Appendix D2: Traffic Impact Assessment

MEMORANDUM

TRAFFIC IMPACT ASSESSMENT

PROPOSED NEW KATHU CEMETERY TO BE SITUATED ON THE REMAINING EXTENT OF THE FARM LYLEVELD 545, NORTHERN CAPE

FEBRUARY 2017

Prepared for:
Synergistic Environmental Services (Pty) Ltd
(Part of the SLR Group)
P O Box 1596
Cramerview
2060

SLR Reference: SY0204

Prepared by:
Siyazi Transportation Services
Free State (Pty) Ltd
72 St Andrews Street
Bloemfontein
9301
Siyazi Reference: 16077

Declaration of Independence

I, Leon Roets, hereby declare that Siyazi Transportation Services Free State (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: 23 February 2017

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

	NEMA Regs (2014) - Appendix 6	**Reference to section of specialist report or justification for not meeting requirement**
1	A specialist report or a report on a specialised process prepared in terms of these Regulations must contain -	
(a) i	the person who prepared the report; and	Declaration of independence, page II.
(a) ii	the expertise of that person to carry out the specialist study or specialised process including a curriculum vitae;	Appendix G.
(b)	a declaration that the person is independent in a form as may be specified by the competent authority;	Declaration of independence, page II.
(c)	an indication of the scope of, and the purpose for which, the report was prepared;	Section 1, Introduction, page 3
(d)	the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	28 October 2016, dry season, no impact in terms of traffic impact assessment.
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process;	Section 1, Introduction, Page 3 and throughout the report.
(f)	the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 3, Point 2.4, Page 18.
(g)	an identification of any areas to be avoided, including buffers;	Section 3, Point 2.4, Page 18.
(h)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 3, Page 19, Figures 2.3 and 2.4.
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2, Point 2.1.1. Assumption in terms of traffic growth percentage

	NEMA Regs (2014) - Appendix 6	Reference to section of specialist report or justification for not meeting requirement
(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	Section 3, from Page 26.
(k)	any mitigation measures for inclusion in the EMPr	Section 3, from Page 26.
(l)	any conditions for inclusion in the environmental authorisation	Section 3, from Page 26.
(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 3, from Page 26.
(n)	a reasoned opinion -	Section 3, Point 3.2.3, Page 35.
i.	as to whether the proposed activity or portions thereof should be authorised and	Section 3, Point 3.2.3, Page 35.
ii.	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, from Page 26.
(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	No specific consultation was undertaken or deemed necessary as part of this study. Comments received by Synergistics as part of the Basic Assessment were considered in the undertaking of this study
(p)	a summary and copies if any comments that were received during any consultation process, and where applicable any responses thereto -	No specific consultation was undertaken or deemed necessary as part of this study. Comments received by Synergistics as part of the Basic Assessment were considered in the undertaking of this study
(q)	Any other information requested by the competent authority.	None received

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Section 1

INTRODUCTION

Siyazi Transportation Services Free State (Pty) Ltd was appointed by Synergistic Environmental Services (Pty) Ltd to conduct a Traffic Impact Assessment (TIA) for the proposed new Kathu Cemetery to be situated on the remaining extent of the Farm Lyleveld 545, Northern Cape Province.

The existing Kathu Cemetery is nearing capacity and thus additional space is necessary due to the rapid expansion of the town of Kathu which is partly related to the resettlement of the Dingleton residents as a result of the expansion of the Sishen Iron Ore Mine. Due to the existing Kathu Cemetery being located in the protected Kathu Forest, extending the cemetery is not possible. The best viable alternative is to establish a new cemetery on the remaining extent of the farm Lyleveld 545, approximately 13 km south of central Kathu .The new Kathu Cemetery will be approximately 5 hectares (ha) in extent and is planned to have a parking area for approximately 100 vehicles.

Vehicle access from and to the proposed development is being investigated for two possible access alternatives that have been identified. The two alternatives are as follows:

1) **Access Alternative 1:** Access from Road N14; and
2) **Access Alternative 2:** Access from Dingleton Road (Road D3333).

Figure 1.1 provides the locality of the proposed development in relation to other activities in the vicinity, including the location of the intersections under investigation.

POINT	INTERSECTION STATUS	INTERSECTION	GPS CO-ORDINATES	
			LATITUDE	LONGITUDE
A	Proposed	Proposed intersection of Road N14 and the Proposed Access Road 1 (Access Alternative 1)	S 27°48'55.00"	E 23° 2'37.57"
B	Existing	Intersection of Road N14, Dingleton Road and Road D3333	S 27°49'7.43"	E 23° 2'10.10"
C	Proposed	Proposed intersection of Dingleton Road and Proposed Access Road 2 (Access Alternative 2)	S 27°49'5.03"	E 23° 2'7.63"

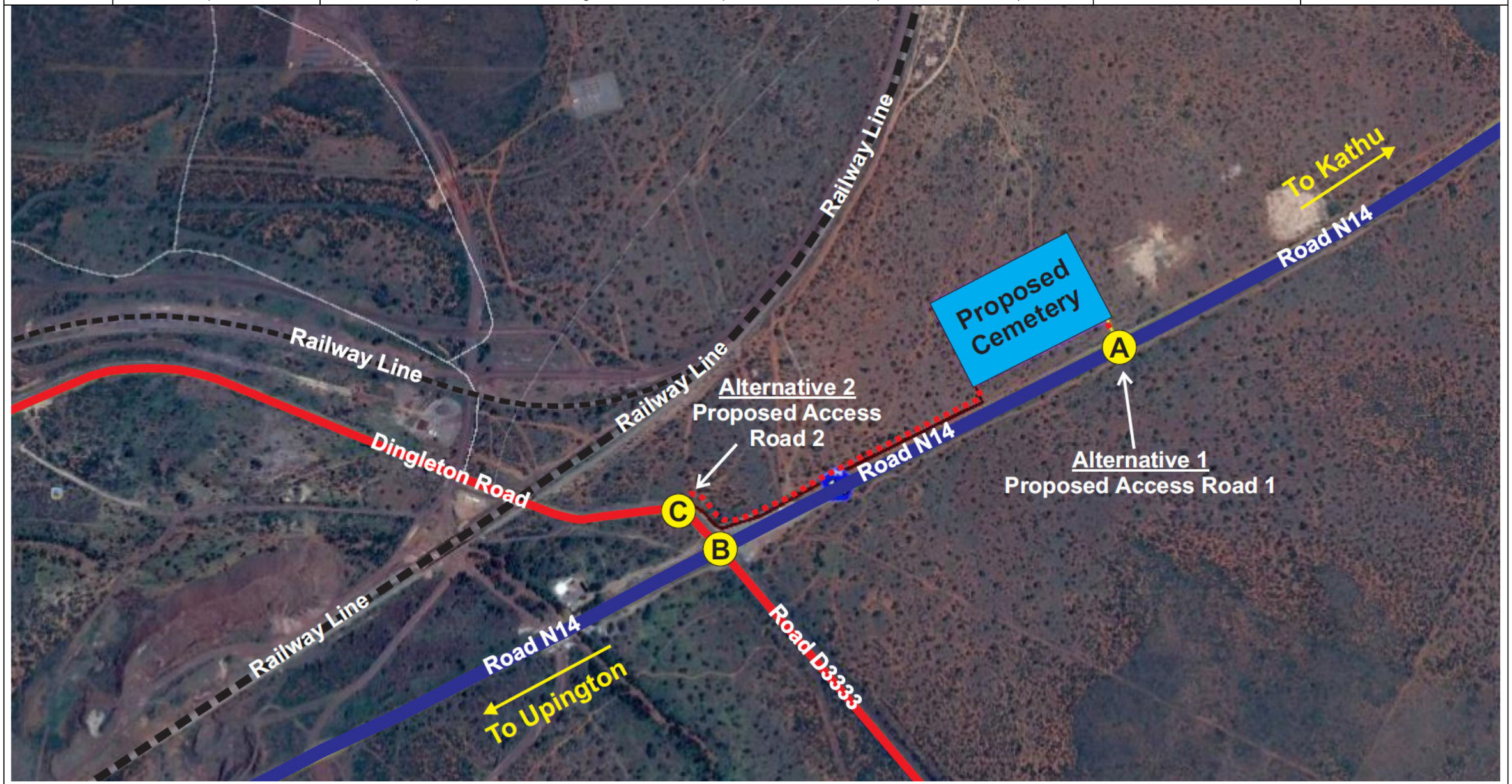


FIGURE 1.1: LOCALITY OF PROPOSED DEVELOPMENT AND RELEVANT INTERSECTIONS

The purpose of this study is to undertake an assessment of the implications of the vehicle traffic that could potentially be generated by the proposed development and to determine:

a) The traffic impact that the change in land use would have on 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; and
c) The mitigating measures required to accommodate the proposed development within acceptable traffic engineering norms.

The following scenarios were investigated as part of the TIA:

a) **Scenario 1:** 2017 peak hour traffic without background traffic growth, without the proposed development (status quo);
b) **Scenario 2:** 2017 peak hour traffic without background traffic growth, with the proposed development (Alternative Access Road 1 from Road N14);
c) **Scenario 3:** 2017 peak hour traffic without background traffic growth, with the proposed development (Alternative Access Road 2 from Dingleton Road);
d) **Scenario 4:** 2022 peak hour traffic with background traffic growth, without the proposed development;
e) **Scenario 5:** 2022 peak hour traffic with background traffic growth, with the proposed development (Alternative Access Road 1 from Road N14); and
f) **Scenario 6:** 2017 peak hour traffic with background traffic growth, with the proposed development (Alternative Access Road 2 from Dingleton Road).

The South African National Roads Agency Ltd (Road N14) and the Northern Cape Department of Roads and Transport (Dingleton Road and Road D3333) are the relevant road authorities related to the adjacent road network to the proposed development.

The following sections of the memorandum elaborate on the:

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

Section 2

DETAILED INFORMATION RELATED DATA COLLECTED AND INVESTIGATIONS

The purpose of **Section 2** is to provide the detailed information related to the findings and recommendations of the proposed development TIA:

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

The following subsection elaborates on the above mentioned.

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

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

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

2.1.1 EXISTING LAND USE INFORMATION

The relevant property related to the proposed development is currently zoned for agricultural purposes and is used by Sishen Mine as a game farm. 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 between the 2017 manual traffic counts and the 2022 scenarios was anticipated at 3% per annum; and
b) That the vehicle traffic absorption rate (rate at which existing developments attract vehicular traffic) by all other types of completed developments will maintain the same status for the next five years.

2.1.2 EXISTING ROAD CHARACTERISTICS AND MODAL DISTRIBUTION

The following are relevant as part of this section:

a) **Table 2.1** contains information related to the existing intersections under investigation.
b) **Figure 2.1** provides the existing road layout for the area under investigation.
c) **Table 2.2** provides information concerning the relevant road sections under investigation and includes the following:

   i) Relevant road section;
   ii) Picture of road section;
   iii) Existing class of road;
   iv) Proposed class of road;
   v) Road reserve widths;
   vi) Lane widths; and
   vii) Median widths.

d) **Tables 2.3** and **2.4** provides a copy of the Guidelines (COTO TRH26 "*South African Road Classification and Access Management Manual, Version 1.0, August 2012*" Rural areas) of typical road characteristics and access management requirements.

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

POINT	DESCRIPTION	INTERSECTION CONTROL	PEDESTRIAN ACTIVITIES	INTERSECTION PHOTO
A	Road N14 and the Proposed Access Road 1 (Alternative 1)	Proposed Intersection.		
B	Road N14. Dingleton Road and Road D3333	Free-flow on Road N14	Limited pedestrian activity present	
C	Dingleton Road and the Proposed Access Road 2 (Alternative 2)	Proposed intersection.		

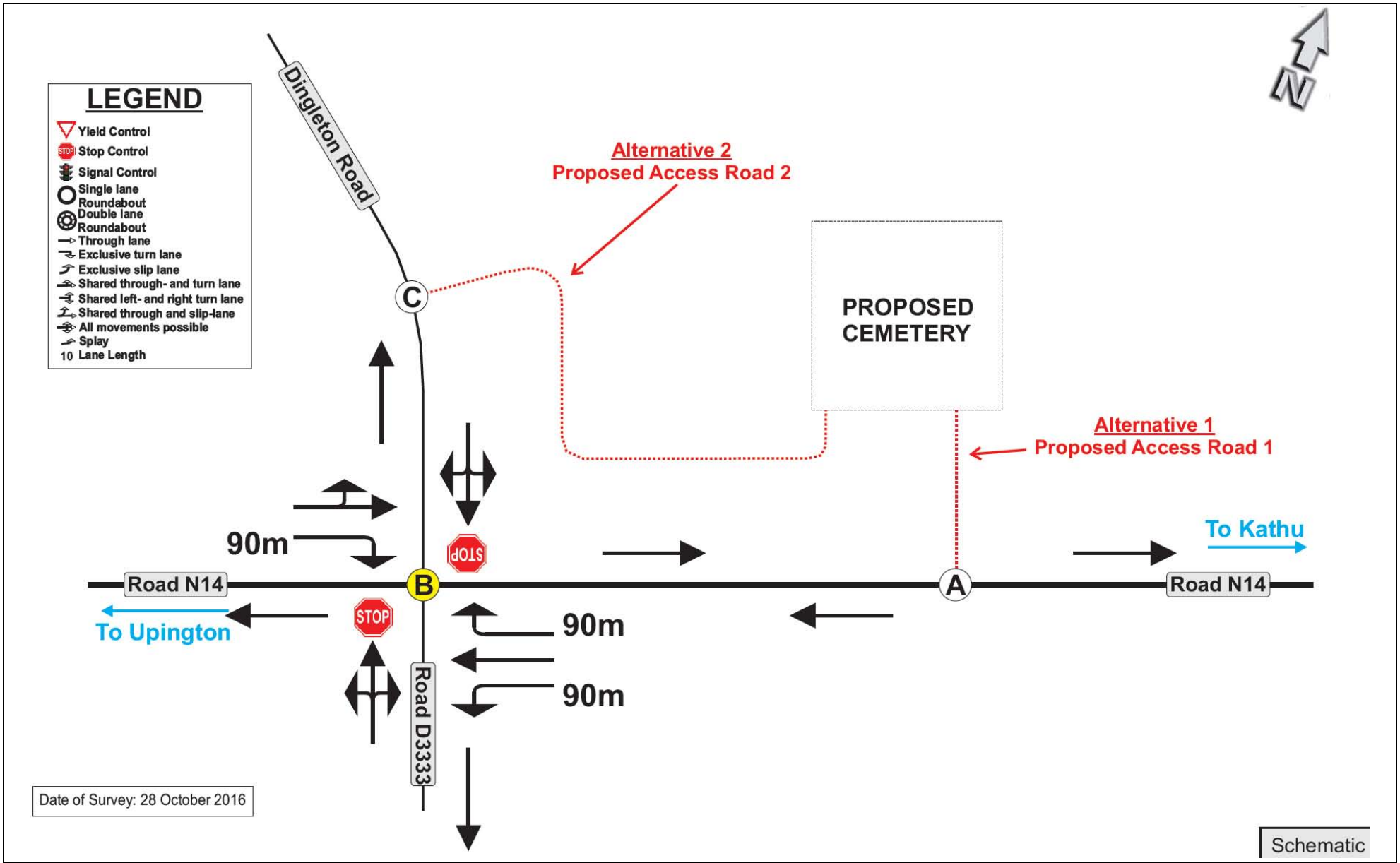


FIGURE 2.1: EXISTING ROAD NETWORK LAYOUT

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 N14** Road link between Kathu and Upington		**Primary Function:** Mobility			**Proposed Function:** Mobility			South African National Roads Agency Ltd.	60m	One lane per direction	3.7m wide	Asphalt	None	3%	None stated. Recommended 80km/h for section
		Class	**Class No.**	**Route No.**	**Class**	**Class No.**	**Route No.**								
		Principal arterial	R2	N	Principal arterial	R2	N								
		Description: Major arterial			**Description:** Major arterial										
		Access spacing: 5.0km			Access spacing: 5.0 km										
Road Section 2 **Dingleton Road (Road D3333)** Access to Dingleton from Road N14		**Primary Function:** Activity / Access			**Primary Function:** Activity / Access			Northern Cape Department of Roads and Transport	40m	One lane per direction	3.7m wide	Asphalt	None	3%	None stated. Recommended 40km/h for intersection
		Class	**Class No.**	**Route No.**	**Class**	**Class No.**	**Route No.**								
		Collector road	R4	N/a	Collector road	R4	N/a								
		Description: Collector			**Description:** Collector										
		Access spacing: N/a			Access spacing: N/a										

