Proposed Township Development
Soshanguve Extension 7 & 8

Traffic Impact Assessment

Report No T2018/006
February 2018

TRAFFTRANS (PTY) LTD
TRAFFIC-LAB

Prepared by:
Trafftrans (Pty) Ltd
181 Zambesi Drive,
Sinoville, **PRETORIA**
☎ 012 543 1379 fax 086 576 8611
F H van Heerden

Instratin Properties (Pty) Ltd **Contact person: Tebogo Modishane**

TRAFFTRANS (PTY) LTD
TRAFFIC-LAB

Verkeersopnames en Analise | **80/03663/07** | **Traffic Surveys and Analysis**

Directoire/Directors
F H VAN HEERDEN (Besturende/Managing)

Pretoria
Zambesirylaan 181 Zambesi Drive
SINOVILLE 0182

Posbus 13900 / PO Box 13900
SINOVILLE 0129
012 543 1379
Fax 086 576 8611
E-mail traffic@trafftrans.co.za

U verw/Your ref APS .....

Ons verw/Our ref Trafftrans T2018/006

14 February 2018

The Director
Infrastructure Planning & Management
Tshwane Metropolitan Municipality
PO Box 1409
PRETORIA
0001

Dear Sirs

PROPOSED TOWNSHIP DEVELOPMENT, SOSHANGUVE EXTENSION 7 & 8:
TRAFFIC IMPACT ASSESSMENT

We are pleased to submit our report for the traffic impact assessment undertaken for the proposed township establishment on the above mentioned property, located in the geographical confines of the Tshwane Metropolitan Municipality.

It is hereby certified that this Traffic Impact Assessment for Soshanguve Extension 7 & 8 has been prepared according to requirements of the *South African Impact and Site Traffic Assessment Manual, TMH 16, Vol 1 & 2.*

We trust this report meets with your requirements, however, should you require any further information, please do not hesitate to contact us.

Yours faithfully

FH VAN HEERDEN Pr Eng (860575)
M Eng Transport
TRAFFTRANS (PTY) LTD

PROPOSED TOWNSHIP DEVELOPMENT
SOSHANGUVE EXTENSION 7 & 8

Traffic Impact Assessment

REPORT NUMBER T2018/006

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1. INTRODUCTION

1.1. Appointment / Terms of Reference

The following report relates to the appointment of Trafftrans (Pty) Ltd by Instratin Properties (Pty) Ltd, to undertake an traffic investigation into the impact of the proposed township development of Soshanguve Extension 7 & 8, on the road network in the immediate vicinity of the property. The location of the site is shown in **Figure 1**.

1.2. Background and Objectives

Background

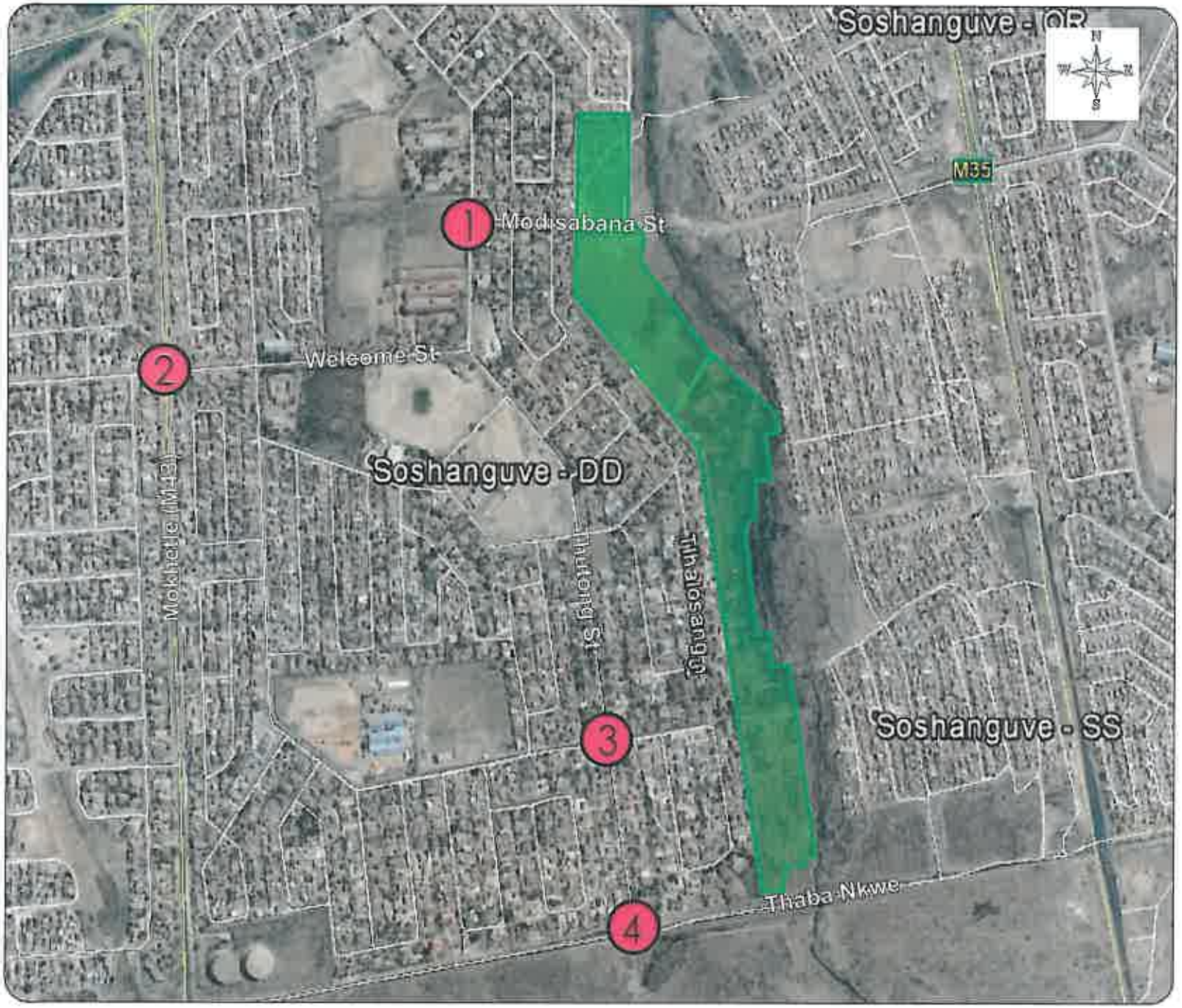
Soshanguve Extension 7 is to be established on Erf 2561, 2562, 2563, 2564 and 2565, Soshanguve SS, while Soshanguve Extension 8 is to be established on Erf 2566, 2567 and 2568, Soshanguve SS. The total extent of the land under consideration is 13,0928ha of which Extension 7 is to cover 6,1305ha and Extension 8 cover 6,9623ha. The land is bounded by a waterway to the east, Thaba Nkwe Road to the south, Soshanguve DD to the west and north. The land resorts under the jurisdiction of the Tshwane Metropolitan Municipality and falls inside of the urban edge in a medium densifying developing area.

The current zoning of the property is "Agricultural". The location of the nearest existing major intersections to be affected, is that of Mokhetle Road (M43) & Welcome Street as well as Thutong Street & Thaba Nkwe Road.

Currently, all affected roads are paved, and in a fair to poor physical condition. All the roads fall under the jurisdiction of, and therefore, the responsibility of the Tshwane Metropolitan Municipality.

