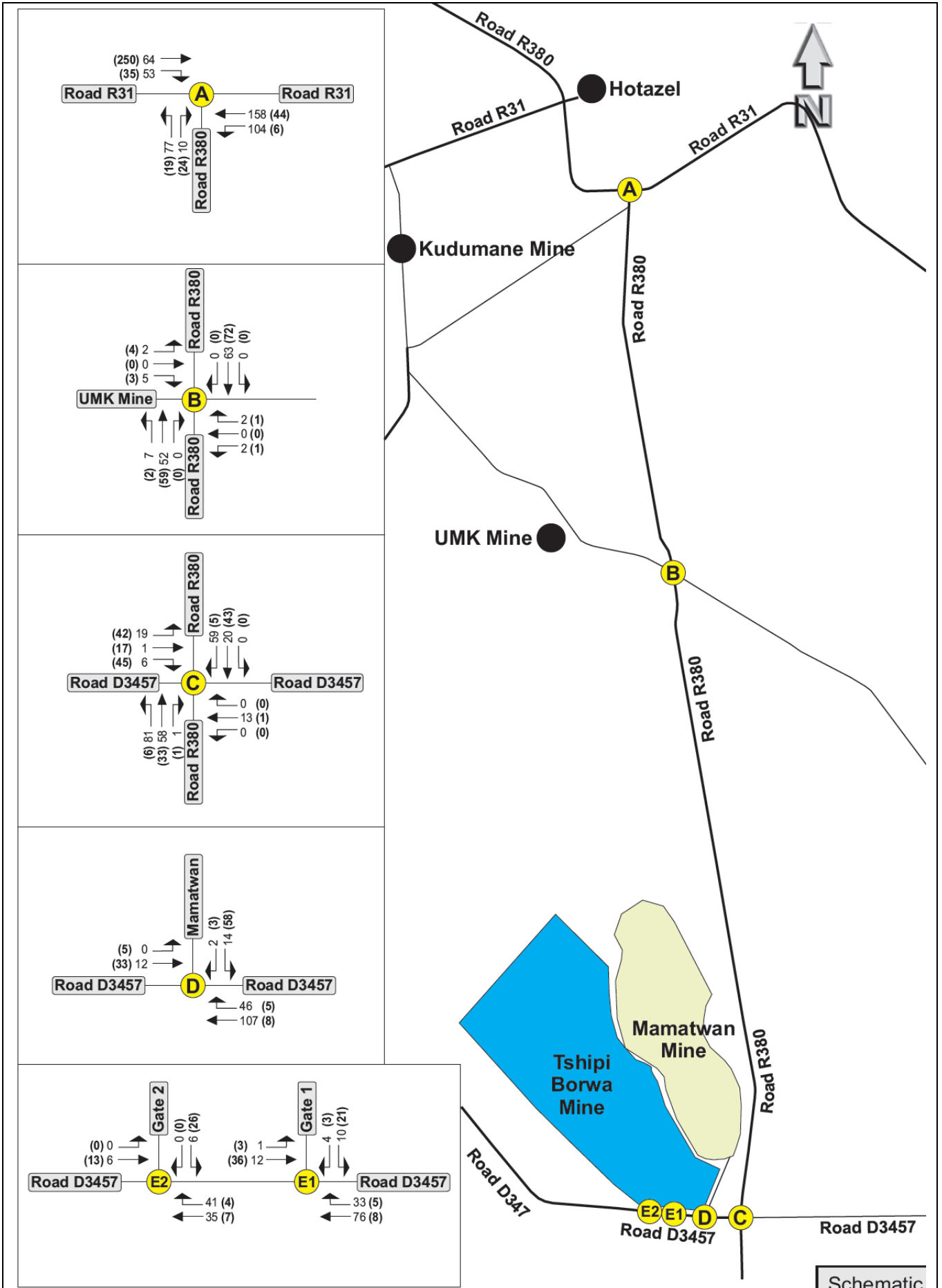