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

FUNCTION			DESCRIPTION		MOBILITY				
BASIC FUNCTION	**ALTERNATE FUNCTIONAL DESCRIPTION**	**DETERMINING FUNCTION**	**CLASS NO (R_)**	**CLASS NAME**	**ORIGIN / DESTINATION**	**THROUGH TRAFFIC COMPONENT**	**REACH OF CONNECTIVITY**	**% OF BUILT KM**	**AADT (AVERAGE ANNUAL DAILY TRAFFIC)**
Mobility	Vehicle priority, vehicle only, long distance, through, high order, high speed, numbered, commercial, economic, strategic, route, arterial road or highway	Movement is dominant, through traffic is dominant, the majority of traffic does not originate or terminate in the immediate vicinity, the function of the road is to carry high volumes of traffic between urban areas.	R 1	Principal arterial*	Metro areas, large cities, large border posts, join national routes.	Exclusively	> 50km	2 - 4% Classes 1 and 2	1 000 - 100 000+
			R 2	Major arterial*	Cities and large towns, transport nodes (harbour and international airports), smaller border posts, join major routes.	Exclusively	> 25km		500 - 25 000+
			R 3	Minor arterial*	Towns, villages and rural settlements, tourist destinations, transport nodes (railway sidings, seaports, landing strips), small border posts, other routes.	Predominant	> 10km	6 - 12% 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	TYPICAL CROSS SECTION	INTERSECTION SPACING	ROADWAY / LANE WIDTH	ROAD RESERVE WIDTH	PUBLIC TRANSPORT AND PEDESTRIAN CROSSINGS	PEDESTRIAN FOOTWAYS (CONSTRUCTED)	CYCLE LANES	ANIMAL DRAWN VEHICLES
Mobility	R 1	Principal arterial	Expressway	Yes (N)	Not allowed*	No (off road rest stops allowed)	120	Grade separated or priority to through	2/3/4 lane, surfaced shoulders, climbing lanes	8.0KM	3.5 - 3.7m	60 - 80m (62m)	No	No	No	No
	R 2	Major arterial	Highway	Yes (R: 2 or 3-digit; or N)	Not allowed */**	No (off road rest stops allowed)	120	Priority or grade separated	2/3 lane, surfaced shoulders, climbing lanes	5.0KM	3.5 - 3.7m	40-70m (48m)	As required	Isolated	Recreational on shoulder	No
	R 3	Minor arterial	Main road	Yes (R: 3 or 2-digit)	Not allowed */**	No (off road rest stops allowed)	100 - 120	Priority, roundabout	2 lane surfaced, gravel shoulders	1.6KM	4.0m	30-50m (30m)	As required	Isolated	Recreational widen roadway both sides	Widen shoulder
Access / Activity	R 4	Collector road	Collector	Allowed, T (tourist) or D (district)	Yes	No (off road edge or in lay byes / viewpoints)	80 - 100	Priority	2 lane surfaced or gravel, gravel shoulders	600m – 800m	3.5m	25m	As required	Rare, isolated	Widen roadway	Widen shoulder
	R 5	Local road	Farm road	Allowed, T (tourist) or L (local)	Yes	No (on verge or shoulder)	60 - 80	Priority	1/2 lane gravel, 600mm concrete strips in environmental areas	450m – 600m	-	20m	As required	Rare	Use roadway	Use roadway
	R 6	Walkway	Track or pathway	No	Yes	n/a	-	-	-	-	-	-	-	Not constructed, formed by use	-	-

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

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

2.1.3 TRAFFIC COUNTS AS BASIS FOR MAKING TRAFFIC-ENGINEERING CALCULATIONS

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

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

The relevant 12-hour manual traffic counts were conducted on Friday 28 October 2016 at the following intersections under investigation:

a) **Point B**: Intersection of Road N14, Dingleton Road and Road D3333

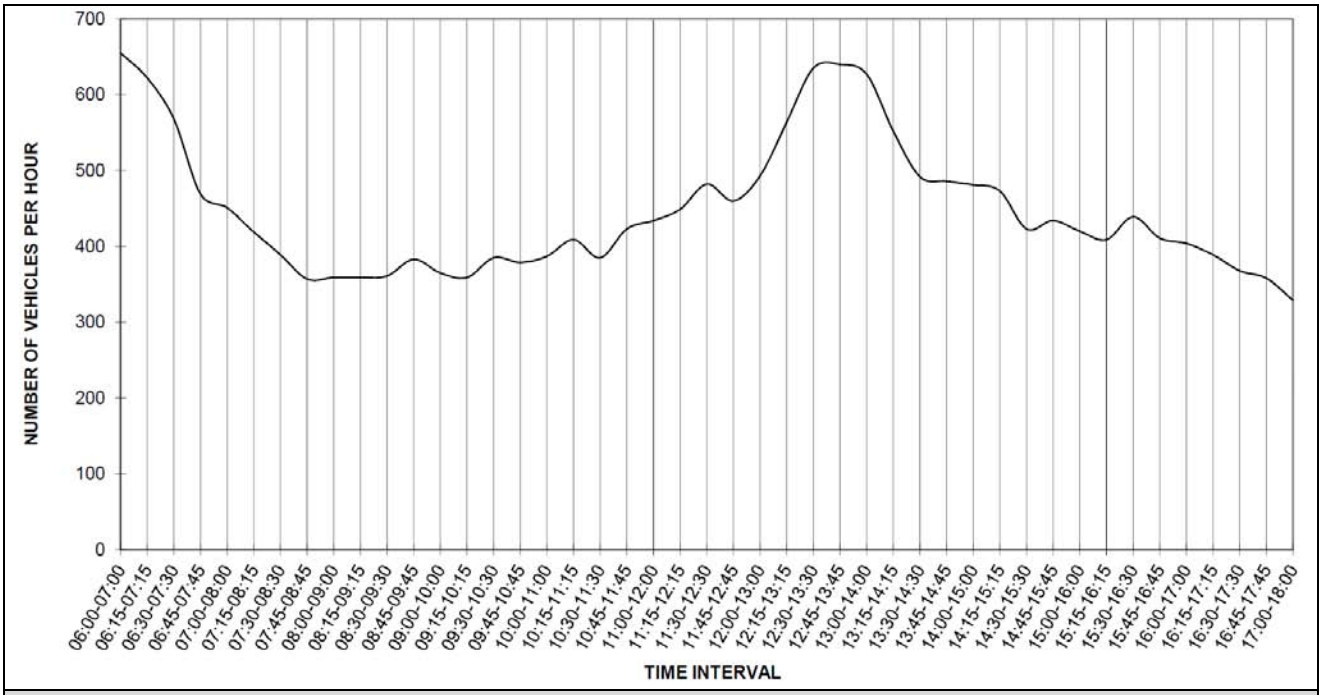
The combined hourly totals of all the vehicle types for the traffic survey conducted on Friday 28 October 2016 between 06:00 and 18:00 are indicated in **Table A-1** of **Appendix A** of this report. The description of the relevant vehicle movements at the relevant intersections appears in **Figure A-1** of **Appendix A**.

The respective peak-hour flows for the traffic counts at the relevant intersections were identified as indicated in **Table 2.5** below. The dominant peaks were the AM and Mid-Day peaks due to mining related activities (shift changes).

TABLE 2.5: PEAK HOUR PERIODS AT THE RELEVANT INTERSECTIONS

POINT	INTERSECTION	AM PEAK		MID PEAK	
		TIME INTERVAL	NUMBER OF VEHICLES	TIME INTERVAL	NUMBER OF VEHICLES
1	Road N14, Dingleton Road and Road D3333	06:45 – 07:45	469	12:45 – 13:45	640

Figure 2.2 indicates the hourly traffic pattern, per 15-minute interval, for all modes of vehicles at the relevant intersections between 06:00 and 18:00 on Friday 28 October 2016.



INTERSECTION OF ROAD N14, DINGLETON ROAD AND ROAD D3333

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

2.2 FUTURE LAND USE AND ROAD CHARACTERISTICS

The following are relevant:

a) Land use information, including possible future developments in the area;
b) Information about the expected future modal distribution;
c) Determination of the vehicle trips anticipated to be generated by the proposed development; and
d) Determination of the total traffic anticipated to be generated by the proposed development at the relevant intersections.

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

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

The remaining extent of the Farm Lyleveld 545 is currently zoned for agricultural purposes and is used by Sishen Mine as a game farm. No latent approved developments within the vicinity of the proposed development were known of at the time of preparing this TIA.

2.2.2 INFORMATION ABOUT THE EXPECTED FUTURE MODAL DISTRIBUTION

Figures B-2 to **B-3** of **Appendix B** indicates (in percentages) the expected vehicle trips distribution respectively for the AM and mid-day peak periods for the relevant scenarios under investigation.

2.2.3 DETERMINATION OF VEHICLE TRIPS EXPECTED TO BE GENERATED BY THE PROPOSED DEVELOPMENT

Table 2.6 indicates the trip generation rates, the number of vehicle trips which are expected to be generated by the proposed development and the distribution of the vehicle trips to and from the respective areas of the proposed development respectively.

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.

The above mentioned guidelines indicate that the highest peak for vehicle trips to be generated by a cemetery is likely to be on a Saturday. A conservative approach was followed in terms of the Traffic Impact Assessment, and therefore the traffic calculations were done for the Friday AM peak and mid-day peak for the following reasons:

a) From data obtained from the 2012 SANRAL Year Book it is possible to derive that vehicle traffic volumes on a Saturday is approximately 32% less than for a Friday which is the highest of the week; and
b) Vehicle trips to be generated by a cemetery according to above mentioned guidelines are potential trips to be generated during background traffic peak periods and thus the guidelines indicate a potentially low number of vehicle trips to be generated during these peaks.
c) It is important to take note that the report investigates the potential vehicle trips to be generated by the proposed development to occur during a peak period (peak hour) of the background traffic not related to the proposed development as a worst case scenario. It therefore does not depict the total number of vehicles that might visit the proposed development at a specific time or for a specific ceremony.

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TABLE 2.6: TRIP GENERATION RATES, EXPECTED NUMBER OF VEHICLE TRIPS TO BE GENERATED BY THE PROPOSED DEVELOPMENT AND THE DISTRIBUTION OF VEHICLE TRIPS								
Item	**Land Use**	**Size (Hectares)**	**Trip Rate (per Ha)**	**Dist. % In**	**Dist. % Out**	**Total Trips In**	**Total Trips Out**	**Total Trips**
AM Peak Hour								
1	Cemetery	5	0,20	70%	30%	1	0	1
TOTAL						**1**	**0**	**1**
MIDDAY Peak Hour								
1	Cemetery	5	4,00	75%	25%	15	5	20
TOTAL						**15**	**5**	**20**
PM Peak Hour								
1	Cemetery	5	0,20	35%	65%	0	1	1
TOTAL						**0**	**1**	**1**
SATURDAY Peak Hour								
1	Cemetery	5	8,00	50%	50%	20	20	40
TOTAL						**20**	**20**	**40**

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

The detailed traffic-related investigation was conducted for the AM and Mid-day peaks for the proposed development. The following figures are relevant:

a) **Figure B-1:** Projected 2017 peak hour background traffic without the proposed development (**Scenario 1**);
b) **Figure B-2:** Projected vehicle trip distribution for the proposed development (**Alternative 1 - Access from Road N14**);
c) **Figure B-3:** Projected vehicle trip distribution for the proposed development (**Alternative 2 - Access from Dingleton Road**);
d) **Figure B-4:** Projected vehicle trips generated by the proposed development (**Alternative 1 - Access from Road N14**);
e) **Figure B-5:** Projected vehicle trips generated by the proposed development (**Alternative 2 - Access from Dingleton Road**);
a) **Figure B-6:** Projected 2017 peak hour traffic with the proposed development (**Alternative 1 – Access from Road N14**) (**Scenario 2**);
b) **Figure B-7:** Projected 2017 peak hour background traffic with the proposed development (**Alternative 2 – Access from Dingleton Road**) (**Scenario 3**);
c) **Figure B-8:** Projected 2022 peak hour traffic without the proposed development (**Scenario 4**);
d) **Figure B-9:** Projected 2022 peak hour traffic with the proposed development (**Alternative 1 – Access from Road N14**) (**Scenario 5**); and
e) **Figure B-10:** Projected 2022 peak hour traffic with the proposed development (**Alternative 2 – Access from Dingleton Road**) (**Scenario 6**);

2.3 CURRENT AND FUTURE LEVELS OF SERVICE AT THE RELEVANT INTERSECTIONS

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

a) **Point A:** Intersection of Road N14 and the proposed Access Road 1 (Alternative 1 – access from Road N14);
b) **Point B:** Intersection of Road N14, Dingleton Road and Road D3333; and
c) **Point C:** Intersection of Dingleton Road and the proposed Access Road 2 (Alternative 2 – access from Dingleton Road).

In **Appendix C Tables C-1** to **C-6** indicate the levels of service and the degree of saturation calculated for the relevant intersections for the respective scenarios:

a) **Table C-1:** Levels of service for various approaches for the year 2017, without background traffic growth **without** the proposed development **(Scenario 1)**;
b) **Table C-2:** Levels of service for various approaches for the year 2022, with background traffic growth, **without** the proposed development **(Scenario 4)**;
c) **Table C-3:** Levels of service for various approaches for the year 2017, without background traffic growth, **with** the proposed development (**Alternative 1 – access from Road N14) (Scenario 2)**;
d) **Table C-4:** Levels of service for various approaches for the year 2017, without background traffic growth, **with** the proposed development (**Alternative 2 – access from Dingleton Road) (Scenario 3)**;
e) **Table C-5:** Levels of service for various approaches for the year 2022, with background traffic growth, **with** the proposed development (**Alternative 1 – access from Road N14) (Scenario 5)**;
f) **Table C-6:** Levels of service for various approaches for the year 2022, with background traffic growth, **with** the proposed development (**Alternative 2 – access from Dingleton Road) (Scenario 6)**;

From **Tables C-1** to **C-6** it is possible to note:

a) That road infrastructure improvement is required from a road safety point of view and not due to capacity constraints.

   Refer to **Section 3** for recommended / required intersection geometric layouts.

b) That the relevant existing intersection under investigation will operate at acceptable levels of services for the relevant time frame for which the TIA was prepared with the required and recommended intersection upgrading implemented from an intersection performance and safety perspective.

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

See **Figures 3.2** and **3.3** for more detailed information concerning the specific proposed development access road intersection layout (**Points A** or **C**), which would be based on road safety and intersection functionality recommendations.

Tables 2.7 and **2.8** provide a summary of the available reserve capacity on the various sections of roads that had been investigated for both access alternatives. The assumed free-flow capacity of individual lanes is relevant provided that the relevant intersections have reserve capacity available for the relevant lanes of the intersections.

