

DRAFT MEMORANDUM

BASELINE TRAFFIC STUDY

**PROPOSED VYGENHOEK MINE TO BE SITUATED ON THE
FARM VYGENHOEK 10 JT NEAR LYDENBURG, THABA
CHWEU MUNICIPALITY, MPUMALANGA PROVINCE**



JULY 2020

Prepared for:

**Environmental Management Assistance (Pty) Ltd
P.O Box 386
Sundra
2000
South Africa**



Prepared by:

**Siyazi Limpopo Consulting
Services (Pty) Ltd
PO Box 11182
Bendor, 0699**

Siyazi Reference: 20041



Declaration of Independence

I, Leon Roets, hereby declare that Siyazi Limpopo Consulting Services (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.

Consultant name: Leon Roets

Signature:

A handwritten signature in black ink, appearing to read 'Roets', written over a horizontal line.

Date: 16 July 2020

VERIFICATION PAGE

PROJECT NAME:	PROPOSED VYGENHOEK MINE TO BE SITUATED ON THE FARM VYGENHOEK 10 JT NEAR LYDENBURG, THABA CHWEU MUNICIPALITY, MPUMALANGA PROVINCE	
<u>Project No:</u> 20041	<u>Date:</u> July 2020	<u>Report Status:</u> Draft F1-0
<u>Prepared by:</u> Siyazi Limpopo Consulting Services (Pty) Ltd P. O. BOX 11182 Bendor 0699		<u>Commissioned by:</u> Environmental Management Assistance (Pty) Ltd P.O Box 386 Sundra 2000 South Africa
<u>Author:</u> Paul van der Westhuizen <u>Contact information:</u> Cell: +27 79 690 8069 Email: paul@siyazi.co.za		<u>Report reviewed by and compiled under the supervision of:</u> Leon Roets (Pr Eng) Professional Number: 960547 <u>Contact information:</u> Cell: +27 82 371 0253 Email: leon@siyazi.co.za
<u>Declaration by registered professional:</u> The undersigned has been appointed as the registered professional for this Baseline Traffic Study and has applied due diligence to the content of this report and endeavoured to ensure that the study is free of technical errors and takes full responsibility for its contents.		
Name:	Leon Roets	
Address:	Plot 22 Doornbult, Polokwane, Limpopo Province	
Contact Details:	Cell: +27 82 371 0253 Email: leon@siyazi.co.za	
Qualifications:	B Eng (Civil Eng.)	
ECSA Registration Number:	960547 (Attached to report)	
Signature:		

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Section 1

INTRODUCTION

Siyazi Limpopo Consulting Services (Pty) Ltd. was appointed by Environmental Management Assistance (Pty) Ltd. to prepare a Baseline Traffic Impact Assessment (TIA) for the proposed Vygenhoek mine, hereafter referred to as the proposed mining development, to be situated on the Farm Vygenhoek 10 JT within the Thaba Chweu Municipality near Lydenburg, Mpumalanga Province. The proposed mining development is proposing to mine for a period of 10 years (life of mine) by means of open pit mining after which the mined product would be sold and transported to third parties for further processing.

The purpose of the baseline traffic study is:

- a) To determine the status quo of the relevant road network adjacent the proposed mining development; and
- b) To determine and identify any potential constraints for the proposed mining development.

Figure 1.1 provides the locality of the proposed mining development in relation to other activities in the vicinity, including the location of the intersections under investigation as part of this study while **Figure 1.2** provides a concept graphical presentation of the proposed mining development site layout as provided by Environmental Management Assistance (Pty) Ltd.

The following sections of the report elaborate on the:

- a) **Section 2:** Detailed Information Related to data collected and investigations.
- b) **Section 3:** Findings and Recommendations of the existing road network and the identified potential road related constraints for the proposed mining development.

POINT	INTERSECTION STATUS	INTERSECTION	GPS CO-ORDINATES	
			LATITUDE	LONGITUDE
A	Existing	Roads D212 and D874	S25° 4'40.46"	E30°13'15.36"
B	Existing	Road D874 and Local Road	S25° 5'41.44"	E30°10'45.44"