Objectives

The objective of this study is to assess the impact of the proposed development on the existing surrounding road network and the intersections in the immediate vicinity and to establish the capacity requirements, if and where required, of the road infrastructure and any additional capacity that would be required to ensure acceptable traffic flow through the affected junctions/intersections.



PROJECT

SOSHANGUVE, X7 & X8

LOCALITY PLAN

KEY

MANUAL COUNTS

SITE

TRAFFTRANS (PTY) LTD

Proj. T20187/006 Fig. 1

1.3 Methodology

The methodology followed, relates closely to the guideline document of the Committee of Transport Officials (COTO), entitled, "TMH 16 (Volume 1), South African Traffic Impact and Site Traffic Assessment Manual, Version 1.0, August 2012". The following additional procedures were followed:

- The identification of the key intersections in the vicinity on which the development may have a significant impact and which may have an impact on the flow of traffic through these intersections. According to publication of the Institute of Traffic Engineers, Washington D.C. entitled, *"Traffic Access and Impact Studies for Site Development, A proposed recommended practice, 1988"*, key intersections are those through which the newly generated peak hour traffic composes at least 5% of the existing capacity.
- Selecting an appropriate horizon year to be considered in the analyses, based on the type of development and the extent thereof as suggested in "TMH 16 (Volume 1), South African Traffic Impact and Site Traffic Assessment Manual, Version 1.0, August 2012", Appendix B.
- Acquiring traffic data for the key intersections and/or other traffic infrastructure as well as establishing the appropriate growth rates in the traffic flows.
- Establishing the traffic generated by the proposed development in accordance with the guideline document of Committee of Transport Officials (COTO), entitled, *TMH 17 (Volume 1), South African Trip Data Manual, Version 1.0, September 2012"* and the guideline document of the Institute of Traffic Engineers, Washington D.C. entitled, *"Trip Generation, 6th edition, Volume 1 to 3, 1997"*
- The distribution of the generated traffic derived from the existing traffic flow patterns in addition to other external factors that may affect the new traffic flow patterns.
- The effect of other developments in the immediate vicinity that are in the process of construction, developments already approved or developments awaiting approval.
- An assessment will be made on the performance of the intersections and other traffic elements. For this purpose the software developed by the Australian Research Board Ltd, **Sidra Intersection 7.0**, Victoria, Australia, 2015 and/or the **Vistro 6.0** software suite, developed by PTV Planung Transport Verkehr AG. The Sidra software suite has limitations in its application of assessing all-way stop controlled intersections, and largely underestimates the performance of it as well, and for this purpose, either **Vistro 6.0** or the **AutoJ 1712** software package, developed locally by Dr John Sampson or the software developed by Mc Trans Centre, **Highway Capacity Software Version 4.1c**, University of Florida, USA, 2000 will be used to analyse such intersections. Where necessary to assess a wider network, or where the former analysis software does not cover the specific road conditions, the traffic analysis software

Synchro 6, developed by Trafficware Corporation California, USA, 2003, will be used.

- The generally accepted limit for traffic facility performance within an urban environment is LOS D (level-of-service) and that of a rural environment LOS C. In conjunction herewith, it is preferable that a V/C-ratio (volume-capacity ratio), of less than 0,95 will be maintained, where possible, but not exceeding 1,00 as a worst case scenario.
- The effect of security control at entrances to developments will be assessed based on requirements set out in the document of the Committee of Transport Officials (COTO), entitled, *TMH 16 (Volume 2), South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual, Version 1.01, February 2014"*
- The requirements for traffic signals and traffic signs as contained in the SARTSM *"South African Roads Traffic Signs Manual"* as amended, South African Department of Transport.
- If applicable, the impact of and on the public transport system will also be evaluated.

2. STUDY CONSIDERATIONS

2.1 Description of the proposed development

The property is located in a slow to medium pace developing urban area. The application is for single and duplex units as "Residential 3" with a density of 70 units/ha on Extension 7 and 80 units/ha on Extension 8. This amounts to 328 units on Extension 7 (4,6967ha developable land) and 492 units on Extension 8 (6,1576ha developable land).

2.2 Access to the proposed development

Due to its elongated form, the development will get access to the local road network at two locations - one for Extension 7 and one for Extension 8. Both these access roads will link up with Thutong Street, and from there with the rest of the larger road network. For the purpose of this assessment, all trips generated by this development will be carried along Thutong Street either northbound or southbound to join the larger road network.

2.3 Road Infrastructure

Thutong Street is a paved single carriageway road, running north-south and the section north of Welcome Street, according to the Tshwane Roads Master Plan, has not been identified as a significant road, and therefore would, by default, act as a Class U5 road (local street), requiring a 15m road reserve. This section, however, only provides for a 12m road reserve. The section of Thutong Street between Welcome Street and Thaba Nkwe Road, Welcome Street and Thaba Nkwe Road have been identified as Class U4a roads (collector - non residential) requiring a 25m reserve. However, provision has only been made for a 20m reserve on the first two roads, with more than adequate road reserve that should be available on the latter. Mokhetle Road (R43) has been identified as a future Class U3 road (district distributor). Such roads require a 32m road reserve, which has been allowed for.

2.4 Study Area

The extent of the study area is established, based on a number of criteria. The applicable criteria, for identifying key intersections, are the following:

- All intersections where the newly generated peak hour traffic composes **more than 5%** of the existing capacity, are regarded as key intersections.
- In dense urban road networks, a cut-off distance of 1km to 1,5km from the site along the major road network, will be regarded as the limit of the study for large developments, requiring full impact studies.
- Any other extra-ordinary features or conditions that require assessment.

3. DATA / INFORMATION

3.1. Relevant horizon year

The area surrounding the proposed development currently has an urban character, with slow to medium densification been ongoing. This development can be regarded as a medium size development, generating more than 150 vehicle-trips in the peak hour. The required assessment period for such a development, will be taken as the design year as well as the horizon year.

The design year is taken as 2018, with 2023 been taken as the horizon year.

3.2. Applicable peak period

From the traffic counts undertaken at the affected intersections, it is clear that the roads in the immediate vicinity of the site, carrying typical commuter traffic with its associated peak periods during the early morning and afternoon. The weekday morning (AM) peak hour has been found to typically start at between 06:45 and 07:00, with the associated afternoon (PM) peak hour already starting between 15:00 and 15:15 on the internal roads and 17:00 on the external roads. For the purpose of this study, these peak periods will be assessed.

3.3. Relevant development scenarios

It is assumed that the development, once approved, should be constructed and operational within a 12-month period following its approval.

3.4. Data collection

- **Current traffic volumes**

Detailed 12-hour intersection counts were undertaken on Monday, 29 January 2018. A summary of the results of the traffic counts done at these intersections is given in **Table 1 and Figure 2**. The peak-hour factors (phf) for the various approaches, have also been included.

