



**PROPOSED TOWNSHIP ESTABLISHMENT TO BE SITUATED ON THE
REMAINDER OF THE FARM DWARSLOOP 248KU –
BUSHBUCKRIDGE LOCAL MUNICIPALITY**

TRAFFIC IMPACT STUDY REPORT

DRAFT REPORT

REV 00

DATE: 30 November 2020

Prepared for:

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CLIENT: NKANIVO DEVELOPMENT CONSULTANTS (PTY) LTD

PROJECT: Township Establishment to be Situated on the Remainder of the Farm
Dwarsloop 248 KU TIS

PROJECT NO.: 21444

TITLE: Traffic Impact Study for the proposed Township Establishment to be
situated on the Remainder of the Farm Dwarsloop 248 KU

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Traffic Impact Assessment	
TRAFFIC IMPACT STUDY FOR THE PROPOSED TOWNSHIP ESTABLISHMENT TO BE SITUATED ON THE REMAINDER OF THE FARM DWARSLOOP 248 KU	
Report Summary	
Site Location	Remainder of the Farm Dwarsloop 248 KU, Bushbuckridge Local Municipality, Mpumalanga Province
Municipality	Bushbuckridge Local Municipality
Type of Assessment	Traffic Impact Assessment
Proposed Land use	Township establishment for proposed Residential 1, Public Open Space, Primary School, Business, Church, Creche (Pre-School/day care) and Roads
Proposed Site Size	54.24 hectares
Trip Generation Reference	South African Trip Generation Rates, TMH 17, September 2013, Version 1.01
Traffic counts date	12 November 2020
Assessment Years	Scenario 1: 2020 background traffic demand Scenario 2: 2025 background traffic demand with development trips (Design horizon year) Scenario 3: 2040 background traffic demand with development trips (Planning horizon year)
Access	Proposed Access to the site is via Unknown Access Road and Road R40
Capacity of Access	The proposed access must be designed to accommodate the expected demand.
Proposed road upgrades	<ul style="list-style-type: none"> Formalized Accesses to be constructed at R40 and Unknown Access Road
Recommendations	<ul style="list-style-type: none"> The proposed development should be considered favorably from a traffic engineering point of view by the relevant authorities, given the proposed road upgrades in this report. NMT and universal access facilities be incorporated in the development especially on the roads / access that will be used by Public Transport and where the social facilities will be located. Detailed designs for the development access should be undertaken by a professional engineer / technologist with suitable road design experience.
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Report Date	30 November 2020

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LIST OF ACRONYMS

COTO	Committee of Transport Officials
GLA	Gross Leasable Area
LOS	Level of Service
SARTSM	South African Road and Traffic Signs Manual
TIA	Traffic Impact Assessment
TMH	Technical Methods for Highways
v/c	Volume capacity ratio
Veh/h	Vehicles per hour
PTF	Public Transport Facility
Km	Kilometre
NMT	Non-Motorized Transport

1 INTRODUCTION

Nyeleti Consulting was appointed by Nkanivo Development Consultants (Pty) Ltd to conduct a Traffic Impact Assessment for the proposed Township Establishment to be Situated on the Remainder of the Farm Dwarsloop 248 KU. TIS The proposed project area will accommodate 533 erven for multiple land uses and is expected to cover an estimated 54.24ha. This report addresses TIA aspects of the proposed development.

1.1 Objectives of the study

As part of the project implementation plan, several studies are undertaken to assess the technical aspects of developing the project. The assessment studies are aimed at formalising a submission for the approval of the development plans. Amongst the studies is a Traffic Impact Assessment that is aimed at assessing the traffic impact of the proposed development on the adjacent road network around the proposed development. The objectives of the traffic impact study are:

- Determine the existing, pre-development traffic volumes and patterns near the development site;
- Assess the land use of the proposed development to establish the expected trips to be generated;
- Assess any Public Transport operations in and around the proposed development;
- Determine the post-development, projected traffic volumes and assess its impact on the existing road network;
- Provide recommendations on the suitability and safety of the proposed access arrangements;
- Recommend infrastructure improvements, if deemed necessary, to accommodate the expected development traffic;

In essence the traffic study is one of the essential feasibility studies for the planning and implementation of the project.

1.2 Site location

The proposed development site is in the Mpumalanga Province, Bushbuckridge Local Municipality, approximately 13.0 km South of Bushbuckridge. The project is located next to Baromeng and Orinoco A Villages as shown in Figure 1 and Figure 2. The proposed site will be located on Remainder of the Farm Dwarsloop 248 KU. The site is currently vacant.

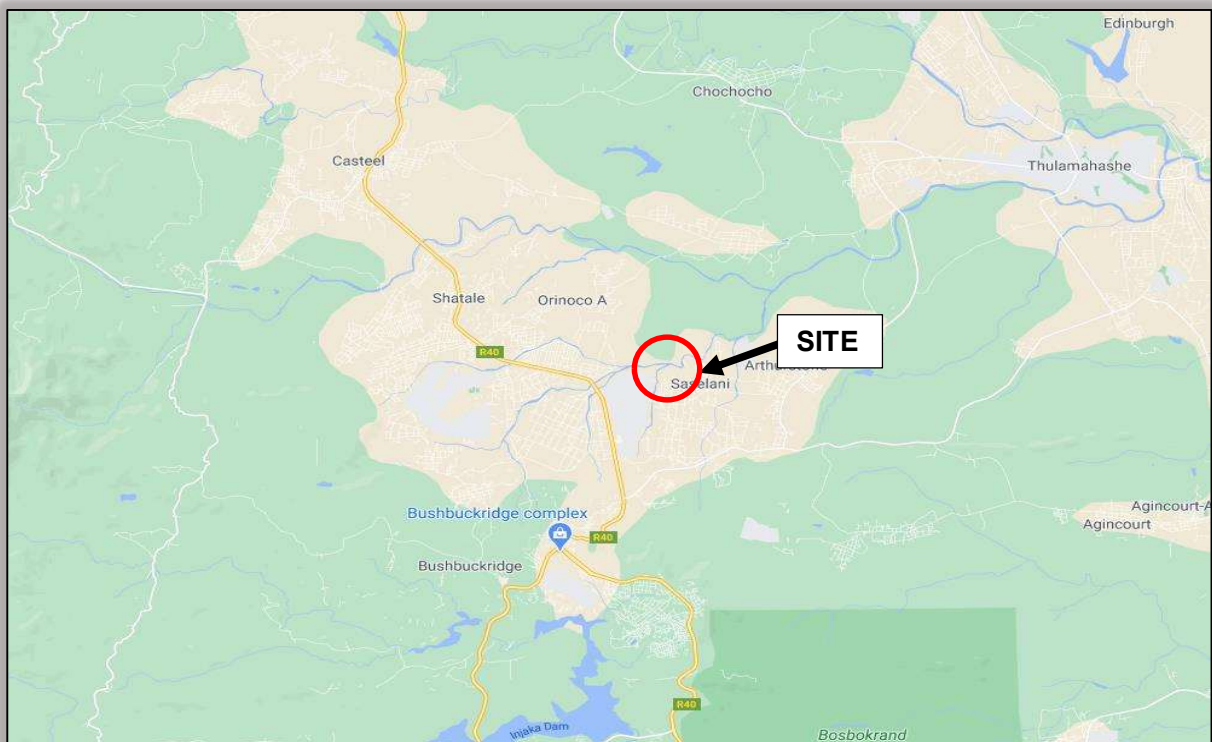


Figure 1: Locality of Proposed Township Establishment in Dwarsloop (Developed from Open Street Maps, 2020)



Figure 2: Location of Proposed Township Establishment in Dwarsloop (Developed from Google Maps, 2020).

1.3 Satus Quo

The land where the proposed development will be located, is currently an open space. Access to the Development will be obtained on the R40 which is a Provincial road linking several villages in the Bushbuckridge local Municipality. The proposed development will access the R40 via roads in Baromeng and Dwarsloop C villages.