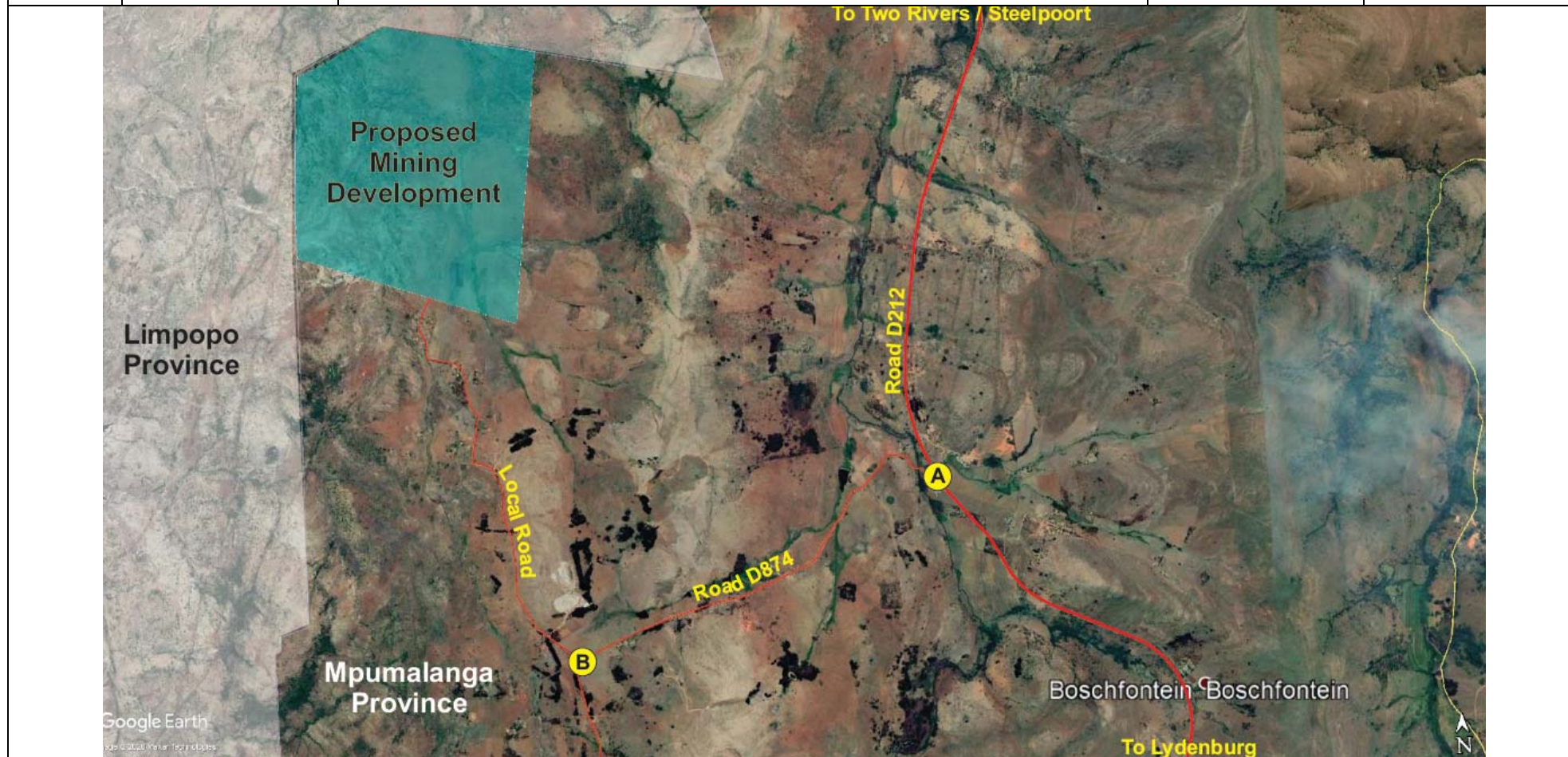


FIGURE 1.1: LOCALITY OF PROPOSED MINING DEVELOPMENT AND RELEVANT INTERSECTIONS UNDER INVESTIGATION

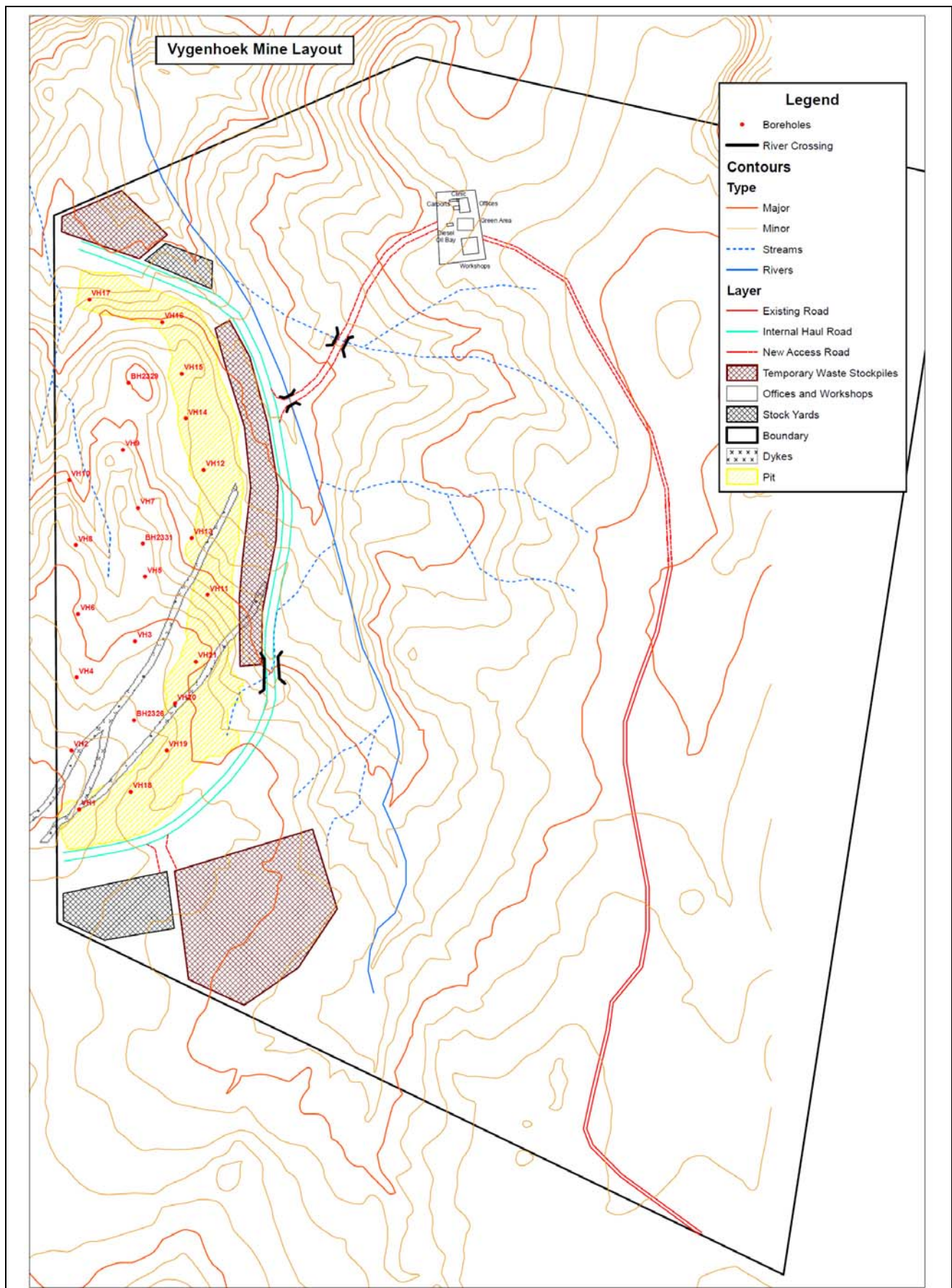


FIGURE 1.2: GRAPHICAL PRESENTATION OF THE PROPOSED MINING DEVELOPMENT SITE LAYOUT

Source: Environmental Management Assistance (Pty) Ltd

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 road network characteristics of roads relevant to the proposed mining development which consists of the following information:
 - i) Existing land use information;
 - ii) Existing road characteristics and modal distribution; and
 - iii) Traffic counts as basis for making traffic-engineering calculations.
- b) The future land use and road network characteristics relevant to the proposed mining development which consists of the following information;
 - i) Future land use information, including existing and proposed approved future developments in the area other than the proposed mining development; and
 - ii) Determination of vehicle trips expected to be generated due to the proposed mining development.
- c) The current levels of service at the relevant intersections under investigation;
- d) Access to and from the proposed mining development; and
- e) Other traffic-related matters.

