

RESEARCH DRIVE DEVELOPMENT TRAFFIC IMPACT STUDY REVISED REPORT



PREPARED FOR:
PORTUCANA CONSTRUCTION & AJ LEGROW HOLDINGS

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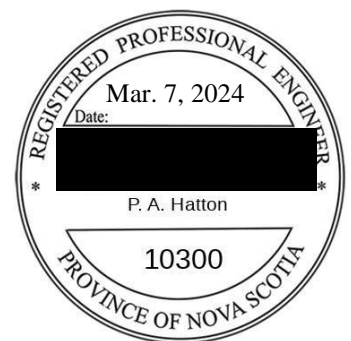
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1 INTRODUCTION

Background

Plans are being prepared for a residential development of up to 1,250 apartment units in Dartmouth, Nova Scotia, see Figure 1. The proposed development is planned to include 10 mid-rise apartment buildings, as shown in Figure 2. Halifax Regional Municipality (HRM) has requested that a Traffic Impact Study (TIS) be completed to review the impacts to the adjacent road network. WSP Canada Inc. has been retained to complete a Traffic Impact Study for the proposed Research Drive Development.



Figure 1 – Study Area and Study Intersections

A Traffic Impact Study Usually Considers Four Questions

A TIS usually consists of determining answers for the following questions:

1. **What is the existing transportation situation** adjacent to the study site? How have volumes changed historically?
2. **What transportation changes are expected** at key Study Area locations? How many vehicle and active mode trips are expected to be generated by the proposed development during weekday peak hours? What routes are the trips expected to use to travel within and through the Study Area?
3. **What transportation impacts will occur** on Study Area roads, sidewalks, and intersections?
4. **What transportation improvements are required** to mitigate project impacts on Study Area travel? Are there transportation modifications that should be made to improve the travel experience for all users?

Study Objectives

The objectives of the Traffic Impact Study are to:

1. Develop projected 2042 background weekday AM and PM peak hourly volumes for Study Intersections.
2. Estimate the number of weekday AM and PM peak hour trips that will be generated by the proposed development.
3. Distribute and assign site generated trips to Study Intersections to project 2042 peak hourly volumes that include site generated trips.

4. Evaluate impacts of site generated traffic on the performance of Study Intersections.
5. Complete warrant analyses, as necessary, for Study Intersections and recommend improvements that may be needed at Study Intersections to mitigate the impacts of site development.



Figure 2 – Site Plan



2 STUDY AREA DESCRIPTIONS

Description of Existing Development

There is currently an office building located on the proposed site and is approximately 80% occupied. The office building of approximately 65,000ft² will be demolished and the proposed 10 mid-rise apartment buildings will be constructed in phases. The access to the existing office building is via Research Drive.

Description of Proposed Development

The proposed residential development is planned to include 10 mid-rise apartment buildings with up to 1,250 units. It is anticipated that the development will be completed by 2037. The horizon year of 2042 (build-out + five years) was analysed.

Existing Study Road Descriptions

Prince Arthur Avenue is a two-lane minor collector roadway (one lane in each direction). The posted speed limit within the study area is 50 km/h. There is an asphalt sidewalk on the west side and a concrete sidewalk on the east side of Prince Arthur Avenue. There are no transit services on Prince Arthur Avenue.

Fenwick Street is a local road that has two lanes with one lane in each direction and a posted speed limit of 50 km/h. There is sidewalk on both sides of Fenwick Street to Clement Street and then sidewalk on the south side to Research Drive. There are no transit services on Fenwick Street.

Research Drive is a local road that has two lanes with one lane in each direction and a posted speed limit of 50 km/h. There are no sidewalk facilities or transit services on Research Drive.

Neptune Crescent is a local road that has two lanes with one lane in each direction and a posted speed limit of 50 km/h. There are no sidewalk facilities or transit services on Neptune Crescent.

Mount Hope Avenue is a minor collector road that has two lanes with one lane in each direction and a posted speed limit of 50 km/h. There is a sidewalk on the north side and an asphalt multi-use pathway on the south side of Mount Hope Avenue. Transit Route #67 provides service along Mount Hope Avenue.

Existing Study Intersection Descriptions

Intersection #1 – Portland Street at Prince Arthur Avenue is a 3-leg signalized intersection with a shared through/right-turn lane in the eastbound direction and a dedicated left-turn lane with a through lane in the westbound direction on Portland Street. The northbound approach has a left-turn and right-turn lane on Prince Arthur Avenue. There are marked pedestrian crossings on all approaches.

Intersection #2 – Prince Arthur Avenue at Fenwick Street is a 3-leg intersection with stop control on the Fenwick Street approach (westbound approach). All approaches have a shared movement and there are two marked pedestrian crossings, one on the east side of the intersection crossing Fenwick Street and a second that is further removed from the intersection on the west leg of Prince Arthur Avenue.

Intersection #3 – Neptune Crescent at Ragus Road is a 4-leg intersection with stop control on Ragus Road. All approaches are shared movements and there are no marked pedestrian crossings at this intersection.

Intersection #4 – Mount Hope Avenue at Neptune Crescent is a 3-leg intersection with stop control on Neptune Crescent. All approaches are shared movements and there are no marked pedestrian crossings at this intersection.

Intersection #5 – Mount Hope Avenue at Leonamaria Drive is a 3-leg signalized intersection. The eastbound approach has a left turn lane and a through lane, the westbound approach has a through lane and a right turn channelized lane, while the southbound approach has a left turn lane



and a right turn lane. There are marked crosswalks on all three approaches and a multi-use path on the west side of Leonamarie Drive.



3 BACKGROUND TRAFFIC

**Turning
Movement
Counts**

Turning movement counts were collected by WSP on Thursday, November 23rd, 2023 at Study Intersection 1 during the morning (7:00-9:00AM), midday (11:30AM-1:30PM), and afternoon (4:00-6:00PM) peak periods and at Study Intersection 2 to 4 on Tuesday, March 22, 2022 during the morning (7:00-9:00AM), midday (11:30AM-1:30PM) and afternoon (4:00-6:00PM) peak periods. Intersection counts have been tabulated in 15-minute intervals with peak hours indicated by shaded areas. Turning movement volumes are provided in Tables A-1 to A-4, Appendix A.

**Future Nearby
Development**

There is a nearby development located on Mount Hope Avenue that includes a large residential development of approximately 875 units. The initial phase of that development is under construction and it is anticipated to be completed by 2029. WSP completed the Traffic Impact Study for this other Mount Hope Avenue Development and has included the full build-out of the 20% non-vehicle reduction analysis scenario in the background road network. That new development includes a new signalized intersection along Mount Hope Avenue and this newly signalized intersection has been included in the study area.

**Traffic Growth
Rate**

There is limited historical data for the Southdale area and the Mount Hope Avenue Interchange with Highway 111. Therefore, an annual growth rate of 0.5% has been applied to project the 2042 background volumes for this Traffic Impact Study for other nearby developments, in addition to the Mount Hope Avenue Development noted above.

**Active
Transportation
& Transit**

Within the study area there is sidewalk provided on Prince Arthur Avenue and Fenwick Street. On Research Drive and Neptune Crescent there are currently no active transportation facilities. Within the proposed development, there are plans to include sidewalk facilities throughout and an active transportation connection to Lynn Drive from Fenwick Street. On Research Drive, that is outside the proposed development area and on Neptune Crescent, it is recommended that HRM complete a review to extend the active transportation facilities to Mount Hope Avenue to connect into the existing sidewalk and multi-use pathway.

There are currently transit routes on Portland Street (Routes # 5, 158, 161, 165, 168, 159), and Mount Hope Avenue (Route #67), however there are no transit routes that travel along the frontage of the proposed development. HRM is currently undertaking a corridor study along Portland Street that reviews opportunities to improve transit and active transportation connections.



4 TRIP GENERATION, DISTRIBUTION, AND ASSIGNMENT

Prepared Trip Generation Estimates

When using the published trip generation rates in the *Trip Generation Manual (Institute of Transportation Engineers)*, the transportation engineer’s objective should be to provide a realistic estimate of the number of trips that will be generated by the proposed development.

Estimation of Trips Generated by Background Development Existing & Proposed Development

The background development, Mount Hope Avenue (Clayton), is expected to include 875 residential units. Trips generated by that development have been assigned to the study area for this TIS.

The existing development has an office building of approximately 65,00ft² that was 80% occupied during the traffic data collection. The proposed development is expected to include 875 mid-rise apartment units.

Anticipated Land Use for the Existing & Proposed Development

Trips generated by the existing Office Building (Land Use 710) are estimated for the AM and PM peak hours by square footage and Multi-family Housing Mid-Rise (Land Use 221) are estimated for the AM and PM peak hours of traffic by unit count. Trip generation estimates for the proposed development were prepared using published rates from *Trip Generation Manual, 11th Edition* (Institute of Transportation Engineers, Washington, 2021).

Based on the proposed development’s proximity to numerous amenities and that the site lies within an area of HRM with trail connectivity and frequent transit nearby, many of the trips generated by the proposed development are anticipated to be non-auto trips. Using the methodology provided in *Trip Generation Handbook, 3rd Edition* (Institute of Transportation Engineers, Washington, 2017), estimates of the total person trips generated by the development were prepared (See Table 1).

Appendix B of the ITE Trip Generation Handbook, 3rd Edition (2017) includes baseline modal share data for a variety of land use types including apartments and shopping centers.

Appendix B of the Handbook indicates that the modal share of the sample trip data for apartment land use was 96% vehicle trips.

For this development, it is expected that significantly more than 4% of the person trips will be by transit and active modes and the multimodal trip generation methodology identified in Figure 3.1 of the Handbook has been applied to the trip generation estimates for this development.

estimates of the total person trips generated by the development were prepared (See Table 1).

Person Trips Generated by the Existing & Proposed Development

Trip generation estimates for the existing and proposed developments are summarized in Table 1. It is estimated that the development will generate:

- 540 two-way person trips (63 entering and 477 exiting) during the AM peak hour; and,
- 485 two-way person trips (335 entering and 150 exiting) during the PM peak hour.

Table 1 – Trip Generation Estimates for the Existing & Proposed Developments

Land Use ¹	Units ²	Trip Generation Rates ³				Trip Generation Estimates ³			
		AM Peak		PM Peak		AM Peak		PM Peak	
		In	Out	In	Out	In	Out	In	Out
Existing Development									
General Office Building (Land Use 710)	52.0 KGLA	1.34	0.18	0.24	1.20	70	9	13	62
Proposed Development									
Multi-family Housing (Mid-Rise) (Land Use 221)	1250 Units	Equations from Pages 275 and 276				124	415	298	190
Net Trip Generation Estimates for Proposed Development						54	406	285	128
Net Estimated Person Trips for the Proposed Development						63	477	335	150
NOTES: 1. Land Use Codes are from Trip Generation, 11th Edition, (Institute of Transportation Engineers, Washington, 2021). 2. 'Residential Units' for Multi-family Housing and 'Gross Leasable Area x 1000 SF' for all other land uses. 3. Rates are 'vehicles per hour per unit'; trips generated are 'vehicles per hour for peak hours'.									



Estimated Modal Shares of Development Trips

The Halifax Regional Municipality Integrated Mobility Plan includes targets for non-auto modal shares within the Municipality: at least 30% of trips will be made by sustainable modes of travel (walking / rolling, bicycling or transit) by 2031. Since the proposed development is located in a more industrial area, a more conservative modal share been applied. Table 2 shows the estimated site generated trips by modal share.

Table 2 - Site Generated Trips by Modal Share

Travel Mode	Modal Share	AM Peak		PM Peak	
		In	Out	In	Out
Person Trips		63	477	335	150
Auto Driver	75%	48	357	252	112
Auto Passenger	10%	6	48	33	15
Transit	10%	6	48	33	15
Active Modes	5%	3	24	17	8

It is estimated that the development will generate:

- 405 new two-way vehicle trips (48 entering and 357 exiting) during the AM peak hour; and,
- 364 new two-way vehicle trips (252 entering and 112 exiting) during the PM peak hour.

Trip Distribution and Assignment

The proposed development generated trips were distributed to the Study Intersections based on counted volumes and local knowledge of the area considering major trip origins and destinations in the region. The estimated directional distributions are provided below.

Direction	Distribution	Description
North & West on Portland	25%	(Dartmouth, Macdonald Bridge and surrounding areas)
North & East on Portland	20%	(Cole Harbour, Hwy 111 and surrounding areas)
South	10%	(Eastern Passage and surrounding areas)
West to Pleasant	20%	(Acadia Street, Dartmouth General Hospital, Woodside, Macdonald Bridge and surrounding areas)
East to Hwy 111	25%	(MacKay Bridge, Sackville and surrounding areas)

Volume Figures

Peak hourly estimated site generated vehicle volumes were distributed and assigned to external streets and intersections in the study area using the above assumptions. Assigned AM and PM peak hourly site generated volumes are illustrated diagrammatically on Figure A-2, Appendix A. Assigned site development trips were added to background volumes (Figure A-1, Appendix A) to provide estimates of the AM and PM peak hour volumes at study area intersections for development build-out which are illustrated diagrammatically on Figure A-3, Appendix A.



5 INTERSECTION OPERATIONAL ANALYSIS

Intersection Capacity Analysis was completed to estimate how intersections may be expected to operate into the future without and with site generated trips. This section of the report addresses how left-turn lane warrants and traffic signal warrants were conducted and how each intersection was evaluated. The following subsections identify each study intersection and summarize the results of the operational analysis.

Left-Turn Lane Warrant Analysis

Left-turn movements on a two-lane street may cause both operational and safety problems. Operational problems result as a vehicle stopped waiting for an opportunity to turn across ‘heavy’ opposing traffic causes a queue of stopped vehicles to form. Safety problems result from rear end collisions when a stopped left-turning vehicle is struck by an advancing vehicle, or from head-on or right-angle collisions when a left-turning vehicle is struck by an opposing vehicle.

The *Geometric Design Standards for Ontario Highways Manual* contains nomographs for left-turn lane analysis for two lane streets at unsignalized intersections. The analysis method, which is normally used by WSP Atlantic to evaluate the need for left-turn lanes, uses a series of nomographs that consider speed, advancing volumes, left-turns as a percentage of advancing volumes, and opposing volumes. A point, based on ‘opposing’ and ‘advancing’ volumes, plotted to the right of the ‘warrant line’ of the appropriate ‘% left-turns’ and ‘approach speed’ nomograph, indicates that a left-turn lane is warranted for the conditions used in the analysis. Similarly, a point that is plotted to the left of the warrant line indicates that a left-turn lane is not warranted.

Left turn lane analyses have been completed for the appropriate study intersections using projected 2042 peak hourly volumes without and with site generated trips. The following are the results:

- Neptune Crescent at Ragus Road – **Left-turn lane not warranted** on Neptune Crescent northbound approach
- Neptune Crescent at Mount Hope Avenue – **Left-turn lane warranted** on Mount Hope Avenue without and with the proposed development. A concept plan showing how the left turn lane could fit in the right-of-way is included in Appendix D.

Traffic Signal Warrant Analysis

A signal warrant analysis is completed to determine if the installation of traffic signals at an intersection will provide a positive impact on total intersection operation. That is, the benefits in time saved and improved safety that will accrue to vehicles entering from a side street will exceed the impact that signals will have in time lost and potential additional collisions for vehicles approaching the intersection on the main street.

The *Canadian Traffic Signal Warrant Matrix Analysis (Transportation Association of Canada (TAC), 2005)* considers 100 warrant points as an indication that traffic signals will provide a positive impact. Signal warrant analysis uses vehicular and pedestrian volumes, and intersection, roadway and study area characteristics to calculate a warrant point value.

Evaluation of traffic signal warrants were completed for appropriate intersections using 2042 traffic volumes with the proposed development and **traffic signals are not warranted** at any of the unsignalized study intersections.

Intersection Capacity Analysis Results

Synchro 11 software have been used for performance evaluation of the Study Intersections. Summaries of the results are provided in the following sub-sections and detailed results of the analyses are included in Appendix C.



5.1 ANALYSIS SCENARIOS

**Summary
Analysis
Scenarios
Considered**

Scenario 1 – Future 2042 without Site: Represents future 2042 traffic volumes on the existing road network, including the traffic control and lane configurations that may be warranted without site generated trips.

Scenario 2 – Future 2042 with Site: Represents future 2042 traffic volumes on the existing road network, including the traffic control and lane configurations that may be warranted with site generated trips. The traffic signals at the intersection of Portland Street and Prince Arthur Avenue have been optimized in both the AM and PM peak periods.

Scenario 3 – Future 2042 with Site & intersection modifications: Represents future 2042 traffic volumes with the proposed development, including modified lane configurations and/or traffic control.

5.2 INT #1: PORTLAND STREET AT PRINCE ARTHUR AVENUE

Operational performance results for this intersection are provided in Table 3 for both the AM and PM peak hours.

The intersection is expected to operate within HRM acceptable limits during the AM and PM peak hours with the exception of the eastbound through/right-turn movement that is over the v/c threshold (v/c ratio over 0.85) without and with the proposed development in the PM peak period. The westbound left-turn lane in the PM peak hour may spill over into the through lane periodically without and with site development as the existing storage length is approximately 55m; however, the 50th percentile queue length is 45m with site development and is expected to be contained within the left-turn lane.

HRM is completing a corridor study of Portland Street and modifications at this intersection should be deferred until that plan is finalized.

Table 3 - Intersection Capacity Analysis: Portland Street at Prince Arthur Avenue

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement					Overall Intersection	
	Portland Street			Prince Arthur Avenue		Delay	Control
	EB-TR	WB-L	WB-T	NB-L	NB-R		
Future 2042 without Site AM Peak Hour (Page C-1)							
Delay	21.1	6.4	11.9	20.3	7.3	13.3	
v/c	0.68	0.39	0.69	0.11	0.37		
Queue	58.3	14.3	72.1	10.9	13.9		
Future 2042 with Site AM Peak Hour (Page C-11)							
Delay	22.2	7.0	12.2	24.6	7.2	14.2	
v/c	0.69	0.41	0.69	0.38	0.47		
Queue	69.0	18.5	85.8	31.2	17.0		
Future 2042 without Site PM Peak Hour (Page C-6)							
Delay	30.2	32.2	5.9	34.8	10.7	21.3	
v/c	0.90	0.76	0.42	0.22	0.59		
Queue	212.2	61.7	51.9	19.0	20.8		
Future 2042 with Site PM Peak Hour (Page C-16)							
Delay	36.0	45.6	5.0	53.1	13.4	27.2	
v/c	0.92	0.82	0.39	0.41	0.66		
Queue	297.0	98.4	53.7	35.6	26.2		

5.3 INT #2: PRINCE ARTHUR AVENUE AT FENWICK STREET

Operational performance results for this intersection are provided in Table 4 for both the AM and PM peak hours. A traffic signal warrant was completed for the 2042 Future with Site scenario, and it was determined that:

- 2042 Future with Site: Traffic signals are **not warranted** (17 Warrant Points, Table B-1, Appendix B)

The intersection is expected to operate within HRM acceptable limits during the AM and PM peak hours. Negligible changes in the operational performance of this intersection are expected with the addition of the proposed development. With an increase of trips expected on Fenwick Street in both the AM and PM peak periods, it is recommended that HRM complete a review to determine if traffic calming features may be required.