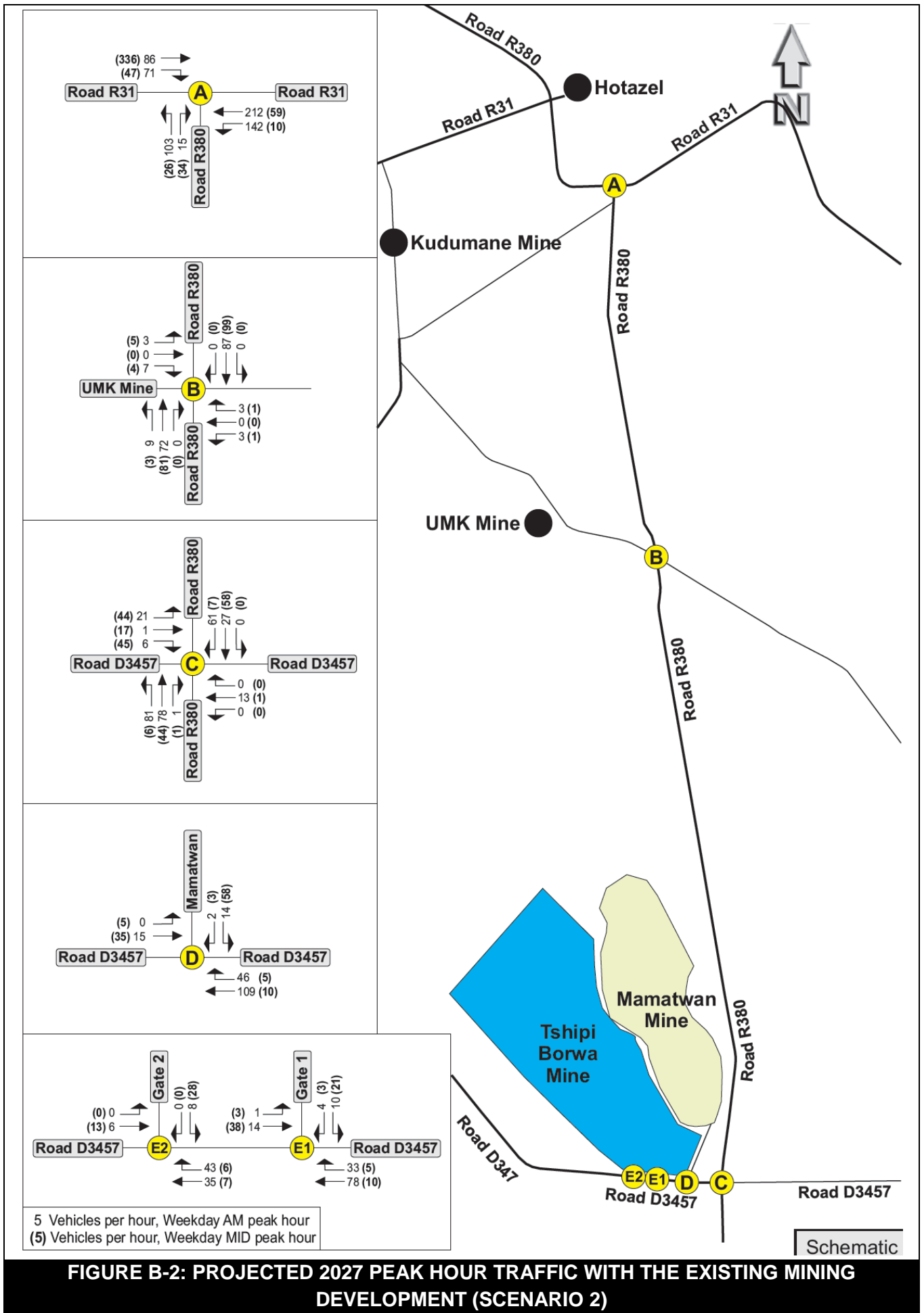


