FINAL MEMORANDUM

TRAFFIC IMPACT ASSESSMENT

PROPOSED LICHTENBURG SOLAR PARK AND POWERLINE TO BE SITUATED NEAR LICHTENBURG, NGAKA MODIRI MOLEMA DISTRICT MUNICIPALITY, NORTH WEST PROVINCE

APRIL 2022

Prepared for:
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AGES Reference: L22 026 E

Prepared by:
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Siyazi Reference: 21069

This report was prepared taking into account the requirements of Appendix 6 as set out in the NEMA Regulations (2014) as amended in 2017.

NEMA Regulations (2014) (as amended) - Appendix 6		Relevant section in report
1	Details of the specialist who prepared the report.	Refer to page V and attached curriculum vitae
2	The expertise of that person to compile a specialist report including a curriculum vitae.	
3	A declaration that the person is independent in a form as may be specified by the competent authority.	Refer to page IV
4	An indication of the scope of, and the purpose for which, the report was prepared.	Section 1, Page 2
5	An indication of the quality and age of base data used for the specialist report.	Section 2.1 Traffic count data
6	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change.	Section 3
7	The duration date and season of the site investigation and the relevance of the season to the outcome of the assessment.	Not relevant to traffic data
8	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used.	Section 2.1 Traffic count data
9	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure inclusive of a site plan identifying site alternative.	Section 2.5
10	An identification of any areas to be avoided, including buffers.	Section 2.5
11	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 2.5
12	A description of any assumptions made and any uncertainties or gaps in knowledge.	Section 2.1.1
13	A description of the findings and potential implications of such findings on the impact of the proposed activity or activities.	Section 3
14	Any mitigation measures for inclusion in the EMPr.	Section 3
15	Any conditions for inclusion in the environmental authorisation.	Section 3
16	Any monitoring requirements for inclusion in the EMPr or environmental authorisation.	None
17	A reasoned opinion as to whether the proposed activity or portions thereof should be authorised and regarding the acceptability of the proposed activity or activities.	Section 3
18	If the opinion is that the proposed 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
19	A description of any consultation process that was undertaken during the course of preparing the specialist report.	Not relevant
20	A summary and copies of any comments received during any consultation process and where applicable all responses thereto.	None raised to date
21	Any other information requested by the competent authority.	None raised to date

Requirements applied as part of this study when undertaking an Initial Site Sensitivity Verification for a site selected on the national web-based environmental screening tool for which no specific assessment protocol related to any theme has been identified.

Requirements for initial site sensitivity verification		Comment
1.	The Initial Site Sensitivity Verification must be undertaken by an environmental assessment practitioner or a registered specialist with expertise in the relevant environmental theme being considered.	Refer to the verification page (Page V) for specialist details.
2.	The Initial Site Sensitivity Verification must be undertaken through the use of:	
2.1	A desktop analysis, using satellite imagery	Refer to section 2.5 of the report
2.2	A preliminary on-site inspection to identify if there are any discrepancies with the current use of land and environmental status quo versus the environmental sensitivity	Refer to section 2.5 of the report

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: 

Date: 19 April 2022

VERIFICATION PAGE

PROJECT NAME:	PROPOSED LICHTENBURG SOLAR PARK AND POWERLINE TO BE SITUATED NEAR LICHTENBURG, NGAKA MODIRI MOLEMA DISTRICT MUNICIPALITY, NORTH WEST PROVINCE	
Project No: 21069	**Date:** April 2022	**Report Status:** Draft Memorandum

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Declaration by the registered professional:

The undersigned has been appointed as the registered professional for this Traffic Impact Assessment and has applied due diligence to the content of this report and endeavoured to ensure that the TIA is free of technical errors and takes full responsibility for its contents.

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ECSA Registration Number:	960547 (Attached to report)
Signature:	

TABLE OF CONTENTS

APPENDICES

APPENDIX A: INFORMATION RELATED TO STATUS QUO
APPENDIX B: TRIP INFORMATION RELATED TO THE EXISTING TRAFFIC
APPENDIX C: SIDRA CALCULATION RESULTS
APPENDIX D: LEVEL OF SERVICE CRITERIA
APPENDIX E: SUMMARY OF IMPACT RATINGS
APPENDIX F: IMPACT RATING CRITERIA
APPENDIX G: PROFESSIONAL REGISTRATION AND CURRICULUM VITAE

LIST OF ASSUMPTIONS

PAGE 7, SECTION 2.1.1: BACKGROUND TRAFFIC GROWTH PER ANNUM

LIST OF FIGURES

LIST OF TABLES

SECTION 1

1. INTRODUCTION

Siyazi Limpopo Consulting Services (Pty) Ltd. was appointed by AGES Limpopo (Pty) Ltd. to conduct a Traffic Impact Assessment (TIA) for the proposed Lichteburg Solar Park and Powerline, hereafter referred to as the proposed development.

Matrigenix (Pty) Ltd is proposing the establishment of a renewable energy generation facility (Photovoltaic Power Plant) with associated infrastructure and structures, and power line on Portion 25 of the Farm Houthaalboomen 31 IP and Portion 10 of the Farm Lichtenburg Town and Townlands 27 IP, Ditsobotla Local Municipality, Ngaka Modiri Molema District Municipality, North West province.

The proposed renewable energy generation facility will be Photovoltaic (PV) Power Plant with a maximum generation capacity up to 120 MW, at the point of connection (Export Capacity) with the Eskom connection infrastructure.

The purpose of this study is to assess the implications of the vehicular traffic that could potentially be generated due to the proposed development and:

a) The traffic impact that the change in land use would have on the road and transport-related infrastructure.
b) Whether it is possible to accommodate the proposed development within acceptable norms from a traffic-engineering point of view.
c) The mitigating measures required to accommodate the proposed development within acceptable traffic-engineering norms.

The Access position from and to Road R505 for the proposed development was not finalised at the time of conducting this study, and therefore basic investigations were conducted to identify tentative access points which would be suitable from a traffic engineering and road safety perspective, for which two tentative proposed points were identified (Points A and B).

Figure 1.1 provides the locality of the proposed development in relation to other activities in the vicinity, including the location of the tentative proposed access points (intersections) under investigation as part of this study.

Table 1.1 provides a summary of information on the proposed development in terms of the planned construction, operations and timelines. It is important to take note that the anticipated timeline as depicted by the last-mentioned table provides an estimated timeline in terms of months and/or years for the construction and operational phases and does not depict the exact month and/or year that construction and operations are planned.

POINT	INTERSECTION STATUS	INTERSECTION	GPS CO-ORDINATES	
			LATITUDE	LONGITUDE
A	Existing / Tentative Access	Road R505 and Tentative Proposed Access Option 1	S 26° 4'23.12"	E 26° 7'32.31"
B	Existing / Tentative Access	Road R505 and Tentative Proposed Access Option 2	S 26° 2'43.83"	E 26° 6'37.79"

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

TABLE 1.1: SUMMARY OF THE EXTENT OF THE PROPOSED DEVELOPMENT FOR THE RESPECTIVE PHASES				
DESCRIPTION	**PHASE**			
	CONSTRUCTION	**OPERATIONAL**	**DECOMMISSIONING**	**CLOSURE**
Duration of phase	Max 18 months	± 35 years	6 months	
Expected number of heavy vehicles delivering consumables and plant materials per day	Max 4 per day per plant	Once off events when required	Limited, occasionally	Limited, occasionally
Expected percentage of heavy vehicles delivering consumables or plant materials during traffic peak times	50%	Once off events when required	Not relevant	Not relevant
Number of construction staff per day	Max 300 at peak	Not relevant	Not relevant	Not relevant
Number of shifts for construction staff per day	1 shift per day	Not relevant	Not relevant	Not relevant
Number of day workers	Not relevant	18 (13 active per day)	Not relevant	Not relevant
Number of shift workers per day	Not relevant	22 (6 active per shift)	Not relevant	Not relevant
Where staff are anticipated to reside	Lichtenburg	Lichtenburg	Not relevant	Not relevant
Heavy vehicle distribution	See **Figure B-3 Appendix B**	See **Figure B-3 Appendix B**	Same as for operational phase	Same as for operational phase
Abnormal vehicles delivering large components related to the proposed development	Once-off events	Once-off events	Once-off events	Once-off events
Access road to proposed development	Access from Road R505	Same as for Construction Phase	Same as for construction phase	Same as for construction phase
Calculated number of vehicle trips to be generated by the proposed development during AM or PM peak hours	AM Peak: 31 PM Peak: 31	AM Peak: 9 PM Peak: 9	Fewer than construction and operational phases	Fewer than construction and operational phases

The following scenarios were investigated as part of the TIA:

a) **Scenario 1:** 2022 peak hour traffic **without** the proposed development.
b) **Scenario 2:** 2022 peak hour traffic **with** the proposed development (Construction phase).
c) **Scenario 3:** 2031 peak hour traffic **without** the proposed development.
d) **Scenario 4:** 2031 peak hour traffic **with** the proposed development (Operational phase).

The following sections of the report elaborate on the detailed information related to the data collected and the investigations conducted, and the findings and recommendations:

a) **Section 2:** Detailed information related to data collected and investigations.
b) **Section 3:** Findings and recommendations.

Section 2

2. DETAILED INFORMATION RELATED TO DATA COLLECTED AND INVESTIGATIONS

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

a) The *status quo* of the land use and road network characteristics of roads relevant to the proposed development which consists of the following information:

   i. Existing land use information.
   ii. Existing road characteristics and modal distribution.
   iii. Traffic counts as a basis for making traffic-engineering calculations.

b) The future land use and road network characteristics relevant to the proposed development which consist of the following information:

   i. Land use information, including existing and proposed approved future developments in the area.
   ii. Determination of vehicle trips expected to be generated due to the proposed development.

c) Access to and from the proposed development.
d) The current and future levels of service at the relevant intersections under investigation.
e) Sensitive road sections and intersections related to existing and future conditions.
f) Other traffic-related matters.

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.
c) Traffic counts conducted as a basis for making traffic calculations.

2.1.1 EXISTING LAND USE INFORMATION

The relevant property of the proposed development is currently vacant with some agricultural activities within the area. 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 proposed development (background traffic) between the years 2022 to 2032 scenarios is anticipated to be 3% per annum.
b) That the anticipated average rate of growth will be included as background traffic for the respective road sections.
c) That the absorption rate 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) **Figures 2.1** and **2.2** provide the existing road network layout for the area under investigation.
b) **Table 2.1** contains information related to the existing intersections 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.
    vii) Median widths (if relevant).

d) **Tables 2.3** and **2.4** provide information on typical road characteristics and access management requirements as per the guideline COTO TRH26 *South African Road Classification and Access Management Manual, Version 1.0, August 2012* Rural areas.

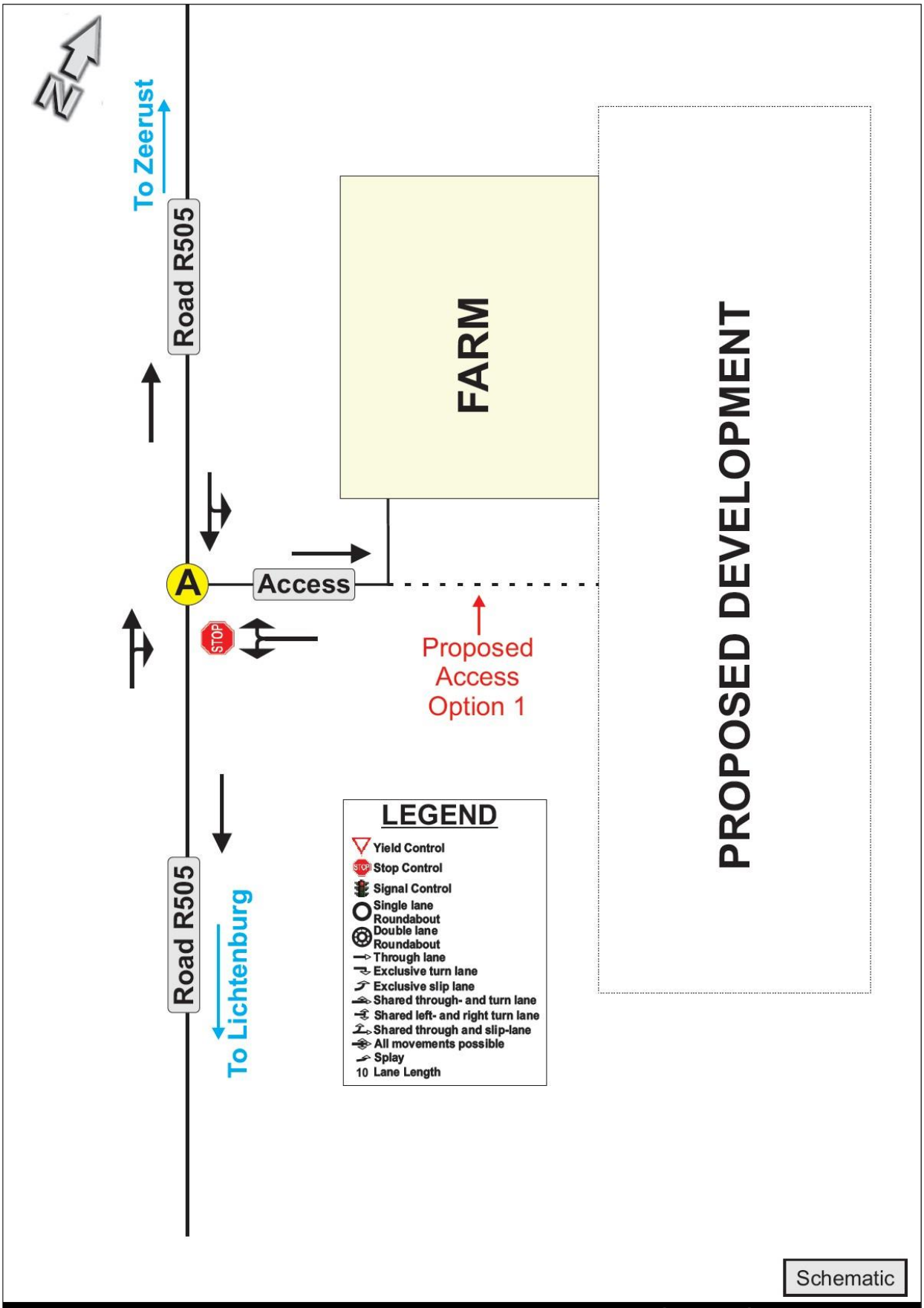


FIGURE 2.1: EXISTING ROAD NETWORK LAYOUT (POINT A)

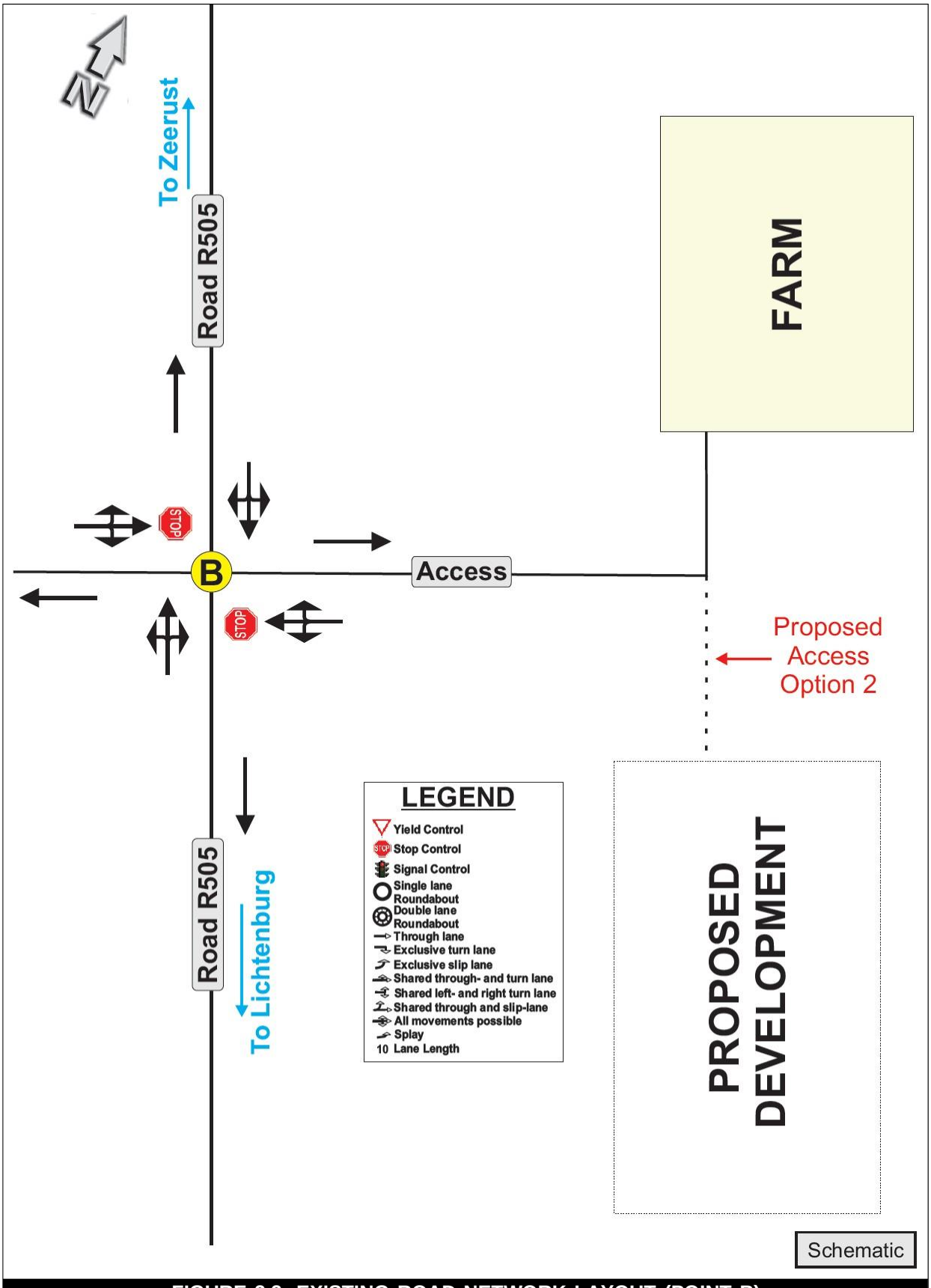


FIGURE 2.2: EXISTING ROAD NETWORK LAYOUT (POINT B)

TABLE 2.1: SUMMARY OF INTERSECTION CONTROL AT EXISTING INTERSECTIONS UNDER INVESTIGATION				
POINT	**DESCRIPTION**	**INTERSECTION CONTROL**	**PEDESTRIAN ACTIVITIES**	**INTERSECTION PHOTO**
A	Road R505 and Tentative Proposed Access Option 1 (Existing Farm Access)	Free flow on Road R505	No pedestrian activity observed during site visit	
B	Road R505 and Tentative Proposed Access Option 2 (Existing Farm Access)	Free flow on Road R505	No pedestrian activity observed during site visit	

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 R505** Road link between Lichtenburg and Zeerust		**Primary Function:** Mobility			**Proposed Function:** Mobility			South African National Roads Agency SOC Ltd	±50m	One lane per direction	3.7m wide with 1.0m paved shoulder	Asphalt	None	3%	100 km/h
		Class	**Class No.**	**Route Number**	**Class**	**Class No.**	**Route Number.**								
		Major arterial	R2	R	Major arterial	R2	R								
		Description: Highway			**Description:** Highway										
		Spacing between Intersections: 5.0 km			**Spacing between Intersections:** 5.0 km										

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 and landing strips), small border posts, and other routes.	Predominant	> 10km	6 - 12% Classes1, 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	INTERSECTION SPACING	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*	No (off-road rest stops allowed)	120	Grade separated or priority to through	8.0km	2/3/4 lanes, 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 */**	No (off-road rest stops allowed)	120	Priority or grade separated	5.0km	2/3 lanes, 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 */**	No (off-road rest stops allowed)	100 - 120	Priority, roundabout	1.6km	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	No (off road edge or in lay byes / viewpoints)	80 - 100	Priority	600 - 800m	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	No (on verge or shoulder)	60 - 80	Priority	450 - 600m	1/2 lane/s 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 which can be considered if access spacing requirements are met and there is no future need for a 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

To gain a better understanding of the existing traffic patterns and movements adjacent to the proposed development, a 12-hour manual traffic count was conducted at the existing intersection of Road R505 and Tentative Proposed Access Option 1 (Currently a farm access), **Point A**, which is located near the proposed development site.

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 count was conducted on Friday 01 April 2022 at **Point A**.