The following subsection elaborates on the above mentioned.

2.1 STATUS QUO OF LAND USE, AS WELL AS ROAD NETWORK 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 proposed mining development is currently vacant with some agricultural activities within the area. For the purpose of this baseline traffic study, it is assumed 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.

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) **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 (If applicable).
- c) **Figures 2.1 and 2.2** provide a graphical presentation of the existing road network layout for the area under investigation.
- 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

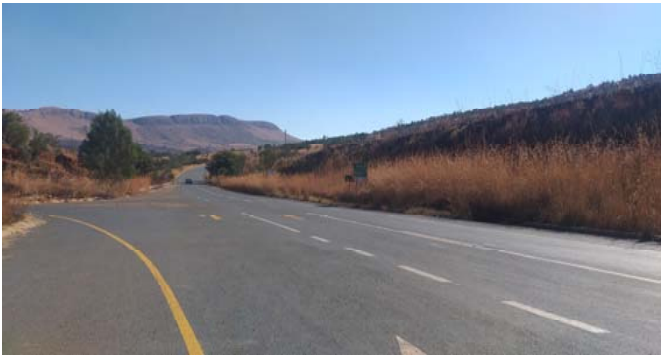
POINT	DESCRIPTION	INTERSECTION CONTROL	PEDESTRIAN ACTIVITIES	INTERSECTION PHOTO
A	Roads D212 and D874	Free-flow on Road D212	No Pedestrian activity observed during surveys	
B	Road D874 and Local Road	Free-flow on Road D874	No Pedestrian activity observed during surveys	

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 D212 Road link between Road R555 to Steelpoort and Road R577 to Lydenburg			Primary Function: Activity and Access			Proposed Function: Activity and Access			Mpumalanga Department of Public Works, Roads and Transport	±40m	One lane per direction	3.7m wide with 2.0m paved shoulder	Asphalt	None.	4%	60 km/h for relevant sections.
Class	Class No.	Route No.	Class	Class No.	Route No.											
Collector	R4	D	Collector	R4	D											
Description: Collector road			Description: Collector road													
Spacing between Intersections: 600 - 800m			Spacing between Intersections: 600 - 800m													
Road Section 2 Road D874 Providing access to local communities and farms from and to Road D212			Primary Function: N/a			Primary Function: N/a			Mpumalanga Department of Public Works, Roads and Transport	±30m	One lane per direction	3.5m wide	Gravel	None.	N/a	40 km/h
Class	Class No.	Route No.	Class	Class No.	Route No.											
Collector	R4	D	Collector	R4	D											
Description: Collector road			Description: Collector road													
Spacing between Intersections: 600 - 800m			Spacing between Intersections: 600 - 800m													

TABLE 2.2: SUMMARY OF ROAD CHARACTERISTICS (Continue...)

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 3 Local Road Township access to Road D874		Primary Function: Activity / Access			Proposed Function: Activity / Access			Thaba Chweu Local Municipality	±20m	Single lane for most of road	3.7m wide	Gravel	None.	3%	40km/h
		Class	Class No.	Route No.	Class	Class No.	Route No.								
		Local Road	R5	N/a	Local Road	R5	N/a								
		Description: Access road			Description: Access road										
		Spacing between Intersections: 450 - 600m			Spacing between Intersections: 450 - 600m										

