TRAFFIC IMPACT STUDY

Winzen Cumac Phase 2 –
Proposed Residential Subdivision,
North of Burbank Circle

Township of Adjala-Tosorontio,
County of Simcoe, ON

August 2021

Prepared for
Winzen Developments Inc.

TRANS-PLAN
Transportation Engineering

785 Dundas St W
Toronto, ON, M6J 1V2

1 (647) 931 7383
1 (877) 668 8784

trans-plan.com
admin@trans-plan.com

TRANS-PLAN

785 Dundas St W
Toronto, ON M6J 1V2

1 (877) 668 8784
1 (647) 931 7383

admin@trans-plan.com
trans-plan.com

August 10, 2021

Mr. Alvin Young
Winzen Developments Inc.
30 Algie Avenue
Toronto, ON M8Z 5J8

Re: **Proposed Residential Subdivision (Winzen Cumac Phase 2), Part of East Half Lot 11, Concession 5, Township of Adjala-Tosorontio, County of Simcoe, ON - Traffic Impact Study**

Dear Mr. Young,

TRANS-PLAN is pleased to submit this Traffic Impact Study for Winzen Cumac Phase 2, the proposed residential subdivision located on the east half of Lot 11, Concession 5. The layout of the subdivision plan includes the future development of 45 single residential building units with a combined area of 3.49 hectares.

Our Traffic Impact Study findings indicate that the proposed development would have minimal impact on the existing road network due to similarities in traffic operations between future background and total conditions. As a result, there would be no additional roadway improvements required to accommodate the proposed subdivision aside from the construction of 'Street A'.

A warrant analysis for auxiliary left and right-turning lanes at the intersection of Main Street Everett and Den Boer Road was also conducted in accordance with the MTO Geometric Design Standards for Ontario Highways. The findings of the analysis indicate that exclusive turning lanes are not warranted, and the intersection can continue operating with the existing traffic control devices in place.

Sincerely,

Anil Seegobin, P.Eng.
Partner and Engineer

Alex Lee
Traffic Analyst

Trans-Plan Transportation Inc.
Transportation Consultants

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1. INTRODUCTION

Trans-Plan has been retained by Winzen Developments Inc. to complete a Traffic Impact Study (TIS) for Winzen Cumac Phase 2, the proposed subdivision located on the east half of Lot 11, Concession 5 in the Township of Adjala-Tosorontio, County of Simcoe, Ontario.

This Traffic Impact Study includes the following components:

- Review and assessment of the existing road network
- Assessment of future background conditions based on anticipated traffic growth, area developments and planned transportation improvements in the study area
- Assessment of the impact of site-generated traffic on the adjacent roadway network under future total traffic conditions at five (2026) and 10 (2031) year horizons
- Determination of roadway and intersection improvements, as required, to accommodate the proposed development

Prior to commencing this study, staff at the Township of Adjala-Tosorontio and at the County of Simcoe were contacted to discuss the scope and methodology and were provided with a study Terms of Reference in July 2021.

2. STUDY AREA CONTEXT

2.1 Site Location

The currently unoccupied site, shown in Figure 1, is located directly north of Burbank Circle in the Township of Adjala-Tosorontio in the County of Simcoe. The subject site is located within an existing residential subdivision within the community of Everett.

Main Street Everett is located approximately 600 metres south of the site, with several retailers and amenities located along the roadway.

2.2 Road Network

The major roadways located in the study area are described as follows:

Main Street Everett / County Road 5 is a roadway under the jurisdiction of the County of Simcoe that runs in an east-west direction with two travel lanes (one in each direction). The roadway has a posted speed limit of 50 km/h in the vicinity of the site.

Burbank Circle is a local roadway under the jurisdiction of the Township of Adjala-Tosorontio that runs in a circular loop, collecting and moving traffic from residential roadways to arterial roadways. The roadway includes two travel lanes (one in each direction) with an assumed speed limit of 50 km/h.

Den Boer Road is a local roadway under the jurisdiction of the Township of Adjala-Tosorontio that runs in a north-south direction with two travel lanes (one in each direction). The roadway, which connects Burbank Circle to Main Street Everett, has a posted speed limit of 50 km/h.

Grohal Drive is a local roadway under the jurisdiction of the Township of Adjala-Tosorontio that runs in a general east-west direction with two travel lanes (one in each direction). The roadway provides residents

in the vicinity of the subject site with a second connection to Main Street Everett. Grohal Drive has a posted speed limit of 50 km/h.

3. PROPOSED DEVELOPMENT

The subdivision plan, prepared by Jones Consulting Group Ltd., is shown in Figure 2. The proposed development includes a subdivision consisting of 45 single residential building units with a combined area of 3.49 hectares. A new road with a total area of 0.83 hectares (referred to as 'Street A' in the subdivision plan) will intersect with Burbank Circle on both the east and west sides where the curvatures exist along Burbank Circle.

4. EXISTING CONDITIONS

4.1 Study Area Intersections and Driveways

The study area intersections and driveways assessed in our analysis are as follows:

- Main Street Everett / County Road 5 at Den Boer Road (unsignalized intersection)
- Burbank Circle at Den Boer Road (unsignalized intersection)
- Burbank Circle at Grohal Drive (unsignalized intersection)
- Burbank Circle at 'Street A', west side (unsignalized intersection)
- Burbank Circle at 'Street A', east side (unsignalized intersection)

The study area roadway characteristics are shown schematically in Figure 3.

4.2 Traffic Counts

To determine the existing operating conditions in the study area, intersection turning movement counts (TMCs) were conducted by Trans-Plan on Tuesday, July 13, 2021.

Table 1 provides a summary of the count time along with the morning and afternoon peak hours for each intersection. Source information along with intersection TMC diagrams are provided in Appendix A.

Table 1 – Intersection Turning Movement Count Details

Intersection	Count Date / Time	Count Hours	Peak Hours
Burbank Circle at Grohal Drive	July 13, 2021	7:00AM – 9:30AM 4:00PM – 6:30PM	7:00AM – 8:00AM 4:30PM – 5:30PM
Burbank Circle at Den Boer Road			8:00AM – 9:00AM 4:30PM – 5:30PM
Main Street Everett at Den Boer Road			8:00AM – 9:00AM 4:15PM- 5:15PM

To approximate existing volumes at the future 'Street A' connections at Burbank Circle, the traffic volumes at the adjacent intersections were carried upstream, assuming that vehicular traffic did not enter the existing residential driveways (due to low traffic volumes). The existing traffic volumes, for the weekday AM and PM peak hours are shown in Figure 4.

4.3 Peak Hour Factors

The peak hour factors (PHFs) used in the analysis for the study area intersections were calculated based on the TMCs conducted by Trans-Plan. The utilized PHFS are shown in Table 2.

Table 2 – Peak Hour Factors, Study Area Intersections and Driveways

Study Area Intersections	Weekday AM Peak Hour	Weekday PM Peak Hour
Burbank Circle at Grohal Drive	0.54	0.91
Burbank Circle at Den Boer Road	0.80	0.91
Main Street Everett at Den Boer Road	0.78	0.85

5. FUTURE BACKGROUND CONDITIONS

Future background traffic volumes were determined based on a review of planned developments and future traffic volume growth in the study area. Planned roadway improvements are also discussed in this section.

5.1 Horizon Years

Following correspondence with County of Simcoe staff, a 10-year horizon period (year 2031) was also utilized for our analysis of future traffic conditions, and are detailed as follows:

- Existing conditions, year 2021
- 5 years thereafter, year 2026
- 10 years thereafter, year 2031

5.2 Background Growth Rate

After correspondence with Township of Adjala-Tosorontio and County staff, it was determined that a 2% growth rate would be applied to the study area roadways for the study area.

5.3 Planned Background Developments

Based on correspondence with Township staff, there are several proposed developments in the vicinity of the study area that were considered, as shown in Table 3.

Table 3 – Study Area Background Developments

No.	Location	Land Use	Development Size
1	Barzo Property – Proposed Residential Development	Residential	Approximately 658 low-density and 282 medium-density dwelling units
2	R&M Homes – Proposed Residential Development	Residential	Approximately 488 low-density dwelling units
3	Southwest quadrant of Main Street Everett & County Road 13	Mixed-Use	Approximately 235 low-density dwelling units and 0.66 ha of retail/commercial uses

The trips generated from the background developments were taken from the Everett Community Secondary Plan report prepared by Trans-Plan, dated October 2012. Source figures are provided in Appendix B. Future background traffic volumes for the 2026 and 2031 horizon years for the weekday AM and PM peak hours are shown in Figure 5 and Figure 6.

6. SITE TRAFFIC

6.1 Trip Generation

Trips for the proposed development were generated using the Institute of Transportation Engineers (ITE) Trip Generation manual, 10th edition. The ITE Land Use Code 210 for Single-Family Detached Housing was used to determine suitable trip rates. The site trip generation is shown in Table 4.

Table 4 – Site Trip Generation

Land Use	Size	Weekday AM Peak Hour			Weekday PM Peak Hour		
		In	Out	Total	In	Out	Total
Single-Family Detached Housing (LUC 210)	45 units						
	Distribution	25%	75%	100%	63%	37%	100%
	Equation	T = 0.71(X) +4.80			Ln(T) = 0.96Ln(X) +0.20		
	Rate	0.20	0.62	0.82	0.66	0.38	1.04
	Trips	**9**	**28**	**37**	**30**	**17**	**47**

The subject site is expected to generate approximately 37 and 47 new two-way trips in the weekday AM and PM peak hours, respectively.

6.2 Trip Distribution and Assignment

The site trips for the proposed development were distributed to/from the subdivision and the boundary roadways based on existing travel patterns observed at the study area intersections.

As demonstrated by the existing travel patterns, all incoming site trips are expected to utilize the left and right turn movements from Main Street Everett onto Den Boer Road given that the roadway provides a quicker route for vehicles travelling eastbound and westbound.

The site traffic assignment for the weekday AM and PM peak hours are shown in Figure 7.

7. FUTURE TOTAL TRAFFIC CONDITIONS

Site traffic volumes and pass-by trips were added to the 2026 and 2031 future background traffic volumes to obtain the future total traffic volumes for the weekday AM and PM peak hours for the study year horizons. The total traffic volumes for the 2026 and 2031 horizon years are shown in Figure 8 and Figure 9.

7.1 Capacity Analysis

A capacity analysis was performed for the study area intersection and site driveways using Synchro analysis software, version 10.0. The capacity analysis results for a five-year horizon and ten-year horizon for the weekday AM and PM peak hours are shown in Table 5. Capacity Analysis Sheets and Level of Service (LOS) definitions are provided in Appendix C and Appendix D, respectively.

The results of the capacity analysis are summarized in this section for each intersection:

Main Street Everett & Den Boer Road

Under existing conditions in the weekday AM and PM peak hour, the intersection operates at a good LOS of B or better during the weekday AM and PM peak hours.

Horizon Year 2026 and 2031

Under future background and total conditions, the southbound approach at the intersection is expected to operate at an acceptable LOS of C. The remaining movements are expected to operate similarly to existing conditions.

Our findings indicate that the intersection is expected to continue operating with minimal delays under future conditions.

Burbank Circle & Den Boer Road

Under existing traffic conditions, the intersection operates at a good LOS of A during the weekday AM and PM peak hours.

Horizon Year 2026 and 2031

Under future background and total conditions, the intersection is expected to operate similarly to the existing conditions with minimal delays.

Our findings indicate that the intersection is expected to operate with minimal delays under future conditions.

Burbank Circle & Grohal Drive

Under existing traffic conditions, the intersection operates at a good LOS of A with minimal delays during the weekday AM and PM peak hours.

Horizon Year 2026 and 2031

Under future background and total conditions, the intersection is expected to continue operating similarly to existing conditions with minimal delays.

Our findings indicate that the intersection is expected to operate with minimal delays under future conditions.

Burbank Circle & 'Street A' (west)

Under future background and total conditions, the movements at the intersection are expected to operate at a good LOS of A with minimal delays. It is assumed that the intersection will operate as an all-way stop similarly to other intersections within the neighbourhood.

Burbank Circle & 'Street A' (east)

Under future background and total conditions, the movements at the intersection are expected to operate with at a good LOS of A with minimal delays. It is assumed that the intersection will operate as an all-way stop similarly to other intersections within the neighbourhood.

Table 5 - Capacity Analysis Results, 2026 and 2031 Conditions

Intersection	Existing Traffic Conditions						2026 Background Traffic Conditions						2026 Total Traffic Conditions						2031 Background Traffic Conditions						2031 Total Traffic Conditions					
Movement	AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS
Main Street Everett & Den Boer Road																														
Eastbound Left / Through		0	A		0	A		0	A		0	A		0	A		0	A		0	A		0	A		0	A		0	A
Westbound Through / Right		0	A		0	A		0	A		0	A		0	A		0	A		0	A		0	A		0	A		0	A
Southbound Left / Right		10	A		11	B		13	B		14	B		13	B		14	B		13	B		15	B		14	B		15	C
Burbank Circle & Den Boer Road																														
Eastbound Through / Right		7	A		7	A		7	A		7	A		7	A		7	A		7	A		7	A		7	A		7	A
Westbound Left / Through		7	A		7	A		7	A		7	A		7	A		7	A		7	A		7	A		7	A		8	A
Northbound Left / Right		7	A		7	A		7	A		7	A		7	A		8	A		7	A		7	A		7	A		8	A
Burbank Circle & Grohal Drive																														
Eastbound Left / Right		6	A		6	A		7	A		7	A		7	A		7	A		7	A		7	A		7	A		7	A
Northbound Left / Through		7	A		7	A		7	A		7	A		7	A		8	A		7	A		8	A		7	A		8	A
Southbound Through / Right		7	A		7	A		7	A		7	A		7	A		7	A		7	A		7	A		7	A		7	A
Burbank Circle & 'Street A' (west)																														
Westbound Left / Right														7	A		7	A								7	A		7	A
Northbound Through / Right														7	A		7	A								7	A		7	A
Southbound Left / Through														7	A		7	A								7	A		7	A
Burbank Circle & 'Street A' (east)																														
Eastbound Left / Right														6	A		6	A								7	A		7	A
Northbound Left / Through														7	A		7	A								7	A		7	A
Southbound Through / Right														7	A		7	A								7	A		7	A

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8. TURN LANE WARRANTS

8.1 Right Turn Lane, Main Street Everett and Den Boer Road

An exclusive right turn lane is generally warranted when the following criteria, according to the MTO Geometric Design Standards for Ontario Highways, are met (see Appendix E).

- Right turning traffic volumes for the design hour is 60 vehicles per hour (vph) or more;
- Property is readily available; and,
- The terminal points of the deceleration / acceleration lanes do not conflict with any adjacent commercial development

The westbound right-turning volumes at the intersection of Main Street Everett and Den Boer Road are expected to be 23 and 95 vehicles during the respective future total AM and PM conditions. While the criterion regarding the 60-vph threshold is met, it is our opinion that an exclusive westbound right-turn lane is not necessary as our capacity analysis at the intersection indicates that no issues are expected with westbound right-turning movements under future conditions.