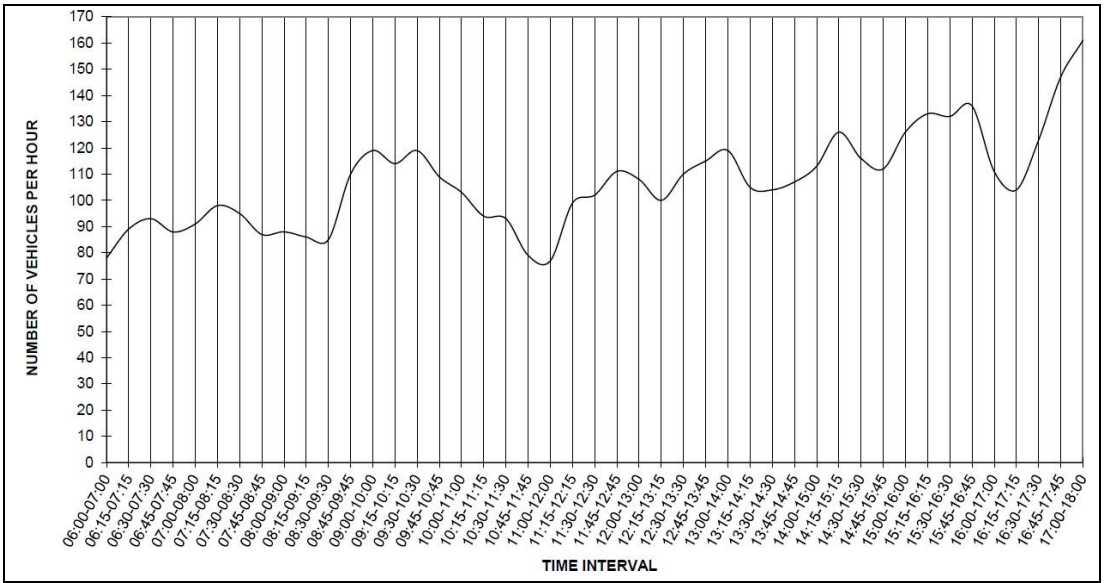
The combined hourly totals of all the vehicle types for the traffic survey conducted on Friday 01 April 2022 between 06:00 and 18:00 are indicated in **Table A-1** of **Appendix A** of this report. The description of the relevant vehicle movements at the relevant intersection appears in **Figure A-1 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 were identified as indicated in **Table 2.5** below.

It is assumed, as a worst-case scenario that the shift starting and ending times of the proposed development (see **Table 1.1** of **Section 1**) would fall within the existing vehicle traffic peak times for the purpose of the traffic impact assessment and that these traffic peak times would be between 06h00 and 18h00.

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	Road R505 and Tentative Proposed Access Option 1	07:15 to 08:15	98	17:00 to 18:00	161

Figure 2.3 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 01 April 2022.



ROAD R505 AND TENTATIVE PROPOSED ACCESS OPTION 1 (POINT A)

FIGURE 2.3: HOURLY TRAFFIC PATTERN PER 15-MINUTE INTERVAL FOR ALL MODES OF VEHICLES (06:00 to 18:00) AT THE RELEVANT INTERSECTION

2.2 FUTURE LAND USE AND ROAD CHARACTERISTICS

The following are relevant:

a) Future land use information, including existing and proposed approved future developments in the area.
b) Determination of the vehicle trips anticipated to be generated by the proposed development.
c) Information about the expected future modal distribution.
d) Determination of the total traffic expected to be generated at the relevant intersection under investigation.

The sections below elaborate on 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 the proposed development.

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

Table 2.6 indicates the trip generation rates and the number of vehicle trips which are expected to be generated due to the proposed development for the construction phase, while **Table 2.7** indicates the trip generation rates and the number of vehicle trips which are expected to be generated due to the proposed development for the operational phase.

The trip generation rates are based on the *COTO TMH17, South African Trip Data Manual Version 1.01, September 2013* information provided by the project team and assumptions made based on professional experience where information was not available.

TABLE 2.6: TRIP GENERATION RATES, EXPECTED NUMBER OF VEHICLE TRIPS TO BE GENERATED AND THE DISTRIBUTION OF VEHICLE TRIPS DURING THE CONSTRUCTION PHASE DUE TO THE PROPOSED DEVELOPMENT

Item	Component	Num Workers per Day	% Workers Active during Peak Hour	Num Workers Active per Peak Hour	Num Trucks Per Day	% Trucks Active during Peak Hour	Num Trucks Active during Peak Hour	Assumed Ave. Num Persons per Veh	Comments	Trip Generation Calculations for Peak Hour						Final Trip Information for Traffic-engineering Calculations			
										If Inward Movement is Relevant Value = 1	Num Veh Trips for Inwards Direction	If Outward Movement is Relevant Value = 1	Num Veh Trips for Outwards Direction	Total Num Veh Trips Generated during Peak Hour (In and Out)	Calculated Trip Generation Rate per Veh during Peak Hour	Trip Dist. %		Trip Generation	
																In	Out	In	Out
AM Peak Hour																			
1.	Construction workers (using own transport = 20%)	60	100%	60				4,0	Trips per worker (4 persons per vehicle)	1	15	0	0	15	**0,25**	100%	0%	15	0
2.	Construction workers (transported via 40-seater bus = 80%)	240	100%	240				40,0	40 persons per bus (bus delivers workers and leaves site empty)	1	6	1	6	12	**0,05**	50%	50%	6	6
3.	Heavy vehicles delivering consumables and plant materials per day				4	50%	2	1,0	Delivery vehicles expected during peak periods	1	2	1	2	4	**2,00**	50%	50%	2	2
									TOTAL					**31**				**23**	**8**
PM Peak Hour																			
1.	Construction workers (using own transport = 10%)	60	100%	60				4,0	Trips per worker (4 persons per vehicle)	0	0	1	15	15	**0,25**	0%	100%	0	15
2.	Construction workers (transported via 40-seater bus = 80%)	240	100%	240				40,0	40 persons per bus (bus delivers workers and leaves site empty)	1	6	1	6	12	**0,05**	50%	50%	6	6
3.	Heavy vehicles delivering consumables and plant materials per day				4	50%	2	1,0	Delivery vehicles expected during peak periods	1	2	1	2	4	**2,00**	50%	50%	2	2
									TOTAL					**31**				**8**	**23**

Note: The anticipated trips will be generated at only one of the identified tentative proposed access points.

TABLE 2.7: TRIP GENERATION RATES, EXPECTED NUMBER OF VEHICLE TRIPS TO BE GENERATED AND THE DISTRIBUTION OF VEHICLE TRIPS DURING THE OPERATIONAL PHASE DUE TO THE PROPOSED DEVELOPMENT

Item	Component	Num Workers per Day	% Workers active during Peak Hour	Num Workers Active per Peak Hour	Num Trucks Per Day	% Trucks active during Peak Hour	Num Trucks active during Peak Hour	Assumed Ave. Num Persons per Veh	Comments	Trip Generation Calculations for Peak Hour						Final Trip Information for Traffic-engineering Calculations			
										If Inward Movement is Relevant Value = 1	Num Veh Trips for Inwards Direction	If Outward Movement is Relevant Value = 1	Num Veh Trips for Outwards Direction	Total Num Veh Trips Generated during Peak Hour (In and Out)	Calculated Trip Generation Rate per Veh during Peak Hour	Trip Dist. %		Trip Generation	
																In	Out	In	Out
AM Peak Hour																			
1.	Operational day staff (using own transport = 100%)	18	72%	13				4,0	Trips per worker (4 persons per vehicle)	1	3	0	0	3	**0,25**	100%	0%	3	0
2.	Operational shift staff (using own transport = 100%)	22	27%	6				4,0	Trips per worker (4 persons per vehicle). One shift ends and next starts	1	2	1	2	4	**0,67**	50%	50%	2	2
3.	Heavy vehicles delivering consumables				1	100%	1	1,0	Delivery vehicles expected during peak periods as worst-case scenario	1	1	1	1	2	**2,00**	50%	50%	1	1
													TOTAL	9				6	3
PM Peak Hour																			
1.	Operational day staff (using own transport = 100%)	18	72%	13				4,0	Trips per worker (4 persons per vehicle)	0	0	1	3	3	**0,25**	0%	100%	0	3
2.	Operational shift staff (using own transport = 100%)	22	27%	6				4,0	Trips per worker (4 persons per vehicle). One shift ends and next starts	1	2	1	2	4	**0,67**	50%	50%	2	2
3.	Heavy vehicles delivering consumables				1	100%	1	1,0	Delivery vehicles expected during peak periods as worst-case scenario	1	1	1	1	2	**2,00**	50%	50%	1	1
													TOTAL	9				3	6

Note: The anticipated trips will be generated at only one of the identified tentative proposed access points.

2.2.3 INFORMATION ABOUT THE EXPECTED FUTURE MODAL DISTRIBUTION

Figures B-3 and **B-4** of **Appendix B** indicates, in percentages, the expected vehicle trips distribution, respectively, of light and heavy vehicles for the AM and PM peak periods for the relevant scenarios at either Point A or Point B.

2.2.4 DETERMINATION OF THE TOTAL TRAFFIC EXPECTED TO BE GENERATED AT THE RELEVANT INTERSECTIONS

A detailed traffic-related investigation was conducted for the construction and operational phases of the proposed development. The following figures are relevant:

a) **Figure B-1:** 2022 peak hour traffic (background traffic) without the proposed development **(Scenario 1)(Point A)**.
b) **Figure B-2:** 2022 peak hour traffic (background traffic) without the proposed development **(Scenario 1)(Point B)**.
c) **Figure B-3:** Projected vehicle trip distribution for the proposed development **(light and heavy vehicles)(Point A)**.
d) **Figure B-4:** Projected vehicle trip distribution for the proposed development **(light and heavy vehicles)(Point B)**.
e) **Figure B-5:** Projected vehicle trips to be generated by the proposed development (construction phase)**(Point A)**.
f) **Figure B-6:** Projected vehicle trips to be generated by the proposed development (construction phase)**(Point B)**.
g) **Figure B-7:** Projected 2022 peak hour traffic **with** the proposed development **(Scenario 2)** (construction phase)**(Point A)**.
h) **Figure B-8:** Projected 2022 peak hour traffic **with** the proposed development **(Scenario 2)** (construction phase)**(Point B)**.
i) **Figure B-9:** Projected 2032 peak hour traffic without the proposed development **(Scenario 3)(Point A)**.
j) **Figure B-10:** Projected 2032 peak hour traffic without the proposed development **(Scenario 3)(Point B)**.
k) **Figure B-11:** Projected vehicle trips to be generated by the proposed development (operational phase)**(Point A).**
l) **Figure B-12:** Projected vehicle trips to be generated by the proposed development (operational phase)**(Point B).**
m) **Figure B-13:** Projected 2032 peak hour traffic **with** the proposed development **(Scenario 4)** (operational Phase)**(Point A).**
n) **Figure B-14:** Projected 2032 peak hour traffic **with** the proposed development **(Scenario 4)** (operational Phase)**(Point B).**

2.3 ACCESS TO AND FROM THE PROPOSED DEVELOPMENT

Vehicle access to and from the proposed development is proposed to be gained from and to Road R505. The exact location of the access point had not yet been determined at the time of conducting this study and therefore further investigations were conducted to provide information on tentative access points to be used as input as part of the detailed design phase during which the relevant access point will be finalised.

Two feasible points central to the locality of the proposed development were identified by means of a visual inspection during a site visit and deemed suitable for access points from and to Road R505 based on intersection stopping and decision sight distance requirements guided by the *Committee of Transport Official TMH 16 Volume 2 South African Traffic Impact and Site Traffic Assessment Standards and Requirements Guideline version 1.01 February 2014*, as well as from a road geometry perspective.

Tables 2.8.1 and **2.8.2** respectively provide information on the identified tentative proposed points to serve as access to and from the proposed development, while S**ection 3** of this report provides recommendations regarding the access to the proposed development. **Figure 2.4** provides a graphical presentation of the relevant identified tentative proposed access points.

TABLE 2.8.1: AVAILABLE INTERSECTION STOPPING AND DECISION SIGHT DISTANCE INFORMATION FOR TENTATIVE PROPOSED ACCESS OPTION 1 (POINT A)

Relevant Picture		
	Southbound	Northbound
Co-ordinates	S 26° 4'23.12"	E 26° 7'32.31"
Required Stopping Sight Distance @ 100km/h	185m	185m
Available Stopping Sight Distance	400m	400m
Required Decision Sight Distance @ 100km/h	315m	315m
Available Decision Sight Distance	400m	400m

TABLE 2.8.2: AVAILABLE INTERSECTION STOPPING AND DECISION SIGHT DISTANCE INFORMATION FOR TENTATIVE PROPOSED ACCESS OPTION 2 (POINT B)		
Relevant Picture		
	Southbound	Northbound
Co-ordinates	S 26° 2'43.83"	E 26° 6'37.79"
Required Stopping Sight Distance @ 100km/h	185m	185m
Available Stopping Sight Distance	400m	400m
Required Decision Sight Distance @ 100km/h	315m	315m
Available Decision Sight Distance	400m	400m

From **Tables 2.8.1** and **2.8.2** is is possible to note that for a design speed of 100 km/h both tentative proposed intersections comply with the relevant required sight distances.

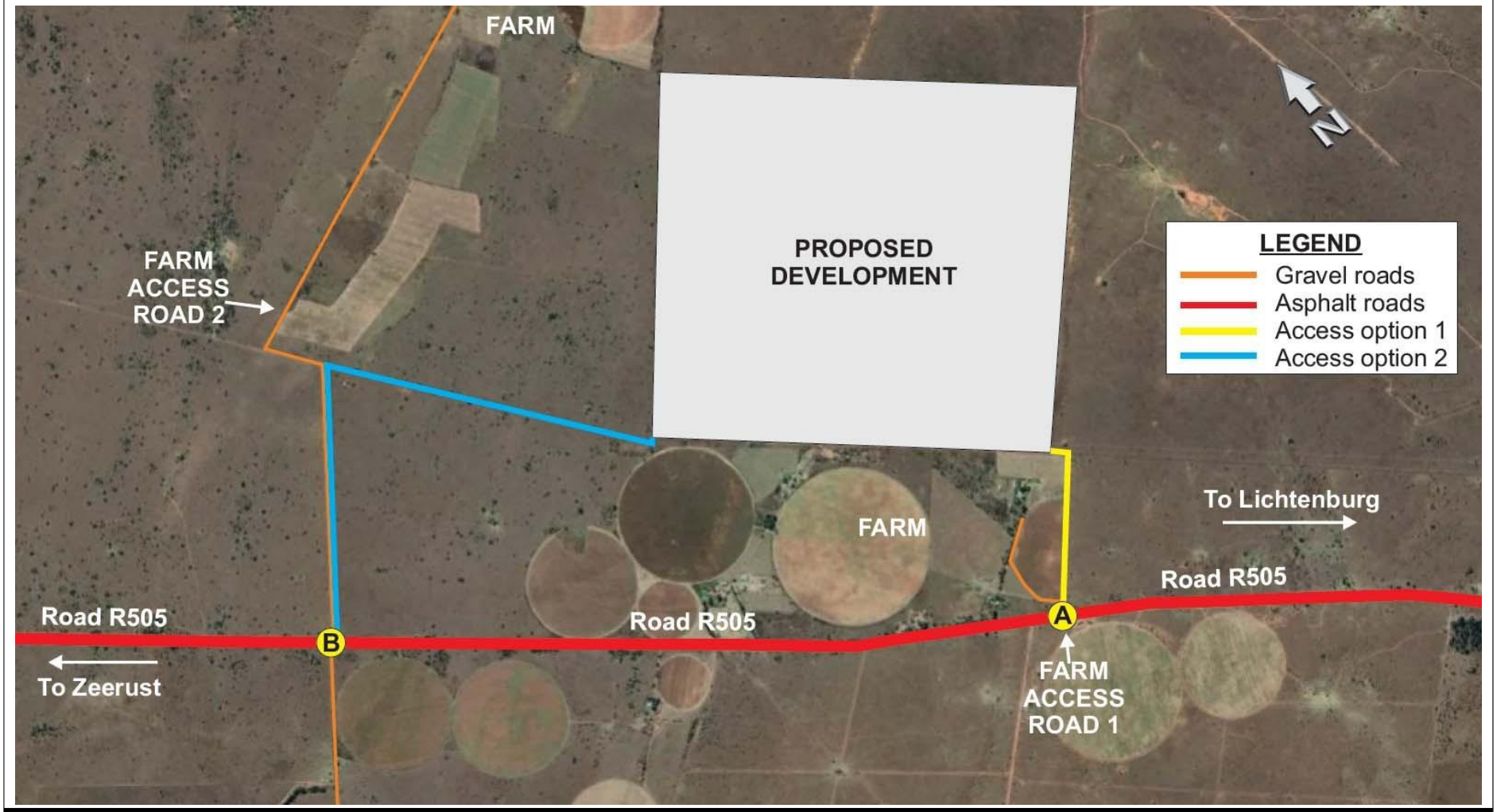


FIGURE 2.4: GRAPHICAL PRESENTATION OF THE RELEVANT IDENTIFIED POTENTIAL ACCESS POINTS

2.4 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 evaluations determine the intersection levels of service (LOS) which qualitatively describe the operating conditions of a roadway based on factors such as speed, travel time, manoeuvrability, delay and safety. The intersection of Road R505 and Tentative Proposed Access Option 1 (Point A) and Road R505 and Tentative Proposed Access Option 2 (Point B) was evaluated for Levels of Service.

In Appendix C, Tables C-1 to C-4 indicate the levels of service and the degree of saturation calculated for the relevant intersection for the respective scenarios:

a) **Table C-1:** Levels of service for various approaches for the year 2022 (background traffic) **without** the proposed development**.**
b) **Table C-2:** Levels of service for various approaches for the year 2022 (background traffic) **with** the proposed development **(construction phase)(Scenario 2)**.
c) **Table C-3:** Levels of service for various approaches for the year 2032 (background traffic) **without** the proposed development **(Scenario 3)**.
d) **Table C-4:** Levels of service for various approaches for the year 2032 (background traffic) **with** the proposed development **(operational phase)(Scenario 4)**.

From **Tables C-1** to **C-4,** it is possible to note from the relevant evaluations as part of the proposed mining development that:

a) No additional road infrastructure is required from a traffic capacity point of view.
b) That the tentative proposed access intersection, whether access is gained via Point A or Point B, will operate at acceptable levels of services for the relevant time frame that this report was prepared.
c) Reserve capacity is available at the relevant tentative proposed intersections (**Points A** and **B**) on the existing road network.

Refer to **Section 3** of this report for more information regarding required and/or recommended improvements and **Tables D-1** and **D-2** of **Appendix D** for the level of service criteria description respectively for unsignalised and signalised intersections.

Tables 2.9 provide a summary of the available reserve capacity on the various sections of roads that were 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 intersection.

TABLE 2.9: 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			
						2022 Construction		2032 Operational		2022 Construction		2032 Operational	
						AM	PM	AM	PM	AM	PM	AM	PM
SHOULD POINT A BE UTILISED FOR ACCESS FROM AND TO ROAD R505													
A	Road R505 and Tentative Proposed Access Option 1	North (Road R505)	1 100	1	1 100	44	97	59	130	1056	1003	1041	970
		East (Tentative Proposed Access Option 1)	Not relevant. Access road.										
		South (Road R505)	1 100	1	1 100	62	84	76	89	1058	1016	1024	1011
SHOULD POINT B BE UTILISED FOR ACCESS FROM AND TO ROAD R505													
B	Road R505 and Tentative Proposed Access Option 2	North (Road R505)	1 100	1	1 100	44	97	59	130	1056	1003	1041	970
		East (Tentative Proposed Access Option 2)	Not relevant. Access road.										
		South (Road R505)	1 100	1	1 100	62	83	76	87	1058	1017	1024	1013
		West (Farm Access)	Not relevant. Access road.										

2.5 SENSITIVE ROAD SECTIONS AND INTERSECTIONS RELATED TO EXISTING AND FUTURE CONDITIONS

Sensitive road sections and intersections related to existing and future conditions **without** and **with** the proposed development in terms of vehicular traffic include the following:

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

The following figures are presented as part of the sensitive road sections **without** and **with** the proposed development:

a) **Figure 2.5:** Sensitive road sections and intersections indicating existing sensitive areas and intersections **without** the proposed development (status quo).
b) **Figure 2.6:** Sensitive road sections and intersections indicating anticipated sensitive areas and intersections **with** the proposed development **without** mitigating measures (Access via Point A).
c) **Figure 2.7:** Sensitive road sections and intersections indicating anticipated sensitive areas and intersections **with** the proposed development **without** mitigating measures (Access via Point B).
d) **Figure 2.8:** Sensitive road sections and intersections indicating anticipated sensitive areas and intersections **with** the proposed development **with** mitigating measures (Access via Point A).
e) **Figure 2.9:** Sensitive road sections and intersections indicating anticipated sensitive areas and intersections **with** the proposed development **with** mitigating measures (Access via Point B).

It can be concluded from **Figures 2.5** to **2.9** that:

a) The relevant sections of Road R505 under investigation (Points A and B) currently has a low sensitivity in terms of the factors used for assessment.
b) Sensitivity of the tentative proposed access intersection (Either Point A or B) proposing to provide access from and to the proposed development from Road R505 is anticipated to increase to a medium sensitivity without any mitigating measures implemented (intersection geometry with reference to the lack of dedicated right-turn lane).
c) Implimenting mitigating measures as part of the proposed development as recommended in **Section 3** of this report, is anticipated to improve sensitivity from medium to low, therefore mitigating the impact by the proposed development on the relevant roads network investigated as part of this report.

