TITLE: ***TRAFFIC IMPACT ASSESSMENT STUDY IN SUPPORT OF PROPOSED EXTENSION OF MATWABENG EXTESION 6 SITUATED ON PORTION OF THE FARM DE PUT 298, MATWABENG, FREE STATE PROVINCE***

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CONTENTS

List of Tables

APPENDICES

1. INTRODUCTION

1.1 Terms of Reference

MSDP Consulting (PTY) LTD appointed Lumka Civil Developments on the 9th April 2021 for the Compilation of Traffic Analysis Report for the proposed Extension of Matwabeng Ext 6 situated on portion of the Farm De Put 298, Matwabeng, Free State Province

1.2 Background

Lumka Civil Developments Projects was appointed to conduct a Traffic Impact Assessment (TIA) for the proposed development in accordance with the Manual of Traffic Impact Studies Technical Methods for Highways published by the South African Roads Agency Limited, TMH16 and TMH17.

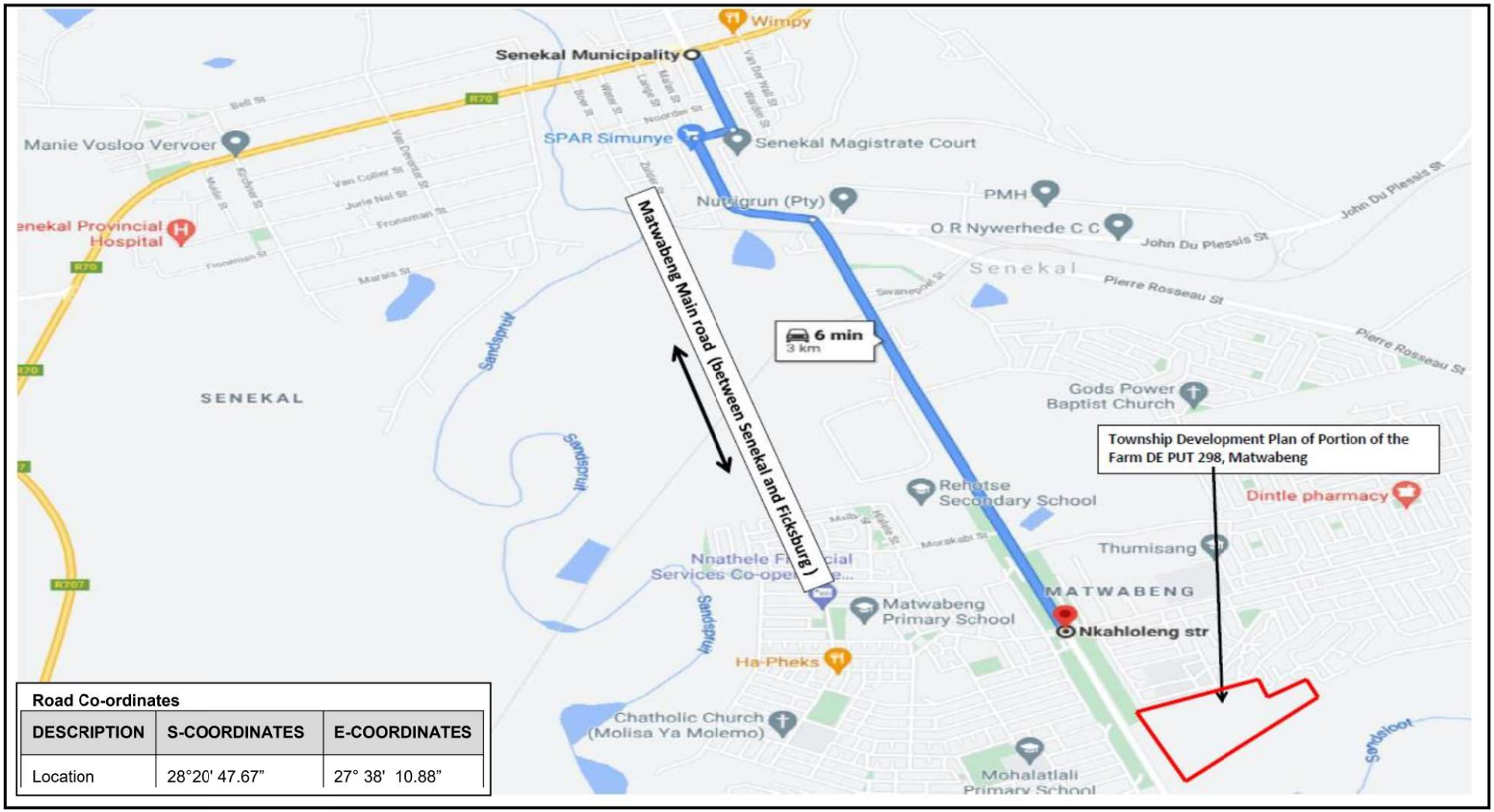
These manuals set the guidelines for carrying out a traffic impact investigations as a result of proposed developments. In terms of the guidelines, a fully-fledged traffic impact analysis is required to be carried out if more than 50 vehicle trips per hour will be generated by any development.

This should include conducting vehicle count surveys, conflicting turning movement analysis, and intersection performance analysis and road safety assessment if applicable. Measures such as level of service, delay, and volume or capacity ratio can be used to quantify the performance of an intersection or a roadway facility as a result of the proposed development. Further, the report assesses the impact of the township establishment on the Senekal/ Matwabeng Main Road

1.3 Site Location

The Matwabeng village is located approximately 3 km North East of Senekal using Matwabeng Main road toward Ficksburg, in the Setsoto Local Municipality within Thabo Mofutsanyane District of the Free State in South Africa.

Table 1: Locality Map



Road Co-ordinates

DESCRIPTION	S-COORDINATES	E-COORDINATES
Location	28°20' 47.67"	27° 38' 10.88"

Table 2: Site Map

1.4 Climate

In Senekal, the summers are long and warm; the winters are short, cold, and dry; and it is mostly clear year round. Over the course of the year, the temperature typically varies from 31°F to 82°F and is rarely below 25°F or above 90°F.

Based on the tourism score, the best time of year to visit Senekal for warm-weather activities is from mid-November to mid-April.

Temperature

The warm season lasts for 4.1 months, from November 10 to March 12, with an average daily high temperature above 78°C. The hottest day of the year is January 2, with an average high of 82°C and low of 59°C.

The cold season lasts for 2.4 months, from May 26 to August 7, with an average daily high temperature below 66°C. The coldest day of the year is July 5, with an average low of 31°C and high of 62°C.

RAIN	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
mm	97	83	77	53	21	10	8	15	25	63	79	87
Rainy days	13	11	11	8	3	2	2	2	4	10	11	12

TEMPERATURE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
°C	28.4	27.2	25.5	22.3	19.4	16.4	17	19.6	23.2	24.6	26.2	27.7

1.5 Demographics

Setsoto Local Municipality is part of Thabo Mofutsanyana District Municipality.