2 PROPOSED DEVELOPMENT

The development site is on the Remainder of the Farm Dwarsloop 248 KU, which measures 54.24 ha in size. The proposed township establishment development is meant to accommodate 533 erven for multiple land uses. The following land uses form part of the development.

- Residential 1 single dwelling units – 517 Erven (32.07 ha)
- Public Open Space – 4 Erven (3.78 ha)
- Public Primary School – 1 Erven (3.24 ha)
- Business – 5 Erven (0.65 ha)
- Church (Public place of worship) – 3 erven (0.30 ha)
- Creche (Pre-School/day care) – 3 erven (0.27 ha)
- Roads – (13.93 ha)

The total size for the proposed development is 54.24 ha. The site development plan can be found in Appendix C

3 DATA COLLECTION

3.1 Information from external sources

The following information was obtained from various interested and affected parties:

- Site Layout for the Proposed Township Establishment on the Remainder of the Farm Dwarsloop 248 Ku

The information mentioned above is referred to and used in this report.

3.2 Data collected by Nyeleti Consulting

The following data was collected by Nyeleti Consulting:

- Twelve hour classified traffic counts;
- Twelve hour turning movement traffic counts; and
- Photographs of the area and various affected roads and intersections.

Traffic counts data was collected through a traffic counting subconsultant on the 12 of November 2020. Traffic counts were collected over a period of 12 hours from 06:00am to 18:00pm.

4 TRAFFIC VOLUMES

4.1 Current traffic volumes

Current traffic volumes were determined by means of 12-hour traffic counts. Traffic was counted from 06:00 to 18:00 on Thursday the 12 of November 2020. Figure 3 indicate the traffic counting stations. Traffic counts consisted of turning movement counts and classified vehicle counts. The detailed traffic counting data is attached as Appendix A.

4.2 Turning movement traffic volumes

Turning movement traffic counts were conducted at the following intersections as illustrated in *Figure 3*:

- R40 and Unknown Access Road (intersection 1)



Figure 3: Traffic counting positions (Developed from Google Maps, 2020)

4.2.1 Traffic volumes for the morning peak and afternoon peak

The morning peak is between **06:45 to 07:45** and the afternoon peak is between **15:45 to 16:45** at the respective intersection. The traffic count data can be found in Appendix A and Table 1 shows the peak times and peak traffic volumes for each intersection.

Table 1: Morning and Afternoon Peak times

Intersection	Intersection Type	Traffic Volume		Peak Times	
		AM	PM	AM	PM
R40 and Unknown Access Road (Intersection 1)	Unsignalised, Stop on minor road	43	29	06:45-07:45	15:30-16:30

4.2.2 Traffic volumes for the 12 hour

Table 2 summarises the 12 hour traffic counts for the intersection and it also shows the Average Annual Daily Traffic (AADT), calculated by multiplying the 12-hour volumes with a factor of 1.4.

Table 2: 12 hour traffic volumes

Intersection Name	Intersection Type	12 Hour Traffic Volumes	AADT
R40 and Unknown Access Road (Intersection 1)	Unsignalised, Stop on minor road	8 769	12277

4.3 Turning movement traffic counts

The peak hour traffic volumes for turning movement counts is summarized in Table 3 below.

Table 3: Peak Hour volumes at R40 and Unknown Access Road (Intersection 1)

APPROACH	Morning Peak Volumes (06h45 to 07h45)			
	Left	Through	Right	TOTAL
Unknown Access Road (Westbound)	2	N/A	7	9
R40 (Northbound)	N/A	504	15	519
R40 (Southbound)	2	424	N/A	426
APPROACH	Afternoon Peak Volumes (15h45 to 16h45)			
	Left	Through	Right	TOTAL
Unknown Access Road (Westbound)	7	N/A	20	27
R40 (Northbound)	N/A	407	11	418
R40 (Southbound)	5	359	N/A	364

4.4 Classified traffic counts (Modal Split)

Classified counts at the intersection of R40 and Unknown Access Road (Intersection 1) were conducted on the same day.

Table 4 shows a breakdown of the Classified traffic counts summary on R40 and Unknown Access Road (Intersection 1). It also shows the Average Annual Daily Traffic (AADT), calculated by multiplying the 12-hour volumes with a factor of 1.4.

The modal split on R40 and Unknown Access Road (Intersection 1) is made up of Light Vehicles (LV) at about 78.4% followed by Taxis at about 13.5%, Buses at 0.2% and Heavy Vehicles (HV) at about 7.9%.

Table 4: Classified traffic counts summary

Road	12 Hour Volume	AADT	Modal Split			
			Light Vehicles (LV)	Taxi	Buses	Heavy Vehicles (HV)
R40 and Unknown Access Road (Intersection 1)	8 769	12 277	6 877 (78.4%)	1 188 (13.5%)	15 (0.2%)	689 (7.9%)

5 CAPACITY ANALYSIS

The intersections were analysed using Sidra Intersection to understand current levels of service (LOS). The criteria for LOS are based on the Highway Capacity Manual as summarized in Table 5. Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements. When demand volume exceeds the capacity of the lane, extreme delays will be encountered. With the increase in delays, increase in queue lengths will be encountered causing congestion. This condition usually warrants improvement to the intersection.

5.1 Level of Service (LOS)

At the very least a LOS D has to be obtained in order for the traffic flow to be perceived as acceptable.

The performance of the intersections is based on the average delay in seconds.

Table 5: Level of Service criteria

UNSIGNALIZED INTERSECTION		
Average Control Delay (sec/veh)	Level of Service (LOS)	Expected Delay to Minor Street Traffic
0 - 10.0	A	Free Flow
> 10.0 - 15.0	B	Stable Flow (slight delays)
> 15.0 - 25.0	C	Stable Flow (acceptable delays)
> 25.0 - 35.0	D	Approaching unstable flow (tolerate delay, occasionally wait
> 35.0 - 50.0	E	Very long traffic delays
> 50.0	F	*
SIGNALIZED INTERSECTION		
Average Control Delay (sec/veh)	Level of Service (LOS)	Expected Delay
≤ 10	A	Free Flow
>10 - 20	B	Stable Flow (slight delays)
>20 - 35	C	Stable Flow (acceptable delays)
>35 - 55	D	Approaching unstable flow (tolerate delay, occasionally wait
>55 - 80	E	Very long traffic delays
>80	F	*

* When demand volume exceeds the capacity of the lane, extreme delays will be encountered. With the increase in delays, increase in queue lengths will be encountered causing congestion. This condition usually warrants improvement to the intersection.

The turning movement peak traffic volumes and corresponding Levels of Service at all proposed intersections for the morning and afternoon peaks are shown on Table 6.

Table 6: Level of Service (R40 and Unknown Access Road (Intersection 1)) - Base Traffic)

Intersection (Weekday)	Eastbound			Westbound			Northbound			Southbound			Intersection
	L	T	R	L	T	R	L	T	R	L	T	R	
Movement													All
AM Peak Hour Volumes	N/A	N/A	N/A	2	N/A	7	N/A	504	15	2	424	N/A	954
Level of Service	N/A	N/A	N/A	B	N/A	C	N/A	A	A	A	A	N/A	N/A
PM Peak Hour Volumes	N/A	N/A	N/A	7	N/A	20	N/A	407	11	5	359	N/A	809
Level of Service	N/A	N/A	N/A	A	N/A	B	N/A	A	A	A	A	N/A	N/A

The intersections were analysed for performance for both morning and afternoon peaks. Table 7 below summarizes the intersection current operations.