FIGURE B-1: 2017 PEAK HOUR TRAFFIC (BACKGROUND TRAFFIC) WITH THE EXISTING MINING DEVELOPMENT (SCENARIO 1)



APPENDIX C

SIDRA CALCULATION RESULTS

TABLE C-1: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2017 WITH THE MINING DEVELOPMENT (SCENARIO 1)

POINT A: INTERSECTION OF ROADS R31 AND R380						
<i>Type of intersection control: Free-flow on Road R31</i>						
Levels of Service Acceptable						
APPROACH	FRIDAY (AM)			FRIDAY (PM)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
East (Road R31)	2.2	A	0.085	0.7	A	0.024
South (Road R380)	9.1	A	0.097	9.7	A	0.059
West (Road R31)	3.0	A	0.051	0.7	A	0.024
Intersection	3.7	A	0.097	1.7	A	0.135
POINT B: INTERSECTION OF ROADS R31 AND UMK MINE ACCESS ROAD						
<i>Type of intersection control: Free-flow on Road R380</i>						
Levels of Service Acceptable						
APPROACH	FRIDAY (AM)			FRIDAY (PM)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Road R380)	0.2	A	0.035	0.2	A	0.040
East (Road 1)	8.2	A	0.005	8.2	A	0.003
South (Road R380)	0.7	A	0.033	0.3	A	0.034
West (UMK Access)	8.1	A	0.008	0.2	A	0.040
Intersection	1.2	A	0.035	0.8	A	0.040
POINT C: INTERSECTION OF ROADS R380 AND D3457						
<i>Type of intersection control: Free-flow on Road R380</i>						
Levels of Service Acceptable						
APPROACH	FRIDAY (AM)			FRIDAY (PM)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Road R380)	4.5	A	0.051	0.7	A	0.027
East (Road D3457)	8.7	A	0.016	8.1	A	0.003
South (Road R380)	3.2	A	0.078	1.0	A	0.022
West (Road D3457)	8.3	A	0.023	8.1	A	0.099
Intersection	4.5	A	0.078	4.8	A	0.099
POINT D: INTERSECTION OF ROAD D3457 AND MAMATWAN MINE ACCESS ROAD						
<i>Type of intersection control: Stop controlled on all approaches</i>						
Levels of Service Acceptable						
APPROACH	FRIDAY (AM)			FRIDAY (PM)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Mamatwan Access Road)	24.9	C	0.082	11.3	B	0.086
East (Road D3457)	9.0	A	0.131	10.5	B	0.018
West (Road D3457)	9.8	A	0.015	11.4	B	0.059
Intersection	10.4	B	0.131	11.2	B	0.086

TABLE C-1: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2017 WITH THE MINING DEVELOPMENT (SCENARIO 1)

POINT E1: INTERSECTION OF ROAD D3457 AND TSHIPI BORWA MINE ACCESS GATE 1						
<i>Type of intersection control: Free-flow on Road D3457</i>						
<i>Levels of Service Acceptable</i>						
APPROACH	FRIDAY (AM)			FRIDAY (PM)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Tshipi Gate 1)	8.0	A	0.012	8.1	A	0.019
East (Road D3457)	1.6	A	0.062	1.9	A	0.009
West (Road D3457)	0.4	A	0.008	0.4	A	0.022
Intersection	2.1	A	0.062	3.0	A	0.022
POINT E2: INTERSECTION OF ROAD D3457 AND TSHIPI BORWA MINE ACCESS GATE 2						
<i>Type of intersection control: Free-flow on Road D3457</i>						
<i>Levels of Service Acceptable</i>						
APPROACH	FRIDAY (AM)			FRIDAY (PM)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Tshipi Gate 2)	8.0	A	0.007	8.0	A	0.022
East (Road D3457)	3.0	A	0.045	2.5	A	0.007
West (Road D3457)	0.8	A	0.004	0.4	A	0.008
Intersection	3.3	A	0.045	4.9	A	0.0222

TABLE C-2: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2027 WITH THE MINING DEVELOPMENT (SCENARIO 2)

POINT A: INTERSECTION OF ROADS R31 AND R380						
<i>Type of intersection control: Free-flow on Road R31</i>						
Levels of Service Acceptable						
APPROACH	FRIDAY (AM)			FRIDAY (PM)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
East (Road R31)	2.2	A	0.114	0.8	A	0.032
South (Road R380)	9.7	A	0.145	10.8	B	0.095
West (Road R31)	3.2	A	0.075	0.7	A	0.181
Intersection	3.9	A	0.145	1.9	A	0.181
POINT B: INTERSECTION OF ROADS R31 AND UMK MINE ACCESS ROAD						
<i>Type of intersection control: Free-flow on Road R380</i>						
Levels of Service Acceptable						
APPROACH	FRIDAY (AM)			FRIDAY (PM)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Road R380)	0.1	A	0.048	0.1	A	0.055
East (Road 1)	8.4	A	0.007	8.5	A	0.003
South (Road R380)	0.7	A	0.045	0.3	A	0.046
West (UMK Access)	8.4	A	0.012	8.4	A	0.010
Intersection	1.2	A	0.048	0.8	A	0.055
POINT C: INTERSECTION OF ROADS R380 AND D3457						
<i>Type of intersection control: Free-flow on Road R380</i>						
Levels of Service Acceptable						
APPROACH	FRIDAY (AM)			FRIDAY (PM)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Road R380)	4.1	A	0.041	0.7	A	0.032
East (Road D3457)	9.5	A	0.019	8.6	A	0.003
South (Road R380)	2.8	A	0.089	0.8	A	0.028
West (Road D3457)	8.6	A	0.027	8.4	A	0.109
Intersection	4.1	A	0.089	4.4	A	0.109
POINT D: INTERSECTION OF ROAD D3457 AND MAMATWAN MINE ACCESS ROAD						
<i>Type of intersection control: Stop controlled on all approaches</i>						
Levels of Service Acceptable						
APPROACH	FRIDAY (AM)			FRIDAY (PM)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Mamatwan Access Road)	24.9	C	0.082	11.4	B	0.088
East (Road D3457)	9.0	A	0.133	10.4	B	0.021
West (Road D3457)	9.8	A	0.018	11.1	B	0.060
Intersection	10.4	B	0.133	11.2	B	0.088