MDB code: FS191

Description: The Setsoto Local Municipality is a Category B municipality situated in the eastern Free State Province within the Thabo Mofutsanyana District. It is bordered by the Fezile Dabi District in the north, the Kingdom of Lesotho in the south, Dihlabeng in the east, and Lejweleputswa District in the west. It is one of the six municipalities that make up the district, accounting for 17% of its geographical area.

The municipality was established in terms of Section 14 of the Local Government: Municipal Structures Act 117 of 1998 and was published in Provincial Gazette No. 184 dated 28 September 2000.

Area: 5 431km²

Cities/Towns: Clocolan, Ficksburg, Marquard, **Senekal**

Main Economic Sectors: Finance, insurance, real estate and business (21.21%), manufacturing (17.62%), wholesale and retail trade (13.07%), agriculture, hunting, forestry and fishing (11.83%), government services (11.45%), community, social and personal services (11.31%), transport, storage and communication (6.79%), electricity, gas and water (3.5%), construction (2.17%)

Senekal is a town situated on the banks of the Sand River in the eastern part of the Free State province of South Africa. It was named after Commandant FP Senekal.

It is the second largest town in Setsoto Municipality after Ficksburg, the largest town and capital of Setsoto. Senekal lies on the N5 national road between Winburg on the west and Bethlehem to the east. It has two townships, Matwabeng and OR Tambo Section, the latter being the latest, largest and fastest growing.

Senekal combined with its townships have two police stations, correctional facilities, one hospital and three functioning clinics with the fourth still underway in OR Tambo Section. It has a radio station, Naledi Community radio station, which serves most parts of the Eastern Free State and small parts of Lesotho. It broadcasts on 103.9 MHz.

Farming around Senekal plays a vital role in the economy of the province and country at large. Produce includes maize, sunflower, wheat, milk and livestock.

The two most spoken official languages around Senekal are Afrikaans and Sesotho, the latter being the most widely spoken.

Places of interest in Senekal include Arizona Game Reserve, Biddulphs Mountain Resort and Willem Pretorius Game Reserve, though in Matjhabeng, falls under Setsoto Boundaries.

Setsoto Local Municipality is an administrative area in the Thabo Mofutsanyane District of the Free State in South Africa. The name is a Sesotho word meaning "beauty". Setsoto is headed by Ficksburg, followed by Senekal, Clocolan and Marquard. It is the getaway municipality to the Kingdom of Lesotho through Ficksburg.

2. INTRODUCTION SCOPE OF THE ASSESSMENT

2.1 General

The Traffic Impact Assessment is conducted according to TMH 16 and 17 and in terms of this manuals, Lumka Civil Developments is fully responsible for the Traffic Impact and Site Traffic Assessments. This responsibility, however, is restricted to the assessments described in TMH 16 and TMH17 and Lumka Civil Developments shall not be responsible for undertaking any assessments that would normally form part of the master planning of the Municipality (as described in TMH16).

The assessments that were undertaken by Lumka Civil Developments are as follows:

• Traffic Impact Assessment, requiring the assessment to assess the traffic impact of a proposed change in land-use rights.

• Site Traffic Assessment which entails the assessment of transportation facilities and site accesses proposed in a Site Development Plan or during Township Establishment.

2.2 Objectives of the Traffic Impact Assessment

Traffic Impact Assessments (TIA) is required to determine the traffic impact of a land development proposal and whether such development can be accommodated by the transportation system. Transportation and land development are inescapably related and Traffic Impact Assessments are required to ensure that the impact of land development can be accommodated by the transportation system.

An inadequate transportation system will lead to congestion and result in deterioration of traffic safety, as well as a diminished quality of life and a reduced economic viability of development.

The purpose of traffic assessments is to support sustainable development by protecting the overall integrity of the transportation system for the benefit of all users. Neither public nor private interests are served if transportation systems are needlessly degraded due to poor development planning and control. An efficient, reliable and safe transportation system will in fact unlock and enhance land development potential.

The specific objectives of a Traffic Impact Assessment for Proposed land use for Extension of Matwabeng Ext 6 situated on portion of the Farm De Put 298, Matwabeng, Free State Province:

- The local impact of a proposed change in land use on the road and transportation system surrounding the development.
- To evaluate the combined impacts not only of the proposed development, but also other likely nearby developments,
- Whether it is possible to accommodate the proposed change in land use, with or without the implementation of mitigation measures.
- The mitigation measures and improvements that may be required to accommodate the proposed change.

2.3 Legal Framework

Integrated Development Plan

The Constitution of the Republic of South Africa empowers a Municipality to govern, on its own initiative, the local government affairs of its community, subject to national and provincial legislation.

According to the constitution, the Municipality has executive authority in respect of, and has the right to administer, inter alia; the local government matters listed in Part B of Schedule 4 and Part B of Schedule 5, which includes municipal roads.

The Municipality also has the right to exercise any power concerning a matter reasonably necessary for, or incidental to, the effective performance of its functions. In terms of Section 152(1) of the Constitution, the objects of local government include, inter alia, to ensure provision of services to communities in a sustainable manner and to promote social and economic development.

Section 153 emphasises that in its budgeting and planning processes, the Municipality must give priority to the basic needs of the community and to promote social and economic development of the community. Municipal development planning in South Africa is regulated by the Municipal Systems Act (Act No 32 of 2000). This act requires the preparation and adoption of Integrated Development Plans.

2.4 Assessment Methodology

The assessment methodology entailed the baseline assessment, traffic demand estimation, traffic impact assessment and recommended mitigation measures and associated costs. The baseline assessment included the identification of the following:

• Background study: Extension of Matwabeng Ext 6 situated on portion of the Farm De Put 298, Matwabeng, Identification of affected external roads

- The investigation and assessment of the status quo of internal and external road networks
- Existing traffic volumes
- Capacity analysis of the existing affected access roads and intersections.

Traffic demand estimation entailed the adoption of a methodology for estimating traffic demand as a combination of “traffic growth” and "build-up" methods. The future traffic demand is estimated by applying a growth rate to existing traffic counts and by accumulating the trip generation of other expected developments, including those that have been approved but not yet fully implemented.

The potential impacts of the upgrade of the township establishment were identified and assessed as presented in Section 7 followed by conclusion and recommendations in mitigating the impact of traffic.

2.5 Approach

The approach followed in the execution of this study is described in this section

- The Critical Peak Hours Were Analysed - Design Period - (Average Daily Traffic Demand)
- The Study Period for the Development Base Year (existing situation) is 2021
- The manual traffic counts were also conducted by Lumka Civil Developments.
- A site visit was undertaken on 21st and 23rd April 2021 at the identified sites to view road transport access routes and access implications for the project, in relation to the background traffic and anticipated traffic for the development and formalisation for Extension of Matwabeng Ext 6 situated on portion of the Farm De Put 298, Matwabeng,, Free State Province
- Traffic counts were undertaken at identified intersections during the above site visits, for the AM and PM peak hours, and at the Senekal/Matwabeng Main road and Nkahloleng street (intersection) *(*S: 28° 20' 34,13" E: 27° 37' 58,87") during the AM peak hour

3. TRAFFIC ACCESSMENT METHODOLOGY

3.1 Site Accessibility

The subsection below elaborate on the following:

a) Existing roadway system
b) Traffic flows
c) Public transport
d) Traffic safety.