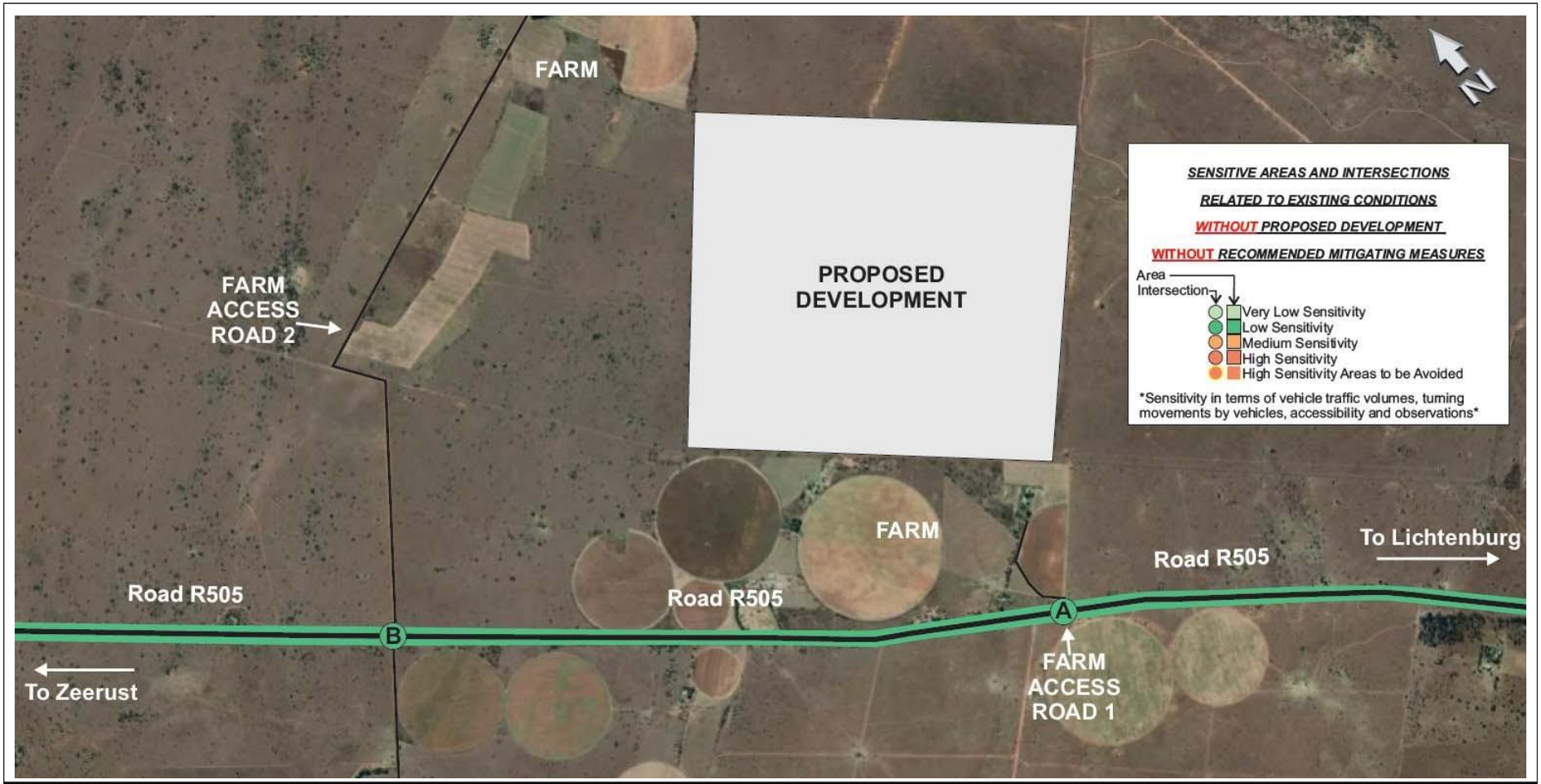


FIGURE 2.5: SENSITIVE ROAD SECTIONS AND INTERSECTIONS INDICATING EXISTING SENSITIVE AREAS AND INTERSECTIONS WITHOUT THE PROPOSED DEVELOPMENT (STATUS QUO)

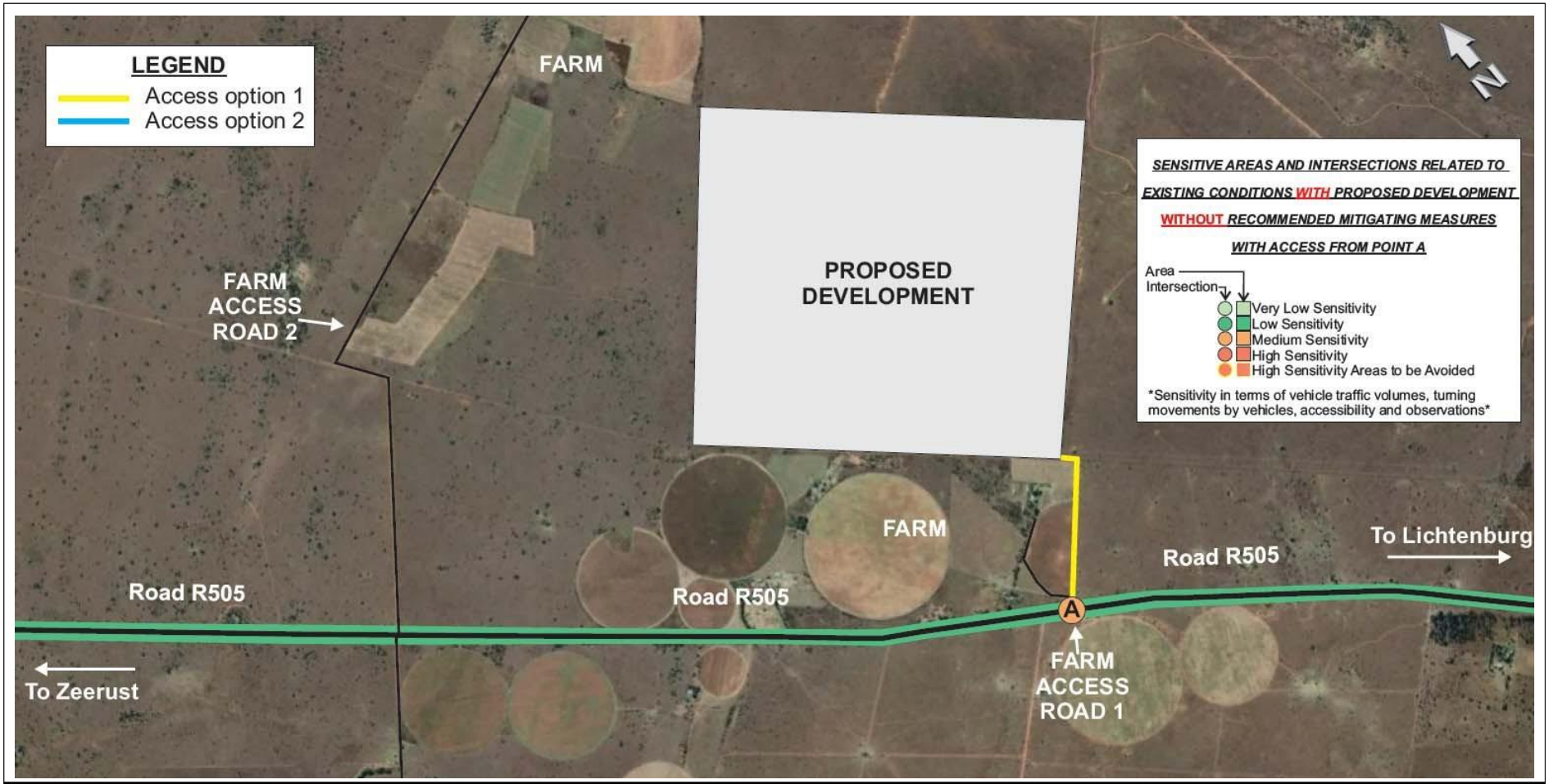


FIGURE 2.6: SENSITIVE ROAD SECTIONS AND INTERSECTIONS INDICATING ANTICIPATED SENSITIVE AREAS AND INTERSECTIONS WITH THE PROPOSED DEVELOPMENT WITHOUT MITIGATING MEASURES (ACCESS VIA POINT A)

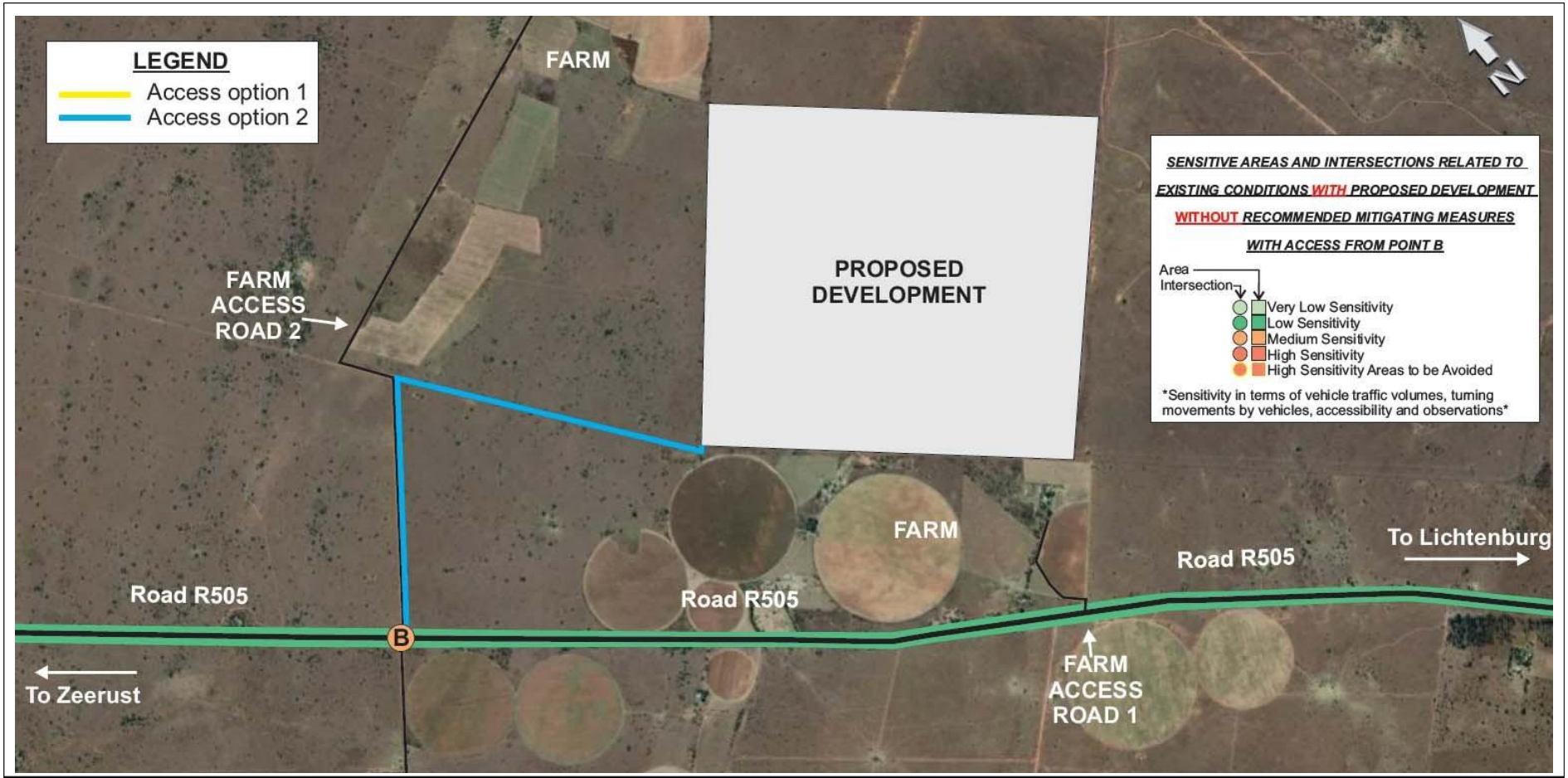


FIGURE 2.7: SENSITIVE ROAD SECTIONS AND INTERSECTIONS INDICATING ANTICIPATED SENSITIVE AREAS AND INTERSECTIONS WITH THE PROPOSED DEVELOPMENT WITHOUT MITIGATING MEASURES (ACCESS VIA POINT B)

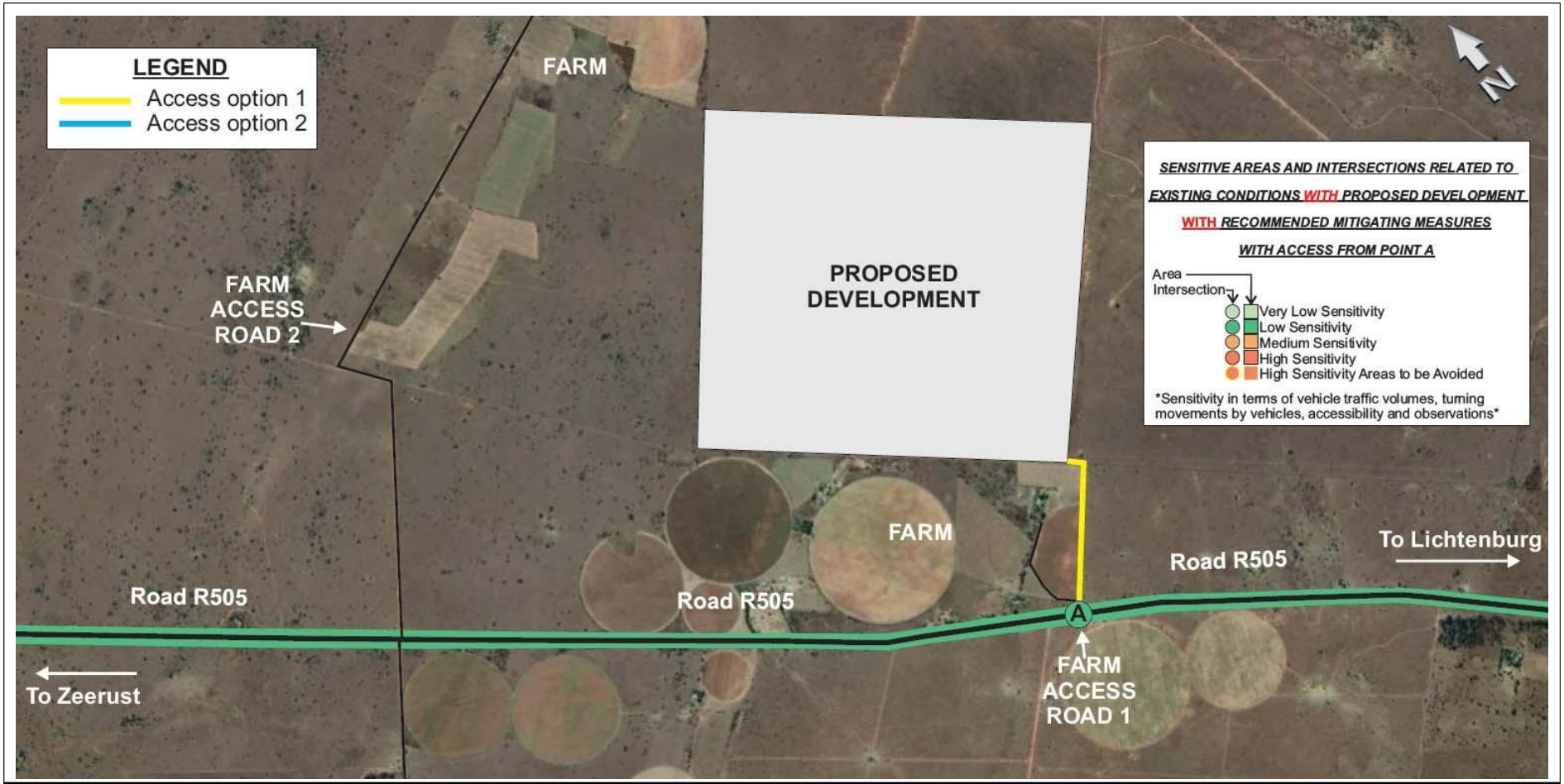


FIGURE 2.8: SENSITIVE ROAD SECTIONS AND INTERSECTIONS INDICATING ANTICIPATED SENSITIVE AREAS AND INTERSECTIONS WITH THE PROPOSED DEVELOPMENT WITH MITIGATING MEASURES (ACCESS VIA POINT A)

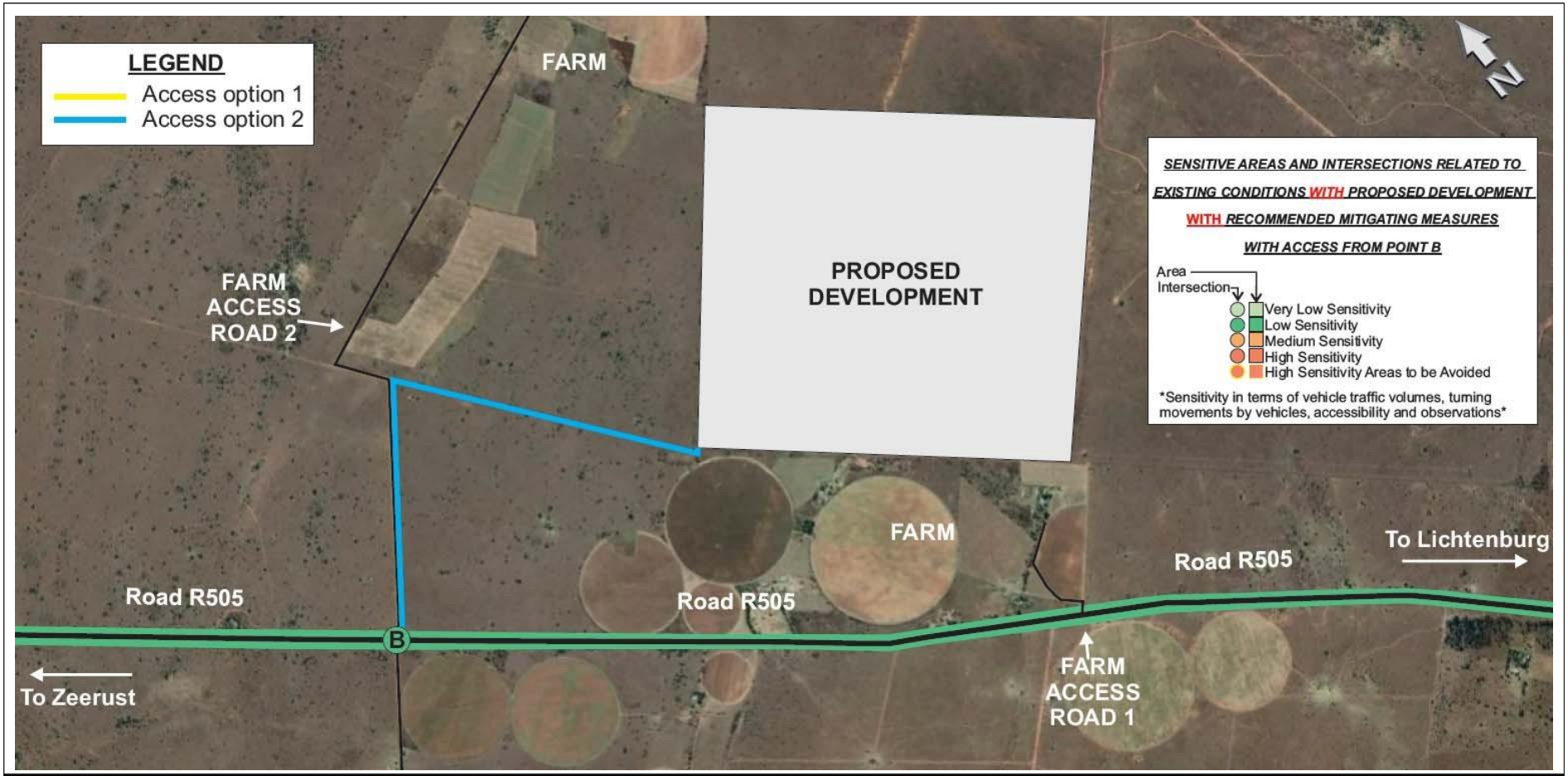


FIGURE 2.9: SENSITIVE ROAD SECTIONS AND INTERSECTIONS INDICATING ANTICIPATED SENSITIVE AREAS AND INTERSECTIONS WITH THE PROPOSED DEVELOPMENT WITH MITIGATING MEASURES (ACCESS VIA POINT B)

2.6 INFORMATION REQUESTED BY RELEVANT ROAD AUTHORITY

Input will be provided by the Environmental Practitioner (Ages) as part of the Detailed Design Phase of the proposed development. All comments/approval from the relevant road authorities will be included as part of the applications for approval and the detailed design process as a separate document.

2.7 OTHER TRAFFIC-RELATED MATTERS

Table 2.10 provides a summary of the following:

a) Road safety matters.
b) Non-motorised transport.
c) Public transport.

TABLE 2.10: SUMMARY OF OTHER TRAFFIC-RELATED MATTERS

Item	Description of Element	General Comments	Specific Issues	Actions Required
1.	**ROAD SAFETY MATTERS**			
1.1	**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 continuously: 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. k) Improper road safety training for workers as well as adjacent communities. l) Lack of universal access related infrastructure.	a) The identified tentative proposed access points (Points A and B) which are existing intersections, currently does not have dedicated right-turn lanes.	a) Provide dedicated right-turn lane on southern approach of Road R505 at either Point A or Point B, whichever access point is utilised. Refer to **Section 3** of this report for the required and recommended intersection layout.
2.	**NON-MOTORISED TRANSPORT**			
2.1	**Non-motorised transport**	a) No pedestrian activity was observed during a site visit at Points A and B.	a) Pedestrian movements along the relevant section of Road R505 is not expected due to the location of the proposed development and therefore all staff and visitors are expected to use motorised transport.	a) None.
3.	**PUBLIC TRANSPORT**			
3.1	**Public transport**	a) Two types of public transport commuters would be relevant to the proposed development: i) Firstly, workers who will travel to and from the proposed development. and ii) Secondly, visitors to the proposed development.	a) Limited public transport is available in the area.	a) Transport for workers should be by means of arranged or contracted transport and provision should be made on site.