Table 4 - Intersection Capacity Analysis: Prince Arthur Avenue at Fenwick Street

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement			Overall Intersection	
	Prince Arthur Avenue		Fenwick Street	Delay	Control
	EB-TR	WB-LT	NB-LR		
Future 2042 without Site AM Peak Hour (Page C-2)					
Delay	0.0	2.0	10.0	1.6	
v/c	0.12	0.16	0.04		
Queue	0.0	1.1	0.9		
Future 2042 with Site AM Peak Hour (Page C-12)					
Delay	0.0	2.6	10.7	4.2	
v/c	0.12	0.22	0.24		
Queue	0.0	1.6	7.5		
Future 2042 without Site PM Peak Hour (Page C-7)					
Delay	0.0	1.0	11.1	2.2	
v/c	0.18	0.21	0.16		
Queue	0.0	0.5	4.6		
Future 2042 with Site PM Peak Hour (Page C-17)					
Delay	0.0	3.9	12.1	4.1	
v/c	0.18	0.31	0.25		
Queue	0.0	3.2	7.9		

5.4 INT #3: NEPTUNE CRESCENT AT RAGUS ROAD

Operational performance results for this intersection are provided in Table 5 for both the AM and PM peak hours.

A left-turn lane warrant was completed for the intersection, and it was determined that a left-turn lane is not warranted, see Figure B-1 & B-2 in Appendix B. Based on the existing traffic control and lane configurations, traffic signal warrants were completed for the study scenarios, and it was determined that:

- 2042 Future with Site: Traffic signals are **not warranted** (11 Warrant Points, Table B-2, Appendix B)

The intersection is expected to operate within HRM acceptable limits during the AM and PM peak hours. Negligible changes in the operational performance of this intersection are expected with the addition of the proposed development.

Table 5 - Intersection Capacity Analysis: Neptune Crescent at Ragus Road

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement				Overall Intersection	
	Ragus Drive		Neptune Crescent		Delay	Control
	EB-LTR	WB-LTR	NB-LTR	SB-LTR		
Future 2042 without Site AM Peak Hour (Page C-3)						
Delay	9.7	10.5	2.3	0.0	3.0	
v/c	0.03	0.02	0.11	0.03		
Queue	0.9	0.4	0.8	0.0		
Future 2042 with Site AM Peak Hour (Page C-13)						
Delay	11.9	12.9	2.3	0.0	1.9	
v/c	0.06	0.02	0.15	0.18		
Queue	1.5	0.6	0.9	0.0		
Future 2042 without Site PM Peak Hour (Page C-8)						
Delay	9.7	10.9	1.4	0.0	2.6	
v/c	0.07	0.01	0.09	0.08		
Queue	1.9	0.2	0.4	0.0		
Future 2042 with Site PM Peak Hour (Page C-18)						
Delay	12.5	14.4	0.9	0.0	2.2	
v/c	0.14	0.01	0.26	0.15		
Queue	4.0	0.3	0.6	0.0		

5.5 INT #4: NEPTUNE CRESCENT AT MOUNT HOPE AVENUE

Operational performance results for this intersection are provided in Table 6 for both the AM and PM peak hours.

A left-turn lane warrant was completed for the intersection, and it was determined that a left-turn lane is warranted on Mount Hope Avenue in the eastbound direction, see Figure B-1 in Appendix B. A concept plan for that left turn lane is included in Appendix D. Based on the existing traffic control and lane configurations, traffic signal warrants were completed for the study scenarios, and it was determined that:

- 2042 Future with Site: Traffic signals are **not warranted** (76 Warrant Points, Table B-3, Appendix B)

The intersection is expected to operate within HRM acceptable limits during the AM and PM peak hours with the exception of the southbound left-turn lane in the PM peak period is expected to perform with 95 seconds of delay, however the v/c ratio is within HRM Guidelines.

Table 6 - Intersection Capacity Analysis: Neptune Crescent at Mount Hope Avenue

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement					Overall Intersection	
	Mount Hope Avenue			Neptune Crescent		Delay	Control
	EB-L	EB-T	WB-TR	SB-L	SB-R		
Scenario 1 - Future 2042 without Site AM Peak Hour - LT Lane as Warranted (Page C-4)							
Delay	9.3	0.0	0.0	17.9	13.3	1.1	
v/c	0.03	0.09	0.44	0.11	0.05		
Queue	0.6	0.0	0.0	2.8	1.2		
Scenario 2 - Future 2042 with Site AM Peak Hour - LT Lane as Warranted (Page C-14)							
Delay	9.6	0.0	0.0	30.5	16.5	4.8	
v/c	0.04	0.10	0.48	0.48	0.26		
Queue	1.0	0.0	0.0	19.6	8.2		
Scenario 1 - Future 2042 without Site PM Peak Hour- LT Lane as Warranted (Page C-9)							
Delay	8.1	0.0	0.0	30.7	10.2	3.8	
v/c	0.02	0.36	0.22	0.49	0.03		
Queue	0.6	0.0	0.0	20.0	0.8		
Scenario 2 - Future 2042 with Site PM Peak Hour - LT Lane as Warranted (Page C-19)							
Delay	8.6	0.0	0.0	94.9	11.0	11.5	
v/c	0.08	0.39	0.28	0.90	0.08		
Queue	2.1	0.0	0.0	53.6	1.9		

While the analysis summarized in Table 6 has been completed as a stand-alone intersection, the proposed traffic signals on Mount Hope Avenue with the nearby development may provide additional gaps on Mount Hope Avenue and assist the left-turn movement from Neptune Crescent. The network performance during the PM peak hour was output using *SimTraffic* software and is summarized in Table 7.

Table 7 - SimTraffic PM Delays - Mount Hope Avenue at Neptune Crescent

Sim Traffic	Control Delay (sec/veh) by Intersection Movement					Overall Intersection		
	Mount Hope Avenue				Neptune Crescent		Delay	Control
	EB-L	EB-T	WB-T	WB-R	SB-L	SB-R		
Delay	2.7	0.0	0.0	0.0	24.9	6.3	3.0	

5.6 INT #5: MOUNT HOPE AVENUE AT LEONAMARIE DRIVE

Operational performance results for this intersection are provided in Table 8 for both the AM and PM peak hours.

The intersection is expected to operate within HRM acceptable limits during the AM and PM peak hours with the exception of the westbound through movement during the AM peak hour and the eastbound through movement during the PM peak hour. Both are at or over the v/c threshold (v/c ratio over 0.85) without and with the proposed development.

The traffic generated by the proposed development is expected to have little impact on the performance of this intersection.

Table 8 - Intersection Capacity Analysis: Mount Hope Avenue at Leonamarie Drive

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement						Overall Intersection	
	Mount Hope Avenue				Leonamarie Drive		Delay	Control
	EB-L	EB-T	WB-T	WB-R	SB-L	SB-R		
Future 2042 without Site AM Peak Hour (Page C-5)								
Delay	8.6	6.5	19.2	2.9	34.4	9.4	17.5	
v/c	0.17	0.25	0.85	0.08	0.58	0.18		
Queue	5.1	28.2	161.0	6.0	56.2	10.7		
Future 2042 with Site AM Peak Hour (Page C-15)								
Delay	10.0	7.1	21.3	2.7	37.3	9.6	18.5	
v/c	0.20	0.34	0.88	0.08	0.60	0.19		
Queue	5.6	41.3	189.3	5.8	56.2	10.7		
Future 2042 without Site PM Peak Hour (Page C-10)								
Delay	5.2	17.7	6.5	1.3	30.7	11.1	13.8	
v/c	0.11	0.85	0.36	0.18	0.42	0.14		
Queue	7.5	150.0	38.3	5.9	37.3	8.8		
Future 2042 with Site PM Peak Hour (Page C-20)								
Delay	5.2	19.5	6.9	1.2	33.8	11.4	14.8	
v/c	0.12	0.88	0.42	0.17	0.44	0.15		
Queue	7.7	183.4	50.9	5.9	37.3	8.8		



6 SUMMARY & CONCLUSIONS

6.1 SUMMARY

Background	1. Plans are being prepared by Portucana Construction and AJ LeGrow Holdings for a residential development of up to 1,250 apartment units in Dartmouth, Nova Scotia. The proposed development is planned to include 10 mid-rise apartment buildings.
Description of Existing Development	2. There is currently an office building located on the proposed site and is approximately 80% occupied. The office building of approximately 65,000ft ² will be demolished and the proposed 10 mid-rise apartment buildings will be constructed in phases. The access to the existing office building is via Research Drive.
Future Nearby Development	3. There is a known nearby future development located on Mount Hope Avenue that includes a large residential development of approximately 875 units. It is anticipated to be completed by 2029.
Description of Proposed Development	4. The proposed development is planned to include up to 1,250 mid-rise apartment units and it is anticipated that the development will be completed by 2037.
Proposed Site Access	5. The access to the proposed development will be via multiple driveways on Research Drive.
Study Area Roads	6. The study considers Portland Street, Prince Arthur Avenue, Fenwick Street, Neptune Crescent, Mount Hope Avenue, and Leonamarie Drive.
Turning Movement Counts	7. Turning movement volumes were collected by WSP on Tuesday, March 22 nd , 2022.
Background Traffic Volumes	8. Projected 2042 peak hour future background volumes include an annual growth of 0.5% between 2022 and 2042.
Estimation of Trips Generated by Background Development	9. The background development, Mount Hope Avenue (Clayton), is expected to include 875 residential units. Trips generated by that development have been assigned to the study area for this TIS.
Estimation of Existing & Proposed Development Trips	10. Trip generation estimates for the proposed development were prepared using rates published in <i>Trip Generation, 11th Edition</i> (Institute of Transportation Engineers, Washington, 2021). 11. It is estimated that the development will generate: <ul style="list-style-type: none">• 405 two-way primary vehicle trips (48 entering and 357 exiting) during the AM peak hour; and,• 364 two-way pass-by vehicle trips (252 entering and 112 exiting) during the PM peak hour.
Trip Distribution and Assignment	12. Proposed development generated trips were distributed to the Study Intersections based on counted volumes and local knowledge of the area considering major trip origins and destinations in the region. Trips were distributed to the north and west on Portland Street (25%), north and east on Portland Street (20%), west (20%), east (25%) and south (10%).

**Analysis
Scenarios
Considered**

13. **Scenario 1 – Future 2042 without Site:** Represents future 2042 traffic volumes on the existing road network, including the traffic control and lane configurations that may be warranted without site generated trips.
14. **Scenario 2 – Future 2042 with Site:** Represents future 2042 traffic volumes on the existing road network, including the traffic control and lane configurations that may be warranted with site generated trips. The traffic signals at the intersection of Portland Street and Prince Arthur Avenue have been optimized in both the AM and PM peak periods.
15. **Scenario 3 – Future 2042 with Site & intersection modifications:** Represents future 2042 traffic volumes with the proposed development, including modified lane configurations and/or traffic control.

**Warrant
Analysis
Summary**

16. Warrant reviews were completed for left-turn lanes and traffic signals with the projected traffic volumes.
17. It was determined that left-turn lanes are warranted at the following study intersection:
 - Neptune Crescent @ Mount Hope Avenue (without and with site development)
18. It was determined that traffic signals are not warranted at the unsignalized study intersections.

**Summary –
Intersection
Capacity
Analysis**

19. Intersection performance analysis was completed using *Synchro 11* at the Study Intersections.
 20. The **Portland Street at Prince Arthur Avenue intersection** is expected to work well during the study analysis scenarios during both the AM and PM peak periods without and with the proposed development. During the PM peak period the eastbound through/right-turn is expected to operate over the HRM acceptable limits (v/c ratio over 0.85) without and with the proposed development. The westbound left-turn lane in the PM peak hour may spill over into the through lane periodically as the existing storage length is approximately 55m; however, the 50th percentile queue length is 45m and is expected to be contained within the left-turn lane.
 21. The **Prince Arthur Avenue at Fenwick Street intersection** is expected to operate well during both the AM and PM peak periods and within HRM Guidelines.
 22. The **Neptune Crescent at Ragus Road intersection** is expected to operate well during both the AM and PM peak periods and within HRM Guidelines.
 23. The **Neptune Crescent at Mount Hope Avenue intersection** is expected to operate well during both the AM and PM peak periods with the inclusion of the eastbound left-turn lane on Mount Hope Avenue and within HRM Guidelines with the exception of the southbound left-turn lane in the PM peak period is expected to perform with 95 seconds of delay. With traffic signals being proposed on Mount Hope Avenue with the nearby development, this may provide gaps in the network to allow for vehicles to travel left onto Mount Hope Avenue and improve this operation, as demonstrated by the *SimTraffic* analysis.
 24. The **Mount Hope Avenue at Leonamarie Drive intersection** is expected to operate well during both the AM and PM peak periods with the exception of the westbound through movement in the AM peak hour and the eastbound through movement during the PM peak hour (v/c ratio over 0.85) without and with site generated trips. The trips generated by the proposed development are expected to have little impact on the performance of the intersection.
-

6.2 CONCLUSIONS

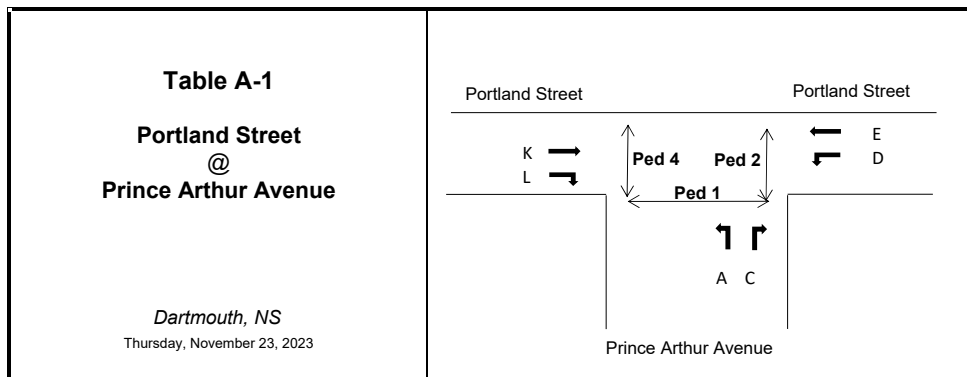
- Conclusions**
25. Trips generated by the Research Drive Development are expected to have a minimal or negligible impact on the operational performance of any of the Study Intersections and the adjacent street network.
 26. HRM should monitor the Neptune Drive at Mount Hope Avenue intersection and install a left-turn lane at this intersection.
-

APPENDIX

A

TRAFFIC VOLUME DATA





AM Peak Period Volume Data

Time	Prince Arthur Avenue Northbound Approach		Portland Street Westbound Approach		Portland Street Eastbound Approach		Total Vehicles
	A	C	D	E	K	L	
07:00 07:15	4	9	15	107	42	2	179
07:15 07:30	6	29	14	152	66	4	271
07:30 07:45	5	32	19	154	62	4	276
07:45 08:00	4	39	41	154	76	8	322
08:00 08:15	5	25	31	165	76	7	309
08:15 08:30	4	37	40	138	72	14	305
08:30 08:45	11	34	47	172	76	6	346
08:45 09:00	12	40	63	132	76	8	331
AM Peak Hour	32	136	181	607	300	35	1291
07:00 08:00	19	109	89	567	246	18	1048
08:00 09:00	32	136	181	607	300	35	1291
	Ped 1		Ped 2		Ped 4		Total Peds
07:00 08:00	5		0		0		5
08:00 09:00	6		0		2		8

Midday Peak Period Volume Data

Time	Prince Arthur Avenue Northbound Approach		Portland Street Westbound Approach		Portland Street Eastbound Approach		Total Vehicles
	A	C	D	E	K	L	
11:30 11:45	6	37	28	106	87	4	268
11:45 12:00	6	29	25	95	114	5	274
12:00 12:15	14	49	26	92	110	7	298
12:15 12:30	9	46	39	122	105	10	331
12:30 12:45	7	40	38	106	107	8	306
12:45 13:00	9	47	39	92	108	5	300
13:00 13:15	7	37	40	97	102	10	293
13:15 13:30	5	39	26	112	99	10	291
Midday Peak Hour	39	182	142	412	430	30	1235
11:30 12:30	35	161	118	415	416	26	1171
12:30 13:30	28	163	143	407	416	33	1190
	Ped 1		Ped 2		Ped 4		Total Peds
11:30 12:30	12		0		5		17
12:30 13:30	5		1		1		7