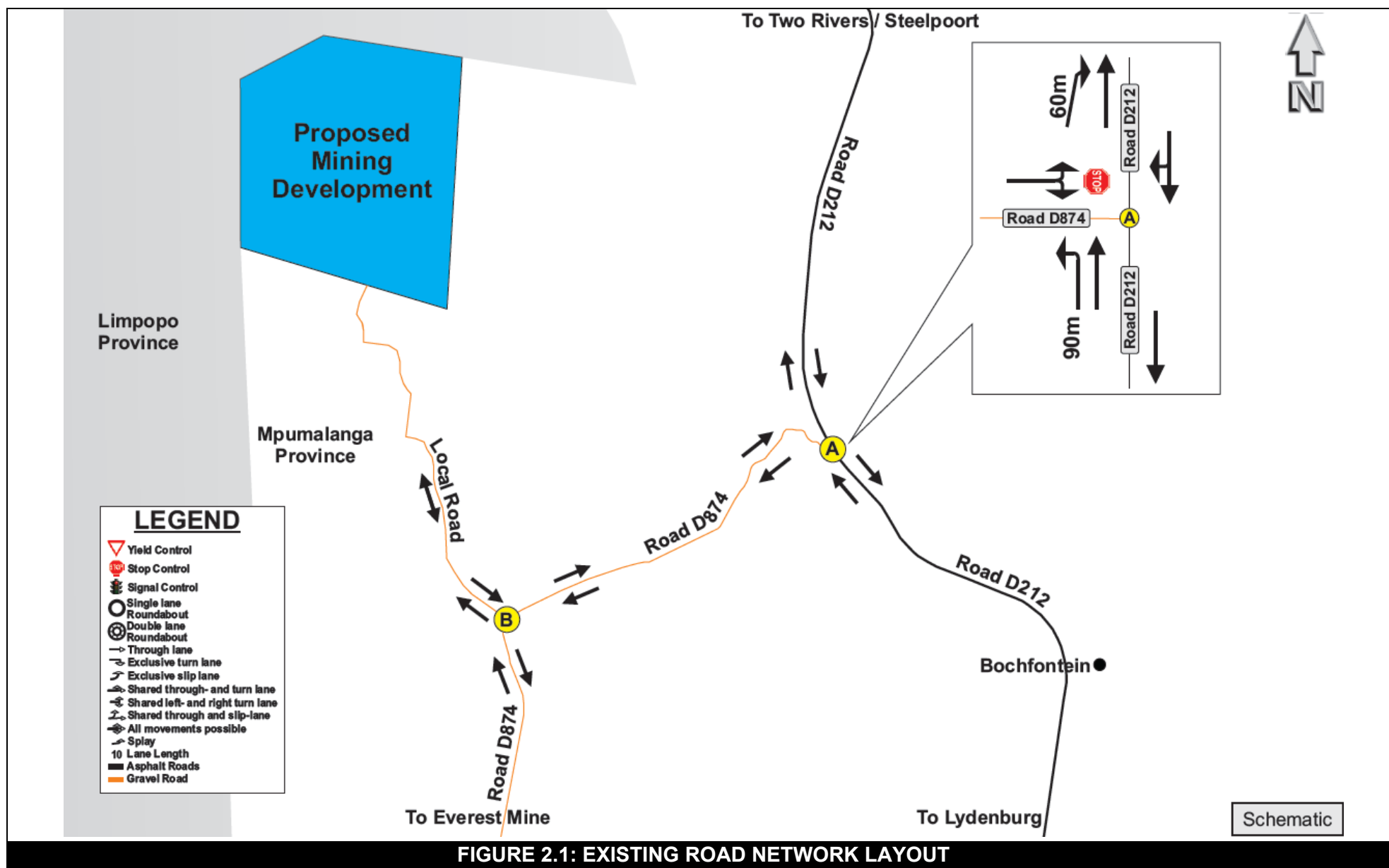


TABLE 2.3: RURAL FUNCTIONAL ROAD CLASIFICATION
(COTO TRH26 - SOUTH AFRICAN ROAD CLASSIFICATION AND ACCESS MANAGEMENT MANUAL VERSION 1.0 AUGUST 2012)

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	INTERSECTION SPACING	PARKING	SPEED km/h	INTERSECTION CONTROL	TYPICAL CROSS SECTION	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*	8.0km	No (off road rest stops allowed)	120	Grade separated or priority to through	2/3/4 lane, surfaced shoulders, climbing lanes	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 */**	5.0km	No (off road rest stops allowed)	120	Priority or grade separated	2/3 lane, surfaced shoulders, climbing lanes	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 */**	1.6km	No (off road rest stops allowed)	100 - 120	Priority, roundabout	2 lanes surfaced, gravel shoulders	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	600 - 800m	No (off road edge or in lay byes / viewpoints)	80 - 100	Priority	2 lanes surfaced or gravel, gravel shoulders	3.5m	25m	As required	Rare, isolated	Widen roadway	Widen shoulder
	R 5	Local road	Farm road	Allowed , T (tourist) or L (local)	Yes	450 - 600m	No (on verge or shoulder)	60 - 80	Priority	1/2 lane gravel, 600mm concrete strips in environmental areas		20m	As required	Rare	Use roadway	Use roadway
	R 6	Walkway	Track or pathway	No	Yes	N/a	n/a							Not constructed, formed by use		

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

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 proposed mining development, 12-hour manual traffic counts were conducted at existing intersections that could potentially be affected by the proposed 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 3 July 2020 at the intersection of Roads D212 and D874 (**Point A**).

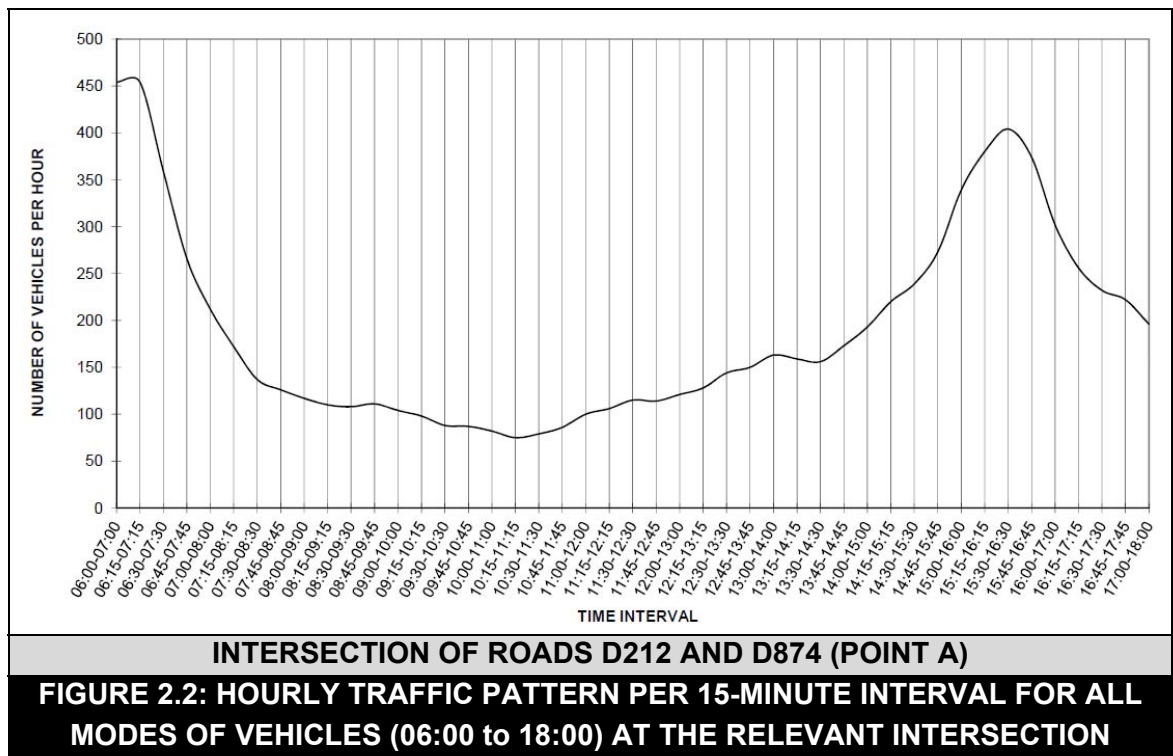
Due to a very low vehicle volumes along Road D874 it was not deemed necessary to include vehicle traffic counts at the intersection of Road D874 and the Local Road (**Point B**).

