

Transportation & Traffic Analysis Final Report

Regional Road 45 (Creek Road) Municipal Class Environmental Assessment

October 2021

**Prepared for:
Niagara Region
1815 Sir Isaac Brock Way
Thorold, ON
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October 14, 2021

Our Ref: [603118]

Niagara Region
1815 Sir Isaac Brock Way
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**Re: Regional Road 45 (Creek Road) Environmental Assessment Study –
Transportation & Traffic Analysis Final Report**

We are pleased to provide you a pdf copy of the completed Transportation and Traffic Analysis Report as part of the Environmental Assessment (EA) Study for the Reconstruction of Regional Road 45 (Creek Road), between Regional Road 27 (River Road) and Regional Road 63 (Canborough Road).

If you would like any additional information or further clarifications on any aspect of our submission, please contact the undersigned at (289) 213-7631.

Yours truly,



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List of Revisions:

VERSION	DATE	DESCRIPTION
1	July 2017	Draft for Submission
2	October 2021	Final Report

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1. BACKGROUND

Parsons has been retained by the Niagara Region to undertake an Environmental Assessment (EA) & Preliminary Design, Reconstruction of Regional Road 45 (Creek Road), between Regional Road 27 (River Road) and Regional Road 63 (Canborough Road) in the Township of Wainfleet. Creek Road is a two-lane east-west rural arterial roadway under the jurisdiction of the Niagara Region and it serves mainly to residential, agricultural, industrial and institutional land uses. Within the study area, there are two bridge structures which cross the Welland River known as the Oswego Creek Bridge and Creek Road Bridge with the Oswego Bridge being only a single lane crossing.

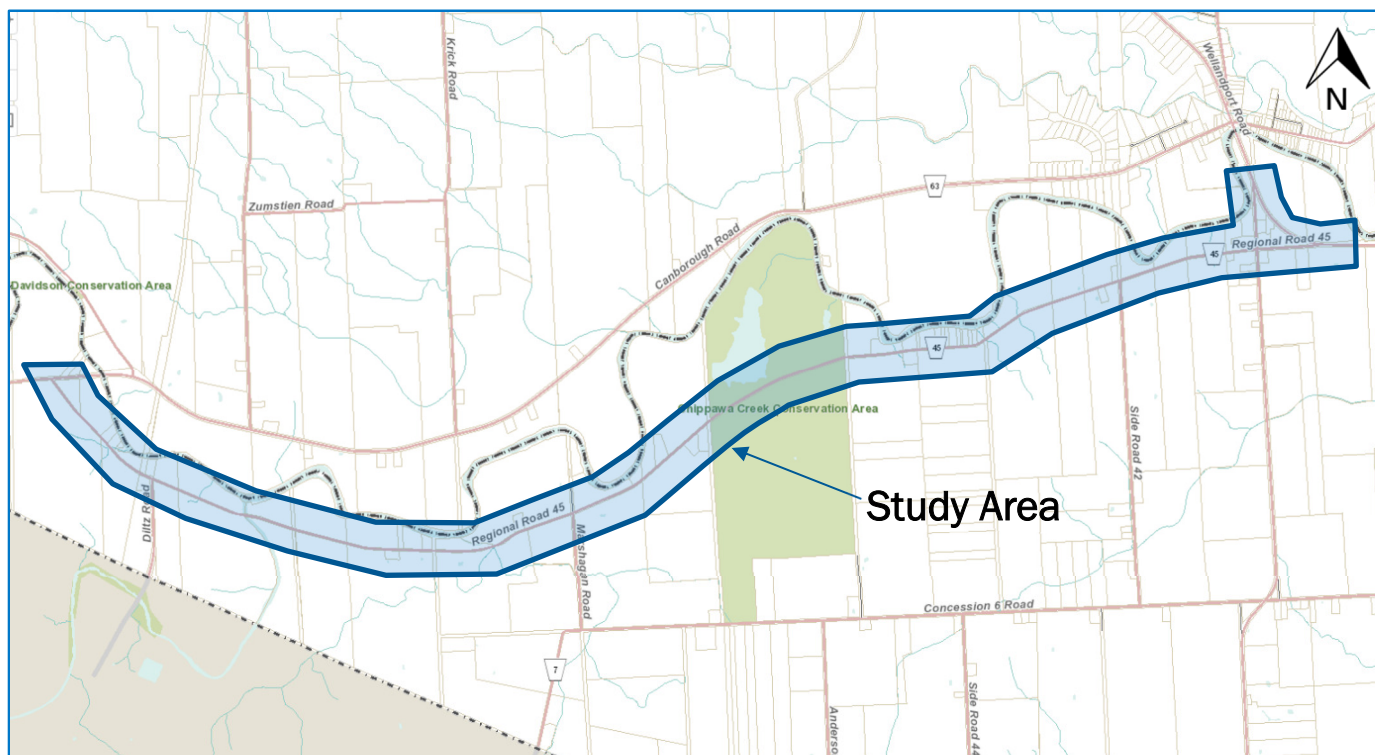
The purpose of this study is to determine the existing and future transportation needs of the study corridor in order to adequately accommodate future travel demands within the study area.

1.1 STUDY AREA AND ANALYSIS SCOPE

The project limits for the EA study include the entire length of Creek Road from Canborough Road (RR 63) in the west to River Road (RR 27) in the east and also includes the intersection of River Road and Wellandport Road. The study area for the traffic analysis is illustrated in **Figure 1**. The following bullets highlight the traffic analysis scope of work:

- Summarize and review the existing traffic volumes provided by the Niagara Region;
- Undertake the existing Creek Road corridor capacity and intersection operation analysis to identify any operational issues;
- Conduct safety performance assessment based on the historical collisions to identify any safety-related concerns within the project limits;
- Estimate future traffic volumes using a general traffic growth rate;
- 10 and 20 year horizons were selected for the future traffic forecast and operational analyses;
- Undertake the Creek Road corridor capacity and intersection operation analysis using the future projected traffic volumes without improvements (Do Nothing Scenario), Identify the geometric improvements needed to improve the traffic flows along the study corridor;
- Conduct signal warrant analysis for the study area unsignalized intersections and recommend the appropriate intersection controls;
- Undertake left turn lane warrant analysis; and
- Analyze the Creek Road corridor and intersection operations for the minimum lane configurations and recommend the future lane configurations for both the corridor and intersections.

Figure 1: Traffic Analysis Study Area



2. EXISTING (2016) TRAFFIC CONDITIONS

2.1 ANALYSIS APPROACH AND TOOLS

The traffic analysis conducted for this study considers the capacity and level of service for individual intersections and mid-block sections along the study corridor. Intersections were analyzed using the procedures of the Highway Capacity Manual (HCM) methodologies for signalized and unsignalized intersections, as implemented in the Synchro / SimTraffic software developed by Trafficware.

Level of Service (LOS) can be characterized for each intersection approach and each lane group. Control delay alone is used to characterize LOS for the entire intersection or an approach. Control delay and volume-to-capacity (V/C) ratio are used to characterize LOS for a lane group. Delay quantifies the variations in travel time due to traffic signal control. It is also a surrogate measure of driver discomfort and fuel consumption. The volume-to-capacity (V/C) ratio quantifies the degree to which the capacity of each signal phase is utilized by a defined lane group. **Table 1** summarizes the characteristics of each level of service at signalized intersections.

The LOS criteria for unsignalized intersections are somewhat different from the criteria for signalized intersections because perceptions of facility users differ. The expectation is that a signalized intersection is designed to carry higher traffic volumes and will present greater delay than an unsignalized intersection. Unsignalized intersections are also associated with more uncertainty for users, as delays are less predictable

than at signalized junctions. This uncertainty can reduce driver's delay tolerance. **Table 2** summarizes the characteristics of each level of service at unsignalized intersections.

Table 1: Signalized Intersection Level of Service Characteristics

LEVEL OF SERVICE	DESCRIPTION
A	LOS A describes operations with control delay of 10 seconds/vehicle (s/veh) or less and a volume-to-capacity (v/c) ratio no greater than 1.0. This level is typically assigned when a v/c ratio is low and either progression is exceptionally favourable or the cycle length is very short. If it is due to favourable progression, most vehicles arrive during the green indication and travel through the intersection without stopping.
B	LOS B describes operations with control delay between 10 and 20 s/veh and a v/c of no greater than 1.0. This level is typically assigned when the v/c ratio is low and either progression is highly favourable or the cycle length is short. More vehicles stop than with LOS A.
C	LOS C describes operations with control delay between 20 and 35 s/veh and a v/c of no greater than 1.0. This level is typically assigned when progression is favourable or the cycle length is moderate. Individual cycle failures (i.e., one or more queued vehicles are not able to depart as a result of insufficient capacity during the cycle) may begin to appear at this level. The number of vehicles stopping is significant, although many vehicles still pass through the intersection without stopping.
D	LOS D describes operations with control delay between 35 and 55 s/veh and a v/c ratio of no greater than 1.0. This level is typically assigned when the v/c is high and either progression is ineffective or the cycle length is long. Many vehicles stop and individual cycle failures are noticeable.
E	LOS E describes operations with control delay between 55 and 80 s/veh and a v/c no greater than 1.0. This level is typically assigned when the v/c is high, progression is unfavourable, and the cycle length is long. Individual cycle failures are frequent.
F	LOS F describes operations with control delay exceeding 80 s/veh or a v/c of greater than 1.0. This level is typically assigned when the v/c is very high, progression is very poor, and the cycle length is long. Most cycles fail to clear the queue.

Source: HCM 2010 Chapter 18, Signalized Intersections, pages 18-5 and 18-6

Table 2: Unsignalized Intersection Level of Service Characteristics

CONTROL DELAY (S/VEH)	LOS BY VOLUME-TO-CAPACITY RATIO	
	V/C ≤ 1.0	V/C > 1.0
0 – 10	A	F
> 10 - 15	B	F
> 15 - 25	C	F
> 25 - 35	D	F
> 35 – 50	E	F
> 50	F	F

Source: HCM 2010 Manual, Exhibit 19-1

Roadway corridor operations are generally assessed based on the lane capacity analysis. Lane capacity analysis at the mid-block sections are based on the ratio of the estimated link volumes and theoretical lane capacity (V/C). **Table 3** shows planning level LOS at corridor based on the estimated V/C values.

Table 3: Lane Capacity Level of Service Characteristics

VOLUMES TO CAPACITY RATIOS (V/C)	LOS	GENERAL CONDITIONS
< 0.75	A to C	Stable flows with acceptable delays
$\geq 0.75 < 0.85$	D	Approaching unstable flows and tolerable delays
$\geq 0.85 < 1.00$	E	Unstable flows and intolerable delays
≥ 1.00	F	Forced flows and significant delays

2.2 EXISTING (2016) TRAFFIC VOLUMES

Existing traffic volumes for the study area intersections collected in 2016 were provided by the Niagara Region and are included in **Appendix A**. It should be noted that the turning movement count data (TMC) for the Chippawa Creek Conservation area entrance was collected during a Saturday midday time period. This was completed to reflect the peak demand of the driveway due to the nature of the land use.

A summary of the existing (2016) intersection volumes for the weekday AM and PM peak hours is shown in **Appendix B**. The existing intersection lane configurations are also provided in **Appendix B**.

2.3 EXISTING (2016) TRAFFIC CONDITIONS, LANE CAPACITY ANALYSIS

Link volumes were estimated using the intersection entering and existing volumes at the mid-block sections. Lane capacity analysis for the existing traffic conditions was undertaken using the estimated mid-block link volumes and theoretical lane capacity of 850 and 700 vehicles per hour per lane. The theoretical lane capacity is based on the posted speed limits along Creek Road. The section of Creek Road from Canborough Road to Marshagan Road has a posted speed limit of 70 km/hr. From Marshagan Road to Side Road 42 the posted speed is 80 km/hr and from Side Road 42 to River Road the posted speed is 50 km/hr.

The lane capacity analysis results for the existing (2016) conditions are presented in **Tables 4** and **Table 5**, for the AM and PM peak hours, respectively.

Table 4: Existing (2016) AM Peak Hour, Lane Capacity Analysis

ROADWAY SECTION	EASTBOUND			WESTBOUND		
	VOLUME	CAPACITY	V/C	VOLUME	CAPACITY	V/C
between Canborough Rd. & Diltz Rd.	46	850	0.05	77	850	0.09
between Diltz Rd. & Chippawa Creek Conservation Area	28	850	0.03	29	850	0.03
between Chippawa Creek Conservation Area & Wellandport Rd.	48	850	0.06	40	850	0.05
between Wellandport Rd. & River Rd.	15	700	0.02	31	700	0.04

Table 5: Existing (2016) PM Peak Hour, Lane Capacity Analysis

ROADWAY SECTION	EASTBOUND			WESTBOUND		
	VOLUME	CAPACITY	V/C	VOLUME	CAPACITY	V/C
between Canborough Rd. & Diltz Rd.	84	850	0.10	62	850	0.07
between Diltz Rd. & Chippawa Creek Conservation Area	28	850	0.03	29	850	0.03
between Chippawa Creek Conservation Area & Wellandport Rd.	43	850	0.05	60	850	0.07
between Wellandport Rd. & River Rd.	19	700	0.03	22	700	0.03

As presented in **Tables 4** and **5**, under the existing (2016) traffic conditions, all of the major sections of Creek Road are operating below capacity in both the eastbound and westbound directions. Based on the results there are no additional capacity requirements required for the corridor.

2.4 EXISTING (2016) INTERSECTION OPERATIONS

Using the existing traffic volumes received from the Region, operation analysis for the unsignalized intersections were completed within the corridor using the Synchro/SimTraffic (Version 8) for the AM and PM peak hours (including Saturday midday peak for the Chippawa Creek Conservation Area entrance). All analyses were completed using parameters outlined in the Niagara Region Guidelines for Transportation Impact Studies, May 2012.

The results of the Synchro analysis completed for the existing (2016) Weekday AM and PM (and Saturday Mid-day for Chippawa Creek Conservation Area entrance) peak hours are provided in **Table 6** for the study area unsignalized intersections. The Synchro output sheets are provided in **Appendix C**.

Table 6: Existing (2016) Traffic Operation Analysis Results

INTERSECTION/ MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*
Creek Rd. & Canborough Rd. (Unsignalized)	[4]	-	-	[3]	-	-
EBT&R	A [0]	0.07	0	A [0]	0.08	0
WBL&T	A [2]	0.02	0	A [2]	0.03	1
NBL&R	B [10]	0.11	3	B [10]	0.08	2
Creek Rd. & Diltz Rd. (Unsignalized)	[5]	—	—	[4]	—	—
EBT&R	A [0]	0.03	0	A [0]	0.05	0
WBL&T	A [1]	0.00	0	A [2]	0.00	0
NBL&R	A [9]	0.08	2	A [9]	0.07	2
Creek Rd. & Chippawa Creek Area Entrance (Unsignalized)	[2]	-	—	[2]	-	—
EBL&T	A [2]	0.00	0	A [2]	0.00	0
WBT&R	A [0]	0.03	0	A [0]	0.03	0
SBL&R	A [9]	0.02	0	A [9]	0.02	0
Creek Rd. & Wellandport Rd. (Unsignalized)	[3]	-	-	[2]	-	-
EBL&T&R	B [11]	0.08	2	B [11]	0.07	2
WBL&T&R	B [10]	0.05	1	B [11]	0.04	1
NBL&T&R	A [0]	0.00	0	A [0]	0.00	0
SBL&T&R	A [0]	0.00	0	A [0]	0.00	0
Creek Rd. & River Rd. (Unsignalized)	[2]	-	-	[1]	-	-
EBL&R	A [9]	0.02	0	A [9]	0.02	0
NBL&T	A [2]	0.02	0	A [2]	0.02	0

INTERSECTION/ MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*
SBT&R	A [0]	0.04	0	A [0]	0.09	0
Wellandport Rd. & River Rd. (Unsignalized)	[4]	-	-	[2]	-	-
EBL&R	B [11]	0.20	6	B [12]	0.18	5
NBL&T	A [0]	0.00	0	A [0]	0.00	0
SBT&R	A [0]	0.09	0	A [0]	0.19	0

* rounded values

As presented in **Table 6**, all of the unsignalized intersections analyzed are operating well under existing (2016) traffic conditions.

3. SAFETY PERFORMANCE ASSESSMENT – COLLISION ANALYSIS

The Safety Performance Assessment completed as part of this study included a review of intersection and midblock collision data within the study area. The purpose of the review was to determine if there are any discernable collision trends which require the implementation of mitigation measures or roadway improvements. Historical collision data for the study area was received from the Niagara Region for the years 2009 to 2016 (8 years). A summary of the intersection and midblock collision data is presented in **Tables 7** and **8** respectively.

Table 7: Summary of Intersection Collisions

INTERSECTION	ANGLE	COLLISION TYPE							TOTAL	%
		APPROACHING	REAR END	SIDESWIPE	SMV/OTHER	SMV/ UNATTENDED	TURNING MOVEMENT	OTHER		
Creek Rd. & Canborough Rd.									0	0
Creek Rd. & Diltz Rd.	1								1	17%
Creek Rd. & Marshagan Rd.									0	0
Creek Rd. & Side Rd. 42									0	0
Creek Rd. & Wellandport Rd.	4		1						5	83%
Creek Rd. & River Rd.									0	0

		COLLISION TYPE								
INTERSECTION	ANGLE	APPROACHING	REAR END	SIDESWIPE	SMV/OTHER	SMV/ UNATTENDED	TURNING MOVEMENT	OTHER	TOTAL	%
Totals	5	0	1	0	0	0	0	0	6	100%
	83%	0%	17%	0%	0%	0%	0%	0%	100%	

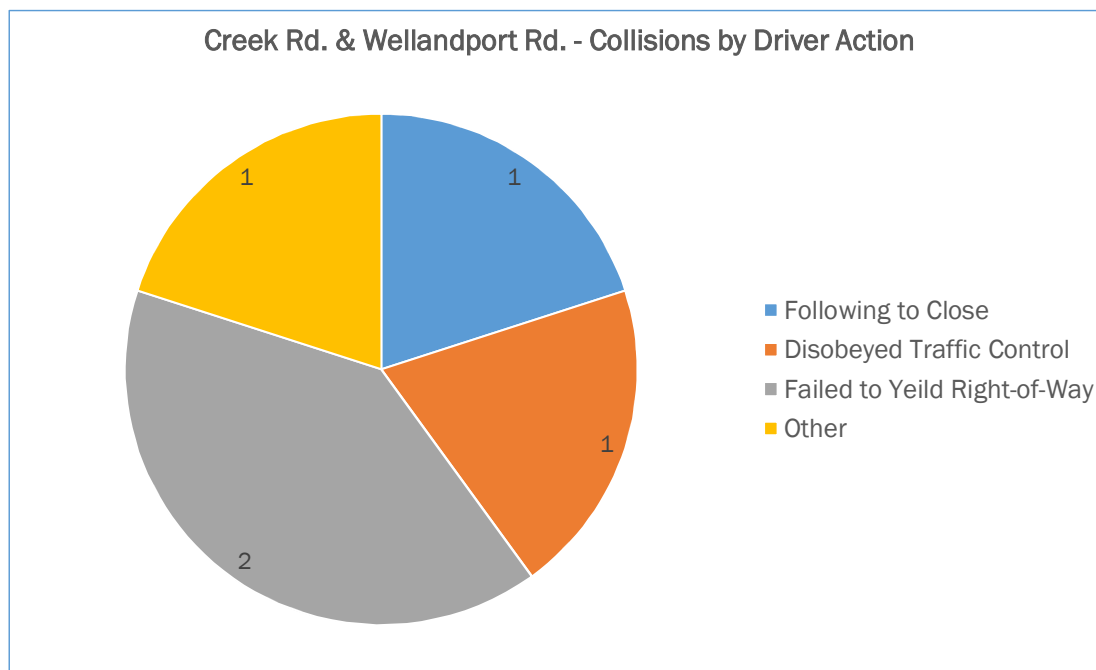
As illustrated in **Table 7**, a total of six (6) collisions occurred at intersections within the study area over the eight year historical period. The intersection of Creek Road and Wellandport Road contained the highest percentage of collisions with 83% or five (5) total collisions, while the intersection of Creek Road with Diltz Road contained 17% or one collision. No other collisions were reported at any other study area intersection.

Based on the five (5) collisions which occurred at the intersection of Creek Road and Wellandport Road, four were classified as angle collisions. The collisions which occurred at this intersection were examined further to identify any trends which may indicate operational or safety deficiencies.

3.1 CREEK ROAD AND WELLANDPORT ROAD INTERSECTION COLLISIONS

Under further investigation of the collisions which occurred at the intersection of Creek Road and Wellandport Road, a review based on driver action was conducted to determine if any collisions were the result of driver error or could be attributed to any operational or safety deficiencies.

Figure 2: Creek Rd. & Wellandport Rd. – Collisions by Driver Action



As illustrated in **Figure 2**, two (2) of the five (5) documented collisions were the result of ‘failing to yield right-of-way’. One of the collisions was the result of ‘disobeying traffic control’, one was classified as ‘following to close’ and one was recorded as ‘other’. Based on these finding the majority of collisions which occurred at the intersection were the result of driver error and not due to operational or roadway safety deficiencies.

Overall, there are no significant patterns at any intersections within the Creek Road study area which would indicate the need for any operational or roadway safety improvements.

Table 8 presents a summary of midblock collisions in the study area based on collision type.

Table 8: Summary of Midblock Collisions

MIDBLOCK	ANGLE	COLLISION TYPE							TOTAL	%
		APPROACHING	REAR END	SIDESWIPE	SMV/OTHER	SMV/ UNATTENDED	TURNING MOVEMENT	OTHER		
Between Canborough Rd. & Diltz Rd.			1						1	6%
Between Diltz Rd. & Marshagan Rd.		1		1		1			3	18%
Between Marshagan Rd. & Side Rd. 42					4				4	23%
Between Side Rd. 42 & Wellandport Rd.					2	2			4	23%
Between & Wellandport Rd. & River Rd.	1							1	2	12%
Wellandport Rd. between & Creek Rd. & River Rd.					1				1	6%
River Rd. between Wellandport Rd. & Creek Rd.					2				2	12%
Totals	1	1	1	1	9	3	0	1	17	100%
	6%	6%	6%	6%	53%	17%	0%	6%	100%	

As illustrated in **Table 8**, a total of 17 midblock collisions occurred within the study area over the eight-year historical period. The majority of collisions which occurred within the midblock sections of Creek Road were single motor vehicle collisions. Single motor vehicle collisions (other) accounted for 53% while single motor vehicle (unattended) accounted for 17%.

The midblock section between Marshagan Road and Side Road 42 and from Side Road 42 to the intersection of Wellandport Road recorded four (4) collisions or 23% attributed to this section. The section of Creek Road

between Diltz Road and Marshagan Road contained three (3) collisions (18%) while the section from Wellandport Road to River Road contained two (2) collisions (12%). The midblock section of River Road between Wellandport Road and Creek Road also contained two (2) collisions or 12% of the total.

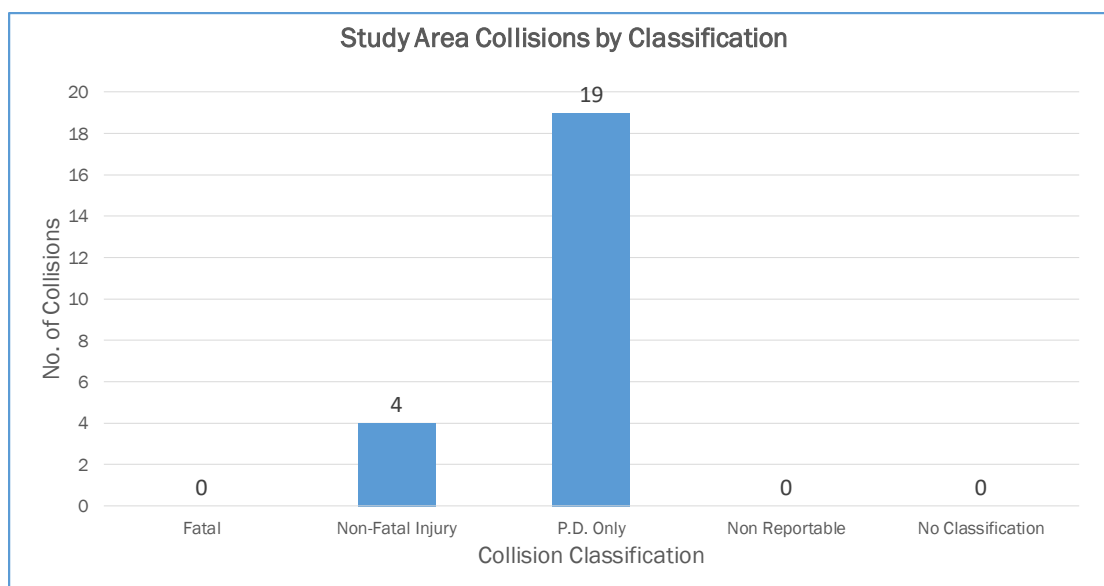
If possible, can we add some comments here on collision types specially on one angle and SMV collisions?

Overall, there are no discernable collision trends within the midblock sections of the Creek Road study area which would indicate the need for any operational or roadway safety improvements.

3.2 OVERALL STUDY AREA COLLISIONS BY COLLISION CLASSIFICATION

A review of the overall study area collisions by classification was examined to determine the breakdown of collisions which resulted in serious injuries. This was completed to determine if any collision trends are occurring within the study area that are resulting in serious injuries.

Figure 3: Study Area Collisions by Classification



The review of collision data by classification shown in **Figure 3** indicates that of the 23 total collisions within the study area, 19 or 83% collisions resulted in property damage only and 4 (17%) resulted in non-fatal injury. No collisions within the study area resulted in a fatal injury.

4. FUTURE (2026 AND 2036) TRAFFIC CONDITIONS

4.1 FUTURE (2026 & 2036) TRAFFIC VOLUMES

The future (2026) and (2036) traffic volumes were established by applying a 2% per annum growth rate to the existing (2016) traffic volumes. This growth rate is consistent with recommendations outlined in the Niagara Region Guidelines for Transportation Impact Studies, May 2012. It is assumed that this growth rate also

considers the potential for future developments within the study area. The resulting weekday AM and PM peak hour traffic volumes under future 2026 and 2036 conditions are presented in **Appendix D**.

4.2 FUTURE (2026) TRAFFIC CONDITIONS LANE CAPACITY ANALYSIS, DO NOTHING

Corridor lane capacity analysis for the future (2026) do nothing traffic conditions was undertaken using the estimated mid-block link volumes and a theoretical lane capacity noted in Section 2.3. The lane capacity analysis results are presented in **Tables 9** and **10**, for the AM and PM peak hours, respectively.

Table 9: Future (2026) AM Peak Hour Lane Capacity Analysis – Do Nothing Option

ROADWAY SECTION	EASTBOUND			WESTBOUND		
	VOLUME	CAPACITY	V/C	VOLUME	CAPACITY	V/C
between Canborough Rd. & Diltz Rd.	55	850	0.06	92	850	0.11
between Diltz Rd. & Chippawa Creek Conservation Area	34	850	0.04	35	850	0.04
between Chippawa Creek Conservation Area & Wellandport Rd.	58	850	0.07	48	850	0.06
between Wellandport Rd. & River Rd.	18	700	0.03	37	700	0.05

Table 10: Future (2026) PM Peak Hour Link Volume Capacity Analysis – Do Nothing Option

ROADWAY SECTION	EASTBOUND			WESTBOUND		
	VOLUME	CAPACITY	V/C	VOLUME	CAPACITY	V/C
between Canborough Rd. & Diltz Rd.	101	850	0.12	74	850	0.09
between Diltz Rd. & Chippawa Creek Conservation Area	34	850	0.04	35	850	0.04
between Chippawa Creek Conservation Area & Wellandport Rd.	52	850	0.06	72	850	0.08
between Wellandport Rd. & River Rd.	23	700	0.03	26	700	0.04

As presented in **Tables 9** and **10**, under the future (2026) traffic conditions, all of the major sections of Creek Road will operate below capacity in the eastbound and westbound directions. Based on the results there are no additional capacity requirements required for the study corridor.

4.3 SIGNAL WARRANT ANALYSIS

It was estimated that the total left turning and opposing through volumes at each of the unsignalized intersections within the Creek Road study area are less than the volumes threshold specified in the OTM Book 12 manual for traffic signal warrants. As a result, detailed signal warrant analyses for the study area intersections was not undertaken.

4.4 LEFT TURN LANE WARRANT ANALYSIS

As part of the traffic analysis for Creek Road, the need for dedicated left turn lanes at the study area intersections was evaluated. A Left Turn Warrant Analysis using methodology outlined in the Geometric Design Standards for Ontario Highways published by Ministry of Transportation Ontario (MTO) was performed at each intersection. This analysis was completed using the peak hourly traffic volumes under the horizon year scenario of (2026) and (2036).

Table 11 presents the results of the Left Lane Warrant Analysis for each intersection under future (2026) and (2036) traffic conditions. The detailed warrant analysis sheets can be found in **Appendix E**.

Table 11: Left Turn Lane Warrant Requirements Based on Future (2026) & (2036) Traffic Conditions

INTERSECTION	DIRECTION	2026 HORIZON YEAR		2036 HORIZON YEAR	
		LEFT TURN LANE WARRANTED	REQUIRED MINIMUM STORAGE LENGTH (M)	LEFT TURN LANE WARRANTED	REQUIRED MINIMUM STORAGE LENGTH (M)
Creek Rd. & Canborough Rd.	Northbound	No	-	No	-
Creek Rd. & Diltz Rd.	Westbound	No	-	No	-
Creek Rd. & Chippawa Creek Area Entrance	Eastbound	No	-	No	-
Creek Rd. & Wellandport Rd.	Northbound	No	-	No	-
	Southbound	No	-	No	-
Creek Rd. & River Rd.	Eastbound	No	-	No	-
Wellandport Rd. & River Rd.	Eastbound	No	-	No	-

The results of the left turn lane warrants presented in **Table 11** indicate that exclusive left turn lanes are not required at any of the unsignalized study area intersections under either future (2026) or (2036) traffic conditions.

4.5 FUTURE (2026) INTERSECTION OPERATIONS – DO NOTHING

Parsons completed capacity analyses for the unsignalized intersections within the corridor under future (2026) traffic conditions. The results of the analysis completed are summarized in **Table 12**. The Synchro output sheets are placed in **Appendix F**.

Table 12: Future (2026) Traffic Intersection Operation Results – Do Nothing

INTERSECTION/ MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*
Creek Rd. & Canborough Rd. (Unsignalized)	[4]	-	-	[3]	-	-
EBT&R	A [0]	0.08	0	A [0]	0.09	0
WBL&T	A [2]	0.02	0	A [2]	0.03	1
NBL&R	B [11]	0.14	4	B [10]	0.11	3
Creek Rd. & Diltz Rd. (Unsignalized)	[5]	–	–	[4]	–	–
EBT&R	A [0]	0.04	0	A [0]	0.06	0
WBL&T	A [1]	0.00	0	A [0]	0.00	0
NBL&R	A [9]	0.09	2	A [2]	0.09	2
Creek Rd. & Chippawa Creek Area Entrance (Unsignalized)	[2]	-	–	[2]	-	–
EBL&T	A [2]	0.01	0	A [2]	0.01	0
WBT&R	A [0]	0.03	0	A [0]	0.03	0
SBL&R	A [9]	0.02	1	A [9]	0.02	1
Creek Rd. & Wellandport Rd. (Unsignalized)	[3]	-	-	[3]	-	-
EBL&T&R	B [11]	0.10	2	B [12]	0.10	2
WBL&T&R	B [11]	0.06	1	B [11]	0.05	1
NBL&T&R	A [0]	0.00	0	A [0]	0.00	0
SBL&T&R	A [0]	0.00	0	A [0]	0.00	0
Creek Rd. & River Rd. (Unsignalized)	[2]	-	-	[1]	-	-

INTERSECTION/ MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*
EBL&R	A [9]	0.02	0	A [9]	0.03	1
NBL&T	A [2]	0.03	1	A [2]	0.02	0
SBT&R	A [0]	0.05	0	A [0]	0.10	0
Wellandport Rd. & River Rd. (Unsignalized)	[4]	-	-	[3]	-	-
EBL&R	B [12]	0.26	8	B [13]	0.23	7
NBL&T	A [0]	0.00	0	A [0]	0.00	0
SBT&R	A [0]	0.11	0	A [0]	0.23	0

* rounded values

The results of the capacity analysis completed under the future (2026) traffic conditions and presented in **Table 12**, all of the unsignalized intersections analyzed are forecast to operate well with no critical movements.

4.6 FUTURE (2036) TRAFFIC CONDITIONS LANE CAPACITY ANALYSIS, DO NOTHING

Corridor Lane capacity analysis for the future (2036) traffic conditions was undertaken using the estimated mid-block link volumes. The analysis results are presented in **Table 13** and **Table 14**, for the AM and PM peak Hours, respectively.

Table 13: Future (2036) AM Peak Hour Lane Capacity Analysis – Do Nothing Option

ROADWAY SECTION	EASTBOUND			WESTBOUND		
	VOLUME	CAPACITY	V/C	VOLUME	CAPACITY	V/C
between Canborough Rd. & Diltz Rd.	77	850	0.09	129	850	0.15
between Diltz Rd. & Chippawa Creek Conservation Area	47	850	0.06	49	850	0.06
between Chippawa Creek Conservation Area & Wellandport Rd.	81	850	0.09	67	850	0.08
between Wellandport Rd. & River Rd.	25	700	0.04	52	700	0.07

Table 14: Future (2036) PM Peak Hour Lane Capacity Analysis – Do Nothing Option

ROADWAY SECTION	EASTBOUND			WESTBOUND		
	VOLUME	CAPACITY	V/C	VOLUME	CAPACITY	V/C
between Canborough Rd. & Diltz Rd.	141	850	0.17	104	850	0.12
between Diltz Rd. & Chippawa Creek Conservation Area	47	850	0.06	49	850	0.06
between Chippawa Creek Conservation Area & Wellandport Rd.	72	850	0.08	101	850	0.12
between Wellandport Rd. & River Rd.	32	700	0.05	37	700	0.05

As presented in **Tables 13** and **14**, under the future (2036) traffic conditions all of the major sections of Creek Road will operate below capacity in both the eastbound and westbound directions. Based on the results there are no additional capacity requirements required for the corridor.