TABLE C-2: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2027 WITH THE MINING DEVELOPMENT (SCENARIO 2)

POINT E1: INTERSECTION OF ROAD D3457 AND TSHIPI BORWA MINE ACCESS GATE 1						
<i>Type of intersection control: Free-flow on Road D3457</i>						
<i>Levels of Service Acceptable</i>						
APPROACH	FRIDAY (AM)			FRIDAY (PM)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Tshipi Gate 1)	8.0	A	0.012	8.1	A	0.019
East (Road D3457)	1.6	A	0.062	1.9	A	0.009
West (Road D3457)	0.4	A	0.008	0.4	A	0.022
Intersection	2.1	A	0.062	3.0	A	0.022
POINT E2: INTERSECTION OF ROAD D3457 AND TSHIPI BORWA MINE ACCESS GATE 2						
<i>Type of intersection control: Free-flow on Road D3457</i>						
<i>Levels of Service Acceptable</i>						
APPROACH	FRIDAY (AM)			FRIDAY (PM)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Tshipi Gate 2)	8.0	A	0.007	8.0	A	0.022
East (Road D3457)	3.0	A	0.045	2.5	A	0.007
West (Road D3457)	0.8	A	0.004	0.4	A	0.008
Intersection	3.3	A	0.045	4.9	A	0.0222

APPENDIX D

LEVEL OF SERVICE CRITERIA DESCRIPTION

TABLE D-1: LEVEL OF SERVICE CRITERIA DESCRIPTION FOR UNSIGNALISED INTERSECTIONS

LEVEL OF SERVICE	AVERAGE TOTAL DELAY (SEC/VEH)	PERFORMANCE EVALUATION
A	≤ 5	Excellent
B	> 5 and ≤ 10	Very Good
C	>10 and ≤ 20	Good
D	>20 and ≤ 30	Average
E	>30 and ≤ 45	Poor
F	>45	Fail

TABLE D-2: LEVEL OF SERVICE CRITERIA DESCRIPTION FOR SIGNALISED INTERSECTIONS

LEVEL OF SERVICE	AVERAGE TOTAL DELAY (SEC/VEH)	PERFORMANCE EVALUATION
A	≤ 5	Excellent
B	> 5 and ≤ 15	Very Good
C	> 15 and ≤ 25	Good
D	> 25 and ≤ 40	Average
E	> 40 and ≤ 60	Poor
F	> 60	Fail

Level of Service criteria obtained from *The Highway Capacity Manual (Special Report 2009)*

APPENDIX E

SUMMARY OF IMPACT RATINGS

TABLE E-1: IMPACT RATING

RECEPTOR	ACTIVITY	IMPACT	BEFORE MITIGATION					AFTER MITIGATION					Comments and Mitigation Measures		
			Intensity	Duration	Spatial Scale	Consequence	Probability	Significance	Intensity	Duration	Spatial Scale	Consequence		Probability	Significance
Road and Traffic	Road Capacity	1. Relevant road sections (reconstructing/repairing of roads)	L	M	M	Low	H	Med	L	M	M	Low	H	Med	(Capacity is no problem and the proposed development is anticipated to generate an insignificant volume of vehicle traffic on the relevant roads network during peak periods.
		2. Relevant intersections (need for additional lanes)	L	M	M	Low	H	Med	L	M	M	Low	H	Med	See Section 3.2 of the report and Appendix C of the report. (No additional lanes required at relevant intersections from a road capacity point of view)
	Road Safety Issues	3. Intersection (access) spacing	L	H	M	Med	H	High	L	H	M	Med	H	High	Intersection spacing acceptable.
		4. Vertical road alignment	L	H	M	Med	H	High	L	H	M	Med	H	High	Road Alignment acceptable.
		5. Available sight distance at intersection	L	H	M	Med	H	High	L	H	M	Med	H	High	See Item 1.1.2 of Table 2.9. Sight Distances acceptable.
		6. Speed limit	L	H	M	Med	H	High	L	H	M	Med	H	High	Acceptable.
		7. Relevant intersections (need for dedicated left- and right-turn lanes, Point C)	M	H	M	High	M	High	M+	H	M	High+	M	High+	See Table 3.1. Dedicated right-turn required.
		8. Pedestrian movements (with reference to access roads and intersections)	L	H	M	Med	H	High	L	H	M	Med	H	High	See Item 3.1 of Table 2.9. In general pedestrians do not walk along the relevant road sections under investigation. All pedestrian movement occur within the development boundaries.
		9. Public transport loading and off-loading	L	H	M	Med	H	High	L	H	M	Med	H	High	See Item 4.1 of Table 2.9. Workers and visitors are loaded and off loaded within the mining development boundaries at dedicated loading areas.

