TRAFFIC IMPACT STUDY

16114 AIRPORT ROAD

SHACCA CALEDON HOLDINGS

PREPARED BY:

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CROZIER
CONSULTING ENGINEERS

1. Executive Summary

C.F. Crozier & Associates Inc. (Crozier) was retained by Shacca Caledon Holdings to complete a Traffic Impact Study (TIS) in support of a proposed mixed development located at 16114 Airport Road, in the Town of Caledon, Regional Municipality of Peel. The site is bounded by Airport Road to the east, Walker Road to the south, an existing residential condominium townhouse development to the north, and a treed area to the west.

The original TIS was submitted in March 2017, and a TIS update was submitted in October 2019 which addressed comments received from the Town of Caledon and Region of Peel. Further to the October 2019 submission, additional comments were received from the Region of Peel relating to the commercial entrance movement restrictions and auxiliary turn-lane requirements. Accordingly, this TIS update has been prepared to address the outstanding comments. The analysis and assumptions contained within this report are consistent with the October 2019 analysis, with the exception of the revised access configuration under 2024 and 2029 future total traffic volume conditions. A comment response matrix has been prepared which addresses the comments received following the second submission.

The analysis contained within this report included the intersection of Airport Road and Walker Road, as well as the proposed site accesses. The analysis of traffic operations at the study intersections indicates the following:

- The study intersections are operating acceptably with a LOS "C" or better under existing 2016 conditions.
- The study intersections are expected to continue operating acceptably with a LOS "D" or better under future background conditions.
- A northbound left-turn lane is warranted at the Airport Road residential access with a minimum storage of 15 metres.
- As requested by the Region of Peel, a southbound right-turn taper has been provided at Site Access B to facilitate turns into the right-in only commercial entrance on Airport Road.
- Examination of the 2024 and 2029 future total traffic conditions indicates that the Airport Road and Walker Road intersection is anticipated to operate at a LOS "E" or better during the weekday a.m., mid-day and p.m. peak hours and the control delay and maximum volume to capacity ratios are expected to experience a maximum increase of 13.7 seconds and 0.14, respectively, when compared with future background traffic operations;
- The proposed site accesses operate with excellent levels of service under 2029 future total traffic volume conditions, with a LOS "B" or better, and a maximum delay of 13.5 seconds in the p.m. peak hour at Site Access C.
- The available sight distance to the north and south of the Airport Road residential access and to the west of the Walker Road access exceeds the minimum stopping and intersection sight distance requirements.
    - The Walker Road access is located approximately 55 metres west of Airport Road. While this is less than the minimum sight distance requirement, vehicles are approaching from a stop or turning movement. Accordingly, they are not expected to attain operating speed before reaching the site access.
- A truck turning analysis was completed, and it is concluded that refuse and emergency vehicles can manoeuvre the site without any conflicts, and Light Single Unit trucks can access the proposed delivery space.

As described above, a northbound left-turn lane is warranted at the Airport Road residential access with a minimum storage of 15 metres, and the Region of Peel has requested that a southbound right-turn lane be provided at the proposed commercial right-in only access. Given the spacing between the two Airport Road entrances, only a taper has been recommended. The above recommendations have been

illustrated on a Preliminary Functional Design, included as **Figure 15**.

It is concluded that the traffic generated from the proposed development can be accommodated by the boundary road network, with the noted recommendations.

The analysis undertaken herein was prepared using the Development Concept Plan dated June 12, 2019. The trip generation described herein was overstated by one trip, four trips and one trip in the weekday a.m., mid-day and p.m. peak hours, respectively. As such, the recommendations and conclusions contained within this report remain valid when considering the revised Site Plan dated November 16, 2020. Any minor changes to the Site Plan will not materially affect the conclusions contained within this report.

The proposed mixed-use development can be supported from a traffic safety, operations and circulation perspective, with the implementation of the noted recommendations.

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2. Introduction

C.F. Crozier & Associates Inc. (Crozier) was retained by Shacca Caledon Holdings to complete a Traffic Impact Study (TIS) in support of a proposed mixed development located at 16114 Airport Road (the "site"), in the Town of Caledon, Regional Municipality of Peel.

The original TIS was completed in March 2017. A TIS Update was completed in October 2019 to address comments that were received from the Region of Peel and Town of Caledon on May 29, 2018. Responses to these comments are addressed individually in a Comment Response Memo included in **Appendix M**.

Following the October 2019 submission, the Region provided additional comments requesting that the commercial site access on Airport Road be restricted to right-in movements only and that a southbound right-turn lane be provided. Accordingly, this TIS update has been prepared to address the outstanding comments. The analysis and assumptions contained within this report are consistent with the March 2017 and October 2019 analyses, with the exception of the revised access configuration under 2024 and 2029 future total traffic volume conditions. A comment response matrix, included in **Appendix M**, has been prepared which addresses the comments received following the second submission.

The study has been completed in accordance with the procedures outlined in the Region of Peel's "Traffic Impact Study – Terms of Reference" document and the agreed upon Terms of Reference with the Town of Caledon and the Regional Municipality of Peel. Per correspondence with the Town of Caledon, mid-day counts were undertaken to capture the mid-day peak hour. Correspondence with the Town and County has been included in **Appendix A**.

The analysis contained within this report is based on the Development Concept Plan dated June 12, 2019. The June 12, 2019 version of the Development Concept Plan proposed a greater Commercial gross floor area (GFA). The previous concept proposed a GFA of 1,288 square metres (13,864 square feet), whereas the most recent Site Plan proposes a commercial GFA of 1,222.59 square metres (13,160 square feet). As such, the trip generation described herein was overstated by one trip, four trips and one trip in the weekday a.m., mid-day and p.m. peak hours, respectively. Accordingly, the findings and conclusions contained within this report remain valid when considering the revised Site Plan dated November 16, 2020, included as **Figure 1**.

3. Existing Conditions

3.1 Development Lands

The site is approximately 4.09 hectares (10.11 acres) in size and is bounded by Airport Road to the east, Walker Road to the south, an existing residential condominium townhouse development to the north, and a treed area to the west. The site itself currently contains a residential property with one existing access to Airport Road. The site is currently zoned as Rural "A2" per the Town of Caledon Zoning By-law 2006-50, of which "Dwelling, Detached" is a permitted use.

The location of the site is reflected on the development Site Location Plan included as **Figure 1**.

3.2 Study Area

The study area encompasses the boundary road network surrounding the site and is described in **Section 3.3**.

3.3 Boundary Road Network

With skewed directions, the directional orientation of the roadway system is ambiguous. To provide clarity throughout this report and in the supporting analysis, Airport Road has been assigned a north-south orientation, and Walker Road has been assigned an east-west orientation.

Airport Road is a north-south road under the jurisdiction of the Region of Peel. The roadway consists of a two-lane rural cross-section and is designated rural Main Street per the Region of Peel Road Characterization Study. An approximate 1.5 metre concrete sidewalk exists on the west side of Airport Road adjacent to the site. The road has a posted speed limit of 50 km/h through the study area.
Walker Road is an east-west road under the jurisdiction of the Town of Caledon. The roadway consists of a two-lane rural cross-section and is designated as a local road with a posted speed limit of 40 km/h. An approximate 1.5 metres concrete sidewalk exists on the south side of Walker Road.

The intersection of Airport Road and Walker Road is a four-legged two-way stop-controlled intersection. The east approach (Walker Road East) and west approach (Walker Road West) each consist of a shared left/through/right-turn lane. The north approach (Airport Road) and south approach (Airport Road) consist of a shared right/through/left-turn lane. The intersection is stop-controlled in the eastbound and westbound directions and free flowing in the northbound and southbound directions.

3.4 Development Proposal

The Site Plan consists of 32 condo townhouse units and two commercial buildings with a total GFA of 1,222.59 square metres (13,160 square feet). Access to the development will be provided by one access to Walker Road and two accesses on Airport Road.

The Walker Road access (Site Access A) will permit full moves and provide access to the commercial buildings. The south Airport Road access (Site Access B) will be restricted to right-in movements only and provide direct access to the commercial buildings. The north Airport Road access (Site Access C) will permit full moves and provide direct access to the residential dwellings. An internal connection between the residential and commercial portions of the site has now been proposed to facilitate improved site circulation. The internal private road will conform to the Town of Caledon Standard Drawing 223 "Private Road Cross Section Common Element Condominium Road" which has been included in **Appendix N** for reference.

Refer to **Figure 1** for the most recent Site Plan by FBP Architects Inc. dated November 16, 2020. The noted external road improvements described herein and illustrated in **Figure 15** have also been reflected on the Site Plan.

3.5 Traffic Data

Turning movement counts for the boundary road intersection was undertaken by Ontario Traffic Inc. staff from 7:00 a.m. to 9:00 a.m., 11:00 a.m. to 2:00 p.m. and 3:00 p.m. to 6:00 p.m. on August 16, 2016. The traffic count data is summarized in **Appendix B**. **Figure 3** illustrates the 2016 existing traffic volumes.

3.6 Intersection Operations

The operations of the critical intersection were analyzed based on the traffic volumes illustrated in **Figure 3**. **Table 1** outlines the 2016 traffic levels of service for the counts taken at the intersection under existing conditions. Level of Service definitions have been included in **Appendix C**, with detailed capacity analysis worksheets included in **Appendix D**.

Table 1: 2016 Existing Level of Service

Intersection	Control	Peak Hour	Level of Service	Control Delay	Maximum Individual V/C Ratio	95th %ile Queues > Available Storage
Airport Road and Walker Road	Stop	A.M.	B	13.9 s (WB)	0.11 (EB)	None
		Mid-Day	B	13.0 s (WB)	0.11 (EB)	None
		P.M.	C	16.7 s (EB/WB)	0.18 (EB)	None

Note: The Level of Service of a stop-controlled intersection is based on the delay associated with the critical minor road approach; i.e., Walker Road.

The intersection of Airport Road and Walker Road is currently operating at a LOS "B" with control delays of 13.9 seconds (WB) and 13.0 seconds (WB) and maximum volume to capacity ratios of 0.11 (EB) and 0.11 (EB) in the a.m. and mid-day peak hours, respectively. The intersection operates at a LOS "C" in the p.m. peak hour with a control delay of 16.7 seconds (EB) and a maximum volume-to-capacity ratio of 0.18 (EB). The low delay and volume-to-capacity ratios indicate that the intersection is operating efficiently with minor delays and has reserve capacity for increases in traffic volumes.

The traffic metrics listed above indicate that there are no traffic operational issues at the analyzed intersection under existing conditions.

4. Future Background Conditions

4.1 Horizon Years

Per the original 2016 report, the proposed development was anticipated to be fully built out and occupied by 2019. Thus, study horizons of full buildout (2019), as well as five (2024) and ten (2029) years beyond were studied. These horizons have been maintained, however, it is noted that the future total operations are not analyzed for the 2019 horizon year. The future total operations are analyzed in the 2024 and 2029 horizon years only.

4.2 Growth Rate

Traffic growth rates were determined using average annual daily traffic (AADT) data obtained from the Region of Peel. Data was obtained for the segment of Airport Road, one kilometre south and one kilometre north of Walker Road. Historical AADT volumes indicate that there is a growth rate of approximately 1.57 percent in the community, thus an industry standard two percent growth rate was assumed per discussions with the Town. Historical AADT volumes have been included in **Appendix E** for reference.

Figures 4, 5, and 6 illustrate the future background traffic volumes for the 2019, 2024 and 2029 horizon years, respectively.

4.3 Future Roadway Improvements

The Region of Peel is in the process of completing an Environmental Assessment (EA) for the Airport Road corridor from 100 metres north of King Street to 300 metres north of Huntsmill Drive. Based on the recently released "Preliminary Preferred Design", a northbound left-turn lane and southbound left and right-turn lanes are recommended at the intersection of Airport Road and Walker Road. Additionally, a raised centre median is proposed to act as a gateway feature, and a multi-use pathway is proposed along the west side of Airport Road. It is highlighted that the improvements identified in the EA do not appear to impact the current Site Plan as they are contained within the determined Regional right-

of-way. The "Preliminary Preferred Design" has been included as **Appendix F** for reference.

These improvements are still preliminary, and based on correspondence with Regional Staff and the comments dated April 8, 2020, a northbound left-turn lane is required at the residential site access (Site Access C) and a southbound right-turn lane is required at the commercial right-in only site access (Site Access B).

Accordingly, the analysis contained within this report reflects the noted development driven improvements and does not account for the "Preliminary Preferred Design" suggested improvements.

4.4 Future Background Developments

Per comments received from Town staff, analyses of future background traffic operations should include trips generated by the Castles of Caledon development proposed at the intersection of Mountainview Road and Walker Road West. It is noted that construction of the development has not commenced. As such, the trips generated by the Castles of Caledon are only incorporated in the 2024 and 2029 horizon years.

The trip generation of the Castles of Caledon was adopted from the Revised TIS (March 2014), by Cole Engineering. Relevant excerpts have been included in **Appendix G** for reference. The analysis contained within the Revised TIS was based on the development proposal of 203 single family detached dwellings. The trip generation was undertaken using information contained within the Institute of Transportation Engineers (ITE) Trip Generation Manual, 9th Edition.

It is noted that the redlined draft plan dated March 25, 2018 illustrates 200 single family detached dwelling and has also been included in **Appendix G**. The three-unit reduction will have a negligible impact, accordingly, the trip generation and assignment from the Revised TIS was utilized.

The Revised TIS assessed the weekday a.m. and p.m. peak hours. The analysis contained within this report was completed for the weekday mid-day peak as well. In Appendix A of the ITE Trip Generation Manual, 10th Edition, hourly information for the trip generation by land use is provided.

The mid-day peak hour of the roadway was recorded from 12:30 p.m. to 1:30 p.m. According to the Trip Generation Manual, the trip generation at 12:45 p.m. represents 6.1 percent of the daily traffic. Accordingly, the daily traffic volumes were forecasted using the fitted curve equation and resulted in a weekday trip generation of 1,995 trips (997 inbound, 998 outbound). Assuming 6.1 percent, the mid-day traffic volumes are forecasted to be 122 vehicles. Directional distribution information is not available for the mid-day, accordingly, a 50 percent split was assumed.

Excerpts from the ITE Trip Generation Manual have been included in **Appendix G** for reference. The Castles of Caledon trip generation is summarized in **Table 2**

Table 2: Castles of Caledon - Trip Generation

Proposed Use	Roadway Peak Hour	Trip Type	Number of Trips		
			Inbound	Outbound	Total
Single Family Detached (Land Use 210)	Weekday A.M.	Primary	38	114	152
	Weekday Mid-Day	Primary	61	61	122
	Weekday P.M.	Primary	134	79	213

The trips were distributed to the boundary road network based on the Site Trip Distribution summarized in Table 5.2 of the Revised TIS. At the intersection of Airport Road and Walker Road, 79 percent of trips arrive from and depart to the south, and one percent of trips arrive from and depart to the north. The trip assignment at the intersection of Airport Road and Walker Road is illustrated in Figure 5-1 of the Revised TIS. These trips, as well as the mid-day trips, were applied to the future background volume forecasts for the 2024 and 2029 horizon years. These volumes are illustrated in **Figures 5 and 6**, respectively.

4.5 Intersection Operations

Table 3, Table 4, and Table 5 summarize the 2019, 2024 and 2029 future background traffic levels of service associated with the boundary road network based on the future background traffic volumes illustrated in **Figures 4 through 6,** with detailed capacity analyses included in **Appendix D**.

Table 3: 2019 Future Background Level of Service

Intersection	Control	Peak Hour	Level of Service	Control Delay	Maximum Individual V/C Ratio	95th %ile Queues > Available Storage
Airport Road and Walker Road	Stop	A.M.	B	14.7 s (WB)	0.13 (EB)	None
		Mid-Day	B	13.4 s (WB)	0.12 (EB)	None
		P.M.	C	17.9 s (EB)	0.20 (EB)	None

Note: The Level of Service of a stop-controlled intersection is based on the delay associated with the critical minor road approach; i.e., Walker Road.

Table 4: 2024 Future Background Level of Service

Intersection	Control	Peak Hour	Level of Service	Control Delay	Maximum Individual V/C Ratio	95th %ile Queues > Available Storage
Airport Road and Walker Road	Stop	A.M.	C	21.3 s (WB)	0.31 (EB)	None
		Mid-Day	C	17.5 s (WB)	0.21 (EB)	None
		P.M.	D	27.4 s (WB)	0.45 (EB)	None

Note: The Level of Service of a stop-controlled intersection is based on the delay associated with the critical minor road approach; i.e., Walker Road.

Table 5: 2029 Future Background Level of Service

Intersection	Control	Peak Hour	Level of Service	Control Delay	Maximum Individual V/C Ratio	95th %ile Queues > Available Storage
Airport Road and Walker Road	Stop	A.M.	C	24.7 s (WB)	0.34 (EB)	None
		Mid-Day	C	20.5 s (WB)	0.25 (EB)	None
		P.M.	D	34.5 s (EB)	0.56 (EB)	None

Note: The Level of Service of a stop-controlled intersection is based on the delay associated with the critical minor road approach; i.e., Walker Road.

The intersection of Airport Road and Walker Road is anticipated to operate at a LOS "C" in the weekday a.m., and mid-day peak hours and a LOS "D" in the p.m. peak hour through the 2029 future background conditions under two-way stop-controlled conditions. The intersection is expected to have control delays of 24.7 seconds (WB), 20.5 seconds (WB) and 34.5 (EB) seconds and maximum

volume-to-capacity ratios of 0.34 (EB), 0.25 (EB), and 0.56 (EB) in the weekday a.m., mid-day and p.m. peak hours, respectively. This indicates that the intersection is expected to continue operating efficiently under future background traffic conditions throughout all horizon years, with excess capacity for increases in traffic volumes.

The traffic metrics listed above indicate that there are no operational issues expected to occur under the future background traffic conditions, through to the 2029 horizon year.

5. Site Generated Traffic

The proposed development will result in additional vehicles on the boundary road network that previously did not exist. The proposed development will also result in additional turning movements at the boundary road intersections.

The following trip generation calculations for the mixed-use development were conducted based on the site statistics summarized on a previous version of the Development Concept Plan dated June 12, 2019. These calculations were based on a unit count of 32 residential units and a commercial GFA of 13,864 square feet.

This resulted in a forecasted trip generation that is overstated by one trip, four trips and one trip in the weekday a.m., mid-day and p.m. peak hours, respectively. As such, the findings and conclusions contained within this report remain valid when considering the revised Site Plan dated November 16, 2020.

5.1 Trip Generation

The trip generation of the residential townhomes was forecasted using the fitted curve equations found in the Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition, under Land Use Category 220 "Multifamily Housing (Low-Rise)". Per the Site Plan the proposed development is comprised of 32 townhomes.

The trip generation of the commercial retail development was forecasted using the average rates provided for Land Use Category 820 "Shopping Centre". The June 12, 2019 Development Concept Plan proposes a total commercial GFA of 1,288 square metres (13,864 ft^2). The average rate was used because the trip generation resulting from the fitted curve equation is too high for such a small commercial retail GFA.

As defined by the ITE Trip Generation Handbook, 3rd Edition, primary trips are made for the specific purpose of visiting the generator. Pass-by trips are made as intermediate stops on the way from an origin to a primary destination without a route diversion. Accordingly, these vehicles do not increase the volume of vehicles on the roadway.

The pass-by trip percentage of the commercial retail pass-by trips was forecasted using the rates provided by the ITE Trip Generation Handbook. Land Use Category 820 "Shopping Centre" was used to forecast a pass-by trip percentage of 34 percent for the mid-day and p.m. peak periods. A pass-by percentage was not applied to the a.m. peak periods as this trip generation generally captures employees of the commercial retail uses.

Per the Terms of Reference discussed with the Region of Peel, the analysis is to include the weekday mid-day trips generated from the site. The ITE Trip Generation Manual does not have fitted curve equations or average values for a mid-day peak, therefore these values were forecasted as percentages of the daily trip generation given for each Land Use Category in Appendix A of the Trip

Generation Manual.

The mid-day peak hour of the roadway was recorded from 12:30 p.m. to 1:30 p.m. According to the Trip Generation Manual, the Multifamily Housing (Low-Rise) trip generation at 12:30 p.m. represents 5.2 percent of the daily traffic. Accordingly, the daily traffic volumes were forecasted using the fitted curve equation and resulted in a weekday trip generation of 234 trips (117 inbound, 117 outbound). Assuming 5.2 percent, the mid-day traffic volumes are forecasted to be 12 vehicles. Directional distribution information is not available for the mid-day, accordingly, a 50 percent split was assumed.

According to the Trip Generation Manual, the Shopping Centre trip generation at 12:30 p.m. represents 9.8 percent of the daily traffic. Accordingly, the daily traffic volumes were forecasted using the average rate and resulted in a weekday trip generation of 523 trips (261 inbound, 262 outbound). Assuming 9.8 percent, the mid-day traffic volumes are forecasted to be 51 vehicles. Directional distribution information is not available for the mid-day, accordingly, a 50 percent split was assumed. Relevant excerpts from the ITE Trip Generation Manual, 10th Edition and ITE Trip Generation Handbook, 3rd Edition have been included in **Appendix H** for reference. The forecasted trips are tabulated in **Table 6**.

Table 6: Trip Generation

Proposed Use[1]	Roadway Peak Hour	Trip Type	Number of Trips		
			Inbound	Outbound	Total
LUC 820: Shopping Centre (13,864 square feet)	Weekday A.M.	Primary	8	5	13
		Pass-By	0	0	0
	Weekday Mid-Day	Primary	17	17	34
		Pass-By	9	8	17
	Weekday P.M.	Primary	17	18	35
		Pass-By	8	10	18
LUC 220: Multifamily Housing (Low-Rise) (32 units)	Weekday A.M.	Primary	3	12	15
	Weekday Mid-Day	Primary	6	6	12
	Weekday P.M.	Primary	11	7	18
Total	**Weekday A.M.**	**Primary**	**11**	**17**	**28**
		Pass-By	**0**	**0**	**0**
	Weekday Mid-Day	**Primary**	**23**	**23**	**46**
		Pass-By	**9**	**8**	**17**
	Weekday P.M.	**Primary**	**28**	**25**	**53**
		Pass-By	**8**	**10**	**18**

Note[1]: The trip generation forecasts presented in this table were based on a previous version of the Development Concept Plan dated June 12, 2019 and represents a forecasted trip generation that is overstated by one trip, four trips and one trip in the weekday a.m., mid-day and p.m. peak hours, respectively.

5.2 Trip Distribution and Assignment

The residential trips generated by the proposed development were distributed to the boundary road network based on Transportation Tomorrow Survey (TTS) published data, and the location of employment, retail and residential areas within Caledon. The TTS data was generated for trips to and from Caledon and surrounding areas, as well as trips within the Caledon area. The residential trip distribution was determined for the weekday a.m., mid-day and p.m. peak hours. TTS survey data has been included in **Appendix I**.

The inbound and outbound trip distributions for the residential trips are illustrated in **Figure 7** and summarized in **Table 7** below.

The commercial trips generated by the proposed development were previously distributed to the boundary road network based on a combination of TTS data and observed travel patterns. The addition of the Castles of Caledon development results in more vehicles on the west approach of the intersection of Airport Road and Walker Road. Accordingly, the 2024 future background traffic volumes were used to establish the primary and pass-by trip distributions for the commercial portion of the development.

The commercial trip distribution is summarized in **Table 8** below. The primary and pass-by commercial trip distributions are illustrated in **Figures 9 and 11**, respectively.

Table 7: Residential Trip Distribution

Peak Hour	Inbound	Outbound
A.M.	• 32% from the north via Airport Road • 50% from the south via Airport Road • 2% from the east via Walker Road • 16% from the west via Walker Road	• 8% to the north via Airport Road • 53% to the south via Airport Road • 2% to the east via Walker Road • 37% to the west via Walker Road
Mid-Day	• 24% from the north via Airport Road • 57% from the south via Airport Road • 2% from the east via Walker Road • 17% from the west via Walker Road	• 16% to the north via Airport Road • 76% to the south via Airport Road • 2% to the east via Walker Road • 6% to the west via Walker Road
P.M.	• 12% from the north via Airport Road • 55% from the south via Airport Road • 1% from the east via Walker Road • 32% from the west via Walker Road	• 31% to the north via Airport Road • 60% to the south via Airport Road • 1% to the east via Walker Road • 8% to the west via Walker Road

Table 8: Commercial Trip Distribution

Peak Hour	Inbound	Outbound
A.M.	• 53% from the north via Airport Road • 27% from the south via Airport Road • 18% from the west/south via Walker Road • 2% from the east via Walker Road	• 53% to the north via Airport Road • 27% to the south via Airport Road • 18% to the west/south via Walker Road • 2% to the east via Walker Road
Mid-Day	• 35% from the north via Airport Road • 48% from the south via Airport Road • 16% from the west/south via Walker Road • 1% from the east via Walker Road	• 35% to the north via Airport Road • 48% to the south via Airport Road • 16% to the west/south via Walker Road • 1% to the east via Walker Road
P.M.	• 22% from the north via Airport Road • 66% from the south via Airport Road • 12% from the west/south via Walker Road • 0% from the east via Walker Road	• 22% to the north via Airport Road • 66% to the south via Airport Road • 12% to the west/south via Walker Road • 0% to the east via Walker Road

6. Total Future Conditions

6.1 Basis of Assessment

The traffic impacts arising from the proposed development were assessed based on the site generated traffic illustrated in **Figures 8, 10 and 12** being superimposed on the 2024 and 2029 future background traffic volumes in **Figures 5 and 6**. The resulting total traffic volumes for the weekday a.m., mid-day and p.m. peak hours are illustrated in **Figures 13 and 14** for the 2024 and 2029 horizon years.

Detailed capacity analyses are included in **Appendix D**.

6.2 Auxiliary Left-Turn Lane Analysis

Left-turn lane warrants were undertaken for a northbound left-turn lane on Airport Road at the north access and an eastbound left-turn lane on Walker Road at the site access. The warrants were completed using the MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads. Airport Road has a posted speed limit of 50 km/h adjacent to the site, thus a 60 km/h design speed was selected, reflecting a traffic engineering convention of a 10 km/h increase to the posted speed limit for lower speed roads. Walker Road has a posted speed limit of 40 km/h, thus a 50 km/h design speed was selected. **Table 9** summarizes the results of the northbound and eastbound left-turn lane analyses. Auxiliary left-turn lane warrant charts have been included in **Appendix J** for reference.

Table 9: 2029 Future Total Auxiliary Lane Analysis

Intersection	Peak Hour	V_A	% Left Turns in V_A	V_O	Warranted	Minimum Storage (metres)	TAC GDGCR MTO Design Supplement Figure
Eastbound Left-turn Lane (50 km/h Design Speed)							
Walker Road and Site Access A	A.M.	177	1%	89	No	-	Ex 9A-2
	Mid-Day	143	4%	141	No	-	Ex 9A-2
	P.M.	154	5%	225	No	-	Ex 9A-2
Northbound Left-turn Lane (60 km/h Design Speed)							
Airport Road and Site Access C	A.M.	223	1%	533	No	-	Ex 9A-6
	Mid-Day	324	1%	321	No	-	Ex 9A-6
	P.M.	**716**	**1%**	**299**	**Yes**	**15 m**	**Ex 9A-6**

Given the results in **Table 9**, a left turn lane is warranted on Airport Road at Site Access C, with a minimum storage length of 15 metres.

6.3 Recommended Improvements

Per comments received from the Region of Peel dated April 8, 2020, a southbound right-turn lane is required at the commercial right-in only site access. Given the spacing between Site Access B and Site Access C, there is insufficient distance to accommodate a parallel lane length, accordingly, an approximate 50-metre taper is proposed. The right-in only access itself provides a clear throat length of approximately 20 metres.

As noted above, a northbound left-turn lane is warranted at Site Access C. The taper of the left-turn lane at Leamster Trail extends to the north curb extension of the proposed Condo Road (Allison's Grove). It is recommended that the Leamster Trail left-turn lane be extended south to connect with the Site Access C left-turn lane to allow for a consistent road width.

Per Schedule F of the Region of Peel's Official Plan, the mid-block road right-of-way width is 36 metres on Airport Road adjacent to the site. Given the proximity of the site to the intersection of Airport Road and Walker Road, the Region requires an additional 5.5 metres (Official Plan Section 5.9.4.2.5). Accordingly, these improvements can be contained within the Region's right-of-way.

The analysis contained within this report accounts for a northbound left-turn lane at Site Access C. As Site Access B is proposed to be right-in only with a southbound right-turn taper, there is no delay associated with this movement and therefore, the access has not been analyzed. The noted improvements have been illustrated on a Preliminary Functional Design included as **Figure 15** and are reflected on the Site Plan included as **Figure 1**. As noted previously, the Preliminary Functional Design does not account for the "Preliminary Preferred Design" outlined in the recently published Airport Road EA documents given the preliminary nature of the EA.

6.4 Intersection Operations

Table 10 and Table 11 outline the 2024 and 2029 future total traffic operations associated with the boundary road network, with detailed capacity analyses included in **Appendix D**. Site Accesses A and C were analyzed under full moves condition. As Site Access B is proposed to be right-in only with a southbound right-turn taper, there is no delay associated with this movement and therefore, the intersection has not been included in the tables below. Additionally, analysis of all horizon years included a 15-metre northbound left-turn lane on Airport Road at Site Access C.

Table 10: 2024 Future Total Level of Service

Intersection	Control	Peak Hour	Level of Service	Control Delay	Maximum Individual V/C Ratio	95th %ile Queues > Available Storage
Airport Road and Walker Road	Stop	A.M.	C	22.2s (WB)	0.34 (EB)	None
		Mid-Day	C	18.4 s (WB)	0.27 (EB)	None
		P.M.	D	30.0 s (EB)	0.54 (EB)	None
Walker Road and Site Access A	Stop	A.M.	A	9.5 s (SB)	0.01 (SB)	None
		Mid-Day	B	10.0 s (SB)	0.04 (SB)	None
		P.M.	B	10.7 s (SB)	0.05 (SB)	None
Airport Road and Site Access C	Stop	A.M.	B	11.7 s (EB)	0.01 (EB)	None
		Mid-Day	B	10.5 s (EB)	0.01 (EB)	None
		P.M.	B	12.7 s (EB)	0.01 (EB)	None

Note: The Level of Service of a stop-controlled intersection is based on the delay associated with the critical minor road approach; i.e., Walker Road.

Table 11: 2029 Future Total Level of Service

Intersection	Control	Peak Hour	Level of Service	Control Delay	Maximum Individual V/C Ratio	95th %ile Queues > Available Storage
Airport Road and Walker Road	Stop	A.M.	D	25.6 s (WB)	0.36 (EB)	None
		Mid-Day	C	21.8 s (WB)	0.31 (EB)	None
		P.M.	E	48.2 s (EB)	0.70 (EB)	None
Walker Road and Site Access A	Stop	A.M.	A	9.6 s (SB)	0.01 (SB)	None
		Mid-Day	B	10.1 s (SB)	0.04 (SB)	None
		P.M.	B	10.9 s (SB)	0.05 (SB)	None
Airport Road and Site Access C	Stop	A.M.	B	12.2 s (EB)	0.01 (EB)	None
		Mid-Day	B	10.9 s (EB)	0.01 (EB)	None
		P.M.	B	13.5 s (EB)	0.01 (EB)	None

Note: The Level of Service of a stop-controlled intersection is based on the delay associated with the critical minor road approach; i.e., Walker Road.

The metrics listed above indicate that the site accesses are expected to operate efficiently with minimal delays. The intersection of Airport Road and Walker Road is expected to operate at levels of service "D", "C" and "E" in the weekday a.m., mid-day and p.m. peak hours, respectively, under unsignalized conditions. The addition of site generated traffic results in an increase in control delay of 13.7 seconds in the p.m. peak hour, and less than two seconds in the weekday a.m. and mid-day peak hours. Furthermore, the addition of the site generated traffic results in a maximum increase in volume-to-capacity ratio of 0.14.

7. Sight Distance Assessment

A sight distance analysis was conducted to confirm that there is sufficient sight distance for drivers approaching and exiting the site on Airport Road. The measured sight distances were compared to the standards set out in the Transportation Association of Canada (TAC) Geometrics Design Guide for Canadian Roads (GDGCR).

7.1 Stopping Sight Distance

As noted previously, Airport Road has a design speed of 60 km/h and Walker Road has a design speed of 50 km/h. Airport Road has a downward slope travelling south towards the site accesses. Using aerial photography, a three percent downgrade was estimated on Airport Road approaching the accesses from the north. Airport Road is relatively level approaching the accesses from the south, similarly, Walker Road is level fronting the access. The minimum stopping sight distance requirements are as follows:

- Per TAC GDGCR Table 2.5.3, the minimum stopping sight distance for roads with a downgrade of three percent and a design speed of 60 km/h is 87 metres.
- Per TAC GDGCR Table 2.5.2, the minimum stopping sight-distance for level roadways with a design speed of 60 km/h is 85 metres.
- Per TAC GDGCR Table 2.5.2, the minimum stopping sight-distance for level roadways with a design speed of 50 km/h is 65 metres.

The available sight distance to the north and south of the Airport Road residential access is in excess of 200 metres. The Walker Road access is located approximately 55 metres west of the centre of the intersection of Airport Road and Walker Road. Clear sight lines are available to Airport Road, where vehicles would be approaching from turning movements, and therefore would not have attained the posted or design speed before reaching the access. To the west of the access, the available sight distance is in excess of 200 metres.

There is sufficient sight distance at the proposed accesses to meet the minimum TAC stopping sight distance criteria.

Relevant TAC GDGCR excerpts are included in **Appendix K**.

7.2 Intersection Sight Distance

Section 9.9 of the TAC GDGCR provides intersection sight distance for different intersection control types. The applicable cases are as follows:

- Case B – Intersections with stop control on the minor road
  - Case B1 – Left turn from the minor road
  - Case B2 – Right turn from the minor road
- Case F – Left turns from the major road

Intersection sight distance is calculated using equation 9.9.1 from the GDGCR as outlined below:

$$ISD = 0.278 * V\ major * t_G$$

Where;
ISD = Intersection Sight Distance
V_{major} = design speed of roadway (km/h)
t_G = assumed time gap for vehicles to turn from stop onto roadway (s)

The calculated and design sight distances are further summarized in TAC GDGCR Tables 9.9.4, 9.9.6 and 9.9.12 for vehicles turning left from stop, turning right from stop, or turning left from the major road, respectively. Case B1 represents the most conservative sight distance requirement, accordingly, **Table 12** contains a summary of the intersection sight distance requirements for case B1.

Table 12: Intersection Sight Distance Requirements

Case	Approach	Time Gap	Required Intersection Sight Distance	Available Sight Distance	TAC Reference
Airport Road Design Speed = 60 km/h					
B1: Vehicles turning left from stop	North	8.0 s	135 m	+ 200 m	Table 9.9.3 and Equation 9.9.1
	South	8.0 s	135 m	+ 200 m	Table 9.9.3 and Equation 9.9.1
Walker Road Design Speed = 50 km/h					
B1: Vehicles turning left from stop	East	7.5 s	105 m	55 m [1]	Table 9.9.4
	West	7.5 s	105 m	+ 200 m	Table 9.9.4

Note[1]: The intersection of Airport Road and Walker Road is 55 metres east of the site access.

Walker Road forms the minor approach of the intersection of Airport Road and Walker Road. Walker Road has a straight and flat profile, and as such there are clear sightlines to the nearby intersection. The access is located approximately 55 metres west of the intersection of Airport Road and Walker Road. While this distance is less than the minimum sight distance requirements, vehicles from Airport Road would approach via turning movements, thus, vehicles are not expected to attain operating speed before reaching the site accesses. Therefore, there is sufficient sight distance for vehicles approaching and exiting the proposed Walker Road site access.

The available sight distance on Walker Road to the west, and Airport Road to the north and south exceed the minimum sight distance requirements. Accordingly, the proposed accesses can be supported from a sight distance perspective. Relevant excerpts from TAC GDGCR have been included in **Appendix K**.

8. Transit and Cycling

There are no transit facilities within a ten-kilometre radius of the site at this time. As such, transit is not considered to be a viable/convenient primary transportation mode choice for accessing the site. The Caledon Trailway, Trans Canada Trail and Greenbelt Cycling Route intersect with Airport Road approximately 500 metres south of the intersection of Airport Road and Walker Road, offering east/west cycling connectivity throughout Caledon. The "Prelimimary Preferred Design" released with the recent EA documents proposes a multi-use pathway along the west side of Airport Road with a dedicated bicycle crossing at Walker Road. The "Preliminary Preferred Design" has been included as **Appendix F** for reference.

9. Truck Turning Analysis

A truck turning analysis was completed for the site to demonstrate that design vehicles could manoeuvre through the site and access the proposed delivery space without any conflicts. The vehicle manoeuvring diagrams have been included in **Appendix L**. The diagrams demonstrate that the internal road layout allows for continuous curbside pickup, and a refuse vehicle and emergency vehicle can manoeuvre through the site without any conflicts with curbs or parking spaces. Additionally, Light Single Unit (LSU) trucks can access the proposed delivery space without any conflicts with curbs or parking spaces. Accordingly, the proposed Site Plan is supportable from a vehicular manoeuvring perspective.

10. Conclusions

The detailed analysis contained within this report has resulted in the following key findings:

- Examination of the existing 2016 traffic conditions indicate that the Airport Road and Walker Road intersection is operating efficiently at a LOS "C" or better during the weekday a.m., mid-day and p.m. peak hours;

- Examination of the 2019, 2024 and 2029 future background traffic conditions indicate that the Airport Road and Walker Road intersection is anticipated to continue operating efficiently at a LOS "D" or better during the weekday a.m., mid-day and p.m. peak hours;

- Calculation of the trips generated by the proposed residential and commercial development indicate that the proposed development is expected to add 28, 46 and 53 primary trips and 0, 17 and 18 pass-by trips to the boundary road network in the weekday a.m., mid-day and p.m. peak hours, respectively;

- Completion of an auxiliary turn-lane analysis indicates that a northbound left-turn lane with 15 metres of storage is warranted at Site Access C. It is recommended that the left-turn lane at Leamster Trail be extended south past the access to allow for a consistent road width;

    - It is noted that the traffic volumes at Site Access A are too low to warrant an eastbound left-turn lane;

- Per comments dated April 8, 2020 by the Region of Peel, a southbound right-turn lane is required at the right-in only commercial entrance on Airport Road. Given the spacing between the two Airport Road entrances, only a taper has been recommended;

- Examination of the 2024 and 2029 future total traffic conditions indicate that the Airport Road and Walker Road intersection is anticipated to operate at a LOS "E" or better during the weekday a.m., mid-day and p.m. peak hours and the control delay and maximum volume to capacity ratios are expected to experience a maximum increase of 13.7 seconds and 0.14, respectively, when compared with future background traffic operations;

- Examination of the 2024 and 2029 future total traffic conditions at Site Accesses A and C indicates that the accesses are anticipated to operate efficiently at a LOS "B" or better during the weekday a.m., mid-day and p.m. peak hours, with a maximum control delay and volume-to-capacity ratio of 13.5 seconds and 0.05, respecitvely. The proposed site accesses can be supported from a traffic operations perspective;

- Assessment of sight distances at the site accesses indicate that there is sufficient sight distance for vehicles entering and exiting the site. Accordingly, the proposed development is not expected to create a safety hazard due to vehicle ingress or egress at the full moves site accesses on Airport Road and Walker Road. The proposed accesses can be supported from a sight distance perspective; and,

- Assessment of the vehicle manoeuvres indicates that refuse vehicles, emergency vehicles and LSU trucks can manoeuvre through the site without any conflicts with internal curbs or parking spaces.

As described above, a northbound left-turn lane is warranted at the Airport Road residential access with a minimum storage of 15 metres, and the Region of Peel has requested that a southbound right-turn lane be provided at the proposed commercial right-in only access. Given the spacing between the two Airport Road entrances, only a taper has been recommended. The above recommendations have been illustrated on a Preliminary Functional Design, included as **Figure 15** and are reflected on the Site Plan included as **Figure 1**.

It is concluded that the traffic generated from the proposed development can be accommodated by the boundary road network, with the noted recommendations.

The analysis undertaken herein was prepared using the Development Concept Plan dated June 12, 2019. The trip generation described herein was overstated by one trip, four trips and one trip in the weekday a.m., mid-day and p.m. peak hours, respectively. As such, the findings and conclusions contained within this report remain valid when considering the revised Site Plan dated November 16, 2020. Any minor changes to the Site Plan will not materially affect the conclusions contained within this report.

The proposed mixed-use development can be supported from a traffic safety, operations and circulation perspective, with the implementation of the noted recommendations.

Prepared by,

C.F. CROZIER & ASSOCIATES INC.

Alexander J. W. Fleming, MBA, P.Eng.
Associate

C.F. CROZIER & ASSOCIATES INC.

Madeleine Ferguson, P.Eng.
Project Engineer, Transportation

/MF

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APPENDIX A

Correspondence

Madeleine Ferguson

Subject: FW: 16114 Airport Road - TIS ToR

From: Dean McMillan <Dean.McMillan@caledon.ca>
Sent: Wednesday, August 10, 2016 12:50 PM
To: Madeleine Ferguson <mferguson@cfcrozier.ca>
Cc: Michael Linton <mlinton@cfcrozier.ca>; Alex Fleming <afleming@cfcrozier.ca>
Subject: RE: 16114 Airport Road - TIS ToR

Madeleine,

Thank you for the e-mail below, very much appreciated.

My comments include the following:

- Typically, our traffic count data includes collection during the hours of 7:00 a.m. to 9:00 a.m., 11:00 a.m. to 2:00 p.m. and 3:00 p.m. to 6:00 p.m.
- It would be ideal if you could include any parking analysis that you have conducted or parking information collected pertaining to this development

If you have any questions or concerns, please contact me at the number below,

Dean

Dean McMillan
Acting Manager, Transportation
Transportation
Finance & Infrastructure Services

Town of Caledon
6311 Old Church Road
Caledon, ON L7C 1J6
1.888.225.3366
905.584.2272 x.4093

www.caledon.ca
www.visitcaledon.ca

Madeleine Ferguson

From: Kol, Rani <rani.kol@peelregion.ca>
Sent: Friday, August 12, 2016 10:02 AM
To: Madeleine Ferguson
Subject: Traffic Engineering Comments - Terms of Reference - 16114 Airport Road - our file D-00729675W

Madeleine,

This is in response to your request for Regional input to the proposed Terms of Reference for the Traffic Impact Study (TIS) associated with the proposed above noted development. We would like to offer the following comments with respect to analysis of Regional Roads:

Full Description
The study should provide a full description of the proposed development. This will include, but not be limited to the following:

1. Municipal address;
2. Existing land uses that are permitted and use provisions in an Official Plan Amendment, Zoning By-law, etc.;
3. Proposed land uses;
4. Floor space including a summary of each type of use;
5. Anticipated date of occupancy;
6. Planned phasing of the development;
7. We agree with the listed intersections to be included;
8. Number of lanes, width and configuration;
    - All design standards must be in accordance with those outlined in the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads and the Ministry of Transportation, Ontario (MTO) Geometric Design Standards for Ontario Highways.
9. Proposed access points and type of access;
    - When determining the location of an access, consideration should be given to how the access will affect the surrounding road network, area residents and area businesses. All proposed site access points on Regional roads should be evaluated for capacity, safety and adequacy of queue storage capacity. Approval of the proposed access will be evaluated using the Region of Peel's current Controlled Access By-law and sound engineering judgement.
    - Please refer to the Region of Peel Public Works Standard Drawing 5-1-4, typical design for right in/right out access.
10. Nearby transit facilities/stops;
11. Bike paths;
12. A combination of maps and other documentation which will identify all relevant information.
13. Confirmation from Town of Caledon staff for any on-street parking requirements is needed. Should on-street parking be required, it will be required to be incorporated into a functional design.

Traffic Volume Analysis
Please include the following in the analysis:

1. We agree with the proposed horizon years;
2. We agree with the AM and PM peak periods;
3. Background, Site Generated and Total traffic volumes;
4. "Worst case" combination of site-related and background traffic;
5. Please contact Eric Chan, Principal Planner, Transportation Planning at extension 4417 to obtain the Growth Rates along Airport Road;

6. Please contact Josh Di Rocco, Traffic Operations at extension 7905 for most recent average annual daily traffic (AADT) and TMCs required for the study.

Functional Design

The Region will consider right-in/right-out access onto Airport Road. A functional design of any right turn lanes will be required.

