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39 Years

Proposed Residential Development

3317 Navan Road, Ottawa

Transportation Impact Assessment

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Proposed Residential Development
3317 Navan Road

Transportation Impact Assessment

Prepared By:

NOVATECH
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario
K2M 1P6

Dated: June 2023
Revised: November 2023

Novatech File: 118076
Ref: R-2023-011

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November 15, 2023

City of Ottawa
Planning, Real Estate, and Economic Development Department
110 Laurier Ave. W., 4th Floor,
Ottawa, Ontario K1P 1J1

Attention: **Ms. Neeti Paudel**
Project Manager, Infrastructure Approvals

Dear Ms. Paudel:

Reference: **3317 Navan Road**
Revised Transportation Impact Assessment
Novatech File No. 118076

We are pleased to submit the following revised Transportation Impact Assessment (TIA), in support of Zoning By-Law Amendment and Site Plan Control applications at 3317 Navan Road, for your review and signoff. The structure and format of this report is in accordance with the City of Ottawa's *Transportation Impact Assessment Guidelines* (June 2017).

The original TIA prepared in support of this development was submitted on June 5, 2023. This revised TIA includes an updated Site Plan, and addresses City comments.

If you have any questions or comments regarding this report, please feel free to contact Jennifer Luong, or the undersigned.

Yours truly,

NOVATECH

Joshua Audia, P.Eng.
Project Engineer | Transportation

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

Certification Form for Transportation Impact Assessment (TIA) Study Program Manager

TIA Plan Reports

On April 14, 2022, the Province's Bill 109 received Royal Assent providing legislative direction to implement the More Homes for Everyone Act, 2022 aiming to increase the supply of a range of housing options to make housing more affordable. Revisions have been made to the TIA guidelines to comply with Bill 109 and streamline the process for applicants and staff.

Individuals submitting TIA reports will be responsible for all aspects of development-related transportation assessment and reporting, and undertaking such work, in accordance and compliance with the City of Ottawa's Official Plan, the Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines.

By submitting the attached TIA report (and any associated documents) and signing this document, the individual acknowledges that they meet the four criteria listed below.

Certification

- ☑ I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines (Update Effective July 2023);
- ☑ I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;
- ☑ I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and

City of Ottawa
Transportation Engineering Services
Planning, Real Estate and Economic Development
110 Laurier Avenue West, 4th fl.
Ottawa, ON K1P 1J1
Tel. : 613-580-2424
Fax: 613-560-6006

☑ I am either a licensed or registered[1] professional in good standing, whose field of expertise [check ✓ appropriate field(s)]:

- ☑ is either transportation engineering
- ☐ or transportation planning.

Dated at Ottawa (City) this 15 day of November, 2023.

Name: Jennifer Luong, P.Eng.

Professional Title: Senior Project Manager

Signature of Individual certifier that they meet the above four criteria

Office Contact Information (Please Print)	
Address:	240 Michael Cowpland Drive, Suite 200
City / Postal Code:	Ottawa, ON K2M 1P6
Telephone / Extension:	613-254-9643 x 254
E-Mail Address:	j.luong@novatech-eng.com

Stamp

[1] License of registration body that oversees the profession is required to have a code of conduct and ethics guidelines that will ensure appropriate conduct and representation for transportation planning and/or transportation engineering works.

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EXECUTIVE SUMMARY

This Transportation Impact Assessment (TIA) has been prepared in support of Zoning By-Law Amendment and Site Plan Control applications for the property located at 3317 Navan Road. The subject site is approximately 1.57 hectares in size, and is currently vacant.

The subject site is surrounded by the following:

- Residences and Glenlivet Avenue/Birkhill Place to the north,
- Navan Road, followed by residences and a waste disposal site to the south,
- The planned Eastboro subdivision and Esselmont Street to the east, and
- Residences and followed by Navan Road to the west.

The proposed development consists of three low-rise apartment buildings, with a total of 164 apartment dwellings. A total of 230 parking spaces will be provided on-site, consisting of 146 underground parking spaces and 84 at-grade parking spaces. Access to the development will be provided at the terminus of Esselmont Street. The development will be constructed in a single phase, with a buildout year of 2025.

The subject site is designated as 'Neighbourhood' on Schedule B8 of the City of Ottawa's Official Plan. The implemented zoning for the property is 'Development Reserve' (DR), and therefore a rezoning is required to permit the proposed use. The subject site is located within the East Urban Community Design Plan (CDP) area.

The study area for this report includes the boundary roadway Navan Road, as well as the following intersections:

- Navan Road/Renaud Road
- Navan Road/Markinch Road
- Renaud Road/Markinch Road/Compass Street

The selected time periods for the analysis are the weekday AM and PM peak hours, as they represent the 'worst case' combination of site generated traffic and adjacent street traffic. Analysis will be completed for the buildout year 2025 and horizon year 2030.

The conclusions and recommendations of this TIA can be summarized as follows:

Forecasting

- The proposed development is estimated to generate 66 person trips (including 35 vehicle trips) during the AM peak hour, and 67 person trips (including 36 vehicle trips) during the PM peak hour.

Development Design and Parking

- Pedestrian walkways will be provided at the perimeter of each apartment building, and one walkway will connect to the north side of Esselmont Street. Private amenity space will be provided at the western edge of the subject site, with a walkway connection to Navan Road.

- OC Transpo's service design guideline for peak period service is to provide transit service within a five-minute (400m) walk of home, work, or school for 95% of urban residents. Main entrances to the proposed building are within 400m walking distance of stop #2252. The subject site is within 600m walking distance of transit stops along Renaud Road.

- It is anticipated that all Transportation Demand Management (TDM) supportive design and infrastructure measures in the TDM checklist will be met.

- A staging area for garbage collection is proposed at the entrance of the development, on the south side of the proposed access to Esselmont Street. The parking areas will accommodate move-in/move-out and delivery trucks, as there are no designated loading spaces on-site.

- The proposed on-site fire route includes the driveway to Esselmont Street, the drive aisle between Building A and B, and the drive aisle in front of Building C.

- Para Transpo vehicles will drive into each aisle, reverse across the garage ramp, and drive forward to exit the site. City staff have confirmed that the provision of mirrors on both sides of the ramp will mitigate the conflict of Para Transpo vehicles reversing across the top of the ramp.

- The proposed development will meet the minimum vehicle and bicycle parking requirements outlined in the City's *Zoning By-Law*, and the minimum accessible parking requirements outlined in the City's *Accessibility Design Standards*.

Boundary Streets

- Navan Road does not meet the target pedestrian level of service (PLOS) or target bicycle level of service (BLOS), but does meet the target truck level of service (TkLOS).

- Based on the characteristics of Navan Road (operating speed of 70 km/h and an average AADT of 3,000 vpd in each direction), the best-possible PLOS is a PLOS D, which can be achieved by implementing sidewalks with a minimum width of 2.0m and a minimum boulevard width of 2.0m. This is identified for the City's consideration if/when this section of Navan Road is urbanized.

- The *Ontario Traffic Manual – Book 18* identifies that a paved shoulder with buffer or a separate multi-use pathway is appropriate for Navan Road, based on the operating speed and traffic volumes. Implementation of a separated cycling facility will improve Navan Road to a BLOS A. This is identified for the City's consideration.

Access Design

- The proposed access meets all relevant requirements of the City's *Private Approach By-Law (PABL)* and ZBL, and the Transportation Association of Canada (TAC)'s *Geometric Design Guide for Canadian Roads*.

Transportation Demand Management

- A review of the City's *TDM Measures Checklist* has been conducted by the proponent, who has agreed to consider contracting with a provider to install on-site carshare vehicles and promote their use by residents.

Transit

- The proposed development is anticipated to generate 15 transit trips during the AM peak hour and 14 transit trips during the PM peak hour. Therefore, transit capacity constraints are not anticipated as a result of the proposed development.

Intersection MMLOS

- Navan Road/Renaud Road does not meet the target PLOS, BLOS, or TkLOS.

- All approaches have an undivided cross-section equivalent to four or more lanes crossed. There is limited opportunity in improving the PLOS at each approach without reducing the number of travel lanes or restricting turning movements. No approaches meet the City's vehicle/pedestrian conflict threshold for zebra-striped crosswalks (greater than 400,000 vehicle/pedestrian conflicts over an eight-hour period). Therefore, no recommendations are identified.

- Based on left turn characteristics, all approaches do not meet the target BLOS. The target BLOS can be achieved for left turn movements through the implementation of two-stage left-turn bike boxes. From a traffic operations perspective, this implementation would require a restriction of right turns on red (RTOR) at the north and east approaches. The vehicular level of service and delays at these approaches would be marginally affected by the RTOR restriction. Bike boxes at this intersection are identified for the City's consideration.

- The north and south approaches do not meet the target TkLOS. As these approaches represent trucks turning from Navan Road onto Renaud Road, and Renaud Road is not a truck route, no recommendations are identified.

Existing Traffic Operations

- All movements within the study area meet the target vehicular level of service (Auto LOS).

Background Traffic Operations

- Based on the projected 2025 background volumes at Navan Road/Markinch Road, a 15m auxiliary eastbound left turn lane for inbound trips is warranted, based on the Ministry of Transportation of Ontario (MTO)'s Left Turn Lane Warrants.

- Based on the projected 2030 background volumes, the northbound through/right turn, southbound left turn, eastbound left turn, and westbound through/right turn movements at Navan Road/Renaud Road are anticipated to operate at an Auto LOS E during the AM peak hour. The maximum queue length of the westbound through/right turn movement is approximately 200m, extending through the upstream intersection at Renaud Road/ Penency Terrace. The maximum queue length of the southbound left turn movement is approximately 50m, and exceeds the storage length of the southbound left turn lane.

- An alternate scenario where an auxiliary westbound right turn lane has been added to Navan Road/Renaud Road has been developed for the 2030 background conditions. In this scenario, all movements operate at an Auto LOS D or better. Construction of an auxiliary westbound right turn lane would require the acquisition of additional ROW across the frontages of 6157 and 6173 Renaud Road.

- The City has identified that the Navan Road/Renaud Road intersection will be converted to a roundabout beyond the horizon year 2030. It is anticipated that the roundabout will be designed to accommodate the projected volumes included in this TIA and other traffic studies in support of other developments in the area.

Total Traffic Operations

- Compared to the background traffic conditions, the addition of site-generated traffic is anticipated to have marginal impacts on the operations of any intersection within the study area. The maximum queue length for the westbound through/right turn lane at Navan Road/Renaud Road is anticipated to increase marginally, by approximately 4m.

- No additional storage length to accommodate the eastbound left turn movement at Navan Road/Markinch Road is required, as a result of site-generated traffic.

- The proposed development is recommended from a transportation perspective.

1.0 SCREENING

1.1 Introduction

This Transportation Impact Assessment (TIA) has been prepared in support of Zoning By-Law Amendment and Site Plan Control applications for the property located at 3317 Navan Road. The subject site is approximately 1.57 hectares in size, and is currently vacant.

The subject site is surrounded by the following:

- Residences and Glenlivet Avenue/Birkhill Place to the north,
- Navan Road, followed by residences and a waste disposal site to the south,
- The planned Eastboro subdivision and Esselmont Street to the east, and
- Residences and followed by Navan Road to the west.

An aerial of the vicinity around the subject site is provided in **Figure 1**.

Figure 1: View of the Subject Site

1.2 Proposed Development

The proposed development consists of three low-rise apartment buildings, with a total of 164 apartment dwellings. A total of 230 parking spaces will be provided on-site, consisting of 146 underground parking spaces and 84 at-grade parking spaces. Access to the development will be provided at the terminus of Esselmont Street. The development will be constructed in a single phase, with a buildout year of 2025.

The subject site is designated as 'Neighbourhood' on Schedule B8 of the City of Ottawa's Official Plan. The implemented zoning for the property is 'Development Reserve' (DR), and therefore a rezoning is required to permit the proposed use. The subject site is located within the East Urban Community Design Plan (CDP) area.

A copy of the preliminary site plan is included in **Appendix A**.

1.3 Screening Form

The City's *2023 Revised TIA Guidelines* identify three triggers for completing a TIA report, including trip generation, location, and safety. The criteria for each trigger are outlined in the City's TIA Screening Form, which is included in **Appendix B**. The trigger results are as follows:

- Trip Generation Trigger – The development is anticipated to generate over 60 peak hour person trips; further assessment is **required** based on this trigger.

- Location Triggers – The development does not propose a new connection to a designated Rapid Transit or Transit Priority (RTTP) corridor or a Cross-Town Bikeway, and is not located within a Hub, Design Priority Area (DPA), or Protected Major Transit Station Area (PMTSA); further assessment is **not required** based on this trigger.

- Safety Triggers – The proposed development does not meet any safety triggers; further assessment is **not required** based on this trigger.

2.0 SCOPING

2.1 Existing Conditions

2.1.1 Roadways

All roadways within the study area fall under the jurisdiction of the City of Ottawa.

Navan Road is an arterial roadway that generally runs on an east-west alignment between Blackburn Hamlet Bypass and Trim Road. For the purposes of this TIA, the roadway is considered to run on a north-south alignment at the intersection of Navan Road/Renaud Road and an east-west alignment at the intersection of Navan Road/Markinch Road. Within the study area, Navan Road has a two-lane undivided rural cross-section, paved shoulders on both sides of the roadway, and a posted speed limit of 60 km/h. Navan Road is classified as a truck route. The City of Ottawa's Official Plan identifies a right-of-way (ROW) protection of 37.5m for Navan Road within the study area, and therefore a widening will be required along the site frontage.

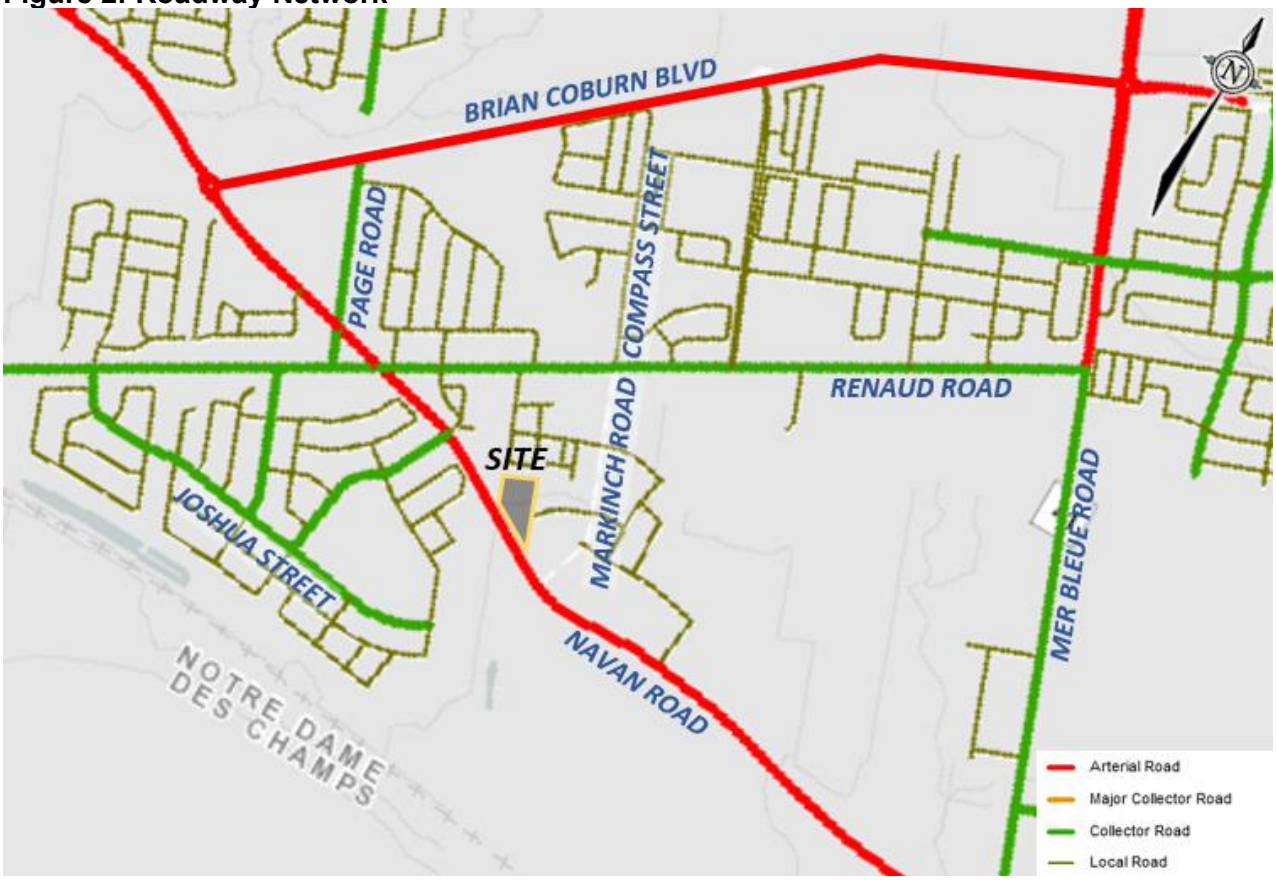
Renaud Road is an collector roadway that generally runs on an east-west alignment between Anderson Road and Mer Bleue Road. Within the study area, Renaud Road has a two-lane undivided urban cross-section and sidewalks on both sides of the roadway. The posted speed limit is generally 50 km/h, with a reduced speed limit of 40 km/h in vicinity of Notre Dame des Champs Elementary School, which is located at the corner of Renaud Road/Markinch Road. Renaud Road is not classified as a truck route. Street parking is not permitted.

Esselmont Street is a planned local roadway that generally runs on an east-west alignment from west of Fordyce Private to Annakisha Drive. Within the study area, Esselmont Street has a two-lane undivided urban cross-section and a sidewalk on the north side of the roadway. Esselmont Street is not classified as a truck route. It is anticipated that street parking will generally be permitted on one side of the roadway.

Markinch Road is a planned collector roadway that will generally run on a north-south alignment between Renaud Road and Navan Road. North of Renaud Road, the roadway will continue as Compass Street. Within the study area, Markinch Road will have a two-lane undivided urban cross-section, a sidewalk on the west side of the roadway, and a multi-use pathway (MUP) on the east side of the roadway. Markinch Road is not classified as a truck route. It is anticipated that street parking will generally be permitted.

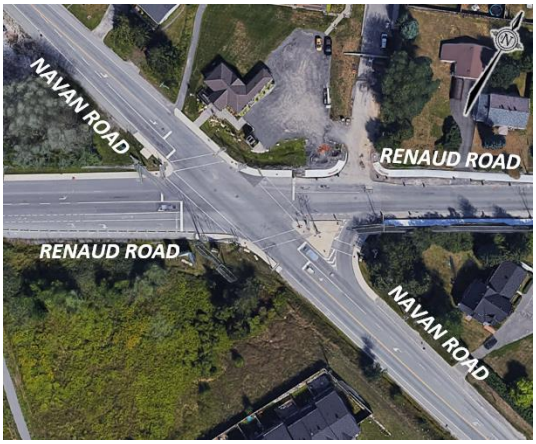
The roadway of the greater area surrounding the subject site is illustrated in **Figure 2**.

Figure 2: Roadway Network



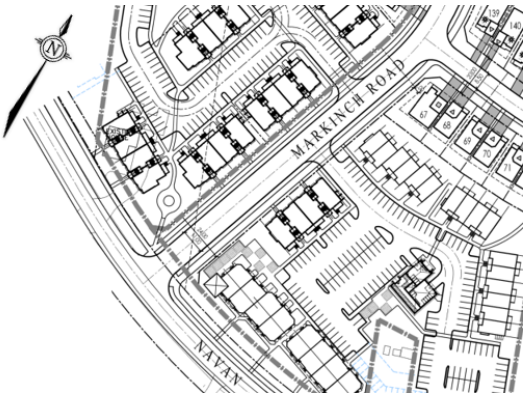
2.1.2 Intersections

Navan Road/Renaud Road



- Signalized four-legged intersection
- North Approach (Navan Road):
  one left turn lane and one shared through/right turn lane
- South Approach (Navan Road):
  one left turn lane, one through lane, and one channelized right turn lane
- East Approach (Renaud Road):
  one left turn lane and one shared through/right turn lane
- West Approach (Renaud Road):
  one left turn lane, one through lane, one pocket bike lane, and one right turn lane
- Standard crosswalks on all approaches

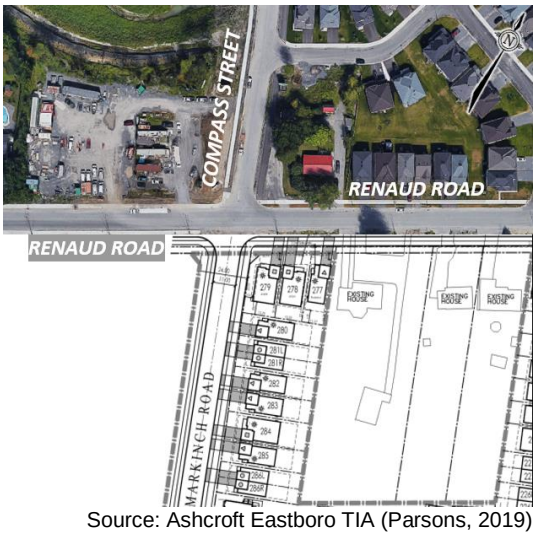
Navan Road/Markinch Road



Source: Ashcroft Eastboro TIA (Parsons, 2019)

- Unsignalized three-legged intersection
- North Approach (Markinch Road):
  one shared left turn/through/right turn lane
- East Approach (Navan Road):
  one shared through/right turn lane
- West Approach (Navan Road):
  one shared left turn/through lane
- Paved shoulders on east and west approaches

Renaud Road/Markinch Road/Compass Street



Source: Ashcroft Eastboro TIA (Parsons, 2019)

- Unsignalized three-legged intersection
- North Approach (Compass Street):
  one shared left turn/through/right turn lane
- South Approach (Markinch Road):
  one shared left turn/through/right turn lane
- East Approach (Renaud Road):
  one shared left turn/through/right turn lane
- West Approach (Renaud Road):
  one shared left turn/through/right turn lane
- Bike lanes on east and west approaches

2.1.3 Driveways

In accordance with the *2017 TIA Guidelines*, a review of the existing adjacent driveways along the boundary roads (based on the most recent aerial photography) are provided as follows:

Navan Road, North Side
- Nine driveways to residences or land to be developed at 3217-3329 Navan Road

Navan Road, South Side
- Eight driveways to residences or land to be developed at 3252-3330 Navan Road

2.1.4 Pedestrian and Cycling Facilities

Sidewalks are provided on both sides of Renaud Road, and paved shoulders are provided on both sides of Navan Road. A Class B pedestrian crossover (PXO) is provided on Renaud Road at Notre Dame des Champs Elementary School. In the City of Ottawa's primary cycling network, Navan Road is classified as a Spine Route and Renaud Road is classified as a Local Route. A Major Pathway is shown to follow the alignment of Markinch Road.

2.1.5 Area Traffic Management

Within the study area, there are no Area Traffic Management (ATM) studies that are in progress.

There are existing traffic calming measures on Renaud Road within the study area, including traffic speed boards, speed humps, and bollards along the eastbound bike lane in front of Notre Dame des Champs Elementary School. The City has also developed a recommended plan to implement traffic calming measures on the section of Renaud Road between Joshua Street and Navan Road, which will include centre island medians (painted or concrete), reduced curb radii at Renaud Road/ Joshua Street/Percifor Way, and green thermoplastic treatment for the eastbound pocket bike lane at Navan Road/Renaud Road.

2.1.6 Transit

The locations of OC Transpo bus stops in the vicinity of the subject site are described in **Table 1**, and are shown in **Figure 3**. A summary of the various routes which serve the study area is included in **Table 2**. Detailed route information and an excerpt from the OC Transpo System Map are included in **Appendix C**.

Table 1: OC Transpo Transit Stops

Stop	Location	Routes Serviced
#2250	East side of Navan Road, south of Renaud Road	228
#2251	West side of Navan Road, south of Spring Valley Drive	228
#2252	East side of Navan Road, south of Spring Valley Drive	228
#2253	South side of Navan Road, at Navan Medical Centre	228
#2254	North side of Navan Road, at Navan Medical Centre	228
#5936	West side of Pagé Road, north of Renaud Road	34, 612, 622, 634, 641
#8462	North side of Renaud Road, west of Penency Terrace	32, 634, 641
#8464	North side of Renaud Road, east of Melodie Street	32, 634, 641
#8479	North side of Renaud Road, west of Compass Street	32, 634, 641
#8481	South side of Renaud Road, west of Mullin Private	32, 634, 641
#8485	South side of Renaud Road, west of Glenlivet Avenue	32, 634, 641
#8488	South side of Renaud Road, east of Markinch Road	32, 634

Stop	Location	Routes Serviced
#9058	North side of Renaud Road, west of Navan Road	228, 634, 641
#9059	South side of Renaud Road, west of Navan Road	228, 612, 634, 641

Figure 3: OC Transpo Bus Stop Locations

Table 2: OC Transpo Route Information

Route	From ↔ To	Frequency
32	Blair ↔ Chapel Hill	Select time periods, seven days a week; 30-minute headways
34	Blair ↔ Renaud	All day service, seven days a week; 30-minute headways
228	Blair ↔ Navan–Sarsfield	Peak periods only in peak direction, Mon to Fri; 35- to 50-minute headways
612	Renaud ↔ Beatrice Desloges E.S./ Gisèle Lalonde H.S.	Service at select times on school days only
622	Renaud ↔ Colonel By H.S./ Gloucester H.S./Lester B. Pearson H.S.	Service at select times on school days only
634	Place d'Orléans ↔ Mer Bleue H.S.	Service at select times on school days only
641	Orléans ↔ Louis Riel H.S.	Service at select times on school days only

2.1.7 Existing Traffic Volumes

Weekday traffic counts completed by the City of Ottawa or coordinated by Parsons have been used to determine the existing traffic volumes at the study area intersections. The Navan Road/Renaud Road count conducted by the City includes pedestrian and cyclist volumes, in addition to vehicle volumes. These counts were completed on the dates listed below:

- Navan Road/Renaud Road October 29, 2019 (City)
- Renaud Road/Compass Street April 24-25, 2019 (Parsons)

Based on the traffic count data at Navan Road/Renaud Road, the average annual daily traffic (AADT) on Navan Road south of Renaud Road is approximately 8,540 vehicles per day (vpd).

All traffic count data previously discussed are included in **Appendix D**. Traffic volumes within the study area are shown in **Figure 4**.

2.1.8 Collision Records

Historical collision data from the last five years available was obtained from the City's Public Works and Service Department for the study area intersections and midblock segments. Copies of the collision summary reports are included in **Appendix E**.