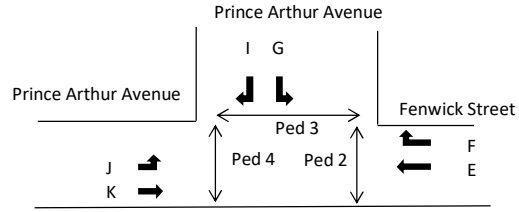
PM Peak Period Volume Data

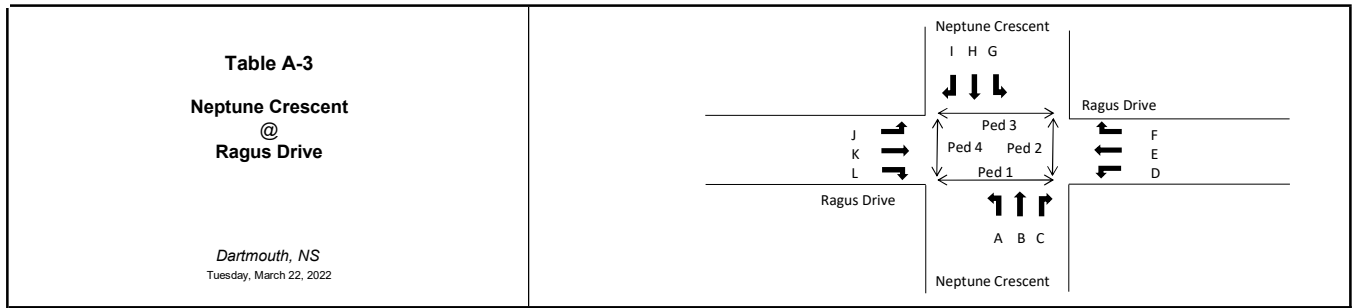
Time	Prince Arthur Avenue Northbound Approach		Portland Street Westbound Approach		Portland Street Eastbound Approach		Total Vehicles
	A	C	D	E	K	L	
16:00 16:15	15	49	48	103	160	6	381
16:15 16:30	8	64	48	128	187	10	445
16:30 16:45	12	64	53	114	168	6	417
16:45 17:00	9	47	58	99	177	14	404
17:00 17:15	18	42	50	120	167	6	403
17:15 17:30	7	42	45	139	143	8	384
17:30 17:45	11	52	45	135	171	4	418
17:45 18:00	9	41	50	119	102	6	327
PM Peak Hour	47	217	209	461	699	36	1669
16:00 17:00	44	224	207	444	692	36	1647
17:00 18:00	45	177	190	513	583	24	1532
	Ped 1		Ped 2		Ped 4		Total Peds
16:00 17:00	15		0		1		16
17:00 18:00	8		0		1		9

Time		Fenwick Street Westbound Approach		Prince Arthur Avenue Southbound Approach		Prince Arthur Avenue Eastbound Approach		Total Vehicles
		E	F	G	I	J	K	
07:00	07:15	0	3	2	7	17	1	30
07:15	07:30	3	2	4	12	15	0	36
07:30	07:45	3	5	4	17	25	2	56
07:45	08:00	2	6	11	24	26	2	71
08:00	08:15	0	4	10	27	25	0	66
08:15	08:30	0	2	12	35	25	1	75
08:30	08:45	2	4	12	45	32	2	97
08:45	09:00	2	6	16	76	71	4	175
AM Peak Hour		4	16	50	183	153	7	413
07:00	08:00	8	16	21	60	83	5	193
08:00	09:00	4	16	50	183	153	7	413
		Ped 2		Ped 3		Ped 4		Total Peds
07:00	08:00	2		0		2		4
08:00	09:00	15		0		69		84
Midday Peak Period Volume Data								
Time		Fenwick Street Westbound Approach		Prince Arthur Avenue Southbound Approach		Prince Arthur Avenue Eastbound Approach		Total Vehicles
		E	F	G	I	J	K	
11:30	11:45	1	3	2	25	21	2	54
11:45	12:00	0	4	5	21	21	0	51
12:00	12:15	0	1	1	19	29	2	52
12:15	12:30	2	9	4	29	35	0	79
12:30	12:45	0	5	4	20	30	1	60
12:45	13:00	1	2	8	23	28	3	65
13:00	13:15	0	6	3	27	37	1	74
13:15	13:30	1	5	3	24	24	1	58
Midday Peak Hour		3	22	19	99	130	5	278
11:30	12:30	3	17	12	94	106	4	236
12:30	13:30	2	18	18	94	119	6	257
		Ped 2		Ped 3		Ped 4		Total Peds
11:30	12:30	6		1		10		17
12:30	13:30	3		2		125		130
PM Peak Period Volume Data								
Time		Fenwick Street Westbound Approach		Prince Arthur Avenue Southbound Approach		Prince Arthur Avenue Eastbound Approach		Total Vehicles
		E	F	G	I	J	K	
15:30	15:45	4	5	4	30	37	1	81
15:45	16:00	1	13	2	32	53	3	104
16:00	16:15	3	15	0	29	39	2	88
16:15	16:30	2	6	6	37	33	1	85
16:30	16:45	2	16	5	26	51	4	104
16:45	17:00	1	17	7	29	29	0	83
17:00	17:15	0	18	3	46	38	4	109
17:15	17:30	6	8	3	34	28	4	83
PM Peak Hour		9	85	23	199	243	14	573
15:30	16:30	10	39	12	128	162	7	358
16:30	17:30	9	59	18	135	146	12	379
		Ped 2		Ped 3		Ped 4		Total Peds
15:30	16:30	0		2		6		8
16:30	17:30	2		0		13		15

Table A-2
Prince Arthur Avenue @ Fenwick Street

Dartmouth, NS
Tuesday, March 22, 2022





AM Peak Period Volume Data														
Time	Neptune Crescent Northbound Approach			Ragus Drive Westbound Approach			Neptune Crescent Southbound Approach			Ragus Drive Eastbound Approach			Total Vehicles	
	A	B	C	D	E	F	G	H	I	J	K	L		
07:00 - 07:15	3	7	2	5	0	0	0	6	1	1	1	0	26	
07:15 - 07:30	2	8	0	0	1	0	0	8	1	0	0	3	23	
07:30 - 07:45	12	25	2	2	0	0	0	5	0	1	0	2	49	
07:45 - 08:00	12	24	1	1	2	0	0	10	3	5	0	2	60	
08:00 - 08:15	8	26	0	2	0	0	0	4	1	3	0	4	48	
08:15 - 08:30	14	20	2	1	0	0	0	7	2	3	0	0	49	
08:30 - 08:45	8	24	1	6	0	0	0	12	1	3	0	2	57	
08:45 - 09:00	6	27	1	6	0	1	0	7	2	3	1	3	57	
AM Peak Hour	42	94	4	10	2	0	0	33	7	14	0	8	214	
07:00 - 08:00	29	64	5	8	3	0	0	29	5	7	1	7	158	
08:00 - 09:00	36	97	4	15	0	1	0	30	6	12	1	9	211	
	Ped 1			Ped 2			Ped 3			Ped 4			Total Peds	
07:00 - 08:00	1			1			0			1			4	
08:00 - 09:00	1			0			0			3			4	

Midday Volume Data														
Time	Neptune Crescent Northbound Approach			Ragus Drive Westbound Approach			Neptune Crescent Southbound Approach			Ragus Drive Eastbound Approach			Total Vehicles	
	A	B	C	D	E	F	G	H	I	J	K	L		
11:30 - 11:45	13	7	1	2	2	0	0	7	2	4	1	6	45	
11:45 - 12:00	14	6	5	1	0	1	0	20	1	3	0	4	55	
12:00 - 12:15	5	10	0	1	0	0	0	16	2	3	2	7	46	
12:15 - 12:30	9	10	2	1	1	0	0	11	3	1	0	3	41	
12:30 - 12:45	5	10	0	2	0	0	0	12	1	2	0	4	36	
12:45 - 13:00	10	14	1	2	1	1	0	11	0	4	0	2	46	
13:00 - 13:15	6	13	2	0	0	0	0	8	2	3	1	11	46	
13:15 - 13:30	9	6	3	4	0	0	0	4	0	0	0	5	31	
Midday Peak Hour	41	33	8	5	3	1	0	54	8	11	3	20	187	
11:30 - 12:30	41	33	8	5	3	1	0	54	8	11	3	20	187	
12:30 - 13:30	30	43	6	8	1	1	0	35	3	9	1	22	159	
	Ped 1			Ped 2			Ped 3			Ped 4			Total Peds	
11:30 - 12:30	0			0			0			0			0	
12:30 - 13:30	0			2			1			1			4	

PM Peak Period Volume Data														
Time	Neptune Crescent Northbound Approach			Ragus Drive Westbound Approach			Neptune Crescent Southbound Approach			Ragus Drive Eastbound Approach			Total Vehicles	
	A	B	C	D	E	F	G	H	I	J	K	L		
15:30 - 15:45	4	11	6	5	0	0	0	14	3	1	0	5	49	
15:45 - 16:00	9	14	2	5	1	0	0	17	0	1	1	3	53	
16:00 - 16:15	10	23	0	5	1	0	0	35	3	4	1	11	93	
16:15 - 16:30	8	19	3	1	0	0	0	12	2	5	0	6	56	
16:30 - 16:45	2	17	1	0	0	0	0	24	4	5	0	4	57	
16:45 - 17:00	7	15	1	1	0	0	0	18	3	3	0	14	62	
17:00 - 17:15	5	16	0	2	0	0	0	33	4	5	0	13	78	
17:15 - 17:30	11	32	1	0	0	0	0	17	3	6	0	3	73	
PM Peak Hour	25	80	3	3	0	0	0	92	14	19	0	34	270	
15:30 - 16:30	31	67	11	16	2	0	0	78	8	11	2	25	251	
16:30 - 17:30	25	80	3	3	0	0	0	92	14	19	0	34	270	
	Ped 1			Ped 2			Ped 3			Ped 4			Total Peds	
15:30 - 16:30	0			1			2			1			4	
16:30 - 17:30	0			1			1			0			2	

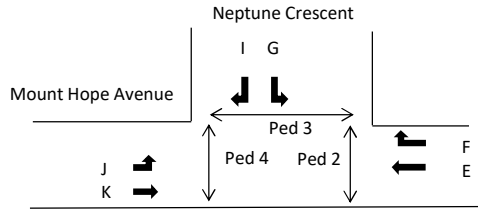
Time		Mount Hope Avenue Westbound Approach		Neptune Crescent Southbound Approach		Mount Hope Avenue Eastbound Approach		Total Vehicles
		E	F	G	I	J	K	
07:00	07:15	76	9	7	3	3	41	139
07:15	07:30	130	13	5	5	4	26	183
07:30	07:45	120	34	7	4	5	42	212
07:45	08:00	144	37	6	8	6	28	229
08:00	08:15	118	32	8	2	4	34	198
08:15	08:30	115	29	7	4	4	28	187
08:30	08:45	97	26	15	3	5	39	185
08:45	09:00	95	32	14	4	7	41	193
AM Peak Hour		497	132	28	18	19	132	826
07:00	08:00	470	93	25	20	18	137	763
08:00	09:00	425	119	44	13	20	142	763
		Ped 2		Ped 3		Ped 4		Total Peds
07:00	08:00	0		1		0		1
08:00	09:00	0		2		1		3

Time		Mount Hope Avenue Westbound Approach		Neptune Crescent Southbound Approach		Mount Hope Avenue Eastbound Approach		Total Vehicles
		E	F	G	I	J	K	
11:30	11:45	67	12	10	5	5	95	194
11:45	12:00	67	13	18	11	13	75	197
12:00	12:15	70	12	16	14	8	69	189
12:15	12:30	76	13	12	1	8	79	189
12:30	12:45	91	14	14	5	5	67	196
12:45	13:00	60	16	9	6	8	57	156
13:00	13:15	73	18	9	9	4	63	176
13:15	13:30	73	11	10	2	4	74	174
Midday Peak Hour		304	52	60	31	34	290	771
11:30	12:30	280	50	56	31	34	318	769
12:30	13:30	297	59	42	22	21	261	702
		Ped 2		Ped 3		Ped 4		Total Peds
11:30	12:30	0		1		0		1
12:30	13:30	1		1		0		2

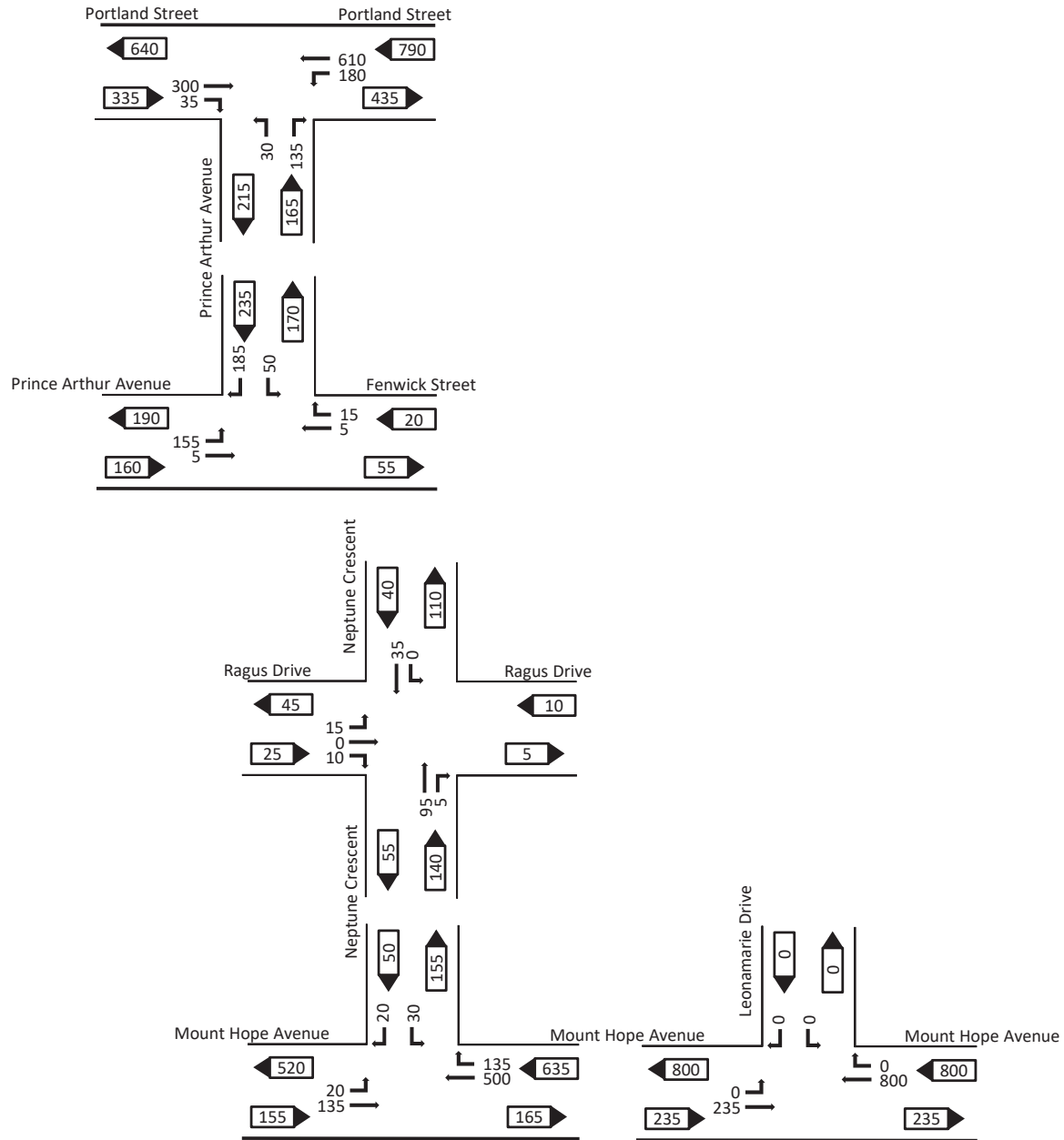
Time		Mount Hope Avenue Westbound Approach		Neptune Crescent Southbound Approach		Mount Hope Avenue Eastbound Approach		Total Vehicles
		E	F	G	I	J	K	
15:30	15:45	59	18	21	6	3	119	226
15:45	16:00	52	22	22	7	5	98	206
16:00	16:15	66	28	40	6	7	141	288
16:15	16:30	59	24	21	1	4	133	242
16:30	16:45	55	11	27	6	8	138	245
16:45	17:00	47	15	29	7	6	85	189
17:00	17:15	37	21	35	8	6	82	189
17:15	17:30	52	3	16	2	11	53	137
PM Peak Hour		232	85	110	20	24	510	981
15:30	16:30	236	92	104	20	19	491	962
16:30	17:30	191	50	107	23	31	358	760
		Ped 2		Ped 3		Ped 4		Total Peds
15:30	16:30	0		1		1		2
16:30	17:30	1		0		0		1