Appendix

The following is to be included in the appendix:

1. Turning movement counts (include date counted) with breakdown of heavy vehicle counts;
2. Signal timing plan for signalized intersections; and
3. Electronic Synchro files (CD copy or sent concurrently with the TIS via email).

The traffic impact study should consist of a main document, supplemented by technical appendices containing detailed analyses as required.

The Region of Peel will require one (1) copy to be in electronic format and two (2) hard copies complete with the appropriate supporting documentation. This shall be submitted to the Traffic Engineering section of Public Works for our review and comment.

All information submitted to Regional staff in connection with any Traffic Impact Study will be considered to be in the public domain.

Also, for reference, the Region's generic terms of reference can be found at
https://www.peelregion.ca/pw/transportation/business/impact-study.htm

Should you have any further questions or concerns regarding this matter, please feel free to contact me.

Sincerely,

Rani Kol
Technical Analyst, Traffic Development & Permits
Transportation Division, Public Works

Tel: (905) 791-7800 ext. 7858
Fax: (905) 791-1442

APPENDIX B

Turning Movement Counts

Ontario Traffic Inc.

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:45:00
To: 8:45:00

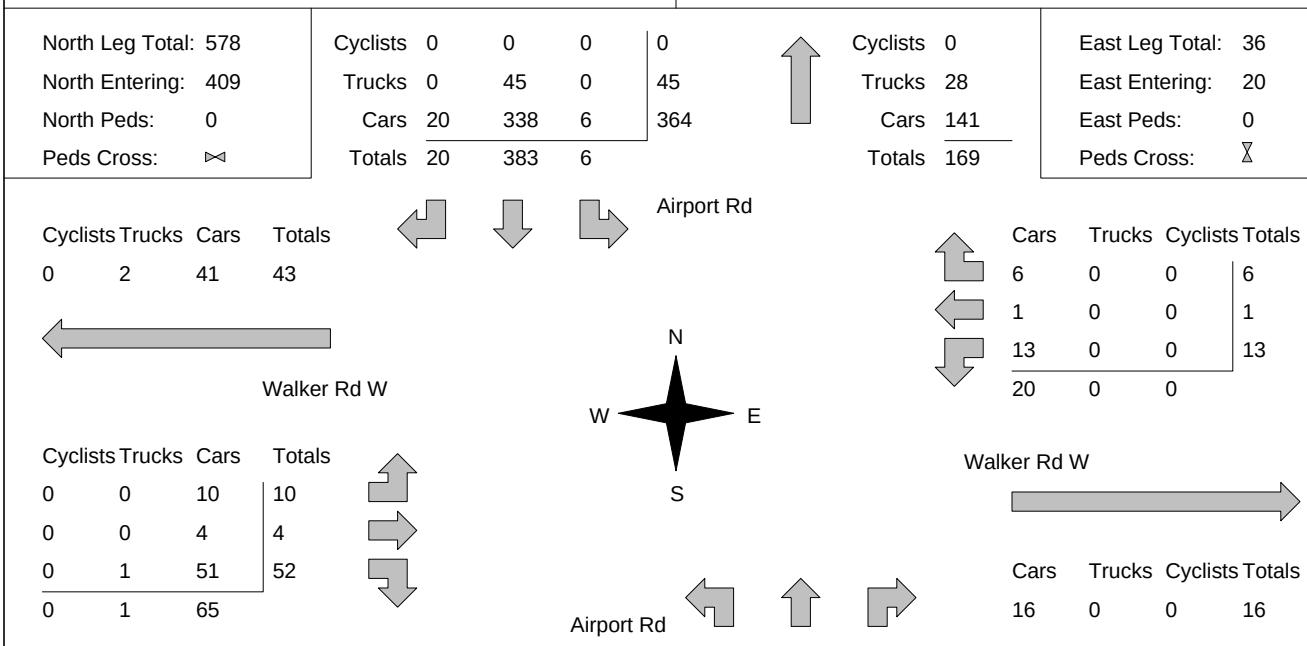
Municipality: Caledon
Site #: 1625000001
Intersection: Airport Rd & Walker Rd W
TFR File #: 1
Count date: 17-Aug-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Airport Rd runs N/S



Comments

Ontario Traffic Inc.

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 12:30:00
To: 13:30:00

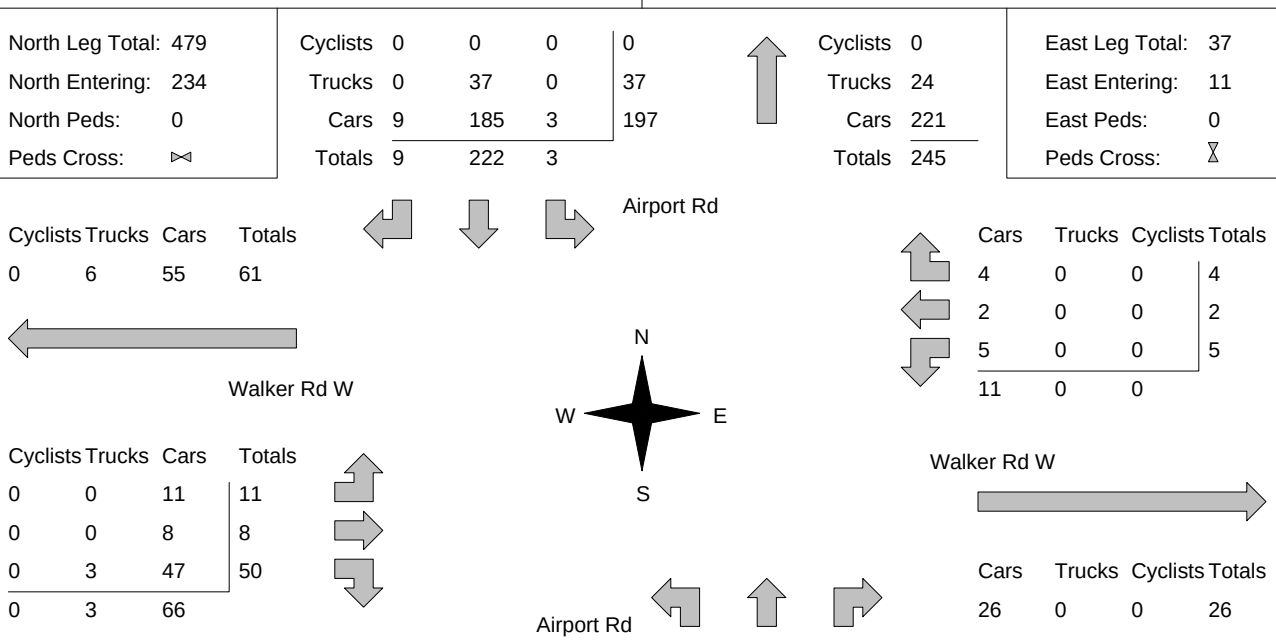
Municipality: Caledon
Site #: 1625000001
Intersection: Airport Rd & Walker Rd W
TFR File #: 1
Count date: 17-Aug-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Airport Rd runs N/S



Comments

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:30:00
To: 17:30:00

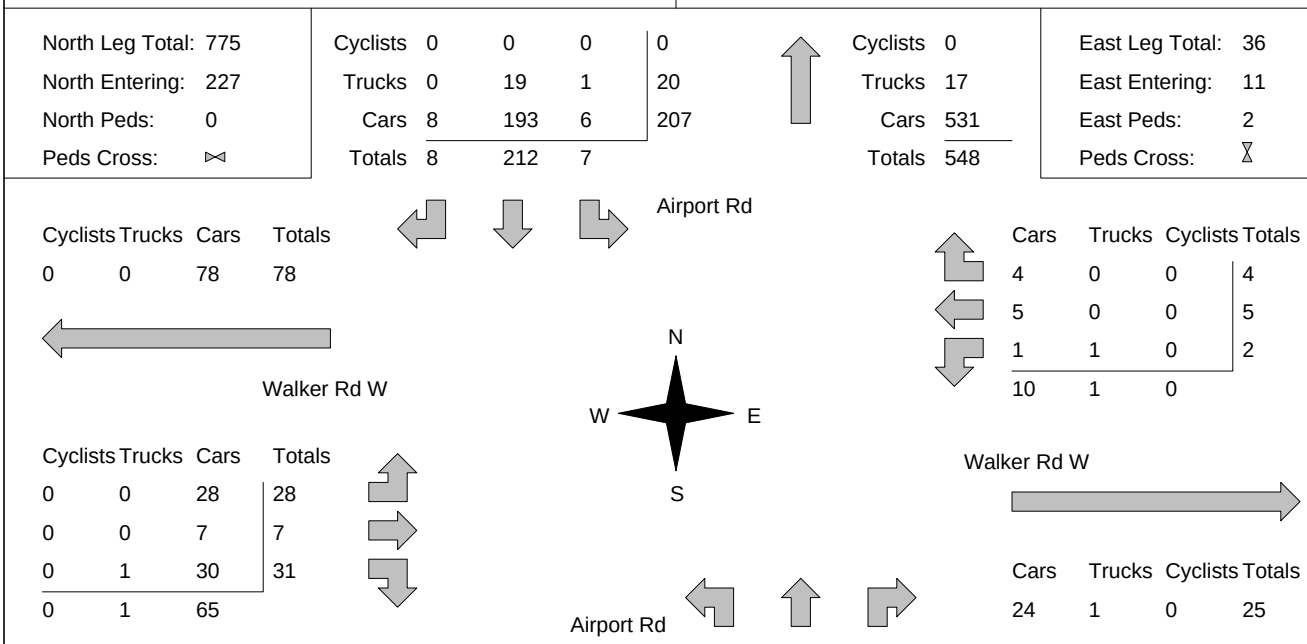
Municipality: Caledon
Site #: 1625000001
Intersection: Airport Rd & Walker Rd W
TFR File #: 1
Count date: 17-Aug-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Airport Rd runs N/S



Comments

Ontario Traffic Inc.

Total Count Diagram

Municipality: Caledon
Site #: 1625000001
Intersection: Airport Rd & Walker Rd W
TFR File #: 1
Count date: 17-Aug-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Airport Rd runs N/S

North Leg Total:	4615			
North Entering:	2186			
North Peds:	0			
Peds Cross:	⋈			
Cyclists	0	0	0	0
Trucks	2	237	1	240
Cars	98	1816	32	1946
Totals	100	2053	33	
Cyclists	0			
Trucks	170			
Cars	2259			
Totals	2429			
East Leg Total:	286			
East Entering:	120			
East Peds:	8			
Peds Cross:	⧖			

Airport Rd

Cyclists	Trucks	Cars	Totals
0	16	428	444

Cars	Trucks	Cyclists	Totals
41	0	0	41
27	0	0	27
51	1	0	52
119	1	0	

Walker Rd W

N
W E
S

Cyclists	Trucks	Cars	Totals
0	0	120	120
0	1	46	47
0	8	300	308
0	9	466	

Walker Rd W

Cars	Trucks	Cyclists	Totals
163	3	0	166

Airport Rd

Peds Cross:	⧖			
West Peds:	18			
West Entering:	475			
West Leg Total:	919			
Cars	2167			
Trucks	246			
Cyclists	0			
Totals	2413			
Cars	303	2098	85	2486
Trucks	14	170	1	185
Cyclists	0	0	0	0
Totals	317	2268	86	
Peds Cross:	⋈			
South Peds:	2			
South Entering:	2671			
South Leg Total:	5084			

Comments

Ontario Traffic Inc.
Traffic Count Summary

Intersection: Airport Rd & Walker Rd W | **Count Date:** 17-Aug-16 | **Municipality:** Caledon

North Approach Totals

Hour Ending	Includes Cars, Trucks, & Cyclists: Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches
7:00:00	0	0	0	0	0	0
8:00:00	2	393	23	418	0	569
9:00:00	5	349	21	375	0	554
11:00:00	1	5	0	6	0	9
12:00:00	4	217	10	231	0	478
13:00:00	5	227	13	245	0	504
14:00:00	2	215	4	221	0	511
15:00:00	0	5	0	5	0	18
16:00:00	3	216	9	228	0	630
17:00:00	4	219	9	232	0	800
18:00:00	7	207	11	225	0	780
Totals:	33	2053	100	2186	0	4853

South Approach Totals

Hour Ending	Includes Cars, Trucks, & Cyclists: Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	10	136	5	151	1
9:00:00	18	155	6	179	0
11:00:00	0	2	1	3	0
12:00:00	31	202	14	247	0
13:00:00	44	202	13	259	0
14:00:00	52	225	13	290	0
15:00:00	3	10	0	13	0
16:00:00	38	353	11	402	0
17:00:00	57	503	8	568	1
18:00:00	64	476	15	555	0
Totals:	317	2264	86	2667	2

East Approach Totals

Hour Ending	Includes Cars, Trucks, & Cyclists: Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches
7:00:00	0	0	0	0	0	0
8:00:00	12	5	2	19	0	80
9:00:00	8	0	7	15	0	74
11:00:00	0	2	0	2	0	3
12:00:00	8	5	6	19	1	74
13:00:00	4	3	7	14	4	80
14:00:00	7	2	4	13	0	72
15:00:00	0	0	0	0	0	0
16:00:00	6	2	8	16	0	73
17:00:00	5	2	4	11	2	64
18:00:00	1	6	3	10	1	74
Totals:	51	27	41	119	8	594

West Approach Totals

Hour Ending	Includes Cars, Trucks, & Cyclists: Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	17	4	40	61	5
9:00:00	8	4	47	59	2
11:00:00	0	1	0	1	0
12:00:00	9	2	44	55	0
13:00:00	12	10	44	66	4
14:00:00	5	9	45	59	7
15:00:00	0	0	0	0	0
16:00:00	20	5	32	57	0
17:00:00	22	7	24	53	0
18:00:00	27	5	32	64	0
Totals:	120	47	308	475	18

Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00
Crossing Values:	35	20	22	26	21	31	35	34

Ontario Traffic Inc.

Count Date: 17-Aug-16 Site #: 1625000001

Interval Time	Passenger Cars - North Approach						Trucks - North Approach						Cyclists - North Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		North Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	91	91	4	4	0	0	4	4	0	0	0	0	0	0	0	0	0	0
7:30:00	0	0	174	83	13	9	0	0	8	4	0	0	0	0	0	0	0	0	0	0
7:45:00	1	1	272	98	18	5	0	0	17	9	0	0	0	0	0	0	0	0	0	0
8:00:00	2	1	364	92	23	5	0	0	29	12	0	0	0	0	0	0	0	0	0	0
8:15:00	2	0	435	71	26	3	0	0	41	12	0	0	0	0	0	0	0	0	0	0
8:30:00	6	4	524	89	33	7	0	0	51	10	0	0	0	0	0	0	0	0	0	0
8:45:00	7	1	610	86	38	5	0	0	62	11	0	0	0	0	0	0	0	0	0	0
9:00:00	7	0	671	61	42	4	0	0	71	9	2	2	0	0	0	0	0	0	0	0
9:01:14	8	1	675	4	42	0	0	0	71	0	2	0	0	0	0	0	0	0	0	0
11:00:00	8	0	675	0	42	0	0	0	72	1	2	0	0	0	0	0	0	0	0	0
11:15:00	8	0	720	45	45	3	0	0	79	7	2	0	0	0	0	0	0	0	0	0
11:30:00	10	2	765	45	48	3	0	0	89	10	2	0	0	0	0	0	0	0	0	0
11:45:00	11	1	816	51	51	3	0	0	102	13	2	0	0	0	0	0	0	0	0	0
12:00:00	12	1	858	42	52	1	0	0	106	4	2	0	0	0	0	0	0	0	0	0
12:15:00	14	2	903	45	54	2	0	0	111	5	2	0	0	0	0	0	0	0	0	0
12:30:00	15	1	957	54	59	5	0	0	116	5	2	0	0	0	0	0	0	0	0	0
12:45:00	15	0	1021	64	62	3	0	0	122	6	2	0	0	0	0	0	0	0	0	0
13:00:00	17	2	1059	38	65	3	0	0	132	10	2	0	0	0	0	0	0	0	0	0
13:15:00	18	1	1099	40	67	2	0	0	142	10	2	0	0	0	0	0	0	0	0	0
13:30:00	18	0	1142	43	68	1	0	0	153	11	2	0	0	0	0	0	0	0	0	0
13:45:00	18	0	1192	50	68	0	0	0	160	7	2	0	0	0	0	0	0	0	0	0
14:00:00	19	1	1240	48	69	1	0	0	166	6	2	0	0	0	0	0	0	0	0	0
14:00:39	19	0	1240	0	69	0	0	0	166	0	2	0	0	0	0	0	0	0	0	0
15:00:00	19	0	1244	4	69	0	0	0	167	1	2	0	0	0	0	0	0	0	0	0
15:15:00	19	0	1294	50	71	2	0	0	176	9	2	0	0	0	0	0	0	0	0	0
15:30:00	20	1	1335	41	74	3	0	0	188	12	2	0	0	0	0	0	0	0	0	0
15:45:00	21	1	1377	42	75	1	0	0	194	6	2	0	0	0	0	0	0	0	0	0
16:00:00	22	1	1428	51	78	3	0	0	199	5	2	0	0	0	0	0	0	0	0	0
16:15:00	23	1	1481	53	80	2	0	0	205	6	2	0	0	0	0	0	0	0	0	0
16:30:00	23	0	1533	52	81	1	0	0	211	6	2	0	0	0	0	0	0	0	0	0
16:45:00	25	2	1588	55	84	3	0	0	217	6	2	0	0	0	0	0	0	0	0	0
17:00:00	26	1	1623	35	87	3	0	0	223	6	2	0	0	0	0	0	0	0	0	0
17:15:00	26	0	1675	52	89	2	1	1	226	3	2	0	0	0	0	0	0	0	0	0
17:30:00	29	3	1726	51	89	0	1	0	230	4	2	0	0	0	0	0	0	0	0	0
17:45:00	32	3	1772	46	94	5	1	0	235	5	2	0	0	0	0	0	0	0	0	0
18:00:00	32	0	1816	44	98	4	1	0	237	2	2	0	0	0	0	0	0	0	0	0
18:00:14	32	0	1816	0	98	0	1	0	237	0	2	0	0	0	0	0	0	0	0	0

Ontario Traffic Inc.

Count Date: 17-Aug-16 Site #: 1625000001

Interval Time	Passenger Cars - East Approach						Trucks - East Approach						Cyclists - East Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		East Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	3	2	4	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45:00	7	4	4	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00:00	12	5	5	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15:00	18	6	5	0	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30:00	19	1	5	0	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45:00	20	1	5	0	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00:00	20	0	5	0	9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:01:14	20	0	7	2	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00:00	20	0	7	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15:00	20	0	8	1	11	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1
11:30:00	23	3	9	1	12	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
11:45:00	27	4	9	0	13	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
12:00:00	28	1	12	3	15	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0
12:15:00	30	2	13	1	18	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0
12:30:00	31	1	14	1	21	3	0	0	0	0	0	0	0	0	0	0	0	0	5	4
12:45:00	31	0	14	0	22	1	0	0	0	0	0	0	0	0	0	0	0	0	5	0
13:00:00	32	1	15	1	22	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
13:15:00	33	1	15	0	24	2	0	0	0	0	0	0	0	0	0	0	0	0	5	0
13:30:00	36	3	16	1	25	1	0	0	0	0	0	0	0	0	0	0	0	0	5	0
13:45:00	38	2	16	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
14:00:00	39	1	17	1	26	1	0	0	0	0	0	0	0	0	0	0	0	0	5	0
14:00:39	39	0	17	0	26	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
15:00:00	39	0	17	0	26	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
15:15:00	43	4	17	0	27	1	0	0	0	0	0	0	0	0	0	0	0	0	5	0
15:30:00	43	0	19	2	30	3	0	0	0	0	0	0	0	0	0	0	0	0	5	0
15:45:00	45	2	19	0	33	3	0	0	0	0	0	0	0	0	0	0	0	0	5	0
16:00:00	45	0	19	0	34	1	0	0	0	0	0	0	0	0	0	0	0	0	5	0
16:15:00	46	1	19	0	36	2	0	0	0	0	0	0	0	0	0	0	0	0	5	0
16:30:00	48	2	20	1	36	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
16:45:00	48	0	21	1	38	2	0	0	0	0	0	0	0	0	0	0	0	0	5	0
17:00:00	49	1	21	0	38	0	1	1	0	0	0	0	0	0	0	0	0	0	7	2
17:15:00	49	0	23	2	39	1	1	0	0	0	0	0	0	0	0	0	0	0	7	0
17:30:00	49	0	25	2	40	1	1	0	0	0	0	0	0	0	0	0	0	0	7	0
17:45:00	50	1	26	1	40	0	1	0	0	0	0	0	0	0	0	0	0	0	8	1
18:00:00	50	0	27	1	41	1	1	0	0	0	0	0	0	0	0	0	0	0	8	0
18:00:14	51	1	27	0	41	0	1	0	0	0	0	0	0	0	0	0	0	0	8	0

Ontario Traffic Inc.

Count Date: 17-Aug-16 Site #: 1625000001

Interval Time	Passenger Cars - South Approach						Trucks - South Approach						Cyclists - South Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		South Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	1	1	16	16	1	1	0	0	11	11	0	0	0	0	0	0	0	0	0	0
7:30:00	1	0	44	28	3	2	0	0	17	6	0	0	0	0	0	0	0	0	0	0
7:45:00	2	1	71	27	3	0	0	0	21	4	0	0	0	0	0	0	0	0	1	1
8:00:00	8	6	108	37	5	2	2	2	28	7	0	0	0	0	0	0	0	0	1	0
8:15:00	12	4	126	18	7	2	2	0	36	8	0	0	0	0	0	0	0	0	1	0
8:30:00	14	2	162	36	9	2	2	0	42	6	0	0	0	0	0	0	0	0	1	0
8:45:00	22	8	196	34	9	0	2	0	49	7	0	0	0	0	0	0	0	0	1	0
9:00:00	26	4	234	38	10	1	2	0	57	8	1	1	0	0	0	0	0	0	1	0
9:01:14	26	0	235	1	10	0	2	0	57	0	1	0	0	0	0	0	0	0	1	0
11:00:00	26	0	236	1	11	1	2	0	57	0	1	0	0	0	0	0	0	0	1	0
11:15:00	34	8	277	41	15	4	2	0	58	1	1	0	0	0	0	0	0	0	1	0
11:30:00	43	9	314	37	21	6	2	0	67	9	1	0	0	0	0	0	0	0	1	0
11:45:00	50	7	380	66	23	2	2	0	71	4	1	0	0	0	0	0	0	0	1	0
12:00:00	57	7	421	41	25	2	2	0	74	3	1	0	0	0	0	0	0	0	1	0
12:15:00	67	10	460	39	28	3	2	0	80	6	1	0	0	0	0	0	0	0	1	0
12:30:00	75	8	502	42	29	1	2	0	83	3	1	0	0	0	0	0	0	0	1	0
12:45:00	85	10	555	53	35	6	4	2	93	10	1	0	0	0	0	0	0	0	1	0
13:00:00	96	11	600	45	38	3	7	3	97	4	1	0	0	0	0	0	0	0	1	0
13:15:00	108	12	655	55	40	2	7	0	104	7	1	0	0	0	0	0	0	0	1	0
13:30:00	119	11	708	53	44	4	8	1	107	3	1	0	0	0	0	0	0	0	1	0
13:45:00	127	8	773	65	45	1	9	1	111	4	1	0	0	0	0	0	0	0	1	0
14:00:00	144	17	808	35	51	6	11	2	114	3	1	0	0	0	0	0	0	0	1	0
14:00:39	144	0	809	1	51	0	12	1	114	0	1	0	0	0	0	0	0	0	1	0
15:00:00	146	2	817	8	51	0	12	0	115	1	1	0	0	0	0	0	0	0	1	0
15:15:00	153	7	891	74	54	3	14	2	117	2	1	0	0	0	0	0	0	0	1	0
15:30:00	166	13	975	84	57	3	14	0	119	2	1	0	0	0	0	0	0	0	1	0
15:45:00	174	8	1064	89	59	2	14	0	129	10	1	0	0	0	0	0	0	0	1	0
16:00:00	182	8	1146	82	62	3	14	0	139	10	1	0	0	0	0	0	0	0	1	0
16:15:00	196	14	1254	108	63	1	14	0	144	5	1	0	0	0	0	0	0	0	1	0
16:30:00	208	12	1365	111	65	2	14	0	149	5	1	0	0	0	0	0	0	0	1	0
16:45:00	226	18	1480	115	67	2	14	0	152	3	1	0	0	0	0	0	0	0	1	0
17:00:00	239	13	1631	151	70	3	14	0	157	5	1	0	0	0	0	0	0	0	2	1
17:15:00	260	21	1738	107	71	1	14	0	163	6	1	0	0	0	0	0	0	0	2	0
17:30:00	273	13	1864	126	76	5	14	0	166	3	1	0	0	0	0	0	0	0	2	0
17:45:00	288	15	1978	114	80	4	14	0	167	1	1	0	0	0	0	0	0	0	2	0
18:00:00	303	15	2094	116	85	5	14	0	170	3	1	0	0	0	0	0	0	0	2	0
18:00:14	303	0	2098	4	85	0	14	0	170	0	1	0	0	0	0	0	0	0	2	0

Ontario Traffic Inc.

Count Date: 17-Aug-16 Site #: 1625000001

Interval Time	Passenger Cars - West Approach						Trucks - West Approach						Cyclists - West Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		West Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	5	5	0	0	11	11	0	0	0	0	0	0	0	0	0	0	0	0	1	1
7:30:00	9	4	2	2	18	7	0	0	0	0	0	0	0	0	0	0	0	0	4	3
7:45:00	11	2	2	0	24	6	0	0	0	0	0	0	0	0	0	0	0	0	4	0
8:00:00	17	6	4	2	39	15	0	0	0	0	1	1	0	0	0	0	0	0	5	1
8:15:00	18	1	5	1	48	9	0	0	0	0	1	0	0	0	0	0	0	0	5	0
8:30:00	18	0	6	1	66	18	0	0	0	0	1	0	0	0	0	0	0	0	5	0
8:45:00	21	3	6	0	75	9	0	0	0	0	1	0	0	0	0	0	0	0	6	1
9:00:00	25	4	7	1	86	11	0	0	1	1	1	0	0	0	0	0	0	0	7	1
9:01:14	25	0	7	0	86	0	0	0	1	0	1	0	0	0	0	0	0	0	7	0
11:00:00	25	0	8	1	86	0	0	0	1	0	1	0	0	0	0	0	0	0	7	0
11:15:00	26	1	9	1	100	14	0	0	1	0	1	0	0	0	0	0	0	0	7	0
11:30:00	29	3	9	0	106	6	0	0	1	0	1	0	0	0	0	0	0	0	7	0
11:45:00	33	4	9	0	119	13	0	0	1	0	1	0	0	0	0	0	0	0	7	0
12:00:00	34	1	10	1	130	11	0	0	1	0	1	0	0	0	0	0	0	0	7	0
12:15:00	37	3	14	4	143	13	0	0	1	0	1	0	0	0	0	0	0	0	7	0
12:30:00	39	2	16	2	147	4	0	0	1	0	1	0	0	0	0	0	0	0	11	4
12:45:00	42	3	19	3	157	10	0	0	1	0	1	0	0	0	0	0	0	0	11	0
13:00:00	46	4	20	1	173	16	0	0	1	0	2	1	0	0	0	0	0	0	11	0
13:15:00	49	3	22	2	187	14	0	0	1	0	4	2	0	0	0	0	0	0	15	4
13:30:00	50	1	24	2	194	7	0	0	1	0	4	0	0	0	0	0	0	0	15	0
13:45:00	51	1	26	2	202	8	0	0	1	0	4	0	0	0	0	0	0	0	18	3
14:00:00	51	0	29	3	216	14	0	0	1	0	4	0	0	0	0	0	0	0	18	0
14:00:39	51	0	29	0	216	0	0	0	1	0	4	0	0	0	0	0	0	0	18	0
15:00:00	51	0	29	0	216	0	0	0	1	0	4	0	0	0	0	0	0	0	18	0
15:15:00	53	2	30	1	224	8	0	0	1	0	5	1	0	0	0	0	0	0	18	0
15:30:00	62	9	33	3	229	5	0	0	1	0	6	1	0	0	0	0	0	0	18	0
15:45:00	66	4	33	0	239	10	0	0	1	0	7	1	0	0	0	0	0	0	18	0
16:00:00	71	5	34	1	245	6	0	0	1	0	7	0	0	0	0	0	0	0	18	0
16:15:00	80	9	35	1	249	4	0	0	1	0	7	0	0	0	0	0	0	0	18	0
16:30:00	82	2	37	2	258	9	0	0	1	0	7	0	0	0	0	0	0	0	18	0
16:45:00	89	7	39	2	265	7	0	0	1	0	7	0	0	0	0	0	0	0	18	0
17:00:00	93	4	41	2	269	4	0	0	1	0	7	0	0	0	0	0	0	0	18	0
17:15:00	102	9	41	0	278	9	0	0	1	0	7	0	0	0	0	0	0	0	18	0
17:30:00	110	8	44	3	288	10	0	0	1	0	8	1	0	0	0	0	0	0	18	0
17:45:00	117	7	45	1	298	10	0	0	1	0	8	0	0	0	0	0	0	0	18	0
18:00:00	120	3	46	1	300	2	0	0	1	0	8	0	0	0	0	0	0	0	18	0
18:00:14	120	0	46	0	300	0	0	0	1	0	8	0	0	0	0	0	0	0	18	0

APPENDIX C

Level of Service Definitions

Level of Service Definitions

Two-Way Stop Controlled Intersections

Level of Service	Control Delay per Vehicle (seconds)	Interpretation
A	≤ 10	EXCELLENT. Large and frequent gaps in traffic on the main roadway. Queuing on the minor street is rare.
B	> 10 and ≤ 15	VERY GOOD. Many gaps exist in traffic on the main roadway. Queuing on the minor street is minimal.
C	> 15 and ≤ 25	GOOD. Fewer gaps exist in traffic on the main roadway. Delay on minor approach becomes more noticeable.
D	> 25 and ≤ 35	FAIR. Infrequent and shorter gaps in traffic on the main roadway. Queue lengths develop on the minor street.
E	> 35 and ≤ 50	POOR. Very infrequent gaps in traffic on the main roadway. Queue lengths become noticeable.
F	> 50	UNSATISFACTORY. Very few gaps in traffic on the main roadway. Excessive delay with significant queue lengths on the minor street.

Adapted from Highway Capacity Manual 2000, Transportation Research Board

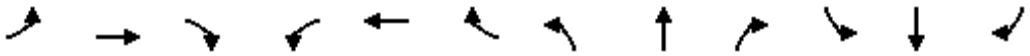
Signalized Intersections

Level of Service	Control Delay per Vehicle (seconds)	Interpretation
A	≤ 10	EXCELLENT. Extremely favourable progression with most vehicles arriving during the green phase. Most vehicles do not stop and short cycle lengths may contribute to low delay.
B	> 10 and ≤ 20	VERY GOOD. Very good progression and/or short cycle lengths with slightly more vehicles stopping than LOS "A" causing slightly higher levels of average delay.
C	> 20 and ≤ 35	GOOD. Fair progression and longer cycle lengths lead to a greater number of vehicles stopping than LOS "B".
D	> 35 and ≤ 55	FAIR. Congestion becomes noticeable with higher average delays resulting from a combination of long cycle lengths, high volume-to-capacity ratios and unfavourable progression.
E	> 55 and ≤ 80	POOR. Lengthy delays values are indicative of poor progression, long cycle lengths and high volume-to-capacity ratios. Individual cycle failures are common with individual movement failures also common.
F	> 80	UNSATISFACTORY. Indicative of oversaturated conditions with vehicular demand greater than the capacity of the intersection.

Adapted from Highway Capacity Manual 2000, Transportation Research Board

APPENDIX D

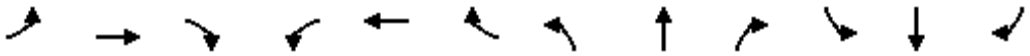
Detailed Capacity Analyses



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	4	52	13	1	6	22	153	6	6	383	20
Future Volume (Veh/h)	10	4	52	13	1	6	22	153	6	6	383	20
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	10	4	52	13	1	6	22	153	6	6	383	20
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	612	608	393	659	615	156	403			159		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	612	608	393	659	615	156	403			159		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	97	99	92	96	100	99	98			100		
cM capacity (veh/h)	398	403	660	341	400	890	1167			1379		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	66	20	181	409
Volume Left	10	13	22	6
Volume Right	52	6	6	20
cSH	580	422	1167	1379
Volume to Capacity	0.11	0.05	0.02	0.00
Queue Length 95th (m)	2.9	1.1	0.4	0.1
Control Delay (s)	12.0	13.9	1.1	0.2
Lane LOS	B	B	A	A
Approach Delay (s)	12.0	13.9	1.1	0.2
Approach LOS	B	B		

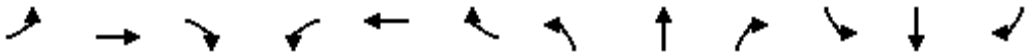
Intersection Summary				
Average Delay	2.0			
Intersection Capacity Utilization	33.0%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	8	50	5	2	4	50	230	15	3	222	9
Future Volume (Veh/h)	11	8	50	5	2	4	50	230	15	3	222	9
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	11	8	50	5	2	4	50	230	15	3	222	9
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	575	578	226	624	574	238	231			245		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	575	578	226	624	574	238	231			245		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.3	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2			2.3		
p0 queue free %	97	98	94	99	100	99	96			100		
cM capacity (veh/h)	415	413	818	360	415	792	1349			1265		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	69	11	295	234
Volume Left	11	5	50	3
Volume Right	50	4	15	9
cSH	645	463	1349	1265
Volume to Capacity	0.11	0.02	0.04	0.00
Queue Length 95th (m)	2.7	0.6	0.9	0.1
Control Delay (s)	11.2	13.0	1.6	0.1
Lane LOS	B	B	A	A
Approach Delay (s)	11.2	13.0	1.6	0.1
Approach LOS	B	B		

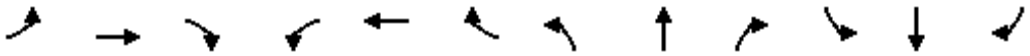
Intersection Summary				
Average Delay	2.3			
Intersection Capacity Utilization	42.4%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	28	7	31	2	5	4	65	516	11	7	212	8
Future Volume (Veh/h)	28	7	31	2	5	4	65	516	11	7	212	8
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	28	7	31	2	5	4	65	516	11	7	212	8
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	888	887	216	916	886	522	220			527		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	888	887	216	916	886	522	220			527		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.2			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3			2.2		
p0 queue free %	89	97	96	99	98	99	95			99		
cM capacity (veh/h)	247	269	829	230	270	553	1281			1050		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	66	11	592	227
Volume Left	28	2	65	7
Volume Right	31	4	11	8
cSH	374	319	1281	1050
Volume to Capacity	0.18	0.03	0.05	0.01
Queue Length 95th (m)	4.4	0.7	1.1	0.1
Control Delay (s)	16.7	16.7	1.4	0.3
Lane LOS	C	C	A	A
Approach Delay (s)	16.7	16.7	1.4	0.3
Approach LOS	C	C		

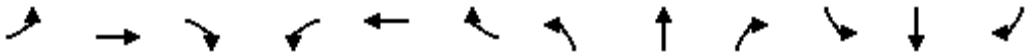
Intersection Summary				
Average Delay	2.4			
Intersection Capacity Utilization	61.2%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	4	55	14	1	6	23	162	6	6	406	21
Future Volume (Veh/h)	11	4	55	14	1	6	23	162	6	6	406	21
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	11	4	55	14	1	6	23	162	6	6	406	21
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	646	642	416	696	650	165	427			168		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	646	642	416	696	650	165	427			168		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	97	99	91	96	100	99	98			100		
cM capacity (veh/h)	377	385	641	319	381	879	1143			1368		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	70	21	191	433
Volume Left	11	14	23	6
Volume Right	55	6	6	21
cSH	558	394	1143	1368
Volume to Capacity	0.13	0.05	0.02	0.00
Queue Length 95th (m)	3.2	1.3	0.5	0.1
Control Delay (s)	12.4	14.7	1.2	0.2
Lane LOS	B	B	A	A
Approach Delay (s)	12.4	14.7	1.2	0.2
Approach LOS	B	B		

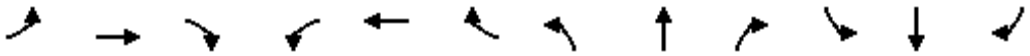
Intersection Summary				
Average Delay	2.0			
Intersection Capacity Utilization	34.5%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	8	53	5	2	4	53	244	16	3	236	10
Future Volume (Veh/h)	12	8	53	5	2	4	53	244	16	3	236	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	12	8	53	5	2	4	53	244	16	3	236	10
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	610	613	241	662	610	252	246			260		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	610	613	241	662	610	252	246			260		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.3	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2			2.3		
p0 queue free %	97	98	93	99	99	99	96			100		
cM capacity (veh/h)	393	393	803	336	395	777	1332			1249		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	73	11	313	249
Volume Left	12	5	53	3
Volume Right	53	4	16	10
cSH	624	439	1332	1249
Volume to Capacity	0.12	0.03	0.04	0.00
Queue Length 95th (m)	3.0	0.6	0.9	0.1
Control Delay (s)	11.5	13.4	1.6	0.1
Lane LOS	B	B	A	A
Approach Delay (s)	11.5	13.4	1.6	0.1
Approach LOS	B	B		

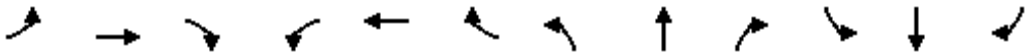
Intersection Summary				
Average Delay	2.4			
Intersection Capacity Utilization	44.5%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	7	33	2	4	5	69	548	12	7	225	8
Future Volume (Veh/h)	30	7	33	2	4	5	69	548	12	7	225	8
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	30	7	33	2	4	5	69	548	12	7	225	8
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	942	941	229	972	939	554	233			560		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	942	941	229	972	939	554	233			560		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.2			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3			2.2		
p0 queue free %	87	97	96	99	98	99	95			99		
cM capacity (veh/h)	227	249	815	210	250	530	1267			1021		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	70	11	629	240
Volume Left	30	2	69	7
Volume Right	33	5	12	8
cSH	348	314	1267	1021
Volume to Capacity	0.20	0.03	0.05	0.01
Queue Length 95th (m)	5.6	0.8	1.3	0.2
Control Delay (s)	17.9	16.9	1.5	0.3
Lane LOS	C	C	A	A
Approach Delay (s)	17.9	16.9	1.5	0.3
Approach LOS	C	C		

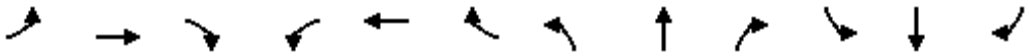
Intersection Summary				
Average Delay	2.6			
Intersection Capacity Utilization	64.4%	ICU Level of Service	C	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	4	151	15	1	7	56	179	7	7	448	23
Future Volume (Veh/h)	13	4	151	15	1	7	56	179	7	7	448	23
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	13	4	151	15	1	7	56	179	7	7	448	23
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	776	772	460	921	780	182	471			186		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	776	772	460	921	780	182	471			186		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	96	99	75	92	100	99	95			99		
cM capacity (veh/h)	301	314	606	180	311	860	1101			1347		

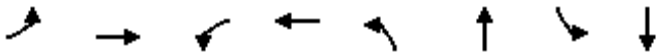
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	168	23	242	478
Volume Left	13	15	56	7
Volume Right	151	7	7	23
cSH	550	243	1101	1347
Volume to Capacity	0.31	0.09	0.05	0.01
Queue Length 95th (m)	9.8	2.4	1.2	0.1
Control Delay (s)	14.4	21.3	2.3	0.2
Lane LOS	B	C	A	A
Approach Delay (s)	14.4	21.3	2.3	0.2
Approach LOS	B	C		

Intersection Summary				
Average Delay	3.9			
Intersection Capacity Utilization	58.4%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	4	151	15	1	7	56	179	7	7	448	23
Future Volume (vph)	13	4	151	15	1	7	56	179	7	7	448	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	8.0	8.0		8.0	8.0		4.5	8.0		8.0	8.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.87		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1640		1825	1640		1825	1712		1674	1628	
Flt Permitted	0.75	1.00		0.71	1.00		0.38	1.00		0.64	1.00	
Satd. Flow (perm)	1446	1640		1372	1640		736	1712		1129	1628	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	13	4	151	15	1	7	56	179	7	7	448	23
RTOR Reduction (vph)	0	136	0	0	6	0	0	2	0	0	2	0
Lane Group Flow (vph)	13	19	0	15	2	0	56	184	0	7	469	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	12%	0%	9%	18%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	5.6	5.6		5.6	5.6		33.5	33.5		26.0	26.0	
Effective Green, g (s)	5.6	5.6		5.6	5.6		33.5	33.5		26.0	26.0	
Actuated g/C Ratio	0.10	0.10		0.10	0.10		0.61	0.61		0.47	0.47	
Clearance Time (s)	8.0	8.0		8.0	8.0		4.5	8.0		8.0	8.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	146	166		139	166		506	1040		532	768	
v/s Ratio Prot		c0.01			0.00		0.01	c0.11			c0.29	
v/s Ratio Perm	0.01			0.01			0.06			0.01		
v/c Ratio	0.09	0.12		0.11	0.01		0.11	0.18		0.01	0.61	
Uniform Delay, d1	22.4	22.5		22.5	22.3		4.8	4.7		7.7	10.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.3		0.3	0.0		0.1	0.4		0.0	3.6	
Delay (s)	22.7	22.8		22.8	22.3		4.9	5.1		7.8	14.4	
Level of Service	C	C		C	C		A	A		A	B	
Approach Delay (s)		22.8			22.6			5.1			14.3	
Approach LOS		C			C			A			B	

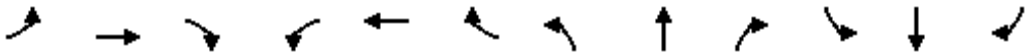
Intersection Summary			
HCM 2000 Control Delay	13.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	55.1	Sum of lost time (s)	20.5
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	13	155	15	8	56	186	7	471
v/c Ratio	0.07	0.45	0.08	0.04	0.09	0.17	0.01	0.54
Control Delay	19.7	9.2	20.0	13.0	4.6	6.3	11.3	17.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.7	9.2	20.0	13.0	4.6	6.3	11.3	17.5
Queue Length 50th (m)	1.1	0.3	1.2	0.1	1.5	6.9	0.4	35.4
Queue Length 95th (m)	4.7	12.3	5.0	2.8	5.2	17.0	2.5	#85.8
Internal Link Dist (m)		213.6		244.1		232.3		337.4
Turn Bay Length (m)	15.0		15.0		15.0		15.0	
Base Capacity (vph)	503	669	477	575	606	1104	602	871
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.23	0.03	0.01	0.09	0.17	0.01	0.54

Intersection Summary

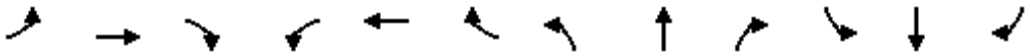
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	9	107	6	2	4	107	269	18	3	261	12
Future Volume (Veh/h)	14	9	107	6	2	4	107	269	18	3	261	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	14	9	107	6	2	4	107	269	18	3	261	12
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	770	774	267	876	771	278	273			287		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	770	774	267	876	771	278	273			287		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.3	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2			2.3		
p0 queue free %	95	97	86	97	99	99	92			100		
cM capacity (veh/h)	296	304	777	214	305	751	1302			1220		

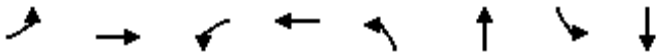
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	130	12	394	276
Volume Left	14	6	107	3
Volume Right	107	4	18	12
cSH	606	301	1302	1220
Volume to Capacity	0.21	0.04	0.08	0.00
Queue Length 95th (m)	6.1	0.9	2.0	0.1
Control Delay (s)	12.6	17.5	2.8	0.1
Lane LOS	B	C	A	A
Approach Delay (s)	12.6	17.5	2.8	0.1
Approach LOS	B	C		

Intersection Summary				
Average Delay	3.6			
Intersection Capacity Utilization	53.7%	ICU Level of Service	A	
Analysis Period (min)	15			



