Transportation Assessment of Left Turn Lane Requirements, Activa Subdivision, Conservation Drive, Waterloo, ON



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Sign-off Sheet

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1.0 INTRODUCTION

Activa Holdings Inc. is seeking draft plan approval of their proposed residential development located north of Conservation Drive between Roy Schmidt Road and Rideau River Street in the City of Waterloo, Ontario.

The development will feature somewhere between 182 to 279 residential units with access to Conservation Drive via the existing Rideau River Street and two other new local street connections.

Appendix A contains Activa's preliminary draft plan of subdivision.

1.1 BACKGROUND

In 2014, the City of Waterloo (City) initiated the Municipal Class Environmental Assessment (MCEA) for Conservation Drive and Beaver Creek Road to assess the need for municipal services and related infrastructure. At around the same time, the Beaver Creek Meadows (BCM) District Plan was proceeding under a separate study to develop and refine the land use plan, transportation network, and environmental policies for the area.

In November 2015, Stantec prepared the *Beaver Creek Road and Conservation Drive Upgrades and Extension Municipal Class EA Transportation Overview*. With an emphasis focused on the intersections along Beaver Creek and Conservation Drive, the Transportation Overview examined existing transportation conditions, developed traffic projections based on the BCM District Plan, and assessed transportation conditions for 2021 and 2035 to determine future operating conditions and infrastructure requirements.

The Transportation Overview found the following:

- The BCM is anticipated to generate a total of 1,758 auto trips during the AM peak hour and 2,312 auto trips during the PM peak hour during the 2035 ultimate horizon.
- The two-way stop controlled intersection of Erbsville Road and Conservation Drive is recommended to be upgraded to an all-way stop-controlled intersection with an auxiliary westbound left turn lane.
- The intersection of Conservation Drive at Beaver Creek Road is anticipated to be constructed as a modern roundabout intersection per the BCM District Plan. The roundabout was recommended to include an additional right turn lane in the eastbound (W-S) and westbound (E-N) directions. Right-of-way will be protected from the adjacent lands for a full two-lane roundabout.
- The Creekside Church entrance on Conservation Drive will operate acceptably during the weekday peak hours (due to low volumes), but will experience high delays on the

minor approach (i.e. the southbound approach) during the Sunday peak. It was recommended that the intersection remain stop-controlled on the minor (southbound) approach. If and when the Creekside Church property proposes expansion or redevelopment, a traffic study would need to be prepared to determine the impact on Conservation Drive, and the potential need/warrant for higher order traffic control, such as a roundabout intersection or semi-actuated traffic signals.

More recently in July 2017, Stantec prepared a report to update the transportation forecasts and to complete left turn lane warrants at the study area intersections along Conservation Drive and Beaver Creek Road. The July 2017 report found the following:

- The Conservation Drive at Street 1 and Conservation Drive at Street 2 intersections both meet the warrants for westbound left turn auxiliary lanes and both require a storage lane with a length of 25m.
- Conservation Drive at Street 4 meets the warrant for a westbound left turn lane (storage length of 15m).
- Although eastbound left turn lanes are not warranted at Streets 1 and 2 (due to low anticipated turning volumes), it would be beneficial to install eastbound left turn lanes at these locations given that the median "shadow lane" will be needed opposite the westbound left turn lanes. The length of the eastbound left turn lanes can be minimized with a storage length of 15m (2 car lengths).

1.2 PURPOSE

The purpose of this transportation assessment is to determine if left turn auxiliary lanes are required along Conservation Drive adjacent to the proposed Activa subdivision at the following three intersections:

- Conservation Drive at Kawartha Street (proposed new intersection);
- Conservation Drive at Cranberry Street (proposed new intersection); and
- Conservation Drive at Rideau River Street (existing intersection).

As the draft plan of subdivision is still being refined, the number of residential units has not yet been finalized. A range of residential units was provided to Stantec to complete the subject report. As such, two scenarios will be analyzed:

- Scenario 1: upper range of unit count of 279 residential units (103 single family homes, 120 apartments, and 56 townhomes)
- Scenario 2: lower range of unit count of 182 residential units (63 single family homes and 119 townhomes)

2.0 TRANSPORTATION ASSESSMENT

Stantec undertook turning movement counts at the Conservation Drive at Rideau River Street intersection on August 17th, 2017. The site traffic generated by the subject development was estimated under both development scenarios and the site traffic volumes were added to the roadway network at the three study area intersections.

The Activa Subdivision is expected to be fully built and occupied by 2023. Future background transportation forecasts for the 2023 horizon were obtained by applying linear interpolation between existing volumes and 2035 traffic projections from the BCM District Plan (*Update to Transportation Forecasts and Left Turn Lane Requirements* - Stantec, July 2017).

Appendix B contains the projected 2023 ultimate traffic volumes during the AM and PM peak hours at the three study area intersections.

2.1 SITE TRAFFIC GENERATION

The Institute of Transportation Engineers (ITE) Trip Generation Manual, 9th Edition, was used to estimate the volume of traffic expected to be generated by the proposed development under both scenarios during the AM and PM peak hours. Land use codes 210 – Single Family Homes, 220 – Apartment, and 230 – Townhouse / Condos were thought to be the most representative of the proposed land uses.

Table 1 summarizes the projected number of inbound and outbound trips the proposed development is anticipated to generate under Scenario 1 (high unit yield scenario).

Table 2 summarizes the projected number of inbound and outbound trips the proposed development is anticipated to generate under Scenario 2(low unit yield scenario).

Table 1 ITE Trip Generation Potential (Scenario 1 – High Unit Yield)

Land Use Code	Land Use Code	Independent Variable	AM Peak Hour			PM Peak Hour		
			Inbound	Outbound	Total	Inbound	Outbound	Total
Trip Generation Rates								
LUC 210 – Single Family Homes		103 Dwellings	0.19	0.56	**0.75**	0.62	0.38	**1.00**
LUC 220 – Apartment		120 Dwellings	0.10	0.41	**0.51**	0.403	0.217	**0.62**
LUC 230 – Townhouse / Condos		56 Dwellings	0.07	0.37	**0.44**	0.35	0.17	**0.52**
Estimated Trip Generation Potential								
LUC 210 – Single Family Homes		103 Dwellings	19	58	**77**	64	39	**103**
LUC 220 – Apartment		120 Dwellings	12	49	**61**	48	26	**74**
LUC 230 – Townhouse / Condos		56 Dwellings	5	20	**25**	20	10	**30**
Total			36	127	**163**	132	75	**207**

Table 2: ITE Trip Generation Potential (Scenario 2 – Low Unit Yield)

Land Use Code	Land Use Code	Independent Variable	AM Peak Hour			PM Peak Hour		
			Inbound	Outbound	Total	Inbound	Outbound	Total
Trip Generation Rates								
LUC 210 – Single Family Homes		63 Dwellings	0.19	0.56	**0.75**	0.62	0.38	**1.00**
LUC 230 – Townhouse / Condos		119 Dwellings	0.07	0.37	**0.44**	0.35	0.17	**0.52**
Estimated Trip Generation Potential								
LUC 210 – Single Family Homes		63 Dwellings	12	35	**47**	39	24	**63**
LUC 230 – Townhouse / Condos		119 Dwellings	9	43	**52**	42	20	**62**
Total			21	78	**99**	81	44	**125**

2.2 LEFT TURN LANE WARRANTS

The need for left turn lanes was assessed at the three subject intersections along Conservation Drive under both scenarios. The need for eastbound left turn lanes at the site access locations was reviewed based on traffic projected to enter the proposed development. Furthermore, according to the Beaver Creek Meadows District Plan, intersections east of Beaver Creek Road will be 4-leg intersections in order to accommodate access to the development areas south of Conservation Drive. As such, the need for westbound left turn lanes was also reviewed at the subject intersections while recognizing that these westbound left turn lanes would not be attributed to Activa.

Using the nomographs provided in the *Geometric Design Standards for Ontario Highways*, and by applying the projected 2023 traffic volumes, the warrants for both eastbound and westbound left turn lanes were completed at the study area intersections.

Table 1 summarizes the findings from the left turn lane warrant analysis at each intersection under Scenario 1.

Table 2 summarizes the findings from the left turn lane warrant analysis at each intersection under Scenario 2.

Table 3: Scenario 1 - Left Turn Lane Warrants (2023 Traffic Volumes)

MAJOR STREET	MINOR STREET	DIR.	ADVANCING VOLUME	LEFT TURNS	% LEFTS[1]	OPPOSING VOLUMES	WARRANT	STORAGE (m)
AM PEAK HOUR								
Conservation	Kawartha St	EB	467	5	1%	259	No	-
		WB	259	8	3%	467	No	-
Conservation	Cranberry St	EB	496	5	1%	262	No	-
		WB	262	8	3%	496	No	-
Conservation	Rideau River St	EB	518	19	4%	233	No	-
		WB	233	8	3%	518	No	-
PM PEAK HOUR								
Conservation	Kawartha St	EB	352	20	6%	527	No	-
		WB	527	29	5%	352	No	-
Conservation	Cranberry St	EB	366	20	5%	561	No	-
		WB	561	29	5%	366	Yes	15
Conservation	Rideau River St	EB	368	35	10%	606	Yes	15
		WB	606	30	5%	368	Yes	15

1. Where the percentage of left turns was less than 2.5% of the advancing volumes, the left turn lane warrants were not applied.

Table 4: Scenario 2 - Left Turn Lane Warrants (2023 Traffic Volumes)

MAJOR STREET	MINOR STREET	DIR.	ADVANCING VOLUME	LEFT TURNS	% LEFTS[1]	OPPOSING VOLUMES	WARRANT	STORAGE (m)
AM PEAK HOUR								
Conservation	Kawartha St	EB	463	3	1%	252	No	-
		WB	252	8	3%	463	No	-
Conservation	Cranberry St	EB	490	3	1%	255	No	-
		WB	255	8	3%	490	No	-
Conservation	Rideau River St	EB	511	18	4%	228	No	-
		WB	228	8	4%	511	No	-
PM PEAK HOUR								
Conservation	Kawartha St	EB	340	12	4%	515	No	-
		WB	515	29	6%	340	No	-
Conservation	Cranberry St	EB	354	12	3%	546	No	-
		WB	546	29	5%	354	Yes	15
Conservation	Rideau River St	EB	358	30	8%	589	Yes	15
		WB	589	30	5%	358	Yes	15

1. Where the percentage of left turns was less than 2.5% of the advancing volumes, the left turn lane warrants were not applied.