TABLE 2.7: AVAILABLE RESERVE CAPACITY FOR RELEVANT ROAD SECTION (ACCESS ALTERNATIVE 1, ACCESS FROM ROAD N14)														
Point	Intersection	Direction of Road Section	Capacity per Lane	Number of Lanes	Total Capacity	Actual Number of Vehicles				Reserve Capacity Available				
						2017		2022		2017		2022		
						AM	MID	AM	MID	AM	MID	AM	MID	
A	Road N14 and the Proposed Access Road 1 (Alternative 1)	North (Access 1)	Proposed Access Road 1 (Alternative 1)											
		East (Road N14)	1100	1	1100	163	428	189	496	937	672	911	604	
		West (Road N14)	1100	1	1100	473	209	548	240	627	891	552	860	
B	Road N14, Dingleton Road and Road D3333	North (Dingleton Road)	700	1	700	126	21	135	25	574	679	565	675	
		East (Road N14)	1100	1	1100	163	424	189	494	937	676	911	606	
		South (Road D3333)	500	1	500	0	0	0	0	500	500	500	500	
		West (Road N14)	1100	1	1100	376	195	435	228	724	905	665	872	
C	Dingleton Road and the Proposed Access Road 2 (Alternative 2)	Intersection relevant to Access Alternative 2.												

TABLE 2.8: AVAILABLE RESERVE CAPACITY FOR RELEVANT ROAD SECTION (ACCESS ALTERNATIVE 2, ACCESS FROM DINGLETON ROAD)													
Point	Intersection	Direction of Road Section	Capacity per Lane	Number of Lanes	Total Capacity	Actual Number of Vehicles				Reserve Capacity Available			
						2017		2022		2017		2022	
						AM	MID	AM	MID	AM	MID	AM	MID
A	Road N14 and the Proposed Access Road 1 (Alternative 1)	Intersection relevant to Access Alternative 1.											
B	Road N14, Dingleton Road and Road D3333	North (Dingleton Road)	700	1	700	117	33	135	36	583	667	565	664
		East (Road N14)	1100	1	1100	163	428	189	495	937	672	911	605
		South (Road D3333)	500	1	500	0	0	0	0	500	500	500	500
		West (Road N14)	1100	1	1100	376	194	435	224	724	965	665	876
C	Dingleton Road and the Proposed Access Road 2 (Alternative 2)	North (Dingleton Road)	700	1	700	116	22	134	25	584	678	566	675
		East (Proposed Access 2)	Proposed Access Road (Alternative 2)										
		South (Dingleton Road)	700	1	700	40	72	46	83	660	628	654	617

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

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

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

Figures 2.3 to **2.5** provide a presentation of the sensitive road sections and intersections indicating existing sensitive areas and intersections without the proposed development (**Figure 2.3**), the change in sensitive road sections and intersections with the proposed development without mitigation measures implemented (**Figure 2.4**) and the change in sensitive road sections and intersections with the proposed development with mitigation measures implemented (**Figure 2.5**).

It can be concluded from **Figures 2.3** to **2.5** that the proposed development will have a manageable impact between and including Points **A, B** and **C**. The impact at the relevant points will be neutralised due to the implementation of the recommended intersection upgrades.

It is anticipated that the sensitivity for all other road sections and intersections will not be affected by the proposed development related vehicular traffic.

FIGURE 2.3: SENSITIVE ROAD SECTIONS AND INTERSECTIONS RELATED TO EXISTING CONDITIONS WITHOUT THE PROPOSED DEVELOPMENT

FIGURE 2.4: SENSITIVE ROAD SECTIONS AND INTERSECTIONS RELATED TO EXISTING CONDITIONS WITH THE PROPOSED DEVELOPMENT WITHOUT MITIGATION MEASURES IMPLEMENTED

FIGURE 2.5: SENSITIVE ROAD SECTIONS AND INTERSECTIONS RELATED TO EXISTING CONDITIONS WITH THE PROPOSED DEVELOPMENT WITH MITIGATION MEASURES IMPLEMENTED

2.5 INFORMATION REQUESTED BY RELEVANT ROAD AUTHORITY

Input will be provided as part of Basic Assessment process.

2.6 CONSULTATION WITH INTERESTED AND AFFECTED PARTIES (IAP)

Table 2.9 provides input related to interested and affected parties.

TABLE 2.9: COMMENTS BY IAP
Comments received during the public consultation process were considered as part of the study.

2.7 OTHER TRAFFIC-RELATED ISSUES

Table 2.10 provides a summary of the following:

a) Access-related issues in terms of access to the proposed development which include:

   i) Sight distances;
   ii) Intersection spacing; and
   iii) Access to proposed development;

b) Road safety;
c) Non-motorised transport; and
d) Public transport.

<table>
<tr><th colspan="5">TABLE 2.10: SUMMARY OF OTHER TRAFFIC-RELATED ISSUES</th></tr>
<tr><th>Item</th><th>Description of Element</th><th>General Comments</th><th>Specific Issues</th><th>Actions Required</th></tr>
<tr><td>1.</td><td colspan="4">ACCESS-RELATED ISSUES</td></tr>
<tr><td>1.1</td><td colspan="4">ACCESS TO THE PROPOSED DEVELOPMENT FROM ROAD N14 (ALTERNATIVE 1, ACCESS ROAD 1, POINT A)</td></tr>
<tr><td>1.1.1</td><td>Access-related issues</td><td>a) Access for Alternative 1 is proposed to be gained from Road N14 via a proposed new access road, Point A.</td><td>a) A new access intersection and access road is required.</td><td>a) Construction of access intersection and access road.</td></tr>
<tr><td>1.1.2</td><td>Sight distances</td><td>a) Sight distances at the proposed intersection of Road N14 and the proposed Access Road 1 (Point A) were assessed visually and were deemed acceptable.
  
WESTBOUND | EASTBOUND
Sight Distance = 500m + | Sight Distance = 500m +</td><td>a) It is a general occurrence for vehicles to maintain normal road speeds at free-flow intersections.</td><td>a) Speed limit signs should be erected along the relevant section of Road N14. The speed limit should be limited to 80 km/h at Points A and B and enforced by the relevant road authority for the relevant section; and
b) Rumble strips could be provided on Road N14 prior to approaching Points A and B.</td></tr>
<tr><td>1.1.3</td><td>Intersection spacing</td><td>a) Intersection spacing between Point A (proposed) and Point B (existing) is proposed to be 800 meters.</td><td>a) Further consultation with SANRAL would be required to confirm if the spacing would be acceptable.</td><td>a) Further consultation with SANRAL would be required to confirm if the spacing would be acceptable.</td></tr>
<tr><td>1.1.4</td><td>Recommended intersection geometric layout for the proposed intersection in terms of road safety</td><td>a) The proposed intersection geometric layout should ensure that the intersection operates in a safe and effective manner at all times.</td><td>a) Right turning vehicles from Road N14 into the proposed development.
b) Vehicles turning left from the proposed development into Road N14 with the need to join the main traffic flow.
c) Vehicles turning left from Road N14 into the proposed development.</td><td>a) Provide a dedicated right-turn lane on Road N14 (western approach).
b) Provide an acceleration lane towards the west on Road N14.
c) Provide a deceleration left-turn lane for the eastern approach of Road N14.

Refer to Figures 3.1 and 3.2 for more detail concerning recommended geometric layout of Point A.</td></tr>
</table>

TABLE 2.10: SUMMARY OF OTHER TRAFFIC-RELATED ISSUES				
Item	**Description of Element**	**General Comments**	**Specific Issues**	**Actions Required**
1.	**ACCESS-RELATED ISSUES**			
1.2	**ACCESS TO THE PROPOSED DEVELOPMENT FROM DINGLETON ROAD (ALTERNATIVE 2, ACCESS ROAD 2, POINT C)**			
1.2.1	**Access-related issues**	a) Access for Alternative 2 is proposed to be gained from Dingleton Road via a proposed new access road, **Point C.**	a) A new access intersection and access road is required.	a) Construction of access intersection and access road
1.2.2	**Sight distances**	a) Sight distances at the proposed intersection of Dingleton Road and the proposed Access Road 2 (**Point C**) were assessed visually and were deemed acceptable.   **NORTHBOUND** **SOUTHBOUND** **Sight Distance = ± 225m** **Sight Distance = ± 110m**	a) None. Low vehicle speeds are achieved for the relevant section of Dingleton Road.	a) Speed limit signs should be erected along the relevant section of Dingleton Road as part of the construction of the proposed intersection. The speed limit should be limited to 40 km/h at **Point C** and enforced by the relevant road authority for the relevant section.
1.2.3	**Intersection spacing**	a) Intersection spacing is deemed acceptable for the proposed access with the closest existing intersection along Road Dingleton Road being approximately 110 metres to the south.	a) None.	a) None.
1.2.4	**Recommended intersection geometric layout for the proposed intersection in terms of road safety**	a) The proposed intersection geometric layout should ensure that the intersection operates in a safe and effective manner at all times.	a) Right turning vehicles from Dingleton Road into the proposed development (southern approach).	a) Provide a dedicated right-turn lane on Dingleton Road (southern approach). Refer to **Figures 3.3** and **3.4** for more detail concerning recommended geometric layout of **Point C.**

TABLE 2.10: SUMMARY OF OTHER TRAFFIC-RELATED ISSUES				
Item	**Description of Element**	**General Comments**	**Specific Issues**	**Actions Required**
2.	**ROAD SAFETY ISSUES**			
2.1	**General road safety**	The following are typical elements related to the road network, which cause road safety problems in rural and urban areas and which need to be addressed on a continuous basis: a) Intersection layout, with specific reference to dedicated right turn lanes, where there is heavy vehicle movement; b) Pedestrian movements (road crossings); c) Intersection alignment, such as staggered intersections; d) Insufficient public transport facilities; e) Access control for vehicle movement; f) Fencing to control animal movement; g) Lack of or deterioration of reflective road studs for visibility during the night at strategic points; h) Lack of pedestrian walkways to separate pedestrian and vehicle movements at strategic points; i) Lack of provision and quality of road markings; j) Lack of provision and quality of road signs; and k) Improper road safety training for workers as well as adjacent communities.	a) Need for reflective road studs at strategic points; b) Road markings are fading (Dingleton Road); and c) Need for relevant road traffic signs.	In general the report was compiled so as to address the road safety issues as far as practically possible. a) Refer to **Table 3.1** and **Figures 3.1** to **3.4** for the required and recommended intersection improvements. b) Provide proper reflective road studs at strategic points (LED if possible) to ensure the safe operation of the relevant intersections under investigation at night time at strategic points; c) Provide required road traffic signs for the relevant intersections; and d) Provide relevant road markings at relevant intersections under investigation (highway paint recommended).
3.	**NON-MOTORISED TRANSPORT**			
3.1	**Non-motorised transport (not related to proposed development)**	a) There is currently a low volume of non-motorised transport movement in the vicinity of the intersection of Road N14 and Dingleton Road (**Point B**). b) Visitors to the proposed development is anticipated to travel to and from the proposed development via private vehicle, bus or taxi.	a) Workers and local residents are currently loaded and off-loaded at **Point B**. b) No pedestrian crossings or road warning signs informing motorists of the potential occurrence of pedestrians are currently provided near **Point B**.	In general, the following should be implemented by the relevant roads authority and is not dependant or required due to the proposed development: a) Pedestrian crossings should be provided at **Point B** (road markings and signs); b) Road traffic warning signs should be provided to warn motorists of the possibility of pedestrians; c) Strategic walkways should be provided.
4.	**PUBLIC TRANSPORT**			
4.1	**Public transport**	a) A dedicated loading and off-loading area (parking area) will be provided for public transport and visitors on the property of the proposed development where visitors can be loaded and off-loaded in a safe environment.	a) None.	a) None.

Section 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 Impact Assessment guideline documents, the following findings and recommendations were made for the proposed development:

3.1 FINDINGS

The following are discussed in terms of the findings for the proposed development:

a) Traffic impact; and
b) Recommended layout of the proposed intersection proposing to provide access to the proposed development.

3.1.1 TRAFFIC IMPACT

The capacity calculations for the TIA were conducted for the years 2017 (base-year) and 2022 respectively. The last mentioned time frame is in line with traffic engineering guidelines and practice and determined by the expected number of vehicle trips that could potentially be generated during any specific peak hour by a specific development.

It could be possible that the traffic to be generated by the proposed development during a peak time could exceed the anticipated traffic volumes as predicted and it might become required at the time of burials or related ceremonies to have a pointsman present at the relevant access intersection to assist with traffic control.

Furthermore, owing to the type and nature of the proposed activities, it is expected that the proposed activities will have a manageable impact on traffic, provided that road infrastructure improvements are implemented as indicated in **Tables 3.1** to **3.3** and **Figures 3.2** and **3.3** (dependant on which access alternative will be implemented) to mitigate the impact of the proposed land development area.

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

From the impact rating assessment is possible to conclude that it is anticipated that the proposed developments impact would be neutralised by the recommended mitigation measures implemented.

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3.1.2 PROVISION OF THE INTERSECTION PROPOSING TO PROVIDE ACCESS TO THE PROPOSED DEVELOPMENT

Safe and effective access will be achievable for both access alternatives provided that the intersection geometric layout recommendations in terms of **Tables 3.1** to **3.3** and **Figures 3.2** to **3.3** are implemented for whichever access alternative is implemented

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

Note: The following should be provided at the proposed access intersection as part of the construction of the intersection (dependant on which alternative is implemented:

a) Reflective road studs to ensure visibility during night;
b) Re-marking of road markings (as and when required); and
c) Road traffic signs should be replacement when required.

3.2 RECOMMENDATIONS

The following are discussed in terms of the recommendations:

a) Improvements required with and without the proposed development;
b) Access recommendations; and
c) Reasoned opinion for authorisation.

3.2.1 IMPROVEMENTS REQUIRED WITH AND WITHOUT THE PROPOSED DEVELOPMENT

Tables 3.1 to **3.3** provides a short summary of the intersection improvements required with and without the proposed development, and whether the improvements are required from an intersections performance point of view (technical / capacity) or a road safety point of view.

TABLE 3.1: SUMMARY OF INTERSECTION IMPROVEMENTS REQUIRED IN TERMS OF ROAD WORKS WITHOUT THE PROPOSED DEVELOPMENT			
Point	Intersection Description	Without Proposed Development	
		Intersection Performance Perspective	Road Safety Perspective
A	Road N14 and Proposed Access Road 1 (Alternative 1)	Not relevant. Proposed intersection.	
B	Road N14 and Dingleton Road	None.	None.
C	Dingleton Road and Proposed Access Road 2 (Alternative 2)	Not relevant. Proposed intersection.	

TABLE 3.2: SUMMARY OF INTERSECTION IMPROVEMENTS REQUIRED IN TERMS OF ROAD WORKS WITH THE PROPOSED DEVELOPMENT (ACCESS ALTERNATIVE 1, ACCESS FROM ROAD N14)			
Point	Intersection Description	Without Proposed Development	
		Intersection Performance Perspective	Road Safety Perspective
A	Road N14 and Proposed Access Road 1 (Alternative 1)	None.	• Dedicated right-turn lane on western approach on Road N14; • Acceleration lane towards west on Road N14; • Left-turn deceleration lane from western approach on Road N14; • Provision of reflective road studs and proper road markings and traffic information signs as part of intersection construction; and • Reduction of speed limit to 80km/h.
B	Road N14 and Dingleton Road	No improvements required due to the proposed development.	
C	Dingleton Road and Proposed Access Road 2 (Alternative 2)	Not relevant.	

TABLE 3.3: SUMMARY OF INTERSECTION IMPROVEMENTS REQUIRED IN TERMS OF ROAD WORKS WITH THE PROPOSED DEVELOPMENT (ACCESS ALTERNATIVE 2, ACCESS FROM DINGLETON ROAD)			
Point	Intersection Description	**Without Proposed Development**	
		Intersection Performance Perspective	Road Safety Perspective
A	Road N14 and Proposed Access Road 1 (Alternative 1)	Not relevant.	
B	Road N14 and Dingleton Road	No improvements required due to the proposed development.	
C	Dingleton Road and Proposed Access Road 2 (Alternative 2)	None.	• Dedicated right-turn lane on southern approach on Dingleton Road; • Provision of reflective road studs and proper road markings and traffic information signs as part of intersection construction; and • Reduction of speed limit to 40km/h at Point C.