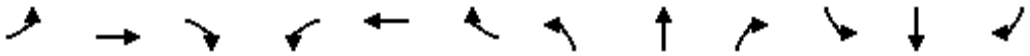
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	9	107	6	2	4	107	269	18	3	261	12
Future Volume (vph)	14	9	107	6	2	4	107	269	18	3	261	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	8.0	8.0		8.0	8.0		4.5	8.0		8.0	8.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.86		1.00	0.90		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1655		1825	1706		1825	1711		1674	1628	
Flt Permitted	0.75	1.00		0.73	1.00		0.50	1.00		0.58	1.00	
Satd. Flow (perm)	1448	1655		1397	1706		953	1711		1029	1628	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	14	9	107	6	2	4	107	269	18	3	261	12
RTOR Reduction (vph)	0	96	0	0	4	0	0	3	0	0	2	0
Lane Group Flow (vph)	14	20	0	6	2	0	107	284	0	3	271	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	12%	0%	9%	18%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	5.5	5.5		5.5	5.5		31.9	31.9		23.4	23.4	
Effective Green, g (s)	5.5	5.5		5.5	5.5		31.9	31.9		23.4	23.4	
Actuated g/C Ratio	0.10	0.10		0.10	0.10		0.60	0.60		0.44	0.44	
Clearance Time (s)	8.0	8.0		8.0	8.0		4.5	8.0		8.0	8.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	149	170		143	175		634	1022		450	713	
v/s Ratio Prot		c0.01			0.00		0.01	c0.17			c0.17	
v/s Ratio Perm	0.01			0.00			0.09			0.00		
v/c Ratio	0.09	0.12		0.04	0.01		0.17	0.28		0.01	0.38	
Uniform Delay, d1	21.7	21.7		21.6	21.5		4.8	5.2		8.5	10.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.3		0.1	0.0		0.1	0.7		0.0	1.5	
Delay (s)	22.0	22.1		21.7	21.5		4.9	5.9		8.5	11.6	
Level of Service	C	C		C	C		A	A		A	B	
Approach Delay (s)		22.0			21.6			5.6			11.6	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM 2000 Control Delay	10.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	53.4	Sum of lost time (s)	20.5
Intersection Capacity Utilization	46.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	14	116	6	6	107	287	3	273
v/c Ratio	0.07	0.38	0.03	0.03	0.15	0.26	0.01	0.34
Control Delay	19.9	9.9	19.3	14.8	4.7	6.7	11.0	13.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.9	9.9	19.3	14.8	4.7	6.7	11.0	13.4
Queue Length 50th (m)	1.1	0.7	0.5	0.2	3.0	11.3	0.2	17.3
Queue Length 95th (m)	4.9	11.2	2.9	2.5	8.3	25.1	1.4	36.8
Internal Link Dist (m)		213.6		244.1		232.3		337.4
Turn Bay Length (m)	15.0		15.0		15.0		15.0	
Base Capacity (vph)	512	654	494	605	731	1098	505	801
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.18	0.01	0.01	0.15	0.26	0.01	0.34

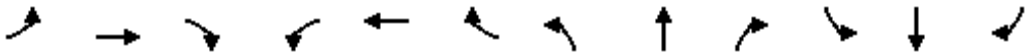
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	34	8	98	2	6	4	181	605	13	8	248	10
Future Volume (Veh/h)	34	8	98	2	6	4	181	605	13	8	248	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	34	8	98	2	6	4	181	605	13	8	248	10
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1250	1249	253	1344	1248	612	258			618		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1250	1249	253	1344	1248	612	258			618		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.2			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3			2.2		
p0 queue free %	73	95	88	98	96	99	85			99		
cM capacity (veh/h)	127	148	791	96	148	492	1240			972		

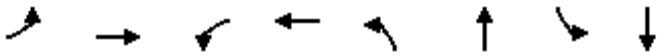
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	140	12	799	266
Volume Left	34	2	181	8
Volume Right	98	4	13	10
cSH	314	173	1240	972
Volume to Capacity	0.45	0.07	0.15	0.01
Queue Length 95th (m)	16.6	1.7	3.9	0.2
Control Delay (s)	25.3	27.4	3.4	0.3
Lane LOS	D	D	A	A
Approach Delay (s)	25.3	27.4	3.4	0.3
Approach LOS	D	D		

Intersection Summary				
Average Delay	5.5			
Intersection Capacity Utilization	79.6%	ICU Level of Service	D	
Analysis Period (min)	15			



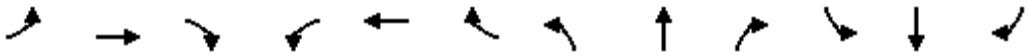
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	8	98	2	6	4	181	605	13	8	248	10
Future Volume (vph)	34	8	98	2	6	4	181	605	13	8	248	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	8.0	8.0		8.0	8.0		4.5	8.0		8.0	8.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.86		1.00	0.94		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1655		1825	1792		1825	1714		1674	1628	
Flt Permitted	0.75	1.00		0.70	1.00		0.50	1.00		0.43	1.00	
Satd. Flow (perm)	1443	1655		1348	1792		966	1714		759	1628	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	34	8	98	2	6	4	181	605	13	8	248	10
RTOR Reduction (vph)	0	88	0	0	4	0	0	1	0	0	2	0
Lane Group Flow (vph)	34	18	0	2	6	0	181	617	0	8	256	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	12%	0%	9%	18%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	5.7	5.7		5.7	5.7		31.9	31.9		23.4	23.4	
Effective Green, g (s)	5.7	5.7		5.7	5.7		31.9	31.9		23.4	23.4	
Actuated g/C Ratio	0.11	0.11		0.11	0.11		0.60	0.60		0.44	0.44	
Clearance Time (s)	8.0	8.0		8.0	8.0		4.5	8.0		8.0	8.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	153	175		143	190		639	1020		331	710	
v/s Ratio Prot		0.01			0.00		0.02	c0.36			0.16	
v/s Ratio Perm	c0.02			0.00			0.15			0.01		
v/c Ratio	0.22	0.11		0.01	0.03		0.28	0.61		0.02	0.36	
Uniform Delay, d1	21.9	21.6		21.4	21.5		5.1	6.9		8.6	10.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	0.3		0.0	0.1		0.2	2.7		0.1	1.4	
Delay (s)	22.7	21.9		21.5	21.6		5.3	9.5		8.7	11.5	
Level of Service	C	C		C	C		A	A		A	B	
Approach Delay (s)		22.1			21.5			8.6			11.4	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM 2000 Control Delay	10.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	53.6	Sum of lost time (s)	20.5
Intersection Capacity Utilization	65.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	34	106	2	10	181	618	8	258
v/c Ratio	0.18	0.35	0.01	0.04	0.25	0.57	0.02	0.32
Control Delay	21.6	9.7	18.5	16.2	5.2	10.4	11.4	13.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.6	9.7	18.5	16.2	5.2	10.4	11.4	13.4
Queue Length 50th (m)	2.8	0.7	0.2	0.5	5.6	33.8	0.5	16.7
Queue Length 95th (m)	8.8	10.7	1.6	3.6	13.0	69.3	2.6	34.7
Internal Link Dist (m)		213.6		244.1		232.3		337.4
Turn Bay Length (m)	15.0		15.0		15.0		15.0	
Base Capacity (vph)	508	645	474	633	735	1093	371	798
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.16	0.00	0.02	0.25	0.57	0.02	0.32

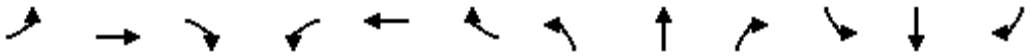
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	4	157	17	1	8	59	198	8	8	495	25
Future Volume (Veh/h)	14	4	157	17	1	8	59	198	8	8	495	25
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	14	4	157	17	1	8	59	198	8	8	495	25
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	852	848	508	1002	856	202	520			206		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	852	848	508	1002	856	202	520			206		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	95	99	72	89	100	99	94			99		
cM capacity (veh/h)	265	282	569	152	279	839	1056			1325		

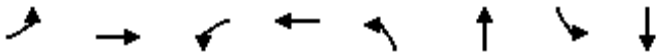
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	175	26	265	528
Volume Left	14	17	59	8
Volume Right	157	8	8	25
cSH	511	208	1056	1325
Volume to Capacity	0.34	0.12	0.06	0.01
Queue Length 95th (m)	11.5	3.2	1.3	0.1
Control Delay (s)	15.7	24.7	2.3	0.2
Lane LOS	C	C	A	A
Approach Delay (s)	15.7	24.7	2.3	0.2
Approach LOS	C	C		

Intersection Summary				
Average Delay	4.1			
Intersection Capacity Utilization	62.7%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	4	157	17	1	8	59	198	8	8	459	25
Future Volume (vph)	14	4	157	17	1	8	59	198	8	8	459	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	8.0	8.0		8.0	8.0		4.5	8.0		8.0	8.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.87		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1640		1825	1636		1825	1712		1674	1628	
Flt Permitted	0.75	1.00		0.70	1.00		0.37	1.00		0.63	1.00	
Satd. Flow (perm)	1444	1640		1348	1636		713	1712		1108	1628	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	14	4	157	17	1	8	59	198	8	8	459	25
RTOR Reduction (vph)	0	141	0	0	7	0	0	2	0	0	3	0
Lane Group Flow (vph)	14	20	0	17	2	0	59	204	0	8	481	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	12%	0%	9%	18%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	5.7	5.7		5.7	5.7		33.3	33.3		25.8	25.8	
Effective Green, g (s)	5.7	5.7		5.7	5.7		33.3	33.3		25.8	25.8	
Actuated g/C Ratio	0.10	0.10		0.10	0.10		0.61	0.61		0.47	0.47	
Clearance Time (s)	8.0	8.0		8.0	8.0		4.5	8.0		8.0	8.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	149	169		139	169		492	1036		519	763	
v/s Ratio Prot		0.01			0.00		0.01	c0.12			c0.30	
v/s Ratio Perm	0.01			c0.01			0.07			0.01		
v/c Ratio	0.09	0.12		0.12	0.01		0.12	0.20		0.02	0.63	
Uniform Delay, d1	22.3	22.4		22.4	22.1		4.9	4.9		7.8	11.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.3		0.4	0.0		0.1	0.4		0.1	3.9	
Delay (s)	22.6	22.7		22.8	22.1		5.0	5.3		7.9	14.9	
Level of Service	C	C		C	C		A	A		A	B	
Approach Delay (s)		22.7			22.6			5.2			14.8	
Approach LOS		C			C			A			B	

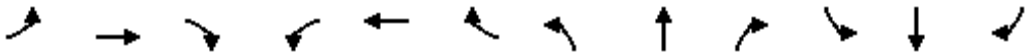
Intersection Summary			
HCM 2000 Control Delay	13.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	55.0	Sum of lost time (s)	20.5
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	14	161	17	9	59	206	8	484
v/c Ratio	0.07	0.46	0.10	0.04	0.10	0.19	0.01	0.56
Control Delay	19.7	9.2	20.2	12.6	4.6	6.4	11.4	18.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.7	9.2	20.2	12.6	4.6	6.4	11.4	18.0
Queue Length 50th (m)	1.1	0.3	1.4	0.1	1.6	7.8	0.4	36.8
Queue Length 95th (m)	4.9	12.5	5.5	3.0	5.5	18.7	2.6	#89.3
Internal Link Dist (m)		213.6		244.1		232.3		337.4
Turn Bay Length (m)	15.0		15.0		15.0		15.0	
Base Capacity (vph)	505	675	471	577	591	1100	589	868
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.24	0.04	0.02	0.10	0.19	0.01	0.56

Intersection Summary

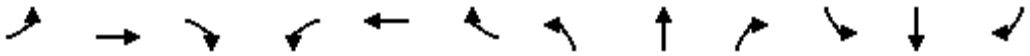
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	11	113	8	2	4	113	297	20	3	298	13
Future Volume (Veh/h)	15	11	113	8	2	4	113	297	20	3	298	13
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	15	11	113	8	2	4	113	297	20	3	298	13
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	848	854	304	962	850	307	311			317		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	848	854	304	962	850	307	311			317		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.3	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2			2.3		
p0 queue free %	94	96	85	96	99	99	91			100		
cM capacity (veh/h)	261	271	740	181	272	724	1261			1189		

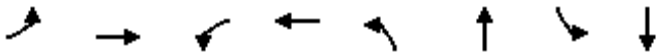
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	139	14	430	314
Volume Left	15	8	113	3
Volume Right	113	4	20	13
cSH	554	246	1261	1189
Volume to Capacity	0.25	0.06	0.09	0.00
Queue Length 95th (m)	7.5	1.4	2.2	0.1
Control Delay (s)	13.7	20.5	2.8	0.1
Lane LOS	B	C	A	A
Approach Delay (s)	13.7	20.5	2.8	0.1
Approach LOS	B	C		

Intersection Summary				
Average Delay	3.8			
Intersection Capacity Utilization	58.1%	ICU Level of Service	B	
Analysis Period (min)	15			



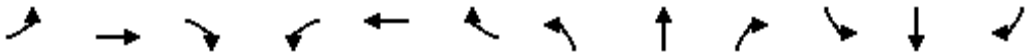
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	11	113	8	2	4	113	297	20	3	298	13
Future Volume (vph)	15	11	113	8	2	4	113	297	20	3	298	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	8.0	8.0		8.0	8.0		4.5	8.0		8.0	8.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.86		1.00	0.90		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1659		1825	1706		1825	1711		1674	1628	
Flt Permitted	0.75	1.00		0.71	1.00		0.48	1.00		0.57	1.00	
Satd. Flow (perm)	1448	1659		1372	1706		920	1711		1001	1628	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	15	11	113	8	2	4	113	297	20	3	298	13
RTOR Reduction (vph)	0	101	0	0	4	0	0	3	0	0	2	0
Lane Group Flow (vph)	15	23	0	8	2	0	113	314	0	3	309	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	12%	0%	9%	18%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	5.6	5.6		5.6	5.6		31.9	31.9		23.4	23.4	
Effective Green, g (s)	5.6	5.6		5.6	5.6		31.9	31.9		23.4	23.4	
Actuated g/C Ratio	0.10	0.10		0.10	0.10		0.60	0.60		0.44	0.44	
Clearance Time (s)	8.0	8.0		8.0	8.0		4.5	8.0		8.0	8.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	151	173		143	178		616	1020		437	712	
v/s Ratio Prot		c0.01			0.00		0.01	c0.18			c0.19	
v/s Ratio Perm	0.01			0.01			0.10			0.00		
v/c Ratio	0.10	0.13		0.06	0.01		0.18	0.31		0.01	0.43	
Uniform Delay, d1	21.7	21.7		21.6	21.5		4.9	5.3		8.5	10.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.3		0.2	0.0		0.1	0.8		0.0	1.9	
Delay (s)	22.0	22.1		21.7	21.5		5.0	6.1		8.5	12.4	
Level of Service	C	C		C	C		A	A		A	B	
Approach Delay (s)		22.1			21.6			5.8			12.3	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM 2000 Control Delay	10.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	53.5	Sum of lost time (s)	20.5
Intersection Capacity Utilization	48.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	15	124	8	6	113	317	3	311
v/c Ratio	0.08	0.39	0.04	0.03	0.16	0.29	0.01	0.39
Control Delay	19.9	10.0	19.4	14.8	4.8	7.0	11.0	14.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.9	10.0	19.4	14.8	4.8	7.0	11.0	14.1
Queue Length 50th (m)	1.2	0.9	0.7	0.2	3.2	12.7	0.2	20.3
Queue Length 95th (m)	5.0	11.7	3.4	2.5	8.9	28.6	1.5	42.8
Internal Link Dist (m)		213.6		244.1		232.3		337.4
Turn Bay Length (m)	15.0		15.0		15.0		15.0	
Base Capacity (vph)	511	658	484	604	711	1096	491	801
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.19	0.02	0.01	0.16	0.29	0.01	0.39

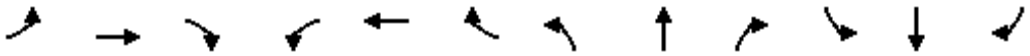
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	37	9	102	2	7	4	189	668	14	9	274	11
Future Volume (Veh/h)	37	9	102	2	7	4	189	668	14	9	274	11
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	37	9	102	2	7	4	189	668	14	9	274	11
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1358	1358	280	1457	1356	675	285			682		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1358	1358	280	1457	1356	675	285			682		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.2			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3			2.2		
p0 queue free %	65	93	87	97	94	99	84			99		
cM capacity (veh/h)	105	126	764	78	126	452	1211			920		

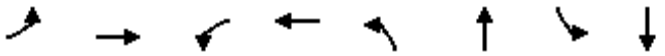
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	148	13	871	294
Volume Left	37	2	189	9
Volume Right	102	4	14	11
cSH	265	144	1211	920
Volume to Capacity	0.56	0.09	0.16	0.01
Queue Length 95th (m)	23.8	2.2	4.2	0.2
Control Delay (s)	34.5	32.4	3.6	0.4
Lane LOS	D	D	A	A
Approach Delay (s)	34.5	32.4	3.6	0.4
Approach LOS	D	D		

Intersection Summary				
Average Delay	6.6			
Intersection Capacity Utilization	86.3%	ICU Level of Service	E	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	9	102	2	7	4	189	668	14	9	274	11
Future Volume (vph)	37	9	102	2	7	4	189	668	14	9	274	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	8.0	8.0		8.0	8.0		4.5	8.0		8.0	8.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.86		1.00	0.95		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1656		1825	1803		1825	1714		1674	1628	
Flt Permitted	0.75	1.00		0.69	1.00		0.48	1.00		0.41	1.00	
Satd. Flow (perm)	1442	1656		1325	1803		929	1714		715	1628	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	37	9	102	2	7	4	189	668	14	9	274	11
RTOR Reduction (vph)	0	91	0	0	4	0	0	1	0	0	2	0
Lane Group Flow (vph)	37	20	0	2	7	0	189	681	0	9	283	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	12%	0%	9%	18%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	5.8	5.8		5.8	5.8		31.0	31.0		21.5	21.5	
Effective Green, g (s)	5.8	5.8		5.8	5.8		31.0	31.0		21.5	21.5	
Actuated g/C Ratio	0.11	0.11		0.11	0.11		0.59	0.59		0.41	0.41	
Clearance Time (s)	8.0	8.0		8.0	8.0		4.5	8.0		8.0	8.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	158	181		145	198		630	1006		291	662	
v/s Ratio Prot		0.01			0.00		0.03	c0.40			0.17	
v/s Ratio Perm	c0.03			0.00			0.15			0.01		
v/c Ratio	0.23	0.11		0.01	0.04		0.30	0.68		0.03	0.43	
Uniform Delay, d1	21.5	21.2		21.0	21.0		5.3	7.5		9.4	11.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	0.3		0.0	0.1		0.3	3.7		0.2	2.0	
Delay (s)	22.2	21.5		21.0	21.1		5.5	11.1		9.6	13.3	
Level of Service	C	C		C	C		A	B		A	B	
Approach Delay (s)		21.6			21.1			9.9			13.1	
Approach LOS		C			C			A			B	

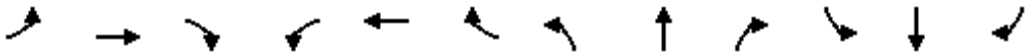
Intersection Summary			
HCM 2000 Control Delay	12.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	52.8	Sum of lost time (s)	20.5
Intersection Capacity Utilization	68.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	37	111	2	11	189	682	9	285
v/c Ratio	0.19	0.36	0.01	0.04	0.27	0.62	0.03	0.42
Control Delay	21.8	9.7	18.5	16.5	5.3	12.2	11.7	14.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.8	9.7	18.5	16.5	5.3	12.2	11.7	14.7
Queue Length 50th (m)	3.1	0.7	0.2	0.6	5.9	39.9	0.5	18.9
Queue Length 95th (m)	9.3	11.0	1.6	3.8	13.7	#89.0	2.9	38.7
Internal Link Dist (m)		213.6		244.1		232.3		337.4
Turn Bay Length (m)	15.0		15.0		15.0		15.0	
Base Capacity (vph)	506	648	466	635	713	1092	300	685
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.17	0.00	0.02	0.27	0.62	0.03	0.42

Intersection Summary

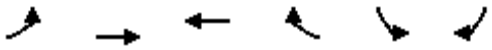
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	8	156	15	1	7	59	180	7	7	452	24
Future Volume (Veh/h)	15	8	156	15	1	7	59	180	7	7	452	24
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	15	8	156	15	1	7	59	180	7	7	452	24
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	787	783	464	940	792	184	476			187		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	787	783	464	940	792	184	476			187		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	95	97	74	91	100	99	95			99		
cM capacity (veh/h)	295	309	602	171	305	859	1097			1346		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	179	23	246	483
Volume Left	15	15	59	7
Volume Right	156	7	7	24
cSH	533	232	1097	1346
Volume to Capacity	0.34	0.10	0.05	0.01
Queue Length 95th (m)	11.2	2.5	1.3	0.1
Control Delay (s)	15.1	22.3	2.4	0.2
Lane LOS	C	C	A	A
Approach Delay (s)	15.1	22.3	2.4	0.2
Approach LOS	C	C		

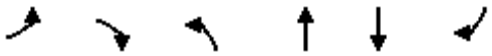
Intersection Summary				
Average Delay	4.2			
Intersection Capacity Utilization	59.5%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	168	81	3	7	4
Future Volume (Veh/h)	2	168	81	3	7	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	2	168	81	3	7	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	84				254	82
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	84				254	82
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1513				733	977

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	170	84	11
Volume Left	2	0	7
Volume Right	0	3	4
cSH	1513	1700	806
Volume to Capacity	0.00	0.05	0.01
Queue Length 95th (m)	0.0	0.0	0.3
Control Delay (s)	0.1	0.0	9.5
Lane LOS	A		A
Approach Delay (s)	0.1	0.0	9.5
Approach LOS			A

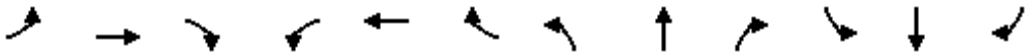
Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	20.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	5	1	201	482	1
Future Volume (Veh/h)	1	5	1	201	482	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1	5	1	201	482	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	686	482	483			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	686	482	483			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	413	584	1080			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	6	1	201	483
Volume Left	1	1	0	0
Volume Right	5	0	0	1
cSH	546	1080	1700	1700
Volume to Capacity	0.01	0.00	0.12	0.28
Queue Length 95th (m)	0.3	0.0	0.0	0.0
Control Delay (s)	11.7	8.3	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	11.7	0.0		0.0
Approach LOS	B			

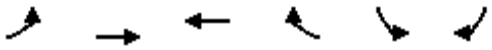
Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	35.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	9	120	6	2	4	120	268	18	3	261	12
Future Volume (Veh/h)	23	9	120	6	2	4	120	268	18	3	261	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	23	9	120	6	2	4	120	268	18	3	261	12
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	795	799	267	914	796	277	273			286		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	795	799	267	914	796	277	273			286		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.3	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2			2.3		
p0 queue free %	92	97	85	97	99	99	91			100		
cM capacity (veh/h)	283	291	777	196	292	752	1302			1221		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	152	12	406	276
Volume Left	23	6	120	3
Volume Right	120	4	18	12
cSH	570	280	1302	1221
Volume to Capacity	0.27	0.04	0.09	0.00
Queue Length 95th (m)	8.1	1.0	2.3	0.1
Control Delay (s)	13.6	18.4	3.0	0.1
Lane LOS	B	C	A	A
Approach Delay (s)	13.6	18.4	3.0	0.1
Approach LOS	B	C		

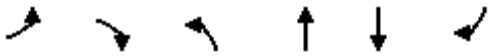
Intersection Summary				
Average Delay	4.2			
Intersection Capacity Utilization	55.8%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	128	120	14	23	4
Future Volume (Veh/h)	6	128	120	14	23	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	6	128	120	14	23	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	134				267	127
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	134				267	127
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				97	100
cM capacity (veh/h)	1451				719	923

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	134	134	27
Volume Left	6	0	23
Volume Right	0	14	4
cSH	1451	1700	744
Volume to Capacity	0.00	0.08	0.04
Queue Length 95th (m)	0.1	0.0	0.9
Control Delay (s)	0.4	0.0	10.0
Lane LOS	A		B
Approach Delay (s)	0.4	0.0	10.0
Approach LOS			B

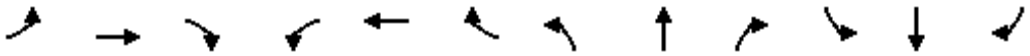
Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	21.6%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	3	2	293	282	1
Future Volume (Veh/h)	1	3	2	293	282	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1	3	2	293	282	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	580	282	283			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	580	282	283			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	476	756	1279			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	4	2	293	283
Volume Left	1	2	0	0
Volume Right	3	0	0	1
cSH	659	1279	1700	1700
Volume to Capacity	0.01	0.00	0.17	0.17
Queue Length 95th (m)	0.1	0.0	0.0	0.0
Control Delay (s)	10.5	7.8	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	10.5	0.1		0.0
Approach LOS	B			

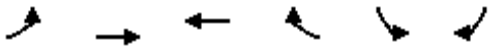
Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	25.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	4	114	2	6	4	199	604	13	8	248	10
Future Volume (Veh/h)	43	4	114	2	6	4	199	604	13	8	248	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	43	4	114	2	6	4	199	604	13	8	248	10
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1284	1284	253	1394	1282	610	258			617		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1284	1284	253	1394	1282	610	258			617		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.2			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3			2.2		
p0 queue free %	64	97	86	98	96	99	84			99		
cM capacity (veh/h)	118	138	791	88	139	492	1240			973		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	161	12	816	266
Volume Left	43	2	199	8
Volume Right	114	4	13	10
cSH	300	162	1240	973
Volume to Capacity	0.54	0.07	0.16	0.01
Queue Length 95th (m)	22.5	1.8	4.3	0.2
Control Delay (s)	30.0	29.0	3.7	0.3
Lane LOS	D	D	A	A
Approach Delay (s)	30.0	29.0	3.7	0.3
Approach LOS	D	D		

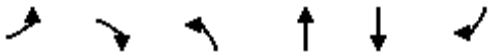
Intersection Summary				
Average Delay	6.6			
Intersection Capacity Utilization	83.2%	ICU Level of Service	E	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	139	196	19	26	4
Future Volume (Veh/h)	7	139	196	19	26	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	7	139	196	19	26	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	215				358	206
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	215				358	206
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				96	100
cM capacity (veh/h)	1355				637	835

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	146	215	30
Volume Left	7	0	26
Volume Right	0	19	4
cSH	1355	1700	658
Volume to Capacity	0.01	0.13	0.05
Queue Length 95th (m)	0.1	0.0	1.1
Control Delay (s)	0.4	0.0	10.7
Lane LOS	A		B
Approach Delay (s)	0.4	0.0	10.7
Approach LOS			B

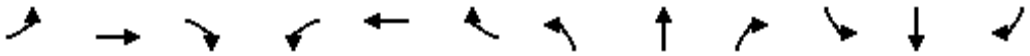
Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	23.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	3	3	647	270	1
Future Volume (Veh/h)	2	3	3	647	270	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	2	3	3	647	270	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	924	270	271			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	924	270	271			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	299	768	1292			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	5	3	647	271
Volume Left	2	3	0	0
Volume Right	3	0	0	1
cSH	472	1292	1700	1700
Volume to Capacity	0.01	0.00	0.38	0.16
Queue Length 95th (m)	0.2	0.1	0.0	0.0
Control Delay (s)	12.7	7.8	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	12.7	0.0		0.0
Approach LOS	B			

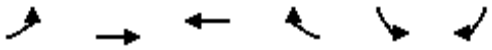
Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	44.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	4	162	17	1	8	62	199	8	8	499	26
Future Volume (Veh/h)	16	4	162	17	1	8	62	199	8	8	499	26
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	16	4	162	17	1	8	62	199	8	8	499	26
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	864	859	512	1019	868	203	525			207		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	864	859	512	1019	868	203	525			207		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	94	99	71	88	100	99	94			99		
cM capacity (veh/h)	260	277	566	146	274	838	1052			1323		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	182	26	269	533
Volume Left	16	17	62	8
Volume Right	162	8	8	26
cSH	502	200	1052	1323
Volume to Capacity	0.36	0.13	0.06	0.01
Queue Length 95th (m)	12.4	3.3	1.4	0.1
Control Delay (s)	16.2	25.6	2.4	0.2
Lane LOS	C	D	A	A
Approach Delay (s)	16.2	25.6	2.4	0.2
Approach LOS	C	D		

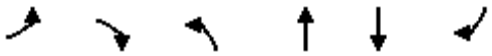
Intersection Summary				
Average Delay	4.3			
Intersection Capacity Utilization	63.6%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	175	86	3	7	4
Future Volume (Veh/h)	2	175	86	3	7	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	2	175	86	3	7	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	89				266	88
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	89				266	88
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1506				722	971

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	177	89	11
Volume Left	2	0	7
Volume Right	0	3	4
cSH	1506	1700	796
Volume to Capacity	0.00	0.05	0.01
Queue Length 95th (m)	0.0	0.0	0.3
Control Delay (s)	0.1	0.0	9.6
Lane LOS	A		A
Approach Delay (s)	0.1	0.0	9.6
Approach LOS			A

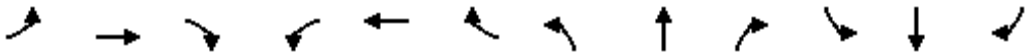
Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	20.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	5	1	222	532	1
Future Volume (Veh/h)	1	5	1	222	532	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1	5	1	222	532	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	756	532	533			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	756	532	533			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	375	547	1035			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	6	1	222	533
Volume Left	1	1	0	0
Volume Right	5	0	0	1
cSH	508	1035	1700	1700
Volume to Capacity	0.01	0.00	0.13	0.31
Queue Length 95th (m)	0.3	0.0	0.0	0.0
Control Delay (s)	12.2	8.5	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	12.2	0.0		0.0
Approach LOS	B			

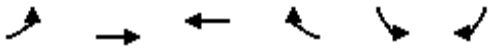
Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	38.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	24	11	126	8	2	4	126	296	20	3	298	13
Future Volume (Veh/h)	24	11	126	8	2	4	126	296	20	3	298	13
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	24	11	126	8	2	4	126	296	20	3	298	13
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	874	878	304	1000	875	306	311			316		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	874	878	304	1000	875	306	311			316		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.3	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2			2.3		
p0 queue free %	90	96	83	95	99	99	90			100		
cM capacity (veh/h)	248	259	740	166	260	725	1261			1190		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	161	14	442	314
Volume Left	24	8	126	3
Volume Right	126	4	20	13
cSH	520	228	1261	1190
Volume to Capacity	0.31	0.06	0.10	0.00
Queue Length 95th (m)	9.9	1.5	2.5	0.1
Control Delay (s)	15.0	21.8	3.0	0.1
Lane LOS	B	C	A	A
Approach Delay (s)	15.0	21.8	3.0	0.1
Approach LOS	B	C		

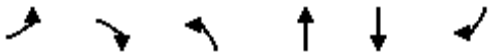
Intersection Summary				
Average Delay	4.4			
Intersection Capacity Utilization	60.1%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	137	127	14	23	4
Future Volume (Veh/h)	6	137	127	14	23	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	6	137	127	14	23	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	141				283	134
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	141				283	134
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				97	100
cM capacity (veh/h)	1442				704	915

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	143	141	27
Volume Left	6	0	23
Volume Right	0	14	4
cSH	1442	1700	729
Volume to Capacity	0.00	0.08	0.04
Queue Length 95th (m)	0.1	0.0	0.9
Control Delay (s)	0.3	0.0	10.1
Lane LOS	A		B
Approach Delay (s)	0.3	0.0	10.1
Approach LOS			B

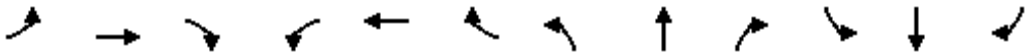
Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	22.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	3	2	322	320	1
Future Volume (Veh/h)	1	3	2	322	320	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1	3	2	322	320	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	646	320	321			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	646	320	321			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	435	720	1239			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	4	2	322	321
Volume Left	1	2	0	0
Volume Right	3	0	0	1
cSH	619	1239	1700	1700
Volume to Capacity	0.01	0.00	0.19	0.19
Queue Length 95th (m)	0.1	0.0	0.0	0.0
Control Delay (s)	10.9	7.9	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	10.9	0.0		0.0
Approach LOS	B			

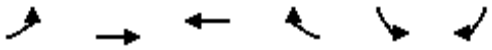
Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	26.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	46	9	118	2	7	4	207	667	14	9	274	11
Future Volume (Veh/h)	46	9	118	2	7	4	207	667	14	9	274	11
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	46	9	118	2	7	4	207	667	14	9	274	11
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1393	1392	280	1508	1391	674	285			681		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1393	1392	280	1508	1391	674	285			681		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.2			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3			2.2		
p0 queue free %	53	92	85	97	94	99	83			99		
cM capacity (veh/h)	97	118	764	69	118	453	1211			921		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	173	13	888	294
Volume Left	46	2	207	9
Volume Right	118	4	14	11
cSH	246	134	1211	921
Volume to Capacity	0.70	0.10	0.17	0.01
Queue Length 95th (m)	35.7	2.4	4.7	0.2
Control Delay (s)	48.2	34.8	3.9	0.4
Lane LOS	E	D	A	A
Approach Delay (s)	48.2	34.8	3.9	0.4
Approach LOS	E	D		

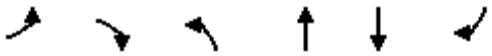
Intersection Summary				
Average Delay	9.0			
Intersection Capacity Utilization	89.9%	ICU Level of Service	E	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	147	206	19	26	4
Future Volume (Veh/h)	7	147	206	19	26	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	7	147	206	19	26	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	225				376	216
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	225				376	216
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				96	100
cM capacity (veh/h)	1344				622	824

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	154	225	30
Volume Left	7	0	26
Volume Right	0	19	4
cSH	1344	1700	643
Volume to Capacity	0.01	0.13	0.05
Queue Length 95th (m)	0.1	0.0	1.1
Control Delay (s)	0.4	0.0	10.9
Lane LOS	A		B
Approach Delay (s)	0.4	0.0	10.9
Approach LOS			B

Intersection Summary			
Average Delay		0.9	
Intersection Capacity Utilization		23.4%	ICU Level of Service A
Analysis Period (min)		15	



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	3	3	713	298	1
Future Volume (Veh/h)	2	3	3	713	298	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	2	3	3	713	298	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1018	298	299			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1018	298	299			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	262	741	1262			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	5	3	713	299
Volume Left	2	3	0	0
Volume Right	3	0	0	1
cSH	429	1262	1700	1700
Volume to Capacity	0.01	0.00	0.42	0.18
Queue Length 95th (m)	0.3	0.1	0.0	0.0
Control Delay (s)	13.5	7.9	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	13.5	0.0		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	47.5%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX E

AADT Data

Year	AADT	Growth Rate									
2005	6594										
2006	5370										
2007	5151										
2008	5114										
2009	5272										
2010	5188										
2011	4832										
2012	5133										
2013	4609										
2014	5581	-19.14%	-1.05%	-4.20%	-1.69%	-2.75%	-2.56%	-1.77%	-1.64%	-1.91%	-3.72%
2015	4513										
	Average Growth Rate	-4.04%									

1.1 KM NW OF WALKERS RD.
NE

Year	AADT	Growth Rate									
2005	0										
2006	0										
2007	0										
2008	0										
2009	0										
2010	0										
2011	0										
2012	3685										
2013	2102										
2014	3531	-1.56%	28.59%	-1.93%	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2015	3476										
	Average Growth Rate	8.37%									

1.1 KM SE OF WALKERS RD.
NE

Year	AADT	Growth Rate									
2005	6401										
2006	5791										
2007	5283										
2008	5245										
2009	5433										
2010	5437										
2011	5003										
2012	5409										
2013	3586										
2014	5458	-10.92%	16.44%	-3.49%	-0.71%	-2.21%	-1.83%	-1.08%	-1.03%	-1.92%	-2.71%
2015	4862										
	Average Growth Rate	-0.95%									

1.1 KM NW OF WALKERS RD. SW

Year	AADT	Growth Rate									
2005	0										
2006	0										
2007	0										
2008	0										
2009	0										
2010	0										
2011	0										
2012	3868										
2013	3016										
2014	3586	1.14%	9.66%	-2.12%	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2015	3627										
	Average Growth Rate	2.89%									

1.1 KM SE OF WALKERS RD. SW

Year	AADT	Growth Rate									
2005	12995										
2006	11161										
2007	10434										
2008	10359										
2009	10705										
2010	10625										
2011	9835										
2012	10542										
2013	8195										
2014	11039	-15.07%	6.96%	-3.84%	-1.19%	-2.47%	-2.19%	-1.42%	-1.33%	-1.92%	-3.21%
2015	9375										
	Average Growth Rate	-2.57%									

1.1 KM NW OF WALKERS RD.
NE+SW

Year	AADT	Growth Rate									
2005	0										
2006	0										
2007	0										
2008	0										
2009	0										
2010	0										
2011	0										
2012	7553										
2013	5118										
2014	7117	-0.20%	17.81%	-2.03%	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2015	7103										
	Average Growth Rate	5.19%									

1.1 KM SE OF WALKERS RD.
NE+SW

STATION_ID	ROAD_NAME	LOCATION	Y_2015_NE	Y_2015_SW	Y_2014_NE	Y_2014_SW	Y_2013_NE	Y_2013_SW	Y_2012_NE	Y_2012_SW	Y_2011_NE	Y_2011_SW	Y_2010_NE	Y_2010_SW
00728673	AIRPORT ROAD	0.8 KM NORTH OF OLDE BASELINE RD. (RR12)	4513	4862	5581	5458	4609	3586	5133	5409	4832	5003	5188	5437
00730837	AIRPORT ROAD	1.5 KM NORTH OF OLD CHURCH RD.	3476	3627	3531	3586	2102	3016	3685	3868	0	0	0	0

STATION_ID	ROAD_NAME	LOCATION	Y_2009_NE	Y_2009_SW	Y_2008_NE	Y_2008_SW	Y_2007_NE	Y_2007_SW	Y_2006_NE	Y_2006_SW	Y_2005_NE	Y_2005_SW	Y_2004_NE	Y_2004_SW
00728673	AIRPORT ROAD	0.8 KM NORTH OF OLDE BASELINE RD. (RR12)	5272	5433	5114	5245	5151	5283	5370	5791	6594	6401	5799	5875
00730837	AIRPORT ROAD	1.5 KM NORTH OF OLD CHURCH RD.	0	0	0	0	0	0	0	0	0	0	0	0

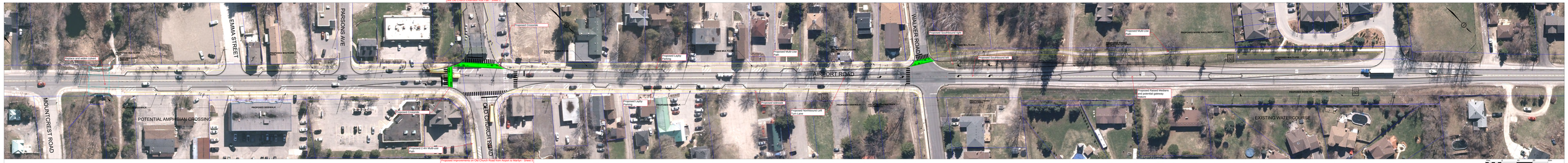
STATION_ID	ROAD_NAME	LOCATION	Y_2003_NE	Y_2003_SW	Y_2002_NE	Y_2002_SW	Y_2001_NE	Y_2001_SW	Y_2000_NE	Y_2000_SW	Y_1999_NE	Y_1999_SW	Y_1998_NE	Y_1998_SW
00728673	AIRPORT ROAD	0.8 KM NORTH OF OLDE BASELINE RD. (RR12)	6059	6895	5765	5796	4458	6080	4262	6160	5401	5208	5602	5234
00730837	AIRPORT ROAD	1.5 KM NORTH OF OLD CHURCH RD.	0	0	0	0	0	0	0	0	0	0	0	0

STATION_ID	ROAD_NAME	LOCATION	Y_1997_NE	Y_1997_SW	Y_1996_NE	Y_1996_SW
00728673	AIRPORT ROAD	0.8 KM NORTH OF OLDE BASELINE RD. (RR12)	5349	5529	4614	4561
00730837	AIRPORT ROAD	1.5 KM NORTH OF OLD CHURCH RD.	0	0	0	0

APPENDIX F

Airport Road EA "Preliminary Preferred Design"

PRELIMINARY PREFERRED DESIGN FOR AIRPORT ROAD
(KING STREET TO HUNTSMILL DRIVE)



SEPTEMBER 17, 2020

APPENDIX G

Castles of Caledon TIS Excerpts

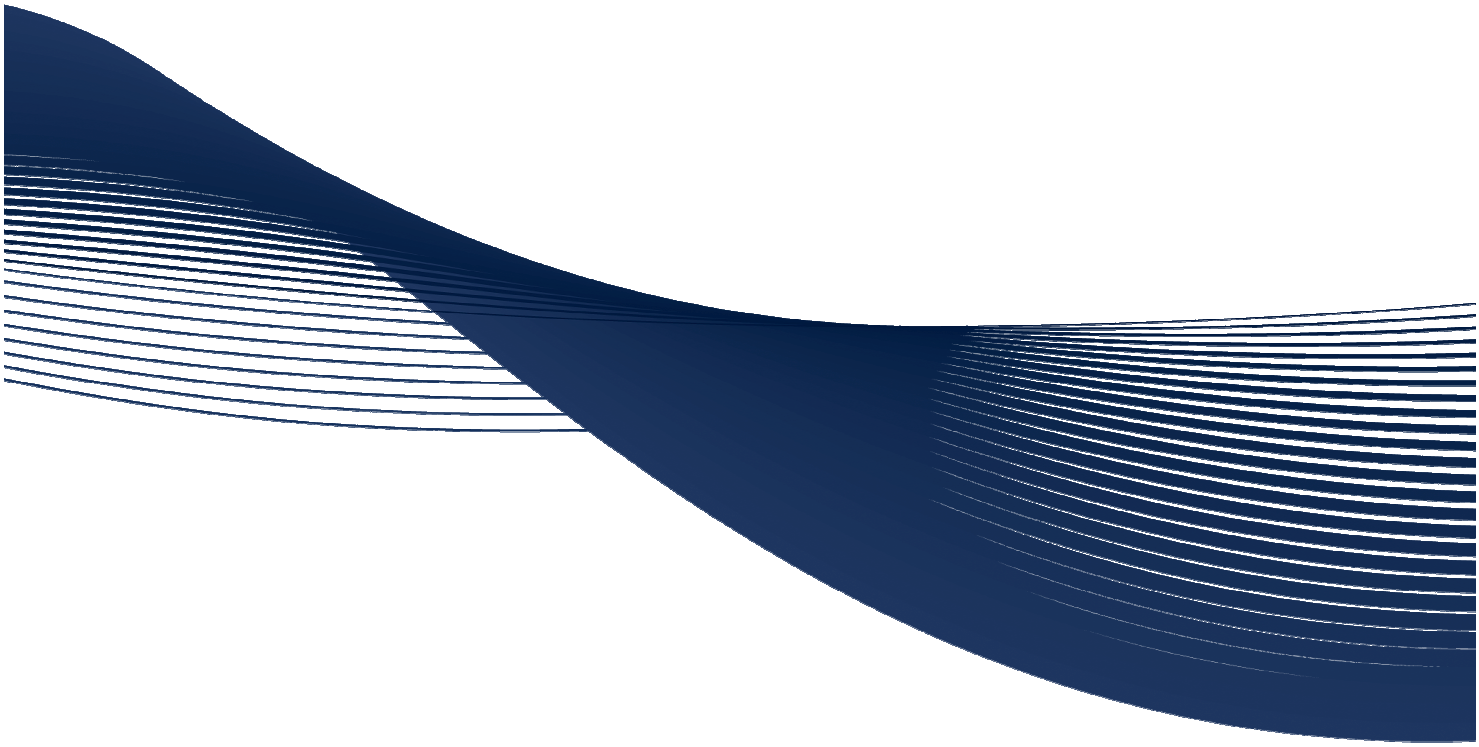
CASTLES OF CALEDON CORPORATION

REVISED TRAFFIC IMPACT STUDY

Mountainview Road and Walker Road West

Town of Caledon

Project No.: TR13-0575



MARCH 2014

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1.0 Introduction

Cole Engineering Group Ltd. (Cole Engineering) was retained by Castles of Caledon Corporation (the "Owner") to undertake a Traffic Impact Study in support of a draft plan of subdivision application for a residential development on the property municipally known as 89 Walker Road West, in the Town of Caledon (the "Town").