The performance of the intersection is based on the average delay in seconds. The current average delays for the R40 and Unknown Access Road (Intersection 1), which operates a three-legged (east-west major road approach and stop controlled on minor road) intersection is 0.4 seconds for the morning peak hour and 0.6 seconds in afternoon peak, however, the average delay on the north approach is 0.1 seconds for both the morning and afternoon peaks respectively and the average delay on the south approach is 0.4 seconds and 0.3 seconds for morning and afternoon peaks respectively.

Table 7: Morning and Afternoon Peak volumes with Corresponding LOS - Base Traffic (2020)

Intersection	Intersection Type	Morning Peak			Afternoon Peak		
		Traffic Volume	LOS	Average delays (sec)	Traffic Volume	LOS	Average delays (sec)
R40 and Unknown Access Road (Intersection 1)	Unsignalised, Stop on minor road	954	N/A	0.4	809	N/A	0.6

The intersection currently operates at acceptable Levels of Service for both morning and afternoon peaks. The Levels of Service for the intersection cannot be indicated (e.g. LOS E) due to the fact that and Major Road Approach LOS values are not applicable for two-way sign control intersection since the average delay is not a good LOS measure due to zero delays associated with major road lanes.

6 TRAFFIC DEMAND

The traffic demand for the upgrading of the intersections will take into consideration two horizon years. The design and the planning horizon years. The design horizon year is the year selected for determining transportation improvements that are required to accommodate the upgrading of the intersections. The transportation / road improvements must be designed for a horizon year of 5 years. The planning horizon year, though not used for determining the transportation improvements that are required for the road network, is the year selected for determining whether it is physically possible to accommodate the proposed development together with future traffic growth. The planning horizon year to be used for the development is 20 years.

6.1 Traffic growth

Average annual economic growth rate for the Bushbuckridge Local Municipality was 0.7% over the period 1996 to 2015, the forecasted average annual GDP growth for the Bushbuckridge Local Municipality for 2015-2020 is around 1.7% per annum which is in line with national and provincial growth expectations (Integrated Development Plan 2017-2022, Bushbuckridge Local Municipality, Unknown).

Traffic growth rates for low growth areas should be between 0 and 3% (Technical Methods for Highways (TMH 17), 2013). It was assumed that traffic growth will be proportional to GDP growth, therefore an annual traffic growth rate of 1.7% was assumed for the design and planning horizon.

6.2 Trip generation

The development generates trips to the access / exit point and generates additional traffic on the road network based on site's Spatial Development Framework. The development is as discussed in Chapter 2 of this report.

According to TMH17, a single dwelling unit (shopping centre) will generate approximately 1 trip per dwelling unit during the morning peak and about 1 trip during the afternoon peak, a public primary school will generate per student 0.85 trip during the morning peak and 0.3 trips during the afternoon , a place of worship will generate per seat 0.05 trips during both the morning peak and afternoon peak, a pre-primary will generate per student 1 trip during the morning peak and 0.8 trips during the afternoon peak, a shopping entre will generate 0.6 trips per 100m²GLA for both the morning and afternoon peak.

The proposed development is located in an area with very low vehicle ownership and adjustment factors were applied to all traffic generated by the proposed land uses, below are the adjustment factors applied to each land use:

- 70% reduction in trips for Single Dwelling Units
- 80% reduction in trips for Public Primary School
- 80% reduction in trips for Place of worship
- 80% reduction in trips for Pre-School (Day Care Centre)
- 60% reduction in trips for Shopping centre

The trips that are generated by the development are as detailed in Table 8.

Table 8: Development Trip Generation

Land Use	Size Units	Peak Hour		Generated Trips		Trip Generation adjustment factor (Very Low Vehicle Ownership)	Adjusted Generated Trips		AM Peak	PM Peak	AM Peak	PM Peak
		Trip Rate-		AM	PM		AM	PM	Split	Split	In/Out	In/Out
		AM	PM						In/Out	In/Out		
210 Single Dwelling Units	650 units 1 D/Unit	1	1	650	650	70%	195	195	25:75	70:30	49:146	137:59
520 Public Primary School	300 students 1 Student	0.85	0.3	255	90	80%	51	18	50:50	50:50	26:26	9:9
561 Place of public worship	500 Seats 1 Seat	0.05	0.05	25	25	50%	13	13	50:50	50:50	6:6	6:6
565 Pre-School (Day Care Centre)	150 Students 1 Student	1	0.8	150	120	80%	30	24	50:50	50:50	15:15	12:12
820 Shopping centre	4300m ² 100m ² GLA	0.6	0.6	26	26	60%	10	10	65:35	35:65	7:3	4:7
Total				1106	991		299	260			103:196	167:93

6.3 Trip distribution

Trip distribution is based on current trip patterns. The trips for both design and planning horizon years were distributed based on existing traffic patterns for analysis purposes.

The Traffic Impact Assessment of the existing intersection and proposed access in question is discussed in Chapter 5, whereby the traffic volumes and corresponding LOS of the design horizon are discussed in detail.

7 TRAFFIC IMPACT ASSESSMENT

Traffic impact assessment was undertaken for the following scenarios:

- Status quo
- Design horizon year
- Planning Horizon year

The status quo assessment is undertaken to understand where the current Levels of Service are at the proposed intersections. The status quo traffic assessment was discussed in Chapter 5 for the proposed intersections. The design horizon year assessment was undertaken with the purpose of establishing mitigation measures that are required to accommodate the upgrading of the intersections. The planning horizon year assessment was carried out to ascertain whether it was physically possible to accommodate the proposed upgrades and future developments in the spatial development framework of the study area.

Table 9 give a summary of the morning and afternoon peak volumes with corresponding LOS for the base traffic. Table 10 gives a summary of the counting station with corresponding LOS for the Design Horizon. Table 11 give a summary of the morning and afternoon peak volumes with corresponding LOS for the Design Horizon. Table 12 gives a summary of the counting station with corresponding LOS for the Planning Horizon. Table 13 give a summary of the morning and afternoon peak volumes with corresponding LOS for the Planning Horizon.

Table 9: Morning and Afternoon Peak volumes with Corresponding LOS - Base Traffic (2020)

Intersection	Intersection Type	Morning Peak			Afternoon Peak		
		Traffic Volume	LOS	Average delays (sec)	Traffic Volume	LOS	Average delays (sec)
R40 and Unknown Access Road (Intersection 1)	Unsignalised, Stop on minor road	954	N/A	0.4	809	N/A	0.6

Table 10: Level of Service (R40 and Unknown Access Road (Intersection 1)) - Design Horizon))

Intersection (Weekday)	Eastbound			Westbound			Northbound			Southbound			Intersection
	L	T	R	L	T	R	L	T	R	L	T	R	
Movement													All
AM Peak Hour Volumes	N/A	N/A	N/A	46	N/A	160	N/A	548	107	14	461	N/A	1337
Level of Service	N/A	N/A	N/A	C	N/A	D	N/A	A	A	A	A	N/A	N/A
PM Peak Hour Volumes	N/A	N/A	N/A	32	N/A	91	N/A	443	127	58	391	N/A	1140
Level of Service	N/A	N/A	N/A	B	N/A	C	N/A	A	A	A	A	N/A	N/A

Table 11: Morning and Afternoon Peak volumes with Corresponding LOS - Design Horizon (2025)

Intersection	Intersection Type	Morning Peak			Afternoon Peak		
		Traffic Volume	LOS	Average delays (sec)	Traffic Volume	LOS	Average delays (sec)
R40 and Unknown Access Road (Intersection 1)	Unsignalised, Stop on minor road	1 337	N/A	5.7	1 140	N/A	3.6

The Design Horizon traffic volumes average delays R40 and Unknown Access Road (Intersection 1), which will operate as a three-legged (east-west major road approach and stop controlled on minor road) intersection is 5.7 seconds for the morning peak hour and 3.6 seconds in afternoon peak, however, the average delay on the north approach is 0.2 seconds and 0.8 seconds for morning and afternoon peaks respectively and the average delay on the south approach is 2.5 seconds and 2.9 seconds for morning and afternoon peaks respectively.