8.2 Left Turn Lane, Main Street Everett and Den Boer Road

A left turn lane warrant was completed for the eastbound left movement at the intersection of Main Street Everett and Den Boer Road. The MTO Geometric Design Standards for Ontario Highways warrants were analyzed based on the two-lane configuration for future total traffic conditions. Source information is provided in Appendix E and are summarized below in Table 6.

Table 6 – Main Street Everett and Den Boer Road, Eastbound Left Turn Warrant Justification

Criteria	2031 AM Peak Hour Traffic Volumes	2031 PM Peak Hour Traffic Volumes
Eastbound Left Turn (EBLT) Traffic Volumes	4	5
Advancing Traffic Volumes (Eastbound)	277	228
% Left Turns in Advancing Traffic Volumes (EB)	1%	2%
Opposing Traffic Volumes (Westbound)	118	362
Exclusive left turn lane justified?	No	No

The results indicate that exclusive left-turn and right-turn lanes at the intersection of Main Street Everett and Den Boer Road would not be warranted according to the MTO Geometric Design guidelines.

9. SUMMARY AND CONCLUSIONS

This Traffic Impact Study for the proposed residential subdivision, located to the immediate north of Burbank Circle in the Township of Adjala-Tosorontio, County of Simcoe, is summarized as follows:

- The proposed residential subdivision, which includes 45 total residential units, is to be located directly north of Burbank Circle. The proposed single residential building units will be fronting a future street (referred to as 'Street A' in this study) which will connect with Burbank Circle at both the northwest and northeast points of the loop-shaped road.

- The auto trips for the subdivision were estimated based on the ITE Trip Generation Manual, 10th Edition. The site is expected to generate approximately 37 and 47 two-way trips in the weekday AM and PM peak hours, respectively.
- As the auto trips generated by the subdivision are expected to be low (i.e. less than 100 trips generated during the peak hours), the auto traffic impacts on the surrounding road network are expected to be minor.
- Based on our capacity analysis for future 2026 and 2031 total traffic conditions, the study area intersections are expected to operate acceptably with the additional traffic generated by the proposed subdivision. It should also be noted that the two future intersections at 'Street A' are modelled as all-way stops similarly to other intersections within the neighbourhood.
- The proposed intersections at 'Street A' are expected to operate well with minimal delays under future 2026 and 2031 total traffic conditions.
- Exclusive left and right-turning lanes at the intersection of Main Street Everett and Den Boer Road are not warranted given the low volumes of left-turning traffic and the acceptable operating conditions of the intersection in future scenarios.
- No further road improvements are required to support the proposed subdivision, aside from the construction of 'Street A'.

Respectfully submitted,

Anil Seegobin, P.Eng.
Partner and Engineer

Alex Lee
Traffic Analyst

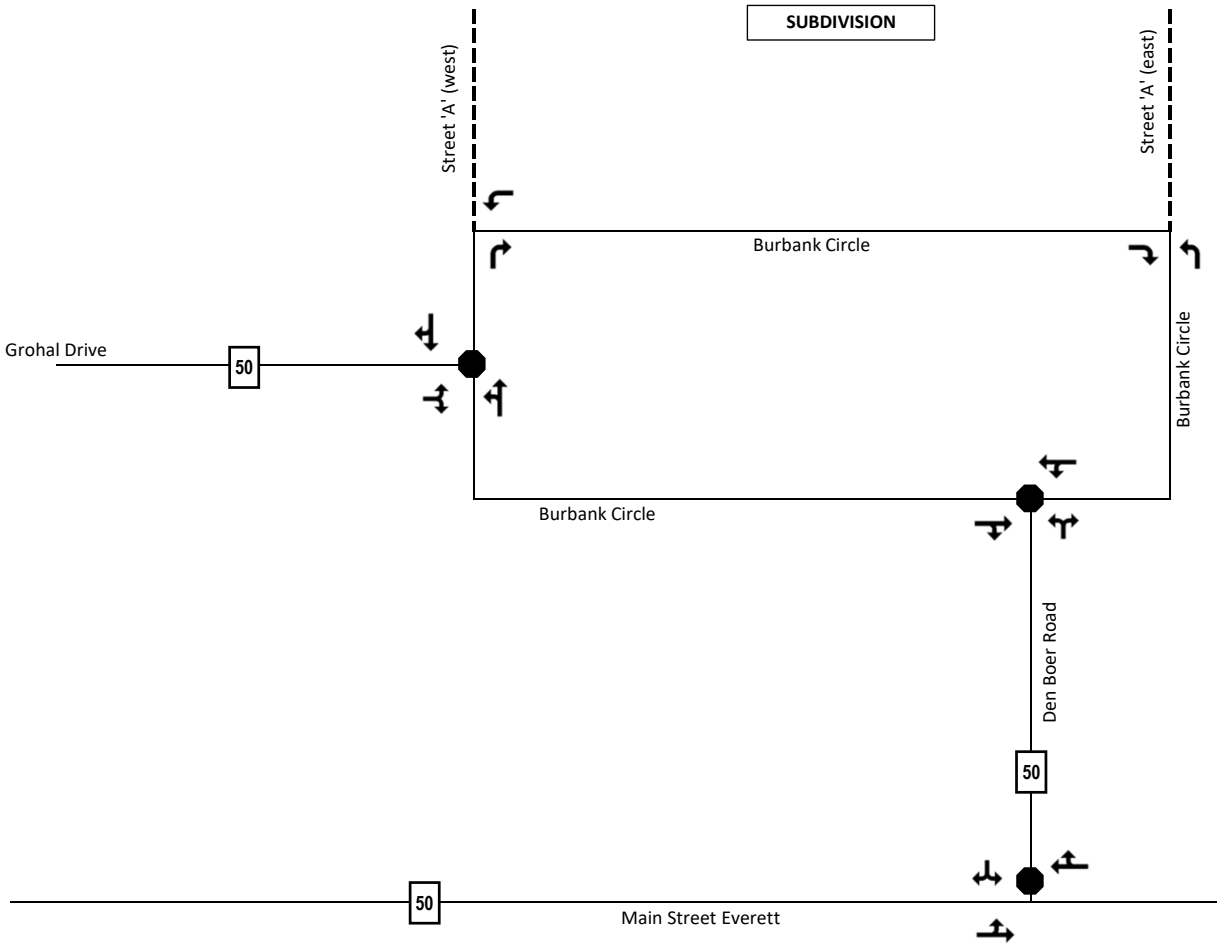
Trans-Plan Transportation Inc.
Transportation Consultants

