Appendix G6

Traffic Impact Study

CIVIL CONCEPTS
Consulting Civil and Structural Engineers

Kale Developments (Pty) Ltd

C2284/01TIA

Proposed Residential Development on Erven 1130 and 1131, Ormonde Extension 24 in Johannesburg

Traffic Impact Assessment

November 2016

REPORT SHEET

PROJECT TITLE: PROPOSED RESIDENTIAL DEVELOPMENT ON ERVEN 1130 AND 1131, ORMONDE EXTENSION 24 IN JOHANNESBURG

TRAFFIC IMPACT ASSESSMENT

PREPARED FOR: KALE DEVELOPMENTS (PTY) LTD

PREPARED BY: CIVIL CONCEPTS (PTY) LTD

PROJECT TEAM:

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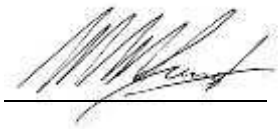
V1				
V2				

DECLARATION

I certify that this study has been prepared under my immediate supervision and that I have experience and training in the field of traffic and transportation engineering.

Signed: 

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EXECUTIVE SUMMARY

A residential development is proposed on Erven 1130 and 1131, Ormonde Extension 24, to be located in the south-western part of the City of Johannesburg Metropolitan Municipality (CoJ) comprising of **192** "Residential 3" dwelling units.

The developer has three (3) other development sites in the close proximity of Erven 1130 and 1131 and form part of the study area. The developer might construct any of the development sites before Erven 1130 and 1131. Civil Concepts (Pty) Ltd prepared separate traffic studies for each site (three (3) other development sites):

- A residential development on Erven 962 and 963;
- A residential development on Erf 982; and
- A residential development on Erven 1010 and 1011.

The Traffic Impact Assessment of Erven 1130 and 1131 was prepared lastly and takes into consideration the above-mentioned developments as latent rights. Erven 1130 and 1131 development site will contribute towards the ultimate road upgrades proposed (refer to **ANNEXURE F**).

This Traffic Impact Assessment (TIA) has been prepared to determine the impact of the development trips on the surrounding road network. This study is prepared in accordance with the Committee of Transport Officials (COTO) TMH17 – Trip Data Manual, COTO TMH16 – Traffic Impact and Site Traffic Assessment Standards and Requirements Manual, Department of Transport's Manual for Traffic Impact Studies (Document RR 93/635), COTO TRH26 – South African Road Classification and Access Management Manual and Requirements Manual and the 2010 Highway Capacity Manual.

The development will generate **163** trips during both the weekday morning and afternoon peak hours, respectively.

The base year (2017) and horizon year (2022) are analysed as part of this study, respectively.

The following studies done by Civil Concepts (Pty) Ltd, dated November 2016 (report no. C2284/01TIA) were considered as latent rights:

- The TIA done for the proposed residential development on Erven 962 and 963, Ormonde Extension 22;

- The TIA done for the proposed residential development on Erven 1010 and 1011, Ormonde Extension 22; and
- The Traffic Impact Statement (TISm) done for the proposed residential development on Erf 982, Ormonde Extension 22.

Seven (7) junctions were analysed in this study using the SIDRA 5.0 Intersection software program. The following junctions were analysed:

- Dorado Avenue / Alwen Road;
- Akker Avenue / Alwen Road / Shakespeare Avenue;
- Akker Avenue / Chamfuti Crescent North;
- Akker Avenue / Chamfuti Crescent South;
- Akker Avenue / Msasa Crescent;
- Akker Avenue / Milkwood Road; and
- Akker Avenue / Proposed Access.

Six (6) of the seven (7) junctions analysed will operate satisfactorily during the 2017 and 2022 weekday morning and afternoon peak hour background with development traffic scenario with the proposed road upgrades in place as shown in **Section 9** of this report.

Akker Avenue / Alwen Road / Shakespeare Avenue junction will experience capacity problems during the 2022 weekday morning peak hour background with development traffic scenario with the proposed road upgrades in place. It will however operate the same when compared to the 2022 weekday morning peak hour background traffic scenario.

The proposed road upgrades are for the developer's account.

No public transport facilities are proposed.

Pedestrian walkways have to be provided along the site frontage by the developer to the satisfaction of the Johannesburg Road Agency (JRA) and CoJ.

1. INTRODUCTION

1.1 Background

Civil Concepts (Pty) Ltd was appointed by Kale Developments (Pty) Ltd to prepare a Traffic Impact Assessment (TIA) in support of a proposed residential development on Erven 1130 and 1131, Ormonde Extension 24 in Johannesburg.

The proposed development will consist of **192** "Residential 3" dwelling units.

The developer has three (3) other development sites in the close proximity of Erven 1130 and 1131 and form part of the study area. The developer might construct any of the development sites before Erven 1130 and 1131. Civil Concepts (Pty) Ltd prepared separate traffic studies for each site (three (3) other development sites):

- A residential development on Erven 962 and 963;
- A residential development on Erf 982; and
- A residential development on Erven 1010 and 1011.

The Traffic Impact Assessment of Erven 1130 and 1131 was prepared lastly.

The site is located to the south of Akker Avenue and it is bordered by Milkwood Road along the western boundary in Ormonde as shown in Figure 1.1.

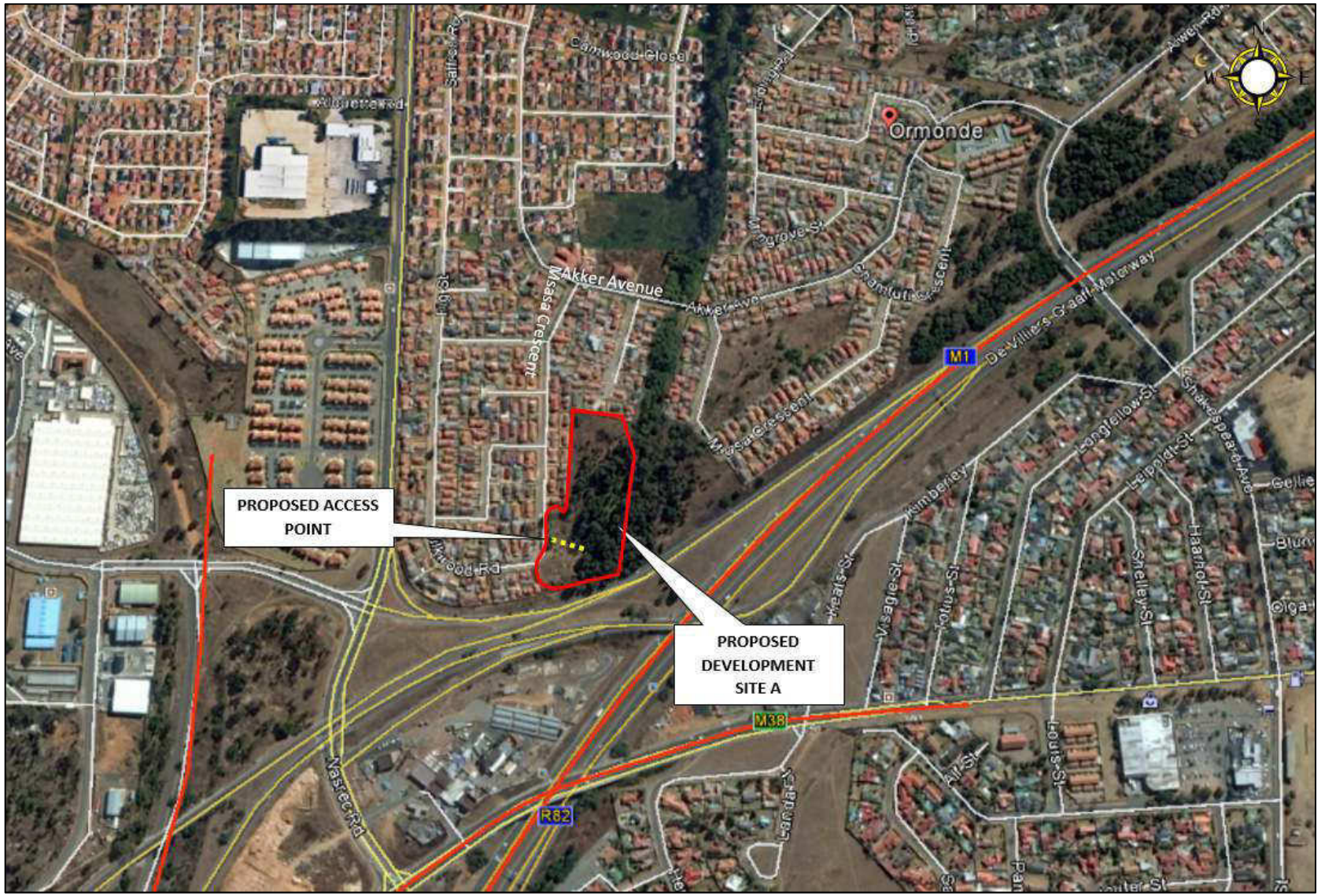


Figure 1.1: Locality Plan

The objective of this study is to determine the impact of the development trips on the adjacent road network. The land use rights and trip generation are described first. This is followed by a description of the existing and proposed traffic volumes and the road network. The traffic operations at the junctions are calculated and upgrading proposals are made. Conclusions and recommendations are made at the end of the report.

1.2 Definitions

The following definitions from the 2010 Highway Capacity Manual are applicable to this report:

Level of Service (LOS)

Level of Service is defined in terms of delay. Delay is a measure of driver discomfort, frustration, fuel consumption and lost travel time. The levels of Service for junctions as defined in the 2010 Highway Capacity Manual are shown in Table 1.1.

TABLE 1.1: LEVEL OF SERVICE DEFINITIONS

Level of Service	Control delay per vehicle (s/veh)	
	Signalised junctions	Unsignalised junctions
A	< 10	< 10
B	10 to 20	10 to 15
C	20 to 35	15 to 25
D	35 to 55	25 to 35
E	55 to 80	35 to 50
F	> 80	> 50

Capacity

The maximum hourly rate at which vehicles can reasonably be expected to traverse a lane or roadway during a given period under prevailing roadway, traffic and control conditions.

Volume

The hourly rate (v/h), the actual flow rate for an approach or lane.

Volume to capacity ratio (V/C)

The ratio of flow to capacity.

1.3 Time Horizon

The base year (2017) and horizon year (2022) are analysed as part of this study.

The weekday morning and afternoon peak hours are analysed.

1.4 Determination of Road Upgrading

The Department of Transport's Manual for Traffic Impact Studies (Document RR 93/635) states:

"The recommended criteria that should be used to measure the level of upgrading/ improvement required, is the LOS and the v/c ratio.

In urban areas it is recommended that either of the following two LOS be used to determine whether an intersection should be upgraded, on condition that the contribution of the proposed development is at least 2% of the sum of the critical volume on a lane basis of the intersection assessed:

All elements of an intersection should operate at LOS D or better and a v/c ratio less than 0.95 during the peak hour of the roadway system.

In areas where the baseline LOS is E or worse, or the v/c ratio is greater than 0.95, this baseline (i.e. prior to development) LOS must be maintained or improved for the situation with the development included. The baseline LOS includes all committed (funded) road improvements and all non-site traffic (including existing site traffic) but exclude the additional traffic that will be generated by the proposed development.

It should, however, be debated whether an application should be approved if the baseline LOS is E or worse and it is not practical to upgrade the intersection any further. Engineering judgement should further be used in the case of the LOS of specifically right turning movements across high opposing traffic volumes at signalised intersections, due to the number of vehicles that are turning during the intergreen period / typically between 1 to 4 vehicles per cycle, depending on the intersection layout. It is not realistic to upgrade an intersection if a small number of right turning vehicles experience a LOS E or F. The same is also true if a level of service E/F is experienced by a small number of vehicles entering a major road from a minor road.

The determination of the necessary upgrading and improvement to the road infrastructure needs to be determined for the "with" and "without-development"

scenarios for the opening year and the horizon years(s). The following procedure should be followed to determine the necessary road upgrading:

Calculate the LOS, v/c ratios and the site traffic as a percentage of the critical flows at the intersection for every scenario.
If the LOS is worse than LOS D for the with-development scenario but not for the without-development scenario, the developer is responsible for all the required road upgrading.

If the LOS is worse than D for the with- and without-development scenarios, the developer is only responsible for the incremental upgrading to obtain the same LOS and v/c ratio as for the without-development scenario."

2. TRIP GENERATION AND ASSIGNMENT

2.1 Introduction

The proposed land use rights of the site are described first. This is followed by the trip generation of the proposed rights. Trip distributions and assignments are then provided.

2.2 Proposed Rights

The proposed land use rights are shown in Table 2.1.

TABLE 2.1: PROPOSED LAND USE RIGHTS

Erven	Land Use	Extent (ha)	Unit/ha	No. Units
1130	"Residential 3"	0.615	113 unit /ha	70
1131		1.0429		118
Total				**192**

A copy of the Township Layout Plan is included in **ANNEXURE A**.

The memorandum concerning the proposed Erven 1130 and 1131, Ormonde Extension 24as per the CoJ Town-Planning Scheme are included in **ANNEXURE B.**

2.3 Trip Generation

2.3.1 Introduction

The trip rates prescribed in the Committee of Transport Officials' (COTO) TMH 17 - Trip Data Manual, Version 1.0 (dated September 2013) were used to calculate the development trips.

No trip reductions were considered in this study.

The weekday morning and afternoon peak hours were analysed.

2.3.2 Trip Generation

The weekday morning and afternoon peak hour trip generations are shown in Tables 2.2 and 2.3, respectively.

TABLE 2.2: WEEKDAY MORNING PEAK HOUR TRIP GENERATION

Land Use	Extent	Trip Rate / Unit	Directional Split		Trips		
			In	Out	In	Out	Total
"Residential 3"	192 Units	0.85	25%	75%	41	122	163
				TOTAL	**41**	**122**	**163**

TABLE 2.3: WEEKDAY AFTERNOON PEAK HOUR TRIP GENERATION

Land Use	Extent	Trip Rate / Unit	Directional Split		Trips		
			In	Out	In	Out	Total
"Residential 3"	192 Units	0.85	70%	30%	114	49	163
				TOTAL	**114**	**49**	**163**

2.4 Trip Distribution and Assignments

The road network, trip distribution, assignment and the development framework information of the study area are shown on schematic diagrams as required in TMH 16 South African Traffic Impact and Site Traffic Assessment Manual, Version 1.0, August 2012 (refer to Figures 2.1 and 2.2 and 3.1 to 3.22 for the schematic diagrams).

The proposed development trips were distributed and assigned to the adjacent road network based on the expected origins and destinations to and from the subject site.

The weekday morning and afternoon peak hour residential development trip distributions and assignments are shown in Figures 2.1 and 2.2, respectively.

3. TRAFFIC AND THE ROAD NETWORK

3.1 Traffic Counts

A weekday morning and afternoon peak hour classified traffic count survey was carried out on 19 October 2016 by Trafsol Data Specialists at the following junctions:

- Dorado Avenue / Alwen Road;
- Akker Avenue / Alwen Road / Shakespeare Avenue;
- Akker Avenue / Chamfuti Crescent North;
- Akker Avenue / Chamfuti Crescent South; and
- Akker Avenue / Msasa Crescent.

The classified traffic counts were converted to Passenger Car Units (PCUs) using the following factors:

- 1 for a car;
- 1.5 for a taxi; and
- 3 for heavies (buses and trucks).

The weekday morning and afternoon peak hour traffic counts (PCUs) are shown in Figures 3.1 and 3.2, respectively.

3.2 Traffic Volumes

3.2.1 2017 Traffic Volumes

The 2016 weekday morning and afternoon peak hour traffic counts (PCUs) were escalated at a 3% annual growth rate over 1 year to obtain the 2017 peak hour traffic volumes.

The 2017 weekday morning and afternoon peak hour traffic volumes are shown in Figures 3.3 and 3.4, respectively.

3.2.2 2022 Traffic Volumes

The 2016 weekday morning and afternoon peak hour traffic counts (PCUs) were escalated at a 3% annual growth rate over 6 years to obtain the 2022 peak hour traffic volumes.

The 2022 weekday morning and afternoon peak hour traffic volumes are shown in Figures 3.5 and 3.6, respectively.

3.3 Latent Rights

The following studies done by Civil Concepts (Pty) Ltd, dated November 2016 (report no. C2284/01TIA) were considered as latent rights:

- The TIA done for the proposed residential development on Erven 962 and 963, Ormonde Extension 22;
- The TIA done for the proposed residential development on Erven 1010 and 1011, Ormonde Extension 22; and
- The TISm done for the proposed residential development on Erf 982, Ormonde Extension 22.

Erven 962 and 963, Ormonde Extension 22 weekday morning and afternoon peak hour latent development trips are shown in Figures 3.7 and 3.8, respectively.

Erven 1010 and 1011, Ormonde Extension 22 weekday morning and afternoon peak hour latent development trips are shown in Figures 3.9 and 3.10, respectively.

Erf 982, Ormonde Extension 22 weekday morning and afternoon peak hour latent development trips are shown in Figures 3.11 and 3.12, respectively.

The weekday morning and afternoon peak hour total latent development trips are shown in Figures 3.13 and 3.14, respectively.

3.4 Background Traffic

3.4.1 2017 Background Traffic Volumes

The weekday morning and afternoon peak hour latent trips were added to the 2017 weekday morning and afternoon peak hour traffic volumes to obtain the 2017 peak hour background traffic volumes.

The 2017 weekday morning and afternoon peak hour background traffic volumes are shown in Figures 3.15 and 3.16, respectively.

3.4.2 2022 Background Traffic Volumes

The weekday morning and afternoon peak hour latent trips were added to the 2022 weekday morning and afternoon peak hour traffic volumes to obtain the 2022 peak hour background traffic volumes.

The 2022 weekday morning and afternoon peak hour background traffic volumes are shown in Figures 3.17 and 3.18, respectively.

3.5 Background and Development Traffic

3.5.1 2017 Background and Development Traffic Volumes

The weekday morning and afternoon peak hour development trips were added to the 2017 background peak hour volumes to obtain the 2017 background and development peak hour traffic volumes.

The 2017 weekday morning and afternoon peak hour background and development traffic volumes are shown in Figures 3.19 and 3.20, respectively.

3.5.2 2022 Background and Development Traffic Volumes

The weekday morning and afternoon peak hour development trips were added to the 2022 background peak hour volumes to obtain the 2022 background and development peak hour traffic volumes.

The 2022 weekday morning and afternoon peak hour background and development volumes are shown in Figures 3.21 and 3.22, respectively.

3.6 Road Network

3.6.1 Existing Road Network – *According to the Gauteng Strategic Major Road Network Master plan and the CoJ Regional Road Master Plan*

- **Shakespeare Avenue** can be assumed to be a class 5b (residential) local street that lies to the north and east of the development site. It runs in a north-south and east-west direction.

- **Alwen Road** can be assumed to be a class 5b (residential) local street that lies to the north of the development site and runs in a north-south direction. It intersect with Shakespeare Avenue and Dorado Avenue to the north-east.

- **Dorado Avenue** can be assumed to be a class 5b (residential) local street that lies to the north of the development site and runs in a north-south direction. This road starts at its intersection with Alwen Road.

- **Akker Avenue** can be assumed to be a class 5b (residential) local street that lies to the north of the development site and runs in an east-west and north-south direction.

- **Chamfuti Crescent** can be assumed to be a class 5b (residential) local street that lies to the north-east of the development.

- **Msasa Crescent** can be assumed to be a class 5b (residential) local street that borders the development site to the east.

3.6.2 Future Road Network

There are no proposed roads within the vicinity of the development site.

3.6.3 Proposed Upgrading of the Road Network

Refer to **Section 9** of this report for the existing and proposed upgraded junction configurations.

4. SITE INVESTIGATION

A site visit was done on 19 October 2016 to determine the existing lane configurations of the junctions analysed in this study and to observe the existing traffic operations. Refer to Figures 4.1 to 4.5 below.

- **Dorado Avenue / Alwen Road**

Figure 4.2: Dorado Avenue / Alwen Road junction configuration

The junction is priority controlled. There are no pedestrian crossings or walkways at this junction which creates an unsafe hazards for pedestrians. The road surface is in good condition and road markings are visible at all approaches to the junction.

- **Akker Avenue / Alwen Road / Shakespeare Avenue**

Figure 4.1: Akker Avenue / Alwen Road / Shakespeare Avenue configuration

The junction is signalised. There are no pedestrian crossings on all approaches. There are existing pedestrian walkways along the western side of Alwen Road at this junction.

The road surface is in good condition and road markings are visible at all approaches to the junction.

- **Akker Avenue / Chamfuti Crescent North and South**

Figure 4.3: Akker Avenue / Chamfuti Crescent North and South configurations

The junctions are priority controlled. There are no pedestrian walkways at both junctions but there is a visible pedestrian crossing sign at the Chamfuti Crescent South junction. The road surface is in good condition and road markings are visible at all approaches to the junction.

- **Akker Avenue / Msasa Crescent**

Figure 4.4: Akker Avenue / Msasa Crescent junction configuration

The junction is priority controlled. There are no pedestrian walkways at the junction which creates an unsafe hazards for pedestrians. The road surface is in good condition and road markings are visible at all approaches to the junction.

- **Akker Avenue / Milkwood Road**

Figure 4.4: Akker Avenue / Milkwood Road junction configuration

The junction is priority controlled. There is an existing pedestrian crossing line at the junction. The road surface is in good condition and road markings are visible at all approaches to the junction.

5. TRAFFIC OPERATIONS

5.1 Introduction

The SIDRA Intersection 5.0 software program was used for the capacity analysis of the following junctions:

- Akker Avenue / Alwen Road / Shakespeare Avenue;
- Dorado Avenue / Alwen Road;
- Akker Avenue / Chamfuti Crescent North;
- Akker Avenue / Chamfuti Crescent South;
- Akker Avenue / Msasa Crescent;
- Akker Avenue / Milkwood Road; and
- Msasa Crescent / Proposed Access.

The average capacity results per junction are given in this section, however in accordance with Section 3.3.2 of the TMH16 Volume 2 – South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual (Version 1.0, August 2012) as published by the Committee of Transport Officials (COTO), detailed capacity analysis results for all individual movements of the junctions are provided in ANNEXURE C of this report.

The pedestrian clearance times were checked at the signalised junction.

5.2 Background Traffic

5.2.1 2017 Background Traffic

The optimised signal timings used to accommodate the background and development traffic for Erven 962 and 962, Ormonde extension 22 were used for the Akker Avenue / Alwen Road / Shakespeare Avenue junction and the optimised signal timings used to accommodate the background and development traffic for Erven 1010 and 1011, Ormonde extension 22 were used for the Dorado Avenue / Alwen Road junction.

The existing signal timings are shown in Table 5.1.

Detailed phasings and timings of the traffic signals are included in **ANNEXURE D**.

TABLE 5.1 2017 BACKGROUND TRAFFIC PEAK HOUR EXISTING SIGNAL TIMINGS

SIGNALISED JUNCTION	PEAK HOUR	SIGNAL TIMINGS (SEC)												CYCLE
		PHASE A			PHASE B			PHASE C			PHASE D			
		G	A	R	G	G	G	G	A	R	G	A	R	
Akker Avenue / Alwen Road / Shakespeare Avenue	AM	30	3	2	20	3	2	-	-	-	-	-	-	60 sec
	PM	19	3	2	15	3	2	11	3	2	-	-	-	60 sec
Dorado Avenue / Alwen Road	AM	17	3	2	23	3	2	13	3	2	-	-	-	65 sec
	PM	7	3	2	38	3	2	7	3	2	-	-	-	70 sec

Legend: G = Green,
A= Amber,
R = Red

The average capacity calculation results are shown in Table 5.2.

Detailed capacity calculation results are included in **ANNEXURE C**.

TABLE 5.2: 2017 BACKGROUND TRAFFIC CAPACITY CALCULATION RESULTS

JUNCTION			WEEKDAY AM PEAK HOUR	WEEKDAY PM PEAK HOUR
SIGNALISED	Akker Avenue / Alwen Road / Shakespeare Avenue	V/C ratio	0. 934	0.777
		LOS	C	B
		Delay (sec/veh)	22.7	17.1
PRIORITY CONTROLLED	Dorado Avenue / Alwen Road	V/C ratio	0.666	0.773
		LOS	B	B
		Delay (sec/veh)	12.9	18.7
	Akker Avenue / Chamfuti Crescent North	V/C ratio	0.351	0.263
		LOS	N/A	N/A
		Delay (sec/veh)	-	-
	Akker Avenue / Chamfuti Crescent South	V/C ratio	0.470	0.224
		LOS	N/A	N/A
		Delay (sec/veh)	-	-
	Akker Avenue / Msasa Crescent	V/C ratio	0.677	0.215
		LOS	N/A	N/A
		Delay (sec/veh)	-	-
	Akker Avenue / Milkwood Road	V/C ratio	0.252	0.082
		LOS	N/A	N/A
		Delay (sec/veh)	-	-

Legend: V/C ratio = Volume to capacity ratio
LOS = Level of Service

N/A = The average junction delay is not a good LOS measure for a priority control junction due to zero delays associated with major road movements.

All five junctions analysed will operate satisfactorily during the 2017 weekday morning and afternoon peak hour background traffic scenario.

5.2.2 2022 Background Traffic

The optimised signal timings are shown in Table 5.3.

Detailed phasings and timings of the traffic signals are included in **ANNEXURE D**.

TABLE 5.3: 2022 BACKGROUND TRAFFIC PEAK HOUR EXISTING SIGNAL TIMINGS

SIGNALISED JUNCTION	PEAK HOUR	SIGNAL TIMINGS (SEC)												CYCLE LENGTH
		PHASE A			PHASE B			PHASE C			PHASE D			
		G	A	R	G	G	G	G	A	R	G	A	R	
Akker Avenue / Alwen Road / Shakespeare Avenue	AM	7	3	2	41	3	2	17	3	2	-	-	-	80 sec
	PM	7	3	2	25	3	2	13	3	2	-	-	-	60 sec
Dorado Avenue / Alwen Road	AM	18	3	2	27	3	2	7	3	2	-	-	-	70 sec
	PM	7	3	2	48	3	2	7	3	2	-	-	-	80 sec

Legend: G = Green,
A= Amber,
R = Red

The average capacity calculation results are shown in Table 5.4.

Detailed capacity calculation results are included in **ANNEXURE C**.

TABLE 5.4: 2022 BACKGROUND TRAFFIC CAPACITY CALCULATION RESULTS

JUNCTION			WEEKDAY AM PEAK HOUR	WEEKDAY PM PEAK HOUR
SIGNALISED	Akker Avenue / Alwen Road / Shakespeare Avenue	V/C ratio	**1.000**	0.925
		LOS	D	B
		Delay (sec/veh)	42.9	14.6
PRIORITY CONTROLLED	Dorado Avenue / Alwen Road	V/C ratio	0.918	0.4800
		LOS	B	C
		Delay (sec/veh)	14.0	21.0
	Akker Avenue / Chamfuti Crescent North	V/C ratio	**1.105**	0.286
		LOS	N/A	N/A
		Delay (sec/veh)	-	-
	Akker Avenue / Chamfuti Crescent South	V/C ratio	0.351	0.241
		LOS	N/A	N/A
		Delay (sec/veh)	-	-
	Akker Avenue / Msasa Crescent	V/C ratio	0.789	0.235
		LOS	N/A	N/A
		Delay (sec/veh)	-	-
	Akker Avenue / Milkwood Road	V/C ratio	0.320	0.095
		LOS	N/A	N/A
		Delay (sec/veh)	-	-

Legend: V/C ratio = Volume to capacity ratio

LOS = Level of Service

N/A = The average junction delay is not a good LOS measure for a priority control junction due to zero delays associated with major road movements.

Two (2) of the six (6) junctions analysed will experience capacity problems during the 2022 weekday morning peak hour background traffic scenario.

5.3 Background and Development Traffic

5.3.1 2017 Background and Development Traffic

The signal timings used are optimised signal timings to accommodate the background and development traffic.

The proposed signal timings are shown in Table 5.5.

Detailed phasings and timings of the traffic signals are included in **ANNEXURE D.**

TABLE 5.5: 2017 BACKGROUND AND DEVELOPMENT TRAFFIC PEAK HOUR PROPOSED SIGNAL TIMINGS

SIGNALISED JUNCTION	PEAK HOUR	SIGNAL TIMINGS (SEC)												CYCLE LENGTH
		PHASE A						PHASE C			PHASE D			
		G		R	G	A	R	G	A	R	G	A	R	
Akker Avenue / Alwen Road / Shakespeare Avenue	AM	7	3	2	32	3	2	15	3	2	-	-	-	70 sec
	PM	22	3	2	16	3	2	7	3	2	-	-	-	60 sec
Dorado Avenue / Alwen Road	AM	17	3	2	23	3	2	13	3	2	-	-	-	65 sec
	PM	7	3	2	38	3	2	7	3	2	-	-	-	70 sec

Legend: G = Green,
A= Amber,
R = Red

The average capacity calculation results are shown in Table 5.6.

Detailed capacity calculation results are included in **ANNEXURE C**.

TABLE 5.6: 2017 BACKGROUND AND DEVELOPMENT TRAFFIC CAPACITY CALCULATION RESULTS

JUNCTION			WEEKDAY AM PEAK HOUR	WEEKDAY PM PEAK HOUR
SIGNALISED	Akker Avenue / Alwen Road / Shakespeare Avenue	V/C ratio	0. 923	0.859
		LOS	C	B
		Delay (sec/veh)	30.1	13.3
	Dorado Avenue / Alwen Road	V/C ratio	0.796	0.838
		LOS	B	C
		Delay (sec/veh)	14.9	21.9
PRIORITY CONTROLLED	Akker Avenue / Chamfuti Crescent North	V/C ratio	0.702	0.425
		LOS	A	A
		Delay (sec/veh)	8.9	8.1
	Akker Avenue / Chamfuti Crescent South	V/C ratio	0.351	0.280
		LOS	N/A	N/A
		Delay (sec/veh)	-	-
	Akker Avenue / Msasa Crescent	V/C ratio	0.498	0.331
		LOS	B	A
		Delay (sec/veh)	10.1	8.9
	Akker Avenue / Milkwood Road	V/C ratio	0.512	0.161
		LOS	N/A	N/A
		Delay (sec/veh)	-	-

TABLE 5.8: CONTINUED

JUNCTION			WEEKDAY AM PEAK HOUR	WEEKDAY PM PEAK HOUR
PRIORITY CONTROLLED	Milkwood Road / Proposed Access	V/C ratio	0.150	0.064
		LOS	N/A	N/A
		Delay (sec/veh)	-	-

Legend: V/C ratio = Volume to capacity ratio

LOS = Level of Service

N/A = The average junction delay is not a good LOS measure for a priority control junction due to zero delays associated with major road movements.

All six (6) junctions analysed will operate satisfactorily during the 2017 weekday morning and afternoon peak hour background with development traffic scenario with the proposed road upgrades in place (refer to **Section 9** of this report).

5.3.2 2022 Background and Development Traffic

The proposed signal timings are shown in Table 5.7.

Detailed phasings and timings of the traffic signals are included in **ANNEXURE D.**

TABLE 5.7: 2022 BACKGROUND AND DEVELOPMENT TRAFFIC PEAK HOUR PROPOSED SIGNAL TIMINGS

SIGNALISED JUNCTION	PEAK HOUR	SIGNAL TIMINGS (SEC)												CYCLE LENGTH
		PHASE A			PHASE B			PHASE C			PHASE D			
		G	A	R	G	A	R	G	A	R	G	A	R	
Akker Avenue / Alwen Road / Shakespeare Avenue	AM	7	3	2	40	3	2	18	3	2	-	-	-	80 sec
	PM	23	3	2	15	3	2	7	3	2	-	-	-	60 sec
Dorado Avenue / Alwen Road	AM	19	3	2	26	3	2	7	3	2	-	-	-	70 sec
	PM	7	3	2	48	3	2	7	3	2	-	-	-	80 sec

Legend: G = Green,

A= Amber,

R = Red

The average capacity calculation results are shown in Table 5.8.

Detailed capacity calculation results are included in **ANNEXURE C**.

TABLE 5.8: 2022 BACKGROUND AND DEVELOPMENT TRAFFIC CAPACITY CALCULATION RESULTS

JUNCTION			WEEKDAY AM PEAK HOUR	WEEKDAY PM PEAK HOUR
SIGNALISED	Akker Avenue / Alwen Road / Shakespeare Avenue	V/C ratio	**1.000**	0.948
		LOS	D	B
		Delay (sec/veh)	47.6	18.2
	Dorado Avenue / Alwen Road	V/C ratio	0.921	0.890
		LOS	B	C
		Delay (sec/veh)	16.5	28.1
PRIORITY CONTROLLED	Akker Avenue / Chamfuti Crescent North	V/C ratio	0.703	0.454
		LOS	A	A
		Delay (sec/veh)	9.1	8.1
	Akker Avenue / Chamfuti Crescent South	V/C ratio	0.421	0.297
		LOS	N/A	N/A
		Delay (sec/veh)	-	-
	Akker Avenue / Msasa Crescent	V/C ratio	0.526	0.352
		LOS	B	A
		Delay (sec/veh)	10.2	8.9
	Akker Avenue / Milkwood Road	V/C ratio	0.612	0.181
		LOS	N/A	N/A
		Delay (sec/veh)	-	-

TABLE 5.8: CONTINUED

JUNCTION			WEEKDAY AM PEAK HOUR	WEEKDAY PM PEAK HOUR
PRIORITY CONTROLLED	Milkwood Road / Proposed Access	V/C ratio	0.150	0.064
		LOS	N/A	N/A
		Delay (sec/veh)	-	-

Legend: V/C ratio = Volume to capacity ratio

LOS = Level of Service

N/A = Not Applicable

N/A = The average junction delay is not a good LOS measure for a priority control junction due to zero delays associated with major road movements.

Akker Avenue / Alwen Road / Shakespeare Avenue junction will experience capacity problems during the 2022 weekday morning peak hour background with development traffic scenario with the proposed road upgrades in place (refer to **Section 9** of this report). It will however operate the same when compared to the 2022 weekday morning peak hour background traffic scenario.

5.4 Capacity analysis comparison

5.4.1 V/C ratio comparison

The V/C ratio comparisons are shown in Table 5.9.

TABLE 5.9: BACKGROUND AND BACKGROUND WITH DEVELOPMENT V/C RATIO COMPARISON

JUNCTION	2017				2022			
	AM PEAK HOUR		PM PEAK HOUR		AM PEAK HOUR		PM PEAK HOUR	
	BG	BG+DEV	BG	BG+DEV	BG	BG+DEV	BG	BG+DEV
Akker Avenue / Alwen Road / Shakespeare Avenue	0.934	0.923	0.777	0.859	**1.000**	**1.000**	0.925	0.948
Dorado Avenue / Alwen Road	0.666	0.796	0.773	0.838	0.918	0.921	0.800	0.890
Akker Avenue / Chamfuti Crescent North	0.351	0.702	0.263	0.425	**1.105**	0.703	0.286	0.454
Akker Avenue / Chamfuti Crescent South	0.470	-	0.224	-	0.351	-	0.241	-
Akker Avenue / Msasa Crescent	0.677	0.478	0.215	0.331	0.789	0.526	0.235	0.352
Akker Avenue / Milkwood Road	0.252	0.512	0.082	0.161	0.320	0.612	0.095	0.181
Milkwood Road / Proposed Access	0.187	-	0.115	-	0.187	-	0.115	-

BG - Background Traffic Scenario

BG+DEV - *Background with Development Traffic Scenario*

Akker Avenue / Alwen Road / Shakespeare Avenue junction will experience capacity problems (v/c ratio>0.95) during the 2022 weekday morning peak hour background with development traffic scenario with the proposed road upgrades (refer to **Section 9** of this report). It will however operate the same when compared to the 2022 weekday morning peak hour background traffic scenario

5.4.2 Level of service (LOS) comparison

The level of service (LOS) comparison is shown in Table 5.10.

TABLE 5.10: BACKGROUND AND BACKGROUND WITH DEVELOPMENT LEVEL OF SERVICE (LOS) COMPARISON

JUNCTION	2017				2022			
	AM PEAK HOUR		PM PEAK HOUR		AM PEAK HOUR		PM PEAK HOUR	
	BG	BG+DEV	BG	BG+DEV	BG	BG+DEV	BG	BG+DEV
Akker Avenue / Alwen Road / Shakespeare Avenue	C	C	B	B	D	D	B	B
Dorado Avenue / Alwen Road	B	B	B	C	B	B	C	C
Akker Avenue / Chamfuti Crescent North	N/A	A	N/A	A	N/A	A	N/A	A
Akker Avenue / Chamfuti Crescent South	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Akker Avenue / Msasa Crescent	N/A	B	N/A	A	N/A	B	N/A	A
Akker Avenue / Milkwood Road	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Milkwood Road / Proposed Access	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

BG - Background Traffic Scenario

BG+DEV - *Background with Development Traffic Scenario*

N/A **-** *Not applicable*

All seven (7) junctions analysed will operate satisfactorily (LOS not worse than D) during the 2017 and 2022 weekday morning and afternoon peak hour background with development traffic scenario with the proposed road upgrades in place (refer to **Section 9** of this report).

5.4.3 Delay comparison

The delay comparison is shown in Table 5.11.

TABLE 5.11: BACKGROUND AND BACKGROUND WITH DEVELOPMENT DELAY COMPARISON

JUNCTION	2017				2022			
	AM PEAK HOUR		PM PEAK HOUR		AM PEAK HOUR		PM PEAK HOUR	
	BG	BG+DEV	BG	BG+DEV	BG	BG+DEV	BG	BG+DEV
Akker Avenue / Alwen Road / Shakespeare Avenue	22.7	30.1	17.1	16.3	42.9	47.6	14.6	18.2
Dorado Avenue / Alwen Road	12.9	14.9	18.7	21.9	14.0	16.5	21.0	28.1
Akker Avenue / Chamfuti Crescent North	-	8.9	-	8.1	-	9.1	-	8.1
Akker Avenue / Chamfuti Crescent South	-	-	-	-	-	-	-	-
Akker Avenue / Msasa Crescent	-	10.1	-	8.9	-	10.2	-	8.9
Akker Avenue / Milkwood Road	-	-	-	-	-	-	-	-
Milkwood Road / Proposed Access	-	-	-	-	-	-	-	-

BG **-** *Background Traffic Scenario*

BG+DEV **-** *Background with Development Traffic Scenario*

All seven (7) junctions analysed will operate satisfactorily (delay not longer than 55 seconds) during the 2017 and 2022 weekday morning and afternoon peak hour background with development traffic scenario with the proposed road upgrades in place (refer to **Section 9** of this report).

6. ACCESS

6.1 Introduction

Access to the proposed development site will be provided off Milkwood Road. The proposed access configuration is described below.

6.2 Access off Milkwood Road

The access to the proposed development site will be provided off Milkwood Road as a three legged priority controlled junction approximately 340 m south of the Akker Avenue / Milkwood Road junction as shown in Figure 6.1 below.

The access arrangement complies with TRH 26 South African Road Classification and Access Management Manual requirements, dated August 2012, Version 1.0.

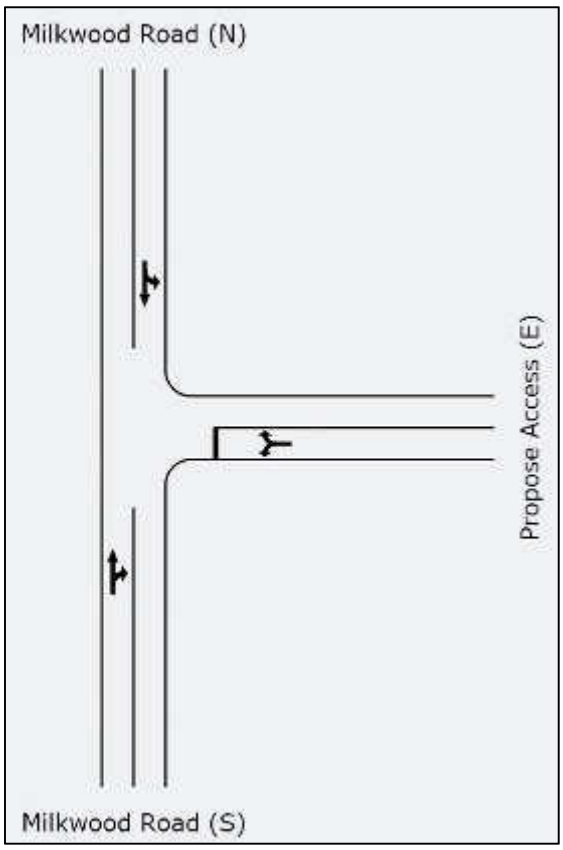


Figure 6.1: Milkwood Road / Proposed Access Configuration

6.3 Access Control

Storage lane length analysis was done at the proposed access point off Milkwood Road.

The proposed access to the residential development will be controlled by a coded card reader with a service rate of approximately 350 vehicles/hour.

The queue storage lane length calculations have been done using the anticipated development traffic and coded card reader service rate. The results show that there will be a queue of one (1) vehicle at the Milkwood Road access control point during the weekday morning or afternoon peak hour, 95% of the time. There is a 5% probability that the queue will exceed one (1) vehicle (refer to **ANNEXURE E** for calculations).

The results show that the number of lanes at the Milkwood Road access control point have to be provided as one (1) lane entering and one (1) lane exiting the development.

It is recommended that one (1) of the lanes be at least 4.5 m wide to accommodate emergency vehicles.

A summary of the queue storage lane length calculations is shown in Table 6.12 below.

TABLE 6.1: QUEUE STORAGE LANE LENGTH CALCULATION RESULTS

ACCESS	SERVICE RATE	NUMBER OF LANES ENTERING	STORAGE LANE REQUIRED	STORAGE LANE TO BE PROVIDED
Off Milkwood Road	350 veh/h	1	6 m	Min 10 m

7. PEDESTRIAN AND PUBLIC TRANSPORT ASSESSMENT

7.1 Pedestrian

There are paved pedestrian walkways at the Akker Avenue / Alwen Road / Shakespeare Avenue junction, along the western side of Alwen Road to the north and along the eastern side of Shakespeare Avenue to the south.

There is an existing pedestrian crossing line at the Akker Avenue / Milkwood Road junction.

There are no other pedestrian facilities that exist at the junctions that form part of this study.

It is recommended that pedestrian walkways be provided along the site frontage in consultation with the CoJ.

7.2 Public Transport

Taxis operate along Alwen Road.

There are no public transport facilities proposed.