Figures 3.1 to **3.3** provide detailed information in terms of the following related to the Intersections:

a) Status quo layout of intersections (**Figure 3.1**);
b) Layout required with the proposed development should access be gained from Road N14 (Access Alternative 1) (**Figure 3.2**); and
c) Layout required with the proposed development should access be gained from Dingleton Road (Access Alternative 2) (**Figure 3.3**).

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

The following is also relevant:

a) Road markings, reflective road studs (LED) and road signs should be provided as part of the intersection construction by the proposed development at the relevant access intersection to the proposed development to ensure visibility during night time, proper visibility of intersection lane geometry, sufficient information to road users and pedestrian safety. The local municipality will monitor the last mentioned and should maintenance be required, the relevant roads authority will be notified.

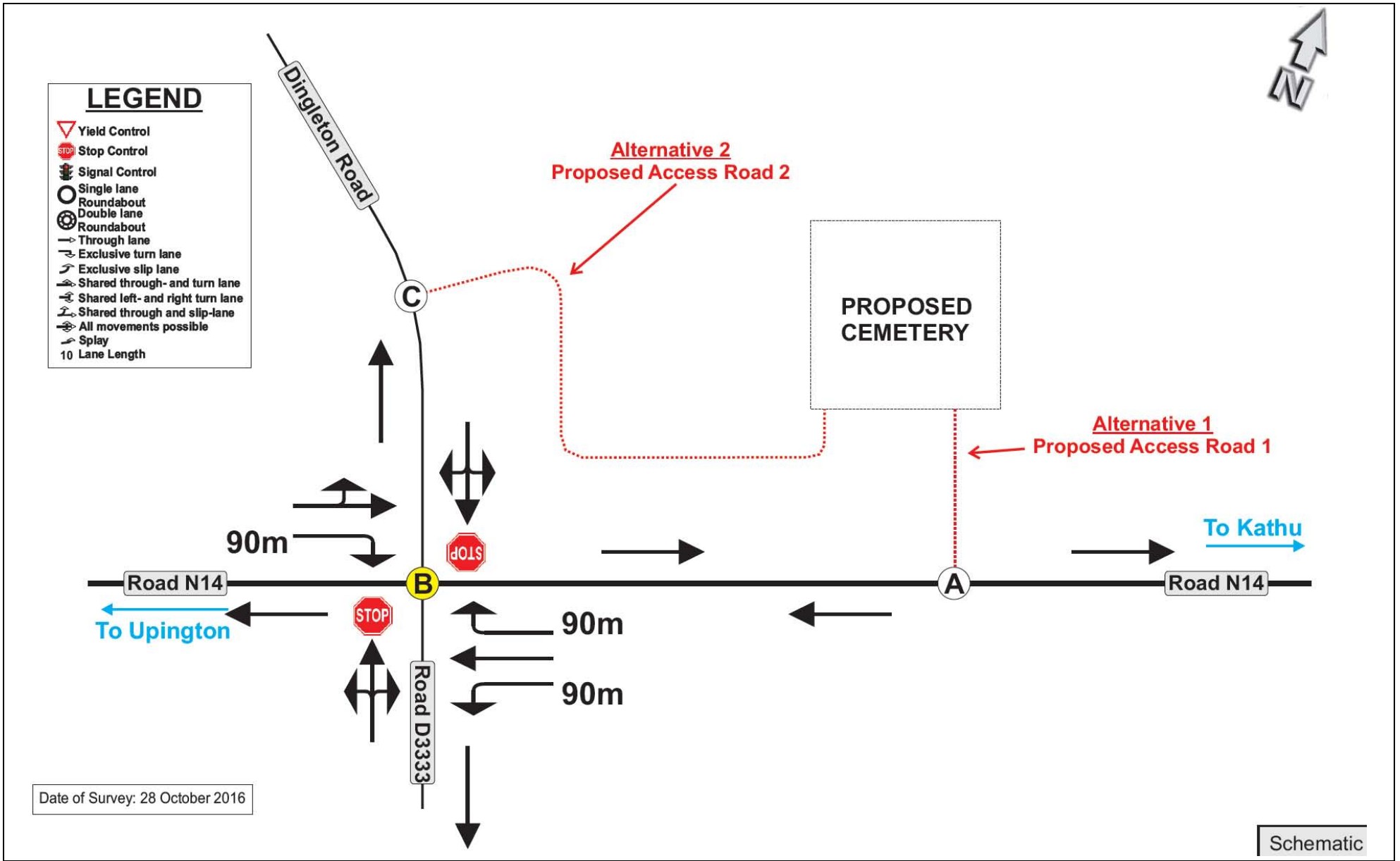

FIGURE 3.1: STATUS QUO LAYOUT OF INTERSECTIONS

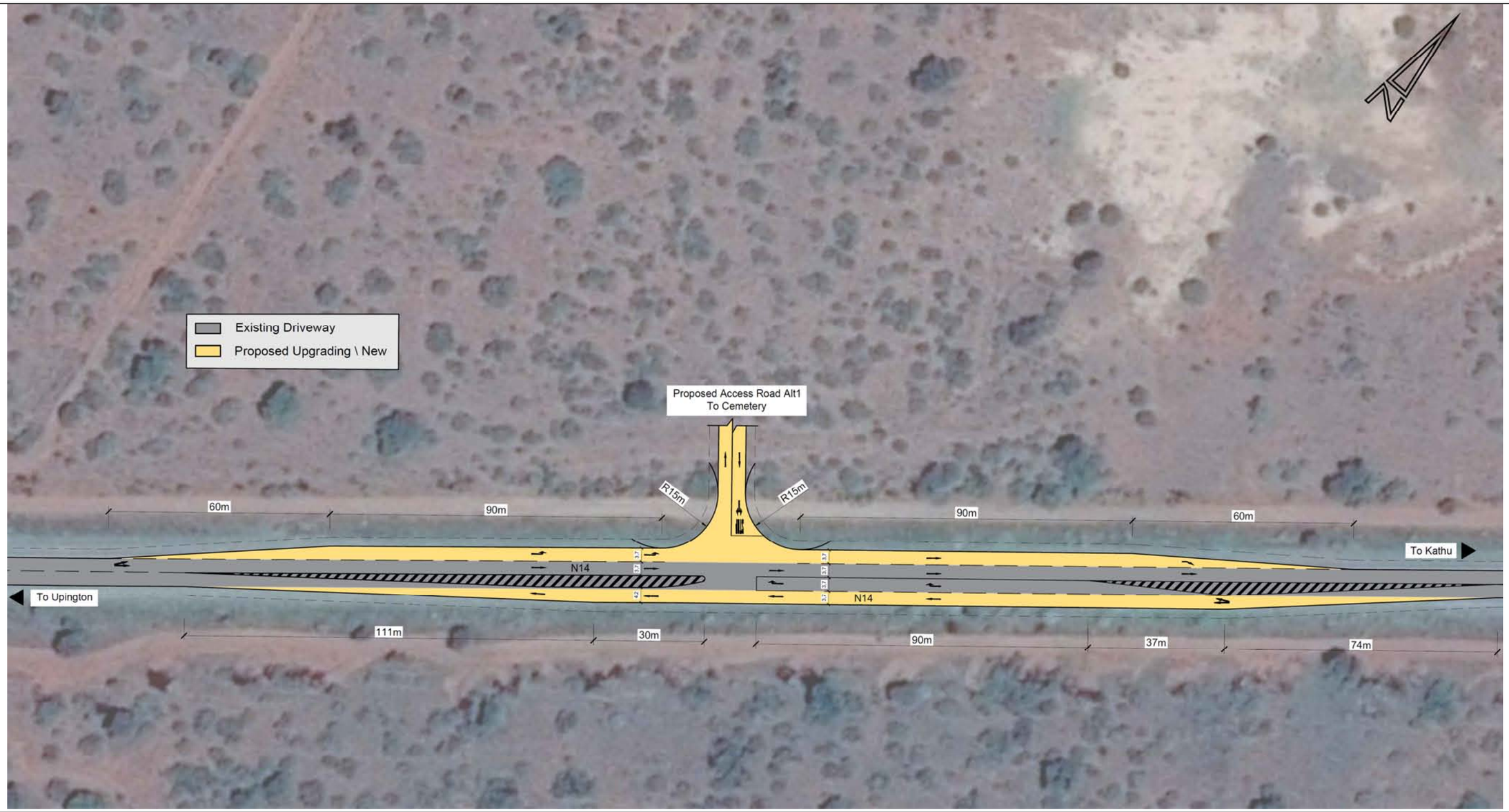

FIGURE 3.2: LAYOUT REQUIRED WITH THE PROPOSED DEVELOPMENT SHOULD ACCESS BE GAINED FROM ROAD N14 (ACCESS ALTERNATIVE 1)

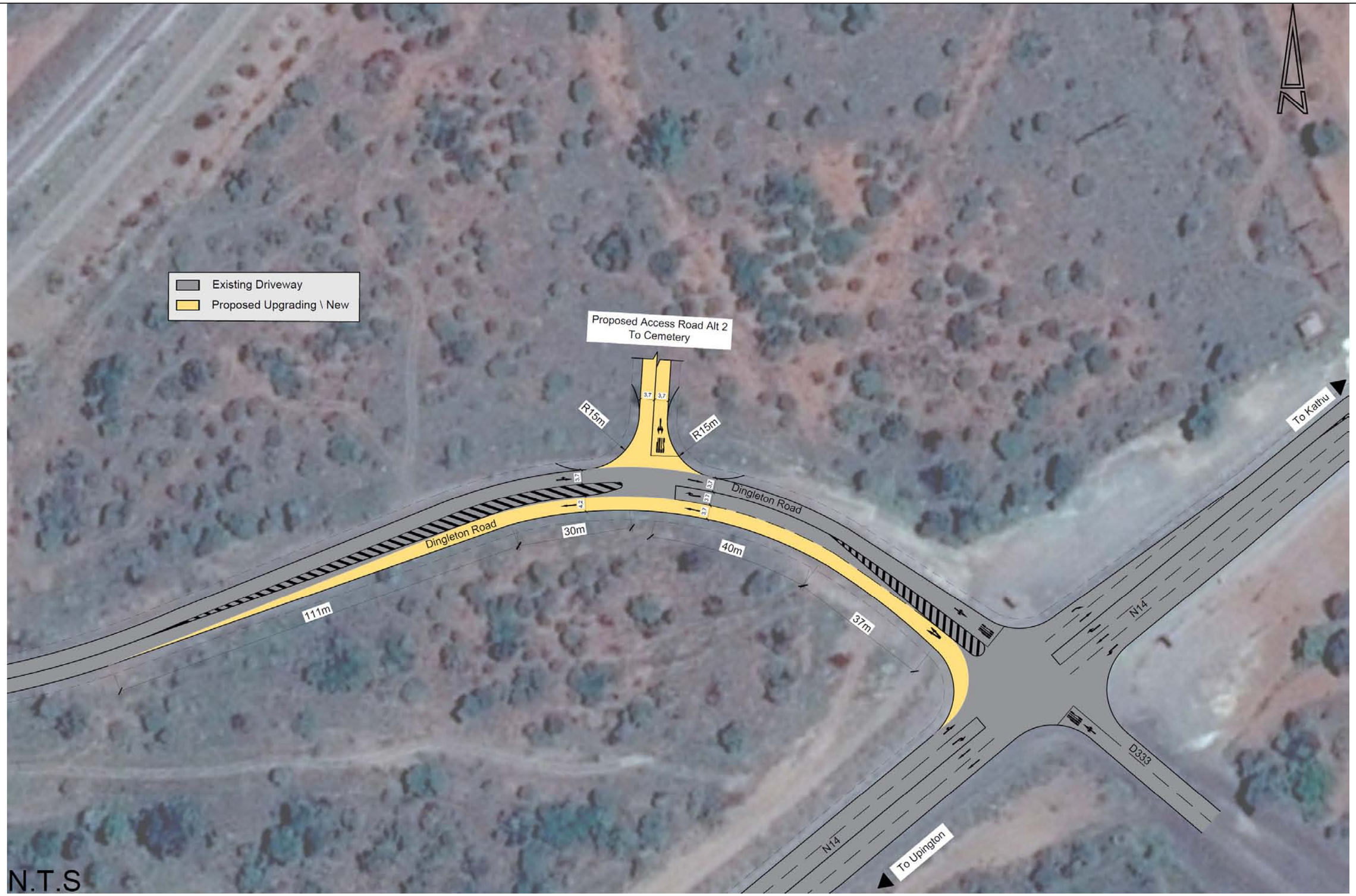

FIGURE 3.3: LAYOUT REQUIRED WITH THE PROPOSED DEVELOPMENT SHOULD ACCESS BE GAINED FROM DINGLETON ROAD (ACCESS ALTERNATIVE 2)

3.2.2 ACCESS RECOMMENDATIONS

Table 3.4 provides a summary of the advantages and disadvantages for the alternative access options.

TABLE 3.4: SUMMARY OF ADVANTAGES AND DISADVANTAGES FOR THE ACCESS ALTERNATIVES

INTERSECTION	ADVANTAGES	DISADVANTAGES
Road N14 and Proposed Access Road 1 (**Point A**)	• Shorter access road to construct.	• High cost to construct access intersection; • High vehicle speeds along Road N14 which affect intersection safety and increase risk. • Higher safety risk for pedestrians should public transport load and off-load passengers at the intersection.
Dingleton Road and Proposed Access Road 2 (**Point C**)	• Low speeds at access intersection resulting in a lower risk. • Lower volume of non-development traffic on Dingleton Road. • Lower cost to construct access intersection. • Safer environment for pedestrians should public transport load and off-load passengers at the intersection.	• Longer access road to be constructed.

Taking into consideration the findings of the investigations in terms of road safety and potential costs for intersection and access road construction, it is recommended that access be gained from Dingleton Road via the proposed **Point C**. This is deemed as the safer option from a road safety and traffic engineering point of view.

3.2.3 REASONED OPINION FOR AUTHORISATION

In conclusion of the findings as part of the investigations, Siyazi Transportation Services Free State (Pty) Ltd is of the opinion that the proposed mining development would have a manageable impact on the relevant roads network as long as the mitigating measures are implemented as recommended as part of **Section 3** of this report and should thus be granted authorisation.