Figure 1 – Site Location

Source : Google Earth

Figure 2 - Subdivision Plan

Figure 3: Existing Study Area Roadway Characteristics



LEGEND

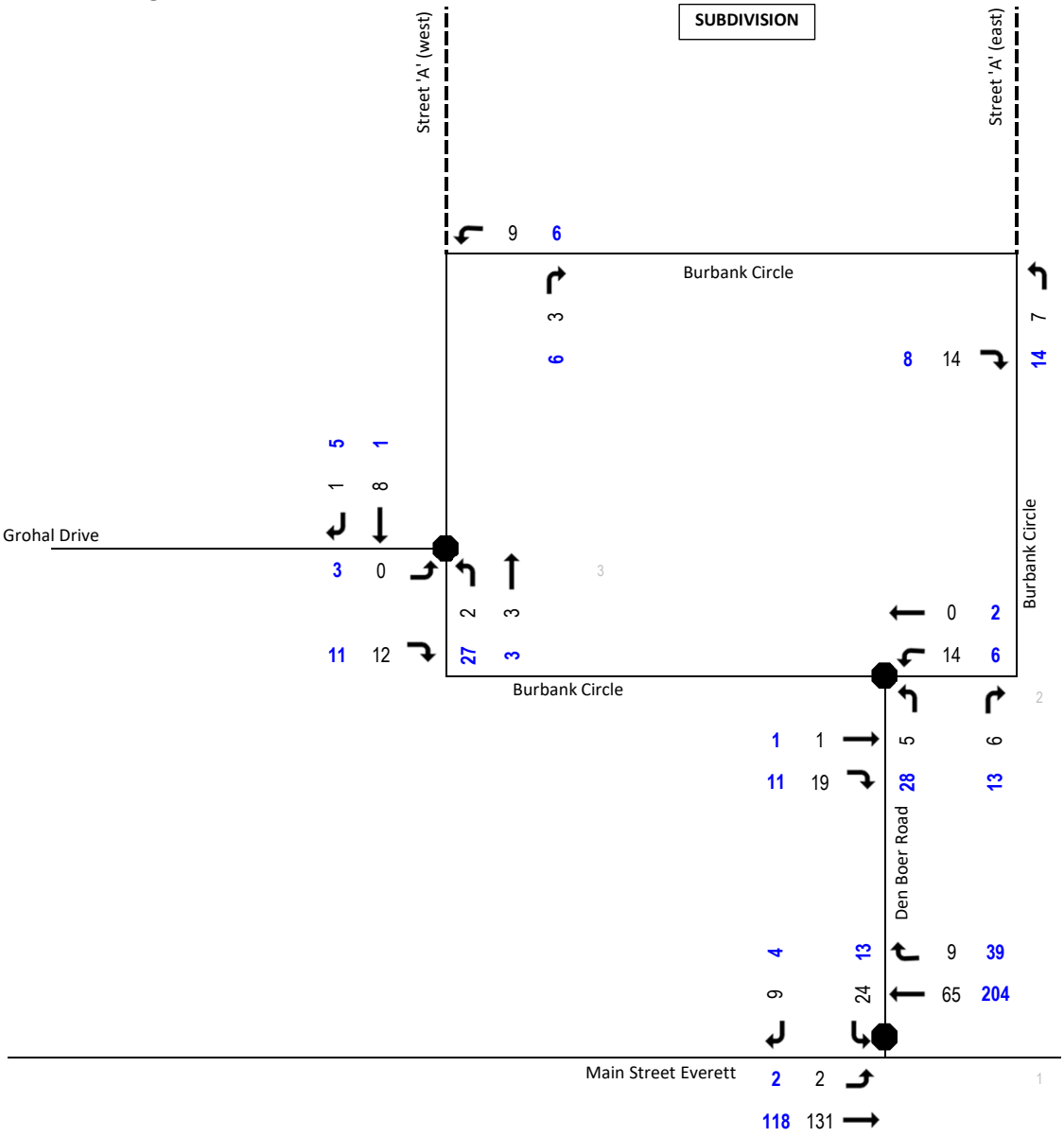
Stop Sign

Lane Configuration

40 Posted Speed Limit

Schematic; Not To Scale

Figure 4: Existing Traffic Volumes, AM and PM Peak Hour

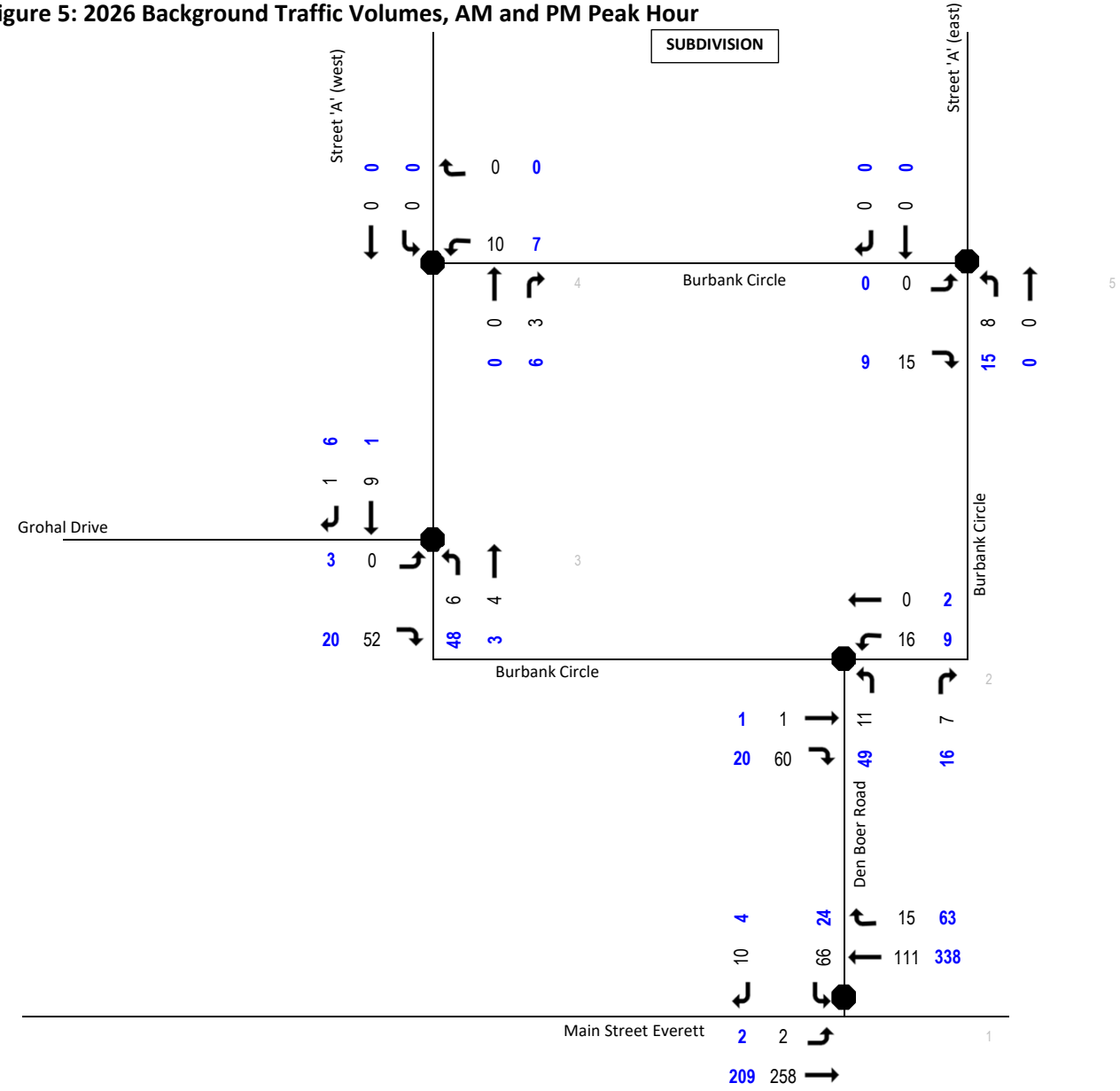


LEGEND

- Stop Sign
- Lane Configuration
- xx **xx** AM / **PM** Peak Hour

Schematic; Not To Scale

Figure 5: 2026 Background Traffic Volumes, AM and PM Peak Hour

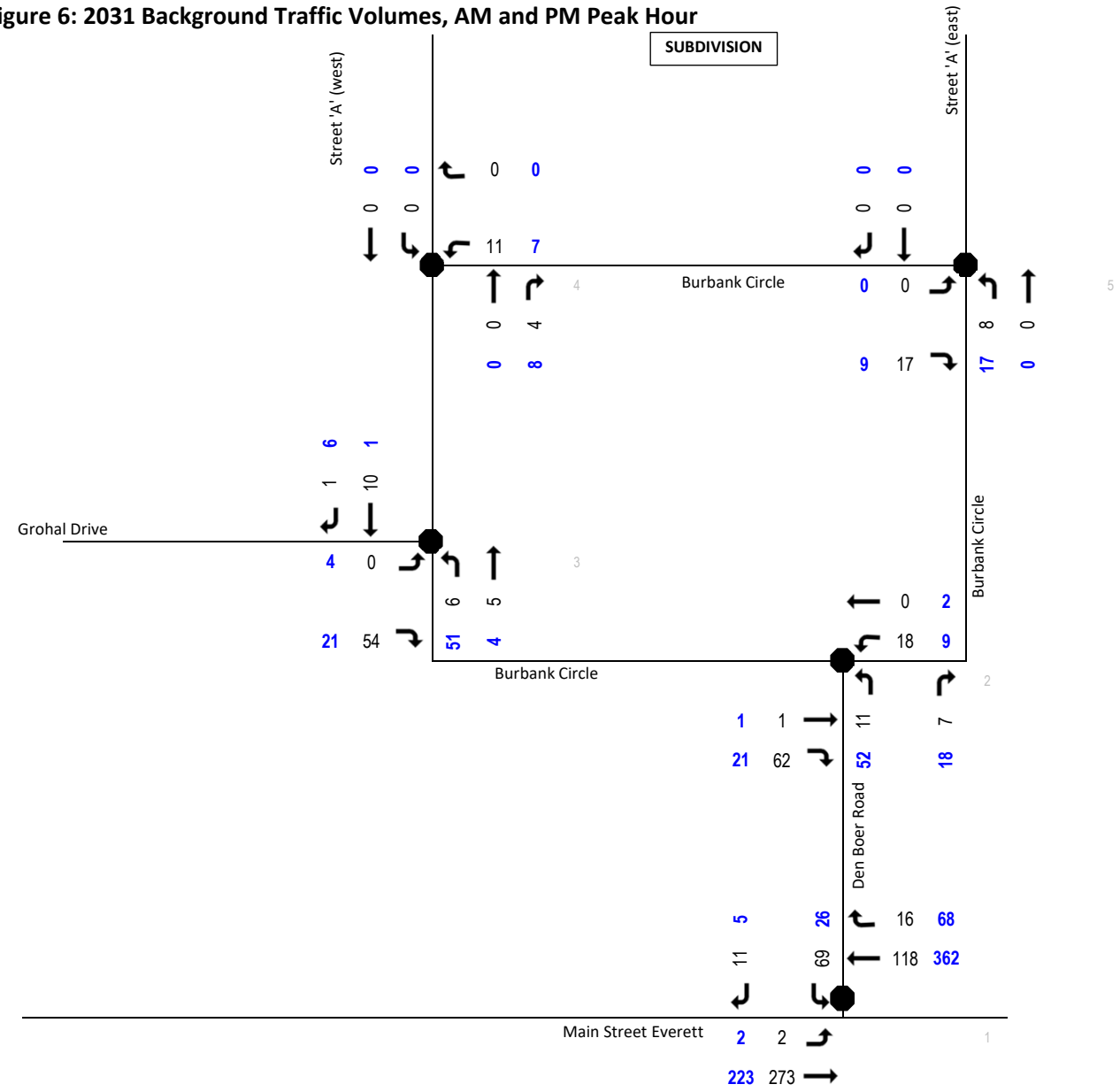


LEGEND

- Stop Sign
- Lane Configuration
- xx **xx** AM / **PM** Peak Hour

Schematic; Not To Scale

Figure 6: 2031 Background Traffic Volumes, AM and PM Peak Hour

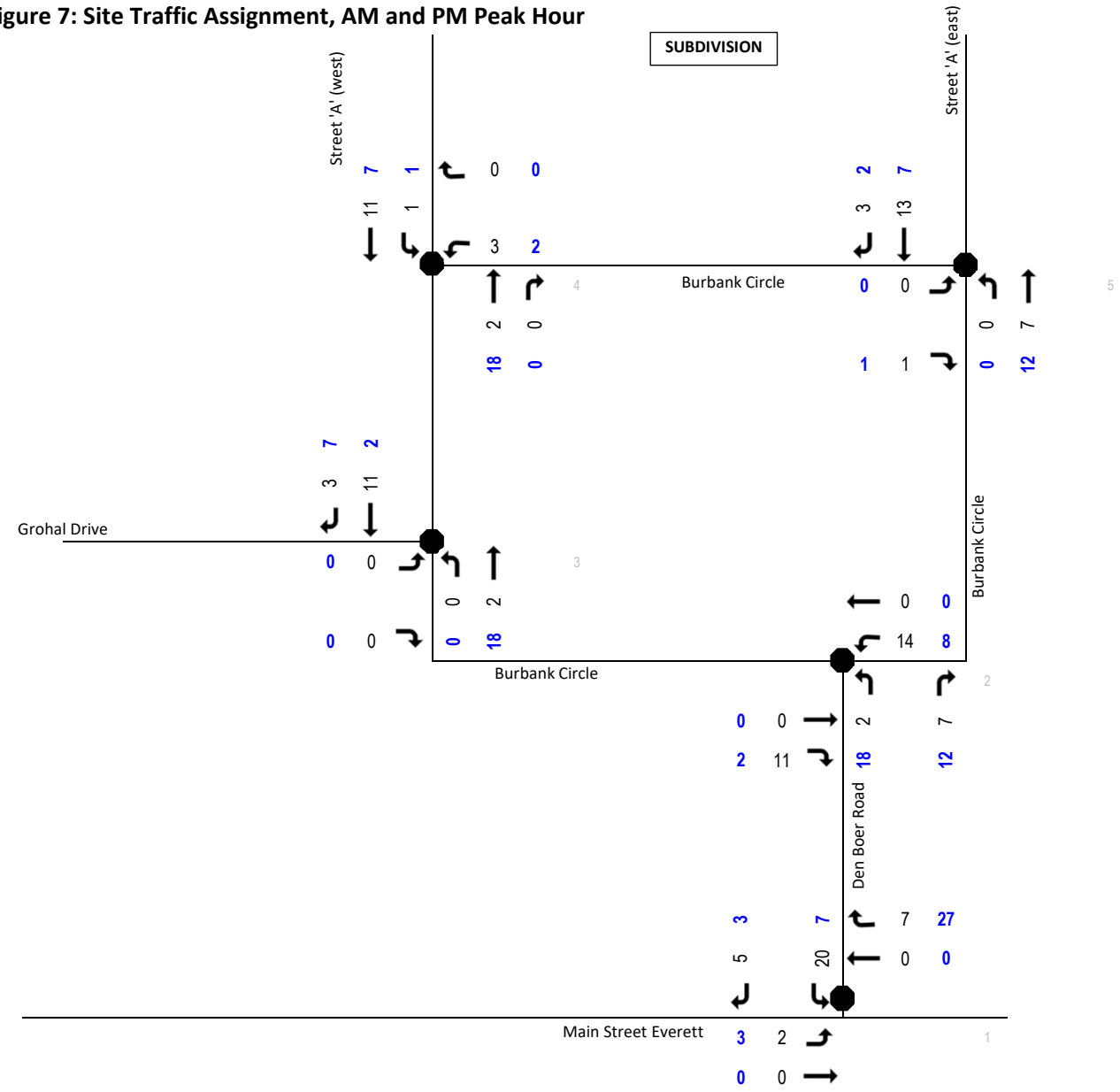


LEGEND

- Stop Sign
- Lane Configuration
- xx **xx** AM / **PM** Peak Hour

Schematic; Not To Scale

Figure 7: Site Traffic Assignment, AM and PM Peak Hour

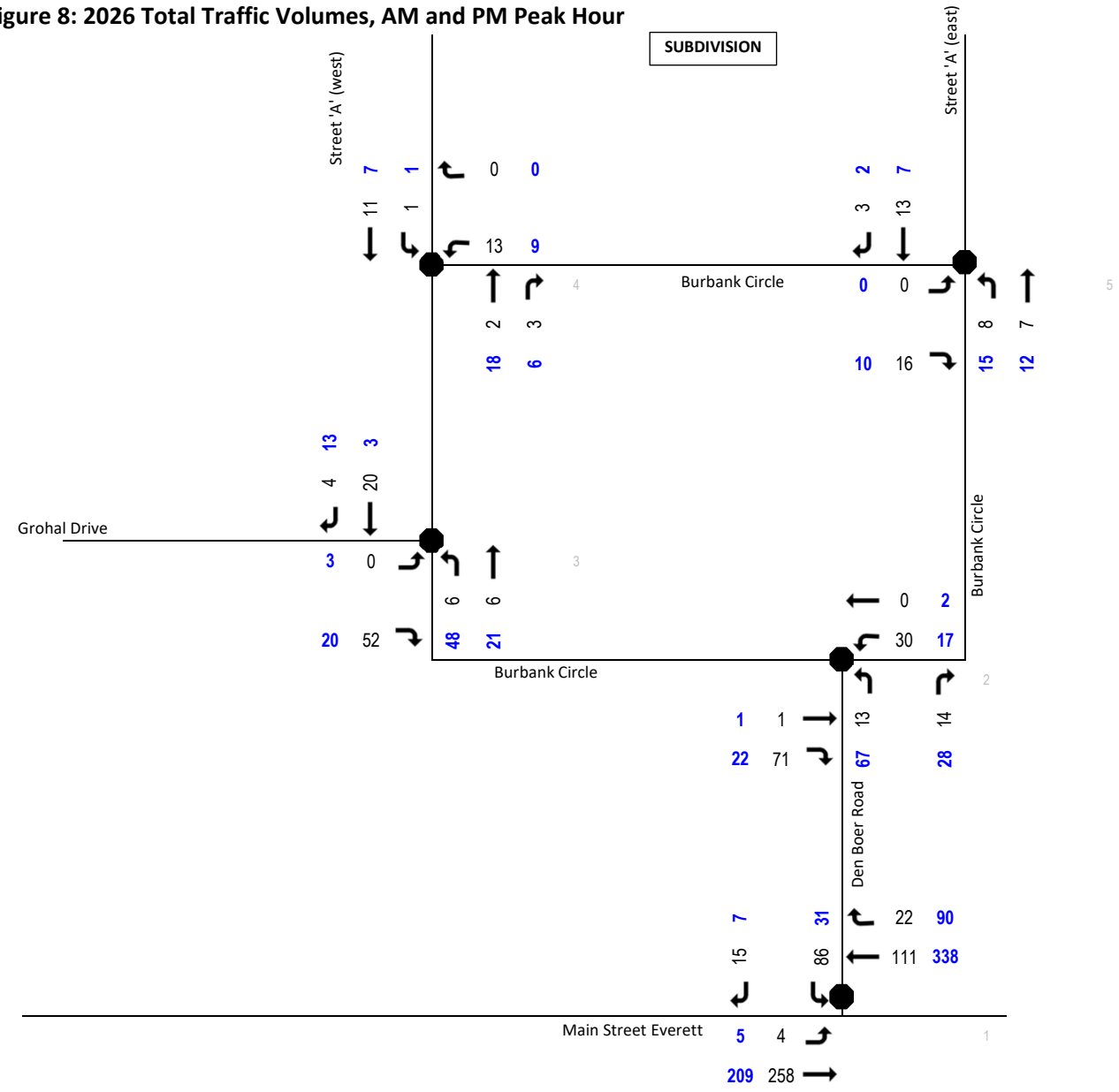


LEGEND

- Stop Sign
- Lane Configuration
- xx **xx** AM / **PM** Peak Hour

Schematic; Not To Scale

Figure 8: 2026 Total Traffic Volumes, AM and PM Peak Hour

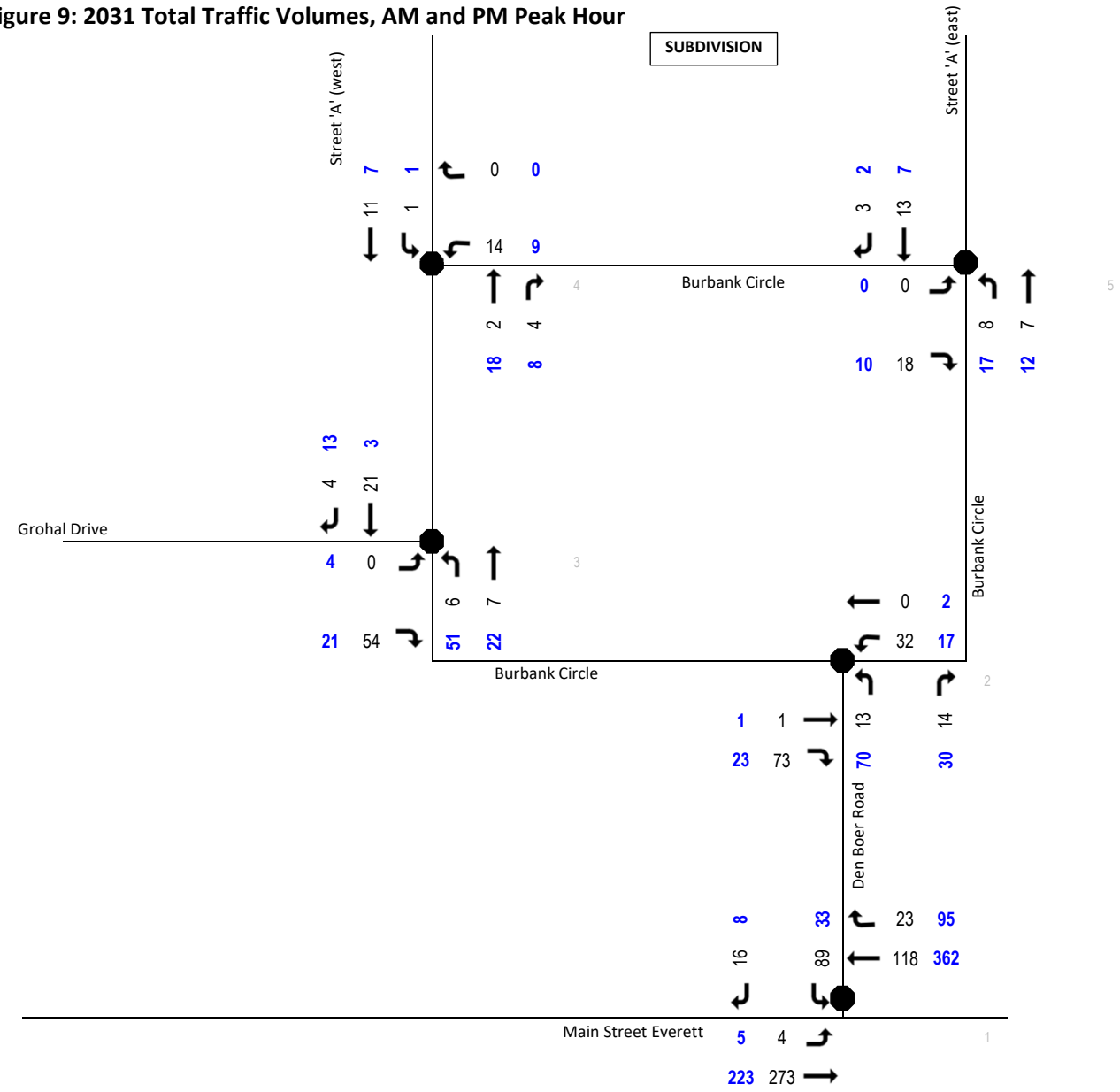


LEGEND

- Stop Sign
- Lane Configuration
- xx **xx** AM / **PM** Peak Hour

Schematic; Not To Scale

Figure 9: 2031 Total Traffic Volumes, AM and PM Peak Hour



LEGEND

- Stop Sign
- Lane Configuration
- xx **xx** AM / **PM** Peak Hour

Schematic; Not To Scale

APPENDICES

Appendix A – Turning Movement Counts

Appendix B – Background Development Information

Appendix C – Capacity Analysis Sheets

Appendix D – Level of Service Definitions

Appendix E – MTO Geometric Design Guidelines, Excerpts

APPENDIX A

Turning Movement Counts

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Turning Movement Count Diagram