As outlined in **Table 3** and **Table 4** above, it was found that Conservation Drive at Cranberry St meets the warrant for left turn auxiliary lanes in the westbound direction only under both the high and low unit yield scenarios. Conservation Drive at Rideau River St intersection was also found to meet the warrant for left turn auxiliary lanes in both the eastbound and westbound directions under both scenarios. In addition, the required storage length for each left turn lane is the same under both scenarios.

The aforementioned left turn lanes will require taper lengths in addition to the storage length requirements in accordance with *Transportation Association of Canada Geometric Design Guidelines* for a 60 km/h design speed (i.e. – a 50 m taper).

Appendix C contains the left turn lane warrants under Scenario 1.

Appendix D contains the left turn lane warrants under Scenario 2.

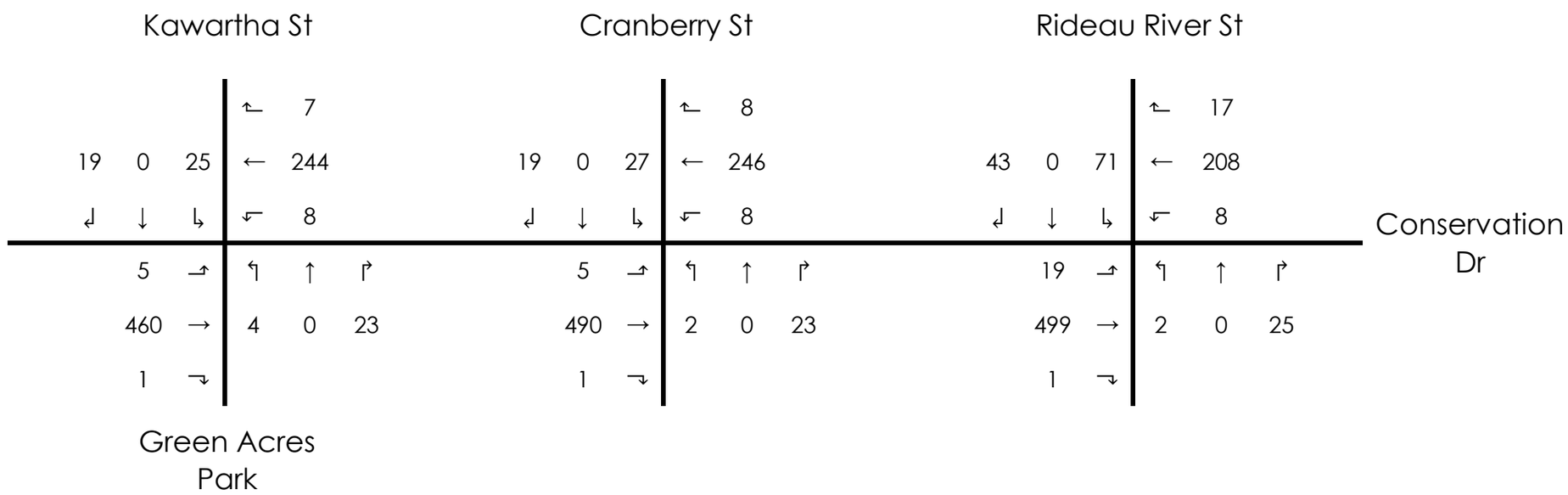
3.0 CONCLUSIONS

The results of the transportation assessment have determined the need for left turn lanes in the westbound direction at the Conservation Drive at Cranberry St intersection as well as in both the eastbound and westbound directions at the Conservation Drive at Rideau River St intersection. The assessment has also determined that the left turn auxiliary lane storage requirement of 15m is required at both intersections under each scenario. Left turn lanes taper lengths should be in accordance with *Transportation Association of Canada Geometric Design Guidelines* for a 60 km/h design speed (i.e. – a 50 m taper).

Appendix A ACTIVA'S PRELIMINARY DRAFT PLAN OF SUBDIVISION


RIDEAU RIVER PLACE
Residential
Walkway
Trail
Open Space/
Storm Water Management
Open Space
Residential
RIDEAU RIVER STREET
Residential
Park
Walkway
Storm Water Management
REGISTERED PLAN 58M-412
Trail
Residential
PINERY TRAIL
Vacant
Temporary Road
Residential
PINERY TRAIL
Residential
KELSO DRIVE
Blk. 1 Residential 0.150 ha.
Blk. 6 Residential 0.265 ha.
Blk. 2 Residential 0.268 ha.
Blk. 3 Residential 0.243 ha.
ROY SCHMIDT ROAD
(Wasaga Crescent)
Blk. 24 Walkway 0.019 ha.
Blk. 25 Walkway 0.019 ha.
Blk. 7 Residential 0.418 ha.
Blk. 8 Residential 0.279 ha.
Blk. 9 Residential 0.276 ha.
Blk. 26 Trail/Park 0.103 ha.
Blk. 3 Residential 0.163 ha.
Blk. 4 Residential 0.165 ha.
STREET ONE
STREET TWO (Kawartha Street)
Blk. 18 Street Towns 0.187 ha. (8 Units)
Blk. 17 Street Towns 0.182 ha. (8 Units)
Blk. 16 Street Towns 0.109 ha. (5 Units)
Blk. 15 Street Towns 0.306 ha. (18 Units)
Blk. 14 Street Towns 0.230 ha. (12 Units)
Blk. 12 Residential 0.166 ha.
Blk. 11 Residential 0.221 ha.
Blk. 13 Residential 0.156 ha.
Blk. 10 Residential 0.577 ha.
STREET FOUR (Gary Cowan Drive)
STREET THREE (Cranberry Street)
RIDEAU RIVER STREET
TIDEWATER PLACE
Residential
Blk. 19 Multiple Residential / Mixed Use 0.290 ha. (12–29 Units)
Blk. 20 Multiple Residentail / Mixed Use 0.330 ha. (13–33 Units)
Blk. 21 Street Towns 0.131 ha. (5 Units)
Blk. 27 Trail/Park 0.044 ha.
Blk. 22 Multiple Residential 0.573 ha. (23–34 Units)
Blk. 23 Multiple Residential 0.394 ha. (15–24 Units)
WASAGA CRESCENT
CONSERVATION DRIVE
Recreation
Recreation
Recreation
Residential
Residential
Residential

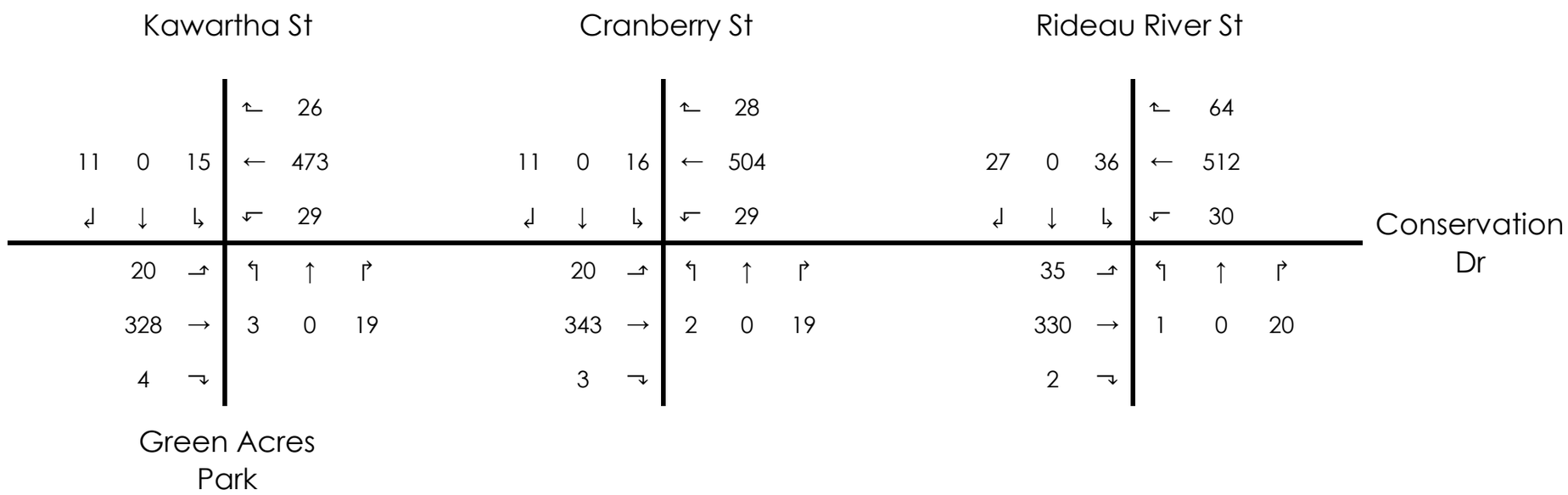
Appendix B 2023 PROJECTED TRAFFIC VOLUMES