Table A-4
Mount Hope Avenue
@
Neptune Crescent

Dartmouth, NS
Tuesday, March 22, 2022



Weekday AM Peak Hour
2023 Existing Traffic Volumes



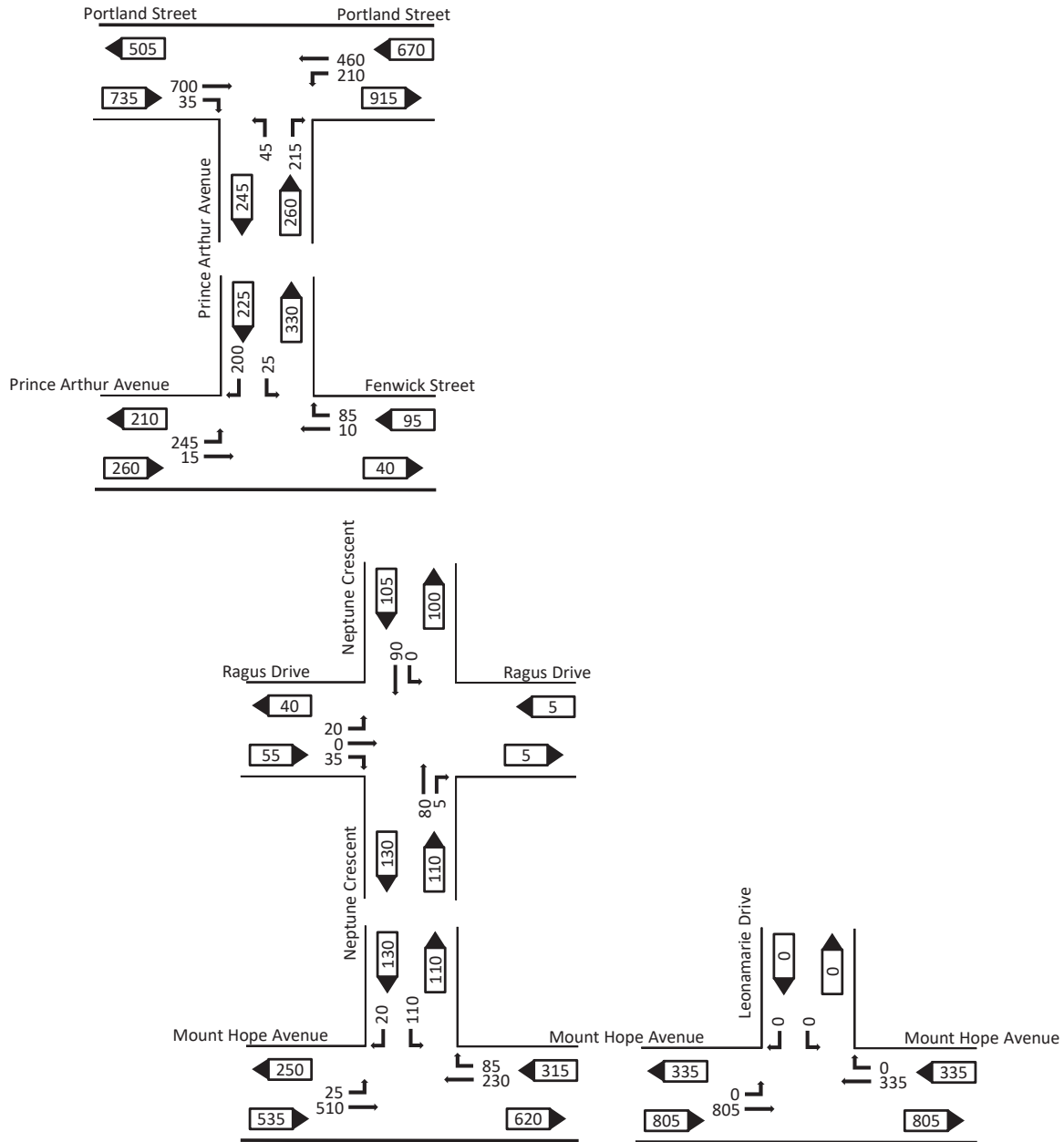
Research Drive TIS
Dartmouth, NS

Figure A-1A

Weekday AM Peak Hour
2023 Existing Traffic Volumes

March 2024

Weekday PM Peak Hour
2023 Existing Traffic Volumes



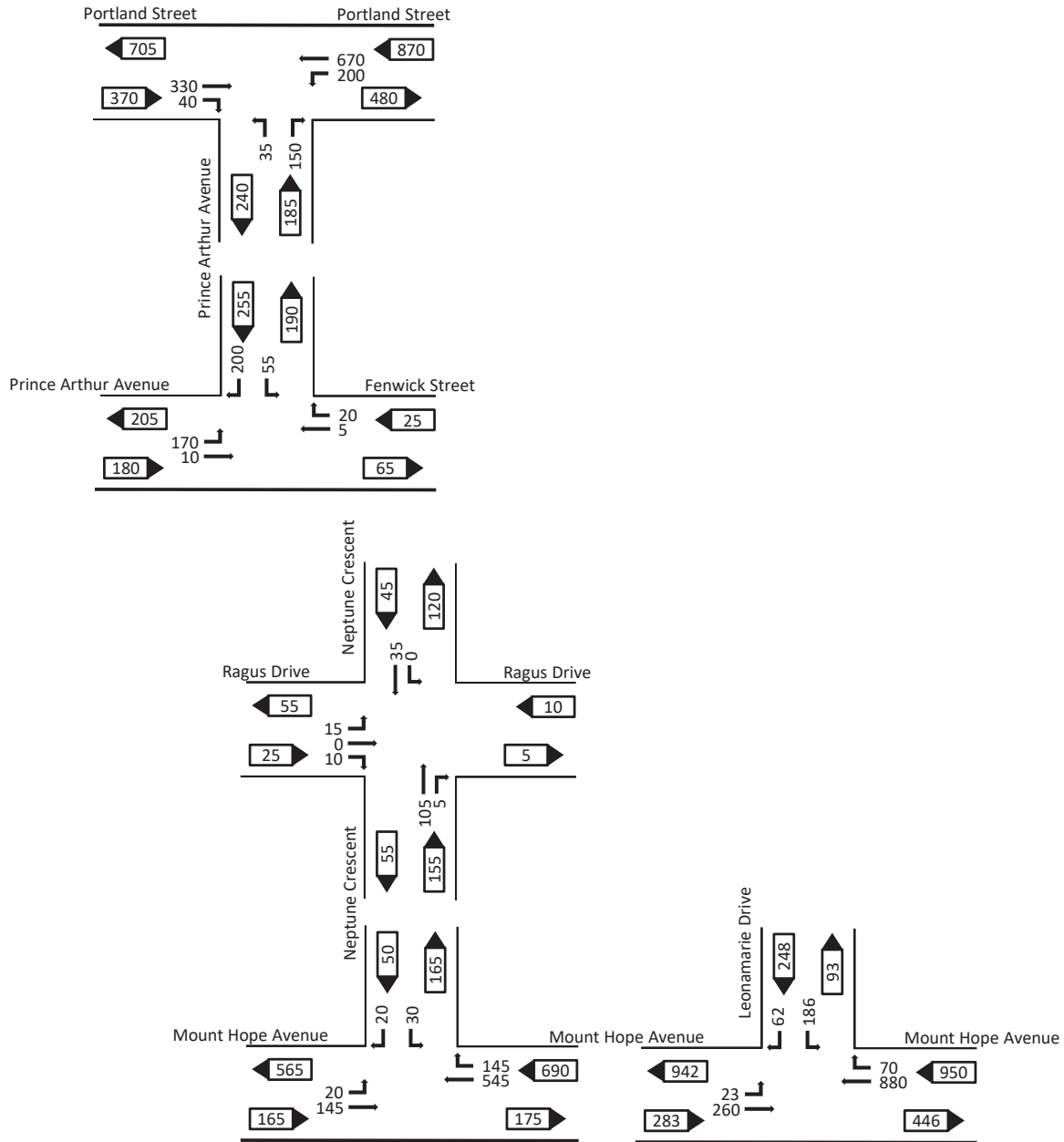
Research Drive TIS
Dartmouth, NS

Figure A-1B

Weekday PM Peak Hour
2023 Existing Traffic Volumes

March 2024

Weekday AM Peak Hour
2042 Future Background Traffic Volumes



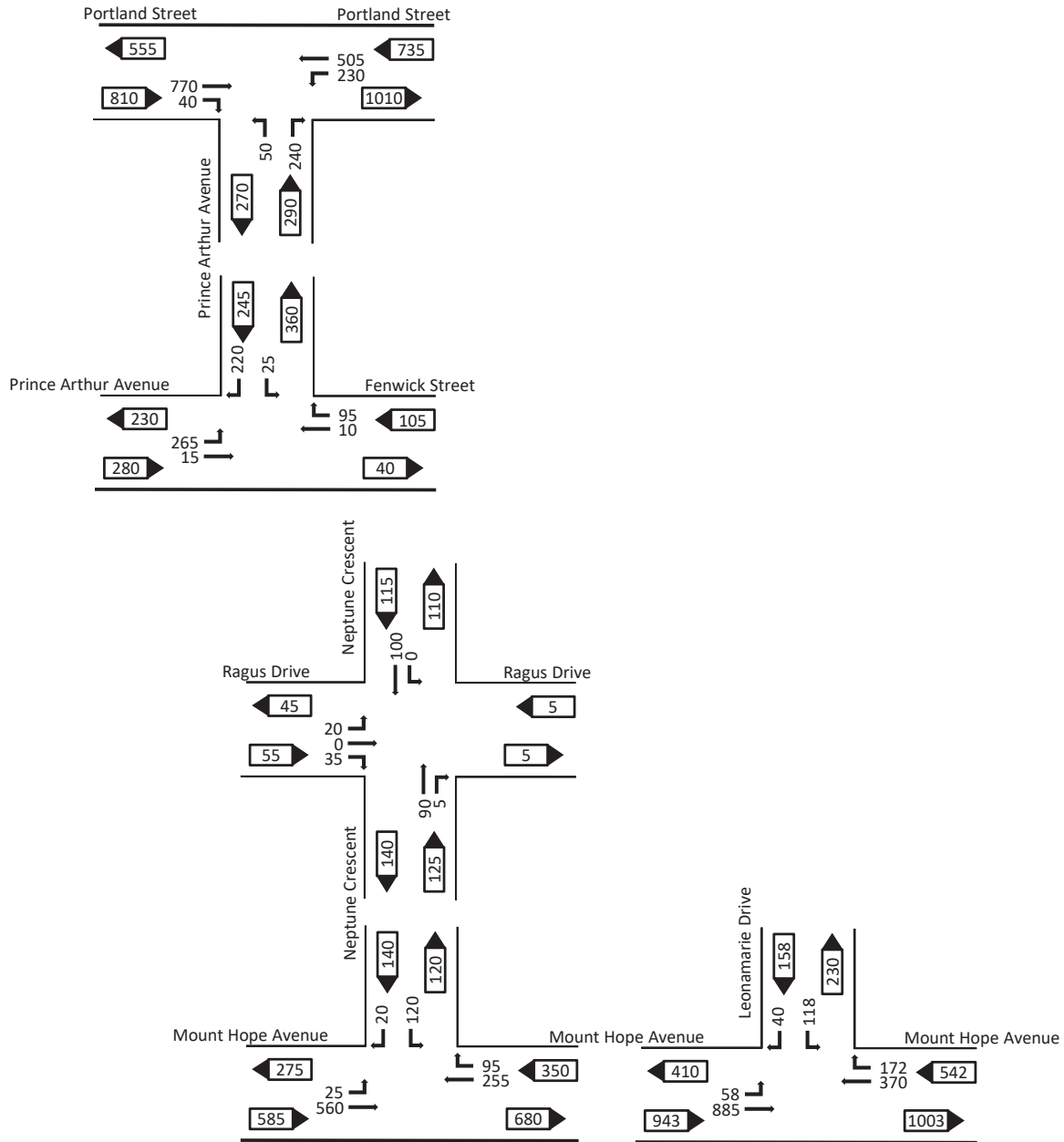
Research Drive TIS
Dartmouth, NS

Figure A-2A

Weekday AM Peak Hour
2042 Future Background Traffic Volumes

March 2024

Weekday PM Peak Hour
2042 Future Background Traffic Volumes



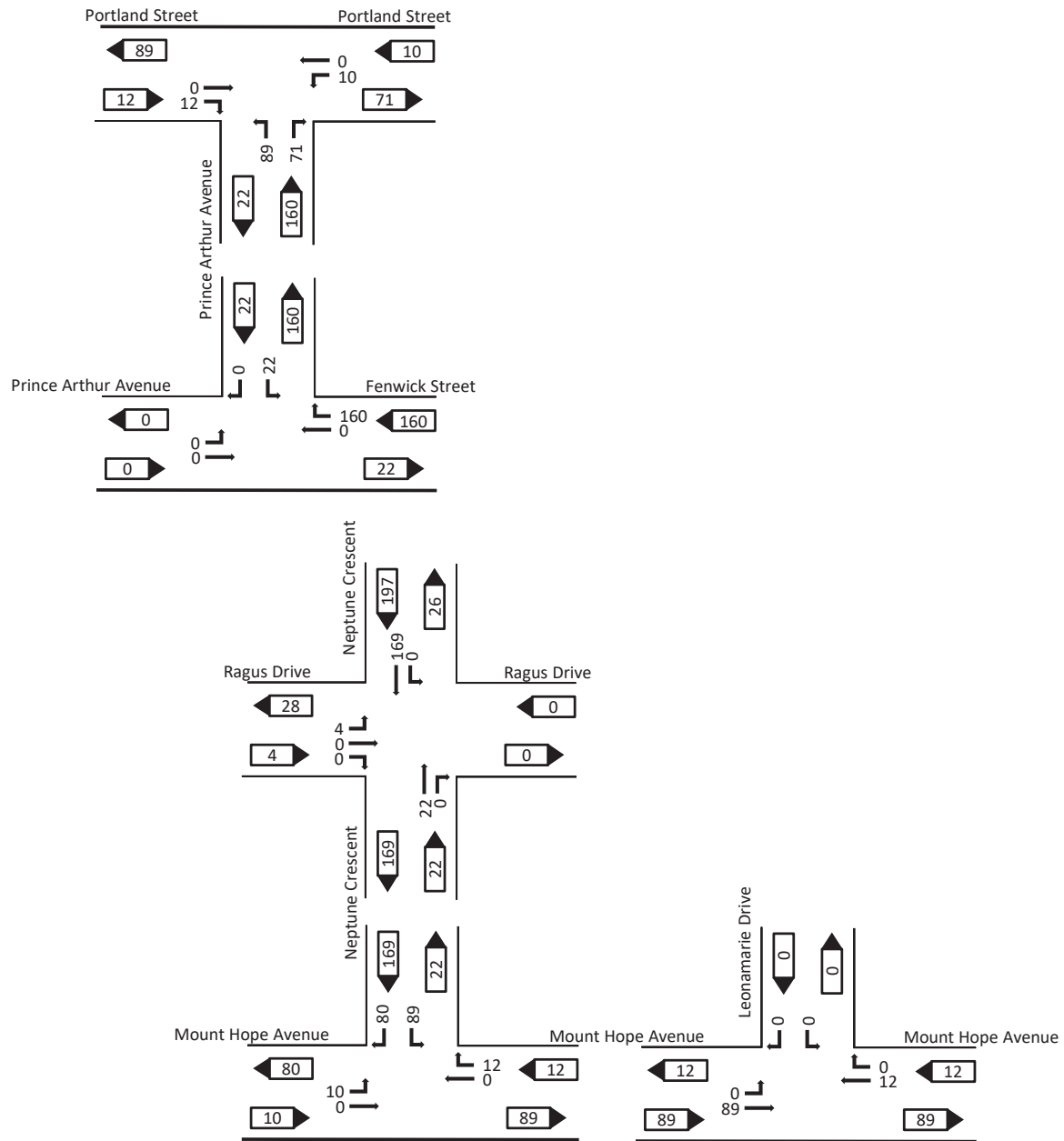
Research Drive TIS
Dartmouth, NS

Figure A-2B

Weekday PM Peak Hour
2042 Future Background Traffic Volumes

March 2024

Weekday AM Peak Hour
Trip Assignment



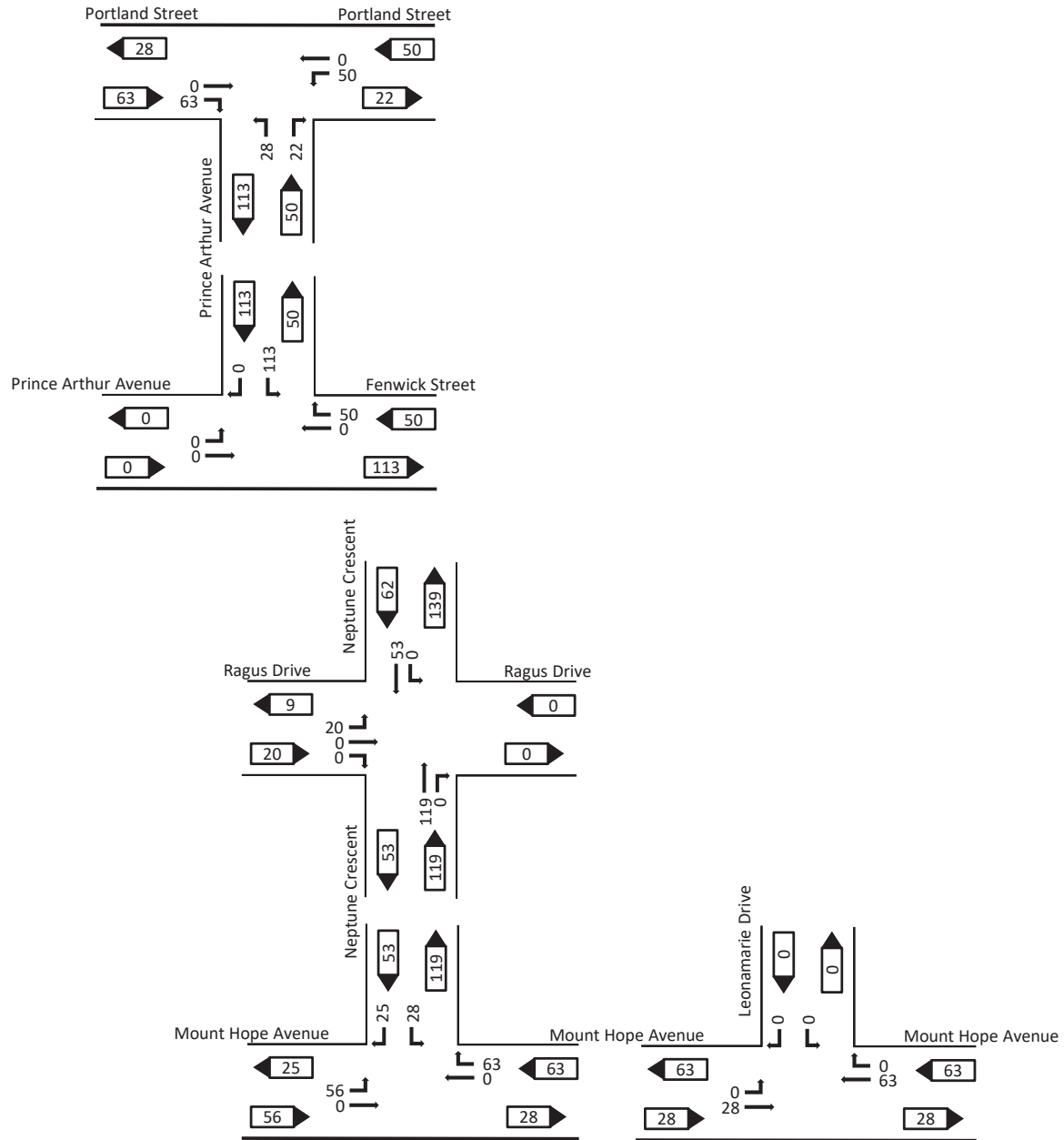
Research Drive TIS
Dartmouth, NS

Figure A-3A

Weekday AM Peak Hour
Trip Assignment

March 2024

Weekday PM Peak Hour
Trip Assignment



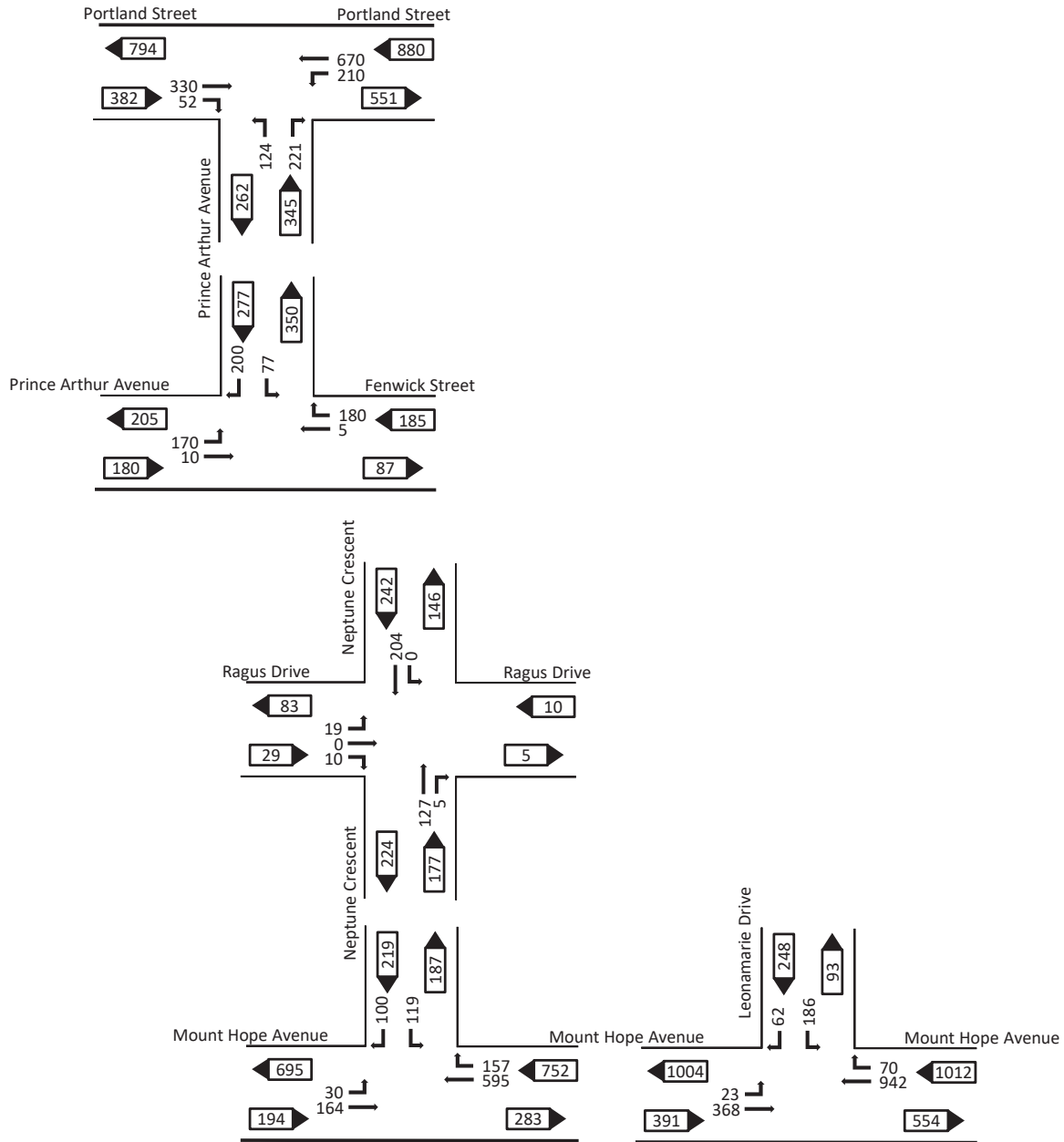
Research Drive TIS
Dartmouth, NS

Figure A-3B

Weekday PM Peak Hour
Trip Assignment

March 2024

Weekday AM Peak Hour
 2042 Total Traffic with Site Generated
 Trips



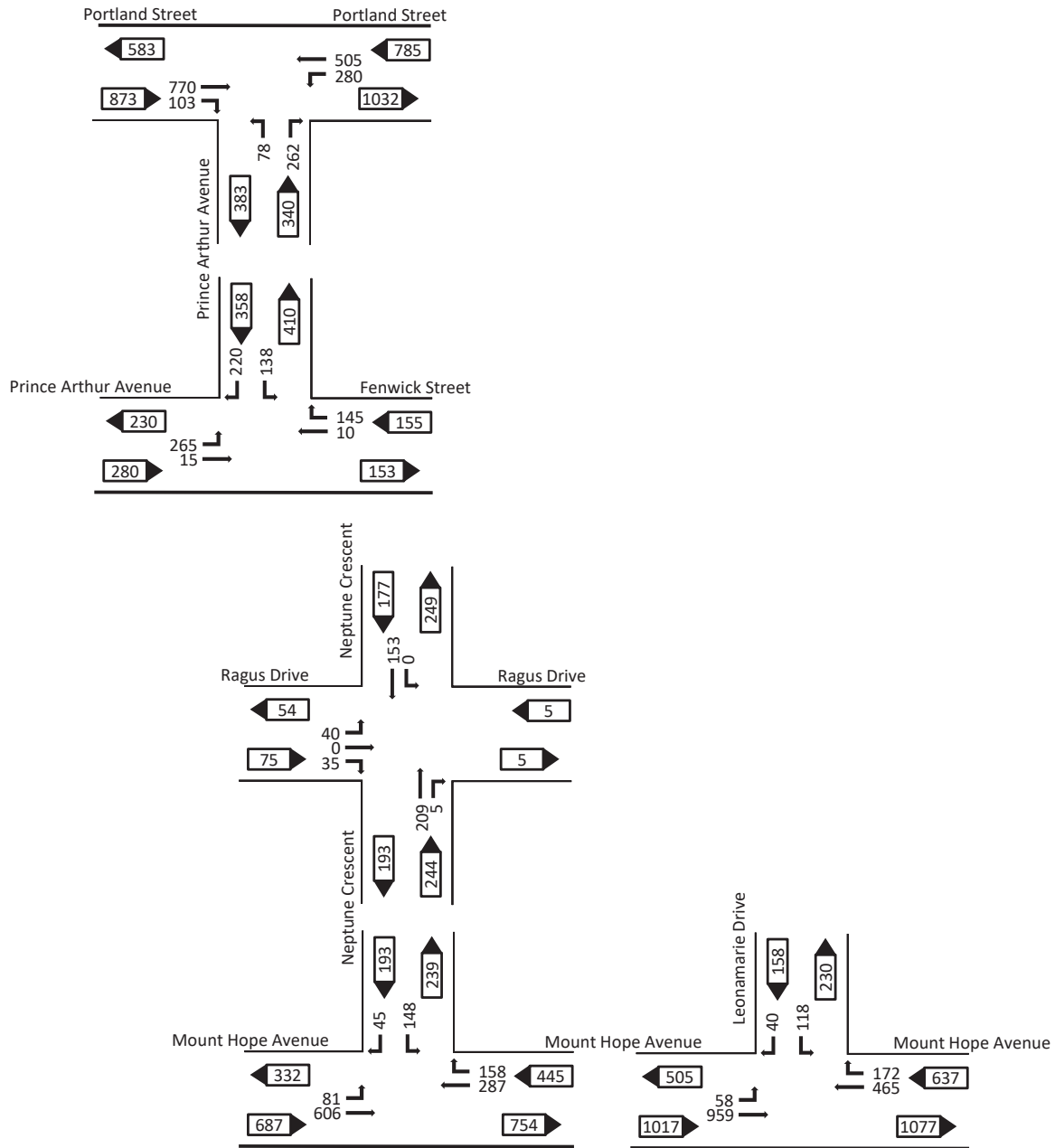
Research Drive TIS
 Dartmouth, NS

Figure A-4A

Weekday AM Peak Hour
 2042 Total Traffic with Site Generated Trips

March 2024

Weekday PM Peak Hour
 2042 Total Traffic with Site Generated
 Trips



Research Drive TIS
 Dartmouth, NS