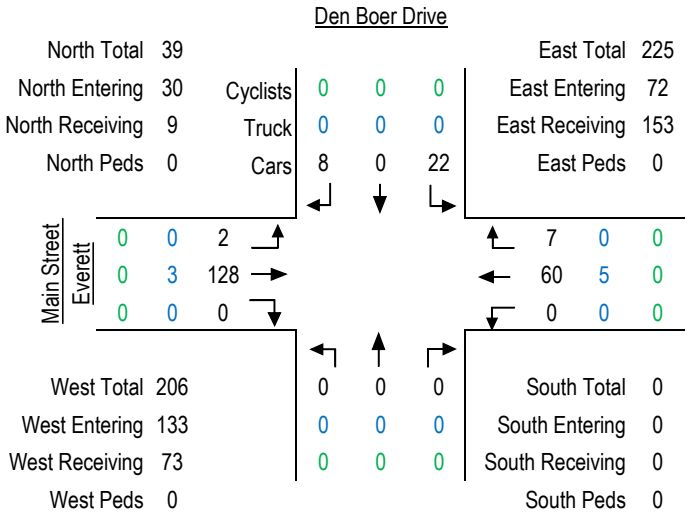
Intersection: Main Street Everett at Den Boer Road

Intersection ID:

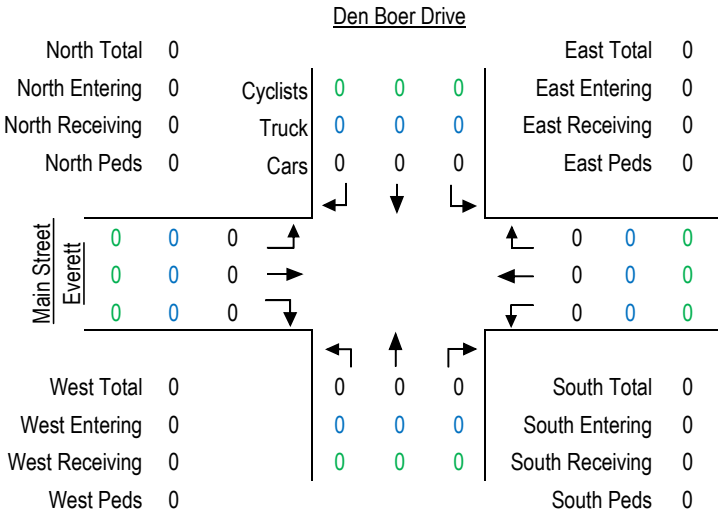
Municipality: Everett, Ontario

Date: Tuesday, July 13th, 2021

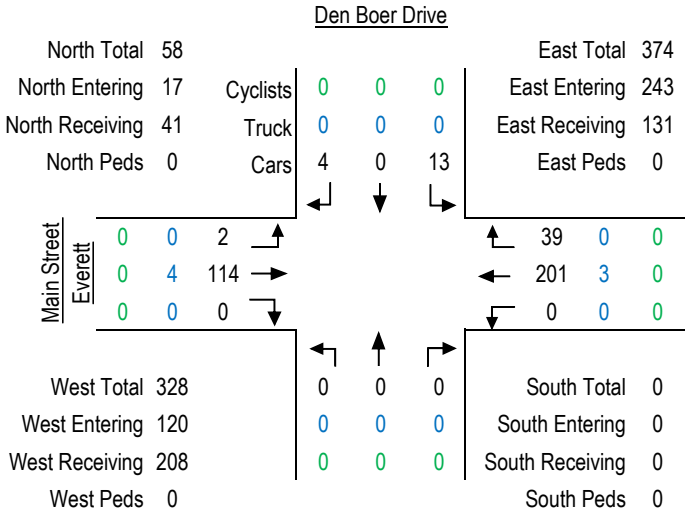
AM Peak Hour: 8:00 to 9:00



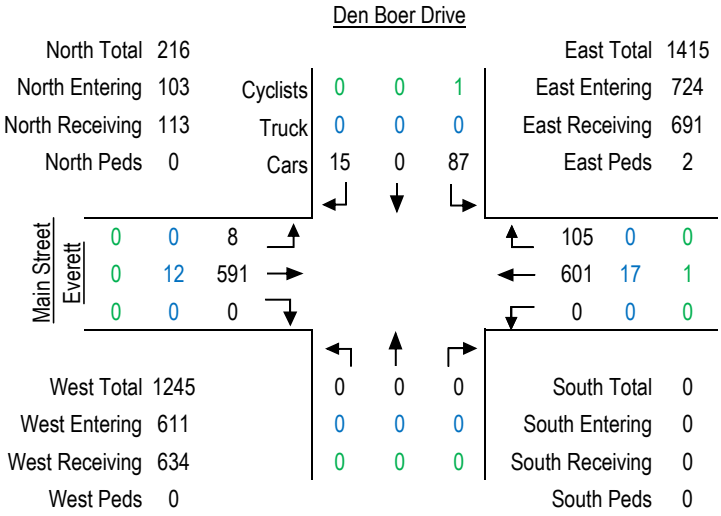
MD Peak Hour: - to -



PM Peak Hour: 16:15 to 17:15



Total 5-Hour Count



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Turning Movement Count Diagram

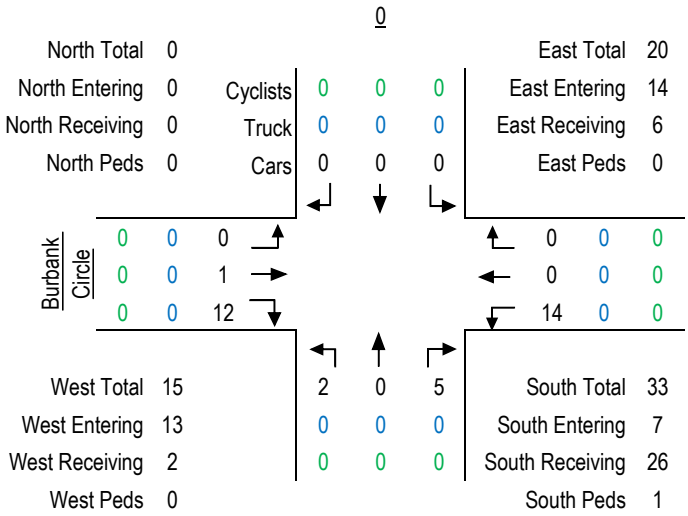
Intersection: Burbank Circle at Den Boer Road

Intersection ID:

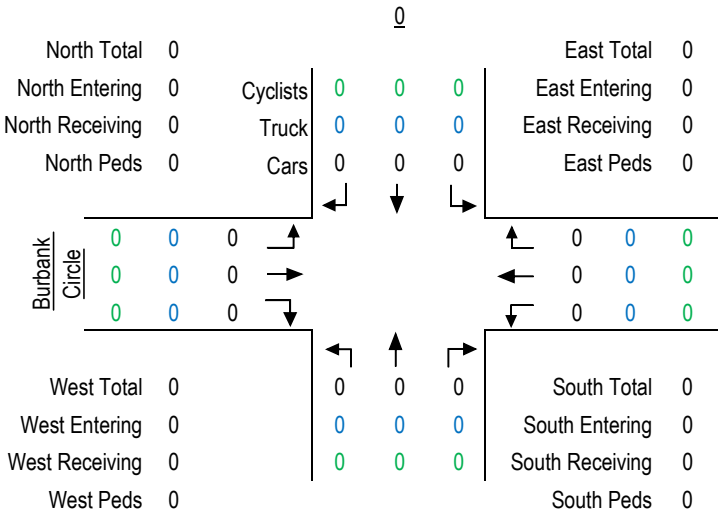
Municipality: Everett, Ontario

Date: Tuesday, July 13th, 2021

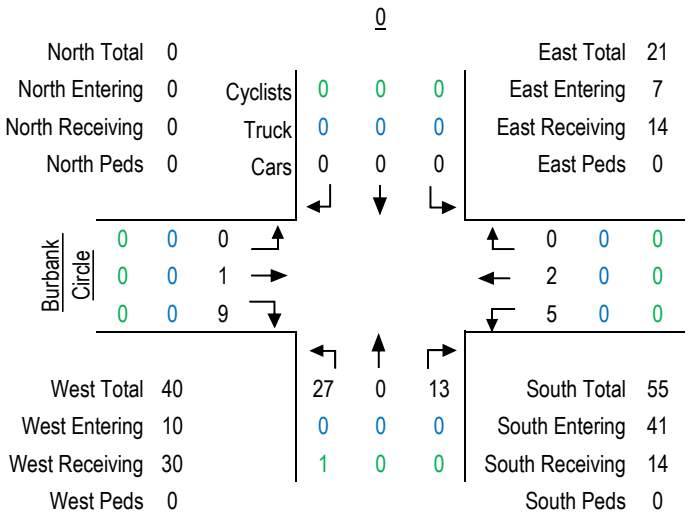
AM Peak Hour: 8:00 to 9:00



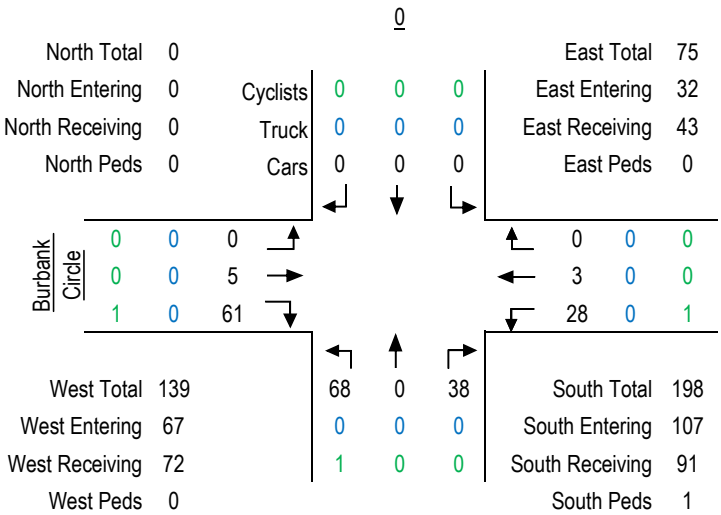
MD Peak Hour: - to -



PM Peak Hour: 16:30 to 17:30



Total 5-Hour Count



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Turning Movement Count Diagram

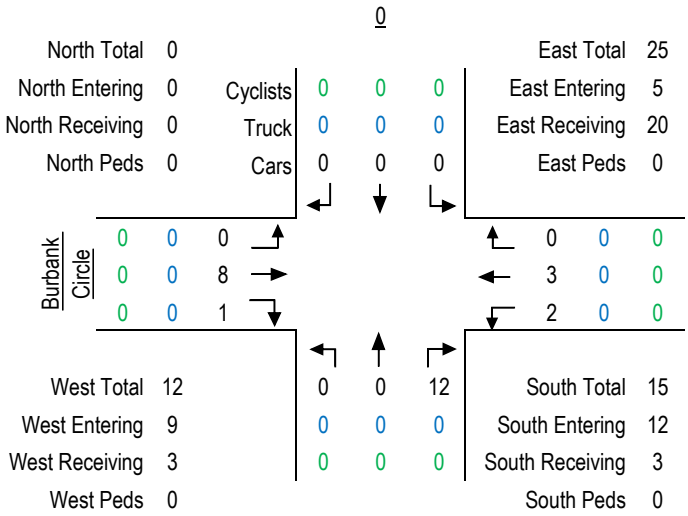
Intersection: Burbank Circle at Grohal Drive

Intersection ID:

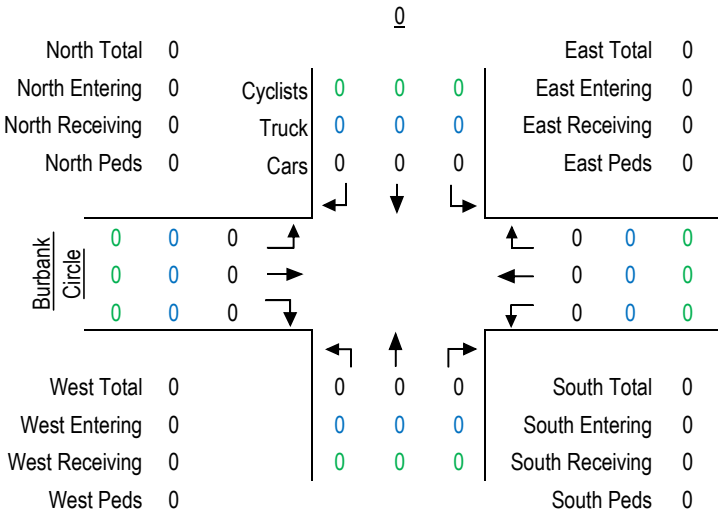
Municipality: Everett, Ontario

Date: Tuesday, July 13th, 2021

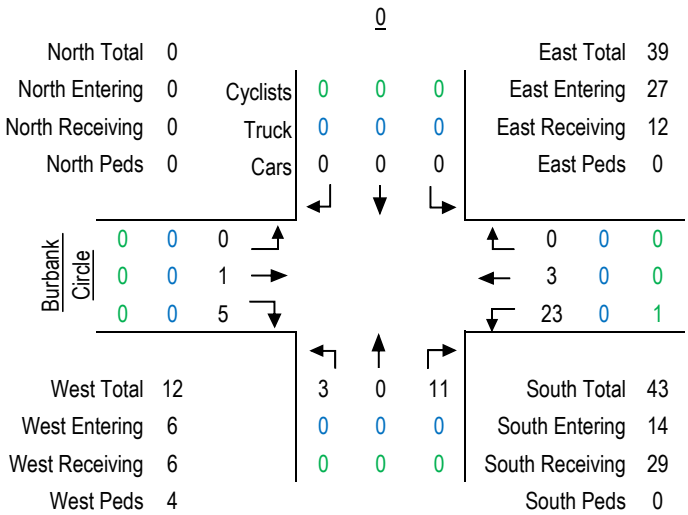
AM Peak Hour: 7:00 to 8:00



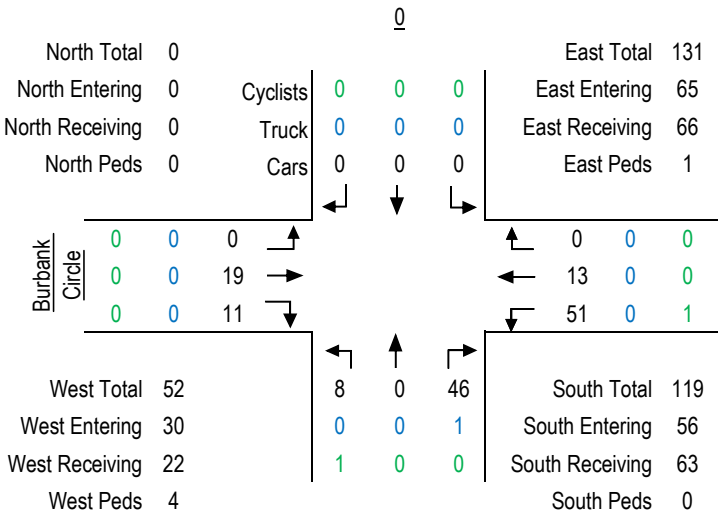
MD Peak Hour: - to -



PM Peak Hour: 16:30 to 17:30



Total 5-Hour Count



APPENDIX B

Background Development Information

Winzen Cumac Phase 2, Adjala-Tosorontio, ON

Background Development Map

1 Barzo Property
Proposed Residential Development

2 R&M Homes
Proposed Residential Development

3 SW Quadrant - Main Street Everett & County Road 13
Proposed Mixed-Use Development

Background Developments - Trip Generation

1) Barzo Property - Proposed Residential Development

Table 1 - Trip Generation Rates & Estimates

Land Use	Trip Rate /Estimate	AM Peak Hour			PM Peak Hour		
		In	Out	TOTAL	In	Out	TOTAL
Single family detached (658 units)	rate	0.19	0.56	0.75	0.64	0.37	1.01
	estimate	123	370	493	419	246	665
Residential condo/townhouse (282 units)	rate	0.07	0.37	0.44	0.35	0.17	0.52
	estimate	21	103	124	98	48	146
Total		144	473	617	517	294	811