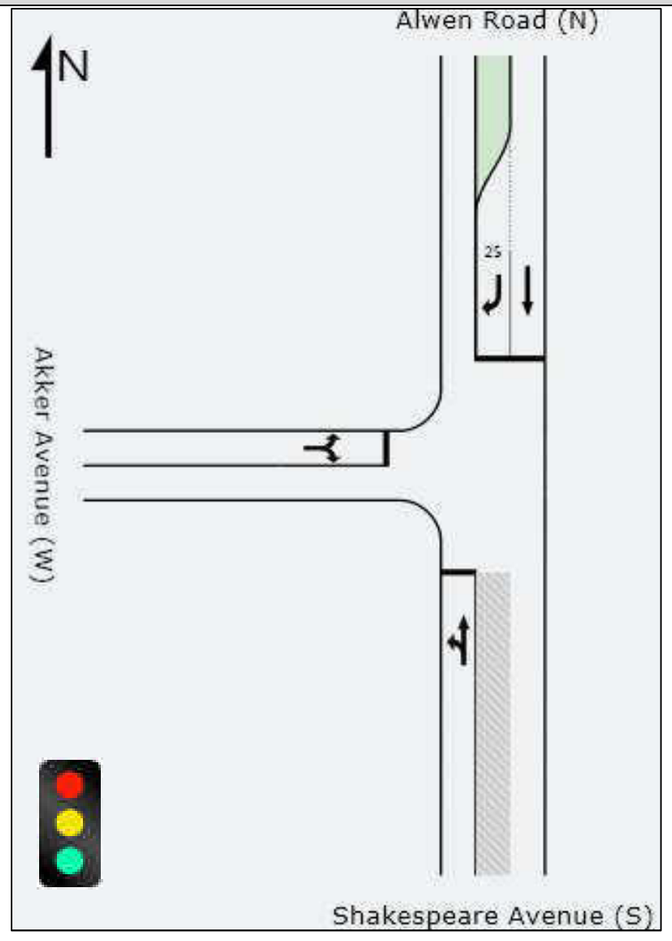
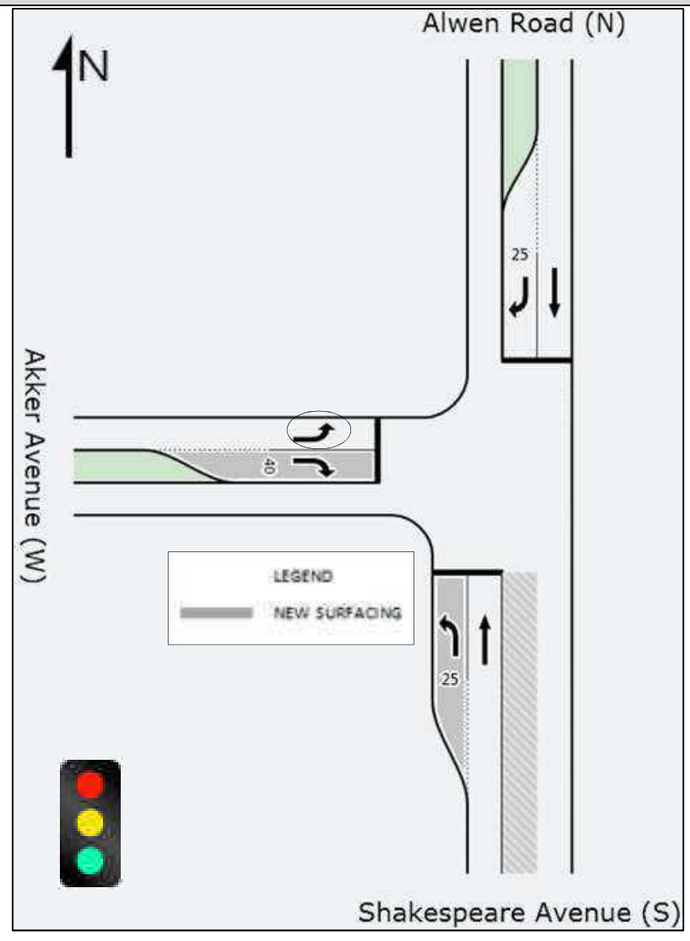
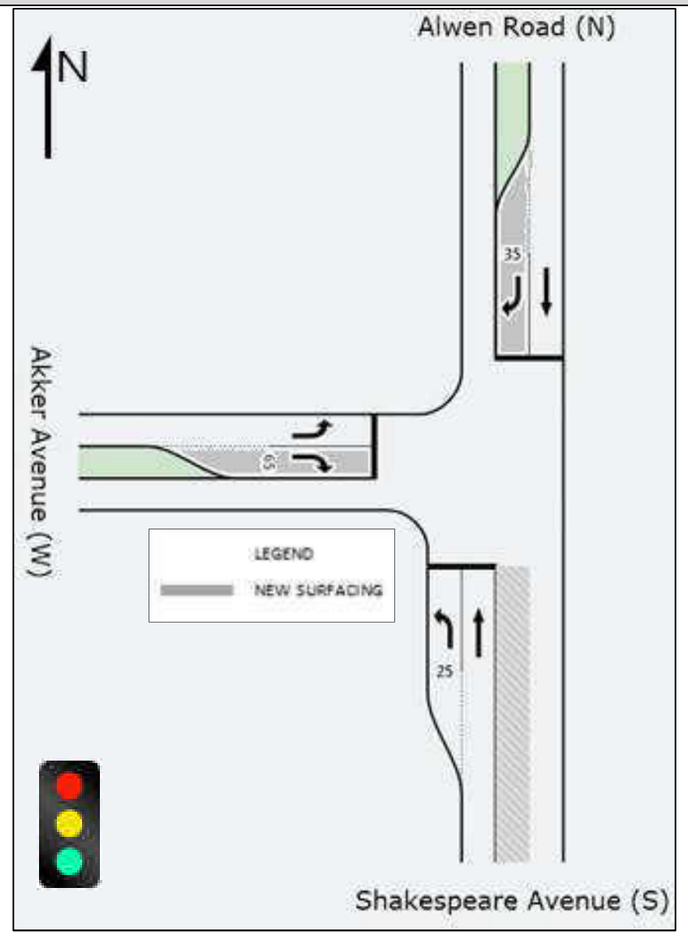
8. PARKING PROVISION

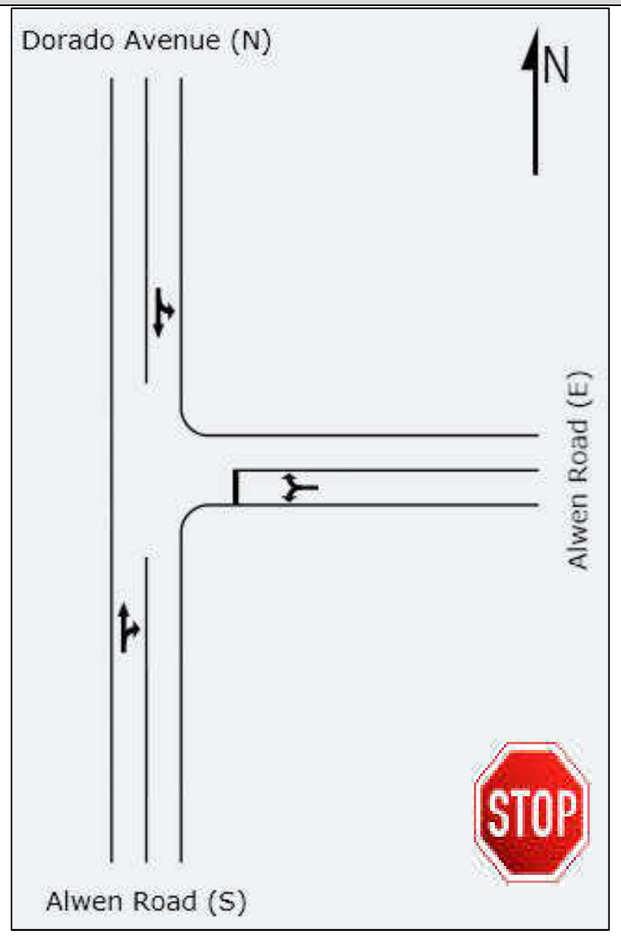
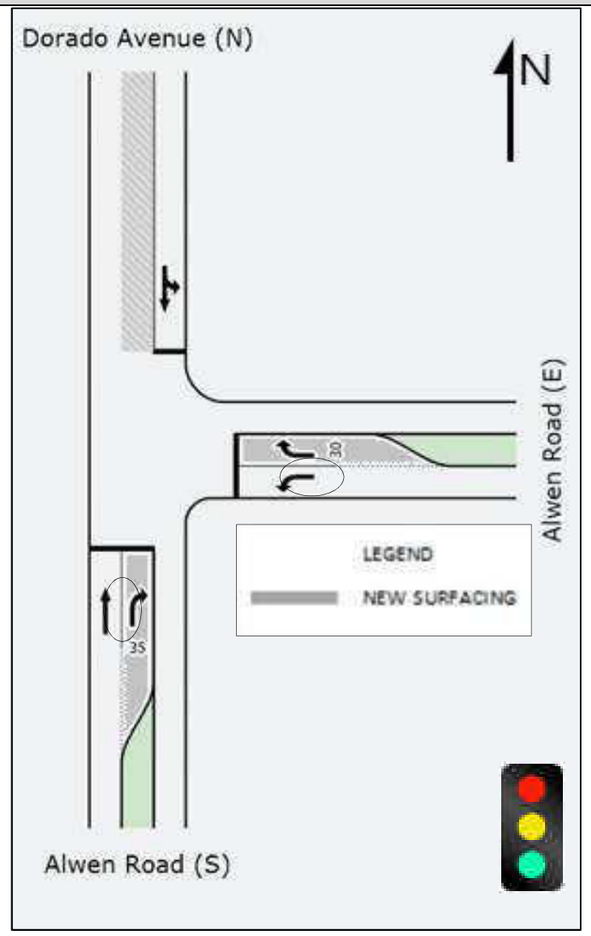
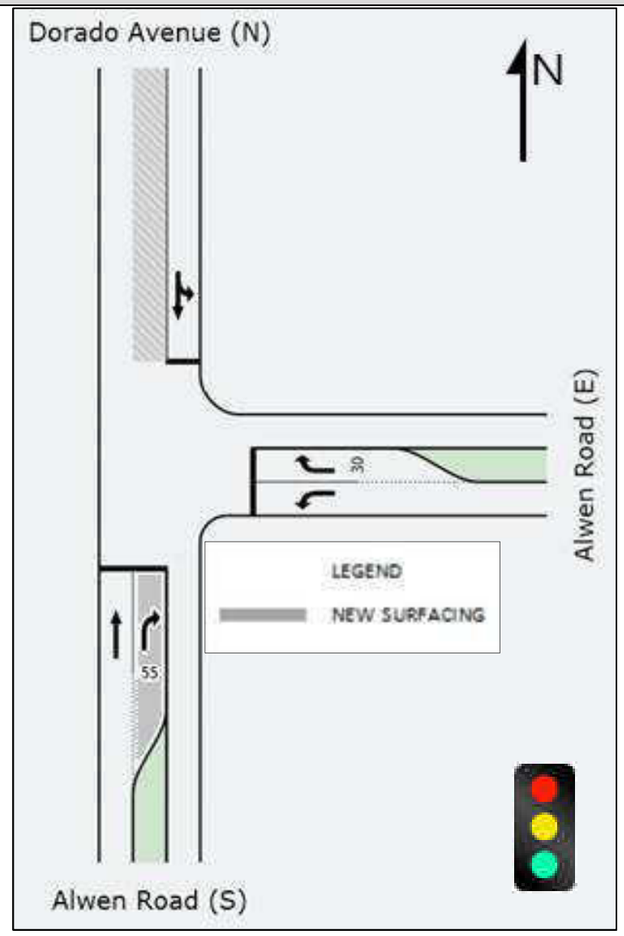
Parking will be provided within the site as required by the City of Johannesburg and in accordance with the Johannesburg Draft Consolidated Town Planning Scheme, 2010.

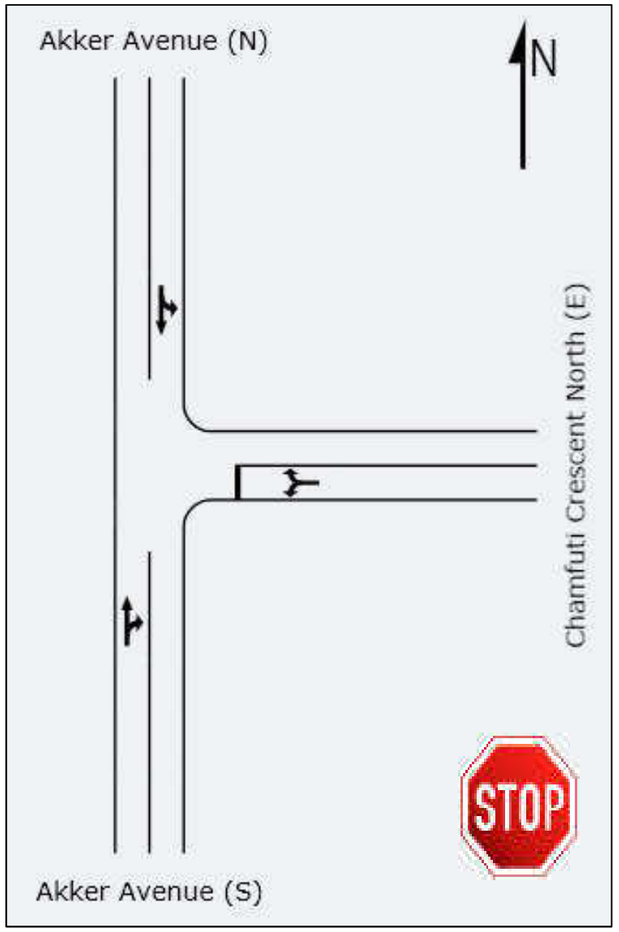
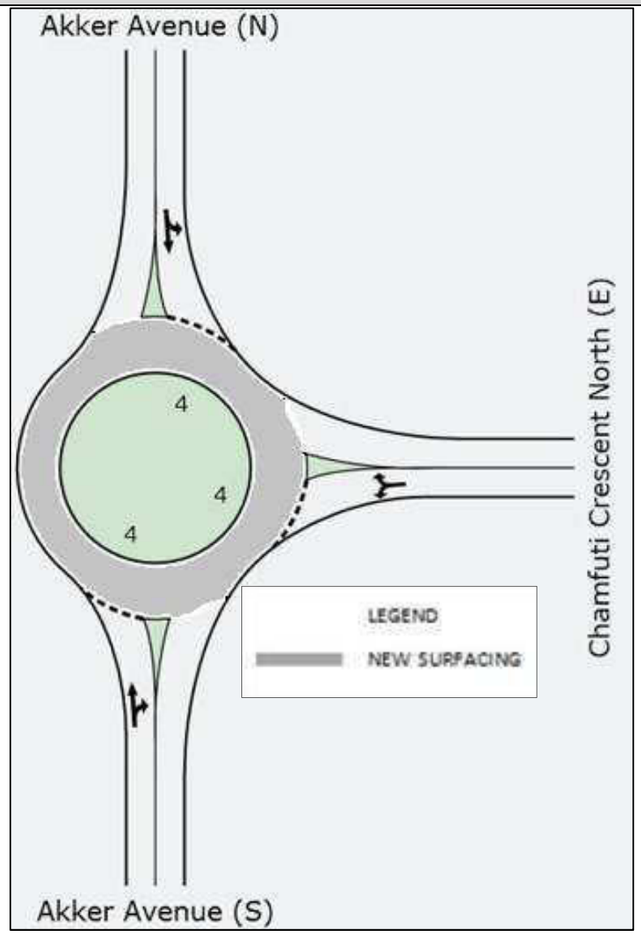
9. EXISTING AND PROPOSED JUNCTION CONFIGURATIONS

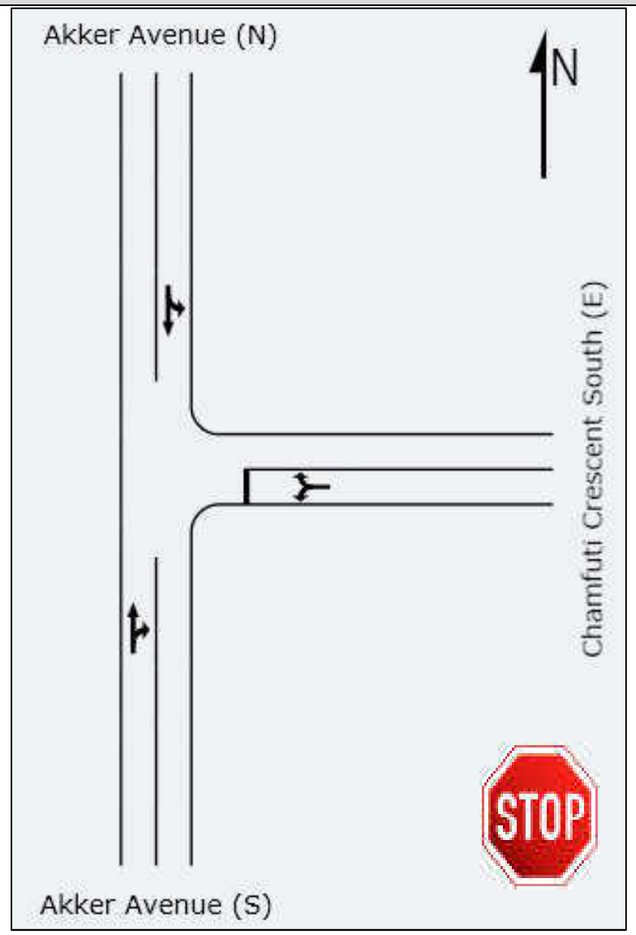
ORMONDE X24 PROPOSED RESIDENTIAL DEVELOPMENT (EXISTING AND PROPOSED CONFIGURATIONS)

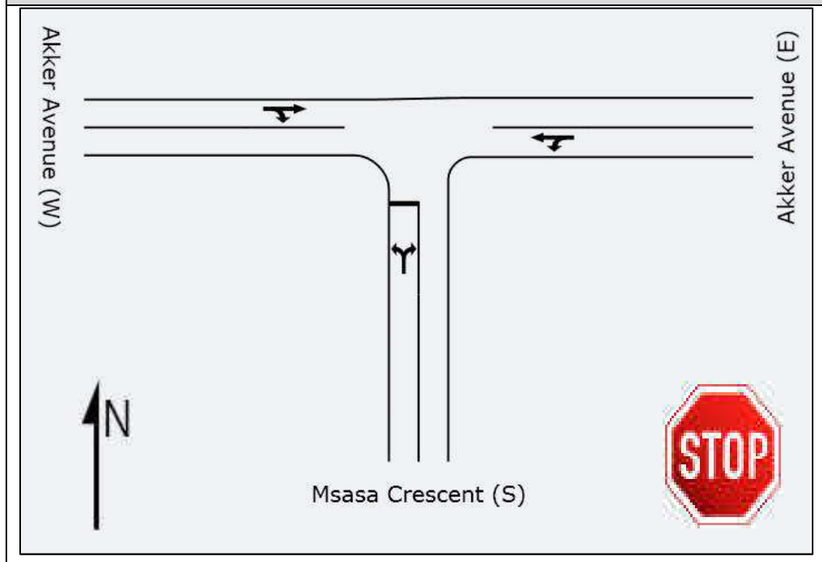
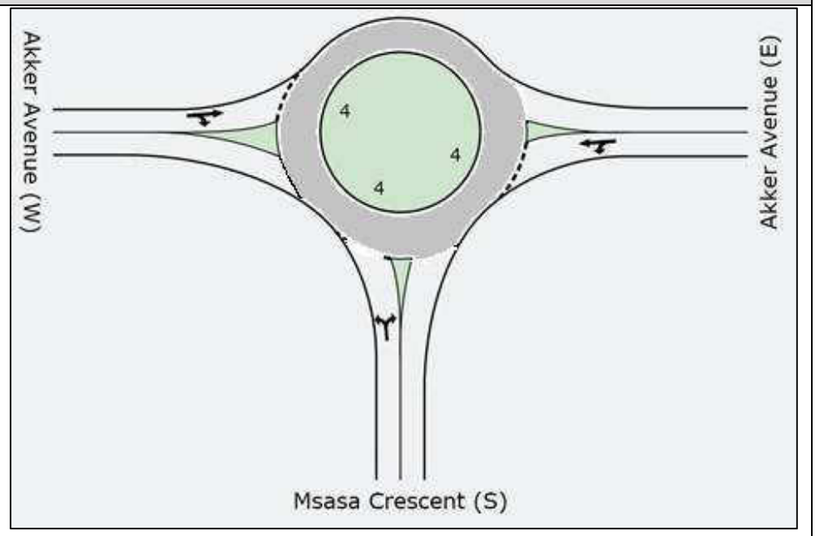
1. Akker Avenue / Alwen Road / Shakespeare Avenue

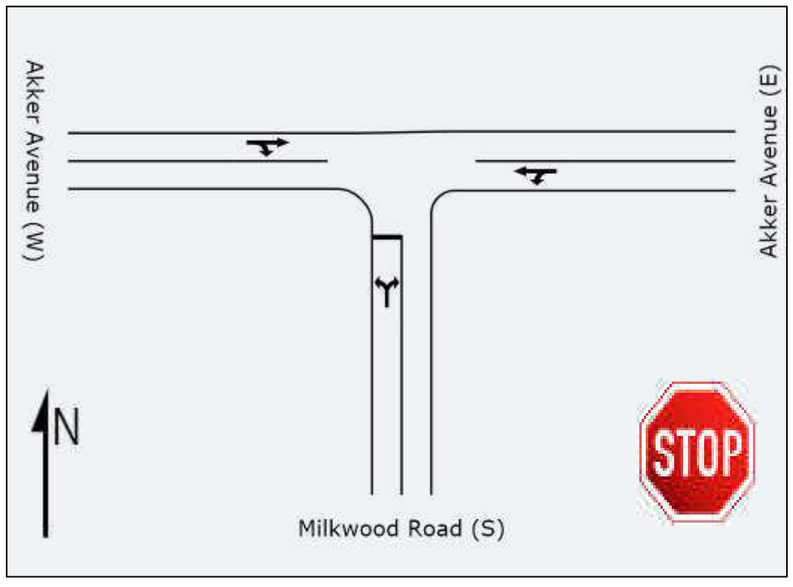
EXISTING	BACKGROUND: PROPOSED BY ERVERN 1010 AND 1011, ORMONDE EXT 22	BACKGROUND AND DEVELOPMENT
		
		The signal timings must be altered at this junction. WESTERN APPROACH The proposed exclusive right turn lane must be increased. WESTERN APPROACH The proposed exclusive right turn lane must be increased.

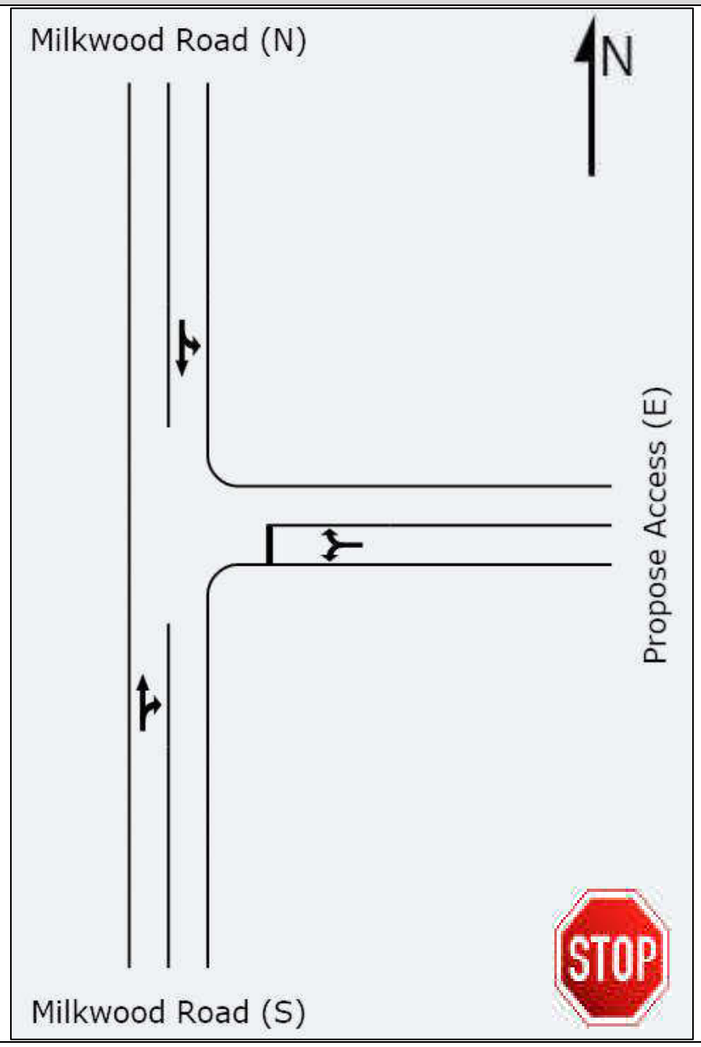
2. Dorado Avenue / Alwen Road		
EXISTING	BACKGROUND: PROPOSED BY ERVERN 963 AND 963, ORMONDE EXT 22	BACKGROUND AND DEVELOPMENT
		 SOUTHERN APPROACH The proposed exclusive right turn lane must be increased.

3. Akker Avenue / Chamfuti Crescent North		
EXISTING	BACKGROUND	BACKGROUND AND DEVELOPMENT
	**NO UPGRADES ARE REQUIRED**	 It is proposed that this junction be converted to a mini-circle.

4. Akker Avenue / Chamfuti Crescent South		
EXISTING	BACKGROUND	BACKGROUND AND DEVELOPMENT
	**NO UPGRADES ARE REQUIRED**	**NO UPGRADES ARE REQUIRED**

5. Akker Avenue / Msasa Crescent		
EXISTING	BACKGROUND	BACKGROUND AND DEVELOPMENT
	**NO UPGRADES ARE REQUIRED**	 It is proposed that this junction be converted to a mini-circle.

6. Akker Avenue / Milkwood Road		
EXISTING	BACKGROUND	BACKGROUND AND DEVELOPMENT
	**NO UPGRADES ARE REQUIRED**	**NO UPGRADES ARE REQUIRED**

7. Milkwood Road / Proposed Access		
EXISTING	BACKGROUND	BACKGROUND AND DEVELOPMENT
N/A	**N/A**	

Refer to **ANNEXURE F** for the proposed road upgrades layout plans.

10. FINANCE AND COST ESTIMATES

10.1 Total Improvement Cost Estimates

The cost estimate for the proposed total road upgrades at the following junctions (excluding VAT and professional fees):

- Akker Avenue / Alwen Road / Shakespeare Avenue is ±R.
- Dorado Avenue / Alwen Road is ±R;
- Akker Road / Chamfuti Crescent North is ±R; and
- Akker Avenue / Msasa Crescent is ±R.

The total amount to be payable is ±R.

Refer to **ANNEXURE G** for the cost estimates.

10.2 Contributions per Development

The contributions payable are shown in Table 10.1 below.

TABLE 10.1: BULK CONTRIBUTIONS

Development	Units	Trips	Contribution/ Trip	Total Contribution
Site B – Erven 962 and 963, Ormonde Extension 22	176	150		
Site C – Erven 1010 and 1011, Ormonde Extension 22	192	163		
Site D – Erf 982, Ormonde Extension 22	88	75		
Site E - Erven 1130 and 1131, Ormonde Extension 24	192	163		

Site D – Erf 982, Ormonde Extension 22 will not contribute towards the road upgrading for the Akker Avenue / Msasa Crescent junction since it will generate close to 0% trips on this junction, however it will have to contribute towards all the other three (3) junctions on the north.

11. CONCLUSIONS AND RECOMMENDATIONS

11.1 Conclusions

The proposed residential development site is located on Erven 1130 and 1131, Ormonde Extension 24 in Johannesburg.

The developer has three (3) other development sites in the close proximity of Erven 1130 and 1131 and form part of the study area. The developer might construct any of the development sites before Erven 1130 and 1131. Civil Concepts (Pty) Ltd prepared separate traffic studies for each site (three (3) other development sites):

- A residential development on Erven 962 and 963;
- A residential development on Erf 982; and
- A residential development on Erven 1010 and 1011.

The Traffic Impact Assessment of Erven 1130 and 1131 was prepared lastly and takes into consideration the above-mentioned developments as latent rights.

The proposed development will consist of **192** "Residential 3" dwelling units.

The development will generate **163** trips during both the weekday morning and afternoon peak hours, respectively.

The base year (2017) and the horizon year (2022) were considered in this study.

Access to the proposed development site will be off Milkwood Road.

Fix (6) of the seven (7) junctions analysed will operate satisfactorily for the 2017 and 2022 weekday morning and afternoon peak hour background with development traffic scenario with the proposed road upgrades in place as shown in **Section 9** of this report.

Akker Avenue / Alwen Road / Shakespeare Avenue junction will experience capacity problems for the 2022 weekday morning peak hour background with development traffic scenario with the proposed road upgrades in place as shown in **Section 9** of this report. It will however operate the same when compared to the 2022 weekday morning peak hour background traffic scenario.

The proposed road upgrades are for the developer's account.

No public transport facilities are proposed.

Pedestrian walkways have to be provided along the site frontage by the developer to the satisfaction of the CoJ.

11.2 Recommendations

It is recommended that:

- the developer carry out the proposed road upgrades to mitigate the effect of the development traffic;
- the developer construct pedestrian walkways in consultation with the relevant departments of CoJ; and
- this traffic assessment be approved.

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9. Trafsol, (October 2016), **Ormonde X22 Traffic Survey**, Johannesburg, South Africa.

FIGURES

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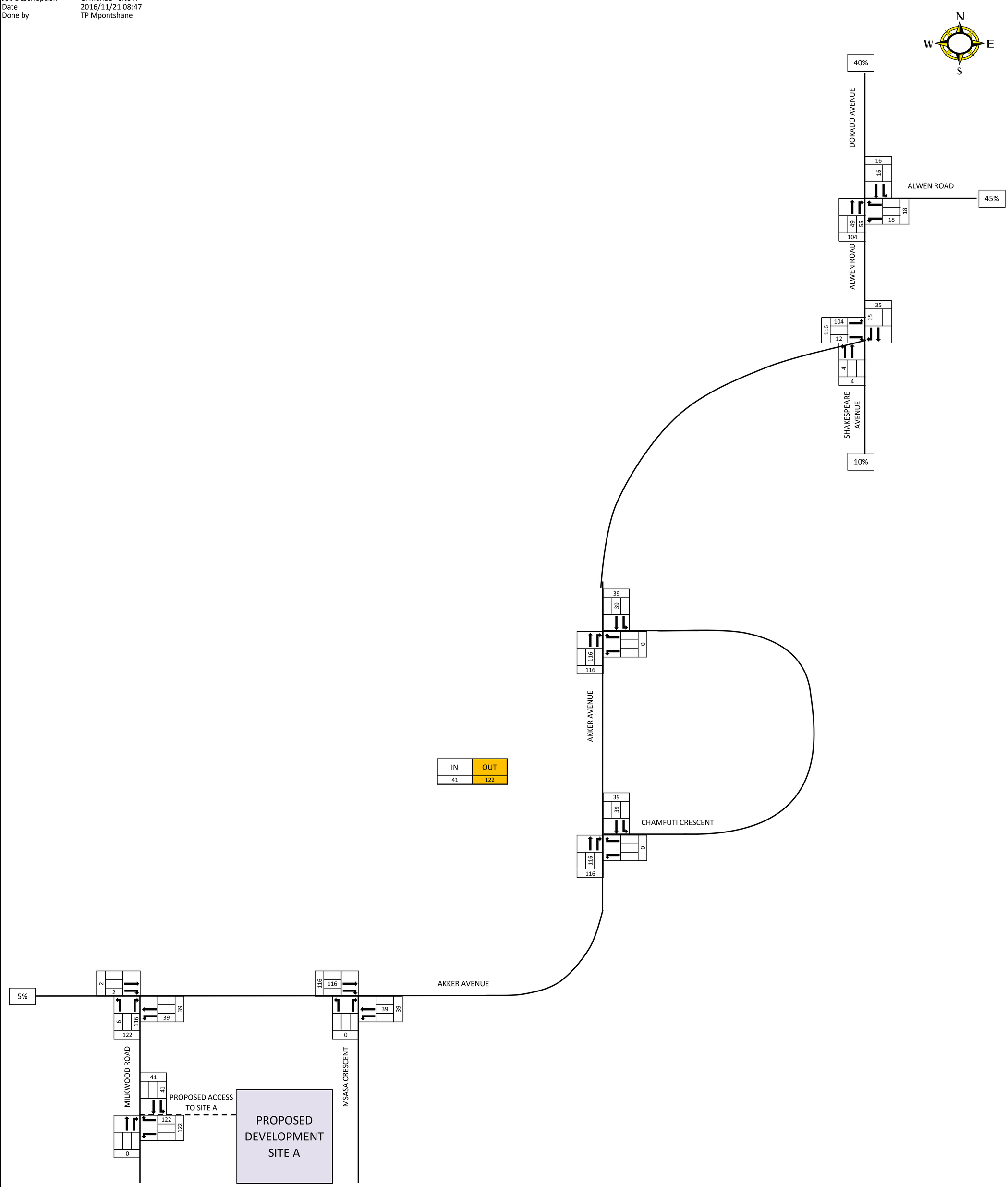
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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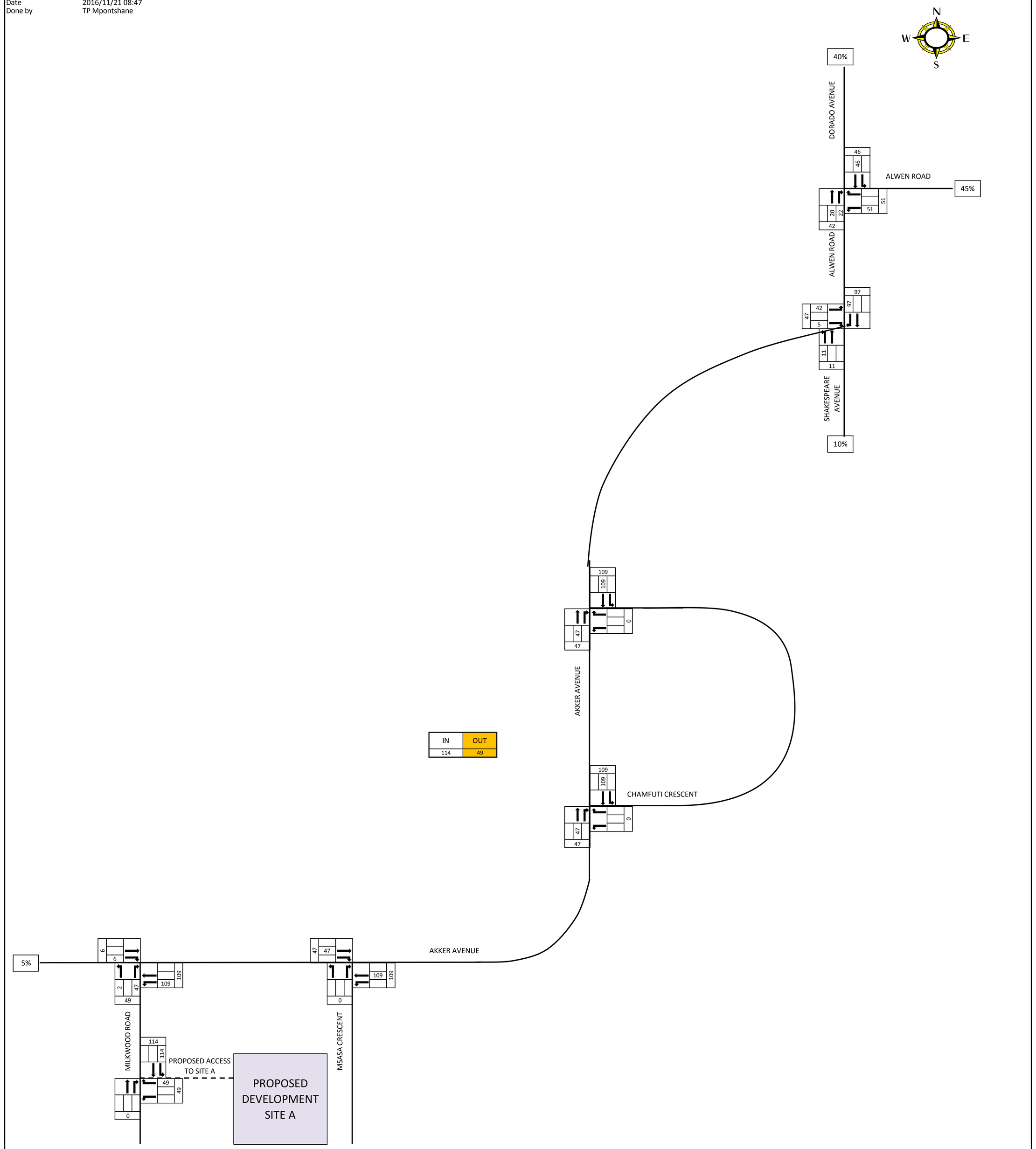
WEEKDAY MORNING PEAK HOUR RESIDENTIAL DEVELOPMENT TRIPS

FIGURE 2.1

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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WEEKDAY AFTERNOON PEAK HOUR RESIDENTIAL DEVELOPMENT TRIPS

FIGURE 2.2

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
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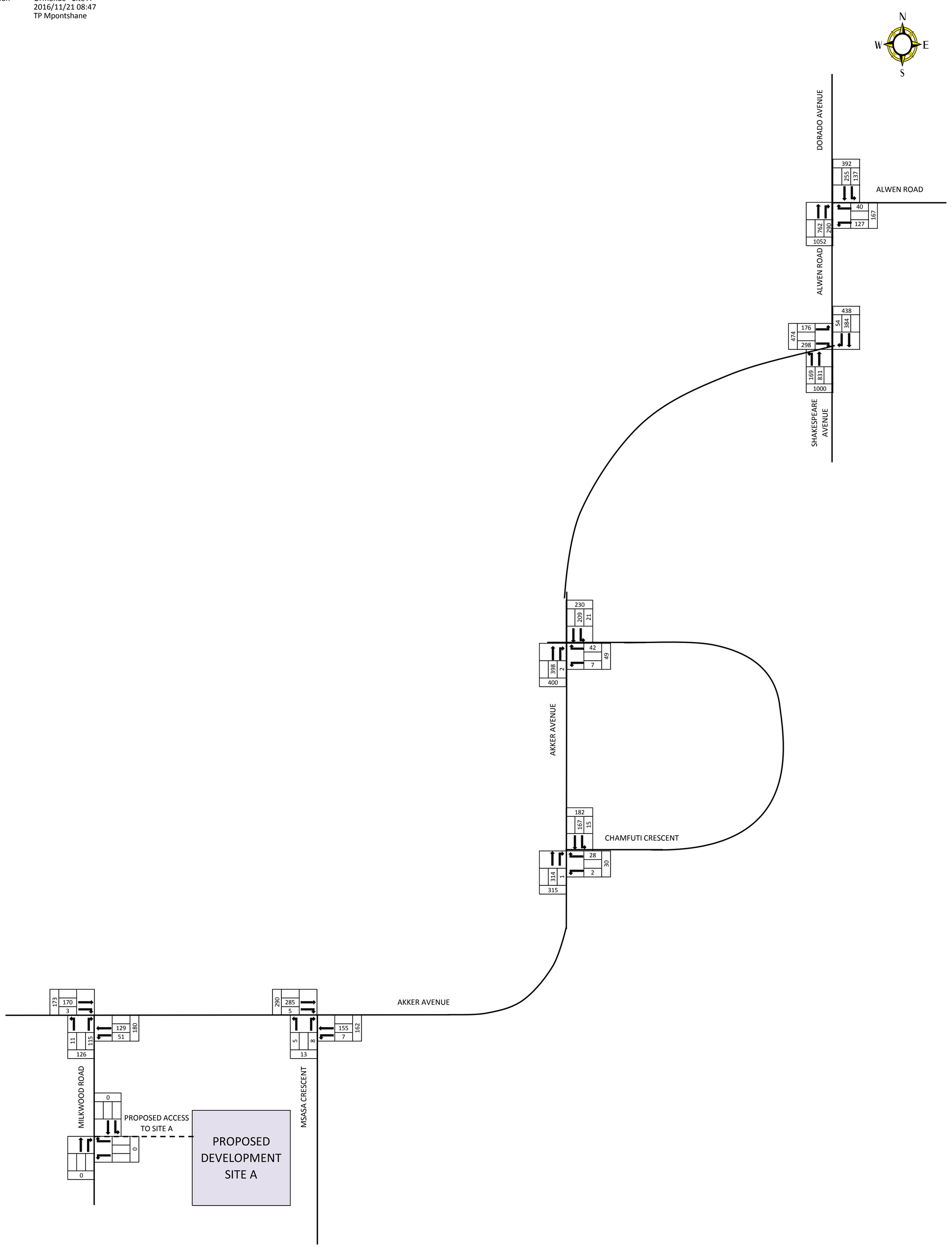

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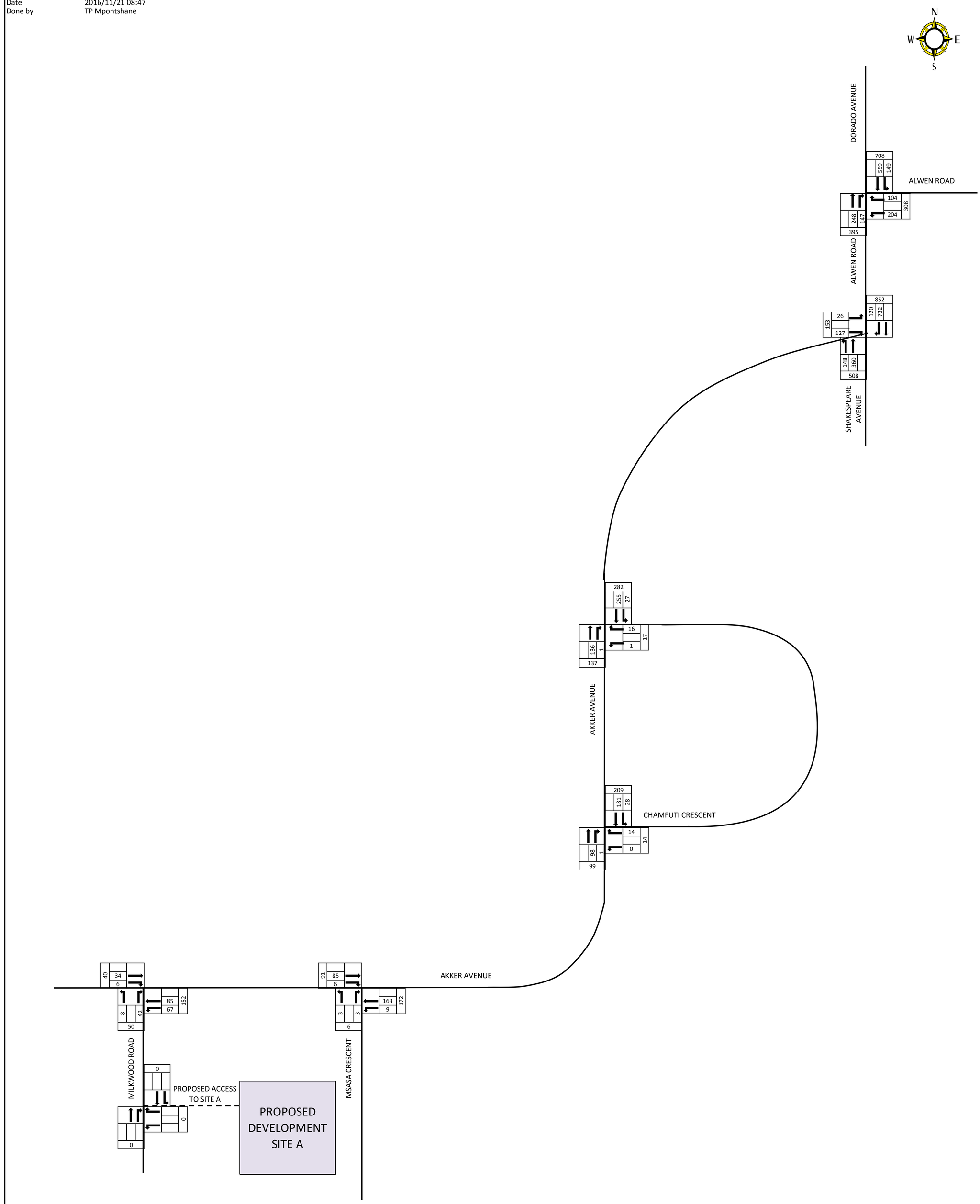
2016 WEEKDAY MORNING PEAK HOUR TRAFFIC COUNTS (PCUs)

FIGURE 3.1

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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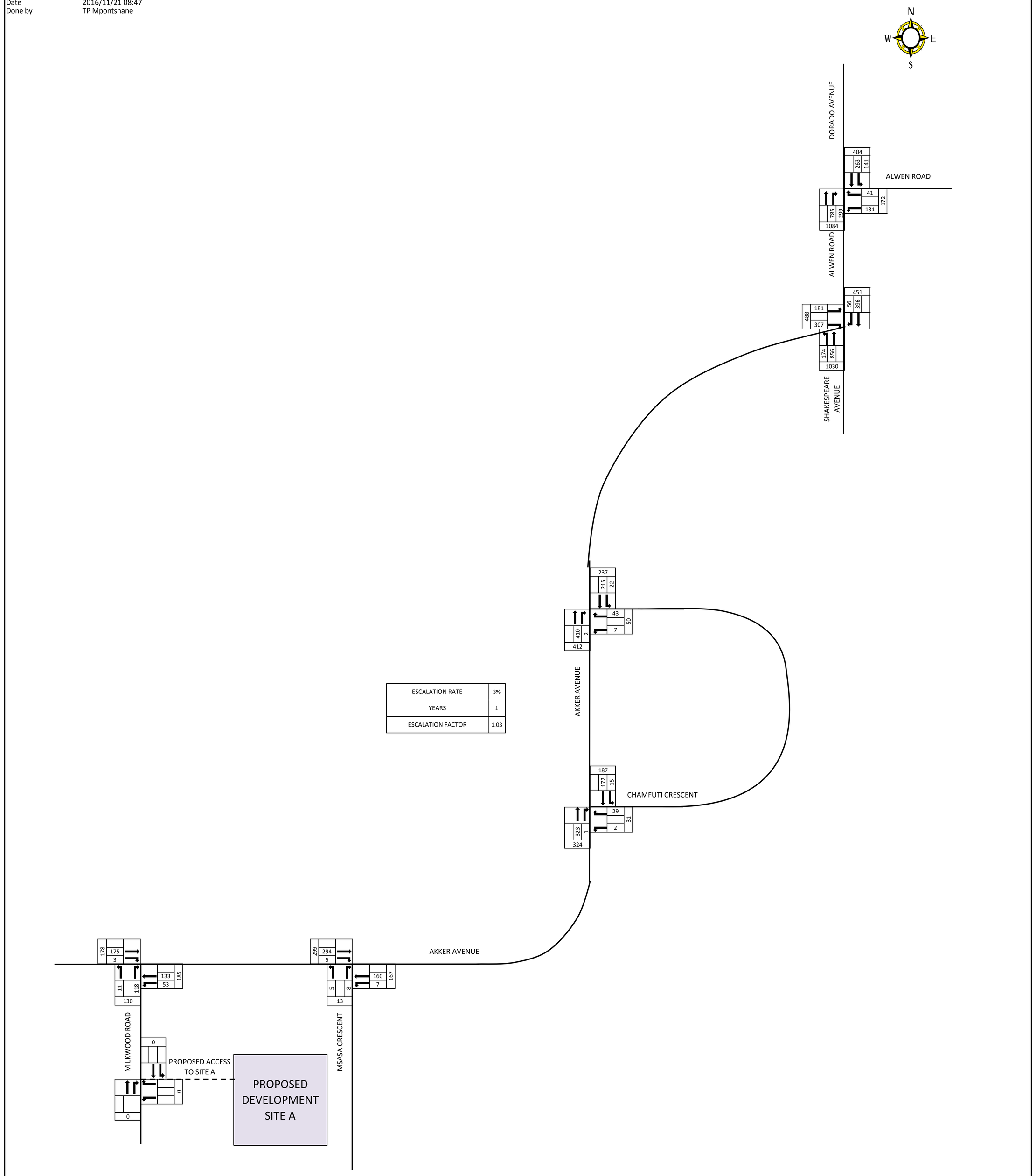
2016 WEEKDAY AFTERNOON PEAK HOUR TRAFFIC COUNTS (PCUs)

FIGURE 3.2

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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2017 WEEKDAY MORNING PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.3

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
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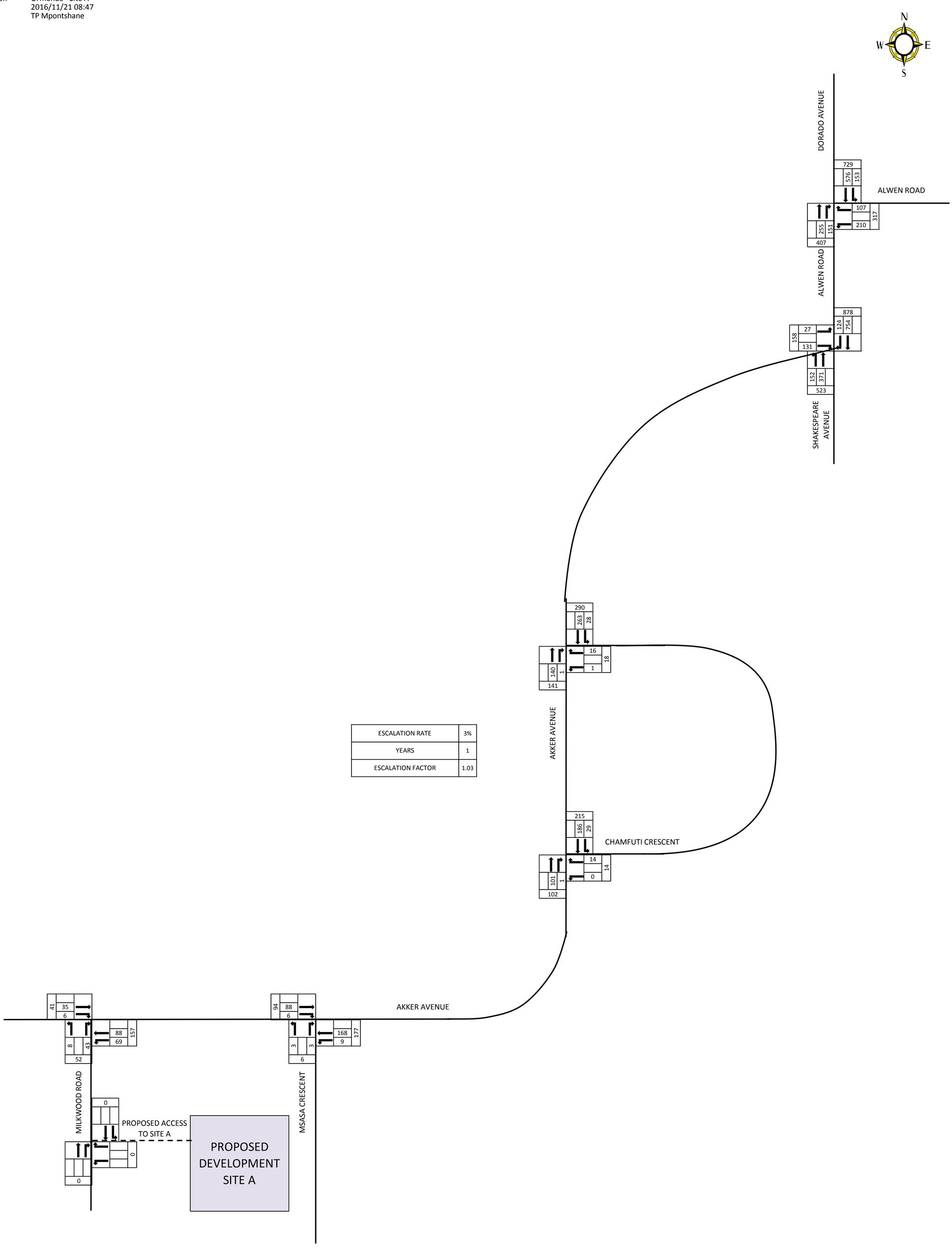