Section 3

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

3.1 FINDINGS

The capacity calculations for the TIA were conducted for the years 2022 and 2032, respectively. This time frame is in line with traffic-engineering guidelines and practice and is determined by the expected number of vehicle trips that could potentially be generated during any specific peak hour by a specific development.

Although the proposed development is anticipated to be operational past the year 2032, anticipated vehicle traffic predictions past a 10-year scenario become unpredictable due to factors that are not known at the time of preparing this report, which include future developments in the area and potential road network changes.

Furthermore, owing to the type and nature of the proposed activities as part of the proposed development, it is expected that the proposed development will have a manageable impact on vehicle traffic during all phases, regardless of whether access is gained via Point A or Point B, provided that road infrastructure improvements are implemented as indicated in **Table 3.1** and **Figures 3.1** and **3.2** to mitigate the impact of the proposed development.

The following are further discussed in terms of the findings:

a) Road network-related impact due to existing vehicle traffic without the proposed development.
b) Road network-related impact during the respective phases for activities as part of the proposed development.
c) Site accessibility.

3.1.1 ROAD NETWORK RELATED IMPACT DUE TO EXISTING VEHICLE TRAFFIC WITHOUT THE PROPOSED DEVELOPMENT

The relevant section of Road R505, where the proposed development is intended to be located, is in a rural setting with limited farming activity in the area and as determined from the 12-hour manual traffic counts a low volume of vehicle traffic along the relevant section of Road R505. The impact of the existing vehicle traffic volumes on Road R505 and other existing developments is negligible in all aspects of road-related impacts.

3.1.2 ROAD NETWORK RELATED IMPACT DURING THE CONSTRUCTION AND OPERATIONAL PHASES FOR ACTIVITIES AS PART OF THE PROPOSED DEVELOPMENT

Tables E-1.1 to **E-1.7** presented as part of **Appendix E** provides a summary of the impact ratings respectively with the proposed development during the construction and operational phases, regardless of whether access is gained via Point A or Point B. **Tables E-1.1** to **E-1.7** of **Appendix E** were derived from the impact rating criteria as provided as part of **Appendix F** of the report which was used in terms of the assessment process.

It is possible to conclude from **Tables E-1.1** to **E-1.7**, in terms of the anticipated vehicle traffic to be generated by the proposed development during the construction and operational phases:

a) That the road network-related impact from a road capacity perspective due to the proposed development would have a low significance due to a low volume of vehicles along Road R505 as determined by the relevant 12-hour manual traffic counts and that no road capacity related mitigating measures would be required.
b) That the road network-related impact from a road safety perspective in terms of intersection spacing would have a low significance due to the rural locality of the proposed development and limited insignificant activity within the vicinity of the proposed development along Road R505 and that no road safety-related mitigating measures in terms of intersection spacing would be required.
c) That the road network-related impact from a road safety perspective in terms of intersection sight distances due to the proposed development access intersection would have a medium-high significance if the required intersection sight distances are not met at the final proposed access intersection position. With the provision of the required sight distances at the final proposed access intersection position which would be determined (mitigated) as part of the detail design phase, the impact from a road safety perspective in terms of intersection sight distances would have a low significance.
d) That the road network-related impact from a road safety perspective in terms of the speed limit along Road R505 would have a low significance on the proposed development and that no road safety-related mitigating measures in terms of the speed limit would be required.
e) That the road network-related impact from a road safety perspective in terms of the need for dedicated right-turn lane along Road R505 as part of the proposed development access intersection would have a Medium-High significance if a dedicated right-turn lane on the southern approach of Road R505 (at either Point A or B) is not provided as part of the proposed development access intersection, due to an increase in potential collisions (rear-end which could lead to fatalities), specifically vehicles waiting within the main traffic flow lane of Road R505 to turn right into the proposed development. With the provision of the required dedicated turning lane at the proposed access intersection, the impact from a road safety perspective in terms of the need for dedicated turning lanes would have a low significance.

f) That the road network-related impact from a road safety perspective in terms of pedestrian movements with the proposed access intersection and access road due to the proposed development would have a low significance as no pedestrian activity is expected along Road R505 and the proposed access intersection due to the rural locality of the proposed development and limited public transport availability, and that no road safety-related mitigating measures in terms of pedestrian movement would be required.

g) That the road network-related impact from a road safety perspective in terms of loading and off-loading of workers, specifically during the construction phase, as part of the proposed development would have a medium-high significance if a dedicated loading and off-loading area is not provided on site as part of the proposed development and workers are loaded and off-loaded within the road reserve of Road R505 at the proposed access intersection. With the provision of a dedicated loading and off-loading area on site as part of the proposed development and ensuring that contractors make use of the dedicated area, the impact from a road safety perspective in terms of loading and off-loading workers would have a low significance.

It is furthermore possible to conclude that owing to the type and nature of the proposed development, it is expected that the activities as part of the construction and operational phases of the proposed development, regardless of whether access is gained via Point A or Point B, will have a manageable impact on vehicle traffic during the construction and operational phases, as long as road infrastructure improvements are implemented as indicated in **Section 3.2**.

3.1.3 SITE ACCESSIBILITY

Vehicle access to and from the proposed development is proposed to be gained from and to Road R505. The exact location of the access point had not yet been determined at the time of preparing this report and therefore further investigations were conducted to provide information to be used as input as part of the detailed design phase during which the relevant access point will be finalised.

Two feasible points central to the locality of the proposed development were identified by means of a visual inspection during a site visit and deemed suitable for access points from and to Road R505 based on intersection stopping and decision sight distance requirements guided by the *Committee of Transport Official TMH 16 Volume 2 South African Traffic Impact and Site Traffic Assessment Standards and Requirements Guideline version 1.01 February 2014*, as well as from a road geometry perspective.

It was determined as part of investigations, which included a visual inspection on site, that the two identified tentative proposed access points provides sufficient intersection and stopping sight distances.

3.2 RECOMMENDATIONS

The following are discussed in terms of the recommendations:

a) Recommended road network improvements without the proposed development.
b) Summary of recommended improvements with the proposed development activities.
c) Detailed summary of recommended improvements with the proposed development activities.
d) Traffic-engineering related recommendations as part of the proposed development.
e) Institutional arrangements.
f) Reasoned opinion for authorisation.

3.2.1 RECOMMENDED ROAD NETWORK IMPROVEMENTS WITHOUT THE PROPOSED DEVELOPMENT (MITIGATING MEASURES)

The identified tentative proposed access points from and to the proposed development from Road R505 are both existing intersections with sufficient intersection spacing between existing intersections and a low volume of vehicles along Road R505. Therefore, there are no mitigating measures required without the proposed development.

3.2.2 SUMMARY OF RECOMMENDED IMPROVEMENTS WITH THE PROPOSED DEVELOPMENT ACTIVITIES.

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

All recommended improvements are relevant to all phases of the proposed development and regardless of whether access is gained via Point A or Point B.

TABLE 3.1: SUMMARY OF INTERSECTION IMPROVEMENTS RECOMENDED IN TERMS OF ROAD / EARTHWORKS WITH THE PROPOSED PROJECT

Point	Intersection Description	**WITH** proposed development relevant to all phases	
		Intersection Performance Perspective	Road Safety Perspective
A	Intersection of Road R505 and Tentative Proposed Access Option 1	None	a) Provide 60 metres dedicated right-turn lane on the southern approach of Road R505. b) Provide 60 metres acceleration taper towards the south of Road R505. c) Provide reflective road studs as part of the proposed intersection to improve visibility of the intersection geometry when it is dark.

TABLE 3.1: SUMMARY OF INTERSECTION IMPROVEMENTS RECOMENDED IN TERMS OF ROAD / EARTHWORKS WITH THE PROPOSED PROJECT			
Point	Intersection Description	**WITH** proposed development relevant to all phases	
		Intersection Performance Perspective	Road Safety Perspective
B	Intersection of Road R505 and Tentative Proposed Access Option 2	None	a) Provide 60 metres dedicated right-turn lane on the southern approach of Road R505. b) Provide 60 metres acceleration taper towards the south of Road R505. c) Provide reflective road studs as part of the proposed intersection to improve visibility of the intersection geometry when it is dark.

3.2.3 DETAILED SUMMARY OF RECOMMENDED IMPROVEMENTS WITH THE PROPOSED DEVELOPMENT ACTIVITIES.

Figure 3.1 (should access be gained via **Point A**) and **Figure 3.2** (should access be gained via **Point B**) provides a graphical presentation of the recommended intersection and road network improvements **WITH** the proposed development while **Table 3.2** provides detailed information on Intersection improvements recommended **WITH** the proposed development. All recommended improvements are relevant to all phases of the proposed development.

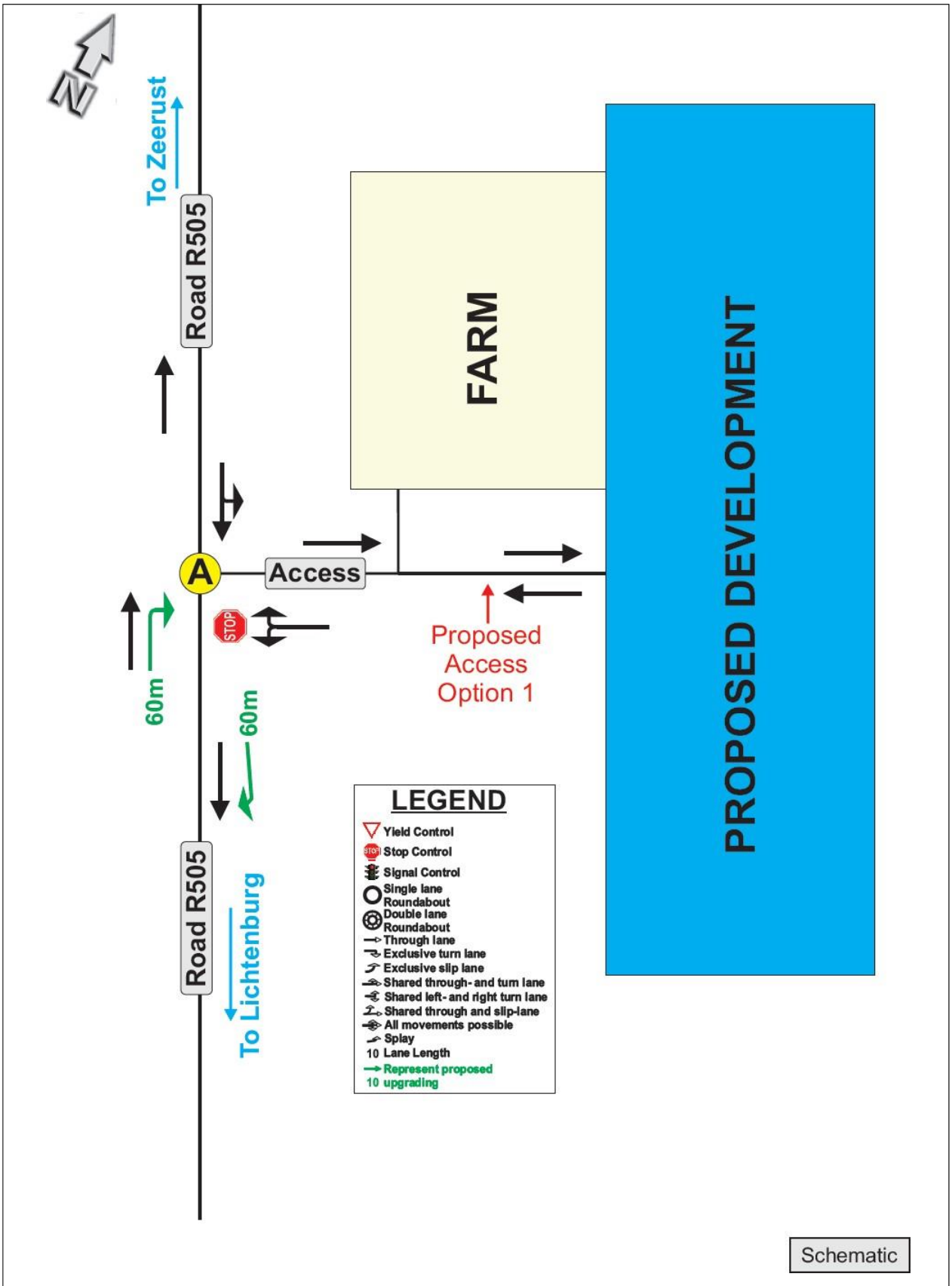


FIGURE 3.1: GRAPHICAL PRESENTATION OF THE RECOMMENDED INTERSECTION AND ROAD NETWORK IMPROVEMENTS WITH THE PROPOSED DEVELOPMENT SHOULD ACCESS BE GAINED VIA POINT A (RELEVANT TO ALL PHASES)

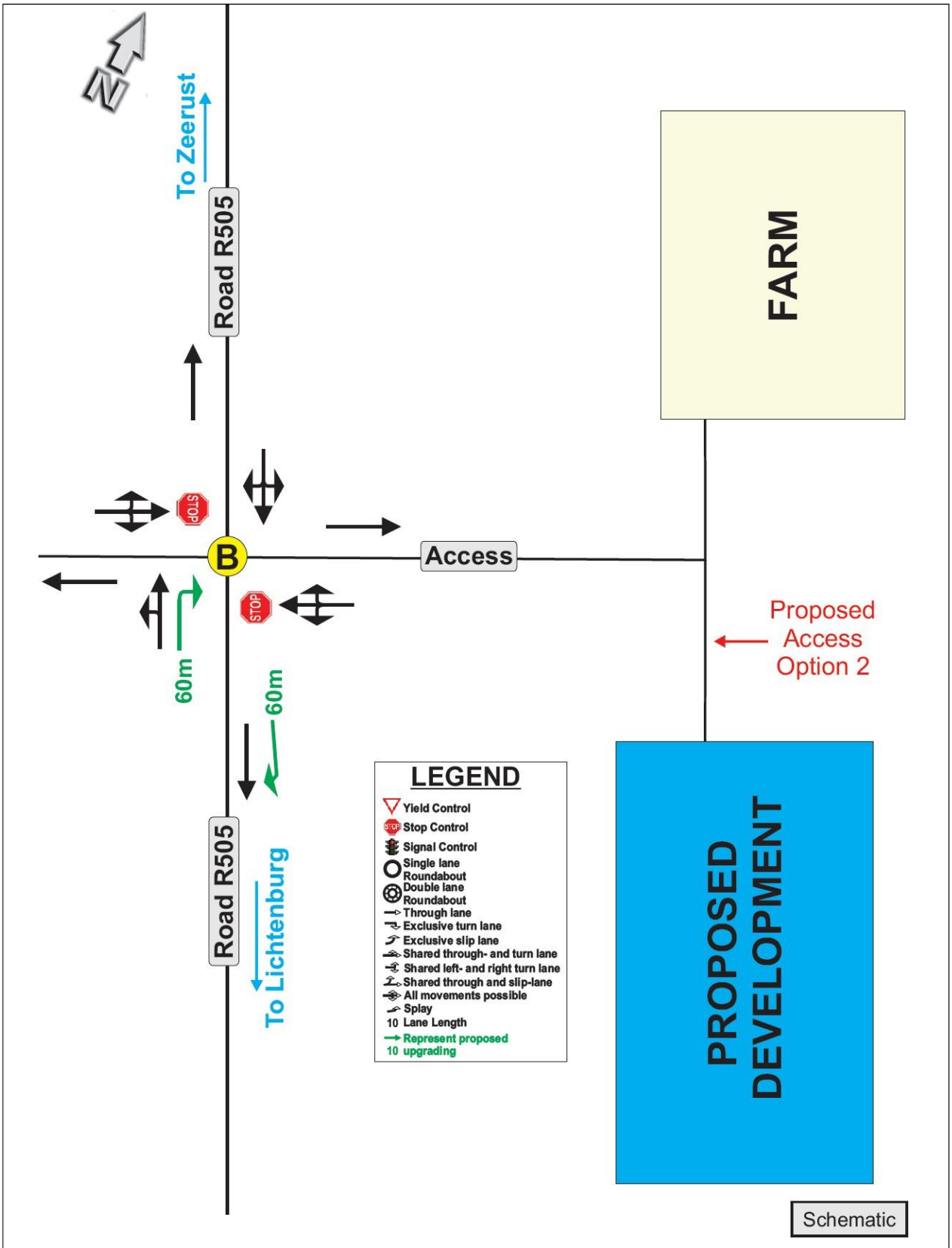
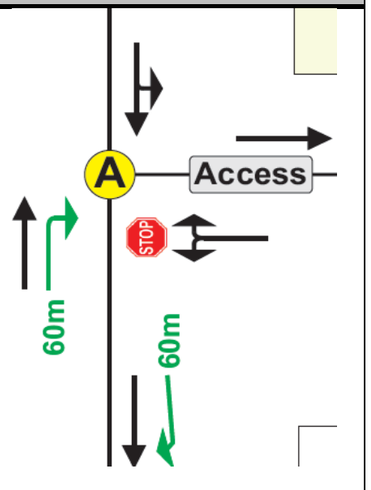
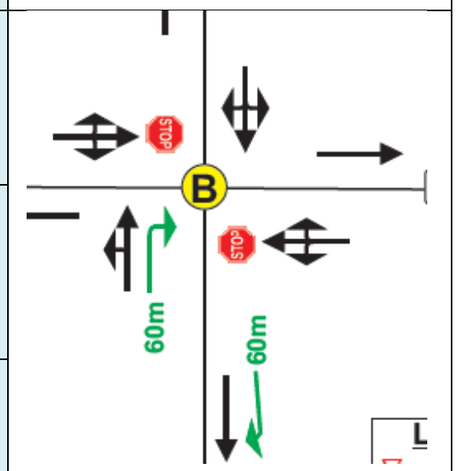


FIGURE 3.2: GRAPHICAL PRESENTATION OF THE RECOMMENDED INTERSECTION AND ROAD NETWORK IMPROVEMENTS WITH THE PROPOSED DEVELOPMENT SHOULD ACCESS BE GAINED VIA POINT B (RELEVANT TO ALL PHASES)

TABLE 3.2: RECOMMENDED ROAD NETWORK IMPROVEMENTS WITH THE PROPOSED DEVELOPMENT (RELEVANT TO ALL PHASES)																			
POINT	INTERSECTION	APPROACH	IMPROVEMENTS RECOMMENDED																GEOMETRY DETERMINED BY MEANS OF SIDRA
			Approach Traffic Control				Extra Lanes Required (m)												
			Free-flow	Stop	60m Radius Roundabout	Traffic Light System	Left-turn Taper	Left-turn Lane	Acceleration Taper	Acceleration Lane	Dedicated Right-turn Lane	Number of Extra Through Lanes	Improvements Required from a Road Safety or Intersection Performance Perspective	Reflective Road Studs required at Intersection	Road Markings Required	Road Signs Required	Public Transport Loading and Off-Loading	Pedestrian Walkways	
A	Intersection of Road R505 and Tentative Proposed Access Option 1	*North (Road R505)*	Yes	-	-	-	-	-	-	-	-	-	-	Yes	Yes	Yes	No	No	
		East (Access Opt 1)	-	Yes	-	-	-	-	-	-	-	-	-		Yes	Yes	No	No	
		South (Road R505)	Yes	-	-	-	-	-	Yes, 60m	-	Yes, 60m	-	Road safety		Yes	Yes	No	No	
B	Intersection of Road R505 and Tentative Proposed Access Option 2	*North (Road R505)*	Yes	-	-	-	-	-	-	-	-	-	-	Yes	Yes	Yes	No	No	
		East (Access Opt 2)	-	Yes	-	-	-	-	-	-	-	-	-		Yes	Yes	No	No	
		South (Road R505)	Yes	-	-	-	-	-	Yes, 60m	-	Yes, 60m	-	Road safety		Yes	Yes	No	No	
		West (Farm Access)	-	Yes	-	-	-	-	-	-	-	-	-		Yes	Yes	No	No	

3.2.4 TRAFFIC-ENGINEERING RELATED RECOMMENDATIONS AS PART OF THE PROPOSED DEVELOPMENT (MITIGATING MEASURES)

The following recommendations are made from a traffic-engineering perspective as part of the proposed development relevant to all phases, regardless of which tentative identified access option is udes:

a) As part of the construction phase, a dedicated loading and off-loading area on site should be established where workers can safely be loaded and off-loaded by public transport or arranged transport.
b) From a road safety perspective, dust suppression on the proposed access road (relevant for gaining access via Point A or Point B) should be conducted when required to avoid road visibility issues caused by dust from vehicles making use of the road, which could lead to vehicle accidents.

3.2.5 INSTITUTIONAL ARRANGEMENTS

The following recommendations are made as part of the detailed design phase and Town Planning process of roads for the proposed development:

a) Approval for the position and geometric layout for the proposed access intersection from and to Road R505 should be obtained from the South African National Roads Agency SOC Ltd.

3.2.6 REASONED OPINION FOR AUTHORISATION

In conclusion of the findings as part of the investigations, Siyazi Limpopo Consulting Services (Pty) Ltd is of the opinion that the proposed development would have a manageable impact on the relevant road network during all phases and regardless of whether access is gained via Point A or Point B, as long as the mitigation measures are implemented as recommended in **Section 3.2** of this report. In this case, it is therefore recommended that authorisation be granted.