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

APPENDIX A

INFORMATION RELATED TO STATUS QUO

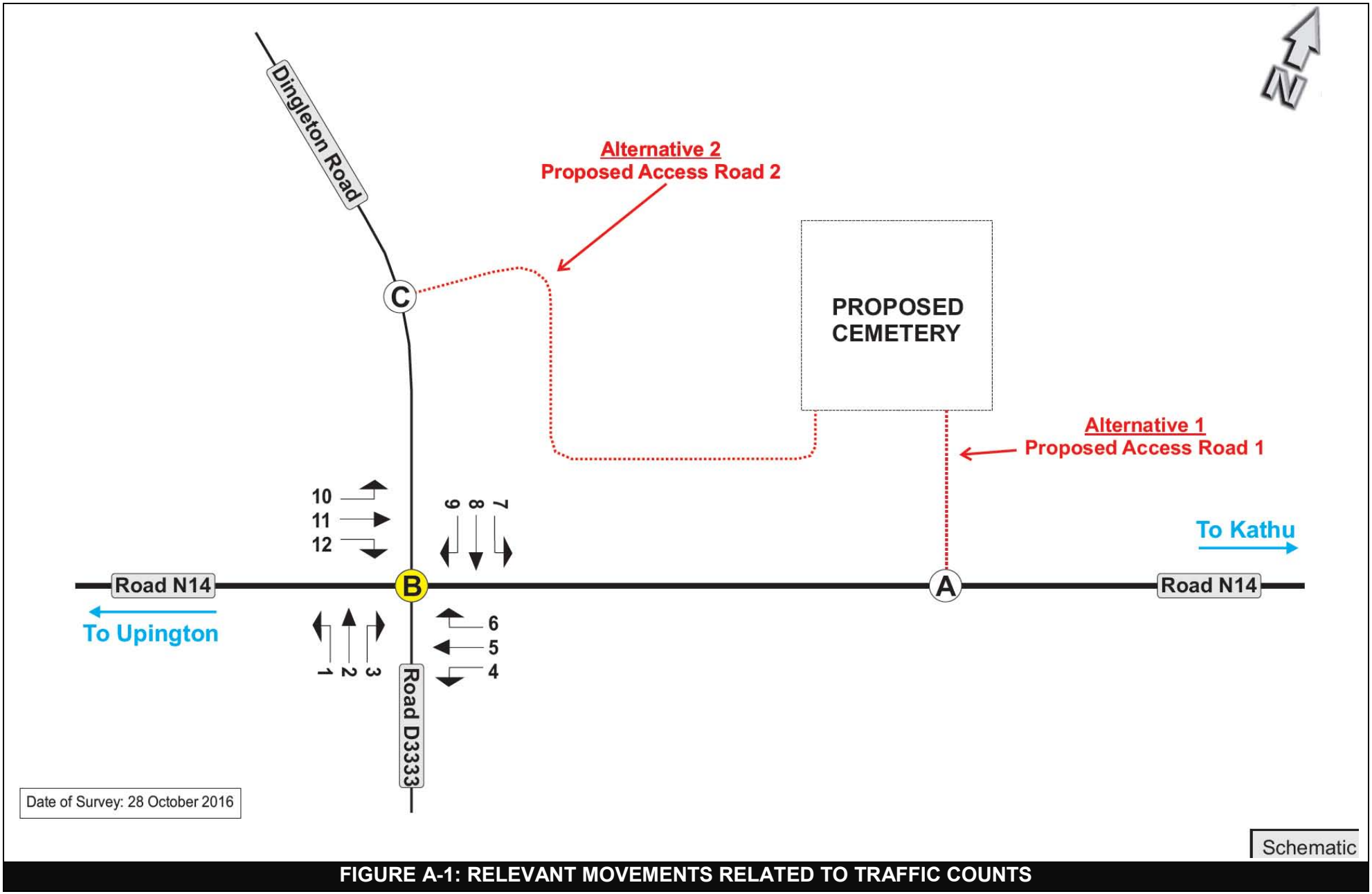

FIGURE A-1: RELEVANT MOVEMENTS RELATED TO TRAFFIC COUNTS

TABLE A-1: HOURLY TRAFFIC COUNTS FOR ALL VEHICLES SIMULTANEOUSLY AT THE INTERSECTION OF ROAD N14, DINGLETON ROAD AND ROAD D3333 (28th OCTOBER 2016)

TIME INTERVALS	MOVEMENTS												
	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
06:00-07:00	0	0	2	0	367	106	31	0	9	10	130	0	**655**
06:15-07:15	0	0	2	1	288	103	45	0	13	12	158	0	**622**
06:30-07:30	0	0	2	1	263	69	39	0	12	8	174	0	**568**
06:45-07:45	1	0	0	2	183	46	38	0	11	9	179	0	**469**
07:00-08:00	1	0	2	2	173	38	35	0	11	15	174	0	**451**
07:15-08:15	1	0	2	2	184	31	23	0	7	12	157	0	**419**
07:30-08:30	1	0	2	2	169	28	22	0	7	12	146	0	**389**
07:45-08:45	0	0	2	2	154	28	19	0	3	10	139	0	**357**
08:00-09:00	0	0	0	2	158	29	23	0	4	5	138	0	**359**
08:15-09:15	0	0	0	2	154	28	24	0	8	3	140	0	**359**
08:30-09:30	0	0	0	2	153	25	28	0	9	3	141	0	**361**
08:45-09:45	0	0	0	2	161	21	28	0	15	2	154	0	**383**
09:00-10:00	0	0	0	2	149	18	20	0	14	1	161	0	**365**
09:15-10:15	0	0	1	1	136	17	21	0	9	2	172	0	**359**
09:30-10:30	0	0	2	1	141	24	25	0	8	4	180	0	**385**
09:45-10:45	0	0	3	0	142	24	32	0	2	5	171	0	**379**
10:00-11:00	0	0	3	0	146	24	33	0	3	7	171	0	**387**
10:15-11:15	0	0	2	1	161	23	35	0	4	6	176	1	**409**
10:30-11:30	0	0	1	1	165	17	27	0	5	4	164	1	**385**
10:45-11:45	0	0	1	1	165	13	32	0	9	3	198	1	**423**
11:00-12:00	0	0	1	1	161	13	32	0	11	2	212	1	**434**
11:15-12:15	0	0	2	0	153	20	35	0	13	3	223	0	**449**
11:30-12:30	0	0	2	1	153	22	40	0	14	2	248	0	**482**
11:45-12:45	0	0	1	1	162	27	41	0	10	5	213	0	**460**
12:00-13:00	1	0	2	1	181	29	58	0	6	6	209	0	**493**
12:15-13:15	1	0	1	1	202	24	64	0	5	6	260	0	**564**
12:30-13:30	1	0	1	0	199	18	67	0	3	8	338	0	**635**
12:45-13:45	1	0	1	0	191	15	65	0	3	6	358	0	**640**
13:00-14:00	0	0	0	0	186	12	62	0	6	4	357	0	**627**
13:15-14:15	0	0	3	1	168	9	59	0	5	3	304	0	**552**
13:30-14:30	0	0	3	2	200	10	54	0	5	1	217	0	**492**
13:45-14:45	0	0	3	2	211	12	50	0	5	0	203	0	**486**
14:00-15:00	0	0	4	2	215	15	35	0	2	0	208	0	**481**
14:15-15:15	0	0	1	1	219	16	27	0	1	0	208	0	**473**
14:30-15:30	0	0	1	0	182	15	24	0	1	1	199	0	**423**
14:45-15:45	0	0	2	0	182	16	17	0	1	2	214	0	**434**
15:00-16:00	0	0	1	0	161	17	15	0	4	2	220	0	**420**
15:15-16:15	0	0	1	0	163	16	14	0	4	2	209	0	**409**
15:30-16:30	0	0	1	0	172	19	12	0	3	1	231	0	**439**
15:45-16:45	0	0	0	0	155	14	15	0	4	0	223	0	**411**
16:00-17:00	0	0	0	0	164	10	15	0	2	0	212	1	**404**
16:15-17:15	0	0	0	0	144	10	16	0	3	0	215	1	**389**
16:30-17:30	0	0	2	2	142	7	16	0	4	0	194	1	**368**
16:45-17:45	0	0	2	2	137	9	15	0	5	0	187	1	**358**
17:00-18:00	0	0	2	2	120	9	16	0	4	0	176	0	**329**

APPENDIX B

TRIP INFORMATION RELATED TO THE PROPOSED DEVELOPMENT

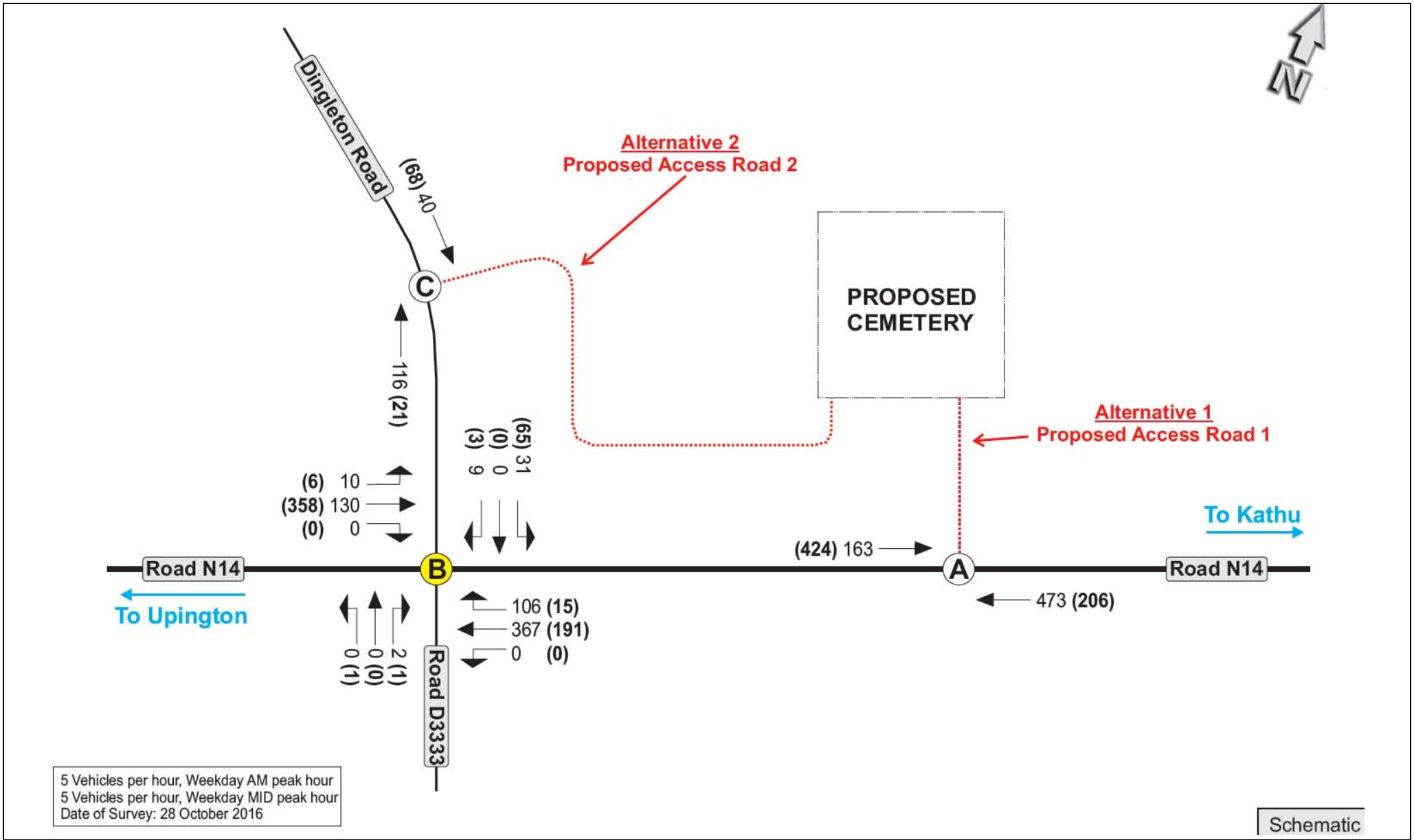

FIGURE B-1: 2017 PEAK HOUR BACKGROUND TRAFFIC WITHOUT THE PROPOSED DEVELOPMENT (SCENARIO 1)

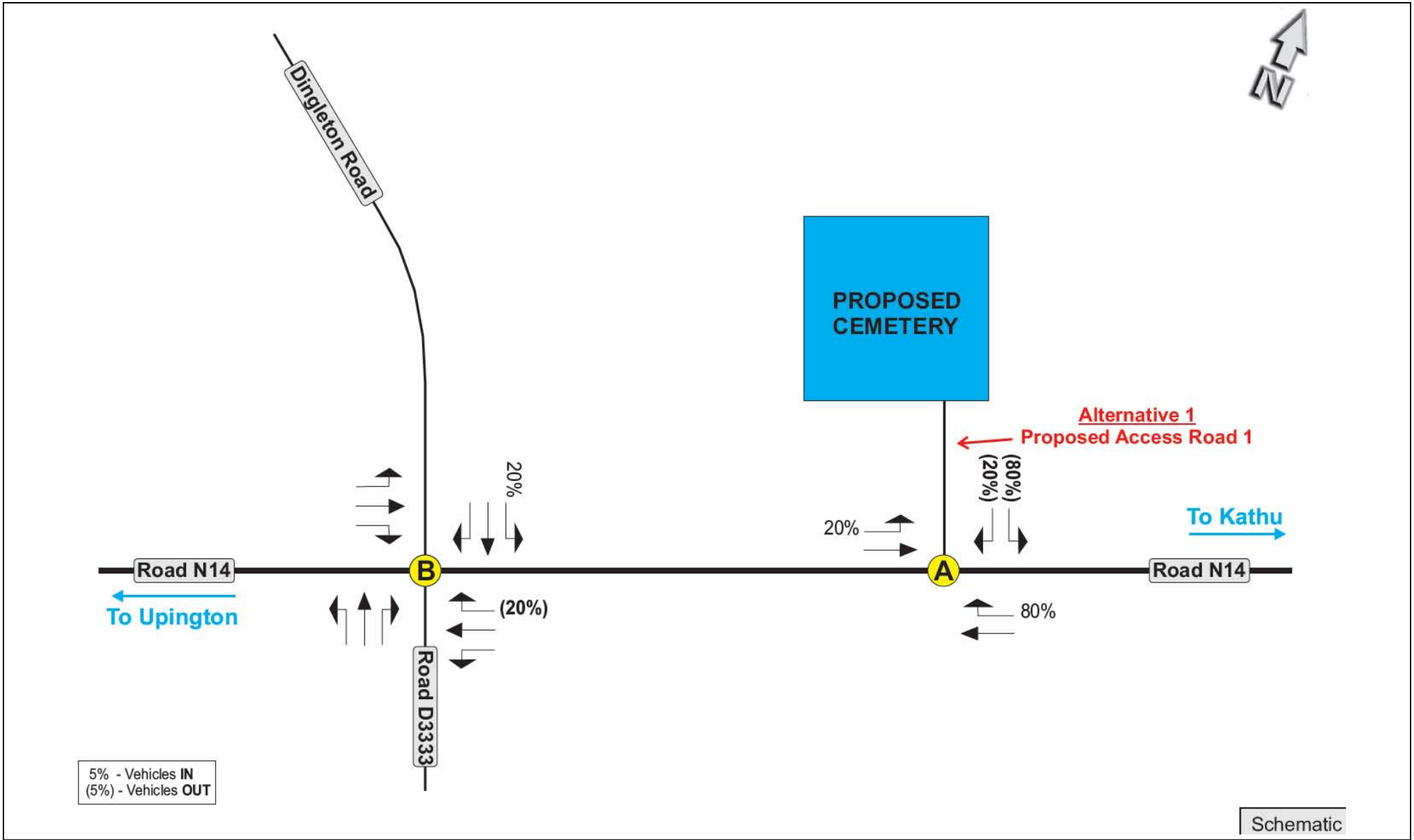

FIGURE B-2: PROJECTED VEHICLE TRIP DISTRIBUTION FOR THE PROPOSED DEVELOPMENT (ALTERNATIVE 1 - ACCESS FROM ROAD N14)