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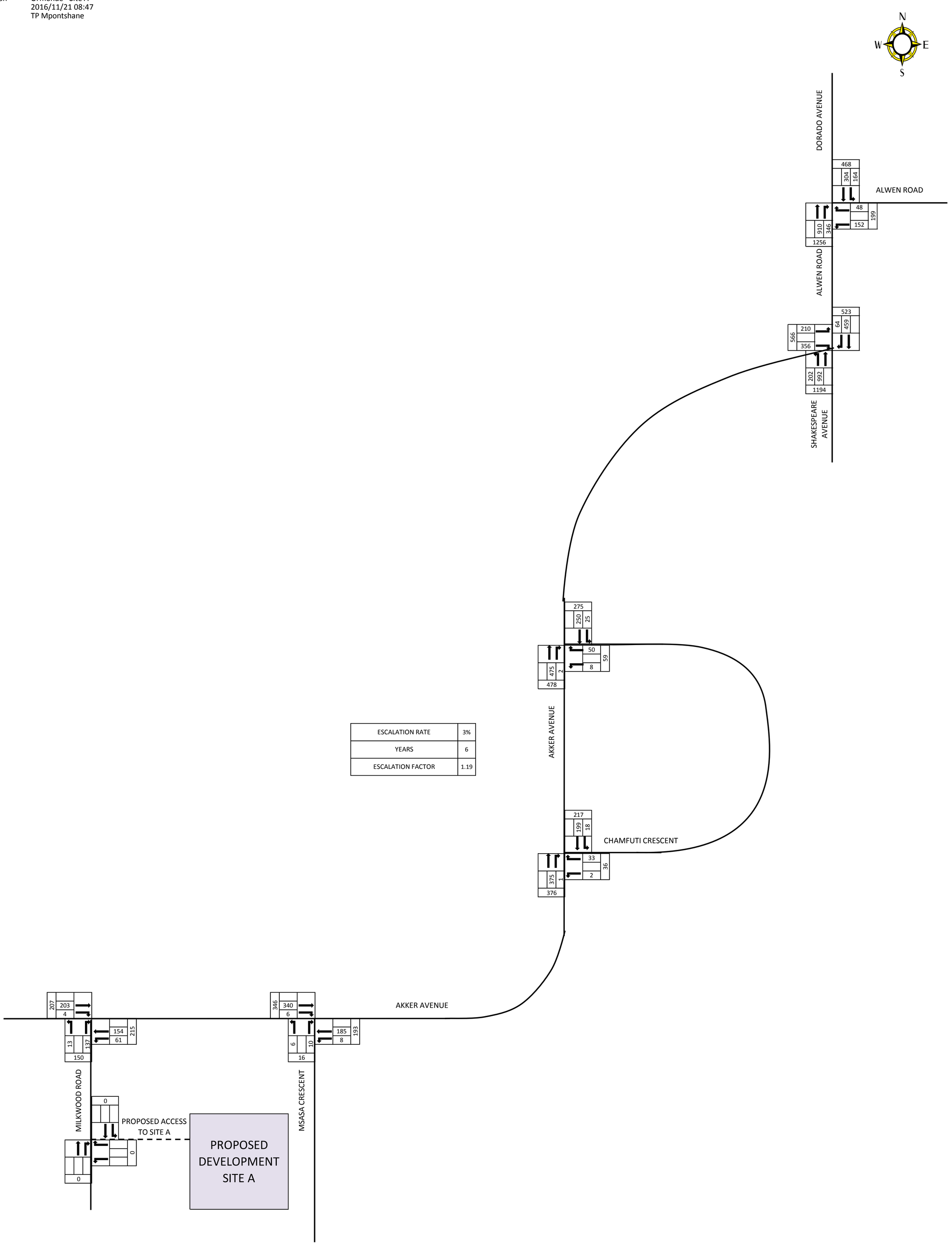
2017 WEEKDAY AFTERNOON PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.4

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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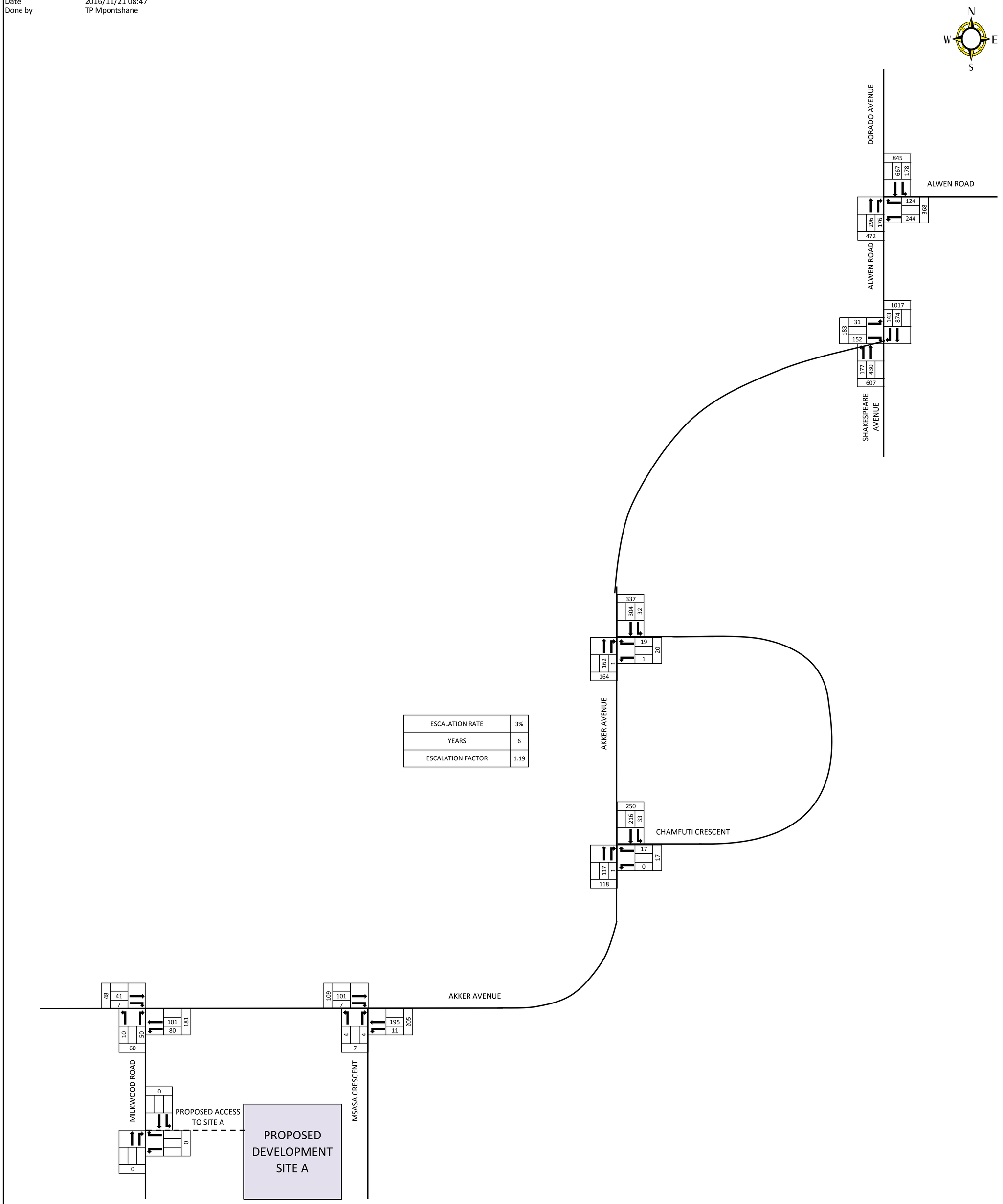
2022 WEEKDAY MORNING PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.5

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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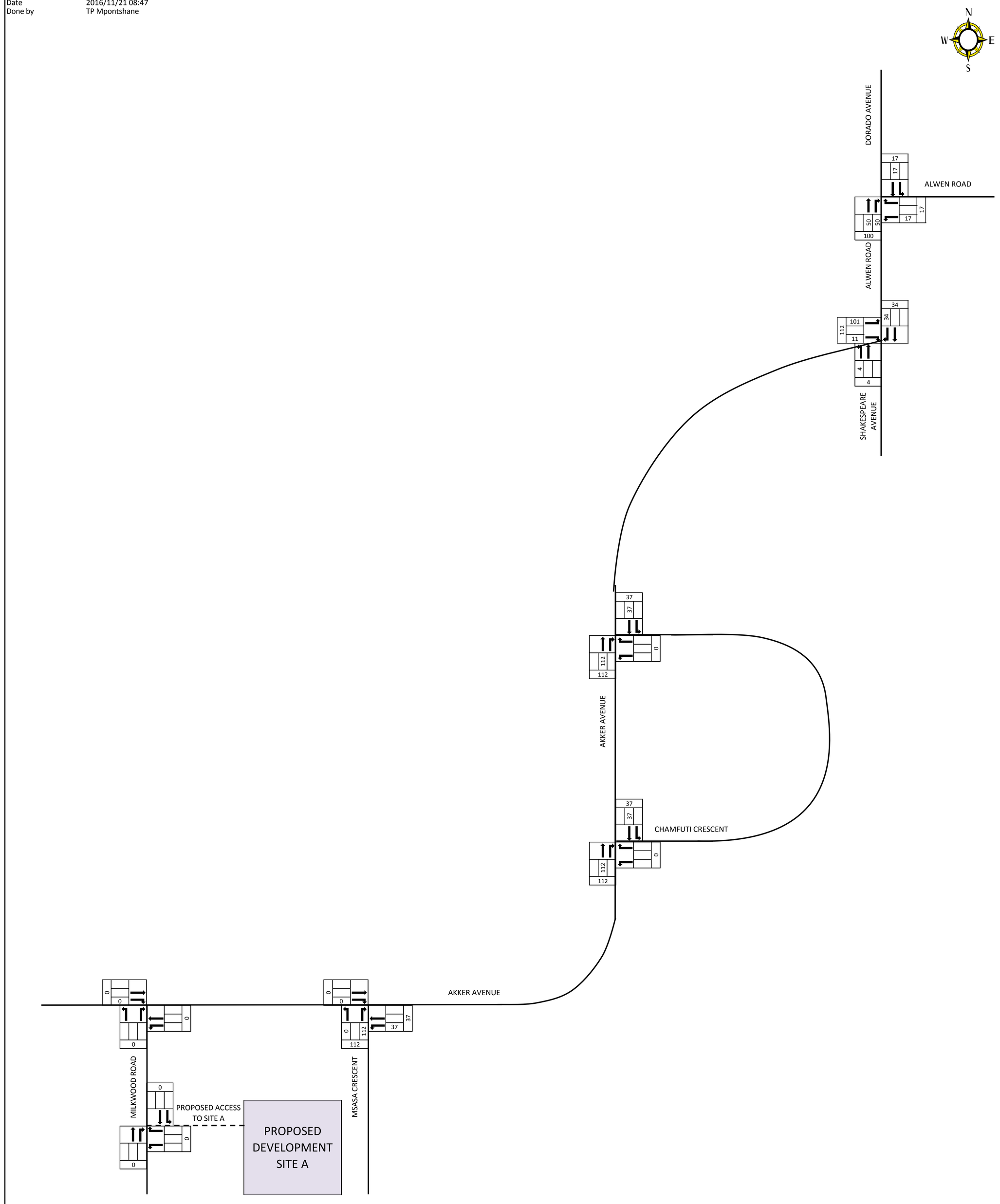
2022 WEEKDAY AFTERNOON PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.6

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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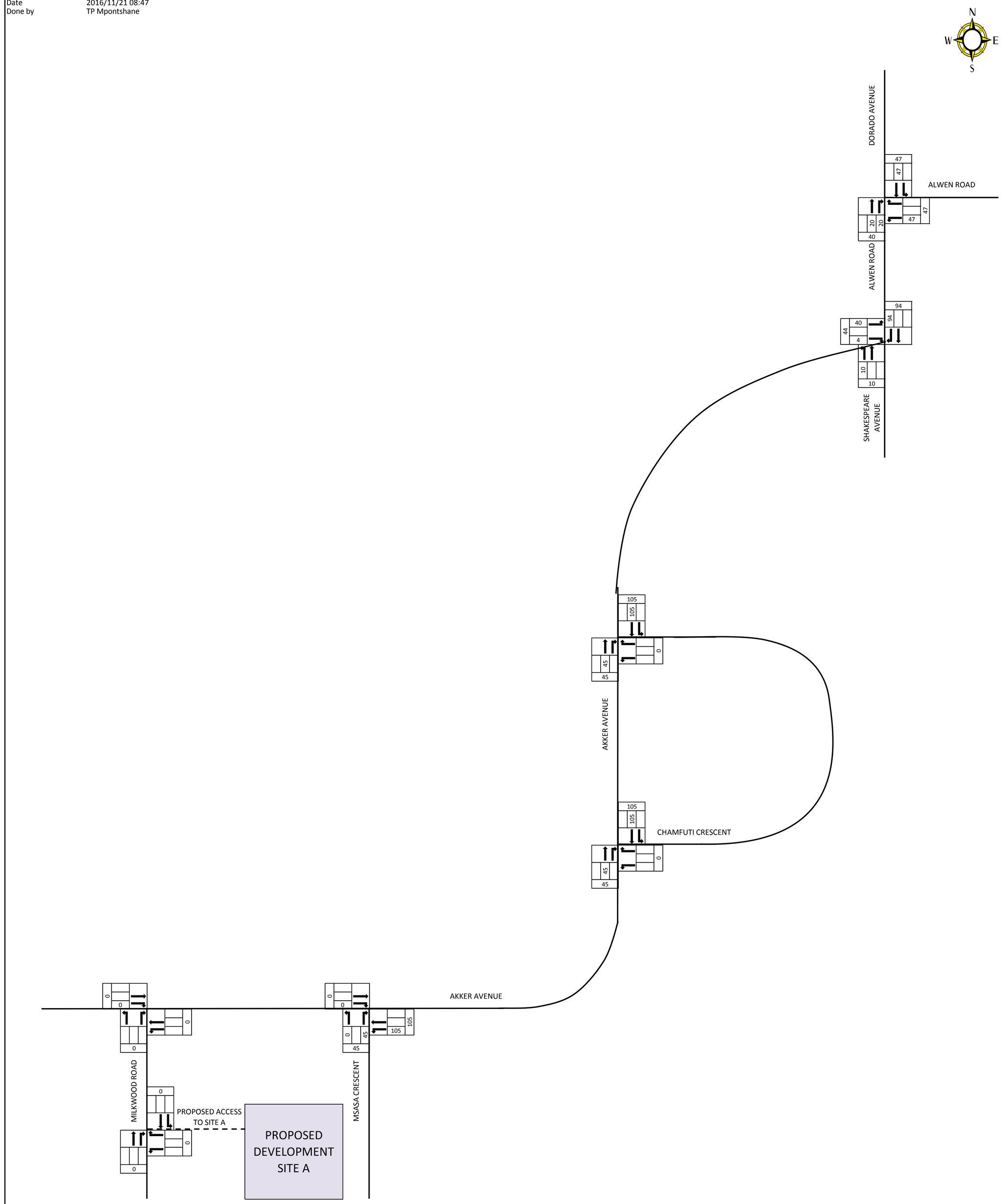
WEEKDAY MORNING PEAK HOUR LATENT TRIPS FOR ERVEN 962 AND 963, ORMONDE

FIGURE 3.7

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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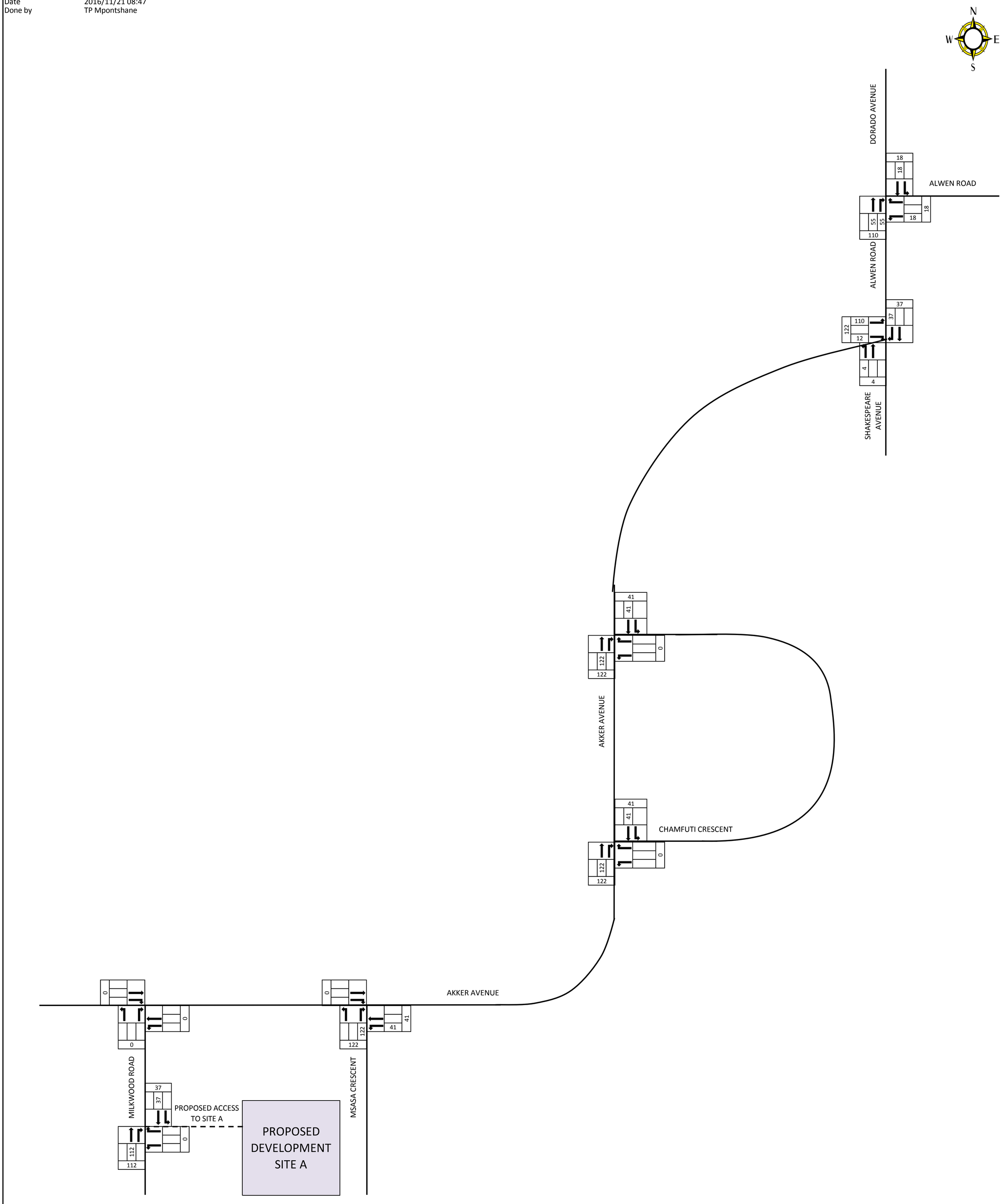
WEEKDAY AFTERNOON PEAK HOUR LATENT TRIPS FOR ERVEN 962 AND 963, ORMONDE

FIGURE 3.8

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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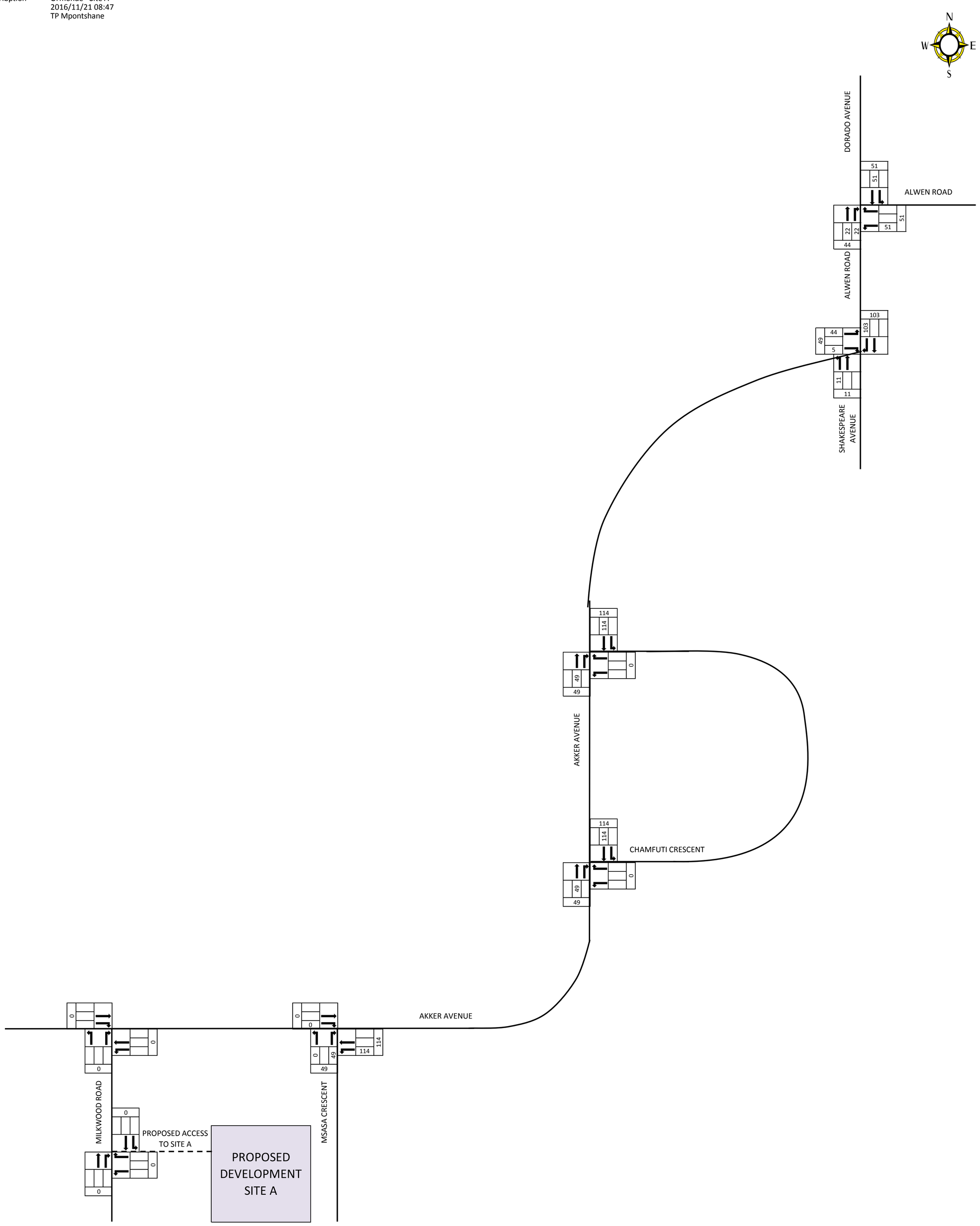
WEEKDAY MORNING PEAK HOUR LATENT TRIPS FOR ERVEN 1010 AND 1011, ORMONDE

FIGURE 3.9

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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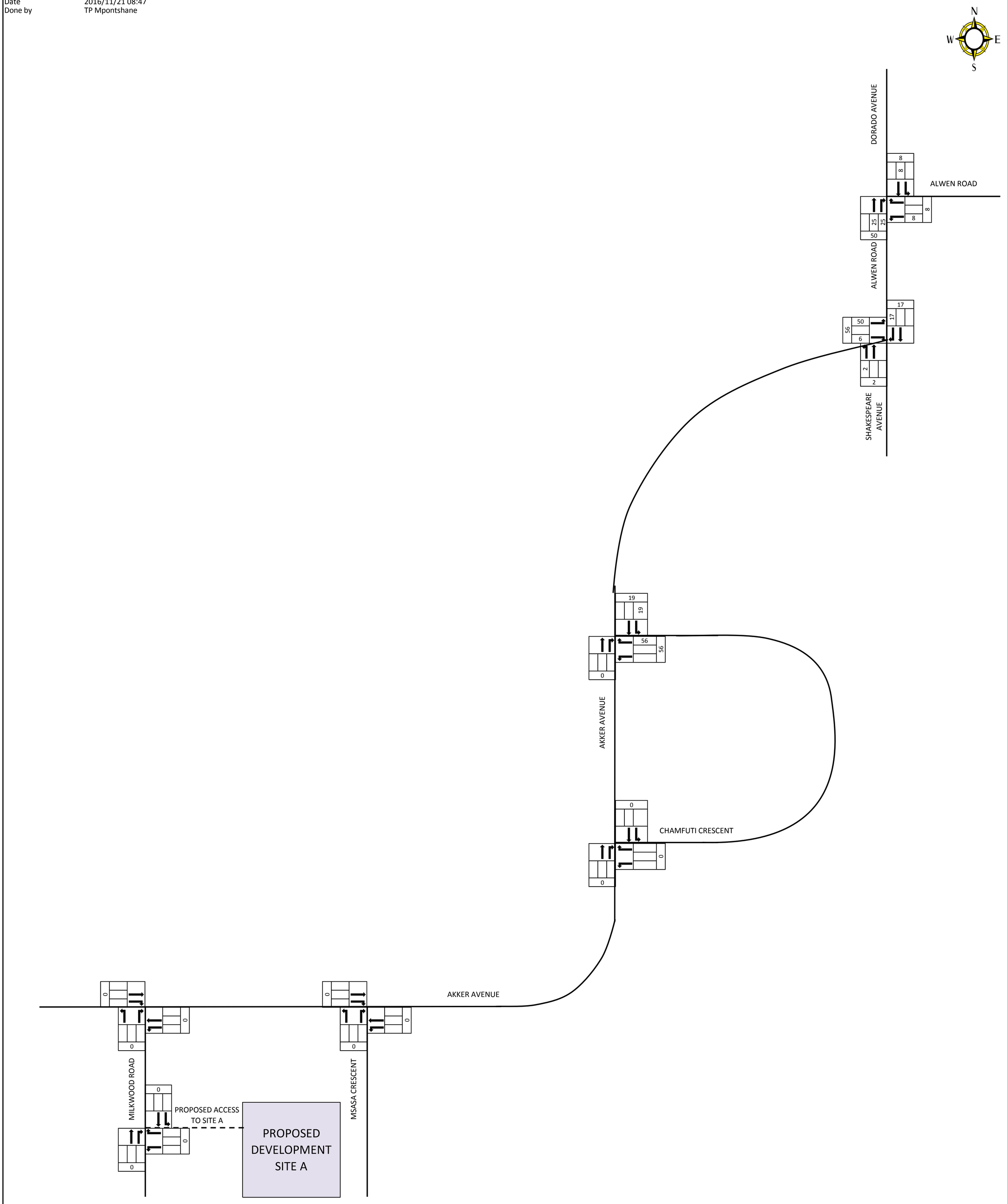
WEEKDAY AFTERNOON PEAK HOUR LATENT TRIPS FOR ERVEN 1010 AND 1011, ORMONDE

FIGURE 3.10

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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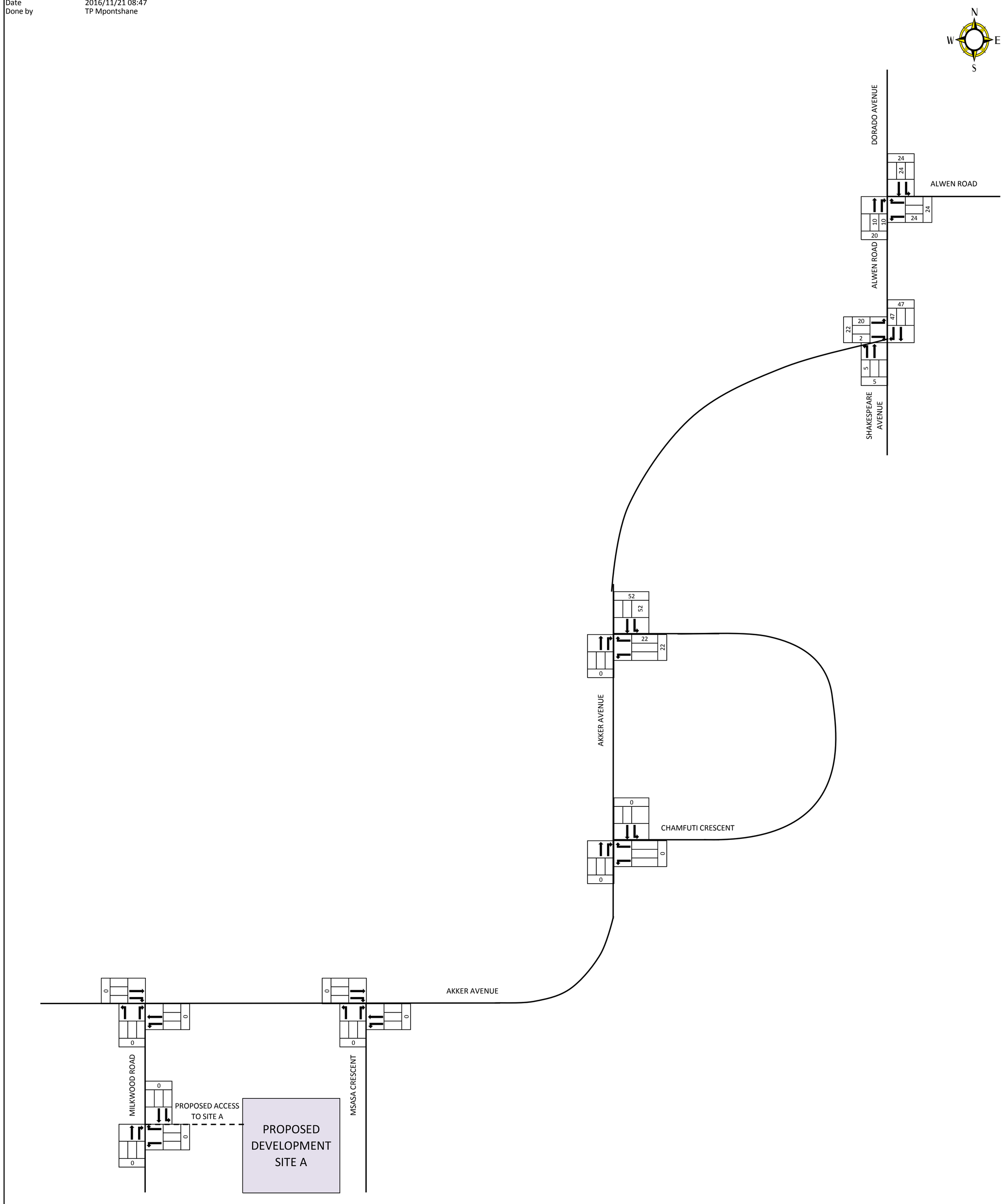
WEEKDAY MORNING PEAK HOUR LATENT TRIPS FOR ERF 982, ORMONDE

FIGURE 3.11

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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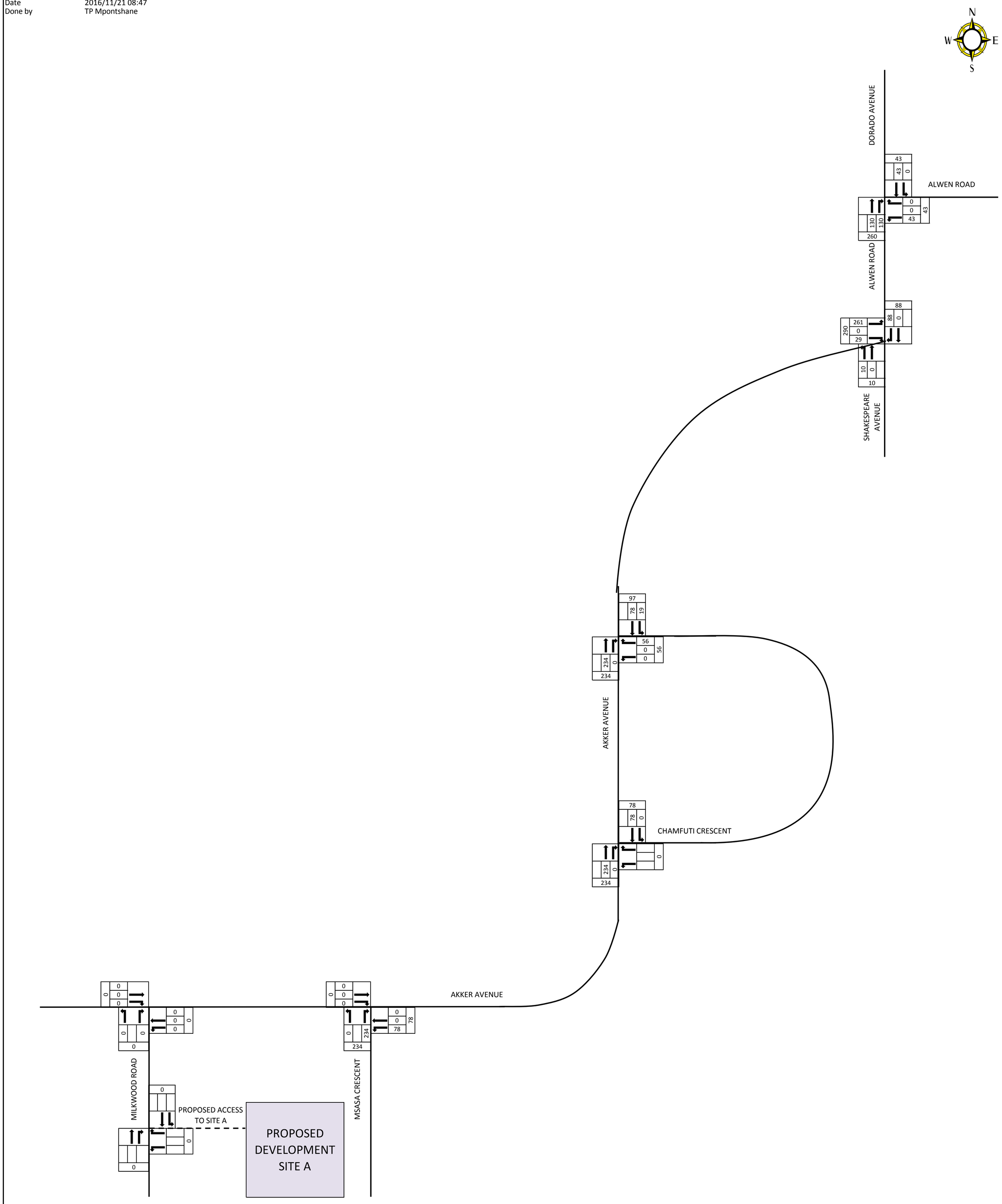
WEEKDAY AFTERNOON PEAK HOUR LATENT TRIPS FOR ERF 982, ORMONDE

FIGURE 3.12

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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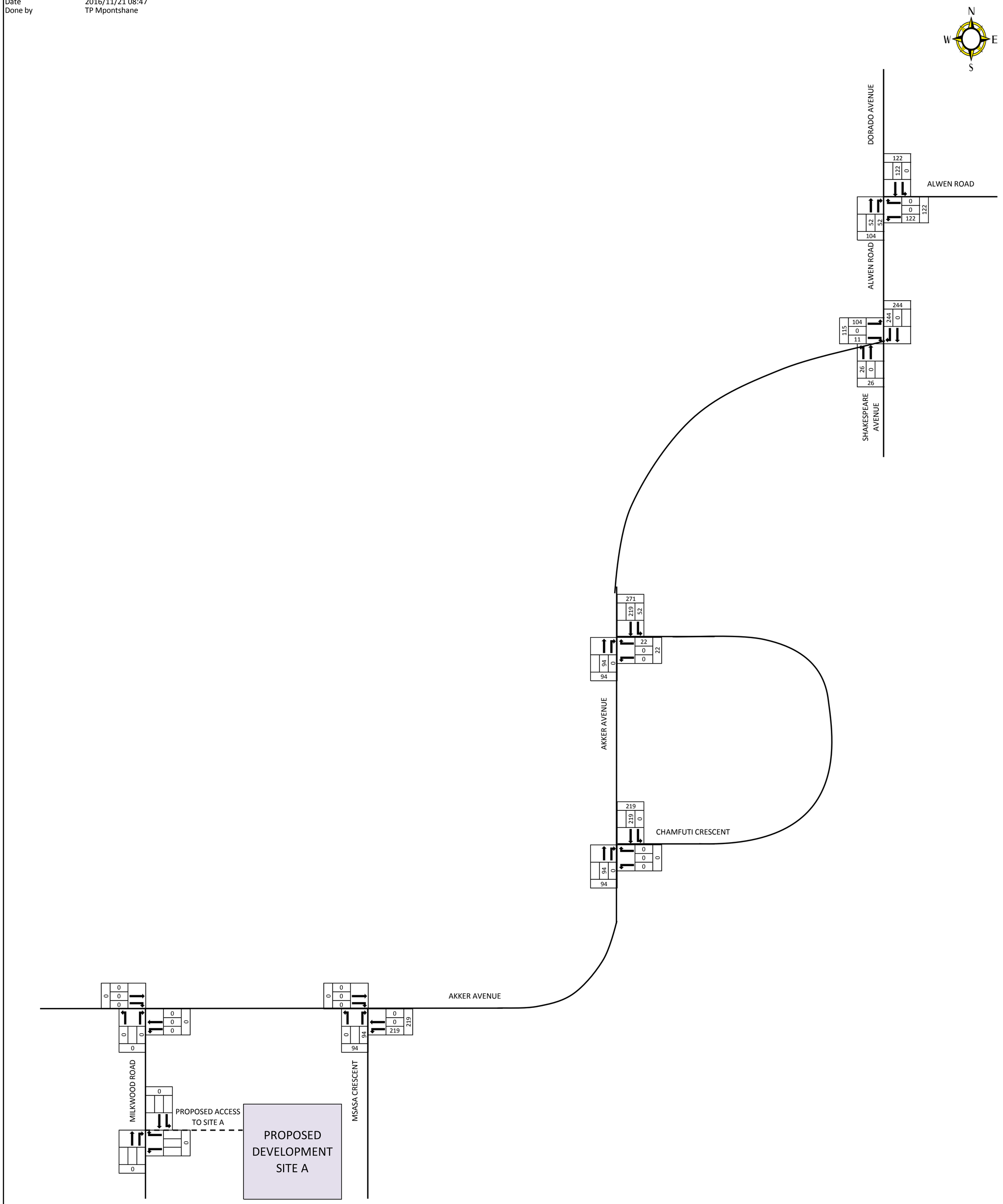
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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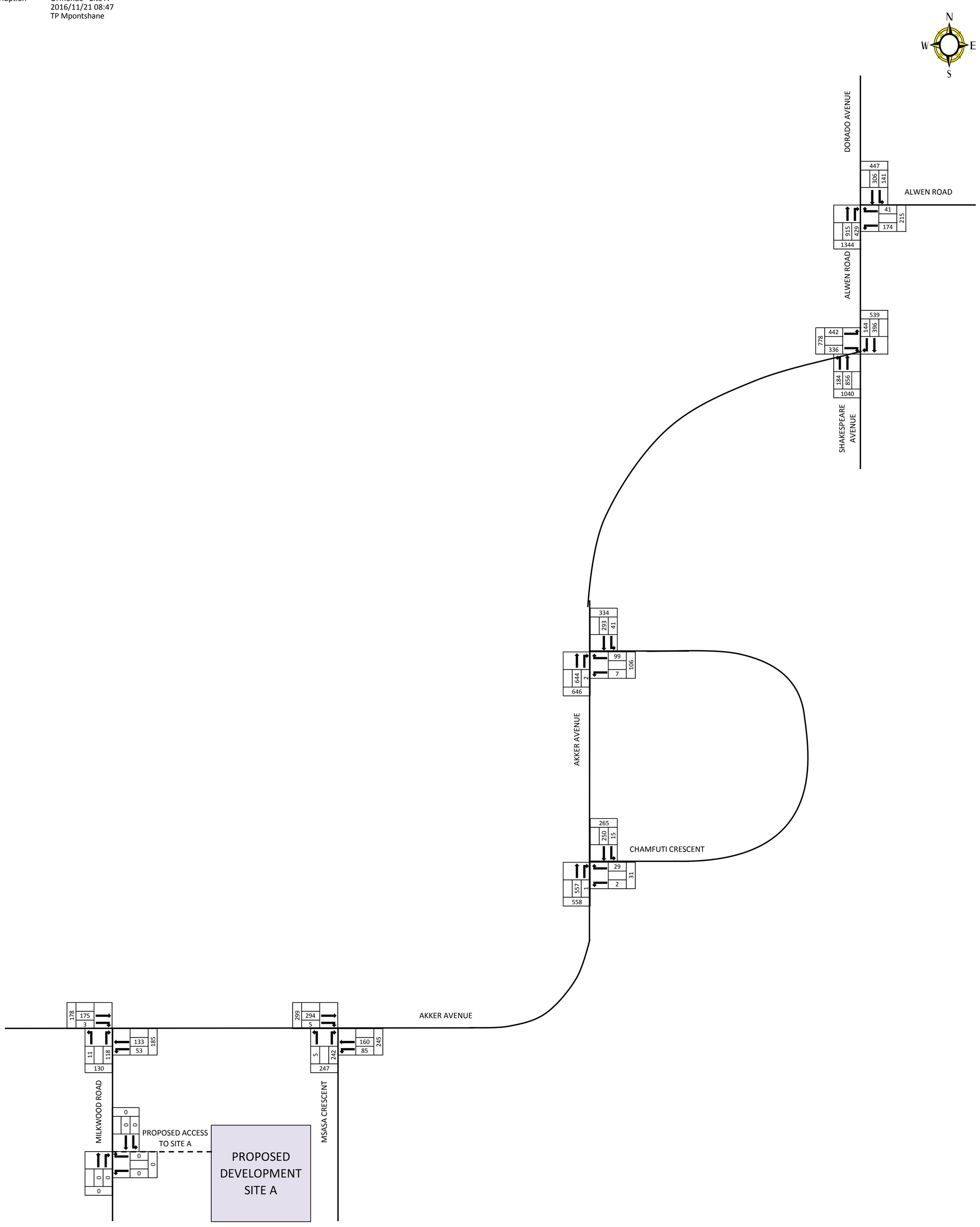
WEEKDAY AFTERNOON PEAK HOUR LATENT TRIPS FOR ERVEN 962 AND 963, ORMONDE

FIGURE 3.14

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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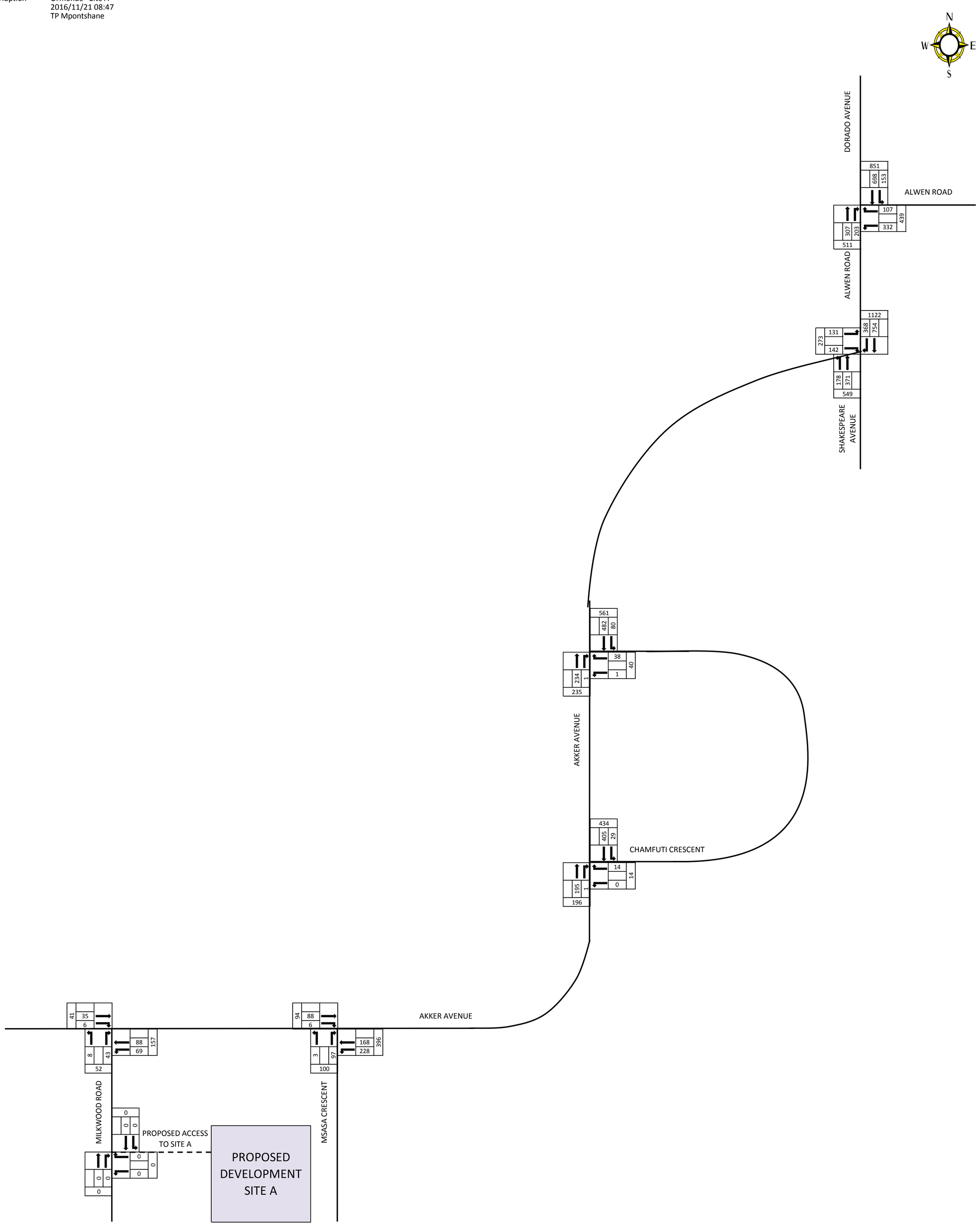
2017 WEEKDAY MORNING PEAK HOUR BACKGROUND TRAFFIC VOLUMES