It can be noted from Table 11 that for the Design Horizon traffic volumes for the R40 and Unknown Access Road (Intersection 1) will operate at acceptable Level of service for both morning and afternoon peaks:

Table 12: Level of Service (R40 and Unknown Access Road (Intersection 1) (Intersection 1)) - Planning Horizon

Intersection (Weekday)	Eastbound			Westbound			Northbound			Southbound			Intersection
	L	T	R	L	T	R	L	T	R	L	T	R	
Movement													All
AM Peak Hour Volumes	N/A	N/A	N/A	59	N/A	206	N/A	706	138	18	594	N/A	1722
Level of Service	N/A	N/A	N/A	F	N/A	F	N/A	A	B	A	A	N/A	N/A
PM Peak Hour Volumes	N/A	N/A	N/A	41	N/A	117	N/A	570	163	74	503	N/A	1468
Level of Service	N/A	N/A	N/A	C	N/A	E	N/A	A	B	A	A	N/A	N/A

Table 13: Morning and Afternoon Peak Volumes with Corresponding LOS - Planning Horizon (2040)

Intersection	Intersection Type	Morning Peak			Afternoon Peak		
		Traffic Volume	LOS	Average delays (sec)	Traffic Volume	LOS	Average delays (sec)
R40 and Unknown Access Road (Intersection 1))	Unsignalised, Stop on minor road	1 722	N/A	62.2	1 468	N/A	6.3

The Planning Horizon traffic volumes average delays R40 and Unknown Access Road (Intersection 1 (Intersection 1), which will operate as a three-legged (east-west major road approach and stop controlled on minor road) intersection is 62.3 seconds for the morning peak hour and 6.3 seconds in afternoon peak, however, the average delay on the north approach is 0.2 seconds and 0.8 seconds for morning and afternoon peaks respectively and the average delay on the south approach is 4.1 seconds and 4.5 seconds for morning and afternoon peaks respectively.

It can be noted from Table 13 that for the Planning Horizon traffic volumes for the R40 and Unknown Access Road (Intersection 1), the following intersection will operate at unacceptable Level of service for the morning peak and at acceptable Level of service for the afternoon peaks.

8 PUBLIC TRANSPORT

Public transport will play an important role due to some public transport vehicles (buses and minibus taxis) observed on the surrounding area. The classified counts indicate that 13.7% of vehicles on the intersection of R40 and Unknown Access Road (Intersection 1) are public transport vehicles consisting of buses and minibus taxis. Minibus taxis consist of 13.5% of all vehicles observed on the intersection of R40 and Unknown Access Road (Intersection 1) and buses consists of 0.2%, therefore public transport facilities such as drop of/pick up laybys for taxis must be incorporated in the design and construction of the proposed development.

9 NON-MOTORISED TRANSPORT

Non-Motorised Transport (NMT) includes inter alia walking, bicycling and animal driven carts. Sustainability of a transport system requires integration of all modes of transport inclusive of NMT. NMT plays a leading role in previously disadvantaged communities, and it is an affordable mode of transport.

It is important to provide safe NMT infrastructure, such as pedestrian walkways and/or cycling lanes. It is therefore recommended that NMT and universal access facilities be incorporated in the development especially on the roads / access that will be used by Public Transport and where the social facilities will be located

10 CONCLUSION

Given the findings in the report, the following conclusions are drawn:

- The project is located approximately 13.0 km South of Bushbuckridge and next to Baromeng and Orinoco A Villages. The development site is on the Remainder of the Farm Dwarsloop 248 KU. This area falls within Bushbuckridge Local Municipality in Mpumalanga Province.
- Current traffic volumes were determined by means of 12-hour traffic counts. Traffic was counted from 06:00 to 18:00 on Thursday the 12 of November October 2020.
- The morning peak is between **06:45 to 07:45** and the afternoon peak is between **15:45 to 16:45 at the respective intersection.**
- The modal split on R40 and Unknown Access Road (Intersection 1) is made up of Light Vehicles (LV) at about 78.4% followed by Taxis at about 13.5%, Buses at 0.2% and Heavy Vehicles (HV) at about 7.9%.
- The existing Intersection at R40 and Unknown Access Road (Intersection 1) operates at average delays of 0.4 seconds and 0.6 seconds for the morning and afternoon peaks respectively.
- The proposed development will generate 299 trips in the morning peak and 260 trips in the afternoon peak
- It was assumed that traffic growth will be proportional to GDP growth, therefore an annual traffic growth rate of 1.7% for design traffic was assumed.
- Design and Planning Horizon analysis was undertaken for the existing R40 and Unknown Access Road (Intersection 1) intersection.
- The Design Horizon traffic volumes for the R40 and Unknown Access Road (Intersection 1) intersection will operate at acceptable Level of service for both morning and afternoon peaks.
- The average delay for all vehicles is 5.7 seconds and 3.6 seconds for the morning and afternoon peaks at design horizon traffic volumes at the existing R40 and Unknown Access Road (Intersection 1) intersection.
- The average delay for all vehicles is 62.2 seconds and 6.3 seconds for the morning and afternoon peaks at planning horizon traffic volumes at the existing R40 and Unknown Access Road (Intersection 1) intersection.
- NMT and universal access facilities be incorporated in the design and construction of the proposed township establishment development and the roads adjacent to the development

- The access to the development must be designed and constructed such that it meets the Bushbuckridge local municipality requirements by a Professional Engineer or Engineering Technologist.

11 RECOMMENDATIONS

The following recommendations are made:

- The proposed development should be considered favourably from a traffic engineering point of view by the relevant authorities, given the proposed road upgrades in this report.
- NMT and universal access facilities be incorporated in the development especially on the roads / access that will be used by Public Transport and where the social facilities will be located.
- Detailed designs for the development access should be undertaken by a professional engineer / technologist with suitable road design experience.

12 REFERENCES

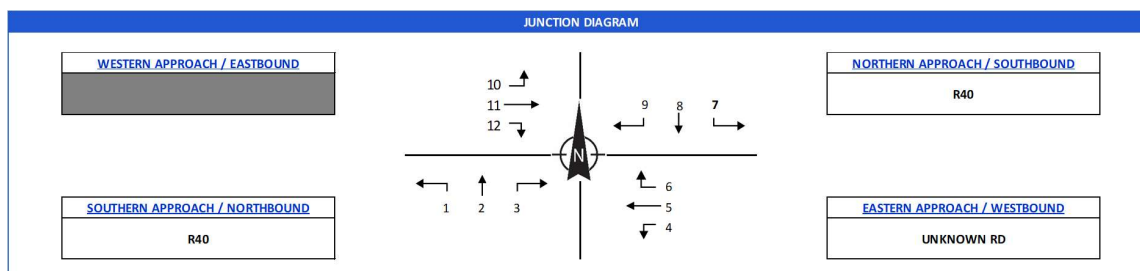
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12. *Integrated Development Plan Draft 2017-2022, Bushbuckridge Local Municipality*

APPENDIX A: TRAFFIC COUNTS DATA

R40 and Unknown Access Road (intersection 1) Turning Movements Traffic Counts Data

LOCATION:	BUSHBUCKRIDGE	PROJECT TITLE:	BUSHBUCKRIDGE-TRAFFIC COUNT					
PROJECT NR:	UT2020-802	INTERSECTION:	R40 & UNKNOWN RD					
SURVEY DATE:	12 November 2020	KMZ FILE NR:	WARSLOO	DATA:	J.A.V	TYPE:		TE-12H-6-18-C
SURVEY TIMES:	06H00-18H00							