The site is located northeast quadrant of Mountainview Road / Walker Road West and is bounded by undeveloped lands to the north and east, Mountainview Road to the west, and Walker Road West to the south. **Figure 1-1** illustrates the site location.

The overall development site area is approximately 24.92 hectares. Currently, the property lands are vacant and fall under 'Schedule D' of the Town of Caledon Official Plan, where the subject lands are designated as *Policy Area – Residential*. The development plan for the site is a residential development comprised of 203 single family detached dwellings as well as a 0.38 ha parkette and a 0.97 ha storm water management (SWM) pond.

Vehicle access to the development is provided via three (3) full movement municipal intersections. One (1) site access is provided off Walker Road West approximately 54 metres east of the Mountainview Road / Walker Road West intersection. The two (2) remaining site accesses will align with the existing Borland Crescent intersection to create a four (4)-way intersection under 'Stop' control at the minor street approaches. **Figure 1-2** illustrates the draft plan for subdivision.

The purpose of this study is to:

- Identify any traffic operational concerns in the existing and future traffic conditions;
- Document the total traffic impacts associated with the subject site;
- Identify any required mitigative measures; and,
- Review the on-site circulation and geometric design as it relates to the turning movements of delivery / service vehicles.

2.0 Study Approach

Existing traffic counts were obtained from the Region of Peel (the "Region") and undertaken by Accu-Traffic on behalf of Cole Engineering. A five (5) year (Year 2018) and ten (10) year (Year 2023) horizon periods were selected to represent future traffic conditions and full-build out of the proposed development.

To forecast the future (2018 and 2023) background traffic condition in the vicinity of the subject site, an annual growth rate will be applied to the study intersections to reflect and capture general traffic growth. Detailed calculation methodologies and assumptions will be presented in the later chapters.

Based on the site related information received, the study area for this analysis includes the following intersections:

- Mountainview Road / Walker Road West – Existing unsignalized;
- Airport Road / Walker Road – Existing unsignalized;

5.0 Site Traffic

5.1. Trip Generation

As previously noted, the proposed development plan for the site is a residential development comprising of 203 single family detached dwellings as well as a 0.38 ha parkette and a 0.97 ha storm water management (SWM) pond. Trip generation for the singe family detached residential units was undertaken using information contained in the Trip Generation Manual, 9th Edition, published by the ITE for Single-Family Detached Housing (Land Use Code 210). The 2006 Transportation Tomorrow Survey (TTS) data for the zones within the subject site's neighbourhood (3101, 3151, 3189 and 3197) indicate a three percent (3%) non-automotive split. However, for a conservative analysis, a non-auto split reduction was not applied. The trip generation calculation is summarized in **Table 5.1.**

Table 5.1 – Site Trip Generation

Land Use	Unit	Parameter	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Single-Family Detached Housing	203 units	Gross Rate (trips / unit)	0.19	0.56	0.75	0.66	0.39	1.05
		Gross Trips	**38**	**114**	**152**	**134**	**79**	**213**

Based on the foregoing, the proposed development is expected to generate 152 two (2)-way (38 inbound and 114 outbound) trips during the roadway a.m. peak hour and 213 two (2)-way (134 inbound and 79 outbound) trips during the roadway p.m. peak hour.

5.2. Trip Distribution

The trip distribution and assignment is based on the traffic patterns extracted from the approved traffic impact study prepared by MMM for the proposed Châteaux of Caledon mixed-use development projects traffic patterns as extracted from the 2006 Transportation Tomorrow Survey (TTS) and existing traffic flows. The applied trip distribution is summarized in **Table 5.2**.

Table 5.2 – Site Trip Distribution

Direction	Via	Proportions
North	Airport Road	1%
South	Airport Road Mountainview Road	9% 3%
East	Airport Road Mountainview Road	40% 8%
West	Airport Road Mountainview Road	30% 9%
Total		**100%**

The site development traffic is assigned to the study area intersections based on the trip distribution presented and the projected site traffic volumes are illustrated in **Figure 5-1**.

6.0 Future Total Traffic Operations

For the purpose of this study, future traffic was assessed in the 2018 and 2023 horizons. The future study area's future road network configuration is illustrated in **Figure 6-1**.

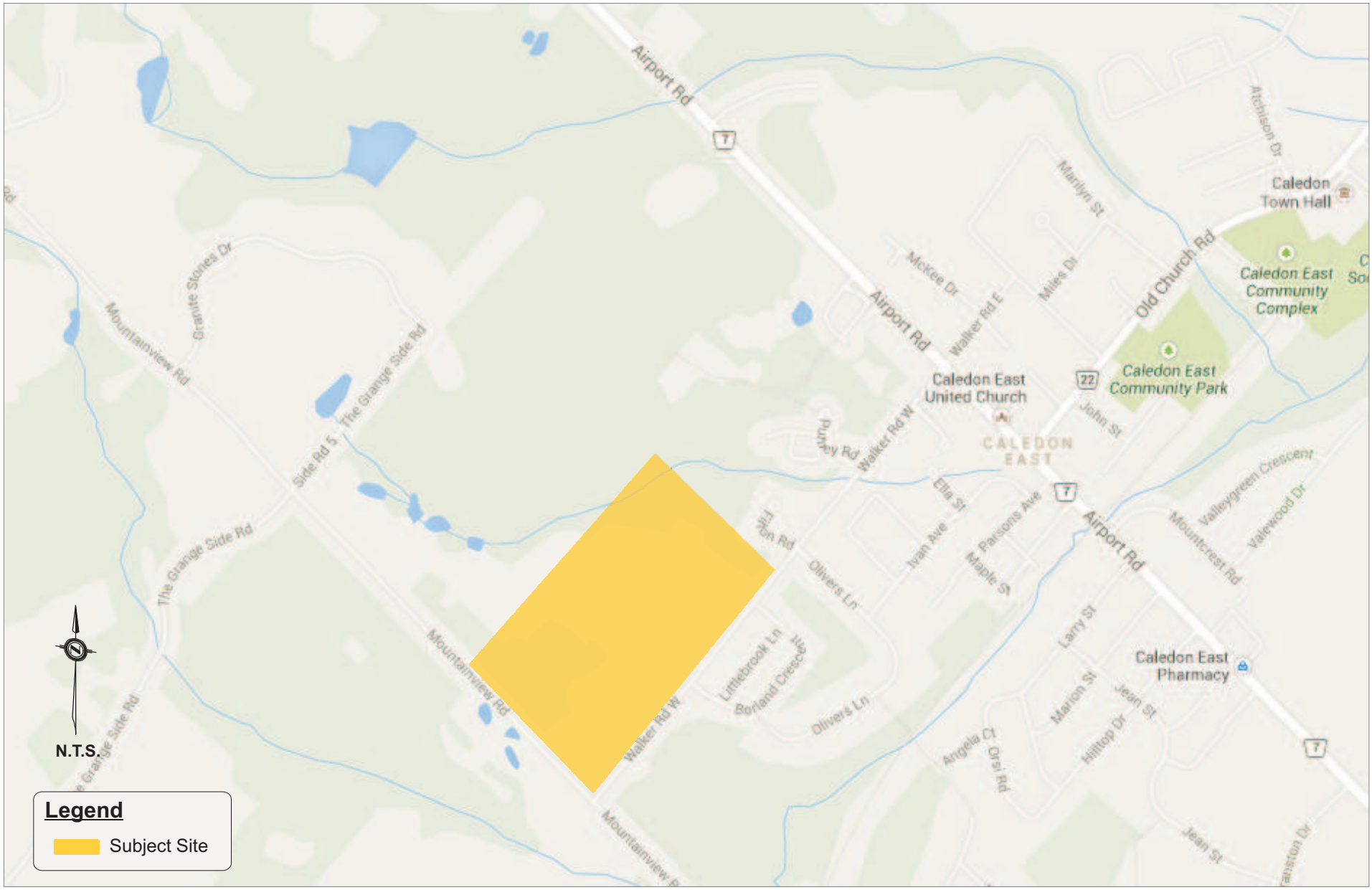


Figure 1-1
Site Location

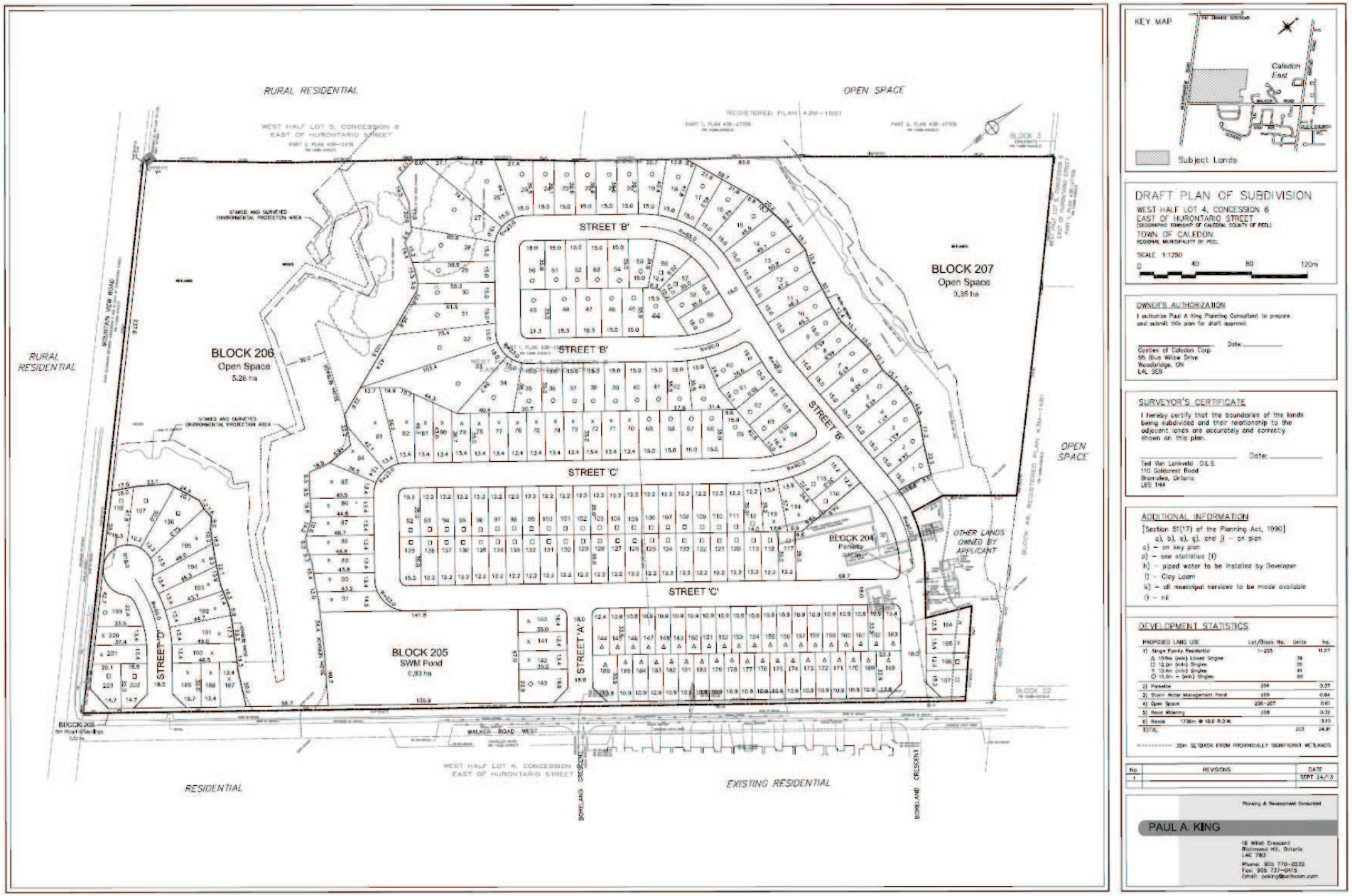


Figure 1-2
Draft Plan of Subdivision

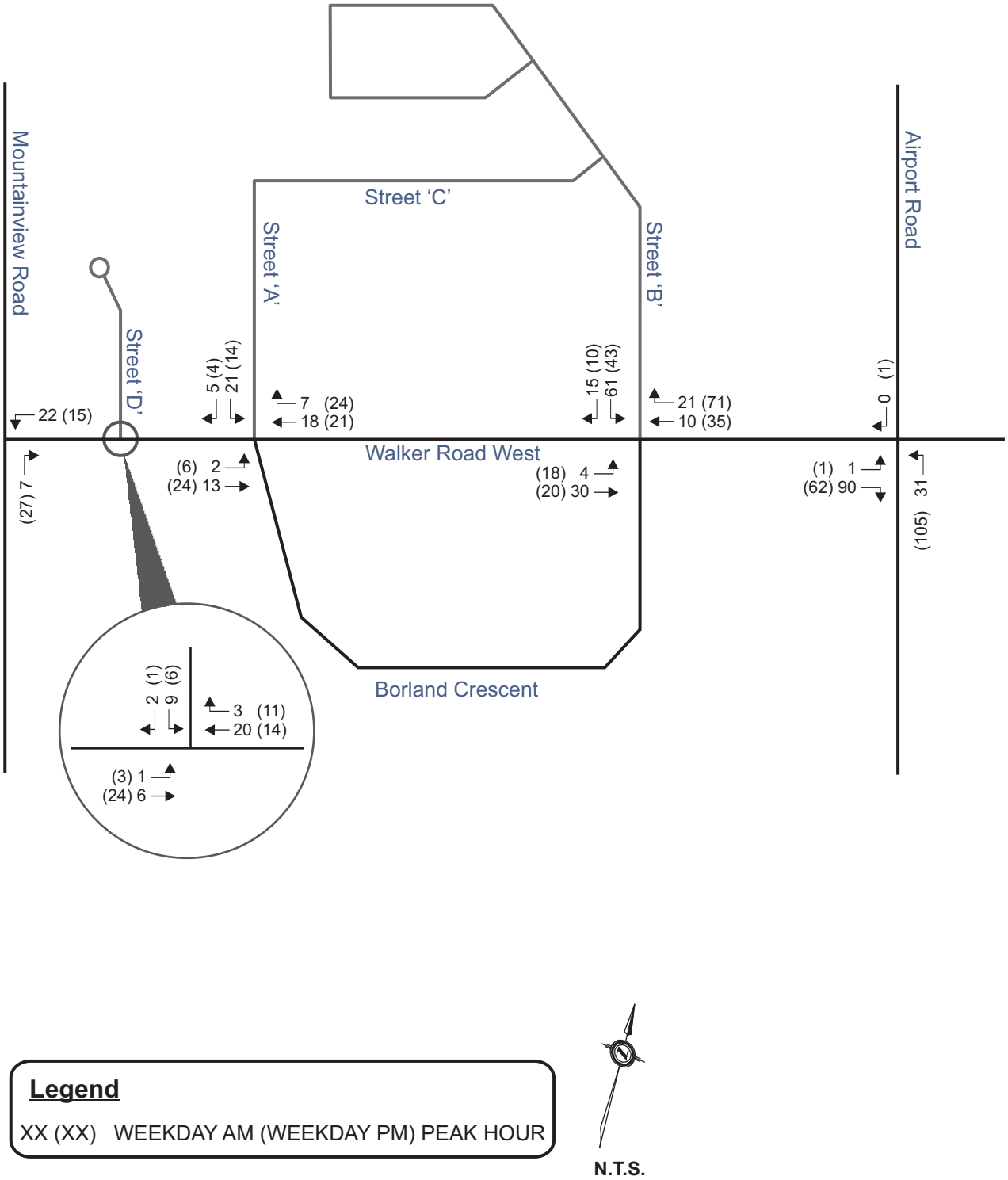
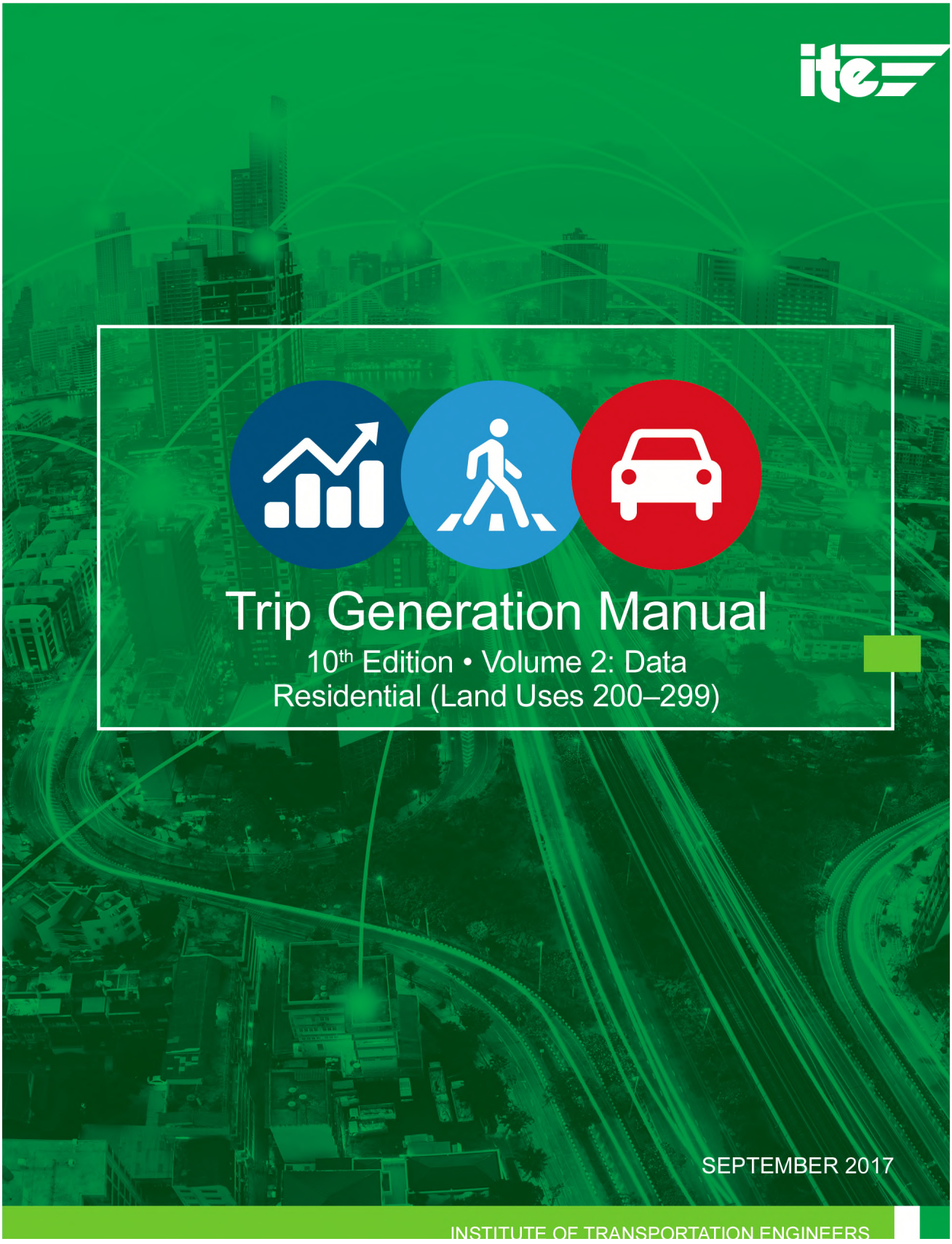


Figure 5-1
Site Traffic Volumes



Trip Generation Manual

10th Edition • Volume 2: Data
Residential (Land Uses 200–299)

SEPTEMBER 2017

INSTITUTE OF TRANSPORTATION ENGINEERS

Single-Family Detached Housing
(210)

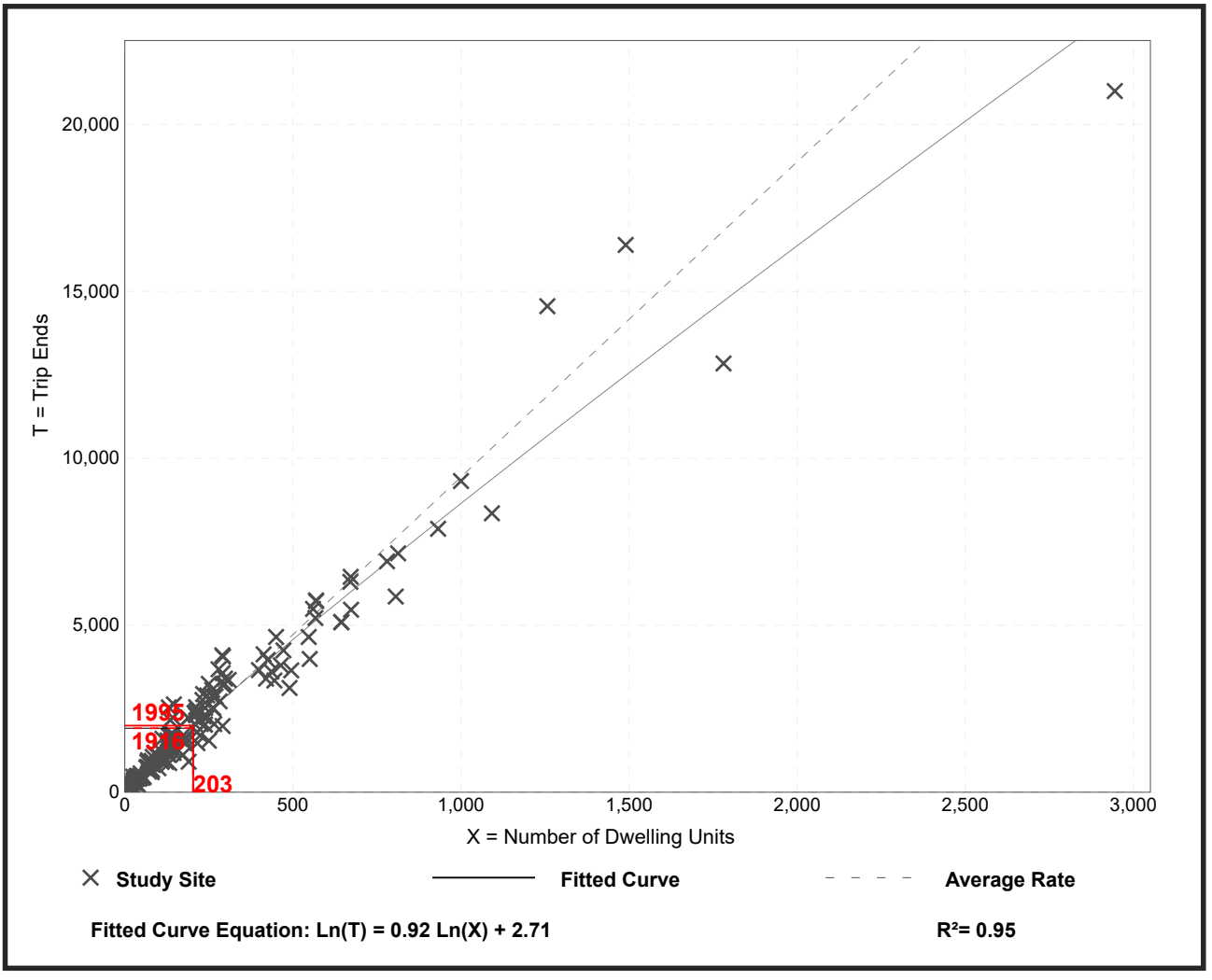
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 159
Avg. Num. of Dwelling Units: 264
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.44	4.81 - 19.39	2.10

Data Plot and Equation



Appendix A

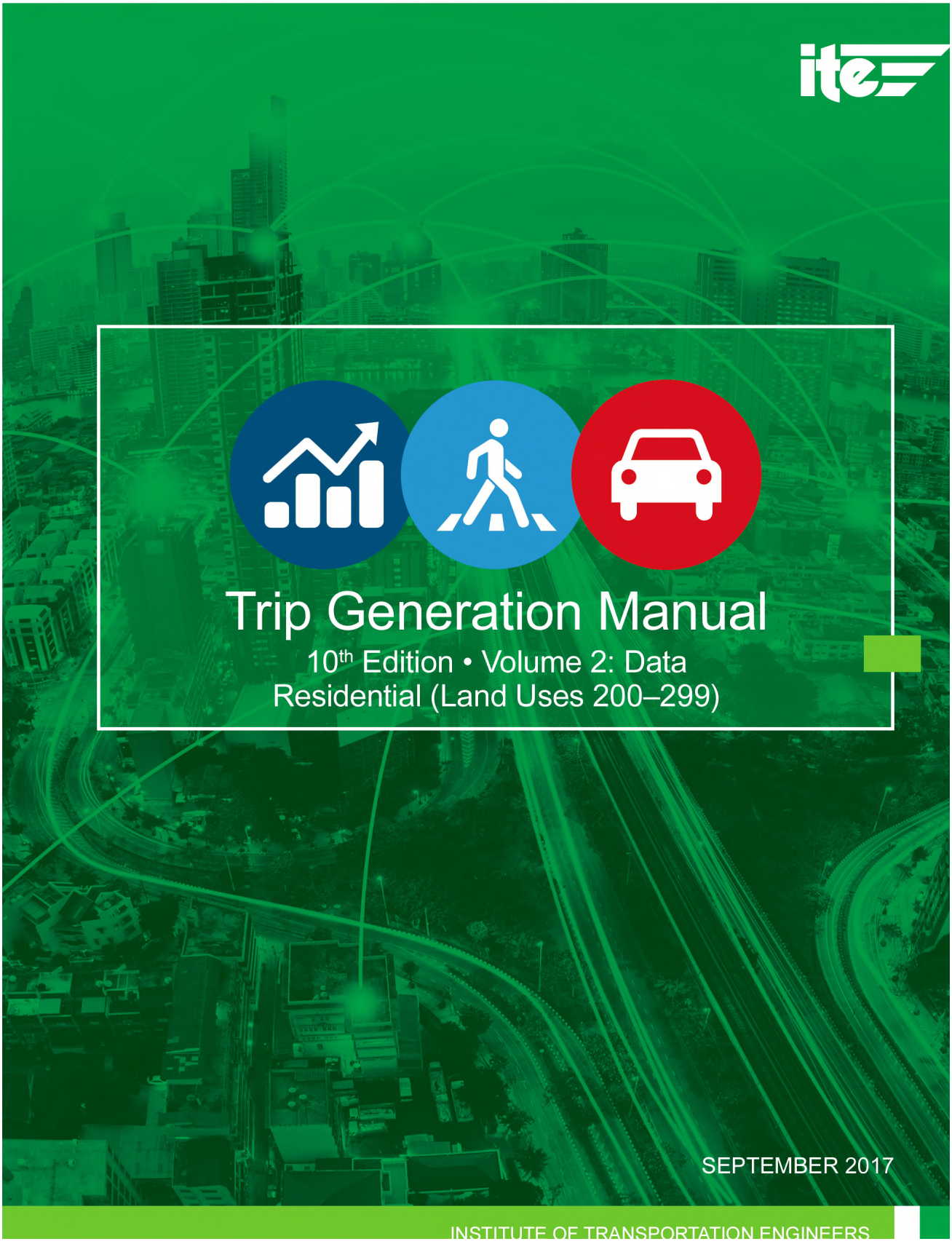
Residential (Land Uses 200–299)

Land Use	210 Single-Family Detached Housing						220 Multifamily Housing (Low-Rise)							
Setting	General Urban/Suburban						General Urban/Suburban						Dense Multi-Use Urban	
Time Period	Weekday		Saturday		Sunday		Weekday		Saturday		Sunday		Weekday	
Trip Type	Vehicle		Vehicle		Vehicle		Vehicle		Vehicle		Vehicle		Vehicle	
# Data Sites	6		2		1		10		1		1		1	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
12:00	0.3	5.5	0.9	7.6	1.0	6.8	0.7	5.4	0.0	8.0	0.0	12.3	0.0	5.0
12:15	0.3	5.6	0.7	8.8	1.0	9.4	0.7	5.3	0.0	10.6	0.0	12.3	0.0	4.6
12:30	0.2	5.8	0.6	9.3	0.5	9.9	0.6	5.2	0.0	11.7	0.0	12.3	0.0	4.2
12:45	0.2	6.1	0.7	8.5	1.0	7.3	0.5	4.9	0.0	9.6	0.0	10.3	0.0	3.8
1:00	0.2	6.0	0.5	8.2	1.0	7.8	0.4	4.6	0.0	7.4	0.0	12.3	0.0	5.0
1:15	0.2	6.1	0.5	7.7	1.0	4.7	0.3	4.9	0.0	3.2	0.0	8.9	0.0	7.3
1:30	0.2	6.2	0.4	6.8	0.5	5.2	0.3	5.0	0.0	2.1	0.0	8.2	0.0	8.0
1:45	0.1	6.2	0.4	8.2	0.0	6.3	0.3	5.6	0.0	3.7	0.0	8.2	0.0	8.8
2:00	0.1	6.6	0.4	8.6	0.0	4.2	0.3	5.7	0.0	5.3	0.0	8.2	0.0	8.0
2:15	0.1	6.8	0.4	9.2	0.0	4.2	0.4	5.7	0.0	5.9	0.0	8.2	0.0	7.6
2:30	0.1	6.7	0.4	9.4	0.0	3.6	0.4	6.3	0.0	5.3	0.0	6.2	0.0	7.6
2:45	0.1	7.1	0.4	9.3	0.0	2.6	0.3	5.9	0.0	5.9	0.0	6.2	0.0	6.5
3:00	0.2	7.2	0.6	10.0	0.5	5.2	0.4	6.2	0.0	5.9	0.0	3.4	0.4	7.3
3:15	0.2	7.7	0.9	8.2	0.5	7.3	0.3	6.5	0.0	6.9	0.0	5.5	0.4	6.1
3:30	0.3	8.5	0.8	8.6	0.5	8.9	0.4	6.4	0.0	5.9	0.0	6.8	0.4	6.9
3:45	0.5	8.9	0.8	7.2	0.5	11.5	0.6	7.0	0.0	5.3	0.0	6.2	0.4	7.3
4:00	0.6	9.0	0.6	6.2	0.0	9.9	0.6	7.6	0.0	5.9	0.0	6.2	0.4	6.9
4:15	0.7	8.9	0.2	7.0	1.0	9.9	0.7	8.1	0.0	6.4	0.0	2.7	0.4	6.5
4:30	1.0	8.9	0.5	7.3	1.6	9.9	0.8	8.8	0.5	9.0	0.7	4.1	0.4	6.1
4:45	1.0	8.9	0.6	7.7	2.1	10.4	1.0	9.2	1.1	8.5	1.4	6.2	1.1	5.7
5:00	1.2	8.8	0.9	8.0	2.1	11.5	1.3	9.1	1.1	10.1	1.4	7.5	0.8	6.1
5:15	1.6	8.6	1.1	7.4	1.6	10.4	1.6	9.2	1.1	10.1	1.4	8.9	2.3	6.9
5:30	2.0	8.3	0.9	6.5	1.0	9.4	1.9	9.0	0.5	9.6	0.7	8.9	3.1	7.3
5:45	2.9	7.9	0.9	5.9	1.0	6.8	2.4	8.2	0.0	11.2	0.7	6.2	4.6	8.4
6:00	3.8	7.2	0.9	5.4	1.6	7.3	2.9	7.9	1.1	8.5	1.4	4.8	5.0	9.2
6:15	4.5	6.7	1.2	5.6	1.0	6.8	3.8	7.2	2.1	6.4	2.7	4.8	5.0	9.5
6:30	5.4	6.0	1.5	5.3	1.6	7.3	4.9	6.6	2.1	4.8	2.7	3.4	6.9	8.4
6:45	6.2	5.6	1.9	5.9	2.1	8.9	6.3	6.4	2.1	3.7	2.1	3.4	8.0	6.9
7:00	6.7	5.2	1.9	5.6	2.1	6.8	7.4	5.7	2.7	2.7	1.4	3.4	11.1	5.0
7:15	7.3	5.0	2.5	5.8	3.1	6.3	7.7	5.4	1.6	4.3	2.7	4.1	9.9	4.6
7:30	7.1	4.8	3.5	5.8	3.6	5.7	7.7	5.4	1.6	4.8	4.1	2.7	8.8	3.8
7:45	6.6	4.7	3.8	5.4	3.6	4.2	6.9	4.9	2.7	4.3	6.2	2.7	7.3	3.8
8:00	6.2	4.7	4.3	5.0	3.1	5.2	6.3	5.1	1.6	3.7	6.8	2.7	4.6	5.7
8:15	5.7	4.5	4.7	3.6	2.6	4.2	6.0	4.8	2.7	4.8	6.2	0.7	5.0	3.8
8:30	5.1	4.3	4.0	3.2	3.1	2.6	5.6	4.1	4.3	4.3	6.2	1.4	3.8	6.9
8:45	4.9	3.7	4.8	2.8	2.1	1.6	5.5	4.1	4.3	3.2	4.8	1.4	3.1	8.8
9:00	4.3	3.4	5.2	2.1	3.6	0.0	5.3	3.6	6.9	3.7	6.2	0.7	2.7	6.9
9:15	4.1	2.8	5.4	2.2	5.2	0.0	5.1	3.6	9.0	2.7	5.5	2.1	2.7	8.0
9:30	4.4	2.3	6.0	2.1	6.3	0.0	4.6	3.6	10.1	3.2	5.5	1.4	3.4	5.0
9:45	4.4	2.0	7.3	1.5	10.9	0.5	4.1	3.3	12.2	4.3	8.9	2.1	4.2	3.1
10:00	4.8	1.6	7.9	1.3	12.5	0.5	4.0	2.9	9.6	3.7	10.3	2.7	4.6	2.3
10:15	5.0	1.3	8.1	0.9	13.0	0.5	4.3	2.2	7.4	2.1	11.6	1.4	4.2	1.5
10:30	5.0	1.2	7.7	0.9	11.5	0.5	4.7	1.8	6.4	2.7	11.6	1.4	3.1	1.1
10:45	5.2	1.2	6.2	0.8	9.4	0.0	5.2	1.4	5.9	1.6	8.9	0.7	1.9	0.8
11:00	5.2	1.0	6.5	1.4	7.3	0.0	5.3	1.2	10.6	1.6	8.2	0.0	1.9	1.5
11:15	5.3	0.8	6.5	1.4	6.3	0.0	5.3	1.0	11.2	1.6	10.3	0.0	3.1	0.8
11:30	5.4	0.7	7.2	1.5	5.7	1.0	5.2	0.8	11.2	0.0	11.6	0.0	4.2	0.8
11:45	5.4	0.4	7.9	1.3	6.3	1.0	5.4	0.7	10.6	0.0	13.7	0.0	5.0	0.8

Percent of Daily Traffic During the 60-Minute Period Beginning at Displayed Time

APPENDIX H

ITE Trip Generation Manual and Handbook Excerpts



Trip Generation Manual

10th Edition • Volume 2: Data
Residential (Land Uses 200–299)

SEPTEMBER 2017

INSTITUTE OF TRANSPORTATION ENGINEERS

Land Use: 220
Multifamily Housing (Low-Rise)

Description

Low-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have one or two levels (floors). Multifamily housing (mid-rise) (Land Use 221), multifamily housing (high-rise) (Land Use 222), and off-campus student apartment (Land Use 225) are related land uses.

Additional Data

In prior editions of *Trip Generation Manual*, the low-rise multifamily housing sites were further divided into rental and condominium categories. An investigation of vehicle trip data found no clear differences in trip making patterns between the rental and condominium sites within the ITE database. As more data are compiled for future editions, this land use classification can be reinvestigated.

For the three sites for which both the number of residents and the number of occupied dwelling units were available, there were an average of 2.72 residents per occupied dwelling unit.

For the two sites for which the numbers of both total dwelling units and occupied dwelling units were available, an average of 96.2 percent of the total dwelling units were occupied.

This land use included data from a wide variety of units with different sizes, price ranges, locations, and ages. Consequently, there was a wide variation in trips generated within this category. Other factors, such as geographic location and type of adjacent and nearby development, may also have had an effect on the site trip generation.

Time-of-day distribution data for this land use are presented in Appendix A. For the 10 general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:15 and 8:15 a.m. and 4:45 and 5:45 p.m., respectively. For the one site with Saturday data, the overall highest vehicle volume was counted between 9:45 and 10:45 a.m. For the one site with Sunday data, the overall highest vehicle volume was counted between 11:45 a.m. and 12:45 p.m.

For the one dense multi-use urban site with 24-hour count data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:00 and 8:00 a.m. and 6:15 and 7:15 p.m., respectively.

For the three sites for which data were provided for both occupied dwelling units and residents, there was an average of 2.72 residents per occupied dwelling unit.

The average numbers of person trips per vehicle trip at the five general urban/suburban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.13 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.21 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in British Columbia (CAN), California, District of Columbia, Florida, Georgia, Illinois, Indiana, Maine, Maryland, Minnesota, New Jersey, New York, Ontario, Oregon, Pennsylvania, South Dakota, Tennessee, Texas, Utah, Virginia, and Washington.

It is expected that the number of bedrooms and number of residents are likely correlated to the number of trips generated by a residential site. Many of the studies included in this land use did not indicate the total number of bedrooms. To assist in the future analysis of this land use, it is important that this information be collected and included in trip generation data submissions.

Source Numbers

168, 187, 188, 204, 211, 300, 305, 306, 319, 320, 321, 357, 390, 412, 418, 525, 530, 571, 579, 583, 864, 868, 869, 870, 896, 903, 918, 946, 947, 948, 951

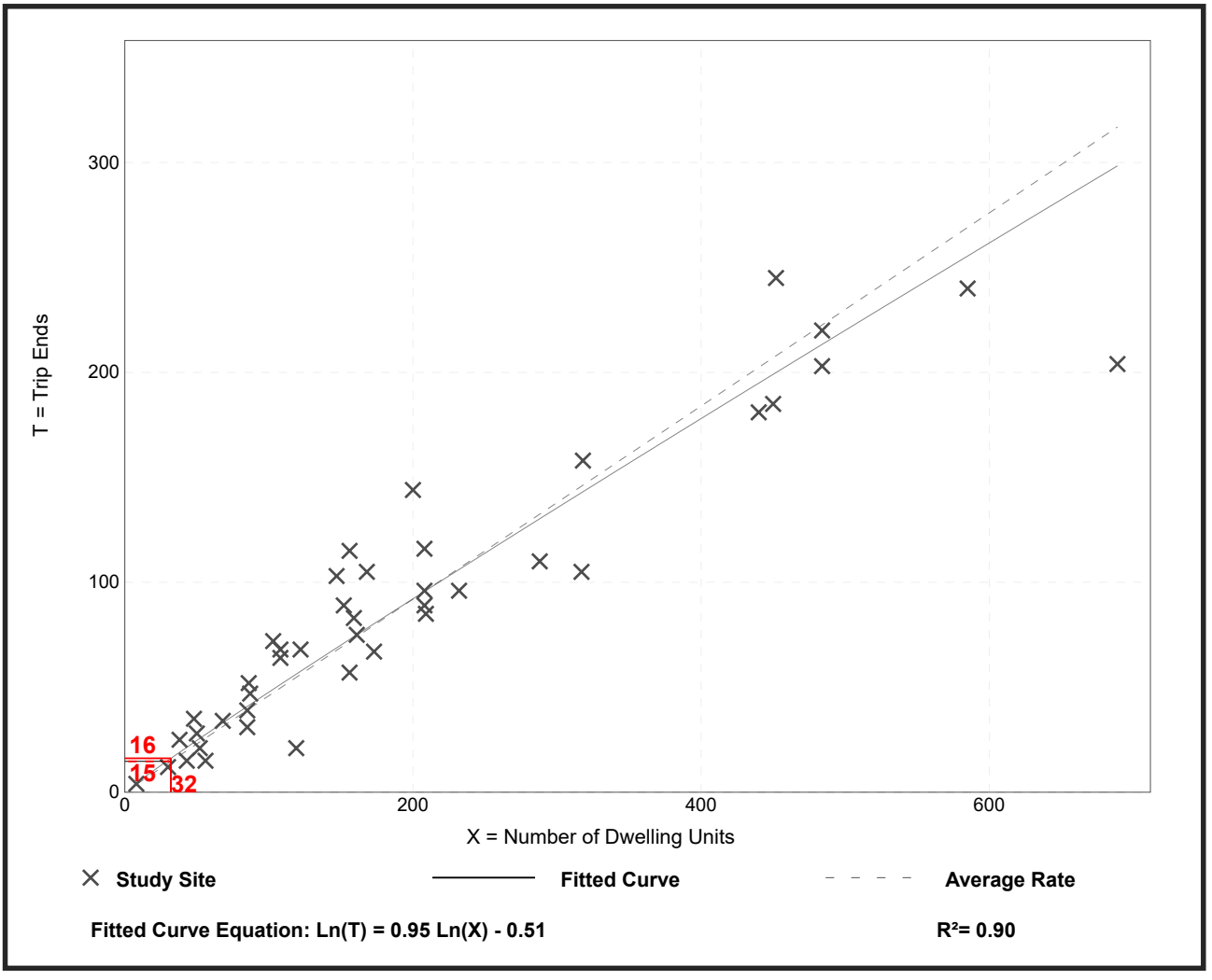
Multifamily Housing (Low-Rise)
(220)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	42
Avg. Num. of Dwelling Units:	199
Directional Distribution:	23% entering, 77% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.46	0.18 - 0.74	0.12

Data Plot and Equation



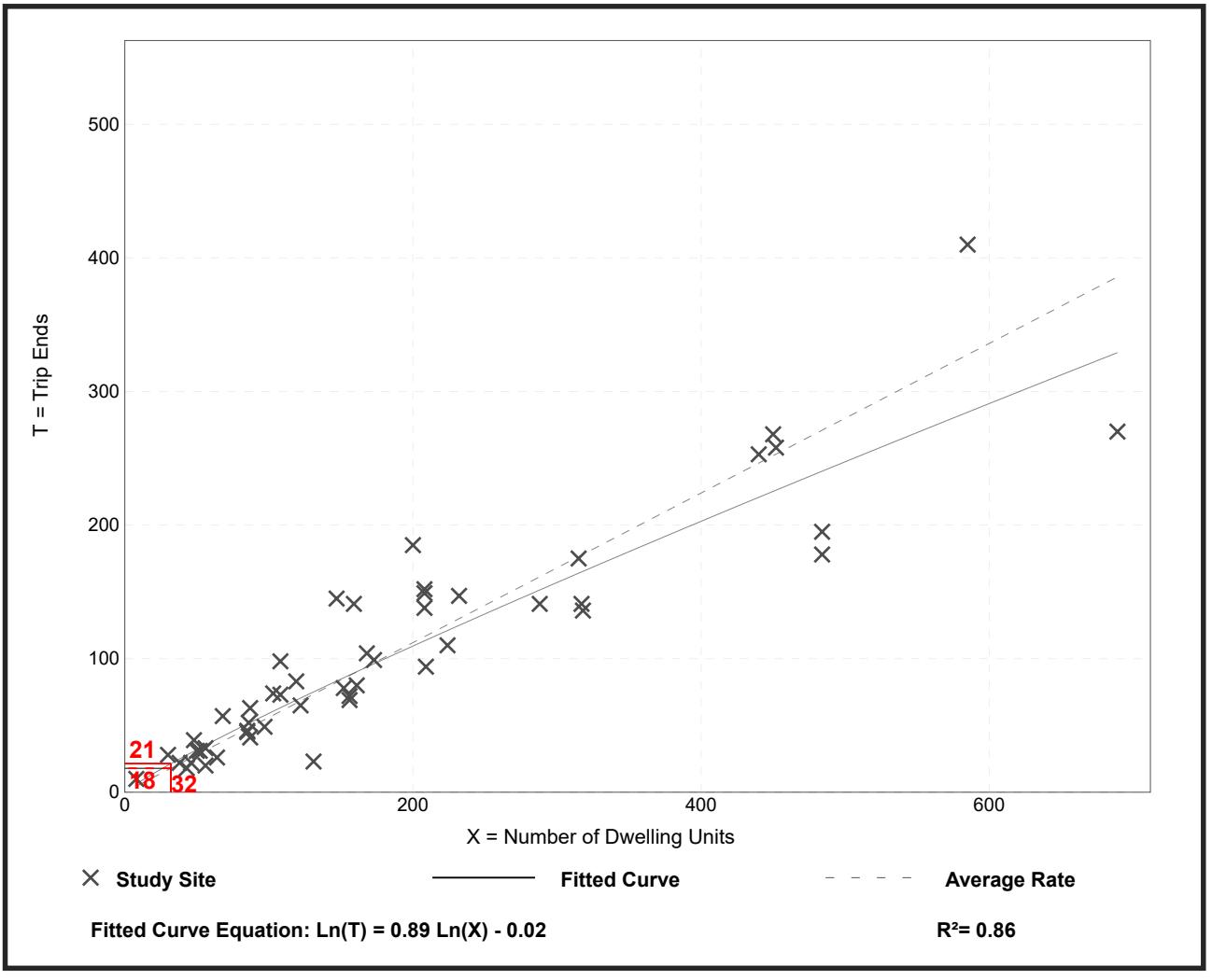
Multifamily Housing (Low-Rise)
(220)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	50
Avg. Num. of Dwelling Units:	187
Directional Distribution:	63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.56	0.18 - 1.25	0.16