APPENDIX F

IMPACT RATINGS CRITERIA

TABLE E-1: CRITERIA USED IN THE ASSESSMENT OF IMPACTS

PART A: DEFINITION AND CRITERIA*					
Definition of SIGNIFICANCE		Significance = consequence x probability			
Definition of CONSEQUENCE		Consequence is a function of severity, spatial extent and duration			
Criteria for ranking of the SEVERITY of environmental impacts	H	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.			
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.			
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.			
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.			
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.			
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.			
Criteria for ranking the DURATION of impacts	L	Quickly reversible. Less than the project life. Short term			
	M	Reversible over time. Life of the project. Medium term			
	H	Permanent. Beyond closure. Long term.			
Criteria for ranking the SPATIAL SCALE of impacts	L	Localised - Within the site boundary.			
	M	Fairly widespread – Beyond the site boundary. Local			
	H	Widespread – Far beyond site boundary. Regional/ national			
PART B: DETERMINING CONSEQUENCE					
SEVERITY = L					
DURATION	Long term	H	Medium	Medium	Medium
	Medium term	M	Low	Low	Medium
	Short term	L	Low	Low	Medium
SEVERITY = M					
DURATION	Long term	H	Medium	High	High
	Medium term	M	Medium	Medium	High
	Short term	L	Low	Medium	Medium
SEVERITY = H					
DURATION	Long term	H	High	High	High
	Medium term	M	Medium	Medium	High
	Short term	L	Medium	Medium	High
			L	M	H
			Localised Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional/ national
SPATIAL SCALE					
PART C: DETERMINING SIGNIFICANCE					
PROBABILITY (of exposure to impacts)	Definite/ Continuous	H	Medium	Medium	High
	Possible/ frequent	M	Medium	Medium	High
	Unlikely/ seldom	L	Low	Low	Medium
			L	M	H
CONSEQUENCE					
PART D: INTERPRETATION OF SIGNIFICANCE					
Significance		Decision guideline			
High		It would influence the decision regardless of any possible mitigation.			
Medium		It should have an influence on the decision unless it is mitigated.			
Low		It will not have an influence on the decision.			

APPENDIX G

PROFESSIONAL REGISTRATION AND CIRICULAM VITAE

Suid-Afrikaanse Raad vir Ingenieurswese



Hiermee word
gesertifiseer
dat

Leon Roets

geregistreer is as

Professionele Ingenieur

kragtens die Wet op die Ingenieurswese-professie van Suid-Afrika
1990 (Wet 114 van 1990)

Datum *14 November 1996*

Registrasienuommer *960547*

A handwritten signature in black ink, appearing to read 'W. Stellen', is written above a horizontal line.

President

A large, stylized handwritten signature in black ink is written above a horizontal line.

Registrateur





Die Suid-Afrikaanse Instituut van Siviele Ingenieurswese

Hiermee word gesertifiseer dat

Leon Roetz

behoorlik verkies is as

Lid

Lidnommer: 206744

van

Die Suid-Afrikaanse
Instituut van Siviele Ingenieurswese
op

29 September 2006

Uitgereik onder die seël van die Instituut
Onder resoluëie van die Raad

President

Uitvoerende Direkteur





SOUTH AFRICAN ROAD FEDERATION

This is to certify that

Leon Roets

ID No: 6510145135085

Has successfully attended a 5 day course on

ROAD SAFETY AUDITS

CPD VALIDATION NUMBER: SARF14/0003/17 (5 CREDITS)

