INFRATRANS
TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING

TRAFFIC IMPACT ASSESSMENT

MELVILLE SECURITY ENCLOSED AREAS

Proposed Road Closures and Access Monitoring for Two Proposed Enclosed Neighbourhoods in Melville, City of Johannesburg Metropolitan Municipality, Gauteng Province

September 2022

REPORT INFORMATION SHEET

Title:	TRAFFIC IMPACT ASSESSMENT – MELVILLE SECURITY ENCLOSED AREAS Proposed Road Closures and Access Monitoring for Two Proposed Enclosed Neighbourhoods in Melville, City of Johannesburg Metropolitan Municipality, Gauteng Province
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1. INTRODUCTION

Infratrans (Pty) Ltd was appointed by the Melville Security Initiative (MSI) to undertake a Traffic Impact Assessment (TIA) in support of an application for two proposed security enclosed areas (SEA's) with road closures and access monitoring in Melville, City of Johannesburg Metropolitan Municipality, Gauteng Province.

The location of the two proposed SEA's, Melville Main SEA and Melville West SEA, are shown in **Figure 1** (all figures and appendices are attached at the end of this report). The proposed SEA's are two separate enclosures with individual requirements and the approval of one SEA does not depend on the approval of the other SEA. This TIA addresses the expected traffic impact of both SEA's, but each SEA will launch its own, separate application to the City of Johannesburg for consideration for approval of its intended SEA scheme.

The assessment is intended to quantify the impact of the proposed SEA's on the surrounding external road network and to determine whether it is necessary to implement any road upgrades to mitigate such impact. The study includes discussions on the surrounding local, provincial and national road networks (including future roads planning aspects) and non-motorised aspects.

2. STUDY SCOPING

All road links crossed by the proposed fence lines of the proposed SEA's were included in the scope of this study. Weekday AM and PM peak hour surveys were conducted for vehicular and pedestrian traffic passing these locations (see **Figure 2**).

3. SURROUNDING ROAD NETWORK & ROADS PLANNING

This section presents the existing surrounding road network as well as the surrounding road network planning on a local, provincial and national level. The impact of the proposed road closures on these existing road networks and roads master plans are assessed and discussed.

3.1 Local Road Network

The JRA is the relevant local roads authority applicable to the subject application. **Figure 3** presents the SEA's in the context of the latest available functional roads master plan of the JRA.

Municipal roads affected by the Melville Main SEA are listed in **Table 3.1** below along with their functional classifications and existing and planned road reserve widths.

Table 3.1 – Affected local road network characteristics for the Melville Main SEA

Road name	Classification	Road reserve width	
		Existing	Planned
1st Avenue	Class 5 Local Street	16-18 m	16 m
2nd Avenue	Class 5 Local Street	16-18 m	16 m
3rd Avenue	Class 5 Local Street	16-18 m	16 m
4th Avenue	Class 5 Local Street	16-18 m	16 m
5th Avenue	Class 5 Local Street	16-18 m	16 m
6th Avenue	Class 5 Local Street	16-18 m	16 m
7th Avenue	Class 5 Local Street	16-18 m	16 m
8th Avenue	Class 5 Local Street	16-18 m	16 m
9th Avenue	Class 5 Local Street	16-18 m	16 m
10th Avenue	Class 5 Local Street	16-18 m	16 m
11th Avenue	Class 5 Local Street	16-18 m	16 m

Table 3.1 – Affected local road network characteristics for the Melville Main SEA (*continued*)

Road name	Classification	Road reserve width	
		Existing	Planned
3rd Street	Class 5 Local Street	16-18 m	16 m
4th Street	Class 5 Local Street	16-18 m	16 m
5th Street	Class 5 Local Street	16-18 m	16 m
6th Street	Class 5 Local Street	16-18 m	16 m
7th Street	Class 5 Local Street	16-18 m	16 m
8th Street	Class 5 Local Street	16-18 m	16 m
9th Street	Class 5 Local Street	16-18 m	16 m
10th Street	Class 5 Local Street	16-18 m	16 m
St Swithins Avenue	Class 5 Local Street	16-18 m	16 m
Auckland Avenue	Class 5 Local Street	16-18 m	16 m
Streatley Avenue	Class 5 Local Street	16-18 m	16 m
Windsor Avenue	Class 5 Local Street	16-18 m	16 m
Goring Avenue	Class 5 Local Street	16-18 m	16 m
Finchley Avenue	Class 5 Local Street	16-18 m	16 m
Shiplake Road	Class 5 Local Street	16-18 m	16 m
Moorgate Road	Class 5 Local Street	16-18 m	16 m
Lothbury Road	Class 5 Local Street	16-18 m	16 m
Sunbury Avenue	Class 5 Local Street	16-18 m	16 m
Walton Avenue	Class 5 Local Street	16-18 m	16 m
Clieveden Avenue	Class 5 Local Street	16-18 m	16 m
Thanet Road	Class 5 Local Street	16-18 m	16 m
Hurley Road	Class 5 Local Street	16-18 m	16 m
Landau Terrace	Class 5 Local Street	16-18 m	16 m
Cecil Terrace	Class 5 Local Street	16-18 m	16 m
Chatou Road	Class 5 Local Street	16-18 m	16 m
Boulogne Road	Class 5 Local Street	16-18 m	16 m
Menton Road	Class 5 Local Street	16-18 m	16 m
Clamart Road	Class 5 Local Street	16-18 m	16 m
Hill Road	Class 5 Local Street	16-18 m	16 m

The planned road reserve widths indicated in **Table 3.1** corresponds with the requirements as per the *South African Road Classification and Access Management Manual*[1].

Each of the above local roads are classified as Class 5 local streets. Important to note here is that through traffic should be prevented for this class of road in accordance with the *South African Road Classification and Access Management Manual*[1].

Municipal roads affected by the Melville West SEA are listed in **Table 3.2** overleaf along with their functional classifications and existing and planned road reserve widths.

Table 3.2 – Affected local road network characteristics for the Melville West SEA

Road name	Classification	Road reserve width	
		Existing	Planned
1st Avenue	Class 5 Local Street	16-18 m	16 m
2nd Avenue	Class 5 Local Street	16-18 m	16 m
3rd Avenue	Class 5 Local Street	16-18 m	16 m
4th Avenue	Class 5 Local Street	16-18 m	16 m
1st Street	Class 5 Local Street	16-18 m	16 m
2nd Street	Class 5 Local Street	16-18 m	16 m
Aberdeen Street	Class 5 Local Street	16-18 m	16 m
East Road	Class 5 Local Street	16-18 m	16 m

The planned road reserve widths indicated in **Table 3.2** also correspond with the requirements as per the *South African Road Classification and Access Management Manual*[1].

Each of the above local roads are classified as Class 5 local streets. To be noted again is that through traffic should be prevented for this class of road in accordance with the *South African Road Classification and Access Management Manual*[1]

3.2 Provincial Road Network

The Gauteng Department of Roads and Transport (Gautrans) is the relevant provincial roads authority applicable to the subject application. **Figure 4** presents the proposed SEA's in the context of the latest available Gautrans strategic road network. From **Figure 4** it is clear that there are no provincial roads in close enough proximity to the either of the proposed SEA's to be considered in this study.

3.3 National Road Network

From **Figure 3** and **Figure 4** it is concluded that there are no national roads in close enough proximity to the subject SEA's to be considered by this study.

4. ROAD CLOSURES & AREA ACCESS

Figure 2 presents both the proposed SEA's and access monitoring points along with the proposed road closures which forms part of the subject application.

As per **Figure 2** the Melville Main SEA will have four 24-hour manned access monitoring points, one each on 4th Avenue, Lothbury Road, Menton Road and 9th Street. In addition to these access points, three semi-permanent road closures are proposed for the SEA, one each on 8th Avenue and 1st Avenue just East of Main Road, and one on 8th Avenue just West of Rustenburg Road (see **Figure 2**). These will be in the form of remote-controlled operated gates for which remotes are held by the local residents/business owners of the proposed enclosed area.

The Melville West SEA will have one 24-hour manned access monitoring point located on 2nd Street.

Access at all monitoring points will only be monitored and not controlled. These posts will be manned at all times by security guards.

An access monitoring system which typically operates by means of a button on a goose neck mounted in a median island (painted or kerbed) is recommended for the above 24-hour manned access monitoring points. Vehicles that wish to enter the enclosed area pull up to the goose neck mounted button and press/wave at the button which then opens the gate. When the button is pressed security cameras record the face of the driver as well as the vehicle details entering the enclosed area. A similar setup is proposed for outbound vehicle movements.

The following subsections will provide some guidance on the layout, configuration and operation of the access gates. Reference is again made to **Figure 2** which presents details regarding the access proposals.

4.1 Access Gate Configuration

Currently in the vicinity of each manned access gate to the Melville Main SEA, the paved road width measures approximately 8 m in width and consists of one inbound and one outbound lane. It is recommended that the inbound lane to the subject enclosed area be a minimum of 4.5 m in width with a minimum vertical clearance of 5.2 m to allow for

emergency vehicle access. This leaves 3.5 m of existing road surface which can be divided into 0.5 m for a median to accommodate the goose necks with the access/exit buttons as well as security camera equipment. Thus, 3.0 m of existing road surface will be left over for the outbound lane. However, 3.0 m is regarded as insufficient for the outbound lane and hence the addition of at least 0.5 m in roadway width is recommended at each 24-hour manned access.

It follows that, in the case of an emergency, emergency vehicles can enter and exit through the entrance gate (4.5 m in width) which will be manually overridden in order to allow for the exit movement. Additionally, emergency vehicles can also exit the Melville Main SEA by means of the remote-controlled gates at one of the semi-permanent road closures as these are expected to have a minimum horizontal gate clearance of 7.0 m.

The proposed access gate to the Melville West SEA is located on 2nd Street which measures only 6.5 m in width on the paved roadway and consists of one inbound and one outbound lane. The road reserve width is however 16 m. A similar access configuration is proposed to that of the Melville Main SEA for 24-hour manned access gates where the inbound lane is 4.5 m in width, the median 0.5 m and the outbound lane 3.5 m. Vertical clearance should be 5.2 m. During emergencies the 4.5 m inbound lane will be overridden to let emergency vehicles out of the SEA. The addition of at least 2.0 m in roadway width is recommended at this access gate.

4.2 Access Control System

The access control system must be chosen such that the service flow rate thereof can cater for the maximum inbound peak hour traffic flow such that the inbound traffic queue does not back up onto the adjacent public road intersections. The access control system described above for the 24-hour manned access gates has previously been measured at 350 vehicles per hour per lane. The typical service flow rate for remote controlled access gates is 450 vehicles per hour per lane.

4.3 Access Gate Stacking Distance

The minimum stacking distance to be provided in front of the inbound access gate up to a point where backing up of inbound vehicles start impeding the traffic flow on the adjacent public road network must be determined. By making use of the method prescribed in Section 10.5 of the *TMH 16, Volume 2, South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual*[3], the expected service flow rate noted in foregoing Section 4.2 and the maximum inbound peak hour traffic volumes at each manned access gate (see **Figure 6a**) it was determined that the access control system will not have sufficient capacity to service the expected traffic volumes during peak hours. At such peak periods the guards on duty will be instructed to override and keep the boom gates open until such time as the backups have cleared and the traffic volumes have reduced such that the access control system can keep up with the traffic demand.

4.4 Pedestrian Gate

Pedestrian gates of 1.0 m in width are proposed at the indicated positions in **Figure 2**. These gates are to operate on a similar basis as the vehicular gates in that pedestrians are required to press an access/exit button which will open the pedestrian gate whilst capturing photographic records of all pedestrians entering/exiting the security enclosed area.

5. TRAFFIC SURVEYS

This section describes the traffic surveys conducted, discusses some of the survey results as well as observations during site visits.

5.1 Surveys Conducted

In support of the subject application and as noted in **Section 2** of this report, peak hour traffic surveys were carried out at locations where the proposed security enclosed area boundary lines cross a road link. Link surveys at these locations of vehicular and pedestrian traffic entering and exiting the subject proposed enclosed areas were carried out during the weekday AM (06:00-09:00) and weekday PM (15:00-18:00) peak periods on Thursday 24 June 2021.

5.2 Survey Results

Analysis of the above traffic surveys yielded the weekday AM and PM peak hours as 07:00-08:00 and 16:15-17:15 respectively for vehicular traffic and 07:15-08:15 and 16:45-17:45 respectively for pedestrian traffic in the area. These peak hour traffic volumes are presented graphically in **Figure 5a** for vehicular traffic and **Figure 5b** for pedestrian traffic.

The overall peak hour factors (PHF's) for the surveyed locations were calculated as ranging between 0.82 to 0.94 for the applicable peak hours.

5.3 Site Visits

A site visit to the study area was carried out on Thursday 24 June 2021 in order to observe the operational conditions of the existing traffic in the vicinity of the subject access monitoring point as well as other aspects related to this application.

6. TRIP REDISTRIBUTION

Assumptions regarding the expected redistribution of the vehicular and pedestrian traffic as a result of the proposed closures were made based on likely trip origins/destinations and distribution characteristics of the existing traffic as per the traffic surveys.

The expected vehicular traffic volume changes at each survey location as a result of the proposed closures are shown in **Figure 6a**. Similarly, the expected pedestrian traffic volume changes are shown in **Figure 6b**.

The subsequent expected rerouted vehicular traffic volumes due to the proposed closures and new access gate positions are shown in **Figure 7a**. Similarly, the expected rerouted pedestrian traffic volumes are shown in **Figure 7b**.

7. INTERSECTIONS IMPACTED BY TRAFFIC REDISTRIBUTION

The traffic redistribution process carried out in this study highlighted the following intersections where significant changes will be effected by the proposed SEA schemes:

7.1 Main Road/4th Avenue Intersection

As 4th Avenue is the position of the only 24-hour manned access gate on the western side of the Melville Main SEA and there are numerous existing access options along Main Road from the west, this is the intersection where the most changes are expected. Additionally, via this intersection and 4th Avenue to the west of Main Road, this is where the Melville West SEA will redirect most of its redistributed traffic (via 4th Avenue).

In order to assess the impact of the proposed SEA's on this intersection, the existing weekday peak hour traffic volumes are shown in **Figure 8a**. The expected traffic volumes at this intersection after redistribution is shown in **Figure 8b**. Existing traffic signal settings were measured on site during a site visit.

7.2 Kingsway Avenue/Lothbury Road/Cookham Road Intersection

This Kingsway Avenue/Lothbury Road/Cookham Road intersection is also expected to be impacted by the proposed traffic redistribution. However, the impact on this intersection will only be minor such that the assessment thereof was not regarded as warranted.