3.2 Manual Traffic counts

The purpose of the manual traffic counts is to determine the pattern of turning movements, as well as the splits between the following various modes of transport for specific time intervals:

a) Heavy vehicles
b) Light vehicles
c) Taxis
d) Buses.

Traffic counts were conducted on Wednesday 21st April 2021 and Friday 23rd April 2021 at the Senekal/Matwabeng Main road and Nkahloleng street (intersection) *(***S:** 28° 20' 34.13", **E:** 27° 37' 58.87"): **See Appendix B**

3.3 Manual Traffic counts

a) The proposed Extension Of Matwabeng Ext 6 Situated On Portion of the Farm DE PUT 298, Matwabeng, Free State Province *(***S:** 28° 20' 43.40", **E:** 27° 38' 08.64")

Detailed information about these manual traffic surveys includes the following:

a) 12-hour traffic counts per movement, per intersection
b) The existing distributing of vehicle per type of mode, per intersection.

The traffic counts are in chapter 5 of this report to make the various calculations.

3.4 Public Transport

The following information about public transport is relevant:

a) There are relatively a lot of public transport movements in the vicinity of the proposed development.
b) People from surrounding areas use public transport to their work place and school, there for the new filling station.

3.5 Traffic Safety

The road is not safe as there is no adequate road signage, most importantly because the area is used mostly by pedestrians and public transport. No accident statistics information was found at the Senekal/Matwabeng Main road.

4. AREA CONDITION ASSESSMENT

4.1 Site Photos

Photo 1. Senekal/Matwabeng Main road and Nkahloleng street (intersection)

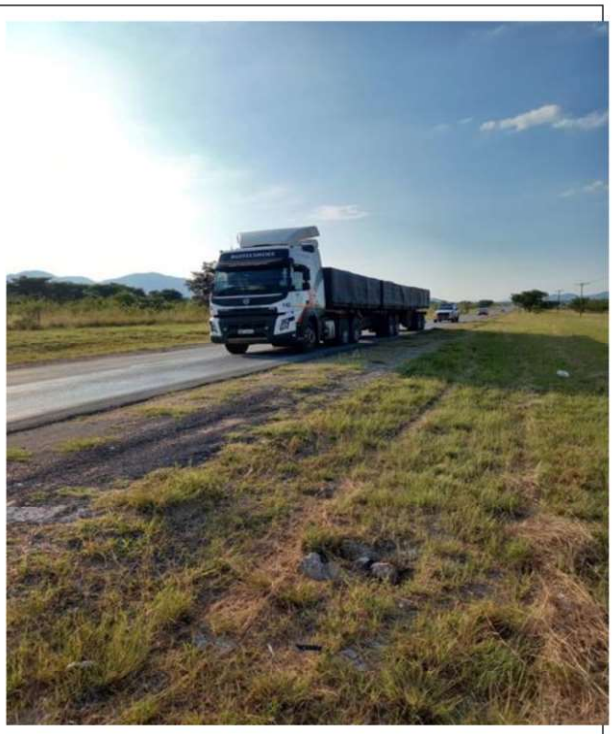


Photo 2. Very low volume of trucks passing the area, Senekal/Matwabeng Main road and Nkahloleng street (intersection)

Photo 3. Very high Volume of Car passing the area

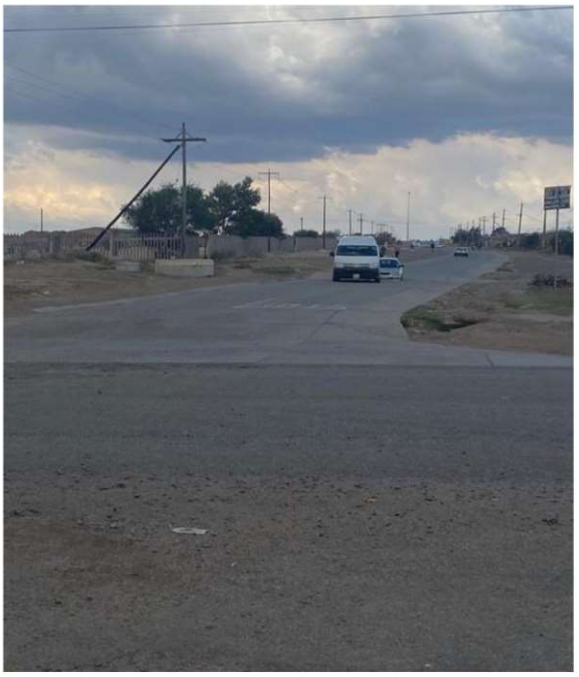
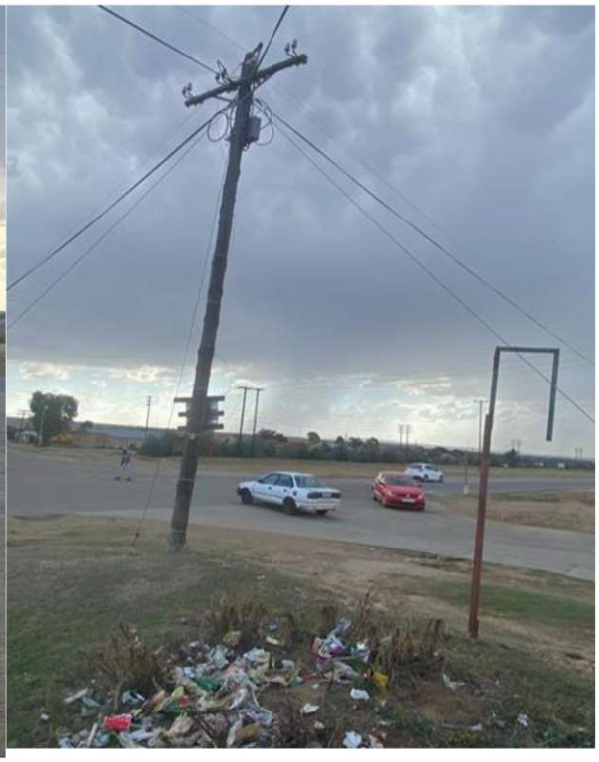


Photo 4.low Volume of Taxis passing the area

	
Photo 5. Very few trucks passing the area	**Photo 6.** trucks passing the area R81 and D4 Intersection
	
Photo 7. Most of the cars Passing the area are used as taxis	**Photo 8.** Very High Volume of Taxis and car passing the area

The existing Intersection to site is no safe considering the type and the volume of the traffic passing on this area and also serving as the main entrance to the Matwabeng and the surrounding area. The intersection in view of road geometry, it has adequate shoulder sight distance. The existing access lacks information, directional and warning signs in mainly areas. Pedestrian signs are no visible on the area.