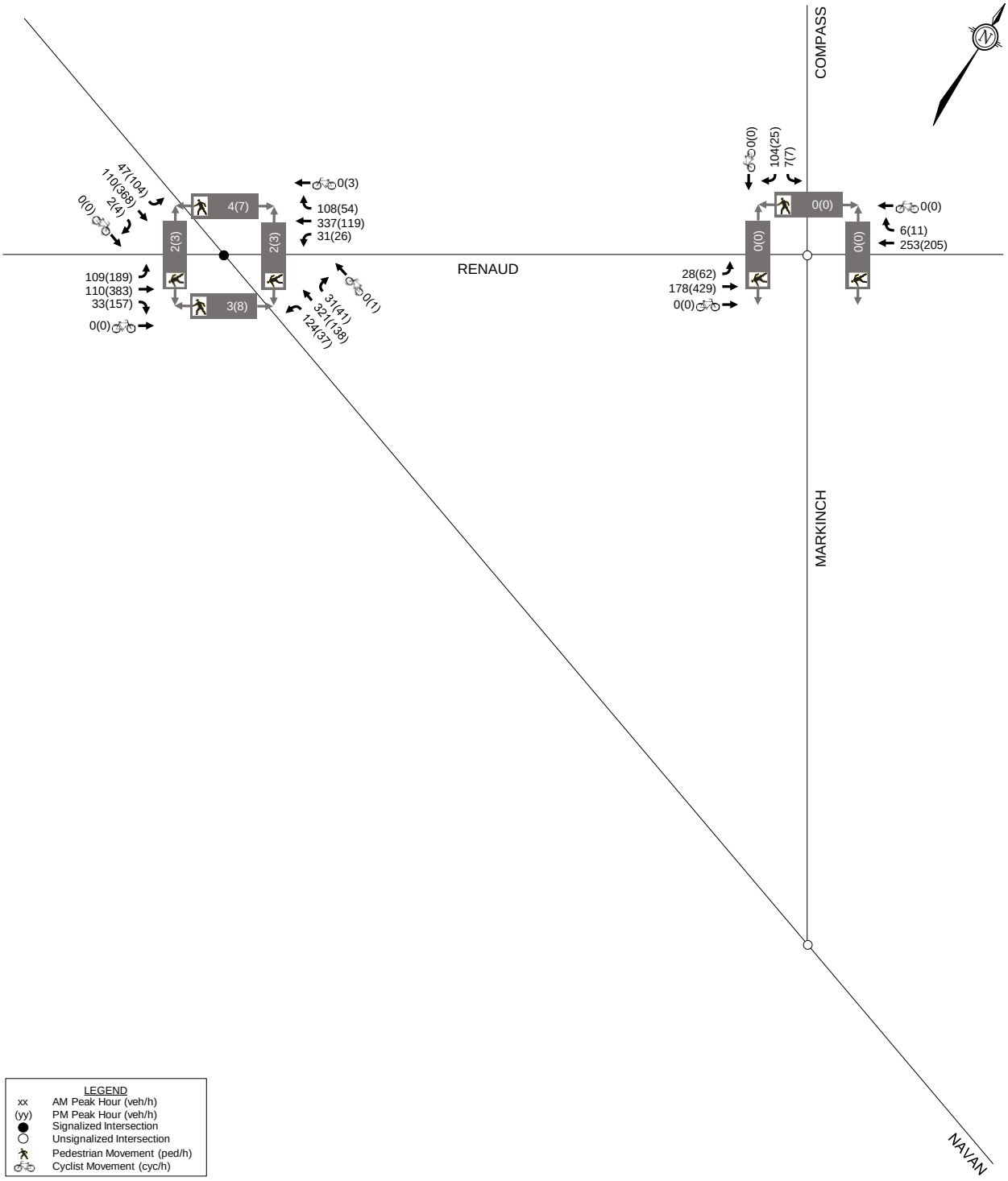
The collision data has been evaluated to determine if there are any identifiable collision patterns, which are defined in the *2017 TIA Guidelines* as 'more than six collisions in five years' for any one movement. The number of collisions at each intersection from January 1, 2016 to December 31, 2020 is summarized in **Table 3**.

Table 3: Reported Collisions

Intersection or Segment	Impact Types					Total
	Angle	Rear End	Sideswipe	Turning	SMV[1]/Other	
Navan Road/ Renaud Road	8	4	-	-	2	**14**
Renaud Road/ Markinch Road/Compass Street	1	-	-	1	1	**3**
Navan Road between Renaud Road & Markinch Road	1	-	-	2	3	**6**
Navan Road between Markinch Road & Fern Casey Street	-	-	-	-	1	**1**
Renaud Road between Navan Road & Markinch Road	3	2	-	1	-	**6**
Renaud Road between Markinch Road & Fern Casey Street	-	-	-	-	1	**1**

1. SMV = Single Motor Vehicle

Figure 4: Existing Traffic Volumes



Navan Road/Renaud Road
A total of 14 collisions were reported at this intersection over the last five years, consisting of eight angle impacts, four rear-end impacts, and two single vehicle/other impacts. Four collisions resulted in injuries, but none caused fatalities. Seven of the 14 collisions (50%) occurred in poor driving conditions. One collision involved a pedestrian, and no collisions involved cyclists.

Of the eight angle impacts, two involved a northbound vehicle and an eastbound vehicle, one involved a northbound vehicle and a westbound vehicle, two involved a southbound vehicle and an eastbound vehicle, and three involved a southbound vehicle and a westbound vehicle.

Both single vehicle impacts involved westbound left-turning vehicles, and one impact involved a pedestrian. Both collisions occurred in poor driving conditions.

Renaud Road/Markinch Road/Compass Street
A total of three collisions were reported at this intersection over the last five years, consisting of one angle impact, one turning movement impact, and one single vehicle/other impact. One collision resulted in injuries, but did not cause fatalities. Two of the three collisions (67%) occurred in poor driving conditions. One collision involved a pedestrian, and no collisions involved cyclists.

Navan Road between Renaud Road and Markinch Road
A total of six collisions were reported along this section over the last five years, consisting of one angle impact, two turning movement impacts, and three single vehicle/other impacts. Two collisions results in injuries, but none caused fatalities. Three of the six collisions (50%) occurred in poor driving conditions. No collisions involved pedestrians or cyclists.

Navan Road between Markinch Road and Fern Casey Street
One collision was reported along this section over the last five years, which was a single vehicle impact. This collision involved an eastbound vehicle striking a pedestrian in poor driving conditions.

Renaud Road between Navan Road and Markinch Road
A total of six collisions were reported along this section over the last five years, consisting of three angle impact, two rear-end impacts, and one turning movement impact. Two collisions results in injuries, but none caused fatalities. Four of the six collisions (67%) occurred in poor driving conditions. No collisions involved pedestrians or cyclists.

Renaud Road between Markinch Road and Fern Casey Street
One collision was reported along this section over the last five years, which was a single vehicle impact. This collision involved an eastbound vehicle in poor driving conditions, and did not involve pedestrians or cyclists.

2.2 Planned Conditions

2.2.1 Planned Transportation Projects

In the City's 2013 Transportation Master Plan (TMP), the 2031 Affordable Rapid Transit and Transit Priority (RTTP) Network identifies transit improvements north of the study area, as Innes Road and Brian Coburn Boulevard west of Tenth Line Road are identified as Transit Priority Corridors with Isolated Measures. Transit signal priority and queue jump lanes will be implemented at select intersections. Peak period bus lanes and transit signal priority are identified for the Blackburn Hamlet Bypass between Innes Road and Brian Coburn Boulevard, which may include the repurposing of general purpose lanes.

The 2031 RTTP Network Concept includes the Cumberland Transitway, which will run between Blair Road and Frank Kenny Road. A corridor for the future transitway has been reserved by the City, immediately north of Brian Coburn Boulevard (north of the study area).

The 2031 Affordable Road Network and Network Concepts include future roadway projects west of the study area. The Network Concept includes a widening of the existing Blackburn Hamlet Bypass from four to six lanes, between the western intersection with Innes Road and Navan Road. In the Affordable Network, the Blackburn Hamlet Bypass Extension was identified as a Phase 2 (2020-2025) project, and would include a new four-lane roadway between Innes Road and Navan Road.

Due to feasibility concerns, the Environmental Assessment (EA) process was reinitiated for the Brian Coburn Boulevard (formerly Blackburn Hamlet Bypass)/Cumberland Transitway Extension. The study produced interim and ultimate conditions for a new alignment of this extension. In the interim condition, bus lanes will be provided in both directions on Innes Road at Anderson Road, and in both directions on the Blackburn Hamlet Bypass at the western intersection with Innes Road and at Navan Road. In the ultimate condition, the Brian Coburn Boulevard extension will generally follow the alignment of Renaud Road south of the Blackburn Hamlet Bypass, with the Cumberland Transitway running immediately north of the extension.

A conversion of the Navan Road/Renaud Road intersection from a signalized intersection to a roundabout is planned, per the East Urban Community CDP. City staff have confirmed that this conversion is not anticipated to be implemented within the time frame of this study (i.e. prior to 2030).

The 2013 Ottawa Cycling Plan and 2024 Draft Transportation Master Plan do not identify any cycling infrastructure projects in vicinity of the study area.

The 2013 Ottawa Pedestrian Plan and 2024 Draft Transportation Master Plan do not identify any pedestrian infrastructure projects in vicinity of the study area.

2.2.2 Other Area Developments

Based on a review of the City's Development Application Search Tool, there are multiple other developments in proximity of the subject site that are under construction, approved, or are in the approval process. These developments are summarized as follows.

Ashcroft Eastboro Development (3323-3433 Navan Road and 6360 Renaud Road)
A TIA was prepared by Parsons in October 2019, in support of a residential subdivision. The subdivision will include 143 single-family homes, 72 semi-detached homes, and 637 townhomes, for a total of 852 dwellings. Phase 1 of the development was assumed to include the first 95 single-family homes, 44 semi-detached homes, and 374 townhomes. The TIA anticipated buildout of Phase 1 in 2021, and buildout of the entire development in 2026.

Spring Valley Trails, Phases 5 & 6 (3252 Navan Road)
A TIA was prepared by IBI Group in February 2020, in support of a residential subdivision. The subdivision will include 11 single-family homes, 262 townhomes, and 48 condominium units. Per the TIA, buildout of the subdivision is anticipated in 2023.

2983-3079 Navan Road
A TIA was prepared by J.L. Richards and Associates in August 2021, in support of a multi-use development. The development will include a 3,398 ft^2 gas station with convenience store, a 4,010 ft^2 fast-food restaurant with drive-through window, a 20,000 ft^2 shopping centre, and 333 townhomes/low-rise apartments. Per the TIA, buildout of the development is anticipated in 2026.

Mer Bleue Phase 1 (2503 & 2559 Mer Bleue Road and 2666 Tenth Line Road)
A TIA was prepared by IBI Group in November 2021, in support of a residential subdivision. The subdivision will include 274 single-family homes and 370 townhomes. Per the TIA, buildout of the subdivision is anticipated in 2025.

A map indicating the approximate location of each development is included in **Figure 5**.

Figure 5: Other Area Developments

2.3 Study Area and Time Periods

The study area for this report includes the boundary roadway Navan Road, as well as the following intersections:

- Navan Road/Renaud Road
- Navan Road/Markinch Road
- Renaud Road/Markinch Road/Compass Street

The selected time periods for the analysis are the weekday AM and PM peak hours, as they represent the 'worst case' combination of site generated traffic and adjacent street traffic. Analysis will be completed for the buildout year 2025 and horizon year 2030.

2.4 Exemptions Review

This module reviews possible exemptions from the final Transportation Impact Assessment, as outlined in the *TIA Guidelines*. The applicable exemptions for this site are shown in **Table 4**.

Table 4: TIA Exemptions

Module	Element	Exemption Criteria	Status
Design Review Component			
4.1 Development Design	*4.1.2* Circulation and Access	• Required for site plans	Not Exempt
	4.1.3 New Street Networks	• Required for plans of subdivision	Exempt
4.2 Parking	*4.2.1* Parking Supply	• Required for site plans	Not Exempt
Network Impact Component			
4.5 Transportation Demand Management	*All elements*	• Required for any development generating more than 60 person trips	Not Exempt
4.6 Neighbourhood Traffic Calming	*4.6.1* Adjacent Neighbourhoods	Required if the development meets all of the following criteria: 1. Access to Collector or Local; 2. "Significant sensitive land use presence" exists, where there is at least two of the following adjacent to the subject street segment: ○ School (within 250m walking distance); ○ Park; ○ Retirement / Older Adult Facility (i.e. long-term care and retirement homes); ○ Licenced Child Care Centre; ○ Community Centre; or	Exempt

Module	Element	Exemption Criteria	Status
		○ 50%, or greater, of adjacent property along the route(s) is occupied by residential lands and a minimum of 10 occupied residential units are present on the route. 3. Application is for Zoning By-Law Amendment or Draft Plan of Subdivision; 4. At least 75 site-generated auto trips; 5. Site Trip Infiltration is expected. Site traffic will increase peak hour vehicle volumes along the route by 50% or more.	
4.8 Network Concept	*All elements*	• Only required when proposed development generates more than 200 person-trips during the peak hour in excess of the equivalent volume permitted by the established zoning	Exempt

Based on the foregoing, the following modules will be included in the TIA report:

Design Review Component
- Module 4.1: Development Design
- Module 4.2: Parking
- Module 4.3: Boundary Streets
- Module 4.4: Access Design

Network Impact Component
- Module 4.5: Transportation Demand Management
- Module 4.7: Transit
- Module 4.9: Intersection Design

3.0 FORECASTING

3.1 Development-Generated Travel Demand

3.1.1 Trip Generation

The number of peak hour person trips generated by the proposed development has been estimated using the *TRANS Trip Generation Manual*, which present peak period trip generation rates and mode shares for different types of housing for the AM and PM peak periods. The data is divided into trip generation rates and mode shares for Single-Family Detached Housing, Low-Rise Multifamily Housing (one or two storeys), and High-Rise Multifamily Housing (three or more storeys). For the High-Rise Multifamily Housing land use, the process of converting the trip generation estimates from peak period to peak hour is shown below.

The *TRANS Trip Generation Manual* identifies the subject site as being located within the Orléans district, which has the following observed mode shares for high-rise multifamily housing during the peak periods:

- Auto Driver: 54% in AM peak, 61% in PM peak;
- Auto Passenger: 7% in AM peak, 13% in PM peak;
- Transit: 29% in AM peak, 21% in PM peak;
- Cyclist: 0% in AM peak, 0% in PM peak;
- Pedestrian: 10% in AM peak, 6% in PM peak.

The mode shares assumed for the TIA in support of the Ashcroft Eastboro subdivision (prepared by Parsons in October 2019) can be summarized as 55% driver, 15% passenger, 20% transit, and 10% non-motorized. As this site directly abuts the proposed Ashcroft Eastboro subdivision to the east, and as the assumed mode shares are generally consistent with the observed mode shares within the Orléans district, it has been assumed that the mode shares of this proposed development will equal the mode shares of the Ashcroft Eastboro subdivision.

The process of converting the trip generation estimates from peak period to peak hour is shown in the following tables. The estimated number of person trips generated by the proposed development during the AM and PM peak periods are shown in **Table 5**. A breakdown of these trips by mode share is shown in **Table 6**.

Table 5: Proposed Residential – Peak Period Trip Generation

Land Use	TRANS Rate	Units	AM Peak Period (ppp[1])			PM Peak Period (ppp)		
			IN	OUT	TOT	IN	OUT	TOT
High-Rise Multifamily Housing	AM: 0.80 PM: 0.90	164	41	90	*131*	86	62	*148*

1. ppp: Person Trips per Peak Period

Table 6: Proposed Residential – Peak Period Trips by Mode Share

Travel Mode	Mode Share	AM Peak Period			PM Peak Period		
		IN	OUT	TOT	IN	OUT	TOT
Residential Person Trips		**41**	**90**	***131***	**86**	**62**	***148***
Auto Driver	55%	23	49	*72*	47	34	*81*
Auto Passenger	15%	6	14	*20*	13	9	*22*
Transit	20%	8	18	*26*	17	13	*30*
Cyclist	0%	-	-	*0*	-	-	*0*
Pedestrian	10%	4	9	*13*	9	6	*15*

Table 4 of the *TRANS Trip Generation Manual* includes adjustment factors to convert the estimated number of trips generated for each mode from peak period to peak hour. A breakdown of the peak hour trips by mode is shown in **Table 7**.

Table 7: Proposed Residential – Peak Hour Trips by Mode Share

Travel Mode	Adj. Factor		AM Peak Hour			PM Peak Hour		
	AM	PM	IN	OUT	TOT	IN	OUT	TOT
Auto Driver	0.48	0.44	11	24	*35*	21	15	*36*
Auto Passenger	0.48	0.44	3	6	*9*	6	4	*10*
Transit	0.55	0.47	5	10	*15*	8	6	*14*
Cyclist	0.58	0.48	-	-	*0*	-	-	*0*
Pedestrian	0.58	0.52	2	5	*7*	4	3	*7*
Peak Hour Person Trips			**21**	**45**	***66***	**39**	**28**	***67***

From the previous table, the proposed development is estimated to generate 66 person trips (including 35 vehicle trips) during the AM peak hour, and 67 person trips (including 36 vehicle trips) during the PM peak hour.

3.1.2 Trip Distribution and Assignment

The distribution of trips generated by the proposed development is based on the trip distribution assumptions outlined in the TIA for the adjacent Ashcroft Eastboro subdivision, the site's

connectivity to the existing road network, and our knowledge of the surrounding area. The trip distribution can be summarized as follows:

- 40% to/from the north via Navan Road;
- 5% to/from the south via Navan Road;
- 15% to/from the east via Renaud Road;
- 40% to/from the west via Renaud Road.

All trips generated by the proposed development will enter/exit via the access at the terminus of Esselmont Street. All trips to/from the south via Navan Road have been assigned to Navan Road/ Markinch Road, and all trips to/from the east via Renaud Road have been assigned to Renaud Road/Markinch Road/Compass Street. Trips to/from the north via Navan Road and west via Renaud Road have been assigned equally to both intersections.

Based on the above, the distribution of site-generated traffic volumes to the study area intersections are shown in **Figure 6**.

3.2 Background Traffic

3.2.1 Other Area Developments

There are multiple other developments in proximity of the subject site that are under construction, approved, or are in the approval process. A summary of each proposed development is included below, and relevant excerpts of the TIA studies in support of these developments are included in **Appendix F**.

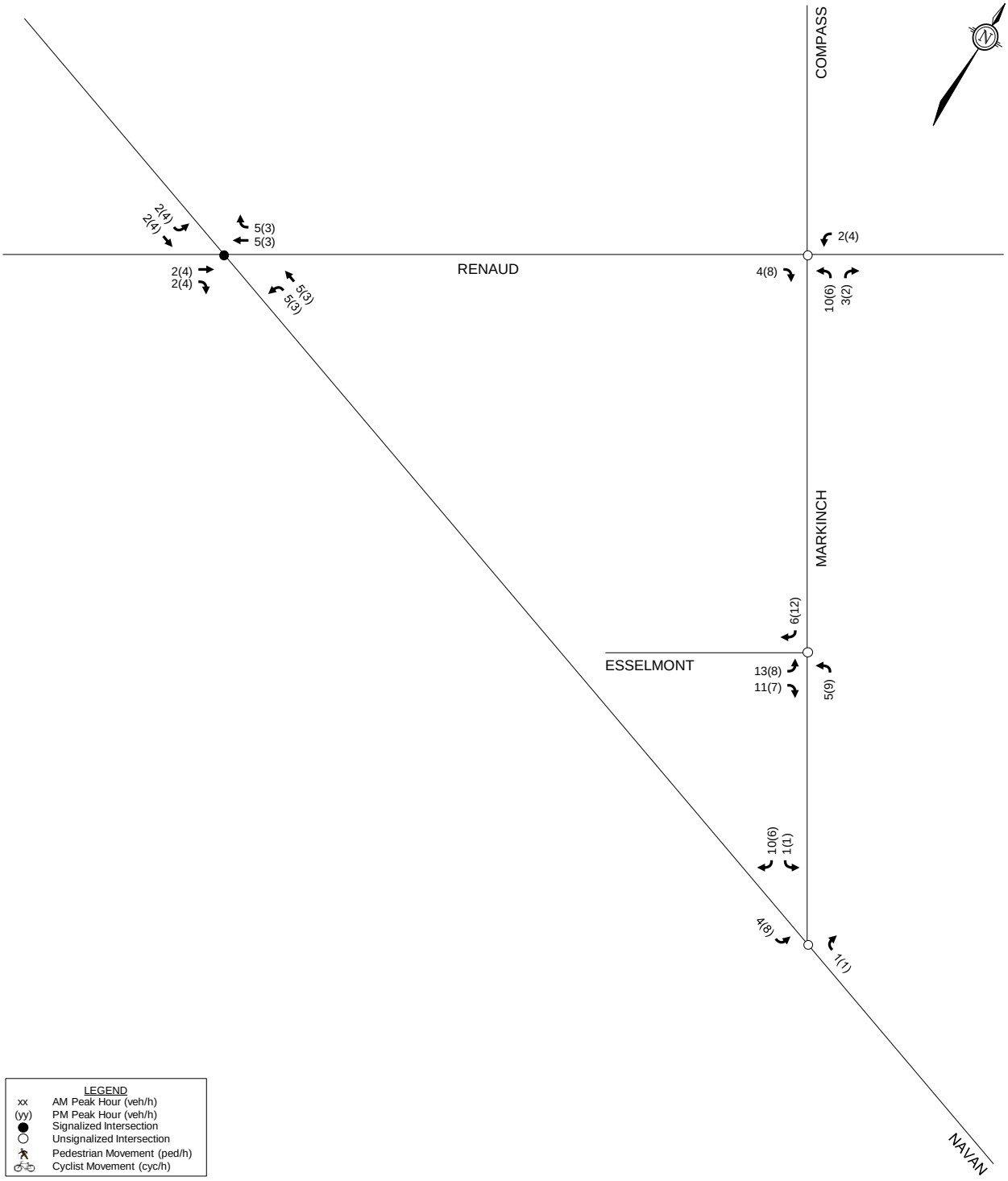
Ashcroft Eastboro Development (3323-3433 Navan Road and 6360 Renaud Road)
This subdivision will include 143 single-family homes, 72 semi-detached homes, and 637 townhomes, for a total of 852 dwellings. Phase 1 of the development was assumed to include the first 95 single-family homes, 44 semi-detached homes, and 374 townhomes. The TIA anticipated buildout of Phase 1 in 2021, and buildout of the entire development in 2026. Therefore, traffic generated by Phase 1 has been added to the 2025 background volumes, and traffic generated by the entire development has been added to the 2030 background volumes.

Spring Valley Trails, Phases 5 & 6 (3252 Navan Road)
This subdivision will include 11 single-family homes, 262 townhomes, and 48 condominium units. Per the TIA, buildout of the subdivision is anticipated in 2023. Therefore, traffic generated by this development has been added to the 2025 and 2030 background volumes.

2983-3079 Navan Road
This development will include a 3,398 ft^2 gas station with convenience store, a 4,010 ft^2 fast-food restaurant with drive-through window, a 20,000 ft^2 shopping centre, and 333 townhomes/low-rise apartments. Per the TIA, buildout of the development is anticipated in 2026. Therefore, traffic generated by this development has been added to the 2030 background volumes.

Mer Bleue Phase 1 (2503-2509 Mer Bleue Road and 2666 Tenth Line Road)
This subdivision will include 274 single-family homes and 370 townhomes. Per the TIA, buildout of the subdivision is anticipated in 2025. Therefore, traffic generated by this development has been added to the 2025 and 2030 background volumes.

Figure 6: Site-Generated Traffic Volumes



3.2.2 General Background Growth Rate

A review of the City's *Strategic Long-Range Model* has been conducted, comparing snapshots of the 2011 and 2031 AM peak hour traffic volumes. The long-range snapshots are included in **Appendix G**.

Within the study area, the long-range snapshots identify positive annual growth rates between 0% and 2% south and west of the Navan Road/Renaud Road intersection, and positive annual growth rates between 5% and 11% north and east of the Navan Road/Renaud Road intersection. This is a result of the planned Blackburn Hamlet Bypass/Brian Coburn Boulevard Extension project. The *2019 Development Charges Background Study* identified a timing of 2025-2029 for this project, however the EA is still underway. This project has not been assumed to be complete prior to the horizon year 2030.

In the Ashcroft Eastboro TIA, an annual growth rate of 2% was applied to Navan Road and Renaud Road, noting that continual large annual growth on these roadways were not anticipated prior to the Blackburn Hamlet Bypass/Brian Coburn Boulevard extension, due to the opening of Brian Coburn Boulevard east of Navan Road, and the existing/planned traffic calming measures on Renaud Road. This assumption has been carried forward for this TIA. Therefore, a 2% annual growth rate continues to be applied on Navan Road and Renaud Road. Eastbound/westbound through volumes at Navan Road/Markinch Road are based on the observed 2019 traffic volumes at Navan Road/ Renaud Road. These projections are included in **Appendix F**.

3.3 Future Traffic Conditions

The figures below present the following future traffic conditions:

- Other area development-generated volumes in 2025 are shown in **Figure 7**;
- Other area development-generated volumes in 2030 are shown in **Figure 8**;
- Background traffic volumes in 2025 are shown in **Figure 9**;
- Background traffic volumes in 2030 are shown in **Figure 10**;
- Total traffic volumes in 2025 are shown in **Figure 11**;
- Total traffic volumes in 2030 are shown in **Figure 12**.

3.4 Demand Rationalization

A review of the existing and background intersection operations has been conducted using Synchro 11, to determine if/when traffic volumes exceed capacity within the study area. The intersection parameters used in the analysis are consistent with the City's *2017 TIA Guidelines* (Saturated Flow Rate: 1,800 vphpl, Peak Hour Factor: 0.9 in existing conditions and 1.0 in future conditions). Signal timing plans for the intersection at Navan Road/Renaud Road are included in **Appendix H**.

Exhibit 22 of the *Multi-Modal Level of Service (MMLOS) Guidelines* (produced by IBI Group in October 2015) includes target vehicular levels of service (Auto LOS), based on the location of an intersection. The intersections at Navan Road/Renaud Road and Navan Road/Markinch Road are located in the General Urban Area, and therefore these intersections have a target Auto LOS D. This equates to a maximum vehicle-to-capacity (v/c) ratio of 0.90 for signalized intersections, or a maximum approach delay of 35 seconds for unsignalized intersections. The intersection at Renaud Road/Markinch Road/Compass Street has a target Auto LOS E, as it is located within 300m of a school. This equates to a maximum approach delay of 50 seconds.