The routes that traffic is used to follow to access the other proposed main gate positions actually remains as is as the main gates were placed at natural, high volumes main routes into especially the Melville Main SEA.

8. JDA TRAFFIC SAFETY IMPROVEMENT PROJECT

Discussions with the relevant official at the JRA revealed that the Johannesburg Development Agency (JDA) was working on a traffic safety improvement project for the Melville area. This project focused on Main Road, including the intersection of Main Road and 6th Avenue and all intersections South of this point. Consultation with the relevant parties in regard to this project indicated no impact on the proposed SEA's.

9. TRAFFIC ANALYSIS

From the vehicular traffic redistribution on the study area road network, the intersection of Main Road and 4th Avenue was identified as a critical intersection that required further analysis. The following analysis scenarios are relevant to this study:

- **2021 Existing peak hour traffic** – The purpose of this scenario is to provide an indication of the existing traffic operational conditions within the study area and, along with on-site observations during the applicable peak hours, provide baseline against which incremental upgrades for the "redistributed" scenario can be measured in order to enable fair allocation of road upgrade responsibilities in respect of the proposed enclosed area;
- **2021 Existing plus rerouted peak hour traffic (unmitigated network)** – This scenario is intended to show the requirement (if any) for road upgrades due to the redistribution of the vehicular traffic for the proposed security enclosed area, and
- **2021 Existing plus rerouted peak hour traffic (mitigated network)** – This scenario is intended to quantify the required road upgrades (if any) due to the redistribution of the vehicular traffic for the proposed security enclosed areas and to prove the feasibility of such upgrades on the study area road network.

The SIDRA INTERSECTION 8 intersection capacity analysis computer programme was used to analyse the critical intersection for the scenarios described above. The outcomes of these analyses are presented and discussed in the following sections.

As noted in the foregoing section, the capacity analysis standards as prescribed in the *TMH 16, Volume 2, South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual*[2] will be applicable to this study.

The analyses utilised the intersection and peak hour specific PHF's. The heavy vehicle proportion of the traffic used in the analyses was assumed to be 2.0%.

Analyses of signalised intersections were carried out in accordance with the *South African Road Traffic Signs Manual, Volume 3, Traffic Signal Design (SARTSM Volume 3)*[3] and included provision for pedestrian movements.

9.1 2021 Existing Peak Hour Traffic

Analysis of the 2021 existing peak hour traffic volumes at the existing Main Road/4th Avenue intersection yields operational performance results as presented in **Table 9.1.1** below. Detailed information on the analysis is included in **Appendix A** of this study.

Table 9.1.1 – Capacity analysis results for 2021 existing peak hour traffic scenario

Intersection & approach definitions	Peak hour	Analysis parameter	Intersection capacity analysis results											
			Approach 1			Approach 2			Approach 3			Approach 4		
			L	T	R	L	T	R	L	T	R	L	T	R
Main Road/4th Avenue Approach 1: Main Road S Approach 2: 4th Avenue E Approach 3: Main Road N Approach 4: 4th Avenue W	**Weekday AM**	**V/C**	0.465	0.465	0.465	0.733	0.733	0.733	0.444	0.444	0.444	1.258	1.258	1.258
		Delay (s)	25.5	21.2	26.3	42.8	37.3	42.8	11.3	7.0	11.4	160.6	157.9	160.5
		LOS	C	C	C	D	D	D	B	A	B	F	F	F
	Weekday PM	**V/C**	0.559	0.559	0.559	0.906	0.906	0.906	0.516	0.516	0.516	1.099	1.099	1.099
		Delay (s)	21.4	18.2	23.9	55.7	50.1	55.6	15.4	11.3	16.4	105.4	102.7	105.4
		LOS	C	B	C	E	D	E	B	B	B	F	F	F

Notes: L=left, T=through, R=right, V/C=volume/capacity, LOS=Level of Service, red text indicates unacceptable performance

9.2 2021 Existing Plus Rerouted Peak Hour Traffic (Unmitigated Network)

Analysis of the 2021 existing plus rerouted peak hour traffic volumes at the Main Road/4th Avenue intersection yields operational performance results as presented in **Table 9.2.1** below. Detailed information on these analyses is included in **Appendix A** of this study.

Table 9.2.1 – Capacity analysis results for 2021 existing plus rerouted peak hour traffic (unmitigated network)

Intersection & approach definitions	Peak hour	Analysis parameter	Intersection capacity analysis results											
			Approach 1			Approach 2			Approach 3			Approach 4		
			L	T	R	L	T	R	L	T	R	L	T	R
Main Road/4th Avenue Approach 1: Main Road S Approach 2: 4th Avenue E Approach 3: Main Road N Approach 4: 4th Avenue W	**Weekday AM**	**V/C**	0.574	0.574	0.574	1.123	1.123	1.123	0.575	0.575	0.575	2.259	2.259	2.259
		Delay (s)	26.5	23.6	32.1	110.4	104.9	110.4	12.3	8.2	13.2	598.5	598.5	598.5
		LOS	C	C	C	F	F	F	B	A	B	F	F	F
	Weekday PM	**V/C**	0.506	0.506	0.506	1.797	1.797	1.797	15.9	11.6	104.0	143.5	140.7	143.4
		Delay (s)	20.7	16.8	22.0	400.5	394.9	400.5	15.9	11.6	104.0	143.5	140.7	143.4
		LOS	C	B	C	F	F	F	B	B	F	F	F	F

Notes: L=left, T=through, R=right, V/C=volume/capacity, LOS=Level of Service, red text indicates unacceptable performance

9.3 2021 Existing Plus Rerouted Peak Hour Traffic (Mitigated Network)

Analysis of the mitigated network for the 2021 existing plus rerouted peak hour traffic volumes at the upgraded Main Road/4th Avenue intersection yields operational performance results as presented in **Table 9.3.1** below. Detailed information on these analyses is included in **Appendix A** of this study.

Table 9.3.1 – Capacity analysis results for 2021 existing plus rerouted peak hour traffic (mitigated network)

Intersection & approach definitions	Peak hour	Analysis parameter	Intersection capacity analysis results											
			Approach 1			Approach 2			Approach 3			Approach 4		
			L	T	R	L	T	R	L	T	R	L	T	R
Main Road/4th Avenue Approach 1: Main Road S Approach 2: 4th Avenue E Approach 3: Main Road N Approach 4: 4th Avenue W	**Weekday AM**	**V/C**	0.514	0.514	0.514	0.696	0.696	0.696	0.837	0.837	0.837	0.903	0.903	0.903
		Delay (s)	33.5	29.9	35.8	43.1	37.5	43.0	31.4	27.3	32.6	37.3	34.5	37.2
		LOS	C	C	D	D	D	D	C	C	C	D	D	D
	Weekday PM	**V/C**	0.821	0.821	0.821	0.813	0.813	0.813	0.760	0.760	0.971	0.700	0.700	0.700
		Delay (s)	41.1	38.1	44.4	39.6	34.0	39.5	27.0	22.7	50.4	25.1	22.3	25.0
		LOS	D	D	D	D	C	D	C	C	D	C	C	C

Notes: L=left, T=through, R=right, V/C=volume/capacity, LOS=Level of Service, red text indicates unacceptable performance

10. PROPOSED ROAD UPGRADES

The analysis procedure in the foregoing sections yields recommended upgrades to the Main Road/4th Avenue intersection as presented in **Table 10.1** below.

Table 10.1 – Summary table of proposed road upgrades

Intersection	Control/ Approach	Required/proposed upgrades per analysis scenario	
		2021 Existing	2021 Existing plus redistributed traffic
Main Rd/4th Ave	Control	New optimised signal settings	New optimised signal settings
	N	None	None
	E		
	S		
	W		

Road infrastructure upgrades necessitated by existing traffic scenarios are the responsibility of the applicable roads authority whereas upgrades necessitated by the redistribution of traffic are the responsibility of the Melville Security Initiative.

11. IMPACT ON PEDESTRIANS

With reference to **Figure 2**, the seven pedestrian gates planned for the Melville Main SEA were spaced such that at maximum pedestrians will be diverted 300 m further to gain access to the SEA, with the average additional distance being only 150 m. The planned pedestrian access gates on the Western border of the Melville Main SEA are all within 65 m of the nearest public transport stop.

The Melville West SEA is similarly planned such that the pedestrian access is within 300 m of all closed accesses. The planned pedestrian access is for this SEA is 270 m from the nearest public transport stop.

12. DISCUSSION

The conventional process followed in a TIA for a proposed enclosed neighbourhood entails the survey of vehicular and pedestrian traffic at all existing public road and public space access points to the area earmarked for an enclosed neighbourhood. Such TIA must then analyse and determine the effect and impact of the proposed enclosed neighbourhood on the existing vehicular routes and pedestrian desire lines. For a proposed enclosed neighbourhood to be considered by the relevant authority, it must be shown that such effect and impact is negligible or can be effectively mitigated by mitigation measures in terms of the design of the closures or access points. The most important principle here is that access to a public road or place may under no circumstances be refused to a member of the public unless allowed for under South African law.

With reference to **Section 3.1.1** and **3.1.2** of this report, it must be noted that all roads within the proposed security enclosed areas are classified as class 5 roads. In terms of the *South African Road Classification and Access Management Manual*[1] (Table C), through traffic components should be prevented. This fact supports the permanent and semi-permanent road closures as shown in **Figure 2**.

The access monitoring points have no negative impact on the accessibility of the enclosed area as traffic is merely monitored and not controlled. These points are manned at all times by security guards and there is therefore no situation where access cannot be obtained to the subject enclosed area via these access points.

13. CONCLUSIONS & RECOMMENDATIONS

The key conclusions and recommendations of this study are presented below:

- This TIA was prepared in support of an application for two proposed SEA's with road closures and access monitoring in Melville, City of Johannesburg Metropolitan Municipality, Gauteng Province. The two proposed SEA's, Melville Main SEA and Melville West SEA, are separate enclosures with individual requirements and the approval of one SEA does not depend on the approval of the other SEA. This TIA addresses the expected traffic impact of both SEA's, but each SEA will launch its own, separate application to the City of Johannesburg for consideration for approval of its intended SEA scheme;
- Future roads planning (municipal, provincial and national) will be unaffected by the either of the proposed SEA's. All roads within the proposed SEA's are classified as Class 5 local streets. Important to note here is that through traffic should be prevented for this class of road;
- Melville Main SEA will have four 24-hour manned access monitoring points and three semi-permanent road closures with remote-controlled operated gates for which remotes are held by the local residents/business owners of the proposed enclosed area (see **Figure 2**);
- The Melville West SEA will have one 24-hour manned access monitoring point located on 2nd Street (see **Figure 2**);
- Access at all monitoring points will only be monitored and not controlled. These posts will be manned at all times by security guards. An access monitoring system which typically operates by means of a button on a goose neck mounted in a median island (painted or kerbed) is recommended where possible for the manned access monitoring points. Vehicles that wish to enter the enclosed area pull up to the goose neck mounted button and press the button which then opens the gate. When the button is pressed security cameras record the face of the driver as well as the vehicle entering the enclosed area. A similar setup is proposed for outbound vehicle movements;
- The following recommendations on the access layout, configuration and operation are offered:
  - Currently in the vicinity of each manned access gate to the Melville Main SEA, the paved road width measures approximately 8 m in width and consists of one inbound and one outbound lane. It is recommended that the inbound lane to the subject enclosed area be a minimum of 4.5 m in width with a minimum vertical clearance of 5.2 m to allow for emergency vehicle access. This leaves 3.5 m of existing road surface which can be divided into 0.5 m for a median to accommodate the goose necks with the access/exit buttons as well as security camera equipment. Thus, 3.0 m of existing road surface will be left over for the outbound lane. However, 3.0 m is regarded as insufficient for the outbound lane and hence the addition of at least 0.5 m in roadway width is recommended at each 24-hour manned access. It follows that, in the case of an emergency, emergency vehicles can enter and exit through the entrance gate (4.5 m in width) which will be manually overridden in order to allow for the exit movement. Additionally, emergency vehicles can also exit the Melville Main SEA by means of the remote-controlled gates at one of the semi-permanent road closures as these are expected to have a minimum horizontal gate clearance of 7.0 m.
    The proposed access gate to the Melville West SEA is located on 2nd Street which measures only 6.5 m in width on the paved roadway and consists of one inbound and one outbound lane. The road reserve width is however 16 m. A similar access configuration is proposed to that of the Melville Main SEA for 24-hour manned access gates where the inbound lane is 4.5 m in width, the median 0.5 m and the

outbound lane 3.5 m. Vertical clearance should be 5.2 m. During emergencies the 4.5 m inbound lane will be overridden to let emergency vehicles out of the SEA. The addition of at least 2.0 m in roadway width is recommended at this access gate.

- The access control system proposed for the 24-hour manned access gates has previously been measured at 350 vehicles per hour per lane. The typical service flow rate for remote controlled access gates is 450 vehicles per hour per lane. It was determined that the access control system at the 24-hour manned access gates will not have sufficient capacity to service the expected traffic volumes during peak hours. At such peak periods the guards on duty will be instructed to override and keep the boom gates open until such time as the backups have cleared and the traffic volumes have reduced such that the access control system can keep up with the traffic demand, and
- Pedestrian gates of 1.0 m in width are proposed at the indicated positions in **Figure 2**. These gates are to operate on a similar basis as the vehicular gates in that pedestrians are required to press an access/exit button which will open the pedestrian gate whilst capturing photographic records of all pedestrians entering/exiting the security enclosed area.

- Peak hour traffic surveys were carried out at locations where the proposed security enclosed area boundary lines cross a road link. Link surveys at these locations of vehicular and pedestrian traffic entering and exiting the subject proposed enclosed areas were carried out during the weekday AM (06:00-09:00) and weekday PM (15:00-18:00) peak periods on Thursday 24 June 2021. Analysis of the above traffic surveys yielded the weekday AM and PM peak hours as 07:00-08:00 and 16:15-17:15 respectively for vehicular traffic and 07:15-08:15 and 16:45-17:45 respectively for pedestrian traffic in the area. The overall PHF's for the surveyed locations were calculated as ranging between 0.82 to 0.94 for the applicable peak hours;
- Site visits to the study area was carried out on various dates during the applicable peak hours in order to observe the operational conditions of the existing traffic in the vicinity of the subject access monitoring point as well as other aspects related to this application;
- The expected traffic redistribution as a result of the proposed SEA schemes highlighted that only the Main Road/4th Avenue Intersection is expected to be affected to an extent worth of analysis;
- The analysis procedure applied in this report has shown that, apart from upgrades associated with the proposed security enclosed areas, the intersection of Main Road and 4th Avenue requires upgrades in the form of new optimised signal settings due to the existing traffic conditions as well as for the rerouted traffic volumes from the proposed SEA's;
- With reference to **Figure 2**, the seven pedestrian gates planned for the Melville Main SEA were spaced such that at maximum pedestrians will be diverted 300 m further to gain access to the SEA, with the average additional distance being only 150 m. The planned pedestrian access gates on the Western border of the Melville Main SEA are all within 65 m of the nearest public transport stop. The Melville West SEA is similarly planned such that the pedestrian access is within 300 m of all closed accesses. The planned pedestrian access is for this SEA is 270 m from the nearest public transport stop, and
- The application for the proposed Melville Main and Melville West SEA's is supported from a traffic engineering perspective provided that the recommendations contained within this report are implemented.