SARF

better roads

Stefan Lotter
Presenter

Innocent Jumo
SARF President

13TH JULY – 17TH JULY 2015
GAUTENG – SANRAL – NORTHERN REGION

ENGINEERING COUNCIL OF SOUTH AFRICA

Registration No.: 960547
Enquiries: Queen Nyembezi
Tel: (011) 607-9500
Fax: (011) 622-9592
E-Mail: queen@ecsa.co.za



28 November 2016

Mr L Roets Pr Eng
P O Box 11182
BENDOR PARK
0699

Dear Mr Roets

RENEWAL OF PROFESSIONAL REGISTRATION IN TERMS OF SECTION 22(1) OF THE ENGINEERING PROFESSION ACT, 2000 (ACT 46 OF 2000)

Please be informed that your application for the renewal of your professional registration, in terms of Section 22(1) of the Engineering Profession Act, 2000 (Act 46 of 2000), has been successful and your registration has been renewed for a further period of five (5) years until 14 November 2021.

Congratulations, on the continued recognition of your status as a Professional Engineer.

Yours faithfully

Joel Matshela Mmapulane
Manager: Education, Accreditation and CPD

www.ecsa.co.za

ENGINEERING COUNCIL OF SOUTH AFRICA
1st Floor Waterview Corner 2 Ernst Oppenheimer Ave Bruma
Private Bag X691 Bruma Johannesburg South Africa 2026
Tel: +27 11 607 9500 | Fax: +27 11 622 9295 | E-mail: engineer@ecsa.co.za

TRANSPORT & TRAFFIC ENGINEER CV

PERSONAL PARTICULARS

Name and Surname: Leon Roets
 Identity Number: 6510145135085
 Nationality: South African
 Prof. Registration: 960547 - Professional Engineer



ACADEMIC QUALIFICATIONS

B Eng. (Civil Eng.) University of Pretoria, 1988

PROFESSIONAL MEMBERSHIP

Engineering Council of South Africa (ECSA)

EMPLOYMENT RECORD

01/2002 – Current: Traffic Engineer Technical Director to SIYAZI Group of Companies
 01/2002 – Current: Office Manager for SIYAZI Limpopo (Pty) Ltd
 01/2002 – Current: Director and shareholder, SIYAZI Holdings (Pty) Ltd, SIYAZI Limpopo, SIYAZI-Thula, SIYAZI Gauteng and SIYAZI Free State
 07/1996 – 12/2003: Office Manager for all SIYAZI activities in the Limpopo Province
 07/1996 – 12/2003: Director and shareholder, SIYAZI Transportation & Services CC
 11/1994 – 06/1996: Representative of Africon Consulting Engineers Inc., Transportation Planning Division in the then Northern Province, based in Polokwane
 08/1992 - 10/1994: Africon Consulting Engineers Inc., Transport Planning Division in Pretoria
 06/1990 - 08/1992: Lexetran, Transport Planning Division of the then Van Wyk & Louw Group

Mr Roets has a total of 24 years experience. He is a Transport and Traffic Engineer with wide experience in transportation planning and modelling, data processing as well as Traffic Impact Studies.

MR ROETS COMPLETED A CONSIDERABLE NUMBER OF TRAFFIC IMPACT STUDIES FOR ALL TYPES OF DEVELOPMENTS, WHICH VARIES FROM BASIC RESIDENTIAL DEVELOPMENTS TO MAJOR SHOPPING CENTRE DEVELOPMENTS. THE FOLLOWING PROVIDES A SUMMARY OF SOME OF THE PROJECTS SPECIFICALLY RELATED TO MINE ACTIVITY:

Project	Client
Siyazi Transport & Technical and Liaison Assistance for Tripartite Forum (Twickenham)	Rustenburg Platinum Mine Limited- Mogalakwena Section
Mogalakwena Section Mine - Road Safety	Anglo American
Existing Aquarius Platinum Mine (Rustenburg) Transport Route Investigation (Proposed ROM Ore Transport by Road from K6 and Kwezi Shafts to AQPSA Kroondal Smelter)	SLR Consulting Engineers (Metago)
Twickenham Platinum Mines Integrated Transport Management Plan	WorleyParsons
7-day Electronic Counts for Two Rivers Platinum Mines	Two Rivers Platinum Mine
Proposed Scheiding Chrome Mine, Limpopo Province	Prime Resources (Pty) Ltd
Traffic Impact Assessment for Fumani Gold Mine	Ages (Pty) Ltd
Proposed CSP and PV Solar Power Plants near Jacobsdal, Free State	SLR Consulting Engineers
Proposed Siyanda Chrome Smelter, Northam, Limpopo	SLR Consulting Engineers
Traffic assessment for AQPSA, Rustenburg	SLR Consulting Engineers
Existing PPM mine near Pilanesberg, North West Province expansion	SLR Consulting Engineers
Proposed Musonoi Mine Situated near the Town of Kolwezi, Democratic Republic of Congo: Traffic Impact Assessment	Metago Environmental Engineers (PTY) Ltd
Botswana Traffic Impact Assessment	SLR Consulting Engineers (Metago)
Proposed division of Road P50-1 near Pilanesberg	SLR Consulting Engineers (Metago)
Development of The Eastern Limb Mining Land Transport Strategy (ELM-LTS)	Steelpoort Valley Producers Forum
Proposed Kotulo Tsatsi Solar Park near Kenhardt, Northern Cape	Savannah Environmental (Pty) Ltd
Proposed Leeuw Mining Coral Mine: Utrecht KZN	SLR Consulting Engineers (Metago)
Proposed Moonlight Iron Ore Mining Development situated in the Waterberg District of the Limpopo Province: Traffic Impact Assessment	SLR Consulting Engineers (Metago)

Project	Client
Proposed Upgrading Kinsenda Copper Mine, Situated near the town of Likasi, in the DRC	SLR Consulting Engineers (Metago)
Traffic Impact Assessment for Intersection between Windhoek and Swakopmund	Metago Environmental Engineers (Pty) Ltd
Traffic Impact Assessment: Proposed Hawerklip Railway Station Situated on the Farm Matjisgoedkuil 266-IR Near Delmas	Metago Environmental Engineers (Pty) Ltd
Road Safety Project for Road R555	Steelpoort Producers Forum
Road Safety Project for Road R37, between Olifantsrivier and Burgersfort	Steelpoort Producers Forum
Kameni Product Transport Feasibility Study	Kameni
Proposed New PGM Mine Situated on the Farms Kalkfontein and Buffelshoek in the Steelpoort Area	Metago Environmental Engineers (Pty) Ltd
Proposed New Manganese Mining Operation, NCMC: Traffic Impact Assessment, Kuruman	Metago Environmental Engineers (Pty) Ltd
Project Management Road N11, Road Safety Project	Economic Sector Forum
Twickenham Public Transport System	Twickenham Platinum Mine
Road Master Plan for Mines in the Sekhukhune District	Steelpoort Producers Forum
Traffic Related Input for Realignment of Road N11	Economic Sector Forum in conjunction with SANRAL
Access to the Polokwane Smelter (Road R37)	Economic Sector Forum
Greenfield Expansion Project, Traffic Impact Assessment for Lwala Smelter	Semancor
Road R37 upgrade in Burgersfort for SANRAL	Steelpoort Producers Forum
Road Master Plan for Burgersfort	Steelpoort Producers Forum
Application to upgrade the existing Access Road D4170 to Road R37 (Modikwa Platinum Mine)	Steelpoort Producers Forum
New concentrator and smelter complex at Hercul's Bokfontein Chrome Mine on the farm Bokfontein 448 JQ near Brits in North West Province	Metago Environmental Engineers (Pty) Ltd
Proposed Development of a Manganese Mining Operation	Metago Environmental Engineers (Pty) Ltd
R555/Tweefontein Road Safety Project (Xtrata)	Xstrata Alloys Lion Ferrochrome
Traffic Related Input for Road R555	Steelpoort Producers Forum
Proposed Manganese Mining Operation On Portion 1 Of The Farm Lehating 741 Near Hotazel, Northern Cape Province	SLR Consulting Engineers (Metago)
Proposed Mokala Manganese Mine Situated Near Hotazel, Northern Cape Province	SLR Consulting Engineers (Metago)
Background Information on the Environmental Assessment for the proposed expansion of Eland Platinum Mine	Metago Environmental Engineers (Pty) Ltd
Development of an opencast and underground coal mining operation – Keaton Mine	Metago Environmental Engineers (Pty) Ltd
Mogalakwena Economic Sector, Transport related input for Mogalakwena Economic Sector	Economic Sector Forum
Traffic Counts Road R37	Steelpoort Producers Forum
Planning of multi modal facility for Burgersfort	Steelpoort Producers Forum
Provide input into traffic safety along Road R37	Steelpoort Producers Forum
Input into the transport of workers (Dilokong corridor)	Steelpoort Producers Forum
Strategy for Travel Demand Management for the Greater Tubatse Municipality and modelling for the R37 road	Steelpoort Producers Forum
Strategy to transport workers at the Modikwa Shaft	Modikwa Mine