Figure 7: 2025 Other Area Development-Generated Traffic Volumes

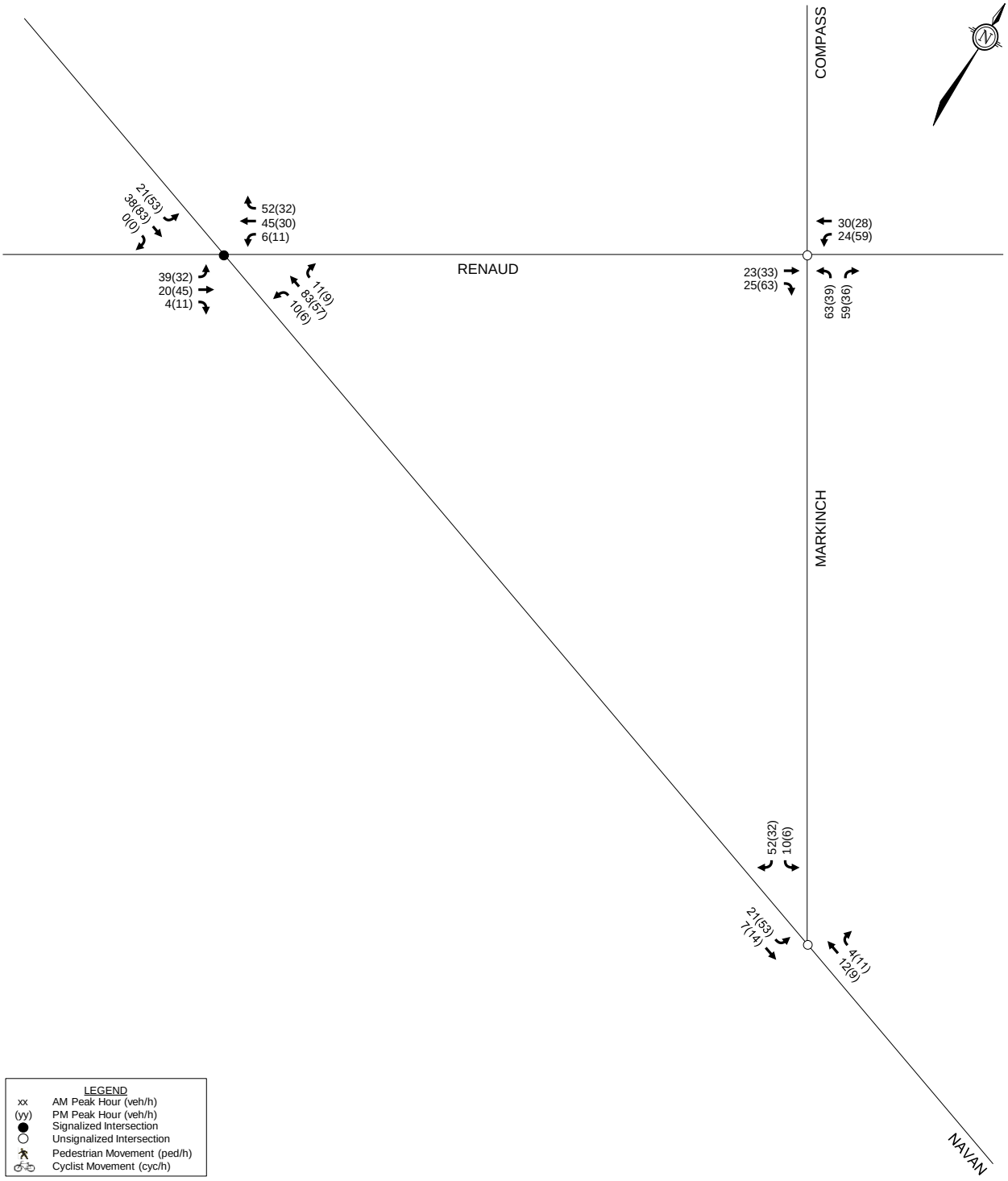


Figure 8: 2030 Other Area Development-Generated Traffic Volumes

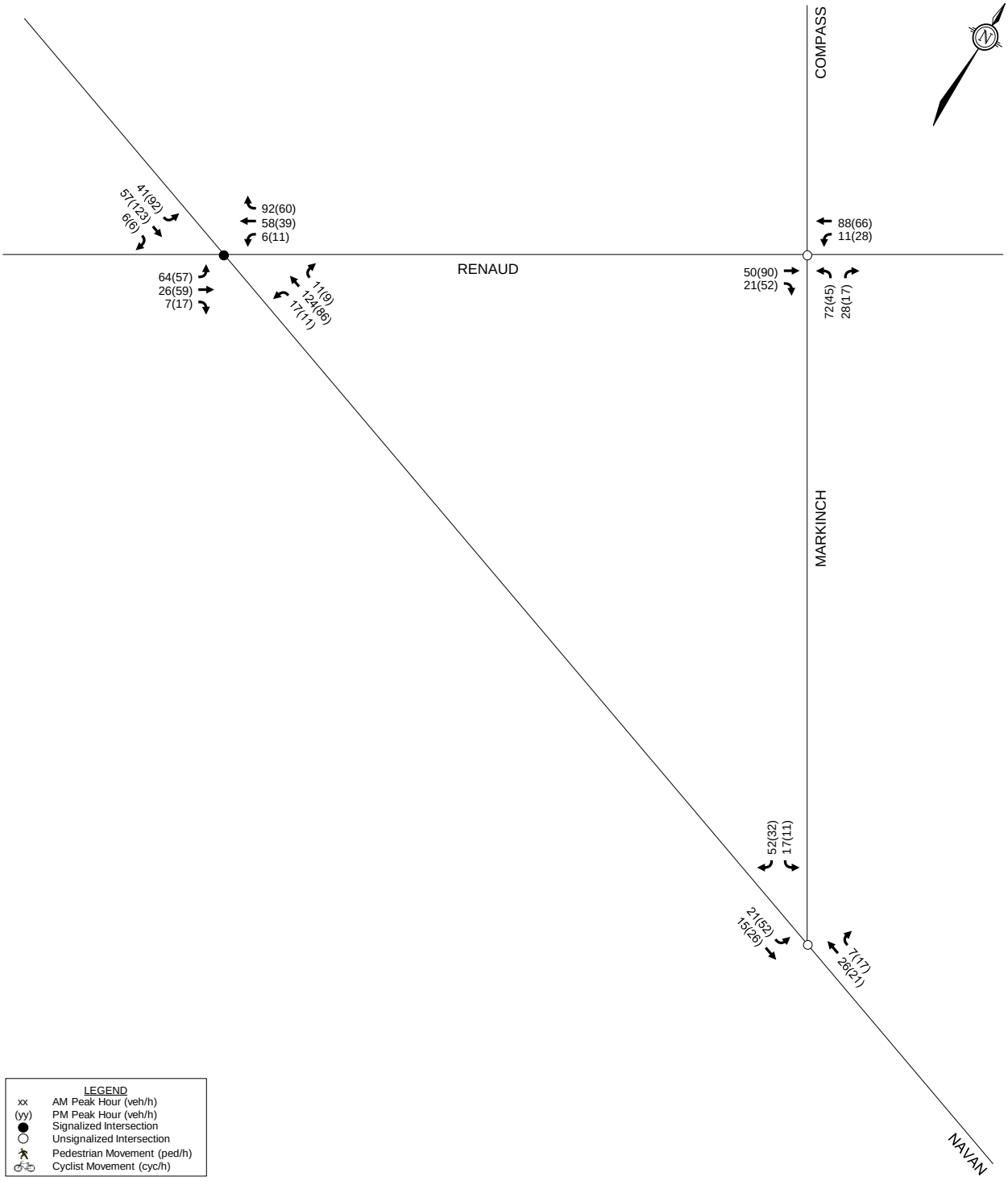


Figure 9: 2025 Background Traffic Volumes

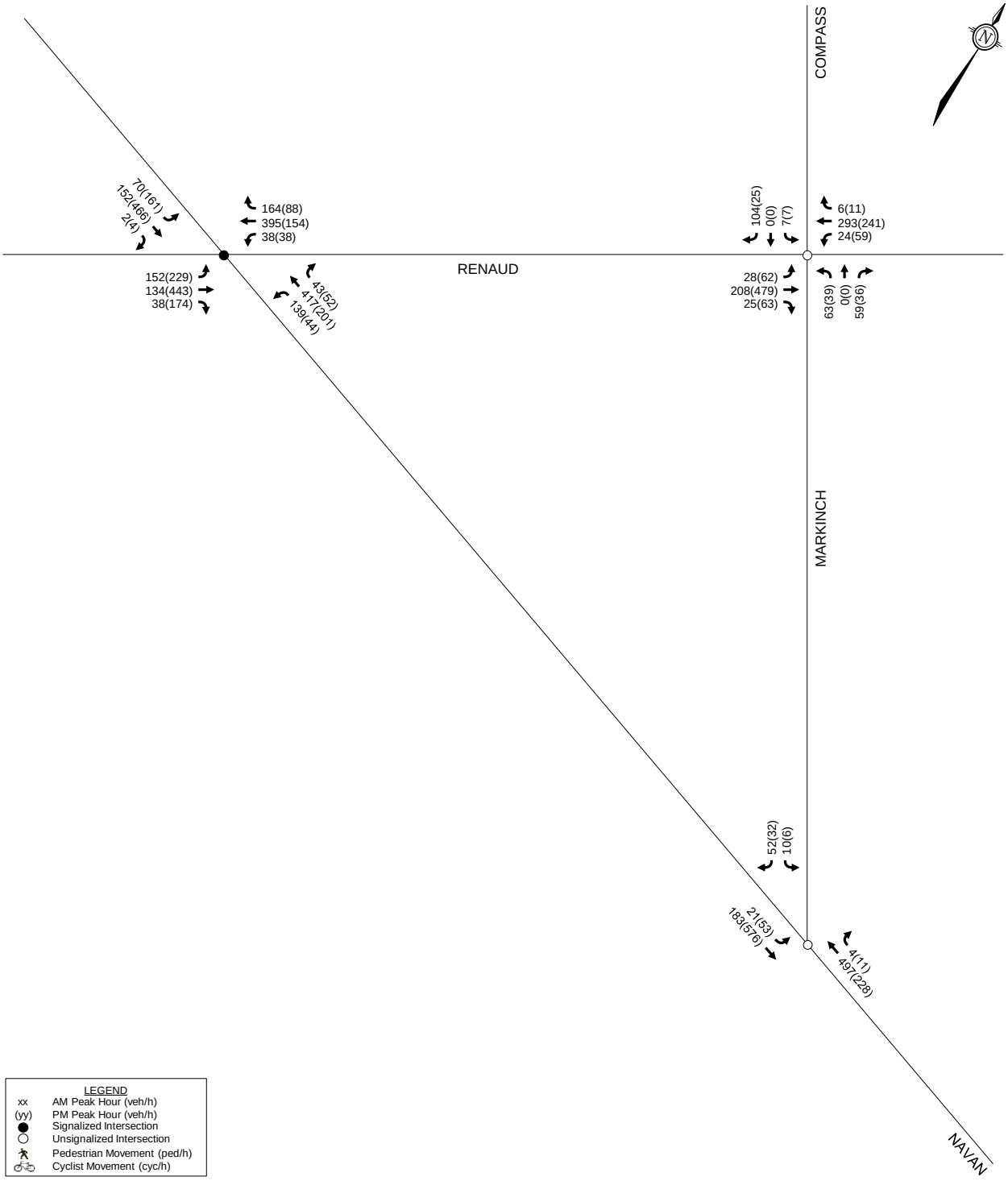


Figure 10: 2030 Background Traffic Volumes

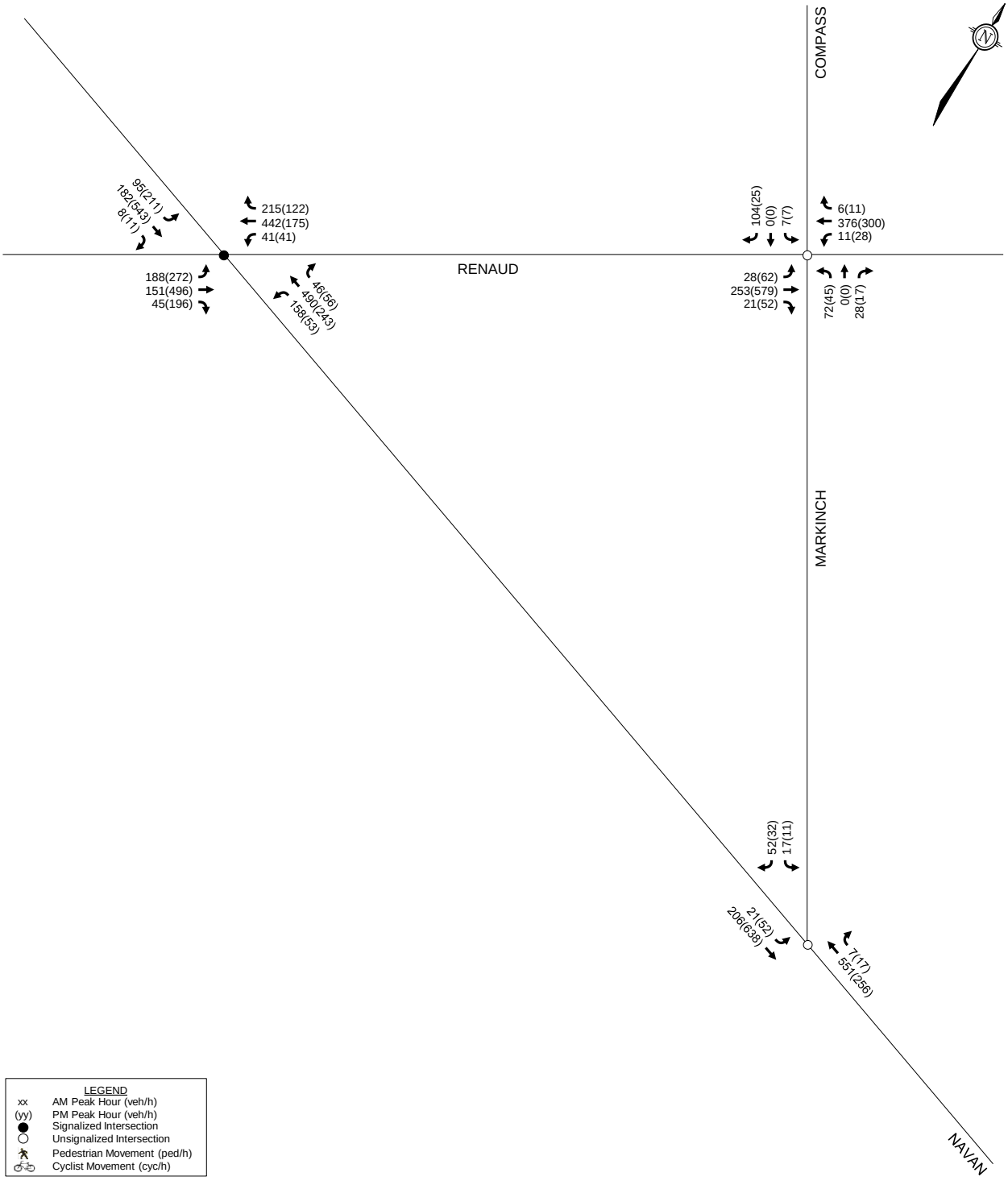


Figure 11: 2025 Total Traffic Volumes

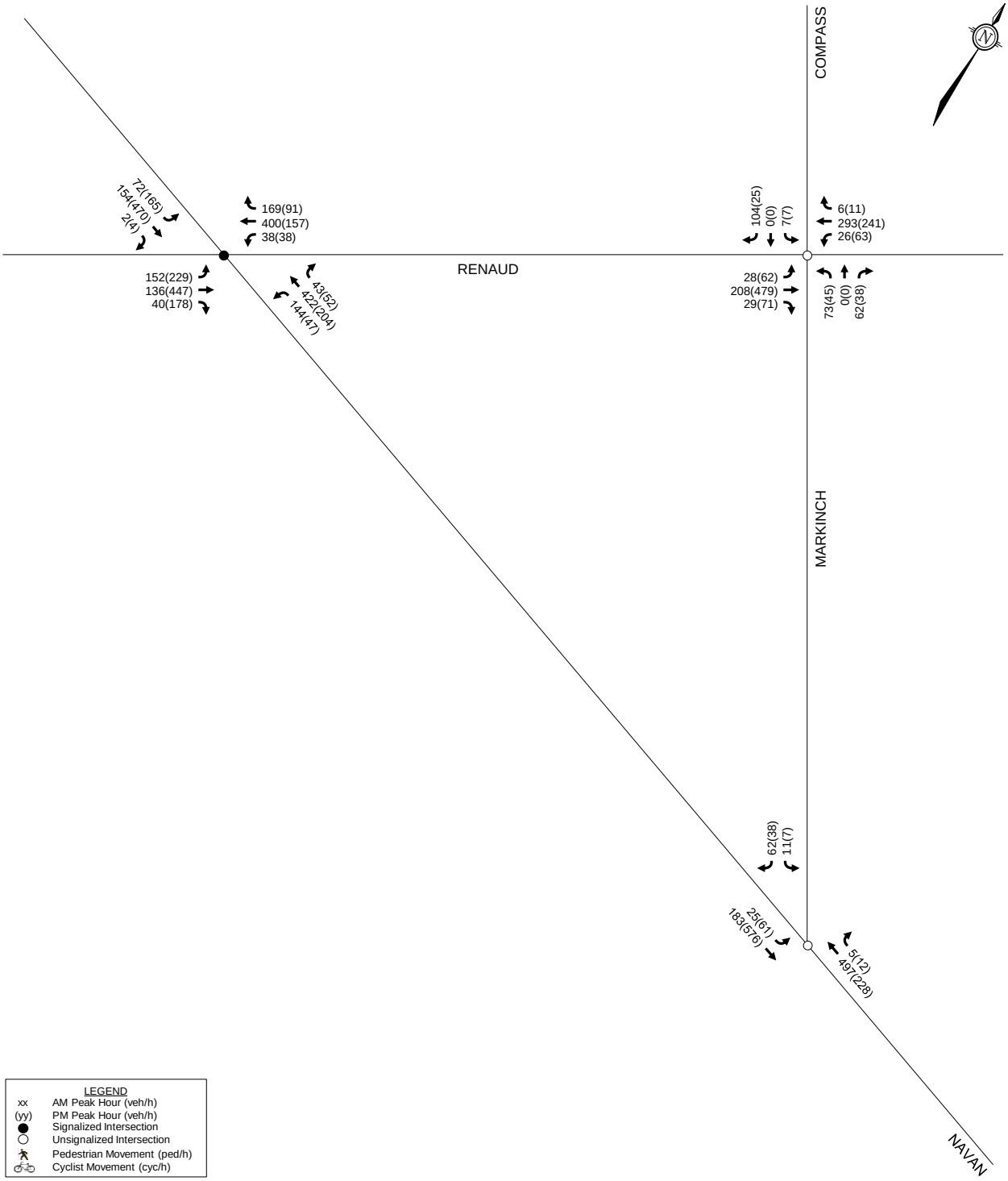
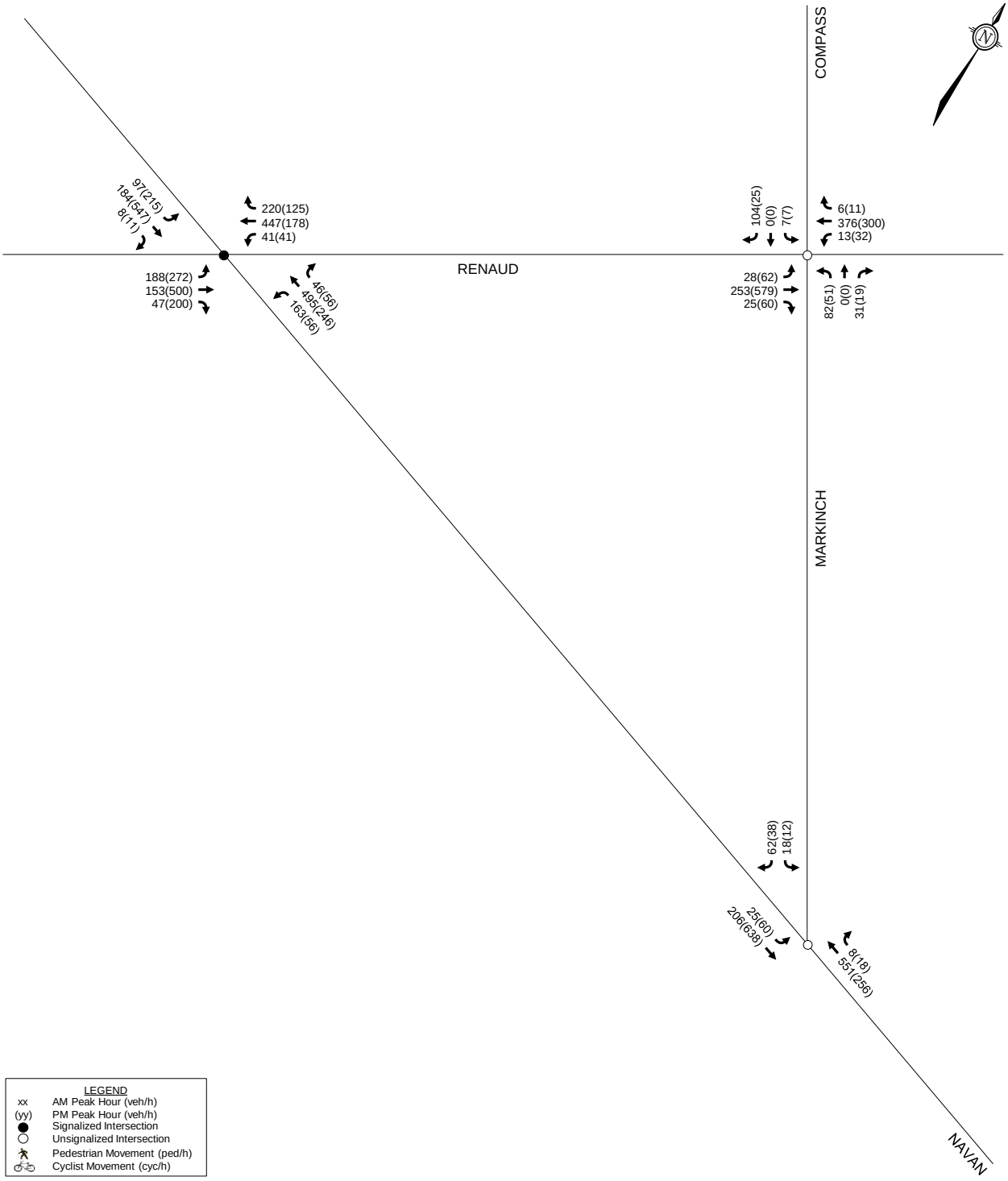


Figure 12: 2030 Total Traffic Volumes



3.4.1 Existing Intersection Operations

Intersection capacity analysis has been conducted for the existing traffic conditions. The results of the analysis are summarized in **Table 8** for the weekday AM and PM peak hours. Detailed reports are included in **Appendix I**.

Table 8: Existing Traffic Operations

Intersection	AM Peak			PM Peak		
	Max v/c or Delay	LOS	Mvmt	Max v/c or Delay	LOS	Mvmt
Navan Road/ Renaud Road(1)	0.87	D	WBT/R	0.73	C	SBT/R
Renaud Road/ Compass Street(2)	11 sec	B	SBL/R	11 sec	B	SBL/R

1. Signalized intersection
2. Unsignalized intersection

From the previous table, all movements within the study area meet the target Auto LOS.

3.4.2 2025 Background Intersection Operations

Intersection capacity analysis has been conducted for the 2025 background traffic conditions. The results of the analysis are summarized in **Table 9** for the weekday AM and PM peak hours. Detailed reports are included in **Appendix J**.

Table 9: 2025 Background Traffic Operations

Intersection	AM Peak			PM Peak		
	Max v/c or Delay	LOS	Mvmt	Max v/c or Delay	LOS	Mvmt
Navan Road/ Renaud Road(1)	**1.06**	**F**	**WBT/R**	0.77	C	SBT/R
Renaud Road/ Markinch Road/Compass Street(2)	18 sec	C	NBL/T/R	23 sec	C	NBL/T/R
Navan Road/ Markinch Road(2)	13 sec	B	SBL/R	11 sec	B	SBL/R

1. Signalized intersection
2. Unsignalized intersection

From the previous table, the westbound through/right turn movement at Navan Road/Renaud Road is anticipated to operate at a failing level of service during the AM peak hour, due to background traffic growth. The maximum (95th-percentile) queue length of this movement is 170m, and extends through the upstream intersection at Renaud Road/Penency Terrace (approximately 140m east of Navan Road/Renaud Road).

An alternate scenario with optimized signal timings has been developed at Navan Road/Renaud Road during the AM peak hour. The changes to the existing signal timing plan can be summarized as follows:

- Cycle length adjusted from a maximum of 113.2 seconds to a maximum of 120 seconds;
- Northbound/southbound maximum green time adjusted from 66.7 seconds to 50 seconds;
- Eastbound left turn maximum green time adjusted from 15 seconds to 13 seconds;

- Eastbound/westbound through maximum green time adjusted from 46.5 seconds to 70 seconds.

Detailed Synchro reports of the alternate scenario is included in **Appendix J**.

In this alternate scenario, all movements at Navan Road/Renaud Road operate at the target Auto LOS D or better, and the maximum queue length of the westbound through/right turn movement during the AM peak hour is reduced to approximately 142m (i.e. marginally encroaches into the upstream intersection at Renaud Road/Penency Terrace). This alternate signal timing has been assumed in the analysis of the 2030 background, 2025 total, and 2030 total traffic conditions.

Based on the projected 2025 background volumes at Navan Road/Markinch Road, a 15m auxiliary eastbound left turn lane for inbound trips is warranted, based on the Ministry of Transportation of Ontario (MTO)'s Left Turn Lane Warrants. The relevant left turn lane warrant is included in **Appendix K**.

3.4.3 2030 Background Intersection Operations

Intersection capacity analysis has been conducted for the 2030 background traffic conditions. The results of the analysis are summarized in **Table 10** for the weekday AM and PM peak hours. Detailed reports are included in **Appendix J**.

Table 10: 2030 Background Traffic Operations

Intersection	AM Peak			PM Peak		
	Max v/c or Delay	LOS	Mvmt	Max v/c or Delay	LOS	Mvmt
Navan Road/ Renaud Road[1]	**0.92**	**E**	**NBT/R**	0.82	D	SBT/R
	0.92	**E**	**SBL**			
	0.94	**E**	**EBL**			
	0.95	**E**	**WBT/R**			
Renaud Road/ Markinch Road/Compass Street[2]	24 sec	C	NBL/T/R	31 sec	D	NBL/T/R
Navan Road/ Markinch Road[2]	14 sec	B	SBL/R	13 sec	B	SBL/R

1. Signalized intersection
2. Unsignalized intersection

From the previous table, the northbound through/right turn, southbound left turn, eastbound left turn, and westbound through/right turn movements at Navan Road/Renaud Road are anticipated to operate at an Auto LOS E during the AM peak hour, due to background traffic growth. The maximum queue length of the westbound through/right turn movement is approximately 200m, extending through the upstream intersection at Renaud Road/Penency Terrace. The maximum queue length of the southbound left turn movement is approximately 50m, and exceeds the storage length of the southbound left turn lane.

An alternate scenario where an auxiliary westbound right turn lane has been added to Navan Road/Renaud Road has been developed for the 2030 background conditions. In this scenario, all movements operate at an Auto LOS D or better. Construction of an auxiliary westbound right turn lane would require the acquisition of additional ROW across the frontages of 6157 and 6173 Renaud Road.

As discussed in Section 2.2.1, the City has identified that the Navan Road/Renaud Road intersection will be converted to a roundabout beyond the horizon year 2030. It is anticipated that the roundabout will be designed to accommodate the projected volumes included in this TIA and other traffic studies in support of other developments in the area.

Without any modifications to the existing Navan Road/Renaud Road intersection by 2030, the approximate required reduction in northbound and westbound volumes for all movements to meet the target Auto LOS D is included below. Detailed Synchro reports of an alternate scenario with these reduced volumes is included in **Appendix J**.

Navan Road/Renaud Road (AM Peak Hour)

- Northbound through/right turn (v/c: 0.92): reduction of 20 vehicles required;
- Westbound through/right turn (v/c: 0.95): reduction of 60 vehicles required.

4.0 ANALYSIS

4.1 Development Design

4.1.1 Design for Sustainable Modes

Pedestrian walkways will be provided at the perimeter of each apartment building, and one walkway will connect to the north side of Esselmont Street. Private amenity space will be provided at the western edge of the subject site, with a walkway connection to Navan Road.

A total of 85 bicycle parking spaces will be provided on-site. The underground parking garage will include 44 bicycle parking spaces, and 41 bicycle parking spaces will be included at-grade, with 15 spaces adjacent to Buildings A and B, and 11 spaces adjacent to Building C. A review of the minimum requirements per the ZBL is included in Section 4.2.

OC Transpo's service design guideline for peak period service is to provide transit service within a five-minute (400m) walk of home, work, or school for 95% of urban residents. Main entrances to the proposed building are within 400m walking distance of stop #2252. The subject site is within 600m walking distance of transit stops along Renaud Road.

A review of the *Transportation Demand Management (TDM) Supportive Development Design and Infrastructure Checklist* has been conducted, and is included in **Appendix L**. It is anticipated that all required TDM supportive design and infrastructure measures in the TDM checklist for residential developments will be met. In addition to the required measures, it is anticipated that the following 'basic' or 'better' measures will be met:

- Locate building close to the street, and do not locate parking areas between the street and building entrances;
- Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort.

4.1.2 Circulation and Access

A staging area for garbage collection is proposed at the entrance of the development, on the south side of the proposed access to Esselmont Street. Garbage is anticipated to be rolled out into the aisle at the entrance for collection. The parking areas will accommodate move-in/move-out and

delivery trucks, as there are no designated loading spaces on-site. The proposed on-site fire route includes the driveway to Esselmont Street, the drive aisle between Building A and B, and the drive aisle in front of Building C. Turning movements for a fire truck entering and exiting the site driveway and the drive aisles in front of each building have been prepared, and are included in **Figure 13** and **Figure 14**. As a fire truck is anticipated to be larger than a garbage truck or moving/delivery truck, these movements illustrate that all vehicles can navigate to/from the proposed parking areas.

Turning movements have also been prepared for a Para Transpo vehicle entering and exiting the drive aisles in front of each building, as shown in **Figure 15** and **Figure 16**. These vehicles will drive forward into the aisle, reverse across the garage ramp, and drive forward to exit the site. City staff have confirmed that the provision of mirrors on both sides of the proposed garage ramp will mitigate the conflict of Para Transpo vehicles reversing across the top of the ramp.

4.2 Parking

The subject site is located in Area C of Schedule 1 and Schedule 1A of the City's ZBL. The minimum resident parking, visitor parking, and bicycle parking rates for the proposed development are identified in Sections 101, 102, and 111 of the ZBL.

A review of the proposed parking supply versus the minimum requirements per the City's ZBL are shown in **Table 11**.