City of Waterloo

Update to Transportation Forecasts and Left Turn Lane Requirements

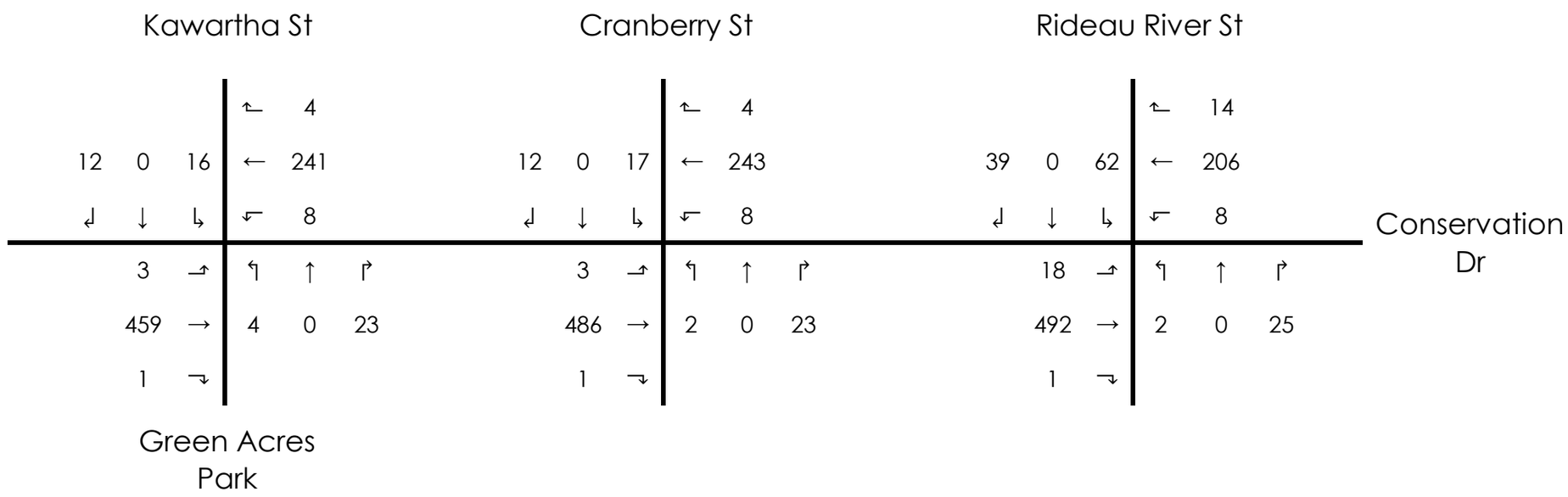
2023 Ultimate Traffic Volumes - AM Peak Hour (Scenario 1)



City of Waterloo

Update to Transportation Forecasts and Left Turn Lane Requirements

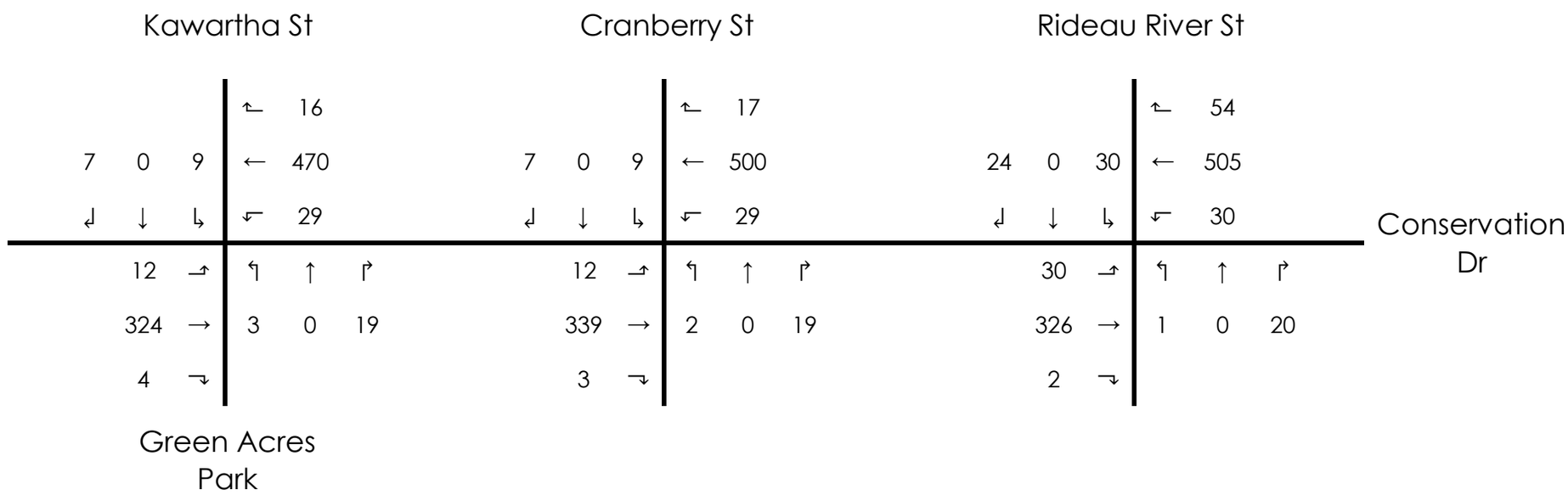
2023 Ultimate Traffic Volumes - PM Peak Hour (Scenario 1)



City of Waterloo

Update to Transportation Forecasts and Left Turn Lane Requirements

2023 Ultimate Traffic Volumes - AM Peak Hour (Scenario 2)



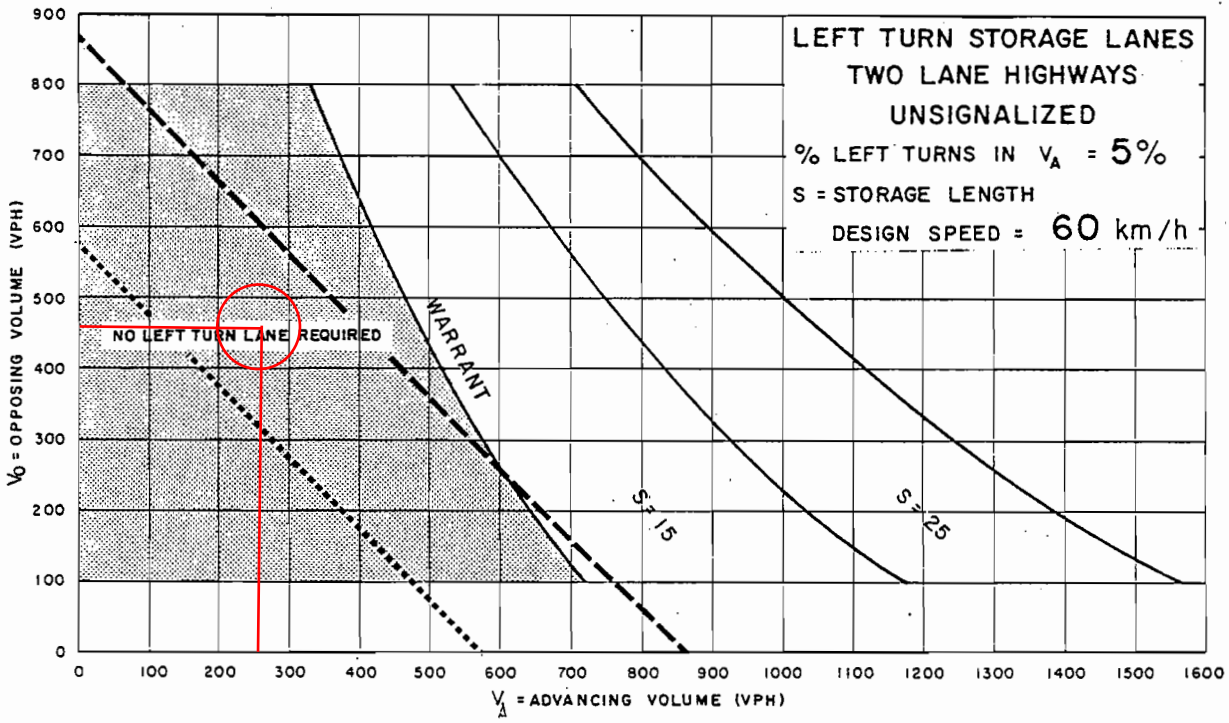
City of Waterloo

Update to Transportation Forecasts and Left Turn Lane Requirements

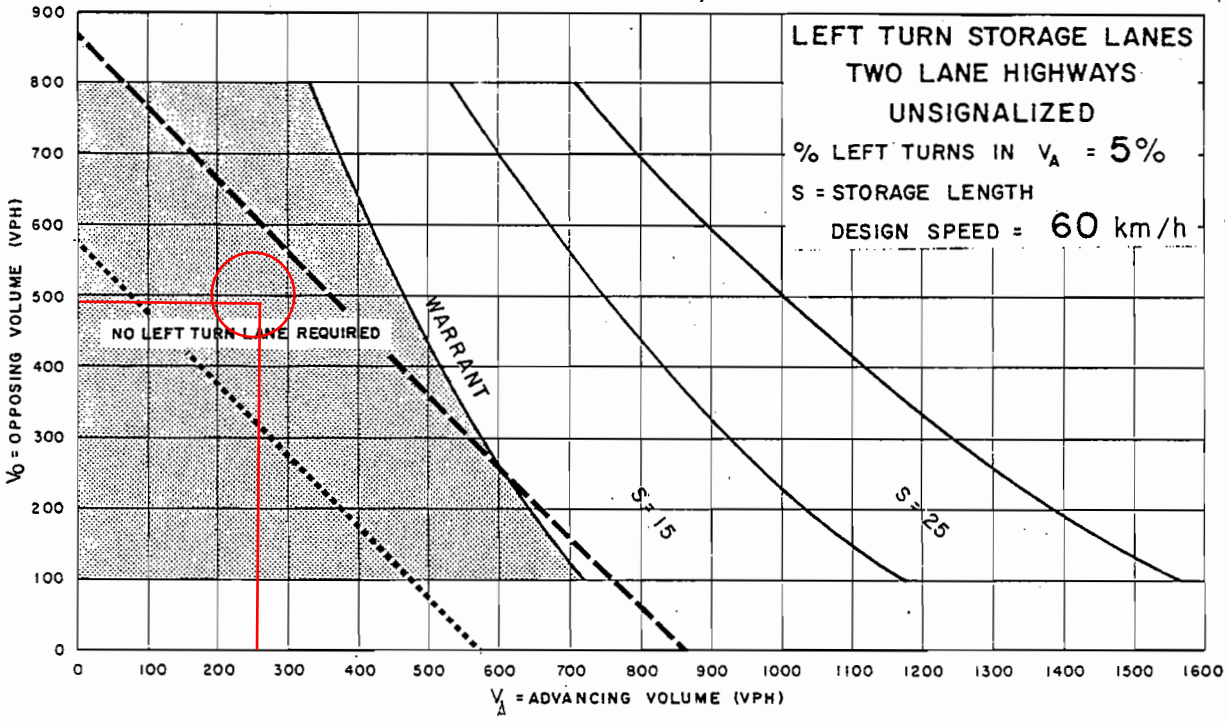
2023 Ultimate Traffic Volumes - PM Peak Hour (Scenario 2)