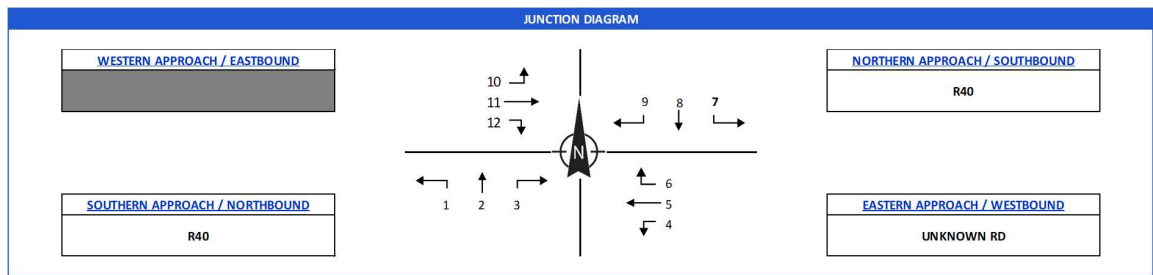
TOTAL SUMMARY														
TIME		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			VOLUME SUMMARY
START	END	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
06:00	06:15	-	51	1	-	-	2	-	52	-	-	-	-	106
06:15	06:30	-	53	2	-	-	1	-	74	-	-	-	-	130
06:30	06:45	-	97	2	-	-	2	-	99	-	-	-	-	200
06:45	07:00	-	141	4	-	-	2	-	92	-	-	-	-	239
07:00	07:15	-	130	4	1	-	2	1	95	-	-	-	-	233
07:15	07:30	-	141	4	-	-	2	1	112	-	-	-	-	260
07:30	07:45	-	92	3	1	-	1	-	125	-	-	-	-	222
07:45	08:00	-	65	2	1	-	6	1	86	-	-	-	-	161
08:00	08:15	-	58	5	1	-	2	1	86	-	-	-	-	153
08:15	08:30	-	70	1	2	-	3	2	72	-	-	-	-	150
08:30	08:45	-	78	2	-	-	3	1	84	-	-	-	-	168
08:45	09:00	-	61	3	-	-	1	1	89	-	-	-	-	155
09:00	09:15	-	71	6	1	-	1	1	78	-	-	-	-	158
09:15	09:30	-	77	1	1	-	2	1	81	-	-	-	-	163
09:30	09:45	-	85	2	-	-	4	1	87	-	-	-	-	179
09:45	10:00	-	78	1	1	-	5	2	85	-	-	-	-	172
10:00	10:15	-	79	3	4	-	5	3	70	-	-	-	-	164
10:15	10:30	-	86	5	-	-	2	3	83	-	-	-	-	179
10:30	10:45	-	80	1	-	-	2	-	78	-	-	-	-	161
10:45	11:00	-	87	3	2	-	4	1	72	-	-	-	-	169
11:00	11:15	-	75	2	2	-	3	2	85	-	-	-	-	169
11:15	11:30	-	77	1	1	-	6	-	75	-	-	-	-	160
11:30	11:45	-	86	4	1	-	3	2	67	-	-	-	-	163
11:45	12:00	-	80	3	2	-	3	-	77	-	-	-	-	165
12:00	12:15	-	90	6	1	-	5	4	78	-	-	-	-	184
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12:30	12:45	-	93	7	3	-	8	-	100	-	-	-	-	211
12:45	13:00	-	94	5	-	-	7	2	92	-	-	-	-	200
13:00	13:15	-	84	5	1	-	2	1	98	-	-	-	-	191
13:15	13:30	-	80	2	2	-	3	-	99	-	-	-	-	186
13:30	13:45	-	85	2	-	-	4	3	93	-	-	-	-	187
13:45	14:00	-	93	3	-	-	-	1	79	-	-	-	-	176
14:00	14:15	-	87	3	1	-	5	1	89	-	-	-	-	186
14:15	14:30	-	87	2	1	-	6	-	102	-	-	-	-	198
14:30	14:45	-	81	7	-	-	3	2	82	-	-	-	-	175
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15:00	15:15	-	66	8	4	-	3	3	106	-	-	-	-	190
15:15	15:30	-	105	9	3	-	5	3	88	-	-	-	-	213
15:30	15:45	-	84	1	-	-	7	-	91	-	-	-	-	183
15:45	16:00	-	104	2	2	-	5	-	94	-	-	-	-	207
16:00	16:15	-	93	3	3	-	5	2	82	-	-	-	-	188
16:15	16:30	-	102	3	1	-	5	-	93	-	-	-	-	204
16:30	16:45	-	108	3	1	-	5	3	90	-	-	-	-	210
16:45	17:00	-	93	-	-	-	3	1	78	-	-	-	-	175
17:00	17:15	-	104	2	-	-	4	-	81	-	-	-	-	191
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17:45	18:00	-	89	5	-	-	4	1	78	-	-	-	-	177
TOTAL		-	4,237	157	46	-	168	53	4,108	-	-	-	-	8,769



R40 and Unknown Access Road (intersection 1) Classified Traffic Counts Data – Light Vehicle

LOCATION:	BUSHBUCKRIDGE	PROJECT TITLE:	BUSHBUCKRIDGE-TRAFFIC COUNT					
PROJECT NR:	UT2020-802	INTERSECTION:	R40 & UNKNOWN RD					
SURVEY DATE:	12 November 2020	KMZ FILE NR:	WARSLOO	DATA:	J.A.V		TYPE:	TE-12H-6-18-C
SURVEY TIMES:	06H00-18H00							

LIGHT VEHICLE SUMMARY														
TIME		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			VOLUME SUMMARY
START	END	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
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06:15	06:30	-	38	2	-	-	1	-	48	-	-	-	-	89
06:30	06:45	-	79	2	-	-	1	-	70	-	-	-	-	152
06:45	07:00	-	125	4	-	-	2	-	71	-	-	-	-	202
07:00	07:15	-	104	3	-	-	2	1	83	-	-	-	-	193
07:15	07:30	-	122	4	-	-	2	-	82	-	-	-	-	210
07:30	07:45	-	69	2	1	-	1	-	98	-	-	-	-	171
07:45	08:00	-	49	1	1	-	6	-	71	-	-	-	-	128
08:00	08:15	-	43	5	-	-	2	1	72	-	-	-	-	123
08:15	08:30	-	49	1	1	-	2	1	61	-	-	-	-	115
08:30	08:45	-	59	2	-	-	2	-	69	-	-	-	-	132
08:45	09:00	-	41	2	-	-	1	-	78	-	-	-	-	122
09:00	09:15	-	53	5	-	-	1	-	60	-	-	-	-	119
09:15	09:30	-	61	1	-	-	1	-	65	-	-	-	-	128
09:30	09:45	-	60	1	-	-	3	-	67	-	-	-	-	131
09:45	10:00	-	59	1	1	-	3	1	67	-	-	-	-	132
10:00	10:15	-	60	2	1	-	2	2	57	-	-	-	-	124
10:15	10:30	-	60	3	-	-	2	1	64	-	-	-	-	130
10:30	10:45	-	63	1	-	-	2	-	67	-	-	-	-	133
10:45	11:00	-	72	3	-	-	3	-	55	-	-	-	-	133
11:00	11:15	-	57	-	2	-	1	-	70	-	-	-	-	130
11:15	11:30	-	62	1	1	-	3	-	60	-	-	-	-	127
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12:30	12:45	-	71	4	1	-	5	-	84	-	-	-	-	165
12:45	13:00	-	74	2	-	-	4	-	70	-	-	-	-	150
13:00	13:15	-	70	4	1	-	1	1	79	-	-	-	-	156
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17:45	18:00	-	76	4	-	-	3	1	57	-	-	-	-	141
TOTAL		-	3,311	118	22	-	117	23	3,286	-	-	-	-	6,877