APPENDIX A

INFORMATION RELATED TO STATUS QUO

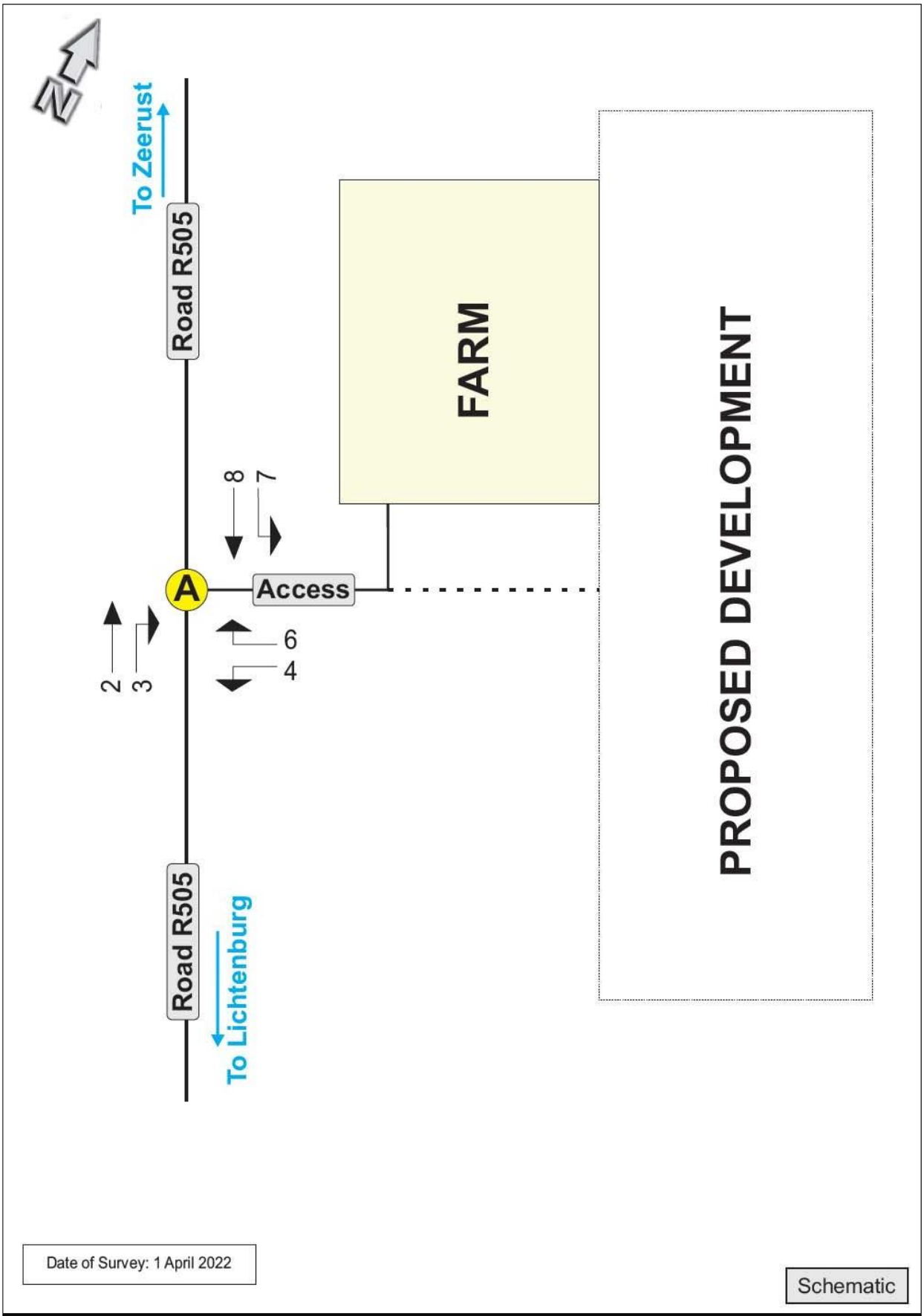


FIGURE A-1: RELEVANT MOVEMENTS RELATED TO TRAFFIC COUNTS

TABLE A-1: HOURLY TRAFFIC COUNTS FOR ALL VEHICLES SIMULTANEOUSLY AT THE INTERSECTION OF ROAD R27 AND PROPOSED ACCESS ROAD (POINT A)							
TIME INTERVALS	MOVEMENTS						
	2	3	4	6	7	8	TOTAL
06:00-07:00	34	0	0	0	0	44	78
06:15-07:15	36	0	0	0	0	53	89
06:30-07:30	34	0	0	0	0	59	93
06:45-07:45	37	0	0	0	0	51	88
07:00-08:00	40	0	0	0	0	51	91
07:15-08:15	44	0	0	0	0	54	98
07:30-08:30	45	0	0	0	0	50	95
07:45-08:45	39	0	0	0	0	48	87
08:00-09:00	39	0	0	0	0	49	88
08:15-09:15	37	0	0	0	0	49	86
08:30-09:30	41	0	0	0	0	44	85
08:45-09:45	57	0	0	0	0	53	110
09:00-10:00	66	0	0	0	0	53	119
09:15-10:15	69	0	0	0	0	45	114
09:30-10:30	67	0	0	0	0	52	119
09:45-10:45	57	0	0	0	0	52	109
10:00-11:00	53	0	0	0	0	50	103
10:15-11:15	45	0	0	0	0	49	94
10:30-11:30	47	0	0	0	0	46	93
10:45-11:45	39	0	0	0	0	40	79
11:00-12:00	38	0	0	0	0	39	77
11:15-12:15	55	0	0	0	0	44	99
11:30-12:30	51	0	0	0	0	51	102
11:45-12:45	62	0	0	0	0	49	111
12:00-13:00	62	0	0	0	0	46	108
12:15-13:15	56	0	0	0	0	44	100
12:30-13:30	71	0	0	0	0	39	110
12:45-13:45	70	0	0	0	0	45	115
13:00-14:00	71	0	0	0	0	48	119
13:15-14:15	59	0	0	0	0	46	105
13:30-14:30	54	0	0	0	0	50	104
13:45-14:45	54	0	0	0	0	53	107
14:00-15:00	57	0	0	0	0	56	113
14:15-15:15	69	0	0	0	0	57	126
14:30-15:30	72	0	0	0	0	44	116
14:45-15:45	77	0	0	0	0	35	112
15:00-16:00	86	0	0	0	0	40	126
15:15-16:15	84	0	0	0	0	49	133
15:30-16:30	77	0	0	0	0	55	132
15:45-16:45	80	0	0	0	0	56	136
16:00-17:00	60	0	0	0	0	51	111
16:15-17:15	60	0	0	0	0	44	104
16:30-17:30	69	1	0	0	0	53	123
16:45-17:45	81	1	1	0	0	64	147
17:00-18:00	97	3	1	0	0	60	161

APPENDIX B

TRIP INFORMATION RELATED TO THE EXISTING TRAFFIC

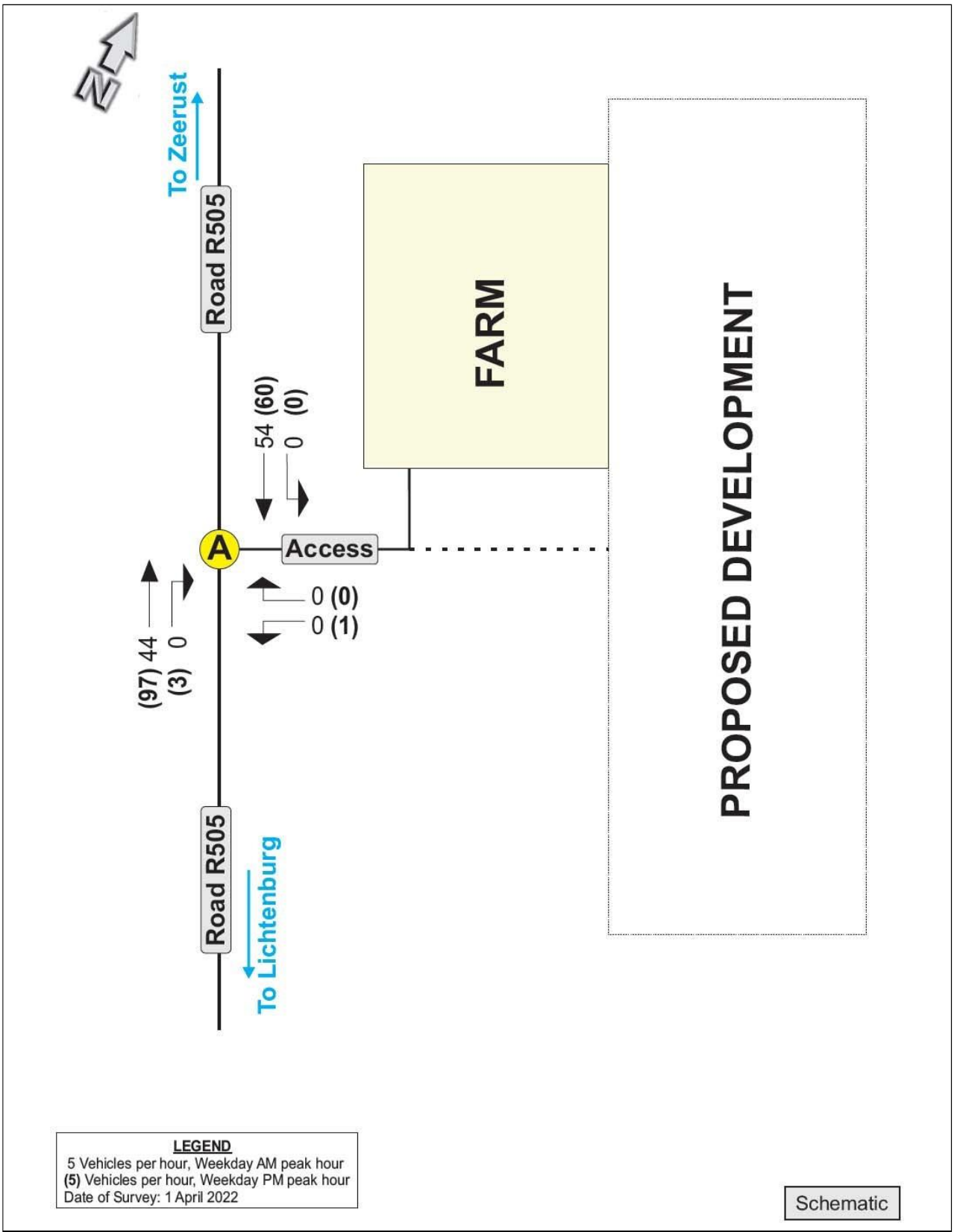


FIGURE B-1: 2022 PEAK HOUR TRAFFIC (BACKGROUND TRAFFIC) WITHOUT THE PROPOSED DEVELOPMENT (SCENARIO 1)(POINT A)

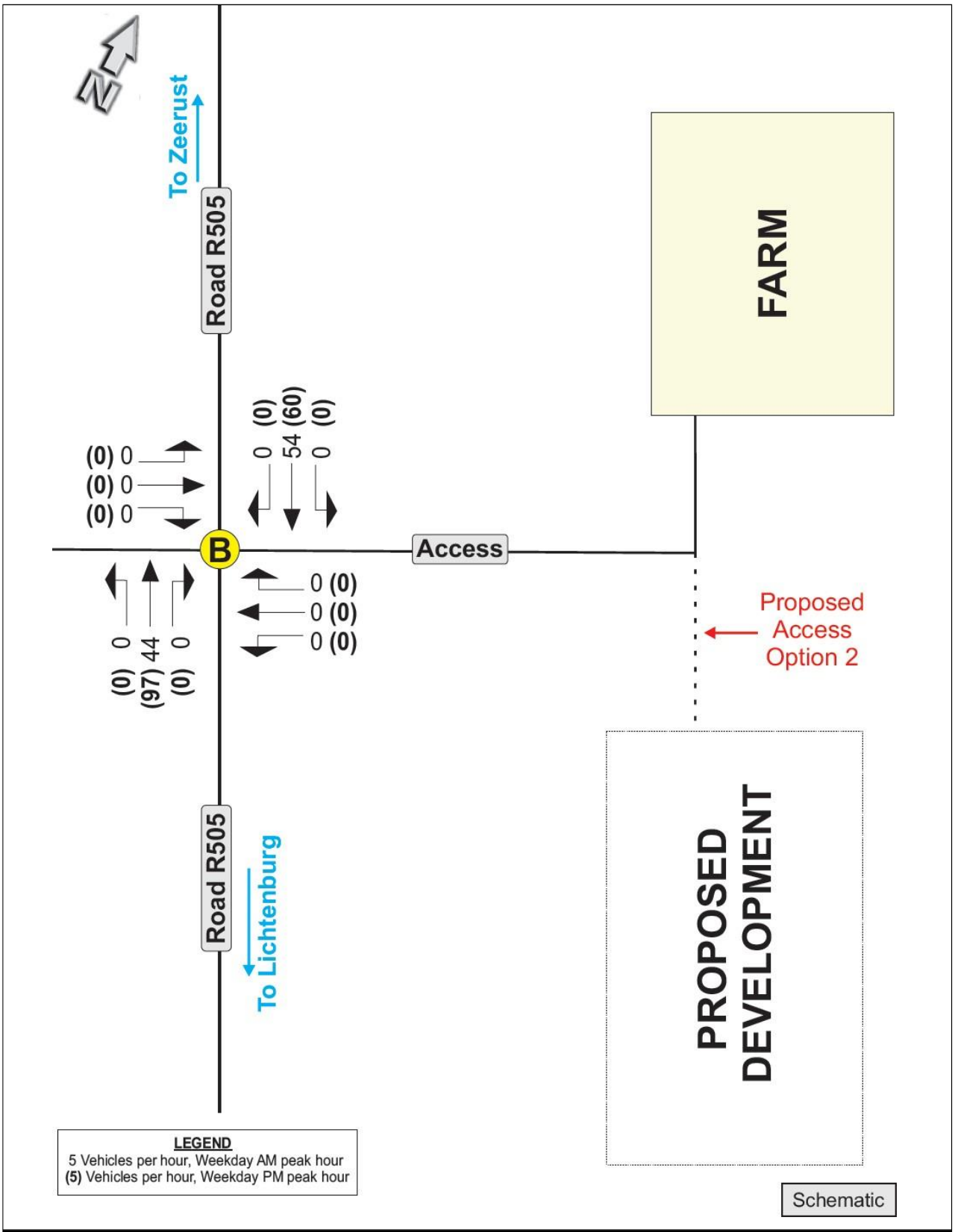


FIGURE B-2: 2022 PEAK HOUR TRAFFIC (BACKGROUND TRAFFIC) WITHOUT THE PROPOSED DEVELOPMENT (SCENARIO 1)(POINT B)

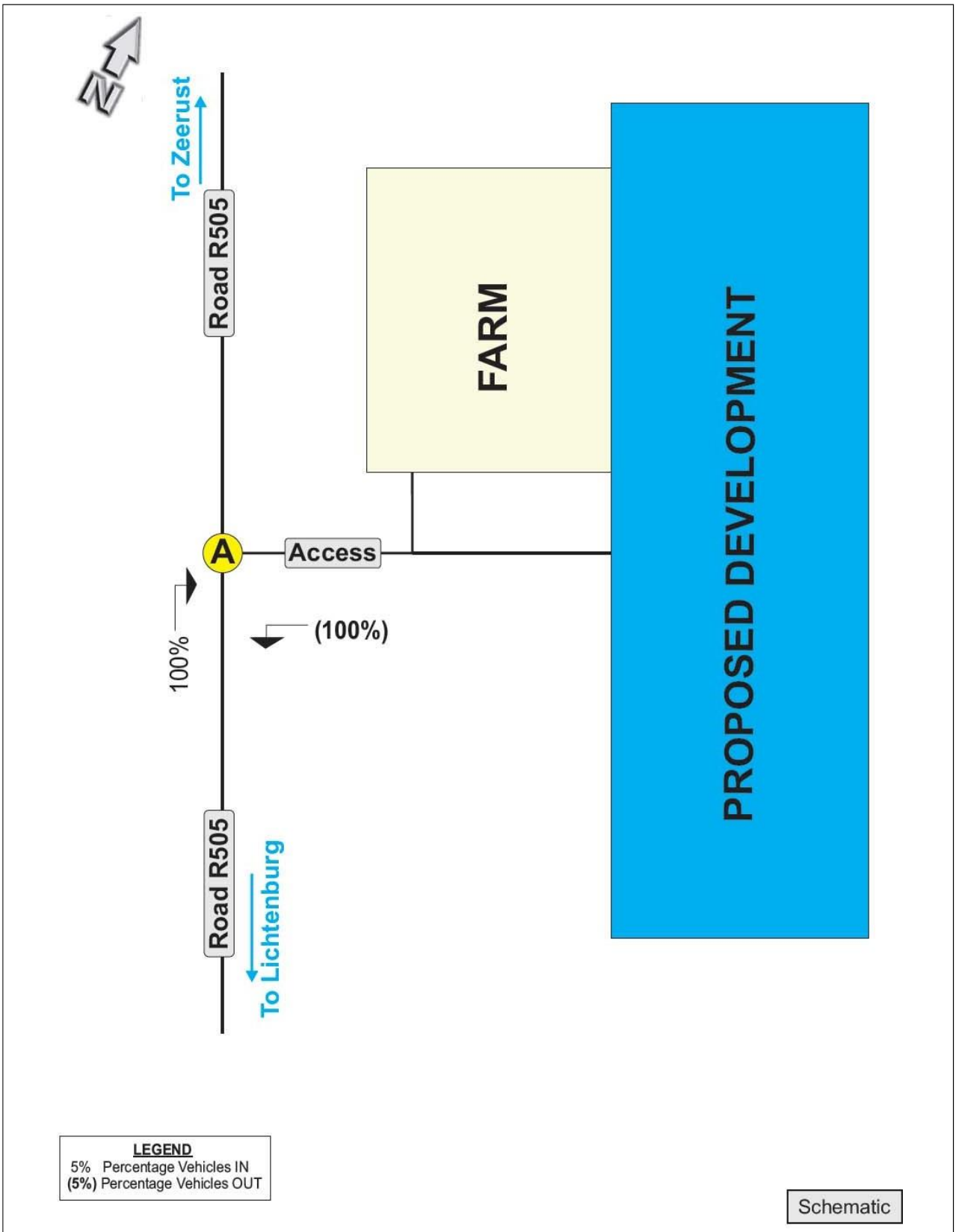


FIGURE B-3: PROJECTED VEHICLE TRIP DISTRIBUTION FOR THE PROPOSED DEVELOPMENT (LIGHT AND HEAVY VEHICLES)(POINT A)

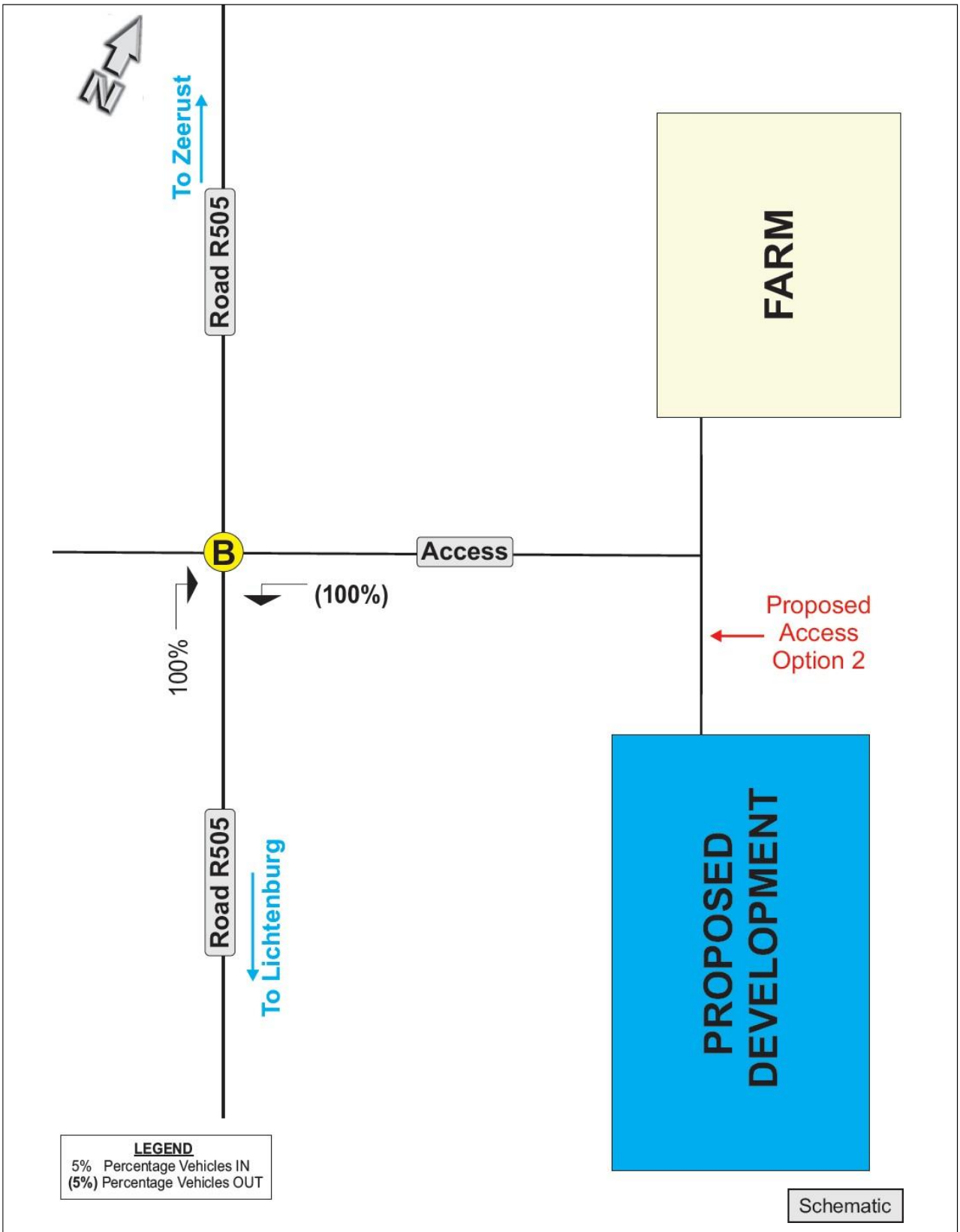


FIGURE B-4: PROJECTED VEHICLE TRIP DISTRIBUTION FOR THE PROPOSED DEVELOPMENT (LIGHT AND HEAVY VEHICLES)(POINT B)