FIGURE 3.15

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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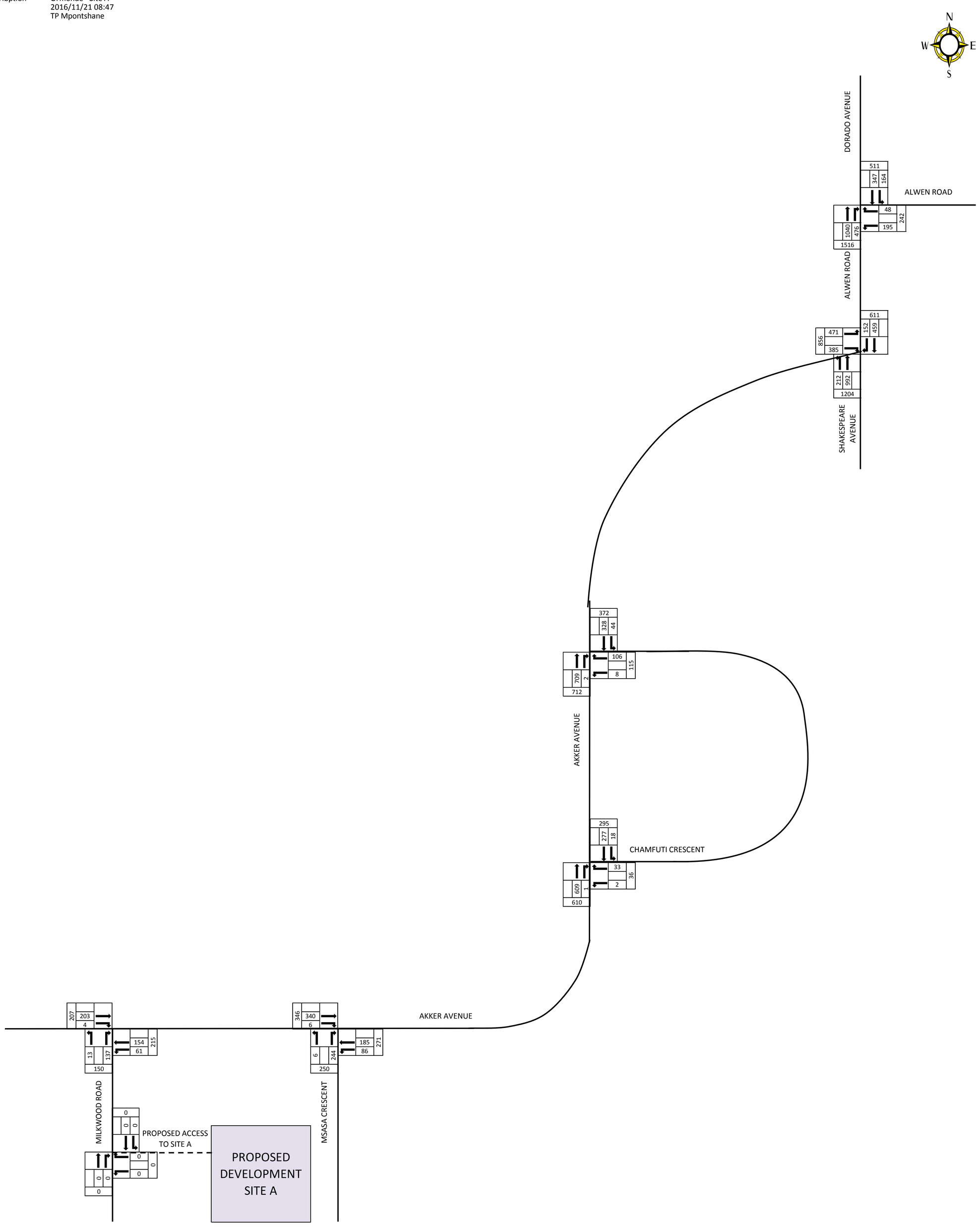
2017 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND TRAFFIC VOLUMES

FIGURE 3.16

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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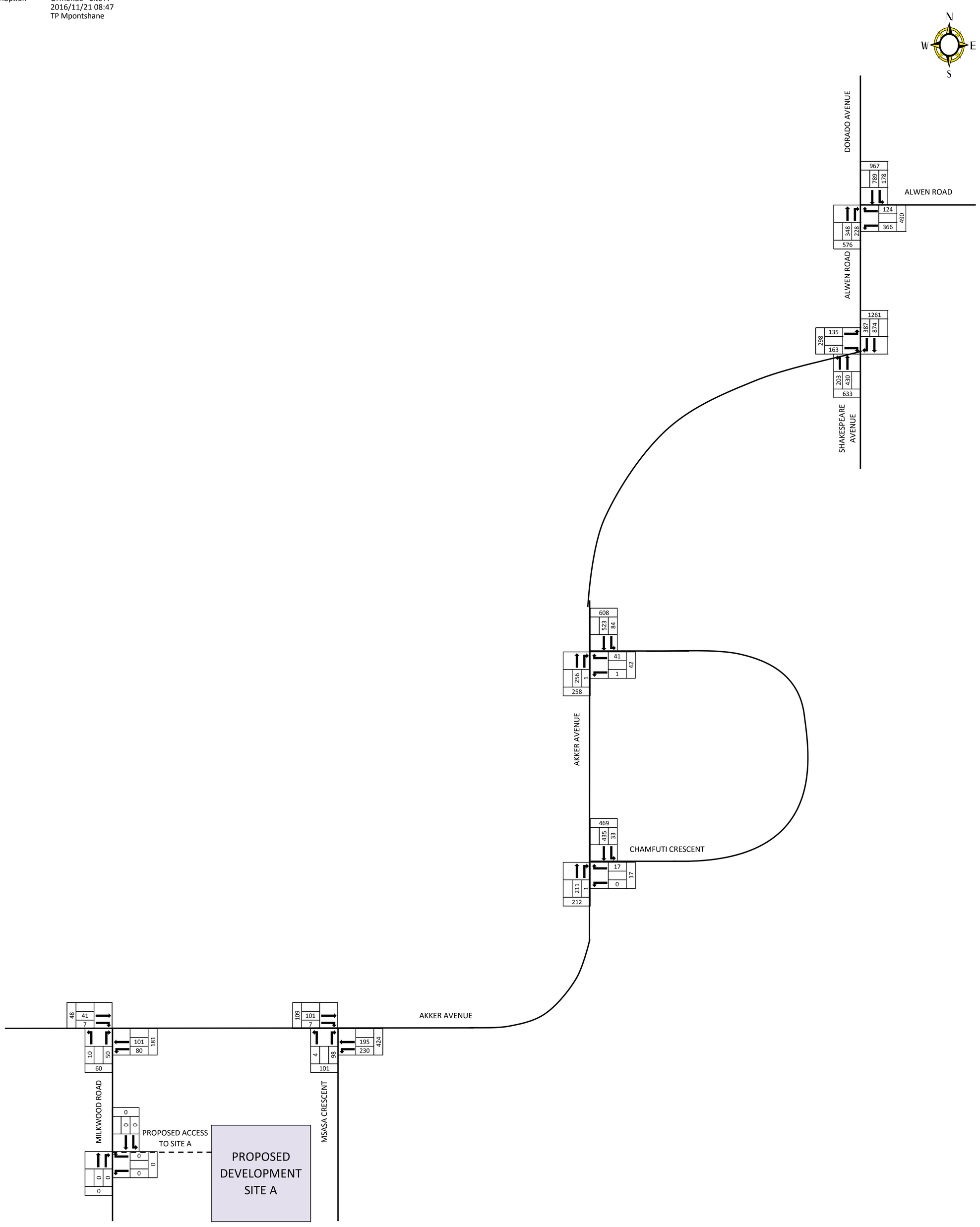
2022 WEEKDAY MORNING PEAK HOUR BACKGROUND TRAFFIC VOLUMES

FIGURE 3.17

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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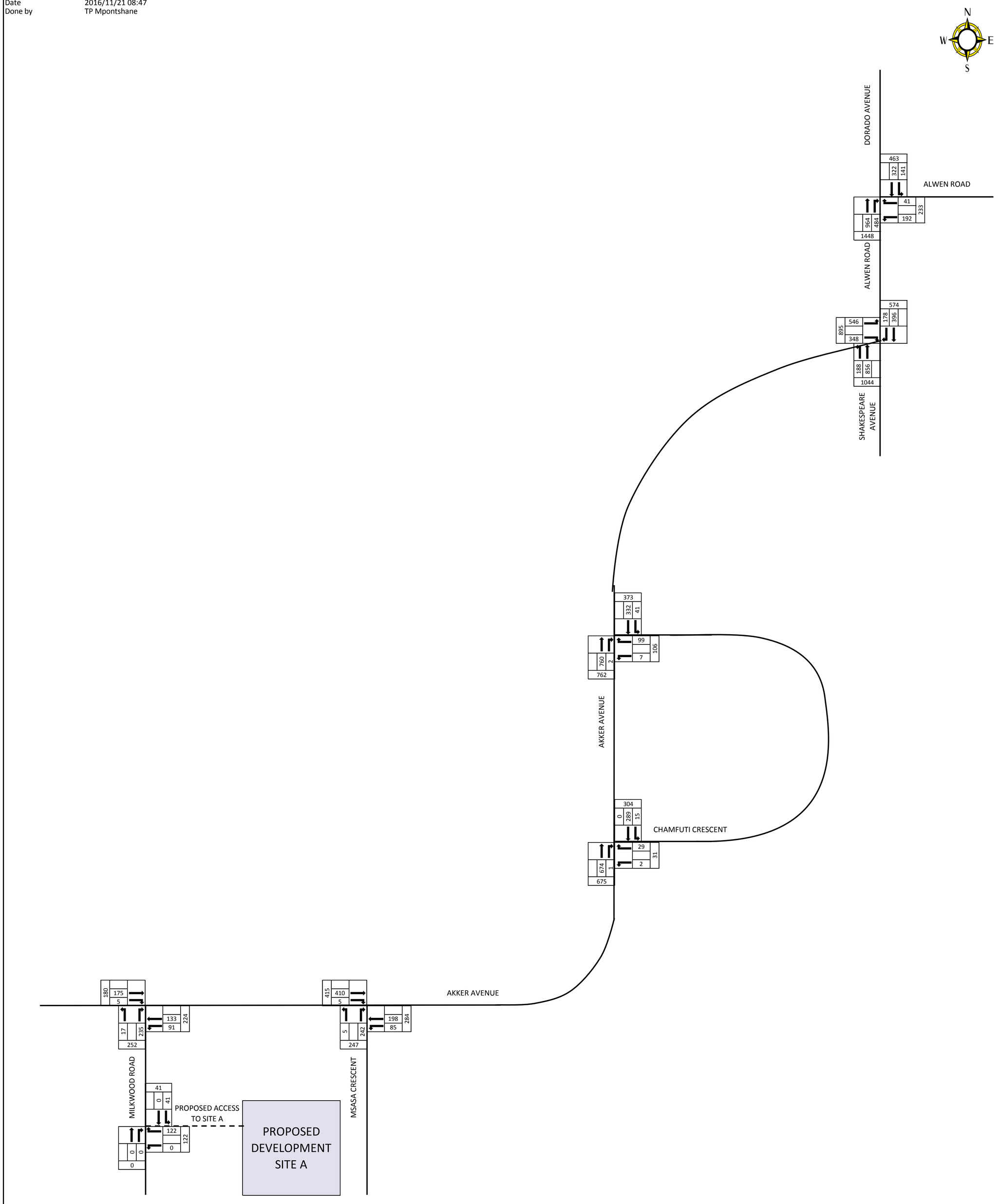
2022 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND TRAFFIC VOLUMES

FIGURE 3.18

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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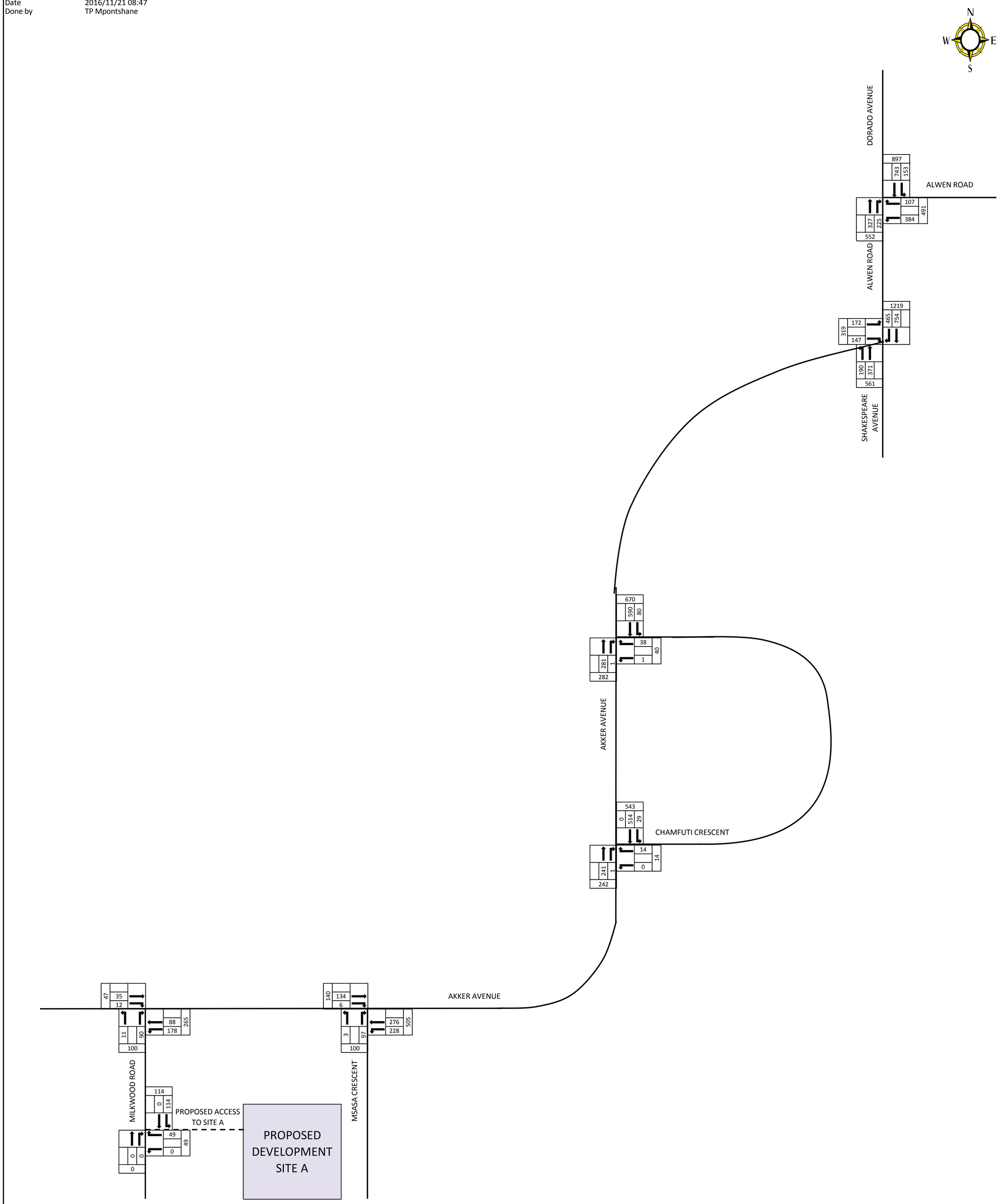
2017 WEEKDAY MORNING PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.19

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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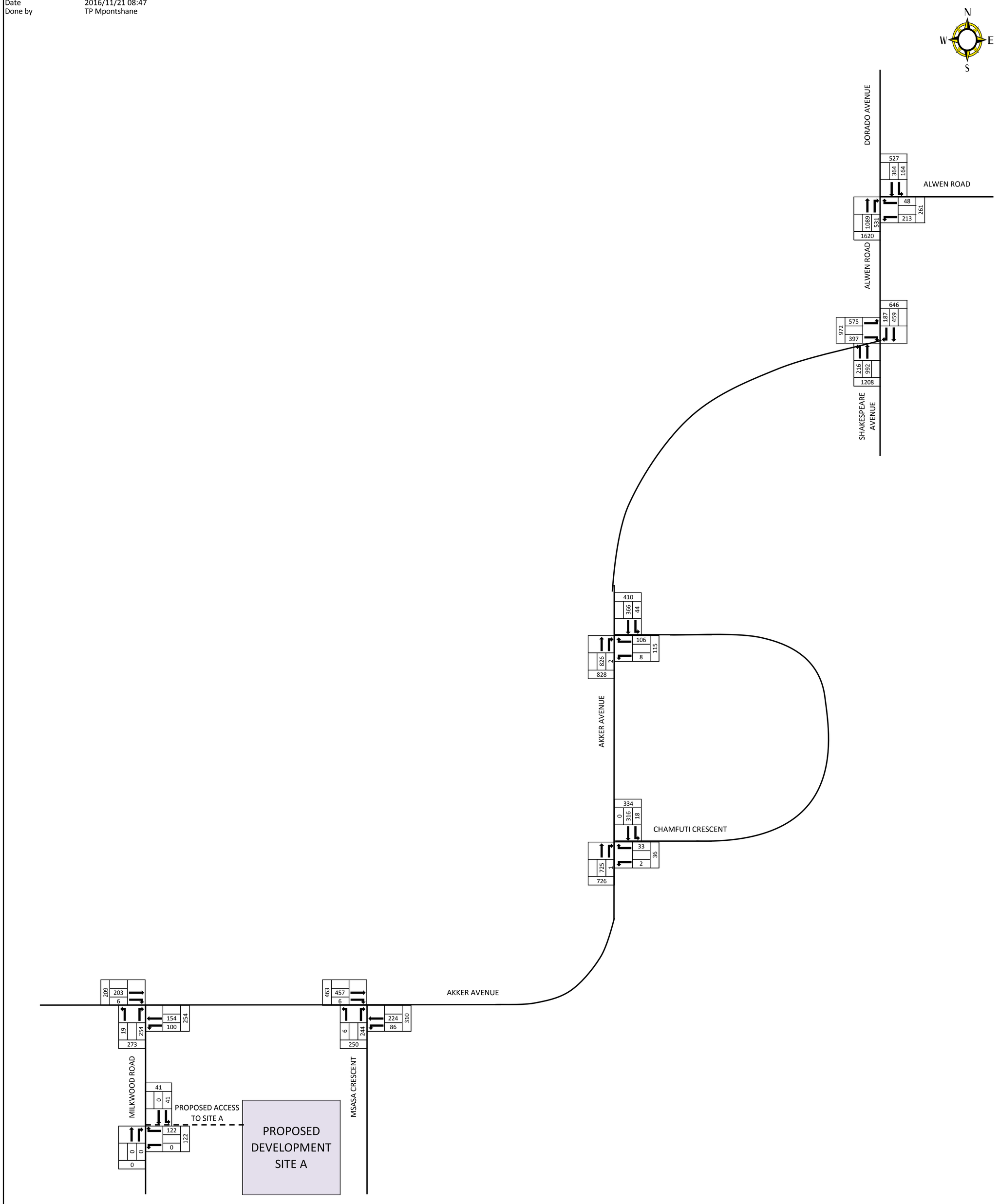
2017 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.20

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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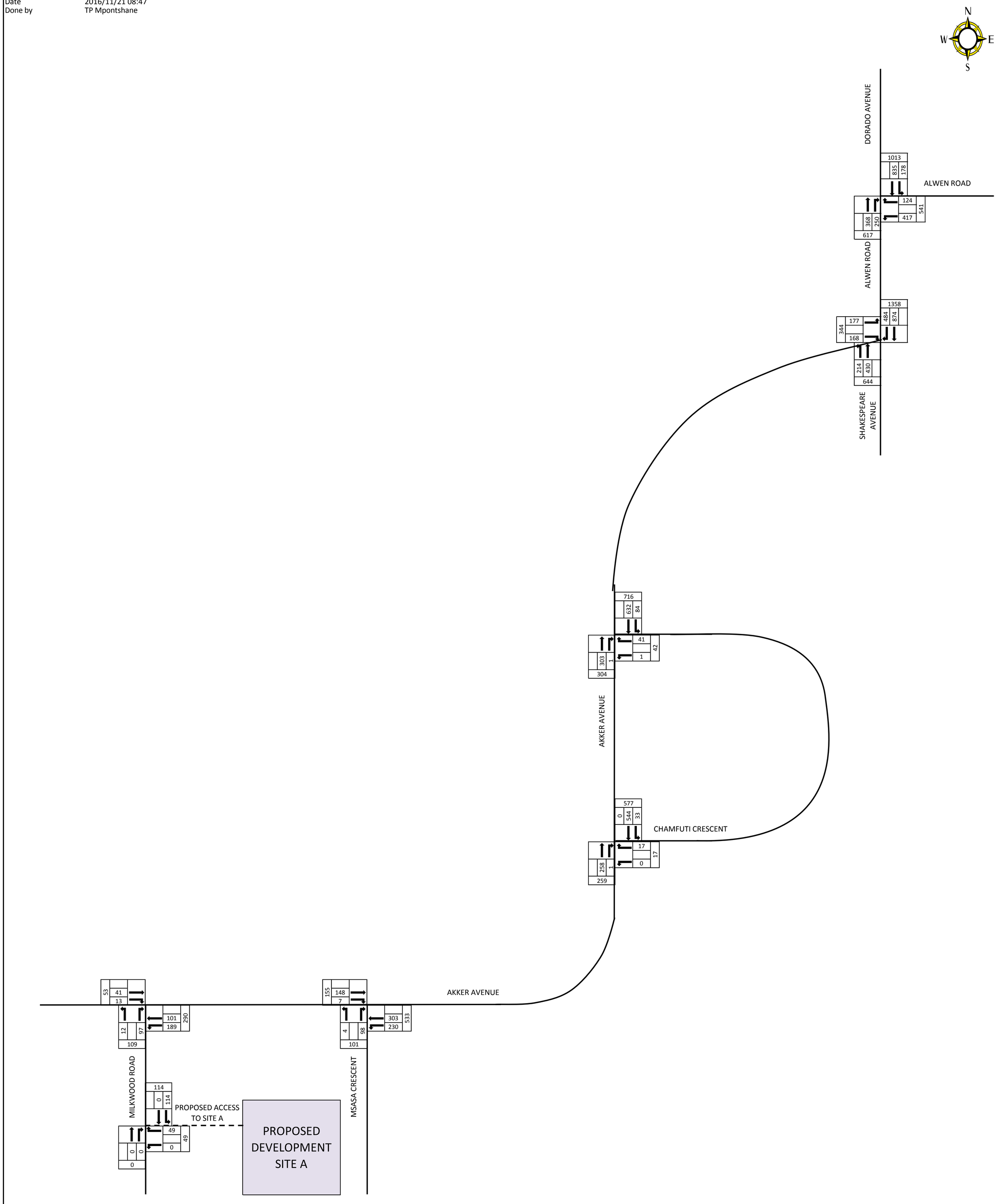
2022 WEEKDAY MORNING PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.21

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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2022 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.22

ANNEXURE A

TOWNSHIP LAYOUT PLAN

DATE	NO	REVISION
OCT 2016	-	ISSUED FOR APPROVAL

CLIENT

Kale Developments

LOCAL AUTHORITY

Joburg
a world class African city

Civil Concepts (Pty) Ltd
Consulting Civil & Structural Engineers
PO Box 36148, Menlo Park, 0102
Office: +27 12 460 0008
www.civilconcepts.co.za

PROJECT

ORMONDE SOUTH

SITE B ON ERF 962 & 963

DRAWING TITLE

SITE LAYOUT PLAN

DRAWING NO C2284-B-201

REV.NO.	-									

SCALE	1:500	DESIGNED	A.OOSTHUIZEN
		DRAWN	A.OOSTHUIZEN
DATE	OCTOBER 2016	CHECKED	L.ZIETSMAN

ANNEXURE B

CONDITIONS OF ESTABLISHMENT

1. EXECUTIVE SUMMARY

1.1 This memorandum is submitted in support of an application in terms of the provisions of Section 21 of The City of Johannesburg Municipal Planning By-Law, 2016 for the amendment of the Johannesburg Town-Planning Scheme, 1979, by the rezoning of Erven 962 & Erf 963, Ormonde Extension 22, subject to certain conditions.

1.2 Application is made for the amendment of the Johannesburg Town-Planning Scheme, 1979, by way of the rezoning of the subject property from "Residential 3" with a density of "25 dwelling units per hectare; FAR of 0.4; Height of 3 storeys; and coverage of 30%" to "Residential 3" with a density of "110 dwelling units per hectare", and subject to the following conditions:

Floor Area Ratio	:	0.7
Coverage	:	30%
Height	:	Four (4) storeys
Parking requirements	:	1.3 parking bays per unit
Building lines	:	In accordance with an approved site development plan
Number of Units	:	176 units

1.3 The purpose of this application is to obtain the appropriate land use rights to enable the registered property owner to develop a higher residential development on the erf.

1.4 Note that a separate application for the consolidation of the two properties, in terms of the provisions of Section 33 of the City of Johannesburg Municipal Planning By-Law, 2016, was also submitted to the Municipality. Even though the rezoning and consolidation applications are submitted separately, approval of both applications will be required before submission of any building plans to Council and before construction can commence.

1.5 This memorandum provides the relevant property information, and motivates the merits of the development proposal from a development planning perspective.

1.6 The consolidation application is submitted separately and will be handled as a separate application, but will form part of the rezoning of the erven.

2. PROPERTY INFORMATION

2.1 Locality

The subject property is situated along Msasa Crescent in Ormonde, towards the north of the M1 Freeway and towards the south of Akker Street. A Locality Plan is attached hereto as **Annexure A**. The site is situated in close proximity to Rand Show Road, Nasrec Road and the M1-Highway.

The figure below gives the context of the application site.

Figure 1: Aerial view of the property

2.2 Property description, ownership and size

Details pertaining to property description, ownership and extent of the subject properties are provided in the table below:

PROPERTY DESCRIPTION	REGISTERED OWNER	DEED OF TRANSFER NUMBER	SIZE
Ormonde X22: Erf 962	Matla Projects (Pty) Ltd	T27309/2009	5 942m²
Ormonde X22: Erf 963	Matla Projects (Pty) Ltd	T27310/2009	10 274m²

Deeds of Transfer T27309/2009 and T27310/2009 are attached as **Annexures B** to form part of the application documentation.

The signed and completed Company Resolution, Power of Attorney and Proof of Directors are attached as **Annexure C** respectively.

2.3 Zoning

The subject properties are currently zoned "Residential 3", in terms of the Johannesburg Town-Planning Scheme, 1979, subject to the following conditions:

Floor Area Ratio	:	0.4
Density	:	25 Dwelling units per ha
Coverage	:	30%
Height	:	Three storeys

The relevant Zoning Certificate is attached hereto as **Annexure D**.

The zoning regime of the surrounding area includes the following zonings:

"Residential 1"; "Residential 3;" "Business 3"; "Institutional" and "Municipal".

2.4 Land Use

A land use plan, based on a visual survey, is attached as **Annexure E**. The subject property is currently vacant, while surrounding land uses include:

- Dwelling houses;
- Open Spaces; and
- Public Roads.

It becomes clear that the area is a predominantly residential area. The proposal to develop the subject property for higher density residential uses will contribute to the livelihood of the area and create additional housing opportunities.

The proposed land-use will have no detrimental effect on any of the surround properties on municipal infrastructure.

3. BONDS, CONDITIONS OF TITLE AND SERVITUDES

3.1 Mortgage Bond

There is currently no bond registered over the property. The consent from a bondholder is therefore not required.

3.2 Conditions of title

The subject property is not affected by any conditions of title which may prove to be restrictive to the proposed development. No removal of restrictions is therefore required.

3.3 Servitudes

In terms of Deed of Transfers T27309/2009 and T27310/2009 the properties are subject to the following servitude:

- A servitude for sewer and other municipal services purposes 2 metres wide, in favour of the City Council of Johannesburg along any two boundaries other than a street boundary.

This servitude will be retained and accommodated in the development proposal and on the final Site Development Plan.

4. DEVELOPMENT PROPOSAL

4.1 Application Particulars and Development Proposal

4.1.1 Application is made in terms of the provisions of Section 21 of the City of Johannesburg Municipal Planning By-Law, 2016 for the amendment of the Johannesburg Town-Planning Scheme, 1979, by the simultaneous rezoning of Erf 962 & Erf 963, Ormonde Extension 22, subject to the following conditions:

Floor Area Ratio	:	0.7
Coverage	:	30%
Height	:	Four (4) storeys
Parking requirements	:	1.3 parking bays per unit
Building lines	:	In accordance with an approved site development plan
Number of Units	:	176 units

4.1.2 Al parking and manoeuvring space will be provide on-site. No parking within the road reserve will be allowed or will be necessary. The proposed site plan is attached hereto as **Annexure G.** Parking will be provided at a ratio of 1.3 parking bays per unit, with a total of 229 parking bays being required. A total of 230 parking bays will be provided on-site, to ensure sufficient parking for residents and visitors. All parking and manoeuvring space will be covered with a permanent dust-free surface.

4.1.3 Access to the development will be obtained via Msasa Crescent. Access will be provided to the satisfaction of the municipality. The current road network is sufficient to accommodate the minimal increase in traffic. If so required by Council, upgrades to the road and services network can be made through a service agreement between the developer and Council.

4.1.3 Sufficient opens space (gardens / lawns) will be provide within the development, as per the minimum requirements from Council.

4.1.4 The privacy of the neighbouring properties will be protected by means of building design, landscaping and building lines. The height of the proposed development will be limited four storeys and building lines will be determined in accordance with an approved site development plan.

4.2 Existing vs Proposed Zoning

4.2.1 The proposed scheme document is attached hereto as **Annexure F**.

4.2.2 The type of housing unit that is being proposed is IHS C-Type (3-4 levels). The design of the units will be done by Boogertman & Partners Architects. A formal Site Development Plan and Building Plans will be submitted to Council after approval of the rezoning application. A concept plan is attached to form part of the application documentation.

4.2.3 The following table compares the current and proposed land use rights:

CURRENT ZONING	PROPOSED ZONING
Existing Zoning: "Residential 3"	**Proposed Zoning:** "Residential 3"
Permitted land uses: Residential dwelling units	**Permitted land uses:** Residential dwelling units
Permitted Density: 25 units/ha	**Proposed Density:** 110 units/ha
Number of Units allowed: 40 sectional title units	**Number of Units allowed:** 176 sectional title units
Height Restriction: Three (3) storeys	**Proposed Height Restriction:** Four (4) storeys
Coverage: 30%	**Proposed Coverage:** 30%
Floor Area Ratio: 0.4	**Proposed Floor Area Ratio:** 0.7
Parking: 1 parking space per dwelling unit of 3 or less habitable rooms. 2 parking space per dwelling unit of 4 or more habitable rooms. Plus 0.3 parking spaces per dwelling unit for visitors.	**Parking:** 1.3 parking bays per unit Required: 229 Provided: 230
Building lines: 0m on all street fronts	**Building lines:** In accordance with an approved site development plan

5. MUNICIPAL SERVICES

5.1 The region is generally well provided with civil service infrastructure. Development pressure in this area challenges the rate at which bulk infrastructure can be provided to accommodate expansion. Existing infrastructure will however be capable of accommodating the proposed additional land-use rights.

5.2 During the application stage, the different engineering departments will get an opportunity to indicate whether additional engineering studies will be required before the rezoning application can be approved. If so required, Professional Engineers will be appointed to investigate the civil services and compile an outline scheme document.

5.3 The amount of Bulk Services Contributions for civil services payable to the City of Joburg will be determined with the finalisation of the rezoning application. Rebate will be given for the existing land use rights on the final amounts.

5.4 A formal Traffic Access Study is currently being prepared by the project Engineers. It will be submitted to Council as soon as it is received.

5.5 The electricity connection has been discussed with City Power. Adequate capacity is currently available for the development at the nearby Crown substation and an estimated 2,2 MVA can therefore be made available for planned developments in the Ormonde area, of which this application forms part of.

Capacity can be released by shifting loads between the various distributor areas. A feeder cable from Crown substation is thus not required. A detailed Electrical Report and/or Outline Scheme Report will be submitted to Council in due course.

6. POLICIES

6.1 National Development Guidelines

6.1.1 Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

Section 7 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013) confirms that the following principles applies to spatial planning, land development and land use management:

7(a) The principle of spatial justice, whereby-:

(i) Past spatial and other development imbalances must be redressed through improved access to and use of land.

It is our opinion that the greater community of this area will benefit from the development proposal through various new housing opportunities.

The development will enhance the urban environment through the strengthening of the residential character and the creation of economic growth, as required in terms of local policies.

(ii) Spatial development frameworks and policies at all spheres of government must address the inclusion of persons and areas that were previously excluded, with an emphasis on informal settlements, former homeland areas and areas characterised by widespread poverty and deprivation.

(iii) Spatial planning mechanism, including land use schemes, must incorporate provisions that enable redress in access to land by disadvantaged communities and persons.

(iv) Land use management system must include all areas of a municipality and specifically include provisions that are flexible and appropriate for the management of disadvantaged areas, informal settlements and former homeland areas.

(v) Land development procedures must include provisions that accommodate access to secure tenure and incremental upgrading of informal areas.

(vi) A Municipal Planning Tribunal considering an application before it, may not be implemented or restricted in the exercise of its discretion solely on the ground that the value of land or property is affected by the outcome of the application.

Principles (7)(a) (ii) to (vi) relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

7(b) The principle of spatial sustainability, whereby spatial planning and land use management systems must-:

(i) Promote land development that is within the fiscal, institutional and administrative means of the Republic.

The proposed development, as motivated, complies with the fiscal, institutional and

administrative means of the Republic as well as the Local Authority.

Development Policies, related administration and laws (City of Johannesburg Municipal Planning By-Law, 2016) and the National Environmental Management Act, 1998, do allow for the application, as submitted, to be entertained. The proposal has been discussed with the relevant Town Planners at Council before submission of the application.

(ii) Ensure that special consideration is given to the protection of prime and unique agricultural land.

The property is surrounded by existing urban infrastructure, and in terms of Municipal policy, the property is earmarked for higher density residential development.

(iii) Uphold consistency of land use measures in accordance with environmental management instruments.

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(iv) Promote and stimulate the effective and equitable functioning of land markets.

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(v) Consider all current and future cost to all parties for the provision of infrastructure and social services in land developments.

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(vi) Promote land development in locations that are sustainable and limit urban sprawl.

The subject property is situated within Region F of the City of Johannesburg and will not contribute to urban sprawl. The proposed development will serve as infill development and will ensure the optimisation of developable land and municipal infrastructure and services.

According to relevant policy guidelines of the Municipality (i.e. the Municipal Spatial Development Framework), the subject property is earmarked for purposes of higher density residential development. The proposal is, in principle, supported by Council.

(vii) Result in communities that are viable.

The proposed development is in close proximity to other residential, some commercial, lifestyle and educational opportunities. It is furthermore located near public transport facilities and is also ideally situated in terms of the main through routes in the area (i.e. the M1-Highway).

7(c) The principle of efficiency, whereby-:

(i) Land development optimises the use of existing resources and infrastructure.

The proposed development will promote efficient land development, as it entails the development of residential housing in close proximity to commercial, lifestyle and educational opportunities. Public transport is also available in close proximity.

The subject property is strategically situated in relation to transportation routes, e.g. M1 Freeway and Shakespeare Avenue.

Civil services are also available in the area for the proposed development.

(ii) Decision-making procedures are designed to minimise negative financial, social, economic or environmental impacts.

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(iii) Development application procedures are efficient and streamlined and timeframes are adhered to by all parties.

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

7(d) **Principal of spatial resilience** whereby flexibility in spatial plans, policies and land use management systems are accommodated to ensure sustainable livelihoods in communities most likely to suffer the impacts of economic and environmental shocks.

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

7(e) **The principle of good administration, whereby-:**

(i) All spheres of government ensure an integrated approach to land use and land development that is guided by the spatial planning and land use management systems as embodied in this Act.

This principle relates to obligations imposed on local government. The application will be circulated to relevant internal municipal departments for their comments.

(ii) All government departments must provide their sector inputs and comply with any other prescribed requirements during the preparation or amendment of spatial planning frameworks.

This principle relates to obligations imposed on local government.

(iii) The requirements of any law relating to land development and land use are met timeously.

This principle relates to obligations imposed on local government.

(iv) The preparation and amendment of spatial plans, policies, land use schemes as well as procedures for development applications, include transparent processes of public participation that afford all parties the opportunity to provide inputs on matters affecting them.

This principle relates to obligations imposed on local government. It is also confirmed

that the application will be advertised by the applicant in the prescribed manner.

(v) Policies, legislation and procedures must be clearly set in order to inform and empower members of the public.

This principle relates to obligations imposed on local government.

6.1.2 National Development Plan, 2030

The National Development Plan identifies five principles for spatial development: spatial justice, spatial sustainability, spatial resilience, spatial quality and special efficiency.

It confirms that South African cities are highly fragmented, as little has been achieved in reversing apartheid geography. The Plan proposes that the situation be addressed by establishing new norms and standards: amongst others by densifying cities, improving transport and locating jobs where people live.

The containment of urban sprawl is particularly highlighted in the Plan, confirming that sprawl be contained and reversed (if possible), "… as denser forms of development are more efficient in terms of land usage, infrastructure cost and environmental protection."

The proposed development aligns with the vision of the National Development Plan, as it will promote compaction of the city and limiting urban sprawl (by means of infill development), by the redevelopment of a property which is currently vacant instead of developing outside the urban edge.

6.2 Provincial Development Guidelines

6.2.1 Gauteng Metropolitan Spatial Development Framework, 2011

The Gauteng Metropolitan Spatial Development Framework (MSDF), 2011, was, amongst others, compiled to specify a clear set of spatial objectives for municipalities to achieve in order to ensure realisation of the future provincial spatial infrastructure; and to enable and direct growth.

The MSDF aims to articulate the spatial objectives of the Gauteng region to assist the alignment of neighbouring municipalities' spatial plans. It is proposed that key principles in local municipality SDFs should include (applicable to this application):

- Promotion of densification in specific areas to utilise resources more efficiently;
- Establishment of a hierarchy of nodes and supporting existing development nodes.

The MSDF confirms that "it remains the intension to limit urban sprawl as a fundamental tenet or urban growth policy and to promote the intentions of intensification and densification, together with a transformed urban structure that de-emphasises the need for outward expansion of the urban system".

The development proposal will not contribute to urban sprawl and should be regarded as infill development.

6.2.2 Gauteng Spatial Development Framework, 2011

The Gauteng Spatial Development Framework (SDF), 2011, was, amongst others, compiled to specify a clear set of spatial objectives for municipalities to achieve in order to ensure realisation of the future provincial spatial infrastructure; and to enable and direct growth.

The SDF aims to articulate the spatial objectives of the Gauteng region to assist the alignment of neighbouring municipalities' spatial plans. It is proposed that key principles in local municipality SDFs should include (applicable to this application):

- Promotion of densification in specific areas to utilise resources more efficiently;
- Establishment of a hierarchy of nodes and supporting existing development nodes.

The SDF confirms on page 128 that "it remains the intension to limit urban sprawl as a fundamental tenet or urban growth policy and to promote the intentions of intensification and densification, together with a transformed urban structure that de-emphasises the need for outward expansion of the urban system".

The SDF furthermore identified four critical factors for development in the province, relevant to this development:

- **Contained urban growth:**

  To contain urban growth, an Urban Edge was identified to curb urban sprawl. The idea behind the urban edge is to limit development within certain areas of a city. Only certain types of developments are allowed on the outside of the urban edge. The goal is to curb urban sprawl and thereby protecting the natural environment. One way to do this is to increase the densities of the built environment within the urban edge.

  This edge is however not set in stone and can be amended if development pressure in an area requires the alteration of this "line" or edge. Normally, areas identified for future development or as future development nodes are not included within the urban edge of a municipality. Amendments to the relevant spatial legislation and frameworks of the municipality usually later include these areas within the edge, so the development potential can be unlocked. Approval of net land-use rights and applications in an area indicates that the characteristics of the area have changed over the ears.

- **Resourced based economic development:**

  Resource based economic development should result in identification of the economic core. Development should be encouraged in close proximity to existing resources, which includes infrastructure such as roads, water and electricity.

  The proposed development is situated near existing and adjacent to approved proposed developments and infrastructure networks. Recent similar approved township establishment applications indicate that there is a growing economic base in the area.

- **Re-direction of urban growth:**

  Developments in economically non-viable areas should be limited and thereby achieving growth within the economic growth sphere. This part of the Municipality is a fast growing sector in Joburg and growth should be encouraged in the precinct.

- **Increased access and mobility:**

  The proposed land development area could be regarded as highly accessible.

6.3 Local Development Guidelines

6.3.1 Spatial Development Framework (SDF), 2011

The SDF was compiled to realise the vision of the Municipality through spatial restructuring and to integrate all aspects of spatial planning.

The subject property is earmarked for purposes of residential development. The Ormonde area is situated within a mixed use area, focussing on sporting / entertainment facilities, light industrial with a very large residential component.

In light of the above, it is apparent that the proposed development is consistent with the principles contained in the SDF.

6.3.2 Integrated Development Plan (IDP), 2012/2016

The Municipality has adopted an Integrated Development Plan (IDP) for 2012/2016 in terms of Section 25 of the Local Government, Municipal Systems Act, 2000 (Act No. 32 of 2000), which plan integrates and coordinates plans and aligns the resources and capacity of the Municipality to implement these plans. The compilation of Spatial Development Frameworks forms part of the IDP.

The Johannesburg Municipality seeks to focus its efforts to complement National and Provincial Government to accomplish the following strategic objectives through the IDP:

- Provide quality basic services and infrastructure;
- Facilitate higher and shared economic growth and development;
- To fight poverty, build clean, healthy, safe and sustainable communities;
- Foster participatory democracy through a caring, accessible and accountable service; and
- To ensure good governance, financial viability and optimal institutional transformation with capacity to execute its mandate.

The Strategic Levers emanating from the city's macro and long-term strategy, including the medium-term plan reflect Joburg's attempts in actively working towards achieving the targets set out at national and provincial level

The IDP confirms the status of the Ormonde area which focusses on the residential component as indicated in the SDF. The proposed development therefore finds support in the IDP.

7. MOTIVATION AND BURDEN OF PROOF

7.1 Need

7.1.1 The need for the development of residential units on the property is acknowledged in the land use policies of the Municipality, particularly the SDF which confirms that the property is earmarked for purposes of residential development. This confirms that the need for the development on the property is also acknowledged from a policy perspective.

7.1.2 The proximity of the subject property to important transport routes (e.g. the, M1 freeway and Shakespeare Avenue), public transport, job opportunities and most importantly renders that the property ideal for the intended land use.

7.1.3 Open and vacant, unutilised land within a build-up area can be perceived as a weakness due to the security threat that vacant land imposes, as well as the negative influence it has on the image of a neighbourhood. Unused open or vacant land, which implies lower densities, makes the provision of essential municipal services less viable and more expensive to provide. By developing the existing land, the development of urban fibre can be stimulated through the strengthening of the development node and region. The proposed land use rights of the erf accommodated in this application is in accordance with the proposals of the Integrated Development Plan (IDP), as the IDP earmarks this area for medium to high density residential uses.

7.1.4 The proposed development will positively influence the income base of the Municipality. The income generated by rates is a function of land value, which is in turn a function of the land use. The establishment of the residential townships (which includes a retail erf) broadens the economic base of the area. The

development will also ensure the following:

- Infill development – The application site is a vacant portion of land situated adjacent to an existing and future residential townships, within the Municipality;
- New work opportunities in close proximity to place of residence during construction; and
- Optimal use of existing infrastructure.

7.1.5 The proposed development is also consistent with approved land use policies in Johannesburg. The need for the proposed development is substantiated by the principles of the IDP, i.e. the infill of vacant land and the optimal use of existing infrastructure, as well as from current market forces.

7.2 Desirability

7.2.1 There is a need for more residential units within the Ormonde area and this development will contribute to this need. Mounting development pressure within the municipality is resulting in all available developable land being developed.

7.2.2 The development proposal is also consistent with, and will promote, the land use policy guidelines of the Municipality. The development can be regarded as being desirable and will have several beneficial social and economic impacts on the area, which can be summarised as follow:

- Optimum utilisation of services and infrastructure;
- Increase in property values of surrounding properties;
- Increased security;
- Compatibility with surrounding land uses; and
- Increased housing opportunities

7.2.3 The proposed development will maximize the potential of the subject property and is consistent with the strategic location of the site. The proposed development will additionally contribute to the overall efficiency, sustainability and improved quality of the greater area. The development will have several beneficial social, economic and ecological impacts once the construction thereof is finalised, which can be summarised as follow:

- Reduction of potential dumping areas and informal settlements;
- Optimum utilisation of services and infrastructure;
- Expansion of municipal infrastructure and services;
- Increase in property values of surrounding properties;
- Increased security;
- Eradication of invasive species;
- Compatibility with surrounding land uses; and
- Landscaping could improve fauna numbers and species.

As mentioned above, the proposed development will include community and will be easy accessible through public transport. The need for social and economic facilities in this area is identified in various planning policies and policy frameworks of the Municipality. The development will provide much needed residential and retail facilities for the area, and thus make a positive contribution with regards to social welfare.

7.2.4 The proposed development will align with the existing urban form and character of the area. It will uplift the area economically and might attract other potential developers to the area as well. Thus, in effect, in might have a very positive financial influence to the precinct. Furthermore, the proposed development will contribute to an economic base in the area. Thus, it is argued that the proposed development will have a positive influence to the area.

7.2.5 When considering that the Building Plans and Site Development Plans which must be submitted to the Municipality, will have to comply with the relevant design guidelines and development parameters of land

use policies, the proposed development can be perceived as desirable from a land use perspective.

7.3 Compliance with SPLUMA principles

7.3.1 With reference to Section 7.1.1 of this Memorandum, it is confirmed that the development proposal complies with the principles of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013).

7.4 Public interest in terms of Section 47(2) of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.4.1 The proposed development is in the public interest, as the land use rights is consistent with approved policy guidelines on national, provincial and local level.

7.5 Facts and circumstances of application in terms of Section 42 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.5.1 This memorandum is submitted in support of an application in terms of the provisions of Section 21 of the City of Johannesburg Municipal Planning By-Law, 2016 for the rezoning of Erf 962 & Erf 963, Ormonde Extension 22, from "Residential 3" with 25 dwelling units per hectare to **"Residential 3"** with "**110 dwelling units per hectare".**

7.5.2 The proposed development aligns with approved policy guidelines on national, provincial and local level.

7.6 Rights and obligations of affected parties in terms of Section 42 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.6.1 The rights and obligations of affected parties will be taken into account in the following manner:

- The application will be advertised as prescribed in Section 21(2) of the City of Johannesburg Municipal Planning By-Law, 2016, by the publications of notices in the Gauteng Provincial Gazette, Beeld and Citizen during February/ March 2017, and by the simultaneous display of a notice on site for fourteen (14 days). An objection period of 28 days will be afforded to any affected parties; and

- The City Planning Department will circulate the application for comments from internal departments of the Municipality. Any concerns raised will have to be dealt with to the satisfaction of the relevant department.

7.7 Interested persons in terms of Section 45 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.7.1 The application will be advertised as prescribed in Section 21(2) of the City of Johannesburg Municipal Planning By-Law, 2016, granting any person the opportunity to register as an interested party.

7.8 Impact on engineering services, social infrastructure and open space in terms of Sections 42 and 49 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013), read with Section 46, 47 and 48 of the City of Johannesburg Municipal Planning By-Law, 2016

7.8.1 The impact of the proposed development will be confirmed by the internal departments of the Municipality who will be afforded an opportunity to comment on the application.

7.8.2 Any adverse impacts will be mitigated and addressed by suitable solutions, which may include service agreements and/or payment of bulk contributions to upgrade existing services infrastructure.

7.9 Reply to objections

7.9.1 The applicant will reply to any valid objections to the application.

7.9.2 The advertisements will comply with the requirements of the relevant sections of the City of Johannesburg Municipal Planning By-Law, 2016. The rights of potential objectors and or interested parties will be brought to the attention of probable objectors and or interested parties in terms of the requirements of Section 21(2) of the City of Johannesburg Municipal Planning By-Law, 2016.

7.9.3 In submitting this application, applicant has endeavoured to comply with the requirements of the relevant provincial legislation as well as the provisions of the City of Johannesburg Municipal Planning By-Law, 2016, read with the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013).

7.9.4 The application clearly indicates the land- use rights, scheme documents, diagrams, layout plans, need and desirability, co-ordinated harmonious development and all other relevant requirements in terms of provincial legislation.

7.9.5 The application further complies with the relevant requirements of the Spatial Planning and Land Use Management Act, 2013 (Act 16 of 2013). Specifically, Sections 7, 42, 47 and 49 thereof.

8. CONCLUSION

8.1 Application is made in terms of the provisions of Section 21 of the City of Johannesburg Municipal Planning By-Law, 2016 for the rezoning of Erf 962 & Erf 963, Ormonde Extension 22, from "Residential 3" with a density of "25 dwelling units per hectare; FAR of 0.4; Height of 3 storeys; and coverage of 30%" to "Residential 3" with a density of "110 dwelling units per hectare; FAR of 0.7; Height of 4 storeys; and coverage of 30%", subject to the following conditions

8.2 The purpose of this application is to obtain the appropriate land use rights to enable higher residential development. The application clearly confirms the need and desirability and compliance with all other relevant requirements in terms of relevant policies and legislation.