Figure A-4B

Weekday PM Peak Hour
 2042 Total Traffic with Site Generated Trips

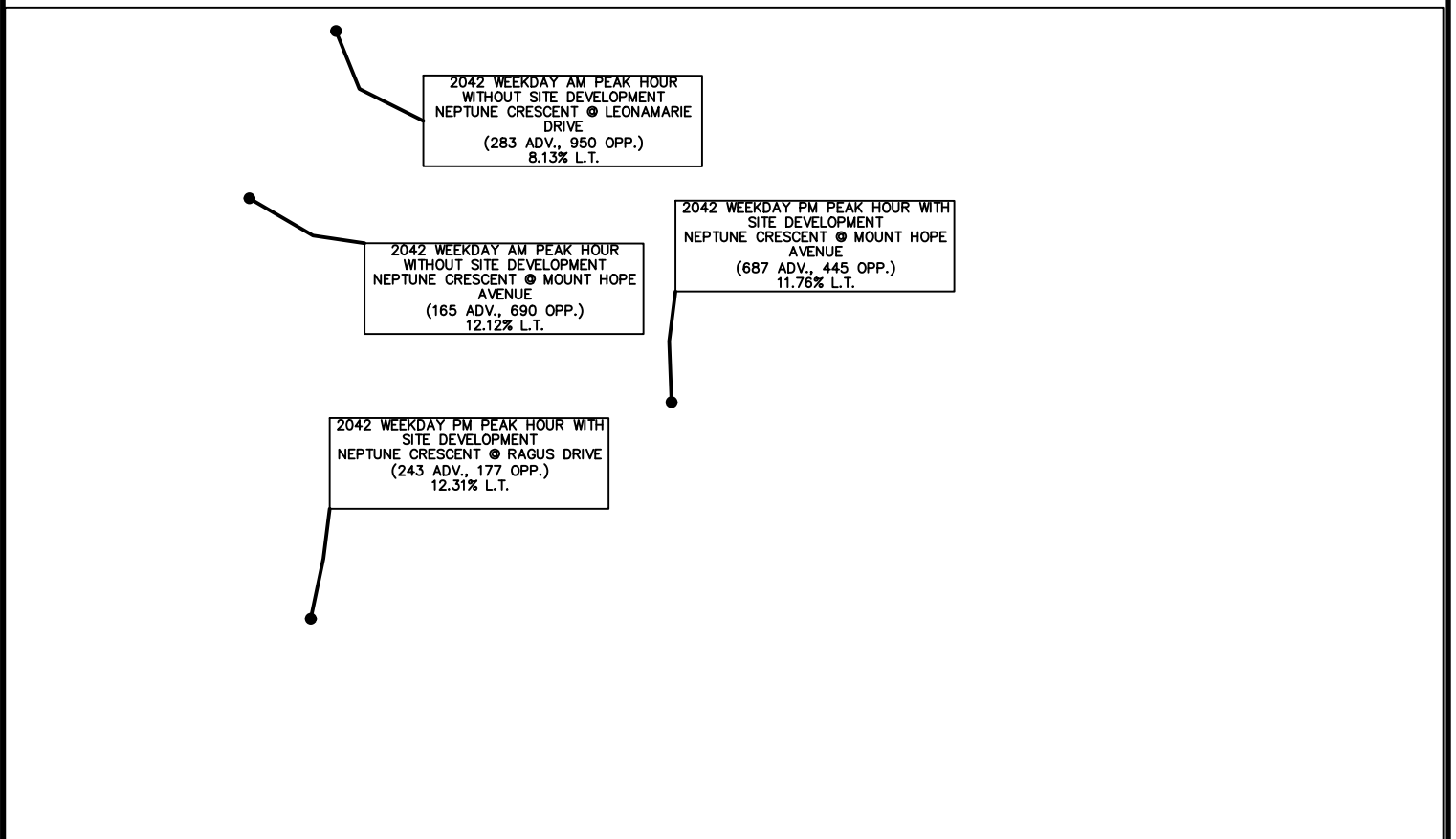
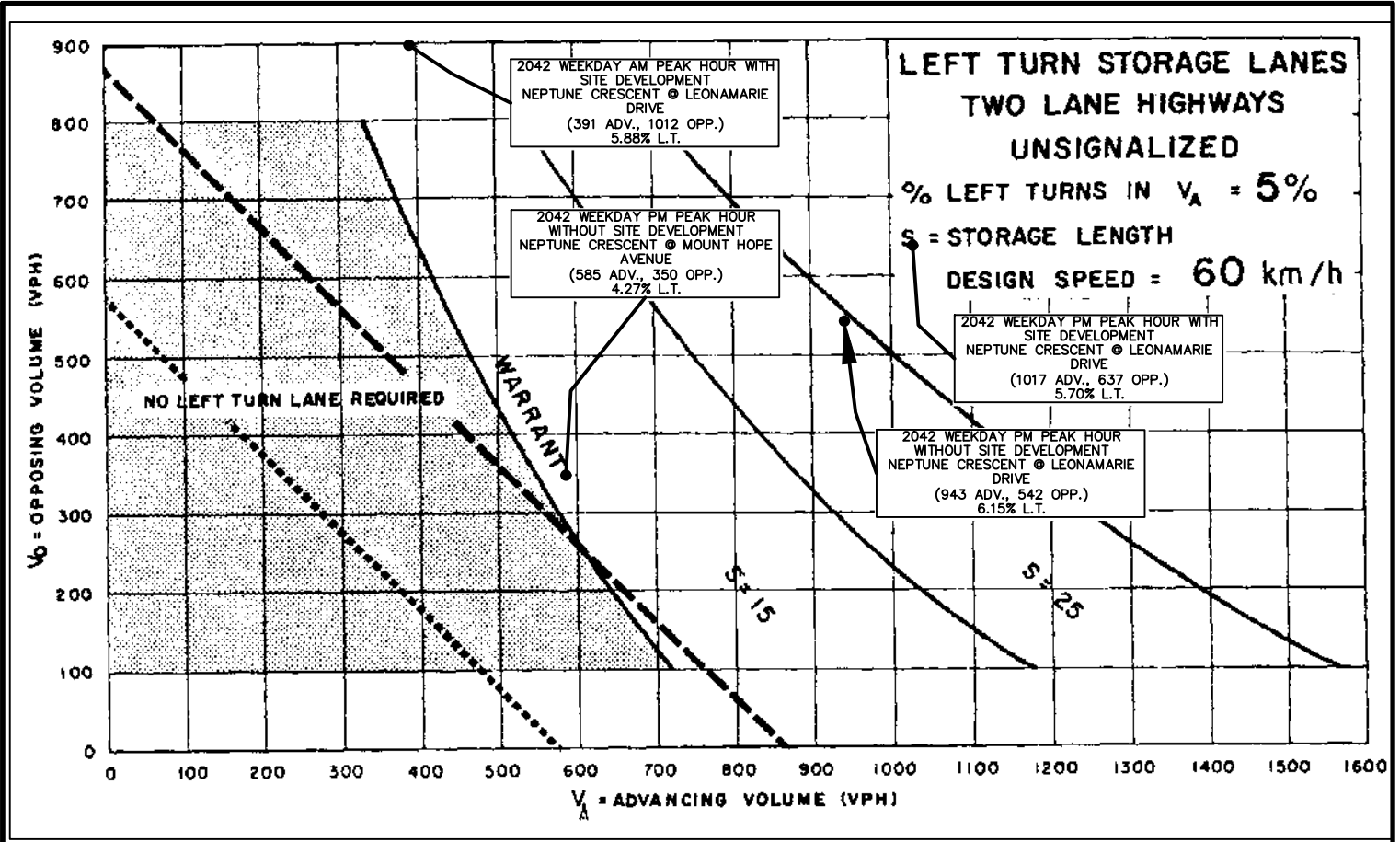
March 2024

APPENDIX

B

WARRANT ANALYSIS





Traffic Impact Study - Research Drive Development (Revised)
Dartmouth Lake, Nova Scotia

Figure B-1

Left Turn Lane Warrants
Projected 2042 with and without Site Volumes

February 2024

2042 WEEKDAY AM PEAK HOUR WITH
SITE DEVELOPMENT
NEPTUNE CRESCENT @ MOUNT HOPE
AVENUE
(194 ADV., 752 OPP.)
15.65% L.T.

2042 WEEKDAY AM PEAK HOUR WITH
SITE DEVELOPMENT
NEPTUNE CRESCENT @ RAGUS DRIVE
(177 ADV., 242 OPP.)
25.36% L.T.

2042 WEEKDAY PM PEAK HOUR
WITHOUT SITE DEVELOPMENT
NEPTUNE CRESCENT @ RAGUS DRIVE
(125 ADV., 115 OPP.)
24.00% L.T.



2042 WEEKDAY AM PEAK HOUR
WITHOUT SITE DEVELOPMENT
NEPTUNE CRESCENT @ RAGUS DRIVE
(155 ADV., 45 OPP.)
29.03% L.T.



Traffic Impact Study - Research Drive Development (Revised)
Dartmouth Lake, Nova Scotia

Figure B-3

Left Turn Lane Warrants
Projected 2042 with and without Site Volumes

February 2024

2005 Canadian Traffic Signal Warrant Matrix Analysis

Table: B-1 - Prince Arthur Avenue at Fenwick Street
2042 Future w Site

Main Street (name)	Prince Arthur Avenue	Direction (EW or NS)	NS	Date:	February 2024
Side Street (name)	Fenwick Street	Direction (EW or NS)	EW	City:	Dartmouth, NS

Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
	NB							
Prince Arthur Avenue	SB			1			185	0
Prince Arthur Avenue	WB				1			
Fenwick Street	EB		1					

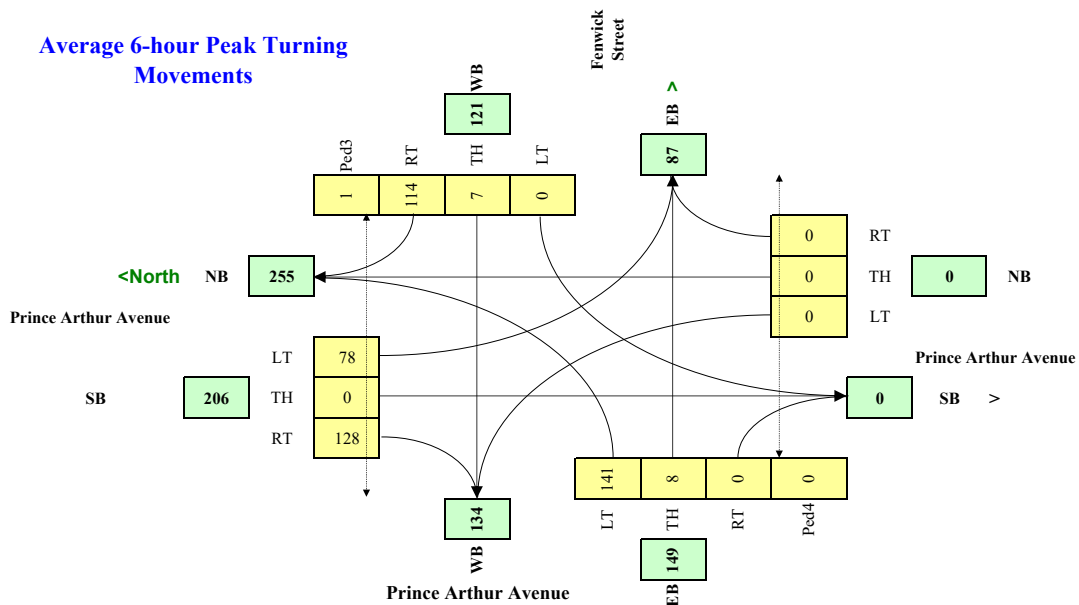
Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Prince Arthur Avenue	NS	50	2.0%	n	0.0
Fenwick Street	EW	50	2.0%	n	