Table 3: Proposed Development Area

Table 4: Development Land use Legend

LAND USE					
ZONING	**LAND USE DESCRIPTION**		**NO, OF STANDS**	**AREA (HA)**	**%**
RESIDENTIAL	RESIDENTIAL		345	10.2	70.3
STREET	STREET		*	4.3	29.7
TOTAL			345	14.5	100

5. TRAFFIC COUNT ANALYSIS AND PROJECTIONS

5.1 Current Transport Usage

During Site visit the following was observed:

- By far the largest use of transport is private vehicles, Taxies linked to the residential areas around the proposed site and also into the village.
- Very Few **Buses and Motorcycles** were seen for entire duration of the traffic survey in this area.
- This could change with the Finalisation and development of the proposed land use for proposed Development Extension of Matwabeng Ext 6 Situated on Portion of the Farm DE PUT 298, Matwabeng, and upgrading of the alternative access road in this report.
- **Truck traffic** is particularly significant and travels mainly from Senekal towards Ficksburg and other places as the road serves as a corridor for **Freight truck** passing the area since the Setsoto Local Municipality's economy is largely based on agriculture, agribusiness, wholesale and retail.

5.2 Traffic Counts

The Following method was applied in the analysis of this project.

a) A two days traffic count (Wednesday & Friday) survey was conducted by Lumka Civil Developments Technicians.

5.3 Vehicle Classification

The average vehicle classification during the survey period was 89% light vehicles, 3% taxi's, 1% buses, and 7% heavy vehicles.

The proposed Industrial Development Development Extension of Matwabeng Ext 6 Situated on Portion of the Farm DE PUT 298, Matwabeng will mostly include light vehicles and Heavy vehicles.

5.4 Traffic Growth within the Study Area

It is expected that the increase in traffic should be significant during the early morning (6:00-08:00) and early evening (17:00-18:00) and the traffic count will therefore done over a 12 hr period.

6. ROADS AND TRAFFIC VOLUMES IN THE SURROUNDING AREA

6.1 Description of Road Infrastructure

a) Road Senekal/Matwabeng Main road and Nkahloleng street (intersection): *(*28° 20' 34, 13" S: 27° 37' 58, 87" E)

Detailed information about these manual traffic surveys includes the following:

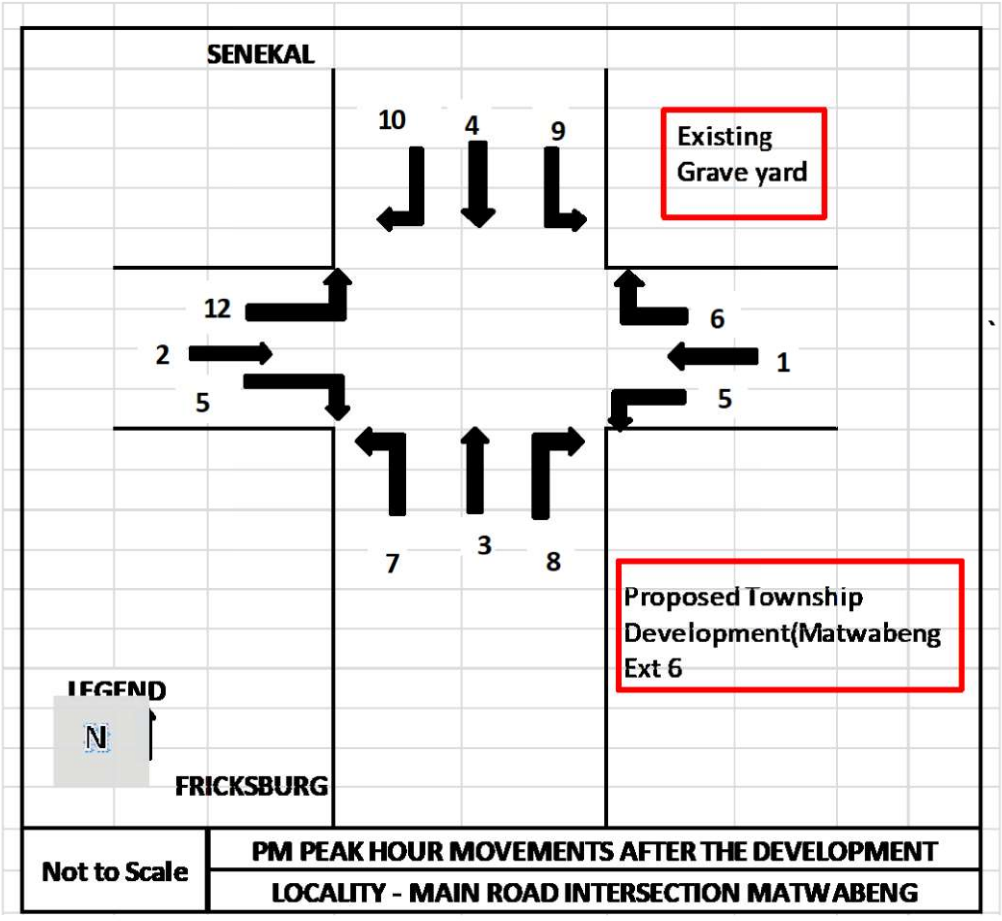
a) 12-hour traffic counts per movement, per intersection.

b) The existing distributing of vehicle per type of mode, per intersection.

The major road in the vicinity of the study area is the Senekal/Matwabeng Main road and Nkahloleng Street (intersection): This section of the road carries high traffic volumes, but has a high percentage of light vehicles (Over 89%)

Heavy vehicles counted but generally some 7% based on annual traffic count data). The heavy vehicles comprise mainly freight trucks.

Table 5: Turning Movement



6.2 Public Transport

The following information about public transport is relevant:

c) There are relatively a lot of public transport (Cars used are public transport/ taxis) movements in the vicinity of the proposed development.

d) People from surrounding villages use public transport to their work place and school therefore it is important to make the access formal and safe.

6.3 Road Accident

No formal accident statistics information was found for the Senekal/Matwabeng Main road.

7. TRAFFIC DEMAND ESTIMATION

7.1 Traffic Demand Estimation

7.1.1 General Methodology for Estimating Traffic

General Methodology for estimating traffic demand described in this appendix is a combination of “traffic growth” and "build-up" methods. The future traffic demand is estimated by applying a growth rate to existing traffic counts and by accumulating the trip generation of the expected township developments.

7.1.2 Traffic Growth Rate

Traffic growth appropriate growth rates must be used for the estimation of future background traffic. Growth rates are only applied to traffic counts and not to the trip generation rates of developments since such rates are determined for fully occupied developments. Typical growth rates are provided in the Trip Data Manual. For the Matwabeng Ext 6 township establishment, a moderate annual growth rate of 3% would be used.

Trip Generation Trip generation fundamentally consists of four types of trips:

(a) Primary trips, - new trips on the total road network. This is in contrast with the other types of trips that are already on the road network, although they could be new on segments of the road network.