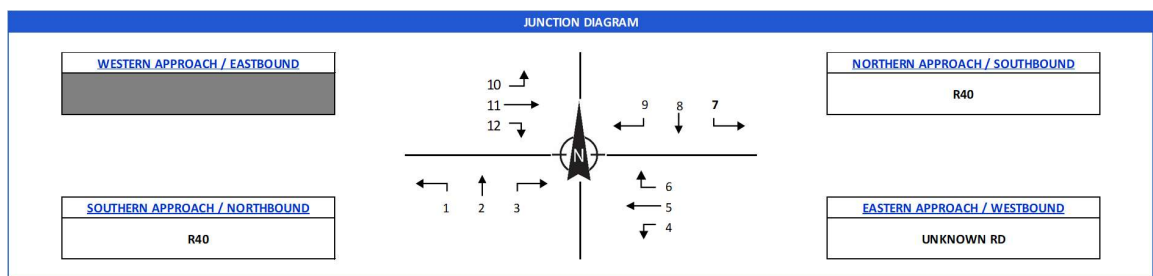


R40 and Unknown Access Road (intersection 1) Classified Traffic Counts Data – Minibus Taxis

LOCATION:	BUSHBUCKRIDGE	PROJECT TITLE:	BUSHBUCKRIDGE-TRAFFIC COUNT	
PROJECT NR:	UT2020-802	INTERSECTION:	R40 & UNKNOWN RD	
SURVEY DATE:	12 November 2020	KMZ FILE NR:	WARSLOO DATA: J.A.V TYPE: TE-12H-6-18-C	
SURVEY TIMES:	06H00-18H00			

TAXI SUMMARY														
TIME		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			VOLUME SUMMARY
START	END	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
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06:30	06:45	-	10	-	-	-	-	-	25	-	-	-	-	35
06:45	07:00	-	13	-	-	-	-	-	18	-	-	-	-	31
07:00	07:15	-	20	1	1	-	-	-	10	-	-	-	-	32
07:15	07:30	-	13	-	-	-	-	-	24	-	-	-	-	37
07:30	07:45	-	12	-	-	-	-	-	21	-	-	-	-	33
07:45	08:00	-	13	-	-	-	-	-	12	-	-	-	-	25
08:00	08:15	-	9	-	-	-	-	-	12	-	-	-	-	21
08:15	08:30	-	12	-	-	-	-	-	10	-	-	-	-	22
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09:00	09:15	-	11	-	-	-	-	-	11	-	-	-	-	22
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17:45	18:00	-	10	-	-	-	-	-	13	-	-	-	-	23
TOTAL		-	609	7	2	-	11	1	558	-	-	-	-	1,188

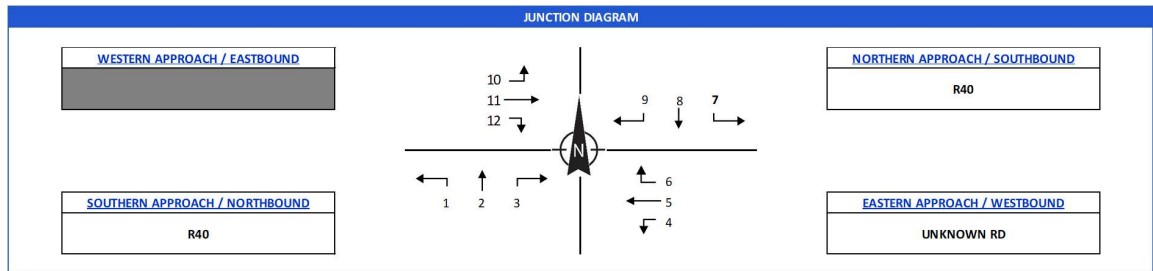
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84
87
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111
110
109
109
100
102
100
106
107



R40 and Unknown Access Road (intersection 1) Classified Traffic Counts Data – Buses

LOCATION:	BUSHBUCKRIDGE	PROJECT TITLE:	BUSHBUCKRIDGE-TRAFFIC COUNT					
PROJECT NR:	UT2020-802	INTERSECTION:	R40 & UNKNOWN RD					
SURVEY DATE:	12 November 2020	KMZ FILE NR:	WARSLOO	DATA:	J.A.V	TYPE:		TE-12H-6-18-C
SURVEY TIMES:	06H00-18H00							

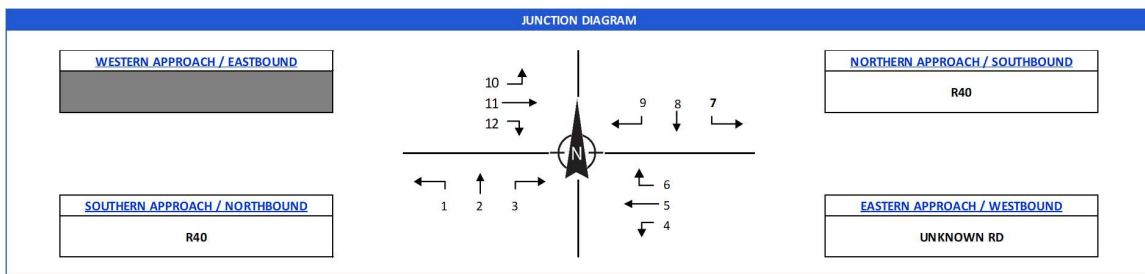
BUS SUMMARY														
TIME		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			VOLUME SUMMARY
START	END	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
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06:15	06:30	-	-	-	-	-	-	-	-	-	-	-	-	-
06:30	06:45	-	-	-	-	-	-	-	-	-	-	-	-	-
06:45	07:00	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00	07:15	-	-	-	-	-	-	-	-	-	-	-	-	-
07:15	07:30	-	-	-	-	-	-	-	2	-	-	-	-	2
07:30	07:45	-	1	-	-	-	-	-	1	-	-	-	-	2
07:45	08:00	-	-	-	-	-	-	-	1	-	-	-	-	1
08:00	08:15	-	-	-	-	-	-	-	-	-	-	-	-	-
08:15	08:30	-	-	-	-	-	-	-	-	-	-	-	-	-
08:30	08:45	-	-	-	-	-	-	-	1	-	-	-	-	1
08:45	09:00	-	-	-	-	-	-	-	-	-	-	-	-	-
09:00	09:15	-	-	-	-	-	-	-	1	-	-	-	-	1
09:15	09:30	-	-	-	-	-	-	-	-	-	-	-	-	-
09:30	09:45	-	-	-	-	-	-	-	-	-	-	-	-	-
09:45	10:00	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00	10:15	-	-	-	-	-	-	-	-	-	-	-	-	-
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11:00	11:15	-	-	-	-	-	-	-	-	-	-	-	-	-
11:15	11:30	-	-	-	-	-	-	-	-	-	-	-	-	-
11:30	11:45	-	-	-	-	-	-	-	-	-	-	-	-	-
11:45	12:00	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00	12:15	-	-	-	-	-	-	-	-	-	-	-	-	-
12:15	12:30	-	-	-	-	-	-	-	-	-	-	-	-	-
12:30	12:45	-	1	-	-	-	-	-	-	-	-	-	-	1
12:45	13:00	-	-	-	-	-	-	-	-	-	-	-	-	-
13:00	13:15	-	-	-	-	-	-	-	-	-	-	-	-	-
13:15	13:30	-	-	-	-	-	-	-	-	-	-	-	-	-
13:30	13:45	-	-	-	-	-	-	-	-	-	-	-	-	-
13:45	14:00	-	-	-	-	-	-	-	-	-	-	-	-	-
14:00	14:15	-	-	-	-	-	-	-	-	-	-	-	-	-
14:15	14:30	-	1	-	-	-	-	-	-	-	-	-	-	1
14:30	14:45	-	-	-	-	-	-	-	-	-	-	-	-	-
14:45	15:00	-	-	-	-	-	-	-	-	-	-	-	-	-
15:00	15:15	-	-	-	-	-	-	-	2	-	-	-	-	2
15:15	15:30	-	1	-	-	-	-	-	-	-	-	-	-	1
15:30	15:45	-	-	-	-	-	-	-	-	-	-	-	-	-
15:45	16:00	-	1	-	-	-	-	-	-	-	-	-	-	1
16:00	16:15	-	-	-	-	-	-	-	-	-	-	-	-	-
16:15	16:30	-	1	-	-	-	-	-	-	-	-	-	-	1
16:30	16:45	-	1	-	-	-	-	-	-	-	-	-	-	1
16:45	17:00	-	-	-	-	-	-	-	-	-	-	-	-	-
17:00	17:15	-	-	-	-	-	-	-	-	-	-	-	-	-
17:15	17:30	-	-	-	-	-	-	-	-	-	-	-	-	-
17:30	17:45	-	-	-	-	-	-	-	-	-	-	-	-	-
17:45	18:00	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL		-	7	-	-	-	-	-	8	-	-	-	-	15