The combined hourly totals of all the vehicle types for the traffic survey conducted on Friday 3 July 2020 between 06:00 and 18:00 are indicated in **Table A-1** of **Appendix A** of this report. The description of the relevant vehicle movements at the relevant intersection appears in **Figures A-1 Appendix A**. **Figure B-1** provides a graphical presentation of the peak-hour traffic volumes as derived from the relevant manual traffic count.

The respective peak-hour flows for the traffic count at the relevant intersection was identified as indicated in **Table 2.5** below.

TABLE 2.5: PEAK HOUR PERIODS AT THE RELEVANT INTERSECTION					
POINT	INTERSECTION	AM PEAK		PM PEAK	
		TIME INTERVAL	NUMBER OF VEHICLES	TIME INTERVAL	NUMBER OF VEHICLES
A	Roads D212 and D874	06:15 to 07:15	454	15:30 to 16:30	404

Figure 2.2 indicates the hourly traffic pattern, per 15-minute interval, for all modes of vehicles at the relevant intersection between 06:00 and 18:00 on Friday 3 July 2020. A graphical presentation of the peak-hour vehicle flows is indicated with **Figure B-1** of **Appendix B**.



2.2 FUTURE LAND USE AND ROAD CHARACTERISTICS

The following are relevant:

- Future land use information, including existing and proposed approved future developments in the area; and
- Determination of the vehicle trips anticipated to be generated due to the proposed mining development.

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

2.2.1 FUTURE LAND USE INFORMATION, INCLUDING EXISTING AND PROPOSED APPROVED FUTURE DEVELOPMENTS IN THE AREA

At the time of conducting this study, there were no known approved latent developments within the area under investigation that would have a significant impact on the relevant road network adjacent to proposed mining development.

2.2.2 DETERMINATION OF THE VEHICLE TRIPS ANTICIPATED TO BE GENERATED DUE TO THE PROPOSED MINING DEVELOPMENT.

As part of the proposed mining development an increase in vehicle traffic volumes is expected due to the transportation of staff, delivery of operational consumables and production. The detailed vehicle trip generation anticipated due to the proposed mining development is not part of the baseline study and would be conducted as part of the full traffic impact assessment.

2.3 DETERMINATION OF THE LEVELS OF SERVICE AT THE RELEVANT INTERSECTIONS

The “*SIDRA Intersection*” software was used as an aid for the evaluation of the existing levels of service of the intersection of Road D212 and D874 (Point A). In **Appendix C, Table C-1** indicates the levels of service and the degree of saturation calculated for the relevant intersection, as part of the baseline study, for the following scenario:

- a) **Table C-1:** Levels of service for various approaches for the year 2020 (background traffic) **without** the proposed mining development (**Scenario 1**).
- b) More scenarios will be developed as part of the full traffic impact assessment.

From **Table C-1** it is possible to note that:

- a) The relevant intersection investigated as part of this study is currently operating at acceptable levels of service; and
- b) Reserve capacity is available at the relevant intersection on the existing road network. The vehicle trips to be generated due to the proposed mining development, will however, determine if road network improvements will be required.

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	Intersection	Direction of Road Section	Capacity per Lane	Number of Lanes	Total Capacity	Actual Number of Vehicles		Reserve Capacity Available	
						2020		2020	
						AM	PM	AM	PM
A	Roads D212 and D874	North (Road D212)	900	1	900	399	52	501	848
		South (Road D212)	900	1	900	55	348	845	552
		West (Road D874)	400	1	400	0	4	400	396

2.4 EXISTING ACCESS TO AND FROM THE PROPOSED MINING DEVELOPMENT SITE

Vehicle access to and from the proposed mining development site is currently by means of a local gravel road which intersects with Road D874 (**Point B**). Broader access to Road D874 is mainly obtained from Road D212 which provides access from the north (Road R555 - Steelpoort) and the south (Road R577 - Lydenburg).

The local road is a two lane gravel road (one lane per direction) for the first 460 meters from the intersection with Road D874 (**Point B**) and then narrows to a single lane gravel road for most of the road section up to the proposed mining development site. This section of the Local Road is shared by vehicle traffic in both directions, has limited passing opportunities on most sections and in general is suitable for light vehicle traffic only.

2.5 OTHER TRAFFIC-RELATED MATTERS

Table 2.7 provides a summary of the following:

- a) Access-related matters in terms of access to and from Road D212 which include:
 - i) Point of Access related matters;
 - ii) Sight distances;
 - iii) Intersection spacing; and
 - iv) Traffic calming measures along Road D212.
- b) Road safety;
- c) Non-motorised transport; and
- d) Public transport.

TABLE 2.7: SUMMARY OF OTHER TRAFFIC-RELATED MATTERS

Item	Description of Element	General Comments				Specific Issues				Actions Required																						
1.	ACCESS - RELATED MATTERS																															
1.1	Access from and to Road D212 (Point A)																															
1.1.1	Point of Access-related matters	a) Broader access from and to Road D874 is mainly gained via an existing intersection with Road D212 (Point A). b) Point A is in an acceptable condition in terms of road markings and road traffic signs.				a) Vehicles turning right at the intersection from the north on Road D212, specifically heavy vehicles in the future as part of the proposed mining development, does so by means of a single lane sharing through and right-turning vehicles which could lead to accidents from vehicles waiting to turn right. b) No reflective road studs are installed.				a) Construct a dedicated right-turn lane on the northern approach of Road D212 as part of the proposed mining development. b) Reflective road studs should be installed at Point A in order to ensure visibility of the intersection geometry to road users at night time.																						
1.1.2	Sight distances	a) Sight distances along Road D212 were inspected visually and were determined to have sufficient sight distance to the northern and southern directions. The current speed limit along Road D212 at the intersection is 60 km/h.				a) None				a) None																						
																																