Appendix C LEFT TURN LANE WARRANTS UNDER SCENARIO 1

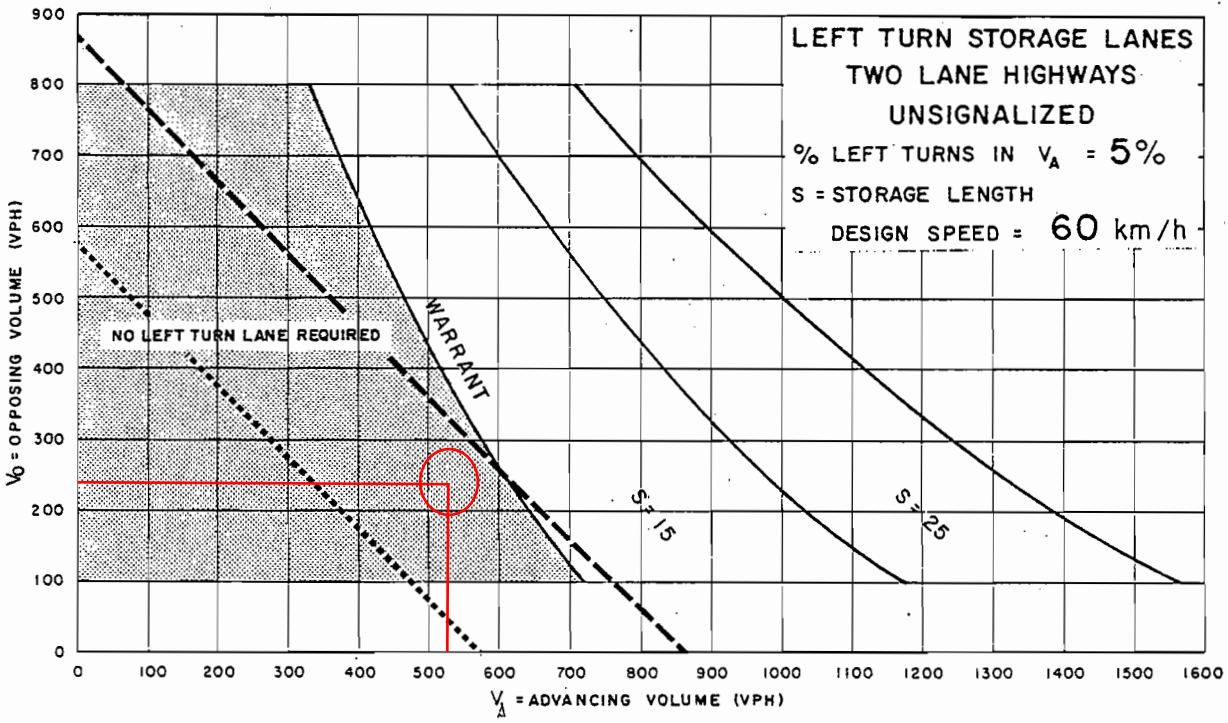
Conservation Drive at Kawartha St - Westbound AM Peak



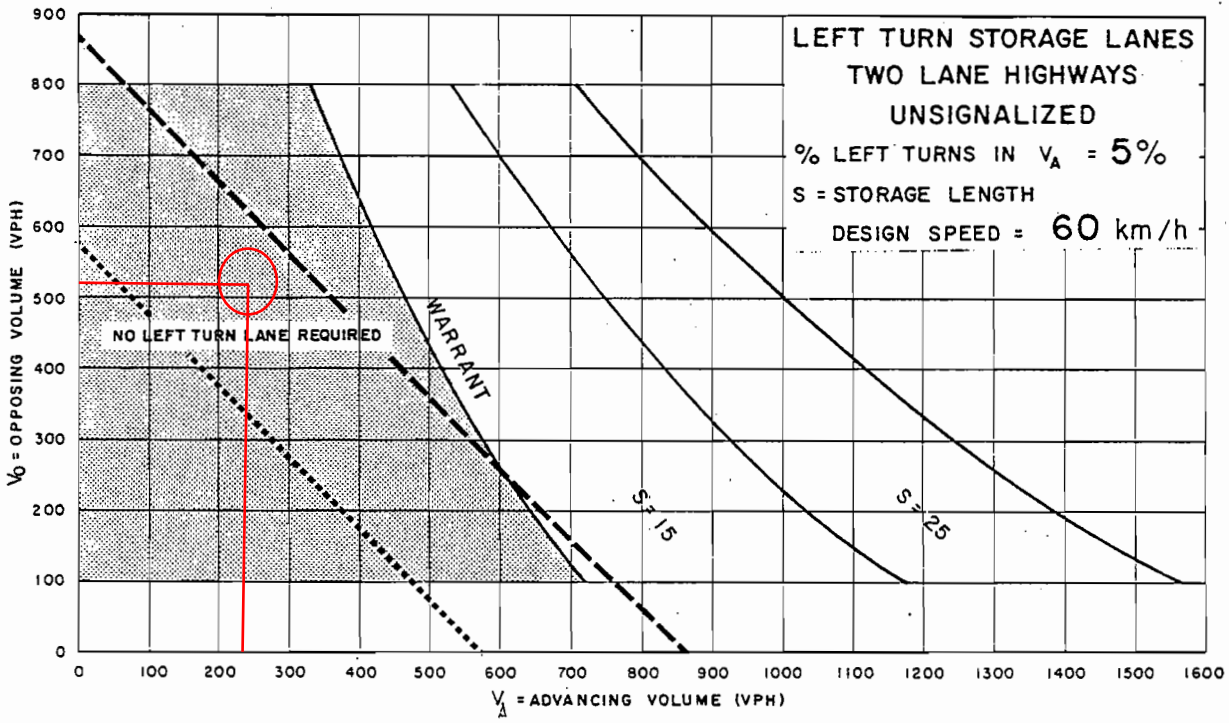
Conservation Drive at Cranberry St - Westbound AM Peak



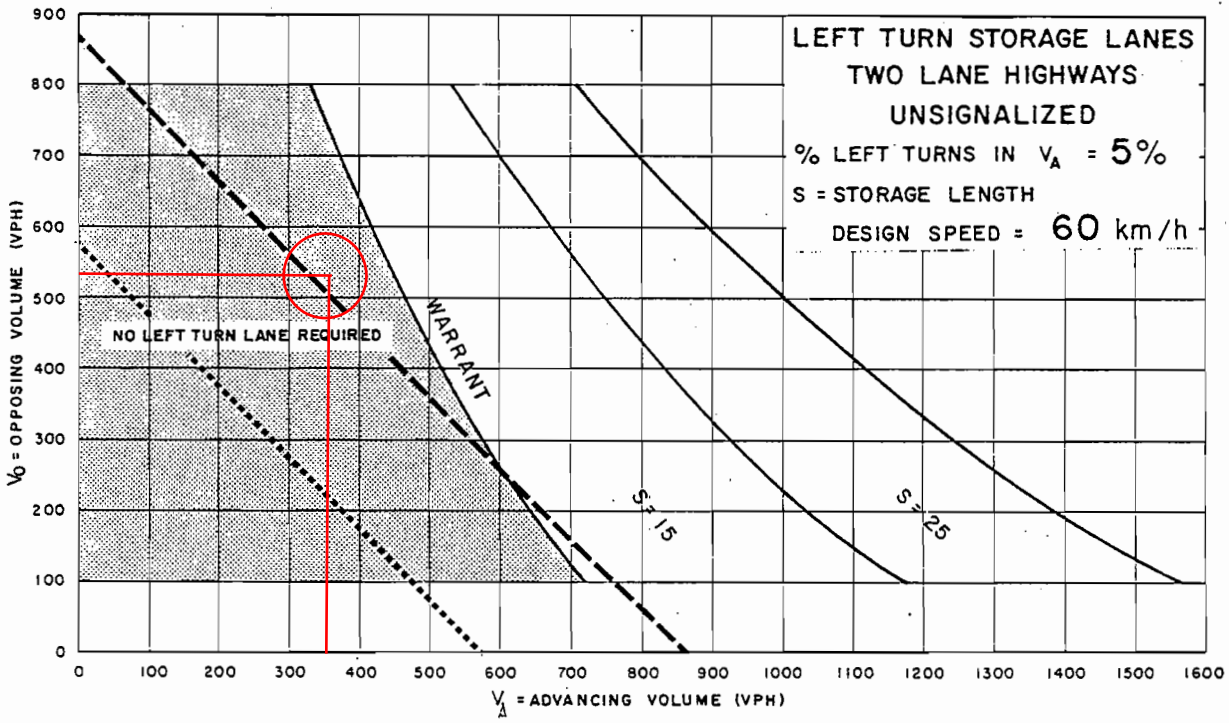
Conservation Drive at Rideau River St - Eastbound AM Peak