	Ped1 NS W Side	Ped2 NS E Side	Ped3 EW N Side	Ped4 EW S side
7:00 - 8:00	2	2	0	
8:00 - 9:00	69	15	0	
11:30 - 12:30	10	6	1	
12:30 - 13:30	125	3	2	
15:30 - 16:30	6	0	2	
16:30 - 17:30	13	2	0	
Total (6-hour peak)	225	28	5	0
Average (6-hour peak)	38	5	1	0

Demographics		
Elementary School	(y/n)	y
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	y
Metro Area Population	(#)	400,000
Central Business District	(y/n)	n

Traffic Input	NB			SB			WB			EB		
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT
7:00 - 8:00	0	0	0	45	0	65	0	10	180	90	5	0
8:00 - 9:00	0	0	0	75	0	200	0	5	160	170	10	0
11:30 - 12:30	0	0	0	45	0	105	0	5	70	115	5	0
12:30 - 13:30	0	0	0	55	0	105	0	0	70	130	5	0
15:30 - 16:30	0	0	0	115	0	140	0	10	90	180	10	0
16:30 - 17:30	0	0	0	135	0	150	0	10	115	160	15	0
Total (6-hour peak)	0	0	0	470	0	765	0	40	685	845	50	0
Average (6-hour peak)	0	0	0	78	0	128	0	7	114	141	8	0

Average 6-hour Peak Turning Movements



$$W = [C_b(X_{v-v}) / K_1 + (F(X_{v-p})L) / K_2] \times C_i$$

W =	17	17	0
		Veh	Ped
NOT Warranted			

2005 Canadian Traffic Signal Warrant Matrix Analysis

Table: B-2 - Neptune Crescent at Ragus Drive
2042 Future w Site

Main Street (name)	Neptune Crescent		Direction (EW or NS)	NS	Date:	February 2024
Side Street (name)	Ragus Drive		Direction (EW or NS)	EW	City:	Dartmouth, NS

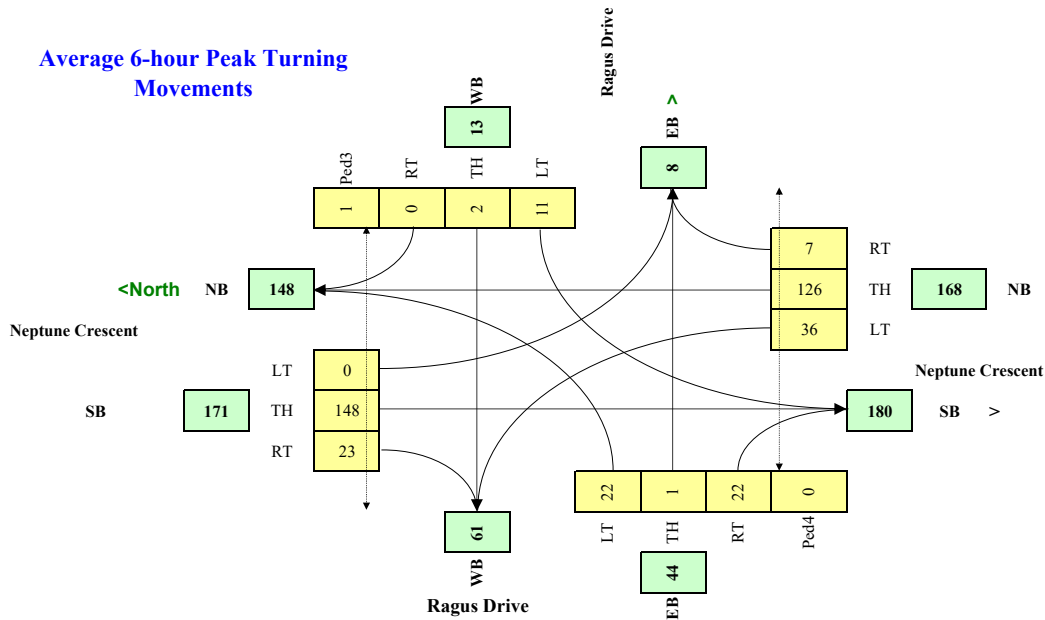
Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Neptune Crescent	NB			1			1,300	1
Neptune Crescent	SB			1			850	1
Ragus Drive	WB			1				
Ragus Drive	EB			1				

Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Neptune Crescent	NS	50	2.0%	n	0.0
Ragus Drive	EW	50	2.0%	n	

	Ped1	Ped2	Ped3	Ped4
	NS W Side	NS E Side	EW N Side	EW S side
7:00 - 8:00	1	1	1	1
8:00 - 9:00	3	0	0	1
11:30 - 12:30	0	0	0	0
12:30 - 13:30	1	2	1	0
15:30 - 16:30	1	1	2	0
16:30 - 17:30	0	1	1	0
Total (6-hour peak)	6	5	5	2
Average (6-hour peak)	1	1	1	0

Demographics	
Elementary School	(y/n) n
Senior's Complex	(y/n) n
Pathway to School	(y/n) n
Metro Area Population (#)	400,000
Central Business District	(y/n) n

Traffic Input	NB			SB			WB			EB		
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT
7:00 - 8:00	30	90	5	0	200	35	10	5	0	10	0	10
8:00 - 9:00	40	125	5	0	185	30	15	0	0	15	0	10
11:30 - 12:30	45	70	10	0	115	20	5	5	0	20	5	20
12:30 - 13:30	35	85	5	0	95	15	10	0	0	15	0	25
15:30 - 16:30	35	180	10	0	135	15	20	0	0	30	0	30
16:30 - 17:30	30	205	5	0	155	25	5	0	0	40	0	35
Total (6-hour peak)	215	755	40	0	885	140	65	10	0	130	5	130
Average (6-hour peak)	36	126	7	0	148	23	11	2	0	22	1	22



$$W = [C_{bt}(X_{v-v}) / K_1 + (F(X_{v-p}) L) / K_2] \times C_i$$

W =	11	10	1
		Veh	Ped
Not Warranted - Vs < 75			

2005 Canadian Traffic Signal Warrant Matrix Analysis

Table: B-3 - Mount Hope Avenue at Neptune Crescent
2042 Future w Site

Main Street (name)	Mount Hope Avenue	Direction (EW or NS)	EW	Date:	February 2024
Side Street (name)	Neptune Crescent	Direction (EW or NS)	NS	City:	Dartmouth, NS

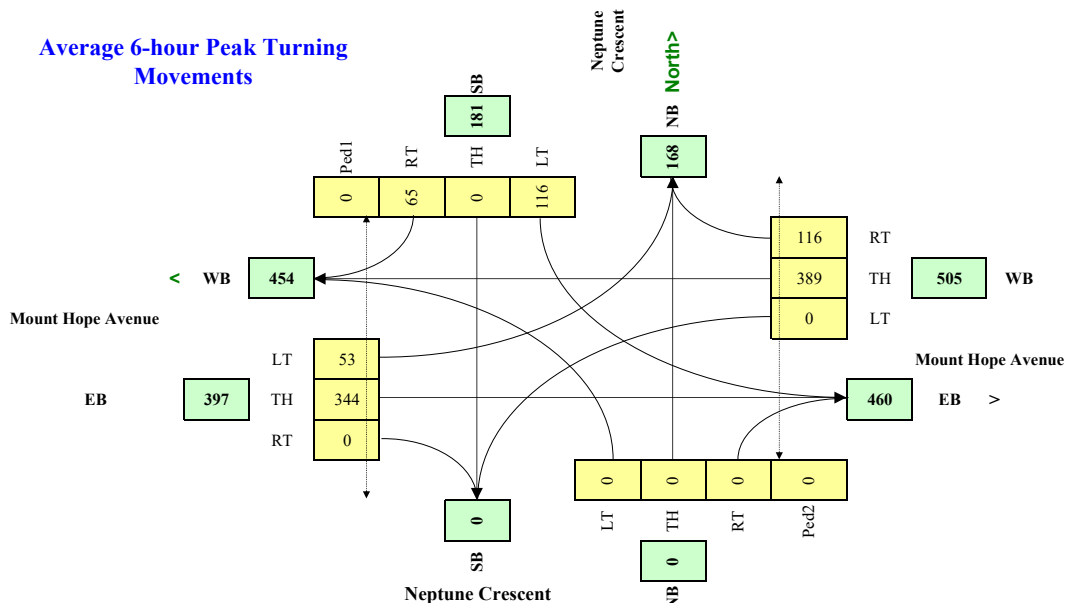
Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Mount Hope Avenue	EB		1				850	1
Mount Hope Avenue	WB				1		10,000	1
Neptune Crescent	NB							
Neptune Crescent	SB			1				

Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Mount Hope Avenue	EW	50	2.0%	n	0.0
Neptune Crescent	NS	50	2.0%	n	

	Ped1	Ped2	Ped3	Ped4
	NS W Side	NS E Side	EW N Side	EW S side
7:00 - 8:00	0	0	1	
8:00 - 9:00	1	0	2	
11:30 - 12:30	0	0	1	
12:30 - 13:30	0	1	1	
15:30 - 16:30	1	0	1	
16:30 - 17:30	0	1	0	
Total (6-hour peak)	2	2	6	0
Average (6-hour peak)	0	0	1	0

Demographics	
Elementary School	(y/n) n
Senior's Complex	(y/n) n
Pathway to School	(y/n) n
Metro Area Population	(#) 400,000
Central Business District	(y/n) n

Traffic Input	NB			SB			WB			EB		
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT
7:00 - 8:00	0	0	0	115	0	100	0	580	115	30	175	0
8:00 - 9:00	0	0	0	130	0	85	0	525	140	30	175	0
11:30 - 12:30	0	0	0	90	0	60	0	335	75	55	370	0
12:30 - 13:30	0	0	0	75	0	50	0	350	85	40	305	0
15:30 - 16:30	0	0	0	140	0	45	0	295	160	70	590	0
16:30 - 17:30	0	0	0	145	0	50	0	250	120	90	450	0
Total (6-hour peak)	0	0	0	695	0	390	0	2,335	695	315	2,065	0
Average (6-hour peak)	0	0	0	116	0	65	0	389	116	53	344	0



$$W = [C_{bt}(X_{v-v}) / K_1 + (F(X_{v-p})L) / K_2] \times C_i$$

W =	76	75	1
		Veh	Ped

NOT Warranted

APPENDIX

C

INTERSECTION PERFORMANCE ANALYSIS



Appendix C - Intersection Capacity Analysis
 1: Prince Arthur Avenue & Portland Street

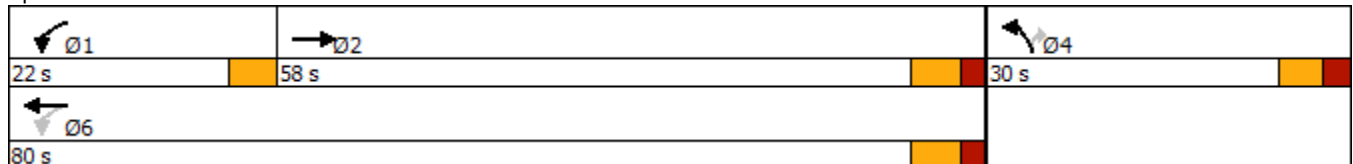
Lane Group						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	330	40	200	670	35	150
Future Volume (vph)	330	40	200	670	35	150
Satd. Flow (prot)	1837	0	1770	1863	1770	1583
Flt Permitted			0.326		0.950	
Satd. Flow (perm)	1837	0	607	1863	1770	1583
Satd. Flow (RTOR)	7					163
Lane Group Flow (vph)	402	0	217	728	38	163
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	4	
Permitted Phases			6			4
Total Split (s)	58.0		22.0	80.0	30.0	30.0
Total Lost Time (s)	6.2		4.0	6.2	6.0	6.0
Act Effct Green (s)	16.5		31.2	28.9	10.1	10.1
Actuated g/C Ratio	0.32		0.61	0.56	0.20	0.20
v/c Ratio	0.68		0.39	0.69	0.11	0.37
Control Delay	21.1		6.4	11.9	20.3	7.3
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	21.1		6.4	11.9	20.3	7.3
LOS	C		A	B	C	A
Approach Delay	21.1			10.7	9.8	
Approach LOS	C			B	A	
Queue Length 50th (m)	31.8		7.7	43.1	3.0	0.0
Queue Length 95th (m)	58.3		14.3	72.1	10.9	13.9
Internal Link Dist (m)	286.7			138.5	181.4	
Turn Bay Length (m)			45.0			30.0
Base Capacity (vph)	1772		780	1863	836	833
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.23		0.28	0.39	0.05	0.20

Intersection Summary










Cycle Length: 110
 Actuated Cycle Length: 51.4
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.69
 Intersection Signal Delay: 13.3
 Intersection Capacity Utilization 53.8%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service A

















Splits and Phases: 1: Prince Arthur Avenue & Portland Street














Appendix C - Intersection Capacity Analysis
 2: Fenwick Street & Prince Arthur Avenue

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	170	10	55	200	5	20
Future Volume (Veh/h)	170	10	55	200	5	20
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)	185	11	60	217	5	22
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				205		
pX, platoon unblocked						
vC, conflicting volume			196		528	190
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			196		528	190
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		99	97
cM capacity (veh/h)			1377		489	851
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	196	277	27			
Volume Left	0	60	5			
Volume Right	11	0	22			
cSH	1700	1377	749			
Volume to Capacity	0.12	0.04	0.04			
Queue Length 95th (m)	0.0	1.1	0.9			
Control Delay (s)	0.0	2.0	10.0			
Lane LOS		A	A			
Approach Delay (s)	0.0	2.0	10.0			
Approach LOS			A			
Intersection Summary						
Average Delay			1.6			
Intersection Capacity Utilization			36.5%		ICU Level of Service	A
Analysis Period (min)			15			













Appendix C - Intersection Capacity Analysis
 3: Neptune Crescent & Ragus Drive

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	0	10	10	0	0	45	105	5	0	35	10
Future Volume (Veh/h)	15	0	10	10	0	0	45	105	5	0	35	10
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)	16	0	11	11	0	0	49	114	5	0	38	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	258	260	44	269	264	116	49			119		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	258	260	44	269	264	116	49			119		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	99	98	100	100	97			100		
cM capacity (veh/h)	678	624	1027	660	622	936	1558			1469		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	27	11	168	49								
Volume Left	16	11	49	0								
Volume Right	11	0	5	11								
cSH	787	660	1558	1469								
Volume to Capacity	0.03	0.02	0.03	0.00								
Queue Length 95th (m)	0.9	0.4	0.8	0.0								
Control Delay (s)	9.7	10.5	2.3	0.0								
Lane LOS	A	B	A									
Approach Delay (s)	9.7	10.5	2.3	0.0								
Approach LOS	A	B										
Intersection Summary												
Average Delay			3.0									
Intersection Capacity Utilization			25.0%		ICU Level of Service				A			
Analysis Period (min)			15									

Appendix C - Intersection Capacity Analysis
 4: Mount Hope Avenue & Neptune Crescent

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	145	545	145	30	20
Future Volume (Veh/h)	20	145	545	145	30	20
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)	22	158	592	158	33	22
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	750				873	671
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	750				873	671
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				89	95
cM capacity (veh/h)	859				312	456
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2	
Volume Total	22	158	750	33	22	
Volume Left	22	0	0	33	0	
Volume Right	0	0	158	0	22	
cSH	859	1700	1700	312	456	
Volume to Capacity	0.03	0.09	0.44	0.11	0.05	
Queue Length 95th (m)	0.6	0.0	0.0	2.8	1.2	
Control Delay (s)	9.3	0.0	0.0	17.9	13.3	
Lane LOS	A			C	B	
Approach Delay (s)	1.1		0.0	16.0		
Approach LOS				C		
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			47.5%		ICU Level of Service	A
Analysis Period (min)			15			

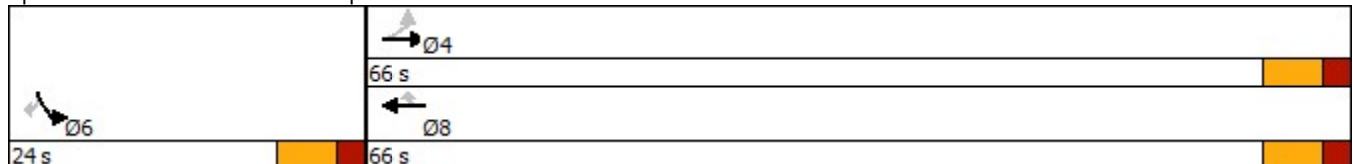
Appendix C - Intersection Capacity Analysis
 16: Mount Hope Avenue & Leonamarie Drive

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	23	260	880	70	186	62
Future Volume (vph)	23	260	880	70	186	62
Satd. Flow (prot)	1770	1863	1863	1583	1770	1583
Flt Permitted	0.135				0.950	
Satd. Flow (perm)	251	1863	1863	1583	1770	1583
Satd. Flow (RTOR)				45		67
Lane Group Flow (vph)	25	283	957	76	202	67
Turn Type	Perm	NA	NA	Perm	Prot	Perm
Protected Phases		4	8		6	
Permitted Phases	4			8		6
Total Split (s)	66.0	66.0	66.0	66.0	24.0	24.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effct Green (s)	39.0	39.0	39.0	39.0	12.8	12.8
Actuated g/C Ratio	0.60	0.60	0.60	0.60	0.20	0.20
v/c Ratio	0.17	0.25	0.85	0.08	0.58	0.18
Control Delay	8.6	6.5	19.2	2.9	34.4	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.6	6.5	19.2	2.9	34.4	9.4
LOS	A	A	B	A	C	A
Approach Delay		6.7	18.0		28.2	
Approach LOS		A	B		C	
Queue Length 50th (m)	1.2	13.9	82.0	1.3	22.6	0.0
Queue Length 95th (m)	5.1	28.2	161.0	6.0	56.2	10.7
Internal Link Dist (m)		59.1	93.5		127.5	
Turn Bay Length (m)	50.0			30.0	50.0	
Base Capacity (vph)	219	1629	1629	1390	532	523
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.17	0.59	0.05	0.38	0.13

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 64.9
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.85
 Intersection Signal Delay: 17.5
 Intersection Capacity Utilization 66.6%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service C