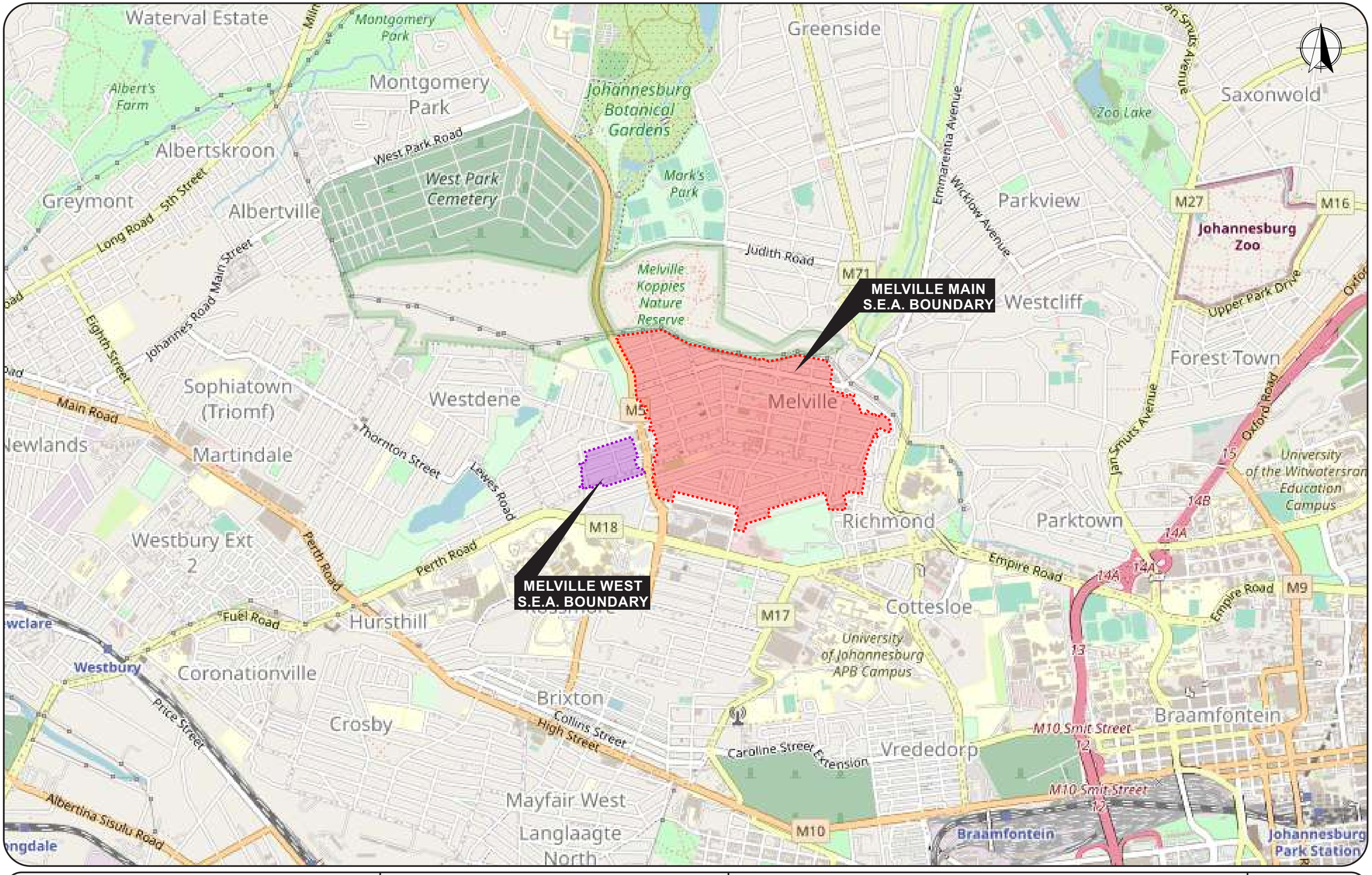
14. REFERENCES

1. Committee of Transport Officials. TRH 26, South African Road Classification and Access Management Manual. Version 1.0, August 2012.

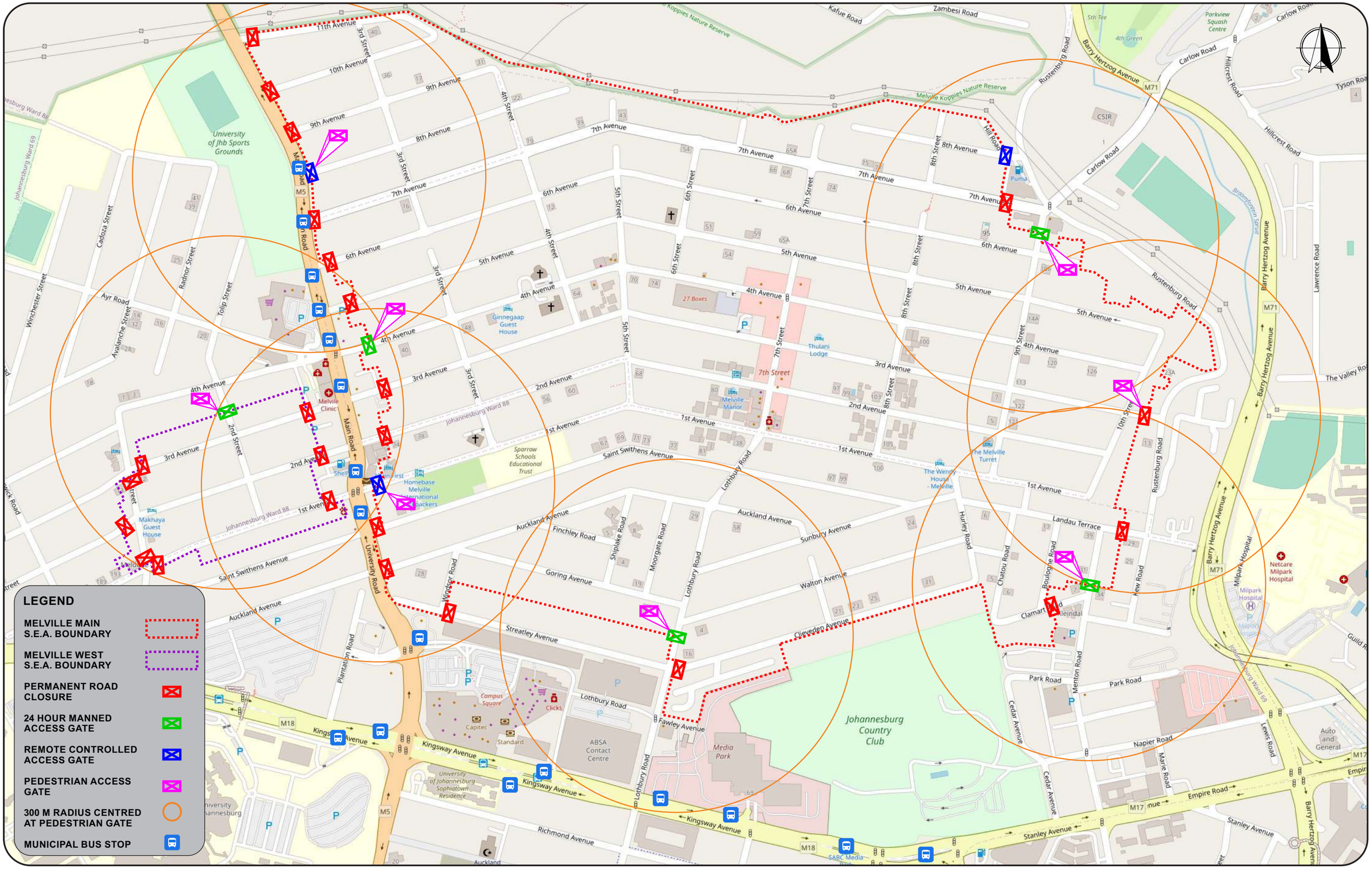
2. Committee of Transport Officials. TMH 16 Volumes 1 & 2, South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual. Version 1.0, August 2012.

3. National Department of Transport. South African Road Traffic Signs Manual, Volume 3: Traffic Signal Design. April 2001.

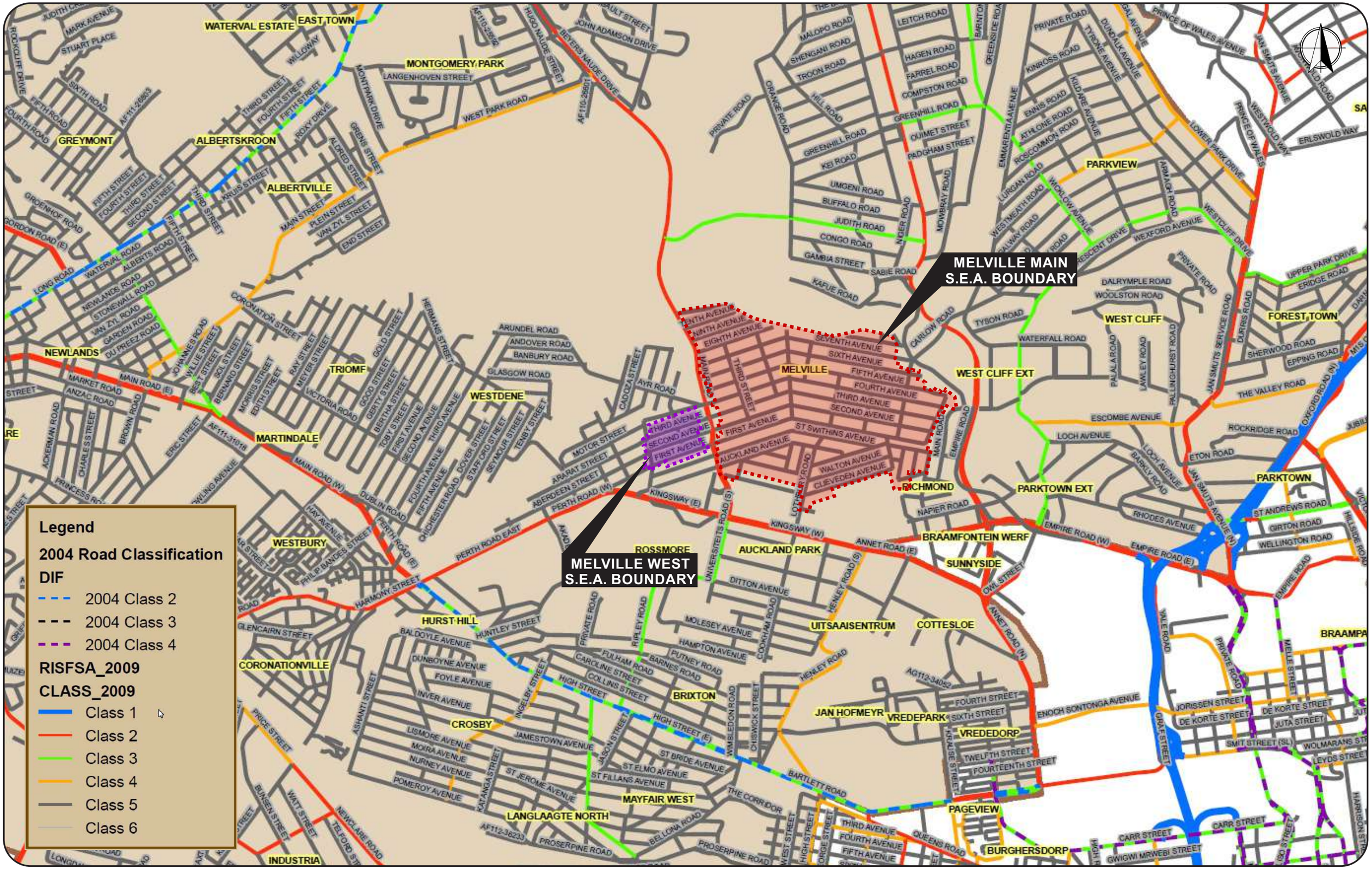
FIGURES



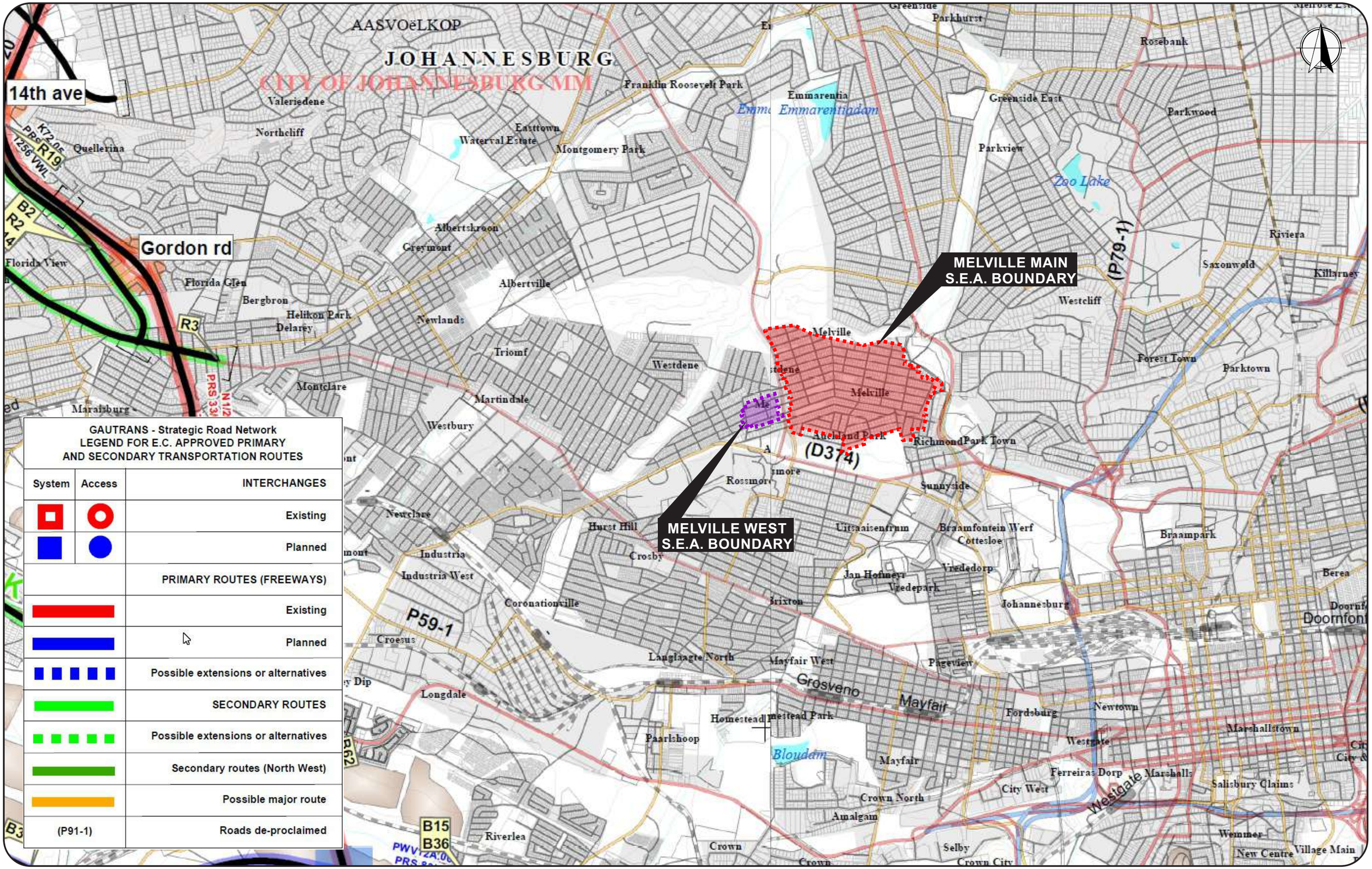
INFRATRANS TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING	PROJECT: Traffic Impact Assessment: Proposed Melville Security Enclosed Area, City of Johannesburg	FIGURE NAME: **Locality Map**	PROJECT NO. **P-279** FIGURE NO. **1**