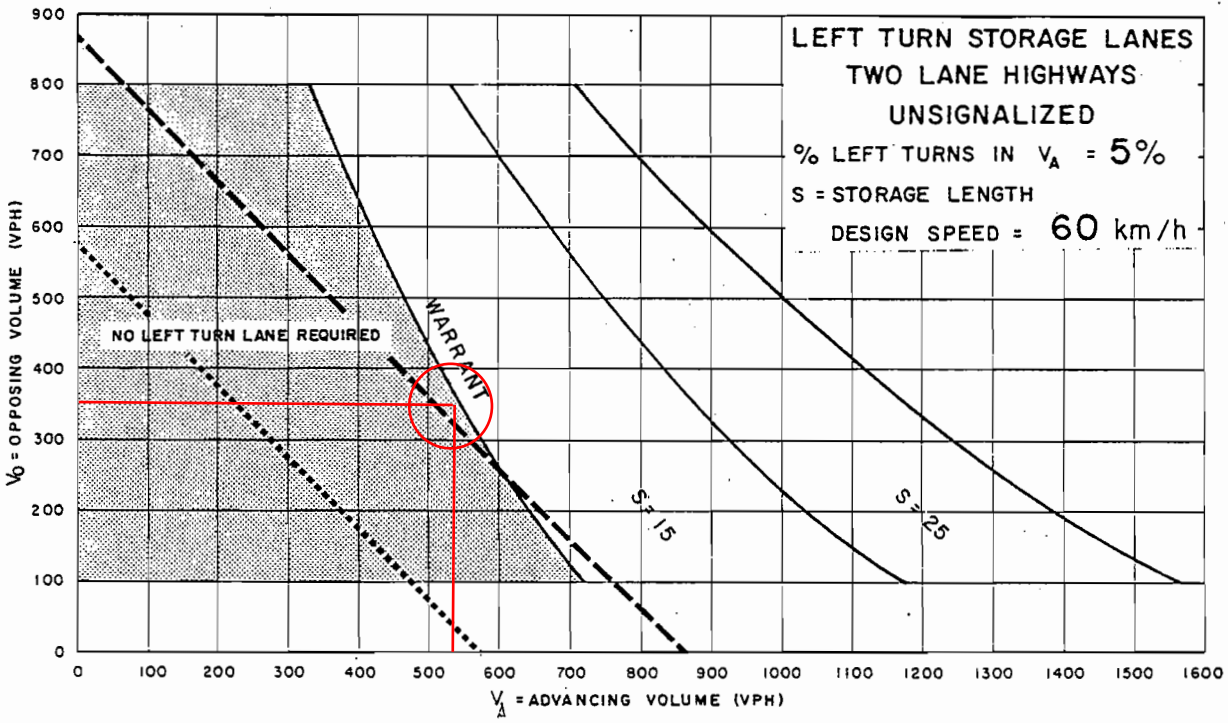
Conservation Drive at Rideau River St - Westbound AM Peak



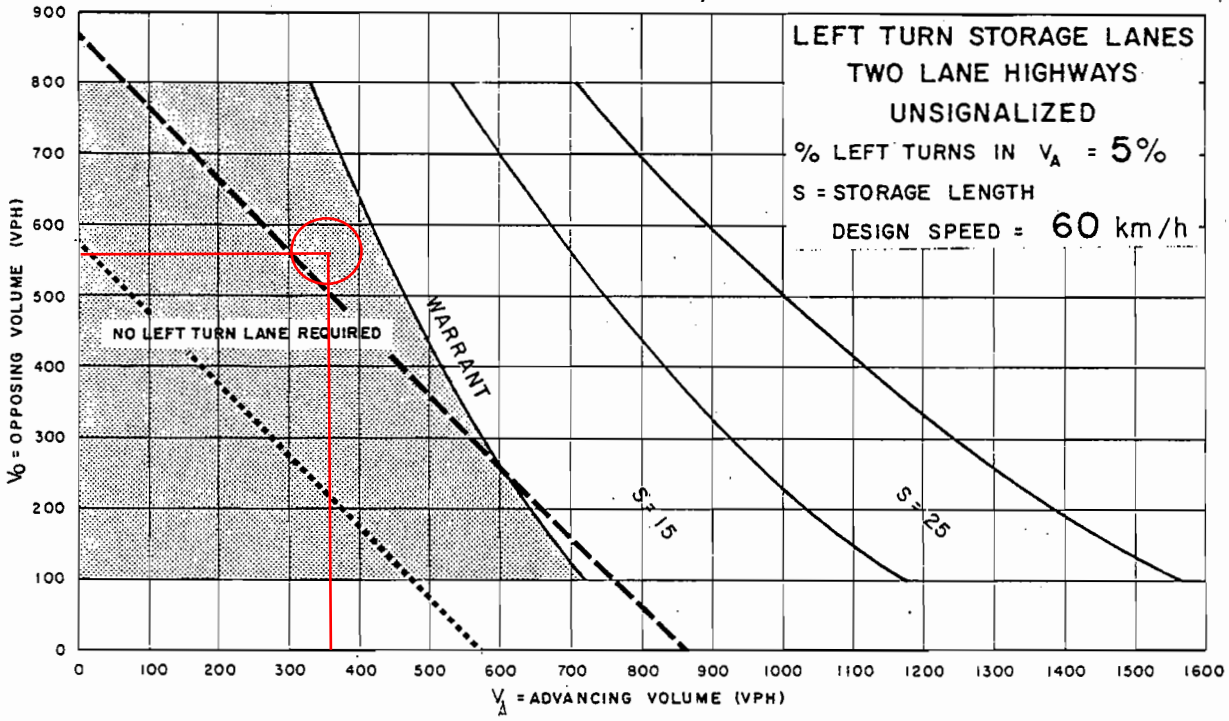
Conservation Drive at Kawartha St - Eastbound PM Peak



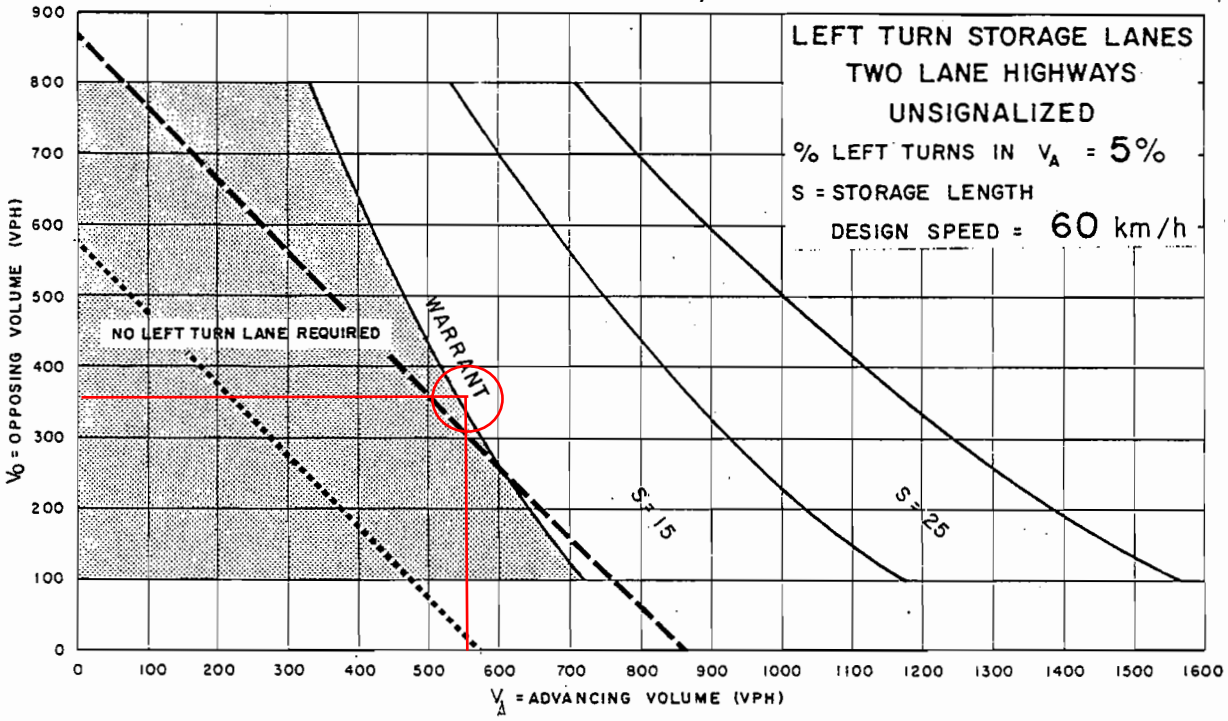
Conservation Drive at Kawartha St - Westbound PM Peak



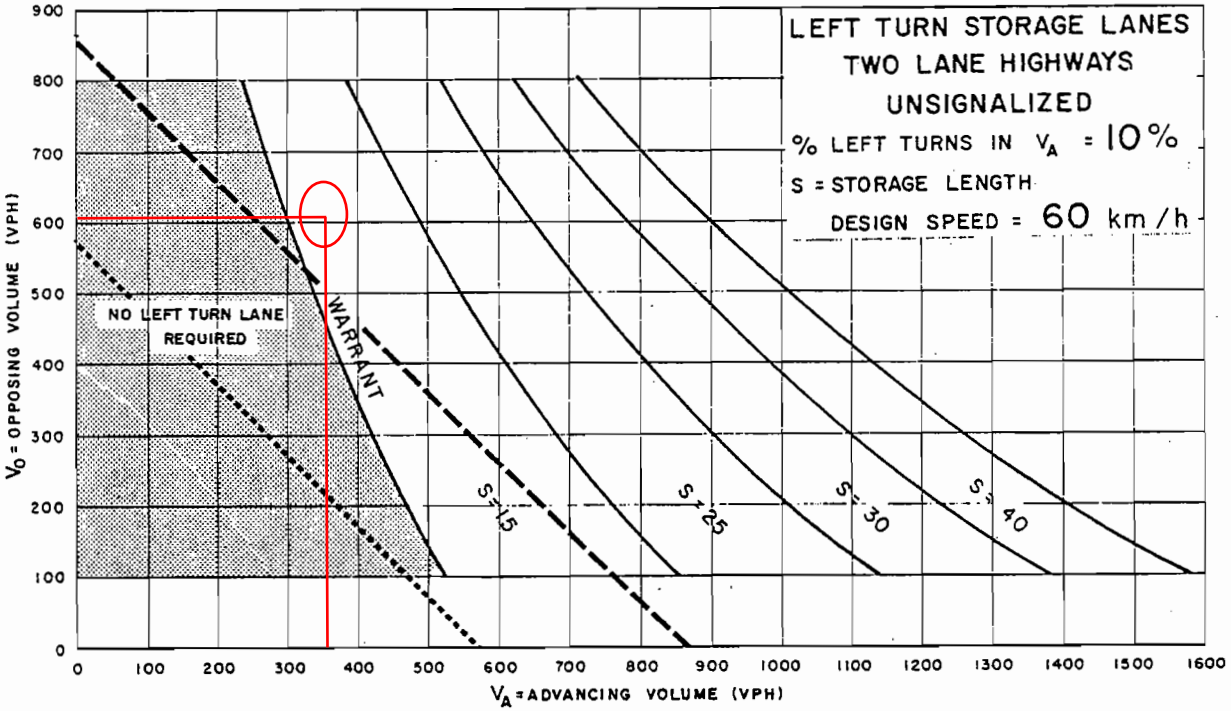
Conservation Drive at Cranberry St - Eastbound PM Peak