Table 11: Parking Review

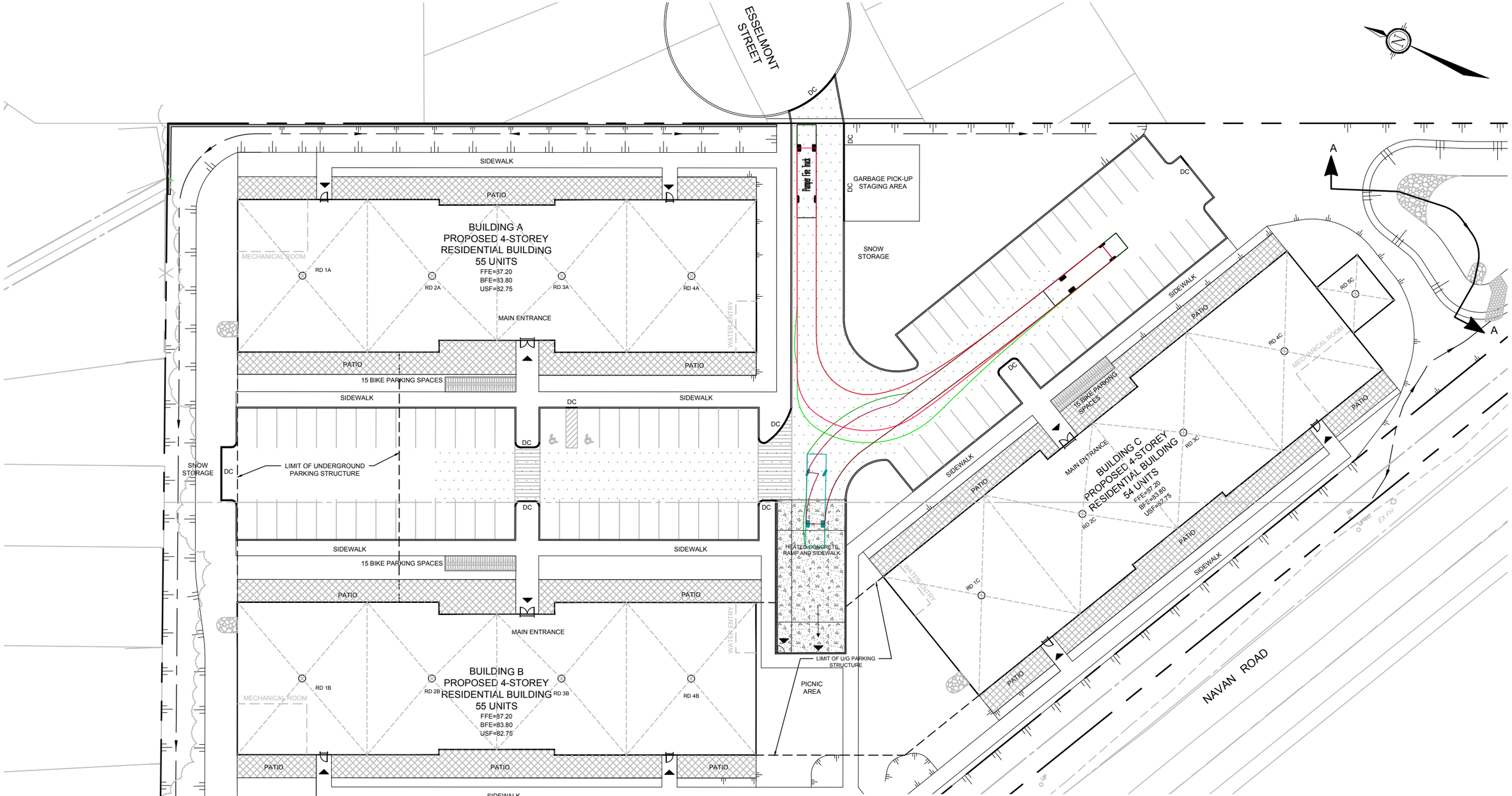
Land Use	Rate	Units	Required	Provided
Minimum Resident and Visitor Vehicle Parking (Section 101/102 of ZBL)				
Apartment, Mid-Rise	1.2 spaces per dwelling unit (resident)	164 units	197	197
	0.2 spaces per dwelling unit (visitor)		33	33
		Total	**230**	**230**
Minimum Bicycle Parking (Section 111 of ZBL)				
Apartment, Mid-Rise	0.50 spaces per dwelling unit	164 units	82	85

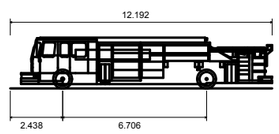
Based on the previous table, the proposed development will meet the minimum vehicle and bicycle parking requirements outlined in the ZBL. The City's *Accessibility Design Standards* identify that a minimum of two accessible parking spaces are required when the public parking supply is between 26 and 50 spaces. Based on the proposed number of visitor parking spaces, this requirement is met, as the proposed development includes two accessible parking spaces adjacent to Building A.

Section 111(12) of the ZBL identifies that, where the number of bicycle parking spaces required for a single residential building exceeds 50 spaces, a minimum of 25% of the required total must be located within a building or structure, a secure area, or bicycle lockers. This requirement is met, as 44 of the 85 proposed bicycle parking spaces (approximately 52%) will be provided within the underground parking garage.

4.3 Boundary Streets

This section provides a review of the boundary street Navan Road, using complete streets principles. It is assumed that the recently approved design of Esselmont Street meets the City's complete streets objectives. The *MMLOS Guidelines*, produced by IBI Group in October 2015, were used to evaluate the levels of service for each alternative mode of transportation on Navan Road, based on existing conditions.





Pumper Fire Truck

Overall Length	12.192m
Overall Width	2.489m
Overall Body Height	2.361m
Min Body Ground Clearance	0.200m
Track Width	2.489m
Lock-to-lock time	5.00s
Max Wheel Angle	45.00°

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

3317 NAVAN ROAD

TURNING MOVEMENT (FIRE TRUCK)

SCALE 1 : 500 (0, 5m, 10m, 20m)

DATE APR 2023 | JOB 118076 | FIGURE FIGURE 13

SHT11X17.DWG - 279mmX432mm

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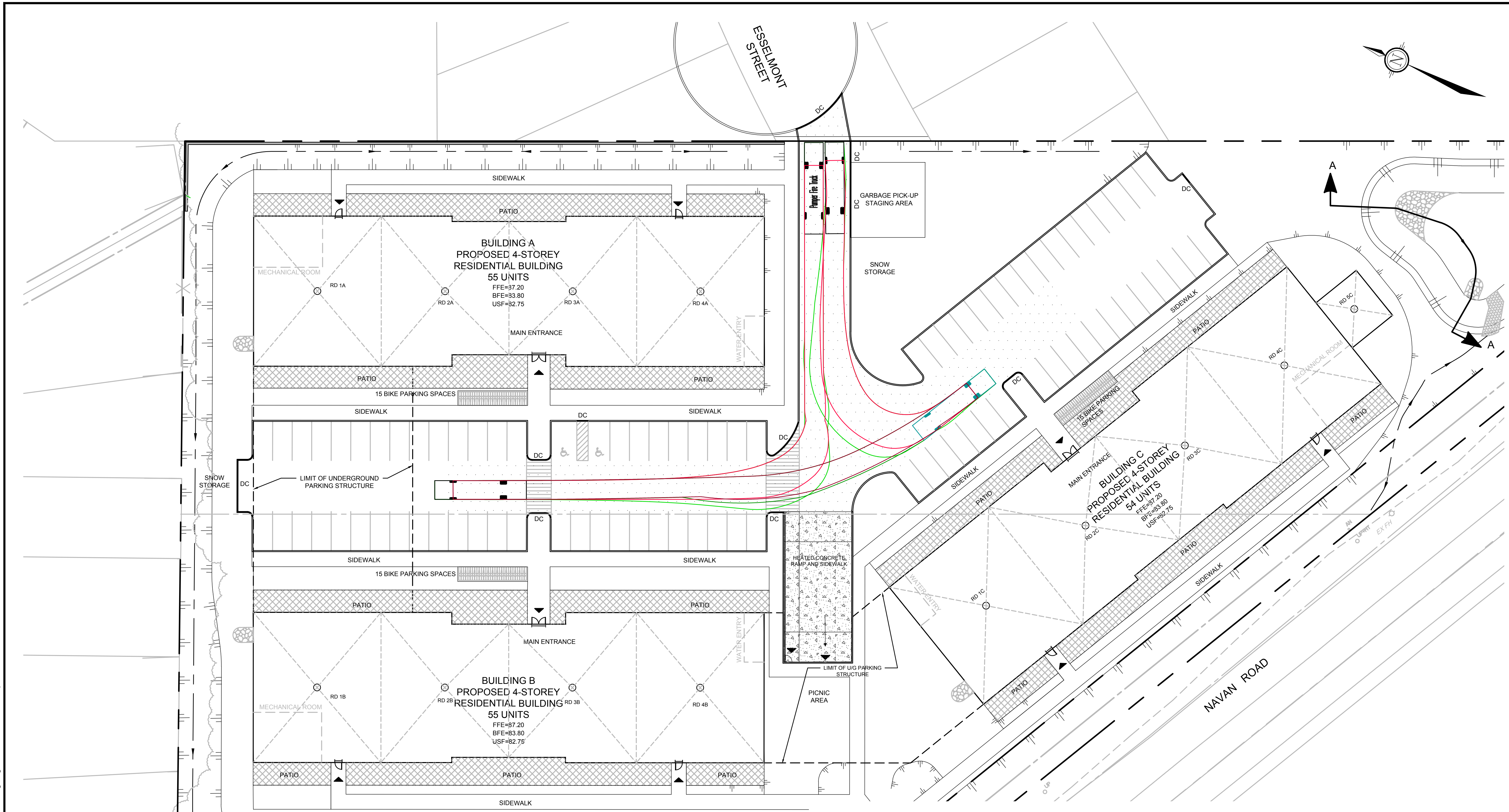
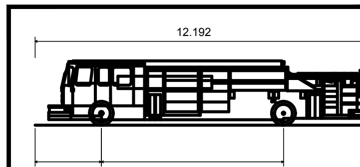

ESSELMONT STREET
GARBAGE PICK-UP STAGING AREA
SNOW STORAGE
Pumper Fire Truck
SIDEWALK
PATIO
BUILDING A
PROPOSED 4-STOREY
RESIDENTIAL BUILDING
55 UNITS
FFE=87.20
BFE=83.80
USF=82.75
MECHANICAL ROOM
RD 1A
RD 2A
RD 3A
RD 4A
MAIN ENTRANCE
WATER ENTRY
15 BIKE PARKING SPACES
DC
LIMIT OF UNDERGROUND PARKING STRUCTURE
HEATED CONCRETE RAMP AND SIDEWALK
LIMIT OF U/G PARKING STRUCTURE
PICNIC AREA
BUILDING B
PROPOSED 4-STOREY
RESIDENTIAL BUILDING
55 UNITS
RD 1B
RD 2B
RD 3B
RD 4B
BUILDING C
PROPOSED 4-STOREY
RESIDENTIAL BUILDING
54 UNITS
RD 1C
RD 2C
RD 3C
RD 4C
RD 5C
NAVAN ROAD
A



Pumper Fire Truck

Overall Length	12.192m
Overall Width	2.489m
Overall Body Height	2.361m
Min Body Ground Clearance	0.200m
Track Width	2.489m
Lock-to-lock time	5.00s
Max Wheel Angle	45.00°

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

3317 NAVAN ROAD

TURNING MOVEMENT (FIRE TRUCK)

SCALE 1 : 500 (0 5m 10m 20m)

DATE APR 2023 | JOB 118076 | FIGURE FIGURE 14

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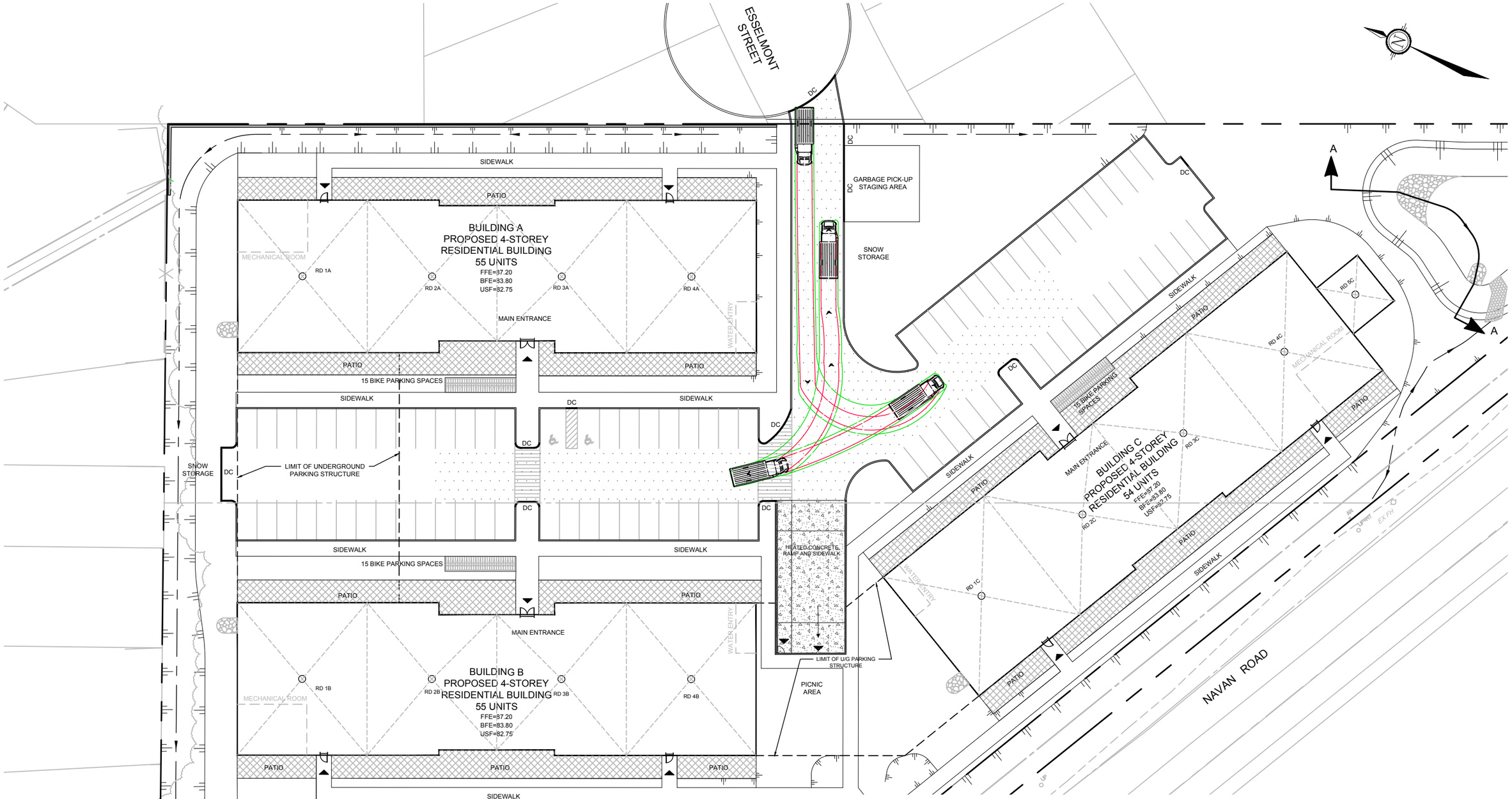

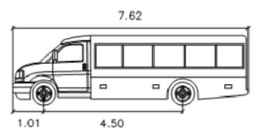

AllStar Chevrolet 4500

	meters
Width	: 2.44
Track	: 1.96
Lock to Lock Time	: 6.0
Steering Angle	: 34.2

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Website www.novatech-eng.com

3317 NAVAN ROAD

TURNING MOVEMENT (SHUTTLE BUS)

SCALE 1 : 500 (0, 5m, 10m, 20m)

DATE APR 2023 | JOB 118076 | FIGURE FIGURE 15

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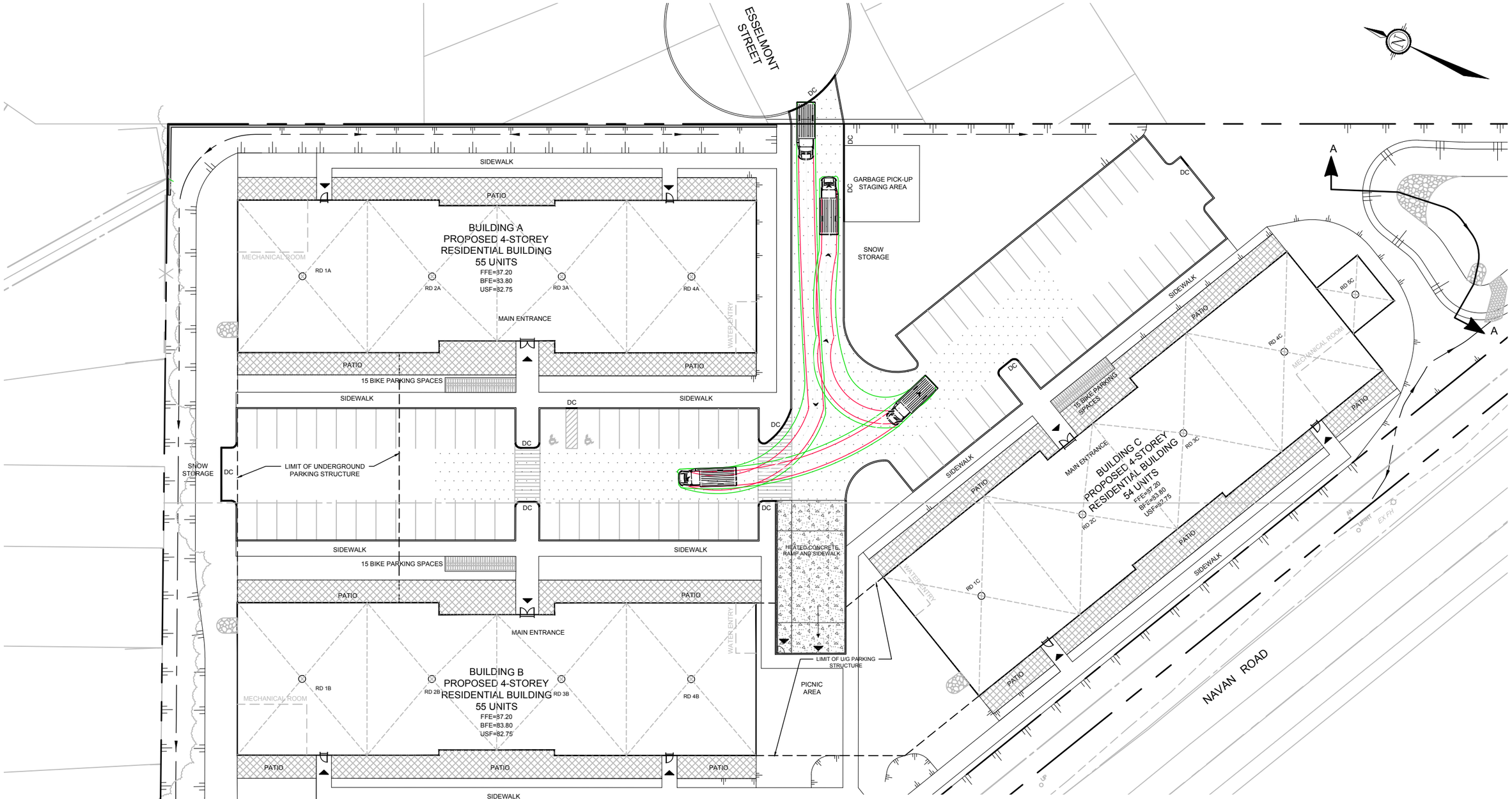

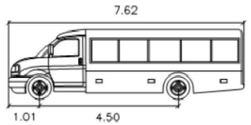

AllStar Chevrolet 4500

	meters
Width	: 2.44
Track	: 1.96
Lock to Lock Time	: 6.0
Steering Angle	: 34.2

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3317 NAVAN ROAD

TURNING MOVEMENT (SHUTTLE BUS)

SCALE 1 : 500 (0, 5m, 10m, 20m)

DATE APR 2023 | JOB 118076 | FIGURE FIGURE 16

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Based on Exhibit 22 of the *MMLOS Guidelines*, Navan Road has been evaluated using the targets for roadways within the General Urban Area. A summary of the segment MMLOS results for Navan Road is provided in **Table 12**, and a detailed MMLOS review is included in **Appendix M**.

Table 12: Segment MMLOS Summary

Segment	PLOS		BLOS		TLOS		TkLOS	
	Actual	Target	Actual	Target	Actual	Target	Actual	Target
Navan Road	**F**	C	**E**	C	D	-	C	D

From the previous table, Navan Road does not meet the target pedestrian level of service (PLOS) or target bicycle level of service (BLOS), but does meet the target truck level of service (TkLOS).

Pedestrian Level of Service
Exhibit 4 of the *MMLOS Guidelines* identifies that based on the characteristics of Navan Road (operating speed of 70 km/h and an average AADT of 3,000 vpd in each direction), the best-possible PLOS is a PLOS D, which can be achieved by implementing sidewalks with a minimum width of 2.0m and a minimum boulevard width of 2.0m. This is identified for the City's consideration if/when this section of Navan Road is urbanized.

Bicycle Level of Service
Exhibit 11 of the *MMLOS Guidelines* identifies that based on the operating speed of Navan Road, the target BLOS can only be achieved by providing a physically-separated bikeway, such as cycle tracks or a MUP. For roadways with an average annual daily traffic volume of 6,000 vehicles or greater, the *Ontario Traffic Manual (OTM) – Book 18* states that a paved shoulder with buffer or a separate multi-use pathway is appropriate (per the selection tool included in *OTM Book 18*, and shown in **Figure 17**). Implementation of a separated cycling facility will improve Navan Road to a BLOS A. This is identified for the City's consideration.

4.4 Access Intersections

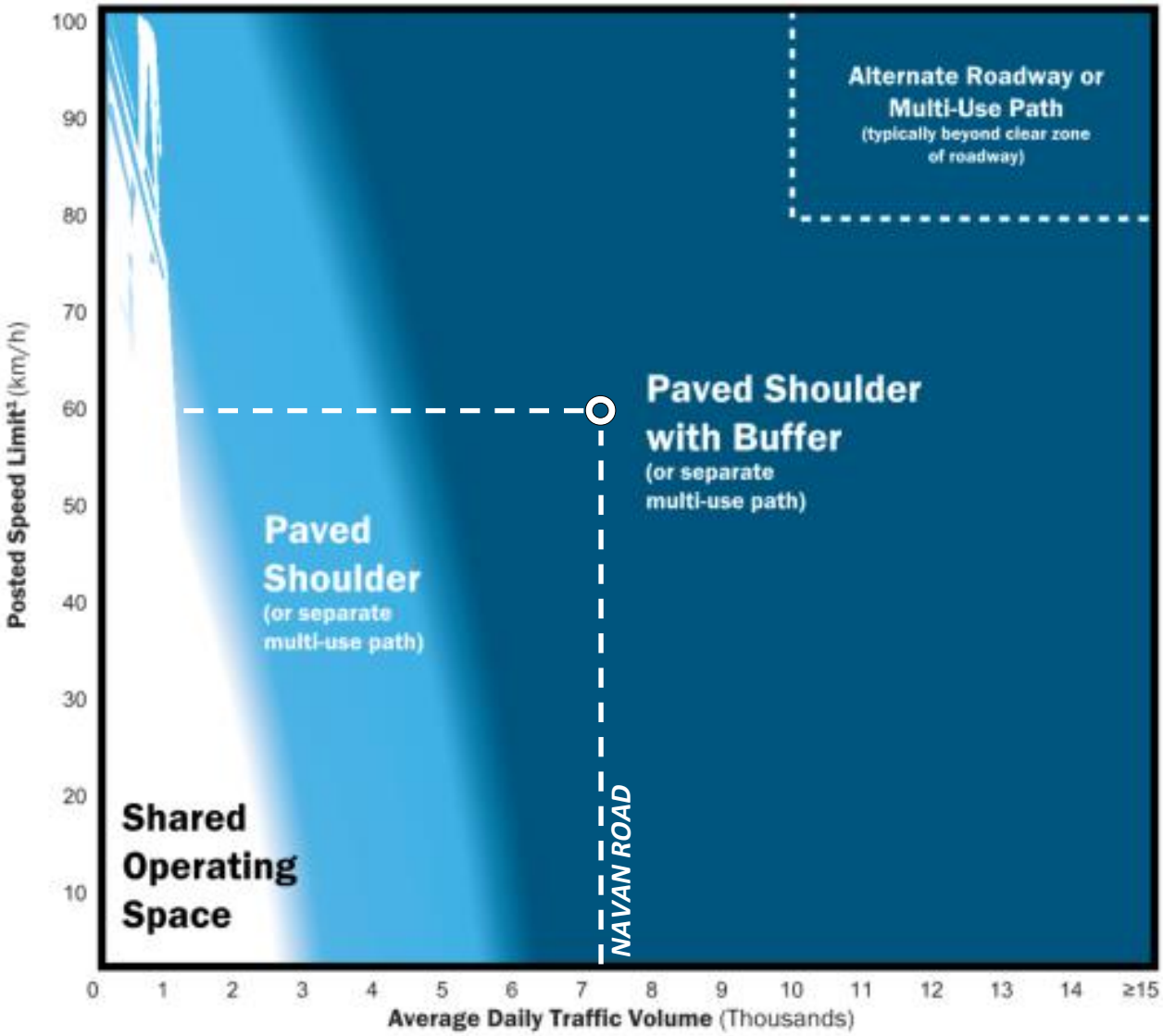
The design of the proposed access to the terminus of Esselmont Street has been evaluated using the relevant provisions of the City's *Private Approach By-Law* (PABL) and *Zoning By-Law* (ZBL), and the Transportation Association of Canada (TAC)'s *Geometric Design Guide for Canadian Roads*.

Section 25(a) of the PABL identifies that a maximum of one private approach may be provided to access a given roadway, when less than 20m of frontage is provided to that roadway. Therefore, the single proposed access to Esselmont Street meets this requirement.

Section 25(c) of the PABL identifies a maximum width requirement of 9.0m for any two-way private approach, as measured at the street line. The proposed access is approximately 6.7m at the street line, and meets this requirement. Sections 107(1)(a) and 107(1)(aa) of the ZBL identify that any driveway providing access to a parking lot or garage must have a minimum width of 6.0m and a maximum width of 6.7m, for double traffic lanes leading to 20 or more parking spaces. The proposed access and all internal drive aisles meet these requirements.

Section 25(u) of the PABL identifies that, for the first 9m inside the property, the maximum grade of a private approach is 2% to 6%. The maximum grade of the proposed access does not exceed 2% for the first 9m inside the property, meeting this requirement. The maximum proposed grade of the parking garage ramp is 19%, with 10% transition slopes on either end of the ramp. Therefore, a subsurface melting device will be included for the garage ramp, as it is required.

Figure 17: Desirable Cycling Facility Pre-Selection Nomograph



A clear throat length of 8m is generally recommended for accesses to local roads. The proposed development meets this criteria, as the proposed access includes approximately 35m of clear throat length before the first point of conflict.

4.5 Transportation Demand Management

4.5.1 Context for TDM

The three proposed buildings will be constructed in a single phase. The unit count and breakdown for each building can be summarized as follows:

- Building A (55 dwellings):
  - 31 one-bedroom units;
  - 17 two-bedroom units;
  - 7 three-bedroom units.

- Building B (55 dwellings):
  - 31 one-bedroom units;
  - 17 two-bedroom units;
  - 7 three-bedroom units.
- Building C (54 dwellings):
  - 31 one-bedroom units;
  - 16 two-bedroom units;
  - 7 three-bedroom units.

4.5.2 Need and Opportunity

The subject site is designated as 'Neighbourhood' on Schedule B8 of the City of Ottawa's Official Plan, and is located within the East Urban Community Design Plan (CDP) area. As discussed in Section 3.1.1, the peak hour driver share assumed for the proposed development (55%) is generally consistent with the observed driver shares within the Orléans district (54% in the AM peak and 61% in the PM peak). If the proposed development achieved a 65% driver share rather than the target driver share of 55%, this would result in an increase of approximately seven vehicle trips during the peak hours. As the neighbourhoods surrounding the subject site continue to develop, it is anticipated that the mode share targets will become easier to attain.

4.5.3 TDM Program

A review of the City's *TDM Measures Checklist* has been conducted by the proponent. A copy of the completed residential checklist is included in **Appendix L**. The proponent has agreed to consider contracting with a provider to install on-site carshare vehicles and promote their use by residents.

4.6 Transit

Based on the trip generation estimates presented in Section 3.1.1, the proposed development is anticipated to generate 15 transit trips during the AM peak hour and 14 transit trips during the PM peak hour. Therefore, transit capacity constraints are not anticipated as a result of the proposed development.

4.7 Intersection Design

4.7.1 Intersection MMLOS

This section provides a review of the signalized study area intersection (Navan Road/Renaud Road), using complete streets principles. The intersection has been evaluated for PLOS, BLOS, TLOS, and TkLOS. The MMLOS targets associated for intersections within the General Urban Area has been used in this review. The full intersection MMLOS analysis is included in **Appendix M**. A summary of the results is shown in **Table 13**.

Table 13: Intersection MMLOS Summary

Intersection	PLOS		BLOS		TLOS		TkLOS	
	Actual	Target	Actual	Target	Actual	Target	Actual	Target
Navan Road/ Renaud Road	**F**	C	**F**	B	F	-	**F**	D

From the previous table, Navan Road/Renaud Road does not meet the target PLOS, BLOS, or TkLOS. A discussion of each mode is included below.

Pedestrian Level of Service
All approaches have an undivided cross-section equivalent to four or more lanes crossed (assuming a lane width equals 3.5m, per the *MMLOS Guidelines*). There is limited opportunity in improving the PLOS at each approach without reducing the number of travel lanes or restricting turning movements. No approaches meet the City's vehicle/pedestrian conflict threshold for zebra-striped crosswalks (greater than 400,000 vehicle/pedestrian conflicts over an eight-hour period). Therefore, no recommendations are identified.