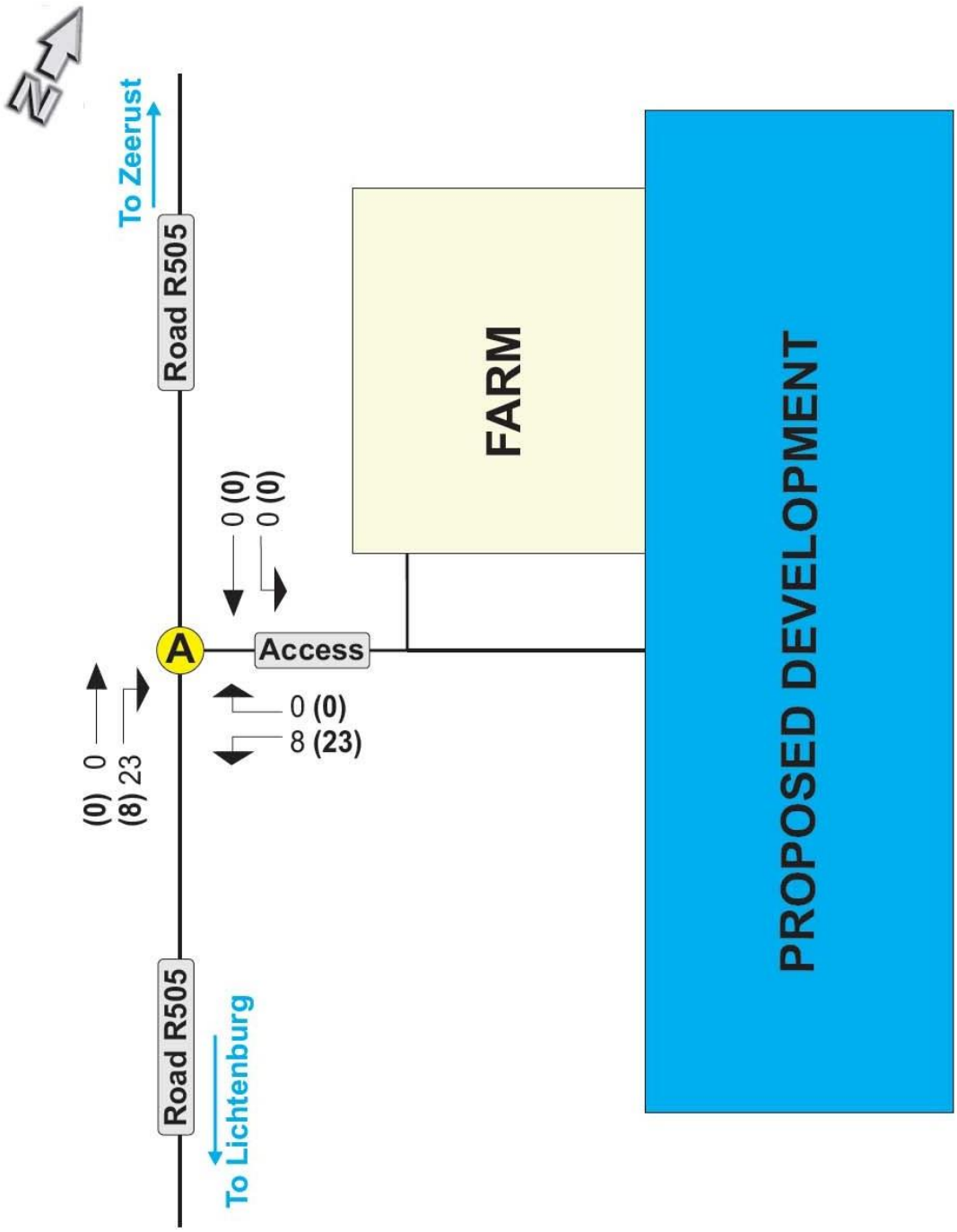


FIGURE B-5: PROJECTED VEHICLE TRIPS TO BE GENERATED BY THE PROPOSED DEVELOPMENT (CONSTRUCTION PHASE)(POINT A)

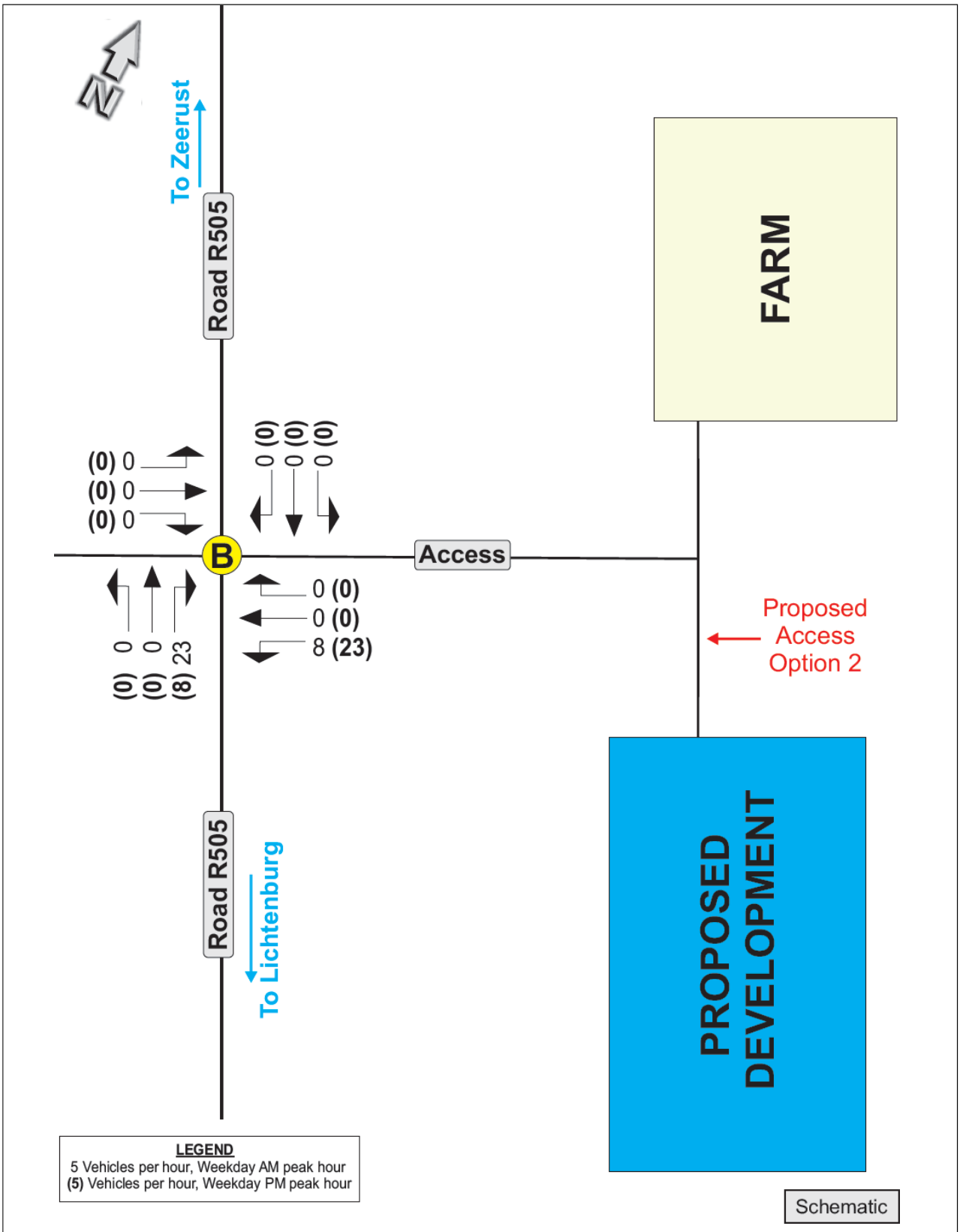


FIGURE B-6: PROJECTED VEHICLE TRIPS TO BE GENERATED BY THE PROPOSED DEVELOPMENT (CONSTRUCTION PHASE)(POINT B)

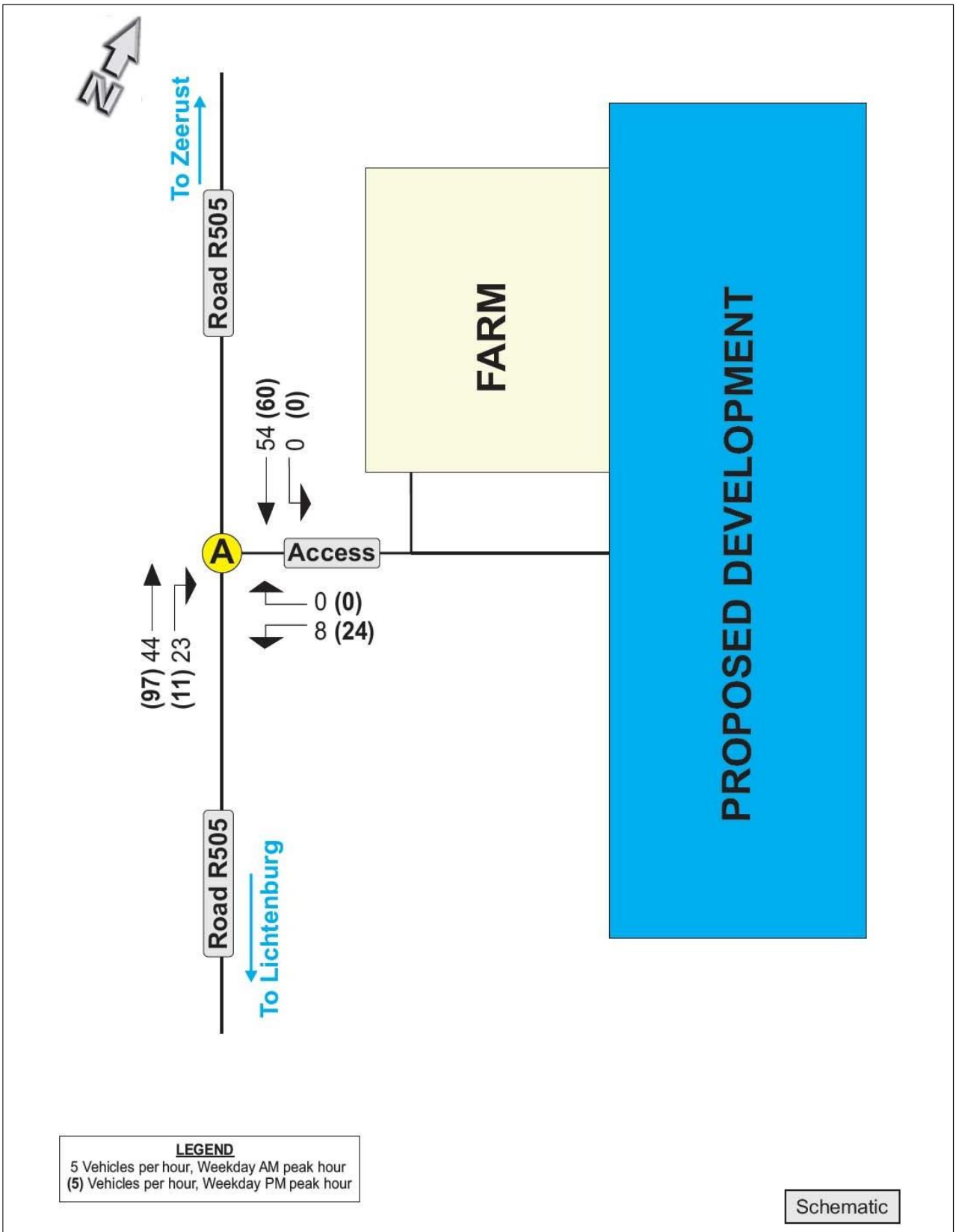


FIGURE B-7: PROJECTED 2022 PEAK HOUR TRAFFIC WITH THE PROPOSED DEVELOPMENT (SCENARIO 2) (CONSTRUCTION PHASE)(POINT A)

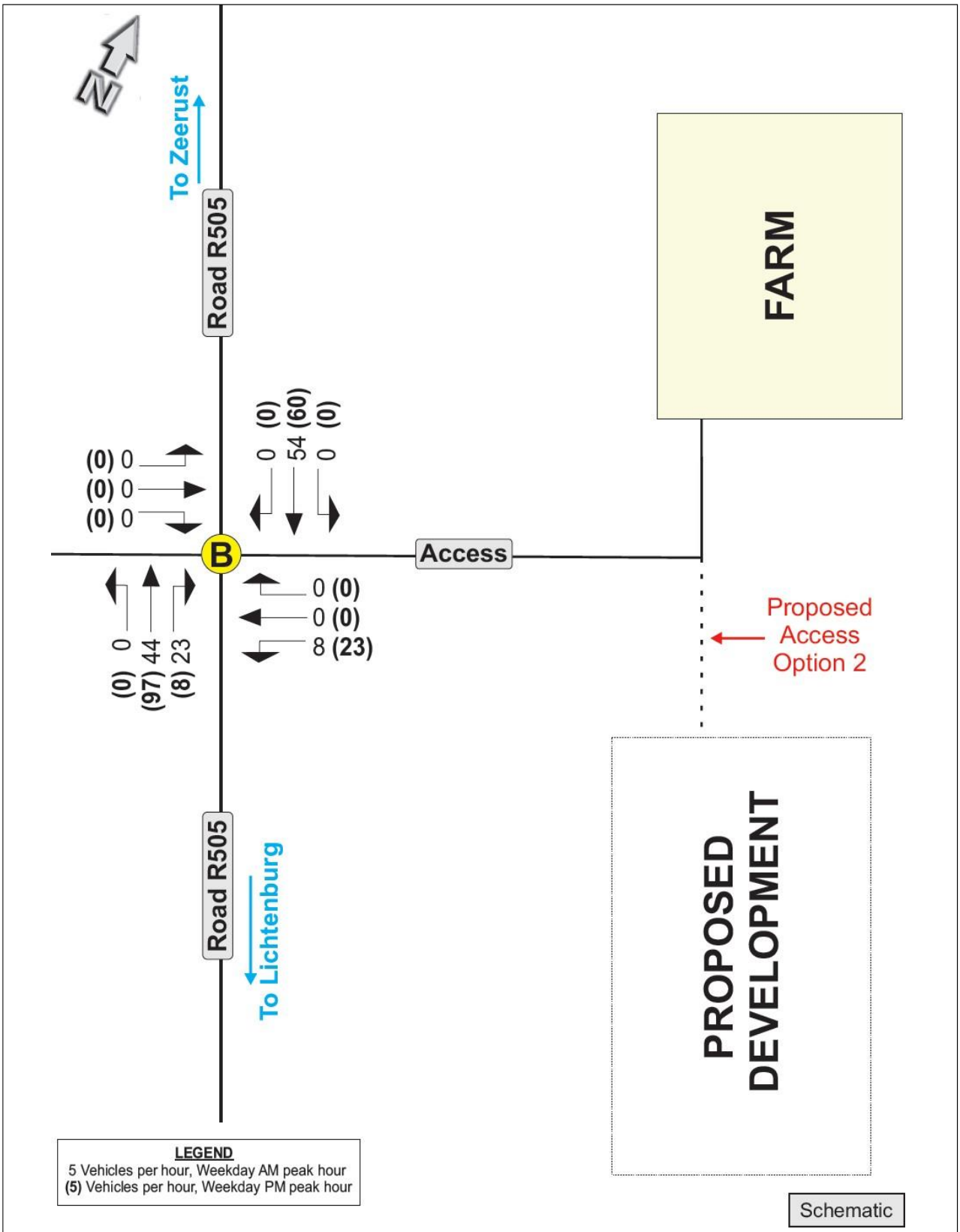


FIGURE B-8: PROJECTED 2022 PEAK HOUR TRAFFIC WITH THE PROPOSED DEVELOPMENT (SCENARIO 2) (CONSTRUCTION PHASE)(POINT B)

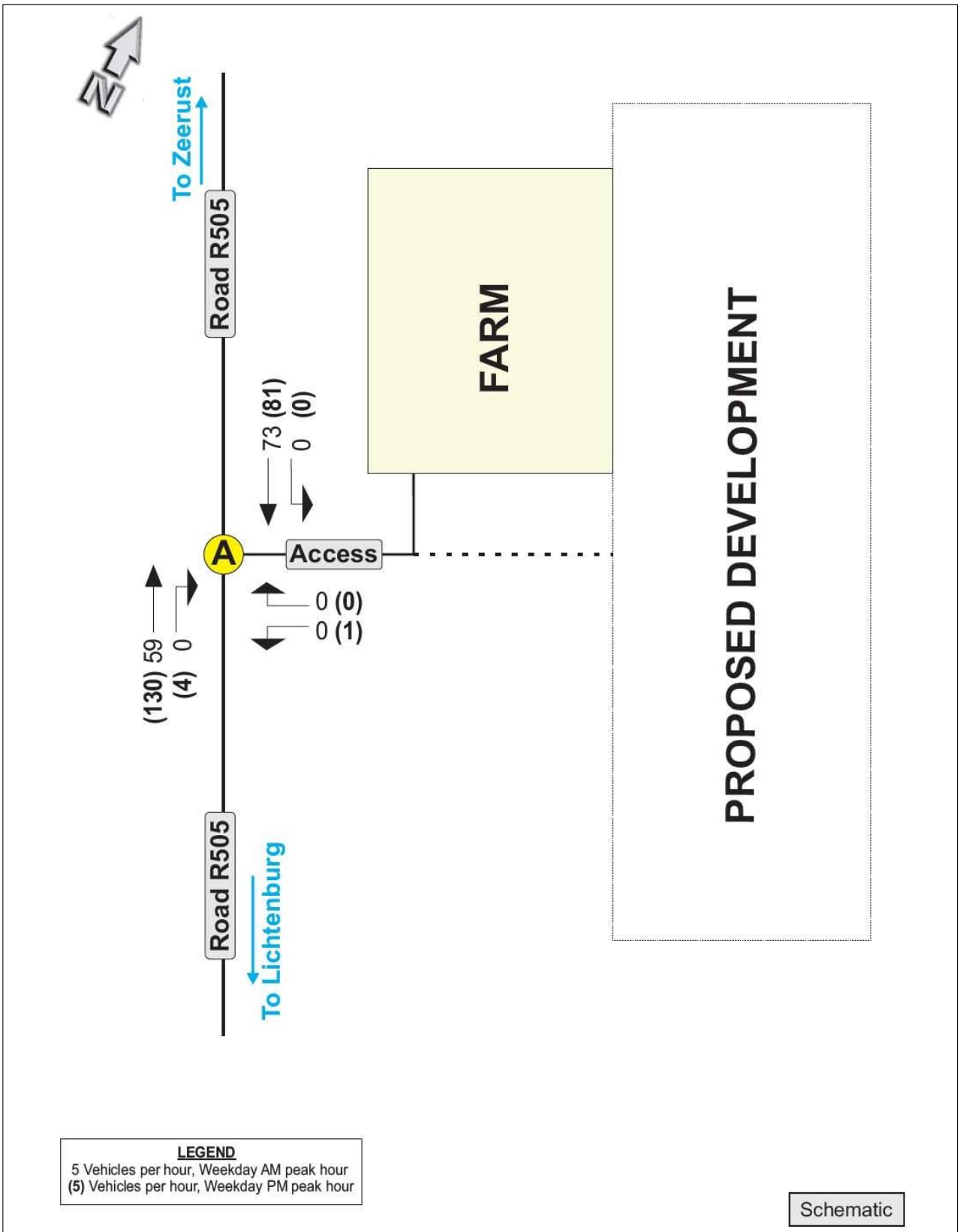


FIGURE B-9: PROJECTED 2032 PEAK HOUR TRAFFIC WITHOUT THE PROPOSED DEVELOPMENT (SCENARIO 3)(POINT A)