(b) Pass-by trips, - these are trips attracted from roads directly adjacent to a development and from which direct access is provided to the development. These trips are made as intermediate stops on the on the way from an origin to a primary destination without route diversion. Pass-by trips are not new trips on the road network, but are trips turning in and out of accesses to the development. The trips should therefore not be deducted from the trip generation of the development – it is only the trip distribution that is affected.

(c) Diverted trips – are the attracted trips from roads in the vicinity of the generator but which require a diversion to another road to gain access to the development. Diverted trips add traffic to streets adjacent to a site, but may not add traffic to other roads in the road network. The trips are similar to pass-by trips, except that they have to deviate to other roads to obtain access to the site. Diverted trips well tend to return to their original route and continue to their original destinations after visiting the development.

(d) Transferred trips, are those that are already present on the road network and which are visiting similar developments near to the proposed development and which has the potential of transferring or switching their destination to the proposed development. These trips are different from pass-by and diverted trips in that trips are wholly transferred from one development to another The trip generation and other traffic characteristics of a development depend not only on the type of development but also on its size and for this project, the Single Dwelling Units would be used as provided in the township layout plan designed.

8. TRAFFIC VOLUME DATA

8.1 Annual Average Daily Traffic (AADT) From Department of Roads and Transport

Lumka Civil Developments requested traffic count information from Department of Roads and Transport .The information obtained was to be used a guideline and also verification purposes. No Information was found to date.

8.2 Annual Average Daily Traffic (AADT) 2021

Traffic counts were used to determine the traffic demand pass the site. Traffic growth allows for the expected increase in traffic due to undeveloped land in the area. A two day traffic count (Wednesday & Friday) survey was conducted by Lumka Civil Developments will be conducted by Lumka Civil Development Technicians. Detail of the traffic count is provided in **Appendix A**

Table 6: Cumulative E80s/DIR

CUMULATIVE E80/DIR													
										CUMULATIVE E80/DIR @ various yrs			
SECTION	DIR	ADT	LV	MB-T	MB	B	HV	ADE	Growth (%)	5	10	15	20
Matwabeng Main road (between Senekal and Ficksburg) (28° 20' 34,13" S : 27° 37' 58,87" E)	Incoming	1152	1012	48	3	7	83	220	4	453 134	1 004 441	1 675 189	2 491 258
									6	480 673	1 123 922	1 984 734	3 136 695
Matwabeng Main road (between Senekal and Ficksburg) (28° 20' 34,13" S : 27° 37' 58,87" E)	Outgoing	749	675	13	2	4	55	147	4	302 089	669 627	1 116 793	1 660 839
									6	320 449	749 281	1 323 156	2 091 130
Total Average		**951**	**844**	**30**	**2**	**5**	**69**	**184**		**377612**	**837034**	**1395991**	**2076048**

9. TRAFFIC ANALYSIS

9.1 Traffic Analysis Using Actual Site 2021 Information

Cumulative E80s over Design Period.

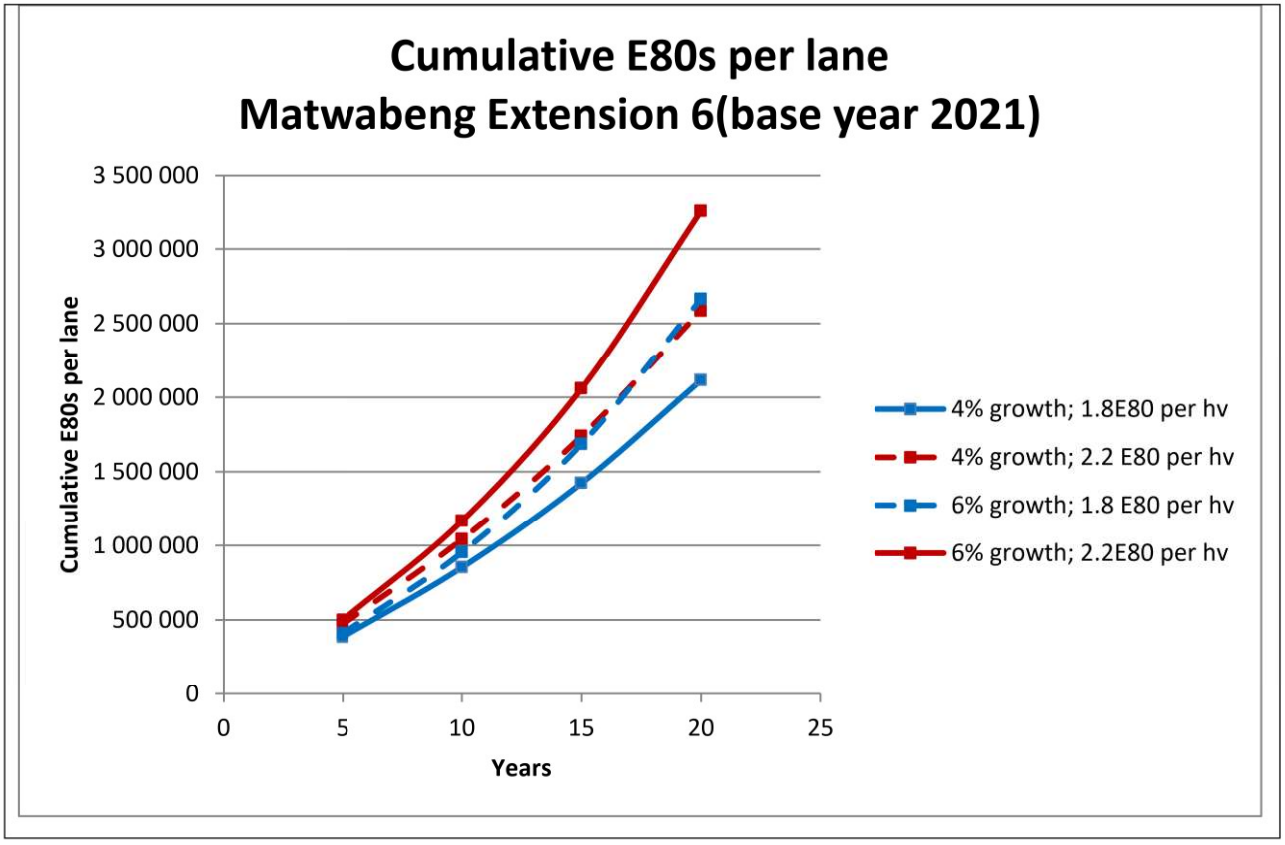
CUMULATIVE E80/DIR												
									CUMULATIVE E80/DIR @ various yrs			
SECTION	DIR	ADT	LV	MB-T	B	HV	ADE	Growth (%)	5	10	15	20
Matwabeng Main road (between Senekal and Ficksburg)(28° 20' 34,13" S : 27° 37' 58,87" E)	Incoming	2190	1923	81	30	152	435	4	895 301	1 984 571	3 309 835	4 922 222
								6	949 713	2 220 642	3 921 433	6 197 475
Matwabeng Main road (between Senekal and Ficksburg) (28° 20' 34,13" S : 27° 37' 58,87" E)	Outgoing	1416	1282	22	9	100	268	4	551 314	1 222 071	2 038 150	3 031 035
								6	584 820	1 367 440	2 414 763	3 816 318
Total Average		**1803**	**1602**	**51**	**19**	**126**	**352**		**723307,31**	**1603321,25**	**2673992,77**	**3976628,37**

Table 5: Cumulative E80s/DIR

Traffic count data for the year 2021 was obtained from Manual traffic counting done by Lumka Civil Developments on the Matwabeng Main Road Intersection: (28° 20' 34,13" S : 27°37' 58,87" E) next to the proposed development in Matwabeng village. The information indicates that the Annual Average Daily Traffic (AADT) for this section in 2021 was 1803 vehicles per day. The Annual Average Daily Truck Traffic (AADTT) was 196 vehicles per day which is about 7% of AADT.