TABLE 1: TRAFFIC VOLUMES - 2018

Intersection	Peak	Approach				phf	12-hr Vol
		N	E	S	W		
Thursday (06:00 - 18:00)							
Modisabana & Thutong	AM	72	40	102		0.91	1258
	PM	92	24	88		0.86	
Welcome & Mokhetle (M43)	AM	597	456	240	201	0.84	7784
	PM	347	201	122	132	0.94	
Thusong & Thutong	AM	156	16	236	126	0.86	2365
	PM	73	7	141	42	0.81	
Thaba Nkwe & Thutong	AM	238	254		133	0.93	4114
	PM	63	172		175	0.92	
Welcome & Thutong	AM	105		133	214	0.80	
	PM	100		67	125	0.90	

The traffic through the intersections, on average, during the AM peak is high at 18,5% of the 12-hour traffic volumes, and a more typical 11,9% for the PM peak. This is typical of commuter traffic flows in residential urban areas (typically >10%). The heavy vehicle component of the traffic, varies between 1% and 3% during the AM and PM peaks and 2% of the total 12-hour traffic.

- **Future traffic volumes**

For the purpose of traffic growth along the routes through the area, the area could be regarded as a slow to medium developing urban area, and a medium growth scenario is expected for the next 5 years. **An annual growth in traffic of 3% has been allowed for over the next five years**. The expected traffic volumes for 2023 is depicted in **Figure 3**.