Bicycle Level of Service
Based on left turn characteristics, all approaches do not meet the target BLOS. The target BLOS can be achieved for left turn movements through the implementation of two-stage left-turn bike boxes. From a traffic operations perspective, this implementation would require a restriction of right turns on red (RTOR) at the north and east approaches. As shown in **Appendix M**, the vehicular level of service and delays at these approaches would be marginally affected by the RTOR restriction. Bike boxes at this intersection are identified for the City's consideration.

Truck Level of Service
The north and south approaches do not meet the target TkLOS. As these approaches represent trucks turning from Navan Road onto Renaud Road, and Renaud Road is not a truck route, no recommendations are identified.

4.7.2 2025 Total Intersection Operations

Intersection capacity analysis has been conducted for the 2025 total traffic conditions. The results of the analysis are summarized in **Table 14** for the weekday AM and PM peak hours. Detailed reports are included in **Appendix N**.

Table 14: 2025 Total Traffic Operations

Intersection	AM Peak			PM Peak		
	Max v/c or Delay	LOS	Mvmt	Max v/c or Delay	LOS	Mvmt
Navan Road/ Renaud Road[1]	0.87	D	WBT/R	0.78	C	SBT/R
Renaud Road/ Markinch Road/Compass Street[2]	19 sec	C	NBL/T/R	25 sec	C	NBL/T/R
Navan Road/ Markinch Road[2]	13 sec	B	SBL/R	11 sec	B	SBL/R

1. Signalized intersection
2. Unsignalized intersection

Compared to the 2025 background traffic conditions, the addition of site-generated traffic is anticipated to have marginal impacts on the operations of any intersection within the study area. The maximum queue length for the westbound through/right turn lane at Navan Road/Renaud Road is anticipated to increase marginally, by approximately 4m. No additional storage length to accommodate the eastbound left turn movement at Navan Road/Markinch Road is required, as a result of site-generated traffic.

4.7.3 2030 Total Intersection Operations

Intersection capacity analysis has been conducted for the 2030 total traffic conditions. The results of the analysis are summarized in **Table 15** for the weekday AM and PM peak hours. Detailed reports are included in **Appendix N**.

Table 15: 2030 Total Traffic Operations

Intersection	AM Peak			PM Peak		
	Max v/c or Delay	LOS	Mvmt	Max v/c or Delay	LOS	Mvmt
Navan Road/ Renaud Road[1]	**0.93**	**E**	**NBT/R**	0.83	D	SBT/R
	0.96	**E**	**SBL**			
	0.97	**E**	**EBL**			
	0.96	**E**	**WBT/R**			
Renaud Road/ Markinch Road/Compass Street[2]	25 sec	C	NBL/T/R	33 sec	D	NBL/T/R
Navan Road/ Markinch Road[2]	14 sec	B	SBL/R	13 sec	B	SBL/R

1. Signalized intersection
2. Unsignalized intersection

Compared to the 2030 background traffic conditions, the addition of site-generated traffic is anticipated to have marginal impacts on the operations of any intersection within the study area. The maximum queue length for the westbound through/right turn lane at Navan Road/Renaud Road is anticipated to increase marginally, by approximately 5m.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the foregoing, the conclusions and recommendations of this TIA can be summarized as follows:

Forecasting

- The proposed development is estimated to generate 66 person trips (including 35 vehicle trips) during the AM peak hour, and 67 person trips (including 36 vehicle trips) during the PM peak hour.

Development Design and Parking

- Pedestrian walkways will be provided at the perimeter of each apartment building, and one walkway will connect to the north side of Esselmont Street. Private amenity space will be provided at the western edge of the subject site, with a walkway connection to Navan Road.

- OC Transpo's service design guideline for peak period service is to provide transit service within a five-minute (400m) walk of home, work, or school for 95% of urban residents. Main entrances to the proposed building are within 400m walking distance of stop #2252. The subject site is within 600m walking distance of transit stops along Renaud Road.

- It is anticipated that all Transportation Demand Management (TDM) supportive design and infrastructure measures in the TDM checklist will be met.

- A staging area for garbage collection is proposed at the entrance of the development, on the south side of the proposed access to Esselmont Street. The parking areas will

accommodate move-in/move-out and delivery trucks, as there are no designated loading spaces on-site.

- The proposed on-site fire route includes the driveway to Esselmont Street, the drive aisle between Building A and B, and the drive aisle in front of Building C.

- Para Transpo vehicles will drive into each aisle, reverse across the garage ramp, and drive forward to exit the site. City staff have confirmed that the provision of mirrors on both sides of the ramp will mitigate the conflict of Para Transpo vehicles reversing across the top of the ramp.

- The proposed development will meet the minimum vehicle and bicycle parking requirements outlined in the City's *Zoning By-Law*, and the minimum accessible parking requirements outlined in the City's *Accessibility Design Standards*.

Boundary Streets

- Navan Road does not meet the target pedestrian level of service (PLOS) or target bicycle level of service (BLOS), but does meet the target truck level of service (TkLOS).

- Based on the characteristics of Navan Road (operating speed of 70 km/h and an average AADT of 3,000 vpd in each direction), the best-possible PLOS is a PLOS D, which can be achieved by implementing sidewalks with a minimum width of 2.0m and a minimum boulevard width of 2.0m. This is identified for the City's consideration if/when this section of Navan Road is urbanized.

- The *Ontario Traffic Manual – Book 18* identifies that a paved shoulder with buffer or a separate multi-use pathway is appropriate for Navan Road, based on the operating speed and traffic volumes. Implementation of a separated cycling facility will improve Navan Road to a BLOS A. This is identified for the City's consideration.

Access Design

- The proposed access meets all relevant requirements of the City's *Private Approach By-Law (PABL)* and ZBL, and the Transportation Association of Canada (TAC)'s *Geometric Design Guide for Canadian Roads*.

Transportation Demand Management

- A review of the City's *TDM Measures Checklist* has been conducted by the proponent, who has agreed to consider contracting with a provider to install on-site carshare vehicles and promote their use by residents.

Transit

- The proposed development is anticipated to generate 15 transit trips during the AM peak hour and 14 transit trips during the PM peak hour. Therefore, transit capacity constraints are not anticipated as a result of the proposed development.

Intersection MMLOS

- Navan Road/Renaud Road does not meet the target PLOS, BLOS, or TkLOS.

- All approaches have an undivided cross-section equivalent to four or more lanes crossed. There is limited opportunity in improving the PLOS at each approach without reducing the

number of travel lanes or restricting turning movements. No approaches meet the City's vehicle/pedestrian conflict threshold for zebra-striped crosswalks (greater than 400,000 vehicle/pedestrian conflicts over an eight-hour period). Therefore, no recommendations are identified.

- Based on left turn characteristics, all approaches do not meet the target BLOS. The target BLOS can be achieved for left turn movements through the implementation of two-stage left-turn bike boxes. From a traffic operations perspective, this implementation would require a restriction of right turns on red (RTOR) at the north and east approaches. The vehicular level of service and delays at these approaches would be marginally affected by the RTOR restriction. Bike boxes at this intersection are identified for the City's consideration.

- The north and south approaches do not meet the target TkLOS. As these approaches represent trucks turning from Navan Road onto Renaud Road, and Renaud Road is not a truck route, no recommendations are identified.

Existing Traffic Operations

- All movements within the study area meet the target vehicular level of service (Auto LOS).

Background Traffic Operations

- Based on the projected 2025 background volumes at Navan Road/Markinch Road, a 15m auxiliary eastbound left turn lane for inbound trips is warranted, based on the Ministry of Transportation of Ontario (MTO)'s Left Turn Lane Warrants.

- Based on the projected 2030 background volumes, the northbound through/right turn, southbound left turn, eastbound left turn, and westbound through/right turn movements at Navan Road/Renaud Road are anticipated to operate at an Auto LOS E during the AM peak hour. The maximum queue length of the westbound through/right turn movement is approximately 200m, extending through the upstream intersection at Renaud Road/ Penency Terrace. The maximum queue length of the southbound left turn movement is approximately 50m, and exceeds the storage length of the southbound left turn lane.

- An alternate scenario where an auxiliary westbound right turn lane has been added to Navan Road/Renaud Road has been developed for the 2030 background conditions. In this scenario, all movements operate at an Auto LOS D or better. Construction of an auxiliary westbound right turn lane would require the acquisition of additional ROW across the frontages of 6157 and 6173 Renaud Road.

- The City has identified that the Navan Road/Renaud Road intersection will be converted to a roundabout beyond the horizon year 2030. It is anticipated that the roundabout will be designed to accommodate the projected volumes included in this TIA and other traffic studies in support of other developments in the area.

Total Traffic Operations

- Compared to the background traffic conditions, the addition of site-generated traffic is anticipated to have marginal impacts on the operations of any intersection within the study area. The maximum queue length for the westbound through/right turn lane at Navan Road/Renaud Road is anticipated to increase marginally, by approximately 4m.

- No additional storage length to accommodate the eastbound left turn movement at Navan Road/Markinch Road is required, as a result of site-generated traffic.

Based on the foregoing, the proposed development is recommended from a transportation perspective.

NOVATECH

Prepared by:

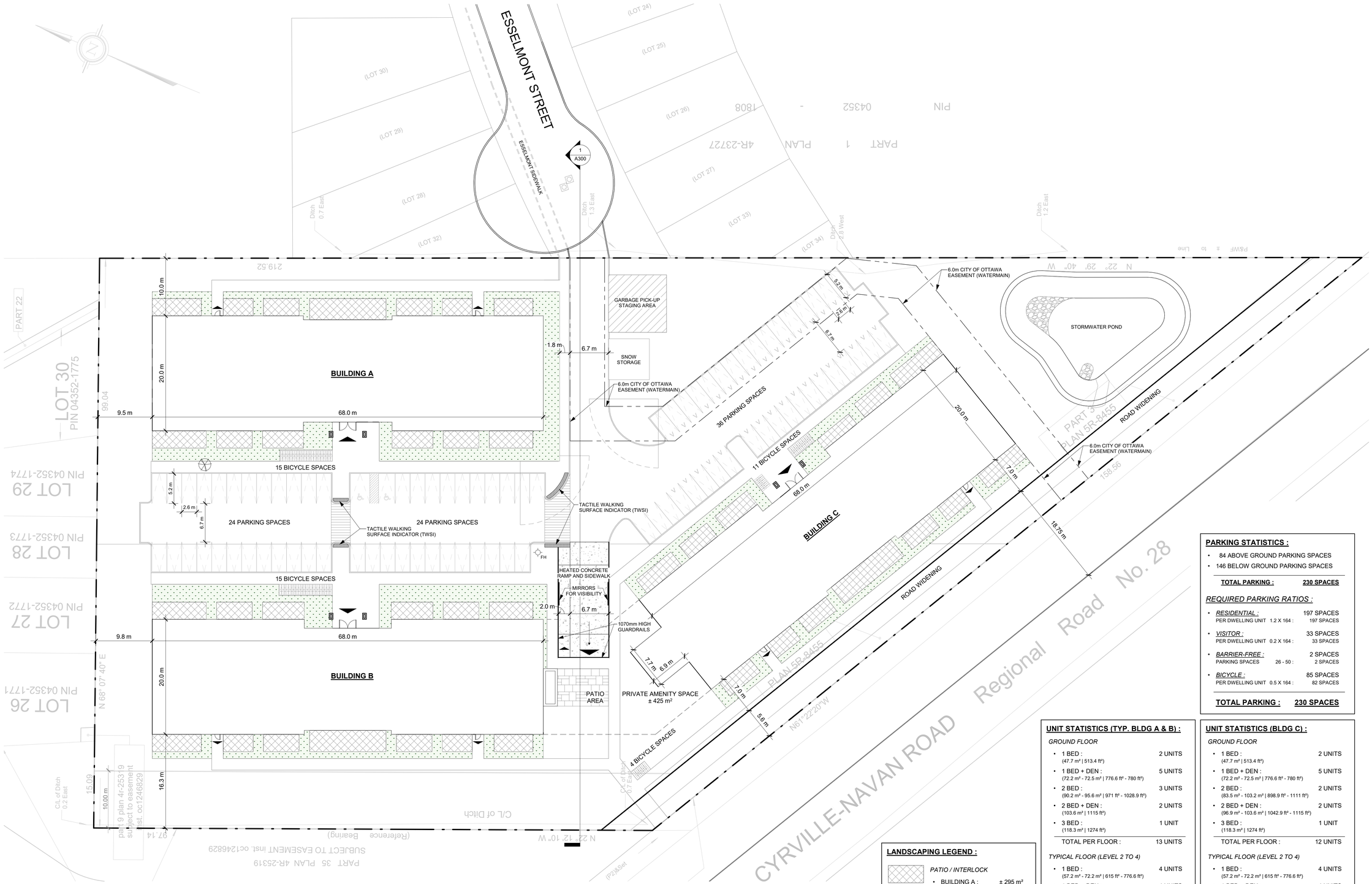
Joshua Audia, P.Eng.
Project Engineer | Transportation

Reviewed by:

Jennifer Luong, P.Eng.
Senior Project Manager | Transportation

APPENDIX A

Preliminary Site Plan



1 A050 COMPLEX SITE PLAN
1 : 300

BIM 360://22248 - 3317 Navan/22248_3317Navan_BLDG_A_DOCUMENTATION.rvt

PARKING STATISTICS :

- 84 ABOVE GROUND PARKING SPACES
- 146 BELOW GROUND PARKING SPACES

TOTAL PARKING : 230 SPACES

REQUIRED PARKING RATIOS :

- *RESIDENTIAL :* PER DWELLING UNIT 1.2 X 164 : 197 SPACES — 197 SPACES
- *VISITOR :* PER DWELLING UNIT 0.2 X 164 : 33 SPACES — 33 SPACES
- *BARRIER-FREE :* PARKING SPACES 26 - 50 : 2 SPACES — 2 SPACES
- *BICYCLE :* PER DWELLING UNIT 0.5 X 164 : 85 SPACES — 82 SPACES

TOTAL PARKING : 230 SPACES

UNIT STATISTICS (TYP. BLDG A & B) :

GROUND FLOOR

- 1 BED : (47.7 m² | 513.4 ft²) — 2 UNITS
- 1 BED + DEN : (72.2 m² - 72.5 m² | 776.6 ft² - 780 ft²) — 5 UNITS
- 2 BED : (90.2 m² - 95.6 m² | 971 ft² - 1028.9 ft²) — 3 UNITS
- 2 BED + DEN : (103.6 m² | 1115 ft²) — 2 UNITS
- 3 BED : (118.3 m² | 1274 ft²) — 1 UNIT

TOTAL PER FLOOR : 13 UNITS

TYPICAL FLOOR (LEVEL 2 TO 4)

- 1 BED : (57.2 m² - 72.2 m² | 615 ft² - 776.6 ft²) — 4 UNITS
- 1 BED + DEN : (72.2 m² - 72.6 m² | 776.6 ft² - 780 ft²) — 4 UNITS
- 2 BED : (103.6 m² | 1115 ft²) — 2 UNITS
- 2 BED + DEN : (103.6 m² | 1115 ft²) — 2 UNITS
- 3 BED : (118.4 m² - 120.5 m² | 1274 ft² - 1297 ft²) — 2 UNITS

TOTAL PER FLOOR : 13 UNITS

TOTAL UNITS PER BLDG : 55 UNITS

GRAND UNITS TOTAL : 164 UNITS

UNIT STATISTICS (BLDG C) :

GROUND FLOOR

- 1 BED : (47.7 m² | 513.4 ft²) — 2 UNITS
- 1 BED + DEN : (72.2 m² - 72.5 m² | 776.6 ft² - 780 ft²) — 5 UNITS
- 2 BED : (83.5 m² - 103.2 m² | 898.9 ft² - 1111 ft²) — 2 UNITS
- 2 BED + DEN : (96.9 m² - 103.6 m² | 1042.9 ft² - 1115 ft²) — 2 UNITS
- 3 BED : (118.3 m² | 1274 ft²) — 1 UNIT

TOTAL PER FLOOR : 12 UNITS

TYPICAL FLOOR (LEVEL 2 TO 4)

- 1 BED : (57.2 m² - 72.2 m² | 615 ft² - 776.6 ft²) — 4 UNITS
- 1 BED + DEN : (72.2 m² - 72.6 m² | 776.6 ft² - 780 ft²) — 4 UNITS
- 2 BED : (103.6 m² | 1115 ft²) — 2 UNITS
- 2 BED + DEN : (103.6 m² | 1115 ft²) — 2 UNITS
- 3 BED : (118.3 m² - 120 m² | 1274 ft² - 1292 ft²) — 2 UNITS

TOTAL PER FLOOR : 14 UNITS

TOTAL UNITS PER BLDG : 54 UNITS

GRAND UNITS TOTAL : 164 UNITS

LANDSCAPING LEGEND :

PATIO / INTERLOCK

- BUILDING A : ± 295 m²
- BUILDING B : ± 295 m²
- BUILDING C : ± 290 m²

TOTAL AREA : ± 880 m²

LANDSCAPING / SHRUBS

- BUILDING A : ± 372 m²
- BUILDING B : ± 350 m²
- BUILDING C : ± 245 m²

TOTAL AREA : ± 965 m²

LANDSCAPING TOTAL : ± 1845 m²

TOPOGRAPHY NOTES :

TOPOGRAPHIC PLAN OF SURVEY
PART OF LOT 4, CONCESSION 4 (OTTAWA FRONT)
GEOGRAPHIC TOWNSHIP OF GLOUCESTER, CITY OF OTTAWA.
Prepared by Annis, O'Sullivan, Vollebekk Ltd.

ROSSMANN ARCHITECTURE

88 Saint-Joseph Boulevard, Gatineau QC J8Y 3W5
Tel : 819-600-1555

NOT FOR CONSTRUCTION / PAS POUR CONSTRUCTION

PROJECT TEAM / ÉQUIPE DU PROJET :

ARCHITECTURE
Pierre Proulx – B. Arch. - Directeur des projets
Tania Leclerc – Technicienne en Architecture

KEY PLAN / PLAN CLÉ :

CLIENT :

ADDRESS, CITY
Tel : XXX-XXX-XXXX | www.WEBSITE.com

revision	description	date
3.3	33% REVISION 3	2023/11/13
3.2	33% REVISION 2	2023/10/25
3.1	33% REVISION 1	2023/10/18
3.0	COORDINATION 33%	2023/06/05
2.0	SCHEMATIC DESIGN	2023/04/28
1.0	PRE-DESIGN	2023/01/13

PROJECT NAME / NOM DU PROJET :

3317 NAVAN RD

3317 Navan Road, Navan ON K4B 1H9

DRAWING NAME / NOM DU DESSIN :

COMPLEX SITE PLAN

DRAWING INFORMATION / INFORMATION DU DESSIN :

PROJECT NO. / NO. DE PROJET :	22248A
DATE :	2023/11/14
DRAWN BY / DESSINÉ PAR :	T. LECLERC
REVIEWED BY / VÉRIFIÉ PAR :	P. PROULX
SCALE / ÉCHELLE :	1 : 300
PROJECT PHASE / PHASE DU PROJET :	0

DWG NO. / NO. DESSIN :

A050

REVISION NO. / NO. DE RÉVISION : 3.3

APPENDIX B

TIA Screening Form

City of Ottawa 2017 TIA Guidelines TIA Screening

1. Description of Proposed Development

Municipal Address	3317 Navan Road
Description of Location	N & E of Navan Road, S of Birkhill Place
Land Use Classification	Multifamily Residential
Development Size (units)	164 units
Development Size square metre (m^2)	-
Number of Accesses and Locations	One connection to Esselmont Street
Phase of Development	1
Buildout Year	2025

If available, please attach a sketch of the development or site plan to this form.

2. Trip Generation Trigger

Considering the Development's Land Use type and Size (as filled out in the previous section), please refer to the Trip Generation Trigger checks below.

Table notes:

1. Table 2, Table 3 & Table 4 TRANS Trip Generation Manual
2. Institute of Transportation Engineers (ITE) Trip Generation Manual 11.1 Ed.

Land Use Type	Minimum Development Size
Single-family homes	**60 units**
Multi-Use Family (Low-Rise)[1]	**90 units**
Multi-Use Family (High-Rise)[1]	**150 units**
Office[2]	**1,400 m^2**
Industrial[2]	**7,000 m^2**
Fast-food restaurant or coffee shop[2]	**110 m^2**
Destination retail[2]	**1,800 m^2**
Gas station or convenience market[2]	**90 m^2**

If the proposed development size is equal to or greater than the sizes identified above, the Trip Generation Trigger is satisfied.

3. Location Triggers

	Yes	No
Does the development propose a new driveway to a boundary street that is designated as part of the Transit Priority Network, Rapid Transit network or Cross-Town Bikeways?	☐	☑
Is the development in a Hub, a Protected Major Transit Station Area (PMTSA), or a Design Priority Area (DPA)?[2]	☐	☑

If any of the above questions were answered with 'Yes,' the Location Trigger is satisfied.

4. Safety Triggers

	Yes	No
Are posted speed limits on a boundary street are 80 kilometers per hour (km/h) or greater?	☐	☑
Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway?	☐	☑
Is the proposed driveway within the area of influence of an adjacent traffic signal or roundabout (i.e. within 300 metre [m] of intersection in rural conditions, or within 150 m of intersection in urban/ suburban conditions)?	☐	☑
Is the proposed driveway within auxiliary lanes of an intersection?	☐	☑
Does the proposed driveway make use of an existing median break that serves an existing site?	☐	☑

[2] Hubs are identified in Schedules B1 to B8 of the City of Ottawa Official Plan. PMTSAs are identified in Schedule C1 of the Official Plan. DPAs are identified in Schedule C7A and C7B of the Official. See Chapter 4 for a list of City of Ottawa Planning and Engineering documents that support the completion of TIA.

	Yes	No
Is there is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?	☐	☑
Does the development include a drive-thru facility?	☐	☑

If any of the above questions were answered with 'Yes,' the Safety Trigger is satisfied.

5. Summary

Results of Screening	Yes	No
Does the development satisfy the Trip Generation Trigger?	☑	☐
Does the development satisfy the Location Trigger?	☐	☑
Does the development satisfy the Safety Trigger?	☐	☑

If none of the triggers are satisfied, the TIA Study is complete. If one or more of the triggers is satisfied, the TIA Study must continue into the next stage (Screening and Scoping).

APPENDIX C

OC Transpo Route Maps

32

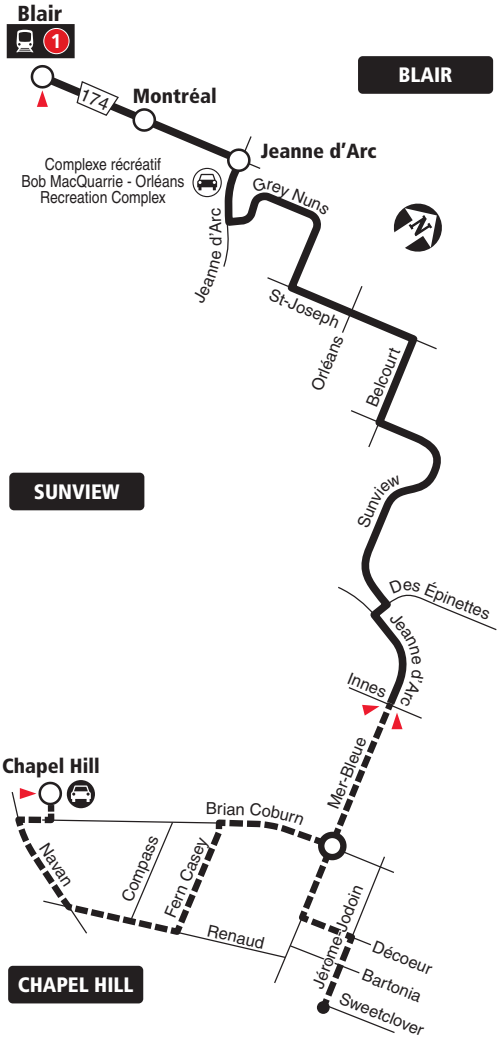
SUNVIEW CHAPEL HILL
BLAIR

Local

7 days a week / 7 jours par semaine

Selected time periods only

Périodes sélectionnées seulement



Station

No weekend service
Aucun service la fin de semaine

Park & Ride / Parc-o-bus

Timepoint / Postes d'attente

2021.09

Schedule / Horaire 613-560-1000

Text / Texto* 560560

plus your four digit bus stop number / *plus* votre numéro d'arrêt à quatre chiffres

*Standard message rates may apply / Les tarifs réguliers de messagerie texte peuvent s'appliquer