4.7 FUTURE (2036) INTERSECTION OPERATIONS – DO NOTHING

Intersection capacity analyses completed for the unsignalized intersections using the future (2036) traffic volumes is presented in **Table 15**. The Synchro output sheets are provided in **Appendix G**.

Table 15: Future (2036) Traffic Intersection Operation Results – Do Nothing

INTERSECTION/ MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*
Creek Rd. & Canborough Rd. (Unsignalized)	[4]	-	-	[3]	-	-
EBT&R	A [0]	0.10	0	A [0]	0.11	0
WBL&T	A [2]	0.02	0	A [2]	0.04	1
NBL&R	B [11]	0.16	4	B [11]	0.13	3
Creek Rd. & Diltz Rd. (Unsignalized)	[5]	–	–	[4]	–	–
EBT&R	A [0]	0.04	0	A [0]	0.07	0
WBL&T	A [1]	0.00	0	A [2]	0.00	0
NBL&R	A [3]	0.11	3	A [10]	0.10	3

INTERSECTION/ MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*
Creek Rd. & Chippawa Creek Area Entrance (Unsignalized)	[2]	-	-	[2]	-	-
EBL&T	A [2]	0.01	0	A [2]	0.01	0
WBT&R	A [0]	0.04	0	A [0]	0.04	0
SBL&R	A [9]	0.03	1	A [9]	0.03	1
Creek Rd. & Wellandport Rd. (Unsignalized)	[4]	-	-	[3]	-	-
EBL&T&R	B [12]	0.12	3	B [13]	0.12	3
WBL&T&R	B [11]	0.07	2	B [12]	0.06	1
NBL&T&R	A [0]	0.00	0	A [0]	0.00	0
SBL&T&R	A [0]	0.00	0	A [0]	0.00	0
Creek Rd. & River Rd. (Unsignalized)	[2]	-	-	[1]	-	-
EBL&R	A [9]	0.02	1	A [9]	0.04	1
NBL&T	A [2]	0.03	1	A [2]	0.03	1
SBT&R	A [0]	0.06	0	A [0]	0.12	0
Wellandport Rd. & River Rd. (Unsignalized)	[5]	-	-	[3]	-	-
EBL&R	B [13]	0.32	10	B [14]	0.29	9
NBL&T	A [0]	0.00	0	A [0]	0.00	0
SBT&R	A [0]	0.13	0	A [0]	0.27	0

* rounded values

Similar to the capacity analysis completed for the future (2026) do nothing scenario, under future (2036) traffic conditions all of the unsignalized intersections are forecasted to operate well as presented in **Table 15**. Based on these results, no improvements to the corridor or intersections are required to accommodate traffic based on a 20-year horizon period.

5. OPTION 2 FOR CREEK ROAD & RIVER ROAD INTERSECTION

Through discussions with the Region for improving alignment issues at the intersection of Creek Road and River Road, an Option 2 was developed where the west leg of Creek Road is disconnected from River Road and

converted to a cul-de-sac. Based on this option, traffic volumes were redistributed for intersections along Wellandport Road. Intersection operations were analyzed to determine if the intersections within the immediate area can accommodate the additional traffic volumes. This analysis was completed under existing (2016) and future (2026) and (2036) traffic conditions.

5.1 REDISTRIBUTED EXISTING (2016) FUTURE (2026 & 2036) TRAFFIC VOLUMES

In order to complete intersection capacity analysis under the Option 2 scenario, Parsons first redistributed the existing and future traffic volumes based on the discontinuation of Creek Road and the existing travel patterns of the Creek Road and River Road intersection. The redistributed traffic volumes under existing (2016) and future (2026) and (2036) traffic conditions can be seen in **Appendix H**.

5.2 EXISTING (2016) INTERSECTION OPERATIONS – OPTION 2 SCENARIO

Utilizing the redistributed traffic volumes under existing (2016) traffic conditions, intersection capacity analysis was completed for the unsignalized intersections of Wellandport Road with Creek Road and River Road. The results of the intersection capacity analyses completed for the unsignalized intersections using the existing (2016) traffic volumes is presented in **Table 16**. The Synchro output sheets are provided in **Appendix I**.

Table 16: Existing (2016) Traffic Intersection Operation Results – Option 2 Scenario

INTERSECTION/ MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*
Creek Rd. & Wellandport Rd. (Unsignalized)	[2]	-	-	[2]	-	-
EBL&T&R	B [11]	0.08	2	B [11]	0.07	2
WBL&T&R	A [0]	0.00	0	B [0]	0.00	0
NBL&T&R	A [0]	0.00	0	A [0]	0.00	0
SBL&T&R	A [0]	0.00	0	A [0]	0.00	0
Wellandport Rd. & River Rd. (Unsignalized)	[5]	-	-	[3]	-	-
EBL&R	B [12]	0.24	7	B [12]	0.22	9
NBL&T	A [2]	0.02	0	A [2]	0.02	0
SBT&R	A [0]	0.09	0	A [0]	0.19	0

* rounded values

As presented in **Table 16**, the redistribution of traffic based on the Option 2 scenario has not adversely affected traffic operations at either intersection. During both peak hours analyzed the intersections of Creek Road with Wellandport Road and River Road are forecast to operate well with no critical movements.

5.3 FUTURE (2026) INTERSECTION OPERATIONS – OPTION 2 SCENARIO

Utilizing the redistributed traffic volumes under future (2026) traffic conditions, intersection capacity analysis was completed for the unsignalized intersections of Wellandport Road with Creek Road and River Road. The results of the intersection capacity analyses completed is presented in **Table 17**. The Synchro output sheets are provided in **Appendix I**.

Table 17: Future (2026) Traffic Intersection Operation Results – Option 2 Scenario

INTERSECTION/ MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*
Creek Rd. & Wellandport Rd. (Unsignalized)	[2]	-	-	[3]	-	-
EBL&T&R	B [11]	0.10	2	B [12]	0.10	2
WBL&T&R	A [0]	0.00	0	B [9]	0.00	0
NBL&T&R	A [0]	0.00	0	A [0]	0.00	0
SBL&T&R	A [0]	0.00	0	A [0]	0.00	0
Wellandport Rd. & River Rd. (Unsignalized)	[5]	-	-	[4]	-	-
EBL&R	B [14]	0.32	10	B [14]	0.29	9
NBL&T	A [1]	0.03	1	A [2]	0.02	1
SBT&R	A [0]	0.11	0	A [0]	0.23	0

* rounded values

Under the future (2026) Option 2 scenario, the Creek Road intersections with Wellandport Road and River Road are forecast to operate well during both peak hours. As presented in **Table 17**, there are no critical movements present at either intersection.

5.4 FUTURE (2036) INTERSECTION OPERATIONS – OPTION 2 SCENARIO

Intersection capacity analysis was completed for the unsignalized intersections of Wellandport Road with Creek Road and River Road utilizing the redistributed traffic volumes under future (2036) traffic conditions. The results of the analyses completed is presented in **Table 18**. The Synchro output sheets are provided in **Appendix I**.

Table 18: Future (2036) Traffic Intersection Operation Results – Option 2 Scenario

INTERSECTION/ MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*
Creek Rd. & Wellandport Rd. (Unsignalized)	[2]	-	-	[2]	-	-
EBL&T&R	B [12]	0.12	3	B [13]	0.12	3
WBL&T&R	A [0]	0.00	0	A [9]	0.00	0
NBL&T&R	A [0]	0.00	0	A [0]	0.00	0
SBL&T&R	A [0]	0.09	0	A [0]	0.00	0
Wellandport Rd. & River Rd. (Unsignalized)	[6]	-	-	[3]	-	-
EBL&R	C [16]	0.40	15	C [16]	0.37	13
NBL&T	A [2]	0.03	1	A [2]	0.03	1
SBT&R	A [0]	0.13	0	A [0]	0.27	0

* rounded values

As presented in **Table 18**, under the future (2036) Option 2 traffic conditions both unsignalized intersections are forecast to operate well. During both peak hours the intersections of Creek Road with Wellandport Road and River Road are forecast to operate with no critical movements with the redistribution of traffic volumes.

5.5 LEFT TURN LANE WARRANT ANALYSIS – OPTION 2 SCENARIO

With the redistribution of traffic volumes based on the Option 2 scenario, the intersections of Wellandport Road with Creek Road and River Road will see changes in volumes including additional left turning movements. As a result of this increase, Parsons has completed an additional left turn warrant analysis for these intersections under existing (2016) and future (2026 & 2036) traffic conditions for the Option 2 scenario. The results of this analysis are presented in **Table 19**. The warrant analysis sheets can be found in **Appendix E**.

Table 19: Left Turn Lane Warrants Based on Existing (2016) and Future (2026 & 2036) Option 2 Traffic Conditions

INTERSECTION	DIRECTION	EXISTING 2016		2026 HORIZON YEAR		2036 HORIZON YEAR	
		LEFT TURN LANE WARRANTED	REQUIRED MINIMUM STORAGE LENGTH (M)	LEFT TURN LANE WARRANTED	REQUIRED MINIMUM STORAGE LENGTH (M)	LEFT TURN LANE WARRANTED	REQUIRED MINIMUM STORAGE LENGTH (M)
Wellandport Rd. & River Rd.	Eastbound	No	-	No	-	No	-

INTERSECTION	DIRECTION	EXISTING 2016		2026 HORIZON YEAR		2036 HORIZON YEAR	
		LEFT TURN LANE WARRANTED	REQUIRED MINIMUM STORAGE LENGTH (M)	LEFT TURN LANE WARRANTED	REQUIRED MINIMUM STORAGE LENGTH (M)	LEFT TURN LANE WARRANTED	REQUIRED MINIMUM STORAGE LENGTH (M)
Wellandport Rd & Creek Rd	Northbound	No	-	No	-	No	-
	Southbound	No	-	No	-	No	-

The results of the left turn lane warrant analysis presented in **Table 19** indicates that exclusive left turn lanes for these intersections are not required under existing 2016 or future (2026 & 2036) traffic conditions with the redistribution of volumes based on the Option 2 scenario.

6. CREEK ROAD & WELLANDPORT ROAD – ALL-WAY STOP WARRANTS

At the request of the Niagara Region, the intersection of Creek Road and Wellandport Road was examined to determine if All-Way Stop control is warranted under the current roadway configuration or under the Option 2 scenario where the east leg of this intersection is disconnected from RR27 (River Rd.) and converted to a cul-de-sac.

The All-way Stop warrant analysis was completed using criteria outlined in the OTM Book 5 – Regulatory Signs manual. Specifically, the All-way Stop Minimum Volume Warrant (Minor Roads) criteria was utilized. According to the manual, an All-way stop may be considered if both of the following conditions are met:

1. The total vehicle volume on all approaches is higher than 350 for the highest hour; and
2. The volume split does not exceed 65% major road/35% minor road for four-way control.

The warrants were completed using the existing (2016) and future (2026) and (2036) traffic volumes established under the existing configuration and Option 2 scenarios.

6.1 ALL-WAY STOP WARRANT RESULTS – EXISTING ROADWAY CONFIGURATION

The results of the All-Way Stop Warrant analysis completed using existing (2016) and future (2026 & 2036) traffic volumes under the existing roadway configuration are presented in **Table 20**. The warrant analysis sheets are provided in **Appendix J**.

Table 20: All-Way Stop Warrant Results – Existing Roadway Configuration

INTERSECTION	ANALYSIS YEAR	CONDITION 1 SATISFIED	CONDITION 2 SATISFIED	ALL-WAY STOP WARRANTED
Creek Rd. & Wellandport Rd.	Existing (2016)	No	No	No
	Future (2026)	Yes	No	No
	Future (2036)	Yes	No	No

Based on the warrant analysis results presented in **Table 20**, under the existing (2016) traffic scenario an All-way Stop control is not warranted as neither conditions 1 or 2 are satisfied. Under the future (2026) and (2036) traffic scenarios, condition 1 for vehicle volume is met however condition 2 does not satisfy the requirements. Therefore, an All-way Stop is not warranted under future conditions.

Although condition 1 is satisfied under Future (2026) and (2036) conditions an All-way Stop control is not recommended based on the proportion of volumes between the major and minor roads. The implementation of an All-way stop control under these conditions could cause increased delay for traffic along major road. It is recommended, however, that the intersection be monitored in the future to determine the requirements for an All-way stop control at this intersection.

6.2 ALL-WAY STOP WARRANT RESULTS – OPTION 2 SCENARIO

The results of the All-Way Stop Warrant analysis completed using the existing (2016) and future (2026 & 2036) redistributed traffic volumes under the Creek Road and River Road Option 2 scenario is presented in **Table 21**. The warrant analysis sheets are provided in **Appendix J**.

Table 21: All-Way Stop Warrant Results – Option 2 Scenario

INTERSECTION	ANALYSIS YEAR	CONDITION 1 SATISFIED	CONDITION 2 SATISFIED	ALL-WAY STOP WARRANTED
Creek Rd. & Wellandport Rd.	Existing (2016)	No	No	No
	Future (2026)	Yes	No	No
	Future (2036)	Yes	No	No

As presented in **Table 21**, under the existing (2016) Option 2 traffic scenario, an All-way Stop control is not warranted as neither conditions 1 or 2 are satisfied. Under the future (2026) and (2036) traffic scenarios, condition 1 is met however condition 2 does not satisfy the requirements. Therefore, an all-way Stop control is not warranted.

Similar to the existing configuration scenario for future traffic conditions, although condition 1 is satisfied under Future (2026) and (2036) traffic conditions, an All-way Stop is not warranted based on the proportion of volumes between the major and minor roads. The implementation of an all-way stop under these conditions could cause increased delay for traffic along the major road. It is recommended, however, that the intersection be further monitored in the future to determine the requirements for an All-way stop control.

7. CONCLUSIONS AND RECOMMENDATIONS

The results of the Traffic and Safety Assessment completed for the Creek Road corridor as part of the Regional Road 45 (Creek Road) Class Environmental Assessment Study are summarized below. This included a review of the existing (2016) and future (2026) and (2036) traffic operations as well as a review of historical collisions from the years 2009 to 2016.

Existing (2016) Traffic Conditions

- A review of the existing corridor capacity indicates that no additional through lane capacity is required;
- All of the unsignalized intersections analyzed as part of the study area operate well with no critical movements.

Safety Performance Assessment

- A total of six (6) collisions occurred at intersections within the study area. The intersection of Creek Road and Wellandport Road contained five (5) total collisions or 83%. The intersection of Creek Road with Diltz Road contained one (1) collision or 17%. No other collisions were reported at any other study area intersections;
- The majority of the five (5) collisions which occurred at the intersection of Creek Road and Wellandport Road were the result of driver errors and not due to any operational or roadway safety deficiencies;
- A total of 17 collisions occurred within midblock sections of the study area. The majority of collisions recorded were single motor vehicle collisions. Single motor vehicle collisions (other) and single motor vehicle (unattended) accounted for 53% (9 collisions) and 17% (3 collisions) of the total midblock collisions; and
- Overall, there are no discernable collision trends within the study area that would require the need for any operational or roadway safety improvements.

Future (2026 & 2036) Traffic Conditions, Do Nothing

- A review of the future (2026) and (2036) corridor capacity indicates that no additional through lane capacity is required;
- Based on traffic volumes specified in the OTM Book 12 manual for traffic signal warrants. The study area intersections do not meet minimum requirements therefore detailed signal warrant analyses for the study area intersections was not undertaken;
- Left turn lane warrants conducted at the study area intersections using methodology outlined in the Geometric Design Standards for Ontario Highways published by Ministry of Transportation Ontario (MTO) indicate that exclusive left turn lanes are not required at any of the unsignalized study area intersections under either future (2026) or (2036) traffic conditions; and

- Under future (2026) and (2036) traffic conditions, all of the unsignalized intersections analyzed as part of the study area operate well with no critical movements.

Option 2 for Creek Road & River Road Intersection

- Under the existing (2016) and future (2026 & 2036) Option 2 scenario for Creek Road and River Road, it is anticipated that the redistribution of traffic volumes through the unsignalized intersections of Wellandport Road with Creek Road and River Road will not adversely affect their operations. Under this scenario both intersections are forecast to operate well during both peak hours with no critical movements.
- Based on the redistributed traffic volumes under the Option 2 scenario, an exclusive eastbound left turn lane is not warranted for the intersection of Wellandport Road and River Road under either existing (2016) or future (2026 & 2036) traffic conditions.

Creek Road & Wellandport Road – All-Way Stop Control Warrants – Existing Configuration

- The results of an All-way Stop Control Warrant analysis conducted for the existing (2016) traffic scenario under the existing roadway configuration indicates that an All-way Stop Control is not warranted.
- Under the future (2026 & 2036) traffic scenarios with the existing roadway configuration, condition 1 for vehicle volume is met however condition 2 does not satisfy the requirements. Therefore, an All-way Stop is not warranted under future conditions.

Creek Road & Wellandport Road – All-Way Stop Warrants – Option 2 Scenario

- The results of an All-way Stop Warrant analysis conducted for the existing (2016) traffic scenario under the Option 2 roadway configuration for Creek Road and River Road also indicates that an All-way Stop is not warranted. The implementation of an all-way stop control under these conditions could cause increased delay for traffic along major road. It is recommended, however, that the intersection be monitored in the future to determine the requirements for an All-way stop control at this intersection
- Under the future (2026 & 2036) traffic scenarios with the Option 2 configuration, condition 1 for vehicle volume is met however condition 2 does not satisfy the requirements. Therefore, an All-way Stop is not warranted under future conditions under this option. The implementation of an all-way stop under these conditions could cause increased delay for traffic along the major road. It is recommended, however, that the intersection be further monitored in the future to determine the requirements for an All-way stop control.

Appendix A

Existing 2016 Turning Movement Count Data

Turning Movements Report - AM Period

Location..... Canborough Road @ Regional Road 45

Geoid..... 00465

Municipality. WAINFLEET

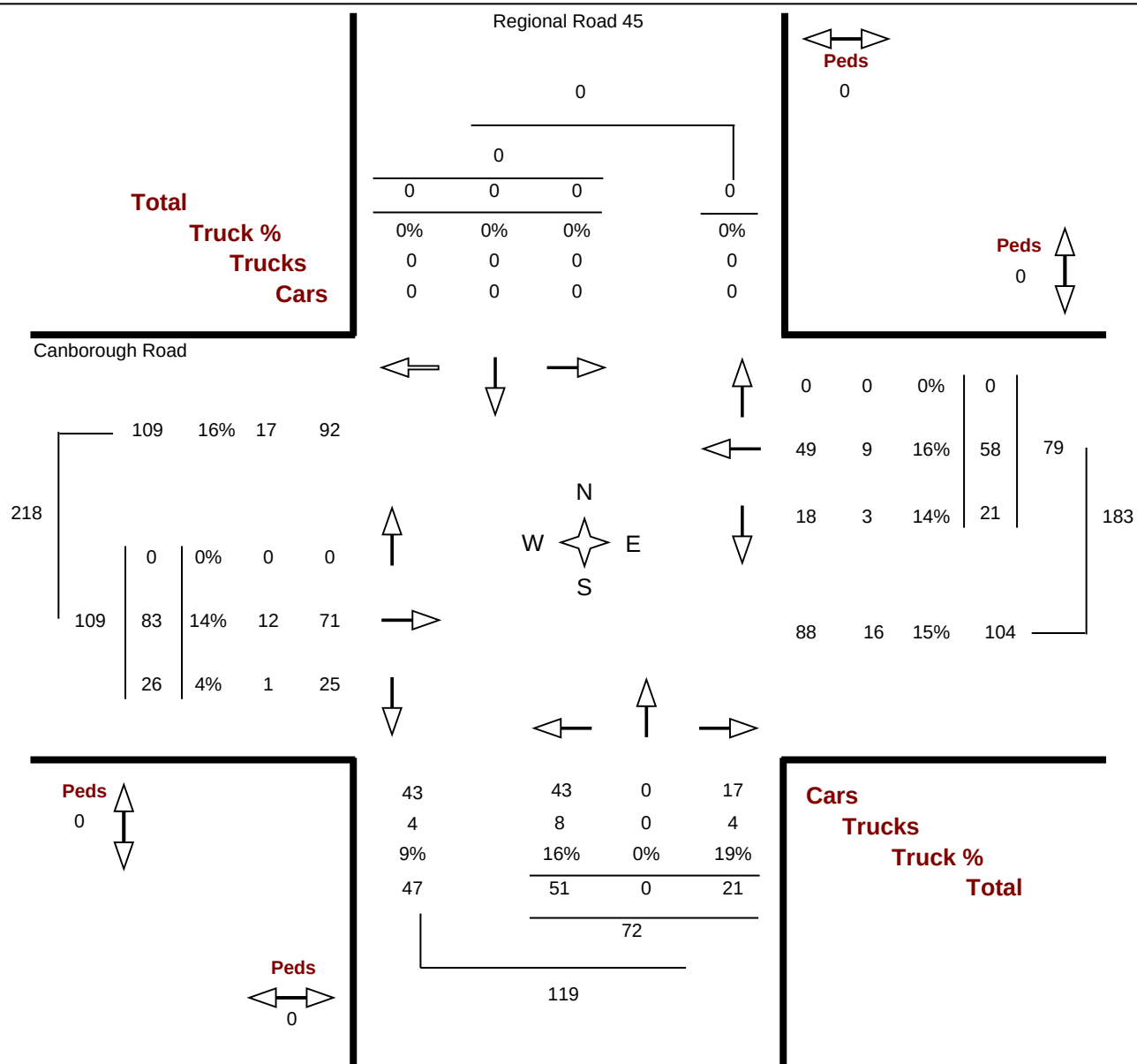
Count Date. Friday, 16 September, 2016

Traffic Cont. Stop sign

Count Time. 07:00 AM — 09:00 AM

Major Dir..... None

Peak Hour.. 07:15 AM — 08:15 AM



Turning Movements Report - PM Period

Location..... Canborough Road @ Regional Road 45

GeoID..... 00465

Municipality. WAINFLEET

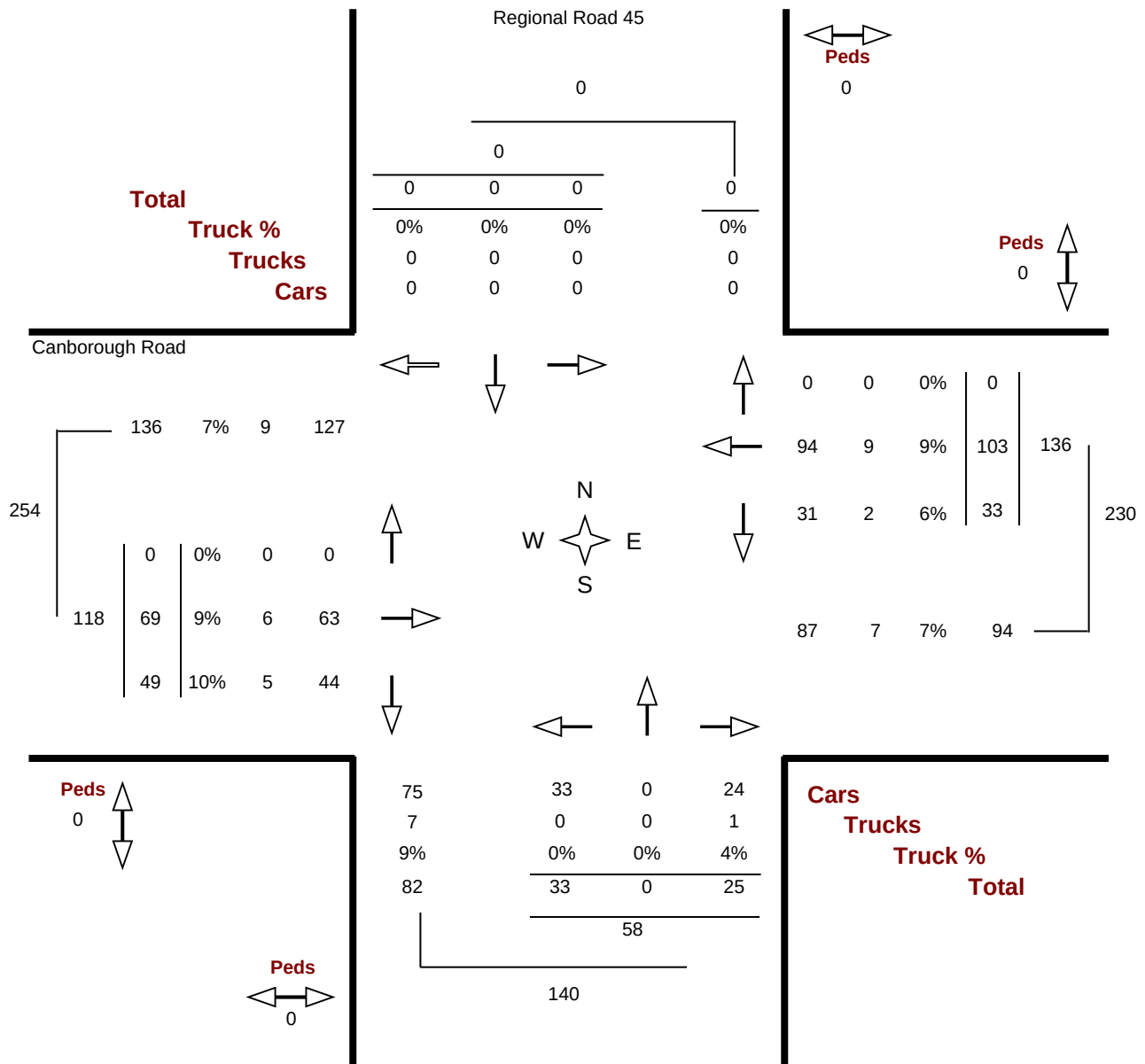
Count Date. Friday, 16 September, 2016

Traffic Cont. Stop sign

Count Time. 03:00 PM — 06:00 PM

Major Dir..... None

Peak Hour.. 04:45 PM — 05:45 PM



Turning Movements Report - AM Period

Location..... Diltz Road @ Regional Road 45

GeoID..... 00634

Municipality. WAINFLEET

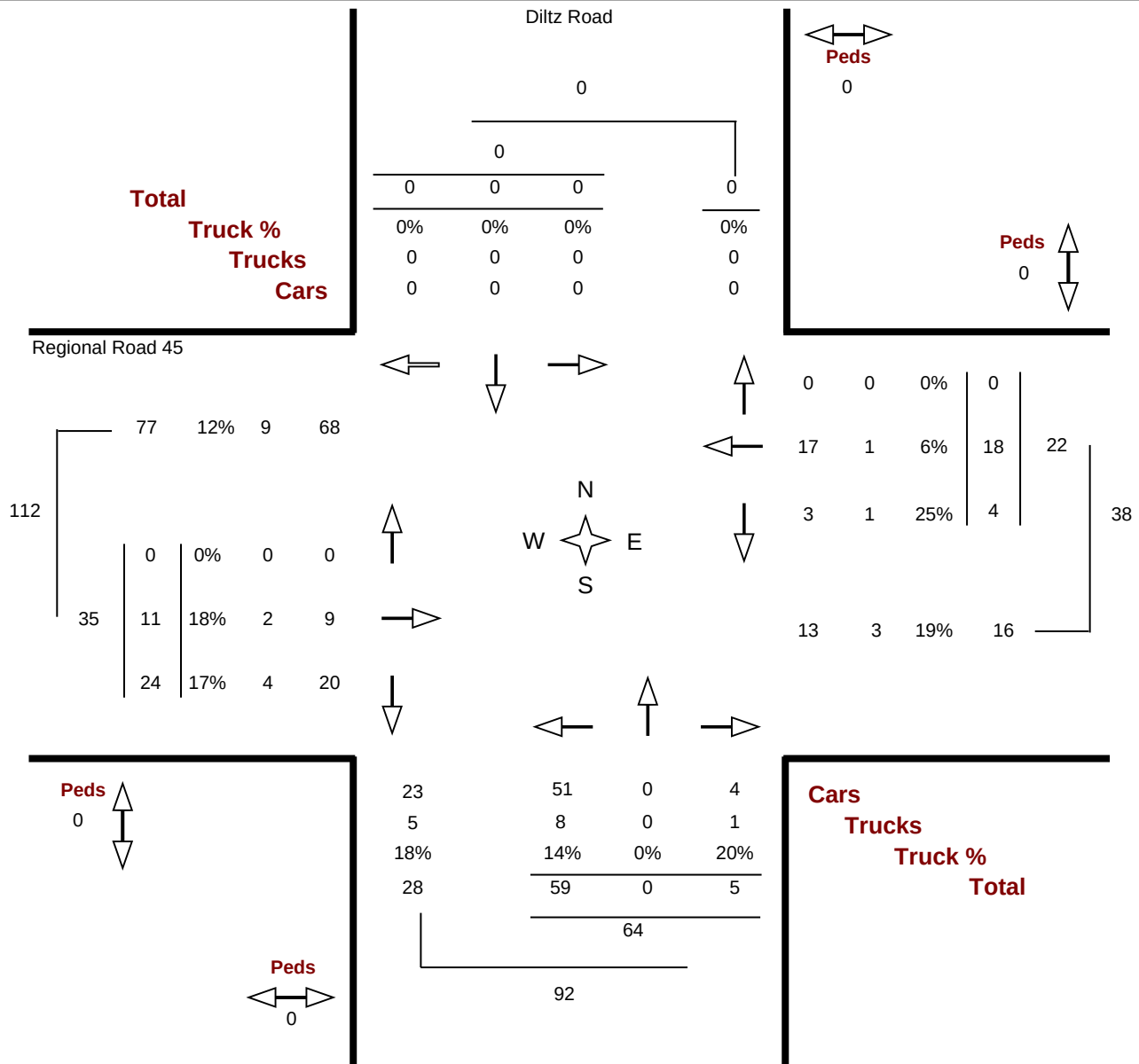
Count Date. Thursday, 15 September, 2016

Traffic Cont. Stop sign

Count Time. 07:00 AM — 09:00 AM

Major Dir..... None

Peak Hour.. 07:00 AM — 08:00 AM



Turning Movements Report - PM Period

Location..... Diltz Road @ Regional Road 45

GeoID..... 00634

Municipality. WAINFLEET

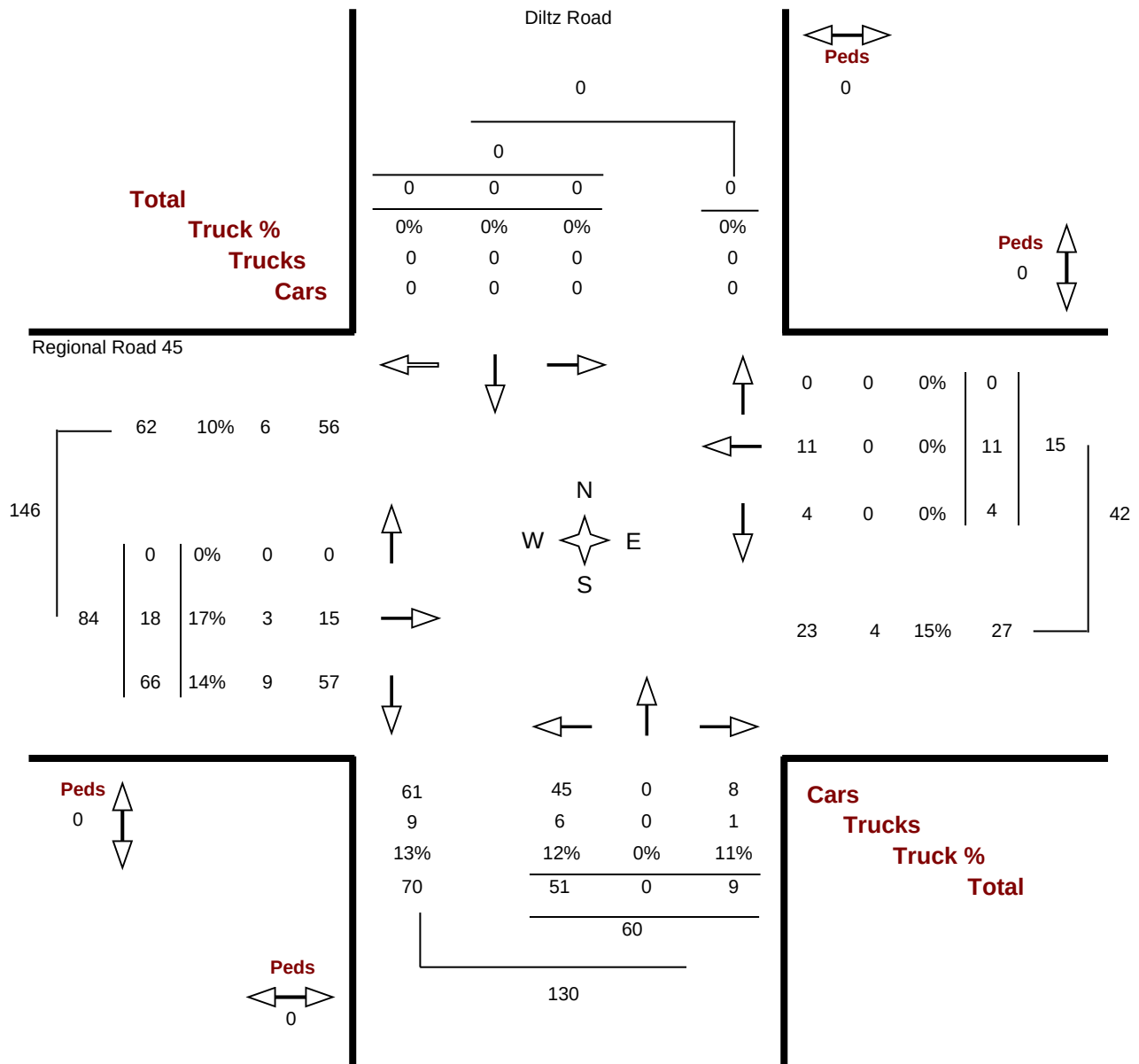
Count Date. Thursday, 15 September, 2016