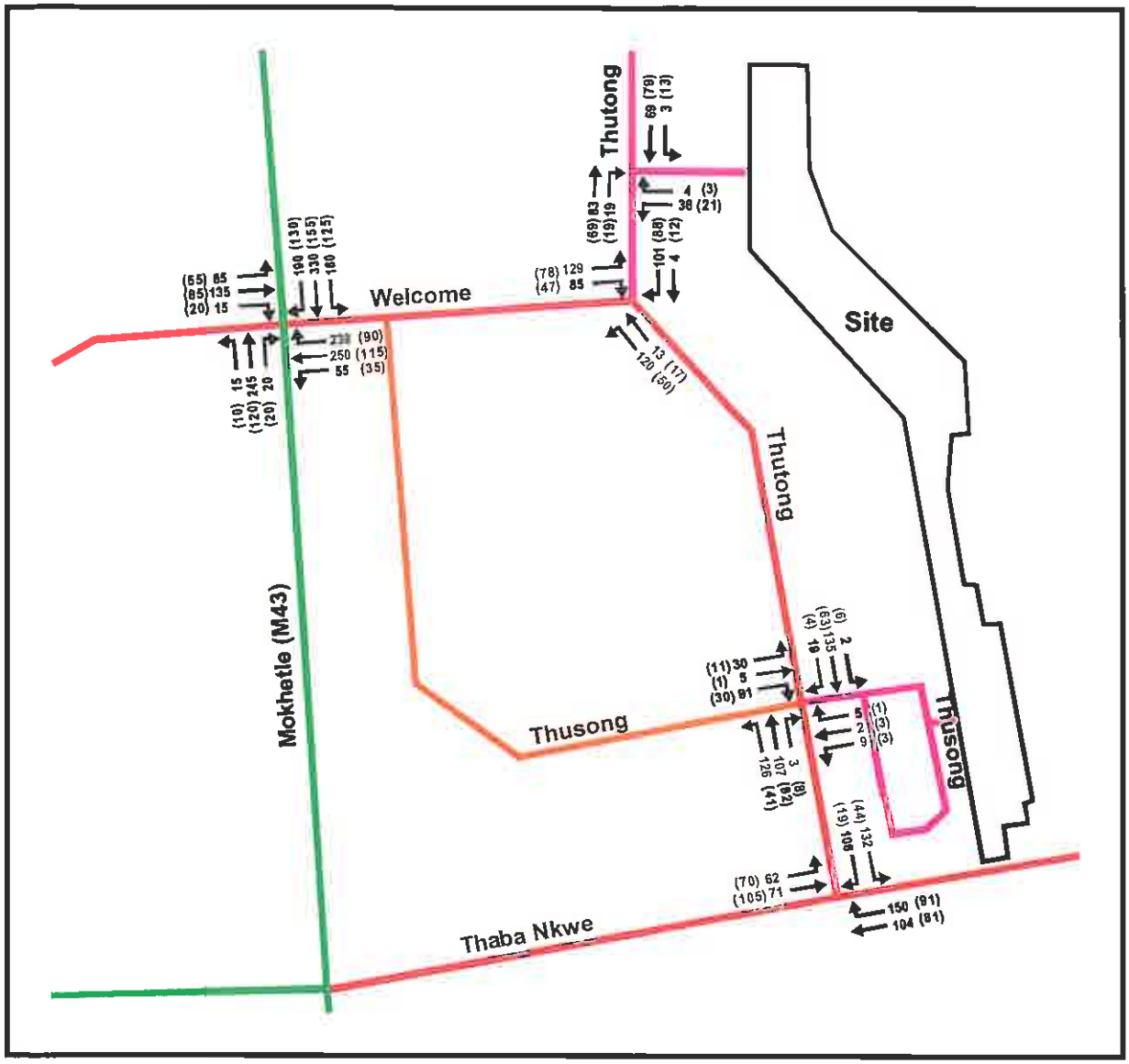


FIGURE 2: TRAFFIC VOLUMES - 2018

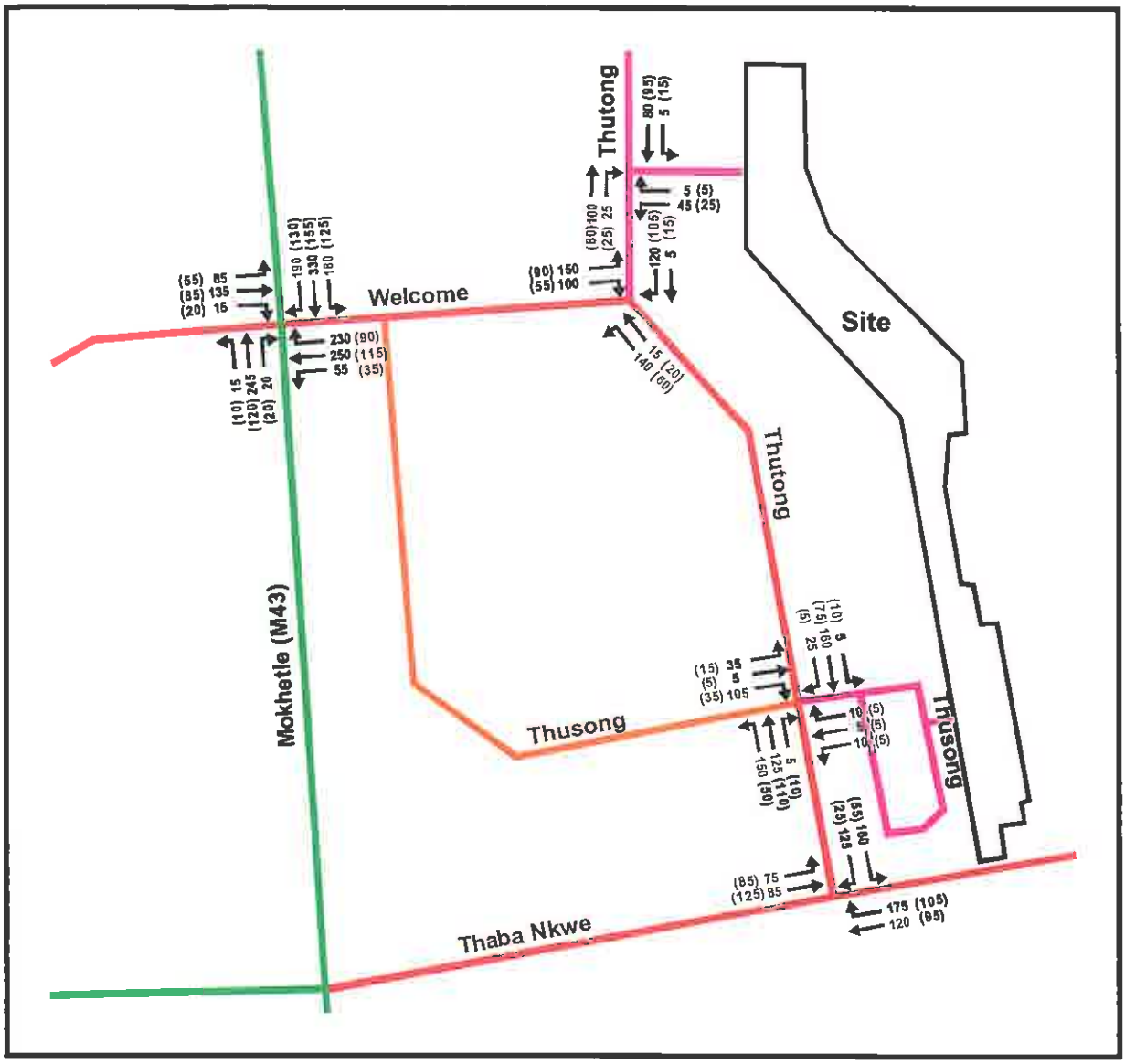


FIGURE 3: TRAFFIC VOLUMES - 2023

- **Traffic control**

The current traffic control at the identified intersections is as follows:

- Modisabana & Thutong — mini roundabout control
- Mokhetle (M43) & Welcome — priority stop control
- Welcome & Thutong — mini roundabout control
- Thusong & Thutong — priority stop control
- Thaba Nkwe & Thutong — priority stop control

4. TRIP GENERATION AND DISTRIBUTION

4.1. Estimated trip generation

The estimated generated trips, are taken from the Committee of Transport Officials (COTO) "TMH 17, Volume 1 - South African Trip Data Manual, Version 1.0, September 2012". Where rates are not available in the document from the former or where the land use contained in the document does not represent the proposed land use well enough, the rates suggested in the *"Trip Generation, 6th edition, Volume 1, 1997"* of the Institute of Transportation Engineers have been applied.

The application at this stage is for the zoning for a "Residential 3" for the development of both townships to a total of 820 units. The total trip generation by the land use for low vehicle ownership is summarised in **Table 2** below.

TABLE 2: TRIPS GENERATED BY THE LAND USE

Land use	Units	Trip Rate	Trips	Peak	Split	In	Out
Extension 7 Residential 3	328	0.45/unit	149	AM	25:75	37	112
				PM	70:30	104	45
Extension 8 Residential 3	492	0.45/unit	224	AM	25:75	56	168
				PM	70:30	157	67
TOTAL	820	0.45/unit	373	AM	25:75	93	280
				PM	70:30	261	112

4.2 Modal split

Due to the nature of the development, it is expected that most of the traffic generated by the development will consist of light vehicles during the peak hours.

4.3 Trip allocation

The trips generated by the development have been manually allocated to and from the development, in line with to the existing traffic flow patterns in the area and the attraction to and from the typical feeding areas. The trip allocation is depicted in **Figure 4**.

Since the generated trips are more than 50 trips in the peak hours, further assessment of the intersections/junctions need to be made with the generated trips on top of the background traffic for all key intersections. This is further discussed in Section 6.1.

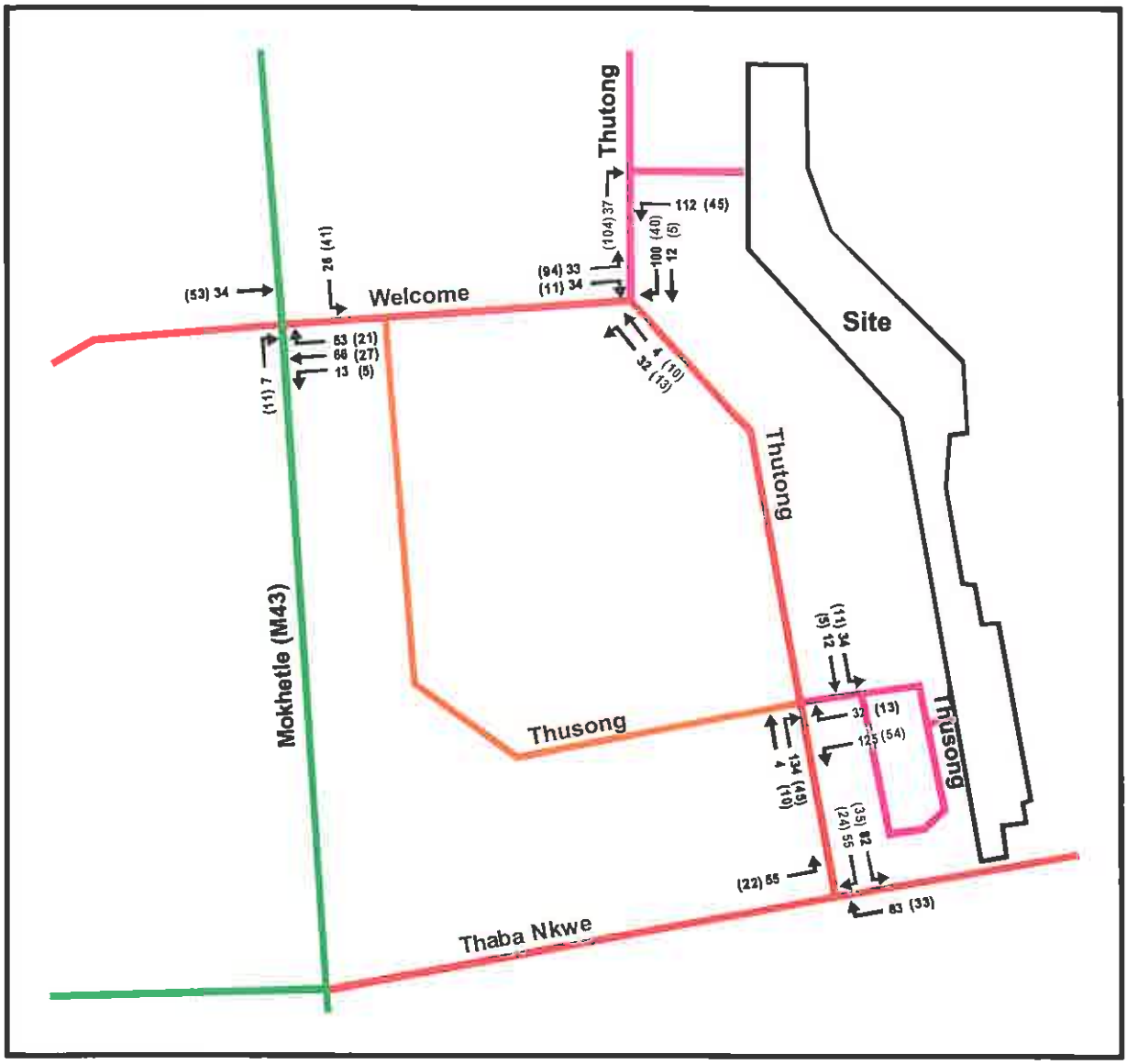


FIGURE 4: GENERATED TRIP ALLOCATION

5. EVALUATION OF BACKGROUND TRAFFIC

5.1 Current Traffic (2017)

The results of the assessment of the relevant intersections under **current existing layout and control conditions** (the performance (LOS) and V/C) of the intersections are summarised in **Table 3** below.