Customer Service
Service à la clientèle **613-560-5000**

Lost and Found / Objets perdus..... **613-563-4011**

Security / Sécurité **613-741-2478**

Effective September 5, 2021

En vigueur 5 septembre 2021

OC Transpo

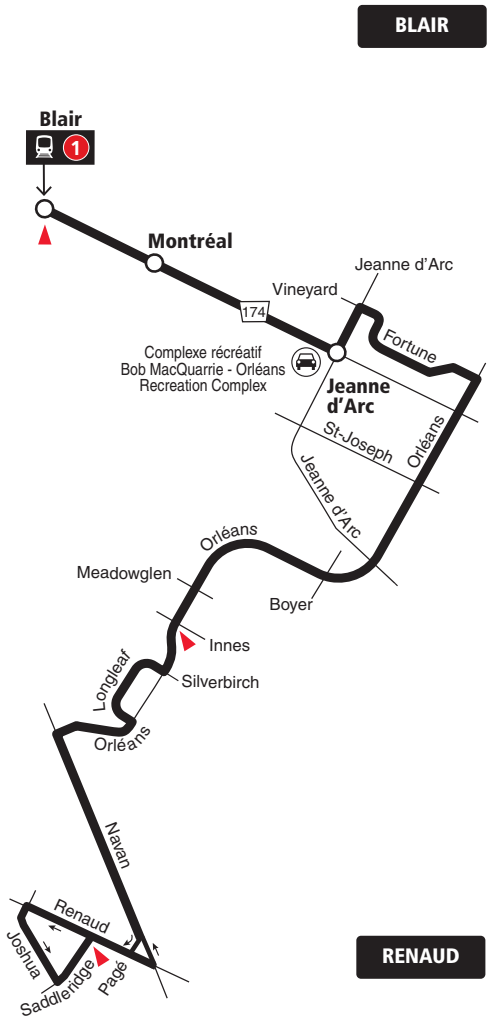
INFO 613-560-5000
octranspo.com

34 RENAUD / BLAIR

Local

7 days a week / 7 jours par semaine

All day service
Service toute la journée

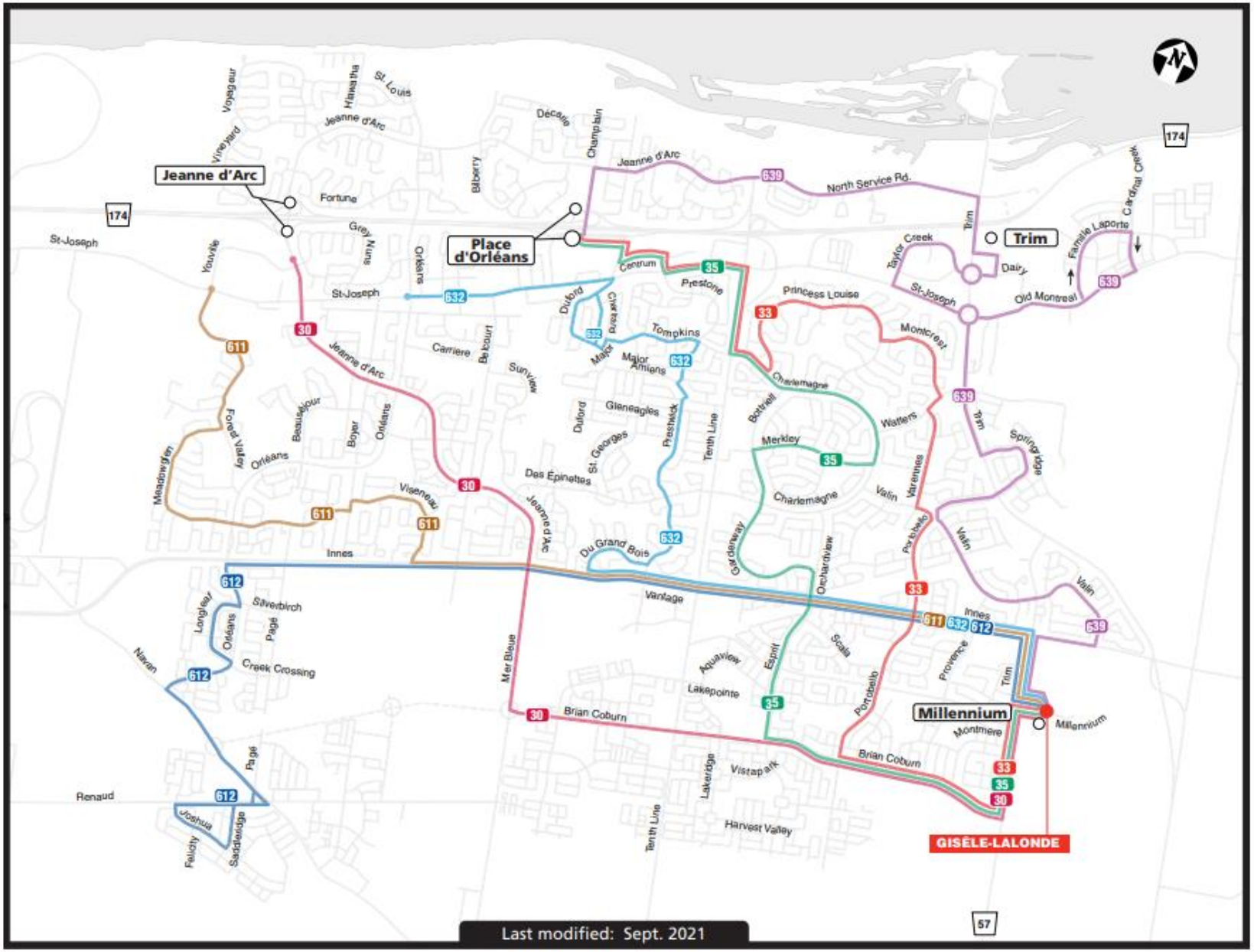


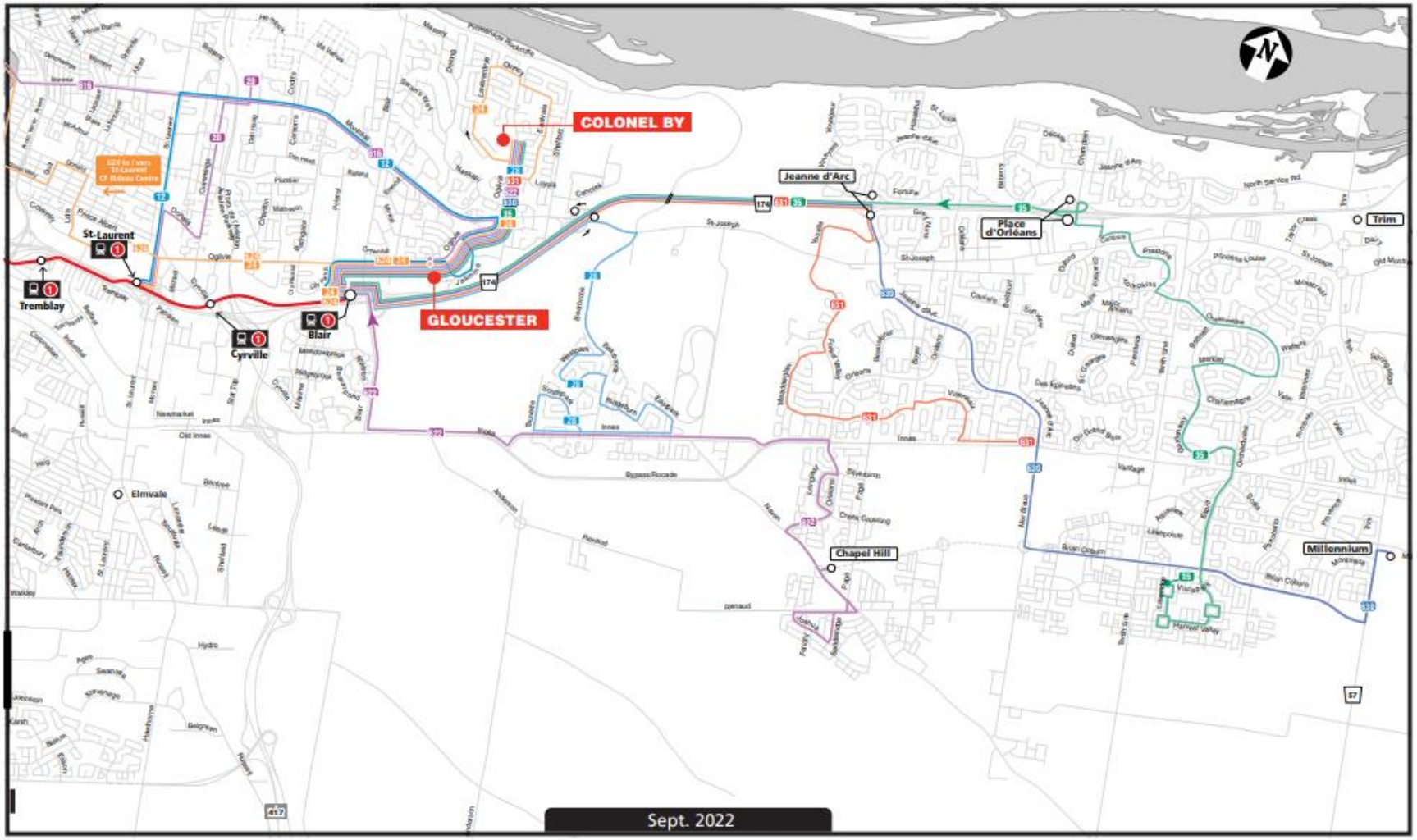
2019.07

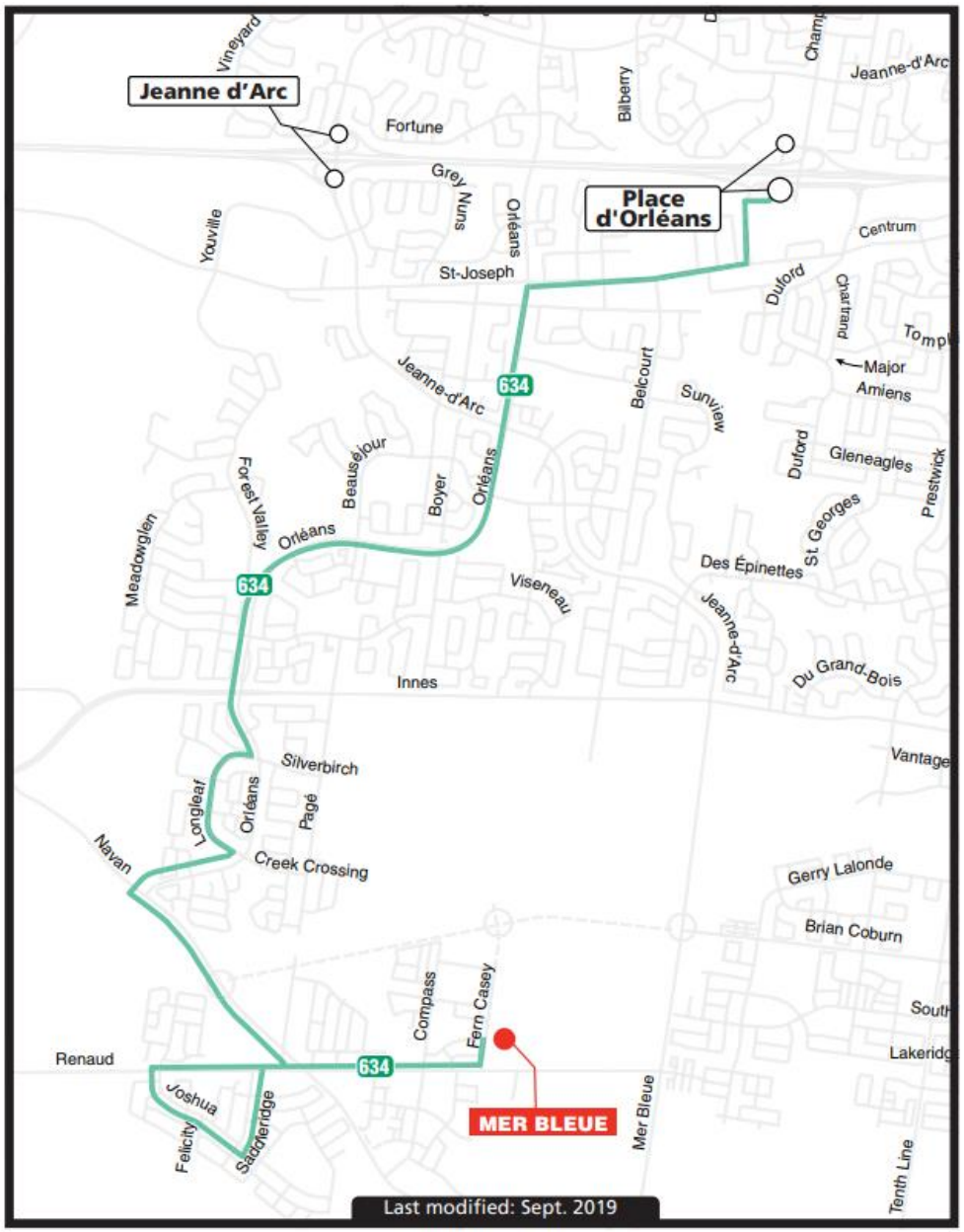
Future route after O-Train Line 1 is open
Trajet du circuit après l'ouverture de la Ligne 1 de l'O-Train

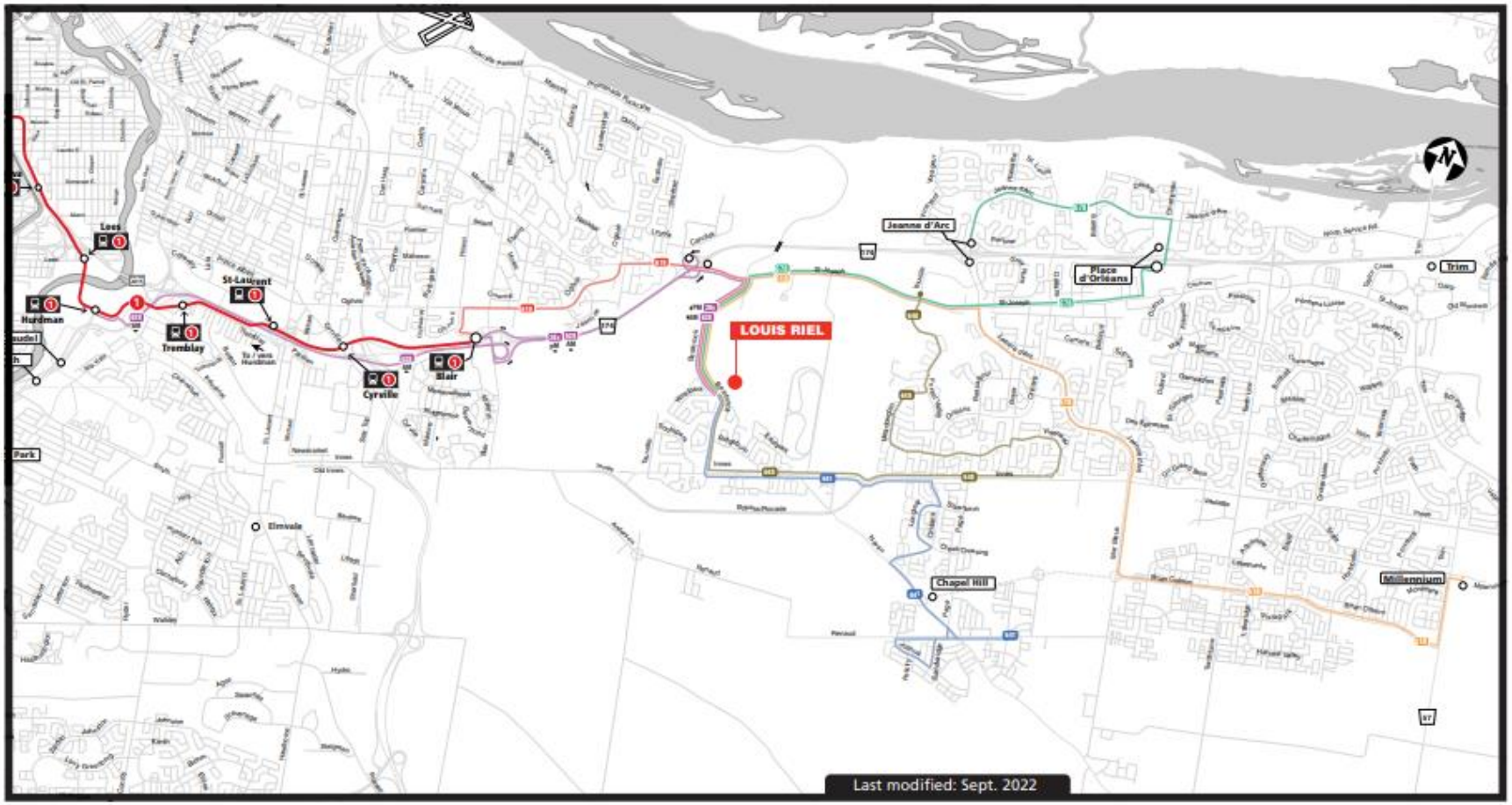
Lost and Found / Objets perdus..... **613-563-4011**
Security / Sécurité..... **613-741-2478**

OC Transpo
INFO 613-741-4390
octranspo.com


Jeanne d'Arc
Place d'Orléans
Trim
Millennium
GISÈLE-LALONDE
174
57
639
North Service Rd.
Jeanne d'Arc
Fortune
St-Joseph
Orléans
Centrum
Prestone
Princess Louise
Montcrest
Old Montreal
Tompkins
Major
Amiens
Charlemagne
Merkley
Walters
Trim
Springhope
Carrière
Belcourt
Sunview
Duford
Gleneagles
Prestwick
Tenth Line
Bothwell
St. Georges
Des Épinettes
Viseneau
Innes
Vantage
Du Grand Bois
Gardenway
Orchardview
Portobello
Valin
Varennes
Provence
Aquaview
Lakepointe
Esprit
Scala
Mer Bleue
Brian Coburn
Montmere
Vistapark
Lakeridge
Harvest Valley
Renaud
Navan
Creek Crossing
Longleaf
Silverbirch
Page
Joshua
Felicity
Sandpebridge
Meadowglen
Fox Valley
Beaujour
Boyar
Yvonne
Vineyard
Voyageur
Hiawatha
St. Louis
Décarie
Champlain
Bibeny
Grey Nuns
Taylor Creek
Dairy
Cardinal Creek
Famille Laporte
Last modified: Sept. 2021


COLONEL BY
GLOUCESTER
Jeanne d'Arc
Place d'Orléans
St-Laurent
Tremblay
Cyrville
Blair
Elmvale
Chapel Hill
Millennium
Trim
Sept. 2022


Jeanne d'Arc
Fortune
Vineyard
Grey Nuns
Orléans
Youville
St-Joseph
Bilberry
Jeanne-d'Arc
Place d'Orléans
Centrum
Duford
Chartrand
Major
Amiens
Belcourt
Sunview
Gleneagles
Prestwick
St Georges
Des Épinettes
Viseneau
Du Grand-Bois
Vantage
Gerry Lalonde
Brian Coburn
South
Lakeridge
Tenth Line
Mer Bleue
Fern Casey
Compass
MER BLEUE
Renaud
Joshua
Felicity
Saddleridge
Navan
Creek Crossing
Longleaf
Silverbirch
Pagé
Innes
Meadowglen
Forest Valley
Beauséjour
Boyer
634
Last modified: Sept. 2019


LOUIS RIEL
Jeanne d'Arc
Place d'Orléans
Trim
Millennium
Chapel Hill
Elmvale
Park
Hurdman
Tremblay
St-Laurent
Cyrville
Blair
Lees
Last modified: Sept. 2022

APPENDIX D

Traffic Count Data

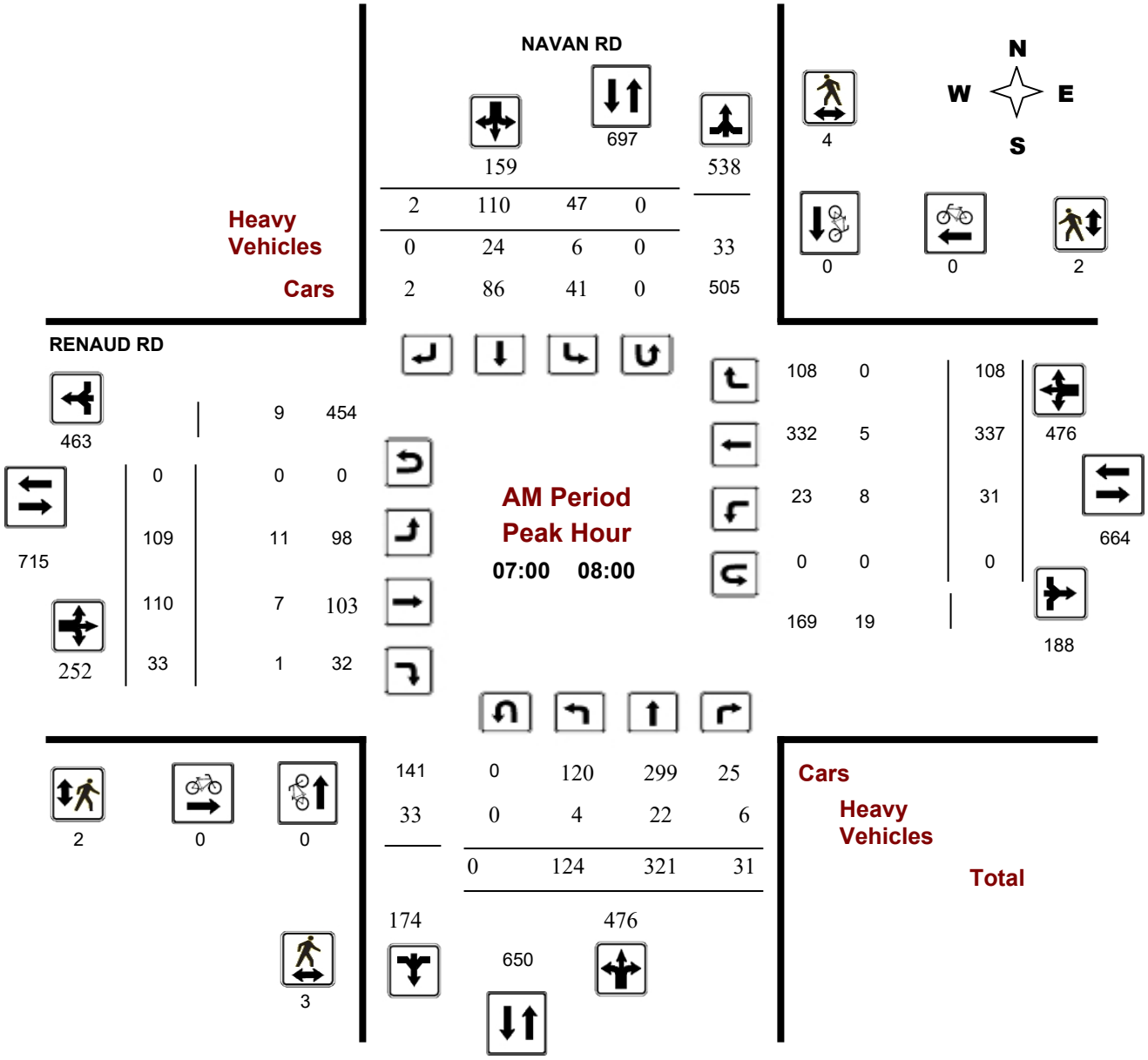
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

RENAUD RD @ NAVAN RD

Survey Date: Tuesday, October 29, 2019 **WO No:** 38897

Start Time: 07:00 **Device:** Miovision



Comments

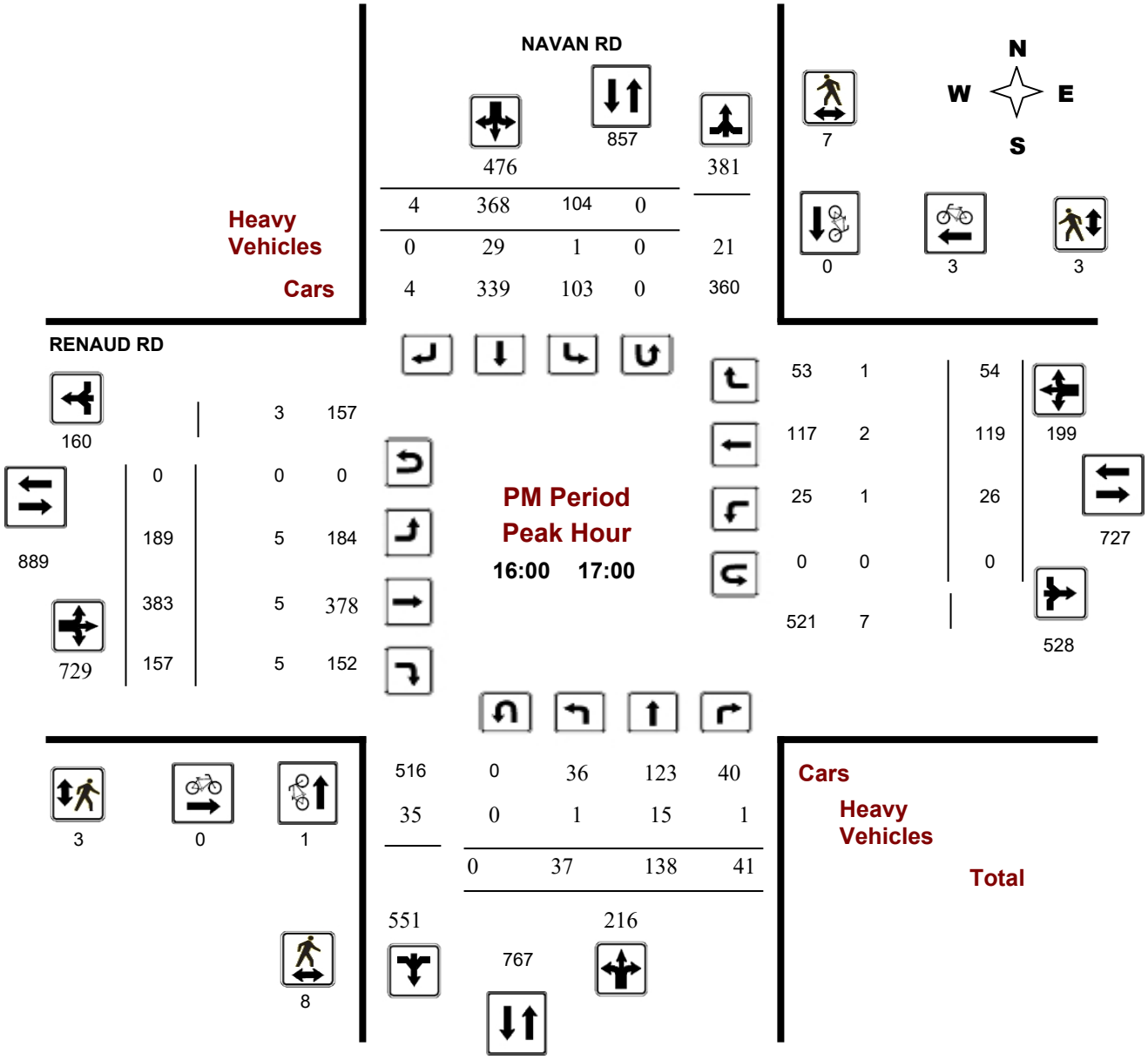
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

RENAUD RD @ NAVAN RD

Survey Date: Tuesday, October 29, 2019 **WO No:** 38897

Start Time: 07:00 **Device:** Miovision



Comments

Transportation Services - Traffic Services

Turning Movement Count - Study Results

RENAUD RD @ NAVAN RD

Survey Date: Tuesday, October 29, 2019 **WO No:** 38897

Start Time: 07:00 **Device:** Miovision

Full Study Summary (8 HR Standard)

Survey Date: Tuesday, October 29, 2019

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 0

AADT Factor

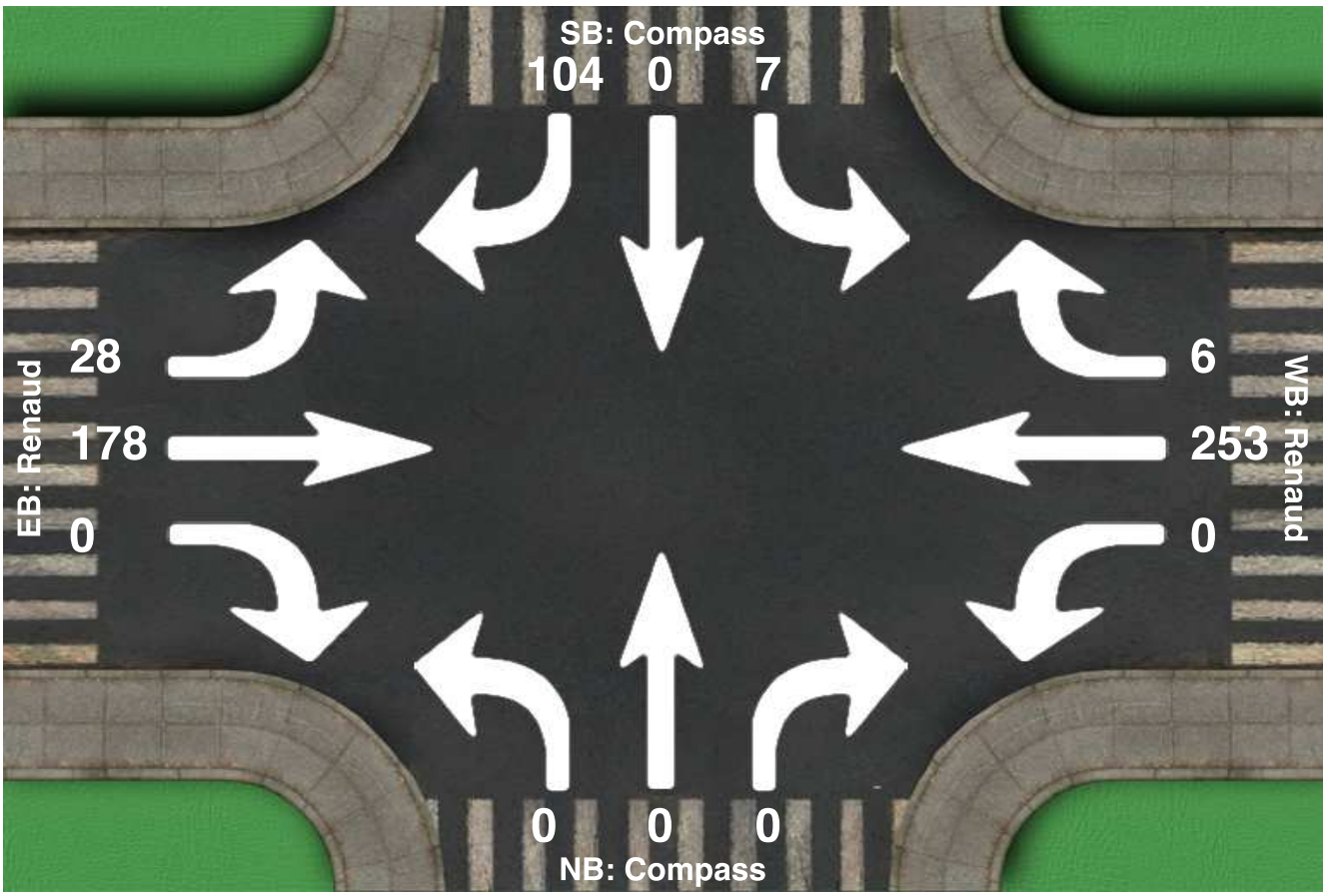
1.25

	NAVAN RD									RENAUD RD									
	Northbound				Southbound					Eastbound				Westbound					
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	124	321	31	**476**	47	110	2	**159**	**635**	109	110	33	**252**	31	337	108	**476**	**728**	**1363**
08:00 09:00	94	241	36	**371**	41	119	2	**162**	**533**	115	135	26	**276**	18	195	91	**304**	**580**	**1113**
09:00 10:00	32	182	26	**240**	30	145	6	**181**	**421**	68	88	21	**177**	12	73	67	**152**	**329**	**750**
11:30 12:30	28	153	23	**204**	46	141	3	**190**	**394**	72	73	27	**172**	15	61	42	**118**	**290**	**684**
12:30 13:30	21	153	26	**200**	43	164	5	**212**	**412**	67	96	39	**202**	16	69	44	**129**	**331**	**743**
15:00 16:00	40	176	35	**251**	68	284	5	**357**	**608**	142	266	127	**535**	32	106	50	**188**	**723**	**1331**
16:00 17:00	37	138	41	**216**	104	368	4	**476**	**692**	189	383	157	**729**	26	119	54	**199**	**928**	**1620**
17:00 18:00	33	134	25	**192**	132	305	2	**439**	**631**	155	364	137	**656**	20	107	54	**181**	**837**	**1468**
Sub Total	409	1498	243	**2150**	511	1636	29	**2176**	**4326**	917	1515	567	**2999**	170	1067	510	**1747**	**4746**	**9072**
U Turns				**0**				**0**	**0**				**0**				**0**	**0**	**0**
Total	409	1498	243	**2150**	511	1636	29	**2176**	**4326**	917	1515	567	**2999**	170	1067	510	**1747**	**4746**	**9072**
EQ 12Hr	569	2082	338	**2988**	710	2274	40	**3025**	**6013**	1275	2106	788	**4169**	236	1483	709	**2428**	**6597**	**12610**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.														**1.39**					
AVG 12Hr	512	1874	304	**2690**	639	2047	36	**2722**	**5412**	1147	1895	709	**3752**	213	1335	638	**2185**	**5937**	**11349**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.														**0.9**					
AVG 24Hr	670	2455	398	**3523**	837	2681	48	**3566**	**7089**	1503	2483	929	**4915**	279	1749	836	**2863**	**7778**	**14867**
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.														**1.31**					

Note: U-Turns provided for approach totals. Refer to 'U-Turn' Report for specific breakdown.