The traffic count data was projected to the initial design year, 2021, using a 4 % annual growth rate. Thereafter, cumulative E80s were determined over a 20 years design period. In order to determine the sensitivity of the cumulative E80s over the design period to design inputs, growth rates of 4 % and 10 % as well as E80s per heavy vehicle of 1.8 and 2.2 were used and results are tabulated in Table 1 below. The analysis indicates that this road section will have cumulative E80s per lane over a 20 year design period ranging from 0.47 to 2.3 million.

Table 7: Cumulative E80s per Lane (base year 2021)



9.2 Average Annual Daily Traffic Demand (AADT)

12-Hour Weekday Traffic Demand

The current traffic demand is shown in Table 1 as about 18,000 vehicles during a 12-hour period on a weekday (Friday).

Average Weekday Traffic Demand (AWDT)

A conversion factor of 1.25 is appropriate to convert 12-hour Friday traffic counts to AWDT traffic counts - based on typical traffic patterns in urban areas along major roads.

Average Annual Daily Traffic Demand (AADT)

Since the expected monthly or annual fuel sales is based on factored daily trips, it is common practice to use a number of average trading days per month which is less than the calendar average of 30.5 days. In this instance – based on the prevailing traffic characteristics - it is recommended to use 25 average trip days per month.

Table 8: Proposed Alternative Access Road

DESCRIPTION	S-COORDINATES	E-COORDINATES
Proposed Alternative Access 1	28° 20' 47.63"	27° 38' 05.11"

The establishment of the township would affect the following major roads:

- Proposed Alternative Access 1 (S 28° 20' 47.63" :E 27° 38' 05.11")

The affected access road is Matwabeng Main Road:

The township establishment is expected to generate 3606 vehicles per day in both directions combined and characterised by the following:

• The week peak AM and PM generated would be 7212 combined in and out. A directional split assumed is 85:15 and 15:85 in the determination of the worst-case scenario to evaluate intersections capacity and propose mitigation measures

• From the site investigations, the morning peak hour at the intersections are 7:00 to 8:00 except for Matwabeng Main road (between Senekal and Ficksburg) road which occurs between 6:00 to 7:00 am. The afternoon peak hour observed was between 5:00 to 6:00pm.

10. PROPOSED ACCESS DESIGN

10.1 Pavement Design

The pavement design was done according to Draft TRH4:1996 "Structural Design of Flexible Pavements for Interurban and Rural Roads".

The following inputs were considered in the design:

- A Structural Design period of 20 years
- ES 10 (3 to 10 million cumulative 80 kN axles per lane)
- Road Category B
- Moderate climatic region.

A structural design period of 20 years was considered most appropriate as this is expected to provide a more optimal life cycle strategy when considering initial construction costs and long term maintenance costs.

Design subgrade CBR:

No geotechnical test was done the existing road to expose the layers in the existing gravel shoulder. A general assumption was used base on the existing geological information of the area. However, descriptions of the assumed profile indicator that the material within the depth of the subbase and selected layers is silty clayey gravel. It is expected that these materials will be of at least G7 quality and will therefore be suitable for use as selected layers.

Table 9: Proposed Pavement Design

Surfacing	45 mm	Continuously graded asphalt (medium) with rolled in chipping.
Base	150 mm	G1 Crushed stone base compacted to 88% Apparent Relative Density, imported material
Upper-Subbase	150 mm	Stabilised natural gravel (C4), Min. UCS of 0.75 MPa at 100% Mod. AASHTO, min. ITS of 200 kPa at 100 Mod. AASHTO compacted to 97% Mod. AASHTO, Imported material
Lower-Subbase	150 mm	Stabilised natural gravel (C4), Min. UCS of 0.75 MPa at 100% Mod. AASHTO, min. ITS of 200 kPa at 100 Mod. AASHTO compacted to 96% Mod. AASHTO, Imported material.
Upper selected	150 mm	Natural Gravel (G7) Compacted to 95% Mod. AASHTO density, min. CBR of 15% at density specified for the layer, Max. PI of 12 or 3GM +10, Imported Material.
Lower selected	150 mm	Natural Gravel (G9) Compacted to 93% Mod. AASHTO density, min. CBR of 7% at density specified for the layer, Max. PI of 12 or 3GM +10, Imported or In-situ material.
Roadbed preparation / fill	-	Roadbed or fill (G10), Compacted to 93% Mod. AASHTO density, min. CBR of 3% at density specified for the layer, Max. PI of 12 or 3GM +10, In-situ or Imported material.

10.2 Junction

The Proposed Access to be upgraded as per Department of Roads and Transport and Setsoto Local Municipality specification.

11. ROAD SAFETY AND ROAD SIGNS

11.1 Road safety and Road Signs

The area lacks information, directional and warning signs in mainly areas. A special budget is required to upgrade and install signage in most of the area.

From a traffic safety point of view it would be advisable to provide the following:

a) It is extremely important to provide the necessary signboards to ensure that the proposed new facilities would function optimally.

12. CONCLUSIONS AND RECOMMENDATIONS

Conclusion The proposed township establishment will adversely impact the level of service of existing intersections owned by the Setsoto Local Municipality and Three additional intersections under. Recommended Access Road be upgraded and signal timing are provided in the recommendations below together with the expected Level of Service at an annual growth rate of 2%.

Recommendations on the intersection will require an upgrade from an existing give way yield control to a signalised control in order to provide enough capacity for the proposed trips generated by the township. The proposed layout is shown in Table: 8. It is expected that the PM Level of Service on Identified locations intersection would be based on average delay on each lane for a signal timing in.

It is recommended that the application be approved as per recommendation of this report and the geometrical specification of the Setsoto Local Municipality and the Department of Roads and Transport, subjected to the provision of the required road reserve as indicated on the attachment.