TABLE 3: INTERSECTION PERFORMANCE - 2018 CONDITIONS

Intersection	Peak	Over all	North			East			South			West		
			R	S	L	R	S	L	R	S	L	R	S	L
Thutong & Modisabana	AM	A		A	A	A		A	A	A				
		0.10		0.06	0.06	0.04		0.04	0.10	0.10				
	PM	A		A	A	A		A	A	A				
		0.09		0.09	0.09	0.03		0.03	0.07	0.07				
Mokhetle (M43) & Welcome	AM	F	F	F	F	A	A	A	F	F	F	A	A	A
		3.20	3.20	3.20	3.20	0.39	0.39	0.39	1.58	1.58	1.58	0.16	0.16	0.16
	PM	C	C	C	B	A	A	A	C	B	B	A	A	A
		0.58	0.58	0.58	0.58	0.14	0.14	0.14	0.31	0.31	0.31	0.08	0.08	0.08
Thutong & Welcome	AM	A		A	A		A	A	A	A				
		0.21		0.10	0.10		0.15	0.15	0.21	0.21				
	PM	A		A	A		A	A	A	A				
		0.12		0.09	0.09		0.07	0.07	0.12	0.12				
Thutong & Thusong	AM	B	A	A	A	B	B	A	A	A	A	B	B	A
		0.27	0.11	0.11	0.11	0.03	0.03	0.03	0.14	0.14	0.14	0.27	0.27	0.27
	PM	A	A	A	A	A	A	A	A	A	A	A	A	A
		0.08	0.05	0.05	0.05	0.01	0.01	0.01	0.08	0.08	0.08	0.08	0.08	0.08
Thutong & Thaba Nkwe	AM	B	B		A	A	A						A	A
		0.37	0.37		0.37	0.19	0.19						0.08	0.08
	PM	B	B		A	A	A						A	A
		0.14	0.11		0.11	0.14	0.14						0.10	0.10

R- Right S - Straight L - Left X - Continuous movement

* The V/C=1.00 is due to the short lanes overflowing into adjacent lanes

** Long delays, very low volumes

From the information summarised in **Table 3**, one of the five intersections is NOT performing satisfactory within the acceptable LOS D (for urban intersections) and V/C < 0.95, during the AM and/or PM peaks under the current traffic conditions and existing layouts.

The following improvements are required:

Mokhetle (M43) & Welcome

- **Introduce a mini roundabout**

The results of the assessment of the relevant intersections under the **improved control and layout conditions** (the performance (LOS) and V/C) of the intersections are summarised in

Table 3A below, showing the impact of the improvements on the performance of the intersection.

TABLE 3A: INTERSECTION PERFORMANCE - 2018 CONDITIONS (IMPROVED)

Intersection	Peak	Over all	North			East			South			West		
			R	S	L	R	S	L	R	S	L	R	S	L
Mokhetle (M43) & Welcome	AM	B	B	A	A	C	C	C	B	B	B	B	B	B
		0.88	0.71	0.71	0.71	0.88	0.88	0.88	0.62	0.62	0.62	0.46	0.46	0.46
	PM	A	A	A	A	A	A	A	A	A	A	A	A	A
		0.31	0.31	0.31	0.31	0.24	0.24	0.24	0.20	0.20	0.20	0.16	0.16	0.16

R- Right S - Straight L - Left X - Continuous movement

* The V/C=1.00 is due to the short lanes overflowing into adjacent lanes

** Long delays, very low volumes

5.2 Future Traffic (2023)

The results of the assessment of the relevant intersections under **future layout and control conditions** (the performance (LOS) and V/C) of the intersections are summarised in **Table 4** below.

TABLE 4: INTERSECTION PERFORMANCE - 2023 CONDITIONS

Intersection	Peak	Over all	North			East			South			West		
			R	S	L	R	S	L	R	S	L	R	S	L
Thutong & Modisabana	AM	A		A	A	A		A	A	A				
		0.12		0.08	0.08	0.05		0.05	0.12	0.12				
	PM	A		A	A	A		A	A	A				
		0.11		0.11	0.11	0.04		0.04	0.08	0.08				
Mokhetle (M43) & Welcome (mini roundabout)	AM	D	B	B	B	F	F	F	C	C	C	B	B	B
		1.21	0.87	0.87	0.87	1.21	1.21	1.21	0.73	0.73	0.73	0.57	0.57	0.57
	PM	A	A	A	A	B	A	A	B	A	A	A	A	A
		0.38	0.38	0.38	0.38	0.31	0.31	0.31	0.26	0.26	0.26	0.21	0.21	0.21
Thutong & Welcome	AM	A		A	A		A	A	A	A				
		0.25		0.13	0.13		0.18	0.18	0.25	0.25				
	PM	A		A	A		A	A	A	A				
		0.15		0.11	0.11		0.09	0.09	0.15	0.15				
Thutong & Thusong	AM	C	A	A	A	B	B	A	A	A	A	C	C	B
		0.36	0.13	0.13	0.13	0.06	0.06	0.06	0.17	0.17	0.17	0.36	0.36	0.36
	PM	B	A	A	A	B	B	A	A	A	A	B	B	A
		0.11	0.06	0.06	0.06	0.03	0.03	0.03	0.09	0.09	0.09	0.11	0.11	0.11
Thutong & Thaba Nkwe	AM	C	C		B	A	A						A	A
		0.49	0.49		0.49	0.23	0.23						0.10	0.10
	PM	B	B		A	A	A						A	A
		0.17	0.15		0.15	0.17	0.17						0.12	0.12

R- Right S - Straight L - Left X - Continuous movement

* The V/C=1.00 is due to the short lanes overflowing into adjacent lanes

** Long delays, very low volumes

From the information summarised in **Table 4**, one of the five intersections is NOT performing satisfactory within the acceptable LOS D (for urban intersections) and V/C < 0.95, during the AM and/or PM peaks under the future traffic conditions and further improvements are necessary, as set out below.

The following improvements are required:

Mokhetle (M43) & Welcome

- **Introduce a left-turn slip lane on the eastern approach (Welcome) with 60m storage capacity**

The results of the assessment of the relevant intersections under the **improved control and layout conditions** (the performance (LOS) and V/C) of the intersections are summarised in **Table 4A** below, showing the impact of the improvements on the performance of the intersection.

TABLE 4A: INTERSECTION PERFORMANCE - 2023 CONDITIONS (IMPROVED)

Intersection	Peak	Over all	North			East			South			West		
			R	S	L	R	S	L	R	S	L	R	S	L
Mokhetle (M43) & Welcome (left-turn slip)	**AM**	**C**	B	B	B	C	C	A	D	D	D	B	B	B
		0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.86	0.86	0.86	0.60	0.60	0.60
	PM	**A**	A	A	A	A	A	A	A	A	A	A	A	A
		0.38	0.38	0.38	0.38	0.21	0.21	0.21	0.26	0.26	0.26	0.21	0.21	0.21

R- Right S - Straight L - Left X - Continuous movement

* The V/C=1.00 is due to the short lanes overflowing into adjacent lanes

** Long delays, very low volumes

6. TRAFFIC ASSESSMENT WITH PROPOSED DEVELOPMENT

6.1 Key Intersections

The extent of the study area is established, based on the a number of criteria as set out in Section 2.4. The traffic generated by this development as a percentage of the available capacity of the peak-hour through the main intersections in the vicinity of the development, satisfying the above requirements, is summarised in **Table 5** below.