Splits and Phases: 16: Mount Hope Avenue & Leonamarie Drive



Appendix C - Intersection Capacity Analysis
 1: Prince Arthur Avenue & Portland Street

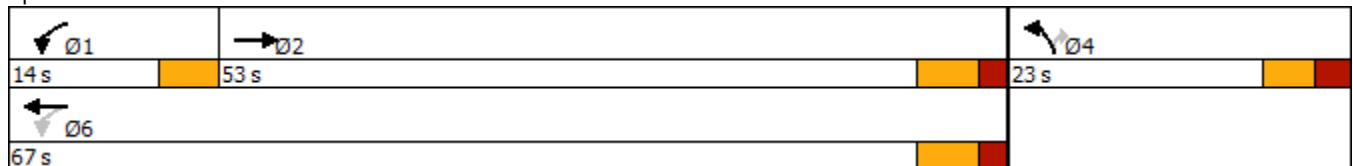
	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗		↖	↗	↖	↗
Traffic Volume (vph)	770	40	230	505	50	240
Future Volume (vph)	770	40	230	505	50	240
Satd. Flow (prot)	1850	0	1770	1863	1770	1583
Flt Permitted			0.093		0.950	
Satd. Flow (perm)	1850	0	173	1863	1770	1583
Satd. Flow (RTOR)	4					261
Lane Group Flow (vph)	880	0	250	549	54	261
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	4	
Permitted Phases			6			4
Total Split (s)	53.0		14.0	67.0	23.0	23.0
Total Lost Time (s)	6.2		4.0	6.2	6.0	6.0
Act Effct Green (s)	41.7		57.8	55.6	10.8	10.8
Actuated g/C Ratio	0.53		0.73	0.71	0.14	0.14
v/c Ratio	0.90		0.76	0.42	0.22	0.59
Control Delay	30.2		32.2	5.9	34.8	10.7
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	30.2		32.2	5.9	34.8	10.7
LOS	C		C	A	C	B
Approach Delay	30.2			14.1	14.8	
Approach LOS	C			B	B	
Queue Length 50th (m)	112.0		19.6	28.0	8.3	0.0
Queue Length 95th (m)	#212.2		#61.7	51.9	19.0	20.8
Internal Link Dist (m)	286.7			138.5	181.4	
Turn Bay Length (m)			45.0			30.0
Base Capacity (vph)	1112		331	1453	386	549
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.79		0.76	0.38	0.14	0.48

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 78.7
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.90
 Intersection Signal Delay: 21.3
 Intersection Capacity Utilization 77.5%
 Analysis Period (min) 15
 Intersection LOS: C
 ICU Level of Service D

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

















Splits and Phases: 1: Prince Arthur Avenue & Portland Street














Appendix C - Intersection Capacity Analysis
 2: Fenwick Street & Prince Arthur Avenue

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↘	
Traffic Volume (veh/h)	265	15	25	220	10	95
Future Volume (Veh/h)	265	15	25	220	10	95
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)	288	16	27	239	11	103
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				205		
pX, platoon unblocked						
vC, conflicting volume			304		589	296
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			304		589	296
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		98	86
cM capacity (veh/h)			1257		461	743
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	304	266	114			
Volume Left	0	27	11			
Volume Right	16	0	103			
cSH	1700	1257	702			
Volume to Capacity	0.18	0.02	0.16			
Queue Length 95th (m)	0.0	0.5	4.6			
Control Delay (s)	0.0	1.0	11.1			
Lane LOS		A	B			
Approach Delay (s)	0.0	1.0	11.1			
Approach LOS			B			
Intersection Summary						
Average Delay			2.2			
Intersection Capacity Utilization			44.2%		ICU Level of Service	A
Analysis Period (min)			15			

Appendix C - Intersection Capacity Analysis
3: Neptune Crescent & Ragus Drive

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	0	35	5	0	0	20	90	5	0	100	15
Future Volume (Veh/h)	20	0	35	5	0	0	20	90	5	0	100	15
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)	22	0	38	5	0	0	22	98	5	0	109	16
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	262	264	117	300	270	100	125			103		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	262	264	117	300	270	100	125			103		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	100	96	99	100	100	98			100		
cM capacity (veh/h)	683	632	935	619	627	955	1462			1489		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	60	5	125	125								
Volume Left	22	5	22	0								
Volume Right	38	0	5	16								
cSH	824	619	1462	1489								
Volume to Capacity	0.07	0.01	0.02	0.00								
Queue Length 95th (m)	1.9	0.2	0.4	0.0								
Control Delay (s)	9.7	10.9	1.4	0.0								
Lane LOS	A	B	A									
Approach Delay (s)	9.7	10.9	1.4	0.0								
Approach LOS	A	B										
Intersection Summary												
Average Delay			2.6									
Intersection Capacity Utilization			22.8%		ICU Level of Service				A			
Analysis Period (min)			15									

Appendix C - Intersection Capacity Analysis
4: Mount Hope Avenue & Neptune Crescent

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	25	560	255	95	120	20
Future Volume (Veh/h)	25	560	255	95	120	20
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	609	277	103	130	22
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	380				992	328
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	380				992	328
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				51	97
cM capacity (veh/h)	1178				266	713
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2	
Volume Total	27	609	380	130	22	
Volume Left	27	0	0	130	0	
Volume Right	0	0	103	0	22	
cSH	1178	1700	1700	266	713	
Volume to Capacity	0.02	0.36	0.22	0.49	0.03	
Queue Length 95th (m)	0.6	0.0	0.0	20.0	0.8	
Control Delay (s)	8.1	0.0	0.0	30.7	10.2	
Lane LOS	A			D	B	
Approach Delay (s)	0.3		0.0	27.8		
Approach LOS				D		
Intersection Summary						
Average Delay			3.8			
Intersection Capacity Utilization			42.8%		ICU Level of Service	A
Analysis Period (min)			15			

Appendix C - Intersection Capacity Analysis
 16: Mount Hope Avenue & Leonamarie Drive

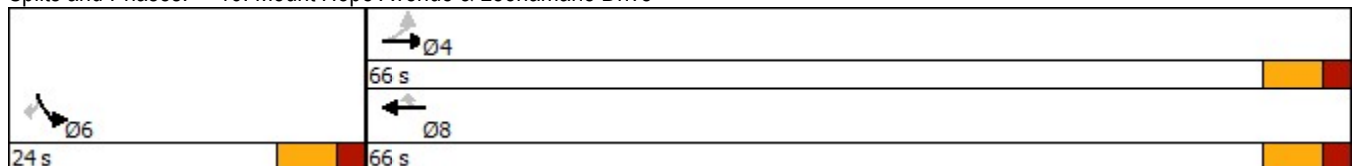
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	58	885	370	172	118	40
Future Volume (vph)	58	885	370	172	118	40
Satd. Flow (prot)	1770	1863	1863	1583	1770	1583
Flt Permitted	0.519				0.950	
Satd. Flow (perm)	967	1863	1863	1583	1770	1583
Satd. Flow (RTOR)				187		43
Lane Group Flow (vph)	63	962	402	187	128	43
Turn Type	Perm	NA	NA	Perm	Prot	Perm
Protected Phases		4	8		6	
Permitted Phases	4			8		6
Total Split (s)	66.0	66.0	66.0	66.0	24.0	24.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effct Green (s)	36.4	36.4	36.4	36.4	10.4	10.4
Actuated g/C Ratio	0.61	0.61	0.61	0.61	0.17	0.17
v/c Ratio	0.11	0.85	0.36	0.18	0.42	0.14
Control Delay	5.2	17.7	6.5	1.3	30.7	11.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.2	17.7	6.5	1.3	30.7	11.1
LOS	A	B	A	A	C	B
Approach Delay		16.9	4.9		25.8	
Approach LOS		B	A		C	
Queue Length 50th (m)	2.4	70.4	18.2	0.0	12.6	0.0
Queue Length 95th (m)	7.5	150.0	38.3	5.9	37.3	8.8
Internal Link Dist (m)		59.1	93.5		127.5	
Turn Bay Length (m)	50.0			30.0	50.0	
Base Capacity (vph)	878	1692	1692	1455	579	546
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.57	0.24	0.13	0.22	0.08












Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 59.9
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.85
 Intersection Signal Delay: 13.8
 Intersection Capacity Utilization 63.1%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service B

Splits and Phases: 16: Mount Hope Avenue & Leonamarie Drive



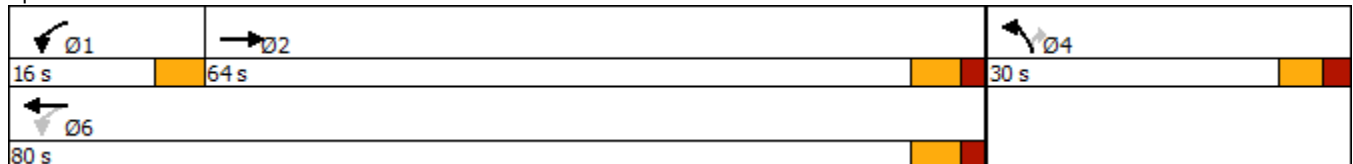
Lane Group						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	330	52	210	670	124	221
Future Volume (vph)	330	52	210	670	124	221
Satd. Flow (prot)	1829	0	1770	1863	1770	1583
Flt Permitted			0.313		0.950	
Satd. Flow (perm)	1829	0	583	1863	1770	1583
Satd. Flow (RTOR)	11					240
Lane Group Flow (vph)	416	0	228	728	135	240
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	4	
Permitted Phases			6			4
Total Split (s)	64.0		16.0	80.0	30.0	30.0
Total Lost Time (s)	6.2		4.0	6.2	6.0	6.0
Act Effect Green (s)	17.9		33.3	31.1	11.1	11.1
Actuated g/C Ratio	0.33		0.61	0.57	0.20	0.20
v/c Ratio	0.69		0.41	0.69	0.38	0.47
Control Delay	22.2		7.0	12.2	24.6	7.2
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	22.2		7.0	12.2	24.6	7.2
LOS	C		A	B	C	A
Approach Delay	22.2			11.0	13.5	
Approach LOS	C			B	B	
Queue Length 50th (m)	33.7		8.1	43.1	11.9	0.0
Queue Length 95th (m)	69.0		18.5	85.8	31.2	17.0
Internal Link Dist (m)	286.7			138.5	181.4	
Turn Bay Length (m)			45.0			30.0
Base Capacity (vph)	1764		622	1863	795	843
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.24		0.37	0.39	0.17	0.28

Intersection Summary










Cycle Length: 110
 Actuated Cycle Length: 54.7
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.69
 Intersection Signal Delay: 14.2
 Intersection Capacity Utilization 54.0%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service A

















Splits and Phases: 1: Prince Arthur Avenue & Portland Street














Appendix C - Intersection Capacity Analysis
2: Fenwick Street & Prince Arthur Avenue

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	170	10	77	200	5	180
Future Volume (Veh/h)	170	10	77	200	5	180
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)	185	11	84	217	5	196
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				205		
pX, platoon unblocked						
vC, conflicting volume			196		576	190
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			196		576	190
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		99	77
cM capacity (veh/h)			1377		450	851
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	196	301	201			
Volume Left	0	84	5			
Volume Right	11	0	196			
cSH	1700	1377	833			
Volume to Capacity	0.12	0.06	0.24			
Queue Length 95th (m)	0.0	1.6	7.5			
Control Delay (s)	0.0	2.6	10.7			
Lane LOS		A	B			
Approach Delay (s)	0.0	2.6	10.7			
Approach LOS			B			
Intersection Summary						
Average Delay			4.2			
Intersection Capacity Utilization			45.8%		ICU Level of Service	A
Analysis Period (min)			15			

Appendix C - Intersection Capacity Analysis
 3: Neptune Crescent & Ragus Drive

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	19	0	10	10	0	0	45	127	5	0	204	38
Future Volume (Veh/h)	19	0	10	10	0	0	45	127	5	0	204	38
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)	21	0	11	11	0	0	49	138	5	0	222	41
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	481	484	242	492	502	140	263			143		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	481	484	242	492	502	140	263			143		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	100	99	98	100	100	96			100		
cM capacity (veh/h)	481	465	796	467	454	907	1301			1440		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	32	11	192	263								
Volume Left	21	11	49	0								
Volume Right	11	0	5	41								
cSH	557	467	1301	1440								
Volume to Capacity	0.06	0.02	0.04	0.00								
Queue Length 95th (m)	1.5	0.6	0.9	0.0								
Control Delay (s)	11.9	12.9	2.3	0.0								
Lane LOS	B	B	A									
Approach Delay (s)	11.9	12.9	2.3	0.0								
Approach LOS	B	B										
Intersection Summary												
Average Delay			1.9									
Intersection Capacity Utilization			35.9%		ICU Level of Service				A			
Analysis Period (min)			15									

Appendix C - Intersection Capacity Analysis
 4: Mount Hope Avenue & Neptune Crescent

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	30	164	595	157	119	100
Future Volume (Veh/h)	30	164	595	157	119	100
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)	33	178	647	171	129	109
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	818				976	732
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	818				976	732
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				52	74
cM capacity (veh/h)	810				267	421
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2	
Volume Total	33	178	818	129	109	
Volume Left	33	0	0	129	0	
Volume Right	0	0	171	0	109	
cSH	810	1700	1700	267	421	
Volume to Capacity	0.04	0.10	0.48	0.48	0.26	
Queue Length 95th (m)	1.0	0.0	0.0	19.6	8.2	
Control Delay (s)	9.6	0.0	0.0	30.5	16.5	
Lane LOS	A			D	C	
Approach Delay (s)	1.5		0.0	24.1		
Approach LOS				C		
Intersection Summary						
Average Delay			4.8			
Intersection Capacity Utilization			54.1%		ICU Level of Service	A
Analysis Period (min)			15			

Appendix C - Intersection Capacity Analysis
 16: Mount Hope Avenue & Leonamarie Drive

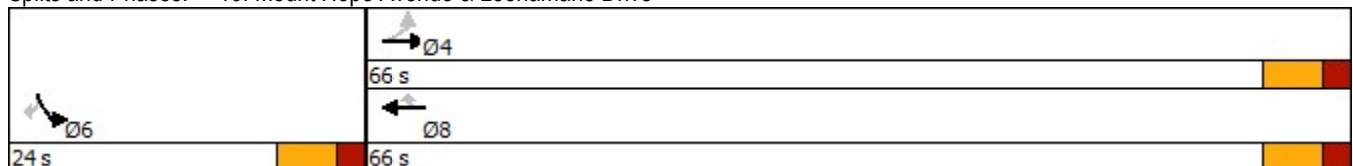
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	23	368	942	70	186	62
Future Volume (vph)	23	368	942	70	186	62
Satd. Flow (prot)	1770	1863	1863	1583	1770	1583
Flt Permitted	0.110				0.950	
Satd. Flow (perm)	205	1863	1863	1583	1770	1583
Satd. Flow (RTOR)				48		67
Lane Group Flow (vph)	25	400	1024	76	202	67
Turn Type	Perm	NA	NA	Perm	Prot	Perm
Protected Phases		4	8		6	
Permitted Phases	4			8		6
Total Split (s)	66.0	66.0	66.0	66.0	24.0	24.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effct Green (s)	43.7	43.7	43.7	43.7	13.3	13.3
Actuated g/C Ratio	0.62	0.62	0.62	0.62	0.19	0.19
v/c Ratio	0.20	0.34	0.88	0.08	0.60	0.19
Control Delay	10.0	7.1	21.3	2.7	37.3	9.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.0	7.1	21.3	2.7	37.3	9.6
LOS	A	A	C	A	D	A
Approach Delay		7.2	20.0		30.4	
Approach LOS		A	B		C	
Queue Length 50th (m)	1.3	22.1	98.9	1.3	25.6	0.0
Queue Length 95th (m)	5.6	41.3	189.3	5.8	56.2	10.7
Internal Link Dist (m)		59.1	93.5		127.5	
Turn Bay Length (m)	50.0			35.0	50.0	
Base Capacity (vph)	172	1564	1564	1337	490	487
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.26	0.65	0.06	0.41	0.14

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 70
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.88
 Intersection Signal Delay: 18.5
 Intersection Capacity Utilization 69.9%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service C

Splits and Phases: 16: Mount Hope Avenue & Leonamarie Drive



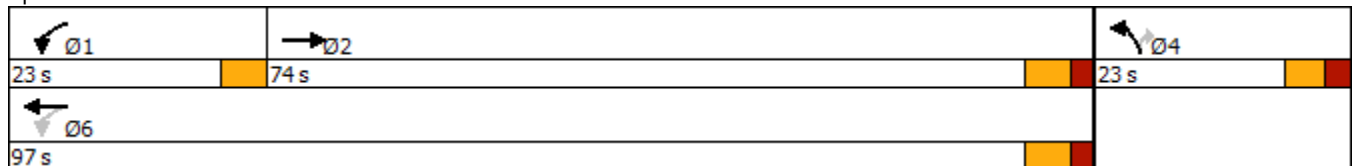
Lane Group						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	770	103	280	505	78	262
Future Volume (vph)	770	103	280	505	78	262
Satd. Flow (prot)	1833	0	1770	1863	1770	1583
Flt Permitted			0.071		0.950	
Satd. Flow (perm)	1833	0	132	1863	1770	1583
Satd. Flow (RTOR)	9					285
Lane Group Flow (vph)	949	0	304	549	85	285
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	4	
Permitted Phases			6			4
Total Split (s)	74.0		23.0	97.0	23.0	23.0
Total Lost Time (s)	6.2		4.0	6.2	6.0	6.0
Act Effct Green (s)	57.7		80.9	78.6	12.0	12.0
Actuated g/C Ratio	0.56		0.78	0.76	0.12	0.12
v/c Ratio	0.92		0.82	0.39	0.41	0.66
Control Delay	36.0		45.6	5.0	53.1	13.4
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	36.0		45.6	5.0	53.1	13.4
LOS	D		D	A	D	B
Approach Delay	36.0			19.4	22.5	
Approach LOS	D			B	C	
Queue Length 50th (m)	173.2		44.8	29.5	18.6	0.0
Queue Length 95th (m)	#297.0		#98.4	53.7	35.6	26.2
Internal Link Dist (m)	286.7			138.5	181.4	
Turn Bay Length (m)			45.0			30.0
Base Capacity (vph)	1242		414	1612	300	505
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.76		0.73	0.34	0.28	0.56