<table><tr><th colspan="2">Required</th><th colspan="2">Available</th></tr><tr><td>Intersection Sight Distance</td><td>225m</td><td>Intersection Sight Distance</td><td>300m</td></tr><tr><td>Stopping Sight Distance</td><td>90m</td><td>Stopping Sight Distance</td><td>300m</td></tr></table>				Required		Available		Intersection Sight Distance	225m	Intersection Sight Distance	300m	Stopping Sight Distance	90m	Stopping Sight Distance	300m	<table><tr><th colspan="2">Required</th><th colspan="2">Available</th></tr><tr><td>Intersection Sight Distance</td><td>225m</td><td>Intersection Sight Distance</td><td>250m</td></tr><tr><td>Stopping Sight Distance</td><td>90m</td><td>Stopping Sight Distance</td><td>200m</td></tr></table>				Required		Available		Intersection Sight Distance	225m	Intersection Sight Distance	250m	Stopping Sight Distance	90m	Stopping Sight Distance	200m	
Required		Available																														
Intersection Sight Distance		225m	Intersection Sight Distance	300m																												
Stopping Sight Distance		90m	Stopping Sight Distance	300m																												
Required		Available																														
Intersection Sight Distance	225m	Intersection Sight Distance	250m																													
Stopping Sight Distance	90m	Stopping Sight Distance	200m																													
ROAD D212 NORTHBOUND / NORTHERN APPROACH				ROAD D212 SOUTHBOUND / SOUTHERN APPROACH																												
1.1.3	Intersection spacing	a) All intersections are existing intersections and deemed to comply with the required intersection spacing standards.				a) None				a) None																						
1.2	Traffic Calming along Road D212 at Point A																															
1.2.1	Traffic calming along Road D212	a) Traffic calming along Road D212 at the intersection of Roads D212 and D874 is already implemented by means of speed bumps.				a) None.				a) None.																						

TABLE 2.7: SUMMARY OF OTHER TRAFFIC-RELATED MATTERS

Item	Description of Element	General Comments	Specific Issues	Actions Required
2.	ROAD SAFETY ISSUES			
2.1	General road safety	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: 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.	a) The relevant section of Road D874, currently a gravel road, between Points A and B which is approximately 5 kilometres apart and provides broader access from and to Road D212 is in need of some rehabilitation of some sections due to water erosion. b) There is a single lane stream crossing on Road D874 approximately 275 meters from Point A which might not be suitable for an increase in mine related heavy vehicles. c) Housing and small informal settlements along the local gravel road are present and should be avoided as far as practically possible from a road and community safety perspective.	a) Some rehabilitation of the relevant section of Road D874 would be required. b) Further investigation with regards to a single lane stream crossing on Road D874 should be conducted. c) Alternative access to the proposed mining development should be investigated. Refer to Section 3 of this report for the required and recommended intersection improvements.
3.	NON-MOTORISED TRANSPORT			
3.1	Non-motorised transport	a) No pedestrian activity was observed during a site visit at Point A.	a) Pedestrian movements can be expected on the Local Road that currently provide access to the proposed mining development site.	a) Road safety training should be provided to local residents.
4.	PUBLIC TRANSPORT			
4.1	Public transport	a) Three types of public transport commuters would be relevant to the proposed mining development: i) Firstly, workers who will travel to and from the proposed mining development; ii) Secondly, visitors to the proposed mining development; and iii) Residents within the local communities along the access road (Local Road) and within the area.	a) Limited public transport is available in the area.	a) Transport for workers should be by means of arranged or contracted transport.

FINDINGS AND RECOMMENDATIONS OF THE EXISTING ROAD NETWORK AS WELL AS IDENTIFIED POTENTIAL ROAD RELATED CONSTRAINTS FOR THE PROPOSED MINING DEVELOPMENT

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 engineering guideline documents, the following findings and recommendations were made:

3.1 FINDINGS

Based on the investigations conducted as part of this study, the following findings were concluded:

- a) The existing roads network investigated as part of this study is currently operating at acceptable levels of service from a road capacity point of view.
- b) The existing access road (Local Road) that provides access to the proposed mining development site from Road D874 is mostly a single lane gravel road that is shared by vehicle traffic in both directions, has limited passing opportunities on most sections, and in general is suitable for light vehicle traffic only and is therefore deemed to not be suitable for mine related vehicle traffic with specific reference to heavy vehicles.
- c) Housing and a small informal settlement along the Local Gravel road are present and should be avoided by mine related heavy vehicles as far as practically possible from a road and community safety perspective.
- d) Vehicles turning right from the north at the intersection of Roads D212 and D874 (**Point A**), specifically heavy vehicles in the future as part of the proposed mining development, does so by means of a single lane sharing through and right-turning movements which could lead to accidents due to vehicles waiting to turn right and no passing lanes for the through movement.
- e) No reflective road studs are installed at Point A.
- f) The relevant section of Road D874 under investigation (currently a gravel road) between **Points A** and **B** which is approximately 5 kilometres apart and provides broader access from and to Road D212 is in need of some rehabilitation of some sections due to water erosion;
- g) A single lane stream crossing along Road D874 near **Point A** would require investigation in order to determine whether the crossing would be able to accommodate an increase in mine related heavy vehicle traffic for the long-term.

3.2 RECOMMENDATIONS

The following recommendations are made from a traffic engineering point of view:

- a) Alternative road access to the proposed mining development should be investigated since the existing Local Road that provides access from Road D874 is deemed to not be suitable for mine related vehicle traffic with specific reference to heavy vehicles.
- a) Geometric improvements in terms of road safety at the intersection of Roads D212 and D874 (**Point A**) would be required as part of the proposed mining development by means of Construct a dedicated right-turn lane on the northern approach of Road D212.
- b) Reflective road studs should be installed at Point A in order to ensure visibility of the intersection geometry to road users at night time.
- c) Rehabilitation of some sections of Road D874 would be required to ensure that workers, consumable deliveries and mine product could be transported at all times to and from the proposed mining development.
- d) Further investigation with regards to a single lane stream crossing on Road D874 near **Point A** should be conducted in order to determine whether this crossing would be suitable for an increase in heavy vehicle traffic in the long-term.