INFRATRANS TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING	PROJECT: Traffic Impact Assessment: Proposed Melville Security Enclosed Area, City of Johannesburg	FIGURE NAME: **Site Aerial View and Key Plan**	PROJECT NO. **P-279** FIGURE NO. **2**



INFRATRANS TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING	PROJECT: Traffic Impact Assessment: Proposed Melville Security Enclosed Area, City of Johannesburg	FIGURE NAME: **Latest JRA Road Master Plan**	PROJECT NO. **P-279** FIGURE NO. **3**



GAUTRANS - Strategic Road Network
LEGEND FOR E.C. APPROVED PRIMARY
AND SECONDARY TRANSPORTATION ROUTES

System	Access	INTERCHANGES
		Existing
		Planned
		PRIMARY ROUTES (FREEWAYS)
		Existing
		Planned
		Possible extensions or alternatives
		SECONDARY ROUTES
		Possible extensions or alternatives
		Secondary routes (North West)
		Possible major route
(P91-1)		Roads de-proclaimed

INFRATRANS
TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING

PROJECT:
Traffic Impact Assessment:
Proposed Melville Security Enclosed Area,
City of Johannesburg

FIGURE NAME:
Gautrans Strategic Road Network

PROJECT NO.
P-279

FIGURE NO.
4

INFRATRANS
TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING

PROJECT:
Traffic Impact Assessment:
Proposed Melville Security Enclosed Area,
City of Johannesburg

FIGURE NAME:
Existing (2021) Weekday Peak Hour Vehicular Traffic Volumes

PROJECT NO.
P-279

FIGURE NO.
5a

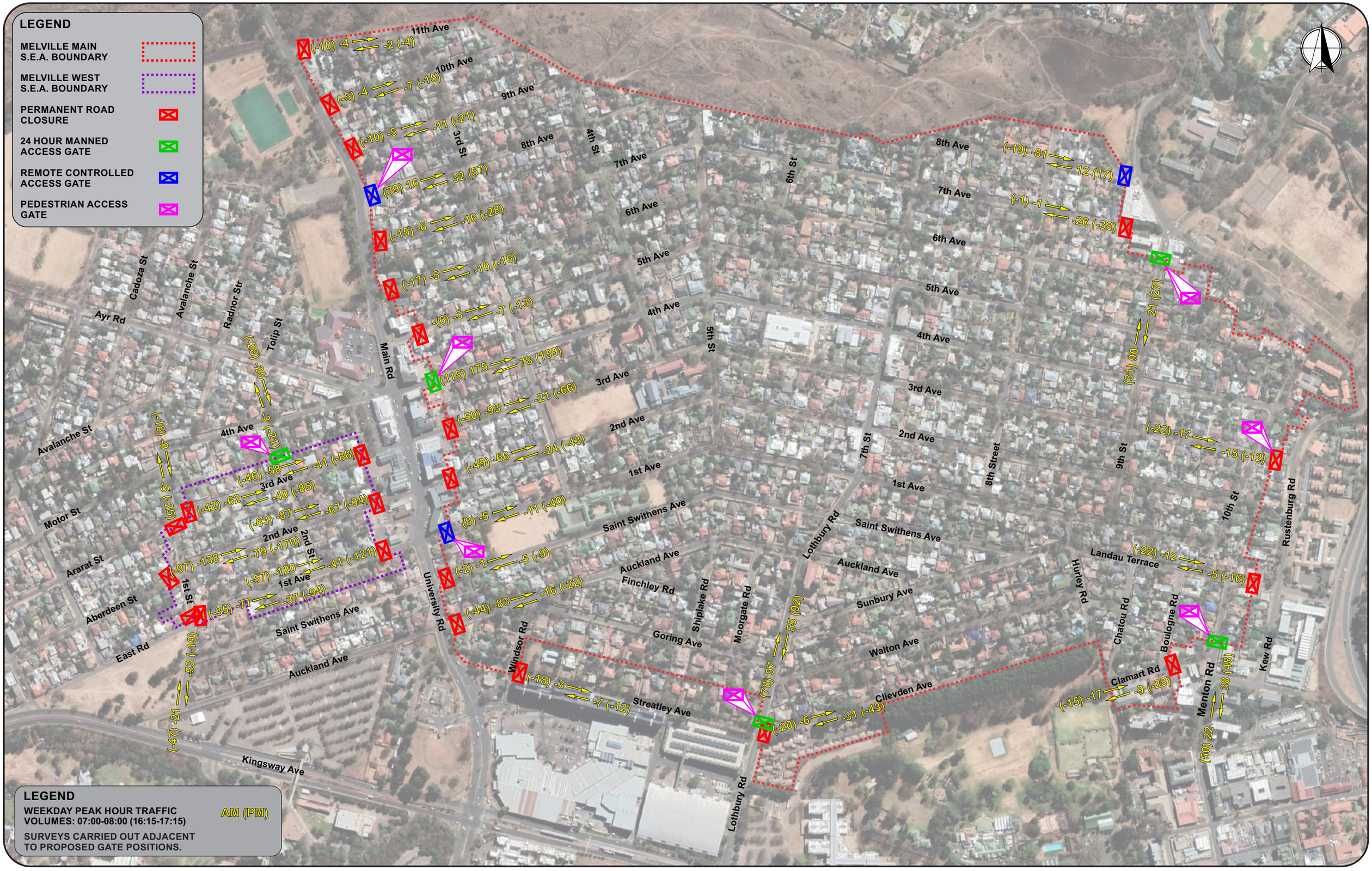
INFRATRANS
TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING

PROJECT:
Traffic Impact Assessment:
Proposed Melville Security Enclosed Area,
City of Johannesburg

FIGURE NAME:
Existing (2021) Weekday Peak Hour Pedestrian Volumes

PROJECT NO.
P-279

FIGURE NO.
5b



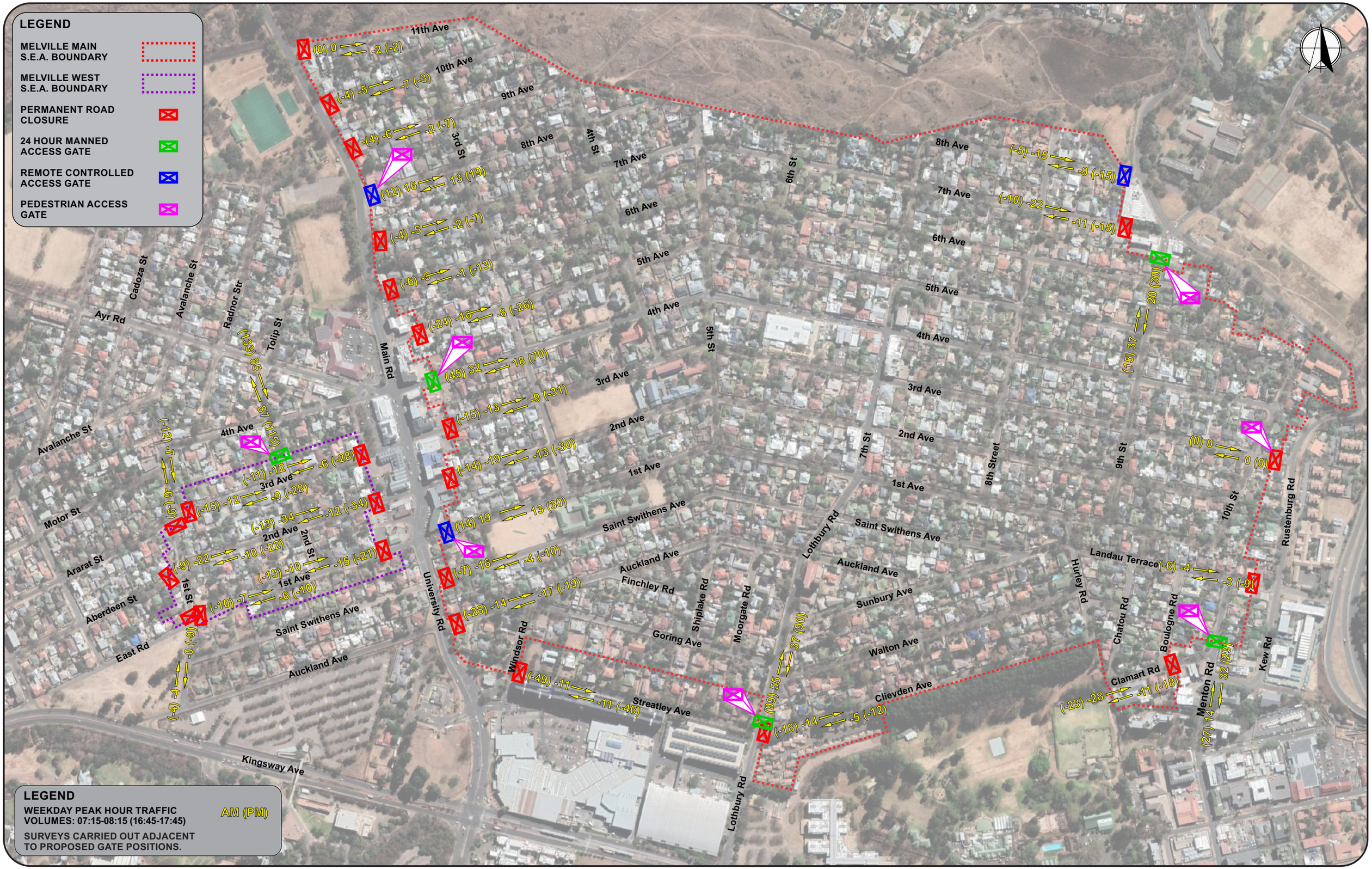
INFRATRANS
TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING

PROJECT:
Traffic Impact Assessment:
Proposed Melville Security Enclosed Area,
City of Johannesburg

FIGURE NAME:
Expected Changes in Existing Weekday Peak Hour Vehicular Traffic Volumes (At Survey Locations)

PROJECT NO.
P-279

FIGURE NO.
6a



INFRATRANS
TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING

PROJECT:
Traffic Impact Assessment:
Proposed Melville Security Enclosed Area,
City of Johannesburg

FIGURE NAME:
Expected Changes in Existing Weekday Peak Hour Pedestrian Volumes (At Survey Locations)

PROJECT NO.
P-279

FIGURE NO.
6b

INFRATRANS
TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING

PROJECT:
Traffic Impact Assessment:
Proposed Melville Security Enclosed Area,
City of Johannesburg

FIGURE NAME:
Rerouted Existing Weekday Peak Hour Vehicular Traffic Volumes for Security Enclosed Areas

PROJECT NO.
P-279

FIGURE NO.
7a

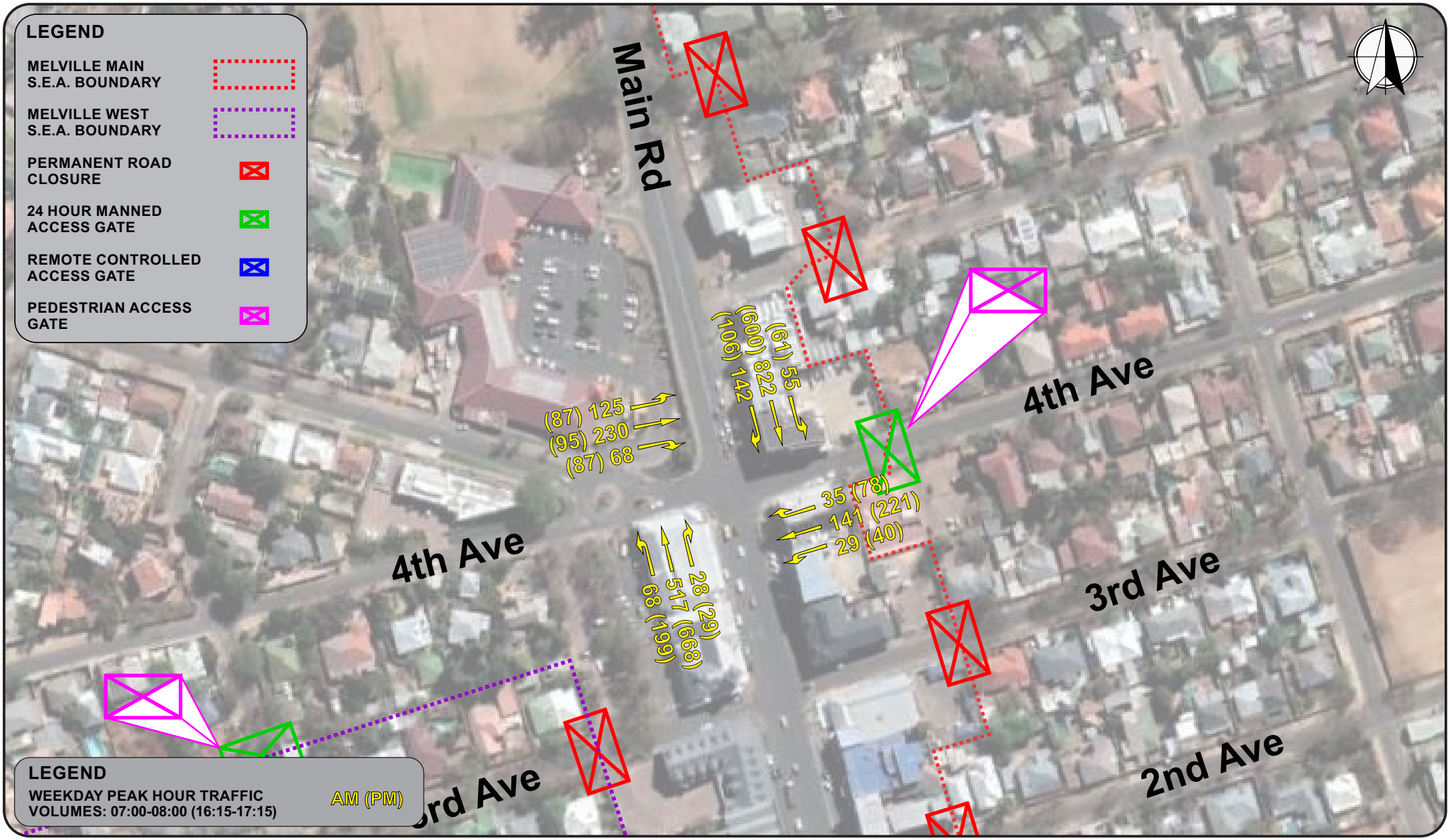
INFRATRANS
TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING

PROJECT:
Traffic Impact Assessment:
Proposed Melville Security Enclosed Area,
City of Johannesburg

FIGURE NAME:
Rerouted Existing Weekday Peak Hour Pedestrian Volumes for Security Enclosed Areas

PROJECT NO.
P-279

FIGURE NO.
7b



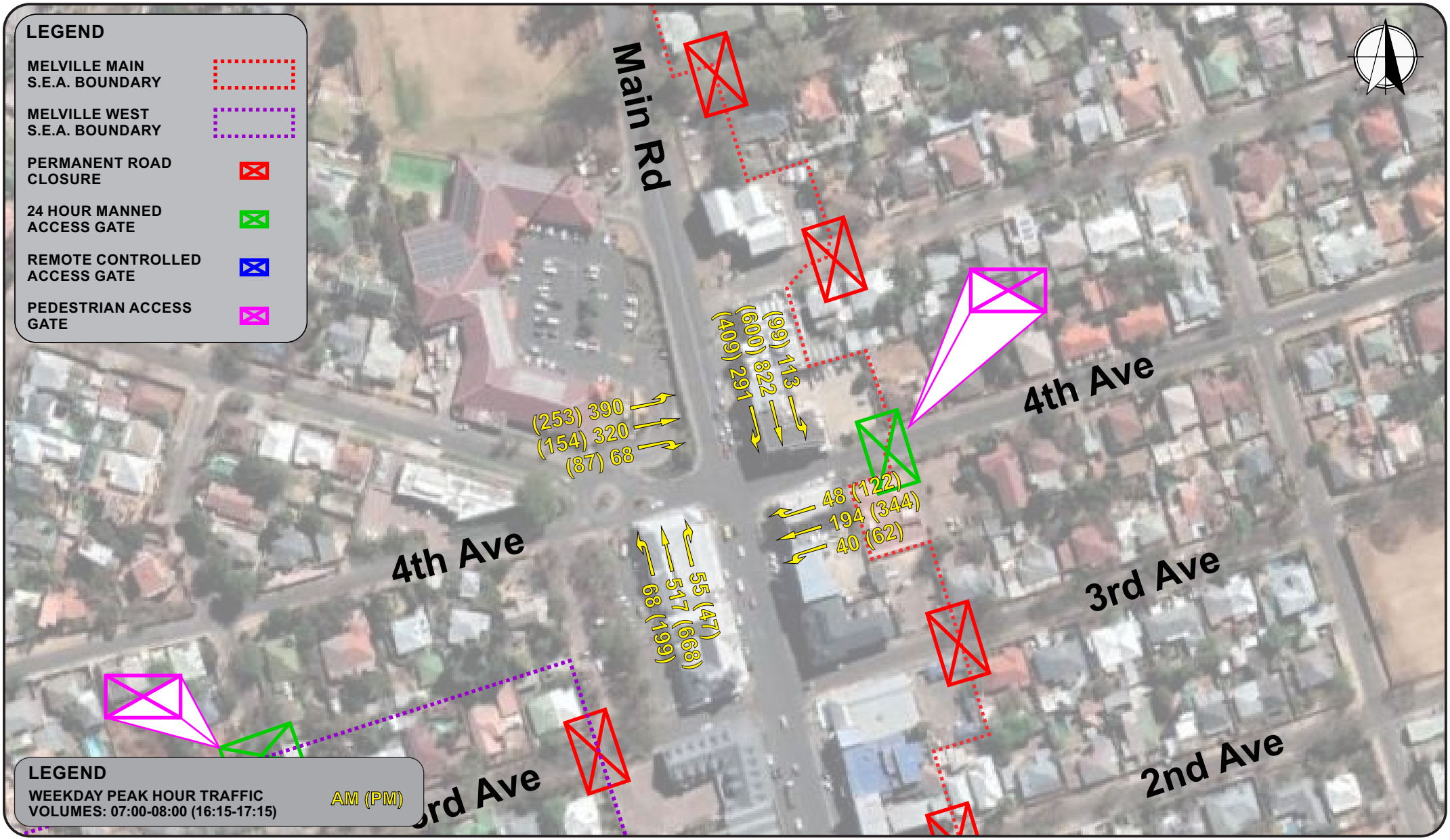
INFRATRANS
TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING

PROJECT:
Traffic Impact Assessment:
Proposed Melville Security Enclosed Area,
City of Johannesburg

FIGURE NAME:
Existing (2021) Peak Hour Vehicular Traffic Volumes (Main Rd/4th Ave)

PROJECT NO.
P-279

FIGURE NO.
8a



INFRATRANS
TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING

PROJECT:
Traffic Impact Assessment:
Proposed Melville Security Enclosed Area,
City of Johannesburg

FIGURE NAME:
Rerouted Existing (2021) Peak Hour Vehicular Traffic Volumes (Main Rd/4th Ave)

PROJECT NO.
P-279

FIGURE NO.
8b

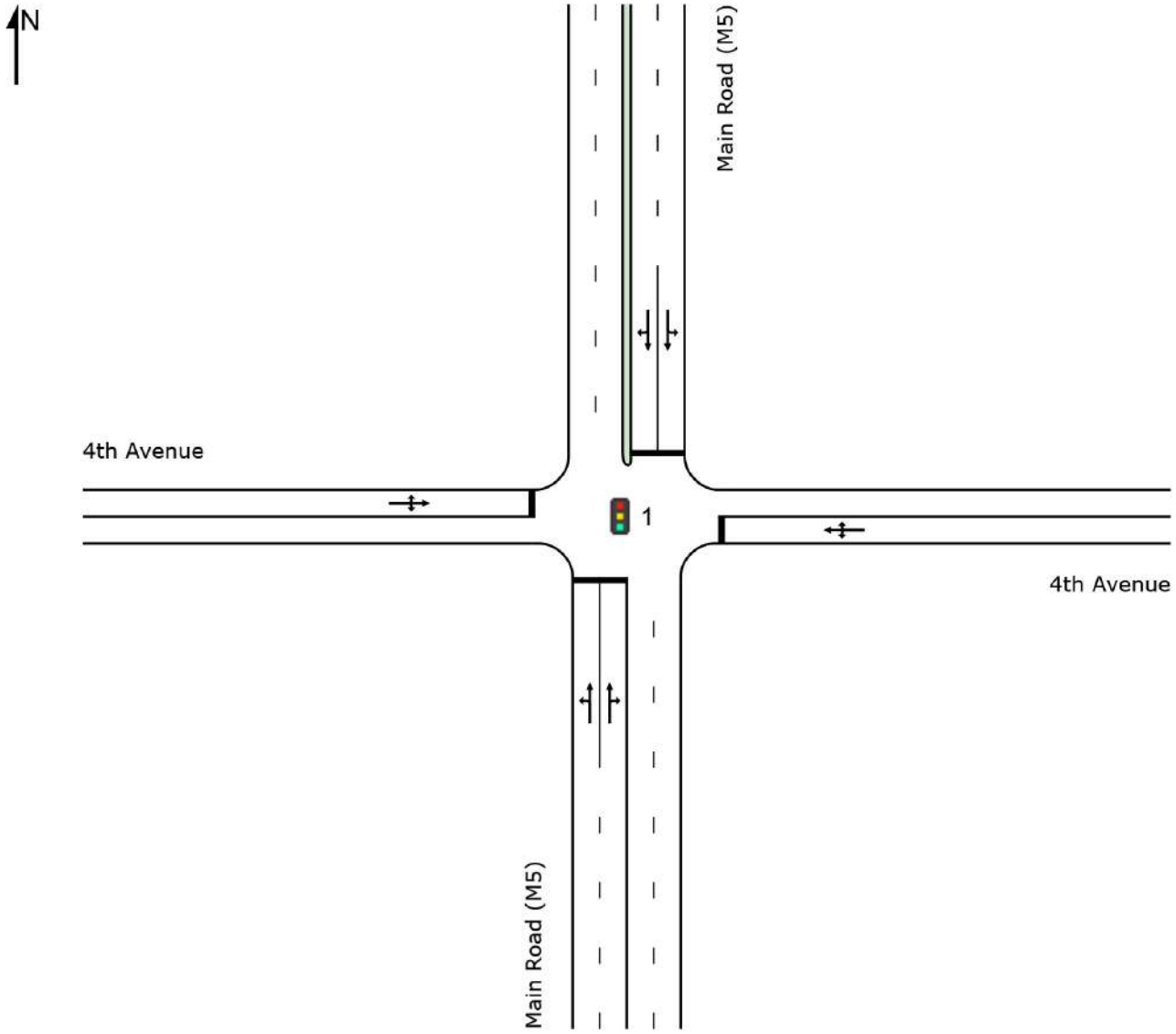
APPENDIX A

Output of SIDRA Intersection Capacity Analyses

SITE LAYOUT

Site: 1 [2021 AM Weekday Pk Hr Traff Vols - Upgrades: None]

Main Road (M5)/4th Avenue Intersection
Site Category: (None)
Signals - Fixed Time Isolated



PHASING SUMMARY

Site: 1 [2021 AM Weekday Pk Hr Traff Vols - Upgrades: None]

Main Road (M5)/4th Avenue Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 78 seconds (Site User-Given Phase Times)

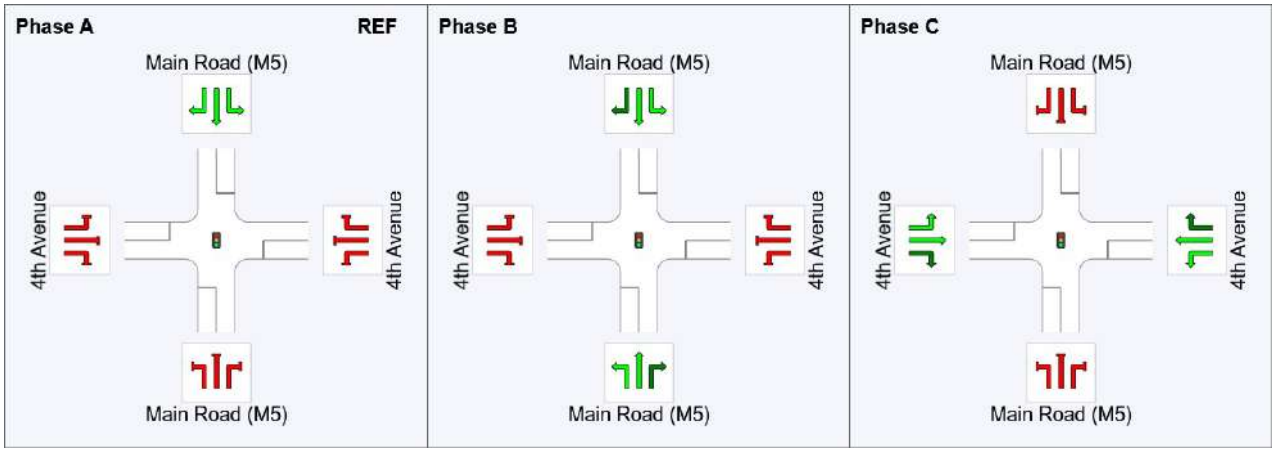
Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Two-Phase
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	0	26	57
Green Time (sec)	20	26	15
Phase Time (sec)	25	32	21
Phase Split	32%	41%	27%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

MOVEMENT SUMMARY

Site: 1 [2021 AM Weekday Pk Hr Traff Vols - Upgrades: None]

Main Road (M5)/4th Avenue Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 78 seconds (Site User-Given Phase Times)