Intersection Peak Hour

Location: Compass at Renaud, Ottawa, On
GPS Coordinates:
Date: 2019-04-25
Day of week: Thursday
Weather: Overcast
Analyst: Basel Ansari



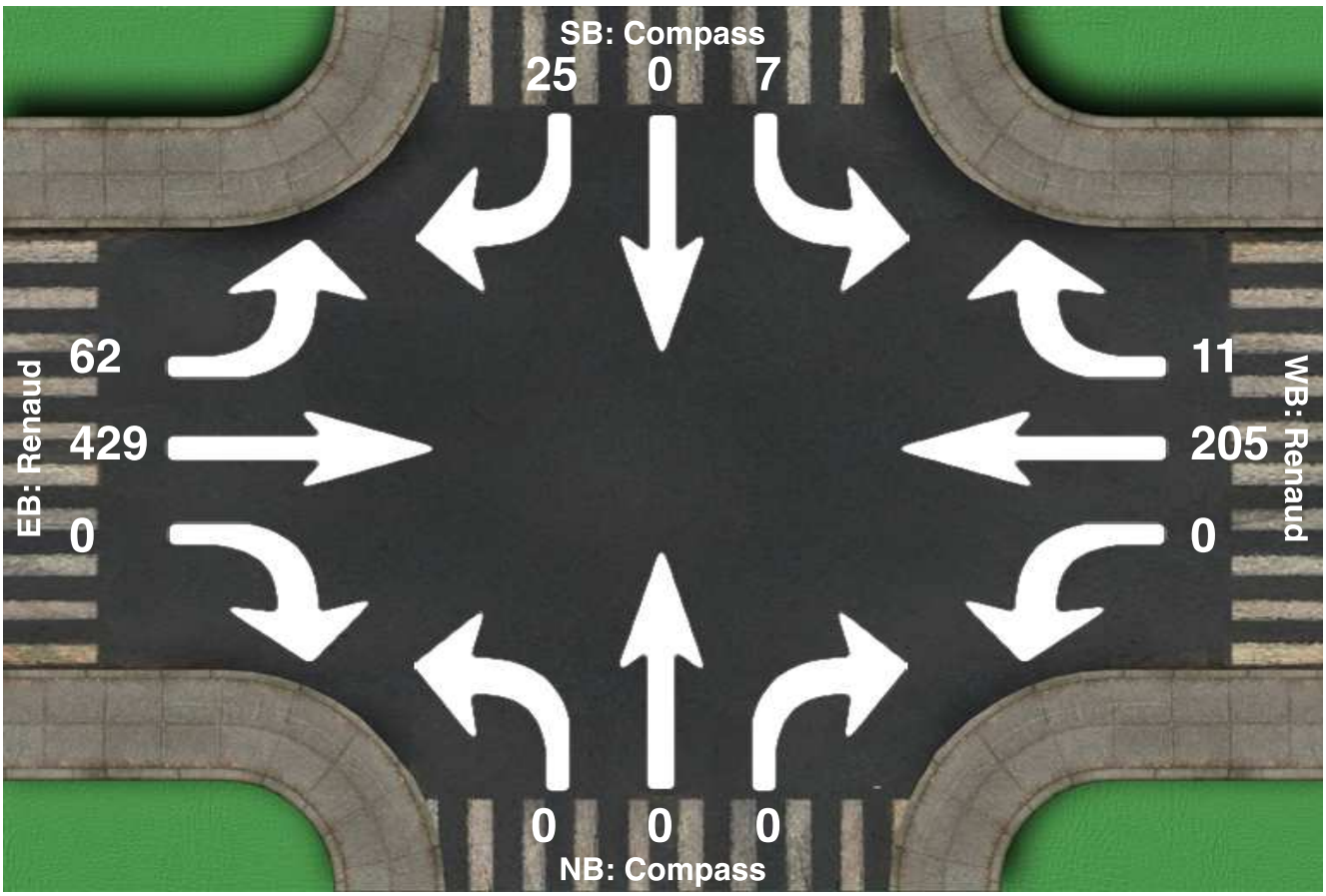
Intersection Peak Hour

07:00 - 08:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	7	0	104	0	253	6	0	0	0	28	178	0	576
Factor	0.35	0.00	0.93	0.00	0.81	0.50	0.00	0.00	0.00	0.70	0.75	0.00	0.87
Approach Factor	0.90			0.82			0.00			0.82			

Intersection Peak Hour

Location: Compass at Renaud, Ottawa, On
GPS Coordinates:
Date: 2019-04-24
Day of week: Wednesday
Weather: Overcast
Analyst: Basel Ansari



Intersection Peak Hour

16:30 - 17:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	7	0	25	0	205	11	0	0	0	62	429	0	739
Factor	0.58	0.00	0.78	0.00	0.83	0.55	0.00	0.00	0.00	0.77	0.82	0.00	0.90
Approach Factor	0.73			0.86			0.00			0.82			

APPENDIX E

Collision Records

Transportation Services - Traffic Services

Collision Details Report - Public Version

From: January 1, 2016 **To:** December 31, 2020

Location: COMPASS ST/MARKINCH RD @ RENAUD RD

Traffic Control: Stop sign **Total Collisions:** 3

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2016-Feb-24, Wed,15:40	Freezing Rain	Angle	P.D. only	Slush	South	Turning left	Truck - closed	Other motor vehicle	0
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Nov-05, Sun,13:53	Rain	SMV other	Non-fatal injury	Wet	South	Turning right	Automobile, station wagon	Pedestrian	1
2018-Sep-08, Sat,17:55	Clear	Turning movement	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Turning left	Automobile, station wagon	Other motor vehicle	

Location: FERN CASEY ST @ RENAUD RD

Traffic Control: Stop sign **Total Collisions:** 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2016-Dec-20, Tue,08:03	Clear	Angle	P.D. only	Loose snow	South	Turning left	Passenger van	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Feb-03, Sat,18:19	Snow	Angle	P.D. only	Loose snow	South	Turning right	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	

Location: GLENLIVET AVE @ RENAUD RD

Traffic Control: Stop sign **Total Collisions:** 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2016-Jan-26, Tue,11:07	Rain	Angle	P.D. only	Wet	East	Turning right	Automobile, station wagon	Other motor vehicle	0
					North	Turning left	Pick-up truck	Other motor vehicle	

Location: MELODIE, RUE DE LA @ RENAUD RD

Traffic Control: Stop sign **Total Collisions:** 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2017-Aug-08, Tue,17:52	Clear	Rear end	Non-fatal injury	Dry	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle	0
					East	Slowing or stopping	Automobile, station wagon	Other motor vehicle	

Transportation Services - Traffic Services

Collision Details Report - Public Version

From: January 1, 2016 **To:** December 31, 2020

Location: MULLIN PRIV/PENENCY PRIV @ RENAUD RD

Traffic Control: Stop sign **Total Collisions:** 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2016-Oct-22, Sat,13:14	Rain	Turning movement	Non-fatal injury	Wet	East	Turning left	Pick-up truck	Other motor vehicle	0
					West	Going ahead	Passenger van	Other motor vehicle	

Location: NAVAN RD @ SPRING VALLEY DR

Traffic Control: Stop sign **Total Collisions:** 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2019-Aug-23, Fri,22:23	Clear	Angle	Non-fatal injury	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle	0
					East	Turning left	Automobile, station wagon	Other motor vehicle	
2019-Oct-11, Fri,20:04	Clear	Turning movement	Non-fatal injury	Dry	West	Turning left	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	

Location: RENAUD RD @ NAVAN RD

Traffic Control: Traffic signal **Total Collisions:** 14

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2016-Jan-05, Tue,18:41	Clear	Angle	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Turning left	Pick-up truck	Other motor vehicle	
2016-Jan-07, Thu,16:17	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle	0
					East	Slowing or stopping	Pick-up truck	Other motor vehicle	
2017-Oct-19, Thu,13:03	Clear	Angle	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Unknown	Other motor vehicle	
2017-Oct-24, Tue,07:24	Rain	SMV other	Non-fatal injury	Wet	West	Turning left	Pick-up truck	Pedestrian	1
2018-Jul-17, Tue,21:43	Clear	Angle	P.D. only	Dry	South	Going ahead	Pick-up truck	Other motor vehicle	0
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Aug-31, Fri,09:20	Clear	Angle	Non-fatal injury	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle	0
					East	Slowing or stopping	Automobile, station wagon	Other motor vehicle	

Transportation Services - Traffic Services

Collision Details Report - Public Version

From: January 1, 2016 **To:** December 31, 2020

Location: RENAUD RD @ NAVAN RD

Traffic Control: Traffic signal **Total Collisions:** 14

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2018-Dec-10, Mon,10:05	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2019-Apr-15, Mon,08:48	Rain	Angle	Non-fatal injury	Wet	South	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2019-May-21, Tue,12:53	Clear	Angle	Non-fatal injury	Dry	South	Going ahead	Pick-up truck	Other motor vehicle	0
					West	Going ahead	Pick-up truck	Other motor vehicle	
2019-Jul-23, Tue,16:55	Clear	Rear end	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Turning right	Automobile, station wagon	Other motor vehicle	
2019-Aug-15, Thu,07:12	Clear	Rear end	P.D. only	Dry	West	Going ahead	Passenger van	Other motor vehicle	0
					West	Turning right	Automobile, station wagon	Other motor vehicle	
2020-Jan-08, Wed,06:10	Rain	Angle	P.D. only	Slush	West	Going ahead	Automobile, station wagon	Other motor vehicle	0
					North	Going ahead	Pick-up truck	Other motor vehicle	
2020-Feb-26, Wed,18:04	Snow	Angle	P.D. only	Slush	South	Turning right	Automobile, station wagon	Other motor vehicle	0
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2020-May-04, Mon,21:22	Clear	SMV other	P.D. only	Dry	West	Turning left	Automobile, station wagon	Ran off road	0

Transportation Services - Traffic Services

Collision Details Report - Public Version

From: January 1, 2016 **To:** December 31, 2020

Location: NAVAN RD btwn MARKINCH RD & FERN CASEY ST

Traffic Control: No control

Total Collisions: 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2017-Jan-12, Thu,07:31	Rain	SMV other	Non-fatal injury	Wet	East	Going ahead	Automobile, station wagon	Pedestrian	1

Location: NAVAN RD btwn SPRING VALLEY DR & MARKINCH RD

Traffic Control: No control

Total Collisions: 3

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2017-Nov-27, Mon,07:20	Clear	SMV unattended vehicle	P.D. only	Dry	West	Going ahead	Bus (other)	Unattended vehicle	0
2019-Apr-26, Fri,08:05	Clear	Turning movement	P.D. only	Dry	East	Making "U" turn	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Passenger van	Other motor vehicle	
2019-Jun-27, Thu,20:55	Clear	SMV other	P.D. only	Wet	North	Going ahead	Automobile, station wagon	Ran off road	0

Location: NAVAN RD btwn RENAUD RD & SPRING VALLEY DR

Traffic Control: No control

Total Collisions: 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2020-Jul-30, Thu,11:42	Clear	SMV other	P.D. only	Dry	East	Going ahead	Pick-up truck	Animal - domestic	0

Transportation Services - Traffic Services

Collision Details Report - Public Version

From: January 1, 2016 **To:** December 31, 2020

Location: RENAUD RD btwn NAVAN RD & PENENCY TERR/MULLIN PRIV

Traffic Control: No control

Total Collisions: 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2016-Jun-14, Tue,18:59	Clear	Rear end	P.D. only	Dry	East	Going ahead	Pick-up truck	Other motor vehicle	0
					East	Slowing or stopping	Pick-up truck	Other motor vehicle	
2018-Mar-14, Wed,06:25	Snow	Angle	P.D. only	Slush	South	Reversing	Farm tractor	Other motor vehicle	0
					West	Going ahead	Automobile, station wagon	Other motor vehicle	

Location: RENAUD RD btwn PIN CHERRY GR & FERN CASEY ST

Traffic Control: No control

Total Collisions: 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2016-Jul-07, Thu,06:17	Rain	SMV other	P.D. only	Wet	East	Going ahead	Pick-up truck	Animal - wild	0

Location: RENAUD RD btwn MELODIE, RUE DE LA & COMPASS ST/MARKINCH RD

Traffic Control: No control

Total Collisions: 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2019-Oct-24, Thu,06:41	Clear	Angle	P.D. only	Dry	South	Reversing	Pick-up truck	Other motor vehicle	0
					East	Stopped	Passenger van	Other motor vehicle	

APPENDIX F

Other Area Developments

PARSONS

TIA Report

1. SCREENING FORM

The Screening Form was prepared for the subject development and is provided in Appendix A along with responses to the most recent City comments. The Screening Form confirmed the need for a Transportation Impact Assessment (TIA) based on the Trip Generation and Location triggers due to the number of residential units and proximity to the cycling network.

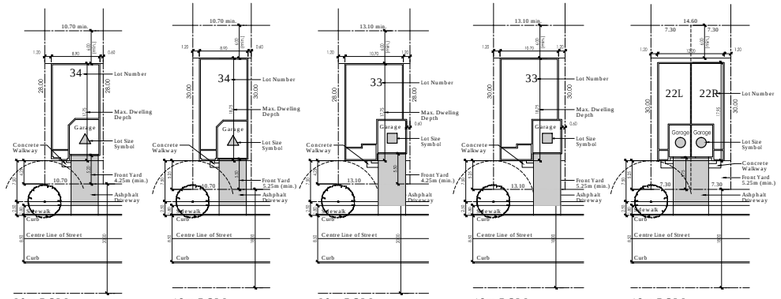
2. SCOPING

2.1. EXISTING AND PLANNED CONDITIONS

2.1.1. PROPOSED DEVELOPMENT

From the information provided, it is our understanding that the proponent is proposing to construct a residential development located at the Municipal addresses of: 3323 Navan Road, 3341 Navan Road, 6360 Renaud Road, and 3433 Navan Road. The development will consist of 852 residential units. The site is currently vacant fields with some residential development occurring to the north and west. Two collector roads are proposed to connect Navan Road to Renaud Road. The local context of the site is provided as Figure 1 and the proposed Site Plan is provided as Figure 2. As the site is currently zoned as a Development Reserve Zone (as per Part 14-Sections 237-238, Zoning By-Law No. 2008-250).

Figure 1: Local Context



SITE INFORMATION:

ZONING :	R3Z
FRONT YARD :	3.0m(min.)
INTERIOR SIDE YARD :	1.2m(min.) ONE SIDE 0.6m(min.) OTHER SIDE
EXTERIOR SIDE YARD :	3.0m(min.)
REAR YARD :	6.0m(min.)

GARAGE TO BE RECESSED (Further from Front Lot Line) FROM EITHER A COVERED FRONT PORCH OR ANY PORTION OF BUILDING FRONT WALL.

PHASE TWO - TOTAL SITE AREA 240,758m²

SINGLE LOTS:

SINGLE LOT AREA=	76,801m²
□ 13.1m (43ft) LOTS =	49
△ 10.67m (35ft) LOTS =	64
✱ Indicates Possible Bungalow Lot	

SEMI LOTS:

○ 6.1m (20ft) LOTS =	62
◇ 7.7m (25'-6"ft) LOTS =	8

FREEHOLD TOWNHOMES:

20' TOWNHOUSE LOTS =	34
25' BUNGALOW TOWNHOUSE LOTS =	24
TOTAL LOTS =	241

MULTI-UNIT SITES: PH2 - MBLK-B

MBLK-B SITE AREA=	12,182m²	
DENSITY =	63 d.u. / 1.21 ha =	52.0 (Units/ha.)
URBAN TOWNHOMES =		19 UNITS
BACK to BACK NEW YORKERS =		12 UNITS
FLATS =		16 UNITS
LOFT UNITS =		16 UNITS
TOTAL MULTI-UNITS =		63 UNITS
COMMERCIAL UNITS =		8 UNITS

MULTI-UNIT SITES: PH2 - MBLK-D

MBLK-D SITE AREA=	12,428m²	
DENSITY =	77 d.u. / 1.24 ha =	62.1 (Units/ha.)
URBAN TOWNHOMES =		5 UNITS
TERRACE HOMES =		46 UNITS
BACK to BACK NEW YORKERS =		26 UNITS
TOTAL MULTI-UNITS =		77 UNITS

MULTI-UNIT SITES: PH2 - MBLK-E

MBLK-E SITE AREA=	12,756m²	
DENSITY =	82 d.u. / 1.27 ha =	64.5 (Units/ha.)
URBAN TOWNHOMES =		22 UNITS
FLATS =		48 UNITS
BACK to BACK NEW YORKERS =		12 UNITS
TOTAL MULTI-UNITS =		82 UNITS

MULTI-UNIT SITES: PH2 - MBLK-F

MBLK-F SITE AREA=	13,789m²	
DENSITY =	70 d.u. / 1.37 ha =	51.1 (Units/ha.)
TERRACE HOMES =		32 UNITS
FLATS =		16 UNITS
LOFT UNITS =		22 UNITS
TOTAL MULTI-UNITS =		70 UNITS
COMMERCIAL UNITS =		11 UNITS

MULTI-UNIT SITES: PH2 - MBLK-G

MBLK-G SITE AREA=	23,250m²	
DENSITY =	173 d.u. / 2.32 ha =	74.5 (Units/ha.)
TERRACE HOMES =		58 UNITS
URBAN TOWNHOMES =		23 UNITS
FLATS =		80 UNITS
BACK to BACK NEW YORKERS =		12 UNITS
TOTAL MULTI-UNITS =		173 UNITS

OTHER AREAS: PH2

PARK AREA=	12,000m²
AREA OF ROADS =	75,464m²
AREA OF ROADS WIDENING =	2,342m²

SCALE 10 100 300
0 50 200

M.David Blakely Architect Inc.
210 Colonnade Rd. Suite 2 Nepean, Ontario
Phone (613) 226-8811 Fax (613) 226-7942

GENERAL NOTES:
1. THE CONTRACTOR IS RESPONSIBLE FOR CHECKING AND VERIFYING ALL DIMENSIONS, ANY DISCREPANCY MUST BE REPORTED TO M. DAVID BLAKELY ARCHITECT INC..
2. ALL WORK AND MATERIALS TO BE IN COMPLIANCE WITH ALL CODES, REGULATIONS, AND BY-LAWS.
3. ADDITIONAL DRAWINGS MAY BE ISSUED FOR CLARIFICATION TO ASSIST THE PROPER EXECUTION OF WORK. SUCH DRAWINGS WILL HAVE THE SAME MEANING AND INTENT AS IF THEY WERE INCLUDED WITH THE PLANS IN CONTRACT DOCUMENTS.
4. DO NOT SCALE DRAWINGS.
5. THIS DRAWING SHALL NOT BE USED OR COPIED WITHOUT THE AUTHORIZATION OF THE ARCHITECT.
6. THIS DRAWING SHALL NOT BE USED FOR PERMIT OR CONSTRUCTION UNLESS THE DRAWING BEARS THE ARCHITECTS SEAL AND SIGNATURE

No.	DATE	DESCRIPTION	INIT.
33.	15/06/15	MARKINCH CROSS SECTION	SM
32.	27/05/15	LOT SETBACK LOCATIONS	SM
31.	24/03/15	LOT 234, 235 - ORIENTATION	SM
30.	18/03/15	LOT SETBACK LOCATIONS	SM
29.	24/02/15	REVISED TYPICAL LOT LAYOUTS	SM
28.	02/10/14	REVISED BELCOURT BLVD.	SM
27.	24/09/14	STREET #5 TO 20m ROW	SM
26.	12/09/14	BUNGALOW TOWNS ADDED	SM
25.	26/08/14	BUNGALOW TOWNS ADDED	SM
24.	26/08/14	BUNGALOW TOWNS ADDED	SM
23.	30/07/14	REVISED LOT NUMBERS	SM
22.	15/07/14	REVISED SITE LAYOUT	SM
21.	10/03/14	REVISED SITE LAYOUT	SM
20.	19/02/14	REVISED SITE LAYOUT	SM
19.	13/02/14	REVISED LAYOUT FOR MODELS	SM
18.	06/02/14	REVISED SITE PHASE LAYOUT	SM
17.	30/01/14	PRIVATE STREET MBLK-G	SM
16.	24/01/14	REVISED SITE LAYOUT	SM
15.	21/01/14	REVISED SITE LAYOUT	SM
14.	29/11/13	REVISED SITE LAYOUT	SM
13.	30/09/13	REVISED SITE LAYOUT	SM
12.	20/09/13	REVISED SITE LAYOUT	SM
11.	30/08/13	REVISED SITE LAYOUT	SM
10.	30/07/13	REVISED SITE LAYOUT	SM
9.	16/11/12	SITE INFOMATION ADDED	SM
8.	19/09/12	SOUTH SIDE SIDEWALK	SM
7.	10/09/12	BELCOURT ROAD ADDED	SM
6.	17/08/12	REV. PHIIc - MIXED USE AREA	SM
5.	10/07/12	REV. PHIIc - MIXED USE AREA	SM
4.	04/07/12	REV. PHIIc - PARK	SM
3.	21/06/12	REV. R.O.W.'s & PHIIc	SM
2.	11/04/12	AS PER ASHCROFT	SM
1.	10/02/11	FOR REVIEW	SM

REVISIONS

A - DETAIL NUMBER
B - SHEET NUMBER (DETAIL REQUIRED)
C - SHEET NUMBER (DETAIL LOCATION)

SEAL:

PROJECT:
EASTBORO
NAVAN ROAD
OTTAWA, ONTARIO

CLIENT:
ASHCROFT HOMES

DRAWING TITLE:
PRELIMINARY SITE PLAN
PHASE TWO,

DATE:	SCALE:	SHEET No.:
JAN., 2011.	1:1,500	SP-2
DRAWN BY: SBM	CHECKED: MDB	

\\Jan-p-c\1\2015 PROJECTS \Ashcroft\Eastboro\Site Plan EB Ph II SP1 150615-Rev33.dwg, 15/06/2015 12:34:35 PM, DWG To PDF.pc3

Figure 9: 'New' 2021 Total Site-Generated Traffic Volumes (Phase 1)

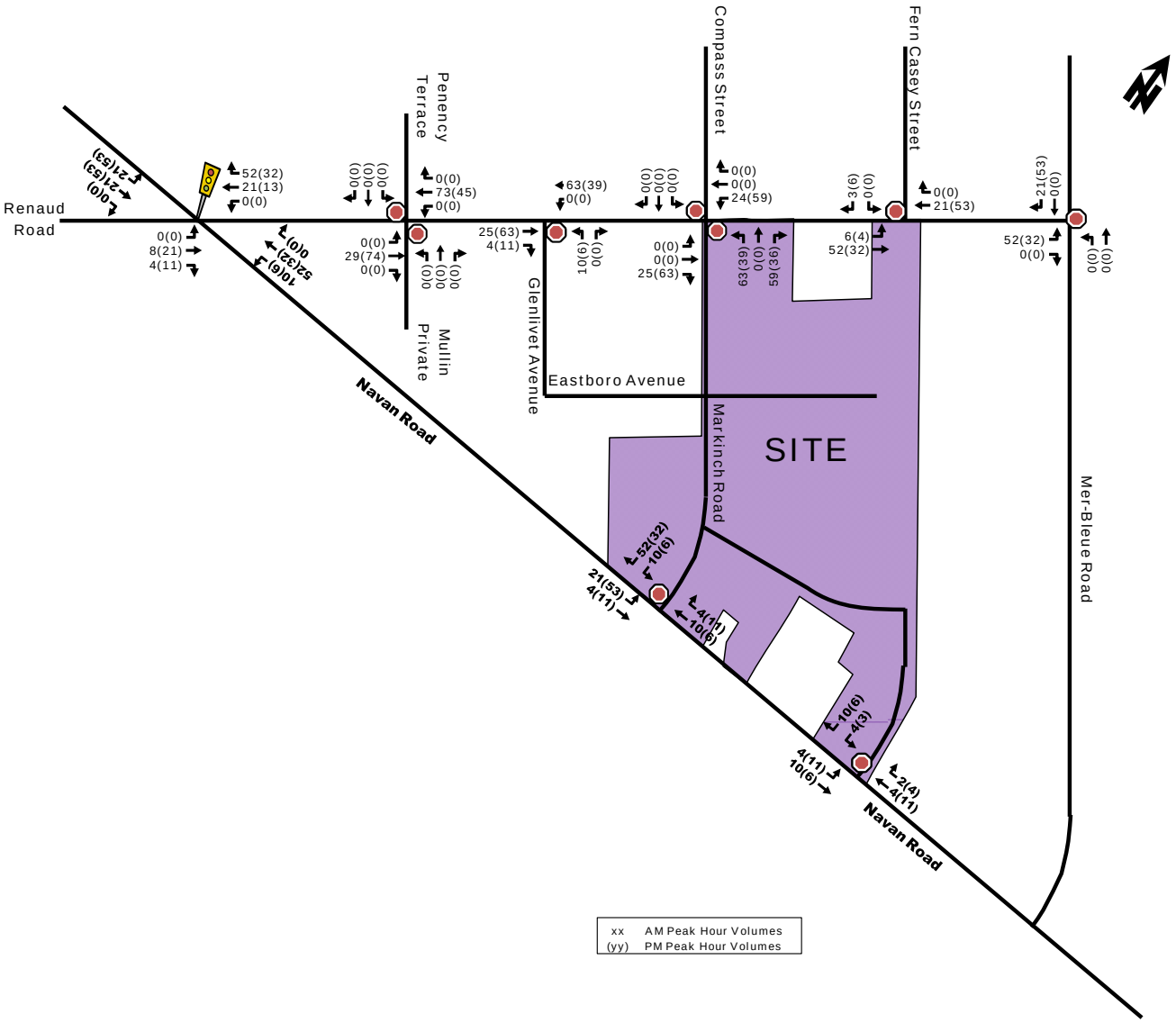


Figure 10: 'New' 2026 Total Site-Generated Traffic Volumes (Full Buildout)

3.2. BACKGROUND NETWORK TRAFFIC

3.2.1. TRANSPORTATION NETWORK PLANS

As outlined within the Ottawa Transportation Master Plan Affordable Network and the Ward 19 Planned Construction Projects map, the following projects are identified for south Orleans:

- Chapel Hill Park & Ride: A new park and ride facility is anticipated to be constructed during 2018 at Navan Road, on the north side of Brian Coburn Boulevard;
- Brian Coburn Boulevard: Four-lane extension between Navan Road and Orleans Boulevard between 2018-2021, and an extension continuing to Innes Road is anticipated during Phase 2 (2020 and 2025); and
- Mer Bleue Road at Willow Aster Road: Mattamy has a southbound left turn lane approved through the RMA and functional design process for access into the current phases of Summerside West. It is assumed that this turn lane will be constructed by 2020.

3.2.2. BACKGROUND GROWTH

The following background traffic growth through the immediate study area (summarized in Table 16) was calculated based on historical traffic count data (2013, 2016 and 2018) provided by the City of Ottawa at the Navan/Renaud intersection. Detailed background traffic growth analysis is included as Appendix D.