Source: C.C. Tatham & Associates Ltd., 2007

2) R&M Homes - Proposed Residential Development

Table 1 - SITE TRAFFIC

USE		A.M. PEAK HOUR			P.M. PEAK HOUR		
		In	Out	Total	In	Out	Total
Residential							
Rates	per d.u.	0.19	0.56		0.64	0.37	
H & M Homes	437 units	83	245		279	162	
Approved subdivision	51 units	10	28		33	19	
TOTAL	**488 units**	**93**	**273**	**366**	**312**	**181**	**493**

Source: Read, Voorhees & Associates, 2007

3) SW Quadrant of Main Street Everett & County Road 13 - Proposed Mixed-Use Development

Land Use		Size	AM Peak Hour				PM Peak Hour			
				In	out	Total		In	out	Total
Retail	sq.ft. GLA:	0								
ITE LUC 820		Distribution		61%	39%	100%		49%	51%	100%
(sq.ft. GLA)		Equation		Ln(T)=0.59Ln(X)+2.32				Ln(T)=0.67Ln(X)+3.37		
		Rate		1.78	1.13	2.91		5.21	5.40	10.60
		DW Volumes		38	24	62		111	115	226
		Pass-by	0%	0	0	0	25%	28	28	56
		Trips		**38**	**24**	**62**		**83**	**87**	**170**
Residential - Low	Units:	235								
ITE Code 210		Distribution		25%	75%	100%		63%	37%	100%
(low density units)		Equation		T= 0.70(X)+9.74				Ln(T)= 0.90Ln(X)+0.51		
		Rate		0.19	0.56	0.74		0.61	0.35	0.97
		Trips		**44**	**131**	**175**		**144**	**83**	**227**
Sum				**82**	**155**	**237**		**227**	**170**	**397**
Less Synergy			*5%*	*4*	*8*	*12*	*5%*	*11*	*9*	*20*
Total Trips				**78**	**147**	**225**		**216**	**161**	**377**

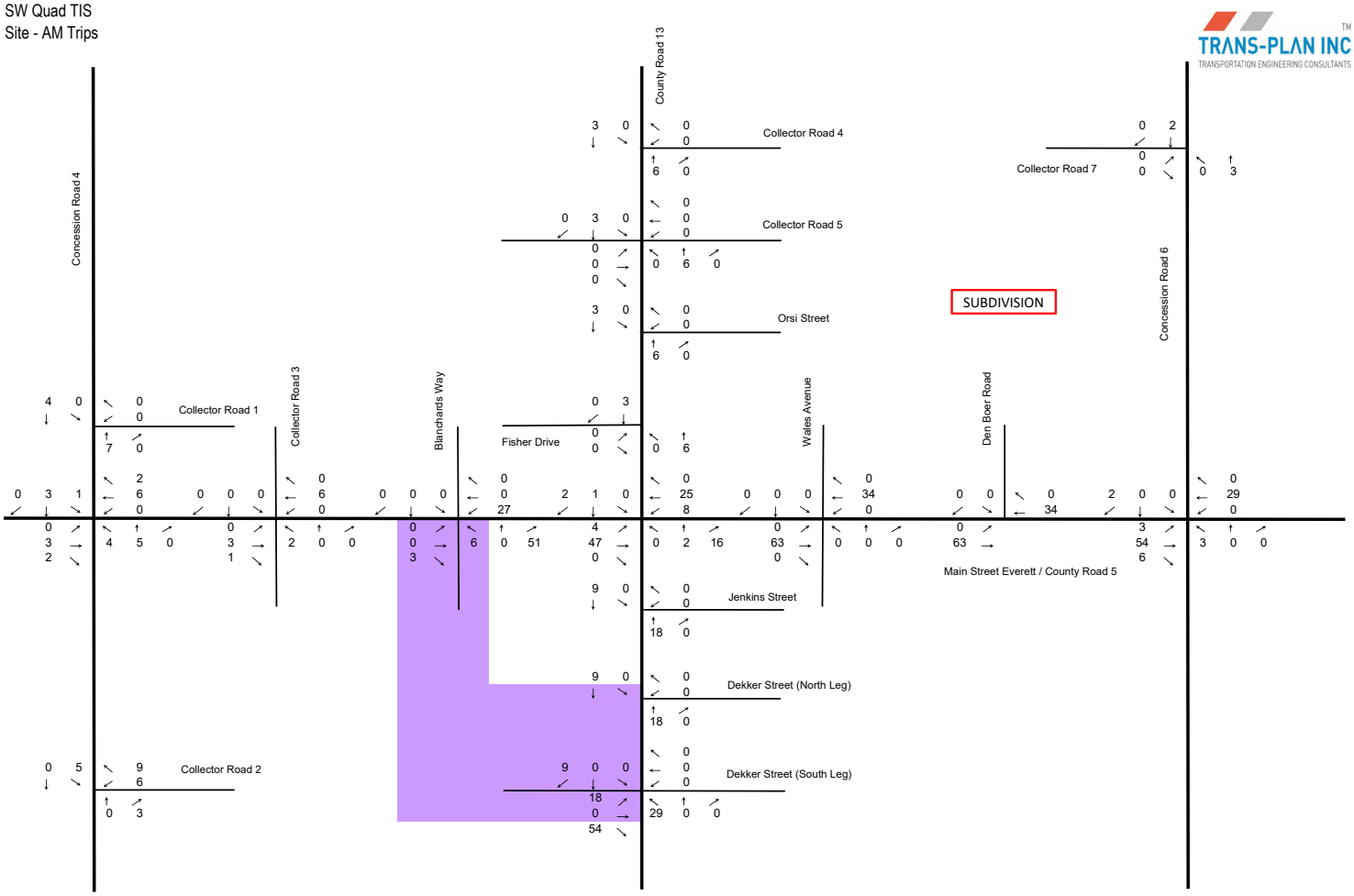
Barzo Development TIS
Site - AM Trips

Barzo Development TIS
Site - PM Trips

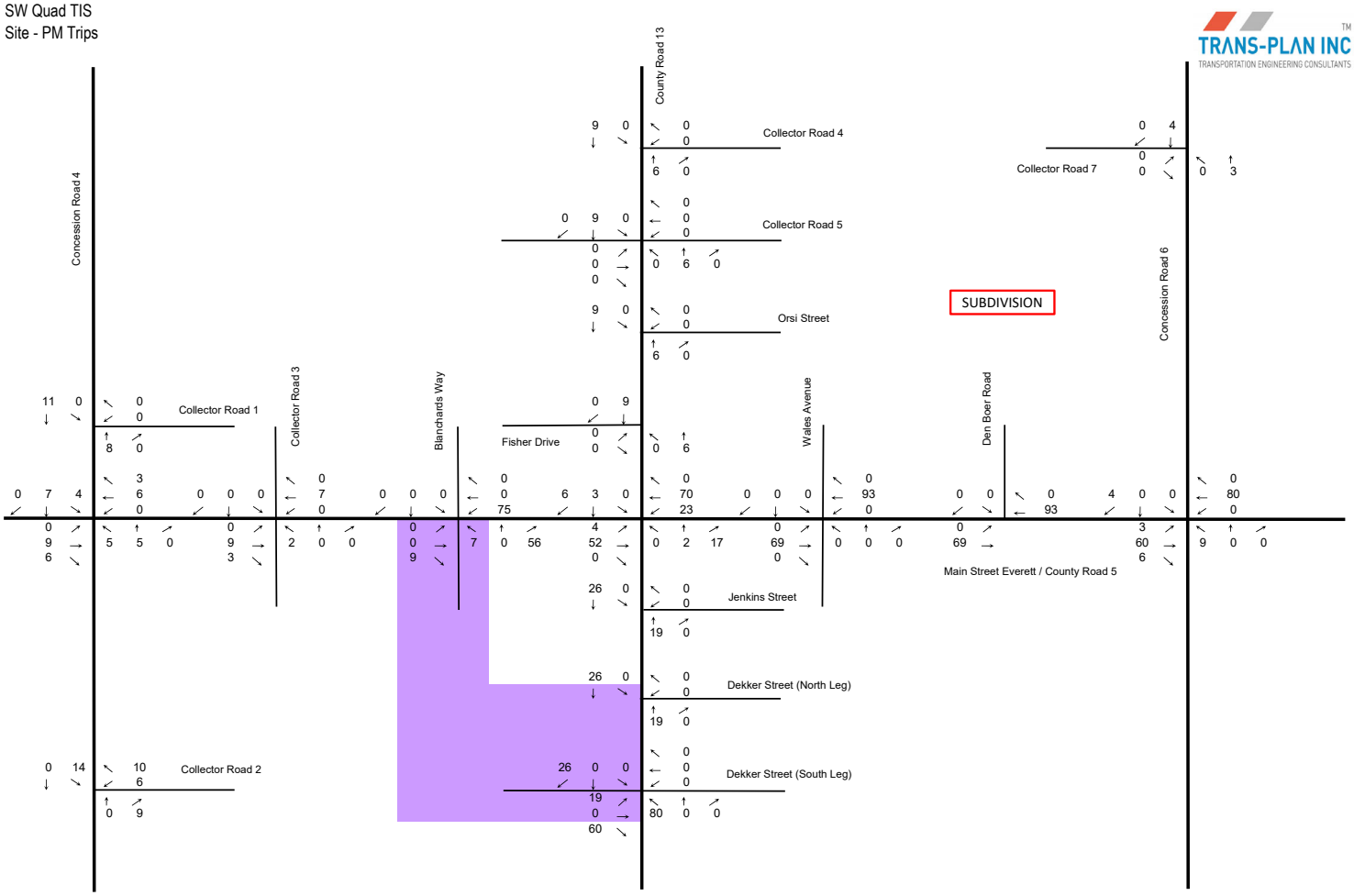
R&M Homes Development TIS
Site - AM Trips