R40 and Unknown Access Road (intersection 1) Classified Traffic Counts Data – Heavy Vehicles

LOCATION:	BUSHBUCKRIDGE	PROJECT TITLE:	BUSHBUCKRIDGE-TRAFFIC COUNT					
PROJECT NR:	UT2020-802	INTERSECTION:	R40 & UNKNOWN RD					
SURVEY DATE:	12 November 2020	KMZ FILE NR:	WARSLOO	DATA:	J.A.V		TYPE:	TE-12H-6-18-C
SURVEY TIMES:	06H00-18H00							

HEAVY VEHICLE SUMMARY														
TIME		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			VOLUME SUMMARY
START	END	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
06:00	06:15	-	2	-	-	-	-	-	2	-	-	-	-	4
06:15	06:30	-	5	-	-	-	-	-	1	-	-	-	-	6
06:30	06:45	-	8	-	-	-	1	-	4	-	-	-	-	13
06:45	07:00	-	3	-	-	-	-	-	3	-	-	-	-	6
07:00	07:15	-	6	-	-	-	-	-	2	-	-	-	-	8
07:15	07:30	-	6	-	-	-	-	1	4	-	-	-	-	11
07:30	07:45	-	10	1	-	-	-	-	5	-	-	-	-	16
07:45	08:00	-	3	1	-	-	-	1	2	-	-	-	-	7
08:00	08:15	-	6	-	1	-	-	-	2	-	-	-	-	9
08:15	08:30	-	9	-	1	-	1	1	1	-	-	-	-	13
08:30	08:45	-	9	-	-	-	1	1	4	-	-	-	-	15
08:45	09:00	-	7	1	-	-	-	1	4	-	-	-	-	13
09:00	09:15	-	7	1	1	-	-	1	6	-	-	-	-	16
09:15	09:30	-	3	-	1	-	1	1	6	-	-	-	-	12
09:30	09:45	-	13	1	-	-	1	1	9	-	-	-	-	25
09:45	10:00	-	6	-	-	-	1	1	5	-	-	-	-	13
10:00	10:15	-	7	1	2	-	3	1	4	-	-	-	-	18
10:15	10:30	-	14	2	-	-	-	2	7	-	-	-	-	25
10:30	10:45	-	6	-	-	-	-	-	3	-	-	-	-	9
10:45	11:00	-	6	-	2	-	-	1	6	-	-	-	-	15
11:00	11:15	-	6	2	-	-	1	2	4	-	-	-	-	15
11:15	11:30	-	6	-	-	-	3	-	4	-	-	-	-	13
11:30	11:45	-	8	1	-	-	-	-	1	-	-	-	-	10
11:45	12:00	-	12	2	2	-	1	-	7	-	-	-	-	24
12:00	12:15	-	9	2	-	-	3	2	2	-	-	-	-	18
12:15	12:30	-	9	-	-	-	-	-	5	-	-	-	-	14
12:30	12:45	-	9	2	2	-	2	-	5	-	-	-	-	20
12:45	13:00	-	10	2	-	-	3	2	10	-	-	-	-	27
13:00	13:15	-	5	1	-	-	1	-	8	-	-	-	-	15
13:15	13:30	-	7	1	2	-	-	-	9	-	-	-	-	19
13:30	13:45	-	5	2	-	-	2	2	2	-	-	-	-	13
13:45	14:00	-	7	-	-	-	-	1	5	-	-	-	-	13
14:00	14:15	-	8	1	-	-	3	1	4	-	-	-	-	17
14:15	14:30	-	10	-	1	-	2	-	4	-	-	-	-	17
14:30	14:45	-	5	3	-	-	1	2	8	-	-	-	-	19
14:45	15:00	-	-	2	1	-	-	-	5	-	-	-	-	8
15:00	15:15	-	8	-	2	-	-	-	3	-	-	-	-	13
15:15	15:30	-	6	2	-	-	2	2	5	-	-	-	-	17
15:30	15:45	-	5	-	-	-	2	-	8	-	-	-	-	15
15:45	16:00	-	4	-	1	-	1	-	10	-	-	-	-	16
16:00	16:15	-	3	-	1	-	2	1	7	-	-	-	-	14
16:15	16:30	-	6	-	-	-	-	-	5	-	-	-	-	11
16:30	16:45	-	4	-	1	-	1	1	11	-	-	-	-	18
16:45	17:00	-	2	-	-	-	-	-	7	-	-	-	-	9
17:00	17:15	-	3	-	-	-	-	-	7	-	-	-	-	10
17:15	17:30	-	8	-	1	-	-	-	8	-	-	-	-	17
17:30	17:45	-	6	-	-	-	-	-	14	-	-	-	-	20
17:45	18:00	-	3	1	-	-	1	-	8	-	-	-	-	13
TOTAL		-	310	32	22	-	40	29	256	-	-	-	-	689



APPENDIX B: SIDRA ANALYSIS OUTPUT FILES

MOVEMENT SUMMARY

Site: 1 [R40 and Unknown Access Road (Intersection 1) - AM Peak]

R40 and Unknown Access Road (Intersection 1)
 Site Category: (None)
 Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m				km/h
South: R40												
2	T1	504	7.9	0.286	0.1	LOS A	0.2	1.4	0.05	0.02	0.05	59.6
3	R2	15	7.9	0.286	8.1	LOS A	0.2	1.4	0.05	0.02	0.05	57.0
Approach		519	7.9	0.286	0.4	NA	0.2	1.4	0.05	0.02	0.05	59.6
East: Unknown Access Road												
4	L2	2	0.0	0.022	10.0	LOS B	0.1	0.5	0.64	0.95	0.64	48.3
6	R2	7	0.0	0.022	15.5	LOS C	0.1	0.5	0.64	0.95	0.64	47.8
Approach		9	0.0	0.022	14.3	LOS B	0.1	0.5	0.64	0.95	0.64	47.9
North: R40												
7	L2	2	7.9	0.230	5.7	LOS A	0.0	0.0	0.00	0.00	0.00	57.9
8	T1	424	7.9	0.230	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		426	7.9	0.230	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
All Vehicles		954	7.8	0.286	0.4	NA	0.2	1.4	0.03	0.02	0.03	59.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [R40 and Unknown Access Road (Intersection 1) - PM Peak]

R40 and Unknown Access Road (Intersection 1)
 Site Category: (None)
 Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m				km/h
South: R40												
2	T1	407	7.9	0.229	0.1	LOS A	0.1	0.9	0.04	0.02	0.04	59.7
3	R2	11	7.9	0.229	7.4	LOS A	0.1	0.9	0.04	0.02	0.04	57.0
Approach		418	7.9	0.229	0.3	NA	0.1	0.9	0.04	0.02	0.04	59.6
East: Unknown Access Road												
4	L2	7	0.0	0.051	9.7	LOS A	0.2	1.1	0.54	0.96	0.54	49.5
6	R2	20	0.0	0.051	13.2	LOS B	0.2	1.1	0.54	0.96	0.54	49.0
Approach		27	0.0	0.051	12.3	LOS B	0.2	1.1	0.54	0.96	0.54	49.1
North: R40												
7	L2	5	7.9	0.196	5.7	LOS A	0.0	0.0	0.00	0.01	0.00	57.9
8	T1	359	7.9	0.196	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.9
Approach		364	7.9	0.196	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.9
All Vehicles		809	7.6	0.229	0.6	NA	0.2	1.1	0.04	0.04	0.04	59.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [R40 and Unknown Access Road (Intersection 1) - AM Peak - Design]