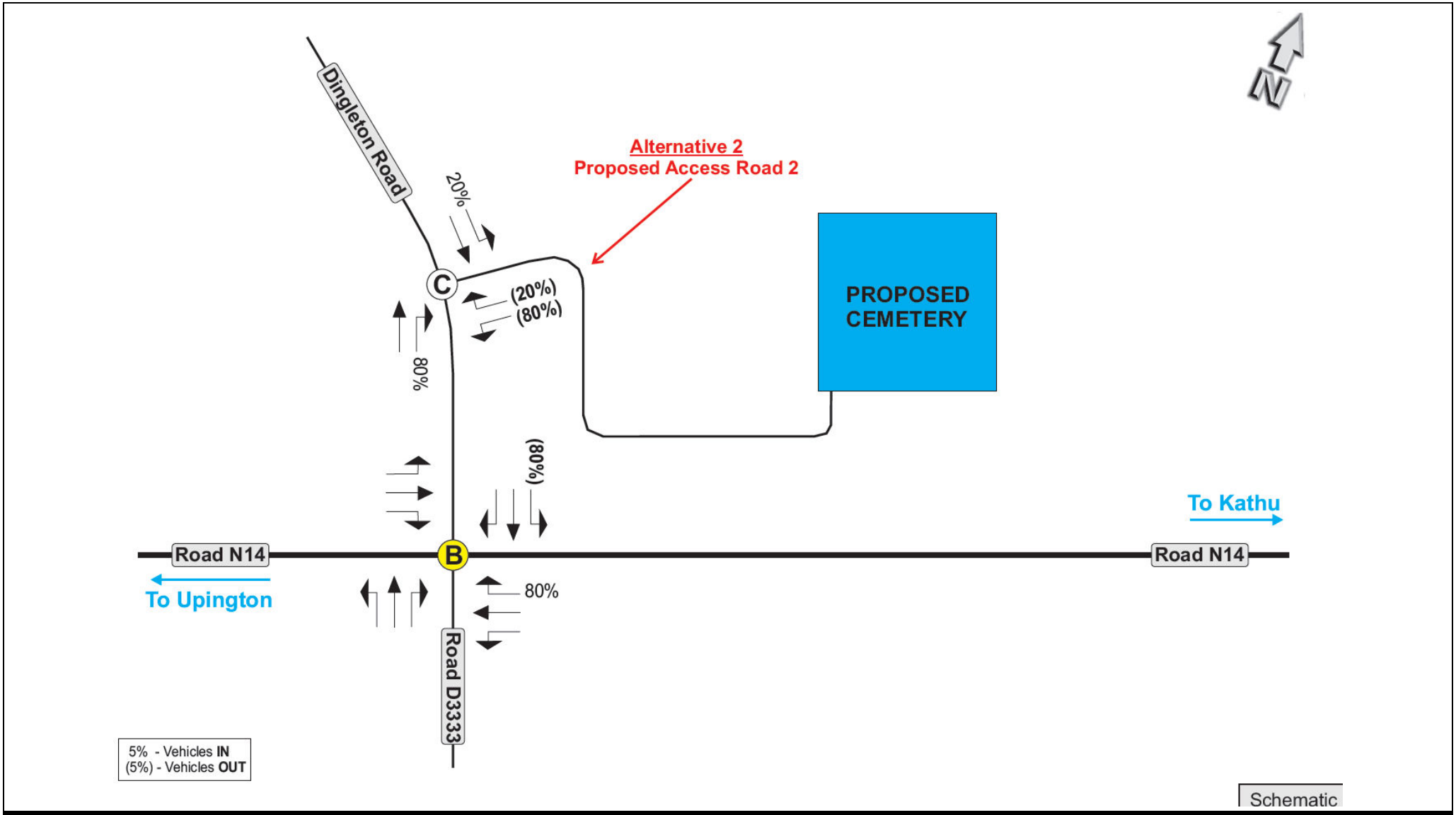

FIGURE B-3: PROJECTED VEHICLE TRIP DISTRIBUTION FOR THE PROPOSED DEVELOPMENT (ALTERNATIVE 2 - ACCESS FROM DINGLETON ROAD)

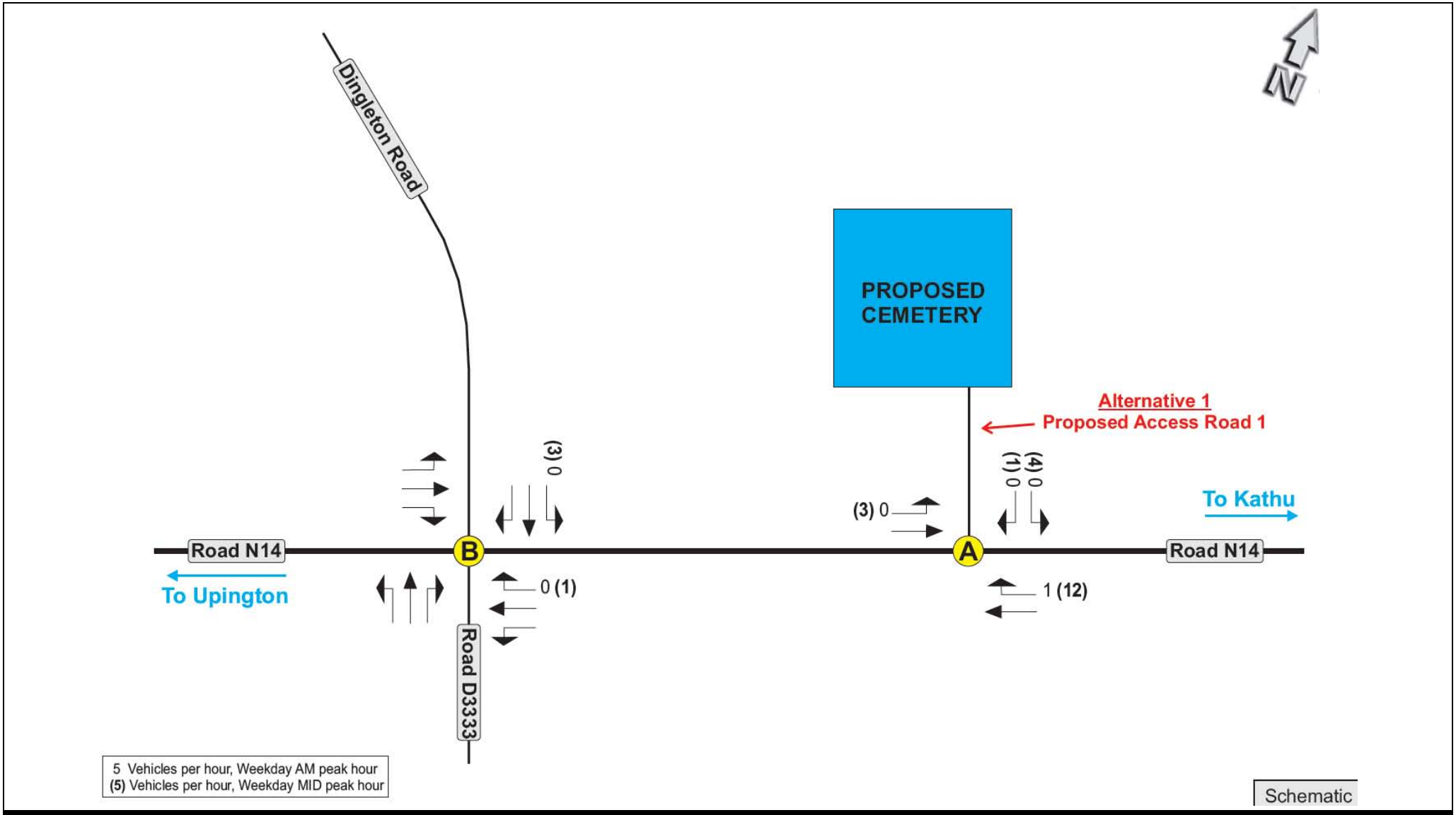

FIGURE B-4: PROJECTED VEHICLE TRIPS GENERATED BY THE PROPOSED DEVELOPMENT (ALTERNATIVE 1 - ACCESS FROM ROAD N14)

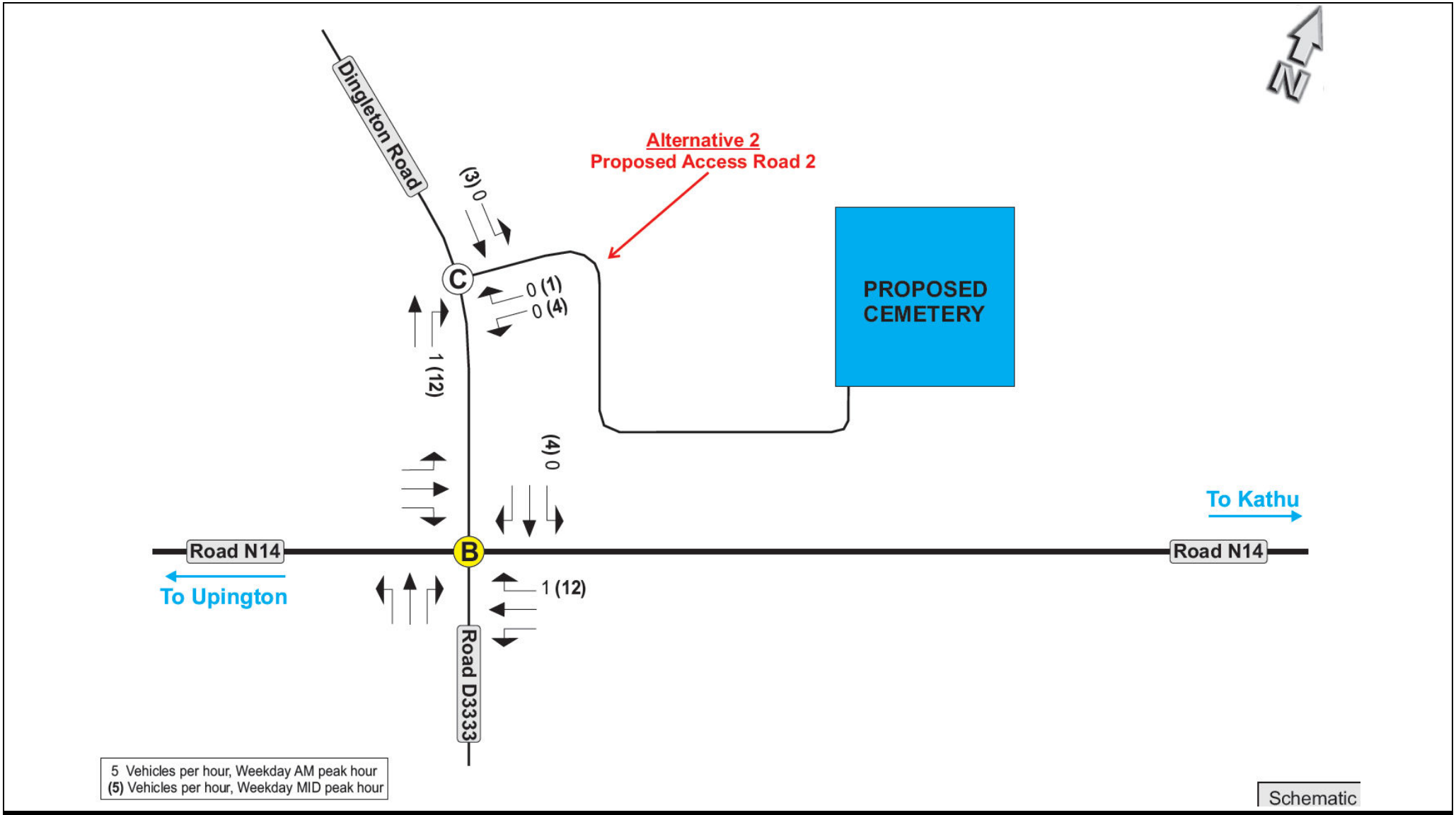

FIGURE B-5: PROJECTED VEHICLE TRIPS GENERATED BY THE PROPOSED DEVELOPMENT (ALTERNATIVE 2 - ACCESS FROM DINGLETON ROAD)

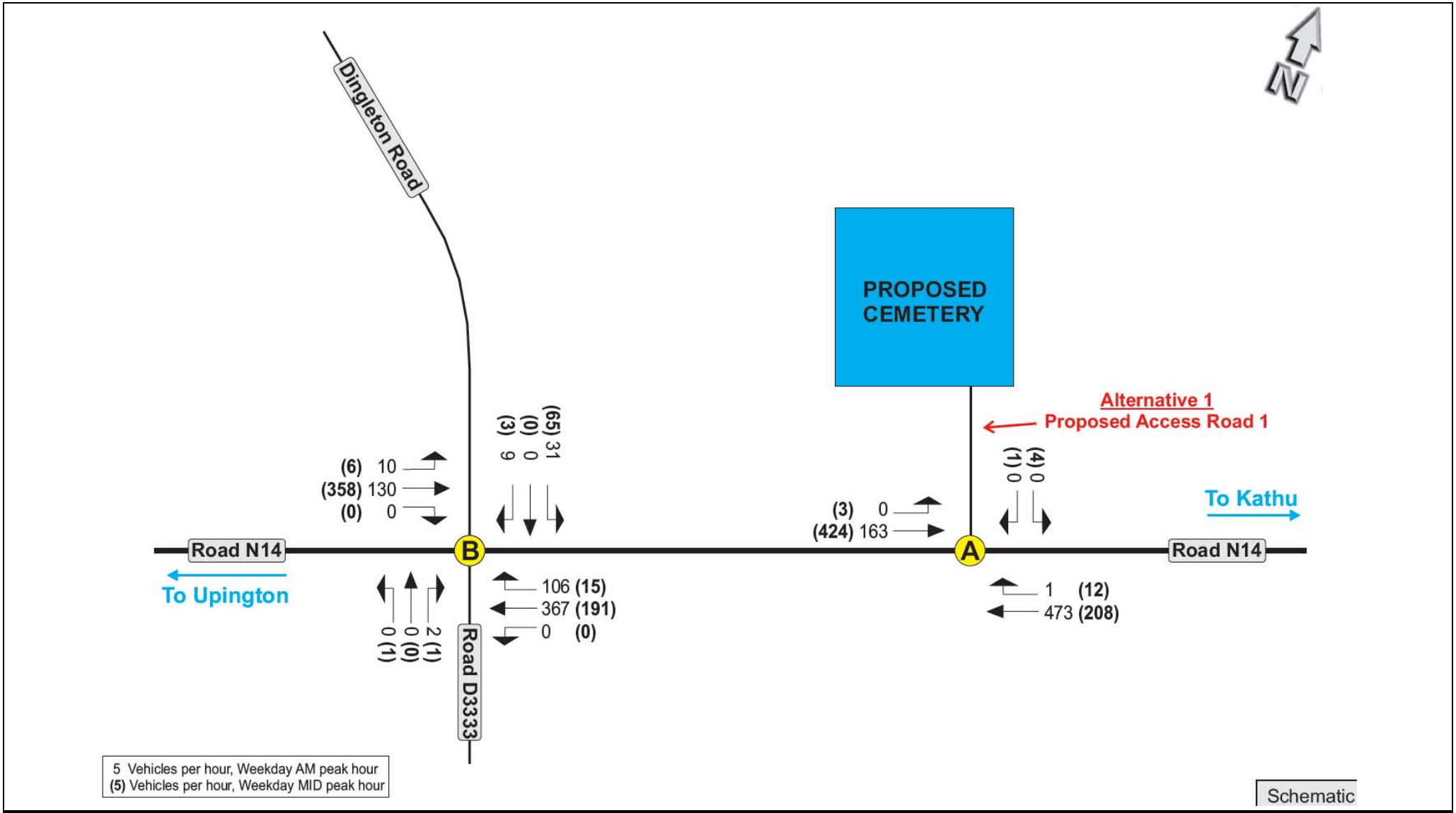

FIGURE B-6: PROJECTED 2017 PEAK HOUR TRAFFIC WITH THE PROPOSED DEVELOPMENT (ALTERNATIVE 1 - ACCESS FROM ROAD N14) (SCENARIO 2)