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APPENDIX A
TRAFFIC COUNTS

TRAFFIC COUNTING SHEET

Project Name:	Proposed Extension of Matwabeng Extension 6 situated on Portion of	**From Road:**	Senekal
		To Road:	Matwabeng Village
Street Name:	Matwabeng Main Road	**Section**	Senekal/Matwabeng Main road and Nkahloleng street (intersection)
		Surface Type:	Paved
Count Date:	21/04/2021	**District Muni:**	Thabo Mofutsanyana District Municipality.
		Local Muni:	Setsoto Local Municipality
Hours Counted:	12 Hours	**Village Name:**	Matwabeng Village
		Peak Hr Ratio:	
Counted By:	Permit Makgaba	**Night Factor:**	N/A
Count Type:	Hand	**Stratum:**	

CO-ORDINATES

S:	28° 20' 34,13" S
E:	27° 37' 58,87" E

COUNT HOUR		LIGHT	HEAVY	VHEAVY	TAXI	BUSES	TOTAL
06h00-07h00	6	305	16	3	15	2	341
07h00-08h00	7	509	15	3	9	5	541
08h00-09h00	8	345	30	1	9	2	387
09h00-10h00	9	296	12	0	10	2	320
10h00-11h00	10	248	14	4	18	3	287
11h00-12h00	11	157	16	2	4	4	183
12h00-13h00	12	159	18	3	6	2	188
13h00-14h00	13	123	11	3	4	4	145
14h00-15h00	14	243	12	3	15	3	276
15h00-16h00	15	246	13	8	13	1	281
16h00-17h00	16	232	16	7	4	3	262
17h00-18h00	17	172	11	3	3	1	190
GRAND TOTAL		**3035**	**184**	**40**	**110**	**32**	**3401**

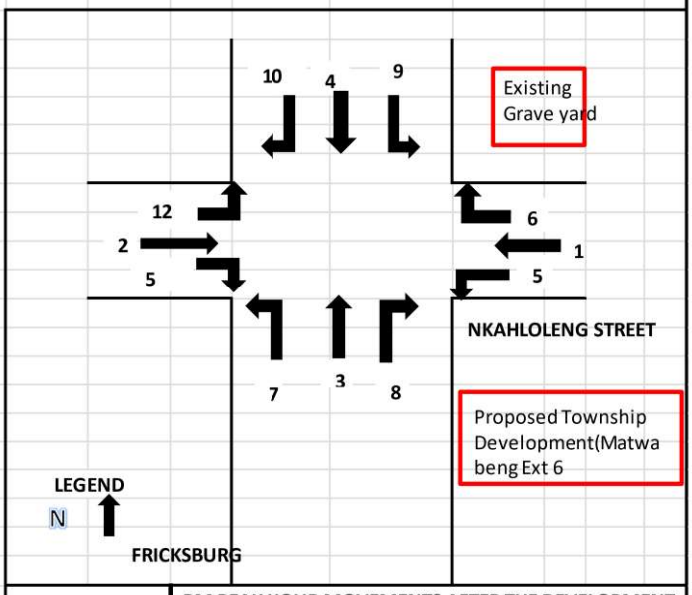
Calculation Information:

1. Night Factor

Don't calculate if 12 hour counts or
if Total volume for the day = 0

2. Peak hour Ratio

Highest Hourly volumes 06h00-10h00 /
Lowest hourly volume between hour of highest hourly volume and 15h00



Not to Scale	PM PEAK HOUR MOVEMENTS AFTER THE DEVELOPMENT
	LOCALITY - MAIN ROAD INTERSECTION MATWABENG

Sketch Box: (Please sketch the intersection)

TRAFFIC COUNTING SHEET

Project Name:	Extension 6 situated on Portion of Farm DE PUT 298, Matwabeng, Free	**From Road:**	Senekal		
		To Road:	Matwabeng Village		
Street Name:	Matwabeng Main Road	**Section**	Senekal/Matwabeng Main road and Nkahloleng street (intersection)		
		Surface Type:	Paved		
Count Date:	23/04/2021	**District Muni:**	Thabo Mofutsanyana District Municipality.		
		Local Muni:	Setsoto Local Municipality		
Hours Counted:	12 Hours	**Village Name:**	Matwabeng Village	**CO-ORDINATES**	
		Peak Hr Ratio:		**S:**	28° 20' 34,13" S
Counted By:	Permit Makgaba			**E:**	27° 37' 58,87" E
		Night Factor:	N/A		
Count Type:	Hand	**Stratum:**			

COUNT HOUR		LIGHT	HEAVY	VHEAVY	TAXI	BUSES	TOTAL
06h00-07h00	6	312	19	3	18	2	354
07h00-08h00	7	516	18	7	11	2	554
08h00-09h00	8	445	34	1	13	2	495
09h00-10h00	9	319	11	0	12	2	344
10h00-11h00	10	248	16	2	15	3	284
11h00-12h00	11	248	21	1	12	5	287
12h00-13h00	12	170	22	3	14	3	212
13h00-14h00	13	130	19	3	12	5	169
14h00-15h00	14	246	19	3	13	3	284
15h00-16h00	15	265	17	10	19	1	312
16h00-17h00	16	263	21	7	13	3	307
17h00-18h00	17	212	14	5	8	0	239
GRAND TOTAL		**3374**	**231**	**45**	**160**	**31**	**3841**

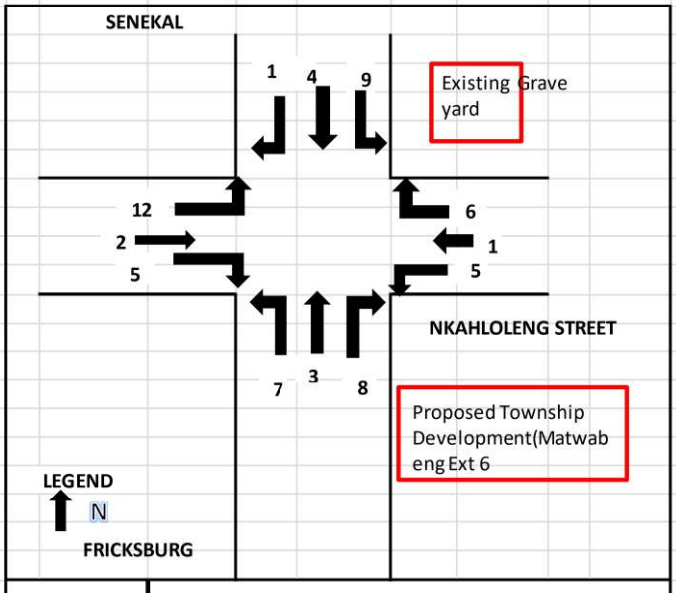
Calculation Information:

1. Night Factor

Don't calculate if 12 hour counts or
if Total volume for the day = 0

2. Peak hour Ratio

Highest Hourly volumes 06h00-10h00 /
Lowest hourly volume between hour of highest hourly volume and 15h00



Not to Scale	PM PEAK HOUR MOVEMENTS AFTER THE DEVELOPMENT
	LOCALITY - MAIN ROAD INTERSECTION MATWABENG

Sketch Box: (Please sketch the intersection)

APPENDIX B
TRAFFIC ANALYSIS CALCULATIONS

SUMMARY OF THE TRAFFIC COUNT(12 HRS COUNT)Matwabeng Main road (between Senekal and Ficksburg) 28° 20' 34,13" S : 27° 37' 58,87" E

Location : Matwabeng Main road (between Senekal and Ficksburg) 28° 20' 34,13" S : 27° 37' 58,87" E
Date: 21/04/2021