Data Plot and Equation



Multifamily Housing (Low-Rise)
(220)

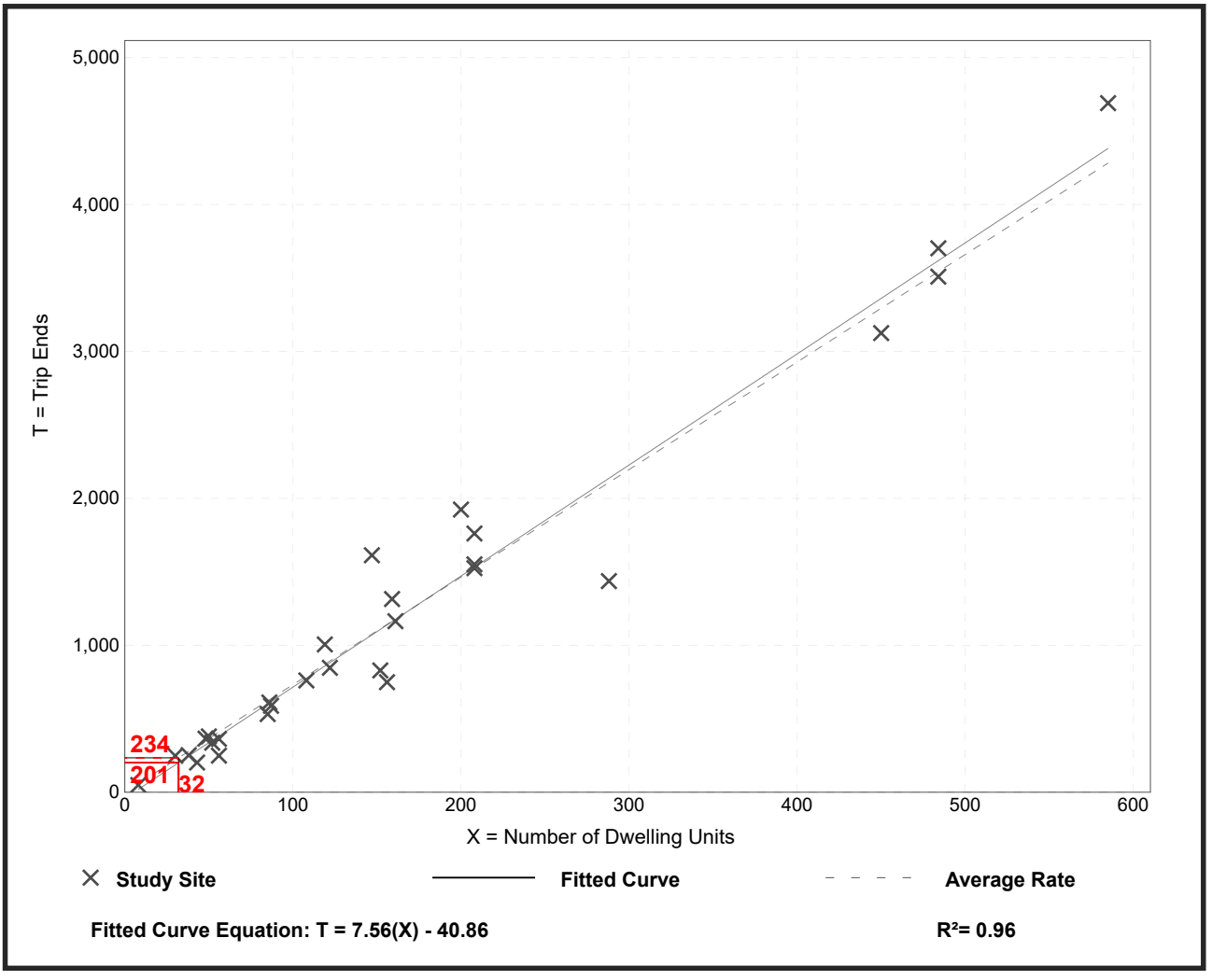
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 29
Avg. Num. of Dwelling Units: 168
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
7.32	4.45 - 10.97	1.31

Data Plot and Equation



Fitted Curve Equation: T = 7.56(X) - 40.86

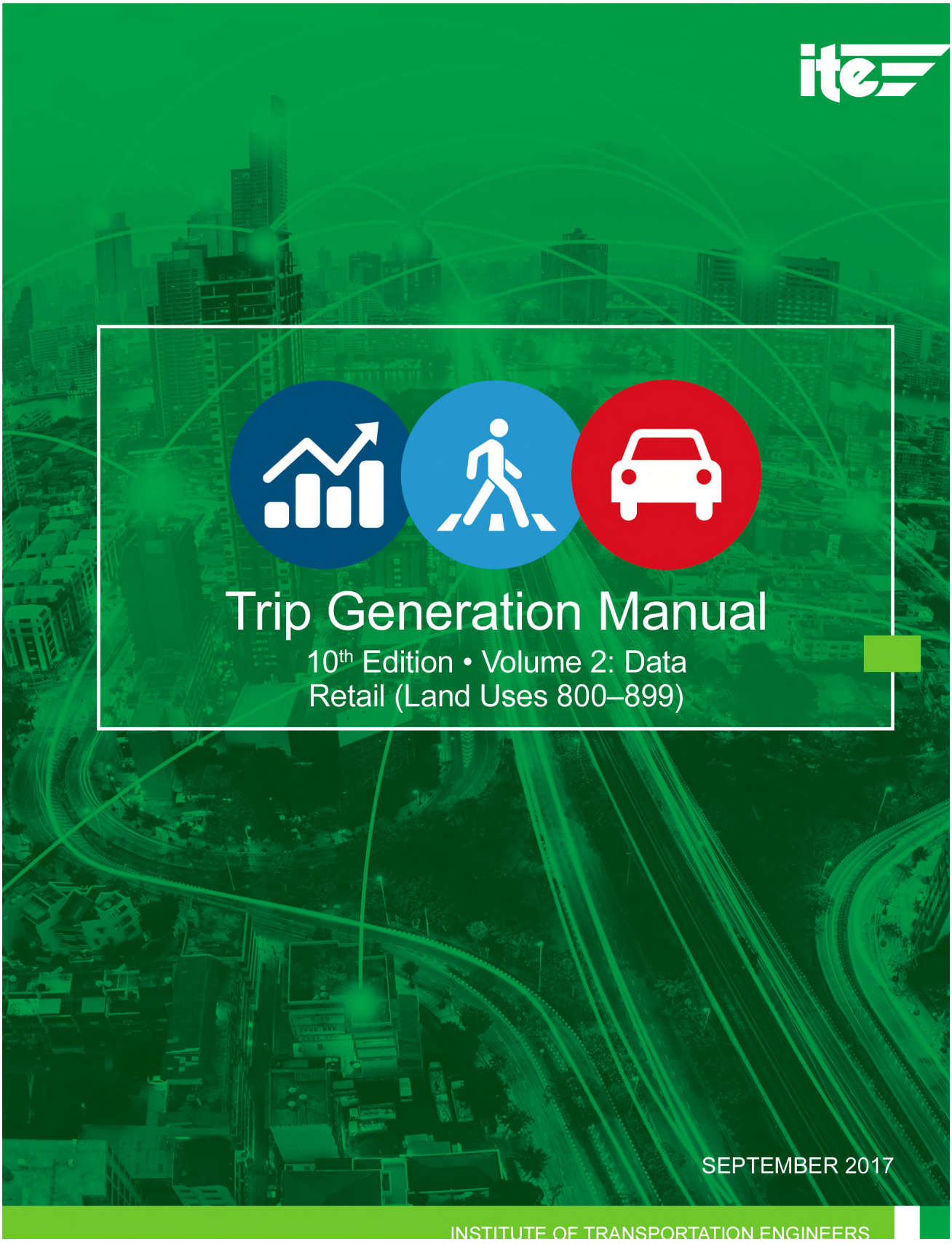
R^2= 0.96

Appendix A

Residential (Land Uses 200–299)

Land Use	210 Single-Family Detached Housing						220 Multifamily Housing (Low-Rise)							
Setting	General Urban/Suburban						General Urban/Suburban						Dense Multi-Use Urban	
Time Period	Weekday		Saturday		Sunday		Weekday		Saturday		Sunday		Weekday	
Trip Type	Vehicle		Vehicle		Vehicle		Vehicle		Vehicle		Vehicle		Vehicle	
# Data Sites	6		2		1		10		1		1		1	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
12:00	0.3	5.5	0.9	7.6	1.0	6.8	0.7	5.4	0.0	8.0	0.0	12.3	0.0	5.0
12:15	0.3	5.6	0.7	8.8	1.0	9.4	0.7	5.3	0.0	10.6	0.0	12.3	0.0	4.6
12:30	0.2	5.8	0.6	9.3	0.5	9.9	0.6	5.2	0.0	11.7	0.0	12.3	0.0	4.2
12:45	0.2	6.1	0.7	8.5	1.0	7.3	0.5	4.9	0.0	9.6	0.0	10.3	0.0	3.8
1:00	0.2	6.0	0.5	8.2	1.0	7.8	0.4	4.6	0.0	7.4	0.0	12.3	0.0	5.0
1:15	0.2	6.1	0.5	7.7	1.0	4.7	0.3	4.9	0.0	3.2	0.0	8.9	0.0	7.3
1:30	0.2	6.2	0.4	6.8	0.5	5.2	0.3	5.0	0.0	2.1	0.0	8.2	0.0	8.0
1:45	0.1	6.2	0.4	8.2	0.0	6.3	0.3	5.6	0.0	3.7	0.0	8.2	0.0	8.8
2:00	0.1	6.6	0.4	8.6	0.0	4.2	0.3	5.7	0.0	5.3	0.0	8.2	0.0	8.0
2:15	0.1	6.8	0.4	9.2	0.0	4.2	0.4	5.7	0.0	5.9	0.0	8.2	0.0	7.6
2:30	0.1	6.7	0.4	9.4	0.0	3.6	0.4	6.3	0.0	5.3	0.0	6.2	0.0	7.6
2:45	0.1	7.1	0.4	9.3	0.0	2.6	0.3	5.9	0.0	5.9	0.0	6.2	0.0	6.5
3:00	0.2	7.2	0.6	10.0	0.5	5.2	0.4	6.2	0.0	5.9	0.0	3.4	0.4	7.3
3:15	0.2	7.7	0.9	8.2	0.5	7.3	0.3	6.5	0.0	6.9	0.0	5.5	0.4	6.1
3:30	0.3	8.5	0.8	8.6	0.5	8.9	0.4	6.4	0.0	5.9	0.0	6.8	0.4	6.9
3:45	0.5	8.9	0.8	7.2	0.5	11.5	0.6	7.0	0.0	5.3	0.0	6.2	0.4	7.3
4:00	0.6	9.0	0.6	6.2	0.0	9.9	0.6	7.6	0.0	5.9	0.0	6.2	0.4	6.9
4:15	0.7	8.9	0.2	7.0	1.0	9.9	0.7	8.1	0.0	6.4	0.0	2.7	0.4	6.5
4:30	1.0	8.9	0.5	7.3	1.6	9.9	0.8	8.8	0.5	9.0	0.7	4.1	0.4	6.1
4:45	1.0	8.9	0.6	7.7	2.1	10.4	1.0	9.2	1.1	8.5	1.4	6.2	1.1	5.7
5:00	1.2	8.8	0.9	8.0	2.1	11.5	1.3	9.1	1.1	10.1	1.4	7.5	0.8	6.1
5:15	1.6	8.6	1.1	7.4	1.6	10.4	1.6	9.2	1.1	10.1	1.4	8.9	2.3	6.9
5:30	2.0	8.3	0.9	6.5	1.0	9.4	1.9	9.0	0.5	9.6	0.7	8.9	3.1	7.3
5:45	2.9	7.9	0.9	5.9	1.0	6.8	2.4	8.2	0.0	11.2	0.7	6.2	4.6	8.4
6:00	3.8	7.2	0.9	5.4	1.6	7.3	2.9	7.9	1.1	8.5	1.4	4.8	5.0	9.2
6:15	4.5	6.7	1.2	5.6	1.0	6.8	3.8	7.2	2.1	6.4	2.7	4.8	5.0	9.5
6:30	5.4	6.0	1.5	5.3	1.6	7.3	4.9	6.6	2.1	4.8	2.7	3.4	6.9	8.4
6:45	6.2	5.6	1.9	5.9	2.1	8.9	6.3	6.4	2.1	3.7	2.1	3.4	8.0	6.9
7:00	6.7	5.2	1.9	5.6	2.1	6.8	7.4	5.7	2.7	2.7	1.4	3.4	11.1	5.0
7:15	7.3	5.0	2.5	5.8	3.1	6.3	7.7	5.4	1.6	4.3	2.7	4.1	9.9	4.6
7:30	7.1	4.8	3.5	5.8	3.6	5.7	7.7	5.4	1.6	4.8	4.1	2.7	8.8	3.8
7:45	6.6	4.7	3.8	5.4	3.6	4.2	6.9	4.9	2.7	4.3	6.2	2.7	7.3	3.8
8:00	6.2	4.7	4.3	5.0	3.1	5.2	6.3	5.1	1.6	3.7	6.8	2.7	4.6	5.7
8:15	5.7	4.5	4.7	3.6	2.6	4.2	6.0	4.8	2.7	4.8	6.2	0.7	5.0	3.8
8:30	5.1	4.3	4.0	3.2	3.1	2.6	5.6	4.1	4.3	4.3	6.2	1.4	3.8	6.9
8:45	4.9	3.7	4.8	2.8	2.1	1.6	5.5	4.1	4.3	3.2	4.8	1.4	3.1	8.8
9:00	4.3	3.4	5.2	2.1	3.6	0.0	5.3	3.6	6.9	3.7	6.2	0.7	2.7	6.9
9:15	4.1	2.8	5.4	2.2	5.2	0.0	5.1	3.6	9.0	2.7	5.5	2.1	2.7	8.0
9:30	4.4	2.3	6.0	2.1	6.3	0.0	4.6	3.6	10.1	3.2	5.5	1.4	3.4	5.0
9:45	4.4	2.0	7.3	1.5	10.9	0.5	4.1	3.3	12.2	4.3	8.9	2.1	4.2	3.1
10:00	4.8	1.6	7.9	1.3	12.5	0.5	4.0	2.9	9.6	3.7	10.3	2.7	4.6	2.3
10:15	5.0	1.3	8.1	0.9	13.0	0.5	4.3	2.2	7.4	2.1	11.6	1.4	4.2	1.5
10:30	5.0	1.2	7.7	0.9	11.5	0.5	4.7	1.8	6.4	2.7	11.6	1.4	3.1	1.1
10:45	5.2	1.2	6.2	0.8	9.4	0.0	5.2	1.4	5.9	1.6	8.9	0.7	1.9	0.8
11:00	5.2	1.0	6.5	1.4	7.3	0.0	5.3	1.2	10.6	1.6	8.2	0.0	1.9	1.5
11:15	5.3	0.8	6.5	1.4	6.3	0.0	5.3	1.0	11.2	1.6	10.3	0.0	3.1	0.8
11:30	5.4	0.7	7.2	1.5	5.7	1.0	5.2	0.8	11.2	0.0	11.6	0.0	4.2	0.8
11:45	5.4	0.4	7.9	1.3	6.3	1.0	5.4	0.7	10.6	0.0	13.7	0.0	5.0	0.8

Percent of Daily Traffic During the 60-Minute Period Beginning at Displayed Time



Trip Generation Manual

10th Edition • Volume 2: Data
Retail (Land Uses 800–899)

SEPTEMBER 2017

INSTITUTE OF TRANSPORTATION ENGINEERS

Land Use: 820
Shopping Center

Description

A shopping center is an integrated group of commercial establishments that is planned, developed, owned, and managed as a unit. A shopping center's composition is related to its market area in terms of size, location, and type of store. A shopping center also provides on-site parking facilities sufficient to serve its own parking demands. Factory outlet center (Land Use 823) is a related use.

Additional Data

Shopping centers, including neighborhood centers, community centers, regional centers, and super regional centers, were surveyed for this land use. Some of these centers contained non-merchandising facilities, such as office buildings, movie theaters, restaurants, post offices, banks, health clubs, and recreational facilities (for example, ice skating rinks or indoor miniature golf courses).

Many shopping centers, in addition to the integrated unit of shops in one building or enclosed around a mall, include outparcels (peripheral buildings or pads located on the perimeter of the center adjacent to the streets and major access points). These buildings are typically drive-in banks, retail stores, restaurants, or small offices. Although the data herein do not indicate which of the centers studied included peripheral buildings, it can be assumed that some of the data show their effect.

The vehicle trips generated at a shopping center are based upon the total GLA of the center. In cases of smaller centers without an enclosed mall or peripheral buildings, the GLA could be the same as the gross floor area of the building.

Time-of-day distribution data for this land use are presented in Appendix A. For the 10 general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 11:45 a.m. and 12:45 p.m. and 12:15 and 1:15 p.m., respectively.

The average numbers of person trips per vehicle trip at the 27 general urban/suburban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.31 during Weekday, AM Peak Hour of Generator
- 1.43 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 1.46 during Weekday, PM Peak Hour of Generator

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Alberta (CAN), British Columbia (CAN), California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Nevada, New Jersey, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, South Dakota, Tennessee, Texas, Vermont, Virginia, Washington, West Virginia, and Wisconsin.

Source Numbers

105, 110, 154, 156, 159, 186, 190, 198, 199, 202, 204, 211, 213, 239, 251, 259, 260, 269, 294, 295, 299, 300, 301, 304, 305, 307, 308, 309, 310, 311, 314, 315, 316, 317, 319, 358, 365, 376, 385, 390, 400, 404, 414, 420, 423, 428, 437, 440, 442, 444, 446, 507, 562, 580, 598, 629, 658, 702, 715, 728, 868, 870, 871, 880, 899, 908, 912, 915, 926, 936, 944, 946, 960, 961, 962, 973, 974, 978

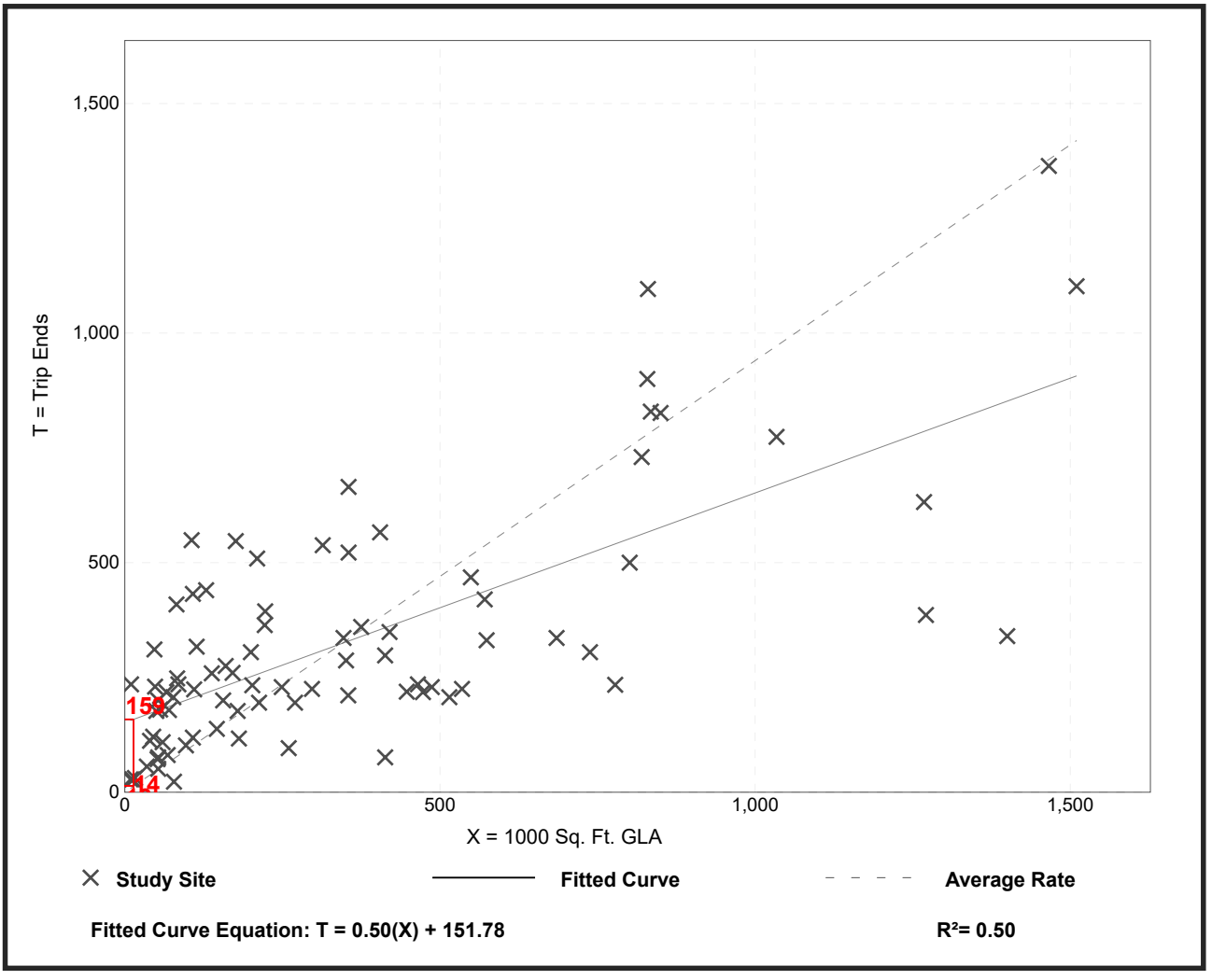
Shopping Center
(820)

Vehicle Trip Ends vs: **1000 Sq. Ft. GLA**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 84
Avg. 1000 Sq. Ft. GLA: 351
Directional Distribution: 62% entering, 38% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
0.94	0.18 - 23.74	0.87

Data Plot and Equation



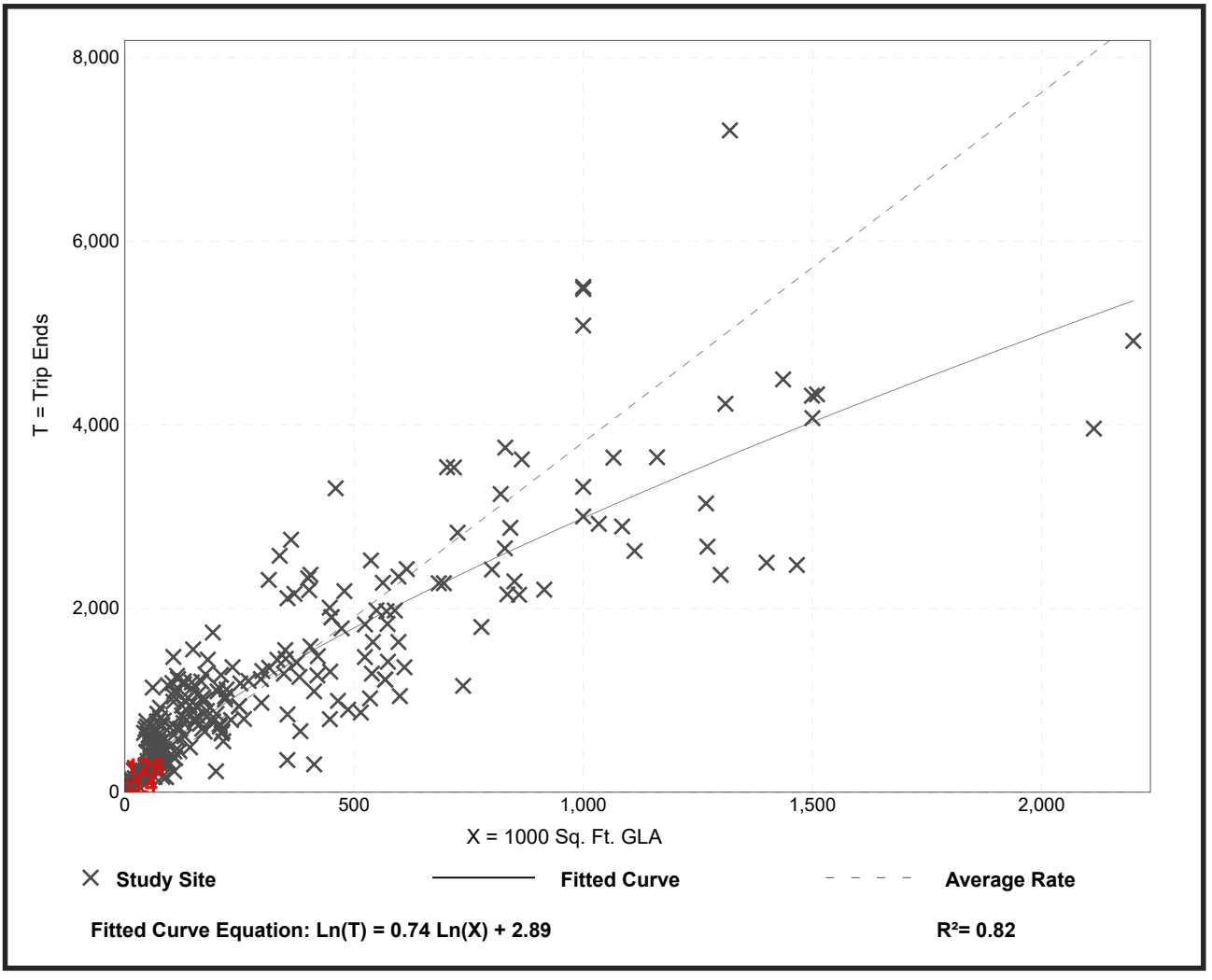
Shopping Center
(820)

Vehicle Trip Ends vs: **1000 Sq. Ft. GLA**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 261
Avg. 1000 Sq. Ft. GLA: 327
Directional Distribution: 48% entering, 52% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
3.81	0.74 - 18.69	2.04

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.74 Ln(X) + 2.89

R^2= 0.82

Shopping Center
(820)

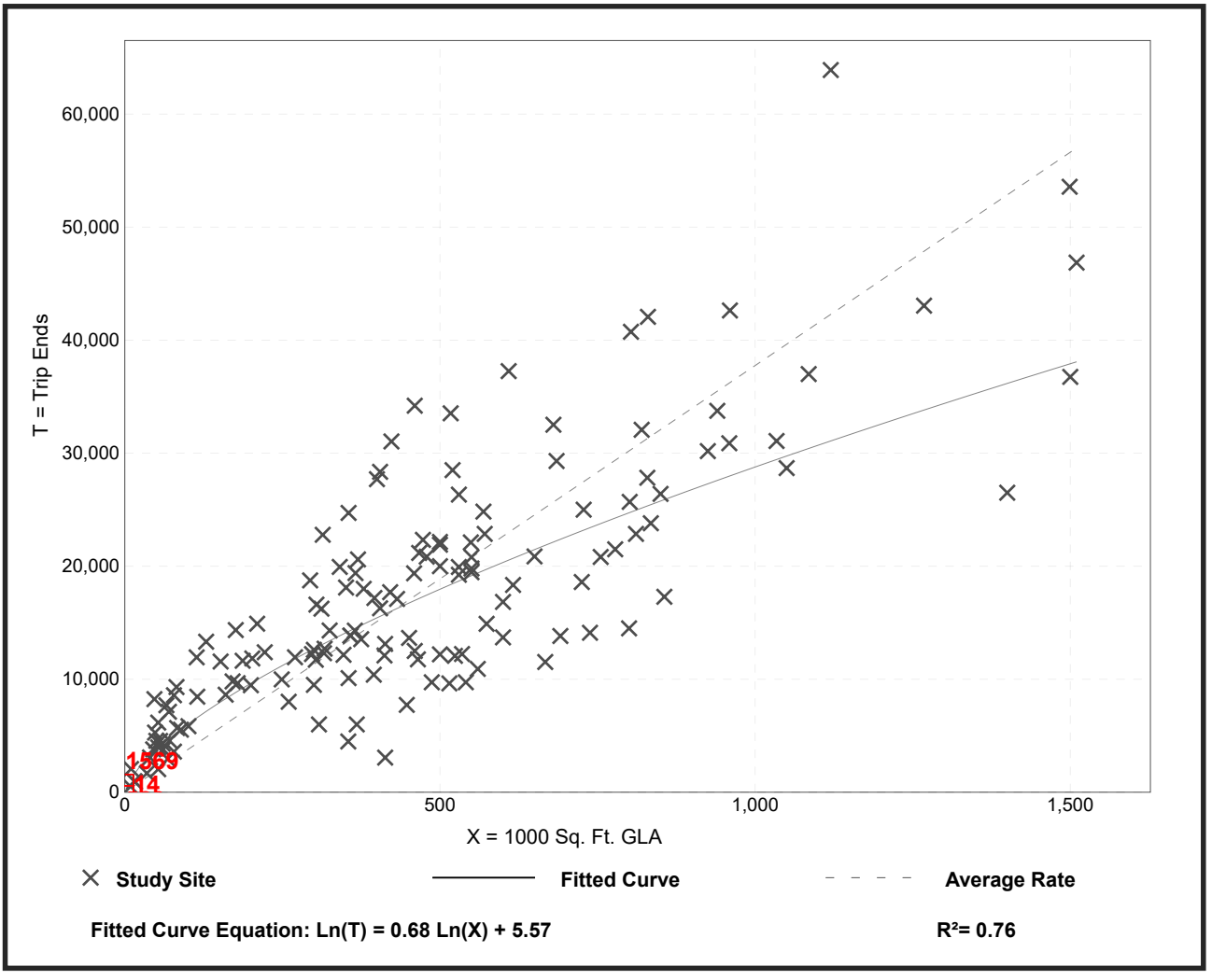
Vehicle Trip Ends vs: **1000 Sq. Ft. GLA**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 147
Avg. 1000 Sq. Ft. GLA: 453
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
37.75	7.42 - 207.98	16.41

Data Plot and Equation



Appendix A

Retail (Land Uses 800–899)

Percent of Daily Traffic During the 60-Minute Period Beginning at Displayed Time

Land Use	820 Shopping Center		840 Automobile Sales (New)		841 Automobile Sales (Used)		842 Recreational Vehicle Sales		843 Automobile Parts Sales		848 Tire Store	
Setting	General Urban/ Suburban		General Urban/ Suburban		General Urban/ Suburban		General Urban/ Suburban		General Urban/ Suburban		General Urban/ Suburban	
Time Period	Weekday		Weekday		Weekday		Weekday		Weekday		Weekday	
Trip Type	Vehicle		Vehicle		Vehicle		Vehicle		Vehicle		Vehicle	
# Data Sites	10		6		14		5		7		6	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
12:00	0.2	10.0	0.0	9.4	0.0	9.1	0.0	10.9	0.0	8.6	0.0	7.4
12:15	0.1	10.1	0.0	8.7	0.0	9.9	0.0	10.5	0.0	8.9	0.0	8.7
12:30	0.2	9.8	0.0	9.0	0.0	9.9	0.0	10.7	0.0	9.2	0.0	9.4
12:45	0.1	9.6	0.0	8.9	0.0	9.4	0.0	8.7	0.0	9.8	0.0	11.3
1:00	0.1	9.3	0.0	9.5	0.0	8.3	0.0	8.3	0.0	8.6	0.0	11.8
1:15	0.1	9.2	0.0	9.8	0.0	7.5	0.0	8.5	0.0	7.8	0.0	11.9
1:30	0.0	9.2	0.0	10.2	0.0	7.1	0.0	7.7	0.0	7.4	0.0	12.9
1:45	0.0	9.2	0.0	10.2	0.0	6.3	0.0	8.2	0.0	6.7	0.0	11.0
2:00	0.0	9.0	0.0	10.0	0.0	7.7	0.0	8.2	0.0	7.0	0.0	10.4
2:15	0.0	8.8	0.0	9.8	0.0	8.5	0.0	9.0	0.0	7.8	0.0	9.1
2:30	0.0	8.8	0.0	9.1	0.0	8.5	0.0	8.0	0.0	8.4	0.0	8.3
2:45	0.0	8.8	0.0	8.9	0.0	8.6	0.0	7.8	0.0	9.0	0.0	9.3
3:00	0.0	8.8	0.0	8.3	0.0	8.4	0.0	7.8	0.0	8.7	0.0	10.1
3:15	0.0	8.9	0.0	8.1	0.0	8.9	0.0	7.0	0.0	8.7	0.0	10.0
3:30	0.0	9.0	0.0	8.1	0.0	9.8	0.0	9.2	0.0	8.4	0.0	9.4
3:45	0.0	9.0	0.0	7.7	0.0	10.9	0.0	9.0	0.0	8.2	0.0	9.5
4:00	0.0	9.2	0.0	7.4	0.0	11.0	0.0	10.0	0.0	8.8	0.0	9.4
4:15	0.0	9.2	0.0	7.5	0.0	11.1	0.0	9.3	0.0	8.5	0.0	9.1
4:30	0.1	9.3	0.0	8.0	0.0	11.4	0.0	8.0	0.0	8.2	0.2	8.4
4:45	0.1	9.4	0.0	8.1	0.0	10.8	0.0	8.8	0.0	7.6	0.2	8.3
5:00	0.1	9.3	0.0	8.2	0.0	10.2	0.0	6.7	0.0	7.5	0.4	6.9
5:15	0.1	9.1	0.0	8.1	0.0	9.6	0.0	5.8	0.0	7.3	0.5	6.1
5:30	0.2	8.7	0.1	6.8	0.0	7.7	0.0	4.3	0.0	7.0	0.5	5.4
5:45	0.2	8.3	0.2	5.9	0.0	6.3	0.0	2.0	0.1	6.7	0.5	3.8
6:00	0.2	8.0	0.7	5.0	0.0	4.5	0.0	1.3	0.3	6.6	0.4	3.0
6:15	0.4	7.6	1.7	4.1	0.0	3.2	0.3	0.8	0.8	5.5	0.7	2.3
6:30	0.6	7.1	2.9	3.6	0.2	2.4	0.3	0.7	1.0	5.3	1.0	1.9
6:45	0.8	6.7	4.3	3.0	0.7	1.8	2.3	0.5	1.5	5.5	1.8	1.4
7:00	1.1	6.1	5.7	2.9	1.9	1.9	5.5	0.2	2.1	5.0	2.9	1.2
7:15	1.4	5.8	6.6	1.7	3.7	1.7	6.5	0.0	2.5	5.4	3.4	0.7
7:30	1.6	5.5	7.8	1.2	4.3	1.6	8.5	0.0	4.3	5.5	4.9	0.3
7:45	1.8	4.9	8.2	0.7	4.9	1.6	7.0	0.0	4.8	5.2	6.6	0.5
8:00	2.0	4.4	8.3	0.0	5.0	1.1	6.3	0.0	5.5	4.3	7.2	0.5
8:15	2.3	4.2	8.4	0.0	7.2	0.4	9.3	0.0	6.6	3.5	7.7	0.3
8:30	2.6	3.8	7.9	0.0	7.7	0.2	9.5	0.0	6.7	2.7	7.8	0.3
8:45	3.1	3.4	8.2	0.0	9.0	0.0	12.5	0.0	7.6	1.9	8.3	0.0
9:00	3.6	2.9	7.5	0.0	11.0	0.0	14.0	0.0	8.2	1.7	9.4	0.0
9:15	4.1	2.3	7.8	0.0	9.7	0.0	12.2	0.0	8.1	1.3	10.9	0.0
9:30	4.7	1.7	7.6	0.0	10.4	0.0	12.7	0.0	7.8	0.8	11.3	0.0
9:45	5.1	1.4	7.8	0.0	11.0	0.0	12.4	0.0	8.0	0.5	10.9	0.0
10:00	5.6	1.1	8.2	0.0	10.2	0.0	12.4	0.0	8.4	0.1	10.7	0.0
10:15	6.3	0.8	8.4	0.0	9.7	0.0	12.5	0.0	8.0	0.0	9.9	0.0
10:30	6.9	0.7	8.7	0.0	10.4	0.0	11.2	0.0	8.5	0.0	9.2	0.0
10:45	7.6	0.5	8.5	0.0	9.7	0.0	11.7	0.0	8.5	0.0	8.9	0.0
11:00	8.3	0.5	8.8	0.0	9.8	0.0	8.3	0.0	8.6	0.0	8.3	0.0
11:15	8.9	0.4	9.4	0.0	9.0	0.0	8.0	0.0	9.3	0.0	8.5	0.0
11:30	9.5	0.3	9.1	0.0	8.5	0.0	9.2	0.0	8.8	0.0	8.6	0.0
11:45	9.8	0.3	9.4	0.0	9.0	0.0	9.0	0.0	8.4	0.0	7.7	0.0

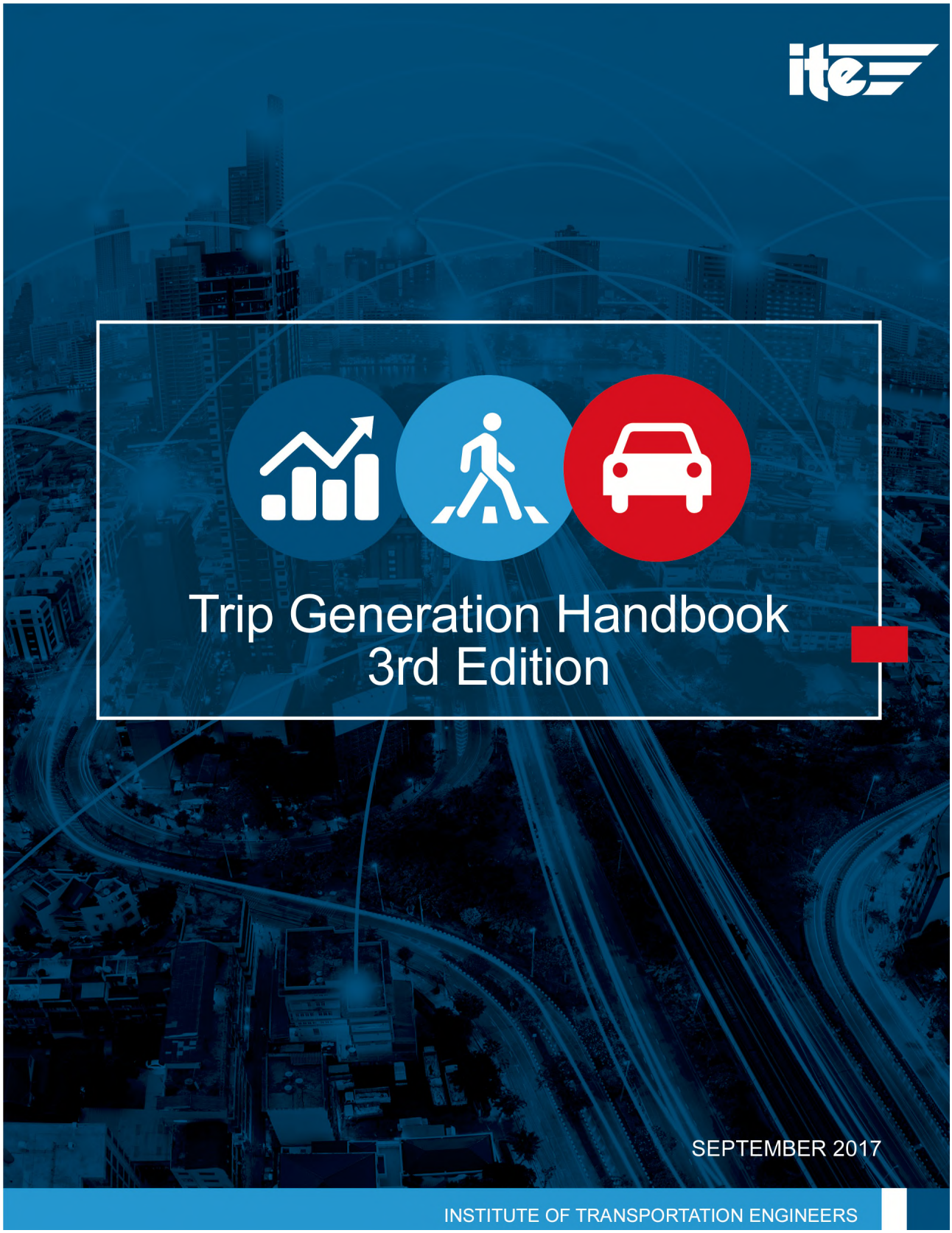

Trip Generation Handbook
3rd Edition
SEPTEMBER 2017
INSTITUTE OF TRANSPORTATION ENGINEERS

Table E.9 (Cont'd) Pass-By and Non-Pass-By Trips Weekday, PM Peak Period Land Use Code 820—Shopping Center

SIZE (1,000 SQ. FT. GLA)	LOCATION	WEEKDAY SURVEY DATE	NO. OF INTERVIEWS	TIME PERIOD	PASS-BY TRIP (%)	NON-PASS-BY TRIP (%)			ADJ. STREET PEAK HOUR VOLUME	AVERAGE 24-HOUR TRAFFIC	SOURCE
						PRIMARY	DIVERTED	TOTAL			
921	Albany, NY	July & Aug. 1985	196	4:00–6:00 p.m.	23	42	35	77	—	60,950	Raymond Keyes Assoc.
108	Overland Park, KS	July 1988	111	4:30–5:30 p.m.	26	61	13	74	—	34,000	—
118	Overland Park, KS	Aug. 1988	123	4:30–5:30 p.m.	25	55	20	75	—	—	—
256	Greece, NY	June 1988	120	4:00–6:00 p.m.	38	62	—	62	—	23,410	Sear Brown
160	Greece, NY	June 1988	78	4:00–6:00 p.m.	29	71	—	71	—	57,306	Sear Brown
550	Greece, NY	June 1988	117	4:00–6:00 p.m.	48	52	—	52	—	40,763	Sear Brown
51	Boca Raton, FL	Dec. 1987	110	4:00–6:00 p.m.	33	34	33	67	—	42,225	Kimley-Horn and Assoc. Inc.
1,090	Ross Twp, PA	July 1988	411	2:00–8:00 p.m.	34	56	10	66	—	51,500	Wilbur Smith and Assoc.
97	Upper Dublin Twp, PA	Winter 1988/89	—	4:00–6:00 p.m.	41	—	—	59	—	34,000	McMahon Associates
118	Tredyffrin Twp, PA	Winter 1988/89	—	4:00–6:00 p.m.	24	—	—	76	—	10,000	Booz Allen & Hamilton
122	Lawnside, NJ	Winter 1988/89	—	4:00–6:00 p.m.	37	—	—	63	—	20,000	Pennoni Associates
126	Boca Raton, FL	Winter 1988/89	—	4:00–6:00 p.m.	43	—	—	57	—	40,000	McMahon Associates
150	Willow Grove, PA	Winter 1988/89	—	4:00–6:00 p.m.	39	—	—	61	—	26,000	Booz Allen & Hamilton
153	Broward Cnty., FL	Winter 1988/89	—	4:00–6:00 p.m.	50	—	—	50	—	85,000	McMahon Associates
153	Arden, DE	Winter 1988/89	—	4:00–6:00 p.m.	30	—	—	70	—	26,000	Orth-Rodgers & Assoc. Inc.
154	Doylestown, PA	Winter 1988/89	—	4:00–6:00 p.m.	32	—	—	68	—	29,000	Orth-Rodgers & Assoc. Inc.
164	Middletown Twp, PA	Winter 1988/89	—	4:00–6:00 p.m.	33	—	—	67	—	25,000	Booz Allen & Hamilton
166	Haddon Twp, NJ	Winter 1988/89	—	4:00–6:00 p.m.	20	—	—	80	—	6,000	Pennoni Associates
205	Broward Cnty., FL	Winter 1988/89	—	4:00–6:00 p.m.	55	—	—	45	—	62,000	McMahon Associates

Table E.9 (Cont'd) Pass-By and Non-Pass-By Trips Weekday, PM Peak Period Land Use Code 820—Shopping Center

SIZE (1,000 SQ. FT. GLA)	LOCATION	WEEKDAY SURVEY DATE	NO. OF INTERVIEWS	TIME PERIOD	PASS-BY TRIP (%)	NON-PASS-BY TRIP (%)			ADJ. STREET PEAK HOUR VOLUME	AVERAGE 24-HOUR TRAFFIC	SOURCE
						PRIMARY	DIVERTED	TOTAL			
237	W. Windsor Twp, NJ	Winter 1988/89	—	4:00–6:00 p.m.	48	—	—	52	—	46,000	Booz Allen & Hamilton
242	Willow Grove, PA	Winter 1988/89	—	4:00–6:00 p.m.	37	—	—	63	—	26,000	McMahon Associates
297	Whitehall, PA	Winter 1988/89	—	4:00–6:00 p.m.	33	—	—	67	—	26,000	Orth-Rodgers & Assoc. Inc.
360	Broward Cnty., FL	Winter 1988/89	—	4:00–6:00 p.m.	44	—	—	56	—	73,000	McMahon Associates
370	Pittsburgh, PA	Winter 1988/89	—	4:00–6:00 p.m.	19	—	—	81	—	33,000	Wilbur Smith
150	Portland, OR	—	519	4:00–6:00 p.m.	68	6	26	32	—	25,000	Kittelson and Associates
150	Portland, OR	—	655	4:00–6:00 p.m.	65	7	28	35	—	30,000	Kittelson and Associates
760	Calgary, Alberta	Oct.-Dec. 1987	15,436	4:00–6:00 p.m.	20	39	41	80	—	—	City of Calgary DOT
178	Bordentown, NJ	Apr. 1989	154	2:00–6:00 p.m.	35	—	—	65	—	37,980	Raymond Keyes Assoc.
144	Manalapan, NJ	July 1990	176	3:30–6:15 p.m.	32	44	24	68	—	69,347	Raymond Keyes Assoc.
549	Natick, MA	Feb. 1989	—	4:45–5:45 p.m.	33	26	41	67	—	48,782	Raymond Keyes Assoc.