Movement Performance - Vehicles

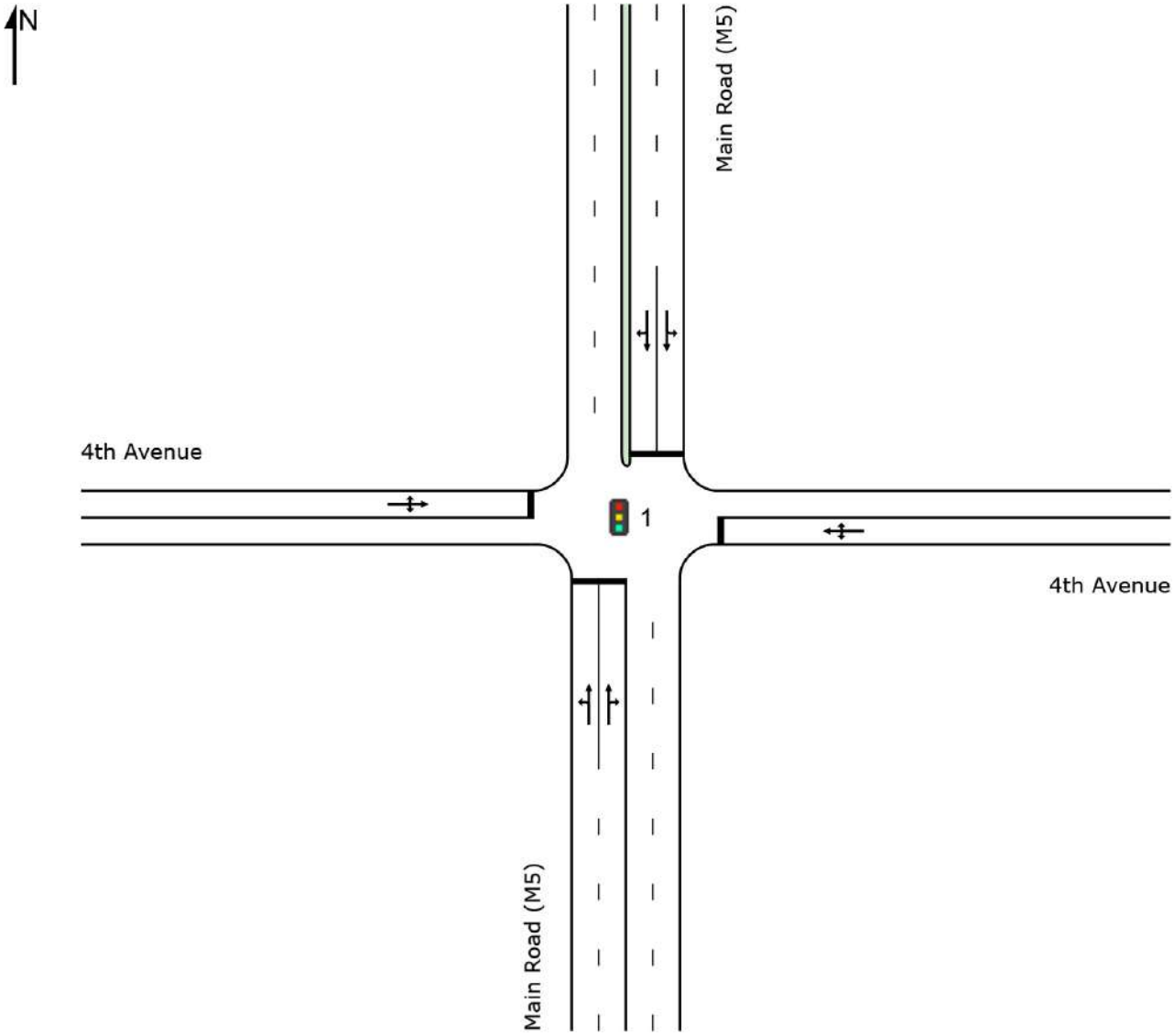
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Main Road (M5)												
1	L2	71	2.0	0.465	25.5	LOS C	10.6	75.2	0.82	0.72	0.82	11.0
2	T1	539	2.0	0.465	21.2	LOS C	10.6	75.2	0.82	0.72	0.82	16.5
3	R2	29	2.0	0.465	26.3	LOS C	8.4	60.0	0.83	0.71	0.83	24.1
Approach		639	2.0	0.465	21.9	LOS C	10.6	75.2	0.82	0.72	0.82	16.3
East: 4th Avenue												
4	L2	30	2.0	0.733	42.8	LOS D	8.4	60.0	1.00	0.89	1.14	17.2
5	T1	147	2.0	0.733	37.3	LOS D	8.4	60.0	1.00	0.89	1.14	15.8
6	R2	36	2.0	0.733	42.8	LOS D	8.4	60.0	1.00	0.89	1.14	16.8
Approach		214	2.0	0.733	39.0	LOS D	8.4	60.0	1.00	0.89	1.14	16.2
North: Main Road (M5)												
7	L2	57	2.0	0.444	11.3	LOS B	11.5	81.9	0.53	0.50	0.53	37.8
8	T1	856	2.0	0.444	7.0	LOS A	11.5	81.9	0.56	0.53	0.56	31.0
9	R2	148	2.0	0.444	11.4	LOS B	7.3	52.2	0.62	0.61	0.62	16.8
Approach		1061	2.0	0.444	7.9	LOS A	11.5	81.9	0.56	0.54	0.56	29.3
West: 4th Avenue												
10	L2	130	2.0	1.258	160.6	LOS F	38.7	275.5	1.00	1.68	2.50	1.9
11	T1	240	2.0	1.258	157.9	LOS F	38.7	275.5	1.00	1.68	2.50	4.6
12	R2	71	2.0	1.258	160.5	LOS F	38.7	275.5	1.00	1.68	2.50	2.2
Approach		441	2.0	1.258	159.1	LOS F	38.7	275.5	1.00	1.68	2.50	3.4
All Vehicles		2354	2.0	1.258	42.8	LOS D	38.7	275.5	0.75	0.83	1.05	10.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2021 PM Weekday Pk Hr Traff Vols - Upgrades: None]

Main Road (M5)/4th Avenue Intersection
Site Category: (None)
Signals - Fixed Time Isolated



PHASING SUMMARY

Site: 1 [2021 PM Weekday Pk Hr Traff Vols - Upgrades: None]

Main Road (M5)/4th Avenue Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site User-Given Phase Times)

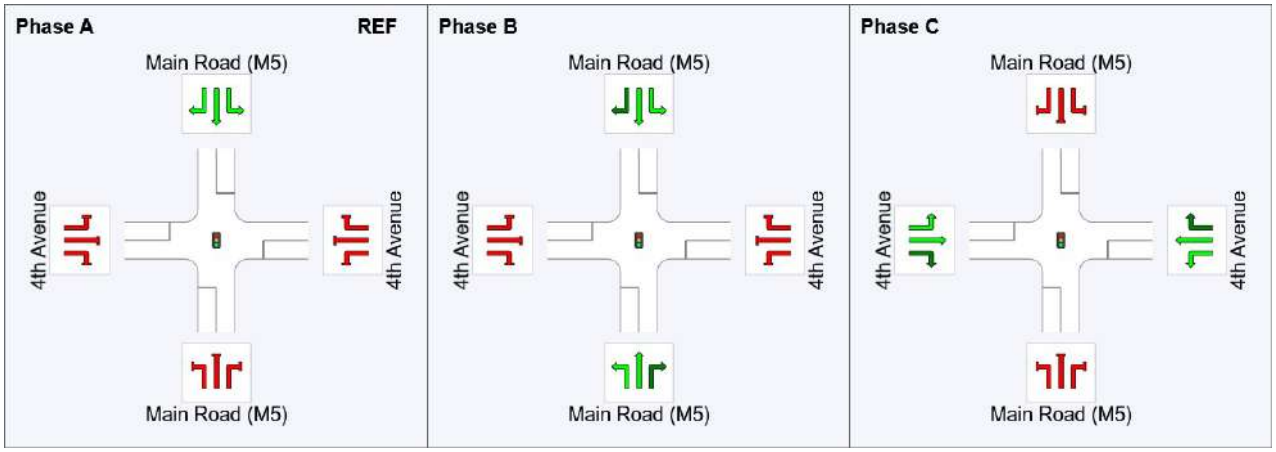
Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Two-Phase
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	0	12	60
Green Time (sec)	6	43	23
Phase Time (sec)	11	50	29
Phase Split	12%	56%	32%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

MOVEMENT SUMMARY

Site: 1 [2021 PM Weekday Pk Hr Traff Vols - Upgrades: None]

Main Road (M5)/4th Avenue Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site User-Given Phase Times)

Movement Performance - Vehicles

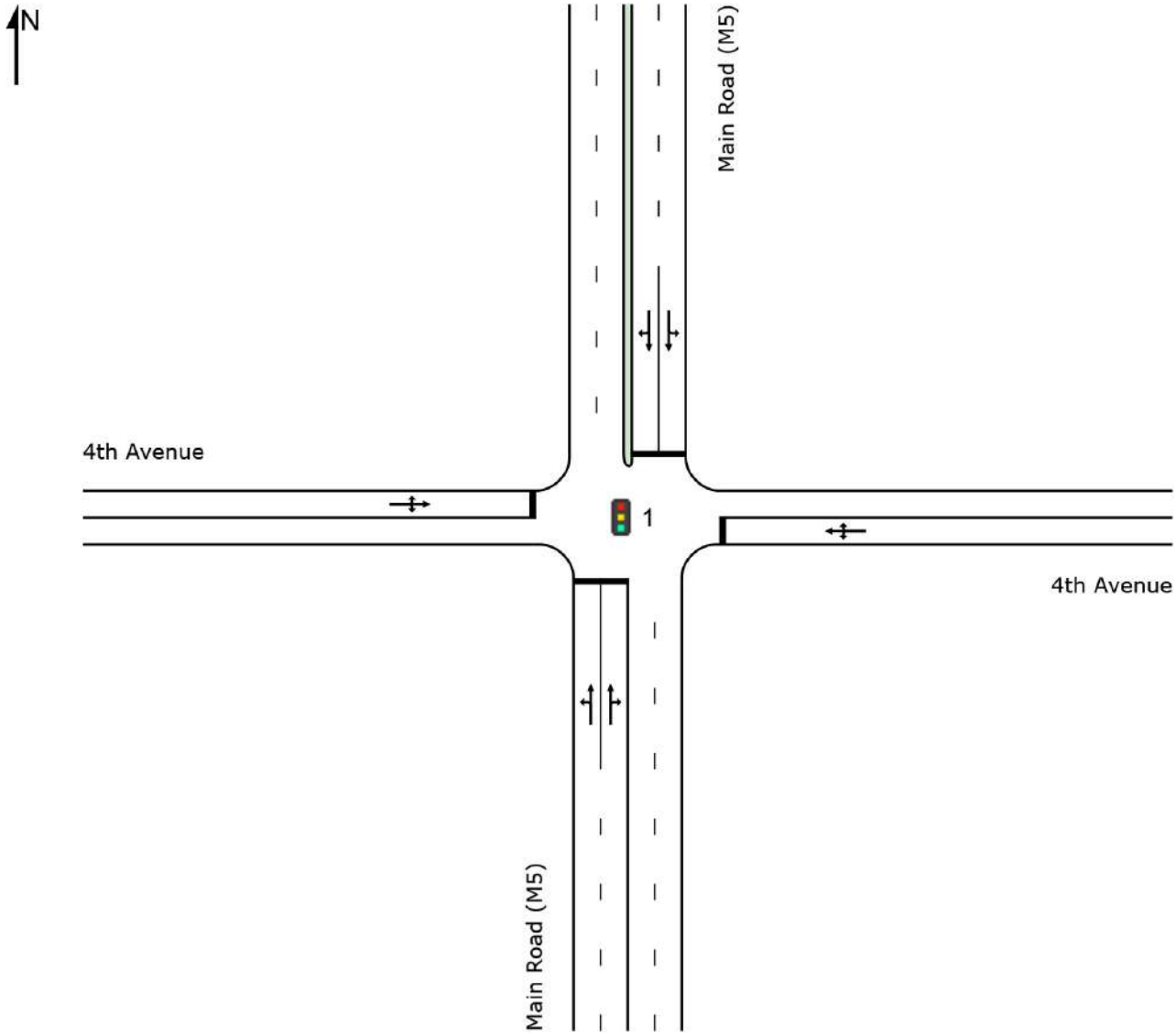
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Main Road (M5)												
1	L2	216	2.0	0.559	21.4	LOS C	16.0	113.8	0.75	0.72	0.75	12.3
2	T1	726	2.0	0.559	18.2	LOS B	16.0	113.8	0.77	0.71	0.77	18.2
3	R2	32	2.0	0.559	23.9	LOS C	14.4	102.3	0.78	0.70	0.78	25.7
Approach		974	2.0	0.559	19.1	LOS B	16.0	113.8	0.76	0.71	0.76	17.1
East: 4th Avenue												
4	L2	43	2.0	0.906	55.7	LOS E	19.3	137.6	1.00	1.07	1.34	14.1
5	T1	240	2.0	0.906	50.1	LOS D	19.3	137.6	1.00	1.07	1.34	12.7
6	R2	85	2.0	0.906	55.6	LOS E	19.3	137.6	1.00	1.07	1.34	13.7
Approach		368	2.0	0.906	52.0	LOS D	19.3	137.6	1.00	1.07	1.34	13.1
North: Main Road (M5)												
7	L2	66	2.0	0.516	15.4	LOS B	14.9	106.3	0.62	0.58	0.62	32.4
8	T1	652	2.0	0.516	11.3	LOS B	14.9	106.3	0.65	0.61	0.65	24.5
9	R2	115	2.0	0.516	16.4	LOS B	5.4	38.1	0.75	0.69	0.75	13.2
Approach		834	2.0	0.516	12.4	LOS B	14.9	106.3	0.66	0.62	0.66	23.5
West: 4th Avenue												
10	L2	95	2.0	1.099	105.4	LOS F	21.7	154.5	1.00	1.31	1.91	2.7
11	T1	103	2.0	1.099	102.7	LOS F	21.7	154.5	1.00	1.31	1.91	6.8
12	R2	95	2.0	1.099	105.3	LOS F	21.7	154.5	1.00	1.31	1.91	3.2
Approach		292	2.0	1.099	104.4	LOS F	21.7	154.5	1.00	1.31	1.91	4.3
All Vehicles		2468	2.0	1.099	31.8	LOS C	21.7	154.5	0.79	0.80	0.95	13.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2021 + Dev AM Weekday Pk Hr Traff Vols - Upgrades: None]

Main Road (M5)/4th Avenue Intersection
Site Category: (None)
Signals - Fixed Time Isolated



PHASING SUMMARY

Site: 1 [2021 + Dev AM Weekday Pk Hr Traff Vols - Upgrades: None]

Main Road (M5)/4th Avenue Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 78 seconds (Site User-Given Phase Times)

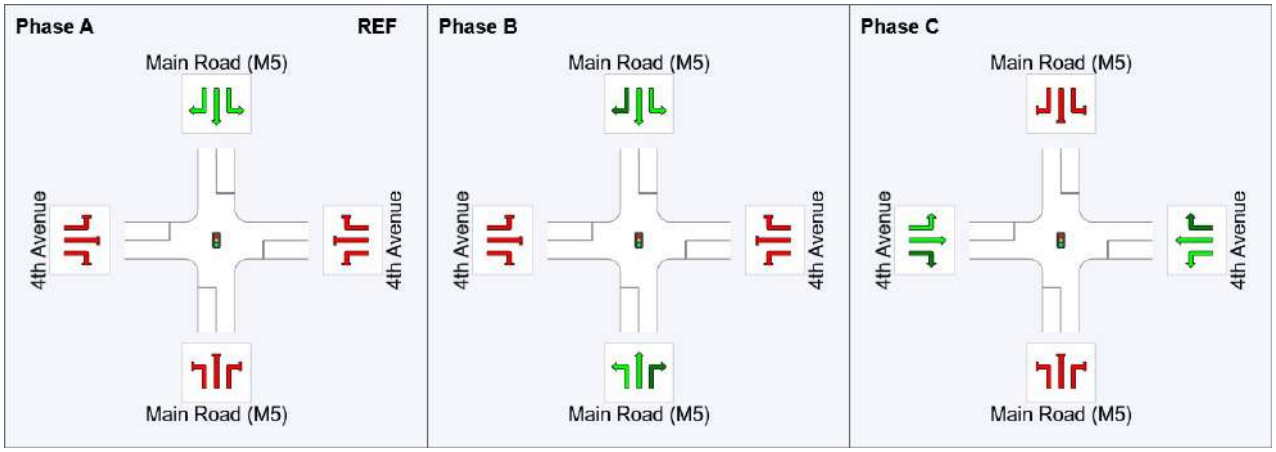
Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Two-Phase
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	0	26	57
Green Time (sec)	20	26	15
Phase Time (sec)	25	32	21
Phase Split	32%	41%	27%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