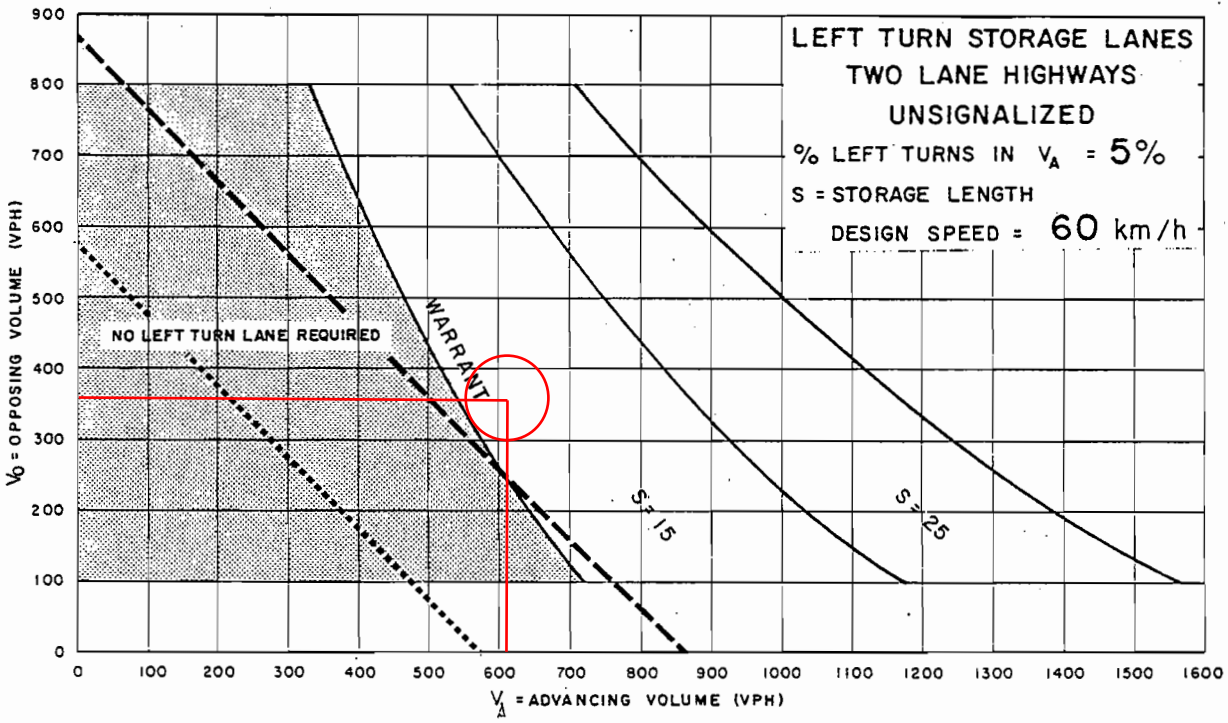
Conservation Drive at Cranberry St - Westbound PM Peak