INCOMING →					OUTGOING ←					
		BUSES					BUSES			
PC + LDV	C-T	MB	B	HV	PC + LDV	C-T	MB	B	HV	DAY 1
1821	66	5,76	46,2	137,4	1214	17,6	3,84	8,96	89,6	

AVERAGE

INCOMING →					OUTGOING ←					
		BUSES					BUSES			
PC + LDV	C-T	MB	B	HV	PC + LDV	C-T	MB	B	HV	
910,5	33	2,88	23,1	68,7	607	8,8	1,92	4,48	44,8	

PC + LDV:	Passenger Cars & Light Delivery Vehicles
C-T:	Combi-Taxis
MB:	Midi-Buses
B:	Buses
HV:	Heavy Vehicles

SUMMARY OF THE TRAFFIC COUNT(12 HRS COUNT) Matwabeng Main road (between Senekal and Ficksburg) 28° 20' 34,13" S : 27° 37' 58,87" E

Location : Matwabeng Main road (between Senekal and Ficksburg) 28° 20' 34,13" S : 27° 37' 58,87" E

Date: 21/04/2021

CUMULATIVE E80/DIR

SECTION	DIR	ADT	LV	MB-T	MB	B	HV	ADE	Growth (%)	CUMULATIVE E80/DIR @ various yrs			
										5	10	15	20
Matwabeng Main road (between Senekal and Ficksburg) 28° 20' 34,13" S : 27° 37' 58,87" E	Incoming	1038	911	33	3	23	69	215	4	442 167	980 131	1 634 646	2 430 964
									6	469 040	1 096 720	1 936 699	3 060 780
Matwabeng Main road (between Senekal and Ficksburg) 28° 20' 34,13" S : 27° 37' 58,87" E	Outgoing	667	607	9	2	4	45	121	4	249 224	552 444	921 357	1 370 196
									6	264 371	618 159	1 091 607	1 725 188
Total Average		**853**	**759**	**21**	**2**	**14**	**57**	**168**		**345696**	**766287**	**1278002**	**1900580**

SUMMARY OF THE TRAFFIC COUNT(12 HRS COUNT) Matwabeng Main road (between Senekal and Ficksburg) 28° 20' 34,13" S : 27° 37' 58,87" E

Location :Matwabeng Main road (between Senekal and Ficksburg) 28° 20' 34,13" S : 27° 37' 58,87" E
Date: 23/04/2021

INCOMING →					← OUTGOING					
		BUSES					BUSES			
PC + LDV	C-T	MB	B	HV	PC + LDV	C-T	MB	B	HV	
2024,4	96	5,58	13,02	165,6	1349,6	25,6	3,72	8,68	110,4	DAY 2

AVERAGE

INCOMING →					← OUTGOING				
		BUSES					BUSES		
PC + LDV	C-T	MB	B	HV	PC + LDV	C-T	MB	B	HV
1012,2	48	2,79	6,51	82,8	674,8	12,8	1,86	4,34	55,2

PC + LDV:	Passenger Cars & Light Delivery Vehicles
C-T:	Combi-Taxis
MB:	Midi-Buses
B:	Buses
HV:	Heavy Vehicles

SUMMARY OF THE TRAFFIC COUNT(12 HRS COUNT)Matwabeng Main road (between Senekal and Ficksburg) 28° 20' 34,13" S : 27° 37' 58,87" E

Location : Matwabeng Main road (between Senekal and Ficksburg) 28° 20' 34,13" S : 27° 37' 58,87" E

Date: 23/04/2021

CUMULATIVE E80/DIR

SECTION	DIR	ADT	LV	MB-T	MB	B	HV	ADE	Growth (%)	CUMULATIVE E80/DIR @ various yrs			
										5	10	15	20
Matwabeng Main road (between Senekal and Ficksburg) 28° 20' 34,13" S : 27° 37' 58,87" E	Incoming	1152	1012	48	3	7	83	220	4	453 134	1 004 441	1 675 189	2 491 258
									6	480 673	1 123 922	1 984 734	3 136 695
Matwabeng Main road (between Senekal and Ficksburg) 28° 20' 34,13" S : 27° 37' 58,87" E	Outgoing	749	675	13	2	4	55	147	4	302 089	669 627	1 116 793	1 660 839
									6	320 449	749 281	1 323 156	2 091 130
Total Average		**951**	**844**	**30**	**2**	**5**	**69**	**184**		**377612**	**837034**	**1395991**	**2076048**

SUMMARY OF THE TRAFFIC COUNT(12 HRS COUNT)Matwabeng Main road (between Senekal and Ficksburg) 28° 20' 34,13" S : 27° 37' 58,87" E

Location :Matwabeng Main road (between Senekal and Ficksburg) 28° 20' 34,13" S : 27° 37' 58,87" E
Date :21/04/2021 and 23/04/2021

INCOMING →					← OUTGOING					
		BUSES					BUSES			
PC + LDV	C-T	MB	B	HV	PC + LDV	C-T	MB	B	HV	
3845,4	162	11,34	59,22	303	2563,6	43,2	7,56	17,64	200	DAY 1 & 2

AVERAGE

INCOMING →					← OUTGOING				
		BUSES					BUSES		
PC + LDV	C-T	MB	B	HV	PC + LDV	C-T	MB	B	HV
1922,7	81	5,67	29,61	151,5	1281,8	21,6	3,78	8,82	100

PC + LDV:	Passenger Cars & Light Delivery Vehicles
C-T:	Combi-Taxis
MB:	Midi-Buses
B:	Buses
HV:	Heavy Vehicles

SUMMARY OF THE TRAFFIC COUNT(12 HRS COUNT) Matwabeng Main road (between Senekal and Ficksburg) 28° 20' 34,13" S : 27° 37' 58,87" E

Location :Matwabeng Main road (between Senekal and Ficksburg) 28° 20' 34,13" S : 27° 37' 58,87" E

Date :21/04/2021 and 23/04/2021

CUMULATIVE E80/DIR

SECTION	DIR	ADT	LV	MB-T	B	HV	ADE	Growth (%)	CUMULATIVE E80/DIR @ various yrs			
									5	10	15	20
Matwabeng Main road (between Senekal and Ficksburg) 28° 20' 34,13" S : 27° 37' 58,87" E	Incoming	2190	1923	81	30	152	435	4	895 301	1 984 571	3 309 835	4 922 222
								6	949 713	2 220 642	3 921 433	6 197 475
Matwabeng Main road (between Senekal and Ficksburg) 28° 20' 34,13" S : 27° 37' 58,87" E	Outgoing	1416	1282	22	9	100	268	4	551 314	1 222 071	2 038 150	3 031 035
								6	584 820	1 367 440	2 414 763	3 816 318
Total Average		**1803**	**1602**	**51**	**19**	**126**	**352**		**723307,31**	**1603321,25**	**2673992,77**	**3976628,37**

Light Vehicles	89%
Taxis	3%
Buses	1%
Heavy	7%