MOVEMENT SUMMARY

Site: 1 [2021 + Dev AM Weekday Pk Hr Traff Vols - Upgrades: None]

Main Road (M5)/4th Avenue Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 78 seconds (Site User-Given Phase Times)

Movement Performance - Vehicles

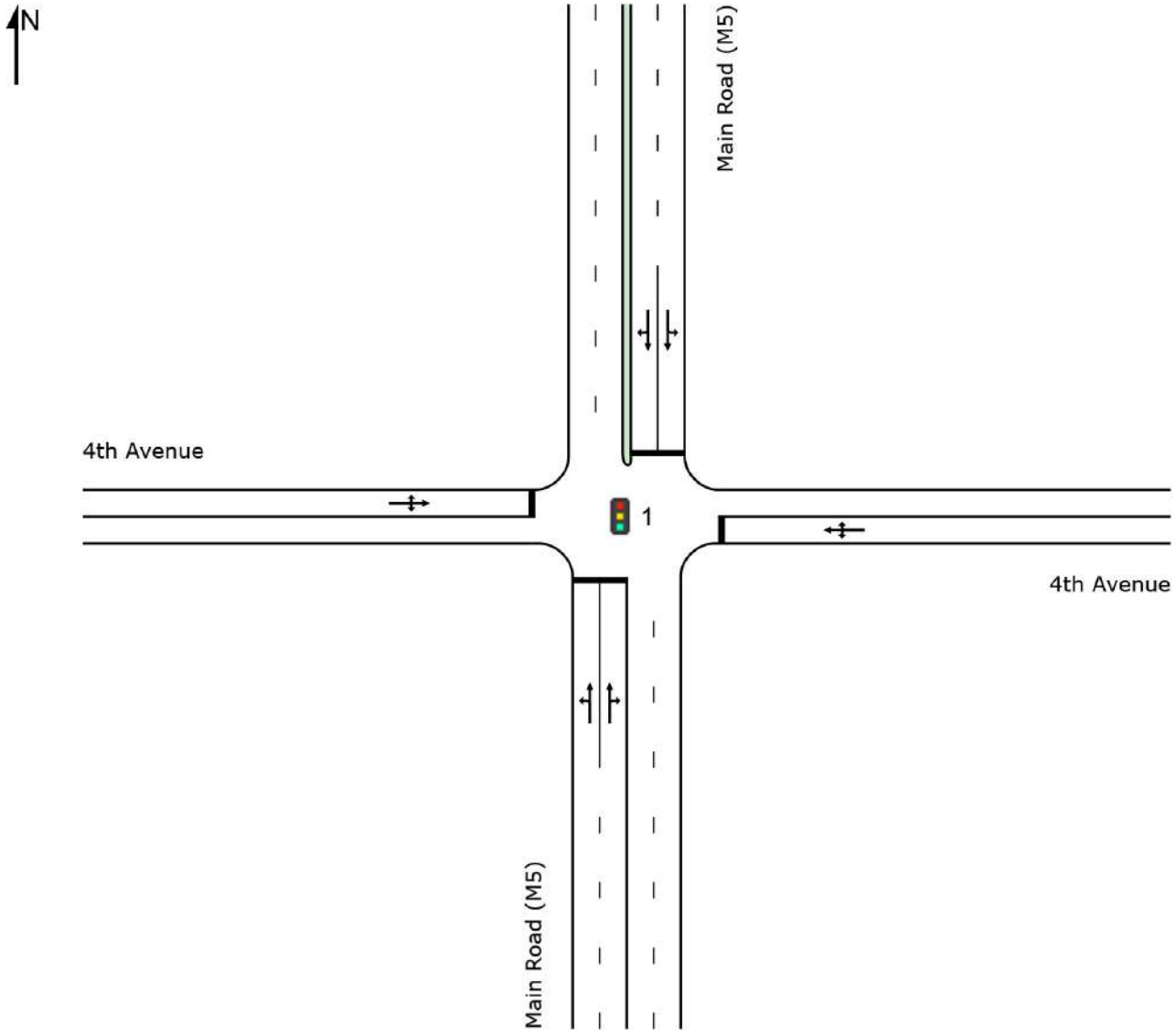
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Main Road (M5)												
1	L2	71	2.0	0.574	26.5	LOS C	13.7	97.9	0.86	0.76	0.86	10.7
2	T1	539	2.0	0.574	23.6	LOS C	13.7	97.9	0.88	0.77	0.88	15.2
3	R2	57	2.0	0.574	32.1	LOS C	7.6	54.0	0.92	0.78	0.92	20.8
Approach		667	2.0	0.574	24.6	LOS C	13.7	97.9	0.88	0.77	0.88	15.4
East: 4th Avenue												
4	L2	42	2.0	1.123	110.4	LOS F	20.7	147.1	1.00	1.37	2.11	7.7
5	T1	202	2.0	1.123	104.9	LOS F	20.7	147.1	1.00	1.37	2.11	6.7
6	R2	50	2.0	1.123	110.4	LOS F	20.7	147.1	1.00	1.37	2.11	7.5
Approach		294	2.0	1.123	106.6	LOS F	20.7	147.1	1.00	1.37	2.11	7.0
North: Main Road (M5)												
7	L2	118	2.0	0.575	12.3	LOS B	16.9	120.4	0.60	0.58	0.60	36.1
8	T1	856	2.0	0.575	8.2	LOS A	16.9	120.4	0.63	0.61	0.63	28.5
9	R2	303	2.0	0.575	13.2	LOS B	8.1	57.6	0.78	0.76	0.78	14.7
Approach		1277	2.0	0.575	9.7	LOS A	16.9	120.4	0.67	0.65	0.67	25.6
West: 4th Avenue												
10	L2	406	2.0	2.259	598.5	LOS F	127.2	905.6	1.00	2.73	4.34	0.6
11	T1	333	2.0	2.259	595.7	LOS F	127.2	905.6	1.00	2.73	4.34	1.3
12	R2	71	2.0	2.259	598.4	LOS F	127.2	905.6	1.00	2.73	4.34	0.6
Approach		810	2.0	2.259	597.3	LOS F	127.2	905.6	1.00	2.73	4.34	0.9
All Vehicles		3048	2.0	2.259	178.6	LOS F	127.2	905.6	0.83	1.30	1.83	2.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2021 + Dev PM Weekday Pk Hr Traff Vols - Upgrades: None]

Main Road (M5)/4th Avenue Intersection
Site Category: (None)
Signals - Fixed Time Isolated



PHASING SUMMARY

Site: 1 [2021 + Dev PM Weekday Pk Hr Traff Vols - Upgrades: None]

Main Road (M5)/4th Avenue Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site User-Given Phase Times)

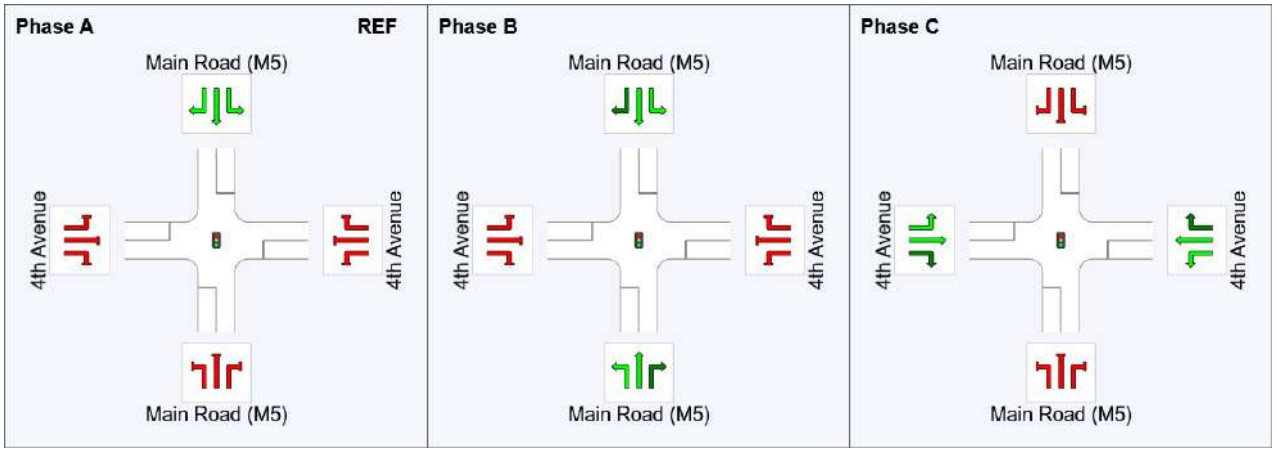
Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Two-Phase
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	0	12	60
Green Time (sec)	6	43	23
Phase Time (sec)	11	50	29
Phase Split	12%	56%	32%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

MOVEMENT SUMMARY

Site: 1 [2021 + Dev PM Weekday Pk Hr Traff Vols - Upgrades: None]

Main Road (M5)/4th Avenue Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site User-Given Phase Times)

Movement Performance - Vehicles

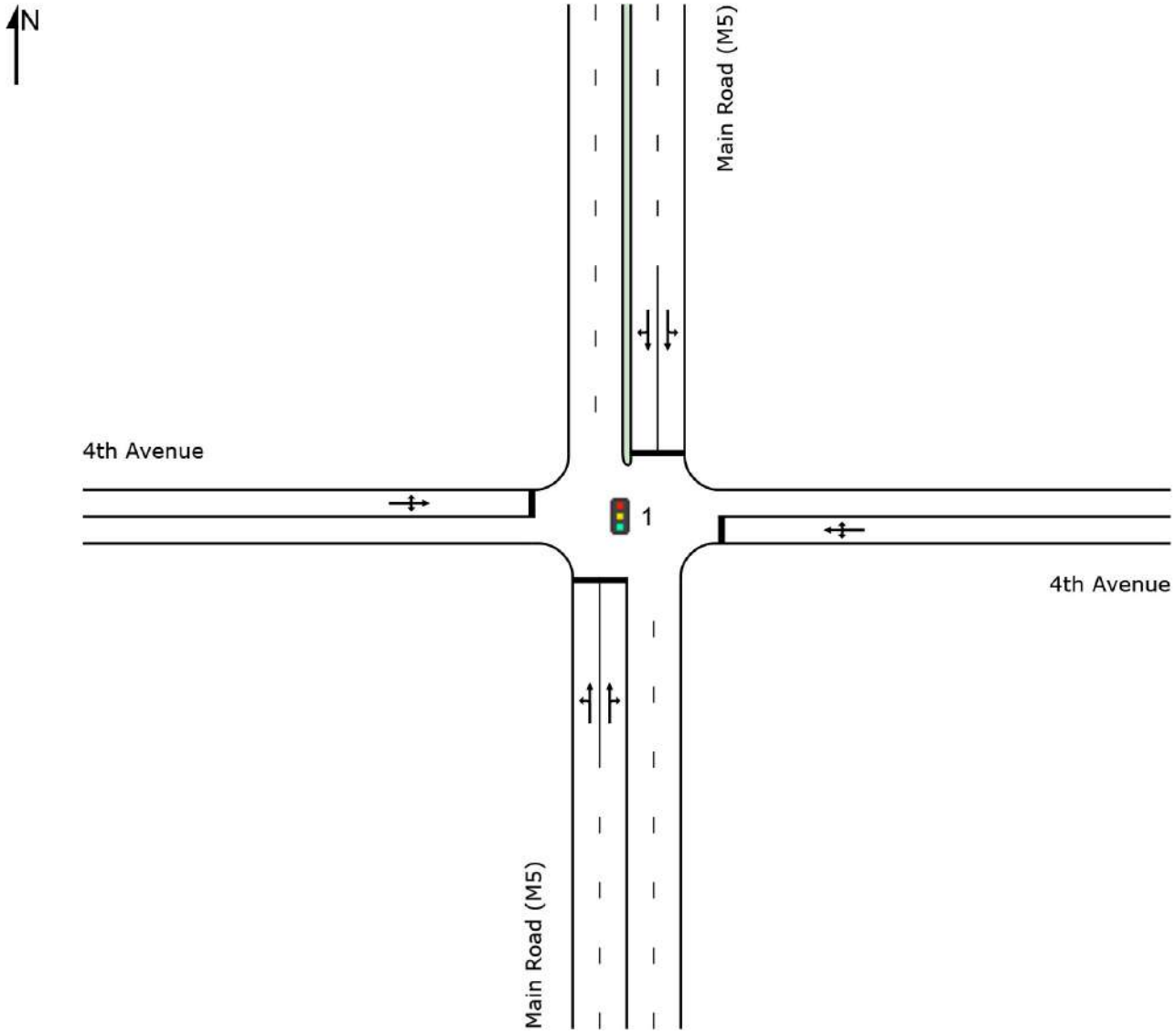
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Main Road (M5)												
1	L2	207	2.0	0.506	20.7	LOS C	15.7	111.7	0.72	0.70	0.72	12.6
2	T1	696	2.0	0.506	16.8	LOS B	15.7	111.7	0.73	0.68	0.73	19.1
3	R2	49	2.0	0.506	22.0	LOS C	12.5	89.1	0.74	0.67	0.74	26.9
Approach		952	2.0	0.506	17.9	LOS B	15.7	111.7	0.73	0.68	0.73	18.1
East: 4th Avenue												
4	L2	65	2.0	1.797	400.5	LOS F	77.3	550.5	1.00	2.18	3.38	2.3
5	T1	358	2.0	1.797	394.9	LOS F	77.3	550.5	1.00	2.18	3.38	2.0
6	R2	127	2.0	1.797	400.5	LOS F	77.3	550.5	1.00	2.18	3.38	2.2
Approach		550	2.0	1.797	396.9	LOS F	77.3	550.5	1.00	2.18	3.38	2.1
North: Main Road (M5)												
7	L2	103	2.0	0.563	15.9	LOS B	19.1	135.8	0.65	0.62	0.65	31.8
8	T1	625	2.0	0.563	11.6	LOS B	19.1	135.8	0.65	0.62	0.65	24.4
9	R2	426	2.0	1.122	104.0	LOS F	27.1	193.2	1.00	1.25	1.97	2.6
Approach		1154	2.0	1.122	46.1	LOS D	27.1	193.2	0.78	0.85	1.14	7.8
West: 4th Avenue												
10	L2	264	2.0	1.203	143.5	LOS F	45.4	323.3	1.00	1.48	2.15	2.1
11	T1	160	2.0	1.203	140.7	LOS F	45.4	323.3	1.00	1.48	2.15	5.1
12	R2	91	2.0	1.203	143.4	LOS F	45.4	323.3	1.00	1.48	2.15	2.4
Approach		515	2.0	1.203	142.6	LOS F	45.4	323.3	1.00	1.48	2.15	3.1
All Vehicles		3171	2.0	1.797	114.1	LOS F	77.3	550.5	0.84	1.13	1.57	4.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2021 + Dev AM Weekday Pk Hr Traff Vols - Upgrades: Signal plan]