Conservation Drive at Rideau River St - Eastbound PM Peak

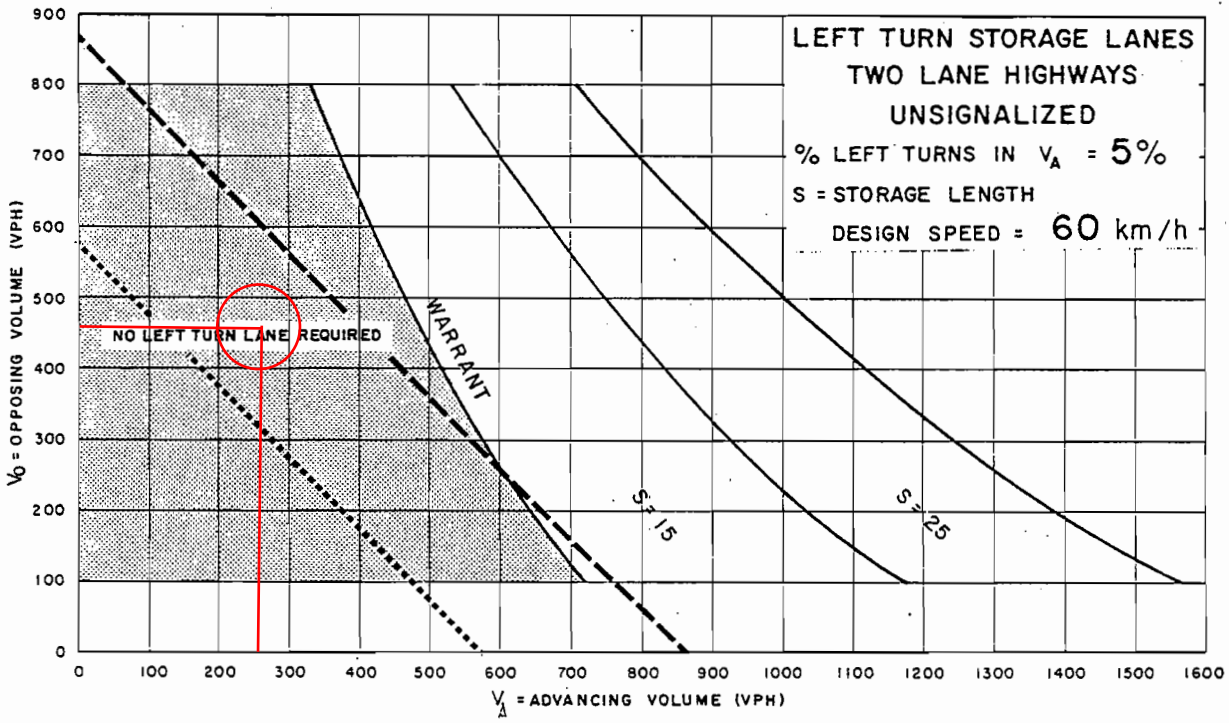


Conservation Drive at Rideau River St - Westbound PM Peak

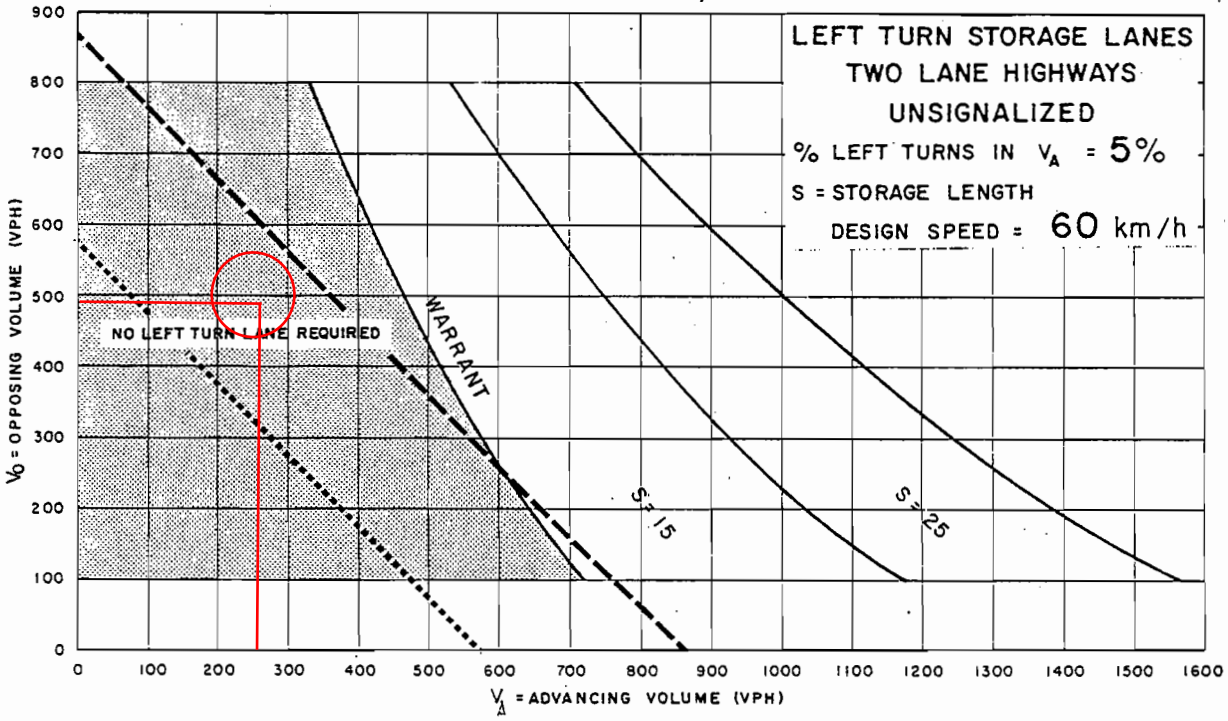


Appendix D LEFT TURN LANE WARRANTS UNDER SCENARIO 2

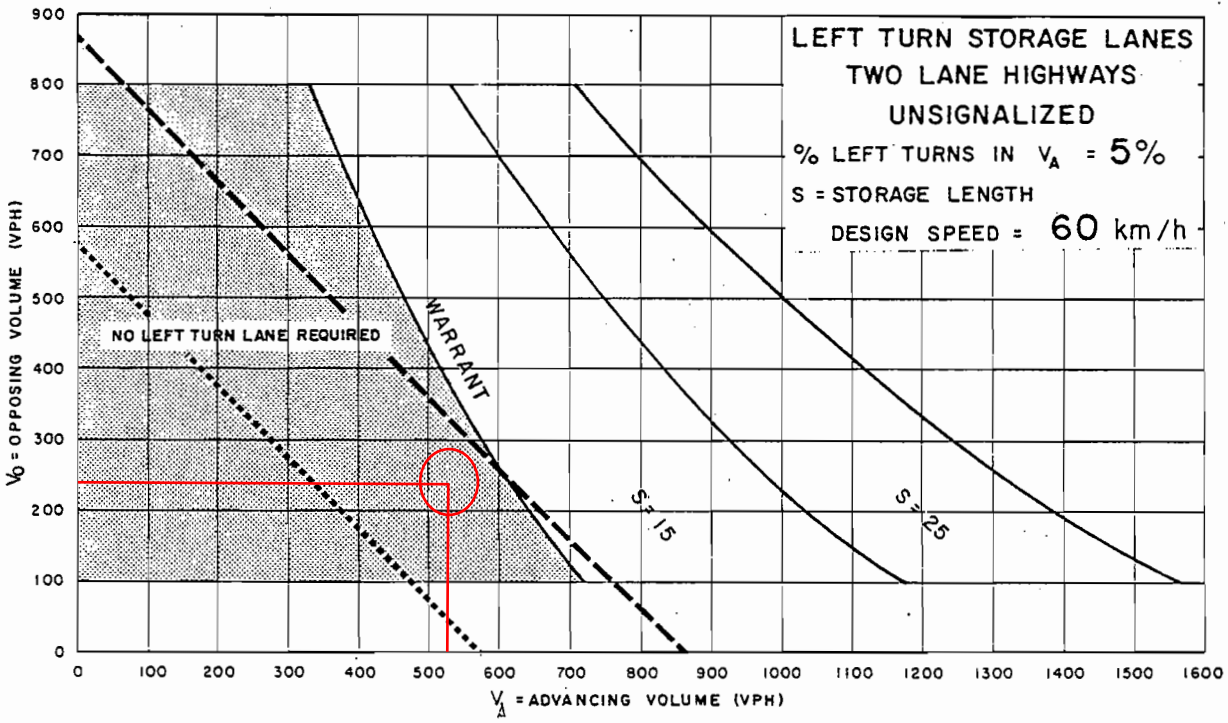
Conservation Drive at Kawartha St - Westbound AM Peak



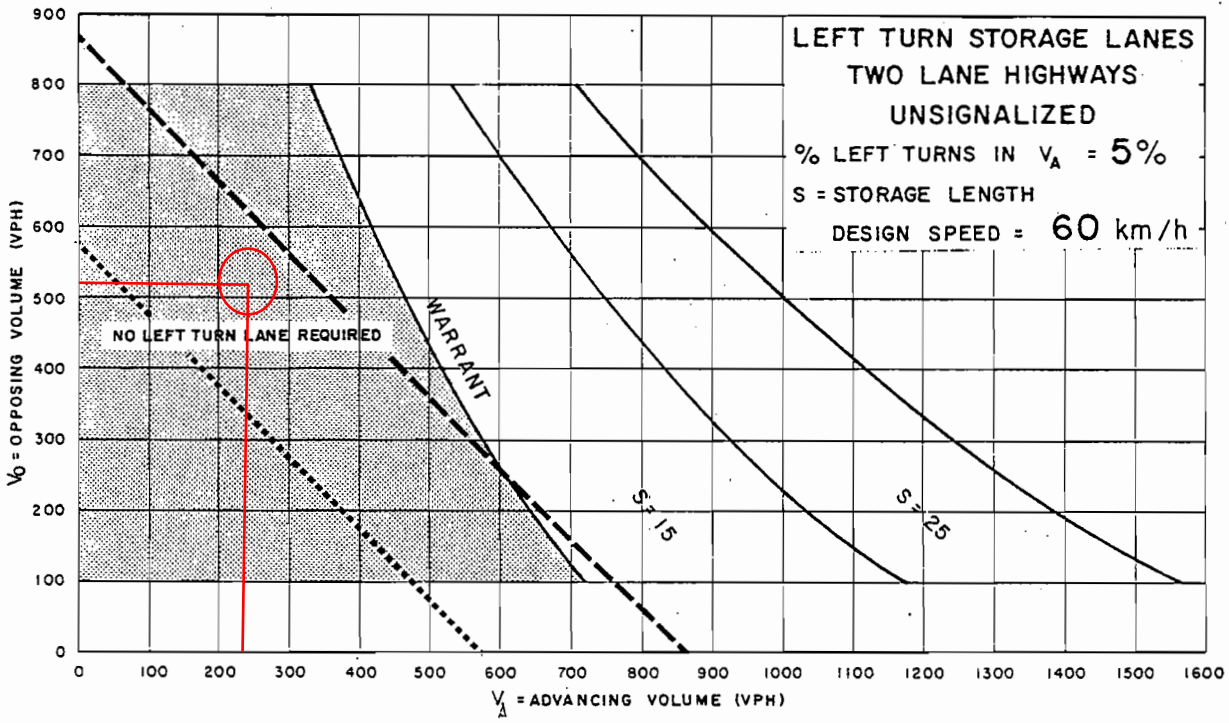
Conservation Drive at Cranberry St - Westbound AM Peak



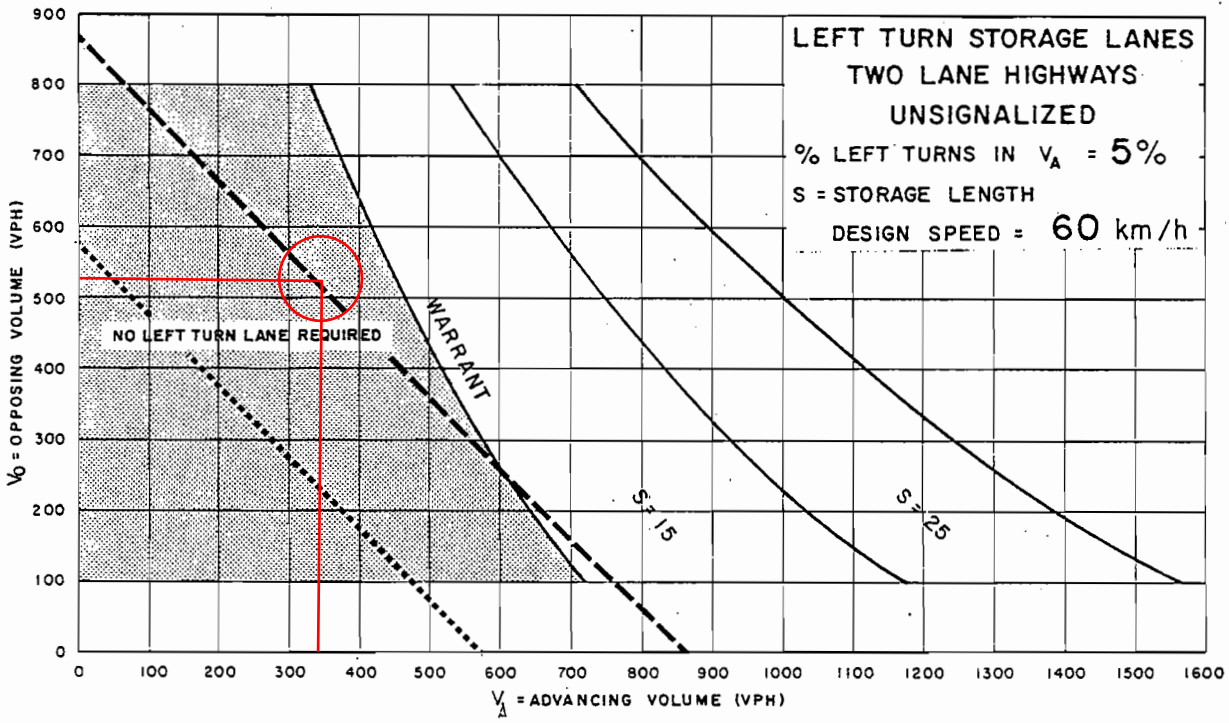
Conservation Drive at Rideau River St - Eastbound AM Peak



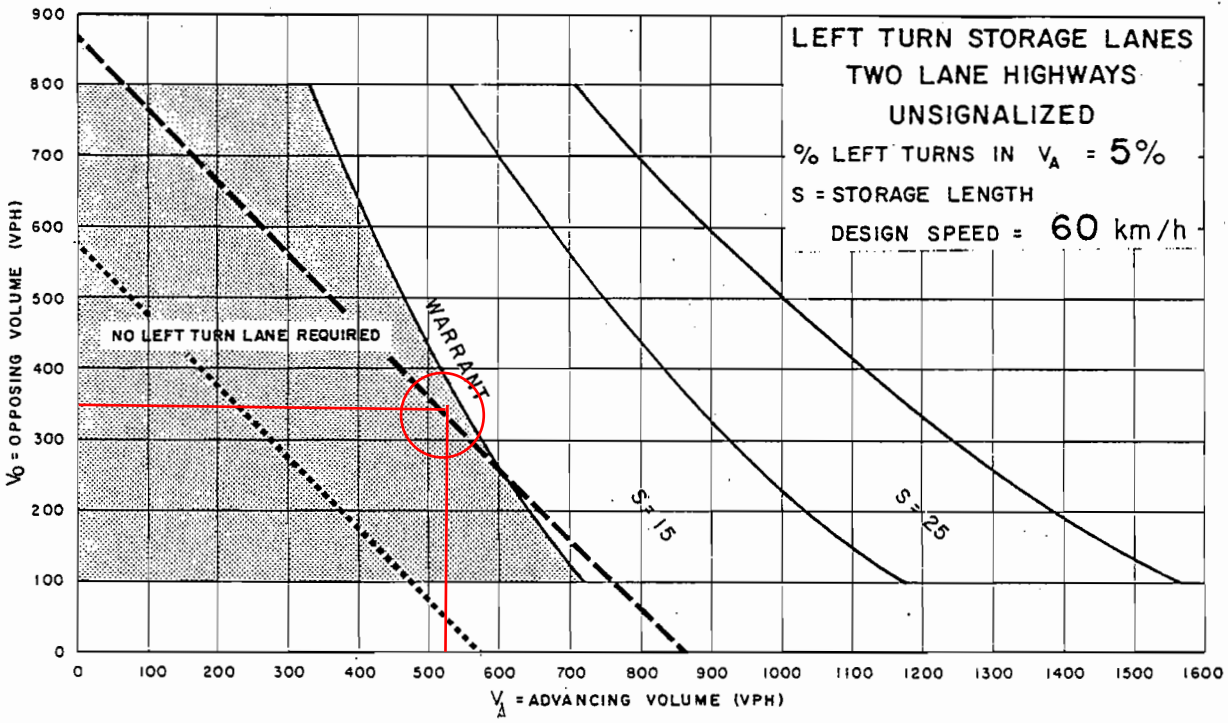
Conservation Drive at Rideau River St - Westbound AM Peak