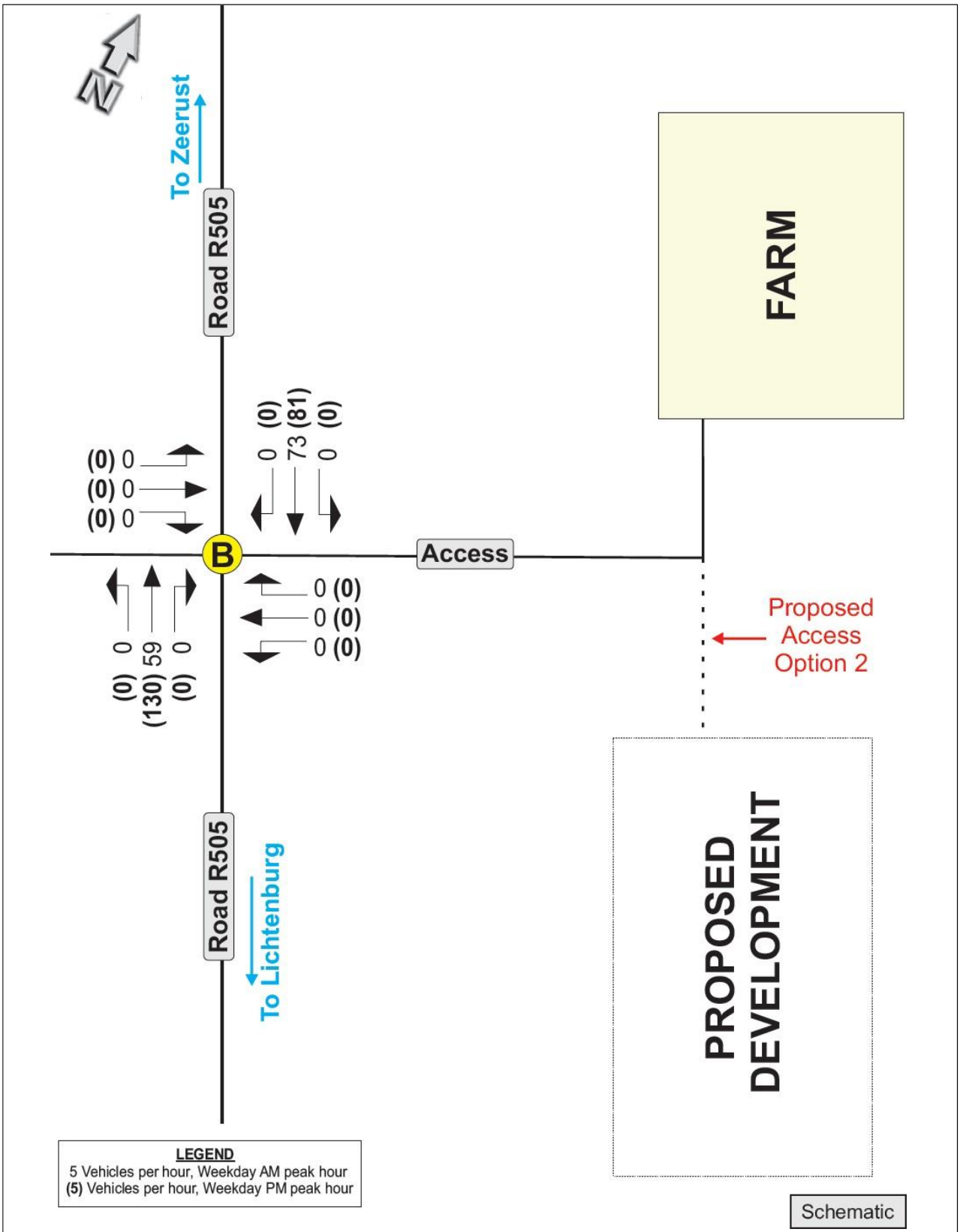


FIGURE B-10: PROJECTED 2032 PEAK HOUR TRAFFIC WITHOUT THE PROPOSED DEVELOPMENT (SCENARIO 3)(POINT B)

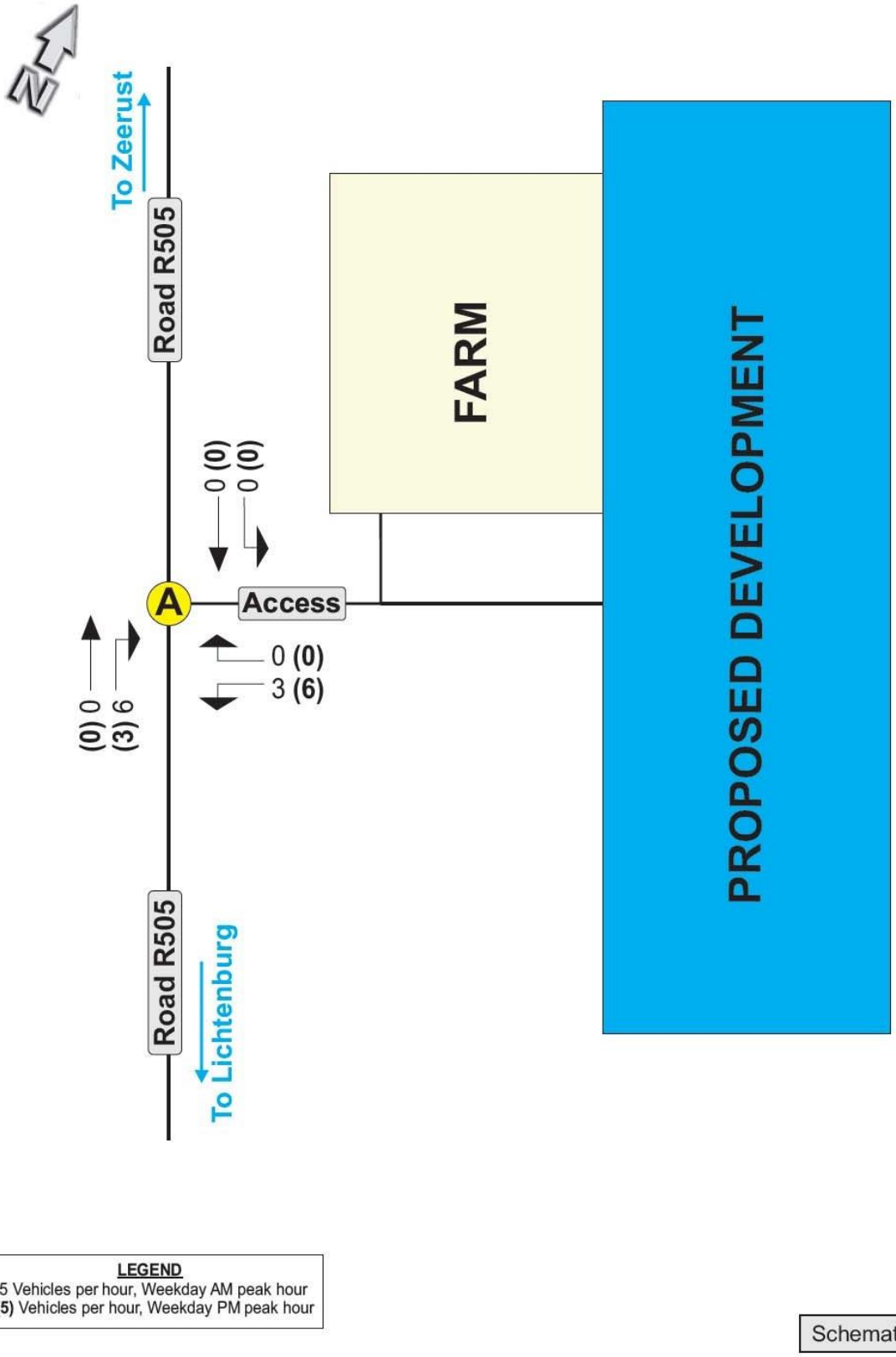


FIGURE B-11: PROJECTED VEHICLE TRIPS TO BE GENERATED BY THE PROPOSED DEVELOPMENT (OPERATIONAL PHASE)(POINT A)

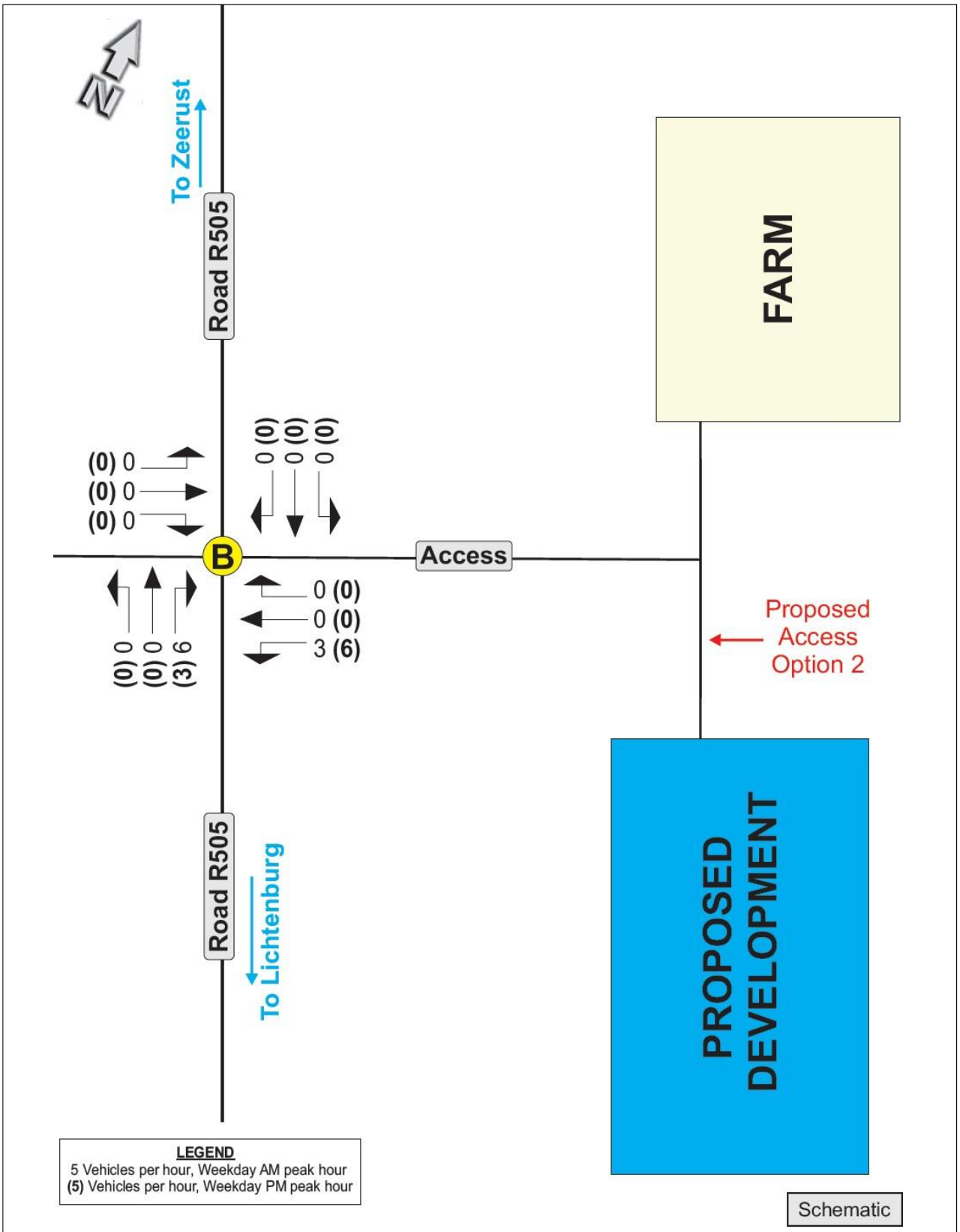


FIGURE B-12: PROJECTED VEHICLE TRIPS TO BE GENERATED BY THE PROPOSED DEVELOPMENT (OPERATIONAL PHASE)(POINT B)

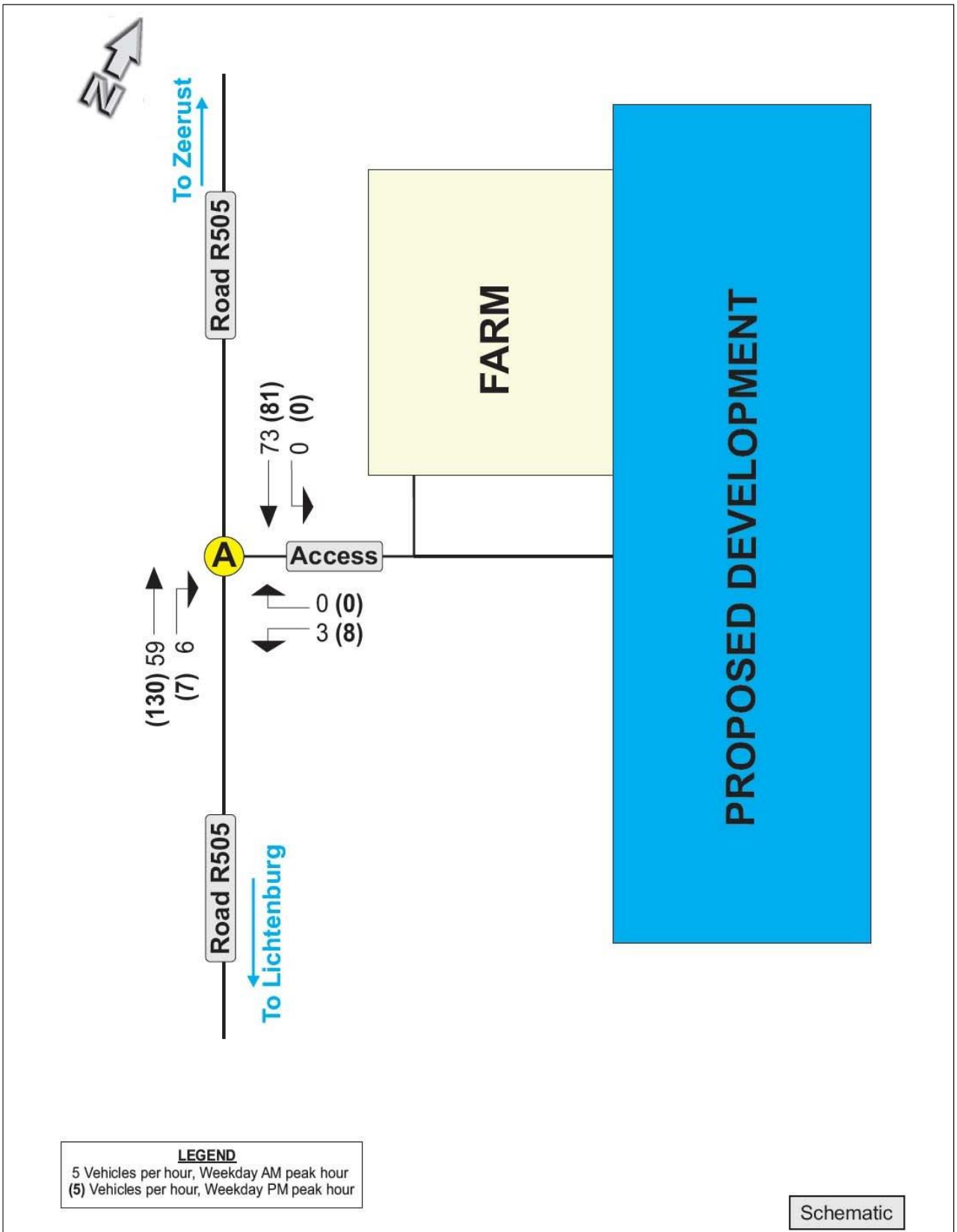


FIGURE B-13: PROJECTED 2032 PEAK HOUR TRAFFIC WITH THE PROPOSED DEVELOPMENT (SCENARIO 4) (OPERATIONAL PHASE)(POINT A)

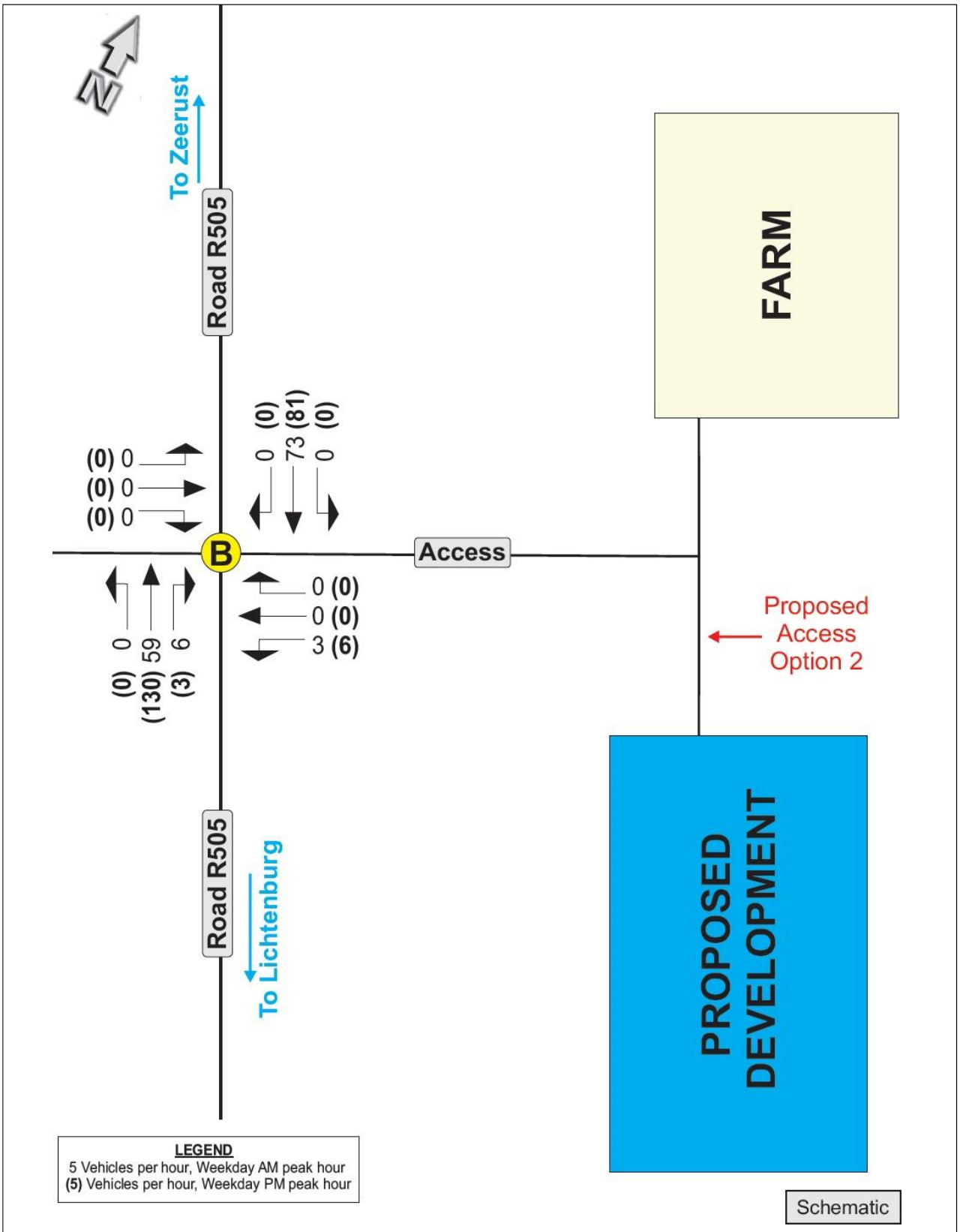


FIGURE B-14: PROJECTED 2032 PEAK HOUR TRAFFIC WITH THE PROPOSED DEVELOPMENT (SCENARIO 4) (OPERATIONAL PHASE)(POINT B)

APPENDIX C

SIDRA CALCULATION RESULTS

TABLE C-1: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2022 (BACKGROUND TRAFFIC) WITHOUT THE PROPOSED DEVELOPMENT

***POINT A:* INTERSECTION OF ROAD R505 AND PROPOSED ACCESS OPTION 1**						
Type of intersection control: Free-flow on Road R505						
Existing intersection geometry						
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 R505)	0.1	A	0.039	0.1	A	0.041
East (Acc Opt 1)	8.2	A	0.002	8.4	A	0.002
South (Road R505)	0.1	A	0.032	0.2	A	0.065
Intersection	**0.3**	**A**	**0.039**	**0.2**	**A**	**0.065**

***POINT B:* INTERSECTION OF ROAD R505 AND PROPOSED ACCESS OPTION 2**						
Type of intersection control: Free-flow on Road R505						
Existing intersection geometry						
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 R505)	0.2	A	0.040	0.2	A	0.042
East (Acc Opt 2)	8.3	A	0.004	8.5	A	0.004
South (Road R505)	0.3	A	0.033	0.1	A	0.064
West (Farm Road)	8.2	A	0.004	8.5	A	0.004
Intersection	**0.7**	**A**	**0.040**	**0.4**	**A**	**0.064**

TABLE C-2: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2022 (BACKGROUND TRAFFIC) WITH THE PROPOSED DEVELOPMENT (CONSTRUCTION PHASE)(SCENARIO 2)

SHOULD ACCESS BE GAINED VIA POINT A

***POINT A:* INTERSECTION OF ROAD R505 AND PROPOSED ACCESS OPTION 1**

Type of intersection control: Free-flow on Road R505

With the provision of dedicated right-turn lane on Southern appa\roach of Road R505

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 R505)	0.1	A	0.039	0.1	A	0.041
East (Acc Opt 1)	8.3	A	0.009	8.3	A	0.024
South (Road R505)	2.0	A	0.031	0.6	A	0.063
Intersection	**1.6**	**A**	**0.039**	**1.4**	**A**	**0.063**

SHOULD ACCESS BE GAINED VIA POINT B

***POINT B:* INTERSECTION OF ROAD R505 AND PROPOSED ACCESS OPTION 2**

Type of intersection control: Free-flow on Road R505

With the provision of dedicated right-turn lane on Southern appa\roach of Road R505

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 R505)	0.2	A	0.040	0.2	A	0.042
East (Acc Opt 2)	8.4	A	0.010	8.4	A	0.025
South (Road R505)	2.0	A	0.032	0.5	A	0.064
West (Farm Road)	8.9	A	0.004	9.3	A	0.004
Intersection	**1.9**	**A**	**0.040**	**1.5**	**A**	**0.064**