R40 and Unknown Access Road (Intersection 1)

Site Category: (None)

Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: R40												
2	T1	548	7.9	0.402	1.2	LOS A	1.9	14.0	0.28	0.12	0.36	57.7
3	R2	107	7.9	0.402	9.1	LOS A	1.9	14.0	0.28	0.12	0.36	55.2
Approach		655	7.9	0.402	2.5	NA	1.9	14.0	0.28	0.12	0.36	57.2
East: Unknown Access Road												
4	L2	46	0.0	0.700	19.1	LOS C	3.6	25.5	0.87	1.22	1.69	40.7
6	R2	160	0.0	0.700	31.6	LOS D	3.6	25.5	0.87	1.22	1.69	40.4
Approach		206	0.0	0.700	28.8	LOS D	3.6	25.5	0.87	1.22	1.69	40.4
North: R40												
7	L2	14	7.9	0.257	5.7	LOS A	0.0	0.0	0.00	0.02	0.00	57.8
8	T1	461	7.9	0.257	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.8
Approach		475	7.9	0.257	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.7
All Vehicles		1336	6.7	0.700	5.7	NA	3.6	25.5	0.27	0.25	0.44	54.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [R40 and Unknown Access Road (Intersection 1) - PM Peak - Design]

R40 and Unknown Access Road (Intersection 1)

Site Category: (None)

Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: R40												
2	T1	443	7.9	0.361	1.3	LOS A	1.8	13.6	0.34	0.16	0.40	57.3
3	R2	127	7.9	0.361	8.6	LOS A	1.8	13.6	0.34	0.16	0.40	54.8
Approach		570	7.9	0.361	2.9	NA	1.8	13.6	0.34	0.16	0.40	56.7
East: Unknown Access Road												
4	L2	32	0.0	0.320	11.2	LOS B	1.2	8.4	0.71	1.03	0.87	46.6
6	R2	91	0.0	0.320	19.2	LOS C	1.2	8.4	0.71	1.03	0.87	46.2
Approach		123	0.0	0.320	17.1	LOS C	1.2	8.4	0.71	1.03	0.87	46.3
North: R40												
7	L2	58	7.9	0.244	5.7	LOS A	0.0	0.0	0.00	0.08	0.00	57.3
8	T1	391	7.9	0.244	0.0	LOS A	0.0	0.0	0.00	0.08	0.00	59.2
Approach		449	7.9	0.244	0.8	NA	0.0	0.0	0.00	0.08	0.00	59.0
All Vehicles		1142	7.0	0.361	3.6	NA	1.8	13.6	0.25	0.22	0.29	56.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [R40 and Unknown Access Road (Intersection 1) - AM Peak - Planning]

R40 and Unknown Access Road (Intersection 1)

Site Category: (None)

Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m				km/h
South: R40												
2	T1	706	7.9	0.548	2.5	LOS A	3.9	29.4	0.41	0.14	0.65	56.2
3	R2	138	7.9	0.548	12.2	LOS B	3.9	29.4	0.41	0.14	0.65	53.8
Approach		844	7.9	0.548	4.1	NA	3.9	29.4	0.41	0.14	0.65	55.8
East: Unknown Access Road												
4	L2	59	0.0	1.786	378.1	LOS F	43.0	301.3	1.00	3.02	9.10	7.9
6	R2	206	0.0	1.786	393.8	LOS F	43.0	301.3	1.00	3.02	9.10	7.9
Approach		265	0.0	1.786	390.3	LOS F	43.0	301.3	1.00	3.02	9.10	7.9
North: R40												
7	L2	18	7.9	0.330	5.7	LOS A	0.0	0.0	0.00	0.02	0.00	57.7
8	T1	594	7.9	0.330	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.8
Approach		612	7.9	0.330	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.7
All Vehicles		1721	6.7	1.786	62.2	NA	43.0	301.3	0.36	0.54	1.72	29.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [R40 and Unknown Access Road (Intersection 1) - PM Peak - Planning]

R40 and Unknown Access Road (Intersection 1)

Site Category: (None)

Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m				km/h
South: R40												
2	T1	570	7.9	0.495	2.6	LOS A	3.7	27.8	0.45	0.19	0.67	55.9
3	R2	163	7.9	0.495	11.1	LOS B	3.7	27.8	0.45	0.19	0.67	53.5
Approach		733	7.9	0.495	4.5	NA	3.7	27.8	0.45	0.19	0.67	55.3
East: Unknown Access Road												
4	L2	41	0.0	0.691	21.8	LOS C	3.2	22.5	0.89	1.20	1.64	38.2
6	R2	117	0.0	0.691	39.3	LOS E	3.2	22.5	0.89	1.20	1.64	37.9
Approach		158	0.0	0.691	34.7	LOS D	3.2	22.5	0.89	1.20	1.64	38.0
North: R40												
7	L2	74	7.9	0.313	5.7	LOS A	0.0	0.0	0.00	0.08	0.00	57.3
8	T1	503	7.9	0.313	0.0	LOS A	0.0	0.0	0.00	0.08	0.00	59.2
Approach		577	7.9	0.313	0.8	NA	0.0	0.0	0.00	0.08	0.00	59.0
All Vehicles		1468	7.0	0.691	6.3	NA	3.7	27.8	0.32	0.26	0.51	54.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

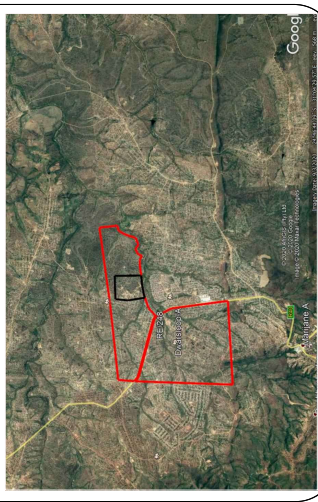
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**APPENDIX C: TOWNSHIP ESTABLISHMENT ON THE REMAINDER OF THE FARM
DWARSLOOP 248 KU SITE LAYOUT**

DEMARCATION LAYOUT PLAN REMAINDER OF THE FARM DWARSLOOP 248 KU




LOCALITY MAP

ZONING	LAND USES	NO. OF ERF	AREA (HA)	AREA (%)	NOTATION
RESIDENTIAL 1	DWELLING UNIT	517	32,07	59,16	Yellow
BUSINESS 1	RETAIL	5	0,65	1,20	Red
INSTITUTIONAL	CRECHE	3	0,27	0,50	Cyan
EDUCATIONAL	CHURCH	3	0,30	0,55	Pink
PUBLIC OPEN SPACE	PRIMARY SCHOOL	1	3,24	5,98	Blue
ROADS PURPOSES	PUBLIC OPEN SPACE	4	3,78	6,97	Green
TOTAL DEVELOPABLE AREA					100%

NOTES:
 1. Represents Proposed Township Boundary.
 2. Final survey of the proposed demarcation project.
 3. All measurements are in meters.
 4. Error of Closure: 1:100,000
 5. Error of Closure: 1:100,000
 6. Error of Closure: 1:100,000
 7. Error of Closure: 1:100,000
 8. Error of Closure: 1:100,000
 9. Error of Closure: 1:100,000
 10. Error of Closure: 1:100,000

CLIENT: **BUSHBUCKRIDGE LOCAL MUNICIPALITY**



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SCALE: 1:1500 (A0)
 SCALE: 1:3000 (A2)

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