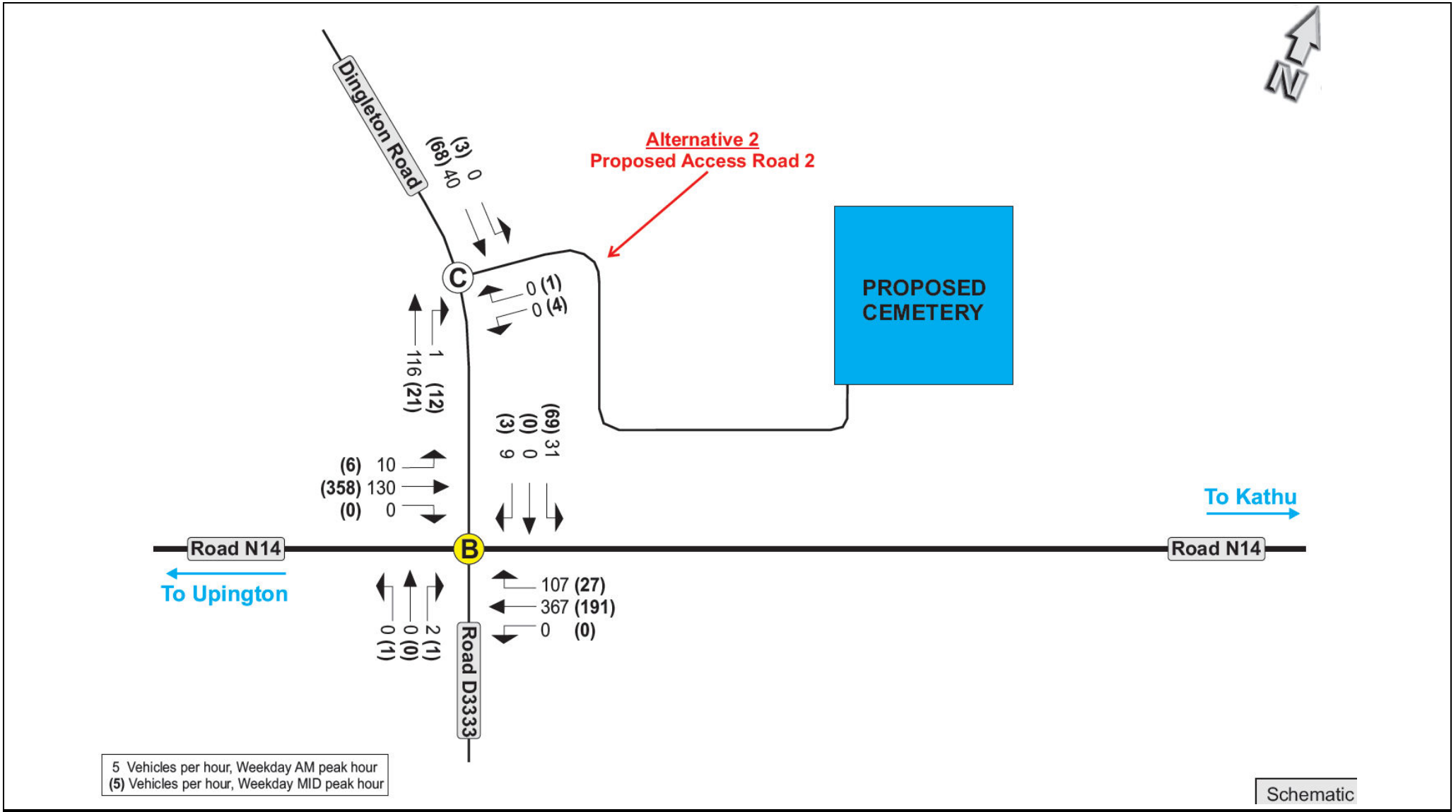

FIGURE B-7: PROJECTED 2017 PEAK HOUR TRAFFIC WITH THE PROPOSED DEVELOPMENT (ALTERNATIVE 2 - ACCESS FROM DINGLETON RD) (SCENARIO 3)

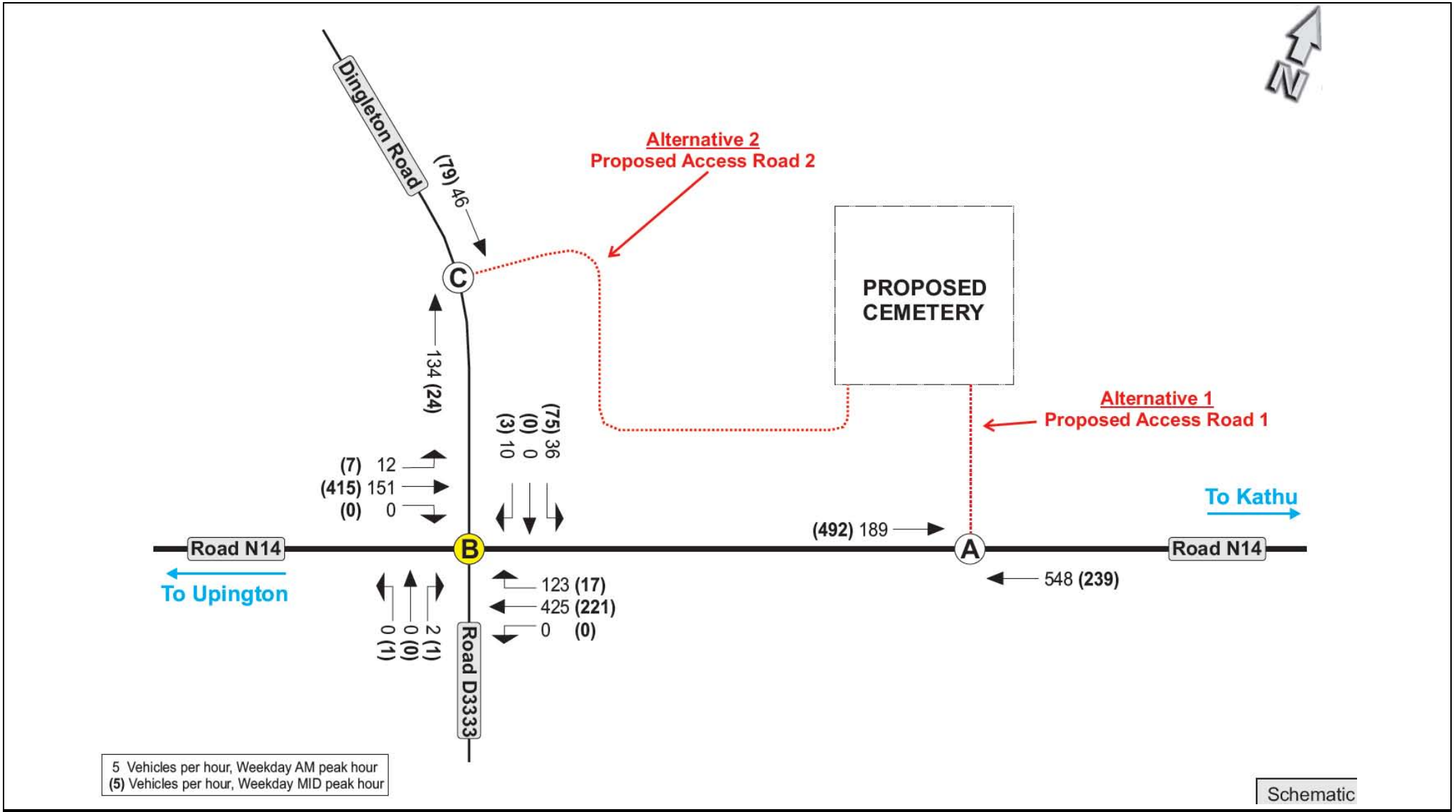

FIGURE B-8: PROJECTED 2022 PEAK HOUR BACKGROUND TRAFFIC WITHOUT THE PROPOSED DEVELOPMENT (SCENARIO 4)

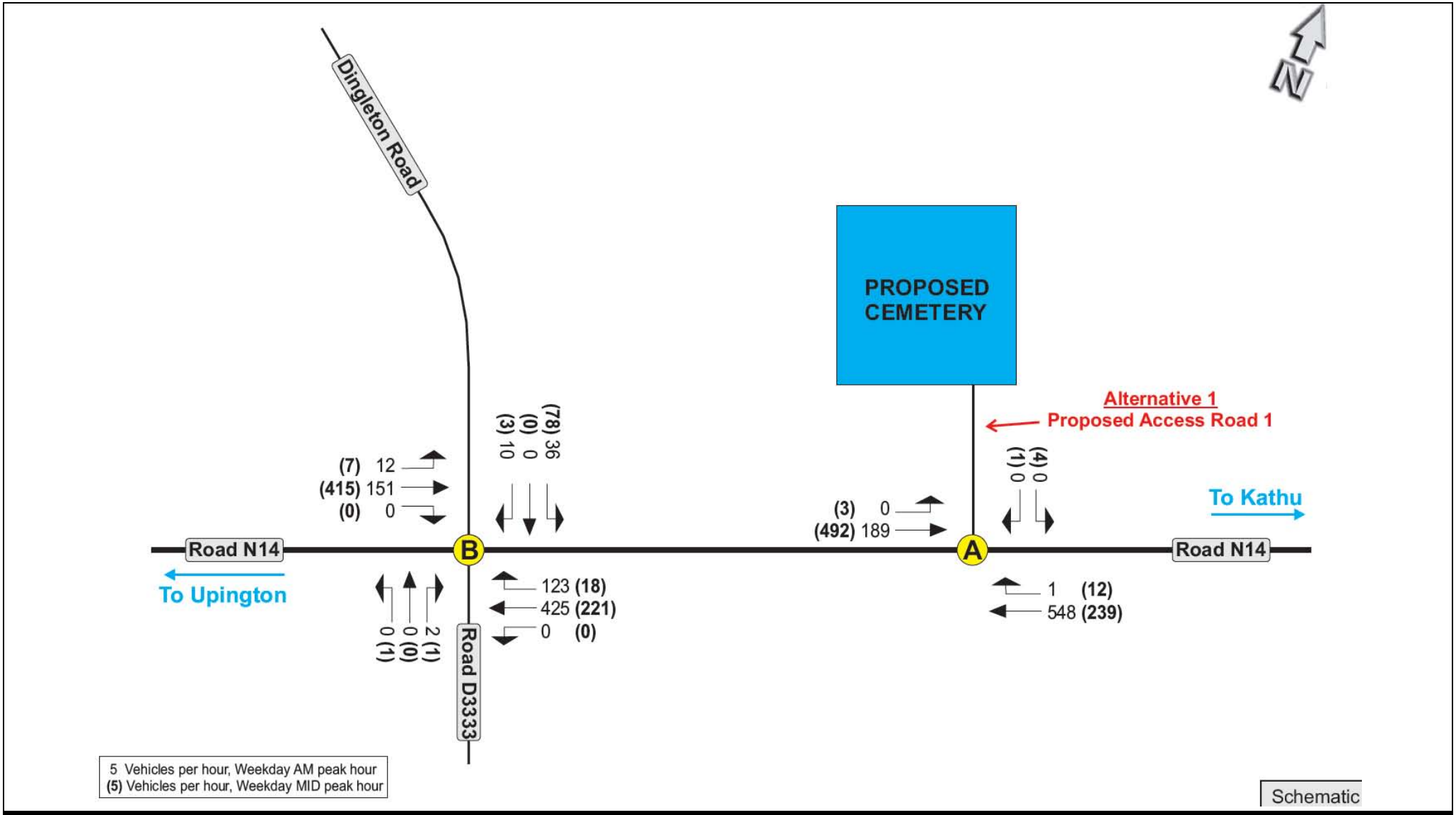

FIGURE B-9: PROJECTED 2022 PEAK HOUR TRAFFIC WITH THE PROPOSED DEVELOPMENT (ALTERNATIVE 1 - ACCESS FROM ROAD N14) (SCENARIO 5)

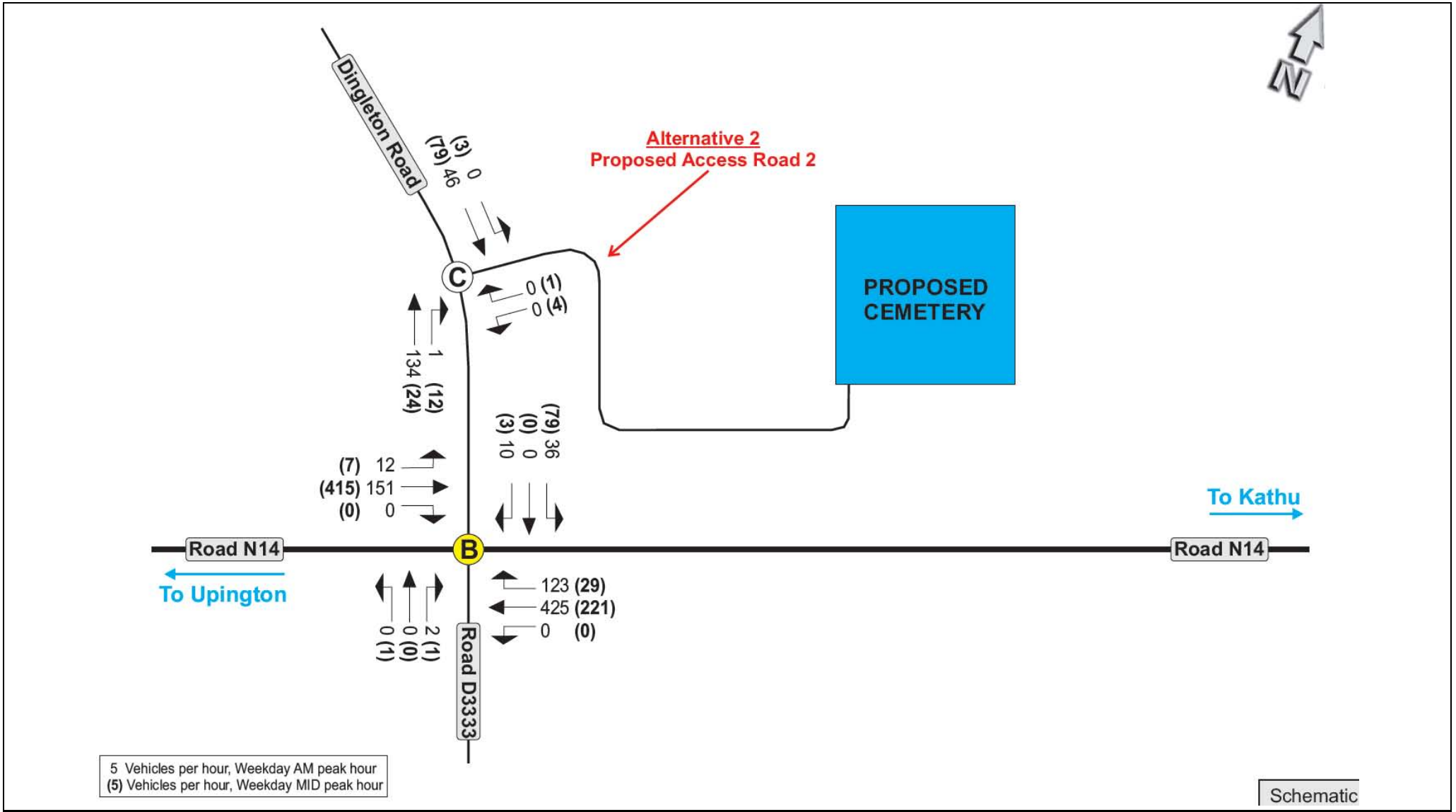

FIGURE B-10: PROJECTED 2022 PEAK HOUR TRAFFIC WITH THE PROPOSED DEVELOPMENT (ALTERNATIVE 2 - ACCESS FROM DINGLETON RD) (SCENARIO 6)

APPENDIX C

SIDRA CALCULATION RESULTS

TABLE C-1: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2017, WITHOUT BACKGROUND TRAFFIC GROWTH WITHOUT THE PROPOSED DEVELOPMENT (SCENARIO 1)

POINT A: **INTERSECTION OF ROAD N14 AND PROPOSED ACCESS ROAD ALT 1 (WITH RECOMMENDED INTERSECION LAYOUT)**

Intersection does not exist for Scenario 1.

POINT B: **INTERSECTION OF ROAD N14, DINGLETON ROAD AND ROAD D3333**

Type of intersection control: Free-flow on Road N14

Levels of Service Acceptable

APPROACH	FRIDAY (AM)			FRIDAY (MID)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Dingleton Rd)	11.8	B	0.075	11.5	B	0.111
East (Road N14)	1.4	A	0.221	0.5	A	0.108
South (Road D333)	17.8	C	0.014	15.7	C	0.009
West (Road N14)	0.5	A	0.082	0.1	A	0.208
Intersection	**1.9**	**A**	**0.211**	**1.6**	**A**	**0.208**

POINT C: **INTERSECTION OF DINGLETON ROAD AND PROPOSED ACCESS ROAD ALT 2 (WITH RECOMMENDED INTERSECION LAYOUT)**

Intersection does not exist for Scenario 1.