R&M Homes Development TIS
Site - PM Trips

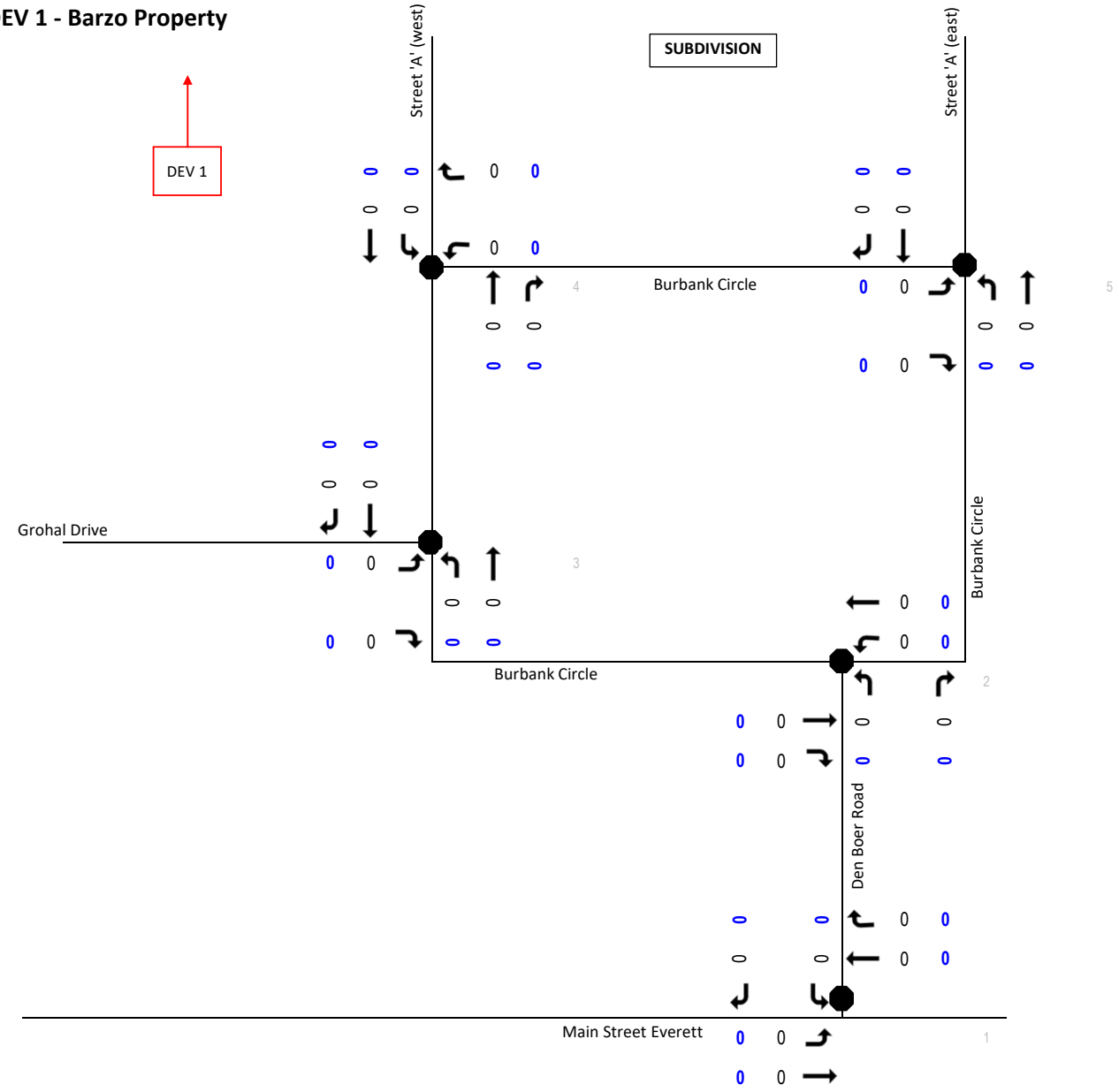
SW Quad TIS
Site - AM Trips



SW Quad TIS
Site - PM Trips



DEV 1 - Barzo Property

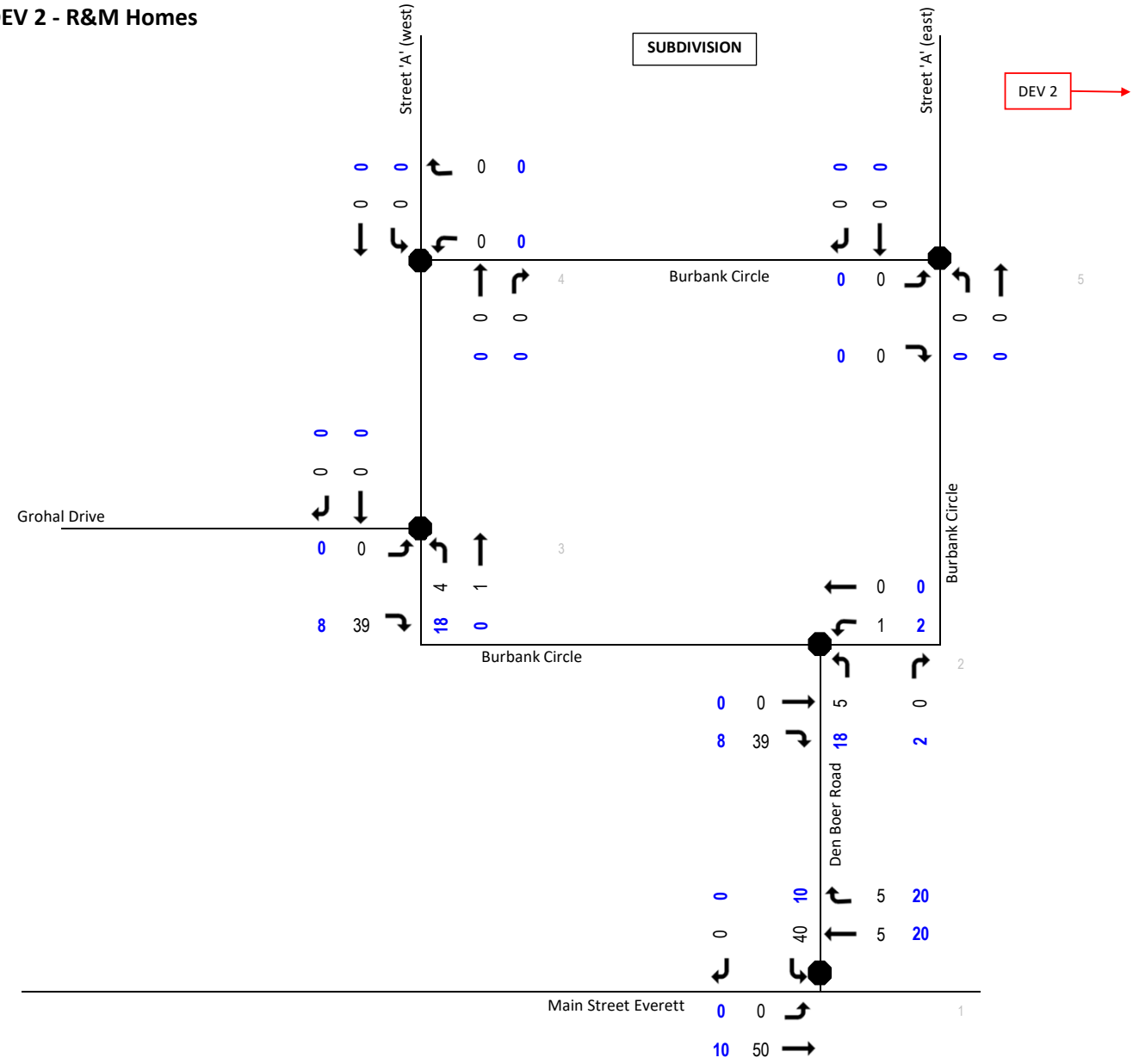


LEGEND

- Stop Sign
- Lane Configuration
- xx **xx** AM / **PM** Peak Hour

Schematic; Not To Scale

DEV 2 - R&M Homes

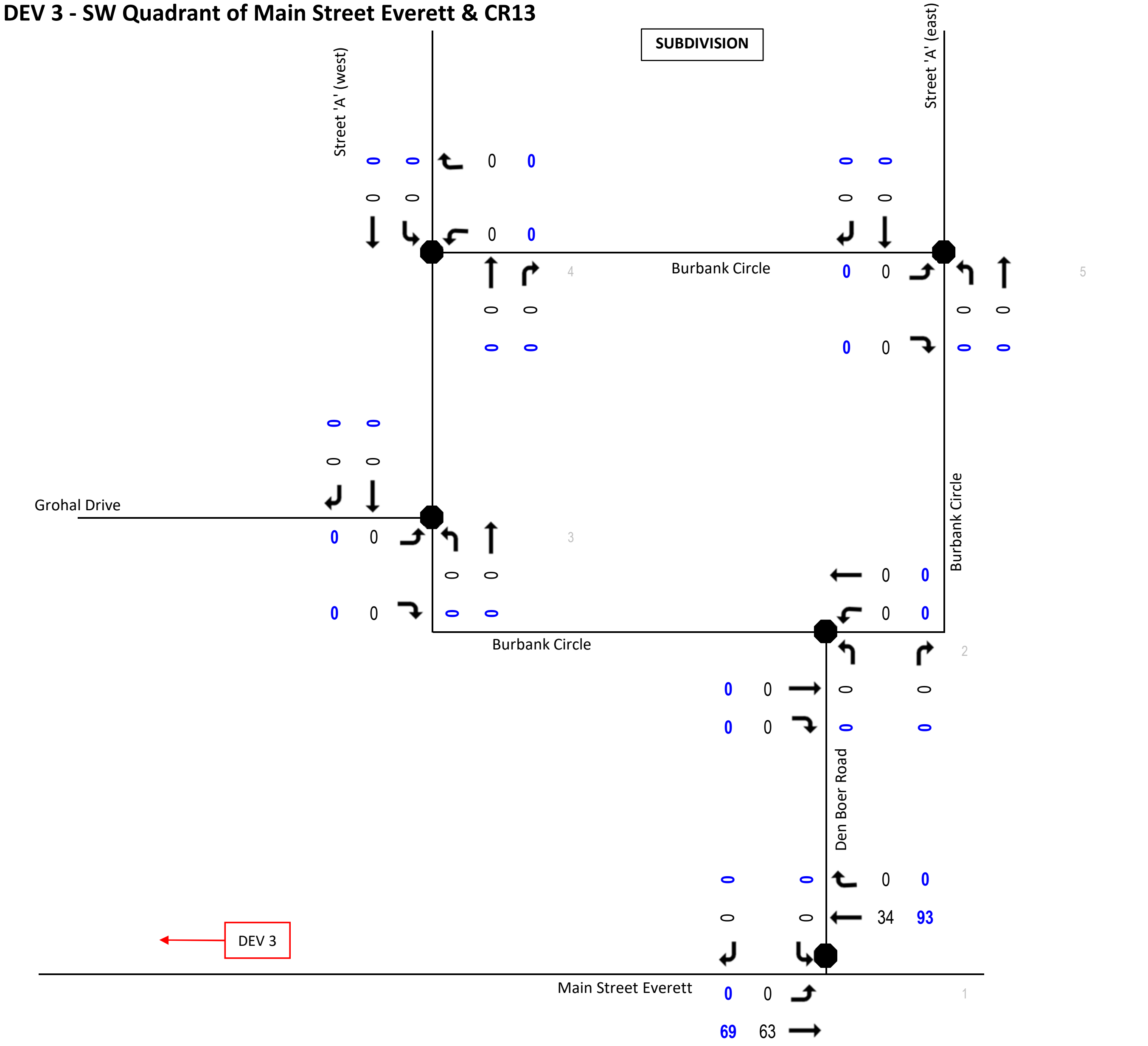


LEGEND

- Stop Sign
- Lane Configuration
- xx **xx** AM / **PM** Peak Hour

Schematic; Not To Scale

DEV 3 - SW Quadrant of Main Street Everett & CR13



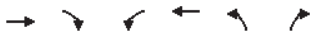
LEGEND

⬣	Stop Sign
←	Lane Configuration
xx **xx**	AM / **PM** Peak Hour

Schematic; Not To Scale

APPENDIX C

Capacity Analysis Sheets



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	1	19	14	0	5	6
Future Volume (vph)	1	19	14	0	5	6
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	1	24	18	0	6	8

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	25	18	14
Volume Left (vph)	0	18	6
Volume Right (vph)	24	0	8
Hadj (s)	-0.58	0.20	-0.26
Departure Headway (s)	3.4	4.1	3.7
Degree Utilization, x	0.02	0.02	0.01
Capacity (veh/h)	1055	859	952
Control Delay (s)	6.5	7.2	6.8
Approach Delay (s)	6.5	7.2	6.8
Approach LOS	A	A	A

Intersection Summary				
Delay		6.8		
Level of Service		A		
Intersection Capacity Utilization	17.4%		ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	131	65	9	24	9
Future Volume (Veh/h)	2	131	65	9	24	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	3	168	83	12	31	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	95				263	89
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	95				263	89
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				96	99
cM capacity (veh/h)	1512				729	975

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	171	95	43
Volume Left	3	0	31
Volume Right	0	12	12
cSH	1512	1700	784
Volume to Capacity	0.00	0.06	0.05
Queue Length 95th (m)	0.0	0.0	1.4
Control Delay (s)	0.1	0.0	9.9
Lane LOS	A		A
Approach Delay (s)	0.1	0.0	9.9
Approach LOS			A

Intersection Summary				
Average Delay		1.5		
Intersection Capacity Utilization	18.5%		ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	118	204	39	13	4
Future Volume (Veh/h)	2	118	204	39	13	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	2	139	240	46	15	5
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	286				406	263
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	286				406	263
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				98	99
cM capacity (veh/h)	1288				604	781

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	141	286	20
Volume Left	2	0	15
Volume Right	0	46	5
cSH	1288	1700	640
Volume to Capacity	0.00	0.17	0.03
Queue Length 95th (m)	0.0	0.0	0.8
Control Delay (s)	0.1	0.0	10.8
Lane LOS	A		B
Approach Delay (s)	0.1	0.0	10.8
Approach LOS			B

Intersection Summary				
Average Delay		0.5		
Intersection Capacity Utilization		23.1%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	0	12	2	3	8	1
Future Volume (vph)	0	12	2	3	8	1
Peak Hour Factor	0.54	0.54	0.54	0.54	0.54	0.54
Hourly flow rate (vph)	0	22	4	6	15	2

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	22	10	17
Volume Left (vph)	0	4	0
Volume Right (vph)	22	0	2
Hadj (s)	-0.60	0.08	-0.07
Departure Headway (s)	3.4	4.0	3.9
Degree Utilization, x	0.02	0.01	0.02
Capacity (veh/h)	1056	873	917
Control Delay (s)	6.4	7.1	7.0
Approach Delay (s)	6.4	7.1	7.0
Approach LOS	A	A	A

Intersection Summary				
Delay		6.7		
Level of Service		A		
Intersection Capacity Utilization		13.3%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	3	11	23	3	1	5
Future Volume (vph)	3	11	23	3	1	5
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	3	12	25	3	1	5

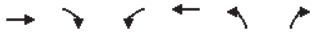
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	15	28	6
Volume Left (vph)	3	25	0
Volume Right (vph)	12	0	5
Hadj (s)	-0.44	0.18	-0.50
Departure Headway (s)	3.5	4.1	3.5
Degree Utilization, x	0.01	0.03	0.01
Capacity (veh/h)	1002	859	1030
Control Delay (s)	6.6	7.2	6.5
Approach Delay (s)	6.6	7.2	6.5
Approach LOS	A	A	A

Intersection Summary				
Delay		7.0		
Level of Service		A		
Intersection Capacity Utilization	18.1%		ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	1	9	5	2	27	13
Future Volume (vph)	1	9	5	2	27	13
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	1	10	5	2	30	14

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	11	7	44
Volume Left (vph)	0	5	30
Volume Right (vph)	10	0	14
Hadj (s)	-0.55	0.14	-0.05
Departure Headway (s)	3.5	4.1	3.9
Degree Utilization, x	0.01	0.01	0.05
Capacity (veh/h)	1021	854	910
Control Delay (s)	6.5	7.2	7.1
Approach Delay (s)	6.5	7.2	7.1
Approach LOS	A	A	A

Intersection Summary				
Delay		7.0		
Level of Service		A		
Intersection Capacity Utilization	14.5%		ICU Level of Service	A
Analysis Period (min)		15		



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	1	60	16	0	11	7
Future Volume (vph)	1	60	16	0	11	7
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	1	75	20	0	14	9

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	76	20	23
Volume Left (vph)	0	20	14
Volume Right (vph)	75	0	9
Hadj (s)	-0.59	0.20	-0.11
Departure Headway (s)	3.4	4.2	4.0
Degree Utilization, x	0.07	0.02	0.03
Capacity (veh/h)	1050	843	875
Control Delay (s)	6.6	7.3	7.1
Approach Delay (s)	6.6	7.3	7.1
Approach LOS	A	A	A

Intersection Summary				
Delay		6.8		
Level of Service		A		
Intersection Capacity Utilization		17.6%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	258	111	15	66	10
Future Volume (Veh/h)	2	258	111	15	66	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	3	331	142	19	85	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	161				488	152
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	161				488	152
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				84	99
cM capacity (veh/h)	1430				541	900

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	334	161	98
Volume Left	3	0	85
Volume Right	0	19	13
cSH	1430	1700	571
Volume to Capacity	0.00	0.09	0.17
Queue Length 95th (m)	0.1	0.0	4.9
Control Delay (s)	0.1	0.0	12.6
Lane LOS	A		B
Approach Delay (s)	0.1	0.0	12.6
Approach LOS			B

Intersection Summary				
Average Delay		2.1		
Intersection Capacity Utilization		26.1%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	209	338	63	24	4
Future Volume (Veh/h)	2	209	338	63	24	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	2	246	398	74	28	5
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	472				685	435
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	472				685	435
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				93	99
cM capacity (veh/h)	1100				416	625

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	248	472	33
Volume Left	2	0	28
Volume Right	0	74	5
cSH	1100	1700	438
Volume to Capacity	0.00	0.28	0.08
Queue Length 95th (m)	0.0	0.0	1.9
Control Delay (s)	0.1	0.0	13.9
Lane LOS	A		B
Approach Delay (s)	0.1	0.0	13.9
Approach LOS			B

Intersection Summary				
Average Delay		0.6		
Intersection Capacity Utilization		31.6%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	0	52	6	4	9	1
Future Volume (vph)	0	52	6	4	9	1
Peak Hour Factor	0.54	0.54	0.54	0.54	0.54	0.54
Hourly flow rate (vph)	0	96	11	7	17	2

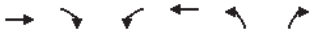
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	96	18	19
Volume Left (vph)	0	11	0
Volume Right (vph)	96	0	2
Hadj (s)	-0.60	0.12	-0.06
Departure Headway (s)	3.4	4.2	4.0
Degree Utilization, x	0.09	0.02	0.02
Capacity (veh/h)	1047	824	867
Control Delay (s)	6.7	7.3	7.1
Approach Delay (s)	6.7	7.3	7.1
Approach LOS	A	A	A