Main Road (M5)/4th Avenue Intersection
Site Category: (None)
Signals - Fixed Time Isolated



PHASING SUMMARY

Site: 1 [2021 + Dev AM Weekday Pk Hr Traff Vols - Upgrades: Signal plan]

Main Road (M5)/4th Avenue Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site User-Given Phase Times)

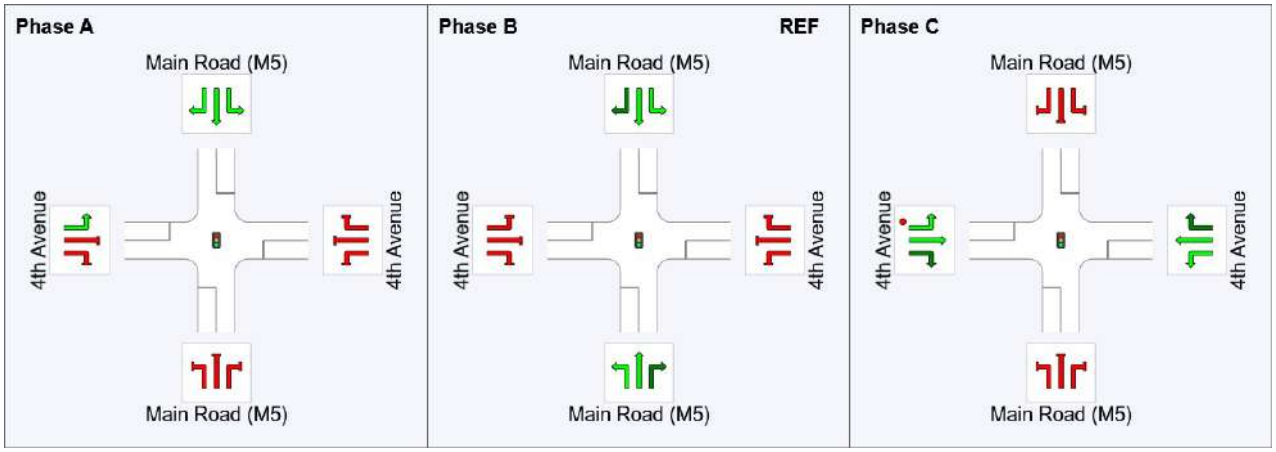
Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Two-Phase
Reference Phase: Phase B
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	73	0	29
Green Time (sec)	11	24	38
Phase Time (sec)	16	30	44
Phase Split	18%	33%	49%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

MOVEMENT SUMMARY

Site: 1 [2021 + Dev AM Weekday Pk Hr Traff Vols - Upgrades: Signal plan]

Main Road (M5)/4th Avenue Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site User-Given Phase Times)

Movement Performance - Vehicles

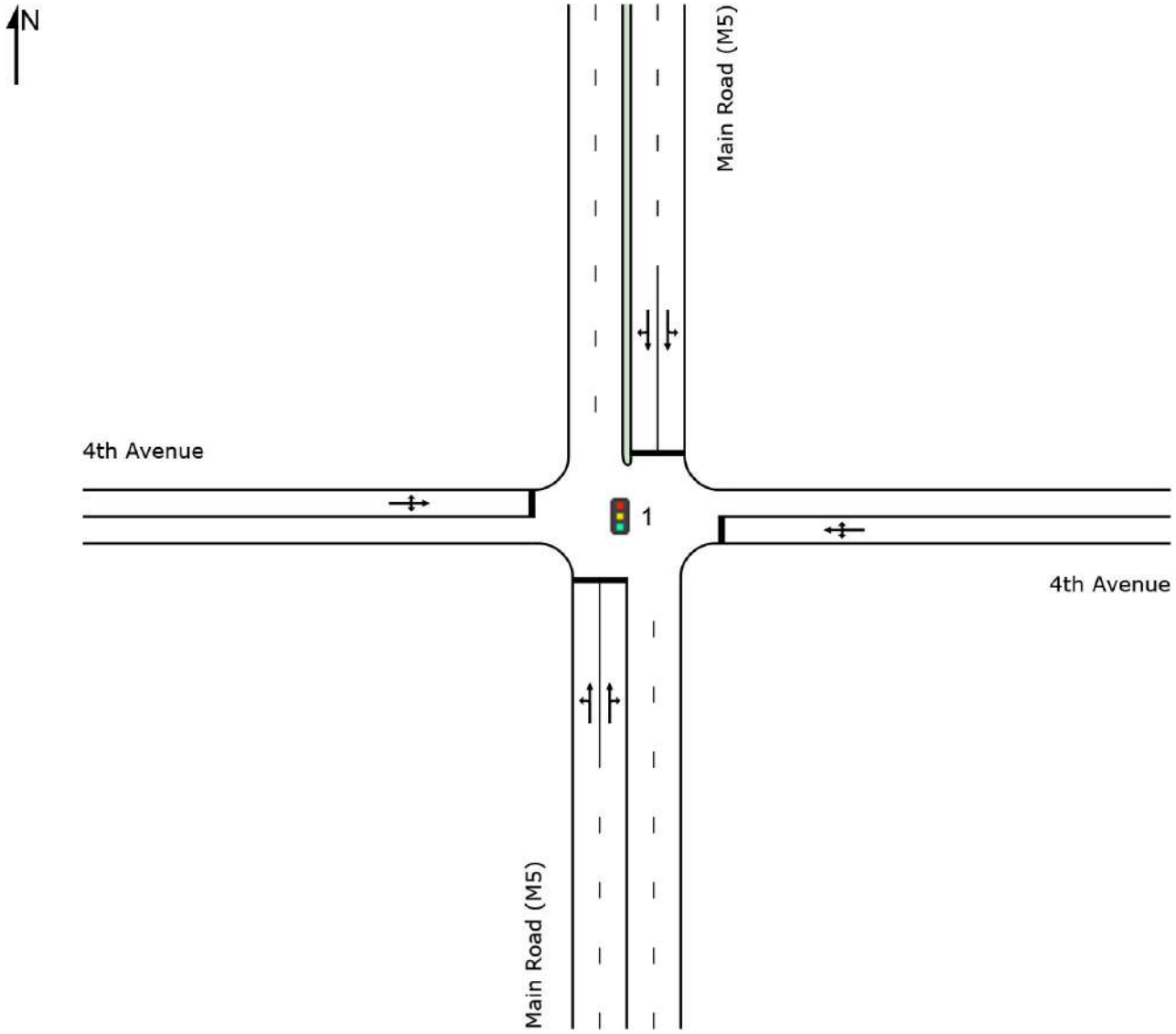
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Main Road (M5)												
1	L2	71	2.0	0.514	33.5	LOS C	13.3	94.9	0.89	0.77	0.89	8.9
2	T1	539	2.0	0.514	29.9	LOS C	13.3	94.9	0.90	0.77	0.90	12.8
3	R2	57	2.0	0.514	35.8	LOS D	11.5	82.1	0.91	0.77	0.91	19.4
Approach		667	2.0	0.514	30.8	LOS C	13.3	94.9	0.90	0.77	0.90	13.1
East: 4th Avenue												
4	L2	42	2.0	0.696	43.1	LOS D	12.4	88.6	0.98	0.85	1.02	17.1
5	T1	202	2.0	0.696	37.5	LOS D	12.4	88.6	0.98	0.85	1.02	15.8
6	R2	50	2.0	0.696	43.0	LOS D	12.4	88.6	0.98	0.85	1.02	16.8
Approach		294	2.0	0.696	39.3	LOS D	12.4	88.6	0.98	0.85	1.02	16.1
North: Main Road (M5)												
7	L2	118	2.0	0.837	31.4	LOS C	34.4	245.2	0.95	0.92	1.02	21.0
8	T1	856	2.0	0.837	27.3	LOS C	34.4	245.2	0.95	0.93	1.05	13.7
9	R2	303	2.0	0.837	32.6	LOS C	16.5	117.2	0.96	0.96	1.19	8.0
Approach		1277	2.0	0.837	28.9	LOS C	34.4	245.2	0.96	0.94	1.08	13.0
West: 4th Avenue												
10	L2	406	2.0	0.903	37.3	LOS D	38.3	272.6	1.00	1.02	1.22	6.3
11	T1	333	2.0	0.903	34.5	LOS C	38.3	272.6	1.00	1.02	1.22	16.7
12	R2	71	2.0	0.903	37.2	LOS D	38.3	272.6	1.00	1.02	1.22	8.4
Approach		810	2.0	0.903	36.1	LOS D	38.3	272.6	1.00	1.02	1.22	10.5
All Vehicles		3048	2.0	0.903	32.2	LOS C	38.3	272.6	0.96	0.91	1.07	12.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2021 + Dev PM Weekday Pk Hr Traff Vols - Upgrades: Signal plan]

Main Road (M5)/4th Avenue Intersection
Site Category: (None)
Signals - Fixed Time Isolated



PHASING SUMMARY

Site: 1 [2021 + Dev PM Weekday Pk Hr Traff Vols - Upgrades: Signal plan]

Main Road (M5)/4th Avenue Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site User-Given Phase Times)

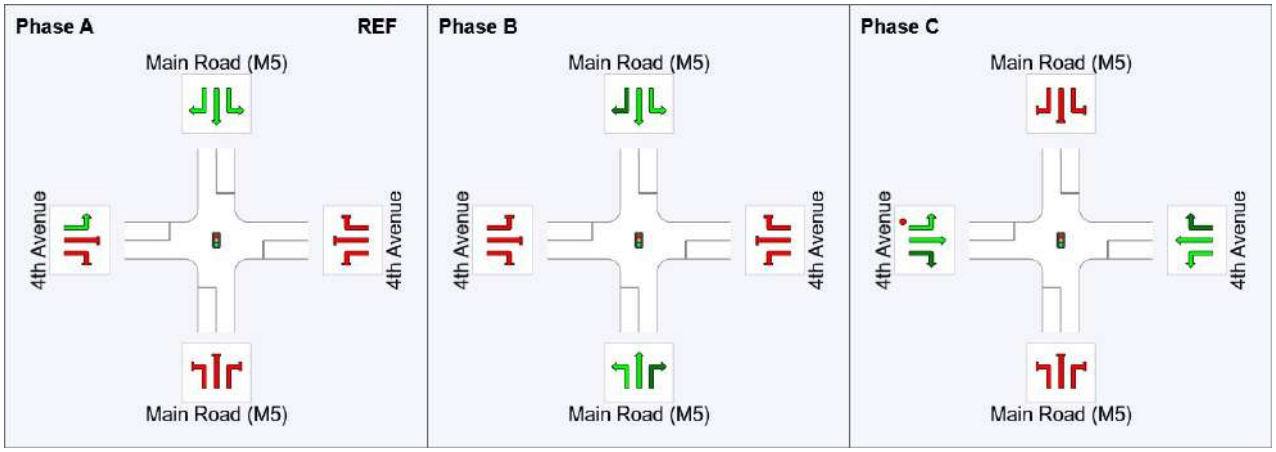
Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Two-Phase
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	0	18	46
Green Time (sec)	12	23	37
Phase Time (sec)	17	30	43
Phase Split	19%	33%	48%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

MOVEMENT SUMMARY

Site: 1 [2021 + Dev PM Weekday Pk Hr Traff Vols - Upgrades: Signal plan]

Main Road (M5)/4th Avenue Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Main Road (M5)												
1	L2	207	2.0	0.821	41.1	LOS D	24.4	174.0	1.00	0.94	1.11	7.4
2	T1	696	2.0	0.821	38.1	LOS D	24.4	174.0	1.00	0.95	1.13	10.5
3	R2	49	2.0	0.821	44.4	LOS D	18.4	130.7	1.00	0.96	1.15	16.7
Approach		952	2.0	0.821	39.1	LOS D	24.4	174.0	1.00	0.95	1.13	10.2
East: 4th Avenue												
4	L2	65	2.0	0.813	39.6	LOS D	24.0	171.0	0.98	0.93	1.08	18.2
5	T1	358	2.0	0.813	34.0	LOS C	24.0	171.0	0.98	0.93	1.08	16.8
6	R2	127	2.0	0.813	39.5	LOS D	24.0	171.0	0.98	0.93	1.08	17.8
Approach		550	2.0	0.813	35.9	LOS D	24.0	171.0	0.98	0.93	1.08	17.2
North: Main Road (M5)												
7	L2	103	2.0	0.760	27.0	LOS C	26.9	191.2	0.90	0.82	0.91	23.3
8	T1	625	2.0	0.760	22.7	LOS C	26.9	191.2	0.90	0.82	0.91	15.8
9	R2	426	2.0	0.971	50.4	LOS D	19.2	136.7	1.00	1.03	1.47	5.9
Approach		1154	2.0	0.971	33.3	LOS C	26.9	191.2	0.94	0.90	1.12	11.5
West: 4th Avenue												
10	L2	264	2.0	0.700	25.1	LOS C	17.9	127.2	0.91	0.83	0.91	7.9
11	T1	160	2.0	0.700	22.3	LOS C	17.9	127.2	0.91	0.83	0.91	22.0
12	R2	91	2.0	0.700	25.0	LOS C	17.9	127.2	0.91	0.83	0.91	11.4
Approach		515	2.0	0.700	24.2	LOS C	17.9	127.2	0.91	0.83	0.91	12.6
All Vehicles		3171	2.0	0.971	34.0	LOS C	26.9	191.2	0.96	0.91	1.08	12.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.