Traffic Cont. Stop sign

Count Time. 03:00 PM — 06:00 PM

Major Dir..... None

Peak Hour.. 04:00 PM — 05:00 PM



RR 45 @ Chippawa Creek Conservation

Mid-day Peak Diagram

Specified Period

From: 11:00:00

To: 15:00:00

One Hour Peak

From: 14:00:00

To: 15:00:00

Municipality: Wainfleet

Site #: 0000000001

Intersection: RR 45 & Chippawa Conservation

TFR File #: 4

Count date: 8-Oct-2016

Weather conditions:

Sunny/Wet

Person(s) who counted:

Ken

** Non-Signalized Intersection **

Major Road: RR 45 runs W/E

North Leg Total: 43

North Entering: 18

North Peds: 0

Peds Cross: 0

	Cyclists	Trucks	Cars	Totals
North	0	0	0	0
East	0	1	1	2
South	7	10	17	24
West	7	11	17	25



	Cyclists	Trucks	Cars	Totals
North	0	2	23	25
East	0	2	23	25
South	0	2	23	25
West	0	2	23	25

East Leg Total: 72
East Entering: 40
East Peds: 0
Peds Cross: 0

Cyclists	Trucks	Cars	Totals
1	1	27	29

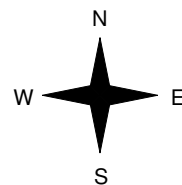


RR 45

Cyclists	Trucks	Cars	Totals
0	0	7	7
1	0	20	21
1	0	27	28



Chippawa Conservation



Cars	Trucks	Cyclists	Totals
16	2	0	18
20	1	1	22
36	3	1	40



RR 45



Cars	Trucks	Cyclists	Totals
30	1	1	32

Peds Cross: 0

West Peds: 1

West Entering: 28

West Leg Total: 57

Comments

RR 45 @ Chippawa Creek Conservation

Total Count Diagram

Municipality: Wainfleet

Site #: 0000000001

Intersection: RR 45 & Chippawa Conservation

TFR File #: 4

Count date: 8-Oct-2016

Weather conditions:

Sunny/Wet

Person(s) who counted:

Ken

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

Major Road: RR 45 runs W/E

North Leg Total: 144

North Entering: 61

North Peds: 0

Peds Cross: $\times$

	Cyclists	Trucks	Cars	Totals
0	0	4	31	35
0	0	7	54	61
0	0	7	74	83



	Cyclists	Trucks	Cars	Totals
2	7	74	83	

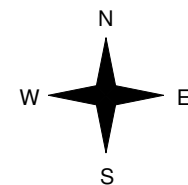
East Leg Total: 231
East Entering: 125
East Peds: 0
Peds Cross: $\times$

Cyclists	Trucks	Cars	Totals
2	8	84	94



RR 45

Cyclists	Trucks	Cars	Totals
0	2	24	26
2	4	65	71
2	6	89	



Chippawa Conservation

Cars	Trucks	Cyclists	Totals
50	5	2	57
61	5	2	68
111	10	4	



RR 45



Cars	Trucks	Cyclists	Totals
96	8	2	106

Peds Cross: $\times$

West Peds: 1

West Entering: 97

West Leg Total: 191

Comments

Turning Movements Report - AM Period

Location..... Regional Road 45 @ Wellandport Road

GeoID..... 00976

Municipality. WAINFLEET

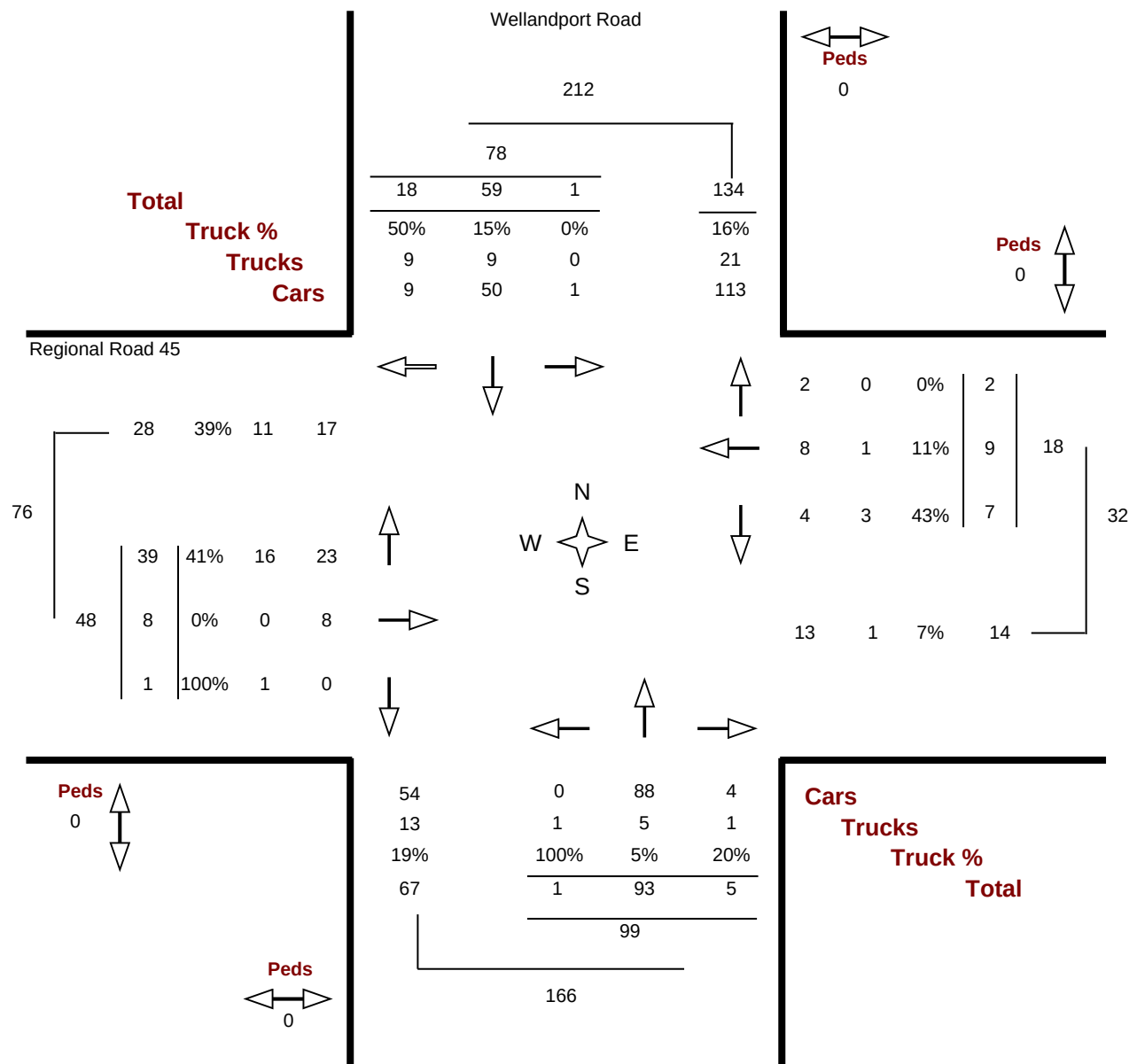
Count Date. Wednesday, 14 September, 2016

Traffic Cont. Two-way Stop

Count Time. 07:00 AM — 09:00 AM

Major Dir..... None

Peak Hour.. 07:45 AM — 08:45 AM



Turning Movements Report - PM Period

Location..... Regional Road 45 @ Wellandport Road

GeoID..... 00976

Municipality. WAINFLEET

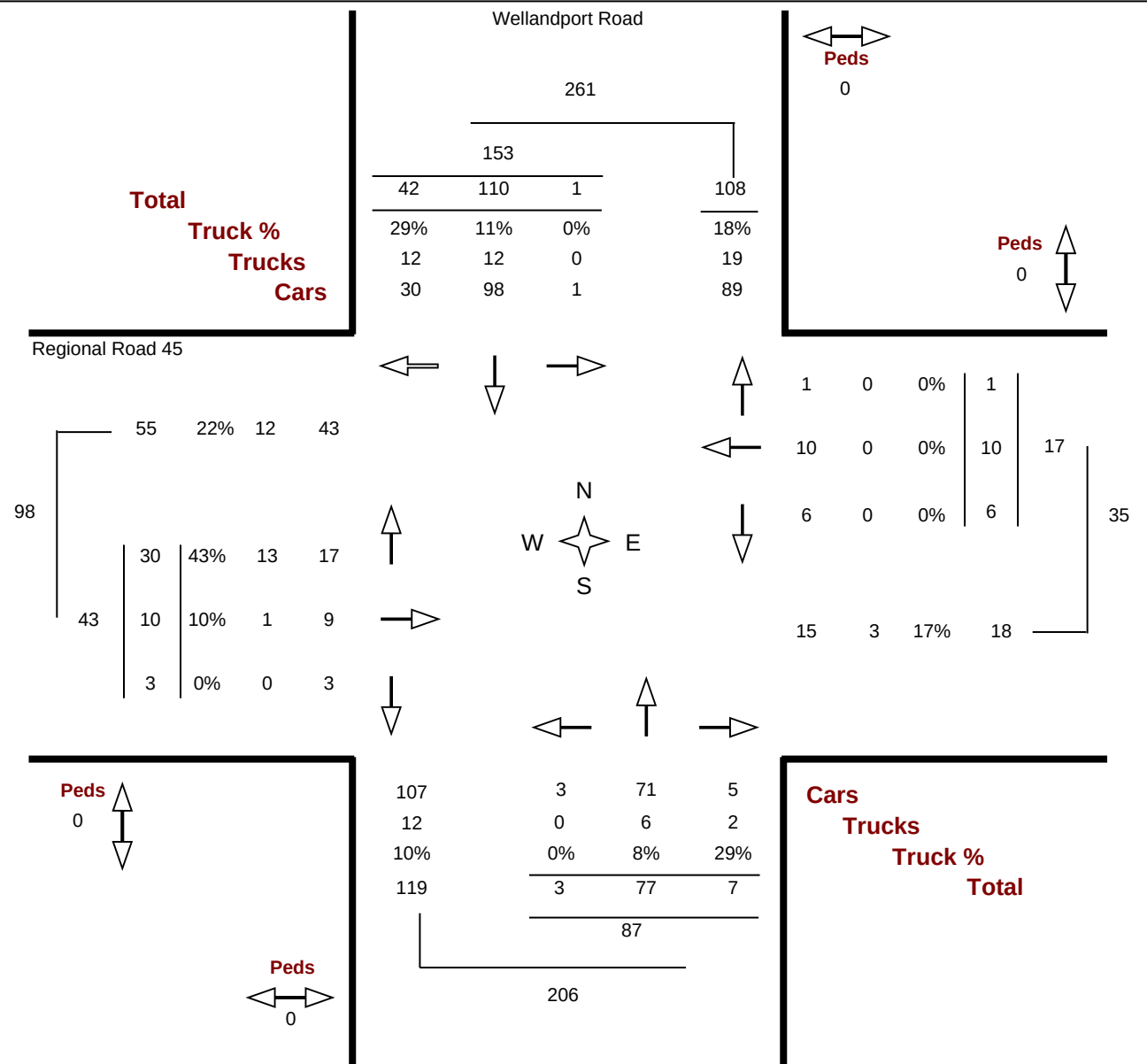
Count Date. Wednesday, 14 September, 2016

Traffic Cont. Two-way Stop

Count Time. 03:00 PM — 06:00 PM

Major Dir..... None

Peak Hour.. 04:45 PM — 05:45 PM



Turning Movements Report - AM Period

Location..... Regional Road 27 @ Regional Road 45

GeoID..... 00978

Municipality. WAINFLEET

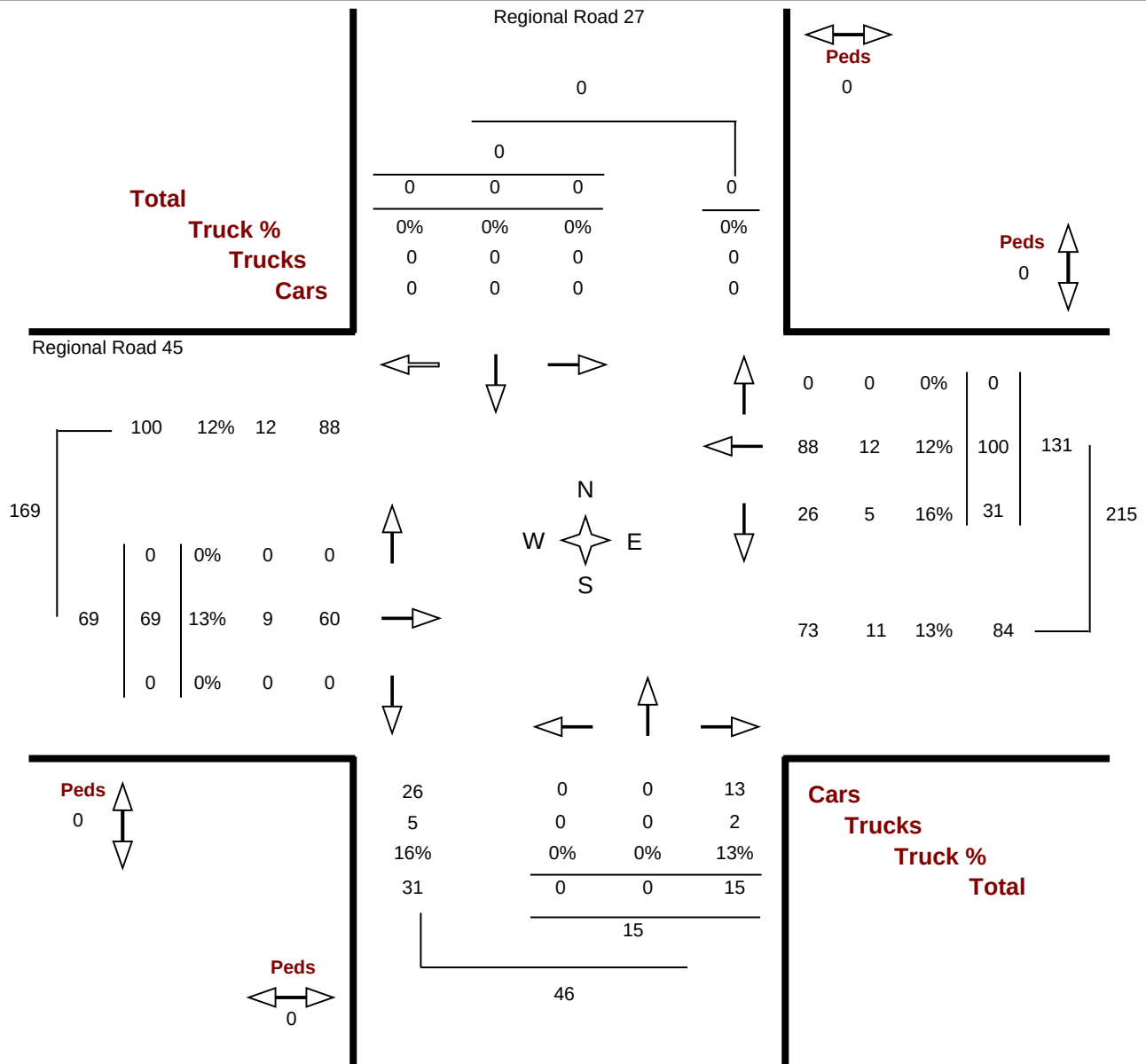
Count Date. Monday, 19 September, 2016

Traffic Cont. Stop sign

Count Time. 07:00 AM — 09:00 AM

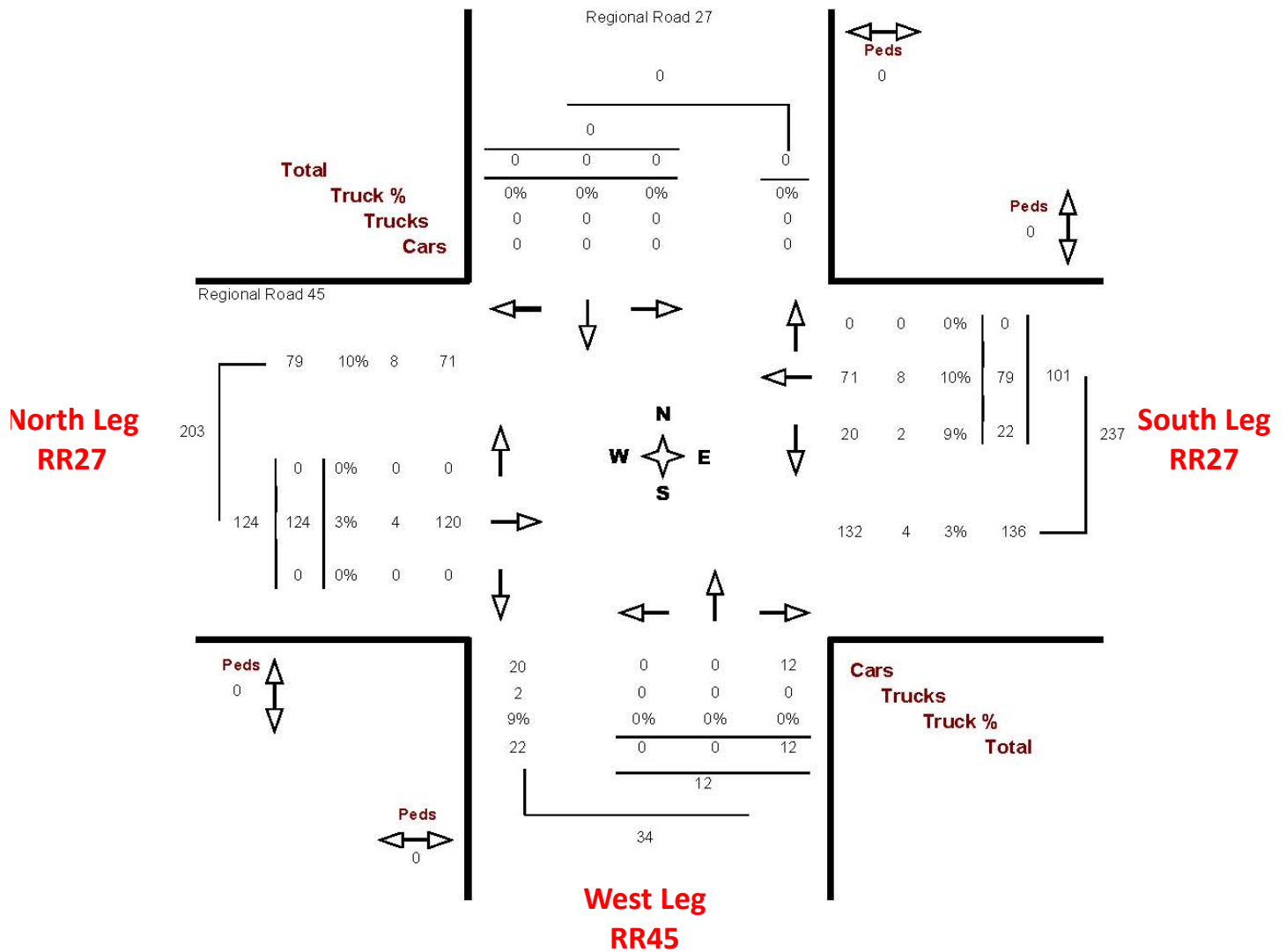
Major Dir..... None

Peak Hour.. 07:15 AM — 08:15 AM



Location..... Regional Road 27 @ Regional Road 45
Municipality. WAINFLEET
Traffic Cont. Stop sign
Major Dir..... None

GeolD..... 00978
Count Date. Monday, 19 September, 2016
Count Time. 03:00 PM — 06:00 PM
Peak Hour.. 04:45 PM — 05:45 PM



Turning Movements Report - AM Period

Location..... Regional Road 27 @ Wellandport Road

Geoid..... 00977

Municipality. WAINFLEET

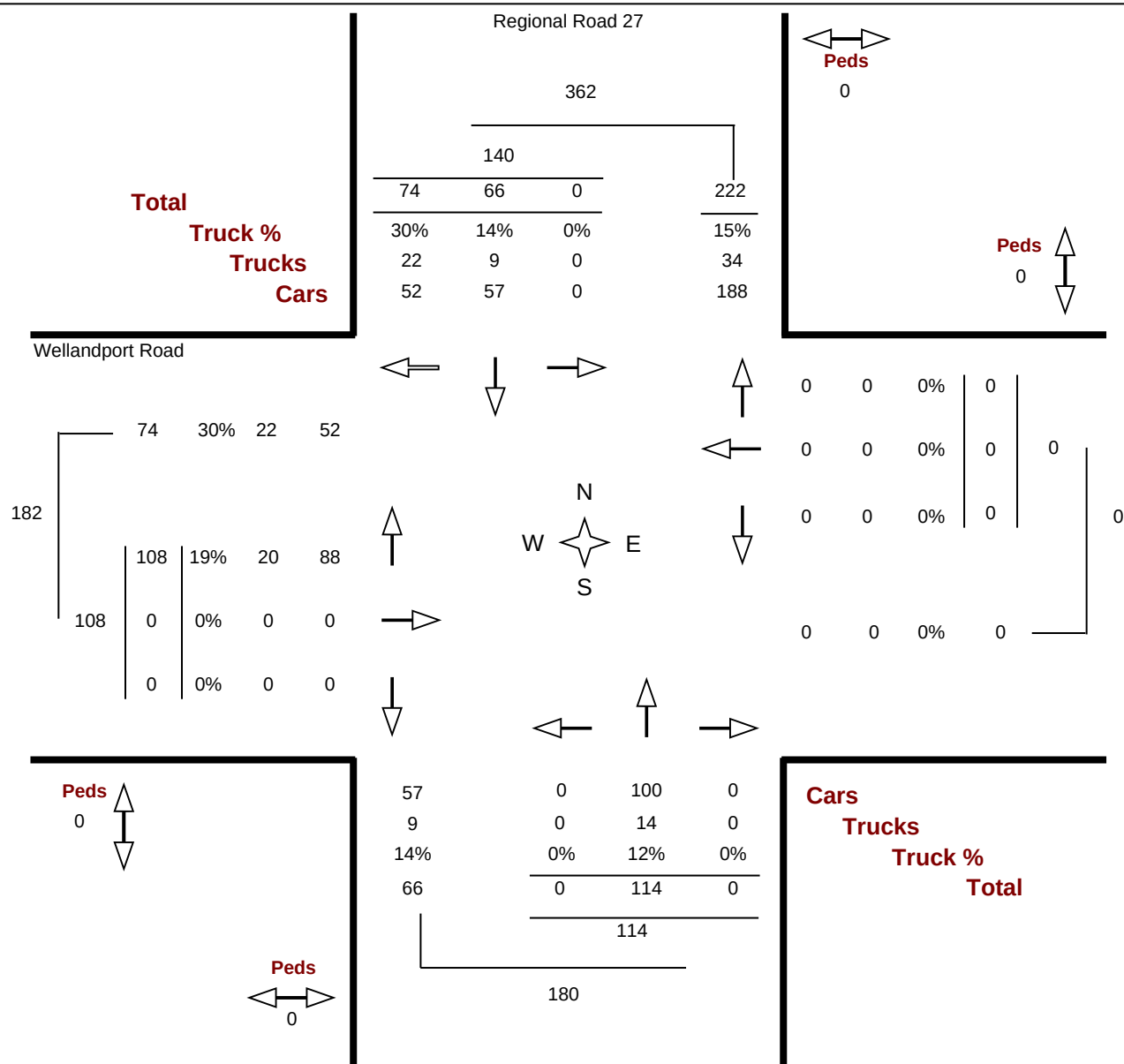
Count Date. Tuesday, 13 September, 2016

Traffic Cont. Stop sign

Count Time. 07:00 AM — 09:00 AM

Major Dir..... None

Peak Hour.. 07:15 AM — 08:15 AM



Turning Movements Report - PM Period

Location..... Regional Road 27 @ Wellandport Road

GeoID..... 00977

Municipality. WAINFLEET

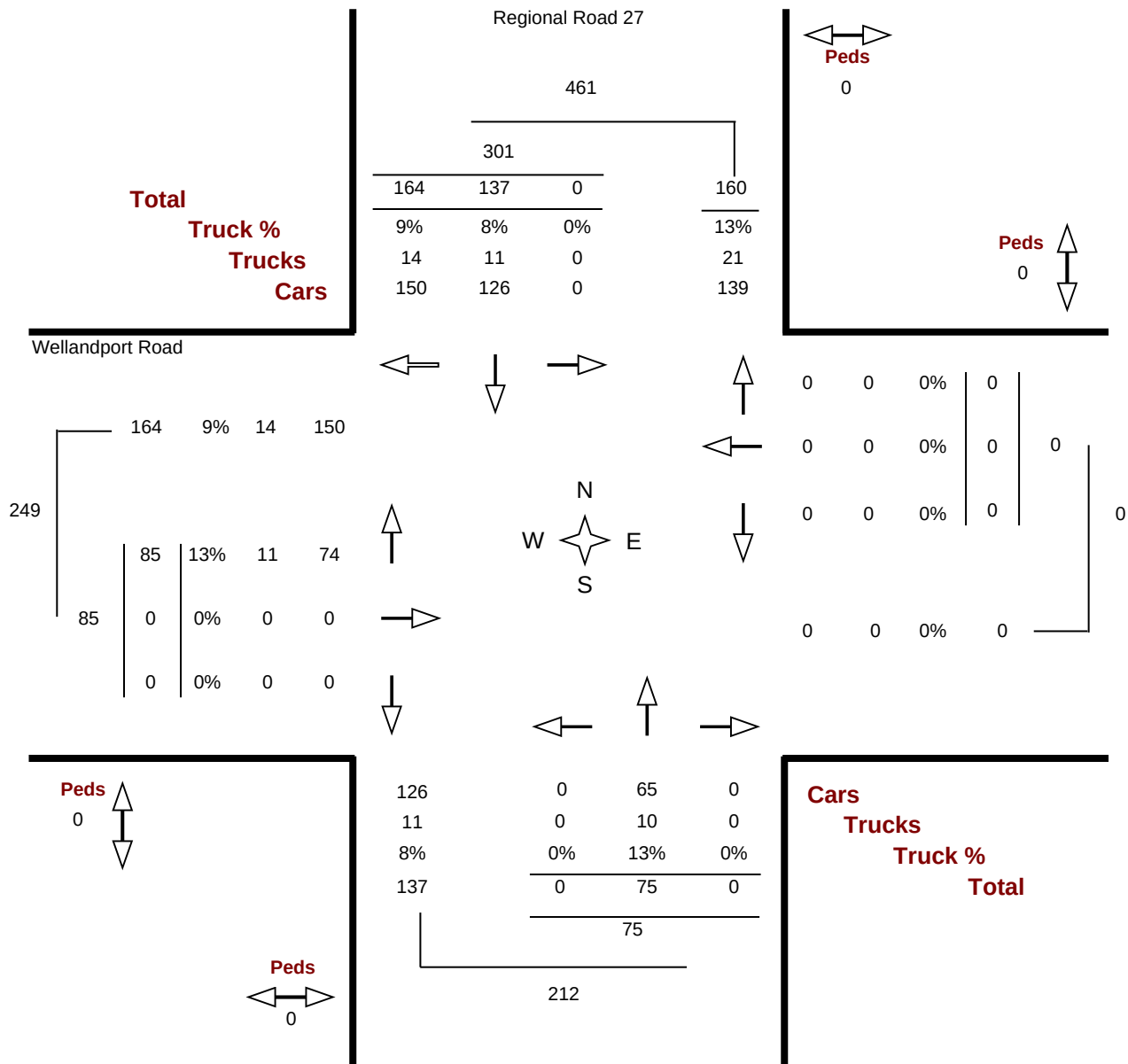
Count Date. Tuesday, 13 September, 2016

Traffic Cont. Stop sign

Count Time. 03:00 PM — 06:00 PM

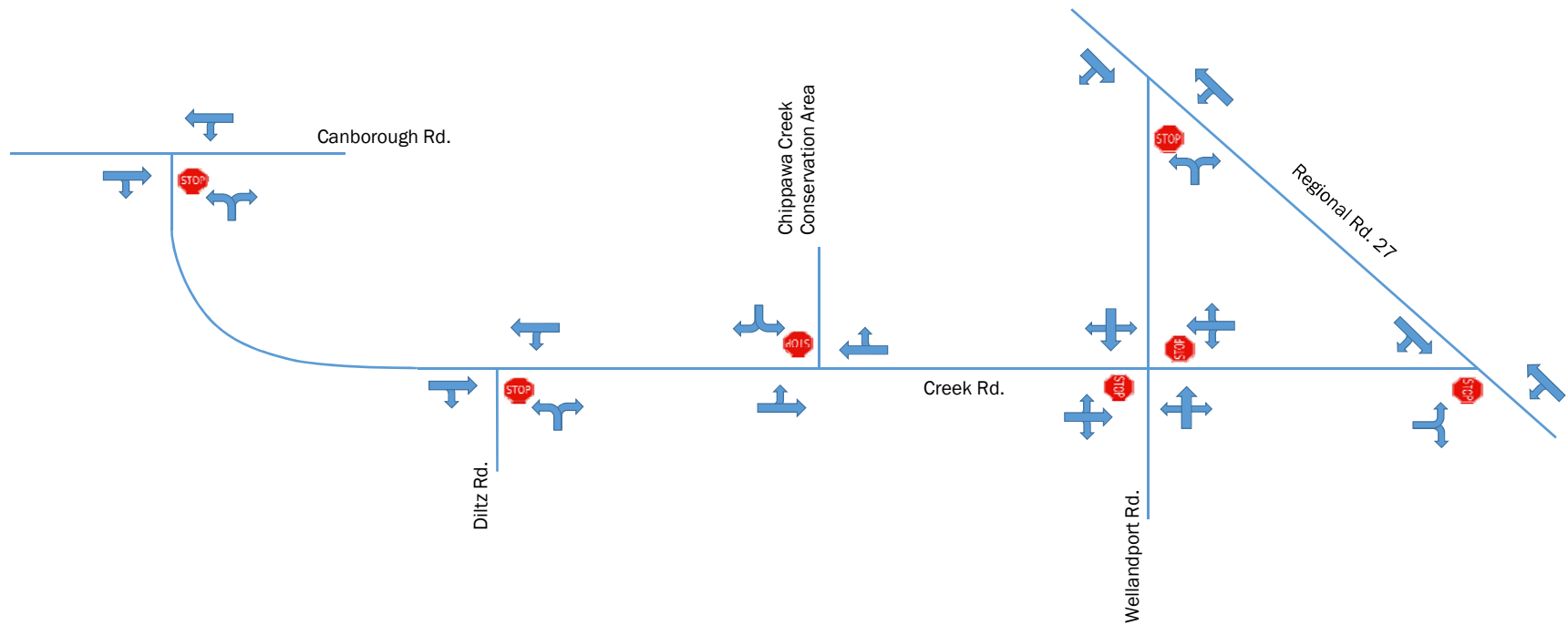
Major Dir..... None

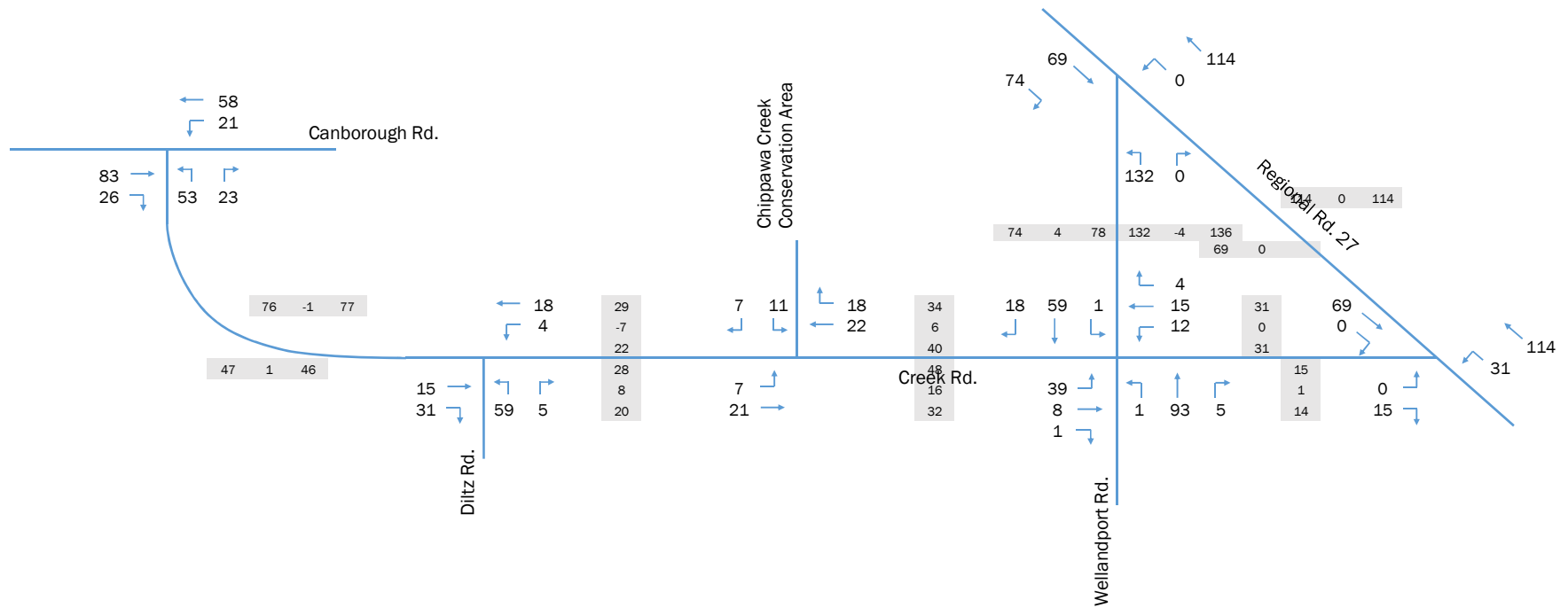
Peak Hour.. 04:45 PM — 05:45 PM



Appendix B

**Existing (2016) Weekday AM & PM Traffic
Volumes and Existing Lane Configurations**





Appendix C

**Existing (2016) Weekday AM and PM Traffic
Analysis Synchro Output Sheets**

Creek Rd. EA - Traffic Study
1: Creek Rd. & Canborough Rd.