TABLE 5: GENERATED TRAFFIC THROUGH INTERSECTION

No	Intersection	% of most critical peak period	Key Intersection
1	Modisabana & Thutong	5,6%	Yes
2	Mokhetle (M43) & Welcome	33,1%	Yes
3	Welcome & Thutong	13,4%	Yes
4	Thusong & Thutong	14,8%	Yes
5	Thaba Nkwe & Thutong	7,8%	Yes

From the above, **all of the five intersections above qualify as a key intersections** (generated trips through them less than 5% of intersection capacity), and only need to be assessed with the background traffic conditions (see Section 5 above).

6.2 Intersection/Junction Performance

6.2.1 Modisabana & Thutong

The results of the performance (LOS and V/C) of the above intersection without any improvements are summarised in **Table 6** below.

TABLE 6: MODISABANA & THUTONG: INTERSECTION PERFORMANCE

Intersection	Peak	Over all	North			East			South			West		
			R	S	L	R	S	L	R	S	L	R	S	L
2018	AM	A		A	A	A		A	A	A				
		0.15		0.15	0.15	0.13		0.13	0.07	0.07				
	PM	A		A	A	A		A	A	A				
		0.15		0.09	0.09	0.15		0.15	0.10	0.10				
2023	AM	A		A	A	A		A	A	A				
		0.23		0.09	0.09	0.16		0.16	0.23	0.23				
	PM	A		A	A	A		A	A	A				
		0.21		0.13	0.13	0.10		0.10	0.21	0.21				

R- Right S - Straight L - Left X - Continuous movement

* The V/C=1.00 is due to the short lanes overflowing into adjacent lanes

** Long delays, very low volumes

From the information summarised in **Table 6**, the intersection is performing satisfactory within the acceptable LOS D (for urban intersections) and V/C < 0.95, during the AM and PM peaks under expected 2018 and 2023 traffic conditions and **no further improvements are required.**

6.2.2 Mokhetle (M43) & Welcome

The results of the performance (LOS and V/C) of the above intersection without any improvements are summarised in **Table 7** below.

TABLE 7: MOKHETLE (M43) & WELCOME: INTERSECTION PERFORMANCE

Intersection	Peak	Over all	North			East			South			West		
			R	S	L	R	S	L	R	S	L	R	S	L
2018	AM	D	B	B	B	F	F	F	C	C	C	B	B	B
		1.16	0.81	0.81	0.81	1.16	1.16	1.16	0.69	0.69	0.69	0.56	0.56	0.56
	PM	A	A	A	A	A	A	A	B	A	A	A	A	A
		0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.24	0.24	0.24	0.24	0.24	0.24
2023	AM	E	D	D	D	F	F	A	F	F	F	C	C	C
		1.10	0.99	0.99	0.99	1.10	1.10	1.10	1.02	1.02	1.02	0.72	0.72	0.72
	PM	A	A	A	A	A	A	A	B	A	B	B	A	A
		0.47	0.47	0.47	0.47	0.28	0.28	0.28	0.30	0.30	0.30	0.30	0.30	0.30

R- Right S - Straight L - Left X - Continuous movement

* The V/C=1.00 is due to the short lanes overflowing into adjacent lanes

** Long delays, very low volumes

From the information summarised in **Table 7**, the intersection is not performing satisfactory within the acceptable LOS D (for urban intersections) and V/C < 0.95, during the AM and PM peaks under expected 2018 and 2023 traffic conditions and **further improvements are required.**

2018

- **Introduce a left-turn slip lane on the eastern approach (Welcome)**

2023

- **Introduce traffic signal control**
- **Provide a dedicated right-turn lane on the eastern approach (Welcome) with a 60m storage capacity**
- **Provide a dedicated right-turn lane on the northern approach (Mokhetle) with a 60m storage capacity**

The results of the assessment of the relevant intersections under the **improved control and layout conditions** (the performance (LOS) and V/C) of the intersections are summarised in **Table 7A** below, showing the impact of the improvements on the performance of the intersection.

TABLE 7A: MOKHETLE (M43) & WELCOME: INTERSECTION PERFORMANCE - IMPROVED

Intersection	Peak	Over all	North			East			South			West		
			R	S	L	R	S	L	R	S	L	R	S	L
2018 (slip lane)	AM	B	B	B	B	C	C	A	C	C	C	B	B	B
		0.85	0.81	0.81	0.81	0.85	0.85	0.85	0.80	0.80	0.80	0.58	0.85	0.85
	PM	A	A	A	A	A	A	A	B	A	A	A	A	A
		0.38	0.38	0.38	0.38	0.28	0.28	0.28	0.24	0.24	0.24	0.24	0.24	0.24
2023 (signalised)	AM	C	C	D	D	D	B	B	C	C	C	B	B	B
		0.95	0.64	0.95	0.95	0.95	0.56	0.56	0.83	0.83	0.83	0.54	0.54	0.54
	PM	B	C	B	B	C	B	C	B	B	B	C	B	C
		0.40	0.25	0.40	0.40	0.33	0.29	0.29	0.36	0.36	0.36	0.38	0.38	0.38

R- Right S - Straight L - Left X - Continuous movement

* The V/C=1.00 is due to the short lanes overflowing into adjacent lanes

** Long delays, very low volumes

From the information summarised in **Table 7A**, the intersection is performing satisfactory within the acceptable LOS D (for urban intersections) and V/C < 0.95, during the AM and PM peaks under expected 2018 and 2023 traffic conditions with the proposed improvements.

6.2.3 Welcome & Thutong

The results of the performance (LOS and V/C) of the above intersection without any improvements are summarised in **Table 8** below.

TABLE 8: WELCOME & THUTONG: INTERSECTION PERFORMANCE

Intersection	Peak	Over all	North			East			South			West		
			R	S	L	R	S	L	R	S	L	R	S	L
2018	AM	A		A	A	A		A	A	A				
		0.28		0.23	0.23	0.22		0.22	0.28	0.28				
	PM	A		A	A	A		A	A	A				
		0.23		0.14	0.14	0.10		0.10	0.23	0.23				
2023	AM	A		A	A	A		A	A	A				
		0.32		0.25	0.25	0.25		0.25	0.32	0.32				
	PM	A		A	A	A		A	A	A				
		0.26		0.16	0.16	0.12		0.12	0.26	0.26				

R- Right S - Straight L - Left X - Continuous movement

* The V/C=1.00 is due to the short lanes overflowing into adjacent lanes

** Long delays, very low volumes

From the information summarised in **Table 8**, the intersection is performing satisfactory within the acceptable LOS D (for urban intersections) and V/C < 0.95, during the AM and PM peaks under expected 2018 and 2023 traffic conditions and **no further improvements are required.**

6.2.4 Thusong & Thutong

The results of the performance (LOS and V/C) of the above intersection without any improvements are summarised in **Table 9** below.