Intersection Summary










Cycle Length: 120
 Actuated Cycle Length: 103.1
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.92
 Intersection Signal Delay: 27.2
 Intersection Capacity Utilization 84.1%
 Analysis Period (min) 15
 Intersection LOS: C
 ICU Level of Service E

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

















Splits and Phases: 1: Prince Arthur Avenue & Portland Street














Appendix C - Intersection Capacity Analysis
 2: Fenwick Street & Prince Arthur Avenue

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	265	15	138	220	10	145
Future Volume (Veh/h)	265	15	138	220	10	145
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)	288	16	150	239	11	158
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				205		
pX, platoon unblocked						
vC, conflicting volume			304		835	296
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			304		835	296
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			88		96	79
cM capacity (veh/h)			1257		297	743
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	304	389	169			
Volume Left	0	150	11			
Volume Right	16	0	158			
cSH	1700	1257	677			
Volume to Capacity	0.18	0.12	0.25			
Queue Length 95th (m)	0.0	3.2	7.9			
Control Delay (s)	0.0	3.9	12.1			
Lane LOS		A	B			
Approach Delay (s)	0.0	3.9	12.1			
Approach LOS			B			
Intersection Summary						
Average Delay			4.1			
Intersection Capacity Utilization			53.6%		ICU Level of Service	A
Analysis Period (min)			15			

Appendix C - Intersection Capacity Analysis
 3: Neptune Crescent & Ragus Drive

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	0	35	5	0	0	30	290	5	0	153	24
Future Volume (Veh/h)	40	0	35	5	0	0	30	290	5	0	153	24
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	38	5	0	0	33	315	5	0	166	26
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	562	565	179	600	576	318	192			320		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	562	565	179	600	576	318	192			320		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	90	100	96	99	100	100	98			100		
cM capacity (veh/h)	429	424	864	387	418	723	1381			1240		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	81	5	353	192								
Volume Left	43	5	33	0								
Volume Right	38	0	5	26								
cSH	562	387	1381	1240								
Volume to Capacity	0.14	0.01	0.02	0.00								
Queue Length 95th (m)	4.0	0.3	0.6	0.0								
Control Delay (s)	12.5	14.4	0.9	0.0								
Lane LOS	B	B	A									
Approach Delay (s)	12.5	14.4	0.9	0.0								
Approach LOS	B	B										
Intersection Summary												
Average Delay			2.2									
Intersection Capacity Utilization			40.6%		ICU Level of Service				A			
Analysis Period (min)			15									

Appendix C - Intersection Capacity Analysis
4: Mount Hope Avenue & Neptune Crescent

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	81	606	287	158	148	45
Future Volume (Veh/h)	81	606	287	158	148	45
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)	88	659	312	172	161	49
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	484				1233	398
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	484				1233	398
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				10	92
cM capacity (veh/h)	1079				179	652
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2	
Volume Total	88	659	484	161	49	
Volume Left	88	0	0	161	0	
Volume Right	0	0	172	0	49	
cSH	1079	1700	1700	179	652	
Volume to Capacity	0.08	0.39	0.28	0.90	0.08	
Queue Length 95th (m)	2.1	0.0	0.0	53.6	1.9	
Control Delay (s)	8.6	0.0	0.0	94.9	11.0	
Lane LOS	A			F	B	
Approach Delay (s)	1.0		0.0	75.4		
Approach LOS				F		
Intersection Summary						
Average Delay			11.5			
Intersection Capacity Utilization			47.4%		ICU Level of Service	A
Analysis Period (min)			15			

Appendix C - Intersection Capacity Analysis
 16: Mount Hope Avenue & Leonamarie Drive

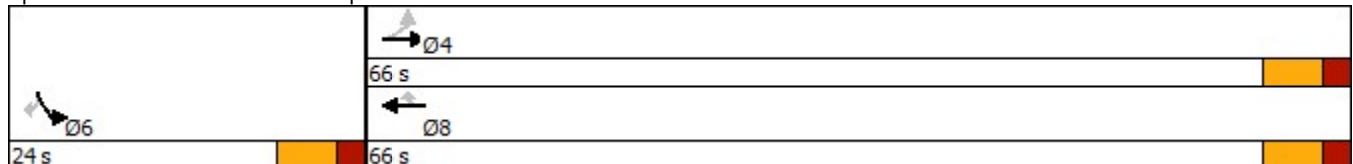
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	58	959	465	172	118	40
Future Volume (vph)	58	959	465	172	118	40
Satd. Flow (prot)	1770	1863	1863	1583	1770	1583
Flt Permitted	0.445				0.950	
Satd. Flow (perm)	829	1863	1863	1583	1770	1583
Satd. Flow (RTOR)				187		43
Lane Group Flow (vph)	63	1042	505	187	128	43
Turn Type	Perm	NA	NA	Perm	Prot	Perm
Protected Phases		4	8		6	
Permitted Phases	4			8		6
Total Split (s)	66.0	66.0	66.0	66.0	24.0	24.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	41.8	41.8	41.8	41.8	10.8	10.8
Actuated g/C Ratio	0.64	0.64	0.64	0.64	0.16	0.16
v/c Ratio	0.12	0.88	0.42	0.17	0.44	0.15
Control Delay	5.2	19.5	6.9	1.2	33.8	11.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.2	19.5	6.9	1.2	33.8	11.4
LOS	A	B	A	A	C	B
Approach Delay		18.7	5.4		28.2	
Approach LOS		B	A		C	
Queue Length 50th (m)	2.5	87.0	25.4	0.0	14.7	0.0
Queue Length 95th (m)	7.7	183.4	50.9	5.9	37.3	8.8
Internal Link Dist (m)		59.1	93.5		127.5	
Turn Bay Length (m)	50.0			35.0	50.0	
Base Capacity (vph)	723	1625	1625	1404	523	498
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.64	0.31	0.13	0.24	0.09

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 65.5
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.88
 Intersection Signal Delay: 14.8
 Intersection Capacity Utilization 67.0%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service C

Splits and Phases: 16: Mount Hope Avenue & Leonamarie Drive



Summary of All Intervals

Run Number	1	2	3	4	5	6	7
Start Time	4:20	4:20	4:20	4:20	4:20	4:20	4:20
End Time	5:30	5:30	5:30	5:30	5:30	5:30	5:30
Total Time (min)	70	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4	4
Vehs Entered	4107	4216	4380	4080	4174	4096	4175
Vehs Exited	4114	4229	4368	4107	4151	4113	4174
Starting Vehs	67	71	76	94	64	73	75
Ending Vehs	60	58	88	67	87	56	76
Travel Distance (km)	2188	2281	2356	2205	2238	2185	2238
Travel Time (hr)	71.6	78.6	82.5	78.6	74.2	72.4	79.7
Total Delay (hr)	24.8	29.9	32.0	31.2	26.3	25.6	31.7
Total Stops	2491	2651	2833	2776	2588	2518	2705
Fuel Used (l)	204.5	215.0	224.0	213.7	209.6	205.7	214.5

Summary of All Intervals

Run Number	8	9	10	Avg
Start Time	4:20	4:20	4:20	4:20
End Time	5:30	5:30	5:30	5:30
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	5	5	5	5
# of Recorded Intervals	4	4	4	4
Vehs Entered	4151	4242	4152	4177
Vehs Exited	4167	4269	4119	4182
Starting Vehs	90	88	61	75
Ending Vehs	74	61	94	69
Travel Distance (km)	2221	2271	2234	2241
Travel Time (hr)	79.6	79.6	72.6	76.9
Total Delay (hr)	32.1	31.0	24.9	29.0
Total Stops	2726	2756	2502	2655
Fuel Used (l)	214.0	218.4	209.7	212.9

Interval #0 Information Seeding

Start Time 4:20
 End Time 4:30
 Total Time (min) 10

Volumes adjusted by Growth Factors.
 No data recorded this interval.

Interval #1 Information

Start Time 4:30
 End Time 4:45
 Total Time (min) 15
 Volumes adjusted by Growth Factors, Anti PHF.

Run Number	1	2	3	4	5	6	7
Vehs Entered	1003	1066	1019	938	1012	978	1046
Vehs Exited	1015	1049	1018	968	1018	981	1042
Starting Vehs	67	71	76	94	64	73	75
Ending Vehs	55	88	77	64	58	70	79
Travel Distance (km)	545	574	543	512	553	515	567
Travel Time (hr)	17.9	19.1	19.3	18.1	17.9	17.9	19.1
Total Delay (hr)	6.1	6.9	7.7	7.1	6.1	6.8	7.0
Total Stops	623	631	675	681	615	652	668
Fuel Used (l)	51.3	53.5	52.3	49.8	51.5	49.7	52.8

Interval #1 Information

Start Time 4:30
 End Time 4:45
 Total Time (min) 15
 Volumes adjusted by Growth Factors, Anti PHF.

Run Number	8	9	10	Avg
Vehs Entered	1020	1033	1021	1012
Vehs Exited	1031	1051	1012	1018
Starting Vehs	90	88	61	75
Ending Vehs	79	70	70	70
Travel Distance (km)	552	556	548	546
Travel Time (hr)	23.3	19.4	17.4	18.9
Total Delay (hr)	11.5	7.5	5.7	7.2
Total Stops	795	674	568	660
Fuel Used (l)	57.1	53.5	50.7	52.2

Interval #2 Information

Start Time 4:45
 End Time 5:00
 Total Time (min) 15
 Volumes adjusted by PHF, Growth Factors.

Run Number	1	2	3	4	5	6	7
Vehs Entered	1111	1173	1185	1158	1109	1118	1151
Vehs Exited	1081	1167	1177	1121	1080	1123	1110
Starting Vehs	55	88	77	64	58	70	79
Ending Vehs	85	94	85	101	87	65	120
Travel Distance (km)	583	627	637	610	581	598	601
Travel Time (hr)	19.2	24.6	22.4	25.4	19.1	21.2	23.6
Total Delay (hr)	6.7	11.2	8.7	12.2	6.7	8.5	10.6
Total Stops	666	841	753	911	648	723	818
Fuel Used (l)	54.2	61.3	60.4	62.4	54.4	58.0	59.8

Interval #2 Information

Start Time 4:45
 End Time 5:00
 Total Time (min) 15
 Volumes adjusted by PHF, Growth Factors.

Run Number	8	9	10	Avg
Vehs Entered	1131	1170	1091	1140
Vehs Exited	1130	1147	1076	1122
Starting Vehs	79	70	70	70
Ending Vehs	80	93	85	86
Travel Distance (km)	601	612	581	603
Travel Time (hr)	22.0	22.3	20.2	22.0
Total Delay (hr)	9.1	9.2	7.8	9.1
Total Stops	739	769	708	756
Fuel Used (l)	58.2	59.5	56.2	58.4

Interval #3 Information

Start Time 5:00
 End Time 5:15
 Total Time (min) 15
 Volumes adjusted by Growth Factors, Anti PHF.

Run Number	1	2	3	4	5	6	7
Vehs Entered	1036	1015	1076	992	1068	998	983
Vehs Exited	1032	1038	1080	1027	1089	1004	1029
Starting Vehs	85	94	85	101	87	65	120
Ending Vehs	89	71	81	66	66	59	74
Travel Distance (km)	547	555	580	553	580	534	534
Travel Time (hr)	17.6	18.6	18.8	18.6	20.3	16.2	20.7
Total Delay (hr)	5.9	6.7	6.4	6.8	7.9	4.7	9.3
Total Stops	634	622	650	625	710	545	657
Fuel Used (l)	50.5	51.8	54.0	52.5	55.3	48.5	52.9

Interval #3 Information

Start Time 5:00
 End Time 5:15
 Total Time (min) 15
 Volumes adjusted by Growth Factors, Anti PHF.

Run Number	8	9	10	Avg
Vehs Entered	1032	1002	1003	1020
Vehs Exited	1042	1031	1016	1039
Starting Vehs	80	93	85	86
Ending Vehs	70	64	72	71
Travel Distance (km)	554	542	551	553
Travel Time (hr)	18.1	19.6	17.5	18.6
Total Delay (hr)	6.3	8.0	5.7	6.8
Total Stops	640	667	609	633
Fuel Used (l)	51.7	52.9	51.7	52.2

Interval #4 Information Recording

Start Time 5:15
 End Time 5:30
 Total Time (min) 15
 Volumes adjusted by Growth Factors, Anti PHF.

Run Number	1	2	3	4	5	6	7
Vehs Entered	957	962	1100	992	985	1002	995
Vehs Exited	986	975	1093	991	964	1005	993
Starting Vehs	89	71	81	66	66	59	74
Ending Vehs	60	58	88	67	87	56	76
Travel Distance (km)	512	524	596	530	523	538	536
Travel Time (hr)	16.9	16.3	22.0	16.5	16.8	17.1	16.3
Total Delay (hr)	6.0	5.1	9.2	5.1	5.6	5.6	4.9
Total Stops	568	557	755	559	615	598	562
Fuel Used (l)	48.5	48.4	57.3	48.9	48.5	49.5	48.9

Interval #4 Information Recording

Start Time 5:15
 End Time 5:30
 Total Time (min) 15
 Volumes adjusted by Growth Factors, Anti PHF.

Run Number	8	9	10	Avg
Vehs Entered	968	1037	1037	1002
Vehs Exited	964	1040	1015	1002
Starting Vehs	70	64	72	71
Ending Vehs	74	61	94	69
Travel Distance (km)	514	561	554	539
Travel Time (hr)	16.3	18.3	17.5	17.4
Total Delay (hr)	5.2	6.2	5.7	5.9
Total Stops	552	646	617	601
Fuel Used (l)	47.1	52.5	51.1	50.1

4: Mount Hope Avenue & Neptune Crescent Performance by movement

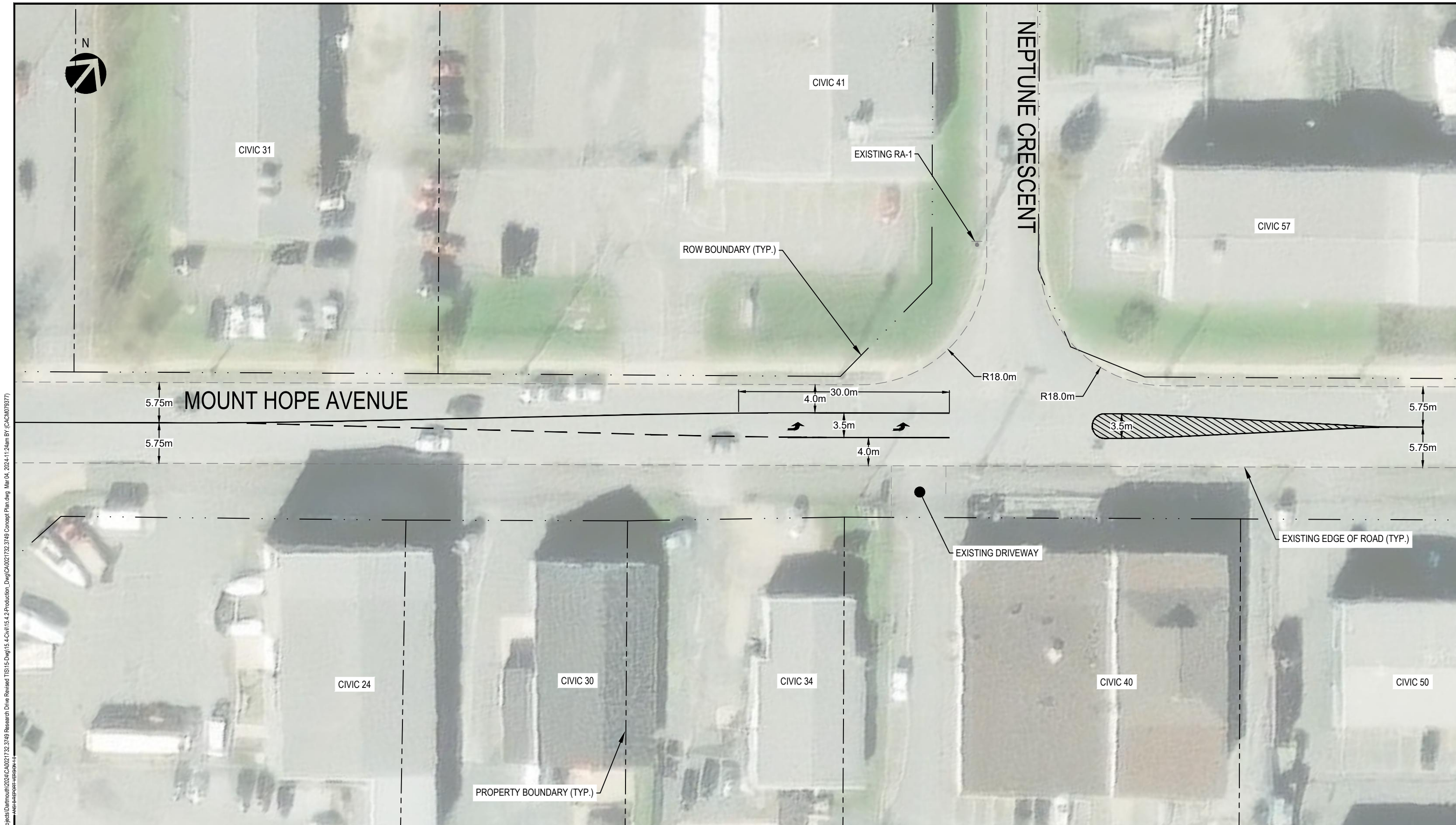
Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Stop Del/Veh (s)	2.7	0.0	0.0	0.0	24.9	6.3	3.0

APPENDIX

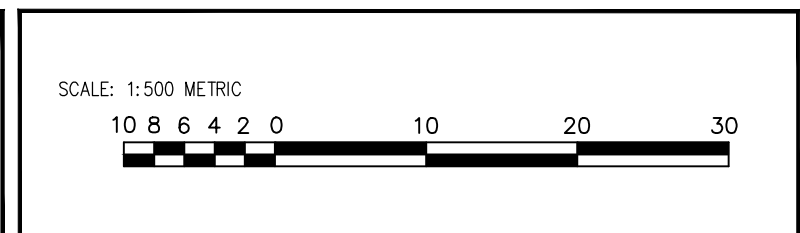
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LEFT TURN LANE CONCEPT PLAN





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PROJECT NO: CA0021732.3749

SCALE:	1:500
DATE:	2024-03-04
DESIGNED BY:	P. HATTON
DRAWN BY:	C. MACPHERSON

PROJECT:		RESEARCH DRIVE TIS
TITLE:		MOUNT HOPE AVE. LEFT TURN CONCEPT
DRAWING:		00