Intersection Summary				
Delay		6.9		
Level of Service		A		
Intersection Capacity Utilization		15.5%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	3	20	48	3	1	6
Future Volume (vph)	3	20	48	3	1	6
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	3	22	53	3	1	7

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	25	56	8
Volume Left (vph)	3	53	0
Volume Right (vph)	22	0	7
Hadj (s)	-0.50	0.19	-0.53
Departure Headway (s)	3.5	4.1	3.5
Degree Utilization, x	0.02	0.06	0.01
Capacity (veh/h)	994	851	1019
Control Delay (s)	6.6	7.4	6.5
Approach Delay (s)	6.6	7.4	6.5
Approach LOS	A	A	A

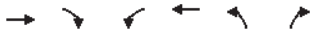
Intersection Summary				
Delay		7.1		
Level of Service		A		
Intersection Capacity Utilization	19.5%		ICU Level of Service	A
Analysis Period (min)		15		



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	1	20	9	2	49	16
Future Volume (vph)	1	20	9	2	49	16
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	1	22	10	2	54	18

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	23	12	72
Volume Left (vph)	0	10	54
Volume Right (vph)	22	0	18
Hadj (s)	-0.57	0.17	0.00
Departure Headway (s)	3.5	4.2	4.0
Degree Utilization, x	0.02	0.01	0.08
Capacity (veh/h)	1003	829	887
Control Delay (s)	6.6	7.3	7.3
Approach Delay (s)	6.6	7.3	7.3
Approach LOS	A	A	A

Intersection Summary				
Delay		7.2		
Level of Service		A		
Intersection Capacity Utilization	17.6%		ICU Level of Service	A
Analysis Period (min)		15		



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	1	71	30	0	13	14
Future Volume (vph)	1	71	30	0	13	14
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	1	89	38	0	16	18

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	90	38	34
Volume Left (vph)	0	38	16
Volume Right (vph)	89	0	18
Hadj (s)	-0.59	0.20	-0.22
Departure Headway (s)	3.4	4.2	3.9
Degree Utilization, x	0.09	0.04	0.04
Capacity (veh/h)	1035	834	880
Control Delay (s)	6.7	7.4	7.1
Approach Delay (s)	6.7	7.4	7.1
Approach LOS	A	A	A

Intersection Summary			
Delay		7.0	
Level of Service		A	
Intersection Capacity Utilization		18.3%	ICU Level of Service A
Analysis Period (min)		15	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	258	111	22	86	15
Future Volume (Veh/h)	4	258	111	22	86	15
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	5	331	142	28	110	19
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	170				497	156
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	170				497	156
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				79	98
cM capacity (veh/h)	1420				534	895

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	336	170	129
Volume Left	5	0	110
Volume Right	0	28	19
cSH	1420	1700	568
Volume to Capacity	0.00	0.10	0.23
Queue Length 95th (m)	0.1	0.0	6.9
Control Delay (s)	0.1	0.0	13.2
Lane LOS	A		B
Approach Delay (s)	0.1	0.0	13.2
Approach LOS			B

Intersection Summary			
Average Delay		2.8	
Intersection Capacity Utilization		29.1%	ICU Level of Service A
Analysis Period (min)		15	

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	13	0	2	3	1	11
Future Volume (vph)	13	0	2	3	1	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	0	2	3	1	12

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	14	5	13
Volume Left (vph)	14	0	1
Volume Right (vph)	0	3	0
Hadj (s)	0.23	-0.33	0.05
Departure Headway (s)	4.2	3.6	4.0
Degree Utilization, x	0.02	0.01	0.01
Capacity (veh/h)	853	987	895
Control Delay (s)	7.2	6.6	7.0
Approach Delay (s)	7.2	6.6	7.0
Approach LOS	A	A	A

Intersection Summary				
Delay	7.1			
Level of Service	A			
Intersection Capacity Utilization	13.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	0	52	6	6	20	4
Future Volume (vph)	0	52	6	6	20	4
Peak Hour Factor	0.54	0.54	0.54	0.54	0.54	0.54
Hourly flow rate (vph)	0	96	11	11	37	7

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	96	22	44
Volume Left (vph)	0	11	0
Volume Right (vph)	96	0	7
Hadj (s)	-0.60	0.10	-0.10
Departure Headway (s)	3.4	4.2	4.0
Degree Utilization, x	0.09	0.03	0.05
Capacity (veh/h)	1021	822	873
Control Delay (s)	6.8	7.3	7.2
Approach Delay (s)	6.8	7.3	7.2
Approach LOS	A	A	A

Intersection Summary				
Delay	7.0			
Level of Service	A			
Intersection Capacity Utilization	15.7%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
1: Main Street Everett & Den Boer Road

<2026 Total> Weekday PM
08-09-2021

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	209	338	90	31	7
Future Volume (Veh/h)	5	209	338	90	31	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	6	246	398	106	36	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	504				709	451
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	504				709	451
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				91	99
cM capacity (veh/h)	1071				401	613

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	252	504	44
Volume Left	6	0	36
Volume Right	0	106	8
cSH	1071	1700	428
Volume to Capacity	0.01	0.30	0.10
Queue Length 95th (m)	0.1	0.0	2.7
Control Delay (s)	0.3	0.0	14.4
Lane LOS	A		B
Approach Delay (s)	0.3	0.0	14.4
Approach LOS			B

Intersection Summary				
Average Delay		0.9		
Intersection Capacity Utilization		33.3%	ICU Level of Service	A
Analysis Period (min)		15		

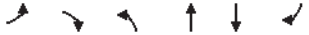
HCM Unsignalized Intersection Capacity Analysis
5: Burbank Circle & 'Street A' (east)

<2026 Total> Weekday AM
08-09-2021

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	0	16	8	7	13	3
Future Volume (vph)	0	16	8	7	13	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	17	9	8	14	3

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	17	17	17
Volume Left (vph)	0	9	0
Volume Right (vph)	17	0	3
Hadj (s)	-0.57	0.14	-0.07
Departure Headway (s)	3.4	4.1	3.9
Degree Utilization, x	0.02	0.02	0.02
Capacity (veh/h)	1039	864	919
Control Delay (s)	6.5	7.2	6.9
Approach Delay (s)	6.5	7.2	6.9
Approach LOS	A	A	A

Intersection Summary				
Delay		6.9		
Level of Service		A		
Intersection Capacity Utilization		17.5%	ICU Level of Service	A
Analysis Period (min)		15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	3	20	48	21	3	13
Future Volume (vph)	3	20	48	21	3	13
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	3	22	53	23	3	14

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	25	76	17
Volume Left (vph)	3	53	0
Volume Right (vph)	22	0	14
Hadj (s)	-0.50	0.14	-0.49
Departure Headway (s)	3.6	4.1	3.5
Degree Utilization, x	0.02	0.09	0.02
Capacity (veh/h)	971	860	1004
Control Delay (s)	6.7	7.5	6.6
Approach Delay (s)	6.7	7.5	6.6
Approach LOS	A	A	A

Intersection Summary				
Delay		7.2		
Level of Service		A		
Intersection Capacity Utilization		20.4%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	1	22	17	2	67	28
Future Volume (vph)	1	22	17	2	67	28
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	1	24	19	2	74	31

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	25	21	105
Volume Left (vph)	0	19	74
Volume Right (vph)	24	0	31
Hadj (s)	-0.58	0.18	-0.04
Departure Headway (s)	3.6	4.3	4.0
Degree Utilization, x	0.02	0.03	0.12
Capacity (veh/h)	973	807	889
Control Delay (s)	6.7	7.4	7.5
Approach Delay (s)	6.7	7.4	7.5
Approach LOS	A	A	A

Intersection Summary				
Delay		7.3		
Level of Service		A		
Intersection Capacity Utilization		19.8%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	0	10	15	12	7	2
Future Volume (vph)	0	10	15	12	7	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	11	16	13	8	2

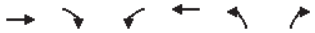
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	11	29	10
Volume Left (vph)	0	16	0
Volume Right (vph)	11	0	2
Hadj (s)	-0.57	0.14	-0.09
Departure Headway (s)	3.4	4.1	3.9
Degree Utilization, x	0.01	0.03	0.01
Capacity (veh/h)	1034	868	923
Control Delay (s)	6.5	7.2	6.9
Approach Delay (s)	6.5	7.2	6.9
Approach LOS	A	A	A

Intersection Summary				
Delay		7.0		
Level of Service		A		
Intersection Capacity Utilization	18.1%	ICU Level of Service	A	
Analysis Period (min)		15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	9	0	18	6	1	7
Future Volume (vph)	9	0	18	6	1	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	0	20	7	1	8

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	10	27	9
Volume Left (vph)	10	0	1
Volume Right (vph)	0	7	0
Hadj (s)	0.23	-0.12	0.06
Departure Headway (s)	4.2	3.8	4.0
Degree Utilization, x	0.01	0.03	0.01
Capacity (veh/h)	842	939	891
Control Delay (s)	7.3	6.9	7.0
Approach Delay (s)	7.3	6.9	7.0
Approach LOS	A	A	A

Intersection Summary				
Delay		7.0		
Level of Service		A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A	
Analysis Period (min)		15		



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	1	62	18	0	11	7
Future Volume (vph)	1	62	18	0	11	7
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	1	78	23	0	14	9

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	79	23	23
Volume Left (vph)	0	23	14
Volume Right (vph)	78	0	9
Hadj (s)	-0.59	0.20	-0.11
Departure Headway (s)	3.4	4.2	4.0
Degree Utilization, x	0.07	0.03	0.03
Capacity (veh/h)	1050	843	872
Control Delay (s)	6.6	7.3	7.1
Approach Delay (s)	6.6	7.3	7.1
Approach LOS	A	A	A

Intersection Summary				
Delay			6.9	
Level of Service			A	
Intersection Capacity Utilization			17.7%	ICU Level of Service A
Analysis Period (min)			15	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	273	118	16	69	11
Future Volume (Veh/h)	2	273	118	16	69	11
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	3	350	151	21	88	14
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	172				518	162
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	172				518	162
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				83	98
cM capacity (veh/h)	1417				521	889

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	353	172	102
Volume Left	3	0	88
Volume Right	0	21	14
cSH	1417	1700	552
Volume to Capacity	0.00	0.10	0.18
Queue Length 95th (m)	0.1	0.0	5.4
Control Delay (s)	0.1	0.0	13.0
Lane LOS	A		B
Approach Delay (s)	0.1	0.0	13.0
Approach LOS			B

Intersection Summary				
Average Delay			2.2	
Intersection Capacity Utilization			27.1%	ICU Level of Service A
Analysis Period (min)			15	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	223	362	68	26	5
Future Volume (Veh/h)	2	223	362	68	26	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	2	262	426	80	31	6
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	506				732	466
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	506				732	466
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				92	99
cM capacity (veh/h)	1069				391	601

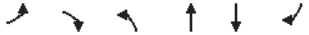
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	264	506	37
Volume Left	2	0	31
Volume Right	0	80	6
cSH	1069	1700	414
Volume to Capacity	0.00	0.30	0.09
Queue Length 95th (m)	0.0	0.0	2.3
Control Delay (s)	0.1	0.0	14.5
Lane LOS	A		B
Approach Delay (s)	0.1	0.0	14.5
Approach LOS			B

Intersection Summary				
Average Delay		0.7		
Intersection Capacity Utilization		33.2%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	0	54	6	5	10	1
Future Volume (vph)	0	54	6	5	10	1
Peak Hour Factor	0.54	0.54	0.54	0.54	0.54	0.54
Hourly flow rate (vph)	0	100	11	9	19	2

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	100	20	21
Volume Left (vph)	0	11	0
Volume Right (vph)	100	0	2
Hadj (s)	-0.60	0.11	-0.06
Departure Headway (s)	3.4	4.2	4.0
Degree Utilization, x	0.09	0.02	0.02
Capacity (veh/h)	1043	823	863
Control Delay (s)	6.7	7.3	7.1
Approach Delay (s)	6.7	7.3	7.1
Approach LOS	A	A	A

Intersection Summary				
Delay		6.9		
Level of Service		A		
Intersection Capacity Utilization		15.6%	ICU Level of Service	A
Analysis Period (min)		15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	4	21	51	4	1	6
Future Volume (vph)	4	21	51	4	1	6
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	4	23	56	4	1	7

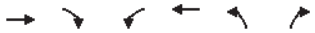
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	27	60	8
Volume Left (vph)	4	56	0
Volume Right (vph)	23	0	7
Hadj (s)	-0.48	0.19	-0.53
Departure Headway (s)	3.6	4.1	3.5
Degree Utilization, x	0.03	0.07	0.01
Capacity (veh/h)	985	851	1016
Control Delay (s)	6.7	7.5	6.5
Approach Delay (s)	6.7	7.5	6.5
Approach LOS	A	A	A

Intersection Summary				
Delay		7.1		
Level of Service		A		
Intersection Capacity Utilization		19.7%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	1	21	9	2	52	18
Future Volume (vph)	1	21	9	2	52	18
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	1	23	10	2	57	20

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	24	12	77
Volume Left (vph)	0	10	57
Volume Right (vph)	23	0	20
Hadj (s)	-0.57	0.17	-0.01
Departure Headway (s)	3.5	4.3	4.0
Degree Utilization, x	0.02	0.01	0.08
Capacity (veh/h)	999	826	889
Control Delay (s)	6.6	7.3	7.3
Approach Delay (s)	6.6	7.3	7.3
Approach LOS	A	A	A

Intersection Summary				
Delay		7.2		
Level of Service		A		
Intersection Capacity Utilization		17.9%	ICU Level of Service	A
Analysis Period (min)		15		



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	1	73	32	0	13	14
Future Volume (vph)	1	73	32	0	13	14
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	1	91	40	0	16	18

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	92	40	34
Volume Left (vph)	0	40	16
Volume Right (vph)	91	0	18
Hadj (s)	-0.59	0.20	-0.22
Departure Headway (s)	3.4	4.2	3.9
Degree Utilization, x	0.09	0.05	0.04
Capacity (veh/h)	1034	834	877
Control Delay (s)	6.7	7.5	7.1
Approach Delay (s)	6.7	7.5	7.1
Approach LOS	A	A	A

Intersection Summary			
Delay		7.0	
Level of Service		A	
Intersection Capacity Utilization		18.4%	ICU Level of Service A
Analysis Period (min)		15	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	273	118	23	89	16
Future Volume (Veh/h)	4	273	118	23	89	16
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	5	350	151	29	114	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	180				526	166
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	180				526	166
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				78	98
cM capacity (veh/h)	1408				514	884

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	355	180	135
Volume Left	5	0	114
Volume Right	0	29	21
cSH	1408	1700	550
Volume to Capacity	0.00	0.11	0.25
Queue Length 95th (m)	0.1	0.0	7.7
Control Delay (s)	0.1	0.0	13.7
Lane LOS	A		B
Approach Delay (s)	0.1	0.0	13.7
Approach LOS			B

Intersection Summary			
Average Delay		2.8	
Intersection Capacity Utilization		30.1%	ICU Level of Service A
Analysis Period (min)		15	