Existing 2016 Traffic Analysis
AM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	83	26	21	58	53	23
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	90	28	23	63	58	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			118		213	104
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			118		213	104
tC, single (s)			4.2		6.6	6.4
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.5
p0 queue free %			98		92	97
cM capacity (veh/h)			1398		733	906
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	118	86	83			
Volume Left	0	23	58			
Volume Right	28	0	25			
cSH	1700	1398	778			
Volume to Capacity	0.07	0.02	0.11			
Queue Length 95th (m)	0.0	0.4	2.7			
Control Delay (s)	0.0	2.1	10.2			
Lane LOS		A	B			
Approach Delay (s)	0.0	2.1	10.2			
Approach LOS			B			
Intersection Summary						
Average Delay			3.6			
Intersection Capacity Utilization		22.6%		ICU Level of Service		A
Analysis Period (min)		15				

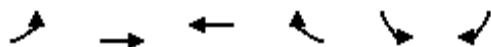
Creek Rd. EA - Traffic Study
4: Diltz Rd. & Creek Rd.

Existing 2016 Traffic Analysis
AM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	15	31	4	18	59	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	34	4	20	64	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			50		61	33
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			50		61	33
tC, single (s)			4.3		6.5	6.4
tC, 2 stage (s)						
tF (s)			2.4		3.6	3.5
p0 queue free %			100		93	99
cM capacity (veh/h)			1421		913	991
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	50	24	70			
Volume Left	0	4	64			
Volume Right	34	0	5			
cSH	1700	1421	919			
Volume to Capacity	0.03	0.00	0.08			
Queue Length 95th (m)	0.0	0.1	1.9			
Control Delay (s)	0.0	1.4	9.2			
Lane LOS		A	A			
Approach Delay (s)	0.0	1.4	9.2			
Approach LOS			A			
Intersection Summary						
Average Delay			4.7			
Intersection Capacity Utilization			15.3%	ICU Level of Service		A
Analysis Period (min)			15			

Creek Rd. EA - Traffic Study
10: Creek Rd. & Chippawa Creek Conservation Area

Existing 2016 Traffic Analysis
AM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	7	21	22	18	11	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	23	24	20	12	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	43				72	34
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	43				72	34
tC, single (s)	4.1				6.5	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.6	3.3
p0 queue free %	100				99	99
cM capacity (veh/h)	1578				911	1045
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	30	43	20			
Volume Left	8	0	12			
Volume Right	0	20	8			
cSH	1578	1700	959			
Volume to Capacity	0.00	0.03	0.02			
Queue Length 95th (m)	0.1	0.0	0.5			
Control Delay (s)	1.8	0.0	8.8			
Lane LOS	A		A			
Approach Delay (s)	1.8	0.0	8.8			
Approach LOS			A			
Intersection Summary						
Average Delay			2.5			
Intersection Capacity Utilization			17.8%	ICU Level of Service		A
Analysis Period (min)			15			

Creek Rd. EA - Traffic Study
17: Wellandport Rd. & Creek Rd.

Existing 2016 Traffic Analysis
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	39	8	1	12	15	4	1	93	5	1	59	18
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	42	9	1	13	16	4	1	101	5	1	64	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	195	185	74	188	192	104	84			107		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	195	185	74	188	192	104	84			107		
tC, single (s)	7.5	6.5	7.2	7.5	6.6	6.2	5.1			4.1		
tC, 2 stage (s)												
tF (s)	3.9	4.0	4.2	3.9	4.1	3.3	3.1			2.2		
p0 queue free %	94	99	100	98	98	100	100			100		
cM capacity (veh/h)	671	712	772	683	686	956	1069			1497		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	52	34	108	85								
Volume Left	42	13	1	1								
Volume Right	1	4	5	20								
cSH	679	711	1069	1497								
Volume to Capacity	0.08	0.05	0.00	0.00								
Queue Length 95th (m)	1.9	1.1	0.0	0.0								
Control Delay (s)	10.7	10.3	0.1	0.1								
Lane LOS	B	B	A	A								
Approach Delay (s)	10.7	10.3	0.1	0.1								
Approach LOS	B	B										
Intersection Summary												
Average Delay			3.3									
Intersection Capacity Utilization			18.4%		ICU Level of Service				A			
Analysis Period (min)			15									

Creek Rd. EA - Traffic Study
19: Regional Rd. 27 & Creek Rd.

Existing 2016 Traffic Analysis
AM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	15	31	114	69	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	16	34	124	75	0
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	266	75	75			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	266	75	75			
tC, single (s)	6.4	6.3	4.3			
tC, 2 stage (s)						
tF (s)	3.5	3.4	2.3			
p0 queue free %	100	98	98			
cM capacity (veh/h)	710	957	1440			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	16	158	75			
Volume Left	0	34	0			
Volume Right	16	0	0			
cSH	957	1440	1700			
Volume to Capacity	0.02	0.02	0.04			
Queue Length 95th (m)	0.4	0.5	0.0			
Control Delay (s)	8.8	1.8	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.8	1.8	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		1.7				
Intersection Capacity Utilization		25.0%		ICU Level of Service		A
Analysis Period (min)		15				

Creek Rd. EA - Traffic Study
20: Regional Rd. 27 & Wellandport Rd.

Existing 2016 Traffic Analysis
AM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	132	0	0	114	69	74
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	143	0	0	124	75	80
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	239	115	155			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	239	115	155			
tC, single (s)	6.6	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.7	3.3	2.2			
p0 queue free %	80	100	100			
cM capacity (veh/h)	713	943	1437			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	143	124	155			
Volume Left	143	0	0			
Volume Right	0	0	80			
cSH	713	1437	1700			
Volume to Capacity	0.20	0.00	0.09			
Queue Length 95th (m)	5.7	0.0	0.0			
Control Delay (s)	11.3	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	11.3	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		3.8				
Intersection Capacity Utilization		23.5%		ICU Level of Service	A	
Analysis Period (min)		15				

Creek Rd. EA - Traffic Study
1: Creek Rd. & Canborough Rd.

Existing 2016 Traffic Analysis
PM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	69	49	33	103	35	26
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	75	53	36	112	38	28
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			128		285	102
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			128		285	102
tC, single (s)			4.2		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.3		3.5	3.3
p0 queue free %			97		94	97
cM capacity (veh/h)			1433		691	948
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	128	148	66			
Volume Left	0	36	38			
Volume Right	53	0	28			
cSH	1700	1433	782			
Volume to Capacity	0.08	0.03	0.08			
Queue Length 95th (m)	0.0	0.6	2.1			
Control Delay (s)	0.0	2.0	10.0			
Lane LOS		A	B			
Approach Delay (s)	0.0	2.0	10.0			
Approach LOS			B			
Intersection Summary						
Average Delay			2.8			
Intersection Capacity Utilization		25.0%		ICU Level of Service		A
Analysis Period (min)			15			

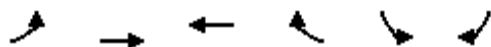
Creek Rd. EA - Traffic Study
4: Diltz Rd. & Creek Rd.

Existing 2016 Traffic Analysis
PM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	18	66	4	11	51	9
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	72	4	12	55	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			91		76	55
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			91		76	55
tC, single (s)			4.1		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.4
p0 queue free %			100		94	99
cM capacity (veh/h)			1516		900	986
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	91	16	65			
Volume Left	0	4	55			
Volume Right	72	0	10			
cSH	1700	1516	912			
Volume to Capacity	0.05	0.00	0.07			
Queue Length 95th (m)	0.0	0.1	1.8			
Control Delay (s)	0.0	2.0	9.2			
Lane LOS		A	A			
Approach Delay (s)	0.0	2.0	9.2			
Approach LOS			A			
Intersection Summary						
Average Delay			3.7			
Intersection Capacity Utilization			15.8%	ICU Level of Service		A
Analysis Period (min)			15			

Creek Rd. EA - Traffic Study
10: Creek Rd. & Chippawa Creek Conservation Area

Existing 2016 Traffic Analysis
PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	7	21	22	18	11	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	23	24	20	12	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	43				72	34
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	43				72	34
tC, single (s)	4.1				6.5	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.6	3.3
p0 queue free %	100				99	99
cM capacity (veh/h)	1578				911	1045
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	30	43	20			
Volume Left	8	0	12			
Volume Right	0	20	8			
cSH	1578	1700	959			
Volume to Capacity	0.00	0.03	0.02			
Queue Length 95th (m)	0.1	0.0	0.5			
Control Delay (s)	1.8	0.0	8.8			
Lane LOS	A		A			
Approach Delay (s)	1.8	0.0	8.8			
Approach LOS			A			
Intersection Summary						
Average Delay			2.5			
Intersection Capacity Utilization			17.8%	ICU Level of Service	A	
Analysis Period (min)			15			

Creek Rd. EA - Traffic Study
17: Wellandport Rd. & Creek Rd.

Existing 2016 Traffic Analysis
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	10	3	8	13	1	3	77	7	2	116	44
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	11	3	9	14	1	3	84	8	2	126	48
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	257	252	150	257	272	88	174			91		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	257	252	150	257	272	88	174			91		
tC, single (s)	7.5	6.6	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.9	4.1	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	98	100	99	98	100	100			100		
cM capacity (veh/h)	607	635	902	687	636	976	1415			1516		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	47	24	95	176								
Volume Left	33	9	3	2								
Volume Right	3	1	8	48								
cSH	628	664	1415	1516								
Volume to Capacity	0.07	0.04	0.00	0.00								
Queue Length 95th (m)	1.8	0.9	0.1	0.0								
Control Delay (s)	11.2	10.6	0.3	0.1								
Lane LOS	B	B	A	A								
Approach Delay (s)	11.2	10.6	0.3	0.1								
Approach LOS	B	B										
Intersection Summary												
Average Delay			2.4									
Intersection Capacity Utilization			21.8%	ICU Level of Service					A			
Analysis Period (min)			15									

Creek Rd. EA - Traffic Study
19: Regional Rd. 27 & Creek Rd.

Existing 2016 Traffic Analysis
PM Peak Hour

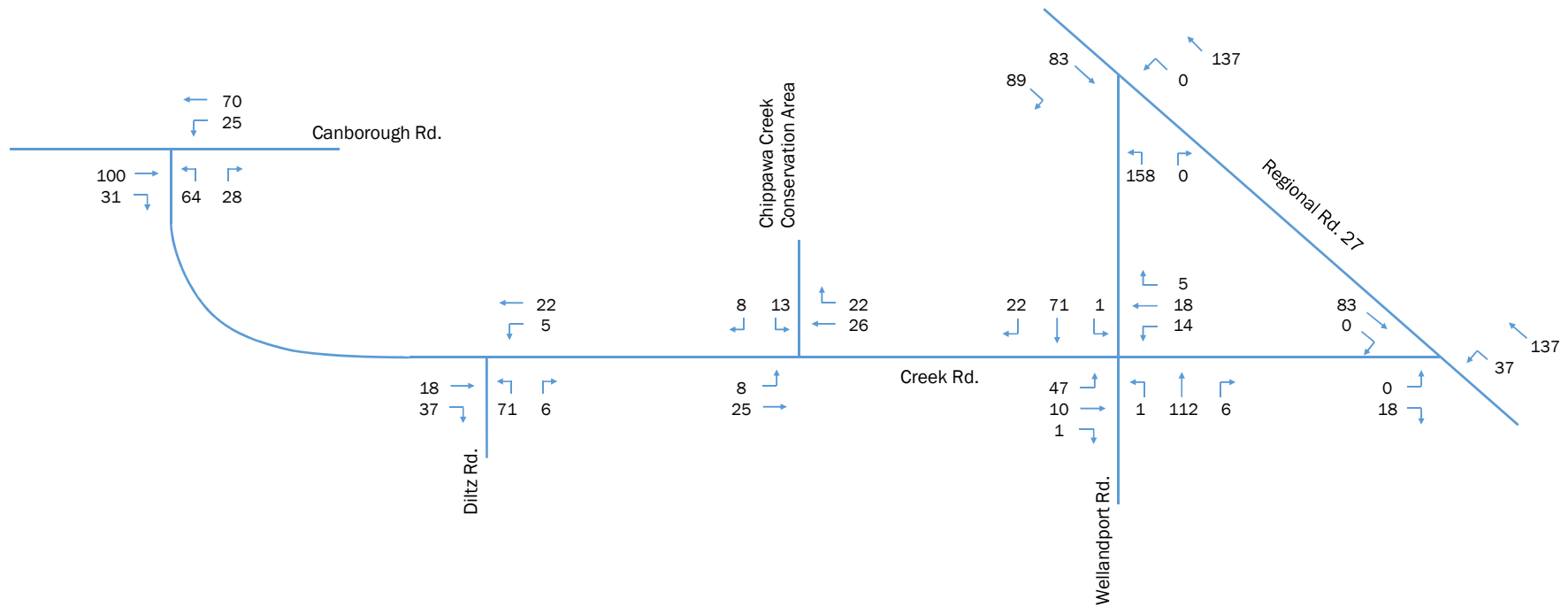
						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	19	22	79	137	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	21	24	86	149	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	283	149	149			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	283	149	149			
tC, single (s)	6.4	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.3			
p0 queue free %	100	98	98			
cM capacity (veh/h)	700	903	1391			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	21	110	149			
Volume Left	0	24	0			
Volume Right	21	0	0			
cSH	903	1391	1700			
Volume to Capacity	0.02	0.02	0.09			
Queue Length 95th (m)	0.5	0.4	0.0			
Control Delay (s)	9.1	1.8	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.1	1.8	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		1.4				
Intersection Capacity Utilization		27.0%		ICU Level of Service		A
Analysis Period (min)		15				

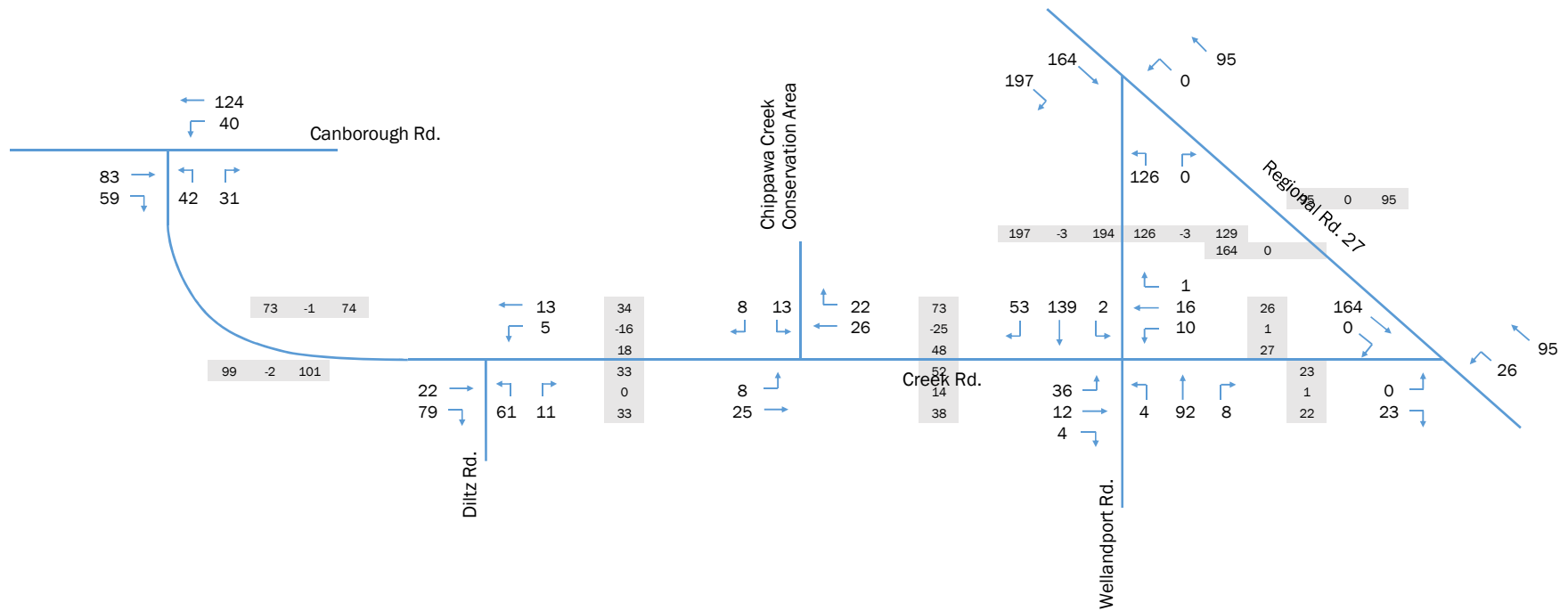


Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	105	0	0	79	137	164
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	114	0	0	86	149	178
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	324	238	327			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	324	238	327			
tC, single (s)	6.5	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.3	2.2			
p0 queue free %	82	100	100			
cM capacity (veh/h)	648	806	1244			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	114	86	327			
Volume Left	114	0	0			
Volume Right	0	0	178			
cSH	648	1244	1700			
Volume to Capacity	0.18	0.00	0.19			
Queue Length 95th (m)	4.8	0.0	0.0			
Control Delay (s)	11.7	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	11.7	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		2.5				
Intersection Capacity Utilization		31.7%		ICU Level of Service	A	
Analysis Period (min)		15				

Appendix D

Future (2026 & 2036) Weekday AM and PM Traffic Volumes





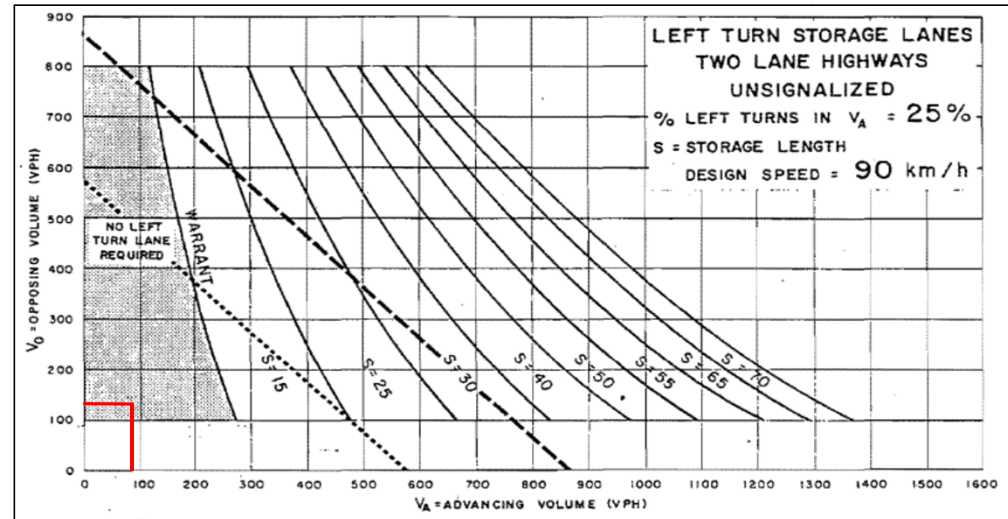
Appendix E

Left Turn Lane Warrants

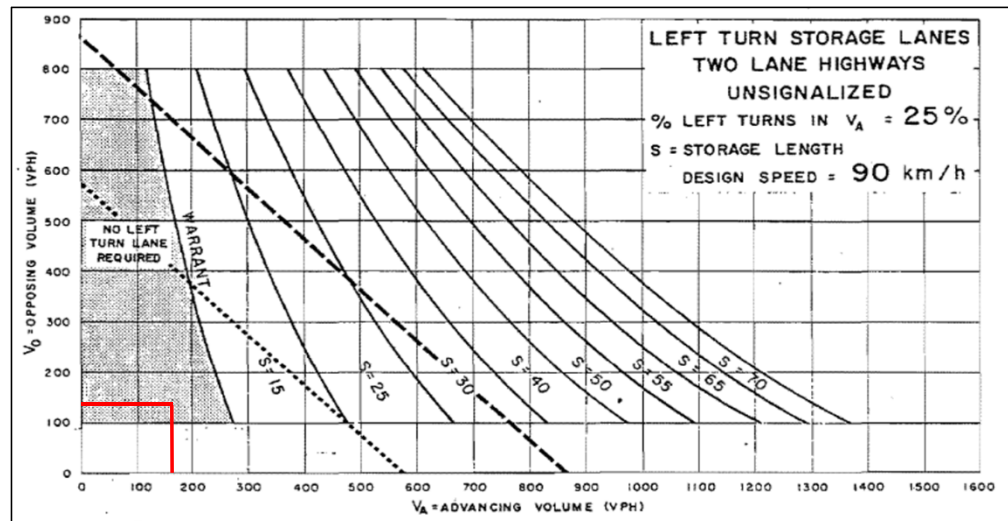
Regional Road 45 (Creek Road) & Regional Road 63 (Canborough Road)

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Westbound Left
Analysis Year:	Future 2026
Peak Hour:	AM Peak Hour
Posted Speed:	70 km/hr
Design Speed:	90 km/hr
$V_A =$	95
$V_O =$	131
$V_L =$	25
Percentage of Left Turning Traffic	26%
Left Turn Lane Warranted:	No
Required Length:	-



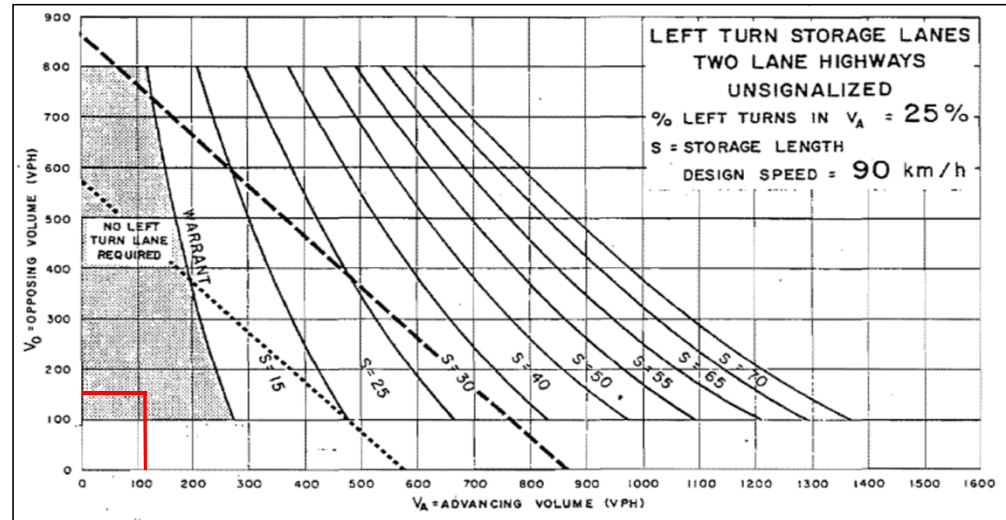
Direction:	Westbound Left
Analysis Year:	Future 2026
Peak Hour:	PM Peak Hour
Posted Speed:	70 km/hr
Design Speed:	90 km/hr
$V_A =$	164
$V_O =$	142
$V_L =$	40
Percentage of Left Turning Traffic	24%
Left Turn Lane Warranted:	No
Required Length:	-



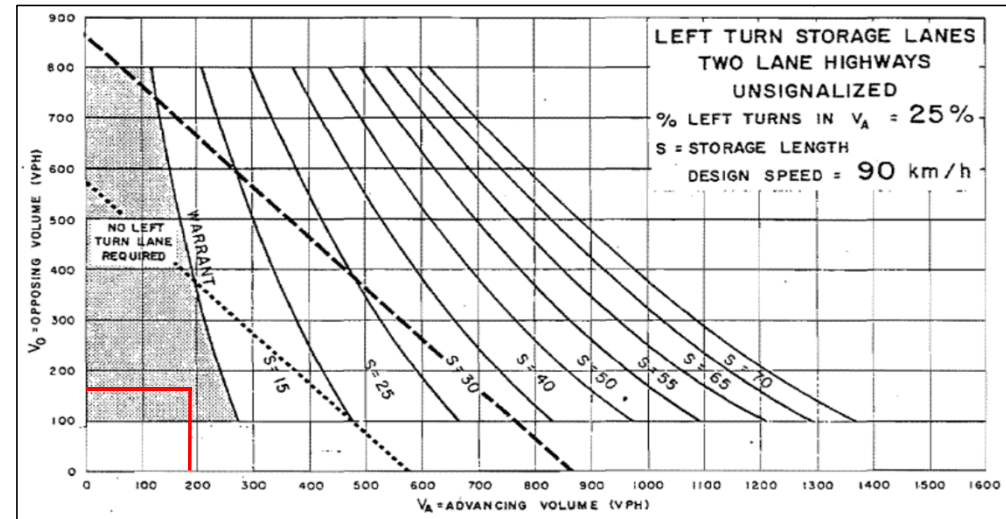
Regional Road 45 (Creek Road) & Regional Road 63 (Canborough Road)

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Northbound Left
Analysis Year:	Future 2036
Peak Hour:	AM Peak Hour
Posted Speed:	70 km/hr
Design Speed:	90 km/hr
V_A :	110
V_O :	152
V_L :	29
Percentage of Left Turning Traffic	26%
Left Turn Lane Warranted:	No
Required Length:	-



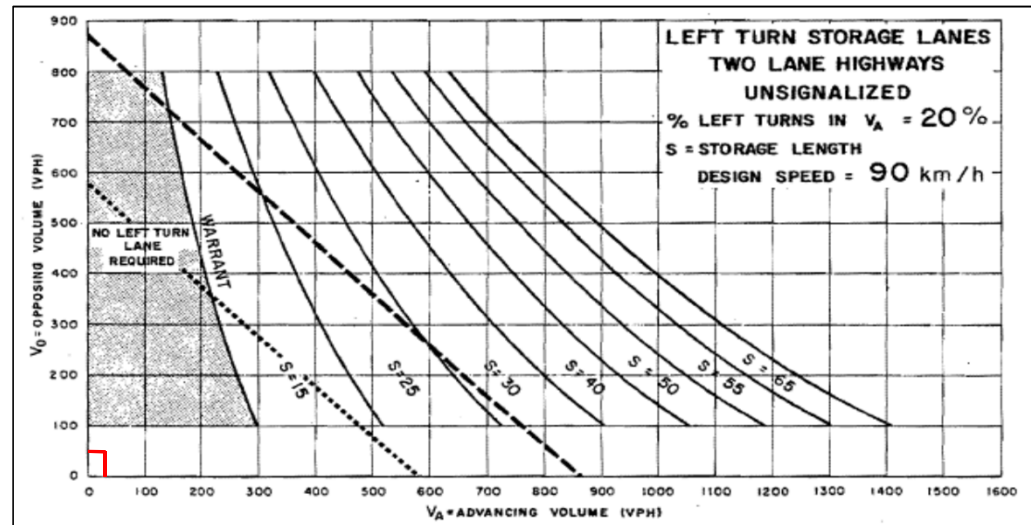
Direction:	Northbound Left
Analysis Year:	Future 2036
Peak Hour:	PM Peak Hour
Posted Speed:	70 km/hr
Design Speed:	90 km/hr
V_A :	190
V_O :	166
V_L :	46
Percentage of Left Turning Traffic	24%
Left Turn Lane Warranted:	No
Required Length:	-



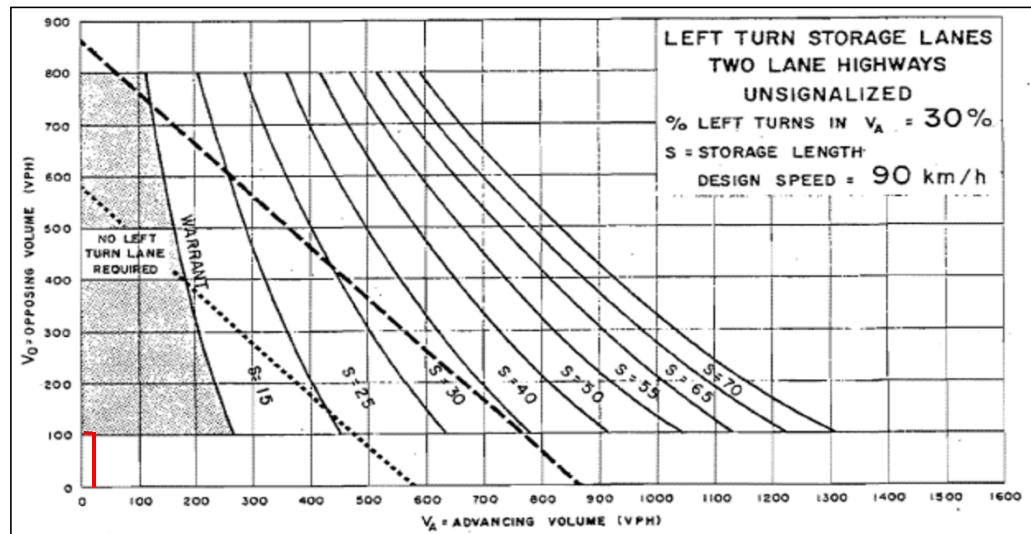
Regional Road 45 (Creek Road) & Diltz Road

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Westbound Left
Analysis Year:	Future 2026
Peak Hour:	AM Peak Hour
Posted Speed:	70 km/hr
Design Speed:	90 km/hr
V_A =	27
V_O =	55
V_L =	5
Percentage of Left Turning Traffic	19%
Left Turn Lane Warranted:	No
Required Length:	-



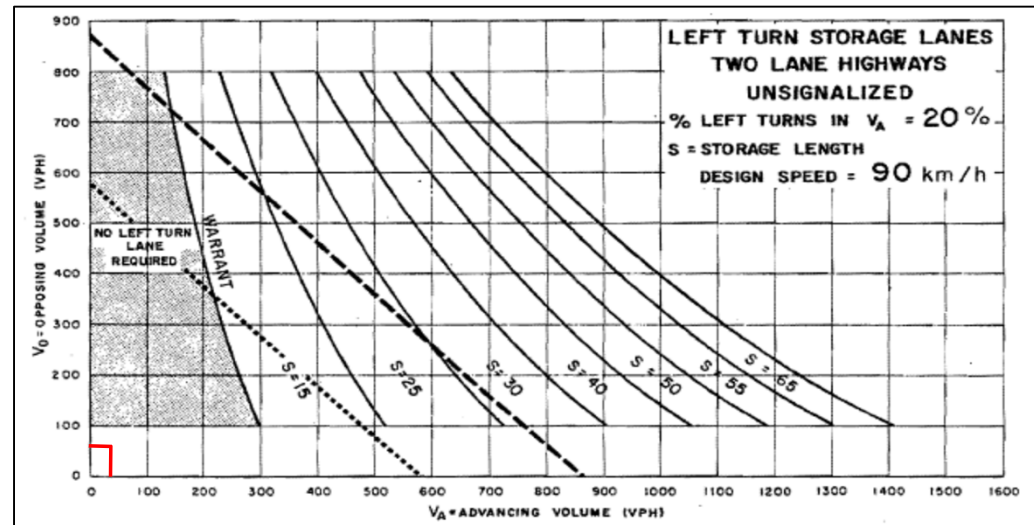
Direction:	Westbound Left
Analysis Year:	Future 2026
Peak Hour:	PM Peak Hour
Posted Speed:	70 km/hr
Design Speed:	90 km/hr
V_A =	18
V_O =	101
V_L =	5
Percentage of Left Turning Traffic	28%
Left Turn Lane Warranted:	No
Required Length:	-



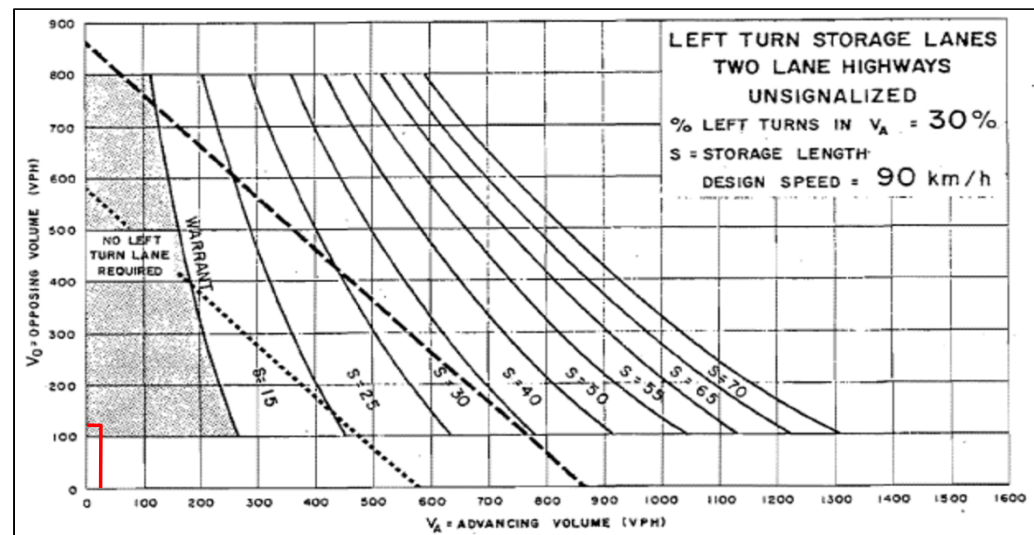
Regional Road 45 (Creek Road) & Diltz Road