Average Pass-By Trip Percentage: 34

"—" means no data were provided

APPENDIX I

TTS Data

USER : Alexander Fleming - CF Crozier and Associates
DATE : Sep 20 2016 (14:19:07)
DATA : 2011 TTS V1.0 Trips
FILTER 1 : mode_prime => Auto driver
FILTER 2 : pd_dest => Caledon
FILTER 3 : start_time => 700-900
FILTER 4 : gta06_dest => 3197
FILTER 5 : purp_dest => Market/Shop
ROW : pd_orig
COLUMN : pd_dest

	Trips	Direction
Caledon	18	North
Brampton	7	South
Brampton	6	West

USER : Alexander Fleming - CF Crozier and Associates
DATE : Sep 20 2016 (14:19:07)
DATA : 2011 TTS V1.0 Trips
FILTER 1 : mode_prime => Auto driver
FILTER 2 : pd_dest => Caledon
FILTER 3 : start_time => 1100-1400
FILTER 4 : gta06_dest => 3197
FILTER 5 : purp_dest => Market/Shop
ROW : pd_orig
COLUMN : pd_dest

	Trips	Direction
Caledon	99	

USER : Alexander Fleming - CF Crozier and Associates
DATE : Sep 20 2016 (14:19:07)
DATA : 2011 TTS V1.0 Trips
FILTER 1 : mode_prime => Auto driver
FILTER 2 : pd_dest => Caledon
FILTER 3 : start_time => 1500-1800
FILTER 4 : gta06_dest => 3197
FILTER 5 : purp_dest => Market/Shop
ROW : pd_orig
COLUMN : pd_dest

	Caledon	
Caledon	101	
Brampton	8	South
	7	West

USER : Alexander Fleming - CF Crozier and Associates
DATE : Sep 20 2016 (14:19:07)
DATA : 2011 TTS V1.0 Trips
FILTER 1 : mode_prime => Auto driver
FILTER 2 : pd_orig => Caledon
FILTER 3 : start_time => 700-900
FILTER 4 : gta06_dest => 3197
FILTER 5 : purp_dest => Market/Shop
ROW : gta06_orig
COLUMN : gta06_dest

	Trips	Direction
3100	18	North

Row Labels	Sum of Trips	
North	18	58%
South	7	23%
West	6	19%
Grand Total	**31**	100%

USER : Alexander Fleming - CF Crozier and Associates
DATE : Sep 20 2016 (14:19:07)
DATA : 2011 TTS V1.0 Trips
FILTER 1 : mode_prime => Auto driver
FILTER 2 : pd_orig => Caledon
FILTER 3 : start_time => 1100-1400
FILTER 4 : gta06_dest => 3197
FILTER 5 : purp_dest => Market/Shop
ROW : gta06_orig
COLUMN : gta06_dest

	Trips	Direction
3001	18	South
3151	13	South
3152	18	North
	18	West
3193	14	South
3197	2	North
	2	West
	2	East
	13	South

Row Labels	Sum of Trips	
East	2	2%
North	20	20%
South	58	58%
West	20	20%
Grand Total	**99**	100%

USER : Alexander Fleming - CF Crozier and Associates
DATE : Sep 20 2016 (14:19:07)
DATA : 2011 TTS V1.0 Trips
FILTER 1 : mode_prime => Auto driver
FILTER 2 : pd_orig => Caledon
FILTER 3 : start_time => 1500-1800
FILTER 4 : gta06_dest => 3197
FILTER 5 : purp_dest => Market/Shop
ROW : gta06_orig
COLUMN : gta06_dest

	Trips	Direction
3001	18	South
3108	9	North
3108	9	South
3152	9	North
	8	West
3196	11	South
3197	2	North
	2	West
	2	East
	13	South
3198	20	South
Brampton	8	South
	7	West

Row Labels	Sum of Trips	
East	2	2%
North	20	17%
South	79	67%
West	17	14%
Grand Total	**117**	100%

USER : Alexander Fleming - CF Crozier and Associates
DATE : Sep 20 2016 (14:19:07)
DATA : 2011 TTS V1.0 Trips
FILTER 1 : mode_prime => Auto driver
FILTER 2 : pd_orig => Caledon
FILTER 3 : start_time => 700-900
FILTER 4 : gta06_orig => 3197
FILTER 5 : purp_orig => Market/Shop
ROW : pd_dest
COLUMN : pd_orig

	Trips	Direction
Aurora	13	South
Brampton	9	South
	9	West

Row Labels	Sum of Trips	
South	22	71%
West	9	29%
Grand Total	**31**	100%

USER : Alexander Fleming - CF Crozier and Associates
DATE : Sep 20 2016 (14:19:07)
DATA : 2011 TTS V1.0 Trips
FILTER 1 : mode_prime => Auto driver
FILTER 2 : pd_orig => Caledon
FILTER 3 : start_time => 1100-1400
FILTER 4 : gta06_orig => 3197
FILTER 5 : purp_orig => Market/Shop
ROW : pd_dest
COLUMN : pd_orig

	Trips	Direction
Caledon	97	

USER : Alexander Fleming - CF Crozier and Associates
DATE : Sep 20 2016 (14:19:07)
DATA : 2011 TTS V1.0 Trips
FILTER 1 : mode_prime => Auto driver
FILTER 2 : pd_orig => Caledon
FILTER 3 : start_time => 1500-1800
FILTER 4 : gta06_orig => 3197
FILTER 5 : purp_orig => Market/Shop
ROW : pd_dest
COLUMN : pd_orig

	Trips	Direction
Caledon	149	
Mulmur	15	North

USER : Alexander Fleming - CF Crozier and Associates
DATE : Sep 20 2016 (14:19:07)
DATA : 2011 TTS V1.0 Trips
FILTER 1 : mode_prime => Auto driver
FILTER 2 : pd_dest => Caledon
FILTER 3 : start_time => 1100-1400
FILTER 4 : gta06_orig => 3197
FILTER 5 : purp_orig => Market/Shop
ROW : gta06_dest
COLUMN : gta06_orig

	Trips	Direction
3001	18	South
3151	14	South
3152	24	North
	23	West
3197	2	North
	2	West
	2	East
	13	South

Row Labels	Sum of Trips	
East	2	2%
North	26	27%
South	45	46%
West	25	26%
Grand Total	**97**	100%

USER : Alexander Fleming - CF Crozier and Associates
DATE : Sep 20 2016 (14:19:07)
DATA : 2011 TTS V1.0 Trips
FILTER 1 : mode_prime => Auto driver
FILTER 2 : pd_dest => Caledon
FILTER 3 : start_time => 1500-1800
FILTER 4 : gta06_orig => 3197
FILTER 5 : purp_orig => Market/Shop
ROW : gta06_dest
COLUMN : gta06_orig

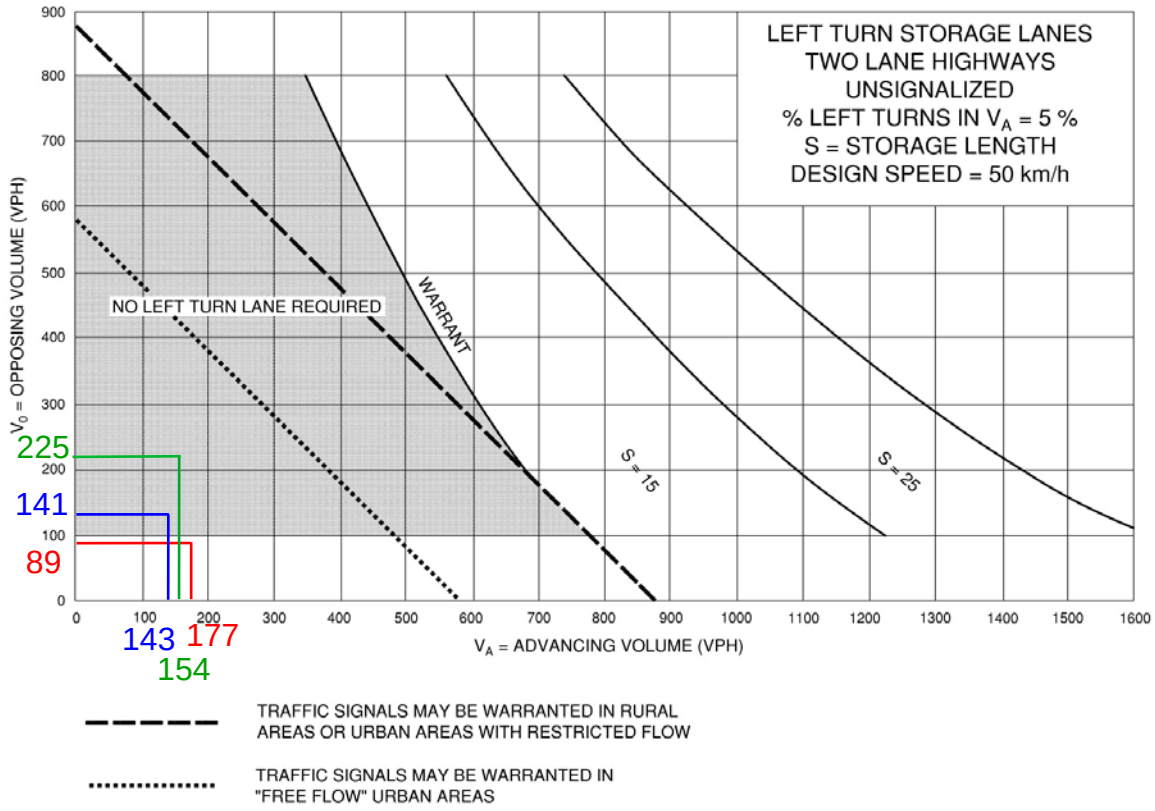
	Trips	Direction
3001	18	South
3108	9	North
	9	South
3151	30	South
3152	9	North
	9	West
3196	11	South
3197	4	North
	4	West
	4	East
	25	South
3198	20	South
Mulmur	15	North

Row Labels	Sum of Trips	
East	4	2%
North	37	22%
South	113	68%
West	13	8%
Grand Total	**165**	100%

APPENDIX J

Auxiliary Left-turn Lane Warrant

Exhibit 9A-3


LEFT TURN STORAGE LANES
TWO LANE HIGHWAYS
UNSIGNALIZED
% LEFT TURNS IN V_A = 5 %
S = STORAGE LENGTH
DESIGN SPEED = 50 km/h
NO LEFT TURN LANE REQUIRED
WARRANT
S = 15
S = 25
225
141
89
143
177
154
V_0 = OPPOSING VOLUME (VPH)
V_A = ADVANCING VOLUME (VPH)
TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW
TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

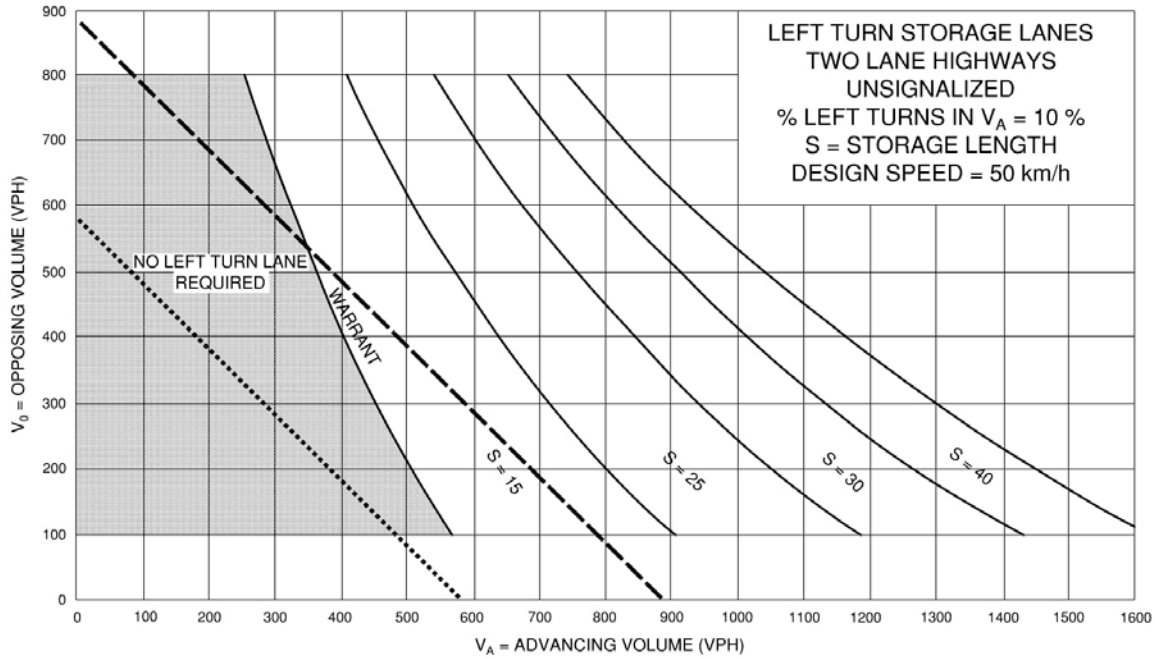
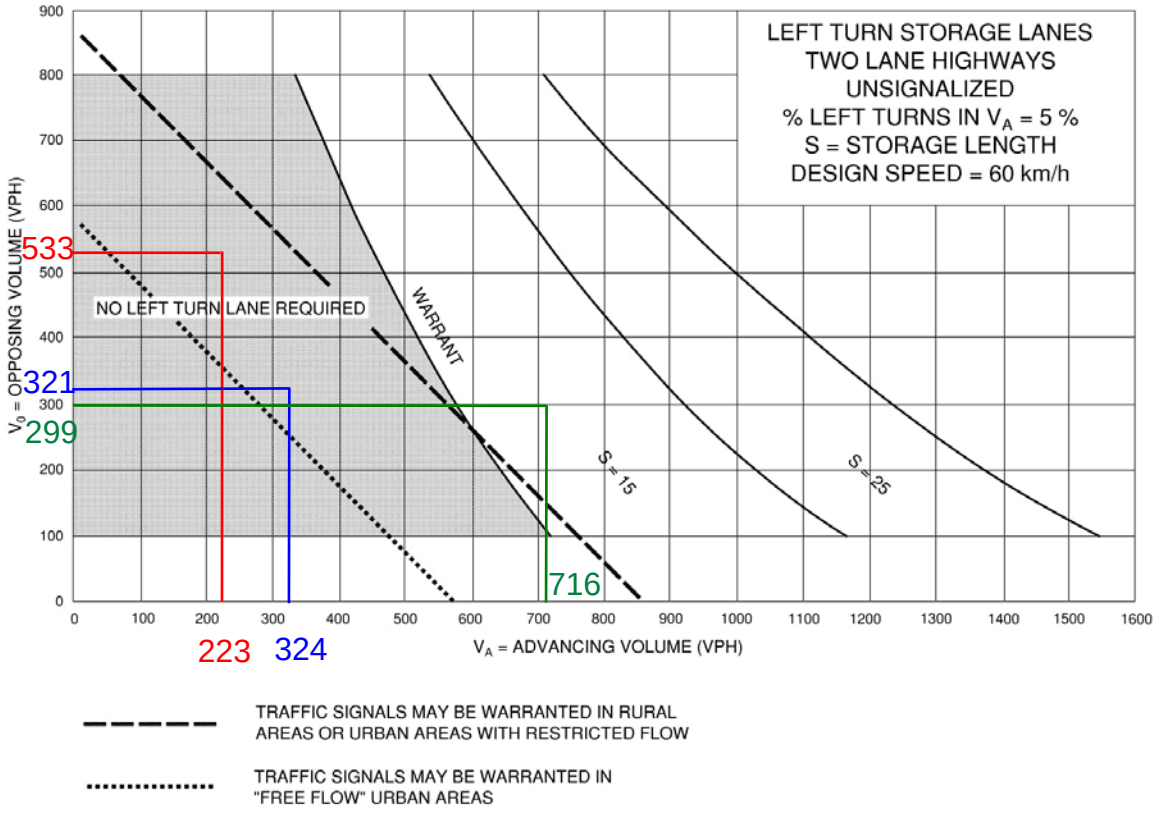
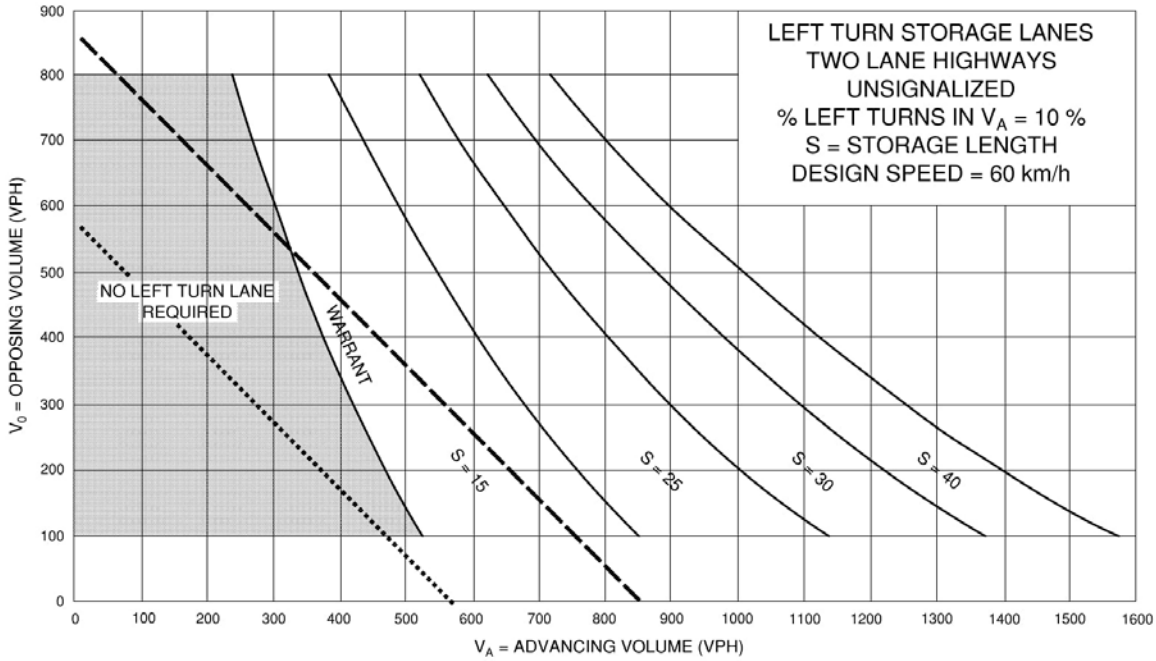

LEFT TURN STORAGE LANES
TWO LANE HIGHWAYS
UNSIGNALIZED
% LEFT TURNS IN V_A = 10 %
S = STORAGE LENGTH
DESIGN SPEED = 50 km/h
NO LEFT TURN LANE REQUIRED
WARRANT
S = 15
S = 25
S = 30
S = 40
V_0 = OPPOSING VOLUME (VPH)
V_A = ADVANCING VOLUME (VPH)

Exhibit 9A-7


LEFT TURN STORAGE LANES
TWO LANE HIGHWAYS
UNSIGNALIZED
% LEFT TURNS IN V_A = 5 %
S = STORAGE LENGTH
DESIGN SPEED = 60 km/h
NO LEFT TURN LANE REQUIRED
WARRANT
S = 15
S = 25
533
321
299
716
223
324
V_O = OPPOSING VOLUME (VPH)
V_A = ADVANCING VOLUME (VPH)
TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW
TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS


LEFT TURN STORAGE LANES
TWO LANE HIGHWAYS
UNSIGNALIZED
% LEFT TURNS IN V_A = 10 %
S = STORAGE LENGTH
DESIGN SPEED = 60 km/h
NO LEFT TURN LANE REQUIRED
WARRANT
S = 15
S = 25
S = 30
S = 40
V_O = OPPOSING VOLUME (VPH)
V_A = ADVANCING VOLUME (VPH)

APPENDIX K

TAC's Geometric Design Guide for Canadian Roads (Relevant Excerpts)

The Effect of Grade

Braking distances will increase on downgrades and decrease on upgrades. When the roadway is on a grade, formula 2.5.1 for braking distance is modified as follows:

$$d_b = \frac{V^2}{254\,[(a/9.81) + G]} \qquad (2.5.3)$$

Where:

- d_b = Braking distance (m)
- V = Design speed (km/h)
- a = Deceleration rate (m/s^2)
- G = Grade (m/m) (G is positive if vehicles uphill and negative if downhill)

It has been noted that many drivers, particularly those in automobiles, do not compensate completely (i.e., by acceleration or deceleration) for the changes in speed caused by grade. It should also be noted that in many cases the sight distance available on downgrades is greater than on upgrades, which can help to provide the necessary corrections for grade. The following **Table 2.5.3** summarizes the stopping sight distances on grades for a variety of design speeds.

Table 2.5.3: Stopping Sight Distance on Grades[55]

Design Speed (km/h)	Stopping Sight Distance (m)					
	Downgrades (%)			Upgrades (%)		
	3	6	9	3	6	9
20	20	20	20	19	18	18
30	32	35	35	31	30	29
40	50	50	53	45	44	43
50	66	70	74	61	59	58
60	87	92	97	80	77	75
70	110	116	124	100	97	93
80	136	144	154	123	118	114
90	164	174	187	148	141	136
100	194	207	223	174	167	160
110	227	243	262	203	194	186
120	263	281	304	234	223	214
130	302	323	350	267	254	243

Stopping sight distance is the sum of the distance travelled during the perception and reaction time and the braking distance.

$$SSD = 0.278Vt + 0.039 \frac{V^2}{a} \quad (2.5.2)$$

Where:

SSD = Stopping sight distance (m)
t = Brake reaction time, 2.5 s
V = Design speed (km/h)
a = Deceleration rate (m/s^2)

Table 2.5.2 gives the minimum stopping sight distances on level grade, on wet pavement, for a range of design speeds. These values are used for vertical curve design, intersection geometry and the placement of traffic control devices. The stopping sight distances quoted in **Table 2.5.2** may need to be increased for a variety of reasons related to grade and vehicle type as noted below.

Table 2.5.2: Stopping Sight Distance on level roadways for Automobiles[54]

Design speed (km/h)	Brake reaction distance (m)	Braking distance on level (m)	Stopping sight distance	
			Calculated (m)	Design (m)
20	13.9	4.6	18.5	20
30	20.9	10.3	31.2	35
40	27.8	18.4	46.2	50
50	34.8	28.7	63.5	65
60	41.7	41.3	83.0	85
70	48.7	56.2	104.9	105
80	55.6	73.4	129.0	130
90	62.6	92.9	155.5	160
100	69.5	114.7	184.2	185
110	76.5	138.8	215.3	220
120	83.4	165.2	248.6	250
130	90.4	193.8	284.2	285

Note: Brake reaction distance predicated on a time of 2.5 s; deceleration rate of 3.4 m/s^2 used to determine calculated sight distance.

The Effect of Grade

Braking distances will increase on downgrades and decrease on upgrades. When the roadway is on a grade, formula 2.5.1 for braking distance is modified as follows:

$$d_b = \frac{V^2}{254\,[(a/9.81) + G]} \qquad (2.5.3)$$

Where:

- d_b = Braking distance (m)
- V = Design speed (km/h)
- a = Deceleration rate (m/s^2)
- G = Grade (m/m) (G is positive if vehicles uphill and negative if downhill)

It has been noted that many drivers, particularly those in automobiles, do not compensate completely (i.e., by acceleration or deceleration) for the changes in speed caused by grade. It should also be noted that in many cases the sight distance available on downgrades is greater than on upgrades, which can help to provide the necessary corrections for grade. The following **Table 2.5.3** summarizes the stopping sight distances on grades for a variety of design speeds.

Table 2.5.3: Stopping Sight Distance on Grades[55]

Design Speed (km/h)	Stopping Sight Distance (m)					
	Downgrades (%)			Upgrades (%)		
	3	6	9	3	6	9
20	20	20	20	19	18	18
30	32	35	35	31	30	29
40	50	50	53	45	44	43
50	66	70	74	61	59	58
60	87	92	97	80	77	75
70	110	116	124	100	97	93
80	136	144	154	123	118	114
90	164	174	187	148	141	136
100	194	207	223	174	167	160
110	227	243	262	203	194	186
120	263	281	304	234	223	214
130	302	323	350	267	254	243

Table 9.9.3: Time Gap for Case B1, Left Turn from Stop

Design Vehicle	Time Gap (t_g)(s) at Design Speed of Major Road
Passenger car	7.5
Single-unit truck	9.5
Combination truck (WB 19 and WB 20)	11.5
Longer truck	To be established by road authority

Notes: Time gaps are for a stopped vehicle to turn left onto a two-lane highway with no median and with grades of 3% or less. The table values should be adjusted as follows:

- For multi-lane highways: For left turns onto two-lane highways with more than two lanes, add 0.5 s for passenger cars and 0.7 s for trucks for each additional lane, from the left, in excess of one, to be crossed by the turning vehicle.
- For minor approach grades: If the approach grade is an upgrade that exceeds 3%, add 0.2 s for each percent grade for left turns.
- Some road authorities use higher values for certain specialized vehicles (e.g., Alberta uses 22 s for very long log trucks).

The intersection sight distance along the major road (distance b in **Figure 9.9.2**) is determined by:

$$ISD = 0.278\ V_{major}\ t_g \qquad (9.9.1)$$

Where:

ISD = intersection sight distance (length of the leg of sight triangle along the major road) (m)
V_{major} = design speed of the major road (km/h)
t_g = time gap for minor road vehicle to enter the major road (s)

For example, a passenger car turning left onto a two-lane major road should be provided sight distance equivalent to a time gap of 7.5 s in major-road traffic. If the design speed of the major road is 100 km/h, this corresponds to a sight distance of 0.278(100)(7.5) = 208.5 or 210 m, rounded for design.

A passenger car turning left onto a four-lane undivided roadway will need to cross two near lanes, rather than one. This increases the recommended gap in major-road traffic from 7.5 to 8.0 s. The corresponding value of sight distance for this example would be 223 m. If the minor-road approach to such an intersection is located on a 4% upgrade, then the time gap selected for intersection sight distance design for left turns should be increased from 8.0 to 8.8 s, equivalent to an increase of 0.2 s for each percent grade.

The design values for intersection sight distance for passenger cars are shown in **Table 9.9.4**. **Figure 9.9.4** includes design values, based on the time gaps for the design vehicles included in **Table 9.9.3**.

No adjustment of the recommended sight distance values for the major-road grade is generally needed because both the major- and minor-road vehicle will be on the same grade when departing from the intersection. However, if the minor-road design vehicle is a heavy truck and the intersection is located near a sag vertical curve with grades over 3%, then an adjustment to extend the recommended sight distance based on the major-road grade should be considered.

Table 9.9.4: Design Intersection Sight Distance – Case B1, Left Turn From Stop

Design Speed (km/h)	Stopping Sight Distance (m)	Intersection Sight Distance for Passenger Cars	
		Calculated (m)	Design (m)
20	20	41.7	45
30	35	62.6	65
40	50	83.4	85
50	65	104.3	105
60	85	125.1	130
70	105	146.0	150
80	130	166.8	170
90	160	187.7	190
100	185	208.5	210
110	220	229.4	230
120	250	250.2	255
130	285	271.1	275

Note: Intersection sight distance shown is for a stopped passenger car to turn left onto a two-lane highway with no median and grades 3% or less. For other conditions, the time gap should be adjusted and the sight distance recalculated.

Sight distance design for left turns at divided-highway intersections should consider multiple design vehicles and median width. If the design vehicle used to determine sight distance for a divided-highway intersection is larger than a passenger car, then sight distance for left turns will need to be checked for that selected design vehicle and for smaller design vehicles as well. If the divided-highway median is wide enough to store the design vehicle with a clearance to the through lanes of approximately 1 m at both ends of the vehicle, no separate analysis for the departure sight triangle for left turns is needed on the minor-road approach for the near roadway to the left. In most cases, the departure sight triangle for right turns (case B2) will provide sufficient sight distance for a passenger car to cross the near roadway to reach the median. Possible exceptions are addressed in the discussion of case B3.

The time gaps in **Table 9.9.3** can be decreased by 1.0 s for right-turn maneuvers without undue interference with major-road traffic. These adjusted time gaps for the right turn from the minor road are shown in **Table 9.9.5**. Design values based on these adjusted time gaps are shown in **Table 9.9.6** for passenger cars. **Figure 9.9.5** includes the design values for the design vehicles for each of the time gaps in **Table 9.9.5**.

Table 9.9.5: Time Gap for Case B2—Right Turn from Stop and Case B3—Crossing Maneuver

Design Vehicle	Time Gap (t_g)(s) at Design Speed of Major Road
Passenger car	6.5
Single-unit truck	8.5
Combination truck (WB 19 and WB 20)	10.5

Note: Time gaps are for a stopped vehicle to turn left onto a two-lane highway with no median and with grades of 3% or less. The table values should be adjusted as follows:

- For multi-lane highways: For left turns onto two-lane highways with more than two lanes, add 0.5 s for passenger cars and 0.7 s for trucks for each additional lane, from the left, in excess of one, to be crossed by the turning vehicle.
- For minor approach grades: If the approach grade is an upgrade that exceeds 3%, add 0.1 s for each percent grade for left turns.

Table 9.9.6: Design Intersection Sight Distance – Case B2, Right Turn from Stop, and Case B3, Crossing Maneuver

Design Speed (km/h)	Stopping Sight Distance (m)	Intersection Sight Distance for Passenger Cars	
		Calculated (m)	Design (m)
20	20	36.1	40
30	35	54.2	55
40	50	72.3	75
50	65	90.4	95
60	85	108.4	110
70	105	126.5	130
80	130	144.6	145
90	160	162.6	165
100	185	180.7	185
110	220	198.8	200
120	250	216.8	220
130	285	234.9	235

Note: Intersection sight distance shown is for a stopped passenger car to turn right onto or to cross a two-lane highway with no median and with grades of 3% or less. For other conditions, the time gap should be adjusted and the sight distance recalculated.

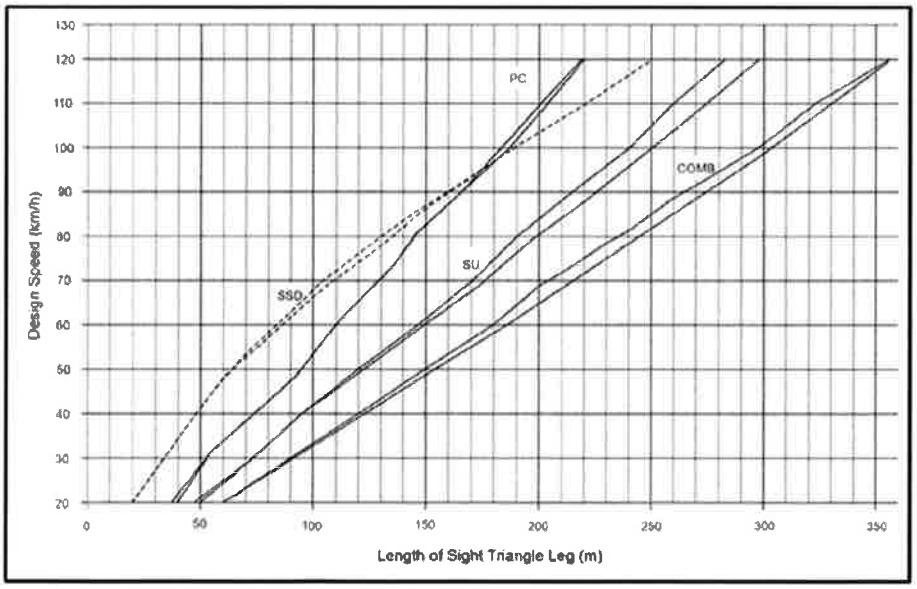


Figure 9.9.5: Intersection Sight Distance – Case B2, Right Turn from Stop, and Case B3, Crossing Maneuver (Calculated and Design Values Plotted)

Case F – Left Turns from the Major Road

All locations along a major highway from which vehicles are permitted to turn left across opposing traffic, including intersections and driveways, should have sufficient sight distance to accommodate the left-turn maneuver. Left-turning drivers need sufficient sight distance to decide when to turn left across the lane(s) used by opposing traffic. Sight distance design should be based on a left turn by a stopped vehicle, since a vehicle that turns left without stopping would need less sight distance. The sight distance along the major road to accommodate left turns is the distance traversed at the design speed of the major road in the travel time for the design vehicle given in **Table 9.9.11**.

Table 9.9.11: Time Gap for Case F, Left Turns from the Major Road

Design Vehicle	Time Gap (t_g)(s) at Design Speed of Major Road
Passenger car	5.5
Single-unit truck	6.5
Combination truck (WB 19 and WB 20)	7.5

Note: Adjustment for multi-lane highways: For turning vehicles that cross more than one opposing lane, add 0.5 s for passenger cars and 0.7 s for trucks for each additional lane to be crossed.

The table also contains appropriate adjustment factors for the number of major-road lanes to be crossed by the turning vehicle. The unadjusted time gap in **Table 9.9.11** for passenger cars was used to develop the sight distances in **Table 9.9.12** and is illustrated in **Figure 9.9.8.**

Table 9.9.12: Intersection Sight Distance – Case F, Left Turn from the Major Road

Design Speed (km/h)	Stopping Sight Distance (m)	Intersection Sight Distance	
		Passenger Cars	
		Calculated (m)	Design (m)
20	20	30.6	35
30	35	45.9	50
40	50	61.2	65
50	65	76.5	80
60	85	91.7	95
70	105	107.0	110
80	130	122.3	125
90	160	137.6	140
100	185	152.9	155
110	220	168.2	170
120	250	183.5	185
130	285	198.8	200

Note: Intersection sight distance shown is for a passenger car making a left turn from an undivided highway. For other conditions and design vehicles, the time gap should be adjusted and the sight distance recalculated.

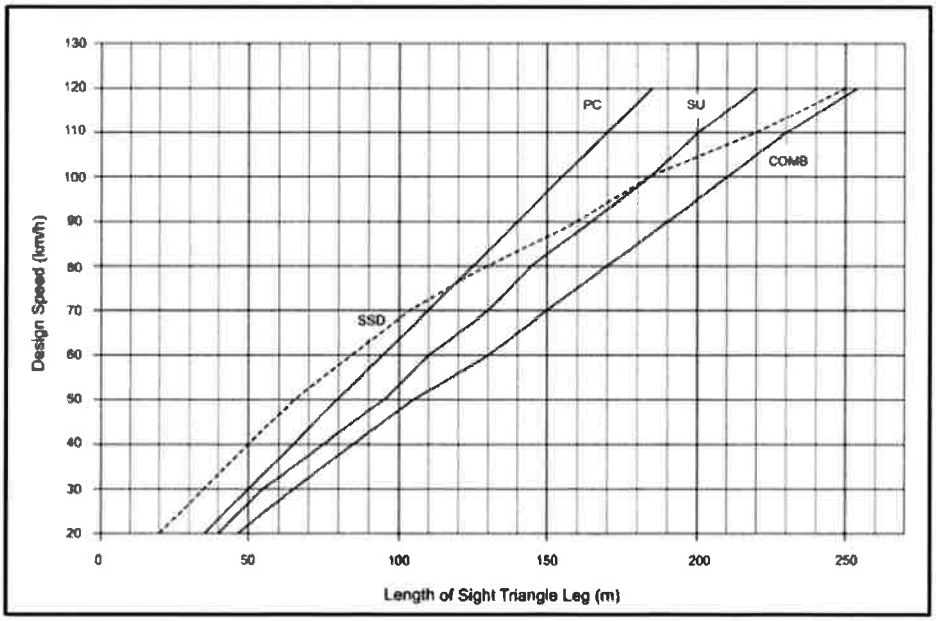
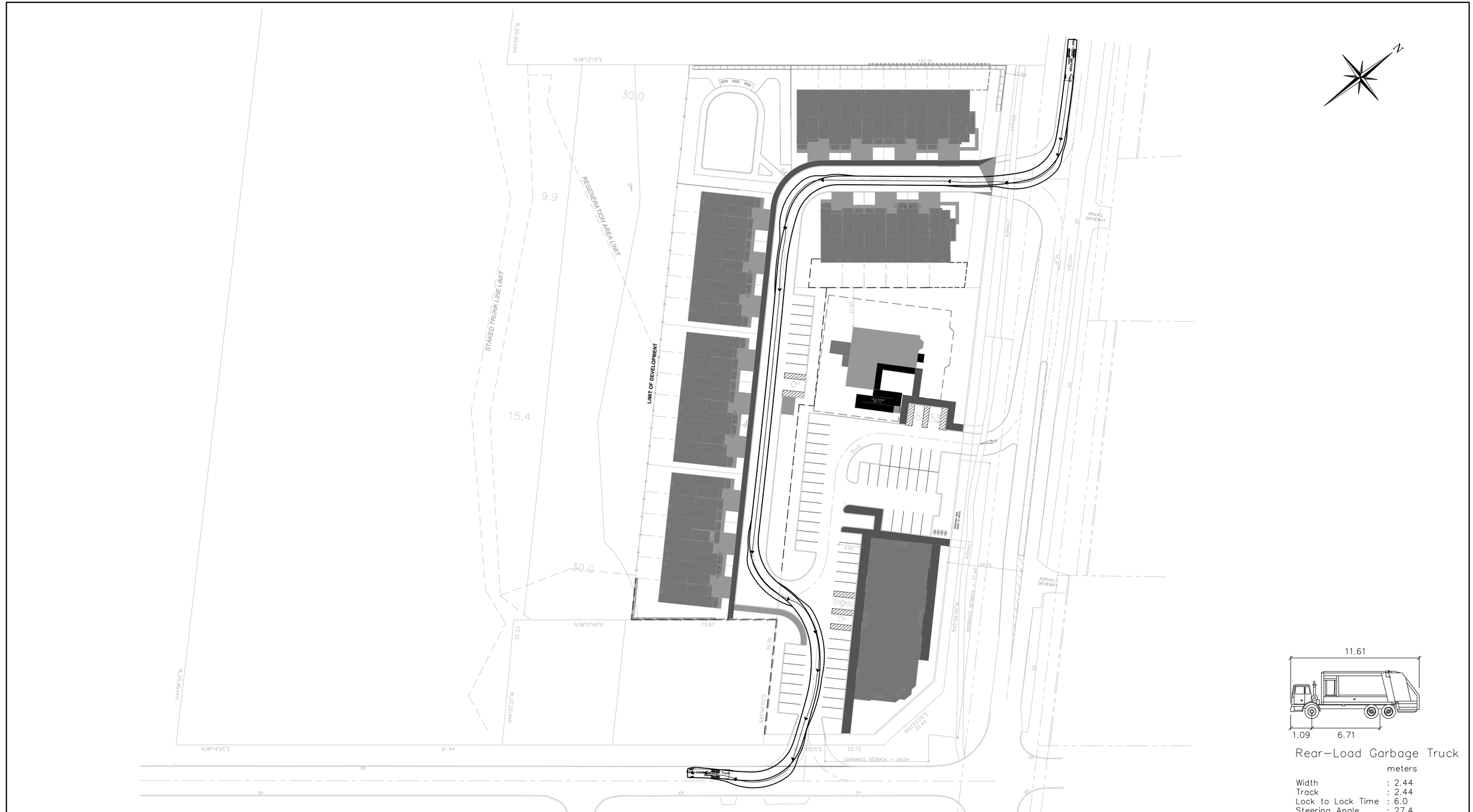


Figure 9.9.8: Intersection Sight Distance – Case F, Left Turn from the Major Road

APPENDIX L

Vehicle Manoeuvring Diagrams



Rear–Load Garbage Truck

meters

Width	: 2.44
Track	: 2.44
Lock to Lock Time	: 6.0
Steering Angle	: 27.4

TEMPORARY BENCHMARKS

TBM#1–
TBM#2–
TBM#3–

Town

No.	ISSUE	DATE: MM/DD/YYYY
A	ISSUED FOR REVIEW	09/17/2019
2B	ISSUED FOR INTERNAL REVIEW	09/22/2020
3	ISSUED FOR INTERNAL REVIEW	11/19/2020

Engineer

DRAFT
FOR DISCUSSION PURPOSES ONLY

Engineer

Project

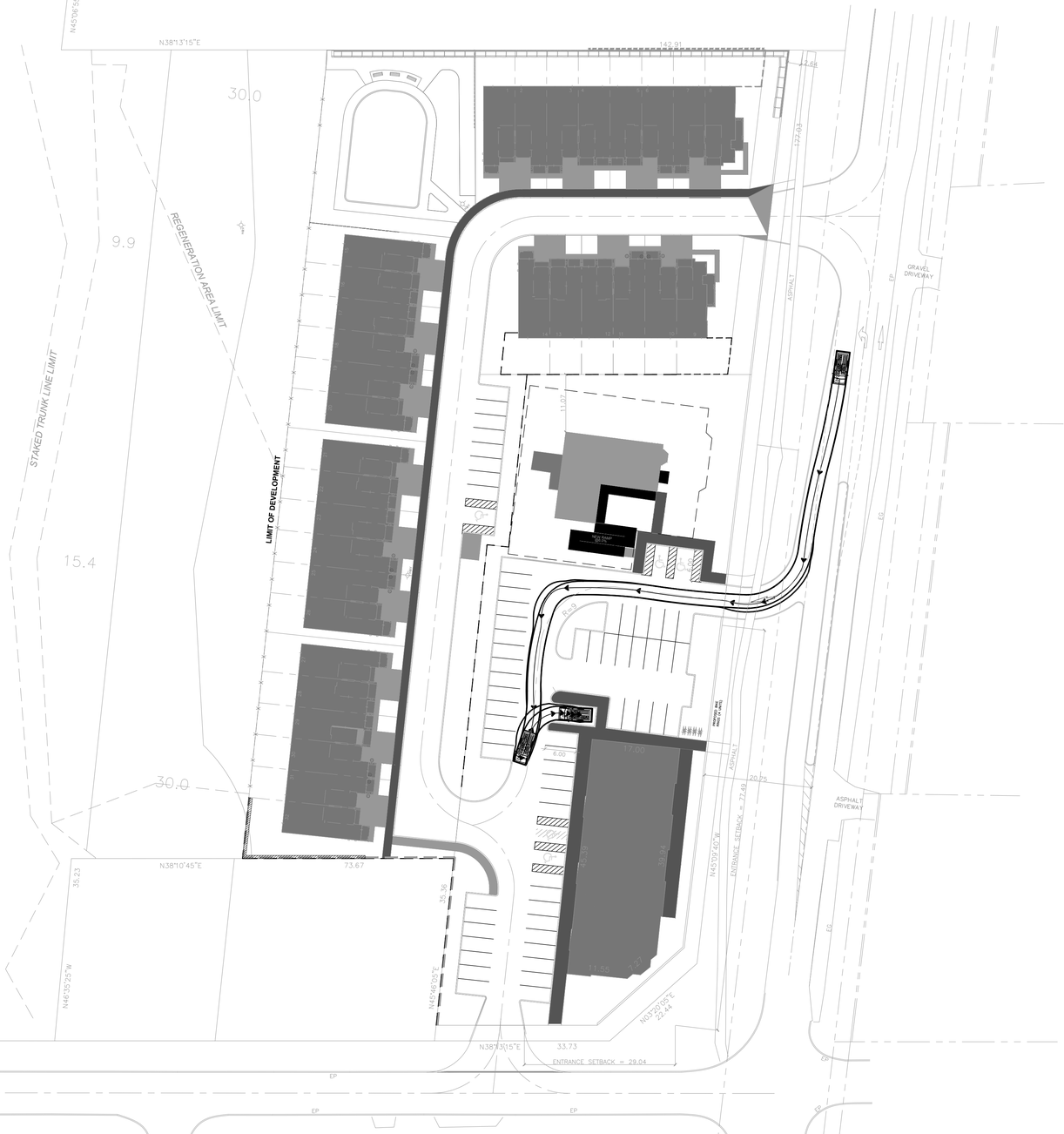
16114 AIRPORT ROAD
TOWN OF CALEDON EAST

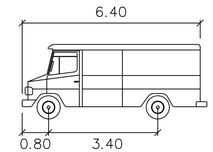
Drawing

REAR LOADING REFUSE TRUCK
TURNING MOVEMENTS

CROZIER CONSULTING ENGINEERS
THE HARBOUREDGE BUILDING,
40 HURON STREET, SUITE 301,
COLLINGWOOD, ON L9Y 4R3
705 446-3510 T
705 446-3520 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn By: S.K.	Design By:	Project: 110–4331	
Check By: M.F.	Check By:	Scale: 1:500	Drawing: 323