8.3 Note that a separate application for the consolidation of the two properties, terms of the provisions of Section 33 of the City of Johannesburg Municipal Planning By-Law, 2016, was also submitted to the Municipality. Even though the rezoning and consolidation applications are submitted separately, approval of both applications will be required before submission of any building plans to Council and before construction can commence.

8.4 We trust that Council will evaluate and consider the application on its merit.

_____

Werner Slabbert B(TRP)
Professional Planner - Pr. Pln A/2190/2015

URBAN INNOVATE CONSULTING CC
CK2007/191853/23

LIST OF ANNEXURES

- ANNEXURE A - LOCALITY PLAN
- ANNEXURE B - DEED OF TRANSFER
- ANNEXURE C - POWER OF ATTORNEY, COMPANY RESOLUTION & PROOF OF DIRECTORS
- ANNEXURE D - ZONING CERTIFICATE AND ZONING MAP
- ANNEXURE E - LAND USE MAP
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- ANNEXURE G - PROPOSED SITE PLAN AND GATEHOUSE DESIGN
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ANNEXURE C

CAPACITY CALCULATION RESULTS

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MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 AM Peak Hour Background Traffic Volume
Proposed by latents
Signals - Fixed Time Cycle Time = 100 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	187	0.0	0.173	8.5	LOS A	0.8	5.5	0.12	0.69	48.4
2	T	901	0.0	0.870	30.4	LOS C	43.9	307.0	0.96	0.96	31.1
Approach		1088	0.0	0.870	26.6	LOS C	43.9	307.0	0.81	0.91	33.2
North: Alwen Road (N)											
8	T	417	0.0	0.403	16.6	LOS B	14.1	98.4	0.67	0.59	39.4
9	R	95	0.0	0.852	69.1	LOS E	7.2	50.2	1.00	1.01	20.6
Approach		512	0.0	0.852	26.4	LOS C	14.1	98.4	0.73	0.66	33.7
West: Akker Avenue (W)											
10	L	297	0.0	0.850	44.3	LOS D	31.9	223.4	0.98	0.94	27.0
12	R	335	0.0	0.850	44.4	LOS D	31.9	223.4	0.98	0.94	27.0
Approach		632	0.0	0.850	44.4	LOS D	31.9	223.4	0.98	0.94	27.0
All Vehicles		2232	0.0	0.870	31.6	LOS C	43.9	307.0	0.84	0.86	31.2

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS E. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 PM Peak Hour Background Traffic Volumes
Proposed by Latents
Signals - Fixed Time Cycle Time = 120 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	171	0.0	0.853	39.3	LOS D	7.5	52.3	0.85	0.83	28.8
2	T	391	0.0	0.526	32.5	LOS C	19.0	132.9	0.85	0.73	30.4
Approach		561	0.0	0.854	34.6	LOS C	19.0	132.9	0.85	0.76	29.9
North: Alwen Road (N)											
8	T	794	0.0	0.494	5.2	LOS A	17.7	123.8	0.40	0.36	50.8
9	R	229	0.0	0.679	16.9	LOS B	5.1	35.5	0.56	0.79	40.8
Approach		1023	0.0	0.679	7.8	LOS A	17.7	123.8	0.43	0.46	48.2
West: Akker Avenue (W)											
10	L	71	0.0	0.808	67.8	LOS E	14.6	102.0	1.00	0.90	20.9
12	R	142	0.0	0.808	67.9	LOS E	14.6	102.0	1.00	0.90	20.9
Approach		213	0.0	0.808	67.9	LOS E	14.6	102.0	1.00	0.90	20.9
All Vehicles		1797	0.0	0.853	23.3	LOS C	19.0	132.9	0.63	0.61	35.8

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS E. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 AM Peak Hour Background Traffic Volumes
Proposed by Latents
Signals - Fixed Time Cycle Time = 120 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	217	0.0	0.200	8.4	LOS A	0.9	6.4	0.10	0.68	48.5
2	T	1044	0.0	0.917	39.1	LOS D	65.8	460.8	0.99	1.02	27.6
Approach		1261	0.0	0.917	33.9	LOS C	65.8	460.8	0.83	0.96	29.8
North: Alwen Road (N)											
8	T	501	0.0	0.441	16.9	LOS B	18.2	127.6	0.64	0.57	39.2
9	R	85	0.0	1.001[3]	80.5	LOS F	7.5	52.3	1.00	0.86	18.6
Approach		586	0.0	1.000	26.2	LOS C	18.2	127.6	0.69	0.61	33.8
West: Akker Avenue (W)											
10	L	327	0.0	0.987	104.7	LOS F	65.6	459.2	1.00	1.14	15.4
12	R	386	0.0	0.987	104.8	LOS F	65.6	459.2	1.00	1.14	15.4
Approach		714	0.0	0.987	104.8	LOS F	65.6	459.2	1.00	1.14	15.4
All Vehicles		2561	0.0	1.001	51.9	LOS D	65.8	460.8	0.85	0.93	24.2

Level of Service (Aver. Int. Delay): LOS D. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

3 x = 1.00 due to short lane

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MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 PM Peak Hour Background Traffic Volumes
Proposed by latents
Signals - Fixed Time Cycle Time = 60 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	197	0.0	0.682	23.1	LOS C	5.7	39.7	0.69	0.83	36.6
2	T	453	0.0	0.525	14.2	LOS B	11.7	81.7	0.80	0.69	40.8
Approach		649	0.0	0.682	16.9	LOS B	11.7	81.7	0.76	0.73	39.5
North: Alwen Road (N)											
8	T	920	0.0	0.720	8.6	LOS A	19.6	137.4	0.75	0.68	45.9
9	R	249	0.0	0.645	17.7	LOS B	5.1	35.5	0.79	0.82	40.2
Approach		1169	0.0	0.720	10.5	LOS B	19.6	137.4	0.75	0.71	44.5
West: Akker Avenue (W)											
10	L	75	0.0	0.588	31.9	LOS C	8.3	57.8	0.95	0.82	31.9
12	R	164	0.0	0.588	32.0	LOS C	8.3	57.8	0.95	0.82	31.9
Approach		239	0.0	0.588	32.0	LOS C	8.3	57.8	0.95	0.82	31.9
All Vehicles		2058	0.0	0.720	15.0	LOS B	19.6	137.4	0.78	0.73	41.0

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time Cycle Time = 70 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	198	0.0	0.377	10.8	LOS B	2.7	18.6	0.31	0.71	46.2
2	T	901	0.0	0.923	37.3	LOS D	41.2	288.6	1.00	1.21	28.3
Approach		1099	0.0	0.923	32.5	LOS C	41.2	288.6	0.88	1.12	30.4
North: Alwen Road (N)											
8	T	417	0.0	0.313	6.0	LOS A	8.0	55.9	0.48	0.42	49.6
9	R	187	0.0	0.589	24.7	LOS C	5.2	36.6	0.97	0.80	35.7
Approach		604	0.0	0.589	11.8	LOS B	8.0	55.9	0.63	0.54	44.2
West: Akker Avenue (W)											
10	L	575	0.0	0.802	33.0	LOS C	20.5	143.8	0.95	0.93	31.4
12	R	366	0.0	0.921	48.5	LOS D	16.4	115.0	1.00	1.01	25.6
Approach		941	0.0	0.920	39.0	LOS D	20.5	143.8	0.97	0.96	28.9
All Vehicles		2644	0.0	0.923	30.1	LOS C	41.2	288.6	0.85	0.93	32.1

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time Cycle Time = 60 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	200	0.0	0.640	20.0	LOS B	5.2	36.1	0.63	0.79	38.7
2	T	391	0.0	0.707	23.1	LOS C	12.6	88.3	0.96	0.86	34.7
Approach		591	0.0	0.707	22.0	LOS C	12.6	88.3	0.85	0.84	36.0
North: Alwen Road (N)											
8	T	794	0.0	0.535	4.2	LOS A	12.2	85.7	0.50	0.45	51.5
9	R	489	0.0	0.859	22.2	LOS C	9.9	69.0	0.78	0.90	37.2
Approach		1283	0.0	0.859	11.0	LOS B	12.2	85.7	0.60	0.62	44.9
West: Akker Avenue (W)											
10	L	181	0.0	0.172	14.9	LOS B	3.6	25.5	0.51	0.75	42.5
12	R	155	0.0	0.714	39.4	LOS D	6.4	45.1	1.00	0.88	28.7
Approach		336	0.0	0.714	26.2	LOS C	6.4	45.1	0.73	0.81	34.8
All Vehicles		2209	0.0	0.859	16.3	LOS B	12.6	88.3	0.69	0.71	40.5

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time Cycle Time = 80 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	227	0.0	0.432	11.2	LOS B	3.1	21.4	0.36	0.73	45.8
2	T	1044	0.0	0.984	72.4	LOS E	73.2	512.1	1.00	1.50	19.4
Approach		1272	0.0	0.984	61.4	LOS E	73.2	512.1	0.89	1.36	21.7
North: Alwen Road (N)											
8	T	483	0.0	0.352	6.3	LOS A	9.9	69.3	0.47	0.42	49.2
9	R	197	0.0	0.725	33.2	LOS C	6.8	47.5	1.00	0.86	31.3
Approach		680	0.0	0.725	14.1	LOS B	9.9	69.3	0.63	0.55	42.2
West: Akker Avenue (W)											
10	L	629	0.0	0.934	58.5	LOS E	34.3	240.3	1.00	1.09	23.0
12	R	395	0.0	1.000[3]	43.4	LOS D	17.2	120.2	1.00	0.86	27.3
Approach		1023	0.0	1.000	52.7	LOS D	34.3	240.3	1.00	1.00	24.4
All Vehicles		2975	0.0	1.000	47.6	LOS D	73.2	512.1	0.87	1.05	25.5

Level of Service (Aver. Int. Delay): LOS D. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS E. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

3 x = 1.00 due to short lane

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MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time Cycle Time = 60 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	225	0.0	0.741	25.1	LOS C	6.6	46.4	0.69	0.87	35.5
2	T	453	0.0	0.874	32.5	LOS C	17.1	119.6	1.00	1.09	30.2
Approach		678	0.0	0.874	30.0	LOS C	17.1	119.6	0.90	1.01	31.7
North: Alwen Road (N)											
8	T	920	0.0	0.620	4.7	LOS A	15.1	105.6	0.55	0.50	50.7
9	R	509	0.0	0.948	20.0	LOS C	9.9	69.0	0.79	0.86	38.6
Approach		1429	0.0	0.949	10.1	LOS B	15.1	105.6	0.64	0.63	45.6
West: Akker Avenue (W)											
10	L	186	0.0	0.172	14.4	LOS B	3.6	25.3	0.49	0.75	42.9
12	R	177	0.0	0.816	42.1	LOS D	7.6	53.0	1.00	0.97	27.7
Approach		363	0.0	0.816	27.9	LOS C	7.6	53.0	0.74	0.85	33.9
All Vehicles		2471	0.0	0.948	18.2	LOS B	17.1	119.6	0.72	0.77	39.0

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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MOVEMENT SUMMARY

Site: 2017 AM BGD

Dorado Avenue / Alwen Road Junction
2017 AM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time Cycle Time = 65 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Alwen Road (S)											
2	T	884	0.0	0.603	5.2	LOS A	15.6	109.1	0.55	0.50	50.1
3	R	373	0.0	0.666	16.3	LOS B	6.5	45.8	0.78	0.82	41.4
Approach		1257	0.0	0.666	8.5	LOS A	15.6	109.1	0.62	0.60	47.2
East: Alwen Road (E)											
4	L	157	0.0	0.172	19.2	LOS B	4.1	28.8	0.62	0.76	39.2
6	R	43	0.0	0.203	38.6	LOS D	2.0	14.0	0.95	0.73	29.0
Approach		200	0.0	0.203	23.4	LOS C	4.1	28.8	0.69	0.75	36.5
North: Dorado Avenue (N)											
7	L	148	0.0	0.593	26.3	LOS C	13.1	91.8	0.86	0.87	36.2
8	T	296	0.0	0.593	18.1	LOS B	13.1	91.8	0.86	0.75	37.0
Approach		444	0.0	0.593	20.8	LOS C	13.1	91.8	0.86	0.79	36.7
All Vehicles		1901	0.0	0.666	12.9	LOS B	15.6	109.1	0.68	0.66	43.0

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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MOVEMENT SUMMARY

Site: 2017 PM BGD

Dorado Avenue / Alwen Road Junction
2017 PM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time Cycle Time = 70 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Alwen Road (S)											
2	T	313	0.0	0.207	3.2	LOS A	4.7	32.8	0.34	0.29	53.5
3	R	203	0.0	0.534	20.9	LOS C	5.6	39.2	0.89	0.82	38.0
Approach		516	0.0	0.534	10.2	LOS B	5.6	39.2	0.56	0.50	46.1
East: Alwen Road (E)											
4	L	325	0.0	0.577	31.7	LOS C	11.4	79.6	0.91	0.83	32.0
6	R	113	0.0	0.571	43.3	LOS D	5.4	37.7	1.00	0.79	27.3
Approach		438	0.0	0.577	34.7	LOS C	11.4	79.6	0.93	0.82	30.6
North: Dorado Avenue (N)											
7	L	161	0.0	0.773	22.3	LOS C	24.7	172.8	0.84	0.94	39.1
8	T	709	0.0	0.773	14.1	LOS B	24.7	172.8	0.84	0.78	40.3
Approach		871	0.0	0.773	15.6	LOS B	24.7	172.8	0.84	0.81	40.1
All Vehicles		1824	0.0	0.773	18.7	LOS B	24.7	172.8	0.78	0.73	38.6

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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MOVEMENT SUMMARY

Site: 2022 AM BGD

Dorado Avenue / Alwen Road Junction
2022 AM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time Cycle Time = 70 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Alwen Road (S)											
2	T	1068	0.0	0.708	5.7	LOS A	21.2	148.3	0.61	0.56	49.3
3	R	475	0.0	0.918	18.4	LOS B	10.1	70.6	0.89	0.86	39.7
Approach		1543	0.0	0.918	9.6	LOS A	21.2	148.3	0.70	0.65	45.9
East: Alwen Road (E)											
4	L	197	0.0	0.225	21.2	LOS C	5.6	39.4	0.66	0.77	37.9
6	R	51	0.0	0.256	41.6	LOS D	2.5	17.6	0.96	0.74	27.9
Approach		247	0.0	0.256	25.4	LOS C	5.6	39.4	0.72	0.77	35.3
North: Dorado Avenue (N)											
7	L	173	0.0	0.654	26.8	LOS C	16.2	113.3	0.87	0.88	35.9
8	T	358	0.0	0.654	18.6	LOS B	16.2	113.3	0.87	0.76	36.7
Approach		531	0.0	0.654	21.2	LOS C	16.2	113.3	0.87	0.80	36.5
All Vehicles		2321	0.0	0.918	14.0	LOS B	21.2	148.3	0.74	0.70	42.1

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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MOVEMENT SUMMARY

Site: 2022 PM BGD

Dorado Avenue / Alwen Road Junction
2022 PM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time Cycle Time = 80 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Alwen Road (S)											
2	T	356	0.0	0.225	2.9	LOS A	5.3	37.3	0.31	0.27	54.1
3	R	229	0.0	0.689	26.8	LOS C	8.6	60.4	0.99	0.88	34.5
Approach		585	0.0	0.689	12.3	LOS B	8.6	60.4	0.57	0.51	44.2
East: Alwen Road (E)											
4	L	360	0.0	0.730	39.9	LOS D	15.0	105.2	0.98	0.88	28.6
6	R	131	0.0	0.756	51.6	LOS D	7.2	50.1	1.00	0.88	24.7
Approach		491	0.0	0.756	43.0	LOS D	15.0	105.2	0.98	0.88	27.4
North: Dorado Avenue (N)											
7	L	187	0.0	0.800	21.9	LOS C	30.7	215.0	0.82	0.94	39.3
8	T	806	0.0	0.800	13.7	LOS B	30.7	215.0	0.82	0.77	40.6
Approach		994	0.0	0.800	15.3	LOS B	30.7	215.0	0.82	0.81	40.3
All Vehicles		2069	0.0	0.800	21.0	LOS C	30.7	215.0	0.79	0.74	37.1

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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MOVEMENT SUMMARY

Site: 2017 AM BGD

Dorado Avenue / Alwen Road Junction
2017 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time Cycle Time = 65 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Alwen Road (S)											
2	T	1015	0.0	0.692	5.8	LOS A	19.4	135.7	0.62	0.57	49.1
3	R	509	0.0	0.796	23.2	LOS C	11.4	80.1	0.91	0.93	36.6
Approach		1524	0.0	0.796	11.6	LOS B	19.4	135.7	0.72	0.69	44.1
East: Alwen Road (E)											
4	L	202	0.0	0.222	19.5	LOS B	5.3	36.9	0.64	0.77	39.0
6	R	43	0.0	0.203	38.6	LOS D	2.0	14.0	0.95	0.73	29.0
Approach		245	0.0	0.222	22.9	LOS C	5.3	36.9	0.69	0.76	36.8
North: Dorado Avenue (N)											
7	L	148	0.0	0.654	26.8	LOS C	14.5	101.5	0.89	0.87	36.0
8	T	339	0.0	0.653	18.7	LOS B	14.5	101.5	0.89	0.77	36.7
Approach		487	0.0	0.653	21.1	LOS C	14.5	101.5	0.89	0.80	36.5
All Vehicles		2257	0.0	0.796	14.9	LOS B	19.4	135.7	0.75	0.72	41.3

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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MOVEMENT SUMMARY

Site: 2017 PM BGD

Dorado Avenue / Alwen Road Junction
2017 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time Cycle Time = 70 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Alwen Road (S)											
2	T	344	0.0	0.228	3.3	LOS A	5.2	36.2	0.35	0.30	53.4
3	R	237	0.0	0.675	25.1	LOS C	7.5	52.5	0.98	0.86	35.4
Approach		581	0.0	0.675	12.2	LOS B	7.5	52.5	0.61	0.53	44.3
East: Alwen Road (E)											
4	L	404	0.0	0.717	34.1	LOS C	14.5	101.8	0.96	0.87	30.9
6	R	113	0.0	0.571	43.3	LOS D	5.4	37.7	1.00	0.79	27.3
Approach		517	0.0	0.717	36.1	LOS D	14.5	101.8	0.97	0.86	30.1
North: Dorado Avenue (N)											
7	L	161	0.0	0.837	27.0	LOS C	31.1	217.6	0.90	1.00	36.3
8	T	782	0.0	0.838	18.8	LOS B	31.1	217.6	0.90	0.90	36.9
Approach		943	0.0	0.838	20.2	LOS C	31.1	217.6	0.90	0.92	36.8
All Vehicles		2041	0.0	0.838	21.9	LOS C	31.1	217.6	0.83	0.79	36.5

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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MOVEMENT SUMMARY

Site: 2022 AM BGD

Dorado Avenue / Alwen Road Junction
2022 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time Cycle Time = 70 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Alwen Road (S)											
2	T	1146	0.0	0.760	6.2	LOS A	24.3	170.1	0.66	0.61	48.6
3	R	559	0.0	0.921	28.3	LOS C	14.3	100.0	0.96	0.96	33.7
Approach		1705	0.0	0.921	13.4	LOS B	24.3	170.1	0.76	0.73	42.5
East: Alwen Road (E)											
4	L	224	0.0	0.257	21.4	LOS C	6.4	44.6	0.67	0.78	37.7
6	R	51	0.0	0.256	41.6	LOS D	2.5	17.6	0.96	0.74	27.9
Approach		275	0.0	0.257	25.1	LOS C	6.4	44.6	0.72	0.77	35.4
North: Dorado Avenue (N)											
7	L	173	0.0	0.687	27.1	LOS C	17.1	119.6	0.89	0.88	35.8
8	T	383	0.0	0.687	18.9	LOS B	17.1	119.6	0.89	0.78	36.5
Approach		556	0.0	0.686	21.4	LOS C	17.1	119.6	0.89	0.81	36.3
All Vehicles		2536	0.0	0.921	16.5	LOS B	24.3	170.1	0.78	0.75	40.1

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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MOVEMENT SUMMARY

Site: 2022 PM BGD

Dorado Avenue / Alwen Road Junction
2022 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time Cycle Time = 80 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Alwen Road (S)											
2	T	387	0.0	0.245	2.9	LOS A	5.8	40.8	0.31	0.27	54.0
3	R	263	0.0	0.857	44.5	LOS D	11.5	80.3	1.00	1.06	26.9
Approach		651	0.0	0.857	19.7	LOS B	11.5	80.3	0.59	0.59	38.4
East: Alwen Road (E)											
4	L	439	0.0	0.890	51.5	LOS D	21.4	149.5	1.00	1.02	24.8
6	R	131	0.0	0.756	51.6	LOS D	7.2	50.1	1.00	0.88	24.7
Approach		569	0.0	0.890	51.5	LOS D	21.4	149.5	1.00	0.98	24.8
North: Dorado Avenue (N)											
7	L	187	0.0	0.859	27.5	LOS C	39.3	275.0	0.89	1.00	35.9
8	T	879	0.0	0.859	19.3	LOS B	39.3	275.0	0.89	0.89	36.6
Approach		1066	0.0	0.859	20.8	LOS C	39.3	275.0	0.89	0.91	36.5
All Vehicles		2286	0.0	0.890	28.1	LOS C	39.3	275.0	0.83	0.84	33.1

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Chamfuti Crescent North Junction
2017 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	678	0.0	0.333	2.4	LOS A	4.3	29.8	0.63	0.00	49.6
3	R	2	0.0	0.351	10.8	LOS B	4.3	29.8	0.63	0.97	49.3
Approach		680	0.0	0.333	2.5	LOS B	4.3	29.8	0.63	0.00	49.6
East: Chamfuti Crescent North (E)											
4	L	7	0.0	0.819	71.0	LOS F	5.3	37.4	0.95	1.38	20.6
6	R	104	0.0	0.784	70.8	LOS F	5.3	37.4	0.95	1.29	20.6
Approach		112	0.0	0.785	70.8	LOS F	5.3	37.4	0.95	1.29	20.6
North: Akker Avenue (N)											
7	L	43	0.0	0.173	8.2	LOS A	0.0	0.0	0.00	1.01	49.0
8	T	308	0.0	0.173	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		352	0.0	0.173	1.0	LOS A	0.0	0.0	0.00	0.12	58.4
All Vehicles		1143	0.0	0.819	8.7	NA	5.3	37.4	0.47	0.17	45.5

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Chamfuti Crescent North Junction
2017 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	246	0.0	0.122	3.8	LOS A	1.7	11.7	0.67	0.00	49.0
3	R	1	0.0	0.117	12.2	LOS B	1.7	11.7	0.67	1.03	48.0
Approach		247	0.0	0.122	3.9	LOS B	1.7	11.7	0.67	0.00	49.0
East: Chamfuti Crescent North (E)											
4	L	1	0.0	0.175	26.2	LOS D	0.8	5.5	0.79	1.00	35.6
6	R	40	0.0	0.183	26.0	LOS D	0.8	5.5	0.79	1.00	35.7
Approach		41	0.0	0.183	26.0	LOS D	0.8	5.5	0.79	1.00	35.7
North: Akker Avenue (N)											
7	L	84	0.0	0.290	8.2	LOS A	0.0	0.0	0.00	1.00	49.0
8	T	507	0.0	0.291	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		592	0.0	0.291	1.2	LOS A	0.0	0.0	0.00	0.14	58.1
All Vehicles		880	0.0	0.291	3.1	NA	1.7	11.7	0.23	0.14	53.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Chamfuti Crescent North Junction
2022 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	746	0.0	0.366	3.1	LOS A	5.5	38.2	0.69	0.00	48.8
3	R	2	0.0	0.351	11.5	LOS B	5.5	38.2	0.69	1.00	48.9
Approach		748	0.0	0.366	3.1	LOS B	5.5	38.2	0.69	0.00	48.8
East: Chamfuti Crescent North (E)											
4	L	8	0.0	1.053	322.8	LOS F	23.9	167.2	1.00	3.37	6.1
6	R	112	0.0	1.105	322.6	LOS F	23.9	167.2	1.00	2.55	6.1
Approach		120	0.0	1.104	322.6	LOS F	23.9	167.2	1.00	2.61	6.1
North: Akker Avenue (N)											
7	L	46	0.0	0.192	8.2	LOS A	0.0	0.0	0.00	1.01	49.0
8	T	345	0.0	0.192	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		392	0.0	0.192	1.0	LOS A	0.0	0.0	0.00	0.12	58.4
All Vehicles		1260	0.0	1.105	32.9	NA	23.9	167.2	0.51	0.29	30.2

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Chamfuti Crescent North Junction
222 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	269	0.0	0.133	4.4	LOS A	2.0	13.8	0.70	0.00	48.6
3	R	1	0.0	0.132	12.9	LOS B	2.0	13.8	0.70	1.05	47.5
Approach		271	0.0	0.133	4.5	LOS B	2.0	13.8	0.70	0.00	48.6
East: Chamfuti Crescent North (E)											
4	L	1	0.0	0.211	30.3	LOS D	1.0	7.1	0.83	1.02	33.4
6	R	43	0.0	0.230	30.2	LOS D	1.0	7.1	0.83	1.02	33.5
Approach		44	0.0	0.230	30.2	LOS D	1.0	7.1	0.83	1.02	33.5
North: Akker Avenue (N)											
7	L	88	0.0	0.314	8.2	LOS A	0.0	0.0	0.00	1.00	49.0
8	T	551	0.0	0.314	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		639	0.0	0.314	1.1	LOS A	0.0	0.0	0.00	0.14	58.2
All Vehicles		954	0.0	0.314	3.4	NA	2.0	13.8	0.24	0.14	53.4

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Chamfuti Crescent North Junction
2017 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	800	0.0	0.643	8.9	LOS A	8.7	60.7	0.57	0.59	47.0
3	R	2	0.0	0.702	11.9	LOS B	8.7	60.7	0.57	0.69	45.6
Approach		802	0.0	0.643	8.9	LOS B	8.7	60.7	0.57	0.59	47.0
East: Chamfuti Crescent North (E)											
4	L	7	0.0	0.127	11.5	LOS B	0.9	6.0	0.53	0.73	45.5
6	R	104	0.0	0.127	13.1	LOS B	0.9	6.0	0.53	0.75	44.2
Approach		112	0.0	0.127	13.0	LOS B	0.9	6.0	0.53	0.74	44.3
North: Akker Avenue (N)											
7	L	43	0.0	0.240	8.9	LOS A	2.1	15.0	0.03	0.77	48.0
8	T	349	0.0	0.239	7.6	LOS A	2.1	15.0	0.03	0.62	49.4
Approach		393	0.0	0.239	7.8	LOS A	2.1	15.0	0.03	0.64	49.2
All Vehicles		1306	0.0	0.702	8.9	LOS A	8.7	60.7	0.40	0.62	47.4

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

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MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Chamfuti Crescent North Junction
2017 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	296	0.0	0.222	7.9	LOS A	1.9	13.4	0.21	0.58	48.6
3	R	1	0.0	0.211	10.9	LOS B	1.9	13.4	0.21	0.76	46.2
Approach		297	0.0	0.222	7.9	LOS B	1.9	13.4	0.21	0.58	48.6
East: Chamfuti Crescent North (E)											
4	L	1	0.0	0.058	13.5	LOS B	0.4	2.7	0.65	0.76	43.6
6	R	40	0.0	0.059	15.2	LOS B	0.4	2.7	0.65	0.77	42.4
Approach		41	0.0	0.059	15.1	LOS B	0.4	2.7	0.65	0.77	42.5
North: Akker Avenue (N)											
7	L	84	0.0	0.425	8.9	LOS A	4.3	30.2	0.03	0.77	48.0
8	T	621	0.0	0.425	7.6	LOS A	4.3	30.2	0.03	0.62	49.4
Approach		705	0.0	0.425	7.8	LOS A	4.3	30.2	0.03	0.64	49.2
All Vehicles		1043	0.0	0.425	8.1	LOS A	4.3	30.2	0.10	0.63	48.7

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

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MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Chamfuti Crescent North Junction
2022 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	869	0.0	0.703	9.2	LOS A	10.4	72.8	0.65	0.60	46.6
3	R	2	0.0	0.702	12.1	LOS B	10.4	72.8	0.65	0.68	45.5
Approach		872	0.0	0.704	9.2	LOS B	10.4	72.8	0.65	0.60	46.6
East: Chamfuti Crescent North (E)											
4	L	8	0.0	0.138	11.5	LOS B	0.9	6.5	0.53	0.73	45.5
6	R	112	0.0	0.137	13.1	LOS B	0.9	6.5	0.53	0.75	44.2
Approach		120	0.0	0.137	13.0	LOS B	0.9	6.5	0.53	0.75	44.3
North: Akker Avenue (N)											
7	L	46	0.0	0.241	8.9	LOS A	2.2	15.5	0.04	0.76	48.0
8	T	349	0.0	0.241	7.6	LOS A	2.2	15.5	0.04	0.62	49.4
Approach		396	0.0	0.241	7.8	LOS A	2.2	15.5	0.04	0.64	49.2
All Vehicles		1387	0.0	0.703	9.1	LOS A	10.4	72.8	0.46	0.62	47.1

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

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MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Chamfuti Crescent North Junction
2022 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	319	0.0	0.240	7.9	LOS A	2.1	14.9	0.22	0.58	48.5
3	R	1	0.0	0.263	10.9	LOS B	2.1	14.9	0.22	0.75	46.2
Approach		320	0.0	0.240	7.9	LOS B	2.1	14.9	0.22	0.58	48.5
East: Chamfuti Crescent North (E)											
4	L	1	0.0	0.066	14.0	LOS B	0.4	3.1	0.67	0.78	43.2
6	R	43	0.0	0.066	15.7	LOS B	0.4	3.1	0.67	0.79	42.0
Approach		44	0.0	0.066	15.6	LOS B	0.4	3.1	0.67	0.79	42.1
North: Akker Avenue (N)											
7	L	88	0.0	0.453	8.9	LOS A	4.8	33.7	0.03	0.77	48.0
8	T	665	0.0	0.454	7.6	LOS A	4.8	33.7	0.03	0.62	49.4
Approach		754	0.0	0.454	7.8	LOS A	4.8	33.7	0.03	0.64	49.2
All Vehicles		1118	0.0	0.454	8.1	LOS A	4.8	33.7	0.11	0.63	48.7

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

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MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Chamfuti Crescent South Junction
2017 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	586	0.0	0.287	1.7	LOS A	3.3	22.9	0.53	0.00	51.0
3	R	1	0.0	0.263	10.1	LOS B	3.3	22.9	0.53	0.96	49.4
Approach		587	0.0	0.287	1.7	LOS B	3.3	22.9	0.53	0.00	51.0
East: Chamfuti Crescent South (E)											
4	L	2	0.0	0.162	27.8	LOS D	0.7	4.7	0.79	0.80	34.7
6	R	31	0.0	0.161	27.6	LOS D	0.7	4.7	0.79	1.00	34.8
Approach		33	0.0	0.161	27.6	LOS D	0.7	4.7	0.79	0.99	34.8
North: Akker Avenue (N)											
7	L	16	0.0	0.136	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
8	T	263	0.0	0.136	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		279	0.0	0.136	0.5	LOS A	0.0	0.0	0.00	0.06	59.2
All Vehicles		899	0.0	0.287	2.3	NA	3.3	22.9	0.37	0.06	52.4

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Akker Avenue / Chamfuti Crescent South Junction
2017 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	205	0.0	0.101	2.5	LOS A	1.2	8.2	0.58	0.00	50.3
3	R	1	0.0	0.105	10.9	LOS B	1.2	8.2	0.58	0.99	49.0
Approach		206	0.0	0.101	2.5	LOS B	1.2	8.2	0.58	0.01	50.3
East: Chamfuti Crescent South (E)											
4	L	1	0.0	0.050	20.1	LOS C	0.2	1.5	0.66	0.87	39.4
6	R	15	0.0	0.050	19.9	LOS C	0.2	1.5	0.66	0.99	39.6
Approach		16	0.0	0.050	19.9	LOS C	0.2	1.5	0.66	0.98	39.6
North: Akker Avenue (N)											
7	L	31	0.0	0.223	8.2	LOS A	0.0	0.0	0.00	1.04	49.0
8	T	426	0.0	0.224	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		457	0.0	0.224	0.5	LOS A	0.0	0.0	0.00	0.07	59.1
All Vehicles		679	0.0	0.224	1.6	NA	1.2	8.2	0.19	0.07	55.5

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Chamfuti Crescent South Junction
2022 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	641	0.0	0.314	2.0	LOS A	3.8	26.4	0.57	0.00	50.4
3	R	1	0.0	0.351	10.4	LOS B	3.8	26.4	0.57	0.97	49.5
Approach		642	0.0	0.314	2.0	LOS B	3.8	26.4	0.57	0.00	50.4
East: Chamfuti Crescent South (E)											
4	L	2	0.0	0.211	33.5	LOS D	0.9	6.6	0.84	0.86	31.8
6	R	35	0.0	0.221	33.3	LOS D	0.9	6.6	0.84	1.02	31.9
Approach		37	0.0	0.222	33.3	LOS D	0.9	6.6	0.84	1.01	31.9
North: Akker Avenue (N)											
7	L	16	0.0	0.150	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
8	T	292	0.0	0.150	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		307	0.0	0.150	0.4	LOS A	0.0	0.0	0.00	0.05	59.3
All Vehicles		986	0.0	0.351	2.7	NA	3.8	26.4	0.40	0.06	51.7

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Chamfuti Crescent South Junction
2022 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	222	0.0	0.110	2.8	LOS A	1.3	9.3	0.61	0.00	49.9
3	R	1	0.0	0.105	11.2	LOS B	1.3	9.3	0.61	1.00	48.7
Approach		223	0.0	0.110	2.9	LOS B	1.3	9.3	0.61	0.00	49.9
East: Chamfuti Crescent South (E)											
4	L	1	0.0	0.066	21.7	LOS C	0.3	2.0	0.70	0.89	38.4
6	R	18	0.0	0.067	21.5	LOS C	0.3	2.0	0.70	1.00	38.5
Approach		19	0.0	0.067	21.5	LOS C	0.3	2.0	0.70	0.99	38.5
North: Akker Avenue (N)											
7	L	35	0.0	0.241	8.2	LOS A	0.0	0.0	0.00	1.04	49.0
8	T	458	0.0	0.241	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		493	0.0	0.241	0.6	LOS A	0.0	0.0	0.00	0.07	59.1
All Vehicles		735	0.0	0.241	1.8	NA	1.3	9.3	0.20	0.08	55.2

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Chamfuti Crescent South Junction
2017 AM Peak Hour Background and Development Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	709	0.0	0.347	2.2	LOS A	4.4	30.6	0.61	0.00	49.9
3	R	1	0.0	0.351	10.6	LOS B	4.4	30.6	0.61	0.97	49.4
Approach		711	0.0	0.347	2.2	LOS B	4.4	30.6	0.61	0.00	49.9
East: Chamfuti Crescent South (E)											
4	L	2	0.0	0.234	39.1	LOS E	1.0	6.9	0.87	0.88	29.5
6	R	31	0.0	0.237	38.9	LOS E	1.0	6.9	0.87	1.02	29.5
Approach		33	0.0	0.237	38.9	LOS E	1.0	6.9	0.87	1.01	29.5
North: Akker Avenue (N)											
7	L	16	0.0	0.156	8.2	LOS A	0.0	0.0	0.00	1.06	49.0
8	T	304	0.0	0.156	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		320	0.0	0.156	0.4	LOS A	0.0	0.0	0.00	0.05	59.3
All Vehicles		1063	0.0	0.351	2.8	NA	4.4	30.6	0.43	0.05	51.3

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS E. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Chamfuti Crescent South Junction
2017 PM Peak Hour Background and Development Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	296	0.0	0.146	3.7	LOS A	2.0	14.0	0.68	0.00	49.0
3	R	1	0.0	0.150	12.2	LOS B	2.0	14.0	0.68	1.03	48.1
Approach		297	0.0	0.146	3.8	LOS B	2.0	14.0	0.68	0.00	49.0
East: Chamfuti Crescent South (E)											
4	L	1	0.0	0.075	27.0	LOS D	0.3	2.2	0.79	0.94	35.1
6	R	15	0.0	0.078	26.8	LOS D	0.3	2.2	0.79	1.00	35.2
Approach		16	0.0	0.077	26.9	LOS D	0.3	2.2	0.79	1.00	35.2
North: Akker Avenue (N)											
7	L	31	0.0	0.280	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
8	T	541	0.0	0.280	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		572	0.0	0.280	0.4	LOS A	0.0	0.0	0.00	0.06	59.3
All Vehicles		884	0.0	0.280	2.0	NA	2.0	14.0	0.24	0.06	54.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Chamfuti Crescent South Junction
2022 AM Peak Hour Background and Development Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	641	0.0	0.314	2.0	LOS A	3.8	26.5	0.58	0.00	50.3
3	R	1	0.0	0.351	10.4	LOS B	3.8	26.5	0.58	0.97	49.5
Approach		642	0.0	0.314	2.0	LOS B	3.8	26.5	0.58	0.00	50.3
East: Chamfuti Crescent South (E)											
4	L	2	0.0	0.234	33.6	LOS D	0.9	6.6	0.84	0.86	31.8
6	R	35	0.0	0.223	33.4	LOS D	0.9	6.6	0.84	1.02	31.9
Approach		37	0.0	0.222	33.4	LOS D	0.9	6.6	0.84	1.01	31.9
North: Akker Avenue (N)											
7	L	19	0.0	0.152	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
8	T	292	0.0	0.152	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		311	0.0	0.152	0.5	LOS A	0.0	0.0	0.00	0.06	59.2
All Vehicles		989	0.0	0.351	2.7	NA	3.8	26.5	0.40	0.06	51.7

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Chamfuti Crescent South Junction
2022 PM Peak Hour Background and Development Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	272	0.0	0.134	4.1	LOS A	1.9	13.3	0.69	0.00	48.8
3	R	1	0.0	0.132	12.5	LOS B	1.9	13.3	0.69	1.04	47.8
Approach		273	0.0	0.134	4.1	LOS B	1.9	13.3	0.69	0.00	48.8
East: Chamfuti Crescent South (E)											
4	L	1	0.0	0.096	27.8	LOS D	0.4	2.8	0.80	0.97	34.7
6	R	18	0.0	0.096	27.6	LOS D	0.4	2.8	0.80	1.00	34.8
Approach		19	0.0	0.096	27.6	LOS D	0.4	2.8	0.80	1.00	34.8
North: Akker Avenue (N)											
7	L	35	0.0	0.297	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
8	T	573	0.0	0.297	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		607	0.0	0.297	0.5	LOS A	0.0	0.0	0.00	0.06	59.2
All Vehicles		899	0.0	0.297	2.1	NA	1.9	13.3	0.23	0.06	54.9

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Msasa Crescent Junction
2017 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	5	0.0	0.658	27.2	LOS D	6.3	44.4	0.80	1.13	35.0
3	R	256	0.0	0.677	27.1	LOS D	6.3	44.4	0.80	1.25	35.1
Approach		261	0.0	0.676	27.1	LOS D	6.3	44.4	0.80	1.25	35.1
East: Akker Avenue (E)											
4	L	89	0.0	0.128	8.2	LOS A	0.0	0.0	0.00	0.89	49.0
5	T	168	0.0	0.128	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		258	0.0	0.128	2.8	LOS A	0.0	0.0	0.00	0.31	55.7
West: Akker Avenue (W)											
11	T	309	0.0	0.163	1.3	LOS A	1.5	10.7	0.44	0.00	52.3
12	R	5	0.0	0.164	9.7	LOS A	1.5	10.7	0.44	0.97	49.3
Approach		315	0.0	0.163	1.4	LOS A	1.5	10.7	0.44	0.02	52.3
All Vehicles		834	0.0	0.677	9.9	NA	6.3	44.4	0.41	0.49	46.1

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Akker Avenue / Msasa Crescent Junction
2017 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	3	0.0	0.211	15.8	LOS C	1.1	7.5	0.56	0.87	42.5
3	R	102	0.0	0.215	15.7	LOS C	1.1	7.5	0.56	0.98	42.7
Approach		105	0.0	0.214	15.7	LOS C	1.1	7.5	0.56	0.98	42.7
East: Akker Avenue (E)											
4	L	241	0.0	0.210	8.2	LOS A	0.0	0.0	0.00	0.79	49.0
5	T	177	0.0	0.210	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		418	0.0	0.210	4.7	LOS A	0.0	0.0	0.00	0.46	53.1
West: Akker Avenue (W)											
11	T	93	0.0	0.054	2.0	LOS A	0.5	3.6	0.50	0.00	51.1
12	R	6	0.0	0.054	10.5	LOS B	0.5	3.6	0.50	0.95	48.9
Approach		99	0.0	0.054	2.6	LOS B	0.5	3.6	0.50	0.06	51.0
All Vehicles		622	0.0	0.215	6.2	NA	1.1	7.5	0.18	0.48	50.7

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Msasa Crescent Junction
2022 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	6	0.0	0.789	36.2	LOS E	8.5	59.3	0.88	1.37	30.7
3	R	257	0.0	0.785	36.0	LOS E	8.5	59.3	0.88	1.41	30.7
Approach		263	0.0	0.786	36.0	LOS E	8.5	59.3	0.88	1.41	30.7
East: Akker Avenue (E)											
4	L	91	0.0	0.141	8.2	LOS A	0.0	0.0	0.00	0.90	49.0
5	T	195	0.0	0.141	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		285	0.0	0.141	2.6	LOS A	0.0	0.0	0.00	0.29	56.0
West: Akker Avenue (W)											
11	T	358	0.0	0.189	1.5	LOS A	1.9	13.1	0.47	0.00	51.8
12	R	6	0.0	0.191	9.9	LOS A	1.9	13.1	0.47	0.97	49.3
Approach		364	0.0	0.189	1.6	LOS A	1.9	13.1	0.47	0.02	51.7
All Vehicles		913	0.0	0.789	11.8	NA	8.5	59.3	0.44	0.50	44.1

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS E. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Msasa Crescent Junction
2022 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	4	0.0	0.234	16.7	LOS C	1.2	8.3	0.59	0.90	41.8
3	R	103	0.0	0.235	16.6	LOS C	1.2	8.3	0.59	1.00	42.0
Approach		107	0.0	0.235	16.6	LOS C	1.2	8.3	0.59	1.00	42.0
East: Akker Avenue (E)											
4	L	242	0.0	0.224	8.2	LOS A	0.0	0.0	0.00	0.81	49.0
5	T	205	0.0	0.224	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		447	0.0	0.224	4.4	LOS A	0.0	0.0	0.00	0.44	53.5
West: Akker Avenue (W)											
11	T	106	0.0	0.063	2.3	LOS A	0.6	4.3	0.53	0.00	50.8
12	R	7	0.0	0.063	10.7	LOS B	0.6	4.3	0.53	0.96	48.7
Approach		114	0.0	0.063	2.8	LOS B	0.6	4.3	0.53	0.06	50.7
All Vehicles		668	0.0	0.235	6.1	NA	1.2	8.3	0.18	0.46	50.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Akker Avenue / Msasa Crescent Junction
2017 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	5	0.0	0.263	10.6	LOS B	1.9	13.6	0.47	0.70	46.3
3	R	255	0.0	0.260	12.3	LOS B	1.9	13.6	0.47	0.72	44.9
Approach		260	0.0	0.260	12.3	LOS B	1.9	13.6	0.47	0.72	44.9
East: Akker Avenue (E)											
4	L	89	0.0	0.188	9.0	LOS A	1.6	11.5	0.06	0.74	47.9
5	T	208	0.0	0.189	7.6	LOS A	1.6	11.5	0.06	0.60	49.2
Approach		298	0.0	0.189	8.0	LOS A	1.6	11.5	0.06	0.64	48.8
West: Akker Avenue (W)											
11	T	432	0.0	0.463	10.2	LOS B	4.4	31.0	0.66	0.71	46.6
12	R	5	0.0	0.478	13.2	LOS B	4.4	31.0	0.66	0.79	44.6
Approach		437	0.0	0.462	10.3	LOS B	4.4	31.0	0.66	0.72	46.6
All Vehicles		995	0.0	0.478	10.1	LOS B	4.4	31.0	0.43	0.70	46.8

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

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MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Msasa Crescent Junction
2017 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	3	0.0	0.113	11.0	LOS B	0.8	5.4	0.49	0.71	46.0
3	R	102	0.0	0.114	12.6	LOS B	0.8	5.4	0.49	0.73	44.6
Approach		105	0.0	0.114	12.6	LOS B	0.8	5.4	0.49	0.72	44.6
East: Akker Avenue (E)											
4	L	240	0.0	0.331	9.0	LOS A	3.1	21.5	0.07	0.72	47.9
5	T	291	0.0	0.331	7.7	LOS A	3.1	21.5	0.07	0.59	49.2
Approach		531	0.0	0.331	8.3	LOS A	3.1	21.5	0.07	0.65	48.6
West: Akker Avenue (W)											
11	T	141	0.0	0.133	8.4	LOS A	1.0	7.2	0.33	0.59	48.0
12	R	6	0.0	0.134	11.4	LOS B	1.0	7.2	0.33	0.74	46.0
Approach		147	0.0	0.133	8.5	LOS B	1.0	7.2	0.33	0.60	47.9
All Vehicles		783	0.0	0.331	8.9	LOS A	3.1	21.5	0.17	0.65	47.9

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

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MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Msasa Crescent Junction
2022 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	6	0.0	0.275	10.9	LOS B	2.0	14.3	0.50	0.72	46.1
3	R	257	0.0	0.272	12.6	LOS B	2.0	14.3	0.50	0.73	44.7
Approach		263	0.0	0.271	12.5	LOS B	2.0	14.3	0.50	0.73	44.7
East: Akker Avenue (E)											
4	L	91	0.0	0.208	9.0	LOS A	1.9	13.0	0.07	0.74	47.9
5	T	236	0.0	0.208	7.6	LOS A	1.9	13.0	0.07	0.60	49.2
Approach		326	0.0	0.208	8.0	LOS A	1.9	13.0	0.07	0.64	48.8
West: Akker Avenue (W)											
11	T	481	0.0	0.514	10.4	LOS B	5.2	36.2	0.69	0.72	46.4
12	R	6	0.0	0.526	13.4	LOS B	5.2	36.2	0.69	0.79	44.5
Approach		487	0.0	0.514	10.4	LOS B	5.2	36.2	0.69	0.73	46.4
All Vehicles		1077	0.0	0.526	10.2	LOS B	5.2	36.2	0.46	0.70	46.7

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

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MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Msasa Crescent Junction
2022 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	4	0.0	0.120	11.2	LOS B	0.8	5.7	0.51	0.72	45.8
3	R	103	0.0	0.120	12.9	LOS B	0.8	5.7	0.51	0.73	44.4
Approach		107	0.0	0.120	12.8	LOS B	0.8	5.7	0.51	0.73	44.5
East: Akker Avenue (E)											
4	L	242	0.0	0.351	9.0	LOS A	3.4	23.5	0.08	0.72	47.9
5	T	319	0.0	0.352	7.7	LOS A	3.4	23.5	0.08	0.59	49.1
Approach		561	0.0	0.352	8.2	LOS A	3.4	23.5	0.08	0.65	48.6
West: Akker Avenue (W)											
11	T	156	0.0	0.147	8.4	LOS A	1.1	8.0	0.34	0.59	48.0
12	R	7	0.0	0.147	11.4	LOS B	1.1	8.0	0.34	0.74	46.0
Approach		163	0.0	0.147	8.5	LOS B	1.1	8.0	0.34	0.60	47.9
All Vehicles		832	0.0	0.352	8.9	LOS A	3.4	23.5	0.18	0.65	47.9