TABLE C-2: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2022, WITH BACKGROUND TRAFFIC GROWTH WITHOUT THE PROPOSED DEVELOPMENT (SCENARIO 4)

POINT A: **INTERSECTION OF ROAD N14 AND PROPOSED ACCESS ROAD ALT 1 (WITH RECOMMENDED INTERSECION LAYOUT)**

Intersection does not exist for Scenario 4.

POINT B: **INTERSECTION OF ROAD N14, DINGLETON ROAD AND ROAD D3333**

Type of intersection control: Free-flow on Road N14

Levels of Service Acceptable

APPROACH	FRIDAY (AM)			FRIDAY (MID)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Dingleton Rd)	12.9	B	0.099	12.3	B	0.140
East (Road N14)	1.4	A	0.245	0.6	A	0.125
South (Road D333)	21.1	C	0.018	18.2	C	0.011
West (Road N14)	0.5	A	0.096	0.1	A	0.241
Intersection	**2.0**	**A**	**0.245**	**1.6**	**A**	**0.241**

POINT C: **INTERSECTION OF DINGLETON ROAD AND PROPOSED ACCESS ROAD ALT 2 (WITH RECOMMENDED INTERSECION LAYOUT)**

Intersection does not exist for Scenario 4.

TABLE C-3: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2017, WITHOUT BACKGROUND TRAFFIC GROWTH WITH THE PROPOSED DEVELOPMENT (ALTERNATIVE 1 – ACCESS FROM ROAD N14) (SCENARIO 2)

POINT A: **INTERSECTION OF ROAD N14 AND PROPOSED ACCESS ROAD ALT 1 (WITH RECOMMENDED INTERSECION LAYOUT)**

Type of intersection control: Free-flow on Road N14

Levels of Service Acceptable

APPROACH	FRIDAY (AM)			FRIDAY (MID)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Access 1)	12.6	B	0.004	12.9	B	0.013
East (Road N14)	0.0	A	0.261	0.5	A	0.129
West (Road N14)	0.0	A	0.090	0.1	A	0.266
Intersection	**0.1**	**A**	**0.261**	**0.3**	**A**	**0.266**

POINT B: **INTERSECTION OF ROAD N14, DINGLETON ROAD AND ROAD D3333**

Type of intersection control: Free-flow on Road N14

Levels of Service Acceptable

APPROACH	FRIDAY (AM)			FRIDAY (MID)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Dingleton Rd)	11.8	B	0.075	11.5	B	0.115
East (Road N14)	1.4	A	0.221	0.6	A	0.108
South (Road D333)	17.8	C	0.014	15.8	C	0.009
West (Road N14)	0.5	A	0.082	0.1	A	0.208
Intersection	**1.9**	**A**	**0.211**	**1.6**	**A**	**0.208**

POINT C: **INTERSECTION OF DINGLETON ROAD AND PROPOSED ACCESS ROAD ALT 2 (WITH RECOMMENDED INTERSECION LAYOUT)**

Intersection does not exist for Scenario 2.

TABLE C-4: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2017, WITHOUT BACKGROUND TRAFFIC GROWTH WITH THE PROPOSED DEVELOPMENT (ALTERNATIVE ACCESS 2 – ACCESS FROM DINGLETON ROAD) (SCENARIO 3)

POINT A: **INTERSECTION OF ROAD N14 AND PROPOSED ACCESS ROAD ALT 1 (WITH RECOMMENDED INTERSECION LAYOUT)**

Intersection does not exist for Scenario 3.

POINT B: **INTERSECTION OF ROAD N14, DINGLETON ROAD AND ROAD D3333**

Type of intersection control: Free-flow on Road N14

Levels of Service Acceptable

APPROACH	FRIDAY (AM)			FRIDAY (MID)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Dingleton Rd)	11.8	B	0.075	11.5	B	0.111
East (Road N14)	1.4	A	0.221	0.5	A	0.108
South (Road D333)	17.8	C	0.014	15.7	C	0.009
West (Road N14)	0.5	A	0.082	0.1	A	0.208
Intersection	**1.9**	**A**	**0.211**	**1.6**	**A**	**0.208**

POINT C: **INTERSECTION OF DINGLETON ROAD AND PROPOSED ACCESS ROAD ALT 2 (WITH RECOMMENDED INTERSECION LAYOUT)**

Type of intersection control: Free-flow on Road N14

Levels of Service Acceptable

APPROACH	FRIDAY (AM)			FRIDAY (MID)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Dingleton Rd)	0.1	A	0.022	0.2	A	0.038
East (Access 2)	8.7	A	0.002	8.4	A	0.005
South (Dingleton Rd)	0.1	A	0.064	2.1	A	0.012
Intersection	**0.2**	**A**	**0.064**	**1.2**	**A**	**0.038**

TABLE C-5: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2022, WITH BACKGROUND TRAFFIC GROWTH WITH THE PROPOSED DEVELOPMENT (ALTERNATIVE 1 – ACCESS FROM ROAD N14) (SCENARIO 5)

POINT A: **INTERSECTION OF ROAD N14 AND PROPOSED ACCESS ROAD ALT 1 (WITH RECOMMENDED INTERSECION LAYOUT)**

Type of intersection control: Free-flow on Road N14

Levels of Service Acceptable

APPROACH	FRIDAY (AM)			FRIDAY (MID)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Access 1)	14.2	B	0.005	14.5	B	0.015
East (Road N14)	0.0	A	0.303	0.4	A	0.150
West (Road N14)	0.0	A	0.104	0.1	A	0.309
Intersection	**0.1**	**A**	**0.303**	**0.3**	**A**	**0.309**

POINT B: **INTERSECTION OF ROAD N14, DINGLETON ROAD AND ROAD D3333**

Type of intersection control: Free-flow on Road N14

Levels of Service Acceptable

APPROACH	FRIDAY (AM)			FRIDAY (MID)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Dingleton Rd)	12.9	B	0.099	12.3	B	0.144
East (Road N14)	1.4	A	0.245	0.6	A	0.125
South (Road D333)	21.1	C	0.018	18.3	C	0.011
West (Road N14)	0.5	A	0.096	0.1	A	0.241
Intersection	**2.0**	**A**	**0.245**	**1.7**	**A**	**0.241**

POINT C: **INTERSECTION OF DINGLETON ROAD AND PROPOSED ACCESS ROAD ALT 2 (WITH RECOMMENDED INTERSECION LAYOUT)**

Intersection does not exist for Scenario 5.

TABLE C-6: LEVELS OF SERVICE FOR VARIOUS APPROACHES FOR THE YEAR 2022, WITH BACKGROUND TRAFFIC GROWTH WITH THE PROPOSED DEVELOPMENT (ALTERNATIVE 2 – ACCESS FROM DINGLETON ROAD) (SCENARIO 6)

POINT A: **INTERSECTION OF ROAD N14 AND PROPOSED ACCESS ROAD ALT 1 (WITH RECOMMENDED INTERSECION LAYOUT)**

Intersection does not exist for Scenario 6.

POINT B: **INTERSECTION OF ROAD N14, DINGLETON ROAD AND ROAD D3333**

Type of intersection control: Free-flow on Road N14

Levels of Service Acceptable

APPROACH	FRIDAY (AM)			FRIDAY (MID)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Dingleton Rd)	12.9	B	0.099	12.3	B	0.146
East (Road N14)	1.4	A	0.245	0.9	A	0.125
South (Road D333)	21.1	C	0.018	18.6	C	0.011
West (Road N14)	0.5	A	0.096	0.1	A	0.241
Intersection	**2.0**	**A**	**0.245**	**1.8**	**A**	**0.241**

POINT C: **INTERSECTION OF DINGLETON ROAD AND PROPOSED ACCESS ROAD ALT 2 (WITH RECOMMENDED INTERSECION LAYOUT)**

Type of intersection control: Free-flow on Road N14

Levels of Service Acceptable

APPROACH	FRIDAY (AM)			FRIDAY (MID)		
	Delay	Level of Service	Degree of Saturation	Delay	Level of Service	Degree of Saturation
North (Dingleton Rd)	0.1	A	0.025	0.2	A	0.044
East (Access 2)	8.8	A	0.002	8.5	A	0.005
South (Dingleton Rd)	0.0	A	0.074	1.9	A	0.013
Intersection	**0.2**	**A**	**0.074**	**1.1**	**A**	**0.044**

APPENDIX D

LEVEL OF SERVICE CRITERIA DESCRIPTION

TABLE D-1: LEVEL OF SERVICE CRITERIA DESCRIPTION FOR UNSIGNALISED INTERSECTIONS		
LEVEL OF SERVICE	**AVERAGE TOTAL DELAY (SEC/VEH)**	**PERFORMANCE EVALUATION**
A	≤ 5	Excellent
B	> 5 and ≤ 10	Very Good
C	>10 and ≤ 20	Good
D	>20 and ≤ 30	Average
E	>30 and ≤ 45	Poor
F	>45	Fail

TABLE D-2: LEVEL OF SERVICE CRITERIA DESCRIPTION FOR SIGNALISED INTERSECTIONS		
LEVEL OF SERVICE	**AVERAGE TOTAL DELAY (SEC/VEH)**	**PERFORMANCE EVALUATION**
A	≤ 5	Excellent
B	> 5 and ≤ 15	Very Good
C	> 15 and ≤ 25	Good
D	> 25 and ≤ 40	Average
E	> 40 and ≤ 60	Poor
F	> 60	Fail

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

APPENDIX E

SUMMARY OF IMPACT RATINGS

TABLE E-1: IMPACT RATING FOR THE PROPOSED DEVELOPMENT

ACCESS ALTERNATIVES 1 AND 2

RECEPTOR	ACTIVITY		IMPACT	BEFORE MITIGATION						AFTER MITIGATION						Comments and Mitigation Measures
				Intensity	Duration	Spatial Scale	Consequence	Probability	Significance	Intensity	Duration	Spatial Scale	Consequence	Probability	Significance	
Road and Traffic	Construction of infrastructure	Road Capacity	1. Relevant road sections (reconstructing/repairing of roads)	*L*	*H*	*M*	*Med*	*H*	*High*	*L*	H	*M*	*Med*	*H*	*High*	*(Capacity is no problem and the proposed development is anticipated to generate an insignificant volume of vehicle traffic on the relevant roads network during peak periods.*
			2. Relevant intersections (need for additional lanes)	*L*	*H*	*M*	*Med*	*H*	*High*	*L*	*H*	*M*	*Med*	*H*	*High*	See **Section 2.3** of the report and **Appendix C** of the report. (No additional lanes required at relevant intersections from a road capacity point of view)
		Road Safety Issues	3. Intersection (access) spacing	*L*	*H*	*M*	*Med*	*H*	*High*	*L*	*H*	*M*	*Med*	*H*	*High*	*If found acceptable by SANRAL, no problems are foreseen.*
			4. Vertical road alignment	*L*	*H*	*M*	*Med*	*H*	*High*	*L*	*H*	*M*	*Med*	*H*	*High*	*See **Item 1.1.2** of **Table 2.11.** Vertical Road Alignment acceptable.*
			5. Available sight distance at intersection	*L*	*H*	*M*	*Med*	*H*	*High*	*L*	*H*	*M*	*Med*	*H*	*High*	*See **Item 1.1.2** of **Table 2.11.** Sight Distances acceptable.*
			6. Speed limit at proposed Access Points A or C	*M*	*H*	*M*	*High*	*M*	*High*	*M+*	*H*	*M*	*High*	*M*	*High +*	*See **Item 1.1.2** of **Table 2.11.** Reduction of speed limit and the provision of road traffic sign.*
			7. Relevant intersections (need for dedicated left- and right-turn lanes, Point A or C)	*H*	*H*	*M*	*High*	*M*	*High*	*H+*	*H*	*M*	*High*	*M*	*High +*	*See **Item 1.1.4** of **Table 2.11.** Dedicated right-turn and left-turn lanes required.*
			8. Pedestrian movements (with reference to access roads and intersections)	*M*	*H*	*M*	*High*	*M*	*High*	*M+*	*H*	*M*	*High*	*M*	*High +*	*See **Item 3.1** of **Table 2.11.** Pedestrian crossings should be provided at intersection B to create a safe space for pedestrians to cross the roadway.*
			9. Public transport loading and off-loading	*M*	*H*	*M*	*High*	*M*	*High*	*M+*	*H*	*M*	*High*	*M*	*High +*	*See **Item 4.1** of **Table 2.11.** Lack of proper public transport loading and off-loading bays will result in public transport stopping in roadways that could lead to fatal accidents.*

APPENDIX F

IMPACT RATINGS CRITERIA

TABLE E-1: CRITERIA USED IN THE ASSESSMENT OF IMPACTS		
PART A: DEFINITION AND CRITERIA*		
Definition of SIGNIFICANCE		**Significance = consequence x probability**
Definition of CONSEQUENCE		**Consequence is a function of severity, spatial extent and duration**
Criteria for ranking of the SEVERITY of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	**L**	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national

PART B: DETERMINING CONSEQUENCE

SEVERITY = L

DURATION	Long term	**H**	**Medium**	**Medium**	**Medium**
	Medium term	**M**	**Low**	**Low**	**Medium**
	Short term	**L**	**Low**	**Low**	**Medium**

SEVERITY = M

DURATION	Long term	**H**	**Medium**	**High**	**High**
	Medium term	**M**	**Medium**	**Medium**	**High**
	Short term	**L**	**Low**	**Medium**	**Medium**

SEVERITY = H

DURATION	Long term	**H**	**High**	**High**	**High**
	Medium term	**M**	**Medium**	**Medium**	**High**
	Short term	**L**	**Medium**	**Medium**	**High**
			L	**M**	**H**
			Localised Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional/ national
			SPATIAL SCALE		

PART C: DETERMINING SIGNIFICANCE

PROBABILITY (of exposure to impacts)	Definite/ Continuous	**H**	**Medium**	**Medium**	**High**
	Possible/ frequent	**M**	**Medium**	**Medium**	**High**
	Unlikely/ seldom	**L**	**Low**	**Low**	**Medium**
			L	**M**	**H**
			CONSEQUENCE		

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	**Decision guideline**
High	It would influence the decision regardless of any possible mitigation.
Medium	It should have an influence on the decision unless it is mitigated.
Low	It will not have an influence on the decision.

APPENDIX G

PROFESSIONAL REGISTRATION AND CIRRICULUM VITAE

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 MR ROETS' OTHER TRAFFIC AND TRANSPORT ENGINEERING EXPERTISE AND EXPERIENCE INCLUDE THE FOLLOWING:
a) Shopping Centres that Range from 2 000 m^2 to 60 000 m^2
b) Various Filling Station Developments
c) Integrated Transport Plans for Various Local and District Municipalities • Vhembe • Ba-Phalaborwa • Polokwane • Sekhukhune • Thulamela • Limpopo • Mogalakwena
d) Public Transport Plans for Various Local and District Municipalities • Mopani • Vhembe • Tubatse • Capricorn
e) Design and Layout of Traffic Light System
f) Residential Development that vary from 100 to 12 000 stands

In conclusion the following are relevant:

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

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

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

SOME OF THE TRANSPORT PLANNING PROJECTS THAT LEON ROETS HAD BEEN INVOLVED IN THE LIMPOPO PROVINCE INCLUDE:																
Authority / Project Description	Transport Forum	CPTR	OLS	RATPlan	PTP	ITP	LITP	DITP	Business Plans	Liaison	Public Transport Intermodal Facilities	Public Transport Facilities	Colour Coding	Transport Framework	Corridor Planning	Year
Technical Advisor – Taxi Industry Polokwane Integrated Rapid Transit									Y	Y		Y			Y	2015-2011
Elim Mall, Tzaneng Mall, Tzaneen Crossing, Tzaneen Lifestyle Centre, Burgersfort Mall, Malamulele												Y				2012-1998
Greater Tubatse Municipality	Y															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