3.3 POTENTIAL ROAD RELATED CONSTRAINTS AS PART OF THE PROPOSED MINING DEVELOPMENT

No road related constraints could be identified as part of this study for the existing road network in terms of road safety and the anticipated potential vehicle trips that could be generated by the proposed mining development, as long as road safety improvements recommended as part of this report have been implemented.

In relation to road and intersection reserve capacity it can be reported that reserve capacity is available. The extent (number of vehicle trips to be generated) by the proposed mining development will, however, determine if the existing reserve capacity would be sufficient.

APPENDIX A

INFORMATION RELATED TO STATUS QUO

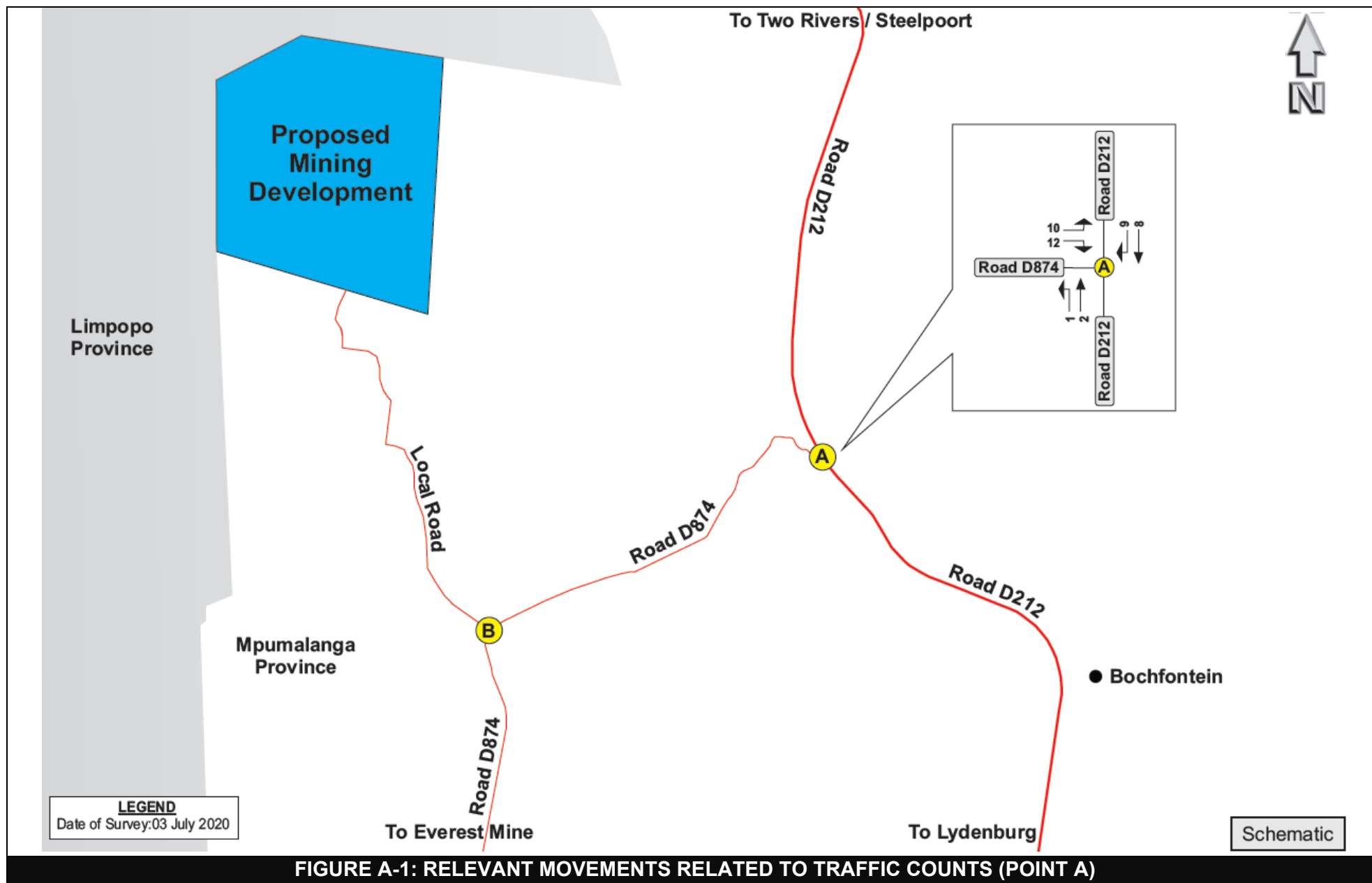


TABLE A-1: HOURLY TRAFFIC COUNTS FOR ALL VEHICLES SIMULTANEOUSLY AT THE INTERSECTION OF ROADS D212 AND D874 (POINT A)