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	14	0	2	4	1	11
Future Volume (vph)	14	0	2	4	1	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	0	2	4	1	12

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	15	6	13
Volume Left (vph)	15	0	1
Volume Right (vph)	0	4	0
Hadj (s)	0.23	-0.37	0.05
Departure Headway (s)	4.2	3.6	4.0
Degree Utilization, x	0.02	0.01	0.01
Capacity (veh/h)	853	997	894
Control Delay (s)	7.2	6.6	7.0
Approach Delay (s)	7.2	6.6	7.0
Approach LOS	A	A	A

Intersection Summary				
Delay		7.1		
Level of Service		A		
Intersection Capacity Utilization	13.3%		ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	0	54	6	7	21	4
Future Volume (vph)	0	54	6	7	21	4
Peak Hour Factor	0.54	0.54	0.54	0.54	0.54	0.54
Hourly flow rate (vph)	0	100	11	13	39	7

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	100	24	46
Volume Left (vph)	0	11	0
Volume Right (vph)	100	0	7
Hadj (s)	-0.60	0.09	-0.09
Departure Headway (s)	3.5	4.2	4.0
Degree Utilization, x	0.10	0.03	0.05
Capacity (veh/h)	1018	821	869
Control Delay (s)	6.8	7.3	7.2
Approach Delay (s)	6.8	7.3	7.2
Approach LOS	A	A	A

Intersection Summary				
Delay		7.0		
Level of Service		A		
Intersection Capacity Utilization	15.7%		ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	223	362	95	33	8
Future Volume (Veh/h)	5	223	362	95	33	8
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	6	262	426	112	39	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	538				756	482
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	538				756	482
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				90	98
cM capacity (veh/h)	1040				377	588

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	268	538	48
Volume Left	6	0	39
Volume Right	0	112	9
cSH	1040	1700	404
Volume to Capacity	0.01	0.32	0.12
Queue Length 95th (m)	0.1	0.0	3.2
Control Delay (s)	0.2	0.0	15.1
Lane LOS	A		C
Approach Delay (s)	0.2	0.0	15.1
Approach LOS			C

Intersection Summary				
Average Delay		0.9		
Intersection Capacity Utilization		34.8%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	0	18	8	7	13	3
Future Volume (vph)	0	18	8	7	13	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	20	9	8	14	3

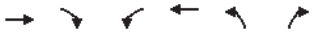
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	20	17	17
Volume Left (vph)	0	9	0
Volume Right (vph)	20	0	3
Hadj (s)	-0.57	0.14	-0.07
Departure Headway (s)	3.4	4.1	3.9
Degree Utilization, x	0.02	0.02	0.02
Capacity (veh/h)	1039	862	917
Control Delay (s)	6.5	7.2	7.0
Approach Delay (s)	6.5	7.2	7.0
Approach LOS	A	A	A

Intersection Summary				
Delay		6.8		
Level of Service		A		
Intersection Capacity Utilization		17.5%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	4	21	51	22	3	13
Future Volume (vph)	4	21	51	22	3	13
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	4	23	56	24	3	14

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	27	80	17
Volume Left (vph)	4	56	0
Volume Right (vph)	23	0	14
Hadj (s)	-0.48	0.14	-0.49
Departure Headway (s)	3.6	4.1	3.5
Degree Utilization, x	0.03	0.09	0.02
Capacity (veh/h)	962	859	1001
Control Delay (s)	6.7	7.5	6.6
Approach Delay (s)	6.7	7.5	6.6
Approach LOS	A	A	A

Intersection Summary				
Delay		7.2		
Level of Service		A		
Intersection Capacity Utilization	20.6%		ICU Level of Service	A
Analysis Period (min)		15		



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	1	23	17	2	70	30
Future Volume (vph)	1	23	17	2	70	30
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	1	25	19	2	77	33

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	26	21	110
Volume Left (vph)	0	19	77
Volume Right (vph)	25	0	33
Hadj (s)	-0.58	0.18	-0.04
Departure Headway (s)	3.6	4.3	4.0
Degree Utilization, x	0.03	0.03	0.12
Capacity (veh/h)	969	804	889
Control Delay (s)	6.7	7.5	7.5
Approach Delay (s)	6.7	7.5	7.5
Approach LOS	A	A	A

Intersection Summary				
Delay		7.4		
Level of Service		A		
Intersection Capacity Utilization	20.1%		ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	0	10	17	12	7	2
Future Volume (vph)	0	10	17	12	7	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	11	18	13	8	2

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	11	31	10
Volume Left (vph)	0	18	0
Volume Right (vph)	11	0	2
Hadj (s)	-0.57	0.15	-0.09
Departure Headway (s)	3.4	4.1	3.9
Degree Utilization, x	0.01	0.04	0.01
Capacity (veh/h)	1032	867	922
Control Delay (s)	6.5	7.2	6.9
Approach Delay (s)	6.5	7.2	6.9
Approach LOS	A	A	A

Intersection Summary				
Delay		7.0		
Level of Service		A		
Intersection Capacity Utilization	18.2%	ICU Level of Service	A	
Analysis Period (min)		15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	9	0	18	8	1	7
Future Volume (vph)	9	0	18	8	1	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	0	20	9	1	8

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	10	29	9
Volume Left (vph)	10	0	1
Volume Right (vph)	0	9	0
Hadj (s)	0.23	-0.15	0.06
Departure Headway (s)	4.2	3.8	4.0
Degree Utilization, x	0.01	0.03	0.01
Capacity (veh/h)	841	946	890
Control Delay (s)	7.3	6.9	7.0
Approach Delay (s)	7.3	6.9	7.0
Approach LOS	A	A	A

Intersection Summary				
Delay		7.0		
Level of Service		A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A	
Analysis Period (min)		15		

APPENDIX D

Level of Service Definitions

LEVEL OF SERVICE ANALYSIS AT UNSIGNALIZED INTERSECTIONS[1]

The term "level of service" implies a qualitative measure of traffic flow at an intersection. It is dependent upon the vehicle delay and vehicle queue lengths at approaches. The level of service at unsignalized intersections is often related to the delay accumulated by flows on the minor streets, caused by all other conflicting movements. The following table describes the characteristics of each level.

Level of Service	Features
A	Little or no traffic delay occurs. Approaches appear open, turning movements are easily made, and drivers have freedom of operation.
B	Short traffic delays occur. Many drivers begin to feel somewhat restricted in terms of freedom of operation.
C	Average traffic delays occur. Operations are generally stable, but drivers emerging from the minor street may experience difficulty in completing their movement. This may occasionally impact on the stability of flow on the major street.
D	Long traffic delays occur. Motorists emerging from the minor street experience significant restriction and frustration. Drivers on the major street will experience congestion and delay as drivers emerging from the minor street interfere with the major through movements.
E	Very long traffic delays occur. Operations approach the capacity of the intersection.
F	Saturation occurs, with vehicle demand exceeding the available capacity. Very long traffic delays occur.

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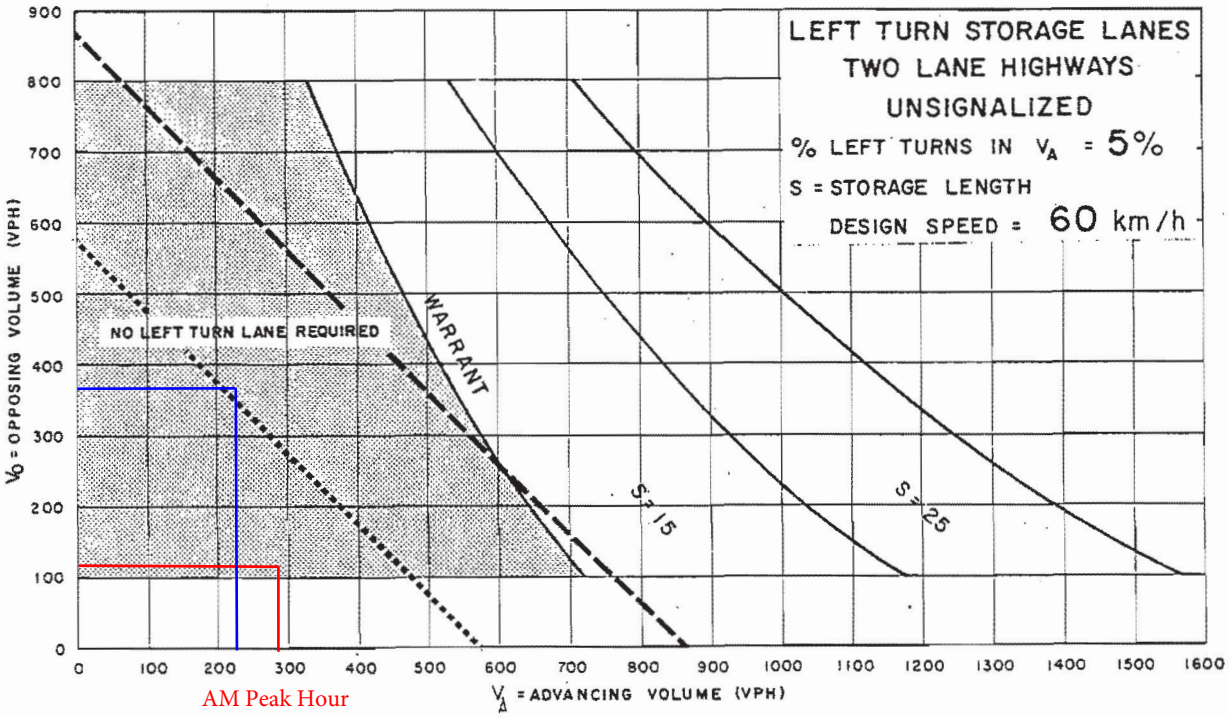
(1) Highway Capacity Manual - Special Report No. 209, Transportation Research Board, 1985.

APPENDIX E

MTO Geometric Design Guidelines, Excerpts



AM Peak Hour
PM Peak Hour

TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW

TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

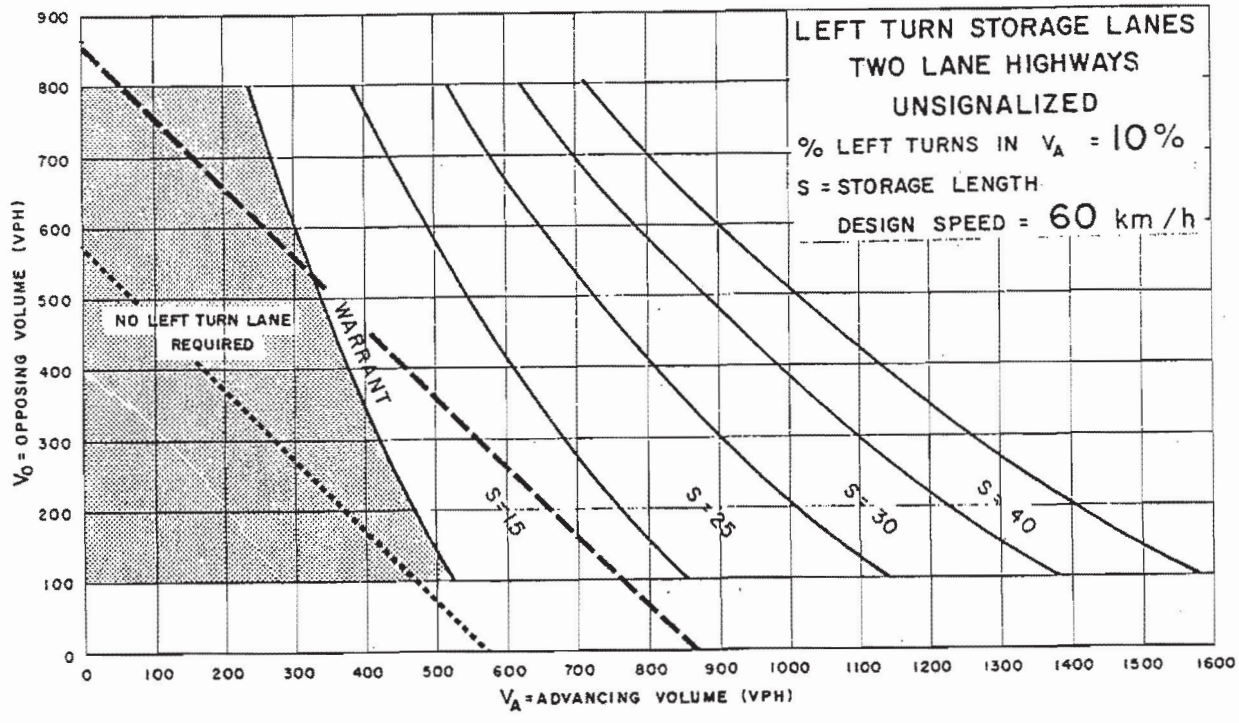


Figure EA-6

E.8 RIGHT TURN LANES AT CHANNELIZED INTERSECTIONS

Right turn lanes forming channelized intersections may be constructed when the following criteria apply:

- right turning traffic volumes for the design hour is 60 vehicles per hour or more,
- property is readily available,and
- the terminal points of the deceleration/ acceleration lanes do not conflict with any adjacent commercial development.

In congested urban areas, the right turn directional island is considered to be of little value since the vehicles on the ramp have difficulty merging with the traffic on the intersecting road when that traffic is moving on its green signal phase.

Conflicts can occur between vehicles and pedestrians at these high volume locations, leading to the conclusion that right turn directional islands should not be constructed at such locations. However, in those areas where there may be some pedestrian traffic, the right turn channelization island has a definite bearing on the need for, and operation of, traffic signals.

E.8.1 DECELERATION TAPER

A deceleration taper is provided in advance of a separate turn lane or ramp at channelized intersection permitting a gradual change in speed from that of the highway to that of the channelized ramp alignment, see Figure E8-1.

The taper form is used where the required deceleration length is equal to or less than 180 m, see Table E8-1. When the deceleration length exceeds 180 m, a parallel lane with taper design is used.

The length of deceleration taper is measured to the bullnose and varies directly with the speed on the highway and inversely to the speed of the ramp. The adjustment for the grade must be applied as outlined in Section E.8.5.

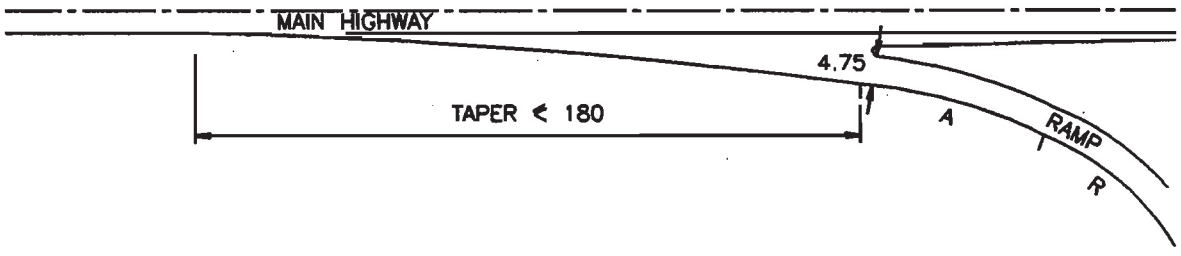


Figure E8-1

Deceleration Taper at Channelized Intersections