SOME OF MR ROETS' OTHER TRAFFIC AND TRANSPORT ENGINEERING EXPERTISE AND EXPERIENCE INCLUDE THE FOLLOWING:

a) Shopping Centres that Range from 2 000 m² to 60 000 m²

b) Various Filling Station Developments

c) Integrated Transport Plans for Various Local and District Municipalities

- Vhembe
- Ba-Phalaborwa
- Polokwane
- Sekhukhune
- Thulamela
- Limpopo
- Mogalakwena

d) Public Transport Plans for Various Local and District Municipalities

- Mopani
- Vhembe
- Tubatse
- Capricorn

e) Design and Layout of Traffic Light System

f) Residential Development that vary from 100 to 12 000 stands

In conclusion the following are relevant:

The above-mentioned successful projects are a clear indication that Mr Roets is fully committed to sustainable development, and believes strongly in the following principles:

- a) Providing safe, secure and reliable traffic-related facilities
- b) Maintaining a balance between traffic engineering and the potential to create job opportunities. In other words, doing everything possible to take certain measures that would ensure the functionality of the proposed developments
- c) Acting as a link between the developer and the relevant authority to ensure that development takes place successfully
- d) Using his knowledge of local circumstances and conditions to the benefit of the local community, in order to stimulate job creation
- e) Using his expertise, experience and qualifications to best effect in the belief that these should serve as a catalyst for job creation as far as is practically possible.

Leon Roets has the distinct advantage of possessing profound knowledge of transport and traffic issues of engineering. This in-depth knowledge in various fields, combined with the extensive knowledge that Siyazi has gained and also his record of successful co-operation with transport-related role players, his knowledge of the road network and the transport environment, probably makes Leon Roets one of the best candidates to provide traffic-related input for this project.

SOME OF THE TRANSPORT PLANNING PROJECTS THAT LEON ROETS HAD BEEN INVOLVED IN THE LIMPOPO PROVINCE INCLUDE:

Authority / Project Description	Transport Forum	CPTR	OLS	RATPlan	PTP	ITP	LITP	DITP	Business Plans	Liaison	Public Transport Intermodal Facilities	Public Transport Facilities	Colour Coding	Transport Framework	Corridor Planning	Year
Technical Advisor – Taxi Industry Polokwane Integrated Rapid Transit									Y	Y		Y			Y	2015-2011
Elim Mall, Tzaneng Mall, Tzaneen Crossing, Tzaneen Lifestyle Centre, Burgersfort Mall, Malamulele												Y				2012-1998
Greater Tubatse Municipality	Y									Y						2013-2003
Road R37 between Polokwane and Burgersfort (Dlokong Corridor)										Y					Y	2013-2003
Polokwane Intermodal Facilities, as part of Prism Consortium (Planning)											Y					2013-2010
Thohoyandou Intermodal Facilities, as part of MCE Consortium											Y					2013-2010
Giyani Intermodal Facility, Taxi Facilitation																2013-2010
Giyani, Makhado, Thohoyandou, Burgersfort, Special advisor for Intersite								Y			Y					2013-2010
Vhembe District Municipality																2010
Burgersfort, Road Master Network															Y	2009-2007
Mogalakwena Local Municipality	Y						Y									2009-2006
Ba-Phalaborwa Local Municipality																2008
Mogalakwena Local Municipality							Y								Y	2008
Mogalakwena, Relocation and Road Safety of Road N11																2008
Fetakgomo Local Municipality	Y															2007-2005
Polokwane, 2010 Priority Statement (PTIS)								Y								2007-2005
Polokwane Local Municipality							Y									2007
Mogalakwena Local Municipality							Y									2007
Polokwane Local Municipality	Y															2006-1997
Sekukhune District Municipality							Y	Y								2006
Taxi Recapitalisation for Limpopo Department of Roads & Transport									Y							2005-2004
Limpopo Department of Roads and Transport													Y			2004
Part of team for Limpopo in Motion														Y		2004
Greater Tubatse Municipality		Y	Y	Y	Y	Y										2003
Capricorn District Municipality		Y														2003
Vhembe District Municipality		Y	Y	Y	Y	Y										2003
Mopani District Municipality		Y	Y	Y	Y	Y										2003
Pietersburg-Polokwane Transport Strategy							Y									2000
Polokwane, N1 Eastern bypass															Y	2000
Pietersburg-Polokwane Public Transport Strategy					Y											1997