LSU

	meters
Width	: 2.60
Track	: 2.60
Lock to Lock Time	: 6.0
Steering Angle	: 40.3

1. THIS DRAWING IS THE EXCLUSIVE PROPERTY OF C.F. CROZIER & ASSOCIATES INC. AND THE REPRODUCTION OF ANY PART WITHOUT PRIOR WRITTEN CONSENT OF THIS OFFICE IS STRICTLY PROHIBITED.
2. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.
3. THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT.
4. DO NOT SCALE THE DRAWINGS.
5. ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

TEMPORARY BENCHMARKS

TBM#1–
TBM#2–
TBM#3–

Town

No.	ISSUE	DATE: MM/DD/YYYY
A	ISSUED FOR REVIEW	09/17/2019
2B	ISSUED FOR INTERNAL REVIEW	09/22/2020
3	ISSUED FOR INTERNAL REVIEW	11/19/2020

Engineer

DRAFT
FOR DISCUSSION PURPOSES ONLY

Engineer

Project

16114 AIRPORT ROAD
TOWN OF CALEDON EAST

Drawing

LSU TRUCK
TURNING MOVEMENTS

CROZIER CONSULTING ENGINEERS
THE HARBOUREDGE BUILDING,
40 HURON STREET, SUITE 301,
COLLINGWOOD, ON L9Y 4R3
705 446-3510 T
705 446-3520 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn By	Design By	Project	
S.K.			110–4331
Check By	Check By	Scale	Drawing
M.F.		1:500	324

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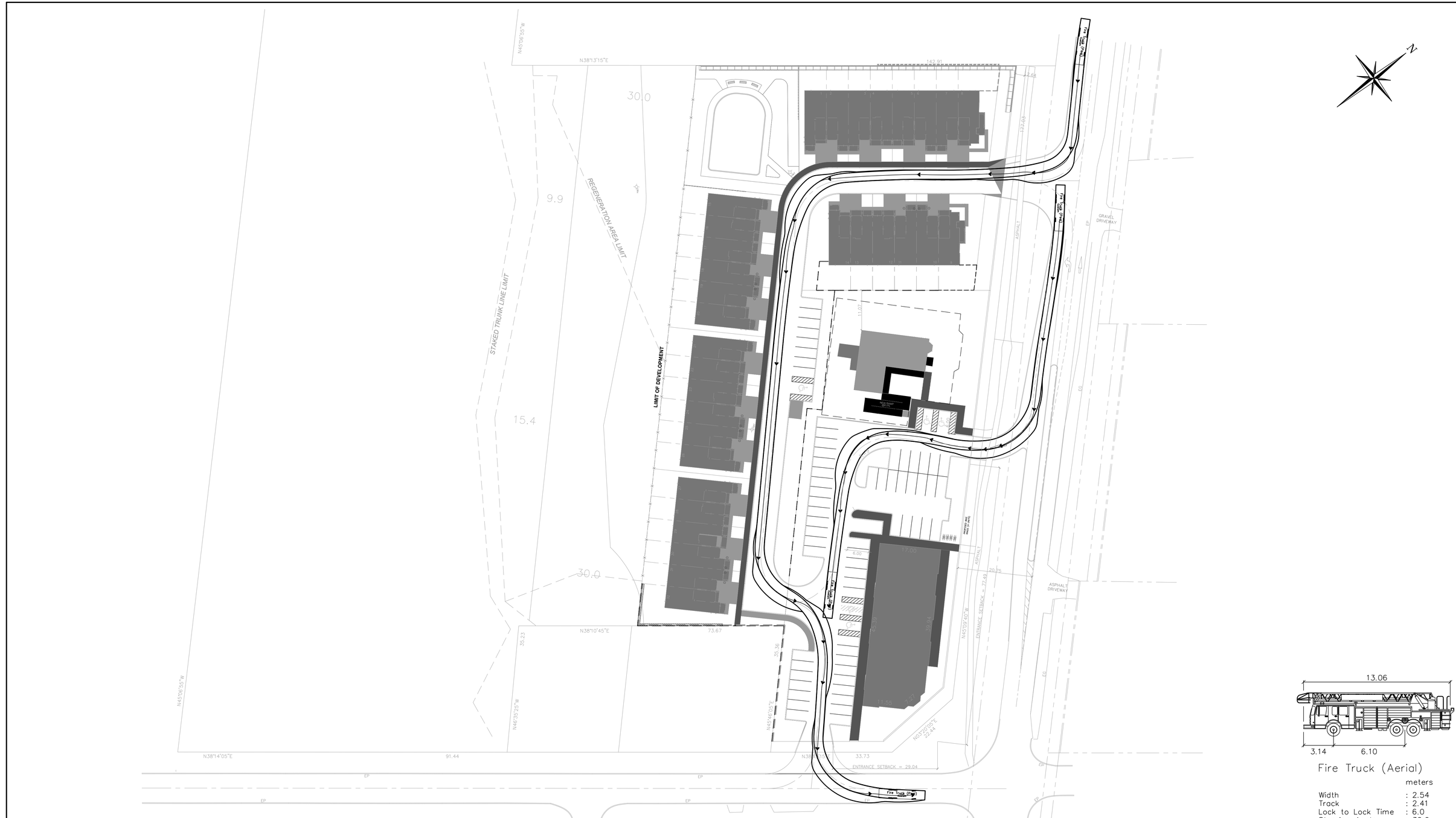

10 0m 10 20 30 40
SCALE: 1:500

Fire Truck (Aerial)

	meters
Width	: 2.54
Track	: 2.41
Lock to Lock Time	: 6.0
Steering Angle	: 32.0

TEMPORARY BENCHMARKS

TBM#1–
TBM#2–
TBM#3–

Town

No.	ISSUE	DATE: MM/DD/YYYY
A	ISSUED FOR REVIEW	09/17/2019
2B	ISSUED FOR INTERNAL REVIEW	09/22/2020
3	ISSUED FOR INTERNAL REVIEW	11/19/2020

Engineer

DRAFT
FOR DISCUSSION PURPOSES ONLY

Engineer

Project

16114 AIRPORT ROAD
TOWN OF CALEDON EAST

Drawing

FIRE TRUCK TURNING MOVEMENT

CROZIER CONSULTING ENGINEERS
THE HARBOUREDGE BUILDING,
40 HURON STREET, SUITE 301,
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WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn By	Design By	Project	
S.K.			110–4331
Check By	Check By	Scale	Drawing
M.F.		1:500	325

\\Collingwood-FS\Collingwood-Projects\100\110 - Schnarr\4331-16114 Airport Rd\CAD\CIVIL\1SHEET\4331-323.dwg, 325, 2020-11-19 12:14:45 PM, skerr

APPENDIX M

Comment Responses

CROZIER
CONSULTING ENGINEERS

40 Huron St., Suite 301 | T. 705.446.3510
Collingwood, On | F. 705.446.3520
L9Y 4R3 | cfcrozier.ca

MEMO

DATE	October 28, 2019	**FILE NO.**	110-4331
RE	16114 Airport Road		
TO	Mary Nordstrom, MCIP RPP Senior Development Planner Town of Caledon	**CC**	Joy Simms Development Services Region of Peel
FROM	Alexander Fleming, MBA, P.Eng Madeleine Ferguson, EIT		

Dear Mary,

This memo has been prepared in response to the Town of Caledon comments dated May 29, 2019, pertaining to the Draft Plan of Subdivision, Official Plan Amendment and Zoning By-law Amendment applications for the site located at 16114 Airport Road in the Town of Caledon. Specifically, the memo addresses comments relating to the Traffic Impact Study (TIS) submitted in March 2017. This memo is intended to address the Town's comments and satisfy their requirements.

We have transcribed the Town's comments, followed by our response.

Town of Caledon – Transportation and Waste Collection Comments

1. The report correctly adopted 34% as a pass-by trips rate for the shopping centre based on the methodology outlined in ITE Trip Generation Handbook 3rd Edition. However, this rate is not consistent and correctly reflected with the primary and pass-by trips numbers in Table 5 of the report. For example, the Shopping Centre is expected to generate 177 trips during pm. Given 34% as a pass-by rate, the site will generate 61 pass-by trips (30 inbound trips and 31 outbound trips) and 116 primary trips. Please update the report accordingly.

   The TIS Update corrected the pass-by trip percentage as noted above. The trip generation calculations were revised to reflect the updated site statistics, as well as the recently released 10th Edition of the ITE Trip Generation Manual. The updated trip generation is outlined in Section 5.1 of the TIS Update. Further, the commercial trip distribution was revised to reflect the travel patterns observed on the roadway with the addition of the Castles of Caledon development to the west. The updated trip distribution is summarized in Section 5.2, with the trip distributions and assignments illustrated in Figures 7 to 12.

2. There is an approved draft plan at the intersection of Mountainview Road and Walker Road. Trips generated by that subdivision need to be considered under the Future Background Conditions (section 4 of the report). Please update the report accordingly.

   The TIS Update includes the trips generated by the Castles of Caledon development. The trips were added to the 2024 and 2029 background volumes, as the development has yet to be constructed. Details relating to the Castles of Caledon development are included in Section 4.4 of the TIS Update, with relevant TIS and ITE Trip Generation excerpts included in Appendix F.

3. The Region has advised in an email dated March 13, 2018 that the stage of the application is too early for detailed traffic engineering comments; however, a full moves access for both the residential and commercial block to Airport Road is not supportable. The Region is willing to review a functional design for a right-in only access for the commercial block (shifted further south) and a full moves access to the residential block. A revised Traffic Impact Study is also required to assess the impacts on Walker Road. Region of Peel.

   It is understood that two full-moves entrances are not supportable to Airport Road. The current Development Concept Plan proposes one full-moves entrance at the north of the lands to service the residential dwellings, and a second right-in/right-out entrance to the commercial lands approximately 75 metres south of the full-moves entrance. The north entrance would include a northbound left-turn lane, which would be formed by extending the northbound left-turn lane at Leamster Trail.

4. To facilitate curbside collection by the Region of Peel, please show minimum turning radius from centre line of 13m on all turns, including entrance to site, a maximum straight back-up distance of 15m where collection vehicles must back up, show and a cul-de-sac or T-turnaround (meeting Regional standards) where continuous forward moving collection cannot be met.

   The development concept plan has been revised to include a connection between the residential and commercial blocks. The layout of the townhouses has also been revised to eliminate the dead-end at the north of the site. These changes allow for continuous forward movements, with vehicle ingress from Airport Road, and egress to Walker Road. A vehicle manoeuvring diagram for the refuse vehicle has been included in Appendix K of the TIS Update to demonstrate the sufficiency of the proposed internal road layout.

Region of Peel – Waste Collection Comments

5. The Region of Peel will provide curbside collection of garbage, recyclable materials, organics and yard waste to households subject to the following conditions:
   i. The turning radius from the centre line must be a minimum of 13 metres on all turns. This includes the turning radii at the entrance to the site.
   ii. In those situations where a waste collection vehicle must reverse, then the maximum straight back-up distance is 15 metres,
   iii. The internal road layouts should be designed to permit continuous collection without reversing. Where the requirement for continuous collection cannot be met, a cul-de-sac or a "T"-turnaround will be permitted in accordance with the specifications shown in

Appendix 2 and 3 of the WCDSM (Waste Collection Design Standards Manual), respectively.

Based on these comments, the roadway at the northwest corner of the site (at the amenity area) and the most southerly portion of the condominium road appear to exceed the back-up distance standards. Please explore possible remedies for continuous collection as noted and in the WCDSM.

Please refer to our response to Comment 4. As noted, the internal road layout has been revised to allow for continuous curbside pick-up. A vehicle manoeuvring diagram is included in Appendix K of the TIS Update to illustrate the refuse vehicle path and the sufficiency of the proposed road layout.

Sincerely,

C.F. CROZIER & ASSOCIATES INC.

Alexander J. W. Fleming, MBA, P.Eng
Associate, Transportation
AF/mf

C.F. CROZIER & ASSOCIATES INC.

Madeleine Ferguson, EIT
Engineering Intern, Transportation

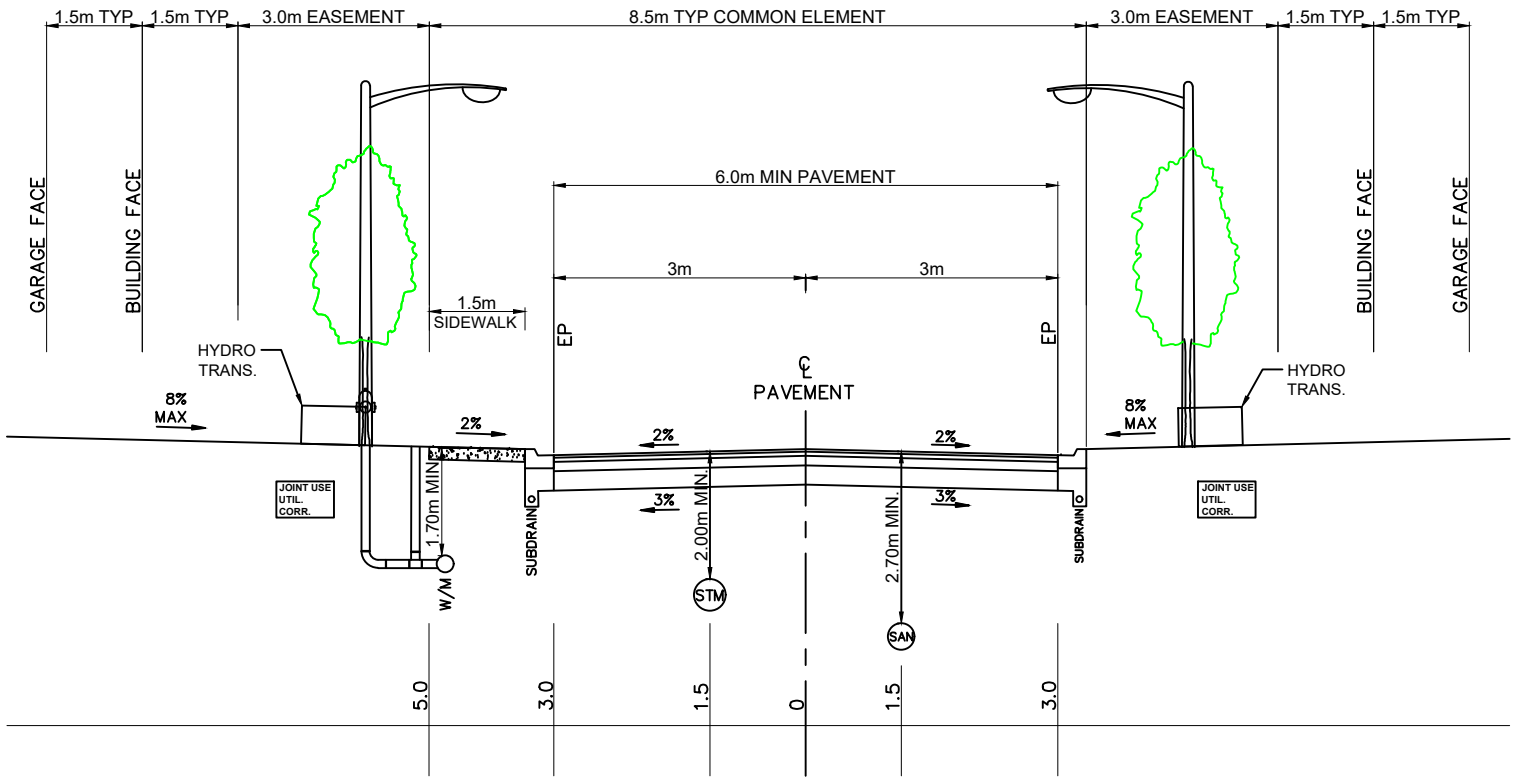
J:\100\110 - Schnarr\4331-16114 Airport Rd\Memos\2019.10.28_Comment Response Memo.docx

COMMENT RESPONSE MATRIX (Second Submission)
Town File OPA 17-02/RZ 17-09
16114 Airport Road, Town of Caledon
August 24, 2020

STATUS	AGENCY/ DEPT	REVIEWER	COMMENT TYPE	#	COMMENTS/CONDITIONS	RESPONSE
To address	**Planning and Development - Community Services**	Leilani Lee-Yates, P: 905.584.2272 x.4228 Email: leilani.lee-yates@caledon.ca	Draft Plan	16	d. The applicant will need to confirm with the Town and Region's Emergency Services that the internal road design meets all their requirements (fire route, turnarounds).	A truck turning analysis was completed for the site to confirm that an emergency vehicle can navigate the site without any conflicts. The diagram has been included as Appendix L in the Traffic Impact Study.
C	**Planning and Development - Community Services**	Leilani Lee-Yates, P: 905.584.2272 x.4228 Email: leilani.lee-yates@caledon.ca	ZBLA	20	e. Entrance Width on the site plan for the proposed condominium townhouse development, dated October 25, 2019 - No dimensions have been provided to determine if the development will comply with the zoning. Entrance separation dimension is required to confirm if the development will comply with the minimum 9m for two-way and 22.5m separation. Entrance Setback is required to determine the development will comply with the 9m.	See updated Concept providing for the setback distance between entrances and from parking spaces.
C	**Planning and Development - Community Services**	Leilani Lee-Yates, P: 905.584.2272 x.4228 Email: leilani.lee-yates@caledon.ca	ZBLA	20	f. Staff is seeking confirmation that the proposed parking spaces located along Walker Road West will not hinder the sight triangle.	See added dimension from parking spaces nearest Walker Road. The parking space is outside of and setback from the sight triangle.
C	**Planning and Development - Community Services**	Leilani Lee-Yates, P: 905.584.2272 x.4228 Email: leilani.lee-yates@caledon.ca	ZBLA	20	g. Staff seeking confirmation if the sidewalks are to connect with Walker Road West. If the sidewalks are to extend to Walker Road West, then the parking spaces will be required to be relocated.	An internal sidewalk connection provides access from the townhouses to the commercial development and Walker Road West.
To address	**Planning and Development - Community Services**	Leilani Lee-Yates, P: 905.584.2272 x.4228 Email: leilani.lee-yates@caledon.ca	ZBLA	20	h. Staff seeking confirmation that sidewalks will be created along Airport Road or already existing. Staff seeking confirmation if sidewalks will be added from the Townhouses to access the two proposed commercial uses.	An approximate 1.5 metre concrete sidewalk exists on the west side of Airport Road adjacent to the site. Additionally, a 1.55 metre sidewalk is proposed along the west side of the condo raod (Allison's Grove), which ties into the commercial block opposite Building 'B'. It is further noted that a "Preliminary Preferred Design" has been released as part of the Airport Road EA which indicates that a nwe multi-use pathway is proposed along the west side of the roadway, replacing the exisitng sidewalk.
					Region of Peel Comments - April 8, 2020	
C	**Region of Peel - Development Services**	Dylan Prouse Planner Extension 7921	Comment		<u>Traffic Engineering</u> Access/TIS • The Region is **supportive of the full-movement access for the residential block via the condo road** – titled "Site Access C";	Acknowledged.
To address	**Region of Peel - Development**	Dylan Prouse Planner Extension 7921	Comment		• As for the proposed **right-in/right-out, we fail to see a demonstrated need for the right-out movement at this access due to the low volume of traffic exiting the site.** We believe the site can operate efficiently without the right-out movement at this location.	Acknowlidged, the revised concept provides for a right-in only access.
To address	**Region of Peel - Development**	Dylan Prouse Planner Extension 7921	Comment		• As a result, the Region will **support one right-in only access at the proposed location for "Site Access B";**	Acknowlidged, the revised concept provides for a right-in only access.
To address	**Region of Peel - Development Services**	Dylan Prouse Planner Extension 7921	Comment		• With regards to auxiliary turn lanes, the TIS recommends that there is a recommendation for an auxiliary northbound left turning lane with a 15 metre storage, however auxiliary southbound right-turning lanes are not warranted for the full-movement access ("Site Access C") or the proposed right-in ("Site Access B"); based on the total traffic volumes exceeding 100 vehicles, **we would require a an auxiliary southbound right-turn lane for the right-in only access ("Site Access B") for the commercial block.**	Acknowledged the revised concept plan provides for a right-turn taper. Due to the spacing between the Airport Road accesses a parallel length could not be provided. A Preliminary Functional Design has been included as Figure 15 in the TIS.

APPENDIX N

Town of Caledon Standard Drawing 223



NOTES

1. WATERMAIN TO HAVE MINIMUM COVER OF 1.7m.
2. UTILITY CORRIDOR TO HAVE A MINIMUM COVER OF 0.9m.
3. TREES TO BE PLACED IN LOCATIONS PER APPROVED LANDSCAPE PLAN.
4. THE FOLLOWING IS A MINIMUM ROAD BASE AND WILL REQUIRE A SOILS REPORT VERIFICATION
   - 40 mm HL3
   - 65 mm HL8
   - 150 mm GRANULAR "A"
   - 300 mm GRANULAR "B"
6. THE BOULEVARDS REQUIRE A MINIMUM OF 300mm OF TOPSOIL AND NURSERY SOD.
8. FULL LENGTH MINIMUM 100 MM DIA.SUB-DRAINS C/W FILTERCLOTH SHALL BE INSTALLED,
9. SUB-GRADE SHALL BE COMPACTED TO A MINIMUM 95% OF S.P.D. AT OPTIMUM MOISTURE CONTENT.
10. WHERE POSSIBLE MANHOLE LIDS TO BE LOCATED OUT OF TIRE LANE OF TRAFFIC.
11. LONG DIMENSION OF TRANSFORMER TO BE PARALLEL TO STREETLINE.

TOWN OF CALEDON

PRIVATE ROAD CROSS SECTION COMMON ELEMENT CONDOMINIUM ROAD

NO.	REVISION	APR'D	DATE

APR'D:

DATE: MAY 19

DRAWN: J.M.

SCALE: N.T.S.

STANDARD No. 223

FIGURES

Legend

= SUBJECT LANDS

Project

16114 AIRPORT ROAD
TOWN OF CALEDON EAST

Drawing

SITE LOCATION PLAN

CROZIER & ASSOCIATES Consulting Engineers
The HarbourEdge Building, 40 Huron Street, Suite 301, Collingwood, ON L9Y 4R3
705-446-3510 T
705-446-3520 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn By	Design By	Project	Scale	Date	Check By	Drawing
K.J.L.	S.W.	110-4331	N.T.S.	SEPT 25, 2020	M.L.	FIG. 1

GENERAL NOTES

1. Builder and Surveyor to confirm difference between FFL and USF before proceeding with excavation. Report discrepancies to the Architect.
2. Surveyor is to comply with current subdivision zoning regarding setbacks in laying out the work. Any discrepancies are to be reported to the Architect and the builder immediatly.
3. The builder shall comply with all current standards for Local Municipal Subdivision Lot Drainage and Grading as they relate to max. & min. slopes for yards, swales & drives and clearances to street furniture and services for driveways.
4. The builder shall check and verify all given grade elevations and drainage prior to commencement of construction. Builder shall verify location of existing and proposed utilities prior to commencement of construction.
5. Footings to bear on natural undisturbed soil and be a min. of 1.22m below finished grade. Underside of footings shown are taken from architectural plans and may not represent actual footing level.
6. All dimensions and grade elevations are shown in metres.
7. Unless otherwise indicated, finished floor level is 0.40m above Specified House Grade at entry points to house and provision of 2 risers at entries must be made to gain entry into house. Maintain top of foundation wall min. 0.15m above finished grade.
8. Unprotected openings (windows,doors) must be min 1.2m from lot lines. Builder to verify location of all windows relative to lot line to maintain min. setback for unprotected openings.
9. These General Notes apply to all drawings for Siting & Grading including siting on individual sheets.
10. Footing adjacent to R.L.C.B. lead to be extended to undisturbed ground and verified by soil consultant.

NOTES:

ACCESSIBLE PARKING SPACES SHALL COMPLY WITH SCHEDULE K OF BY-LAW 2015-058.

THE ENTRANCES TO THE RETAIL / COMMERCIAL BUILDINGS ARE TO BE BARRIER FREE WITH EITHER POWER DOOR OPERATORS OR SLIDING DOOR FEATURES AS PER THE ONTARION BUILDING CODE.

DEVELOPMENT CONCEPT PLAN

SHACCA CALEDON HOLDINGS INC.

16114 AIRPORT ROAD
PART 1, PLAN OF PART OF LOT 4, CONCESSION 6, E.H.S.
TOWN OF CALEDON, REGION OF PEEL

Development Statistics - Total Site

Wetland / Woodlot	1.832ha (4.53ac)
Compensation Area:	0.1844ha (0.46ac)
Compensation Area Buffer:	0.469ha (1.16ac)
Potential Park:	0.1037ha (0.26ac)
Net Residential Area^:	0.842ha (2.08ac)
Commercial Area:	0.555ha (1.37ac)
Road Widening & 0.3m Reserve:	0.10ha (0.25ac)
Gross Site Area:	**4.09ha (10.11ac)**
Net Site Area*:	**1.50ha (3.71ac)**

Development Statistics - 6.1m Condo Townhouse Residential

Total Units:	32 Units
Net Residential Density:	32 Units / 0.842ha = 38.0UPH
Total Visitor Parking:	9 Spaces (0.28 per unit)
Total Landscaped / Snow Storage:	361m² (4.28%)
Total Hard Surface (HS) Area:	1,836m²
Total Snow Storage % of HS Area:	19.7%
Total Parkland Dedication required:	0.042ha (5%)
Total Parkland Dedication provided:	0.1037ha (12%)
Building Coverage:	35.7%

Development Statistics - Retail Commercial (Buildings A & B)

Total GFA:	1,222.59m² (13,160ft²)
Building Coverage:	17.8%
Total Landscaped / Snow Storage:	620m²
Total Hard Surface (HS) Area:	2,580m²
Total Snow Storage % of HS Area:	24.0%
Total Parking Required:	62 Spaces *(1 space per 20m²)*
Total Parking Provided:	59 Spaces
Total Barrier Free Parking Required:	*3 (2 Type 'A' ; 1 Type 'B')*
Total Barrier Free Parking Provided:	*4 (2 Type 'A' ; 2 Type 'B')*
Delivery Spaces Required:	1
Delivery Spaces Provided:	1

Notes:

* Net Site Area only includes: Net Residential Area, Commercial & Potential Park
^ Net Residential Area includes 4.5m Residential Buffers
- Typical Parking Space: 2.75m x 6.0m
- Typical Type 'A' Barrier Free Space: 3.4m x 6.0m
- Typical Type 'B' Barrier Free Space: 2.75m x 6.0m
- Typical Barrier Free Aisle: 1.5m x 6.0m
- Typical Delivery Space: 3.5m x 9.0m
- Wetland / Woodlot constraint information provided by Dillon Consulting
  Denotes pedestrian circulation

TOWNHOUSE UNIT BREAKDOWN

MODEL	UNITS NUMBER	HIEGHT (STORIES)	UNIT GFA (SF)	TOTAL GFA (SF)
TOWNHOUSE				
TYPE 1				
CORNER	2	2	1616	3232
INTERIOR	12	2	1688	20256
INTERIOR	10	2	1650	16500
END	8	2	1700	13600
TOTAL	32			53588 ft²
				4978.32 m²

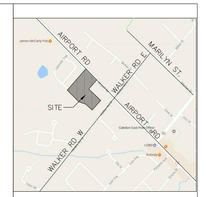
DENSITY: 32 UNITS / 0.842 Ha = 38.0 UpHA

FLOOR SPACE INDEX (FSI): Gross floor area 4978.32 m² / Gross site area 8399.99 m² = 0.592

ROAD WIDTH: 7.0 m
CL ROAD RADIUS: 13.0 m
TOTAL VISITOR PARKING: 9 Spaces (0.28 per unit)

COMMERCIAL STATISTICS		
SITE AREA	5555.00 m²	
COVERAGE	1000.00 m²	18.0%
PARKING, WALKWAY	2472.00 m²	44.5%
LANDSCAPE	2083.00 m²	37.5%
COMMERCIAL G.F.A.	1222.59 m²	

Total Parking Required: 62 Spaces (1 space per 20m²)
Total Parking Provided: 59 Spaces
Total Barrier Free Parking Required: 3 (2 Type 'A' ; 1 Type 'B')
Total Barrier Free Parking Provided: 4 (2 Type 'A' ; 2 Type 'B')
Delivery Spaces Required: 1
Delivery Spaces Provided: 1



KEY PLAN NTS

LEGEND:

EXISTING ELEVATION		TRANSFORMER	
CURB ELEVATIONS		HYDRANT	
PROPOSED ELEVATION		WATER SERVICE CONNECTION	
1.8m WOOD PRIVACY FENCE		DIRECTION OF DRAINAGE FLOW	
1.8m BLACK CHAIN LINK FENCE			
TREE HOARDING		TOP OF FOUNDATION WALL	
2.0m ACOUSTIC WOOD FENCE		FINISHED FLOOR LEVEL	
GAS METER		FINISHED GRADE	
HYDRO METER		BUILDING ENTRANCES	
SUMP PUMP		CSA MANHOLE	
DIAMONDBACK FILL CUT		SAN MANHOLE	
VALVE & VAULT		MAILBOX	
VALVE & BOX		UNIT NUMBER	
STREET LIGHT		MUNICIPAL ADDRESS	
CATCH BASIN			
DEPRESS CURB		EXISTING TREES TO BE SAVED TYP.	
STORM CONNECTION		CABLE TV POSITION	
SANITARY CONNECTION		BELL POSITION	
FUTURE A/C UNIT		RA = STOP SIGN	
FUTURE A/C UNIT W/ ENCLOSURE ABOVE		FIRE ROUTE SIGN ON STREET LIGHT	
FIRE WALL		FIRE ROUTE & POST	
ACOUSTICAL FENCE		VEHICULAR SIGNAGE	
		STREET NAME	

No.	Date	Description
11.16.20	FP	UPDATED & ISSUED PER CITY SPA COMMENTS
10.25.19	FP	UPDATED & ISSUED FOR CITY SUBMISSION
09.24.19	FP	UPDATED COMMERCIAL BLOCK & ADJUSTED STATISTICS
09.13.19	FP	UPDATED GFA FOR CORNER MODEL & ADJUSTED STATISTICS
09.18.19	FP	REV. SITE PER NEW DRAFT PLAN
04.07.17	FP	ADDED MATRIX, LOT NUMBERS UPDATED STATISTICS
03.01.17	CZ	Added RETAIL/COMMERCIAL
02.22.17	CZ	UPDATED BUILDING FOOTPRINTS & STATS
02.01.17	CZ	PRELIMINARY SITE PLAN

Revisions

Drawn	CZ
Date	01/27/17
Checked	
Approved	
Printed	07.18.19
CAD File	61338-SP5.DWG

architects inc.
70 Silton Road, Unit #01,
Woodbridge, Ontario, L4L 8B9
(905) 265-2688

SP

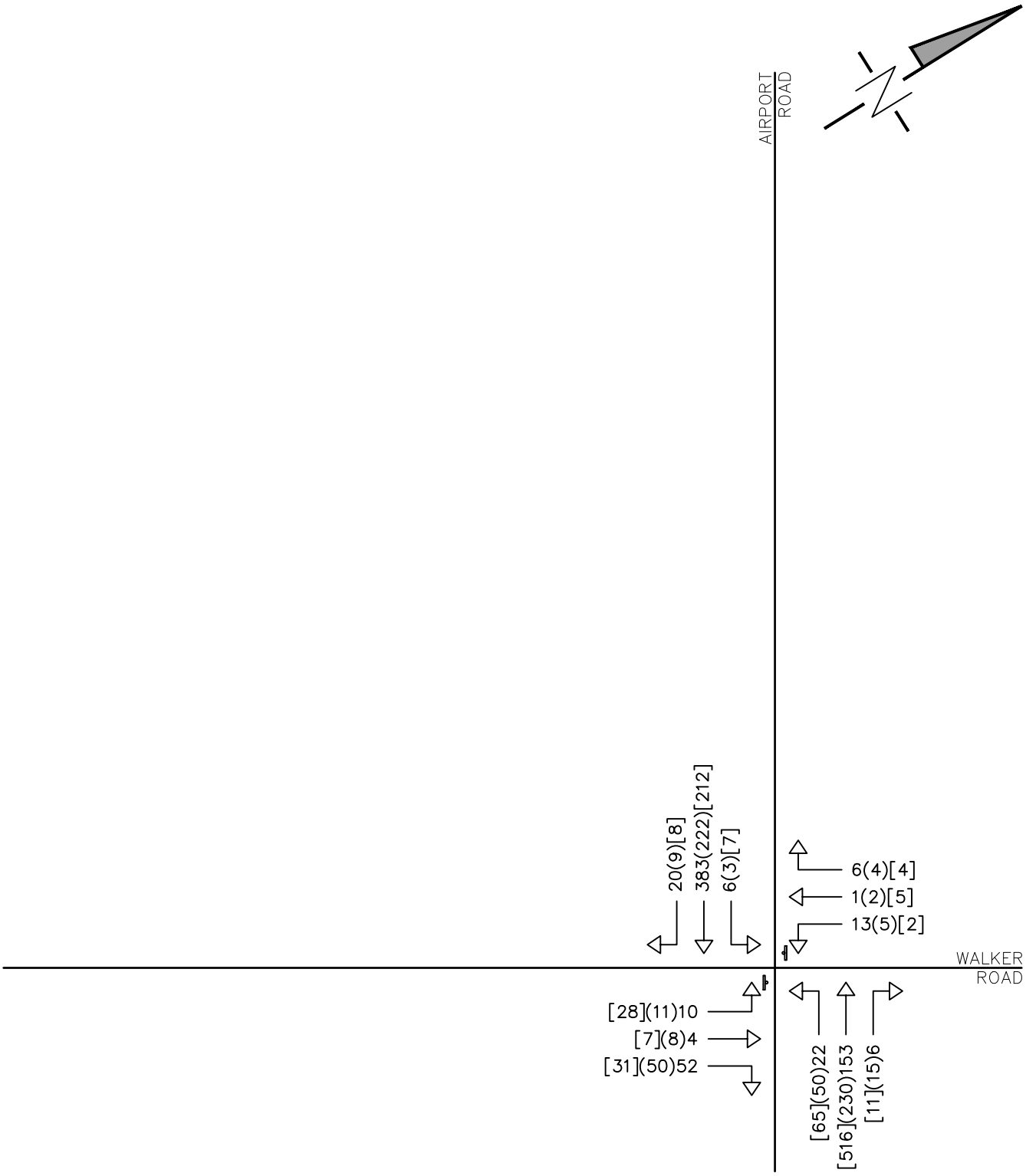
Shacca Caledon Holdings

PROPOSED CONDOMINIUM TOWNHOUSE DEVELOPMENT

16114 AIRPORT ROAD
TOWN OF CALEDON
ONTARIO

16114 AIRPORT ROAD
PART OF LOT 4, CONCESSION 6, E.H.S.
BEING PART 1 ON 43R-20293
EXCEPT PARTS 1&2 ON 43R-21686
AND PART LOT 4, CONCESSION 6, E.H.S.
BEING PART 1 ON 43R-21686
TOWN OF CALEDON, REGION OF PEEL

Sheet Title	SITEPLAN
Scales	1:500
Sheet Number	16-1338-SP1



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

Legend

SIGNAL CONTROL

STOP CONTROL

XX(YY)[ZZ] AM (AFTERNOON) [PM]

Project

16114 AIRPORT ROAD
TOWN OF CALEDON EAST

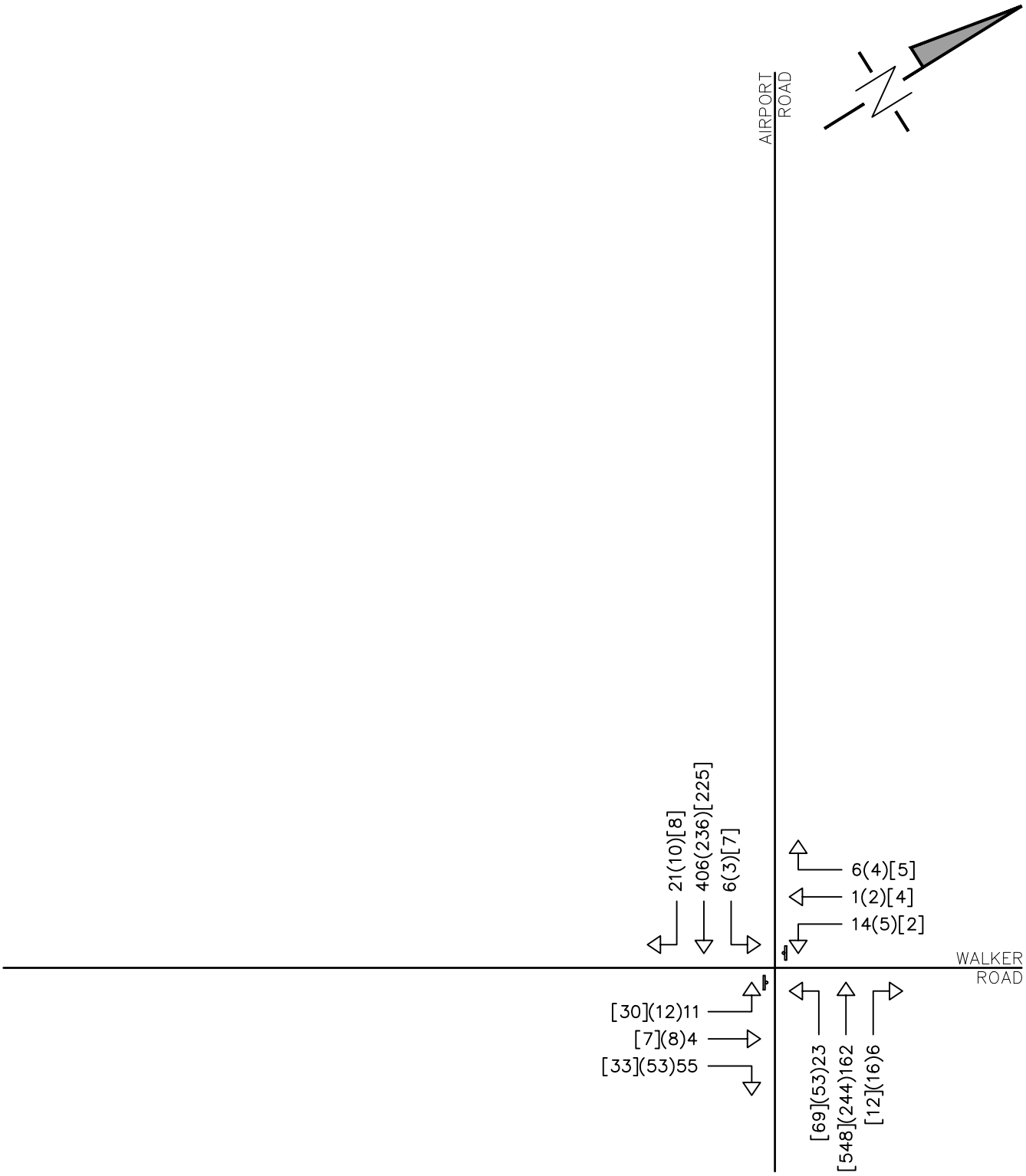
Drawing

2016 EXISTING TRAFFIC VOLUMES

CROZIER & ASSOCIATES Consulting Engineers
The HarbourEdge Building, 40 Huron Street, Suite 301, Collingwood, ON L9Y 4R3
705-446-3510 T
705-446-3520 F
www.cfcrozier.ca
info@cfcrozier.ca

Drawn By	Design By	Project
K.J.L.	S.W.	110-4331

Scale	Date	Check By	Drawing
N.T.S.	SEPT 25, 2020	M.L.	FIG. 3



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

Legend

SIGNAL CONTROL

STOP CONTROL

XX(YY)[ZZ] AM (AFTERNOON) [PM]

Project

16114 AIRPORT ROAD
TOWN OF CALEDON EAST

Drawing

2019 FUTURE BACKGROUND TRAFFIC VOLUMES

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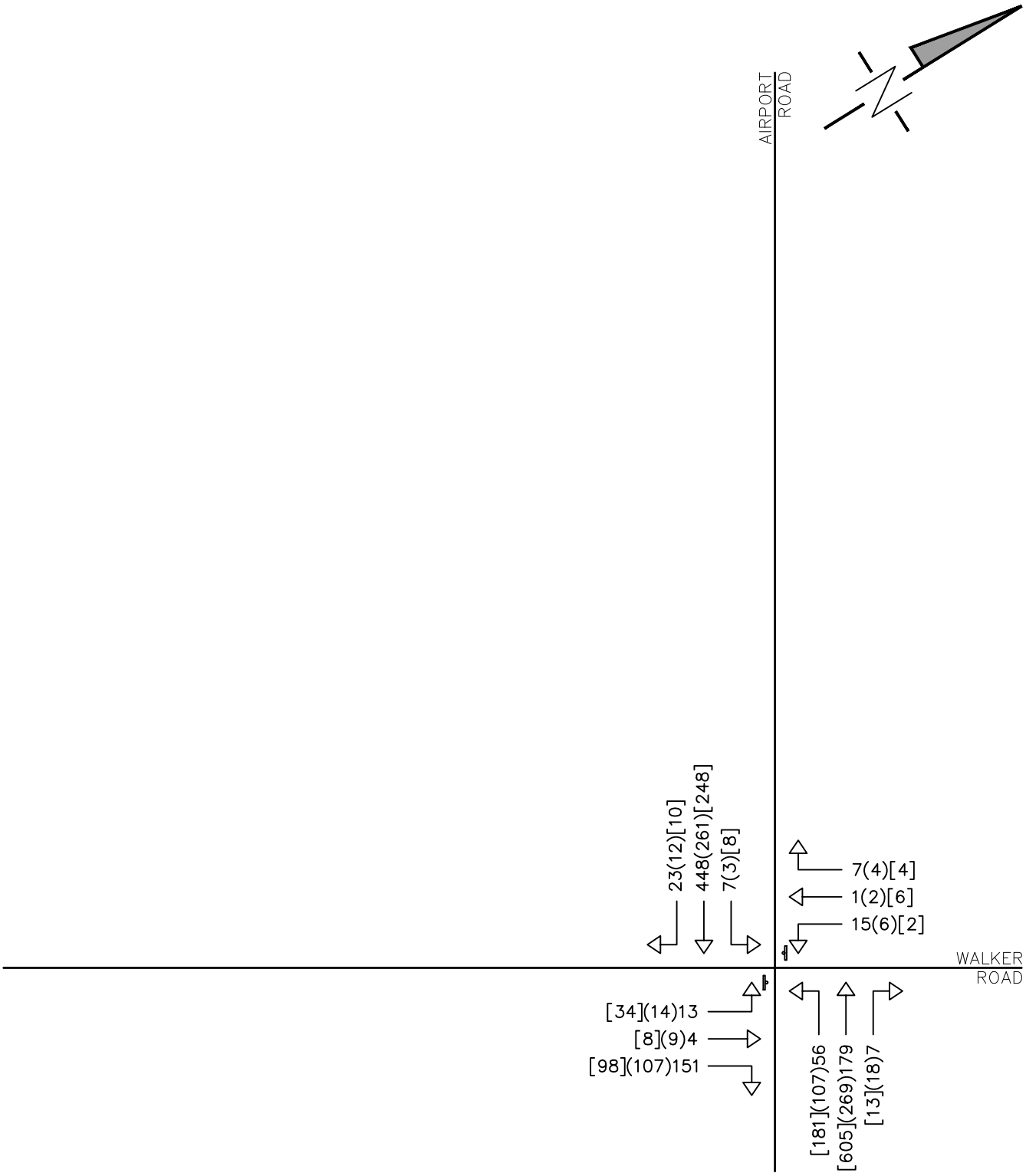
info@cfcrozier.ca