TABLE 9: THUSONG & THUTONG: INTERSECTION PERFORMANCE

Intersection	Peak	Over all	North			East			South			West		
			R	S	L	R	S	L	R	S	L	R	S	L
2018	AM	C	A	A	A	C	C	A	A	A	A	D	C	B
		0.49	0.14	0.14	0.14	0.37	0.37	0.37	0.29	0.29	0.29	0.49	0.49	0.49
	PM	B	A	A	A	B	B	A	A	A	A	B	B	A
		0.14	0.06	0.06	0.06	0.14	0.14	0.14	0.12	0.12	0.12	0.10	0.10	0.10
2023	AM	D	A	A	A	C	D	B	A	A	A	E	D	C
		0.69	0.17	0.17	0.17	0.46	0.46	0.46	0.32	0.32	0.32	0.69	0.69	0.69
	PM	B	A	A	A	B	B	A	A	A	A	B	B	A
		0.18	0.08	0.08	0.08	0.18	0.18	0.18	0.14	0.14	0.14	0.13	0.13	0.13

R- Right S - Straight L - Left X - Continuous movement

* The V/C=1.00 is due to the short lanes overflowing into adjacent lanes

** Long delays, very low volumes

From the information summarised in **Table 9**, the intersection is performing satisfactory within the acceptable LOS D (for urban intersections) and V/C < 0.95, during the AM and PM peaks under expected 2018, but not satisfactory under 2023 traffic conditions and **further improvements are required.**

2023

- **Introduce a mini roundabout**

The results of the assessment of the relevant intersections under the **improved control and layout conditions** (the performance (LOS) and V/C) of the intersections are summarised in **Table 9A** below, showing the impact of the improvements on the performance of the intersection.

TABLE 9A: THUSONG & THUTONG: INTERSECTION PERFORMANCE - IMPROVED

Intersection	Peak	Over all	North			East			South			West		
			R	S	L	R	S	L	R	S	L	R	S	L
2018	AM													
	PM													
2023 (mini circle)	AM	C	C	D	D	D	B	B	C	C	C	B	B	B
		0.95	0.64	0.95	0.95	0.95	0.56	0.56	0.83	0.83	0.83	0.54	0.54	0.54
	PM	B	C	B	B	C	B	C	B	B	B	C	B	C
		0.40	0.25	0.40	0.40	0.33	0.29	0.29	0.36	0.36	0.36	0.38	0.38	0.38

R- Right S - Straight L - Left X - Continuous movement

* The V/C=1.00 is due to the short lanes overflowing into adjacent lanes

** Long delays, very low volumes

From the information summarised in **Table 9A**, the intersection is performing satisfactory within the acceptable LOS D (for urban intersections) and V/C < 0.95, during the AM and PM peaks under expected 2023 traffic conditions with the proposed improvements.

6.2.5 Thaba Nkwe & Thutong

The results of the performance (LOS and V/C) of the above intersection without any improvements are summarised in **Table 10** below.

TABLE 10: THABA NKWE & THUTONG: INTERSECTION PERFORMANCE

Intersection	Peak	Over all	North			East			South			West		
			R	S	L	R	S	L	R	S	L	R	S	L
2018	AM	D	E		C	A	A						A	A
		0.79	0.79		0.79	0.36	0.36						0.12	0.12
	PM	B	B		A	A	A						A	A
		0.24	0.24		0.24	0.18	0.18						0.12	0.12
2023	AM	D	E		D	A	A						A	A
		0.87	0.87		0.87	0.33	0.33						0.13	0.13
	PM	B	C		A	A	A						A	A
		0.30	0.30		0.30	0.21	0.21						0.14	0.14

R- Right S - Straight L - Left X - Continuous movement
* The V/C=1.00 is due to the short lanes overflowing into adjacent lanes
** Long delays, very low volumes

From the information summarised in **Table 10**, the intersection is not performing satisfactory within the acceptable LOS D (for urban intersections) and V/C < 0.95, during the AM and PM peaks under expected 2018 and 2023 traffic conditions and **further improvements are required.**

2018

- **Introduce a mini roundabout**

The results of the assessment of the relevant intersections under the **improved control and layout conditions** (the performance (LOS) and V/C) of the intersections are summarised in **Table 10A** below, showing the impact of the improvements on the performance of the intersection.

TABLE 10A: THABA NKWE & THUTONG: INTERSECTION PERFORMANCE - IMPROVED

Intersection	Peak	Over all	North			East			South			West		
			R	S	L	R	S	L	R	S	L	R	S	L
2018 (mini circle)	AM	A	A		A	A	A						A	A
		0.43	0.32		0.32	0.43	0.43						0.27	0.27
	PM	A	A		A	A	A						A	A
		0.21	0.15		0.15	0.19	0.19						0.21	0.21
2023 (mini circle)	AM	A	A		A	A	A						A	A
		0.41	0.38		0.38	0.41	0.41						0.29	0.29
	PM	A	A		A	A	A						A	A
		0.26	0.18		0.18	0.22	0.22						0.26	0.26

R- Right S - Straight L - Left X - Continuous movement

* The V/C=1.00 is due to the short lanes overflowing into adjacent lanes

** Long delays, very low volumes

From the information summarised in **Table 10A**, the intersection is performing satisfactory within the acceptable LOS D (for urban intersections) and V/C < 0.95, during the AM and PM peaks under expected 2018 and 2023 traffic conditions with the proposed improvements.

6.3 Access

The access to the development will be from Thutong Street at two locations. Access to Extension 7 will be via Modisabana Street in the north and that to Extension 8, via Thusong Street in the south. Access security to the developments is not expected to be introduced.

Since the two townships will each have its separate access, which will be a public road, no further requirements will be posed in this report.

6.4 Traffic control

The type of traffic control at the intersection will be as follows (see **Table 6** for improvement schedule):

	Current control	**Future control**
• Modisabana & Thutong	mini circle control	mini circle control
• Mokhetle (M43) & Welcome	priority stop control	traffic signal control
• Welcome & Thutong	mini circle control	mini circle control
• Thusong & Thutong	priority stop control	mini circle control
• Thaba Nkwe & Thutong	priority stop control	mini circle control

6.5 Parking

The parking requirement for this development as prescribed in the guidelines contained in the *"Parking Standards, PG 3/85 (second edition)"* published by the Department of Transport and Part 5 of the "*Tshwane Town-Planning Scheme 2008 (Revised 2014)*" of the Tshwane Metropolitan Municipality, are to be provided on site.

All parking for the developments are to be provided on-site. Two parking scenarios are provided. The maximum requirement will be where residential units have three habitable rooms or more and the minimum, where the units have two habitable rooms or less. However, it is envisaged at this stage to cater for the latter of the two scenarios above. Since this area is associated with low car ownership, the total number of parking spaces to be provided on site according to the Tshwane Town-Planning Scheme, is to be scaled down in proportion to the reduction in the expected trips to be generated by such developments. In this regard, the normal parking ratio is to be reduced by 35%. However, since such a provision is still expected to be on the high side, no additional provision will be made for parking for visitors (expected to be included in the total number of parking spaces being provided). The total number of parking bays to be provided, will therefore be **213 spaces for Soshanguve X7** and **320 spaces for Soshanguve X8**.

6.6 Public Transport

6.5.1 Introduction

In terms of the National Land Transport Transition Act, Act 5 of 2009, it is also required that a public transport assessment should be carried out as part of the traffic evaluation of all new developments.

The assessment need to address aspects such as the number of new employment opportunities that will be created for workers, the expected travelling pattern of workers, as well as the impact it may have on the existing public transport network.