TABLE C-3: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2032 (BACKGROUND TRAFFIC) WITHOUT THE PROPOSED DEVELOPMENT (SCENARIO 3)

***POINT A:* INTERSECTION OF ROAD R505 AND PROPOSED ACCESS OPTION 1**						
Type of intersection control: Free-flow on Road R505						
Existing intersection geometry						
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 R505)	0.1	A	0.053	0.1	A	0.055
East (Acc Opt 1)	8.3	A	0.002	8.6	A	0.002
South (Road R505)	0.1	A	0.043	0.2	A	0.087
Intersection	**0.2**	**A**	**0.053**	**0.2**	**A**	**0.087**

***POINT B:* INTERSECTION OF ROAD R505 AND PROPOSED ACCESS OPTION 2**						
Type of intersection control: Free-flow on Road R505						
Existing intersection geometry						
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 R505)	0.2	A	0.054	0.2	A	0.056
East (Acc Opt 2)	8.5	A	0.004	8.8	A	0.004
South (Road R505)	0.2	A	0.043	0.1	A	0.086
West (Farm Road)	8.4	A	0.004	8.9	A	0.004
Intersection	**0.5**	**A**	**0.054**	**0.4**	**A**	**0.086**

TABLE C-4: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2032 (BACKGROUND TRAFFIC) WITH THE PROPOSED DEVELOPMENT (OPERATIONAL PHASE)(SCENARIO 4)						
SHOULD ACCESS BE GAINED VIA POINT A						
***POINT A:* INTERSECTION OF ROAD R505 AND PROPOSED ACCESS OPTION 1**						
Type of intersection control: Free-flow on Road R505						
With the provision of dedicated right-turn lane on Southern appa\roach of Road R505						
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 R505)	0.1	A	0.053	0.1	A	0.055
East (Acc Opt 1)	8.4	A	0.004	8.5	A	0.009
South (Road R505)	0.5	A	0.042	0.3	A	0.084
Intersection	**0.1**	**A**	**0.053**	**0.5**	**A**	**0.084**
SHOULD ACCESS BE GAINED VIA POINT B						
***POINT B:* INTERSECTION OF ROAD R505 AND PROPOSED ACCESS OPTION 2**						
Type of intersection control: Free-flow on Road R505						
With the provision of dedicated right-turn lane on Southern appa\roach of Road R505						
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 R505)	0.2	A	0.054	0.2	A	0.056
East (Acc Opt 2)	8.7	A	0.006	8.8	A	0.009
South (Road R505)	0.6	A	0.043	0.2	A	0.085
West (Farm Road)	9.1	A	0.004	9.7	A	0.005
Intersection	**0.8**	**A**	**0.054**	**0.6**	**A**	**0.085**

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-1.1: IMPACT RATINGS			
Receptor	**Roads and Traffic**		
Activity	**Road Vehicle Capacity - Relevant road sections (reconstructing/repairing of roads) and need for additional lanes**		
Risk/Impact	The impact of generating a high volume of vehicle trips with specific reference to heavy vehicles could contribute to a higher rate of deterioration of road surfaces and layers, shortening the lifespan of a specific roadway.		
Project Phase	Construction and Operational Phases.		
Nature of Impact	Negative.		
Type of Impact	Direct: Generating a high volume of vehicle traffic on a roadway could lead to a higher rate of deterioration of a roadway.		
Relevance to Proposed Development	The proposed development would generate a low number of vehicle trips during the construction phase and very low during the operational phase and is expected to not contribute significantly to road deterioration.		
Impact Parameter	**Define Categories**	**Value before Mitigation**	**Value with Mitigation**
Determining Consequence			
Severity	Low number of vehicle trips to be generated by the proposed expansion	1	No mitigation required
Duration	Life of proposed development	5	
Extent	Local, access intersection	2	
Compliance	Legislation on road capacity enforceable	1	
Consequence Total		**9**	
Consequence Average		**2.25**	
Determining Likelihood			
Frequency	Low number of vehicle trips to be generated and would not increase	1	No mitigation required
Probability	Almost never	1	
Likelihood Total		**2**	
Likelihood Average		**1**	
Significance			
Consequence x Likelihood		2.5	No mitigation required
Significance Rating		Low	
Mitigation and Monitoring Requirements			
Required Management Measures	None required.		
Required Monitoring (if any)	None required.		
Responsibility for Implementation	Not applicable.		

TABLE E-1.2: IMPACT RATINGS			
Receptor	**Roads and Traffic**		
Activity	**Road Safety Issues - Intersection (access) spacing (proposed roads)**		
Risk/Impact	Spacing of intersections impacts significantly on the operation, level of service and capacity of a roadway.		
Project Phase	Construction and Operational Phases.		
Nature of Impact	Negative.		
Type of Impact	Direct: Location of a development access road from existing roads has a direct impact on the existing road operations, level of service and capacity		
Relevance to Proposed Development	No other formal access intersections of any significance within the area.		
Impact Parameter	**Define Categories**	**Value before Mitigation**	**Value with Mitigation**
Determining Consequence			
Severity	No other formal access intersections of any significance within the area	1	No mitigation required
Duration	Life of proposed development	5	
Extent	Proposed development access	2	
Compliance	Legislation on access separation and sight distances enforceable	1	
Consequence Total		**9**	
Consequence Average		**2.25**	
Determining Likelihood			
Frequency	Permanent access, no recurring impact	1	No mitigation required
Probability	Permanent access, no recurring impact	1	
Likelihood Total		**2**	
Likelihood Average		**1**	
Significance			
Consequence x Likelihood		2.25	No mitigation required
Significance Rating		Low	
Mitigation and Monitoring Requirements			
Required Management Measures	None required.		
Required Monitoring (if any)	None required.		
Responsibility for Implementation	None required.		

TABLE E-1.3: IMPACT RATINGS			
Receptor	**Roads and Traffic**		
Activity	**Road Safety Issues - Available sight distance at intersections**		
Risk/Impact	The vertical and horizontal road alignment could affect road safety in terms of intersection and stopping sight distances. These effects could result in vehicle accidents at intersections.		
Project Phase	Construction and Operational Phases.		
Nature of Impact	Negative.		
Type of Impact	Direct: Access intersection to development.		
Relevance to Proposed Development	Sight distances at proposed access intersection.		
Impact Parameter	**Define Categories**	**Value before Mitigation**	**Value with Mitigation**
Determining Consequence			
Severity	Insufficient sight distances could lead to fatal accidents	3	1
Duration	Life of proposed development	5	5
Extent	Proposed development access	2	2
Compliance	Legislation on access separation and sight distances enforceable	4	1
Consequence Total		**14**	**9**
Consequence Average		**3.5**	**2.25**
Determining Likelihood			
Frequency	Daily if operations are active	5	1
Probability	Highly likely	5	1
Likelihood Total		**10**	**2**
Likelihood Average		**5**	**1**
Significance			
Consequence x Likelihood		17.5	2.25
Significance Rating		**Med-High**	**Low**
Mitigation and Monitoring Requirements			
Required Management Measures	Intersection sight distances for access intersection need to be complied with. This should be determined as part of the construction phase.		
Required Monitoring (if any)	None required.		
Responsibility for Implementation	Proposed development.		

TABLE E-1.4: IMPACT RATINGS			
Receptor	**Roads and Traffic**		
Activity	**Road Safety Issues - Speed limit at access intersections**		
Risk/Impact	Related to travelling speeds of road users at access intersections. High vehicle speeds at access intersections could result in vehicle accidents which could be caused by several factors.		
Project Phase	Construction and operational phases.		
Nature of Impact	Negative.		
Type of Impact	Direct: Related to travelling speeds of road users at access intersections.		
Relevance to Proposed Development	Speed limit along Road R505 is 100 km/h. With a proper intersection design, not a problem due to low number of background vehicles.		
Impact Parameter	**Define Categories**	**Value before Mitigation**	**Value with Mitigation**
Determining Consequence			
Severity	Impacts easily reversible by reducing speed limit	1	No mitigation required
Duration	Life of proposed development	5	
Extent	Proposed development access	2	
Compliance	Legislation enforceable	1	
Consequence Total		**9**	
Consequence Average		**2.25**	
Determining Likelihood			
Frequency	Unlikely	1	No mitigation required
Probability	Unlikely	1	
Likelihood Total		**2**	
Likelihood Average		**1**	
Significance			
Consequence x Likelihood		2.25	No mitigation required
Significance Rating		Low	
Mitigation and Monitoring Requirements			
Required Management Measures	None required.		
Required Monitoring (if any)	Monitor vehicle volumes along Road R505. Once volumes become high with high vehicle speeds, gaps in traffic flow could become problematic for vehicles to enter traffic flow from proposed development.		
Responsibility for Implementation	Proposed development and South African National Roads Agency SOC Ltd.		

TABLE E-1.5: IMPACT RATINGS			
Receptor	**Roads and Traffic**		
Activity	**Road Safety Issues - Relevant intersections (need for dedicated left- and right-turn lanes)**		
Risk/Impact	Without dedicated turning lanes, specially dedicated right-turn lanes could result in vehicle accidents for instance vehicles waiting to turn right and a vehicle that is travelling straight crashing into the back of the vehicle waiting to turn.		
Project Phase	Construction and operational phases.		
Nature of Impact	Negative.		
Type of Impact	Direct: Related to development access intersections.		
Relevance to Proposed Development	Vehicles waiting within main traffic flow to turn right into proposed development could result in fatal accidents (rear-end collision).		
Impact Parameter	**Define Categories**	**Value prior to Mitigation**	**Value with Mitigation**
Determining Consequence			
Severity	Harmful significant change if not mitigated	3	1
Duration	Life of proposed development	5	5
Extent	Proposed development access intersection	2	2
Compliance	Legislation enforceable	4	1
Consequence Total		**14**	**9**
Consequence Average		**3.5**	**2.25**
Determining Likelihood			
Frequency	Daily if operations are active	5	1
Probability	Highly likely	5	1
Likelihood Total		**10**	**2**
Likelihood Average		**5**	**1**
Significance			
Consequence x Likelihood		17.5	2.25
Significance Rating		Med-High	Low
Mitigation and Monitoring Requirements			
Required Management Measures	Construct access intersection with dedicated right-turn lane on southern approach.		
Required Monitoring (if any)	None required.		
Responsibility for Implementation	Proposed development.		

TABLE E-1.6: IMPACT RATINGS			
Receptor	**Roads and Traffic**		
Activity	**Road Safety Issues - Pedestrian movements (with reference to access roads and access intersections)**		
Risk / Impact	The conflict between vehicles and pedestrians could lead to fatalities. A split between pedestrians and vehicles should be opted for in order to create a safe environment for pedestrians.		
Project Phase	Construction and operational phases.		
Nature of Impact	Negative.		
Type of Impact	Direct: Related to development access intersections.		
Relevance to Proposed Development	Pedestrians not expected at access intersection due to limited public transport and location of proposed development.		
Impact Parameter	**Define Categories**	**Value before Mitigation**	**Value with Mitigation**
Determining Consequence			
Severity	Impact easily reversible	1	No mitigation required
Duration	Life of proposed development	5	
Extent	Proposed development access road	2	
Compliance	None	1	
Consequence Total		**9**	
Consequence Average		**2.25**	
Determining Likelihood			
Frequency	Unlikely	1	No mitigation required
Probability	Unlikely	1	
Likelihood Total		**2**	
Likelihood Average		**1**	
Significance			
Consequence x Likelihood		2.25	No mitigation required
Significance Rating		Low	
Mitigation and Monitoring Requirements			
Required Management Measures	During construction phase, ensure that contractors load and off-load pedestrians on site and not at the access intersection.		
Required Monitoring (if any)	During construction phase, ensure that contractors load and off-load pedestrians on site and not at the access intersection.		
Responsibility for Implementation	Proposed development.		

TABLE E-1.7: IMPACT RATINGS			
Receptor	**Roads and Traffic**		
Activity	**Road Safety Issues - Public transport loading and off-loading**		
Risk / Impact	Loading and off-loading of visitors and workers by public transport/arranged shuttle transport could lead to unsafe manoeuvres by vehicles at intersections (like U-turns) and the unsafe movement of pedestrians (like off-loading a pedestrian next to a road with no pedestrian walkway facilities). The last-mentioned could lead to fatal vehicle accidents.		
Project Phase	Construction and operational phases		
Nature of Impact	Negative.		
Type of Impact	Direct: Related to development.		
Relevance to Proposed Development	During the construction phase, construction staff making use of arranged transport (bus or taxi) need to load and off-load on site at a dedicated loading area and not within the proposed development access intersection.		
Impact Parameter	**Define Categories**	**Value prior to Mitigation**	**Value with Mitigation**
Determining Consequence			
Severity	Harmful significant change	3	1
Duration	Life of proposed development	5	5
Extent	Proposed development access intersection	2	2
Compliance	Legislation enforceable	4	1
Consequence Total		**14**	**9**
Consequence Average		**3.5**	**2.25**
Determining Likelihood			
Frequency	Daily if operations are active	5	1
Probability	Highly likely	5	1
Likelihood Total		**10**	**2**
Likelihood Average		**5**	**1**
Significance			
Consequence x Likelihood		17.5	2.25
Significance Rating		Med-high	Low
Mitigation and Monitoring Requirements			
Required Management Measures	Provide a dedicated loading and off-loading area on site and ensure that contractors make use of it and not stop within Road R27 road reserve at the proposed access intersection to load and off-load workers.		
Required Monitoring (If any)	Yes.		
Responsibility for Implementation	Proposed development.		

APPENDIX F

IMPACT RATING CRITERIA

METHODOLOGY USED IN RANKING THE NATURE, SIGNIFICANCE, CONSEQUENCES, EXTENT, DURATION AND PROBABILITY OF POTENTIAL IMPACTS AND RISKS ASSOCIATED WITH ALTERNATIVES

To assess the impacts on the environment, the process will be divided into two main phases namely the construction phase and the operational phase. The activities, products and services present in these two phases will be studied to identify and predict all possible impacts. In any process of identifying and recognising impacts, one must recognise that the determination of impact significance is inherently an anthropocentric concept. Duinker and Beanlands, (1986) in DEAT 2002. Thompson (1988), (1990) in DEAT 2002 stated that the significance of an impact is an expression of the cost or value of an impact to society.

However, the tendency is always towards a system of quantifying the significance of the impacts so that it is a true representation of the existing situation on site. This will be done by using, where possible, legal and scientific standards which are applicable.

The significance of the aspects/impacts of the process will be rated by using a matrix derived from Plomp (2004) and adapted to some extent to fit this process. These matrixes use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts.

The consequence matrix uses parameters like severity, duration, and extent of impact as well as compliance to standards. Values of 1-5 are assigned to the parameters that are added and averaged to determine the overall consequence. The same process is followed with the likelihood that consists of two parameters namely frequency and probability. The overall consequence and the overall likelihood are then multiplied to give values ranging from 1 to 25. These values as shown in the following table are then used to rank the significance. It must be said, however, that in the end, subjective judging of an impact can still be done, but the reasons for doing so must be qualified.

Significance ratings (Plomp 2004)

Significance	Low -	Low-Medium -	Medium -	Medium-High -	High -
Overall Consequence X Overall Likelihood	1-4.9	5-9.9	10-14.9	15-19.9	20-25

Significance	Low +	Low-Medium +	Medium +	Medium-High +	High +
Overall Consequence X Overall Likelihood	1-4.9	5-9.9	10-14.9	15-19.9	20-25

Description of the parameters used in the matrixes.

Severity:

Low	Low cost/high potential to mitigate. Impacts easily reversible, non-harmful insignificant change/deterioration or disturbance to natural environments.
Low-medium	Low cost to mitigate small/potentially harmful moderate change/deterioration or disturbance to natural environment.
Medium	Substantial cost to mitigate. Potential to mitigate and potential to reverse impact. Harmful significant change/deterioration or disturbance to natural environment.
Medium-high	High cost to mitigate. Possible to mitigate great/very harmful very significant change/deterioration or disturbance to natural environment.
High	Prohibitive cost to mitigate. Little or no mechanism to mitigate. Irreversible. Extremely harmful disastrous change/deterioration or disturbance to natural environment.

Duration:

Low	Up to one month
Low-medium	One month to three months
Medium	Three months to one year
Medium-high	One to ten years
High	Beyond ten years

Extent:

Low	Within footprint area
Low-medium	Whole of site
Medium	Adjacent properties
Medium-high	Communities around the site area
High	Saldanha Bay Municipality area

Frequency:

Low	Once/more a year or once/more during operation
Low-medium	Once/more in 6 months
Medium	Once/more a month
Medium-high	Once/more a week
High	Daily

Probability:

Low	Almost never/almost impossible
Low-medium	Very seldom/highly unlikely
Medium	Infrequent/unlikely/seldom
Medium-high	Often/regularly/likely/possible
High	Daily/highly likely/definitely

Compliance:

Low	Best practise
Low-medium	Compliance
Medium	Non-compliance/conformance to policies, etc. - internal
Medium-high	Non-compliance/conformance to legislation, etc. - external
High	Directive, prosecution of closure or potential for non-renewal of licences or rights

ASSESSMENT CRITERIA

The terms of reference for the EIA study will include criteria for the description and assessment of environmental impacts. These criteria are drawn from the *Integrated Environmental Management Guidelines Series, Guideline 5*: *Assessment of Alternatives and Impacts*, published by the DEFF in terms of the Environmental Impact Assessment. These criteria include:

IMPACT ASSESSMENT CRITERIA

Nature of impact This is an appraisal of the type of effect the proposed activity would have on the affected environmental component. The description should include what is being affected, and how.		
Extent The physical and spatial size of the impact.	**Site**	The impact could affect the whole or a measurable portion of the above-mentioned properties.
	Local	The impacted area extends only as far as the activity, e.g. a footprint.
	Regional	The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.
Duration The lifetime of the impact; this is measured in the context of the lifetime of the proposed base.	**Short term**	The impact will either disappear with mitigation or will be mitigated through a natural process in a span shorter than any of the phases.
	Medium term	The impact will last up to the end of the phases, whereafter it will be entirely negated.
	Long term	The impact will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter.
	Permanent	The only class of impact which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a period that the impact can be considered transient.
Intensity	**Low**	The impact alters the affected environment in such a way that the natural processes or functions are not affected.
	Medium	The affected environment is altered, but function and process continue, albeit in a modified way.
	High	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.

Probability This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time.	**Improbable**	The possibility of the impact occurring is very low, due either to the circumstances, design or experience.
	Probable	There is a possibility that the impact will occur to the extent that provisions must be made therefore.
	Highly probable	It is most likely that the impacts will occur at some or other stage of the development. Plans must be drawn up before the undertaking of the activity.
	Definite	The impact will take place regardless of any prevention plans, and there can only be relied on mitigation actions or contingency plans to contain the effect.
Determination of significance. Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required.	**No significance**	The impact is not substantial and does not require any mitigation action.
	Low	The impact is of little importance but may require limited mitigation.
	Medium	The impact is of importance and therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.
	High	The impact is of great importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential.

APPENDIX G

PROFESSIONAL REGISTRATION AND CURRICULUM VITAE

ECSA

ENGINEERING COUNCIL OF SOUTH AFRICA

10-Sep-2021 12:59

Profile Number : ECSA-00080528
Tel : +27 82 371 0253
Email : leon@siyazi.co.za

Mr,L,Roets
P O Box 11182

Bendor Park
0713

Dear Leon Roets

RENEWAL OF REGISTRATION(s) 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 registration(s), in terms of Section 22(1) of the Engineering Profession Act, 2000 (Act 46 of 2000), has been successful and your registration(s) has been renewed for a further period of (5) years until 14-Nov-2026 00:00, subject to you paying your annual fees.

Congratulations, on the continued recognition of your status with the Engineering Council of South Africa.

Yours Faithfully
Ms Carmen Wright
Manager: Education and CPD

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

Suid-Afrikaanse Raad vir Ingenieurswese

Hiermee word gesertifiseer dat *Leon Roets*

geregistreer is as *Professionele Ingenieur*

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

Datum *14 November 1996*

Registrasienommer *960547*

President

Registrateur

DE JONG 92

Die Suid-Afrikaanse Instituut van Siviele Ingenieurswese

Hiermee word gesertifiseer dat

Leon Roets

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 resolusie van die Raad

President

Uitvoerende Direkteur

SARF
better roads

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

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 Hernic'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 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															2013-2003
Road R37 between Polokwane and Burgersfort (Dilokong 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					2013-2010
Vhembe District Municipality								Y								2010
Burgersfort, Road Master Network															Y	2009-2007
Mogalakwena Local Municipality	Y															2009-2006
Ba-Phalaborwa Local Municipality						Y										2008
Mogalakwena Local Municipality							Y									2008
Mogalakwena, Relocation and Road Safety of Road N11															Y	2008
Fetakgomo Local Municipality	Y															2007-2005
Polokwane, 2010 Priority Statement (PTIS)									Y							2007-2005
Polokwane Local Municipality					Y	Y										2007
Mogalakwena Local Municipality					Y											2007
Polokwane Local Municipality	Y															2006-1997
Sekhukhune District Municipality		Y	Y	Y	Y	Y										2006
Taxi Recapitalisation for Limpopo Department of Roads & Transport									Y							2005-2004
Limpopo Department or 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										2003
Mopani District Municipality		Y	Y		Y	Y										2003
Pietersburg-Polokwane Transport Strategy						Y										2000
Polokwane, N1 Eastern bypass															Y	2000
Pietersburg-Polokwane Public Transport Strategy					Y											1997