TIME INTERVALS	MOVEMENTS						TOTAL
	1	2	8	9	10	12	
06:00-07:00	1	401	51	1	0	0	454
06:15-07:15	0	399	55	0	0	0	454
06:30-07:30	0	297	60	1	1	0	359
06:45-07:45	0	209	55	1	1	0	266
07:00-08:00	0	149	60	1	1	1	212
07:15-08:15	0	103	65	1	1	2	172
07:30-08:30	0	71	61	0	0	5	137
07:45-08:45	0	60	59	0	2	5	126
08:00-09:00	0	57	53	1	2	4	117
08:15-09:15	1	52	50	1	3	3	110
08:30-09:30	1	56	46	2	3	0	108
08:45-09:45	1	53	54	2	1	0	111
09:00-10:00	1	50	51	1	1	0	104
09:15-10:15	0	44	53	1	0	0	98
09:30-10:30	0	35	53	0	0	0	88
09:45-10:45	0	33	53	0	1	0	87
10:00-11:00	0	31	50	0	1	0	82
10:15-11:15	1	30	43	0	1	0	75
10:30-11:30	1	36	39	0	2	1	79
10:45-11:45	2	29	51	0	2	2	86
11:00-12:00	2	30	63	1	2	2	100
11:15-12:15	1	32	68	1	2	2	106
11:30-12:30	2	29	79	1	1	3	115
11:45-12:45	3	28	78	1	1	3	114
12:00-13:00	3	33	80	0	2	3	121
12:15-13:15	3	33	85	1	3	3	128
12:30-13:30	3	42	94	1	3	1	144
12:45-13:45	2	45	99	1	3	0	150
13:00-14:00	3	44	112	1	3	0	163
13:15-14:15	3	45	108	1	2	0	159
13:30-14:30	2	41	110	1	2	0	156
13:45-14:45	1	46	124	1	1	0	173
14:00-15:00	2	60	129	1	1	0	193
14:15-15:15	2	67	148	2	1	0	220
14:30-15:30	3	72	160	3	1	0	239
14:45-15:45	5	75	186	3	2	2	273
15:00-16:00	3	60	269	4	1	2	339
15:15-16:15	3	51	317	3	4	2	380
15:30-16:30	2	48	346	2	4	2	404
15:45-16:45	0	38	329	3	4	0	374
16:00-17:00	1	43	251	2	5	0	302
16:15-17:15	1	48	200	2	5	0	256
16:30-17:30	1	56	167	2	5	1	232
16:45-17:45	1	66	149	1	4	1	222
17:00-18:00	0	64	124	3	4	1	196

APPENDIX B

TRIP INFORMATION RELATED TO STATUS QUO

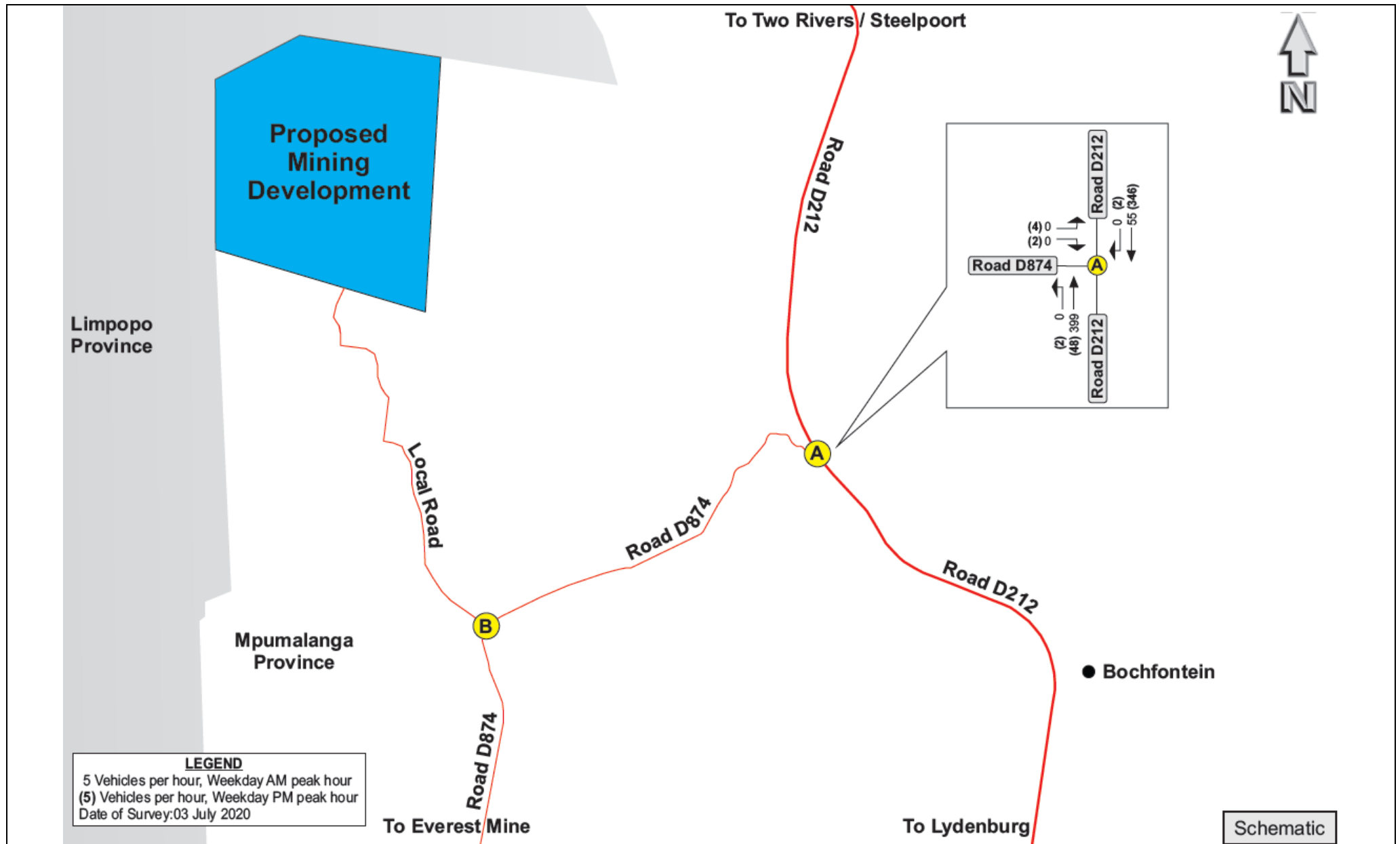


FIGURE B-1: 2020 PEAK HOUR TRAFFIC (BACKGROUND TRAFFIC) (SCENARIO 1)

APPENDIX C

SIDRA CALCULATION RESULTS

**TABLE C-1: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2020
WITHOUT PROPOSED DEVELOPMENT (SCENARIO 1)**

<i>POINT A: INTERSECTION OF ROADS D212 AND D874</i>						
<i>Type of intersection control: Free-flow on Road D212</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 (Road D212)	0.2	A	0.035	0.0	A	0.188
South (Road D212)	0.0	A	0.213	0.2	A	0.028
West (Road D874)	10.8	B	0.003	9.2	A	0.006
Intersection	0.1	A	0.213	0.2	A	0.188

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)*