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Westbound Left
Analysis Year:	Future 2036
Peak Hour:	AM Peak Hour
Posted Speed:	70 km/hr
Design Speed:	90 km/hr
V_A =	31
V_O =	64
V_L =	6
Percentage of Left Turning Traffic	19%
Left Turn Lane Warranted:	No
Required Length:	-



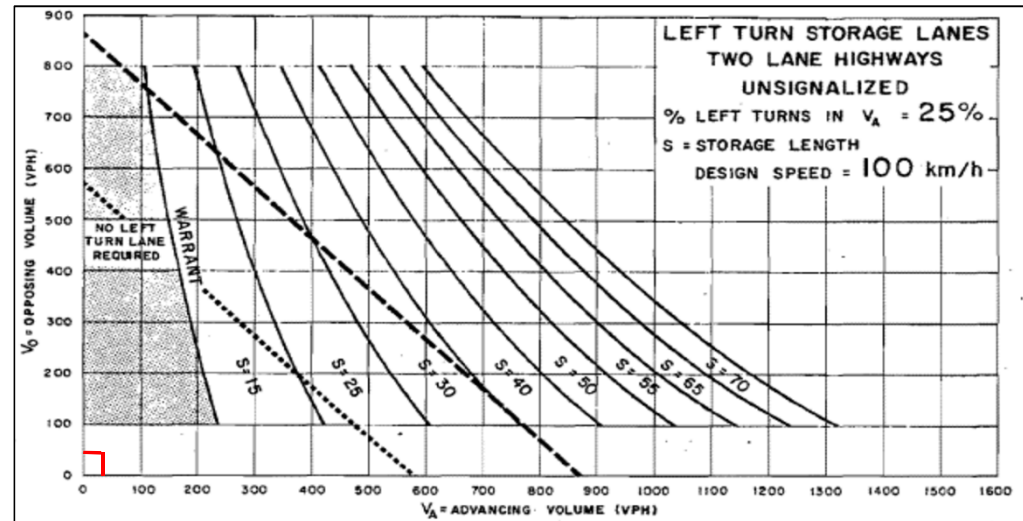
Direction:	Northbound Left
Analysis Year:	Future 2036
Peak Hour:	PM Peak Hour
Posted Speed:	70 km/hr
Design Speed:	90 km/hr
V_A =	21
V_O =	117
V_L =	6
Percentage of Left Turning Traffic	29%
Left Turn Lane Warranted:	No
Required Length:	-



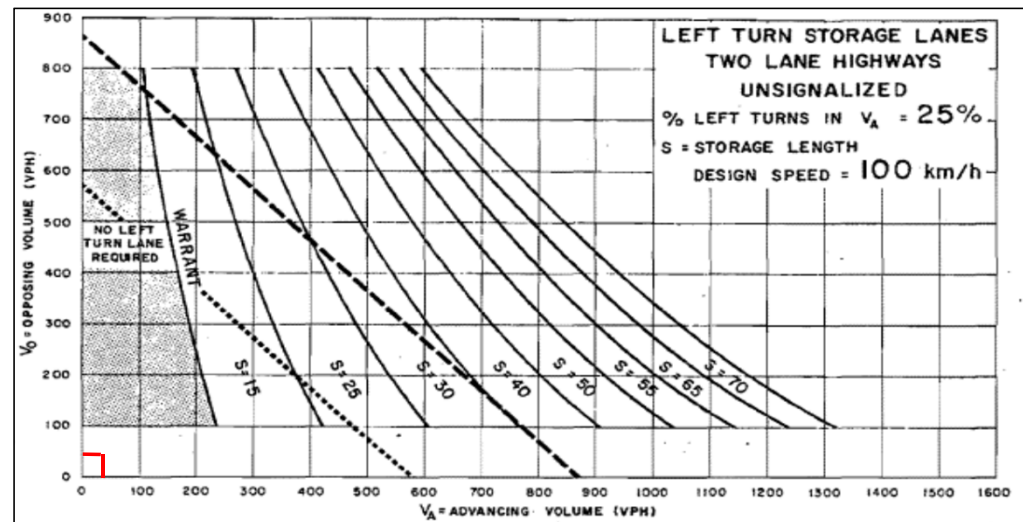
Regional Road 45 (Creek Road) & Chippawa Creek Area Entrance

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Eastbound Left
Analysis Year:	Future 2026
Peak Hour:	AM Peak Hour
Posted Speed:	80 km/hr
Design Speed:	100 km/hr
$V_A =$	33
$V_O =$	48
$V_L =$	8
Percentage of Left Turning Traffic	24%
Left Turn Lane Warranted:	No
Required Length:	-



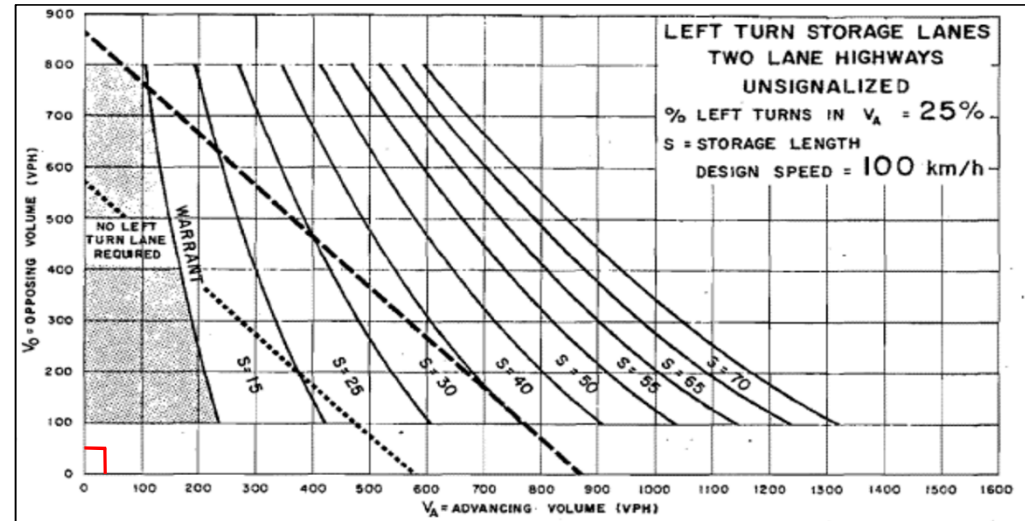
Direction:	Eastbound Left
Analysis Year:	Future 2026
Peak Hour:	PM Peak Hour
Posted Speed:	80 km/hr
Design Speed:	100 km/hr
$V_A =$	33
$V_O =$	48
$V_L =$	8
Percentage of Left Turning Traffic	24%
Left Turn Lane Warranted:	No
Required Length:	-



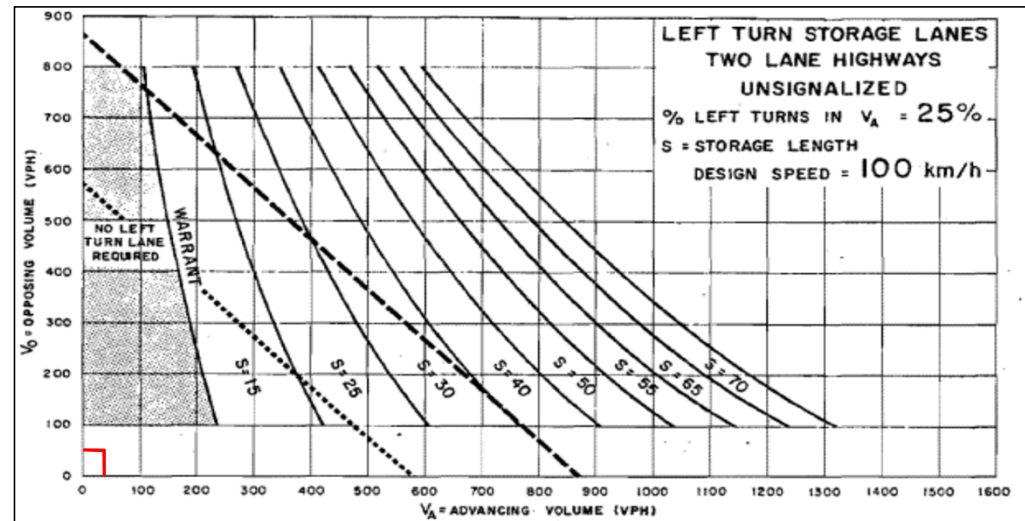
Regional Road 45 (Creek Road) & Chippawa Creek Area Entrance

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Eastbound Left
Analysis Year:	Future 2036
Peak Hour:	AM Peak Hour
Posted Speed:	80 km/hr
Design Speed:	100 km/hr
$V_A =$	39
$V_O =$	56
$V_L =$	10
Percentage of Left Turning Traffic	26%
Left Turn Lane Warranted:	No
Required Length:	-



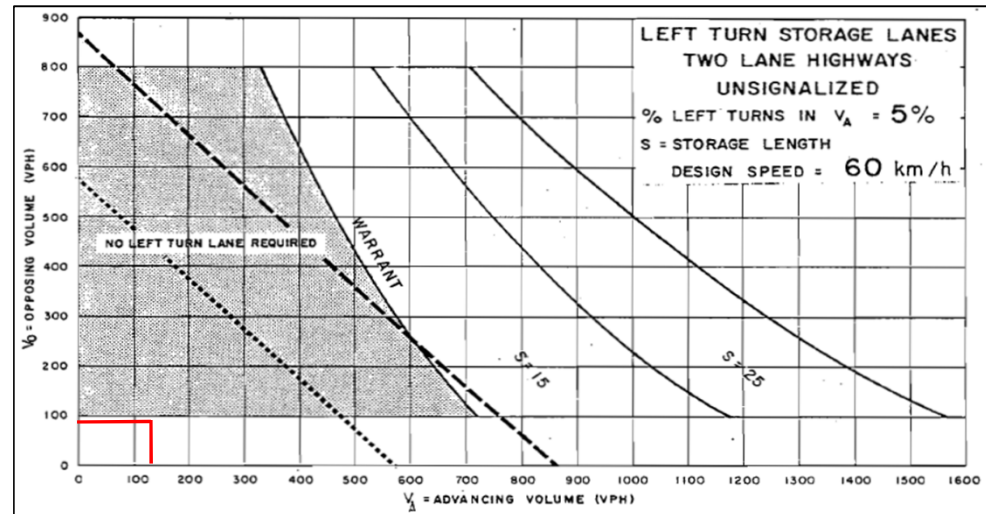
Direction:	Eastbound Left
Analysis Year:	Future 2036
Peak Hour:	PM Peak Hour
Posted Speed:	80 km/hr
Design Speed:	100 km/hr
$V_A =$	39
$V_O =$	56
$V_L =$	10
Percentage of Left Turning Traffic	26%
Left Turn Lane Warranted:	No
Required Length:	-



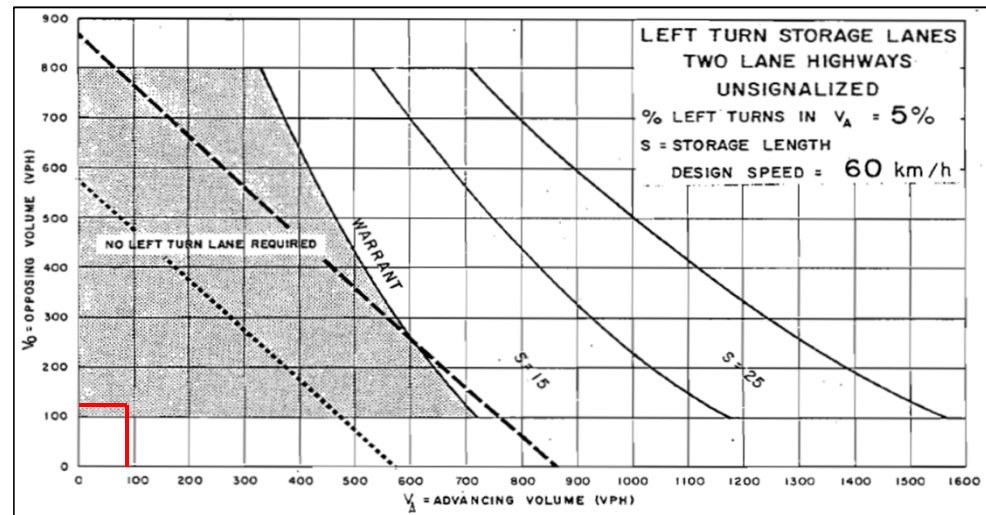
Regional Road 45 (Creek Road) & Regional Road 4 (Wellandport Road)

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Northbound Left
Analysis Year:	Future 2026
Peak Hour:	AM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
V_A =	119
V_O =	94
V_L =	1
Percentage of Left Turning Traffic	1%
Left Turn Lane Warranted:	No
Required Length:	-



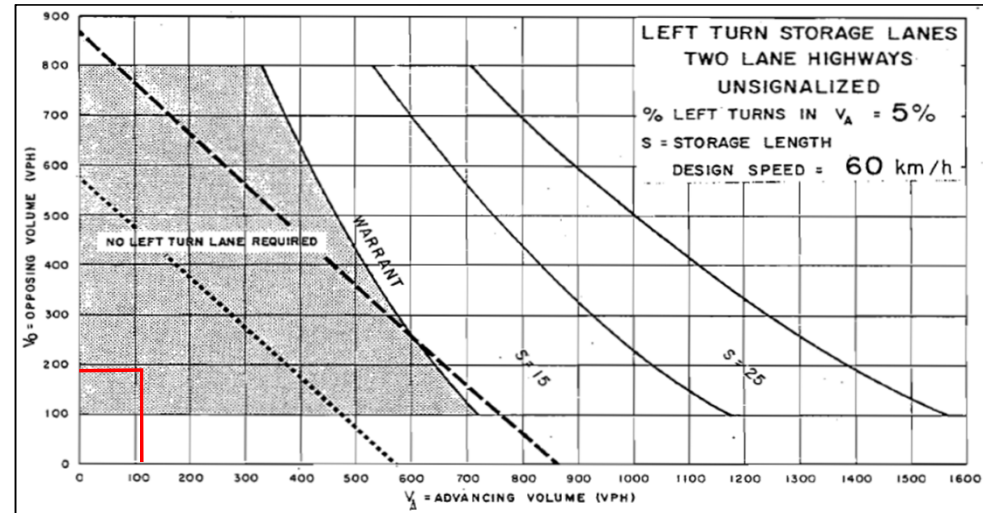
Direction:	Southbound Left
Analysis Year:	Future 2026
Peak Hour:	AM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
V_A =	94
V_O =	119
V_L =	1
Percentage of Left Turning Traffic	1%
Left Turn Lane Warranted:	No
Required Length:	-



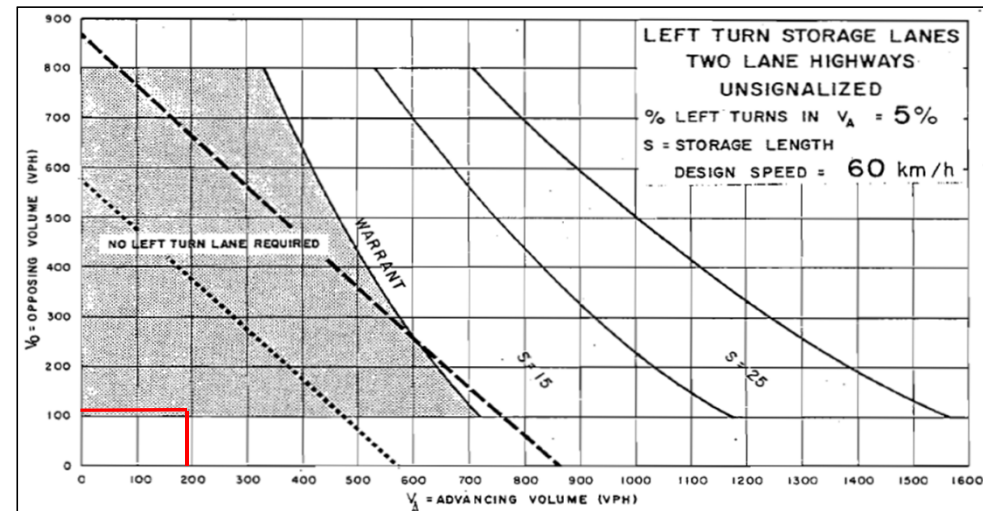
Regional Road 45 (Creek Road) & Regional Road 4 (Wellandport Road)

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Northbound Left
Analysis Year:	Future 2026
Peak Hour:	PM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
$V_A =$	104
$V_O =$	194
$V_L =$	4
Percentage of Left Turning Traffic	4%
Left Turn Lane Warranted:	No
Required Length:	-



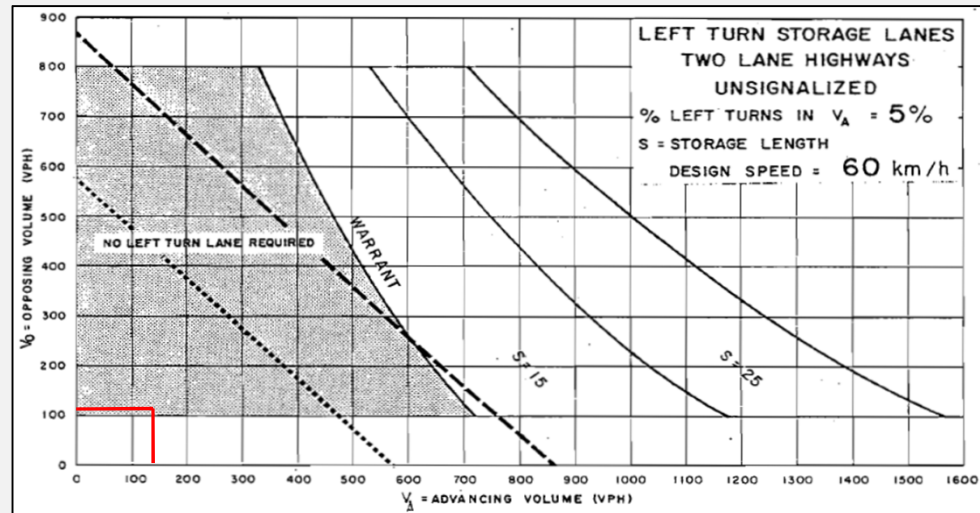
Direction:	Southbound Left
Analysis Year:	Future 2026
Peak Hour:	PM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
$V_A =$	194
$V_O =$	104
$V_L =$	2
Percentage of Left Turning Traffic	1%
Left Turn Lane Warranted:	No
Required Length:	-



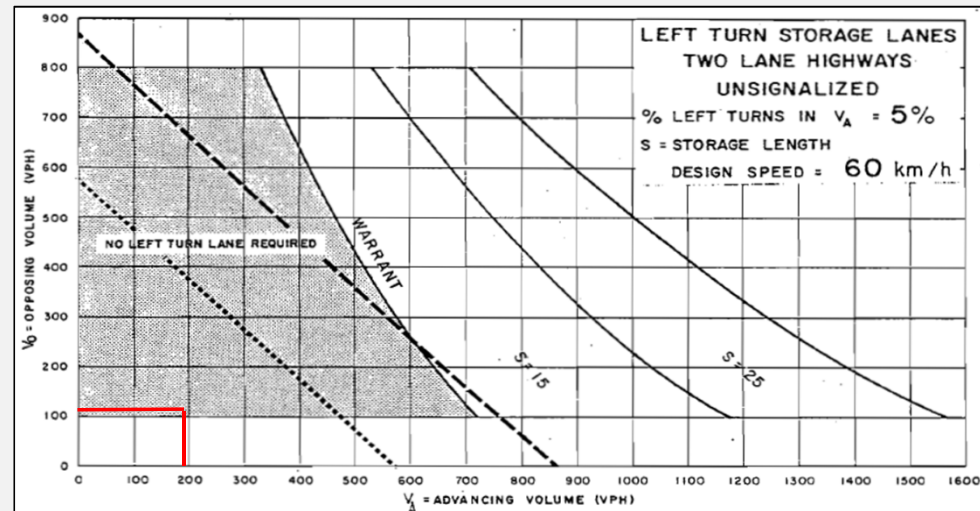
Regional Road 45 (Creek Road) & Regional Road 4 (Wellandport Road)

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Northbound Left
Analysis Year:	Future 2036
Peak Hour:	AM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
$V_A =$	138
$V_O =$	109
$V_L =$	1
Percentage of Left Turning Traffic	1%
Left Turn Lane Warranted:	No
Required Length:	-



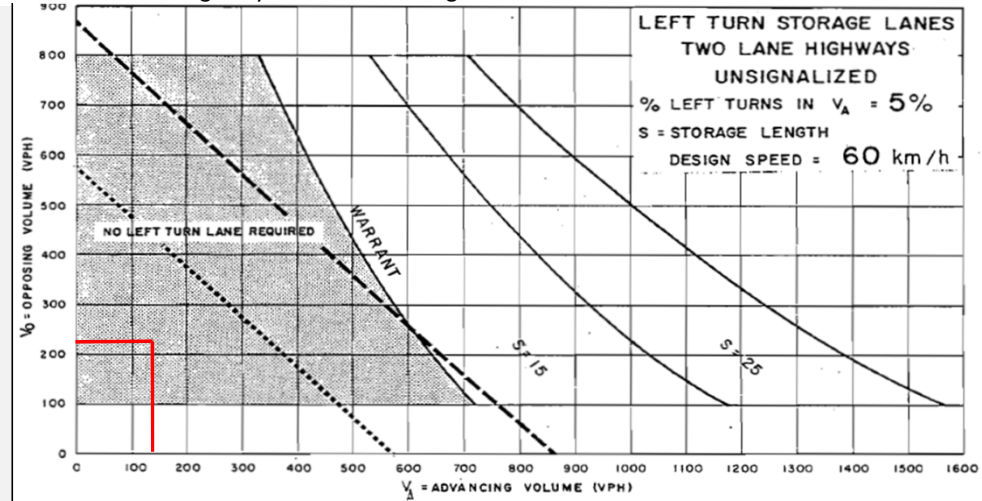
Direction:	Southbound Left
Analysis Year:	Future 2036
Peak Hour:	AM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
$V_A =$	109
$V_O =$	138
$V_L =$	1
Percentage of Left Turning Traffic	1%
Left Turn Lane Warranted:	No
Required Length:	-



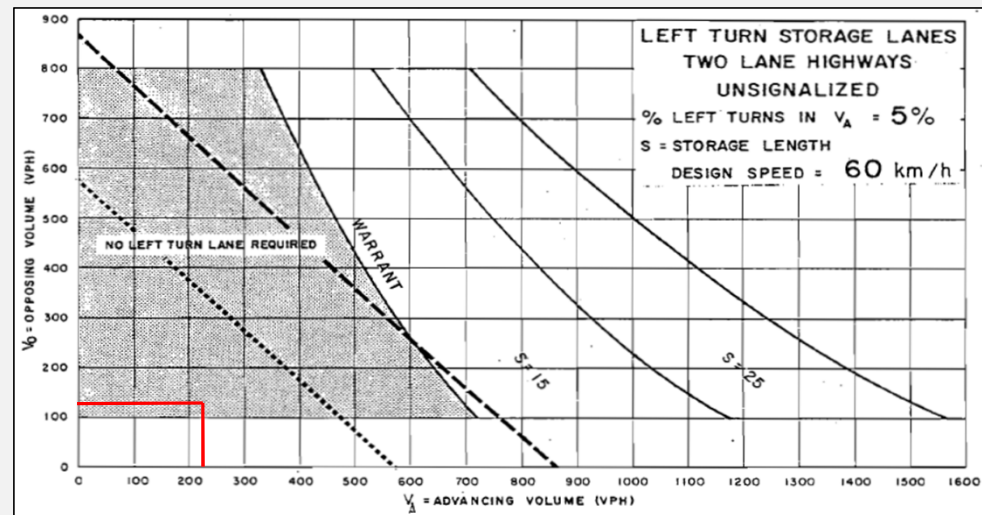
Regional Road 45 (Creek Road) & Regional Road 4 (Wellandport Road)

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Northbound Left
Analysis Year:	Future 2036
Peak Hour:	PM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
V_A =	122
V_O =	227
V_L =	4
Percentage of Left Turning Traffic	3%
Left Turn Lane Warranted:	No
Required Length:	-

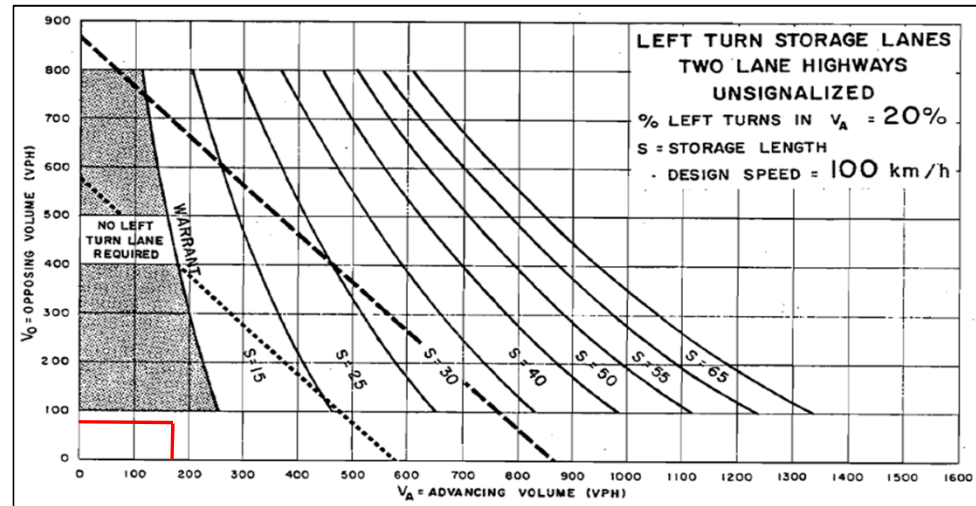


Direction:	Southbound Left
Analysis Year:	Future 2036
Peak Hour:	PM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
V_A =	227
V_O =	122
V_L =	3
Percentage of Left Turning Traffic	1%
Left Turn Lane Warranted:	No
Required Length:	-

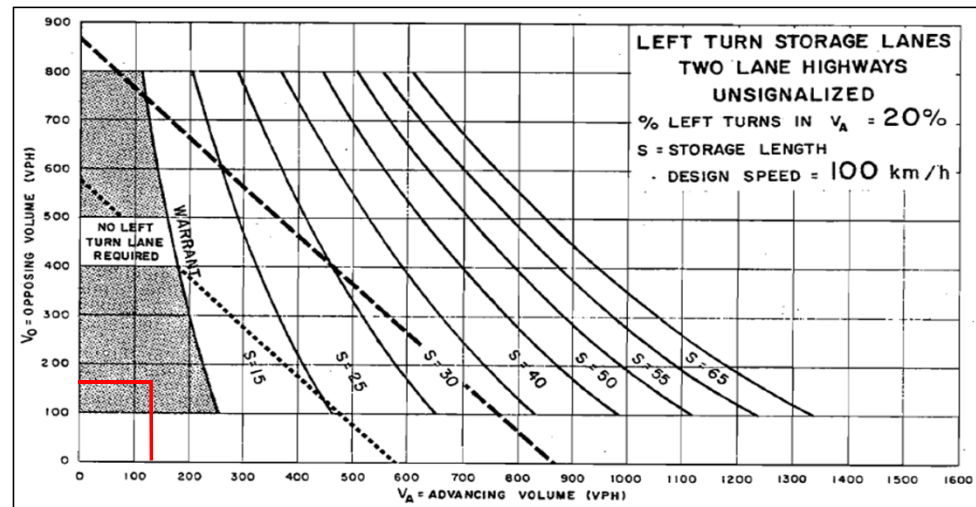


Regional Road 45 (Creek Road) & Regional Road 27 (River Road)
MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Westbound Left
Analysis Year:	Future 2026
Peak Hour:	AM Peak Hour
Posted Speed:	80 km/hr
Design Speed:	100 km/hr
$V_A =$	174
$V_O =$	83
$V_L =$	37
Percentage of Left Turning Traffic	21%
Left Turn Lane Warranted:	No
Required Length:	-

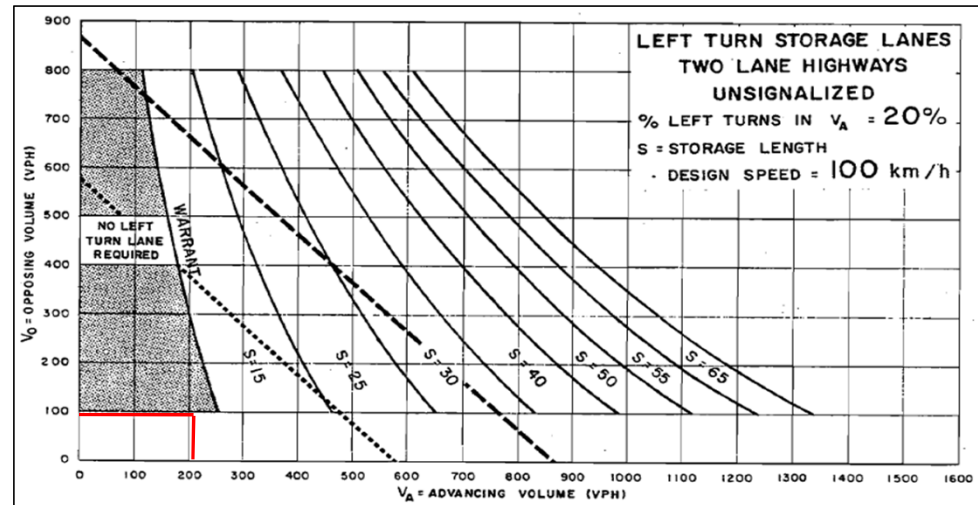


Direction:	Westbound Left
Analysis Year:	Future 2026
Peak Hour:	PM Peak Hour
Posted Speed:	80 km/hr
Design Speed:	100 km/hr
$V_A =$	121
$V_O =$	164
$V_L =$	26
Percentage of Left Turning Traffic	21%
Left Turn Lane Warranted:	No
Required Length:	-

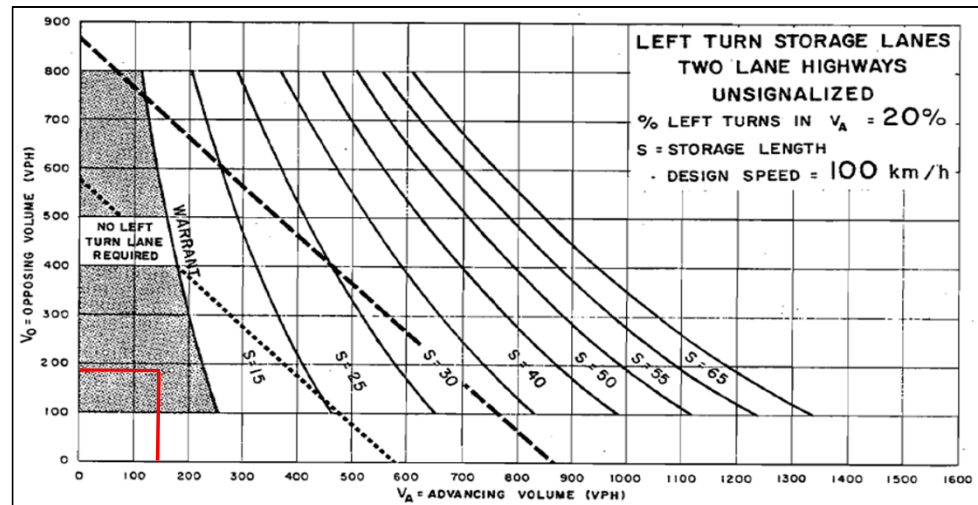


Regional Road 45 (Creek Road) & Regional Road 27 (River Road)
 MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Westbound Left
Analysis Year:	Future 2036
Peak Hour:	AM Peak Hour
Posted Speed:	80 km/hr
Design Speed:	100 km/hr
$V_A =$	203
$V_O =$	97
$V_L =$	43
Percentage of Left Turning Traffic	21%
Left Turn Lane Warranted:	No
Required Length:	-



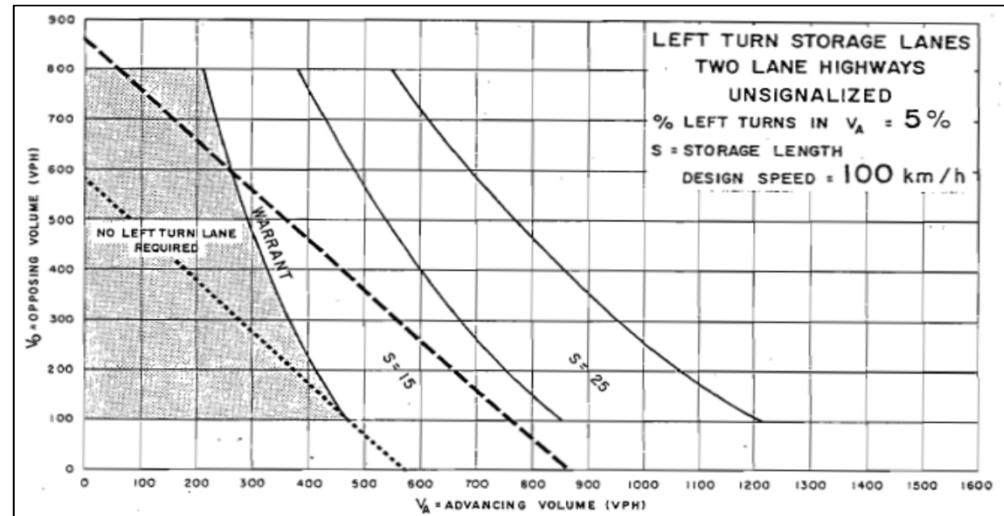
Direction:	Westbound Left
Analysis Year:	Future 2036
Peak Hour:	PM Peak Hour
Posted Speed:	80 km/hr
Design Speed:	100 km/hr
$V_A =$	142
$V_O =$	192
$V_L =$	31
Percentage of Left Turning Traffic	22%
Left Turn Lane Warranted:	No
Required Length:	-