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

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MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Milkwood Road Junction
2017 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
1	L	12	0.0	0.252	15.1	LOS C	1.3	9.1	0.53	0.80	43.1
3	R	124	0.0	0.250	14.9	LOS B	1.3	9.1	0.53	0.97	43.3
Approach		136	0.0	0.250	14.9	LOS C	1.3	9.1	0.53	0.96	43.3
East: Akker Avenue (E)											
4	L	56	0.0	0.097	8.2	LOS A	0.0	0.0	0.00	0.92	49.0
5	T	140	0.0	0.097	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		196	0.0	0.097	2.3	LOS A	0.0	0.0	0.00	0.26	56.4
West: Akker Avenue (W)											
11	T	184	0.0	0.097	0.8	LOS A	0.8	5.7	0.35	0.00	53.7
12	R	3	0.0	0.096	9.3	LOS A	0.8	5.7	0.35	0.98	49.1
Approach		187	0.0	0.097	1.0	LOS A	0.8	5.7	0.35	0.02	53.6
All Vehicles		519	0.0	0.252	5.1	NA	1.3	9.1	0.27	0.35	51.4

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Milkwood Road Junction
2017 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
1	L	8	0.0	0.073	12.2	LOS B	0.4	2.5	0.33	0.82	45.5
3	R	45	0.0	0.073	12.0	LOS B	0.4	2.5	0.33	0.89	45.6
Approach		54	0.0	0.073	12.0	LOS B	0.4	2.5	0.33	0.87	45.6
East: Akker Avenue (E)											
4	L	73	0.0	0.082	8.2	LOS A	0.0	0.0	0.00	0.85	49.0
5	T	93	0.0	0.082	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		165	0.0	0.082	3.6	LOS A	0.0	0.0	0.00	0.37	54.6
West: Akker Avenue (W)											
11	T	37	0.0	0.024	0.6	LOS A	0.2	1.2	0.29	0.00	54.4
12	R	6	0.0	0.024	9.0	LOS A	0.2	1.2	0.29	0.90	48.8
Approach		43	0.0	0.024	1.8	LOS A	0.2	1.2	0.29	0.13	53.5
All Vehicles		262	0.0	0.082	5.0	NA	0.4	2.5	0.12	0.44	52.3

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Milkwood Road Junction
2022 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
1	L	14	0.0	0.318	16.9	LOS C	1.9	13.3	0.59	0.85	41.7
3	R	144	0.0	0.320	16.7	LOS C	1.9	13.3	0.59	1.03	41.9
Approach		158	0.0	0.320	16.7	LOS C	1.9	13.3	0.59	1.02	41.9
East: Akker Avenue (E)											
4	L	64	0.0	0.112	8.2	LOS A	0.0	0.0	0.00	0.92	49.0
5	T	162	0.0	0.112	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		226	0.0	0.112	2.3	LOS A	0.0	0.0	0.00	0.26	56.4
West: Akker Avenue (W)											
11	T	214	0.0	0.113	1.0	LOS A	1.0	6.9	0.39	0.00	53.1
12	R	4	0.0	0.114	9.4	LOS A	1.0	6.9	0.39	0.97	49.2
Approach		218	0.0	0.113	1.2	LOS A	1.0	6.9	0.39	0.02	53.0
All Vehicles		602	0.0	0.320	5.7	NA	1.9	13.3	0.29	0.37	50.6

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Milkwood Road Junction
2022 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
1	L	11	0.0	0.088	12.5	LOS B	0.4	3.0	0.36	0.82	45.2
3	R	53	0.0	0.089	12.3	LOS B	0.4	3.0	0.36	0.89	45.4
Approach		63	0.0	0.089	12.3	LOS B	0.4	3.0	0.36	0.88	45.4
East: Akker Avenue (E)											
4	L	84	0.0	0.095	8.2	LOS A	0.0	0.0	0.00	0.85	49.0
5	T	106	0.0	0.095	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		191	0.0	0.095	3.6	LOS A	0.0	0.0	0.00	0.37	54.6
West: Akker Avenue (W)											
11	T	43	0.0	0.028	0.7	LOS A	0.2	1.4	0.31	0.00	54.0
12	R	7	0.0	0.028	9.2	LOS A	0.2	1.4	0.31	0.90	48.8
Approach		51	0.0	0.028	2.0	LOS A	0.2	1.4	0.31	0.13	53.2
All Vehicles		304	0.0	0.095	5.1	NA	0.4	3.0	0.13	0.44	52.2

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Milkwood Road Junction
2017 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
1	L	18	0.0	0.511	18.8	LOS C	4.3	30.4	0.65	0.93	40.3
3	R	247	0.0	0.512	18.6	LOS C	4.3	30.4	0.65	1.12	40.5
Approach		265	0.0	0.512	18.7	LOS C	4.3	30.4	0.65	1.10	40.5
East: Akker Avenue (E)											
4	L	96	0.0	0.117	8.2	LOS A	0.0	0.0	0.00	0.86	49.0
5	T	140	0.0	0.117	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		236	0.0	0.117	3.3	LOS A	0.0	0.0	0.00	0.35	55.0
West: Akker Avenue (W)											
11	T	184	0.0	0.099	1.0	LOS A	0.9	6.0	0.39	0.00	53.0
12	R	5	0.0	0.099	9.5	LOS A	0.9	6.0	0.39	0.97	49.2
Approach		189	0.0	0.099	1.3	LOS A	0.9	6.0	0.39	0.03	52.9
All Vehicles		691	0.0	0.512	8.7	NA	4.3	30.4	0.36	0.55	47.9

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Akker Avenue / Milkwood Road Junction
2017 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
1	L	12	0.0	0.161	13.1	LOS B	0.8	5.8	0.43	0.83	44.7
3	R	95	0.0	0.161	13.0	LOS B	0.8	5.8	0.43	0.91	44.9
Approach		106	0.0	0.161	13.0	LOS B	0.8	5.8	0.43	0.90	44.9
East: Akker Avenue (E)											
4	L	187	0.0	0.141	8.2	LOS A	0.0	0.0	0.00	0.76	49.0
5	T	93	0.0	0.141	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		280	0.0	0.141	5.5	LOS A	0.0	0.0	0.00	0.51	52.1
West: Akker Avenue (W)											
11	T	37	0.0	0.031	1.2	LOS A	0.2	1.5	0.38	0.00	52.6
12	R	13	0.0	0.031	9.6	LOS A	0.2	1.5	0.38	0.85	48.6
Approach		49	0.0	0.031	3.3	LOS A	0.2	1.5	0.38	0.22	51.6
All Vehicles		436	0.0	0.161	7.1	NA	0.8	5.8	0.15	0.57	50.1

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Milkwood Road Junction
2022 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
1	L	20	0.0	0.606	22.1	LOS C	5.8	40.6	0.72	1.04	38.1
3	R	267	0.0	0.612	22.0	LOS C	5.8	40.6	0.72	1.19	38.2
Approach		287	0.0	0.612	22.0	LOS C	5.8	40.6	0.72	1.18	38.2
East: Akker Avenue (E)											
4	L	105	0.0	0.133	8.2	LOS A	0.0	0.0	0.00	0.87	49.0
5	T	162	0.0	0.133	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		267	0.0	0.133	3.2	LOS A	0.0	0.0	0.00	0.34	55.1
West: Akker Avenue (W)											
11	T	214	0.0	0.115	1.2	LOS A	1.0	7.3	0.42	0.00	52.5
12	R	6	0.0	0.115	9.7	LOS A	1.0	7.3	0.42	0.96	49.2
Approach		220	0.0	0.115	1.5	LOS A	1.0	7.3	0.42	0.03	52.4
All Vehicles		775	0.0	0.612	9.7	NA	5.8	40.6	0.39	0.56	46.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Milkwood Road Junction
2022 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
1	L	13	0.0	0.180	13.5	LOS B	0.9	6.5	0.45	0.84	44.4
3	R	102	0.0	0.181	13.4	LOS B	0.9	6.5	0.45	0.92	44.6
Approach		115	0.0	0.181	13.4	LOS B	0.9	6.5	0.45	0.91	44.5
East: Akker Avenue (E)											
4	L	199	0.0	0.154	8.2	LOS A	0.0	0.0	0.00	0.77	49.0
5	T	106	0.0	0.154	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		305	0.0	0.154	5.3	LOS A	0.0	0.0	0.00	0.50	52.3
West: Akker Avenue (W)											
11	T	43	0.0	0.035	1.3	LOS A	0.3	1.8	0.40	0.00	52.3
12	R	14	0.0	0.035	9.7	LOS A	0.3	1.8	0.40	0.86	48.7
Approach		57	0.0	0.035	3.3	LOS A	0.3	1.8	0.40	0.21	51.4
All Vehicles		477	0.0	0.181	7.0	NA	0.9	6.5	0.16	0.56	50.1

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2017 AM BGD

Milkwood Road / Proposed Access Junction
2017 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
2	T	1	0.0	0.001	0.1	LOS A	0.0	0.1	0.12	0.00	57.2
3	R	1	0.0	0.001	8.6	LOS A	0.0	0.1	0.12	0.79	48.5
Approach		2	0.0	0.001	4.3	LOS A	0.0	0.1	0.12	0.39	52.5
East: Propose Access (E)											
4	L	1	0.0	0.150	10.9	LOS B	0.8	5.6	0.12	0.87	46.3
6	R	128	0.0	0.149	10.7	LOS B	0.8	5.6	0.12	0.92	46.5
Approach		129	0.0	0.149	10.7	LOS B	0.8	5.6	0.12	0.92	46.5
North: Milkwood Road (N)											
7	L	43	0.0	0.024	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
8	T	1	0.0	0.024	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		44	0.0	0.024	8.0	LOS A	0.0	0.0	0.00	0.66	49.2
All Vehicles		176	0.0	0.150	10.0	NA	0.8	5.6	0.09	0.84	47.2

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Milkwood Road / Proposed Access Junction
2017 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
2	T	1	0.0	0.001	0.4	LOS A	0.0	0.1	0.22	0.00	55.1
3	R	1	0.0	0.001	8.8	LOS A	0.0	0.1	0.22	0.75	48.3
Approach		2	0.0	0.001	4.6	LOS A	0.0	0.1	0.22	0.37	51.5
East: Propose Access (E)											
4	L	1	0.0	0.062	11.2	LOS B	0.3	2.2	0.20	0.84	46.2
6	R	52	0.0	0.064	11.0	LOS B	0.3	2.2	0.20	0.89	46.3
Approach		53	0.0	0.064	11.0	LOS B	0.3	2.2	0.20	0.89	46.3
North: Milkwood Road (N)											
7	L	120	0.0	0.062	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
8	T	1	0.0	0.062	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		121	0.0	0.062	8.1	LOS A	0.0	0.0	0.00	0.66	49.0
All Vehicles		176	0.0	0.064	8.9	NA	0.3	2.2	0.06	0.73	48.2

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Milkwood Road / Proposed Access Junction
2022 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
2	T	1	0.0	0.001	0.1	LOS A	0.0	0.1	0.12	0.00	57.2
3	R	1	0.0	0.001	8.6	LOS A	0.0	0.1	0.12	0.79	48.5
Approach		2	0.0	0.001	4.3	LOS A	0.0	0.1	0.12	0.39	52.5
East: Propose Access (E)											
4	L	1	0.0	0.150	10.9	LOS B	0.8	5.6	0.12	0.87	46.3
6	R	128	0.0	0.149	10.7	LOS B	0.8	5.6	0.12	0.92	46.5
Approach		129	0.0	0.149	10.7	LOS B	0.8	5.6	0.12	0.92	46.5
North: Milkwood Road (N)											
7	L	43	0.0	0.023	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
8	T	1	0.0	0.023	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		44	0.0	0.023	8.0	LOS A	0.0	0.0	0.00	0.66	49.2
All Vehicles		176	0.0	0.150	10.0	NA	0.8	5.6	0.09	0.84	47.2

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2022 PM BGD

Milkwood Road / Proposed Access Junction
2022 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
2	T	1	0.0	0.001	0.4	LOS A	0.0	0.1	0.22	0.00	55.1
3	R	1	0.0	0.001	8.8	LOS A	0.0	0.1	0.22	0.75	48.3
Approach		2	0.0	0.001	4.6	LOS A	0.0	0.1	0.22	0.37	51.5
East: Propose Access (E)											
4	L	1	0.0	0.062	11.2	LOS B	0.3	2.2	0.20	0.84	46.2
6	R	52	0.0	0.064	11.0	LOS B	0.3	2.2	0.20	0.89	46.3
Approach		53	0.0	0.064	11.0	LOS B	0.3	2.2	0.20	0.89	46.3
North: Milkwood Road (N)											
7	L	120	0.0	0.062	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
8	T	1	0.0	0.062	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		121	0.0	0.062	8.1	LOS A	0.0	0.0	0.00	0.66	49.0
All Vehicles		176	0.0	0.064	8.9	NA	0.3	2.2	0.06	0.73	48.2

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.

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ANNEXURE D

PROPOSED TRAFFIC SIGNAL PHASINGS AND TIMINGS

PHASING SUMMARY

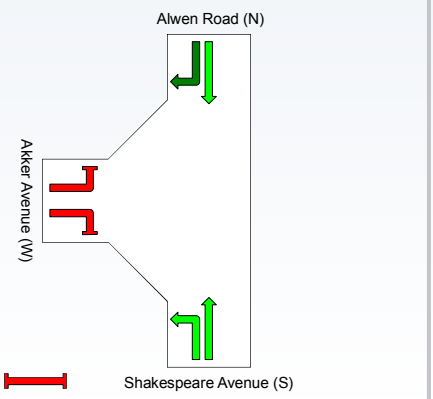
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 AM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time Cycle Time = 60 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B
Output Sequence: A, B

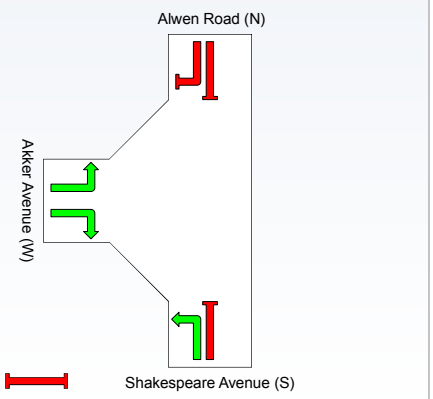
Phase Timing Results

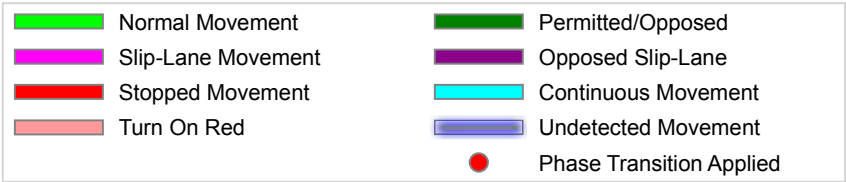
Phase	A	B
Green Time (sec)	30	20
Yellow Time (sec)	3	3
All-Red Time (sec)	2	2
Phase Time (sec)	35	25
Phase Split	58%	42%

Phase A



Phase B





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PHASING SUMMARY

Site: 2017 PM BGD

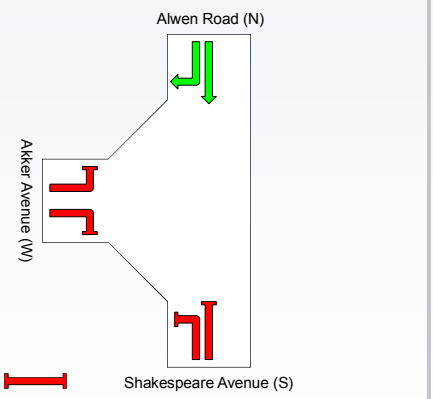
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 AM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time Cycle Time = 60 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

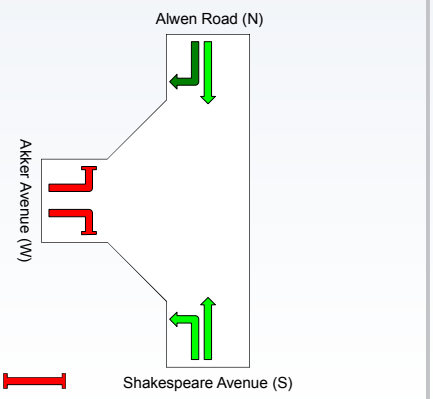
Phase Timing Results

Phase	A	B	C
Green Time (sec)	19	15	11
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	24	20	16
Phase Split	40%	33%	27%

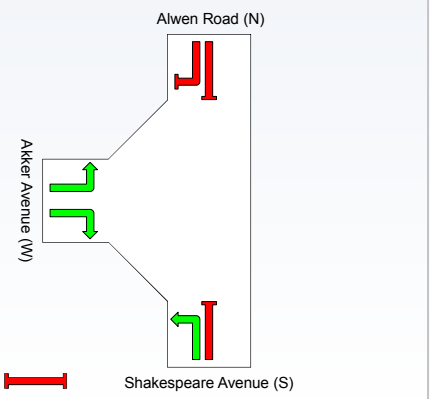
Phase A

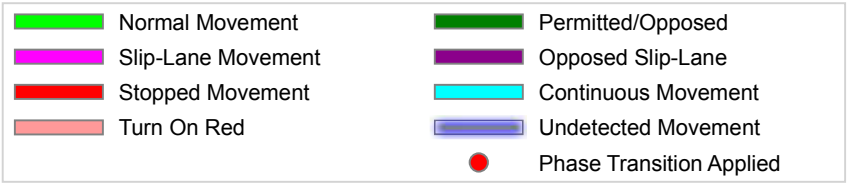


Phase B



Phase C





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PHASING SUMMARY

Site: 2022 AM BGD

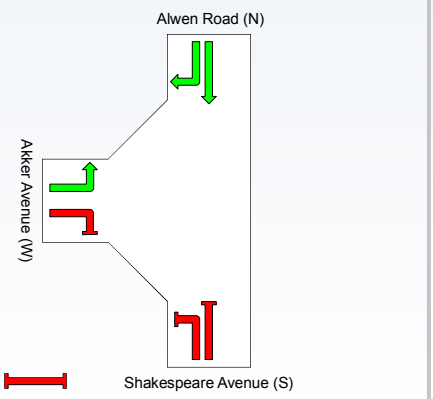
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 AM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time Cycle Time = 80 seconds

Cycle Time Option: **Optimum Cycle Time (Minimum Delay)**
Phase times determined by the program
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

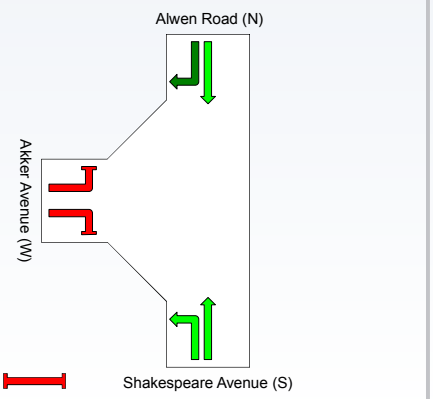
Phase Timing Results

Phase	A	B	C
Green Time (sec)	6	41	18
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	11	46	23
Phase Split	14%	58%	29%

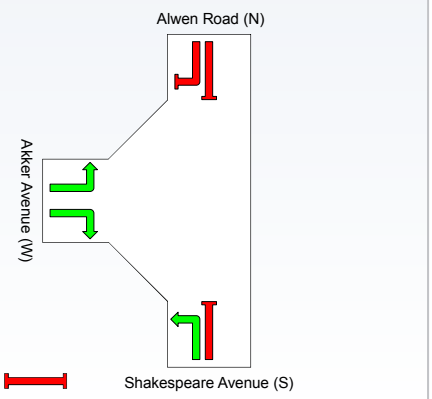
Phase A

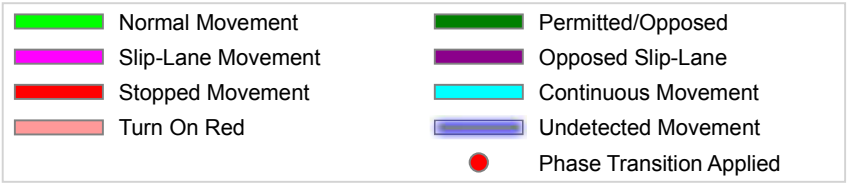


Phase B



Phase C





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PHASING SUMMARY

Site: 2022 PM BGD

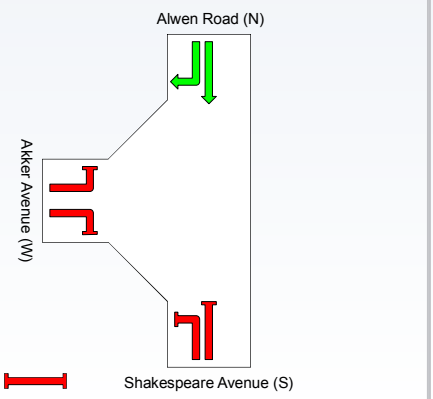
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 PM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time Cycle Time = 60 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

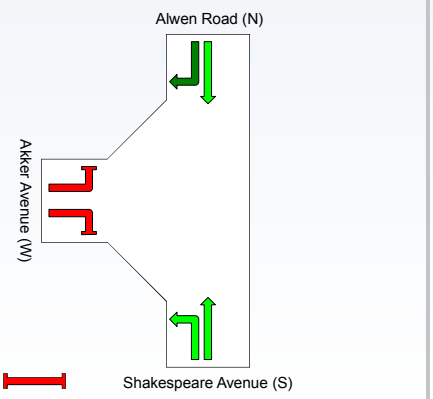
Phase Timing Results

Phase	A	B	C
Green Time (sec)	7	25	13
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	12	30	18
Phase Split	20%	50%	30%

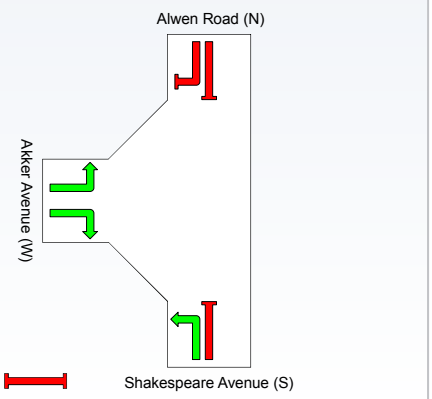
Phase A



Phase B



Phase C



Normal Movement
Slip-Lane Movement
Stopped Movement
Turn On Red
Permitted/Opposed
Opposed Slip-Lane
Continuous Movement
Undetected Movement
Phase Transition Applied

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PHASING SUMMARY

Site: 2017 AM BGD

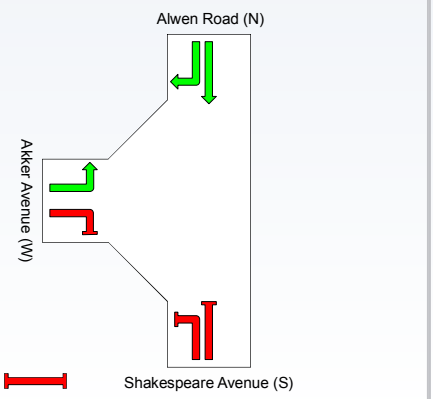
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time Cycle Time = 70 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

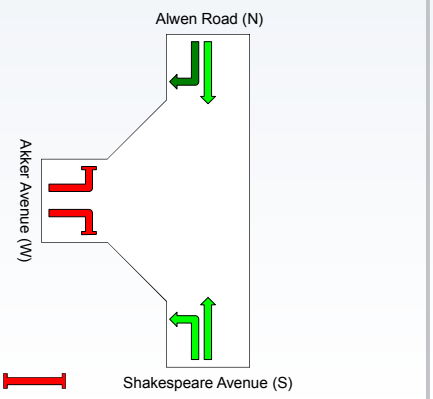
Phase Timing Results

Phase	A	B	C
Green Time (sec)	7	33	15
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	12	38	20
Phase Split	17%	54%	29%

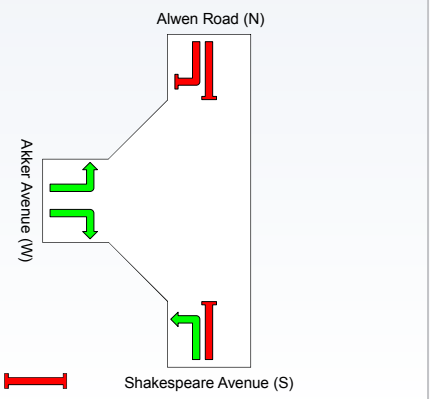
Phase A

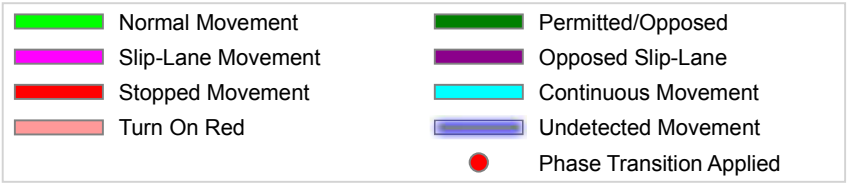


Phase B



Phase C





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PHASING SUMMARY

Site: 2017 PM BGD

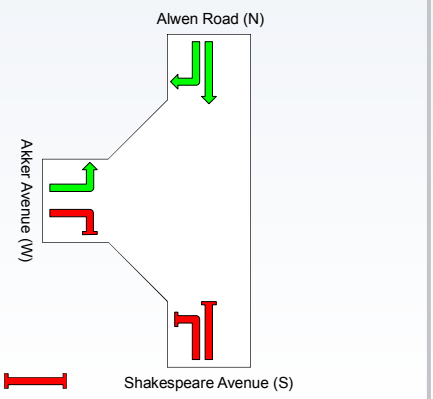
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time Cycle Time = 60 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

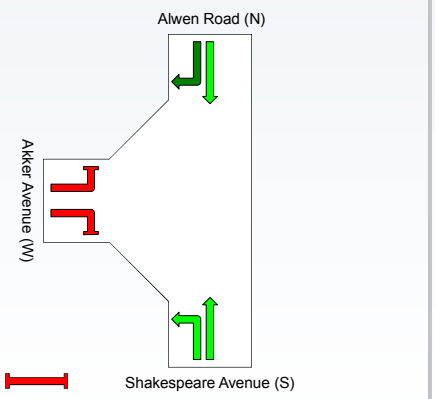
Phase Timing Results

Phase	A	B	C
Green Time (sec)	22	16	7
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	27	21	12
Phase Split	45%	35%	20%

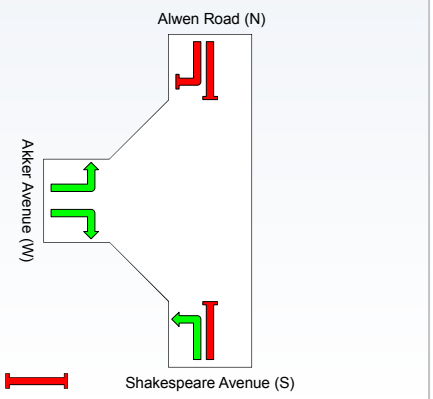
Phase A

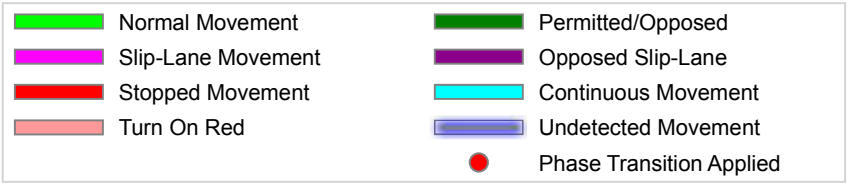


Phase B



Phase C





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PHASING SUMMARY

Site: 2022 AM BGD

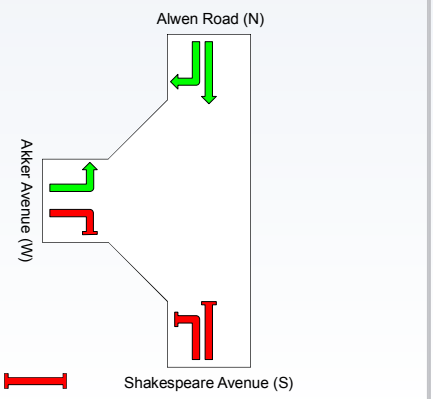
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time Cycle Time = 80 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

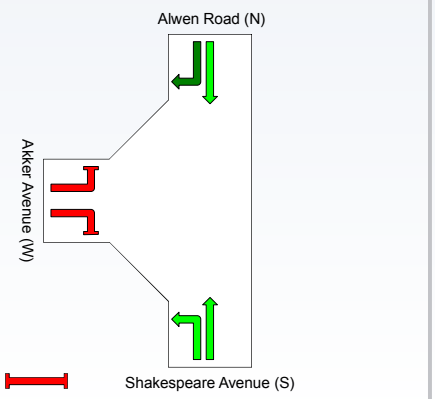
Phase Timing Results

Phase	A	B	C
Green Time (sec)	7	41	17
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	12	46	22
Phase Split	15%	58%	28%

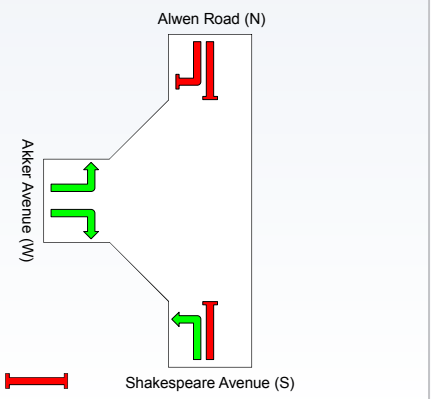
Phase A



Phase B



Phase C



Normal Movement
Slip-Lane Movement
Stopped Movement
Turn On Red
Permitted/Opposed
Opposed Slip-Lane
Continuous Movement
Undetected Movement
Phase Transition Applied

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PHASING SUMMARY

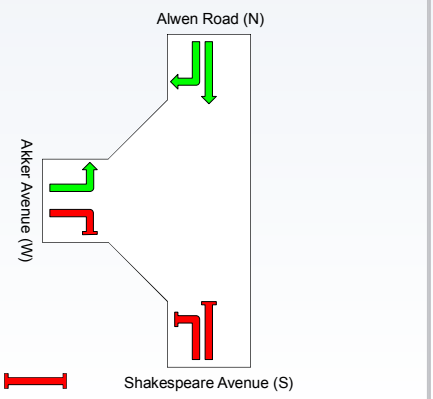
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time Cycle Time = 60 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

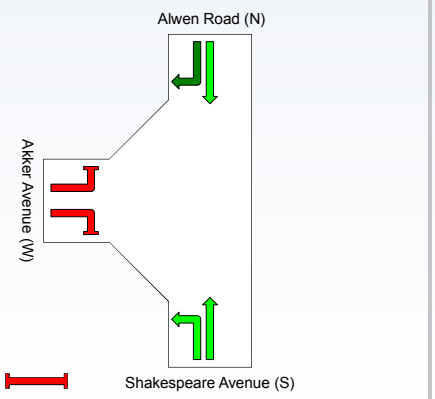
Phase Timing Results

Phase	A	B	C
Green Time (sec)	23	15	7
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	28	20	12
Phase Split	47%	33%	20%

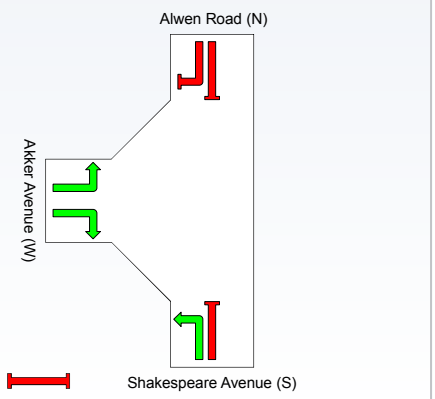
Phase A

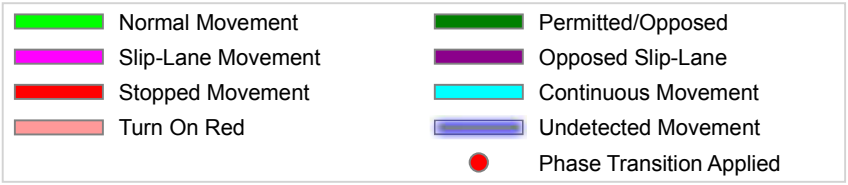


Phase B



Phase C





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PHASING SUMMARY

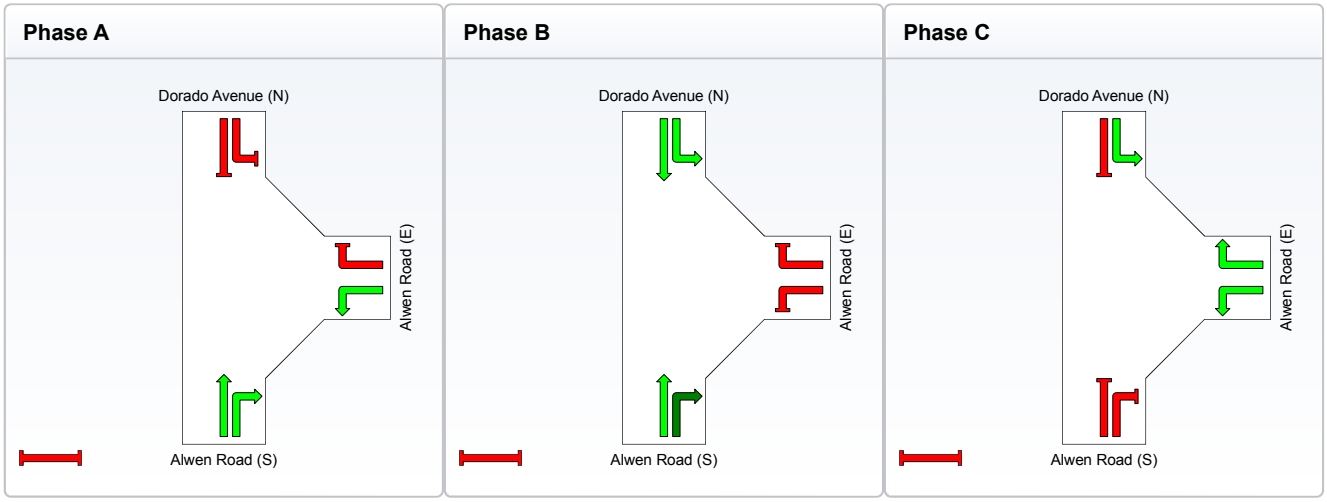
Site: 2017 AM BGD

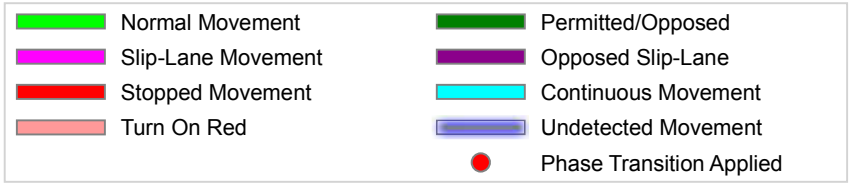
Dorado Avenue / Alwen Road Junction
2017 AM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time Cycle Time = 65 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	17	23	7
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	23	29	13
Phase Split	35%	45%	20%





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PHASING SUMMARY

Site: 2017 PM BGD

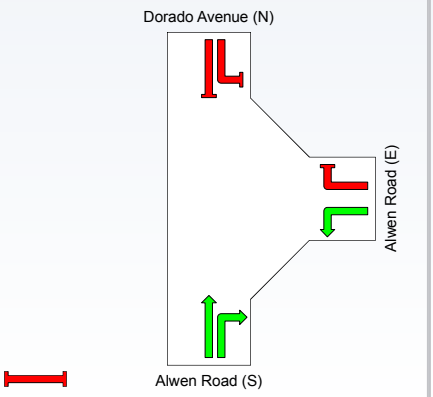
Dorado Avenue / Alwen Road Junction
2017 PM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time Cycle Time = 70 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

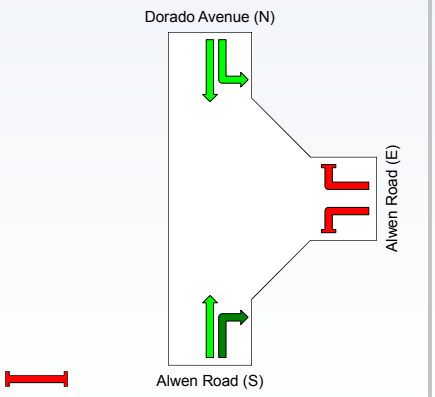
Phase Timing Results

Phase	A	B	C
Green Time (sec)	7	38	7
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	13	44	13
Phase Split	19%	63%	19%

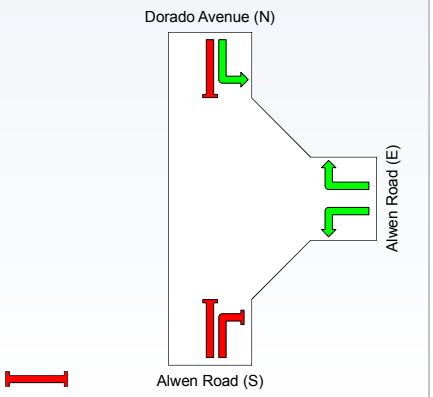
Phase A

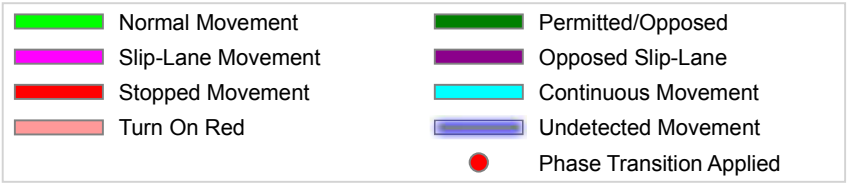


Phase B



Phase C





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PHASING SUMMARY

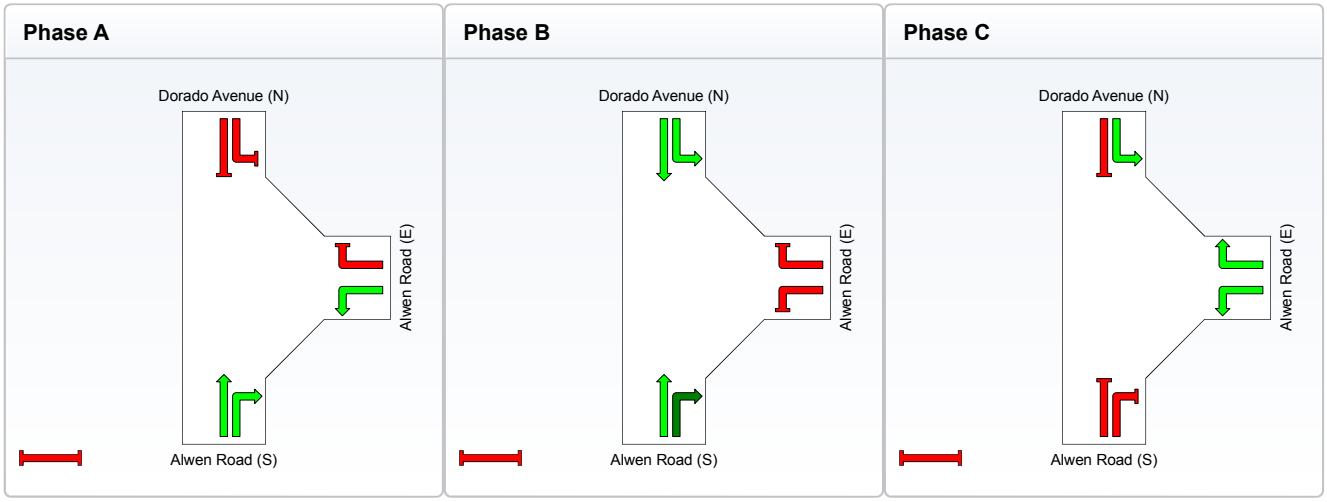
Site: 2022 AM BGD

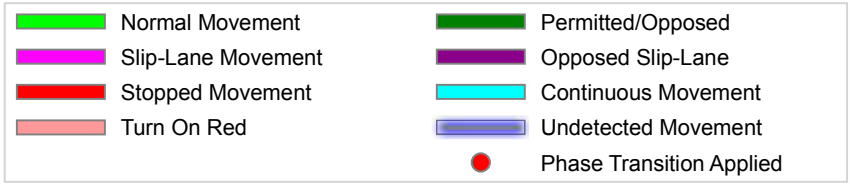
Dorado Avenue / Alwen Road Junction
2022 AM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time Cycle Time = 70 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	18	27	7
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	24	33	13
Phase Split	34%	47%	19%





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PHASING SUMMARY

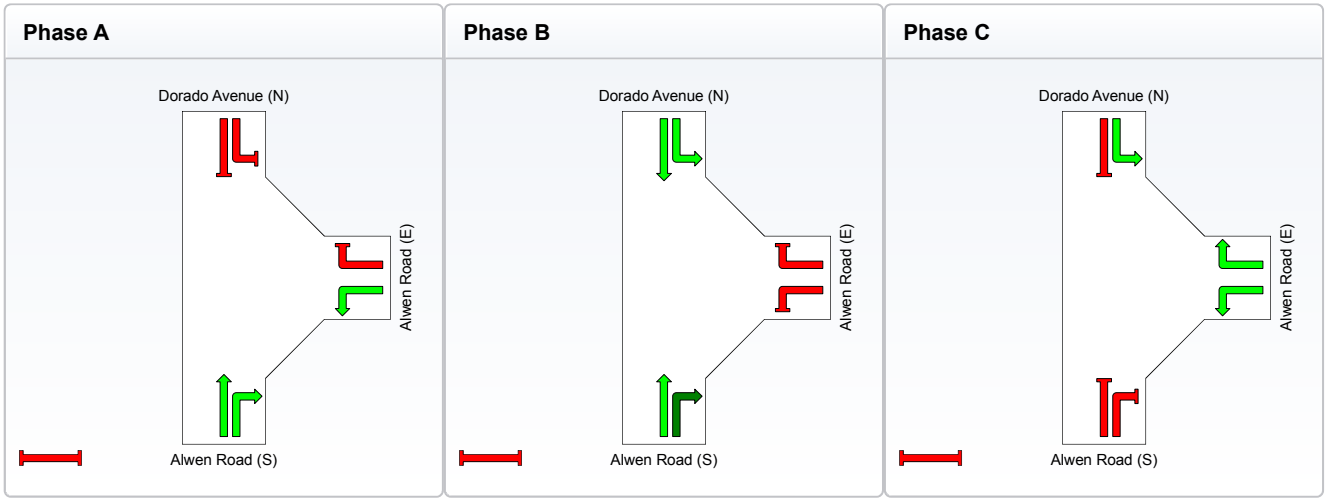
Site: 2022 PM BGD

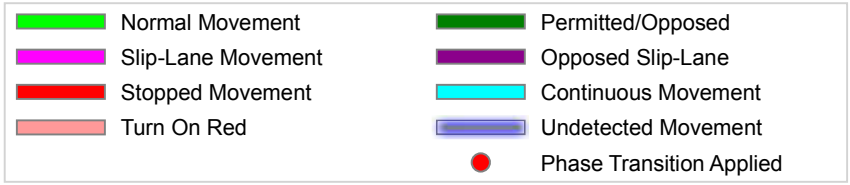
Dorado Avenue / Alwen Road Junction
2022 PM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time Cycle Time = 80 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	7	48	7
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	13	54	13
Phase Split	16%	68%	16%





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PHASING SUMMARY

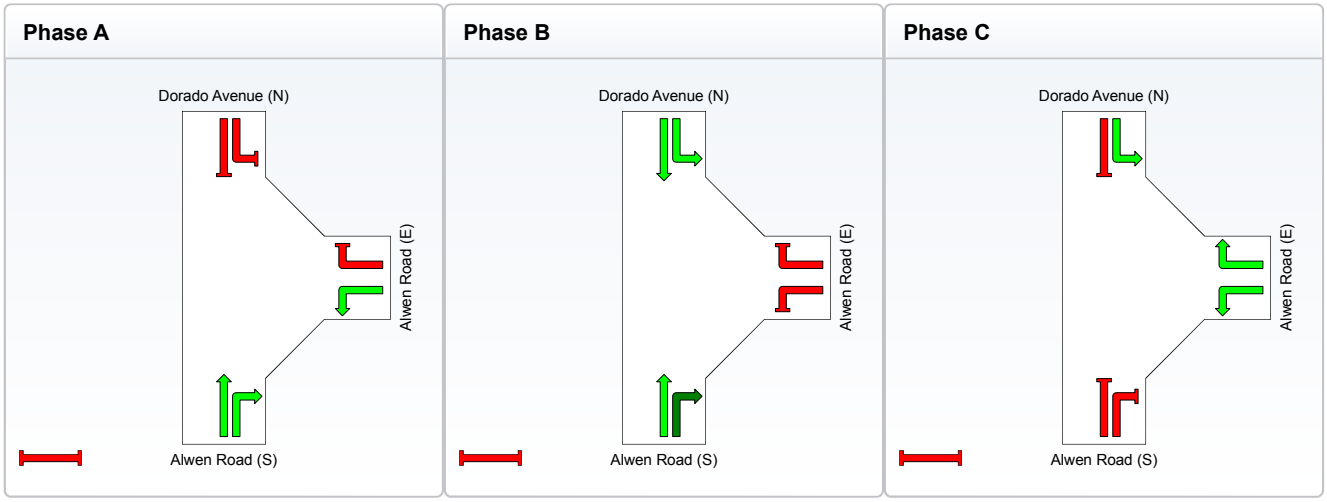
Site: 2017 AM BGD

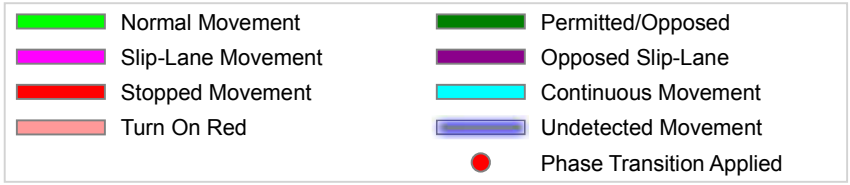
Dorado Avenue / Alwen Road Junction
2017 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time Cycle Time = 65 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	17	23	7
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	23	29	13
Phase Split	35%	45%	20%





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PHASING SUMMARY

Site: 2017 PM BGD

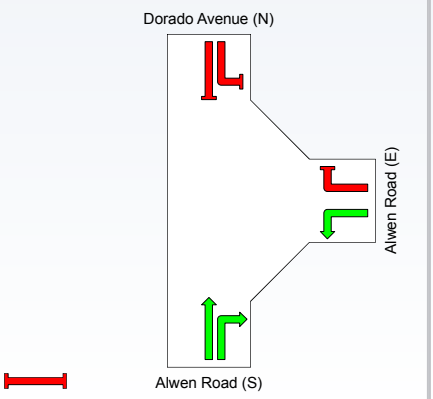
Dorado Avenue / Alwen Road Junction
2017 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time Cycle Time = 70 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

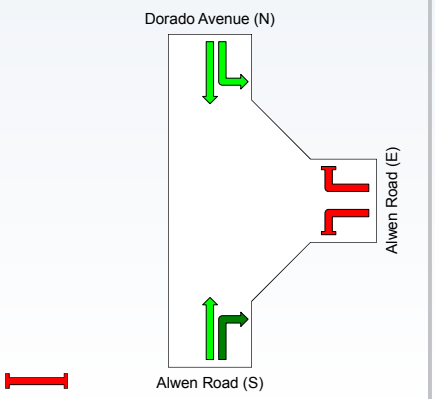
Phase Timing Results

Phase	A	B	C
Green Time (sec)	7	38	7
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	13	44	13
Phase Split	19%	63%	19%