6.5.2 Existing Public Transport Infrastructure

Mokhetle (M43), Welcome and Thutong Street are all public transport routes in the area, both for Tshwane's public transport service, but also frequented by taxis and other bus services. Both developments are situated fairly close to Thutong Street. The access of Soshanguve X7 is located approximately 450m from the intersection of Welcome and Thutong located on the public transport route, while the access of Soshanguve X8 is located less than 350m from the intersection of Thusong and Thutong, also located on the public transport route. It could therefore easily be utilised by residents, without any further action required from either the local authority or the developer.

6.5.3 Proposed Public Transport Infrastructure

The proposed developments will be located close to Thutong Street and within walking distance of the available public transport. This is therefore in line with the objectives of the National Transport Policy (published by the Department of Transport in September 1996), aiming to limit walking distances for public transport users to **less than 1km in urban areas**. The study area is therefore well served and no additional public transport planning is required at this point in time.

7. CAPACITY ANALYSIS CONCLUSIONS

It is proposed in the "TMH 16 (Volume 1), South African Traffic Impact and Site Traffic Assessment Manual, Version 1.0, August 2012", that the developer mitigate the traffic impact of the proposed development under the following circumstances:

- If and where the Level-of-Service (LOS) of any element of a facility drops below LOS D in an urban environment or LOS C in a rural environment; or
- If the Volume-Capacity (V/C) ratio of any element of a facility increases above 0,95 and
- If the contribution of the development is at least 5% of the sum of the critical lane volumes of the element of a facility.

In terms of the above warrants for mitigation measures and the results of the analysis, the mitigation measures are summarised in **Table 11** below.

The measures and contributions in the table below are based on the background (existing) traffic, the traffic generated by other developments in the vicinity, and the proposed development as well as the traffic growth assumed in this report. The final contribution of the developer will be a matter of negotiation, based on the above, with the proportional contributions as proposed in the findings of this report, as well as additional information not available at this stage, at the time of establishment of the final contribution.

TABLE 11: PROPOSED MITIGATION MEASURES AND CONTRIBUTIONS

Intersection	Year	Mitigation Measures	Responsibility		
			Gautrans	Tshwane	Development
Modisbana & Thutong	2018	• None	NA	NA	NA
	2023	• None	NA	NA	NA
Welcome & Mokhetle (M43)	2018	• Introduce a mini roundabout • Introduce a left-turn slip lane on the eastern approach (Welcome) with a 60m storage capacity (for Soshanguve X7)	NA NA	100% 50%	0% 50%
	2023	• Introduce a traffic signal • Provide a dedicated right-turn lane on the eastern approach (Welcome) with a 60m storage capacity (for Soshanguve X7) • Provide a dedicated right-turn lane on the northern approach (Mokhetle) with a 60m storage capacity (for Soshanguve X7)	NA NA NA	0% 0% 0%	100% 100% 100%
Welcome & Thutong	2018	• None	NA	NA	NA
	2023	• None	NA	NA	NA
Thusong & Thutong	2018	• None	NA	NA	NA
	2023	• Introduce a mini roundabout (for Soshanguve X8)	NA	0%	100%

Intersection	Year	Mitigation Measures	Responsibility		
			Gautrain	Tshwane	Development
Thaba Nkwe & Thutong	2018	• Introduce a mini roundabout (for Soshanguve X8)	NA	0%	100%
	2023	• None	NA	NA	NA

In the event of the event of Tshwane not able to meet its responsibilities as depicted in **Table 11** above, the developer could be requested to undertake the necessary improvements on behalf of Tshwane, the cost of such improvements are then to be deducted from the bulk contributions for roads and stormwater, for each particular phase of the development and applied within these financial constraints - therefore improvements that could be financially covered by each phase's contribution value. Since such improvements referred to here, are not the responsibility of the developer, such improvements are not linked to any specific phase of the project and could be completed at any stage of the development, as affordable by the developer.

It is therefore recommended that the improvements, (due to background traffic) mentioned in **Table 11** above, be completed at such a stage of the development (but before completion of the total development), as affordable by the developer and not exceeding the total amount available as bulk contributions for the total development. Where improvements mentioned in this report, have already been completed by the time of the signing of a Services Agreement between the developer and Tshwane, such improvements would be regarded as not applicable any more and therefore not part of any responsibility, whatsoever, to the developer.

8. ESTIMATED COST OF IMPROVEMENTS

The estimated cost of the improvements proposed in the assessment, is summarised in **Table 12** below.

TABLE 12: ESTIMATED COST OF IMPROVEMENTS

Intersection	Year	Estimated Value of Responsibility	
		Tshwane/Gautrans	Development
Welcome & Mokhetle (M43)	2018	R 272,500	R 247,500
	2023	R 0	R 1,198,000
Thusong & Thutong	2018	R 0	R 0
	2023	R 0	R 25,000
Thaba Nkwe & Thutong	2018	R 0	R 25,000
	2023	R 0	R 0
TOTAL	2018	R 272,500	R 272,500
	2023	R 0	R 1,198,000

9. RECOMMENDATIONS

Based on the findings of this study into the traffic conditions in the vicinity of the proposed development, it is recommended that this traffic impact study be accepted and the application for the development of **Soshanguve Extension 7 and Soshanguve Extension 8**, be approved subject to the following conditions:

- The **Developer** must comply with the access arrangements, parking requirements and road upgrades, which are the **Developer's** responsibility, as stated in the Traffic Impact Study. All such road improvements must be in place before a Section 82 or Section 101 certificate (as applicable) will be issued by the **Tshwane Metropolitan Municipality**.
- The minimum number of parking spaces to be provided on-site, are to be provided as indicated in the *"Parking Standards, PG 3/85 (second edition)"* published by the Department of Transport and Part 5 of the "*Tshwane Town-Planning Scheme 2008 (Revised 2014)*" of the Tshwane Metropolitan Municipality.
- All costs for the upgrading of the roads infrastructure and provision of access will be for the account of the responsible entity as indicated in the mitigation measures proposed in **Table 11** and must be discussed with the Section: Infrastructure Planning and Management to be incorporated where necessary, in the Services Agreement between the **Developer** and the **Tshwane Metropolitan Municipality**.
- A Site Development Plan indicating the access, is to be submitted for approval. If a security gate is to be used at the access point, it should be located in such a way that ample storage area is provided in order not to congest the road reserve, as proposed in the impact study.
- Access points and road upgrading of the road infrastructure will only be valid if all the geometric requirements that might be required by the Manager: Roads and Stormwater **Tshwane Metropolitan Municipality** can be met. The planning, design and construction of the access and road infrastructure shall be done in accordance with the latest specifications, and no work inside the road reserve may be done without written permission of the Division: Roads and Stormwater **Tshwane Metropolitan Municipality** obtained (for work involving metropolitan roads) and **Gautrans** (for work involving provincial roads).
- All design plans must be submitted to the Division: Roads and Stormwater **Tshwane Metropolitan Municipality** for approval and/or **Gautrans** as may be required.
- The needs of pedestrians should be taken into consideration in the planning and the design of the access to the development as well as the design of the road infrastructure.
- The requirements for public transport, as identified in the impact study, are to be provided for.
- The applicant will be responsible to obtain any additional road reserve that may be required for the provision of new roads or any additional lanes, applicable to this development.