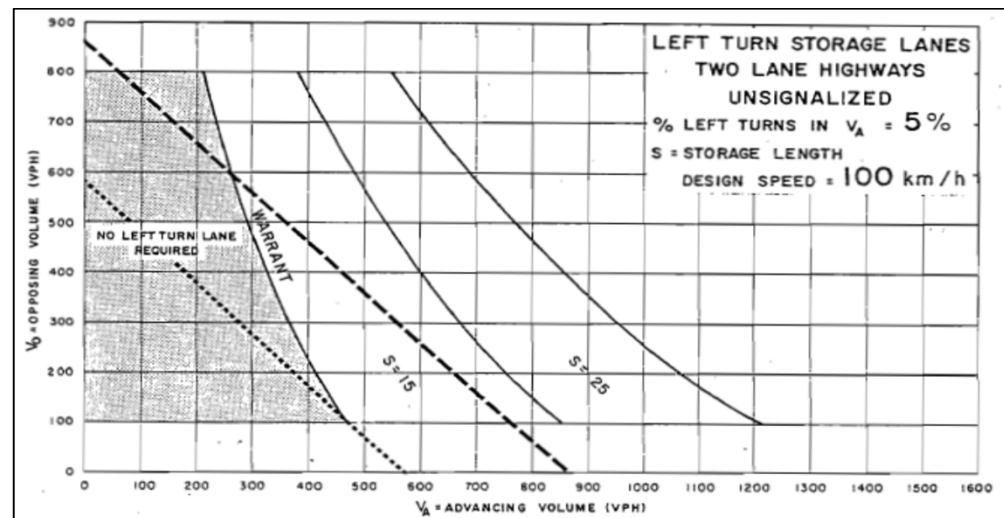
Regional Road 4 (Wellandport Road) & Regional Road 27 (River Road)

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Westbound Left
Analysis Year:	Future 2026
Peak Hour:	AM Peak Hour
Posted Speed:	80 km/hr
Design Speed:	100 km/hr
$V_A =$	137
$V_O =$	172
$V_L =$	0
Percentage of Left Turning Traffic	0%
Left Turn Lane Warranted:	No
Required Length:	-



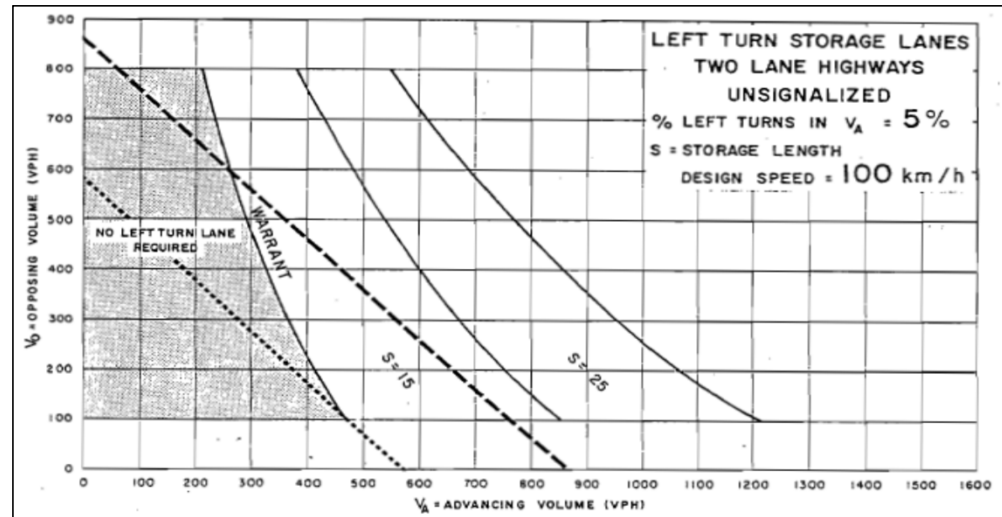
Direction:	Westbound Left
Analysis Year:	Future 2026
Peak Hour:	PM Peak Hour
Posted Speed:	80 km/hr
Design Speed:	100 km/hr
$V_A =$	95
$V_O =$	361
$V_L =$	0
Percentage of Left Turning Traffic	0%
Left Turn Lane Warranted:	No
Required Length:	-



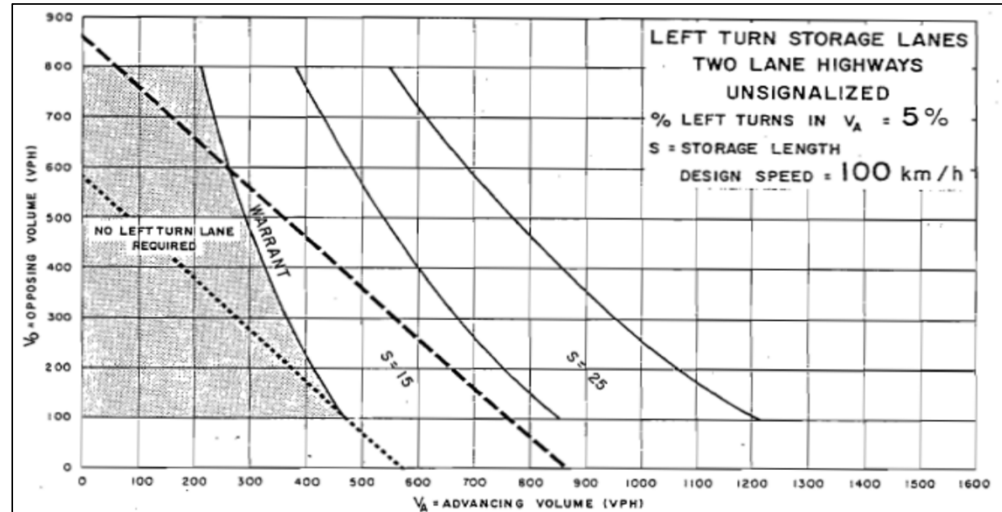
Regional Road 4 (Wellandport Road) & Regional Road 27 (River Road)

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Westbound Left
Analysis Year:	Future 2036
Peak Hour:	AM Peak Hour
Posted Speed:	80 km/hr
Design Speed:	100 km/hr
$V_A =$	160
$V_O =$	201
$V_L =$	0
Percentage of Left Turning Traffic	0%
Left Turn Lane Warranted:	No
Required Length:	-



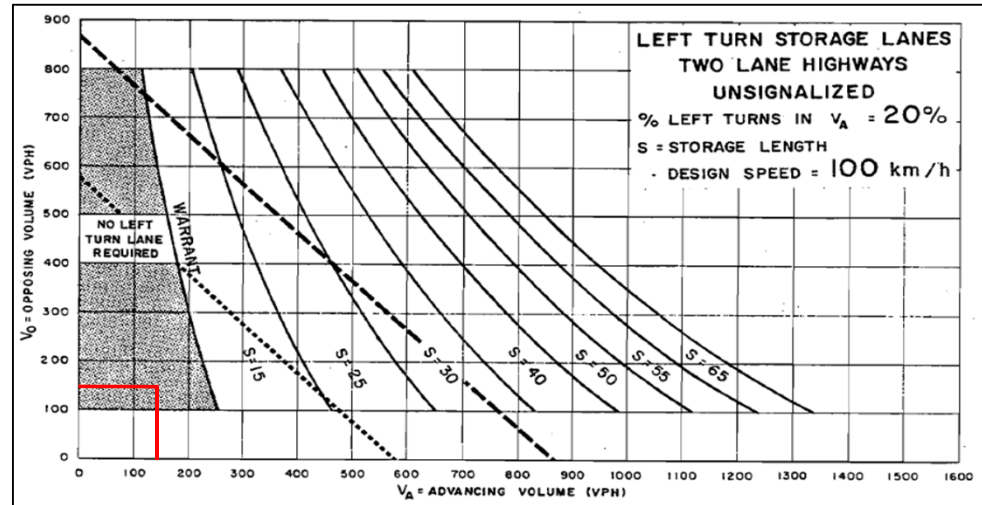
Direction:	Westbound Left
Analysis Year:	Future 2036
Peak Hour:	PM Peak Hour
Posted Speed:	80 km/hr
Design Speed:	100 km/hr
$V_A =$	111
$V_O =$	422
$V_L =$	0
Percentage of Left Turning Traffic	0%
Left Turn Lane Warranted:	No
Required Length:	-



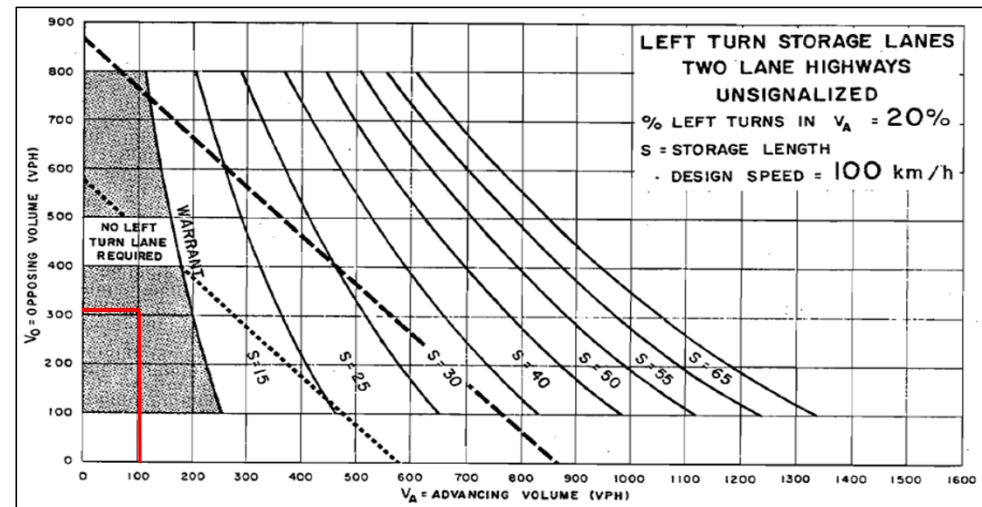
Regional Road 4 (Wellandport Road) & Regional Road 27 (River Road) (Option 2)

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Westbound Left
Analysis Year:	Existing 2016 (Option 2)
Peak Hour:	AM Peak Hour
Posted Speed:	80 km/hr
Design Speed:	100 km/hr
V_A =	145
V_O =	143
V_L =	31
Percentage of Left Turning Traffic	21%
Left Turn Lane Warranted:	No
Required Length:	-



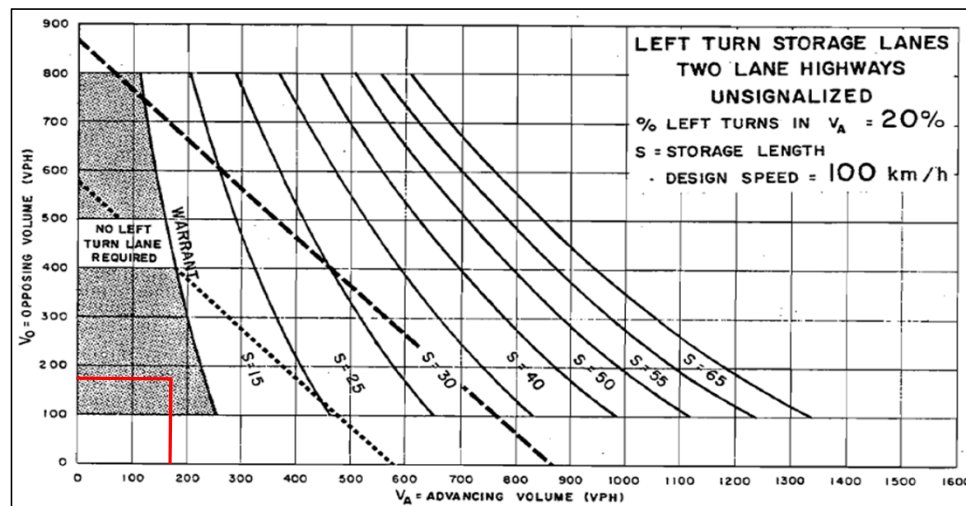
Direction:	Westbound Left
Analysis Year:	Existing 2016 (Option 2)
Peak Hour:	PM Peak Hour
Posted Speed:	80 km/hr
Design Speed:	100 km/hr
V_A =	101
V_O =	301
V_L =	22
Percentage of Left Turning Traffic	22%
Left Turn Lane Warranted:	No
Required Length:	-



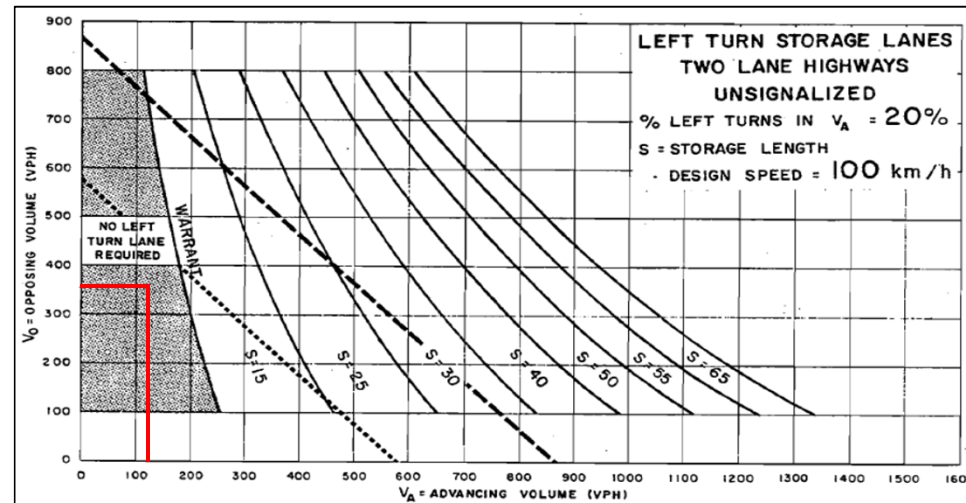
Regional Road 4 (Wellandport Road) & Regional Road 27 (River Road) (Option 2)

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Westbound Left
Analysis Year:	Future 2026 (Option 2)
Peak Hour:	AM Peak Hour
Posted Speed:	80 km/hr
Design Speed:	100 km/hr
V_A =	174
V_O =	172
V_L =	37
Percentage of Left Turning Traffic	21%
Left Turn Lane Warranted:	No
Required Length:	-



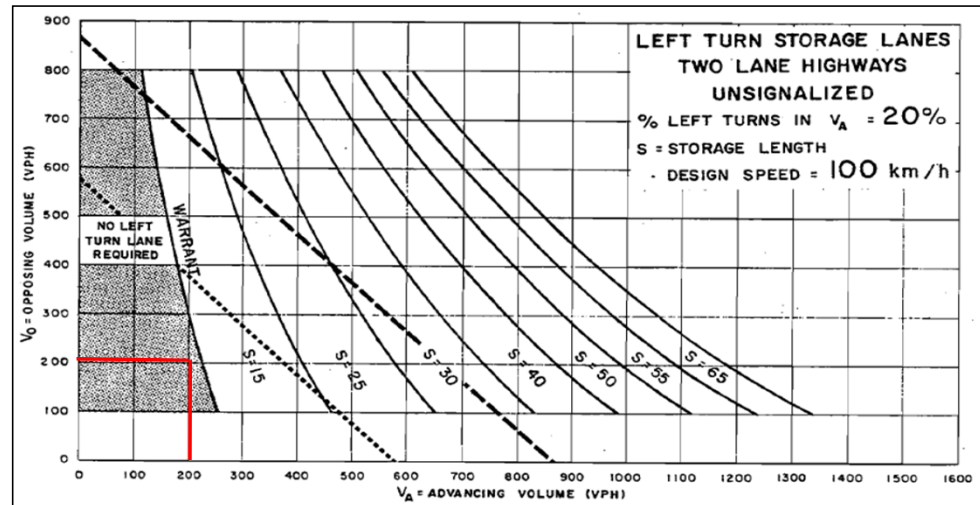
Direction:	Westbound Left
Analysis Year:	Future 2026 (Option 2)
Peak Hour:	PM Peak Hour
Posted Speed:	80 km/hr
Design Speed:	100 km/hr
V_A =	121
V_O =	361
V_L =	26
Percentage of Left Turning Traffic	21%
Left Turn Lane Warranted:	No
Required Length:	-



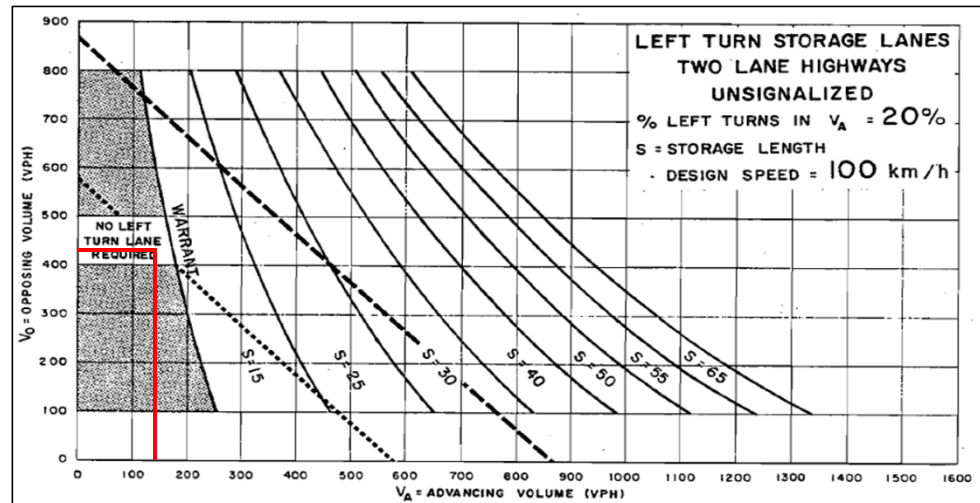
Regional Road 4 (Wellandport Road) & Regional Road 27 (River Road) (Option 2)

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Westbound Left
Analysis Year:	Future 2036 (Option 2)
Peak Hour:	AM Peak Hour
Posted Speed:	80 km/hr
Design Speed:	100 km/hr
V_A =	203
V_O =	201
V_L =	43
Percentage of Left Turning Traffic	21%
Left Turn Lane Warranted:	No
Required Length:	-



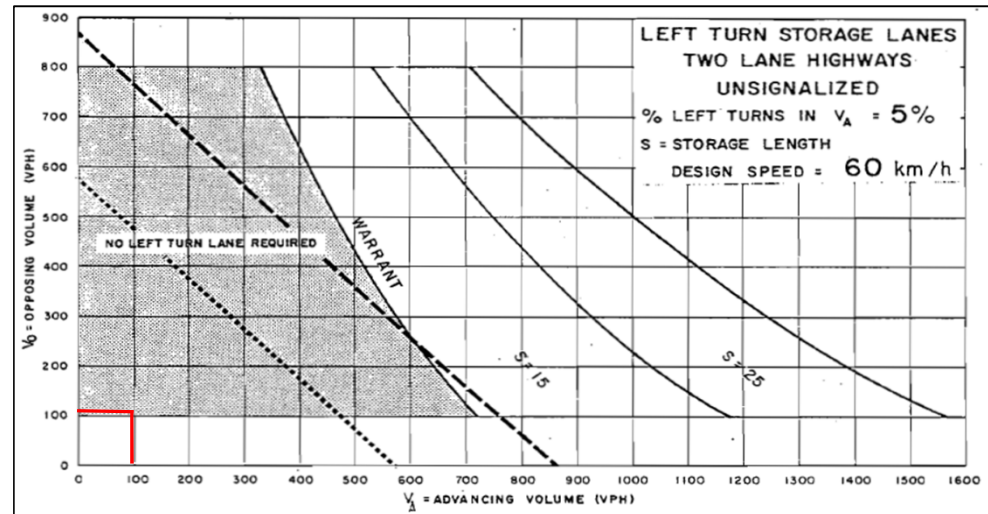
Direction:	Westbound Left
Analysis Year:	Future 2036 (Option 2)
Peak Hour:	PM Peak Hour
Posted Speed:	80 km/hr
Design Speed:	100 km/hr
V_A =	142
V_O =	422
V_L =	31
Percentage of Left Turning Traffic	22%
Left Turn Lane Warranted:	No
Required Length:	-



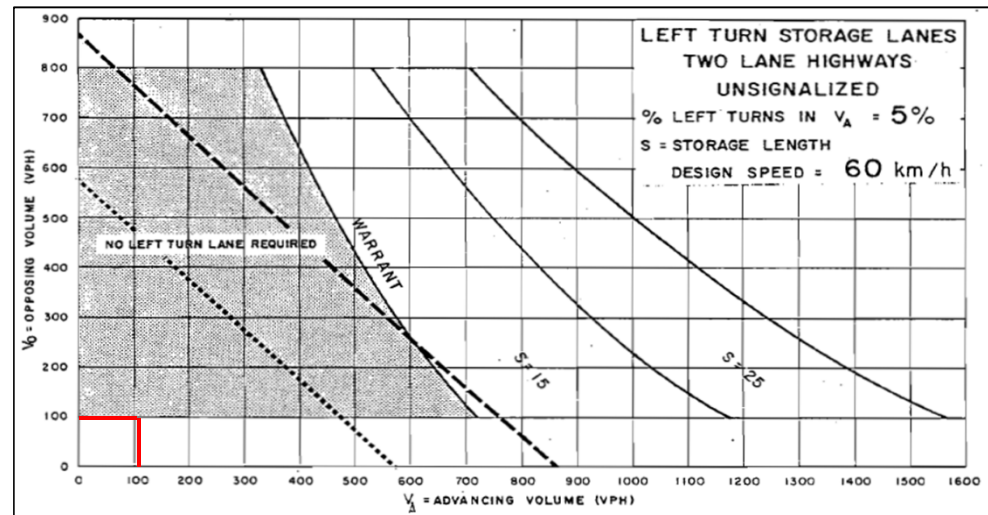
Regional Road 45 (Creek Road) & Regional Road 4 (Wellandport Road) (Option 2)

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Northbound Left
Analysis Year:	Existing 2016 (Option 2)
Peak Hour:	AM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
V_A =	99
V_O =	105
V_L =	1
Percentage of Left Turning Traffic	1%
Left Turn Lane Warranted:	No
Required Length:	-



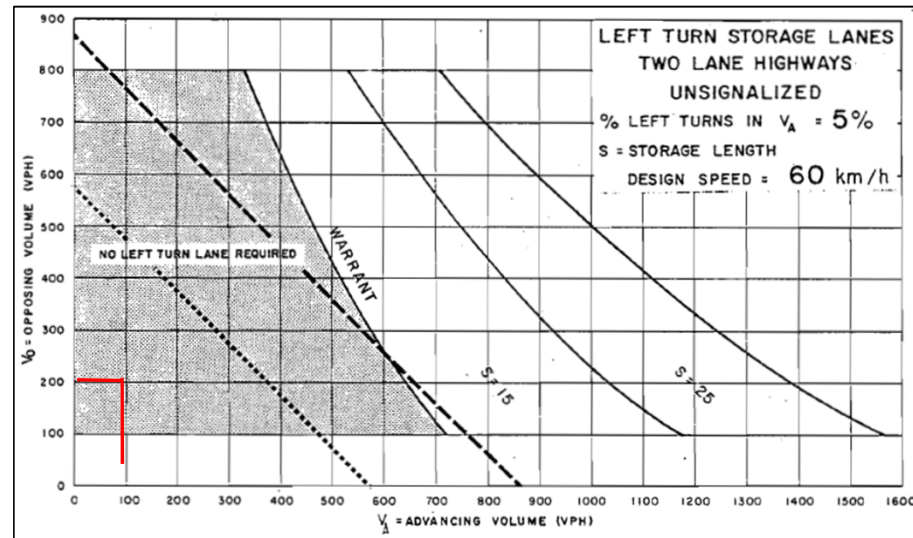
Direction:	Southbound Left
Analysis Year:	Existing 2016 (Option 2)
Peak Hour:	AM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
V_A =	105
V_O =	99
V_L =	1
Percentage of Left Turning Traffic	1%
Left Turn Lane Warranted:	No
Required Length:	-



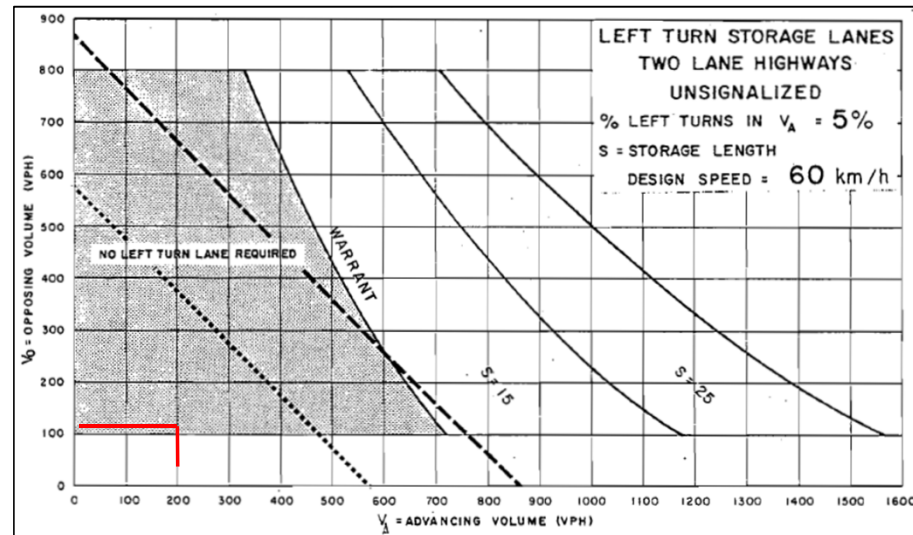
Regional Road 45 (Creek Road) & Regional Road 4 (Wellandport Road) (Option 2)

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Northbound Left
Analysis Year:	Existing 2016 (Option 2)
Peak Hour:	PM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
V_A =	87
V_O =	182
V_L =	3
Percentage of Left Turning Traffic	3%
Left Turn Lane Warranted:	No
Required Length:	-



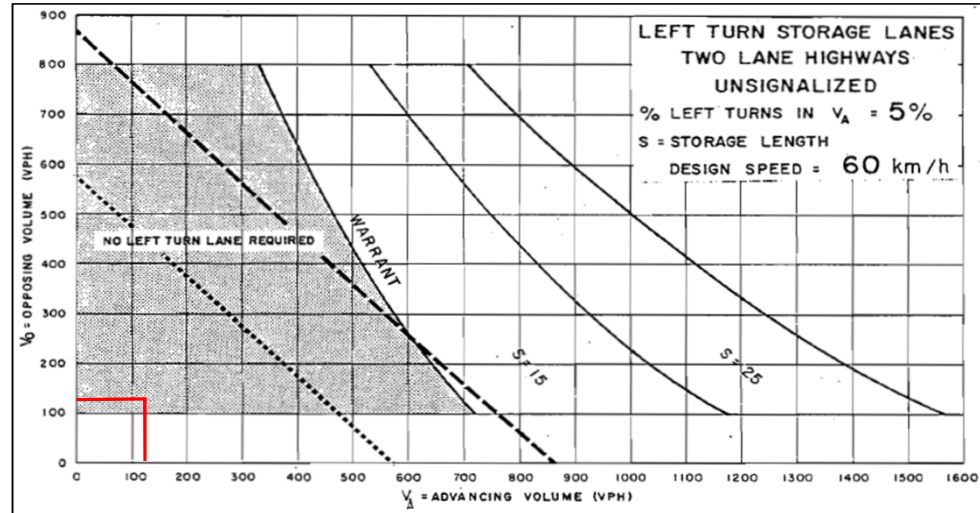
Direction:	Southbound Left
Analysis Year:	Existing 2016 (Option 2)
Peak Hour:	PM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
V_A =	182
V_O =	87
V_L =	1
Percentage of Left Turning Traffic	1%
Left Turn Lane Warranted:	No
Required Length:	-



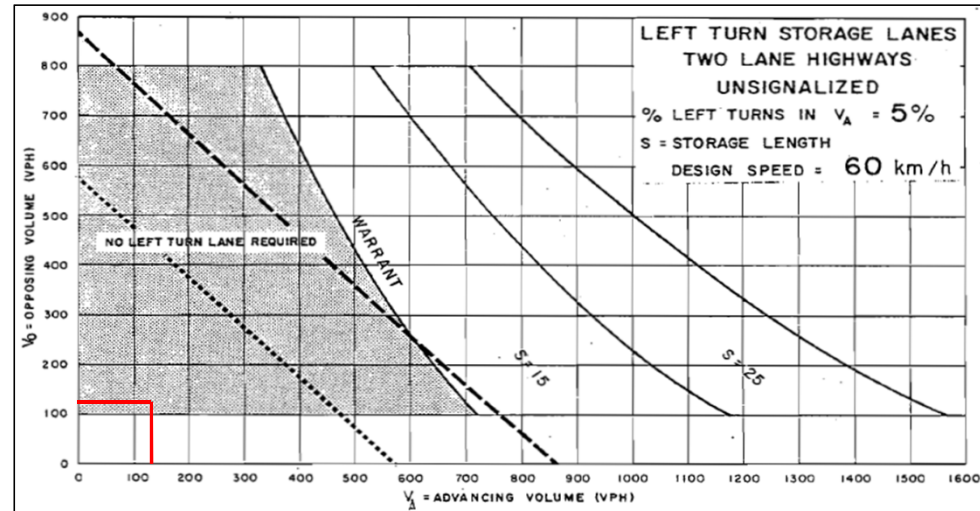
Regional Road 45 (Creek Road) & Regional Road 4 (Wellandport Road) (Option 2)

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Northbound Left
Analysis Year:	Future 2026 (Option 2)
Peak Hour:	AM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
V_A =	119
V_O =	126
V_L =	1
Percentage of Left Turning Traffic	1%
Left Turn Lane Warranted:	No
Required Length:	-



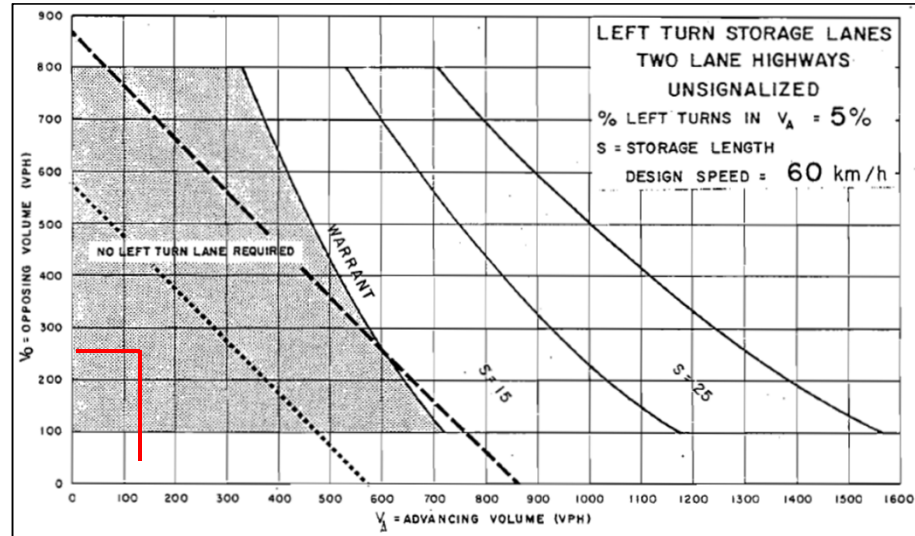
Direction:	Southbound Left
Analysis Year:	Future 2026 (Option 2)
Peak Hour:	AM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
V_A =	126
V_O =	119
V_L =	1
Percentage of Left Turning Traffic	1%
Left Turn Lane Warranted:	No
Required Length:	-



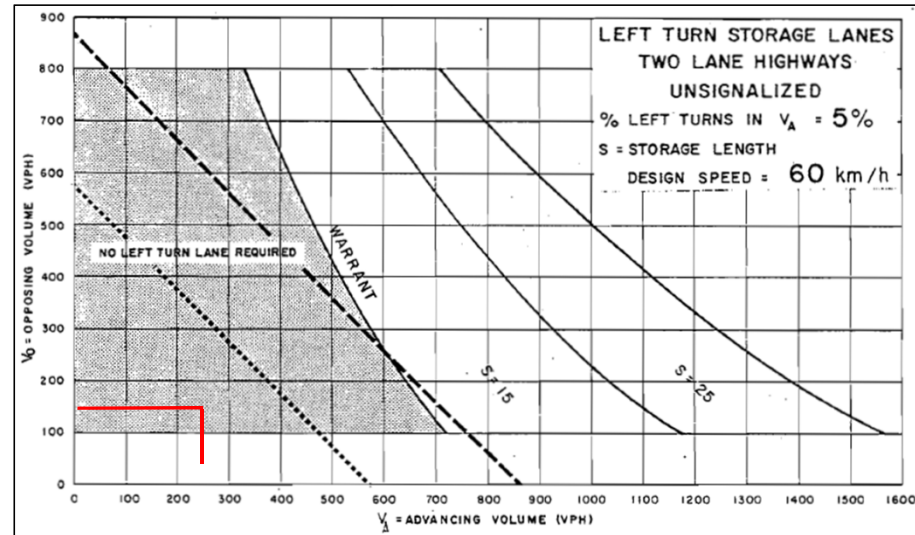
Regional Road 45 (Creek Road) & Regional Road 4 (Wellandport Road) (Option 2)

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Northbound Left
Analysis Year:	Future 2026 (Option 2)
Peak Hour:	PM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
V_A :	105
V_O :	218
V_L :	4
Percentage of Left Turning Traffic:	4%
Left Turn Lane Warranted:	No
Required Length:	-