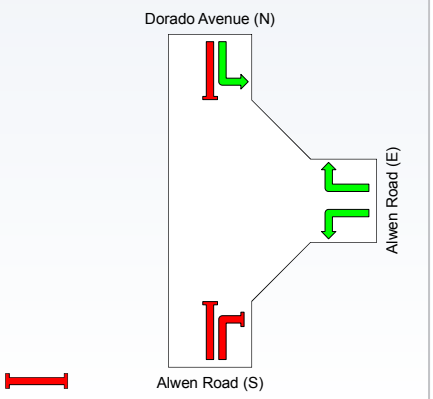
Phase A

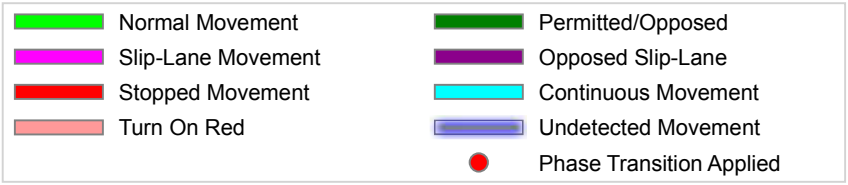


Phase B



Phase C





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PHASING SUMMARY

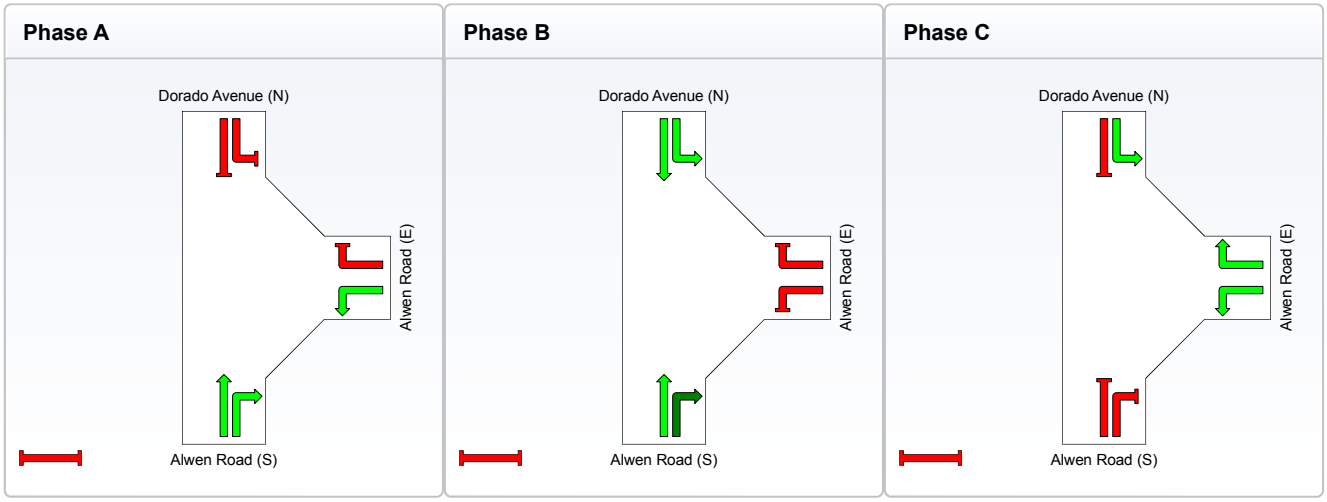
Site: 2022 AM BGD

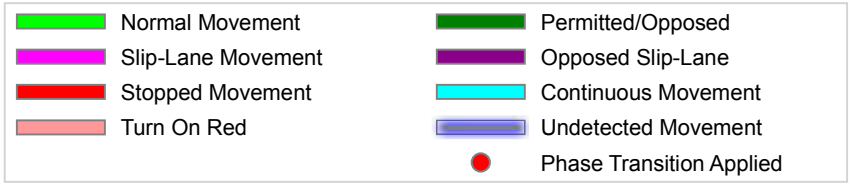
Dorado Avenue / Alwen Road Junction
2022 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time Cycle Time = 70 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	18	27	7
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	24	33	13
Phase Split	34%	47%	19%





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PHASING SUMMARY

Site: 2022 PM BGD

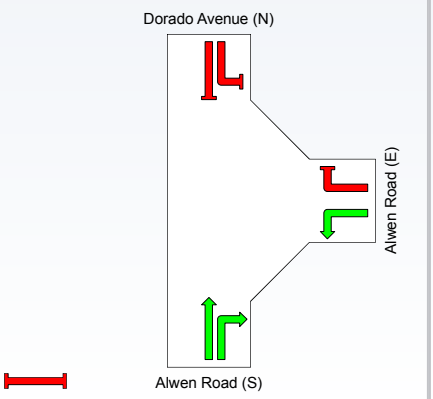
Dorado Avenue / Alwen Road Junction
2022 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time Cycle Time = 80 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

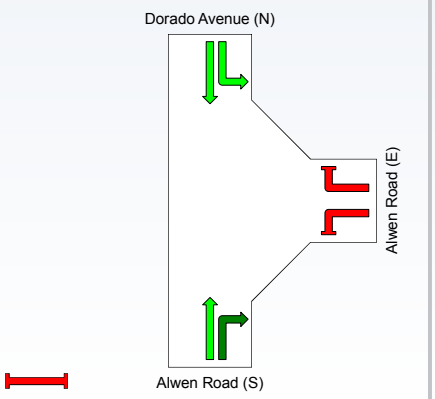
Phase Timing Results

Phase	A	B	C
Green Time (sec)	7	48	7
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	13	54	13
Phase Split	16%	68%	16%

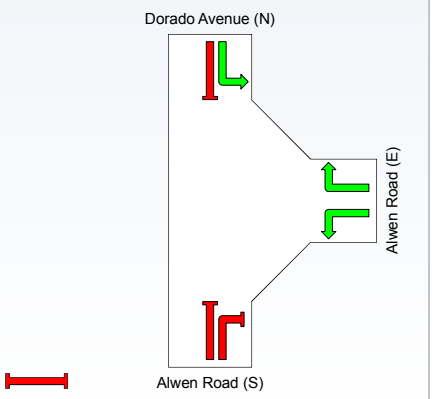
Phase A

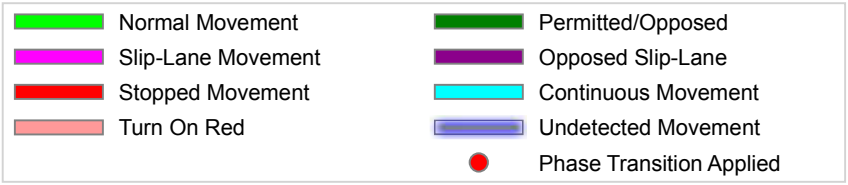


Phase B



Phase C





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ANNEXURE E

STORAGE LANE CALCULATIONS

Required Storage Lane Calculation 18-Nov-16

ORMONDE EXTENSION 24 - SITE A DEVELOPMENT

PM PEAK HOUR TRIP ASSIGMENT
(ACCESS OFF MILKWOOD ROAD)

Input Values:

Trips

	Development IN	41	/h
	Development OUT	122	/h

from: Guidelines for traffic Impact Studies - Table 5.2: Typical parking control service rates per lane

Security gate	max. service rate: Coded Card Reader	350	/hour
Number of channels (IN)	**N**:	1	lanes
Number of channels (OUT)	**N**:	1	lanes
Exceed Probability:	M (queue L) could be exceeded	5%	of the time

Output values:
Trips Generated:

Peak hour:	Primary direction (demand/arrival rate) **q1**:	41	
	Secondary direction (demand/arrival rate) **q2**:	122	
		163	v/h (100%)

Queue length (M) *(ref. Transport & Land Development By Stover / Koepke Eq 8-9b)*

Utilization factor (ρ): ***ρ = q(1,2) / NQ*** *= arrival rate [demand] / (number of channels x service rate per channel)*

ρ =demand (arrive) rate / (**N** x max. service rate)

= 41 / (1 x 350) = 0.1171

= 122 / (1 x 350) = 0.3486

Qm1 (from Table 8-11) = 0.1171

Qm2 (from Table 8-11) = 0.2971

Queue length (M)1 = ((LN[**Probability**]-LN[**Qm**]) / LN[**ρ**]) - 1

= ((LN[0.05]-LN[0.117]) / LN[0.117]) - 1

= (-0.851 / -2.144) - 1 = **-0.7** **Zero queue**

-6 *m*

Queue length (M)2 = ((LN[**Probability**]-LN[**Qm**]) / LN[**ρ**]) - 1

= ((LN[0.05]-LN[0.297]) / LN[0.349]) - 1

= (-1.782 / -1.054) - 1 = **0.9** **Vehicles**

6 *m*

Required Storage Lane Calculation 18-Nov-16

ORMONDE EXTENSION 24 - SITE A DEVELOPMENT

PM PEAK HOUR TRIP ASSIGMENT
(ACCESS OFF MILKWOOD ROAD)

Input Values:

Trips

	Development IN	114	/h
	Development OUT	49	/h

from: Guidelines for traffic Impact Studies - Table 5.2: Typical parking control service rates per lane

Security gate	max. service rate: Coded Card Reader	350	/hour
Number of channels (IN)	**N**:	1	lanes
Number of channels (OUT)	**N**:	1	lanes
Exceed Probability:	M (queue L) could be exceeded	5%	of the time

Output values:
Trips Generated:

Peak hour:	Primary direction (demand/arrival rate) **q1**:	114	
	Secondary direction (demand/arrival rate) **q2**:	49	
		163	v/h (100%)

Queue length (M) *(ref. Transport & Land Development By Stover / Koepke Eq 8-9b)*

Utilization factor (ρ): ***ρ = q(1,2) / NQ*** *= arrival rate [demand] / (number of channels x service rate per channel)*

ρ =demand (arrive) rate / (**N** x max. service rate)

= 114 / (1 x 350) = 0.3257

= 49 / (1 x 350) = 0.1400

Qm1 (from Table 8-11) = 0.2514

Qm2 (from Table 8-11) = 0.1400

Queue length (M)1 = ((LN[**Probability**]-LN[**Qm**]) / LN[**ρ**]) - 1

= ((LN[0.05]-LN[0.251]) / LN[0.326]) - 1

= (-1.615 / -1.122) - 1 = **0.7** **Vehicles**

6 *m*

Queue length (M)2 = ((LN[**Probability**]-LN[**Qm**]) / LN[**ρ**]) - 1

= ((LN[0.05]-LN[0.140]) / LN[0.140]) - 1

= (-1.030 / -1.966) - 1 = **-0.5** **Zero queue**

-6 *m*

ANNEXURE F

PROPOSED ROAD UPGRADES LAYOUT PLANS

CIVIL CONCEPTS
Consulting Civil and Structural Engineers

ORMONDE X22: PROPOSED EXTERNAL ROAD UPGRADES
ALWEN ROAD / DORADO AVENUE INTERSECTION

DATE
2016/11/17

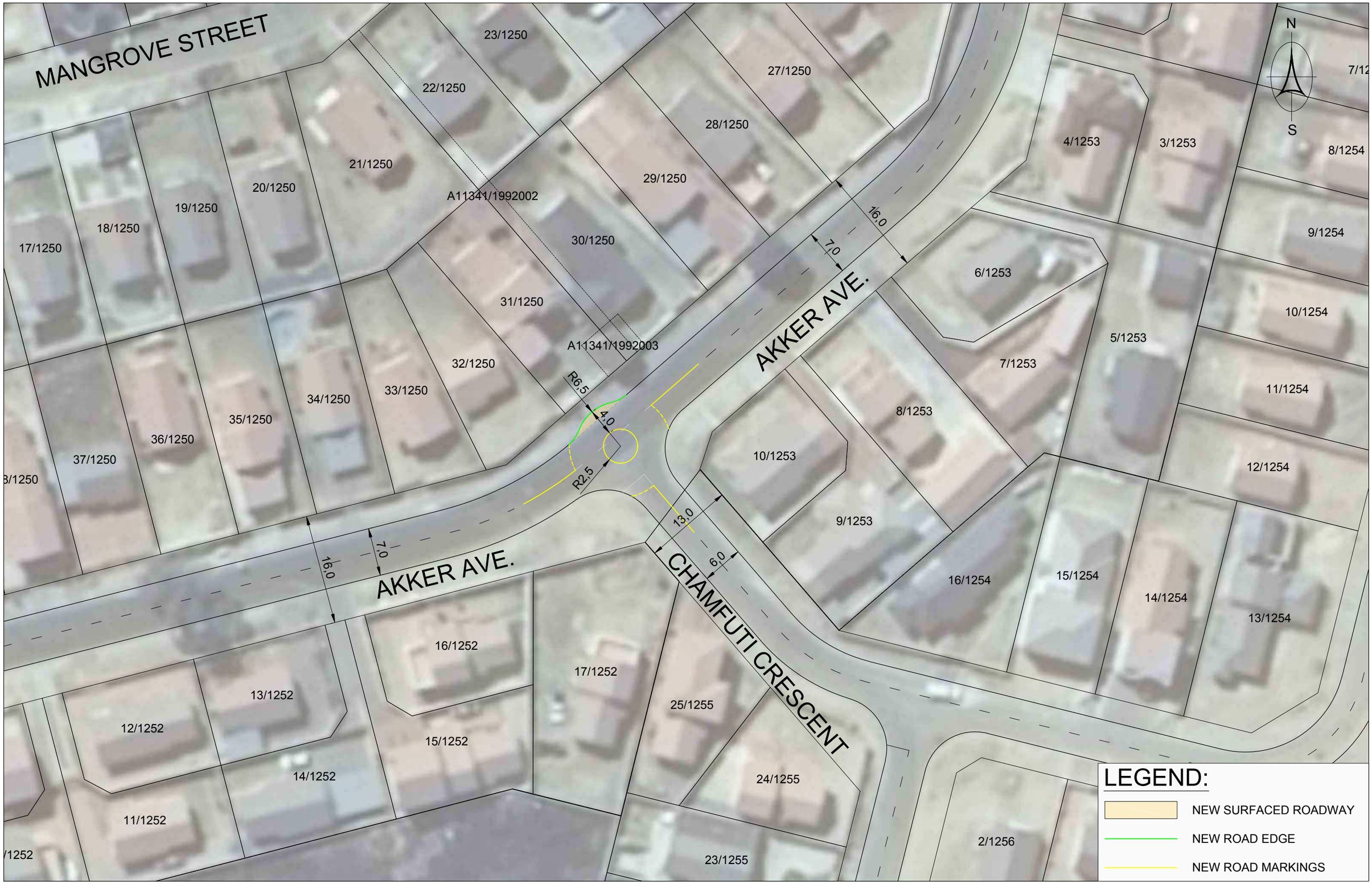
SCALE
1:1000

CIVIL CONCEPTS
Consulting Civil and Structural Engineers

ORMONDE X22: PROPOSED EXTERNAL ROAD UPGRADES
AKKER AVENUE / MSASA CRESCENT INTERSECTION

DATE
2016/11/17

SCALE
1:500



CIVIL CONCEPTS
Consulting Civil and Structural Engineers

ORMONDE X22: PROPOSED EXTERNAL ROAD UPGRADES
AKKER AVENUE / CHAMFUTI CRESCENT INTERSECTION

DATE
2016/11/17

SCALE
1:500

CIVIL CONCEPTS
Consulting Civil and Structural Engineers

ORMONDE X22: PROPOSED EXTERNAL ROAD UPGRADES
AKKER AVENUE / ALWEN ROAD / SHAKESPEARE AVENUE INTERSECTION

DATE
2016/11/17

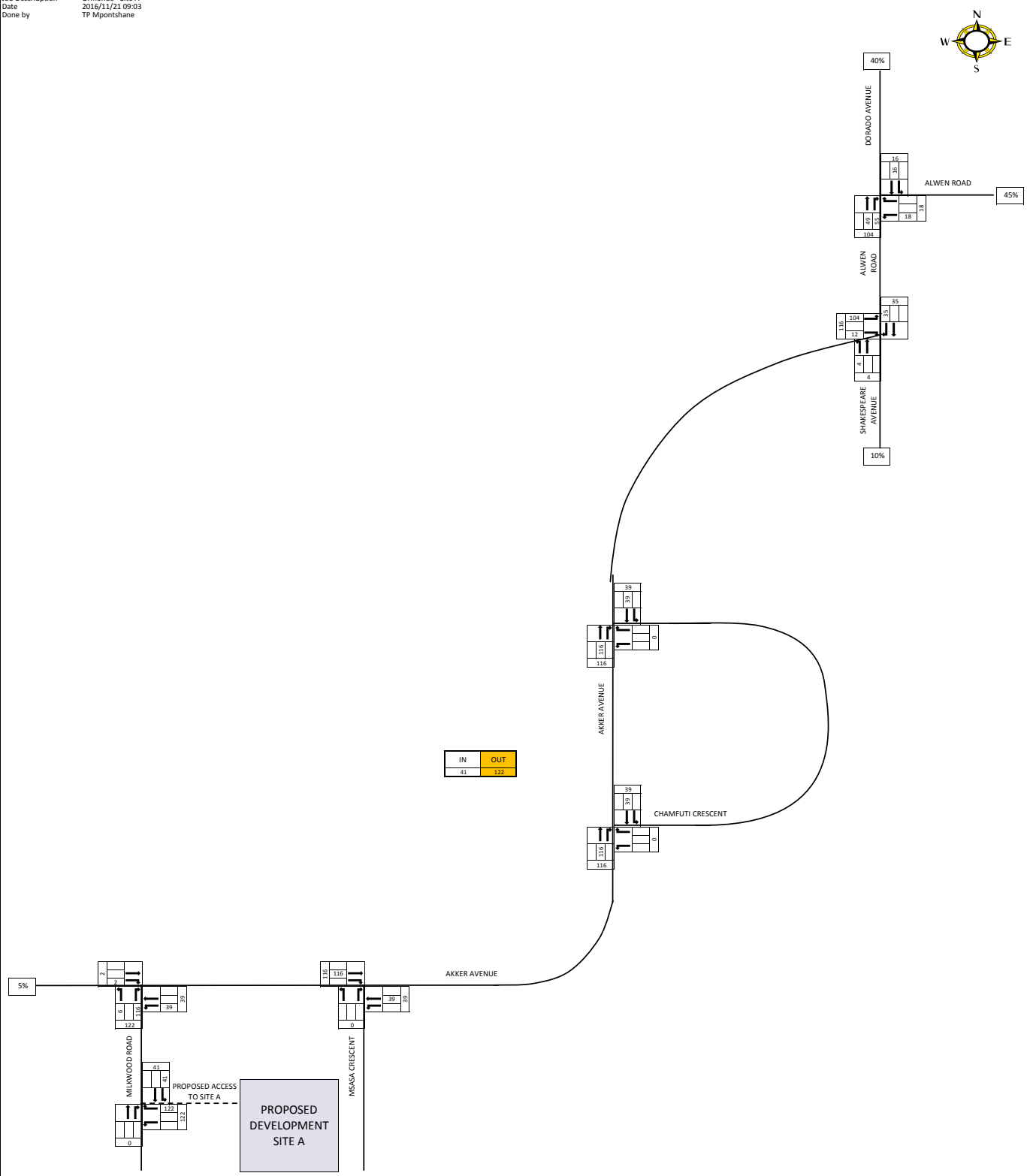
SCALE
1:1000

ANNEXURE G

COST ESTIMATES OF THE PROPOSED UPGRADES

No	INTERSECTION	CONSTRUCTION TYPE	ROADWAY	EARTH WORKS	KERBING	REMOVE KERBS	PAINT LINES	PAINT SYMBOL	REMOVE & REPLACE GUARDRAIL	RELOCATE KERB INLET	RELOCATE STREET LIGHT	RELOCATE SIGN	REMOVE TREE	TRAFFIC SIGNALS	TOTAL PER UPGRADE (RANDS)
		UNIT	m²	m²	m	m	m	m²	m	No.	No.		No.	COMPLETE	
		RANDS / UNIT	***1200***	***120***	***170***	***60***	***80***	***150***	***700***	***15000***	***7500***	***3500***	***3500***	***1000000***	
1	AKKER AVE / ALWEN RD / SHAKESPEARE AVE		840	1150	360	365	650	65	100	2	3	2	11	0.5	**R 1 958 850.00**
2	ALWEN ROAD / DORADO AVE		625		280	285	505	65		1	6	3	2	1	**R 1 942 350.00**
3	AKKER AVE / MSASA CRESCENT		15		12	11	60	10							**R 27 000.00**
4	AKKER AVE / CHAMFUTI CRESCENT		15		12	11	60	10			1				**R 34 500.00**
5															
6															
	SUB-TOTAL UNITS		1495	1150	664	672	1275	150	100	3	10	5	13		
	SUB-TOTAL PRICE (RANDS)		**R 1 794 000**	**R 138 000**	**R 112 880**	**R 40 320**	**R 102 000**	**R 22 500**	**R 70 000**	**R 45 000**	**R 75 000**	**R 17 500**	**R 45 500**		
												TOTAL			**R 3 962 700.00**
												Add: Contingencies	**10%**		R 396 270.00
															R 4 358 970.00
												VAT	**14%**		R 610 255.80
												AMOUNT			**R 4 969 225.80**

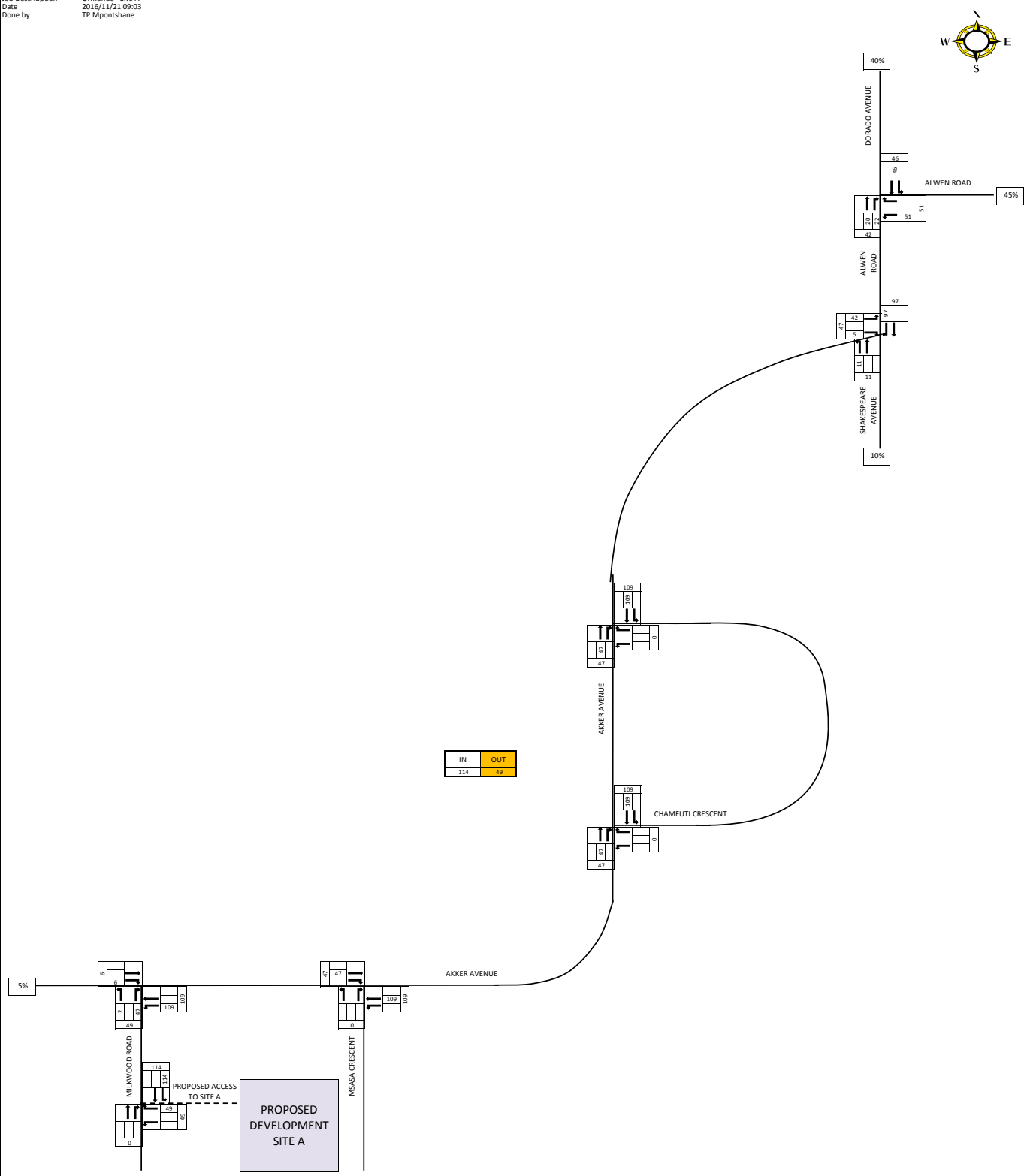
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY MORNING PEAK HOUR RESIDENTIAL DEVELOPMENT TRIPS

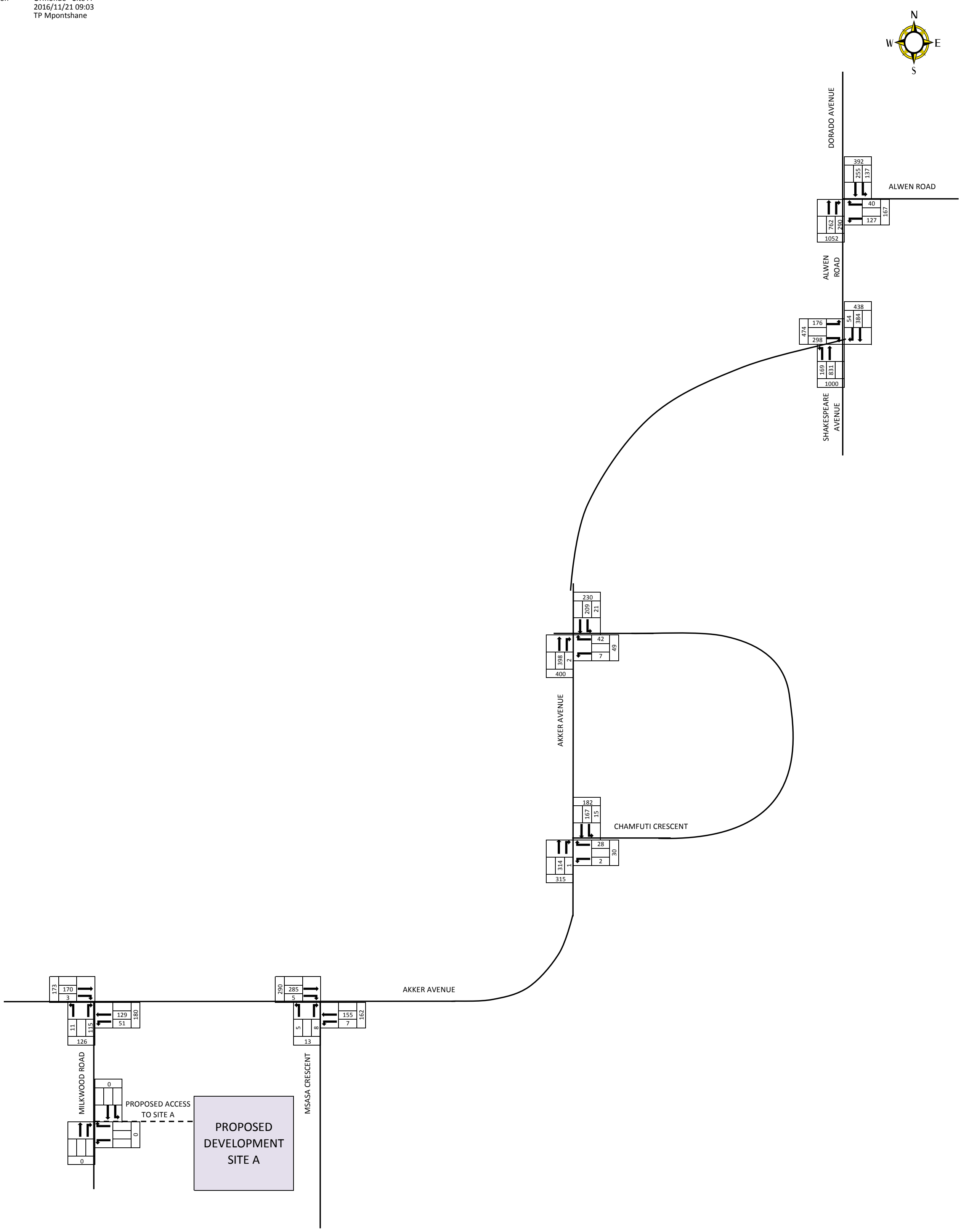
FIGURE 2.1

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



	WEEKDAY AFTERNOON PEAK HOUR RESIDENTIAL DEVELOPMENT TRIPS	FIGURE 2.2

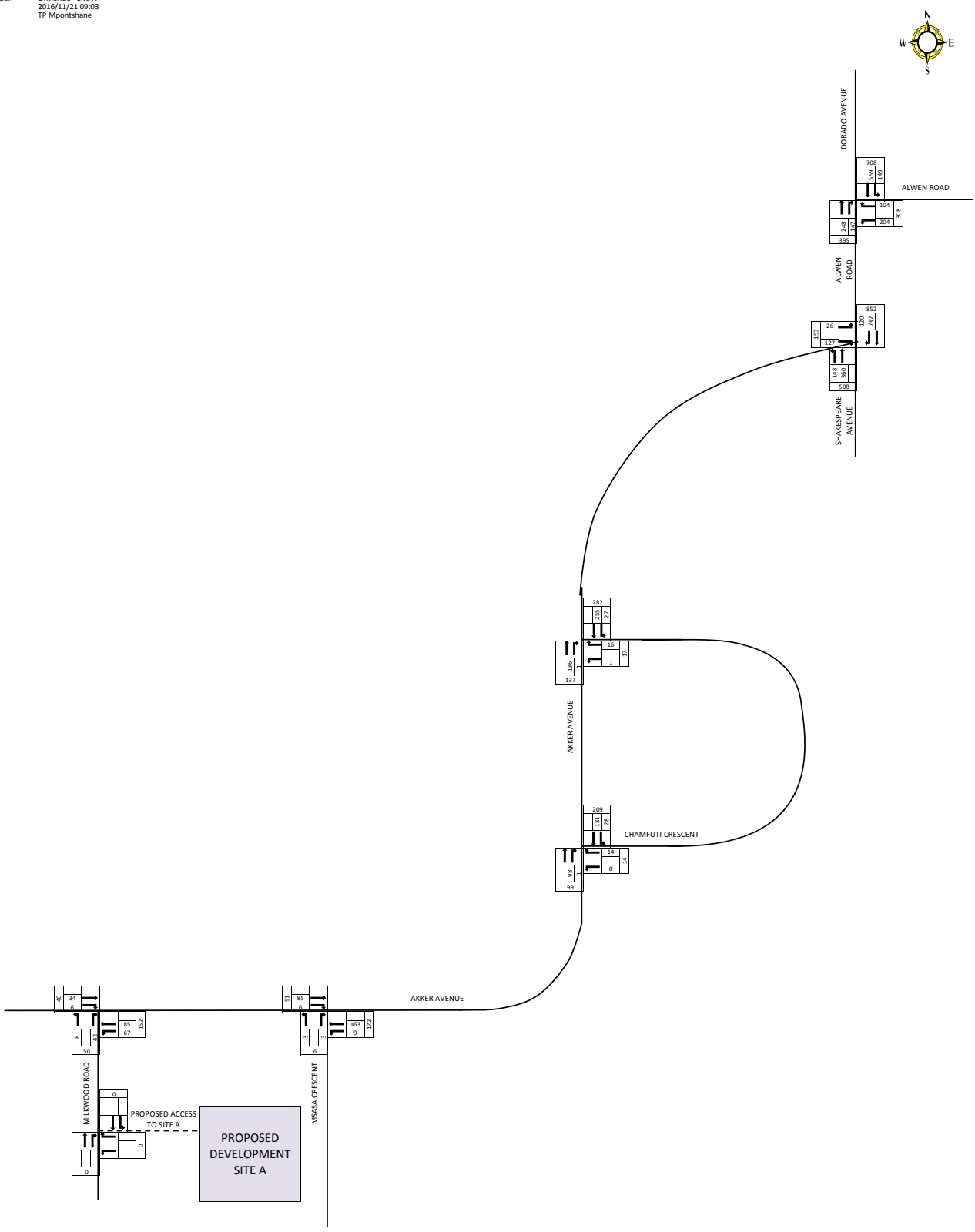
Project Number C2284
Job Describption Ormonde - Site A
Date 2016/11/21 09:03
Done by TP Mpontshane



2016 WEEKDAY MORNING PEAK HOUR TRAFFIC COUNTS (PCUs)

FIGURE 3.1

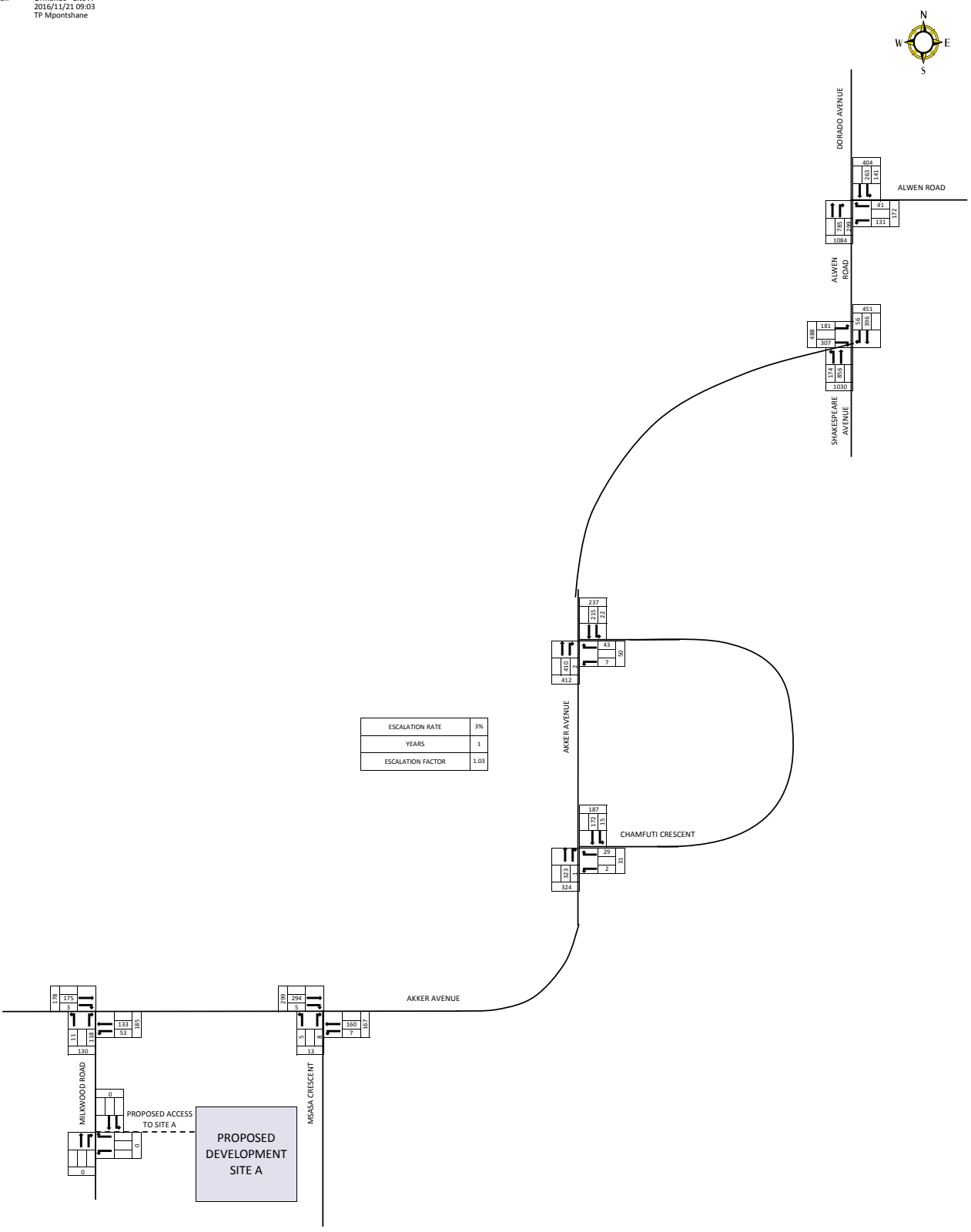
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



2016 WEEKDAY AFTERNOON PEAK HOUR TRAFFIC COUNTS (PCUs)

FIGURE 3.2

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane

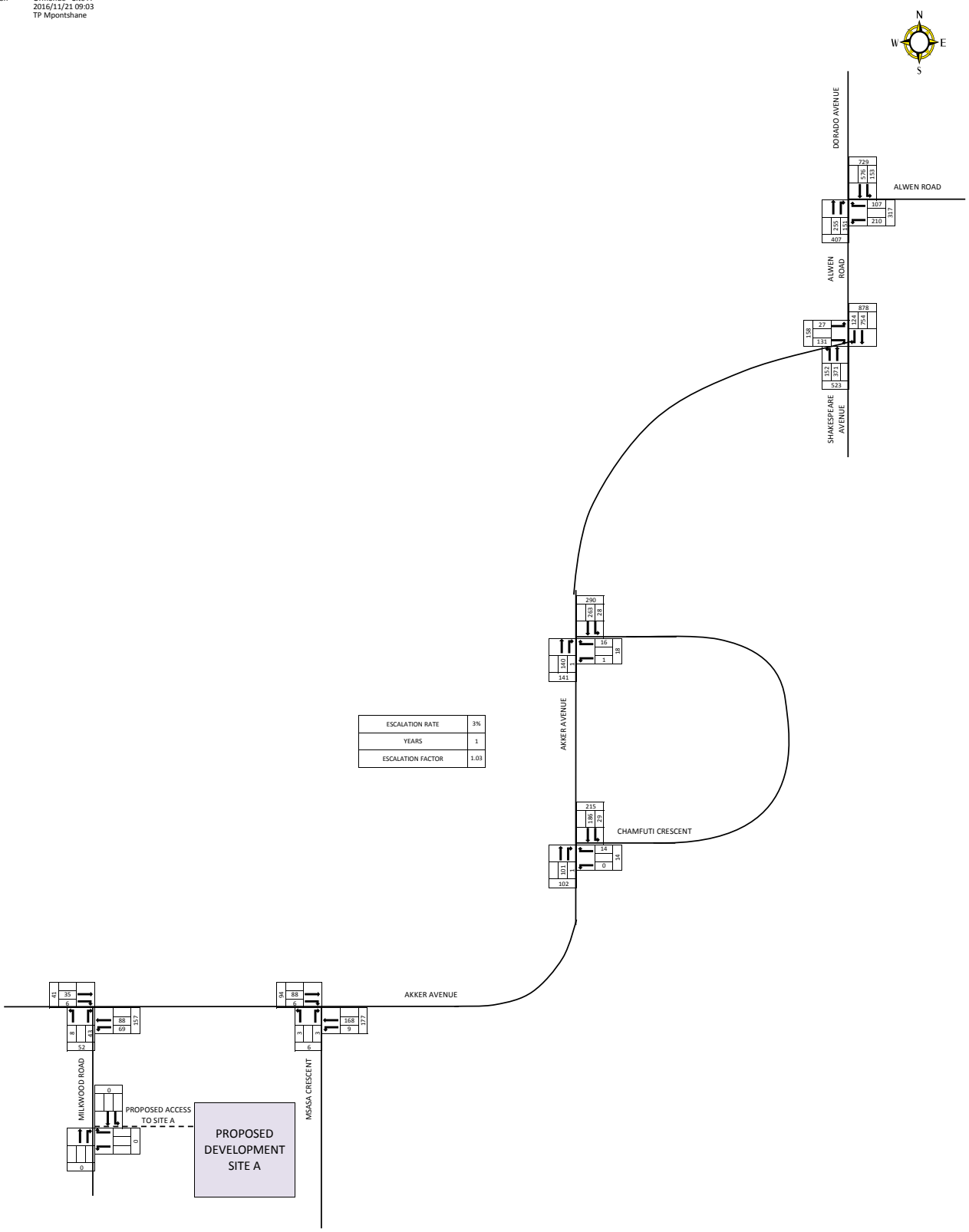


ESCALATION RATE	3%
YEARS	1
ESCALATION FACTOR	1.03

2017 WEEKDAY MORNING PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.3

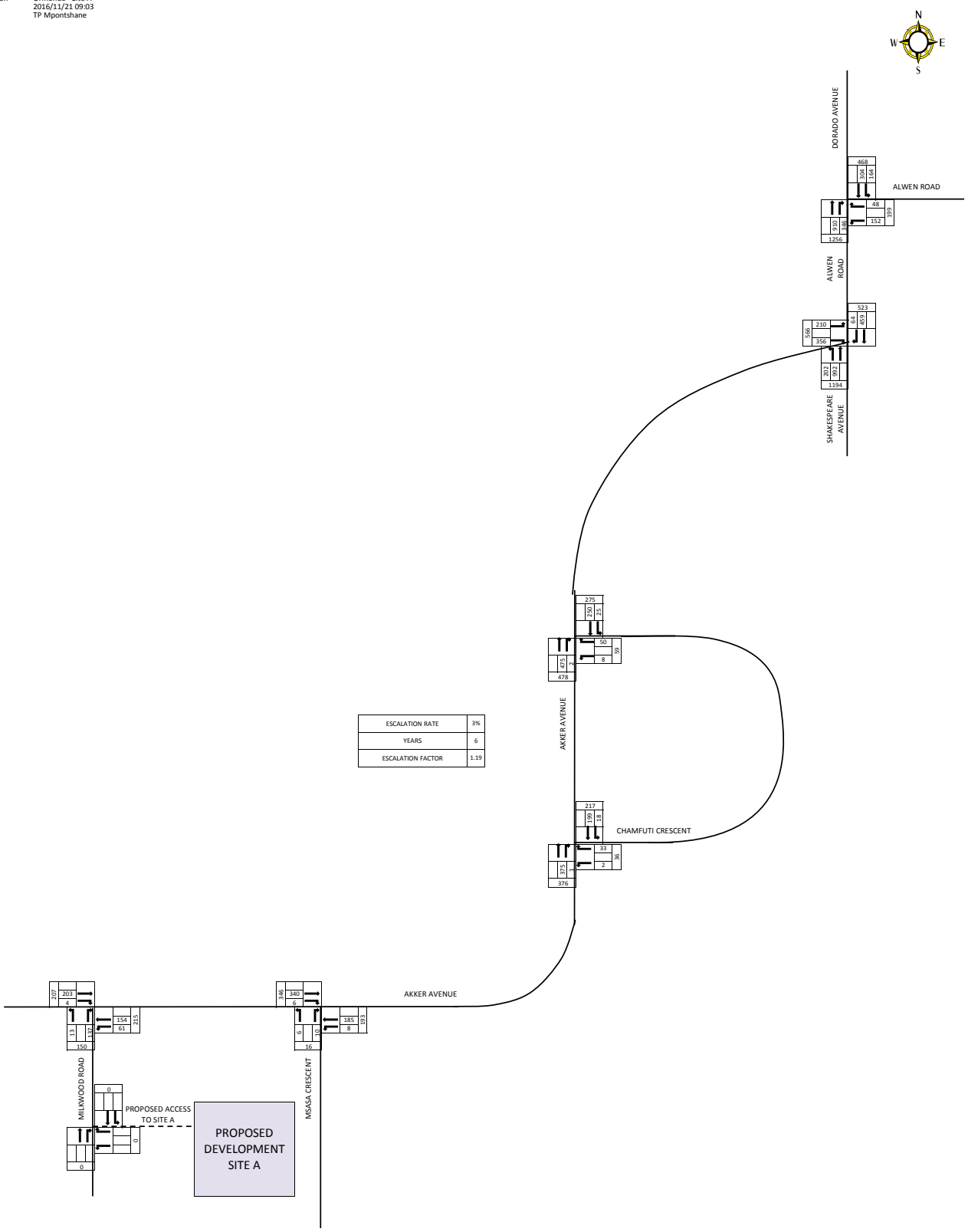
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



2017 WEEKDAY AFTERNOON PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.4

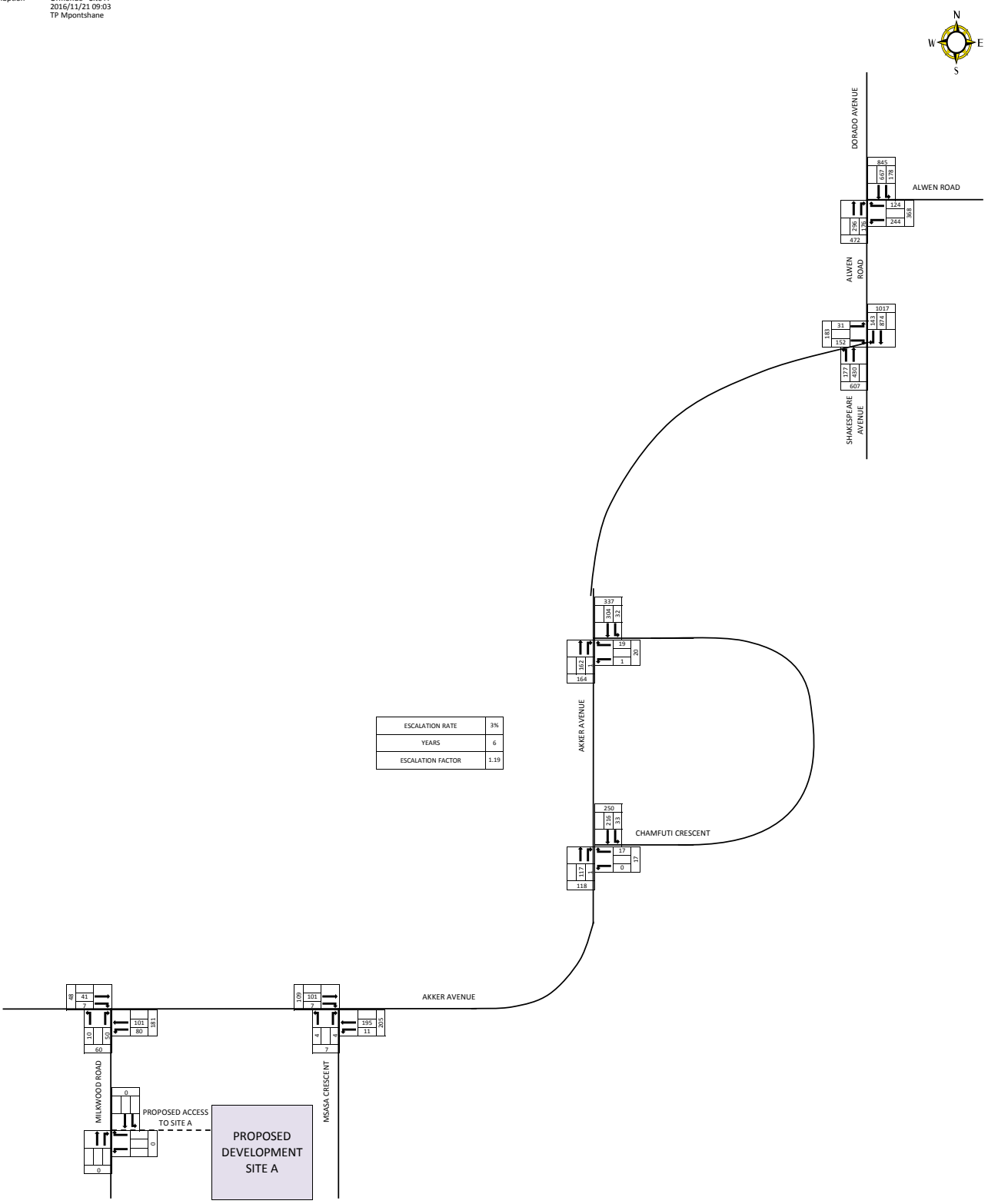
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