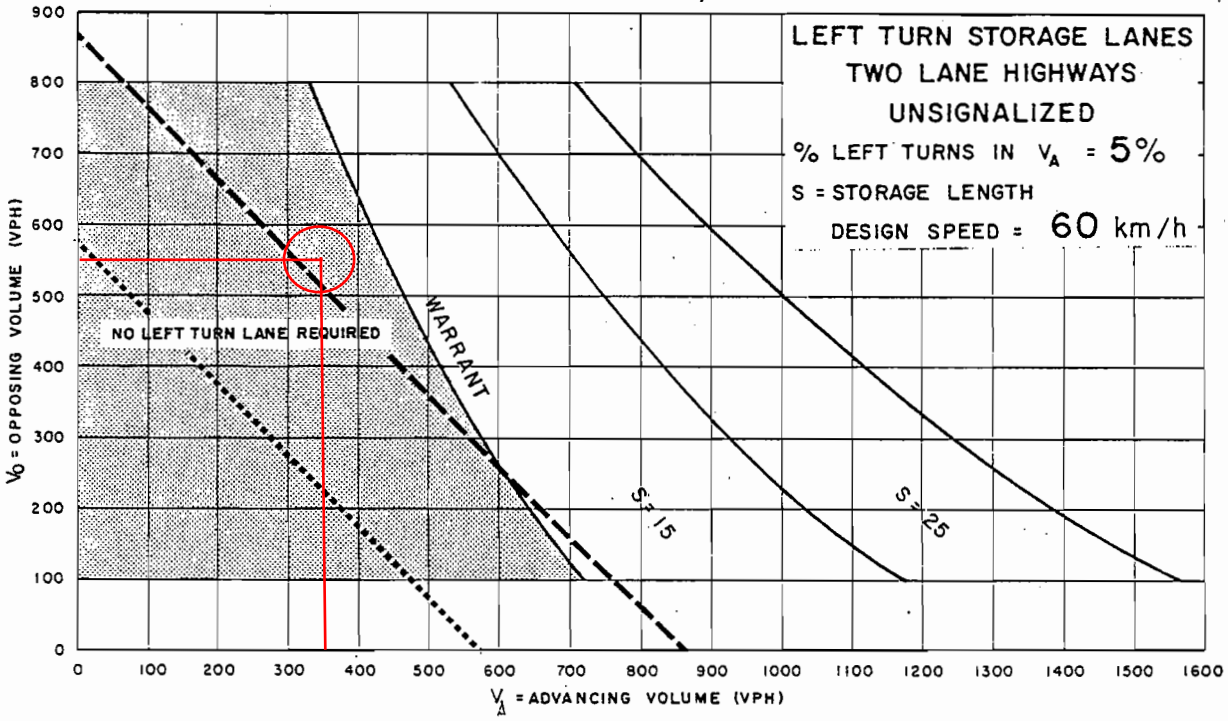
Conservation Drive at Kawartha St - Eastbound PM Peak



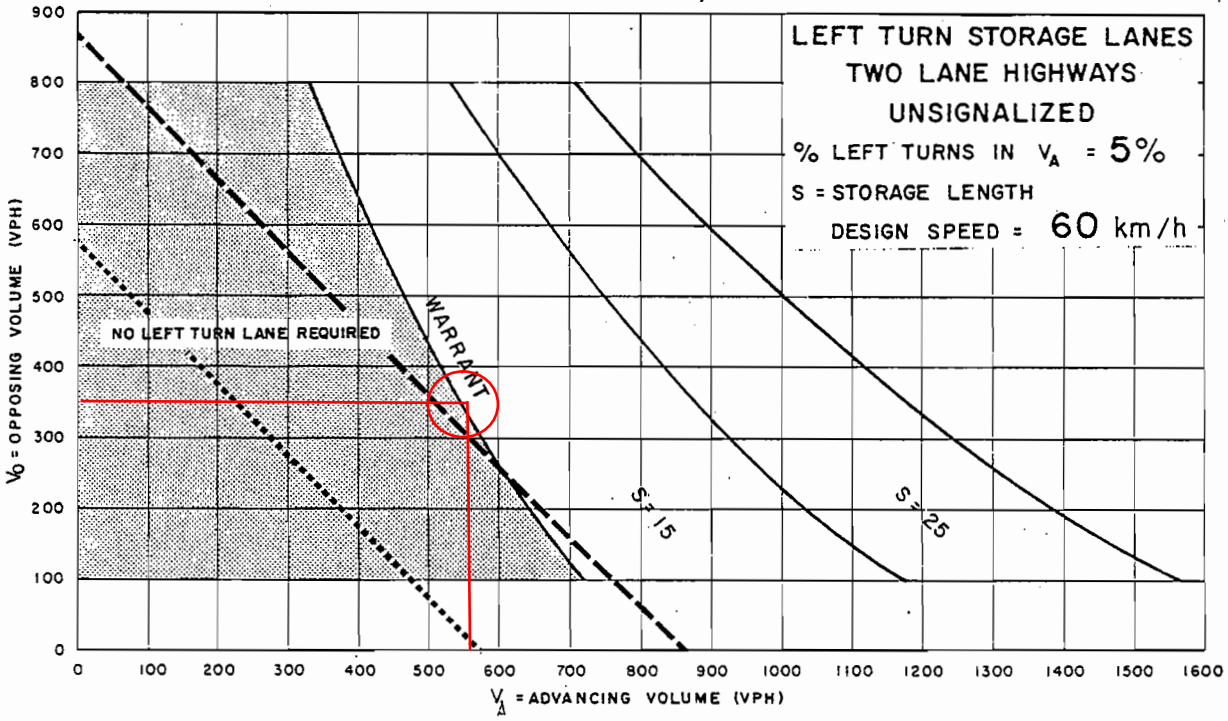
Conservation Drive at Kawartha St - Westbound PM Peak



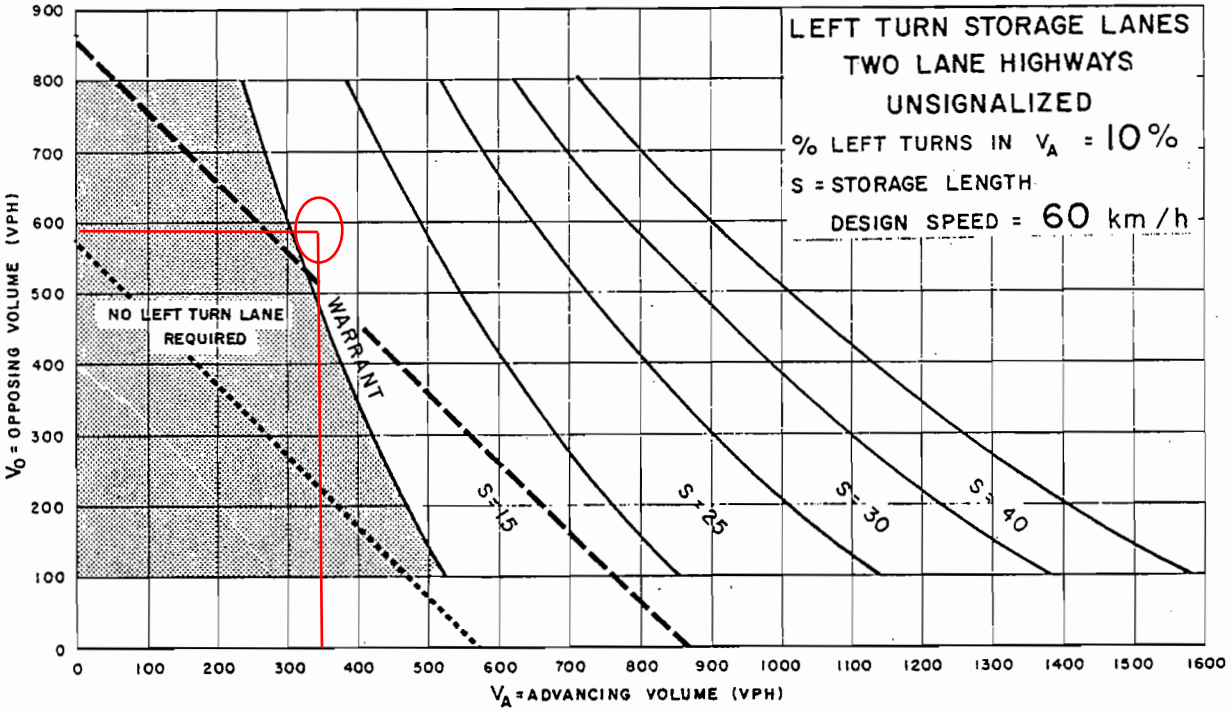
Conservation Drive at Cranberry St - Eastbound PM Peak



Conservation Drive at Cranberry St - Westbound PM Peak



Conservation Drive at Rideau River St - Eastbound PM Peak



Conservation Drive at Rideau River St - Westbound PM Peak