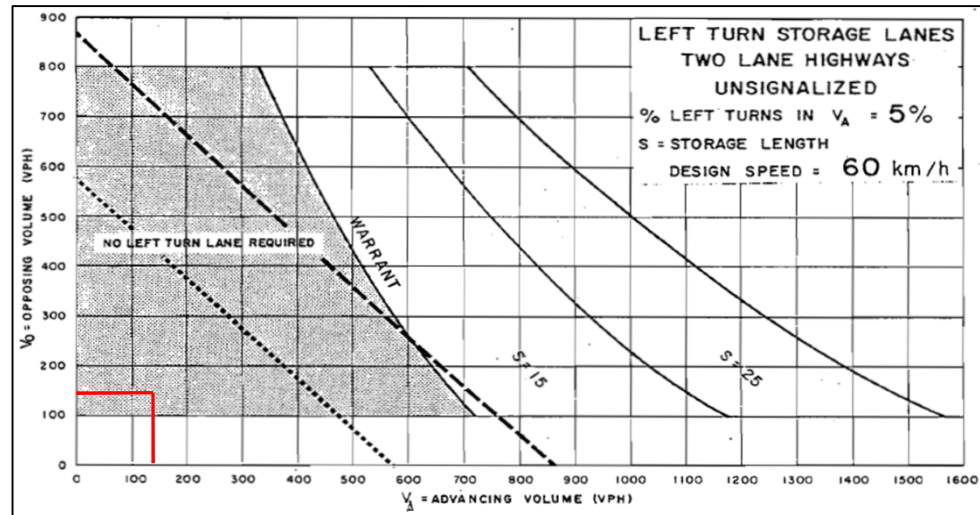
Direction:	Southbound Left
Analysis Year:	Future 2026 (Option 2)
Peak Hour:	PM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
V_A :	218
V_O :	105
V_L :	1
Percentage of Left Turning Traffic:	0%
Left Turn Lane Warranted:	No
Required Length:	-



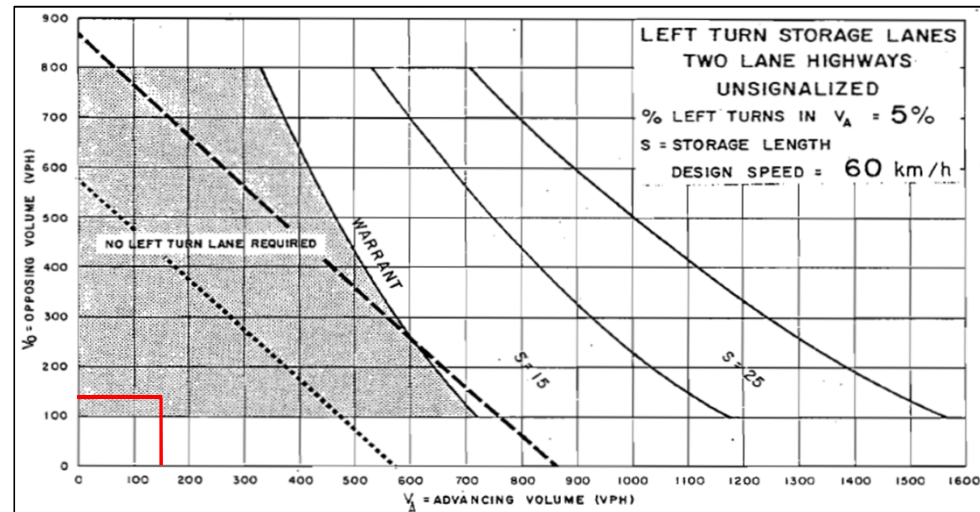
Regional Road 45 (Creek Road) & Regional Road 4 (Wellandport Road) (Option 2)

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Northbound Left
Analysis Year:	Future 2036 (Option 2)
Peak Hour:	AM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
$V_A =$	138
$V_O =$	146
$V_L =$	1
Percentage of Left Turning Traffic	1%
Left Turn Lane Warranted:	No
Required Length:	-



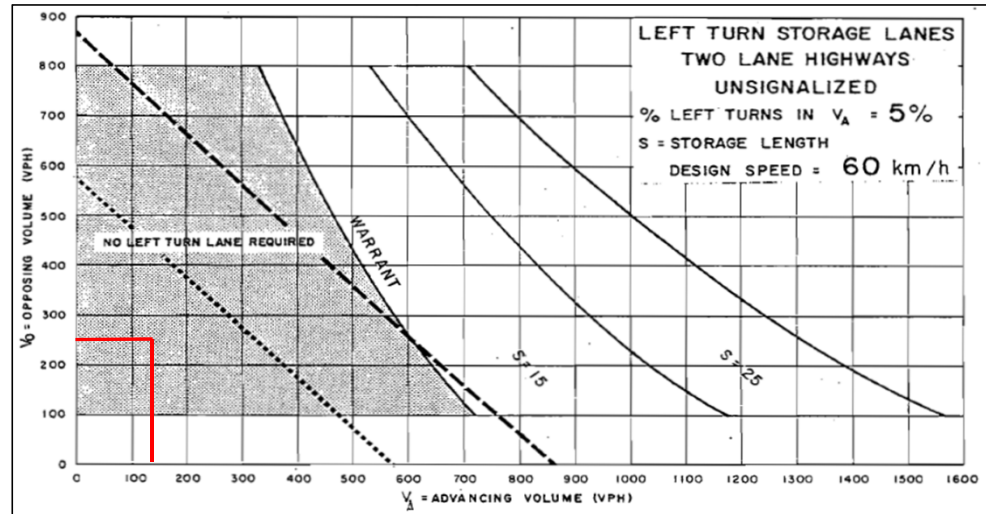
Direction:	Southbound Left
Analysis Year:	Future 2036 (Option2)
Peak Hour:	AM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
$V_A =$	146
$V_O =$	138
$V_L =$	1
Percentage of Left Turning Traffic	1%
Left Turn Lane Warranted:	No
Required Length:	-



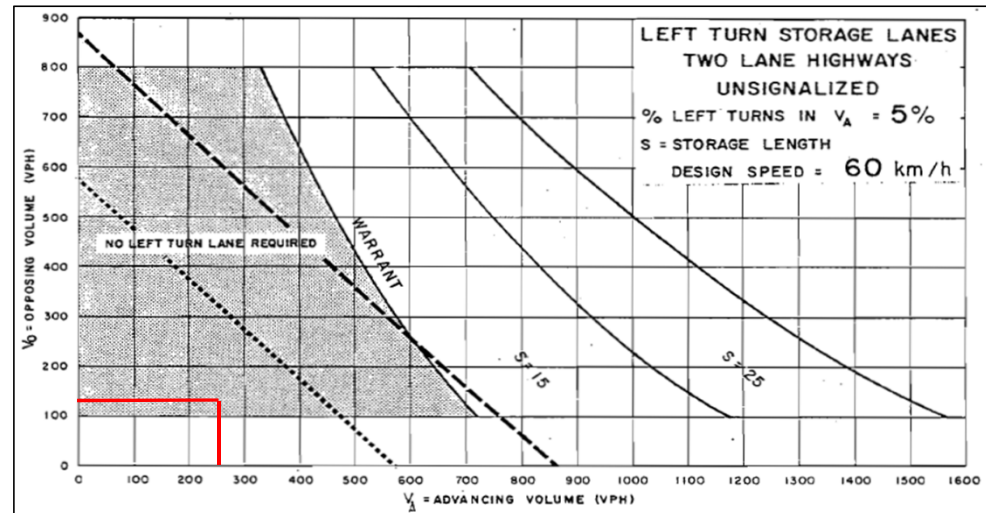
Regional Road 45 (Creek Road) & Regional Road 4 (Wellandport Road) (Option 2)

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Northbound Left
Analysis Year:	Future 2036 (Option 2)
Peak Hour:	PM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
V_A =	122
V_O =	255
V_L =	4
Percentage of Left Turning Traffic	3%
Left Turn Lane Warranted:	No
Required Length:	-



Direction:	Southbound Left
Analysis Year:	Future 2036 (Option 2)
Peak Hour:	PM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
V_A =	255
V_O =	122
V_L =	1
Percentage of Left Turning Traffic	0%
Left Turn Lane Warranted:	No
Required Length:	-



Appendix F

**Future (2026) Do Nothing Weekday AM and
PM Traffic Analysis Synchro Output Sheets**

Creek Rd. EA - Traffic Study
1: Creek Rd. & Canborough Rd.

Future 2026 Traffic Analysis
AM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↘↙	
Volume (veh/h)	100	31	25	70	64	28
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	109	34	27	76	70	30
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			142		256	126
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			142		256	126
tC, single (s)			4.2		6.6	6.4
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.5
p0 queue free %			98		90	97
cM capacity (veh/h)			1370		689	881
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	142	103	100			
Volume Left	0	27	70			
Volume Right	34	0	30			
cSH	1700	1370	738			
Volume to Capacity	0.08	0.02	0.14			
Queue Length 95th (m)	0.0	0.5	3.6			
Control Delay (s)	0.0	2.1	10.6			
Lane LOS		A	B			
Approach Delay (s)	0.0	2.1	10.6			
Approach LOS			B			
Intersection Summary						
Average Delay			3.7			
Intersection Capacity Utilization			29.0%	ICU Level of Service		A
Analysis Period (min)			15			

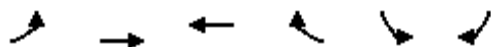
Creek Rd. EA - Traffic Study
4: Diltz Rd. & Creek Rd.

Future 2026 Traffic Analysis
AM Peak Hour

									
Movement	EBT	EBR	WBL	WBT	NBL	NBR			
Lane Configurations									
Volume (veh/h)	18	37	5	22	71	6			
Sign Control	Free			Free	Stop				
Grade	0%			0%	0%				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92			
Hourly flow rate (vph)	20	40	5	24	77	7			
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			60		74	40			
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol			60		74	40			
tC, single (s)			4.3		6.5	6.4			
tC, 2 stage (s)									
tF (s)			2.4		3.6	3.5			
p0 queue free %			100		91	99			
cM capacity (veh/h)			1409		897	983			
Direction, Lane #	EB 1	WB 1	NB 1						
Volume Total	60	29	84						
Volume Left	0	5	77						
Volume Right	40	0	7						
cSH	1700	1409	903						
Volume to Capacity	0.04	0.00	0.09						
Queue Length 95th (m)	0.0	0.1	2.3						
Control Delay (s)	0.0	1.4	9.4						
Lane LOS		A	A						
Approach Delay (s)	0.0	1.4	9.4						
Approach LOS			A						
Intersection Summary									
Average Delay		4.8							
Intersection Capacity Utilization		17.3%	ICU Level of Service	A					
Analysis Period (min)		15							

Creek Rd. EA - Traffic Study
10: Creek Rd. & Chippawa Creek Conservation Area

Future 2026 Traffic Analysis
AM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	8	25	26	22	13	8
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	27	28	24	14	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	52				85	40
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	52				85	40
tC, single (s)	4.1				6.5	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.6	3.3
p0 queue free %	99				98	99
cM capacity (veh/h)	1567				895	1037
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	36	52	23			
Volume Left	9	0	14			
Volume Right	0	24	9			
cSH	1567	1700	944			
Volume to Capacity	0.01	0.03	0.02			
Queue Length 95th (m)	0.1	0.0	0.6			
Control Delay (s)	1.8	0.0	8.9			
Lane LOS	A		A			
Approach Delay (s)	1.8	0.0	8.9			
Approach LOS			A			
Intersection Summary						
Average Delay			2.4			
Intersection Capacity Utilization			18.6%	ICU Level of Service		A
Analysis Period (min)			15			

Creek Rd. EA - Traffic Study
17: Wellandport Rd. & Creek Rd.

Future 2026 Traffic Analysis
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	47	10	1	14	18	5	1	112	6	1	71	22
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	51	11	1	15	20	5	1	122	7	1	77	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	234	222	89	225	230	125	101			128		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	234	222	89	225	230	125	101			128		
tC, single (s)	7.5	6.5	7.2	7.5	6.6	6.2	5.1			4.1		
tC, 2 stage (s)												
tF (s)	3.9	4.0	4.2	3.9	4.1	3.3	3.1			2.2		
p0 queue free %	92	98	100	98	97	99	100			100		
cM capacity (veh/h)	627	679	755	642	653	931	1051			1470		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	63	40	129	102								
Volume Left	51	15	1	1								
Volume Right	1	5	7	24								
cSH	637	676	1051	1470								
Volume to Capacity	0.10	0.06	0.00	0.00								
Queue Length 95th (m)	2.5	1.4	0.0	0.0								
Control Delay (s)	11.3	10.7	0.1	0.1								
Lane LOS	B	B	A	A								
Approach Delay (s)	11.3	10.7	0.1	0.1								
Approach LOS	B	B										
Intersection Summary												
Average Delay			3.5									
Intersection Capacity Utilization			20.9%		ICU Level of Service				A			
Analysis Period (min)			15									

Creek Rd. EA - Traffic Study
19: Regional Rd. 27 & Creek Rd.

Future 2026 Traffic Analysis
AM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	18	37	137	83	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	20	40	149	90	0
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	320	90	90			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	320	90	90			
tC, single (s)	6.4	6.3	4.3			
tC, 2 stage (s)						
tF (s)	3.5	3.4	2.3			
p0 queue free %	100	98	97			
cM capacity (veh/h)	659	938	1421			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	20	189	90			
Volume Left	0	40	0			
Volume Right	20	0	0			
cSH	938	1421	1700			
Volume to Capacity	0.02	0.03	0.05			
Queue Length 95th (m)	0.5	0.7	0.0			
Control Delay (s)	8.9	1.8	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.9	1.8	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		1.7				
Intersection Capacity Utilization		26.7%		ICU Level of Service		A
Analysis Period (min)		15				



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	158	0	0	137	83	89
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	172	0	0	149	90	97
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	288	139	187			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	288	139	187			
tC, single (s)	6.6	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.7	3.3	2.2			
p0 queue free %	74	100	100			
cM capacity (veh/h)	668	915	1400			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	172	149	187			
Volume Left	172	0	0			
Volume Right	0	0	97			
cSH	668	1400	1700			
Volume to Capacity	0.26	0.00	0.11			
Queue Length 95th (m)	7.8	0.0	0.0			
Control Delay (s)	12.2	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	12.2	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			4.1			
Intersection Capacity Utilization			26.8%	ICU Level of Service	A	
Analysis Period (min)			15			

Creek Rd. EA - Traffic Study
1: Creek Rd. & Canborough Rd.

Future 2026 Traffic Analysis
PM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	83	59	40	124	42	31
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	90	64	43	135	46	34
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			154		344	122
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			154		344	122
tC, single (s)			4.2		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.3		3.5	3.3
p0 queue free %			97		93	96
cM capacity (veh/h)			1402		636	923
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	154	178	79			
Volume Left	0	43	46			
Volume Right	64	0	34			
cSH	1700	1402	733			
Volume to Capacity	0.09	0.03	0.11			
Queue Length 95th (m)	0.0	0.7	2.8			
Control Delay (s)	0.0	2.1	10.5			
Lane LOS		A	B			
Approach Delay (s)	0.0	2.1	10.5			
Approach LOS			B			
Intersection Summary						
Average Delay		2.9				
Intersection Capacity Utilization		32.7%	ICU Level of Service	A		
Analysis Period (min)		15				

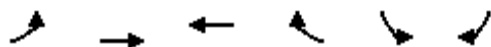
Creek Rd. EA - Traffic Study
4: Diltz Rd. & Creek Rd.

Future 2026 Traffic Analysis
PM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	22	79	5	13	61	11
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	24	86	5	14	66	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			110		92	67
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			110		92	67
tC, single (s)			4.1		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.4
p0 queue free %			100		92	99
cM capacity (veh/h)			1493		881	972
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	110	20	78			
Volume Left	0	5	66			
Volume Right	86	0	12			
cSH	1700	1493	894			
Volume to Capacity	0.06	0.00	0.09			
Queue Length 95th (m)	0.0	0.1	2.2			
Control Delay (s)	0.0	2.1	9.4			
Lane LOS		A	A			
Approach Delay (s)	0.0	2.1	9.4			
Approach LOS			A			
Intersection Summary						
Average Delay			3.7			
Intersection Capacity Utilization			17.6%	ICU Level of Service		A
Analysis Period (min)			15			

Creek Rd. EA - Traffic Study
10: Creek Rd. & Chippawa Creek Conservation Area

Future 2026 Traffic Analysis
PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	8	25	26	22	13	8
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	27	28	24	14	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	52				85	40
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	52				85	40
tC, single (s)	4.1				6.5	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.6	3.3
p0 queue free %	99				98	99
cM capacity (veh/h)	1567				895	1037
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	36	52	23			
Volume Left	9	0	14			
Volume Right	0	24	9			
cSH	1567	1700	944			
Volume to Capacity	0.01	0.03	0.02			
Queue Length 95th (m)	0.1	0.0	0.6			
Control Delay (s)	1.8	0.0	8.9			
Lane LOS	A		A			
Approach Delay (s)	1.8	0.0	8.9			
Approach LOS			A			
Intersection Summary						
Average Delay		2.4				
Intersection Capacity Utilization		18.6%		ICU Level of Service		A
Analysis Period (min)		15				

Creek Rd. EA - Traffic Study
17: Wellandport Rd. & Creek Rd.

Future 2026 Traffic Analysis
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	36	12	4	10	16	1	4	92	8	2	139	53
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	39	13	4	11	17	1	4	100	9	2	151	58
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	307	302	180	308	326	104	209			109		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	307	302	180	308	326	104	209			109		
tC, single (s)	7.5	6.6	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.9	4.1	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	98	99	98	97	100	100			100		
cM capacity (veh/h)	557	595	868	632	593	956	1374			1494		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	57	29	113	211								
Volume Left	39	11	4	2								
Volume Right	4	1	9	58								
cSH	582	616	1374	1494								
Volume to Capacity	0.10	0.05	0.00	0.00								
Queue Length 95th (m)	2.4	1.1	0.1	0.0								
Control Delay (s)	11.9	11.1	0.3	0.1								
Lane LOS	B	B	A	A								
Approach Delay (s)	11.9	11.1	0.3	0.1								
Approach LOS	B	B										
Intersection Summary												
Average Delay			2.6									
Intersection Capacity Utilization			24.5%		ICU Level of Service				A			
Analysis Period (min)			15									

Creek Rd. EA - Traffic Study
19: Regional Rd. 27 & Creek Rd.

Future 2026 Traffic Analysis
PM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	23	26	95	164	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	25	28	103	178	0
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	338	178	178			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	338	178	178			
tC, single (s)	6.4	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.3			
p0 queue free %	100	97	98			
cM capacity (veh/h)	648	870	1356			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	25	132	178			
Volume Left	0	28	0			
Volume Right	25	0	0			
cSH	870	1356	1700			
Volume to Capacity	0.03	0.02	0.10			
Queue Length 95th (m)	0.7	0.5	0.0			
Control Delay (s)	9.3	1.8	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.3	1.8	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		1.4				
Intersection Capacity Utilization		29.7%		ICU Level of Service		A
Analysis Period (min)		15				

Creek Rd. EA - Traffic Study
20: Regional Rd. 27 & Wellandport Rd.

Future 2026 Traffic Analysis
PM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	126	0	0	95	164	197
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	137	0	0	103	178	214
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	389	285	392			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	389	285	392			
tC, single (s)	6.5	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.3	2.2			
p0 queue free %	77	100	100			
cM capacity (veh/h)	594	758	1177			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	137	103	392			
Volume Left	137	0	0			
Volume Right	0	0	214			
cSH	594	1177	1700			
Volume to Capacity	0.23	0.00	0.23			
Queue Length 95th (m)	6.7	0.0	0.0			
Control Delay (s)	12.9	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	12.9	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		2.8				
Intersection Capacity Utilization		36.7%		ICU Level of Service	A	
Analysis Period (min)		15				

Appendix G

**Future (2036) Do Nothing Weekday AM and
PM Traffic Analysis Synchro Output Sheets**

Creek Rd. EA - Traffic Study
1: Creek Rd. & Canborough Rd.

Future 2036 Traffic Analysis
AM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↱	↘↙	
Volume (veh/h)	116	36	29	81	74	32
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	126	39	32	88	80	35
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			165		297	146
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			165		297	146
tC, single (s)			4.2		6.6	6.4
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.5
p0 queue free %			98		88	96
cM capacity (veh/h)			1343		650	858
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	165	120	115			
Volume Left	0	32	80			
Volume Right	39	0	35			
cSH	1700	1343	702			
Volume to Capacity	0.10	0.02	0.16			
Queue Length 95th (m)	0.0	0.5	4.4			
Control Delay (s)	0.0	2.2	11.1			
Lane LOS		A	B			
Approach Delay (s)	0.0	2.2	11.1			
Approach LOS			B			
Intersection Summary						
Average Delay		3.9				
Intersection Capacity Utilization		31.9%	ICU Level of Service	A		
Analysis Period (min)		15				

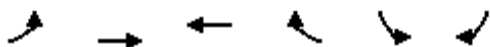
Creek Rd. EA - Traffic Study
4: Diltz Rd. & Creek Rd.

Future 2036 Traffic Analysis
AM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	21	43	6	25	83	7
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	47	7	27	90	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			70		86	46
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			70		86	46
tC, single (s)			4.3		6.5	6.4
tC, 2 stage (s)						
tF (s)			2.4		3.6	3.5
p0 queue free %			100		90	99
cM capacity (veh/h)			1397		882	974
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	70	34	98			
Volume Left	0	7	90			
Volume Right	47	0	8			
cSH	1700	1397	888			
Volume to Capacity	0.04	0.00	0.11			
Queue Length 95th (m)	0.0	0.1	2.8			
Control Delay (s)	0.0	1.5	9.6			
Lane LOS		A	A			
Approach Delay (s)	0.0	1.5	9.6			
Approach LOS			A			
Intersection Summary						
Average Delay			4.9			
Intersection Capacity Utilization			19.2%	ICU Level of Service		A
Analysis Period (min)			15			

Creek Rd. EA - Traffic Study
10: Creek Rd. & Chippawa Creek Conservation Area

Future 2036 Traffic Analysis
AM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	10	29	31	25	15	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	32	34	27	16	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	61				101	47
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	61				101	47
tC, single (s)	4.1				6.5	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.6	3.3
p0 queue free %	99				98	99
cM capacity (veh/h)	1555				875	1028
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	42	61	27			
Volume Left	11	0	16			
Volume Right	0	27	11			
cSH	1555	1700	930			
Volume to Capacity	0.01	0.04	0.03			
Queue Length 95th (m)	0.2	0.0	0.7			
Control Delay (s)	1.9	0.0	9.0			
Lane LOS	A		A			
Approach Delay (s)	1.9	0.0	9.0			
Approach LOS			A			
Intersection Summary						
Average Delay		2.5				
Intersection Capacity Utilization		18.9%		ICU Level of Service		A
Analysis Period (min)		15				

Creek Rd. EA - Traffic Study
17: Wellandport Rd. & Creek Rd.

Future 2036 Traffic Analysis
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	55	11	1	17	21	6	1	130	7	1	83	25
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	60	12	1	18	23	7	1	141	8	1	90	27
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	271	257	104	260	267	145	117			149		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	271	257	104	260	267	145	117			149		
tC, single (s)	7.5	6.5	7.2	7.5	6.6	6.2	5.1			4.1		
tC, 2 stage (s)												
tF (s)	3.9	4.0	4.2	3.9	4.1	3.3	3.1			2.2		
p0 queue free %	90	98	100	97	96	99	100			100		
cM capacity (veh/h)	587	649	739	606	623	907	1034			1445		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	73	48	150	118								
Volume Left	60	18	1	1								
Volume Right	1	7	8	27								
cSH	598	643	1034	1445								
Volume to Capacity	0.12	0.07	0.00	0.00								
Queue Length 95th (m)	3.1	1.8	0.0	0.0								
Control Delay (s)	11.8	11.0	0.1	0.1								
Lane LOS	B	B	A	A								
Approach Delay (s)	11.8	11.0	0.1	0.1								
Approach LOS	B	B										
Intersection Summary												
Average Delay			3.6									
Intersection Capacity Utilization			23.0%		ICU Level of Service				A			
Analysis Period (min)			15									

Creek Rd. EA - Traffic Study
19: Regional Rd. 27 & Creek Rd.

Future 2036 Traffic Analysis
AM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	21	43	160	97	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	23	47	174	105	0
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	373	105	105			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	373	105	105			
tC, single (s)	6.4	6.3	4.3			
tC, 2 stage (s)						
tF (s)	3.5	3.4	2.3			
p0 queue free %	100	98	97			
cM capacity (veh/h)	611	920	1403			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	23	221	105			
Volume Left	0	47	0			
Volume Right	23	0	0			
cSH	920	1403	1700			
Volume to Capacity	0.02	0.03	0.06			
Queue Length 95th (m)	0.6	0.8	0.0			
Control Delay (s)	9.0	1.8	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.0	1.8	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		1.8				
Intersection Capacity Utilization		28.4%		ICU Level of Service		A
Analysis Period (min)		15				

Creek Rd. EA - Traffic Study
20: Regional Rd. 27 & Wellandport Rd.

Future 2036 Traffic Analysis

AM Peak Hour



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	185	0	0	160	97	104
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	201	0	0	174	105	113
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	336	162	218			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	336	162	218			
tC, single (s)	6.6	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.7	3.3	2.2			
p0 queue free %	68	100	100			
cM capacity (veh/h)	626	888	1363			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	201	174	218			
Volume Left	201	0	0			
Volume Right	0	0	113			
cSH	626	1363	1700			
Volume to Capacity	0.32	0.00	0.13			
Queue Length 95th (m)	10.5	0.0	0.0			
Control Delay (s)	13.4	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	13.4	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		4.6				
Intersection Capacity Utilization		30.2%		ICU Level of Service	A	
Analysis Period (min)		15				

Creek Rd. EA - Traffic Study
1: Creek Rd. & Canborough Rd.

Future 2036 Traffic Analysis
PM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	97	69	46	144	49	36
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	105	75	50	157	53	39
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		399	143
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			180		399	143
tC, single (s)			4.2		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.3		3.5	3.3
p0 queue free %			96		91	96
cM capacity (veh/h)			1371		588	899
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	180	207	92			
Volume Left	0	50	53			
Volume Right	75	0	39			
cSH	1700	1371	689			
Volume to Capacity	0.11	0.04	0.13			
Queue Length 95th (m)	0.0	0.9	3.5			
Control Delay (s)	0.0	2.1	11.0			
Lane LOS		A	B			
Approach Delay (s)	0.0	2.1	11.0			
Approach LOS			B			
Intersection Summary						
Average Delay			3.0			
Intersection Capacity Utilization			36.4%	ICU Level of Service		A
Analysis Period (min)			15			

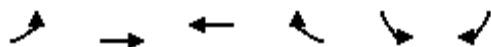
Creek Rd. EA - Traffic Study
4: Diltz Rd. & Creek Rd.

Future 2036 Traffic Analysis
PM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	25	92	6	15	71	13
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	100	7	16	77	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			127		107	77
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			127		107	77
tC, single (s)			4.1		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.4
p0 queue free %			100		91	99
cM capacity (veh/h)			1471		864	959
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	127	23	91			
Volume Left	0	7	77			
Volume Right	100	0	14			
cSH	1700	1471	877			
Volume to Capacity	0.07	0.00	0.10			
Queue Length 95th (m)	0.0	0.1	2.6			
Control Delay (s)	0.0	2.2	9.6			
Lane LOS		A	A			
Approach Delay (s)	0.0	2.2	9.6			
Approach LOS			A			
Intersection Summary						
Average Delay		3.8				
Intersection Capacity Utilization		19.4%		ICU Level of Service	A	
Analysis Period (min)		15				

Creek Rd. EA - Traffic Study
10: Creek Rd. & Chippawa Creek Conservation Area

Future 2036 Traffic Analysis
PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	10	29	31	25	15	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	32	34	27	16	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	61				101	47
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	61				101	47
tC, single (s)	4.1				6.5	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.6	3.3
p0 queue free %	99				98	99
cM capacity (veh/h)	1555				875	1028
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	42	61	27			
Volume Left	11	0	16			
Volume Right	0	27	11			
cSH	1555	1700	930			
Volume to Capacity	0.01	0.04	0.03			
Queue Length 95th (m)	0.2	0.0	0.7			
Control Delay (s)	1.9	0.0	9.0			
Lane LOS	A		A			
Approach Delay (s)	1.9	0.0	9.0			
Approach LOS			A			
Intersection Summary						
Average Delay			2.5			
Intersection Capacity Utilization			18.9%	ICU Level of Service		A
Analysis Period (min)			15			

Creek Rd. EA - Traffic Study
17: Wellandport Rd. & Creek Rd.

Future 2036 Traffic Analysis
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	42	14	4	11	18	1	4	108	10	3	162	62
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	46	15	4	12	20	1	4	117	11	3	176	67
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	359	353	210	360	382	123	243			128		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	359	353	210	360	382	123	243			128		
tC, single (s)	7.5	6.6	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.9	4.1	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	91	97	99	98	96	100	100			100		
cM capacity (veh/h)	511	556	836	582	551	934	1335			1470		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	65	33	133	247								
Volume Left	46	12	4	3								
Volume Right	4	1	11	67								
cSH	535	570	1335	1470								
Volume to Capacity	0.12	0.06	0.00	0.00								
Queue Length 95th (m)	3.1	1.4	0.1	0.1								
Control Delay (s)	12.7	11.7	0.3	0.1								
Lane LOS	B	B	A	A								
Approach Delay (s)	12.7	11.7	0.3	0.1								
Approach LOS	B	B										
Intersection Summary												
Average Delay			2.7									
Intersection Capacity Utilization			27.9%		ICU Level of Service				A			
Analysis Period (min)			15									

Creek Rd. EA - Traffic Study
19: Regional Rd. 27 & Creek Rd.

Future 2036 Traffic Analysis
PM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	27	31	111	192	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	29	34	121	209	0
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	397	209	209			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	397	209	209			
tC, single (s)	6.4	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.3			
p0 queue free %	100	96	97			
cM capacity (veh/h)	597	837	1322			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	29	154	209			
Volume Left	0	34	0			
Volume Right	29	0	0			
cSH	837	1322	1700			
Volume to Capacity	0.04	0.03	0.12			
Queue Length 95th (m)	0.8	0.6	0.0			
Control Delay (s)	9.5	1.9	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.5	1.9	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		1.4				
Intersection Capacity Utilization		32.5%		ICU Level of Service		A
Analysis Period (min)		15				

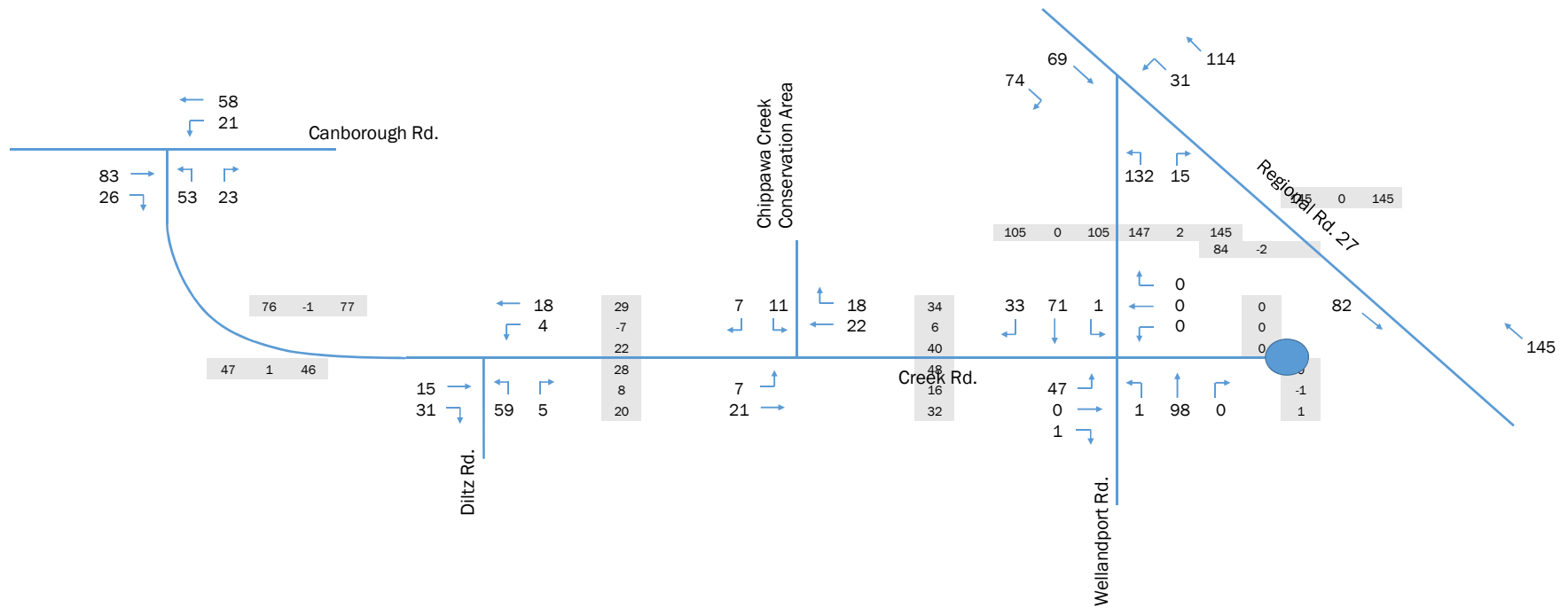
Creek Rd. EA - Traffic Study
20: Regional Rd. 27 & Wellandport Rd.