2022 WEEKDAY MORNING PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.5

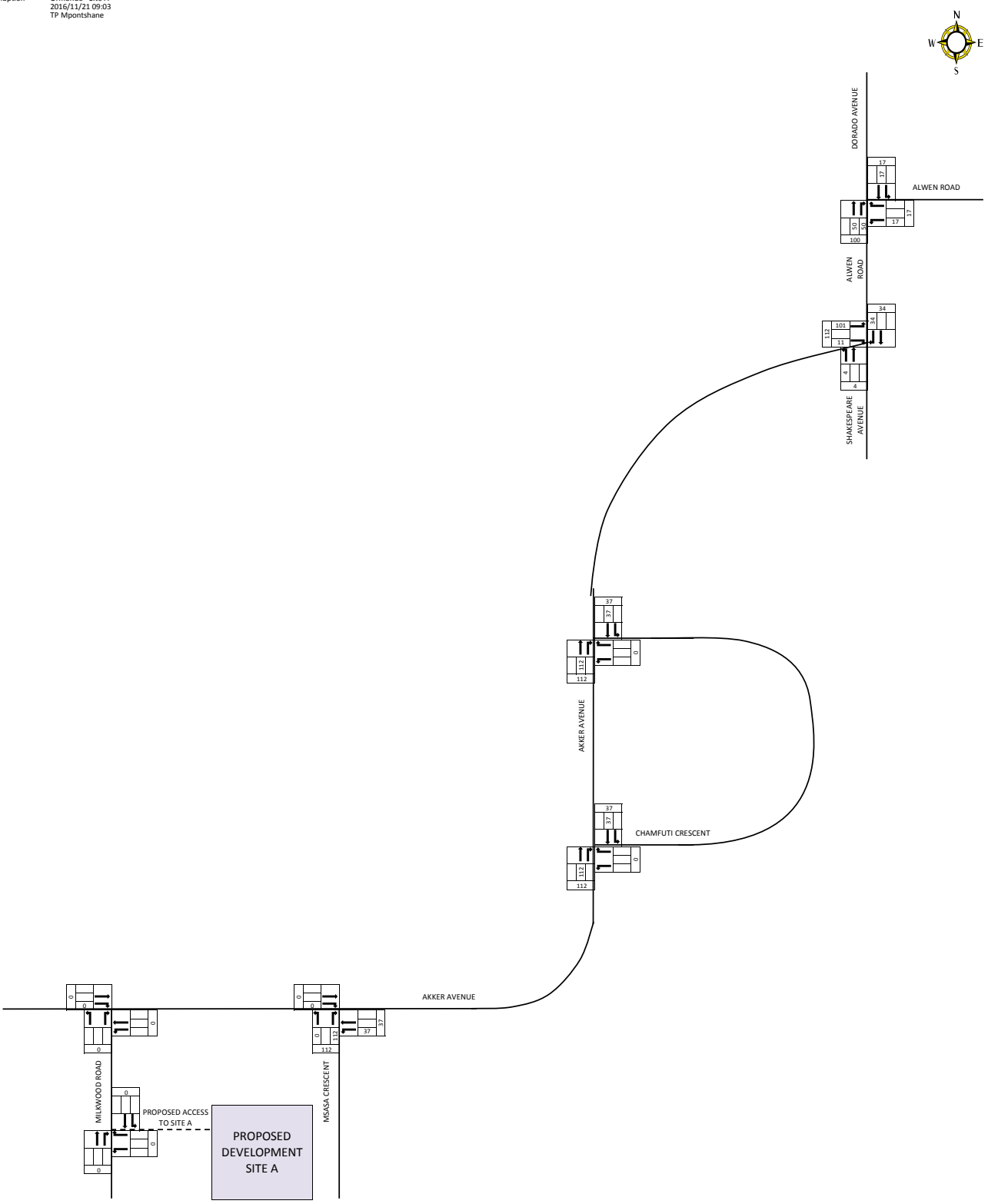
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



2022 WEEKDAY AFTERNOON PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.6

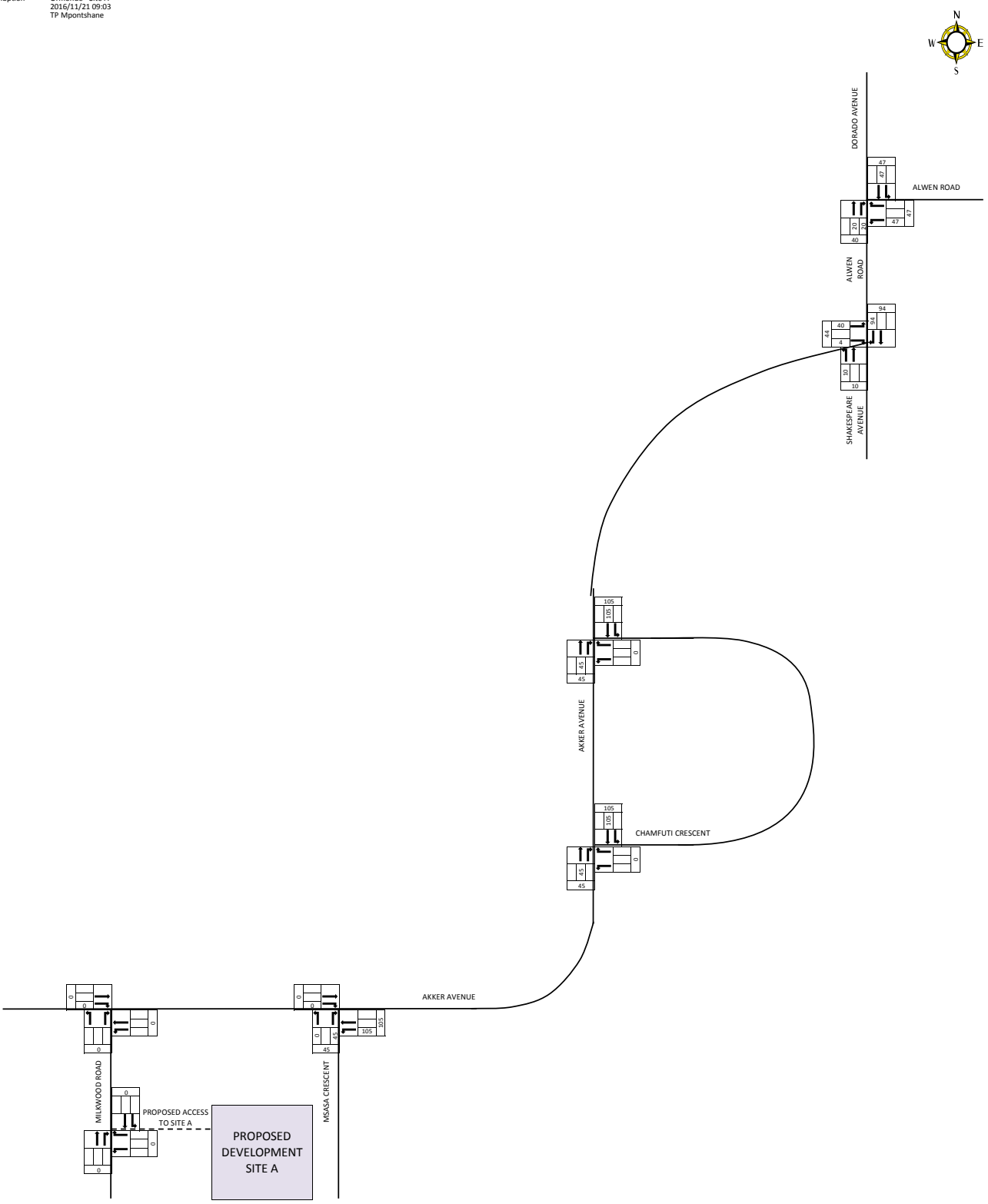
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY MORNING PEAK HOUR LATENT TRIPS FOR ERVEN 962 AND 963, ORMONDE EXTENSION 22

FIGURE 3.7

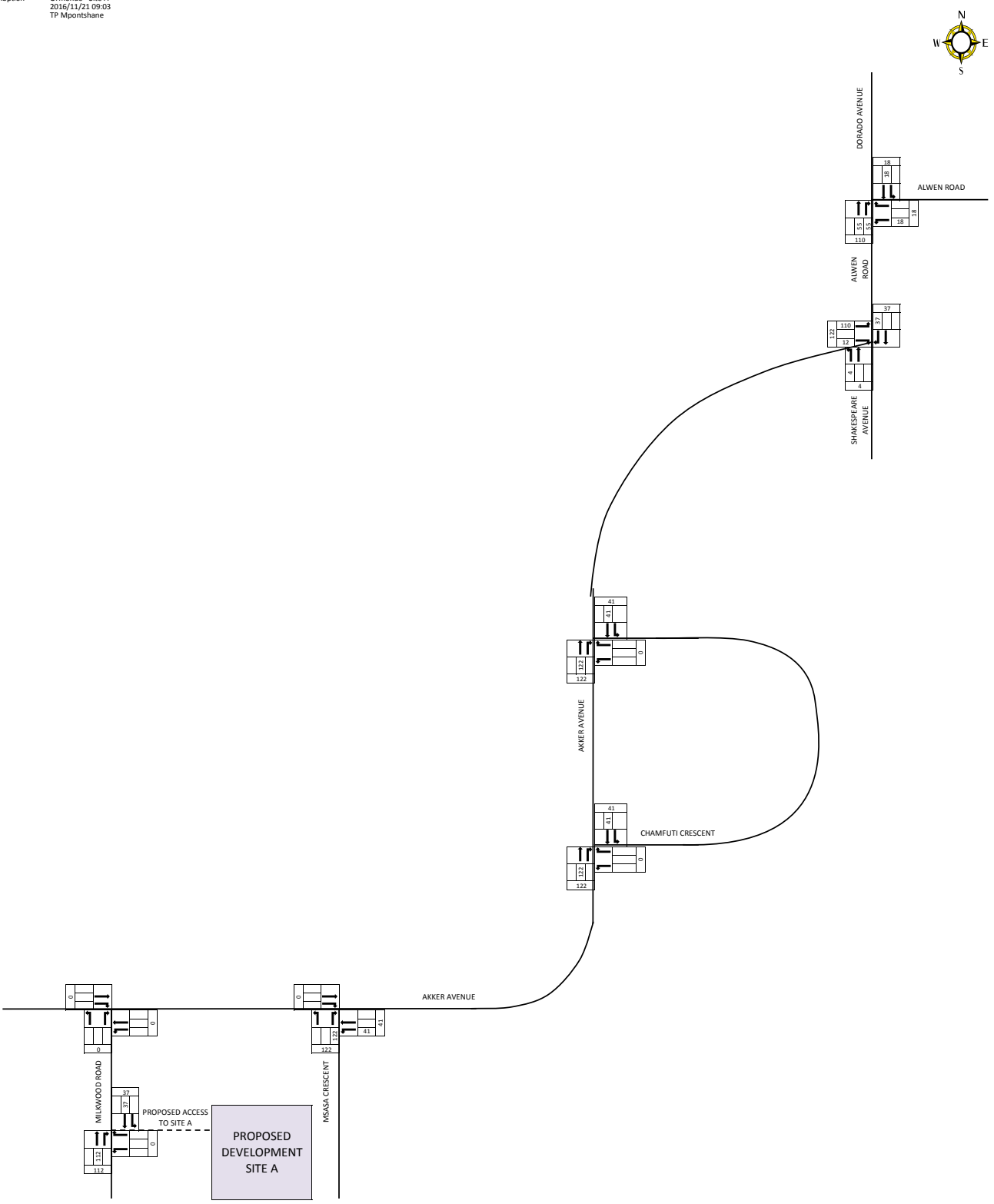
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY AFTERNOON PEAK HOUR LATENT TRIPS FOR ERVEN 962 AND 963, ORMONDE EXTENSION 22

FIGURE 3.8

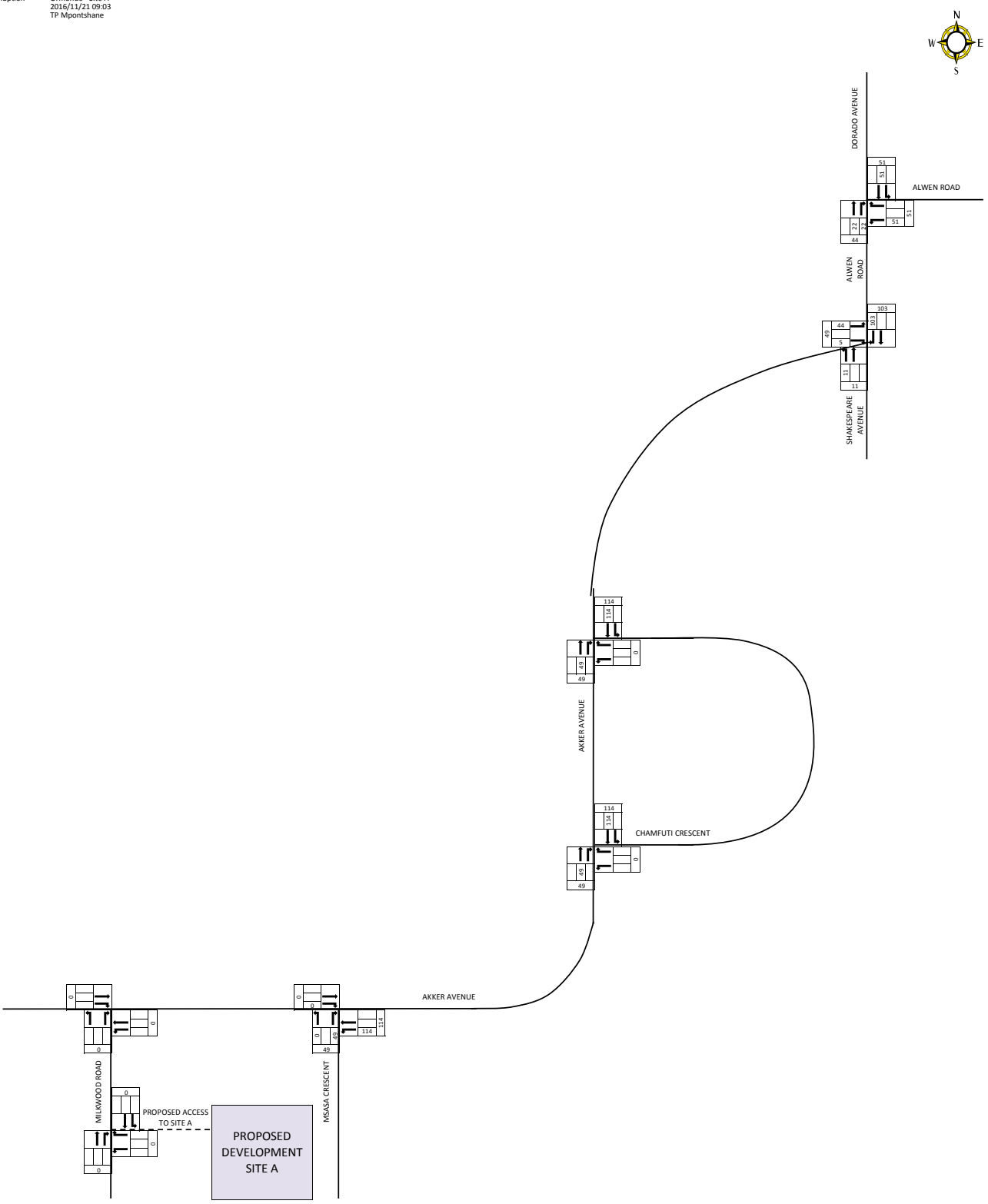
Project Number	C2284
Job Descripption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY MORNING PEAK HOUR LATENT TRIPS FOR ERVEN 1010 AND 1011, ORMONDE EXTENSION 22

FIGURE 3.9

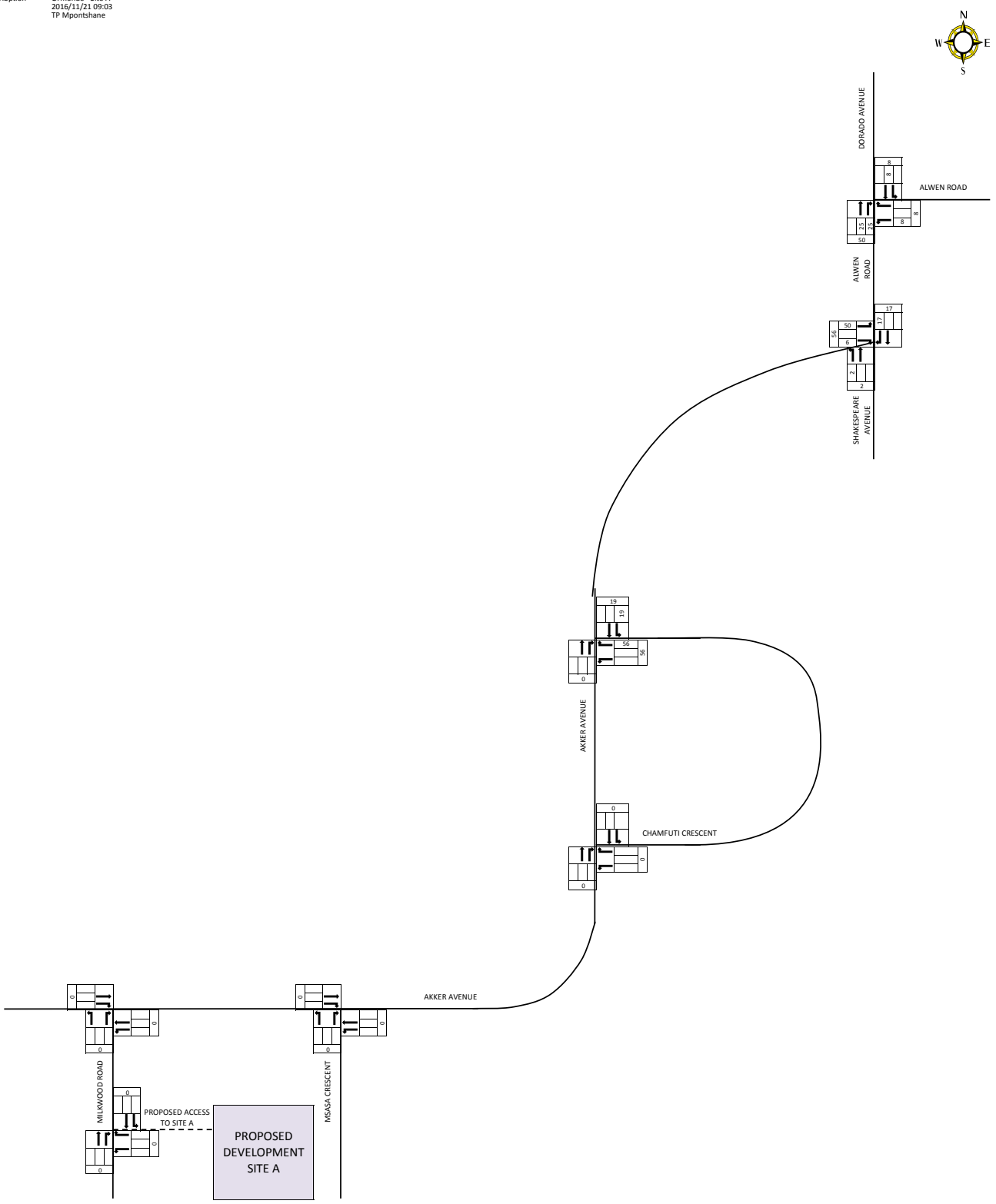
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY AFTERNOON PEAK HOUR LATENT TRIPS FOR ERVEN 1010 AND 1011, ORMONDE EXTENSION 22

FIGURE 3.10

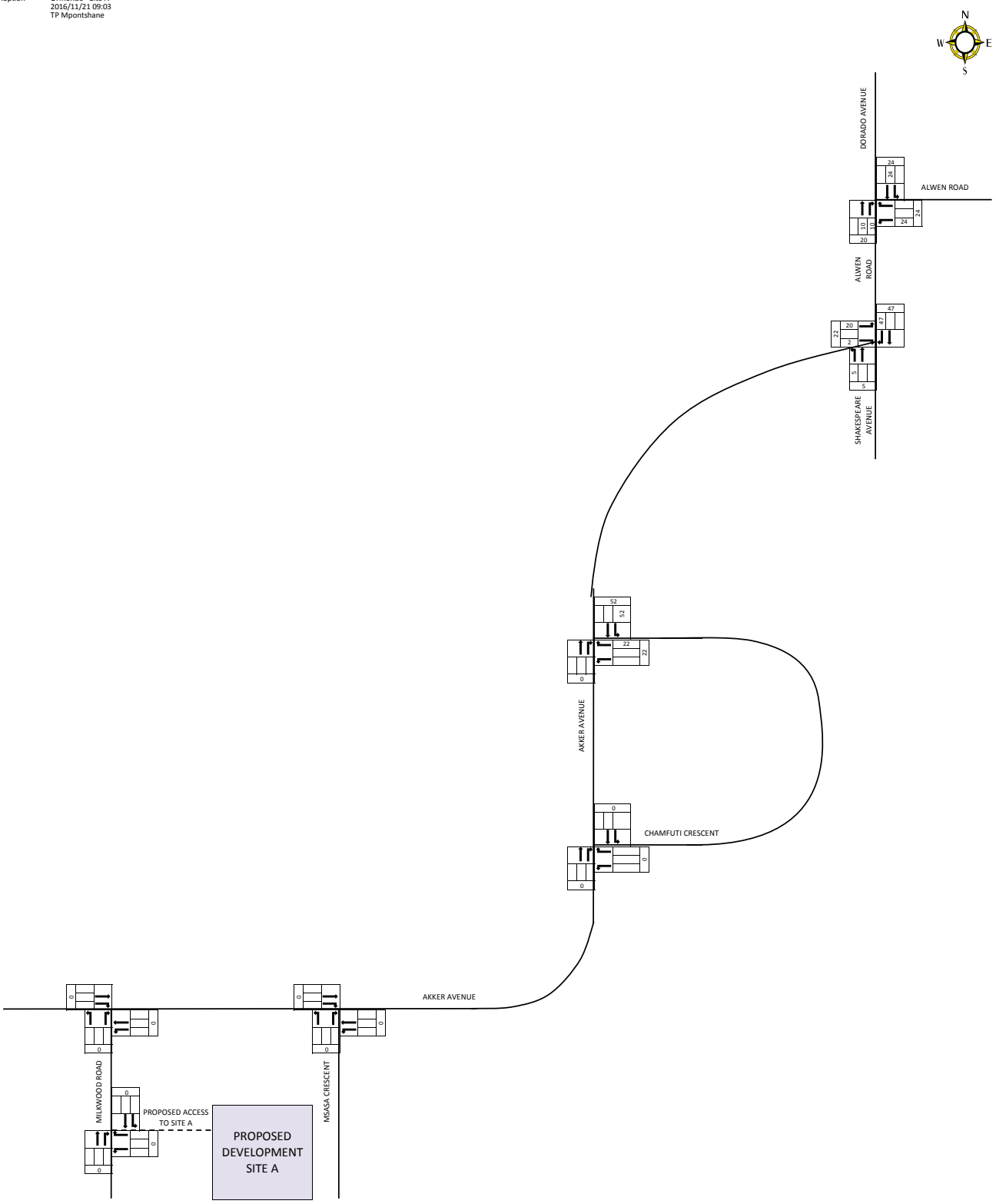
Project Number	C2284
Job Descripbtion	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY MORNING PEAK HOUR LATENT TRIPS FOR ERF 982, ORMONDE EXTENSION 22

FIGURE 3.11

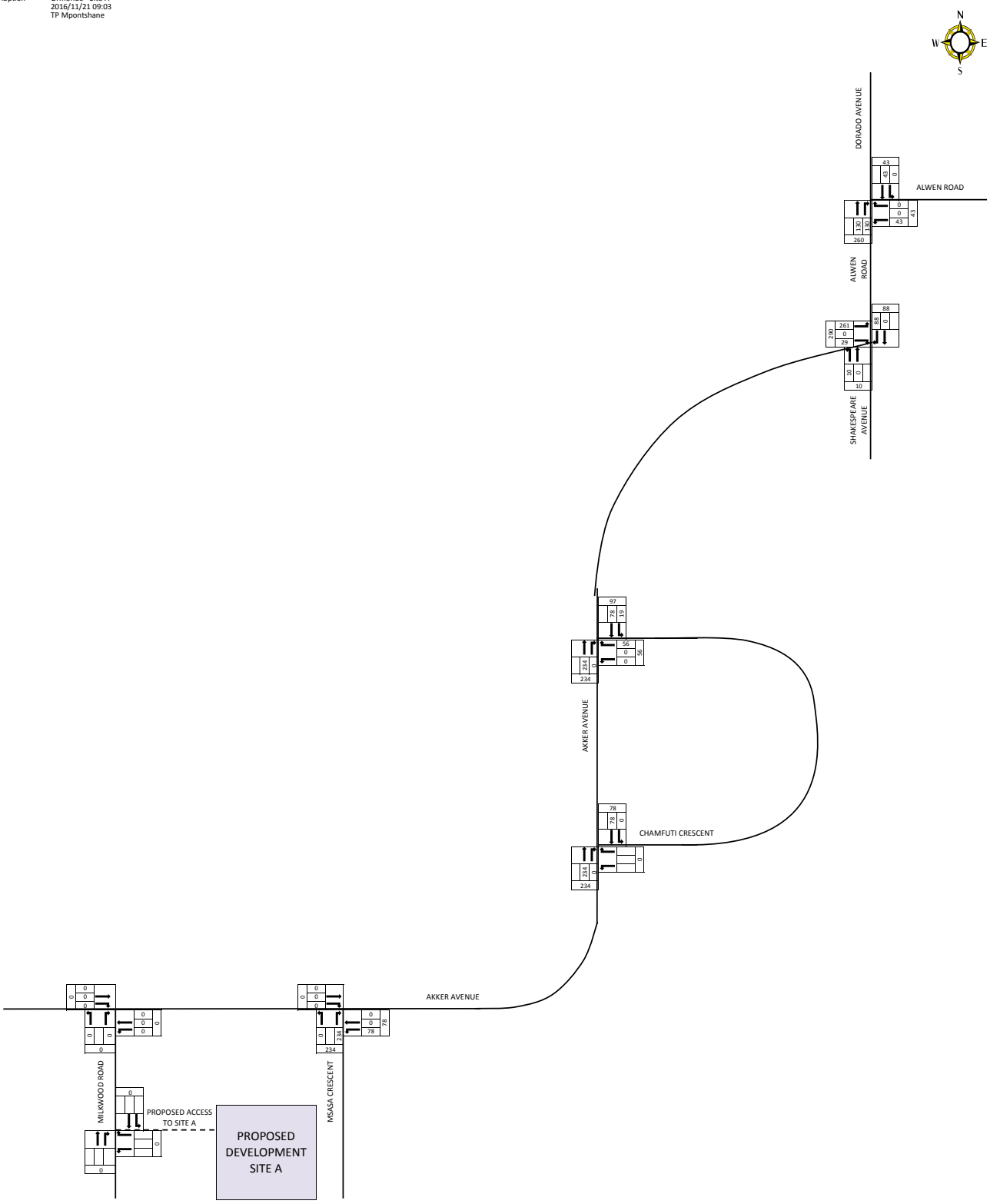
Project Number C2284
Job Description Ormonde - Site A
Date 2016/11/21 09:03
Done by TP Mpontshane



WEEKDAY AFTERNOON PEAK HOUR LATENT TRIPS FOR ERF 982, ORMONDE EXTENSION 22

FIGURE 3.12

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane

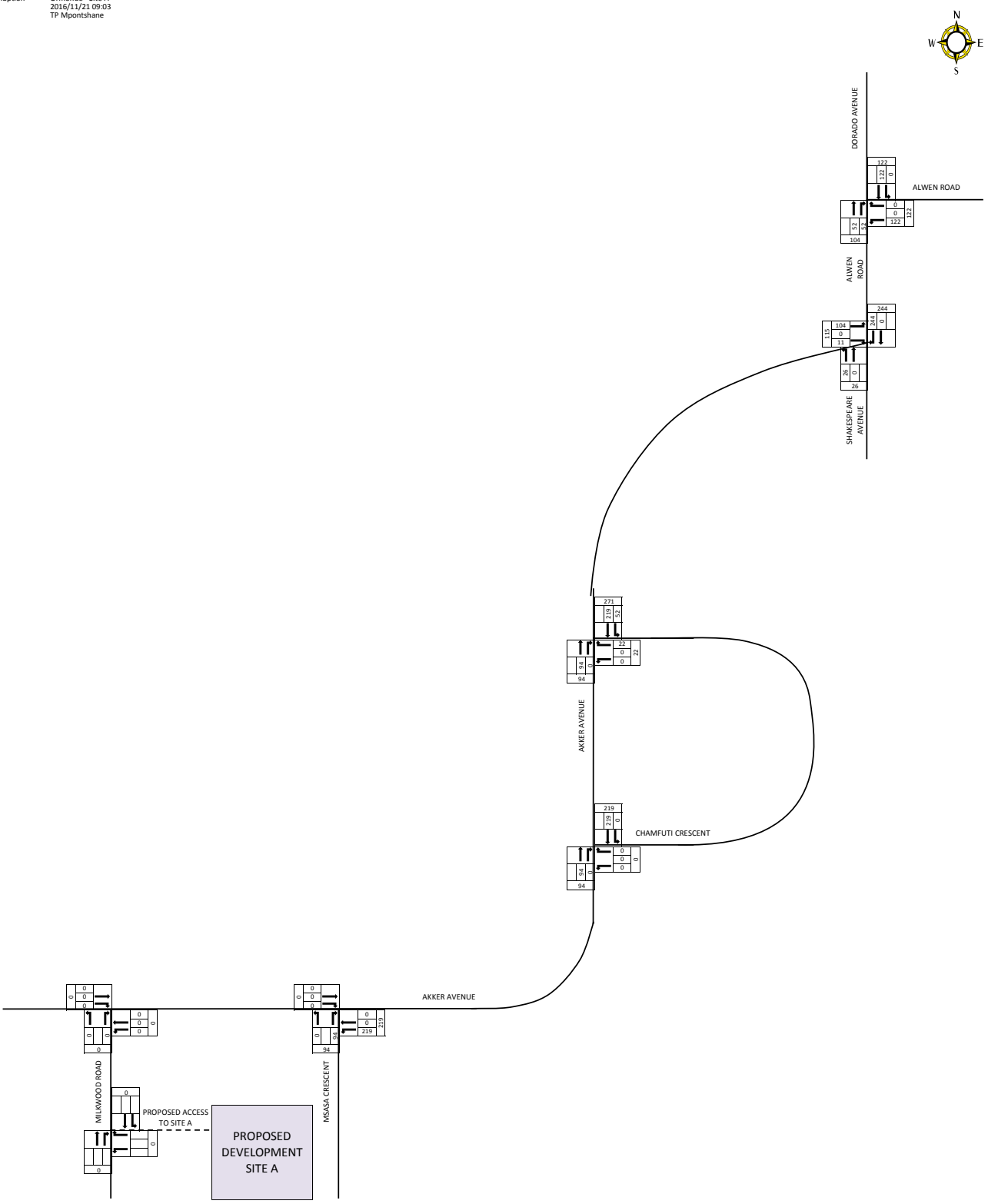


Civil Concepts (Pty) Ltd.

WEEKDAY MORNING PEAK HOUR TOTAL LATENT TRIPS
ORMONDE EXTENSION 22

FIGURE 3.13

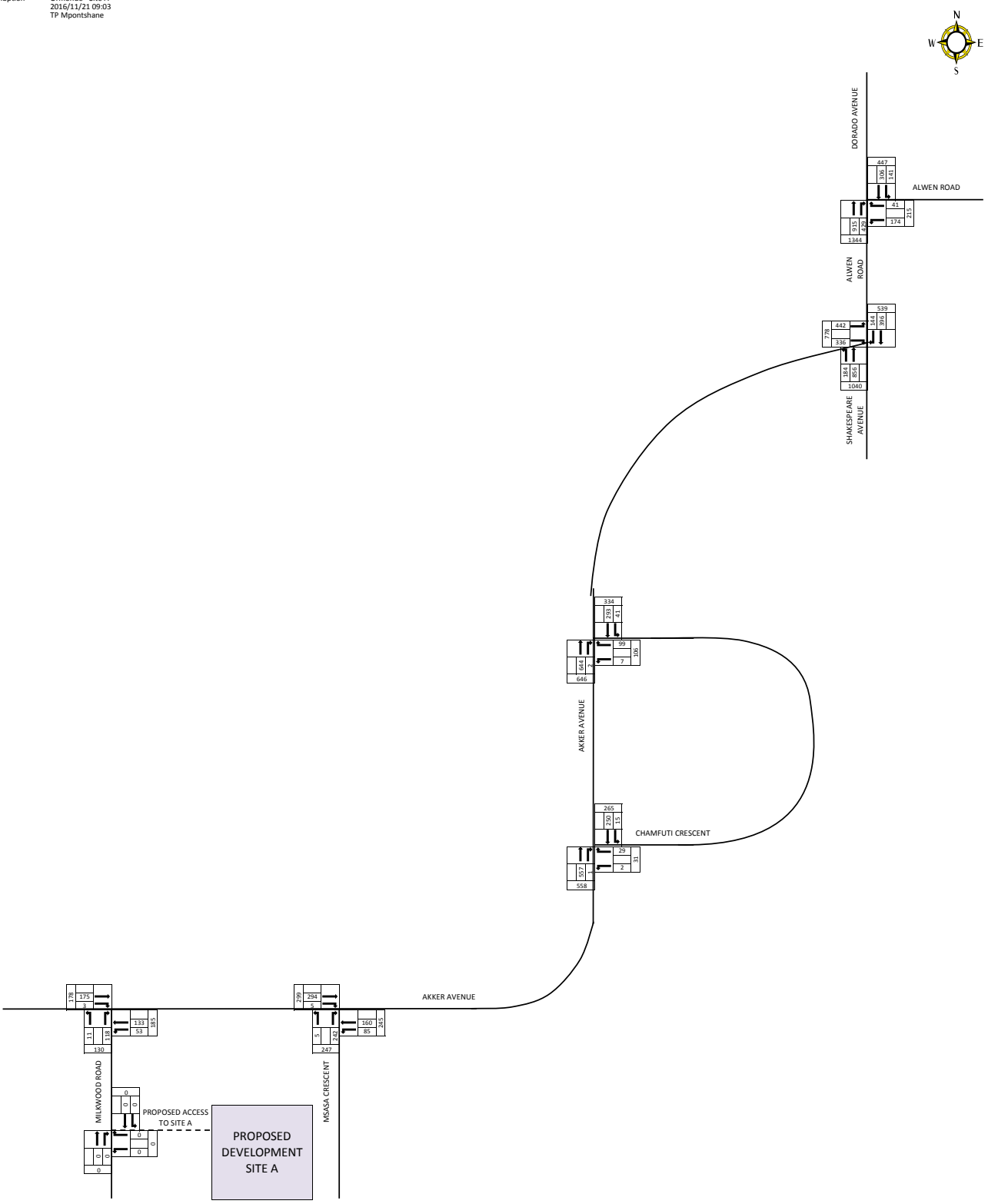
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY AFTERNOON PEAK HOUR TOTAL LATENT TRIPS FOR ORMONDE EXTENSION 22

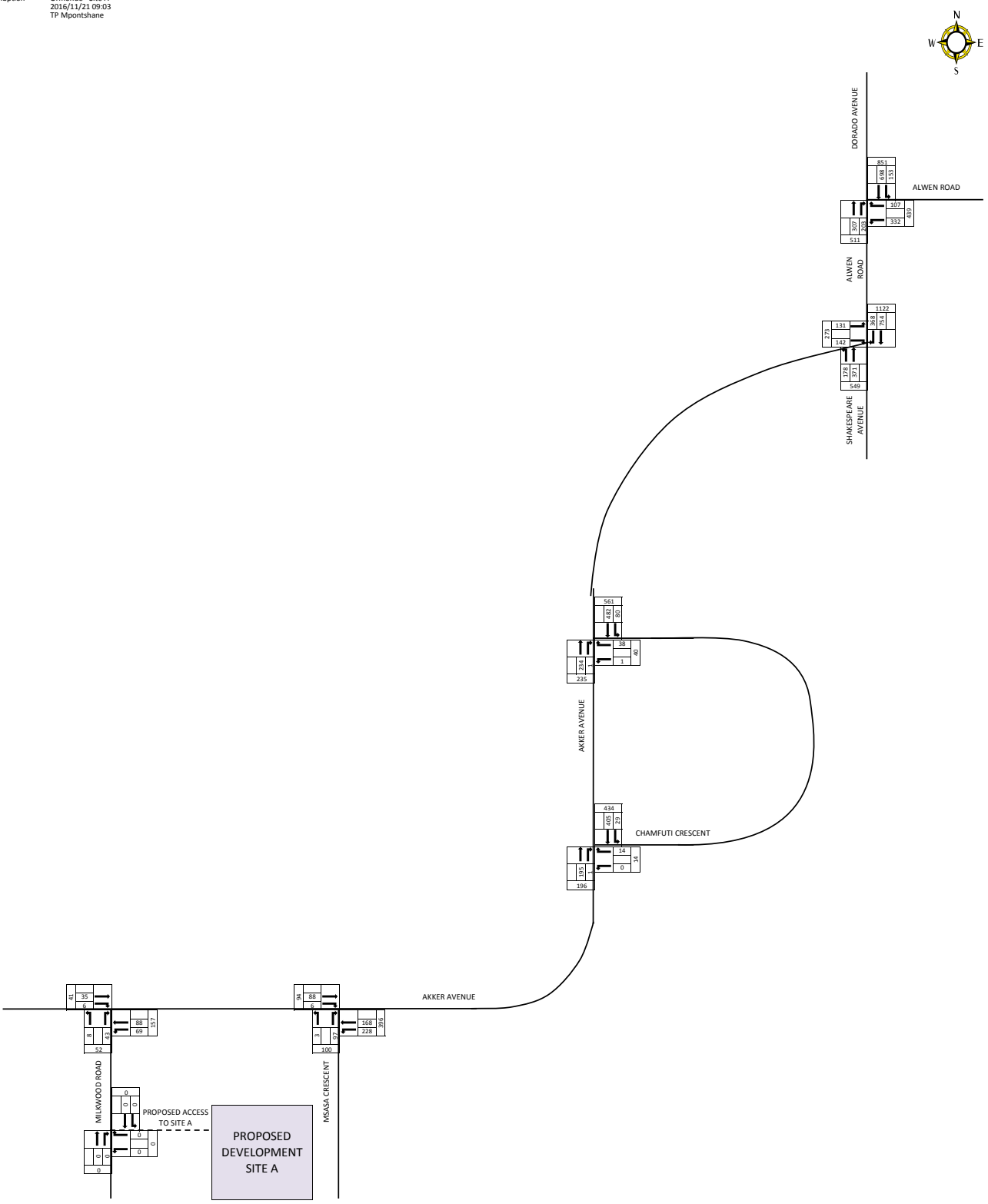
FIGURE 3.14

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



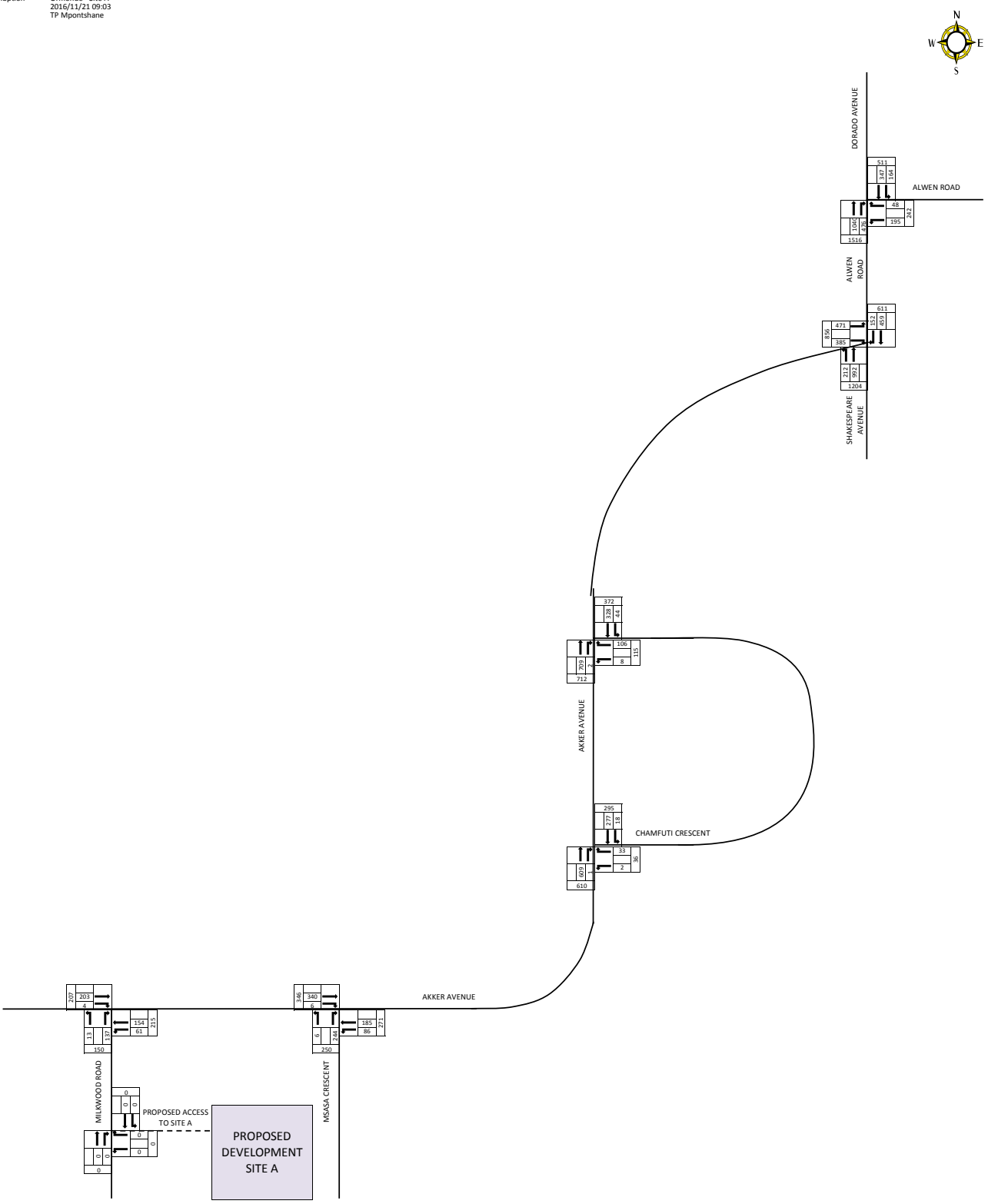
	2017 WEEKDAY MORNING PEAK HOUR BACKGROUND TRAFFIC VOLUMES	FIGURE 3.15

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



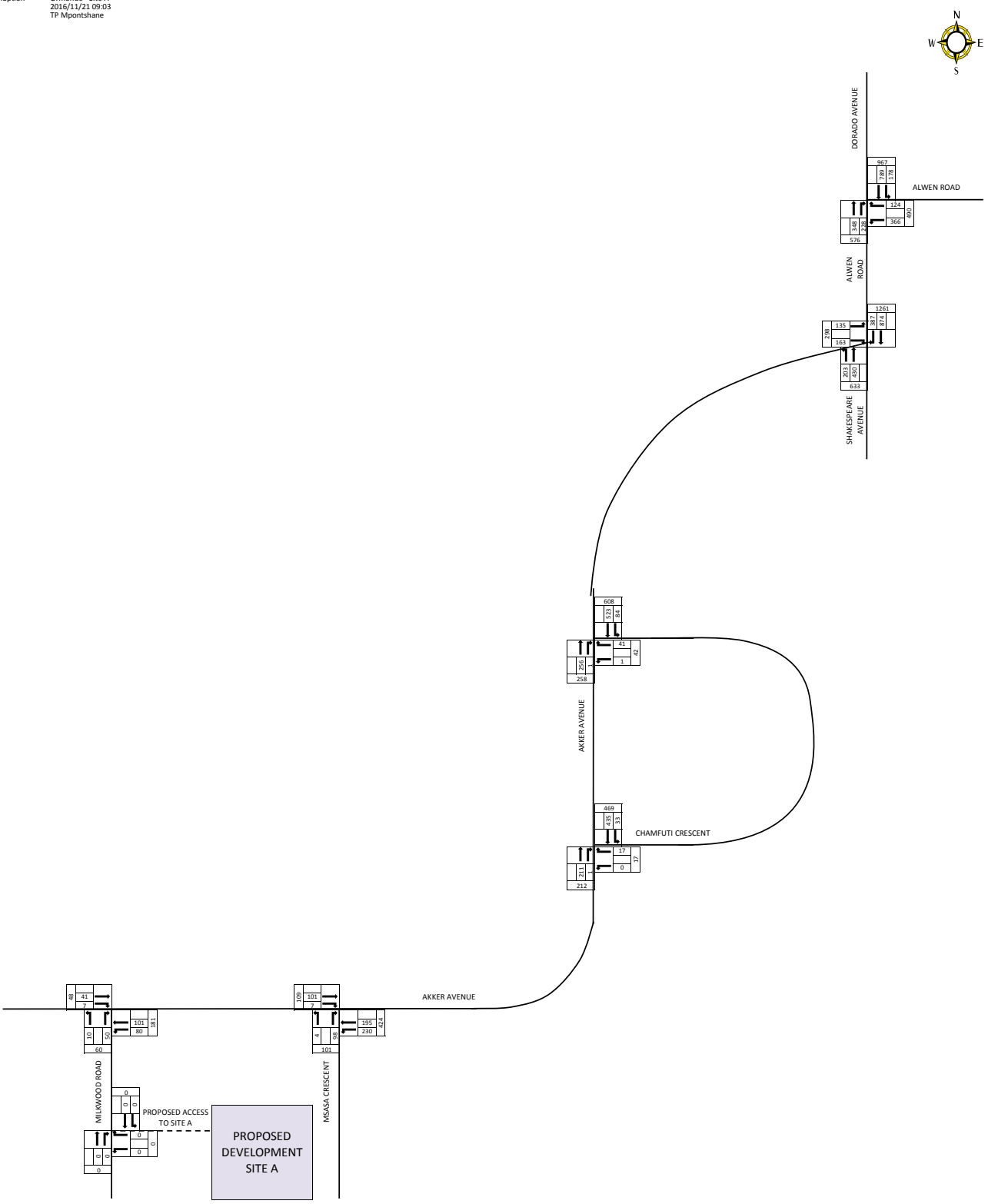
	2017 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND TRAFFIC VOLUMES	FIGURE 3.16

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



	2022 WEEKDAY MORNING PEAK HOUR BACKGROUND TRAFFIC VOLUMES	FIGURE 3.17

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



	2022 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND TRAFFIC VOLUMES	FIGURE 3.18