Drawn By	Design By	Project
K.J.L.	S.W.	110-4331

Scale	Date	Check By	Drawing
N.T.S.	SEPT 25, 2020	M.L.	FIG. 4



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

Legend

SIGNAL CONTROL

STOP CONTROL

XX(YY)[ZZ] AM (AFTERNOON) [PM]

Project

16114 AIRPORT ROAD
TOWN OF CALEDON EAST

Drawing

2024 FUTURE BACKGROUND TRAFFIC VOLUMES

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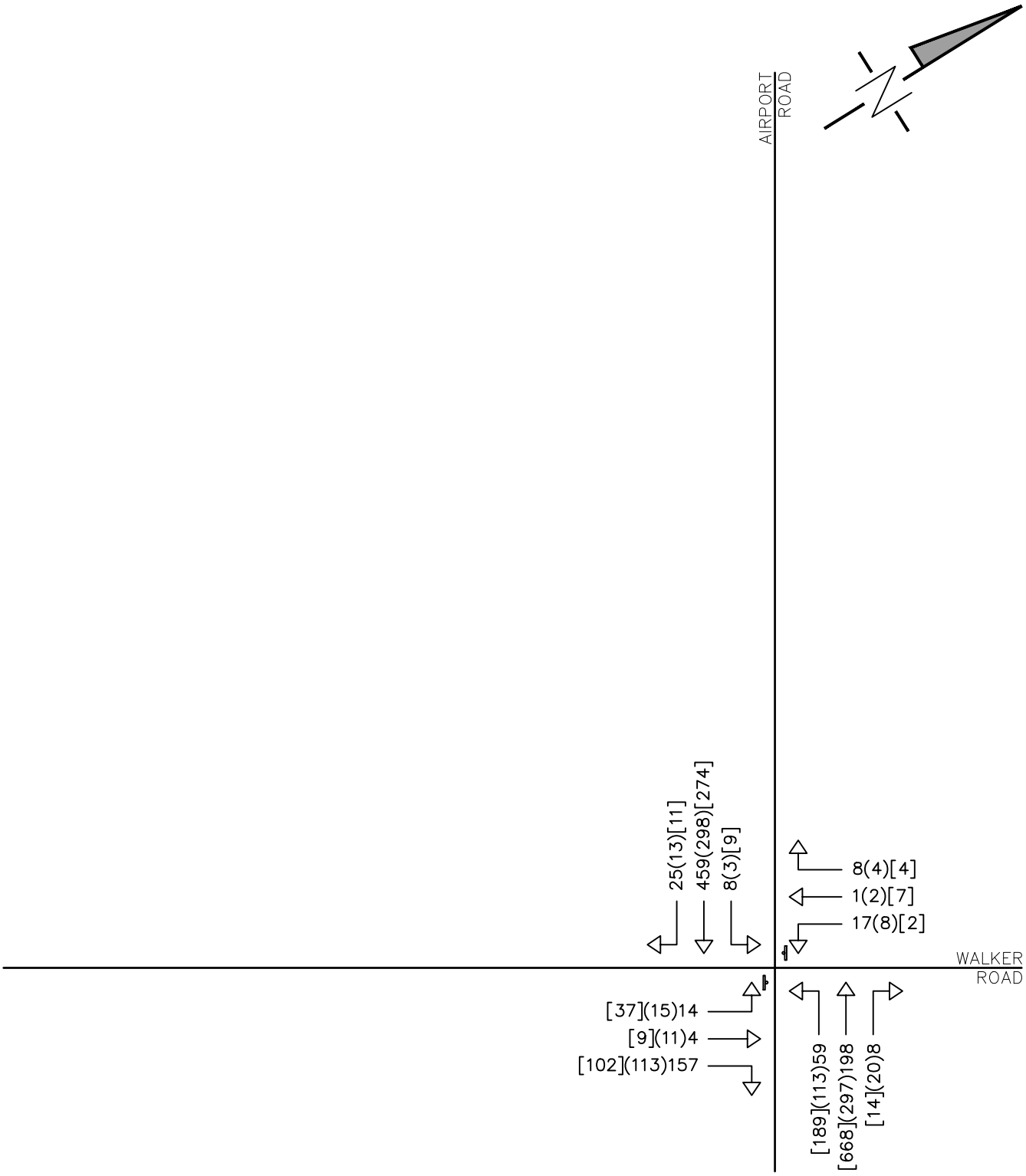
Drawn By	Design By	Project	
M.J.	M.F.		110-4331
Scale	Date	Check By	Drawing
N.T.S.	SEPT 25, 2020	M.F.	FIG. 5



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

Legend

SIGNAL CONTROL

STOP CONTROL

XX(YY)[ZZ] AM (AFTERNOON) [PM]

Project

16114 AIRPORT ROAD
TOWN OF CALEDON EAST

Drawing

2029 FUTURE BACKGROUND TRAFFIC VOLUMES

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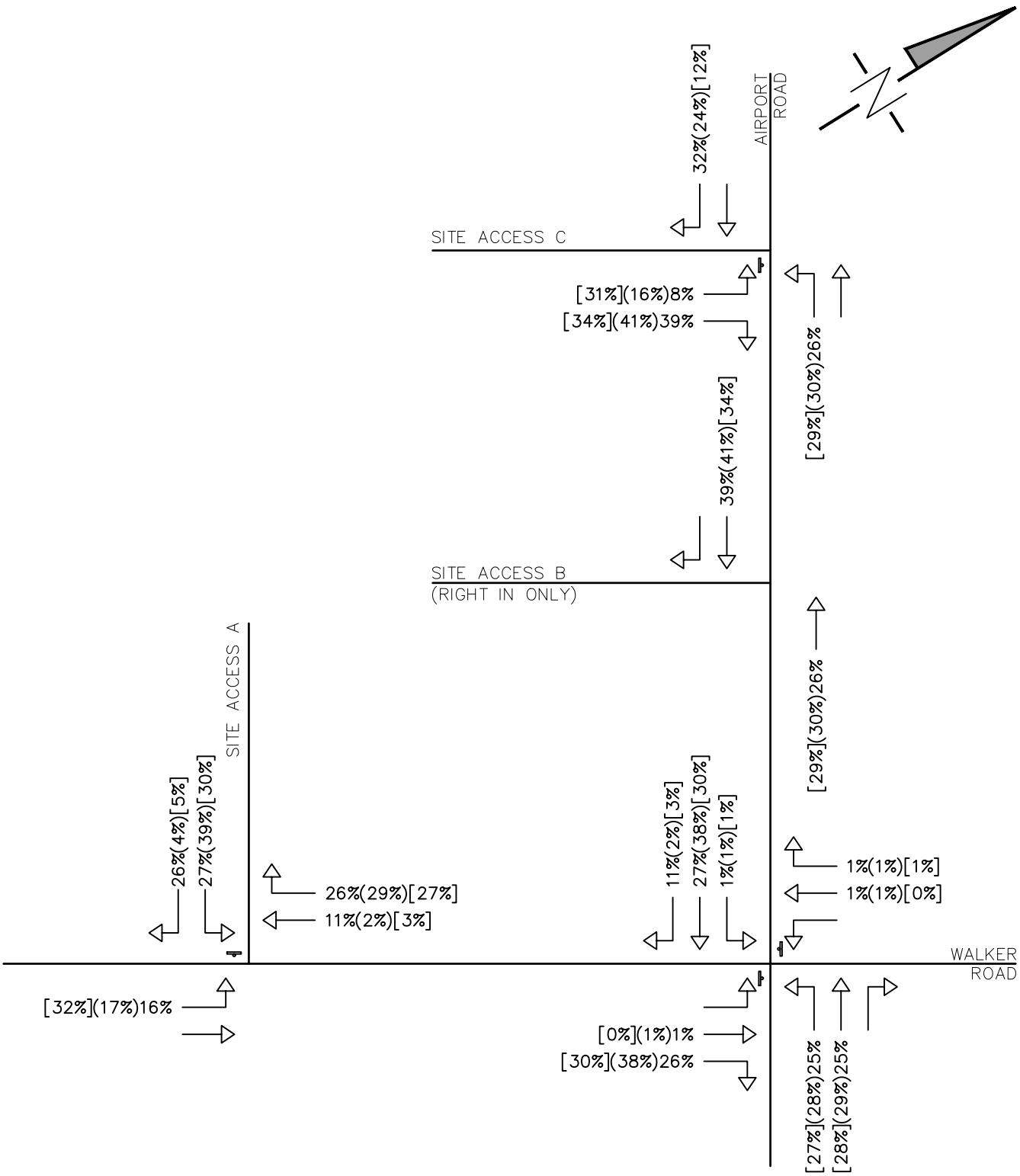
Drawn By	Design By	Project	
M.J.	M.F.		110-4331
Scale	Date	Check By	Drawing
N.T.S.	SEPT 25, 2020	M.F.	FIG. 6



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

Legend

SIGNAL CONTROL

STOP CONTROL

XX%(YY%)[ZZ%] AM (AFTERNOON) [PM]

Project

16114 AIRPORT ROAD
TOWN OF CALEDON EAST

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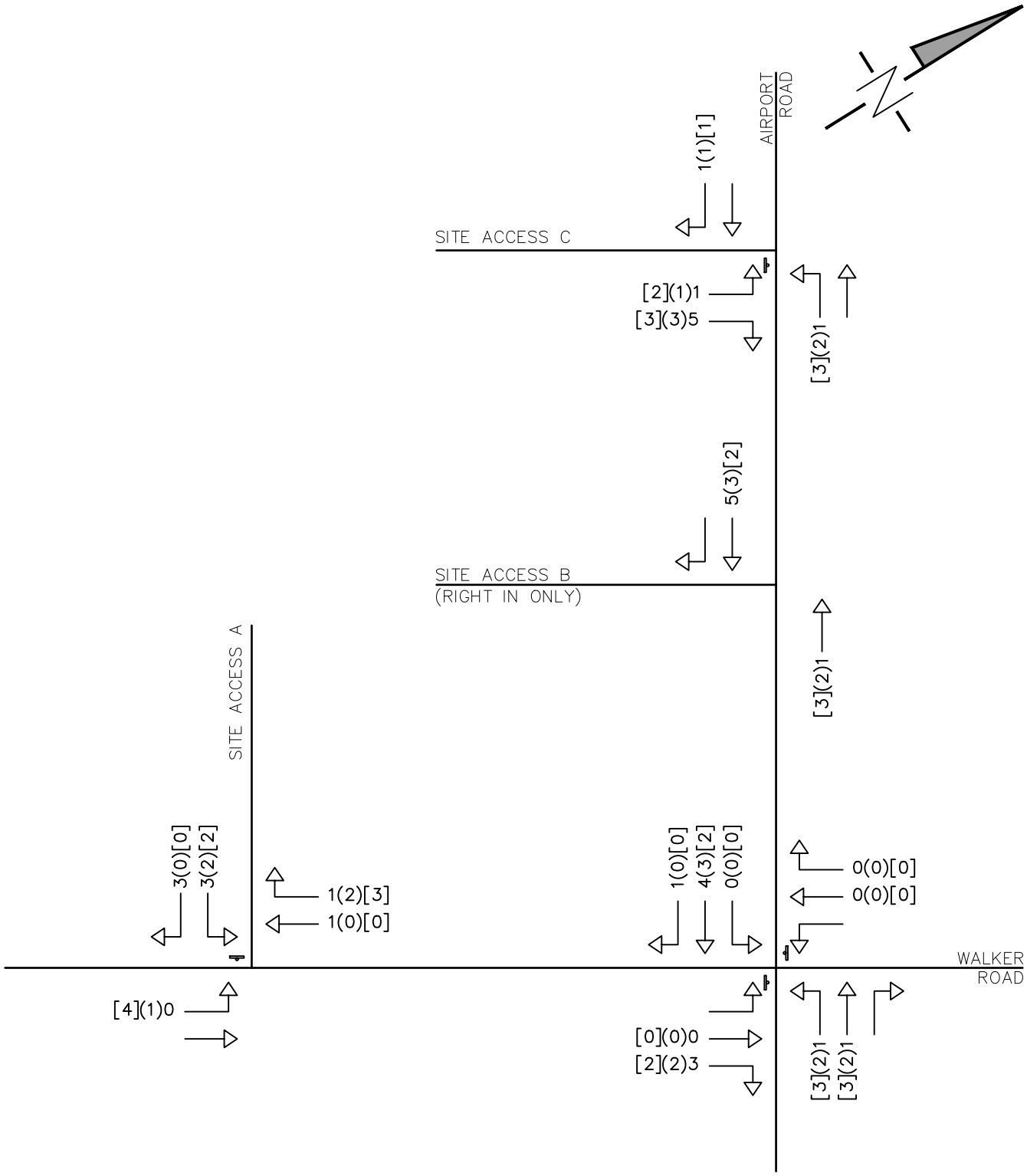
Drawn By	Design By	Project	Scale	Date	Check By	Drawing
M.J.	M.F.	110-4331	N.T.S.	SEPT 25, 2020	M.F.	FIG. 7



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

Legend

SIGNAL CONTROL

STOP CONTROL

XX(YY)[ZZ] AM (AFTERNOON) [PM]

Project

16114 AIRPORT ROAD
TOWN OF CALEDON EAST

Drawing

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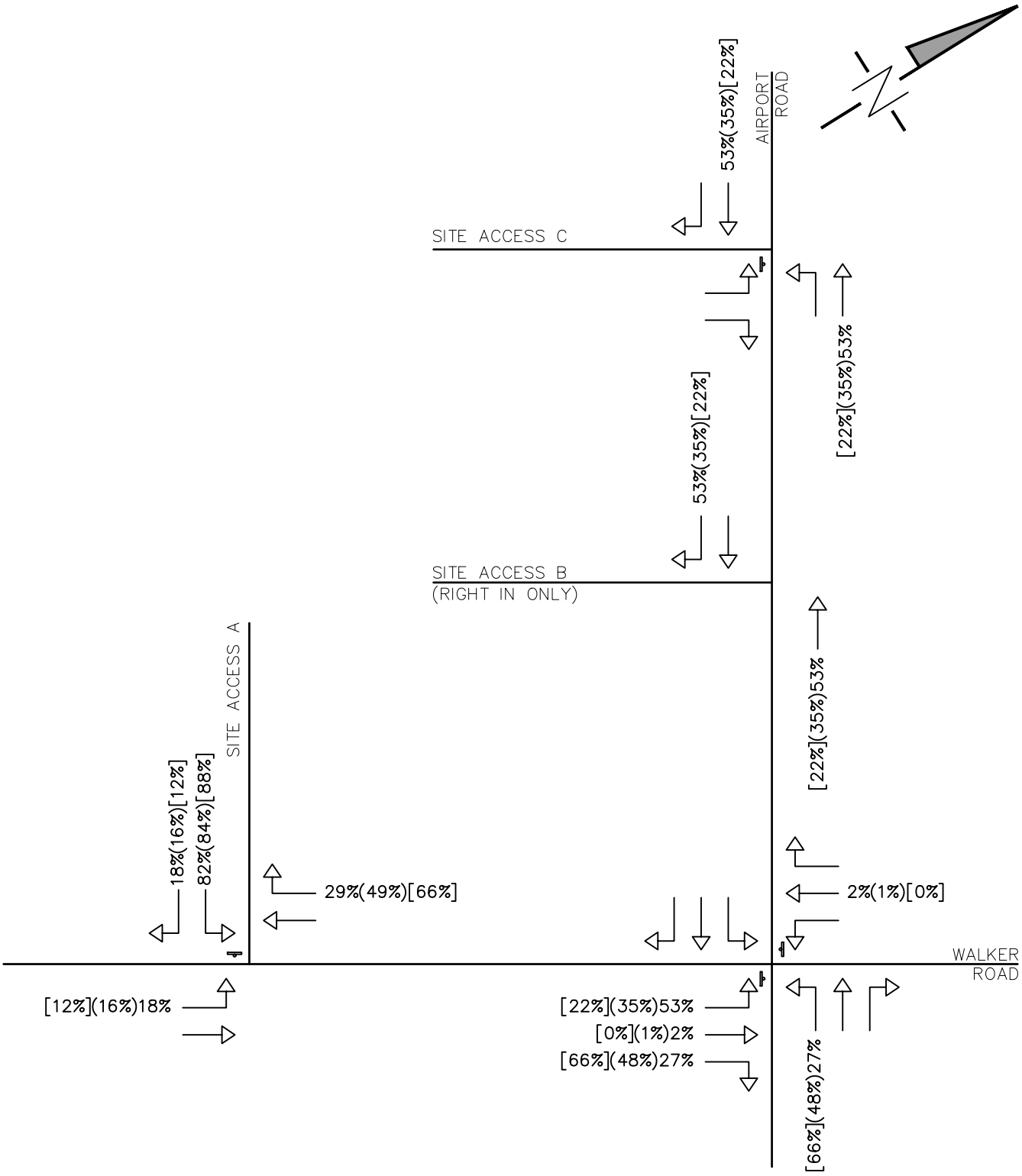
M.J.	M.F.	110-4331	N.T.S.	SEPT 25, 2020	M.F.	FIG. 8



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

Legend

SIGNAL CONTROL

STOP CONTROL

XX%(YY%)[ZZ%] AM (AFTERNOON) [PM]

Project

16114 AIRPORT ROAD
TOWN OF CALEDON EAST

Drawing

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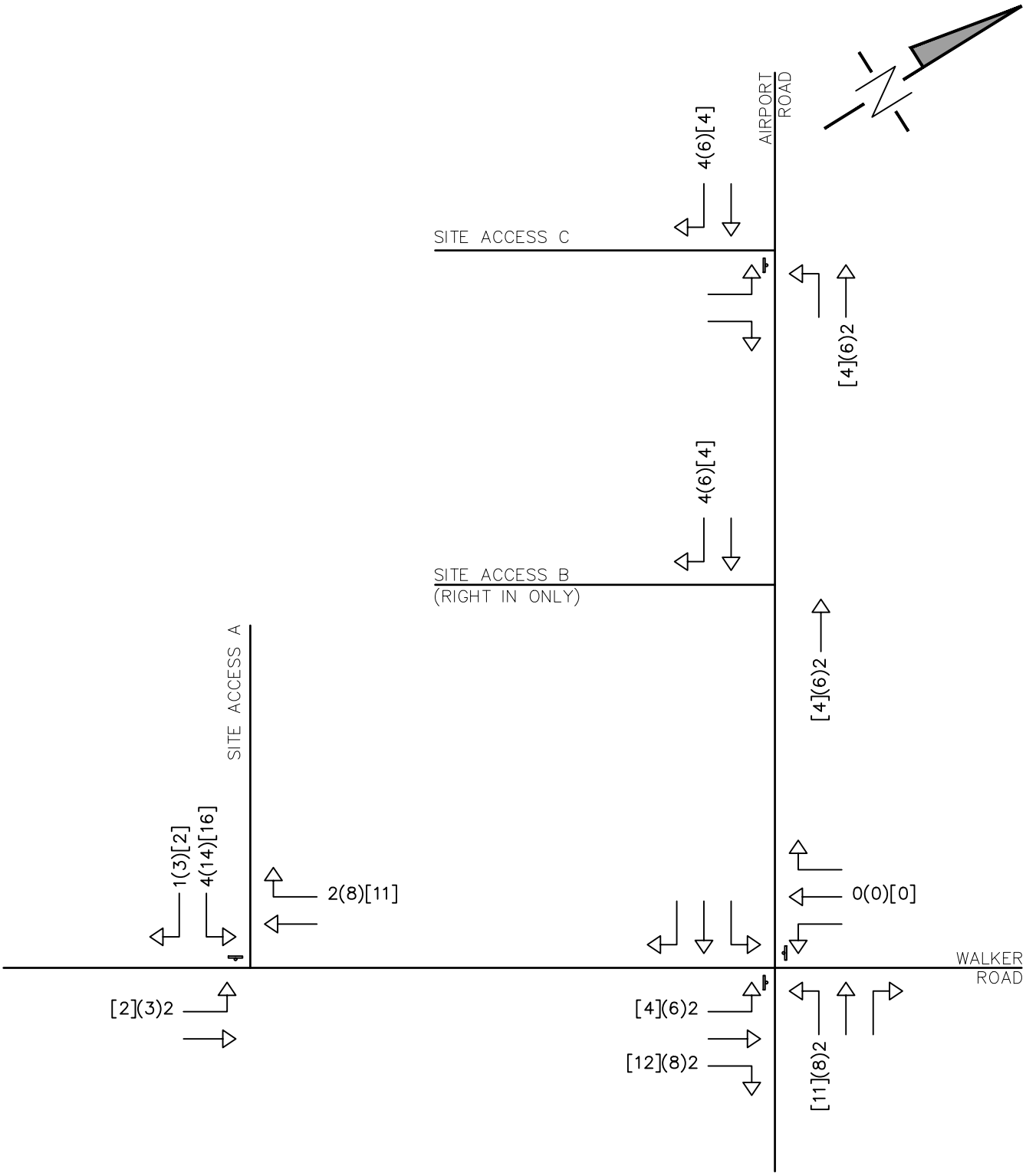
Drawn By	Design By	Project	
S.K.	M.F.		110-4331
Scale	Date	Check By	Drawing
N.T.S.	SEPT 25, 2020	M.F.	FIG. 9



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

Legend

SIGNAL CONTROL

STOP CONTROL

XX(YY)[ZZ] AM (AFTERNOON) [PM]

Project

16114 AIRPORT ROAD
TOWN OF CALEDON EAST

Drawing

PRIMARY COMMERCIAL
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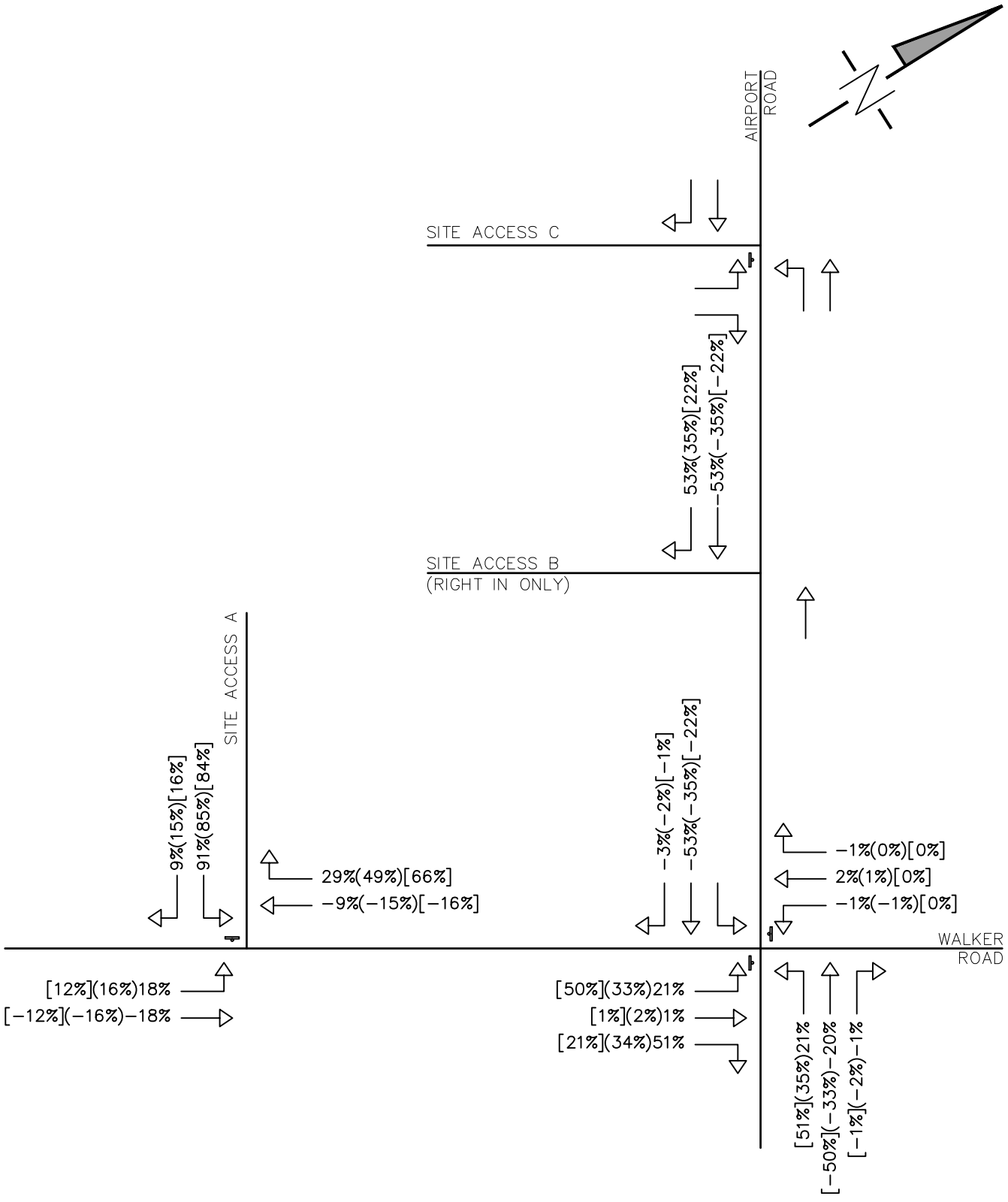
Scale	Date	Check By	Drawing
N.T.S.	SEPT 25, 2020	M.F.	FIG. 10



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

Legend

SIGNAL CONTROL

STOP CONTROL

XX%(YY%)[ZZ%] AM (AFTERNOON) [PM]

Project

16114 AIRPORT ROAD
TOWN OF CALEDON EAST

Drawing

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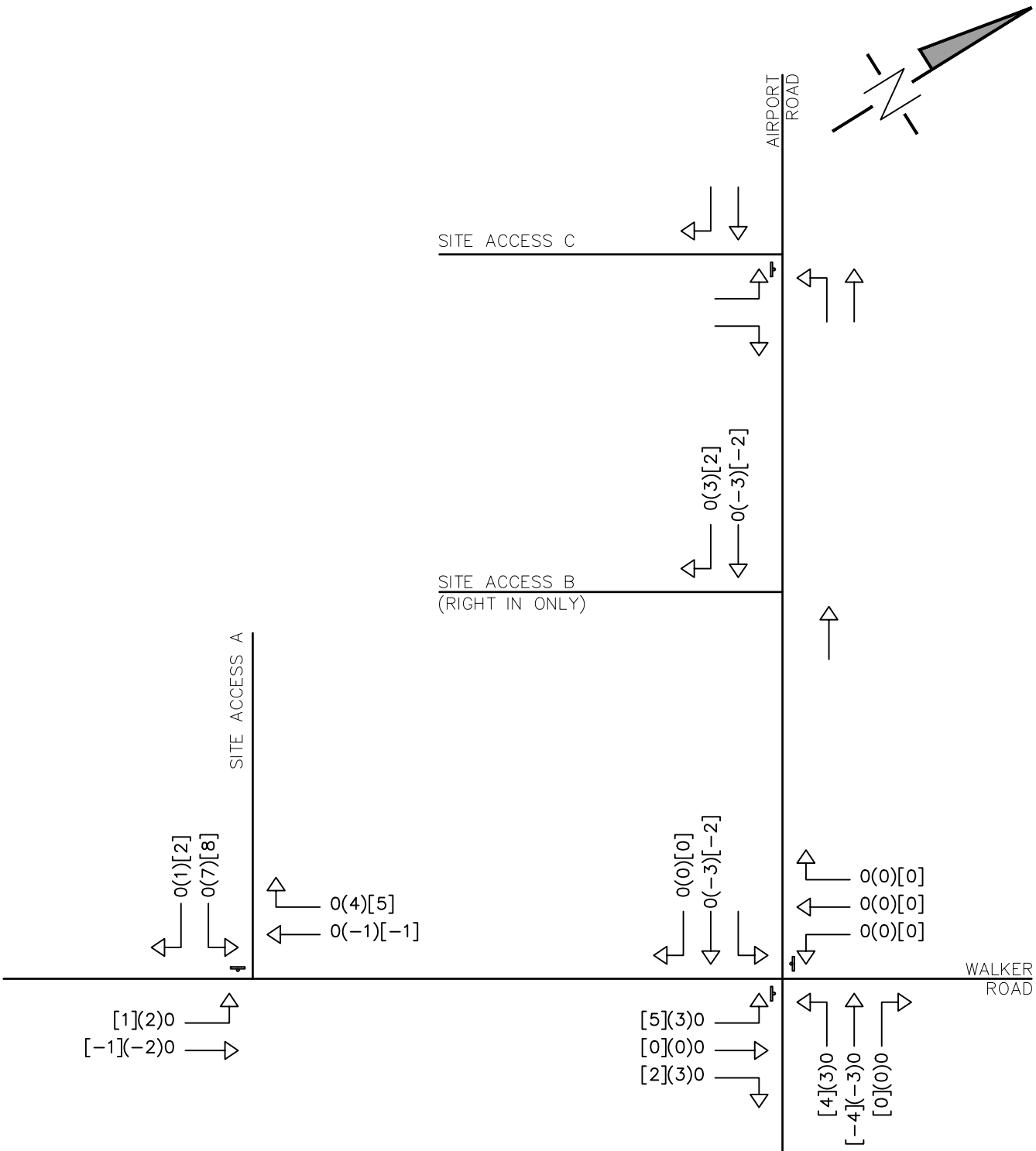
Scale	Date	Check By	Drawing
N.T.S.	SEPT 25, 2020	M.F.	FIG. 11



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

Legend

SIGNAL CONTROL

STOP CONTROL

XX(YY)[ZZ] AM (AFTERNOON) [PM]

Project

16114 AIRPORT ROAD
TOWN OF CALEDON EAST

Drawing

PASS-BY COMMERCIAL
TRIP ASSIGNMENT

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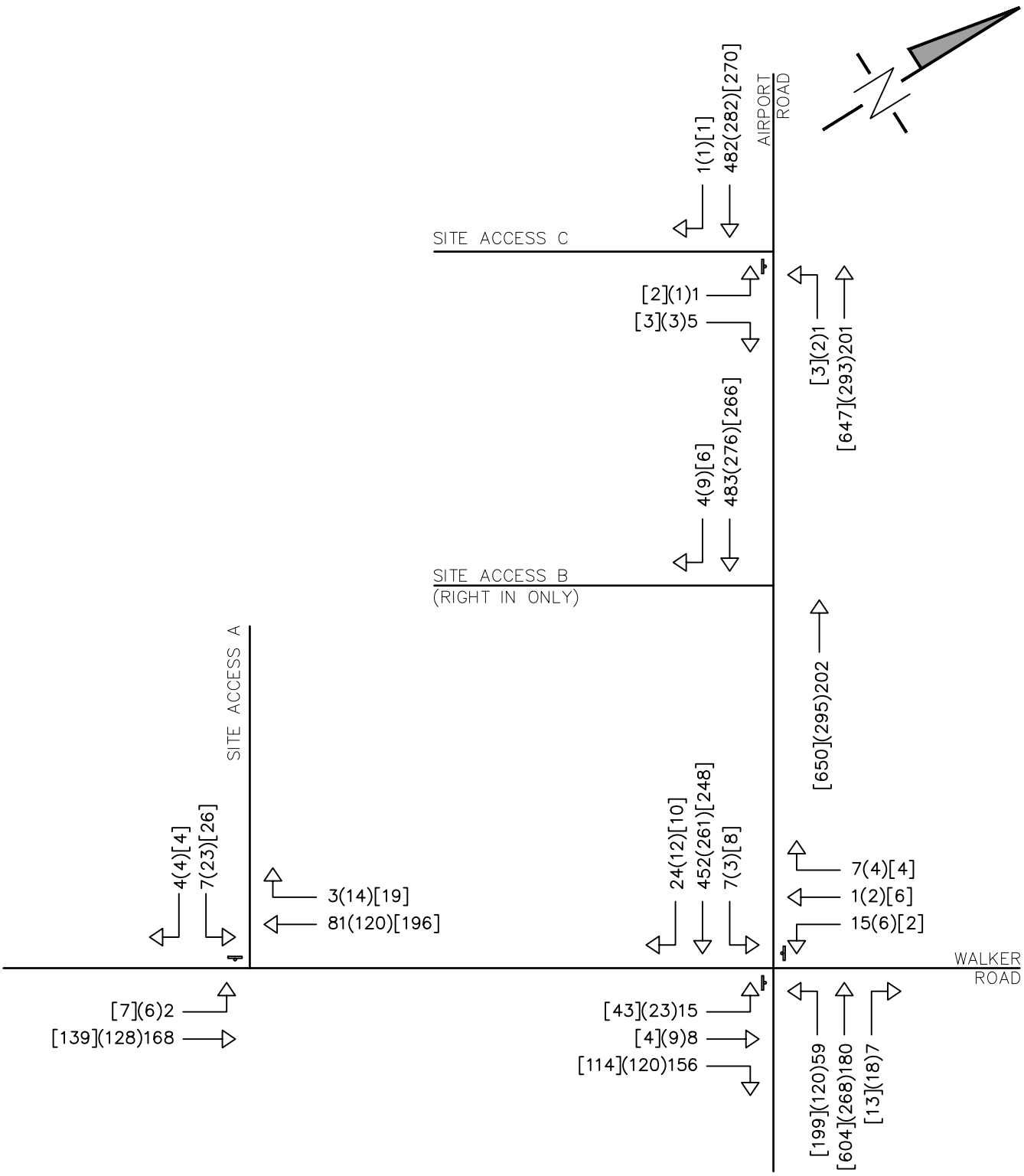
Scale	Date	Check By	Drawing
N.T.S.	SEPT 25, 2020	M.F.	FIG. 12



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

Legend

SIGNAL CONTROL

STOP CONTROL

XX(YY)[ZZ] AM (AFTERNOON) [PM]

Project

16114 AIRPORT ROAD
TOWN OF CALEDON EAST

Drawing

2024 FUTURE TOTAL TRAFFIC VOLUMES

CROZIER & ASSOCIATES Consulting Engineers
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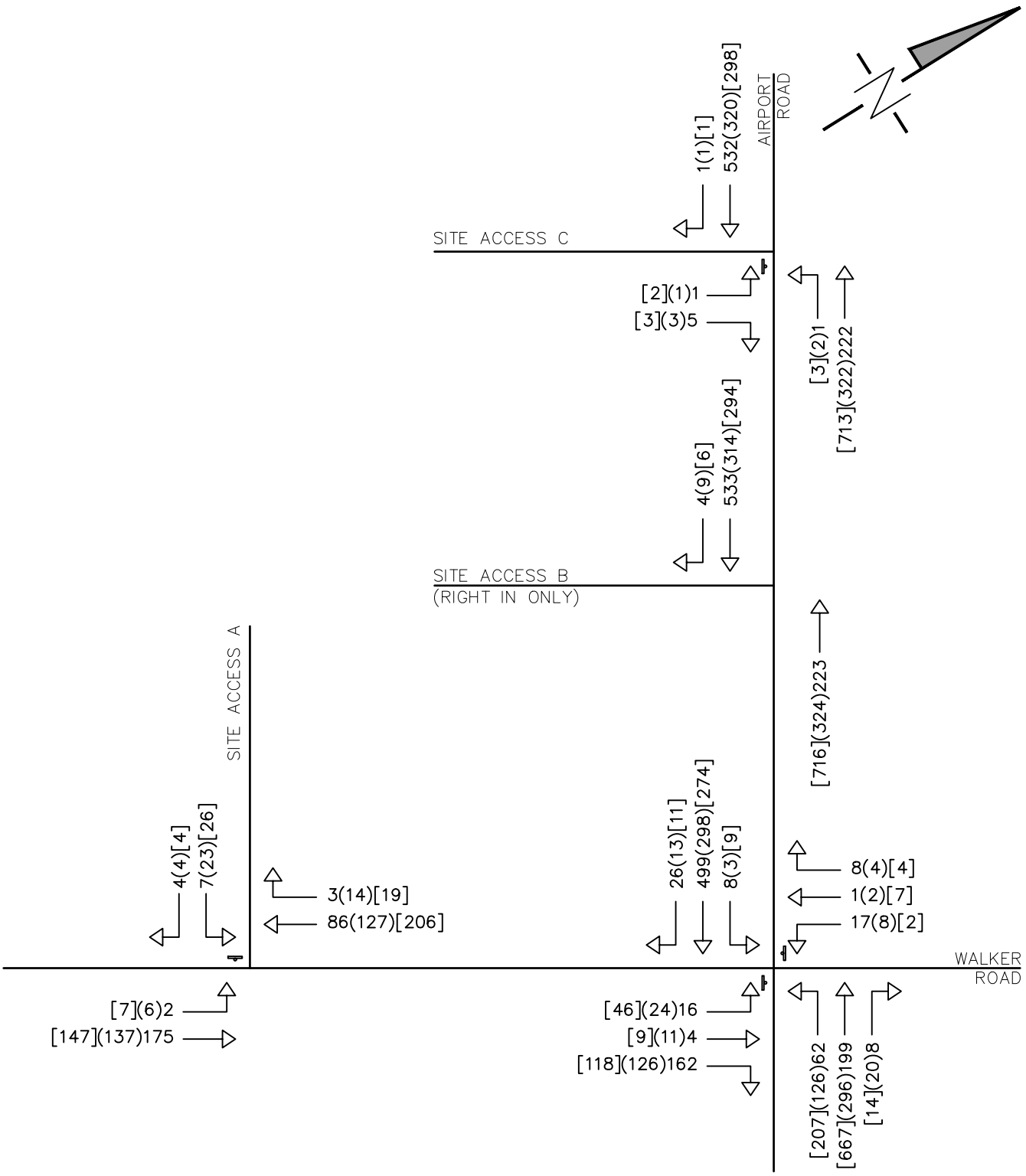
Drawn By	Design By	Project
S.K.	M.F.	110-4331

Scale	Date	Check By	Drawing
N.T.S.	SEPT 25, 2020	M.F.	FIG. 13



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

Legend

SIGNAL CONTROL

STOP CONTROL

XX(YY)[ZZ] AM (AFTERNOON) [PM]

Project

16114 AIRPORT ROAD
TOWN OF CALEDON EAST

Drawing

2029 FUTURE TOTAL TRAFFIC VOLUMES

CROZIER & ASSOCIATES Consulting Engineers
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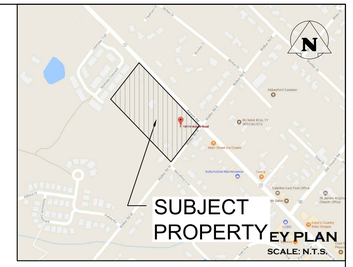
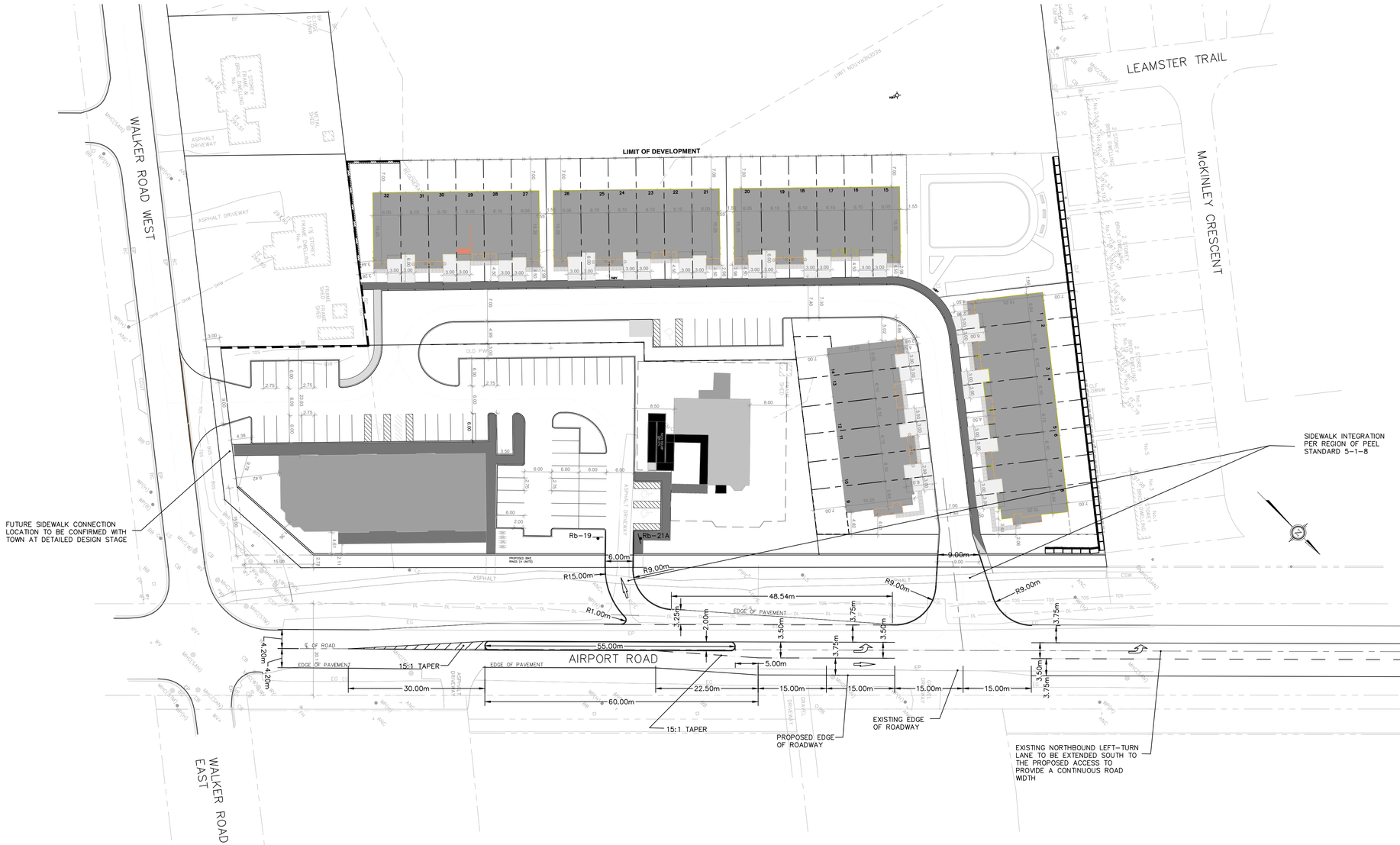
S.K.	M.F.	110-4331

Scale	Date	Check By	Drawing
N.T.S.	SEPT 25, 2020	M.F.	FIG. 14



KEY PLAN
SCALE: N.T.S.



10 0m 10 20 30 40
SCALE: 1:500

NOTES:
- GEOMETRY OF IMPROVEMENTS TO BE CONFIRMED DURING DETAILED DESIGN
- PAVEMENT MARKING AND SIGNAGE DETAILS FOR EXTERNAL IMPROVEMENTS TO BE PROVIDED WITH DETAILED DESIGN PACKAGE

Town

No.	ISSUE	DATE: MM/DD/YYYY
0	ISSUED FOR REVIEW	10/28/2020
1	ISSUED FOR REVIEW	11/20/2020

Engineer

FOR REVIEW
NOT TO BE USED FOR CONSTRUCTION

Engineer

Project
16114 AIRPORT ROAD
CALEDON EAST

Drawing
PRELIMINARY FUNCTIONAL DESIGN

CROZIER & ASSOCIATES Consulting Engineers
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Drawn By	Design By	Project
S.K./A.K.	M.F.	110-4331
Check By	**Check By**	**Scale** / **Drawing**
M.F.	A.F.	1:500 / FIG 15

J:\100\110 - Schnarr\4331-16114 Airport Rd\CAD\CIVIL\1SHEET\4331-FIGURE 1-2v4.dwg, FIG 15, Fri Nov 20 11:32:53 2020, skerr