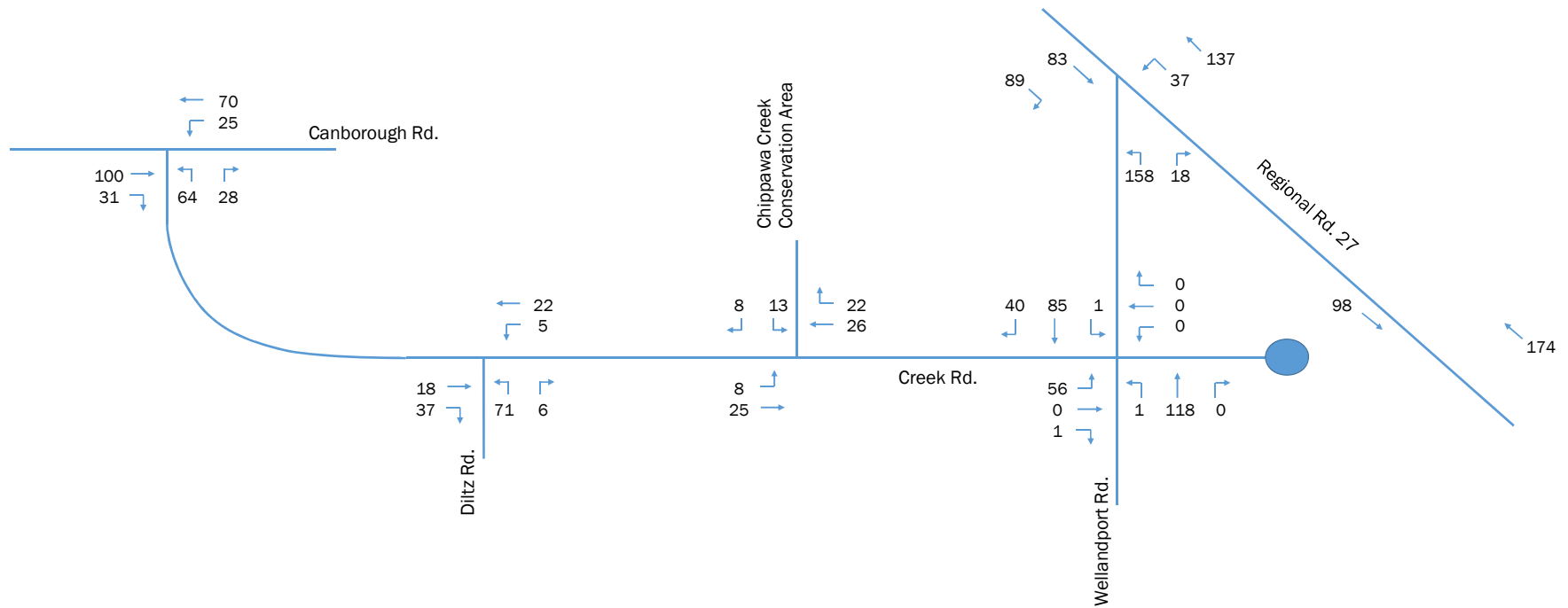
Future 2036 Traffic Analysis
PM Peak Hour

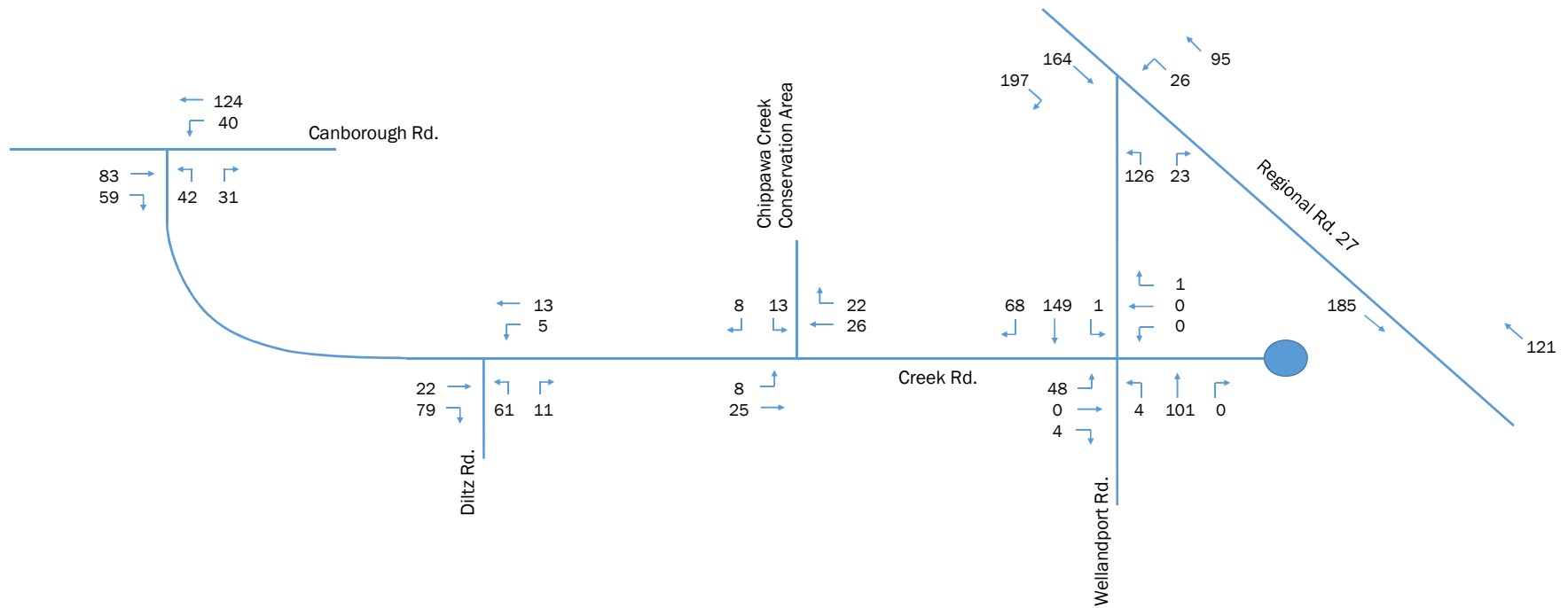
						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	147	0	0	111	192	230
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	160	0	0	121	209	250
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	454	334	459			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	454	334	459			
tC, single (s)	6.5	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.3	2.2			
p0 queue free %	71	100	100			
cM capacity (veh/h)	544	713	1113			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	160	121	459			
Volume Left	160	0	0			
Volume Right	0	0	250			
cSH	544	1113	1700			
Volume to Capacity	0.29	0.00	0.27			
Queue Length 95th (m)	9.3	0.0	0.0			
Control Delay (s)	14.4	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	14.4	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		3.1				
Intersection Capacity Utilization		41.8%		ICU Level of Service	A	
Analysis Period (min)		15				

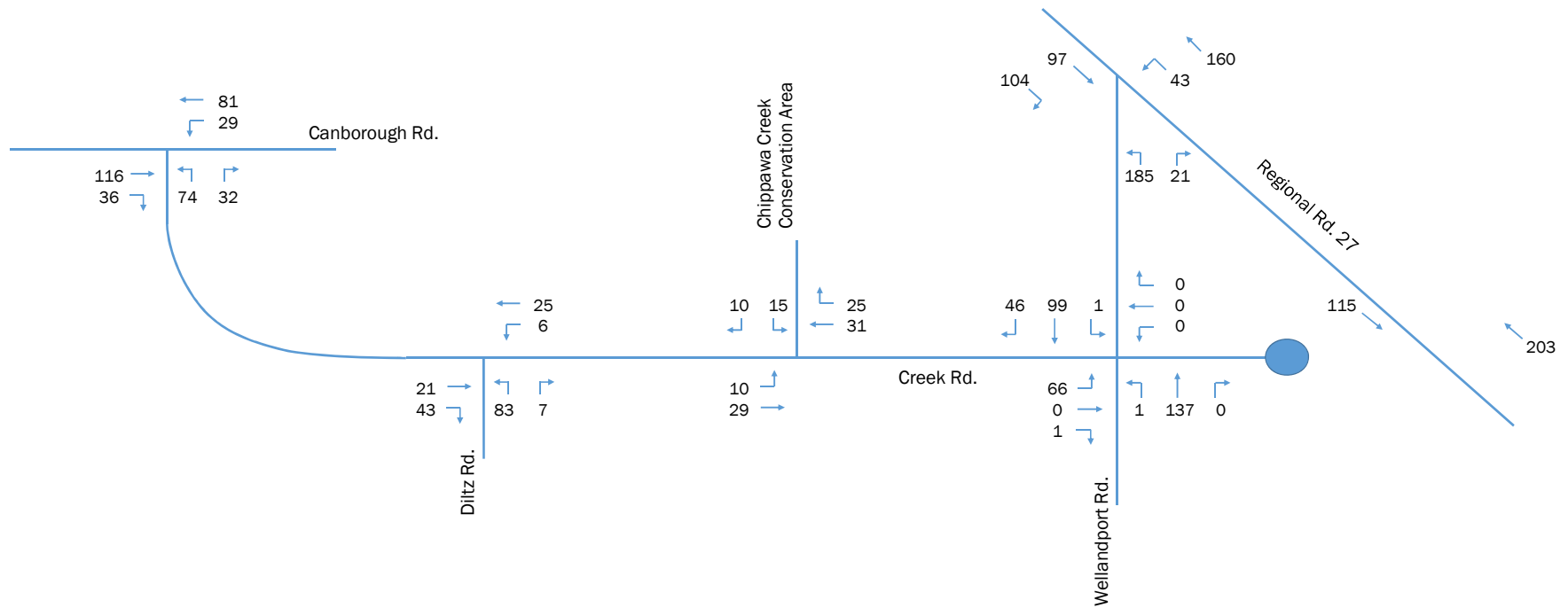
Appendix H

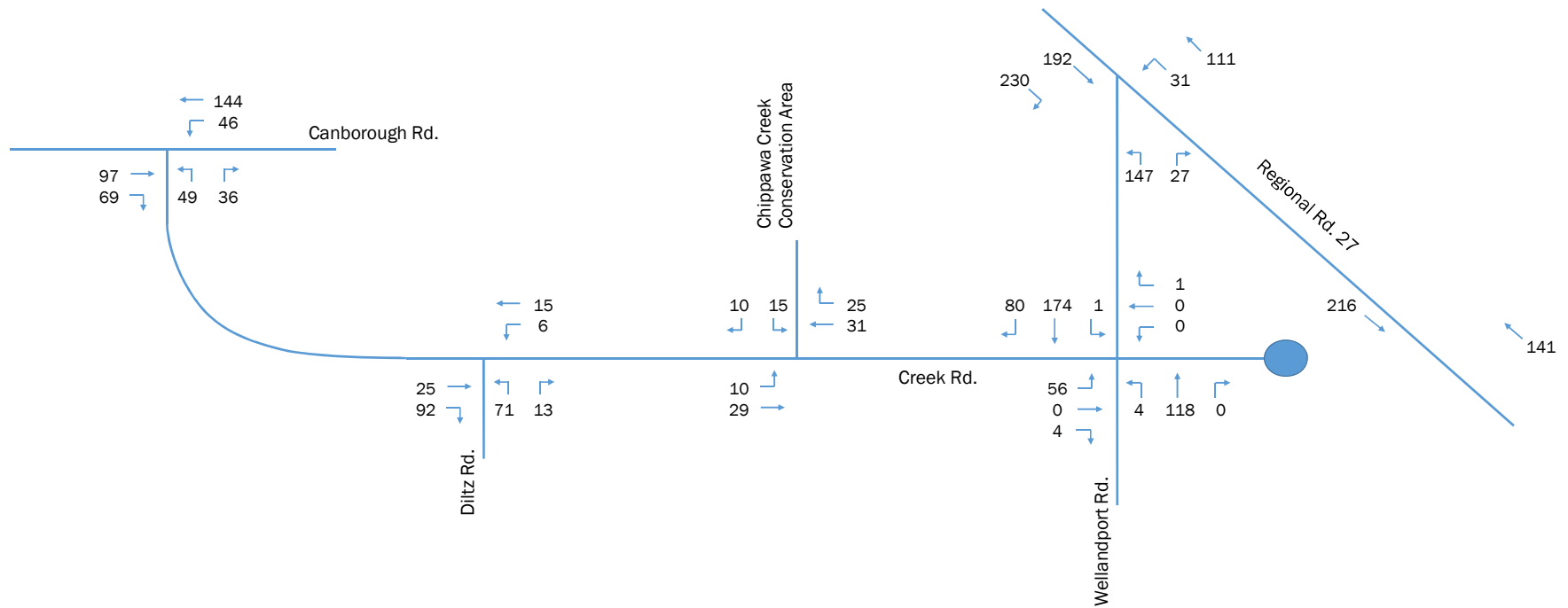
**Existing (2016) & Future (2026 & 2036) Redistributed
Weekday AM & PM Traffic Volumes (Option 2)**











Appendix I

**Existing (2016) & Future (2026 & 2036) Weekday AM &
PM Traffic Analysis Synchro Output Sheets (Option 2)**

Creek Rd. EA - Traffic Study
17: Wellandport Rd. & Creek Rd.

Existing 2016 Traffic Analysis (Option 2)
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	47	0	1	0	0	0	1	98	0	1	71	33
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	51	0	1	0	0	0	1	107	0	1	77	36
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	206	206	95	207	224	107	113			107		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	206	206	95	207	224	107	113			107		
tC, single (s)	7.5	6.5	7.2	7.1	6.5	6.2	5.1			4.1		
tC, 2 stage (s)												
tF (s)	3.9	4.0	4.2	3.5	4.0	3.3	3.1			2.2		
p0 queue free %	92	100	100	100	100	100	100			100		
cM capacity (veh/h)	674	689	749	748	674	948	1038			1484		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	52	0	108	114								
Volume Left	51	0	1	1								
Volume Right	1	0	0	36								
cSH	675	1700	1038	1484								
Volume to Capacity	0.08	0.00	0.00	0.00								
Queue Length 95th (m)	1.9	0.0	0.0	0.0								
Control Delay (s)	10.8	0.0	0.1	0.1								
Lane LOS	B	A	A	A								
Approach Delay (s)	10.8	0.0	0.1	0.1								
Approach LOS	B	A										
Intersection Summary												
Average Delay			2.1									
Intersection Capacity Utilization			16.9%		ICU Level of Service				A			
Analysis Period (min)			15									

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	132	15	31	114	69	74
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	143	16	34	124	75	80
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	307	115	155			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	307	115	155			
tC, single (s)	6.6	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.7	3.3	2.2			
p0 queue free %	77	98	98			
cM capacity (veh/h)	636	943	1437			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	160	158	155			
Volume Left	143	34	0			
Volume Right	16	0	80			
cSH	658	1437	1700			
Volume to Capacity	0.24	0.02	0.09			
Queue Length 95th (m)	7.2	0.5	0.0			
Control Delay (s)	12.2	1.8	0.0			
Lane LOS	B	A				
Approach Delay (s)	12.2	1.8	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		4.7				
Intersection Capacity Utilization		36.2%		ICU Level of Service		A
Analysis Period (min)		15				

Creek Rd. EA - Traffic Study
17: Wellandport Rd. & Creek Rd.

Existing 2016 Traffic Analysis (Option 2)
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	40	0	3	0	0	0	3	84	0	0	124	57
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	0	3	0	0	0	3	91	0	0	135	62
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	264	264	166	267	295	91	197			91		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	264	264	166	267	295	91	197			91		
tC, single (s)	7.5	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.9	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	100	100	100	100	100	100			100		
cM capacity (veh/h)	612	640	884	682	615	966	1388			1504		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	47	0	95	197								
Volume Left	43	0	3	0								
Volume Right	3	0	0	62								
cSH	625	1700	1388	1504								
Volume to Capacity	0.07	0.00	0.00	0.00								
Queue Length 95th (m)	1.8	0.0	0.1	0.0								
Control Delay (s)	11.2	0.0	0.3	0.0								
Lane LOS	B	A	A									
Approach Delay (s)	11.2	0.0	0.3	0.0								
Approach LOS	B	A										
Intersection Summary												
Average Delay			1.6									
Intersection Capacity Utilization			20.9%		ICU Level of Service				A			
Analysis Period (min)			15									

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	105	19	22	79	137	164
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	114	21	24	86	149	178
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	372	238	327			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	372	238	327			
tC, single (s)	6.5	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.3	2.2			
p0 queue free %	81	97	98			
cM capacity (veh/h)	596	806	1244			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	135	110	327			
Volume Left	114	24	0			
Volume Right	21	0	178			
cSH	621	1244	1700			
Volume to Capacity	0.22	0.02	0.19			
Queue Length 95th (m)	6.2	0.4	0.0			
Control Delay (s)	12.4	1.9	0.0			
Lane LOS	B	A				
Approach Delay (s)	12.4	1.9	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		3.3				
Intersection Capacity Utilization		39.5%		ICU Level of Service	A	
Analysis Period (min)		15				

Creek Rd. EA - Traffic Study
17: Wellandport Rd. & Creek Rd.

Future 2026 Traffic Analysis (Option 2)
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	56	0	1	0	0	0	1	118	0	1	85	40
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	61	0	1	0	0	0	1	128	0	1	92	43
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	247	247	114	248	268	128	136			128		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	247	247	114	248	268	128	136			128		
tC, single (s)	7.5	6.5	7.2	7.1	6.5	6.2	5.1			4.1		
tC, 2 stage (s)												
tF (s)	3.9	4.0	4.2	3.5	4.0	3.3	3.1			2.2		
p0 queue free %	90	100	100	100	100	100	100			100		
cM capacity (veh/h)	632	654	729	704	636	922	1015			1458		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	62	0	129	137								
Volume Left	61	0	1	1								
Volume Right	1	0	0	43								
cSH	634	1700	1015	1458								
Volume to Capacity	0.10	0.00	0.00	0.00								
Queue Length 95th (m)	2.5	0.0	0.0	0.0								
Control Delay (s)	11.3	0.0	0.1	0.1								
Lane LOS	B	A	A	A								
Approach Delay (s)	11.3	0.0	0.1	0.1								
Approach LOS	B	A										
Intersection Summary												
Average Delay			2.2									
Intersection Capacity Utilization			18.3%		ICU Level of Service				A			
Analysis Period (min)			15									



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	158	18	37	137	83	89
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	172	20	40	149	90	97
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	368	139	187			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	368	139	187			
tC, single (s)	6.6	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.7	3.3	2.2			
p0 queue free %	71	98	97			
cM capacity (veh/h)	582	915	1400			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	191	189	187			
Volume Left	172	40	0			
Volume Right	20	0	97			
cSH	605	1400	1700			
Volume to Capacity	0.32	0.03	0.11			
Queue Length 95th (m)	10.3	0.7	0.0			
Control Delay (s)	13.7	1.8	0.0			
Lane LOS	B	A				
Approach Delay (s)	13.7	1.8	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			5.2			
Intersection Capacity Utilization			41.4%	ICU Level of Service	A	
Analysis Period (min)			15			

Creek Rd. EA - Traffic Study
17: Wellandport Rd. & Creek Rd.

Future 2026 Traffic Analysis (Option 2)
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	48	0	4	0	0	1	4	101	0	1	149	68
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	52	0	4	0	0	1	4	110	0	1	162	74
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	321	320	199	324	357	110	236			110		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	321	320	199	324	357	110	236			110		
tC, single (s)	7.5	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.9	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	91	100	99	100	100	100	100			100		
cM capacity (veh/h)	558	595	847	624	567	944	1343			1480		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	57	1	114	237								
Volume Left	52	0	4	1								
Volume Right	4	1	0	74								
cSH	573	944	1343	1480								
Volume to Capacity	0.10	0.00	0.00	0.00								
Queue Length 95th (m)	2.5	0.0	0.1	0.0								
Control Delay (s)	12.0	8.8	0.3	0.0								
Lane LOS	B	A	A	A								
Approach Delay (s)	12.0	8.8	0.3	0.0								
Approach LOS	B	A										
Intersection Summary												
Average Delay			1.8									
Intersection Capacity Utilization			29.9%		ICU Level of Service				A			
Analysis Period (min)			15									

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	126	23	26	95	164	197
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	137	25	28	103	178	214
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	445	285	392			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	445	285	392			
tC, single (s)	6.5	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.3	2.2			
p0 queue free %	75	97	98			
cM capacity (veh/h)	537	758	1177			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	162	132	392			
Volume Left	137	28	0			
Volume Right	25	0	214			
cSH	563	1177	1700			
Volume to Capacity	0.29	0.02	0.23			
Queue Length 95th (m)	9.0	0.6	0.0			
Control Delay (s)	14.0	1.9	0.0			
Lane LOS	B	A				
Approach Delay (s)	14.0	1.9	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		3.7				
Intersection Capacity Utilization		45.7%		ICU Level of Service	A	
Analysis Period (min)		15				

Creek Rd. EA - Traffic Study
17: Wellandport Rd. & Creek Rd.

Future 2036 Traffic Analysis (Option 2)
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	66	0	1	0	0	0	1	137	0	0	99	46
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	72	0	1	0	0	0	1	149	0	0	108	50
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	284	284	133	285	309	149	158			149		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	284	284	133	285	309	149	158			149		
tC, single (s)	7.5	6.5	7.2	7.1	6.5	6.2	5.1			4.1		
tC, 2 stage (s)												
tF (s)	3.9	4.0	4.2	3.5	4.0	3.3	3.1			2.2		
p0 queue free %	88	100	100	100	100	100	100			100		
cM capacity (veh/h)	597	625	710	666	605	898	993			1433		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	73	0	150	158								
Volume Left	72	0	1	0								
Volume Right	1	0	0	50								
cSH	598	1700	993	1700								
Volume to Capacity	0.12	0.00	0.00	0.09								
Queue Length 95th (m)	3.1	0.0	0.0	0.0								
Control Delay (s)	11.9	0.0	0.1	0.0								
Lane LOS	B	A	A									
Approach Delay (s)	11.9	0.0	0.1	0.0								
Approach LOS	B	A										
Intersection Summary												
Average Delay			2.3									
Intersection Capacity Utilization			19.4%	ICU Level of Service					A			
Analysis Period (min)			15									



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	185	21	43	160	97	104
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	201	23	47	174	105	113
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	429	162	218			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	429	162	218			
tC, single (s)	6.6	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.7	3.3	2.2			
p0 queue free %	62	97	97			
cM capacity (veh/h)	533	888	1363			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	224	221	218			
Volume Left	201	47	0			
Volume Right	23	0	113			
cSH	556	1363	1700			
Volume to Capacity	0.40	0.03	0.13			
Queue Length 95th (m)	14.7	0.8	0.0			
Control Delay (s)	15.8	1.9	0.0			
Lane LOS	C	A				
Approach Delay (s)	15.8	1.9	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			6.0			
Intersection Capacity Utilization			46.7%	ICU Level of Service	A	
Analysis Period (min)			15			

Creek Rd. EA - Traffic Study
17: Wellandport Rd. & Creek Rd.

Future 2036 Traffic Analysis (Option 2)
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	56	0	4	0	0	1	4	118	0	1	174	80
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	61	0	4	0	0	1	4	128	0	1	189	87
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	373	372	233	376	415	128	276			128		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	373	372	233	376	415	128	276			128		
tC, single (s)	7.5	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.9	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	88	100	99	100	100	100	100			100		
cM capacity (veh/h)	514	556	811	576	526	922	1299			1458		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	65	1	133	277								
Volume Left	61	0	4	1								
Volume Right	4	1	0	87								
cSH	526	922	1299	1458								
Volume to Capacity	0.12	0.00	0.00	0.00								
Queue Length 95th (m)	3.2	0.0	0.1	0.0								
Control Delay (s)	12.8	8.9	0.3	0.0								
Lane LOS	B	A	A	A								
Approach Delay (s)	12.8	8.9	0.3	0.0								
Approach LOS	B	A										
Intersection Summary												
Average Delay			1.9									
Intersection Capacity Utilization			32.7%	ICU Level of Service					A			
Analysis Period (min)			15									

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	147	27	31	111	192	230
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	160	29	34	121	209	250
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	522	334	459			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	522	334	459			
tC, single (s)	6.5	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.3	2.2			
p0 queue free %	67	96	97			
cM capacity (veh/h)	481	713	1113			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	189	154	459			
Volume Left	160	34	0			
Volume Right	29	0	250			
cSH	507	1113	1700			
Volume to Capacity	0.37	0.03	0.27			
Queue Length 95th (m)	13.0	0.7	0.0			
Control Delay (s)	16.3	2.0	0.0			
Lane LOS	C	A				
Approach Delay (s)	16.3	2.0	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay		4.2				
Intersection Capacity Utilization		52.8%		ICU Level of Service	A	
Analysis Period (min)		15				

Appendix J

All-Way Stop Control Warrant Analysis

ALL-WAY STOP CONTROL WARRANT ANALYSIS

Existing (2016) Weekday AM & PM Traffic Volumes
Regional Road 45 (Creek Rd.) & Regional Road 4 (Wellandport Rd.)

Minimum Total Intersection Vehicular Volume

	Hour Beginning							
	07:00 AM	08:00 AM	11:00 AM	12:00 PM	01:00 PM	03:00 PM	04:00 PM	05:00 PM
Total Intersection Traffic Volume	231	222	190	207	199	219	265	295
Minor Collector Warrant >350*	No	No	No	No	No	No	No	No
Arterial/Major Collector Warrant >500**	No	No	No	No	No	No	No	No

* Must be satisfied for peak hour

** Must be satisfied for all eight hours

Minimum Minor Street Pedestrian and Vehicular Volume

	Hour Beginning							
	07:00 AM	08:00 AM	11:00 AM	12:00 PM	01:00 PM	03:00 PM	04:00 PM	05:00 PM
Total Intersection Traffic Volume	61	55	44	60	56	49	56	66
Minor Collector - No Warrant	-	-	-	-	-	-	-	-
Arterial/Major Collector Warrant >200*	No	No	No	No	No	No	No	No

* >200 vehicles must experience >30 seconds delay to be warranted

Peak Hour Volume Split on Major Street

	Warrants	
Minor Collector, Tee - Warrant <75%	76%	
Minor Collector, 4-way - Warrant <65%	76%	
Arterial/Major Collector - Warrant <70%	75%	

* Volume on minor street includes vehicles only

** Volume on major street includes vehicles and pedestrians

ALL-WAY STOP CONTROL WARRANT ANALYSIS

Future (2026) Weekday AM & PM Traffic Volumes
Regional Road 45 (Creek Rd.) & Regional Road 4 (Wellandport Rd.)

Minimum Total Intersection Vehicular Volume

	Hour Beginning							
	07:00 AM	08:00 AM	11:00 AM	12:00 PM	01:00 PM	03:00 PM	04:00 PM	05:00 PM
Total Intersection Traffic Volume	0	308	0	0	0	0	377	0
Minor Collector Warrant >350*	No	No	No	No	No	No	Yes	No
Arterial/Major Collector Warrant >500**	No	No	No	No	No	No	No	No

* Must be satisfied for peak hour

** Must be satisfied for all eight hours

Minimum Minor Street Pedestrian and Vehicular Volume

	Hour Beginning							
	07:00 AM	08:00 AM	11:00 AM	12:00 PM	01:00 PM	03:00 PM	04:00 PM	05:00 PM
Total Intersection Traffic Volume	0	95	0	0	0	0	79	0
Minor Collector - No Warrant	-	-	-	-	-	-	-	-
Arterial/Major Collector Warrant >200*	No	No	No	No	No	No	No	No

* >200 vehicles must experience >30 seconds delay to be warranted

Peak Hour Volume Split on Major Street

	Warrants	
Minor Collector, Tee - Warrant <75%	75%	Yes
Minor Collector, 4-way - Warrant <65%	75%	
Arterial/Major Collector - Warrant <70%	74%	

* Volume on minor street includes vehicles only

** Volume on major street includes vehicles and pedestrians

ALL-WAY STOP CONTROL WARRANT ANALYSIS

Future (2036) Weekday AM & PM Traffic Volumes
Regional Road 45 (Creek Rd.) & Regional Road 4 (Wellandport Rd.)

Minimum Total Intersection Vehicular Volume

	Hour Beginning							
	07:00 AM	08:00 AM	11:00 AM	12:00 PM	01:00 PM	03:00 PM	04:00 PM	05:00 PM
Total Intersection Traffic Volume	0	358	0	0	0	0	439	0
Minor Collector Warrant >350*	No	Yes	No	No	No	No	Yes	No
Arterial/Major Collector Warrant >500**	No	No	No	No	No	No	No	No

* Must be satisfied for peak hour

** Must be satisfied for all eight hours

Minimum Minor Street Pedestrian and Vehicular Volume

	Hour Beginning							
	07:00 AM	08:00 AM	11:00 AM	12:00 PM	01:00 PM	03:00 PM	04:00 PM	05:00 PM
Total Intersection Traffic Volume	0	111	0	0	0	0	90	0
Minor Collector - No Warrant	-	-	-	-	-	-	-	-
Arterial/Major Collector Warrant >200*	No	No	No	No	No	No	No	No

* >200 vehicles must experience >30 seconds delay to be warranted

Peak Hour Volume Split on Major Street

	Warrants	
Minor Collector, Tee - Warrant <75%	75%	Yes
Minor Collector, 4-way - Warrant <65%	75%	
Arterial/Major Collector - Warrant <70%	74%	

* Volume on minor street includes vehicles only

** Volume on major street includes vehicles and pedestrians

ALL-WAY STOP CONTROL WARRANT ANALYSIS

Existing (2016) Rerouted Weekday AM & PM Traffic Volumes (Option 2)
Regional Road 45 (Creek Rd.) & Regional Road 4 (Wellandport Rd.)

Minimum Total Intersection Vehicular Volume

	Hour Beginning							
	07:00 AM	08:00 AM	11:00 AM	12:00 PM	01:00 PM	03:00 PM	04:00 PM	05:00 PM
Total Intersection Traffic Volume	0	252	0	0	0	0	313	0
Minor Collector Warrant >350*	No	No	No	No	No	No	No	No
Arterial/Major Collector Warrant >500**	No	No	No	No	No	No	No	No

* Must be satisfied for peak hour

** Must be satisfied for all eight hours

Minimum Minor Street Pedestrian and Vehicular Volume

	Hour Beginning							
	07:00 AM	08:00 AM	11:00 AM	12:00 PM	01:00 PM	03:00 PM	04:00 PM	05:00 PM
Total Intersection Traffic Volume	0	48	0	0	0	0	44	0
Minor Collector - No Warrant	-	-	-	-	-	-	-	-
Arterial/Major Collector Warrant >200*	No	No	No	No	No	No	No	No

* >200 vehicles must experience >30 seconds delay to be warranted

Peak Hour Volume Split on Major Street

	Warrants	
Minor Collector, Tee - Warrant <75%	84%	
Minor Collector, 4-way - Warrant <65%	84%	
Arterial/Major Collector - Warrant <70%	83%	

* Volume on minor street includes vehicles only

** Volume on major street includes vehicles and pedestrians

ALL-WAY STOP CONTROL WARRANT ANALYSIS

Future (2026) Rerouted Weekday AM & PM Traffic Volumes (Option 2)
Regional Road 45 (Creek Rd.) & Regional Road 4 (Wellandport Rd.)

Minimum Total Intersection Vehicular Volume

	Hour Beginning							
	07:00 AM	08:00 AM	11:00 AM	12:00 PM	01:00 PM	03:00 PM	04:00 PM	05:00 PM
Total Intersection Traffic Volume	0	302	0	0	0	0	376	0
Minor Collector Warrant >350*	No	No	No	No	No	No	Yes	No
Arterial/Major Collector Warrant >500**	No	No	No	No	No	No	No	No

* Must be satisfied for peak hour

** Must be satisfied for all eight hours

Minimum Minor Street Pedestrian and Vehicular Volume

	Hour Beginning							
	07:00 AM	08:00 AM	11:00 AM	12:00 PM	01:00 PM	03:00 PM	04:00 PM	05:00 PM
Total Intersection Traffic Volume	0	57	0	0	0	0	53	0
Minor Collector - No Warrant	-	-	-	-	-	-	-	-
Arterial/Major Collector Warrant >200*	No	No	No	No	No	No	No	No

* >200 vehicles must experience >30 seconds delay to be warranted

Peak Hour Volume Split on Major Street

	Warrants	
Minor Collector, Tee - Warrant <75%	84%	
Minor Collector, 4-way - Warrant <65%	84%	
Arterial/Major Collector - Warrant <70%	83%	

* Volume on minor street includes vehicles only

** Volume on major street includes vehicles and pedestrians

ALL-WAY STOP CONTROL WARRANT ANALYSIS

Future (2036) Rerouted Weekday AM & PM Traffic Volumes (Option 2)
Regional Road 45 (Creek Rd.) & Regional Road 4 (Wellandport Rd.)

Minimum Total Intersection Vehicular Volume

	Hour Beginning							
	07:00 AM	08:00 AM	11:00 AM	12:00 PM	01:00 PM	03:00 PM	04:00 PM	05:00 PM
Total Intersection Traffic Volume	0	351	0	0	0	0	438	0
Minor Collector Warrant >350*	No	Yes	No	No	No	No	Yes	No
Arterial/Major Collector Warrant >500**	No	No	No	No	No	No	No	No

* Must be satisfied for peak hour

** Must be satisfied for all eight hours

Minimum Minor Street Pedestrian and Vehicular Volume

	Hour Beginning							
	07:00 AM	08:00 AM	11:00 AM	12:00 PM	01:00 PM	03:00 PM	04:00 PM	05:00 PM
Total Intersection Traffic Volume	0	67	0	0	0	0	61	0
Minor Collector - No Warrant	-	-	-	-	-	-	-	-
Arterial/Major Collector Warrant >200*	No	No	No	No	No	No	No	No

* >200 vehicles must experience >30 seconds delay to be warranted

Peak Hour Volume Split on Major Street

	Warrants	
Minor Collector, Tee - Warrant <75%	84%	
Minor Collector, 4-way - Warrant <65%	84%	
Arterial/Major Collector - Warrant <70%	83%	

* Volume on minor street includes vehicles only

** Volume on major street includes vehicles and pedestrians

Transportation & Traffic Analysis

Regional Road 45 (Creek Road) Municipal Class EA

Niagara Region

1815 Sir Isaac Brock Way

Thorold, ON

L2V 4T7

PARSONS