Table 24: Navan/Renaud Historical Background Growth (2013 – 2018)

Time Period	Percent Annual Change				
	North Leg	South Leg	East Leg	West Leg	Overall
8 hrs	1.99%	2.87%	4.08%	3.36%	**3.00%**
AM Peak	4.32%	3.49%	8.07%	7.47%	**5.79%**
PM Peak	1.37%	2.54%	2.99%	2.22%	**2.24%**

As shown in Table 24, the Navan/Renaud intersection as a whole has experienced approximately 2% to 6% annual growth within recent years (calculated as a weighted average). The counts during 2013 and 2016 were performed prior to the completion of Brian Cobourn. The 2018 count (performed after the opening of Brian Cobourn) shows a significant decline in traffic volumes experienced at this intersection. Table 25 displays the drop in traffic over the two-year period.

Table 25: Navan/Renaud Historical Background Growth (2016 and 2018)

Time Period	Percent Annual Change				
	North Leg	South Leg	East Leg	West Leg	Overall
8 hrs	-11.75%	-13.71%	-11.73%	-7.90%	**-11.27%**
AM Peak	-11.04%	-19.66%	-12.37%	-11.70%	**-13.55%**
PM Peak	-12.08%	-15.39%	-7.62%	-3.39%	**-9.38%**

With the decline in volume and with Renaud Road planning to have traffic calming measures such as speed bumps constructed in the near future, a continued large percentage growth along Renaud Road is not anticipated. Navan Road shows very little development south of the proposed Site. It should be noted that the generated traffic from the Summerside development located along the east side of Mer Bleue Road (see section 3.2.3) will be included in the analysis. As such, a 2% per annum traffic growth factor has been assumed along Mer Bleue Road, Renaud Road, and Navan Road for the horizon years 2021, and 2026.

The resulting future background traffic for the horizon years 2021, 2026 are depicted as Figures 12, and 13 respectively.

3.2.3. OTHER AREA DEVELOPMENTS

MATTAMY – SUMMERSIDE PHASE 1-3

Mattamy Summerside West is located at 2405 Mer Bleue Road and 2496 Tenth Line Road, directly north of the subject Phases 4-6. Phase 4 will connect through Phase 1 to Tenth Line, and Phases 5-6 will connect through Phases 2-3 to Mer Bleue Road.

Currently, Phase 1 is predominantly completed along Tenth Line Road with residents occupying a significant portion of the development. Phase 2 is under construction adjacent to Mer Bleue Road and Phase 3 estimated to be completed by 2020. In total, Phases 1-3 will include 430 single family homes, 260 townhomes, and 120 low-rise apartment units.

MATTAMY– SUMMERSIDE PHASES 4-6

Mattamy Summerside West Phases 4 to 6 (2564 Tenth Line) is a Greenfields development located in south Orleans. The subdivision is in Ward 19 at Cumberland Concession 11 S Pt Lot 4.

The development will include 778 units, consisting of 374 townhomes and 404 single family homes. The subdivision will connect to the previous developed Summerside Phases to the north, accessing Tenth Line Road via Sweetvalley Drive and Mer Bleue via Willow Aster Road. The estimated date of occupancy is 2020 for Phase 4, 2024 for Phase 5, and 2024 for Phase 6.

For purposes of this study, the site generated traffic for Mattamy Summerside West 5 (2024) and 6 (2024) will be added to the 2026 background growth horizon. Figure 11, displays the additional traffic being applied.

Figure 11: Mattamy-Summerside Traffic Volumes (2024)

TRAILS EDGE DEVELOPMENT

Richcraft is constructing a development between Brian Coburn Boulevard and Renaud Road with a total of 213 single units, 276 Townhouses, an Elementary School and a Mixed-Use Centre. Currently, the site has been partially developed and some of the units have been constructed.

2564 TENTH LINE ROAD

Mattamy is constructing a development east of this development between Tenth Line Road and Mer-Bleue Road with a total of 374 Townhomes and 404 Single Homes. Phases 1-3 have been partially complete for this development, and the final phases are currently applying for approval.

3.3. DEMAND RATIONALIZATION

2021 HORIZON – PHASE 1

The 2021 background peak hour traffic volumes (illustrated in Figure 12) have been generated from the existing turning movement counts and the application of the growth rates discussed in Section 3.2.2. The background operations are summarized in Table 26 and the detailed synchro worksheets are provided in Appendix E.

Figure 12: 2021 Background Peak Hour Traffic Volumes

Figure 13: 2026 Background Peak Hour Traffic Volumes

Table 27: 2026 Background Conditions Performance at Study Area Intersections

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/c / delay (s)	Movement	Delay (s)	LoS	v/c
Navan Road/Renaud Road (S)	B(A)	0.70(0.52)	WBT(EBT)	29.9(24.5)	B(A)	0.61(0.49)
Glenlivet Avenue/Renaud Road (U)	B(B)	13.5(14.7)	NB(NB)	1.2(0.7)	-	-
Compass Street/Markinch Road/Renaud Road (U)	B(B)	11.5(12.7)	SB(SB)	2.1(1.0)	-	-
Fern Casey Street/Renaud Road (U)	B(C)	13.7(19.4)	SBL(SBL)	4.0(3.5)	-	-
Mer-Bleue Road/Renaud Road (U)	B(D)	15.0(27.2)	NB(SB)	12.8(23.6)	-	-
Penency Terrace/Mullin Private/Renaud Road (U)	B(B)	14.6(14.6)	SB(NB)	1.6(1.4)	-	-

Notes:
- Analysis of signalized intersections assumes a PHF of 1.0 and a saturation flow rate of 1800 veh/h/lane.
- (U) - Unsignalized Intersection
- (S) - Signalized Intersection

Figure 16: Total Projected 2021 Traffic Volumes

Table 29: Total Projected 2021 Performance at Study Area Intersection

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/c / delay (s)	Movement	Delay (s)	LoS	v/c
Navan Road/Renaud Road (S)	E(A)	0.91(0.53)	WBT(EBT)	36.8(24.9)	B(A)	0.67(0.48)
Glenlivet Avenue/Renaud Road (U)	B(B)	13.6(14.8)	NB(NB)	1.4(0.9)	-	-
Compass Street/Markinch Road/Renaud Road (U)	C(C)	15.4(21.2)	NB(NB)	4.5(3.1)	-	-
Fern Casey Street/Renaud Road (U)	B(C)	12.7(16.4)	SBL(SBL)	3.8(3.5)	-	-
Mer-Bleue Road/Renaud Road (U)	A(B)	9.8(14.1)	EB(EB)	9.3(12.5)	-	-
Markinch Road/Navan Road (U)	B(B)	13.0(11.1)	SB(SB)	1.3(0.9)	-	-
Belcourt Boulevard/Navan Road (U)	B(B)	12.1(11.2)	SB(SB)	0.3(0.3)	-	-
Penency Terrace/Mullin Private/Renaud Road (U)	C(C)	15.2(15.3)	SB(NB)	1.6(1.4)	-	-

Notes:
- Analysis of signalized intersections assumes a PHF of 1.0 and a saturation flow rate of 1800 veh/h/lane.
- (U) - Unsignalized Intersection
- (S) - Signalized Intersection

As shown in Table 29, the signalized intersection of Navan/Renaud 'as a whole' is projected to operate at a LoS 'B' or better, while the critical movement operates at a LoS 'E' or better, during both morning and afternoon peak hour periods.

With regards to unsignalized intersections, the critical movements at all intersections within the study area are projected to operate at a LoS 'C' or better during morning and afternoon peak hour periods.

TOTAL PROJECTED 2026 CONDITIONS

The total projected 2026 traffic volumes were created by combining the 2026 site-generated traffic volumes with the background 2026 traffic volumes (as per the Forecasting Report). The resulting total projected 2026 traffic volumes are illustrated in Figure 17.

Table 30 provides a summary of the total projected 2026 operations at the study area intersections. The SYNCHRO model output of total projected 2026 conditions is provided within Appendix I.

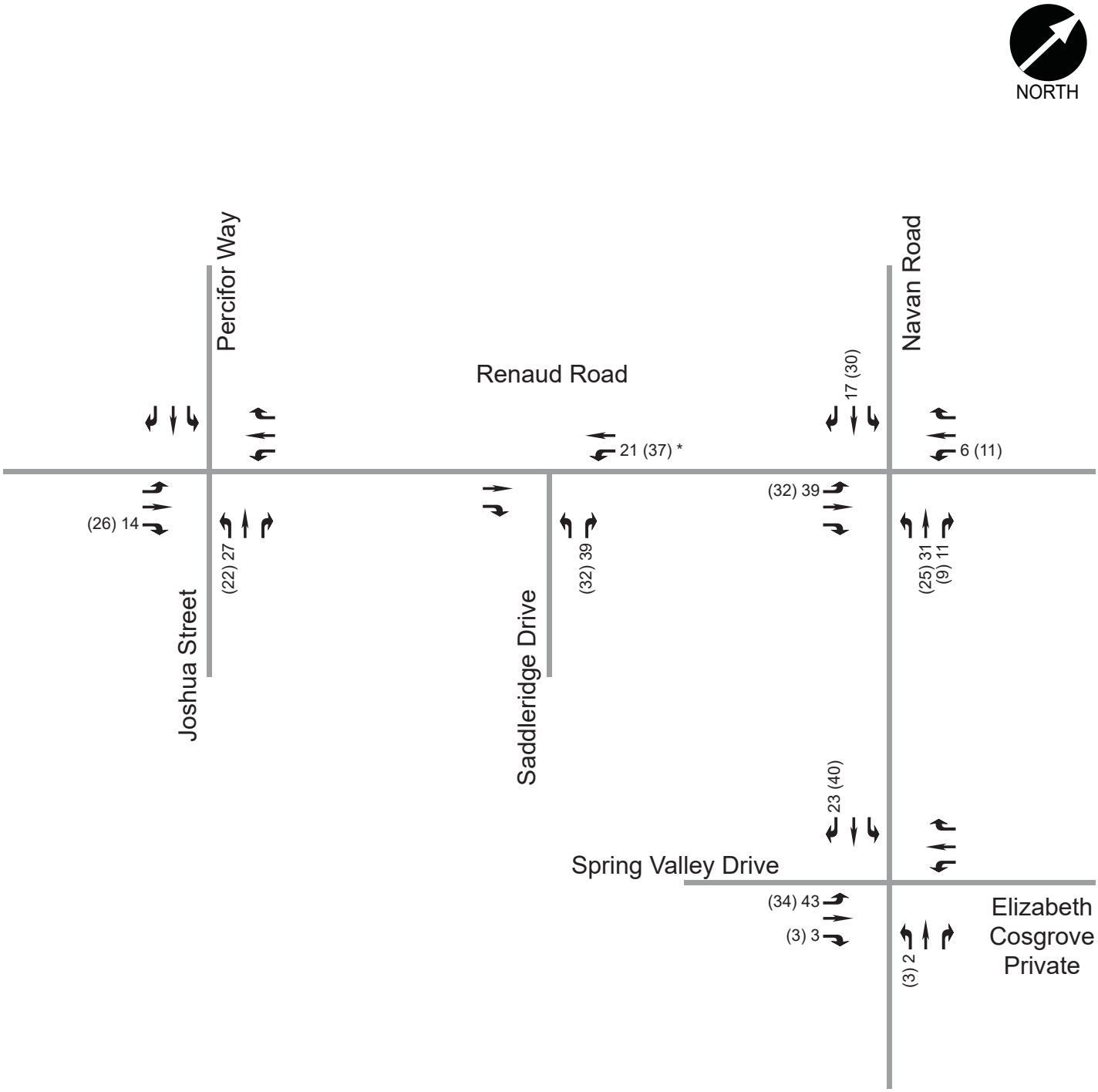
Figure 17: Total Projected 2026 Traffic Volumes

IBI

Spring Valley Trails Phases 5 & 6
Transportation Impact Assessment

Exhibit 1:
Site Location

PROJECT No. 123888
DATE: February 2020
SCALE: N.T.S.



LEGEND

Permitted Movements

xxx (xxx) Weekday AM (PM) Peak Hour Vehicular Volume

* It has been assumed that these vehicles will turn right at Page Road (not shown) rather than at the intersection of Navan Road & Renaud Road.

IBI

Spring Valley Trails Phases 5 & 6
Transportation Impact Assessment

Exhibit 6:
Site-Generated
AM & PM Peak Hour
Traffic Volumes

PROJECT No. 123888
DATE: February 2020
SCALE: N.T.S.

J.L. Richards
& Associates Limited
864 Lady Ellen Place
Ottawa, ON Canada
K1Z 5M2
Tel: 613 728 3571
Fax: 613 728 6012

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

Figure 1: Local Context

Trip Distribution

The projected distribution of site-generated traffic was derived based on existing travel patterns, the site's connections to/from the surrounding road network, our local area knowledge (e.g. the location and proximity of employment, other area shopping, communities, recreational opportunities, etc.). For analysis purposes and to be consistent with other area studies, the following approximate distribution of projected site-generated traffic was assumed:

10%	to/from the northeast via Brian Coburn Boulevard;
5%	to/from the north via Orleans Boulevard;
55%	to/from the west via Navan Road;
5%	to/from the northeast via Renaud Road;
5%	to/from the southeast via Navan Road; and
+ 20%	to/from the southwest via Renaud Road.
100%	

Trip Assignment

Based on the above assumed distribution, projected 'new' site-generated traffic was assigned to the study area network and is depicted in the following **Figure 14**. Similarly, projected 'pass-by' site-generated traffic, which represents existing traffic temporarily diverted to/from the subject site, is depicted in the following **Figure 15**.

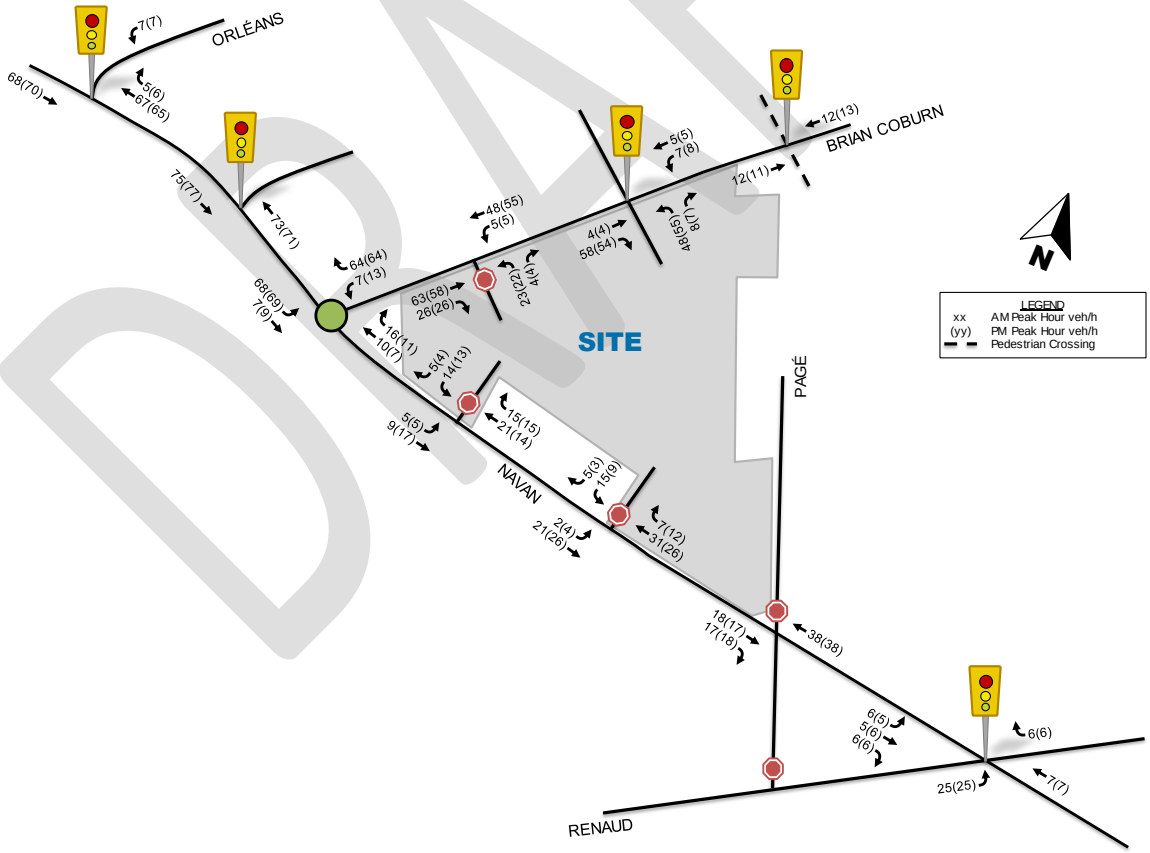


Figure 14: 'New' Projected Site-Generated Traffic

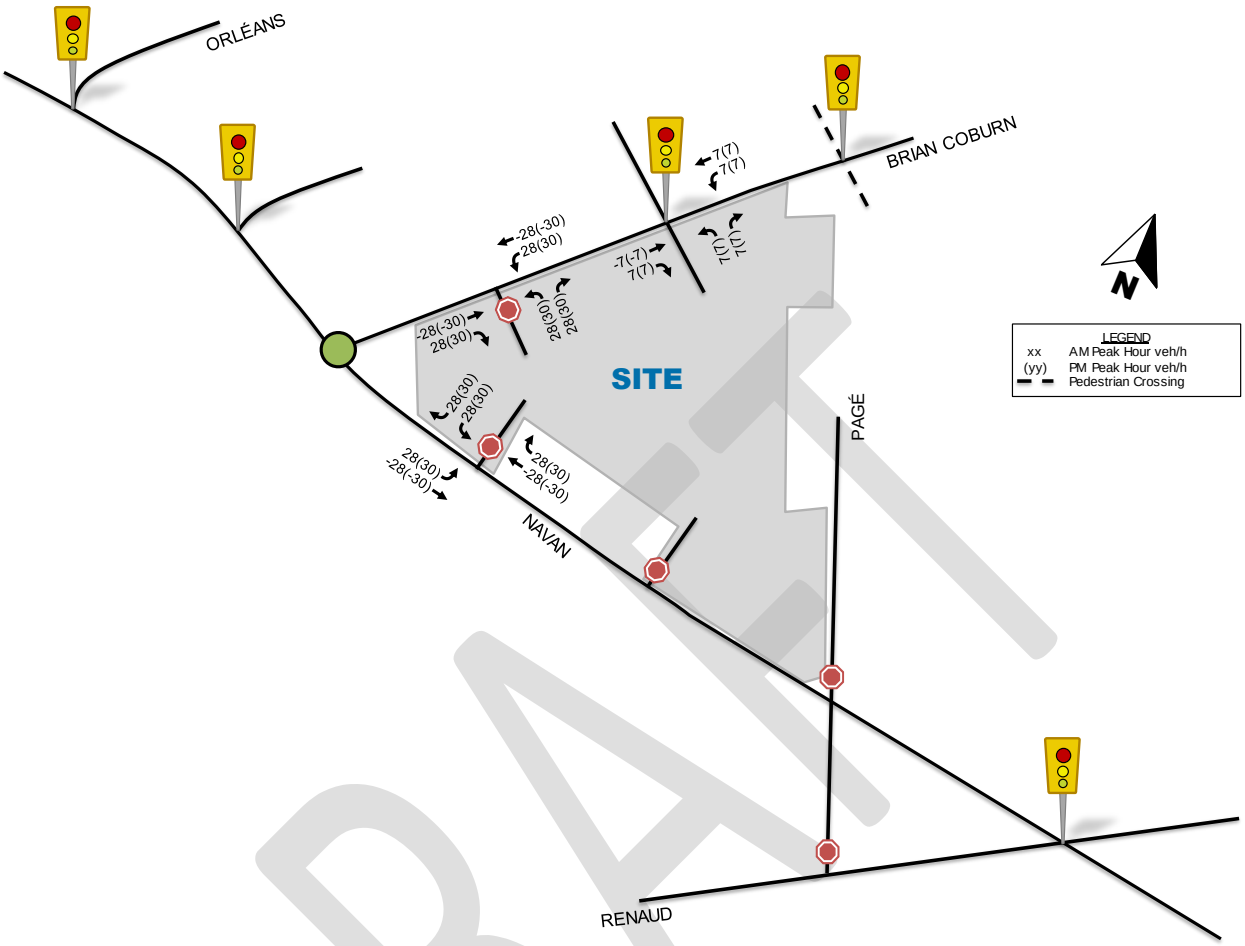


Figure 15: 'Pass-By' Projected Site-Generated Traffic

3.2 Background Network Travel Demands

Transportation Network Plans

According to Ottawa's current Transportation Master Plan (TMP), and identified in the *2031 Affordable Network* plan, Brian Coburn Boulevard will be extended further as a Phase 2 project (i.e. expected between the years 2020 and 2025. Identified in the *2031 Affordable Rapid Transit and Transit Priority* plan, dedicated transit lanes will be provided between Brian Coburn Boulevard and the Blackburn Hamlet Bypass, and isolated transit priority measures are planned along Brian Coburn Boulevard, between Navan Road and Tenth Line.

The alignment of the Brian Coburn Boulevard extension (with dedicated transit priority lanes) is currently being studied as part of the City lead environmental assessment (EA), titled *Brian Coburn Extension / Cumberland Transitway Westerly Alternate Corridor EA Study*. The latest update on this study was posted June 28, 2021 on the City's website, which included a functional design of the preferred alignment of the Brian Coburn Boulevard extension and a two-lane roundabout at the Brian Coburn/Navan intersection. Attached as **Appendix D** is the recommended ultimate design that was presented at the final public consultation meeting.

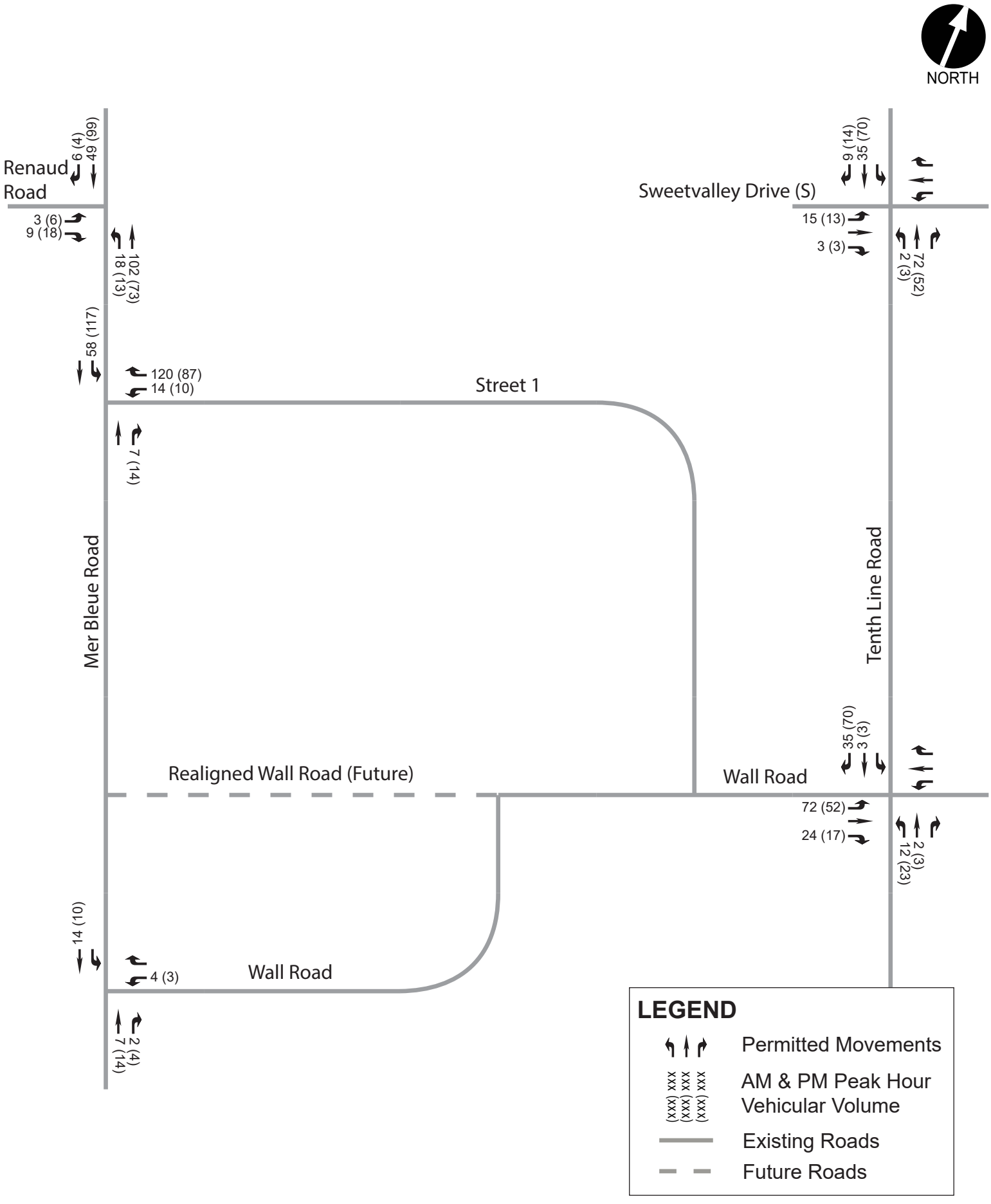
IBI

Mer Bleue Phase 1
Transportation Impact Assessment

Exhibit 1:
Site Location

PROJECT No. 116761

SCALE: 0m 100m 200m



IBI

Mer Bleue Phase 1
Transportation Impact Assessment

Exhibit 6:
Site Generated
AM & PM Peak Hour
Traffic Volumes

PROJECT No. 116761

SCALE: N.T.S.

APPENDIX G

Strategic Long-Range Model Snapshots

TRANS Regional Model

Version 2.15 - Assigned June 16, 2020

AM Peak Hour Total Traffic Volume

Navan/Renaud Area

2011 Model - Basecase

N/A

User Initials: TIMW
Plot Prepared: Jan 17, 2023
EMME Scenario: 21713

TRANS

Legend

AM Peak Hour Total Traffic Volume

1000 2000 3000 4000 5000

N

Distance (m)

100 1000

BLACKBURN HAMLET

NOTRE-DAME-DES-CHAMPS

Renaud Road

Dolman Ridge Rd.

Navan Rd

TRANS Regional Model

Version 2.15 - Assigned June 16, 2020

AM Peak Hour Total Traffic Volume

Navan/Renaud Area

2031 Model - Basecase

N/A

User Initials: TIMW
Plot Prepared: Jan 17, 2023
EMME Scenario: 21715

TRANS

Legend

AM Peak Hour Total Traffic Volume

1000 2000 3000 4000 5000

N

Distance (m)

100 1000

APPENDIX H

Signal Timing Data

Traffic Signal Timing

City of Ottawa, Public Works Department

Traffic Signal Operations Unit

Intersection:	***Main:*** Navan	***Side:***	Renaud
Controller:	**MS 3200**	**TSD:**	**6576**
Author:	Matthew Anderson	**Date:**	01-Feb-2023

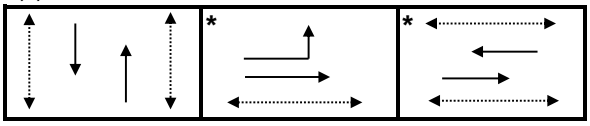
Existing Timing Plans†

	Plan				**Ped Minimum Time**		
	AM Peak 1	**Off Peak** 2	**PM Peak** 3	**Night** 4	***Walk***	***DW***	***A+R***
Cycle	Free	Free	Free	Free			
Offset	-	-	-	-			
NB Thru	max = 66.7	max = 41.7	max = 66.7	max = 41.7	12	23	3.7+3.0
SB Thru	max = 66.7	max = 41.7	max = 66.7	max = 41.7	12	23	3.7+3.0
EB Left	max = 15.0	max = 15.0	max = 15.0	-	-	-	3.3+1.7
EB Thru	max = 46.5	max = 31.5	max = 46.5	max = 21.5	7	9	3.3+3.2
WB Thru	max = 46.5	max = 31.5	max = 46.5	max = 21.5	7	9	3.3+3.2

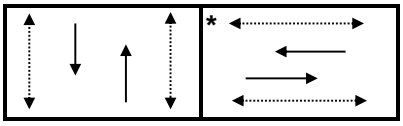
Navan is considered the north-south road

Phasing Sequence‡

Plan: 1,2,3



Plan: 4



Notes: 1) All plans have a minimum recall of 35s green on the NS thru movement

Schedule

Weekday

Time	Plan
0:15	4
6:00	1
9:00	2
15:00	3
18:30	2
22:00	4

Weekend

Time	Plan
0:15	4
7:00	2
22:00	4

Notes

†: Time for each direction includes amber and all red intervals

‡: Start of first phase should be used as reference point for offset

Asterisk (*) Indicates actuated phase

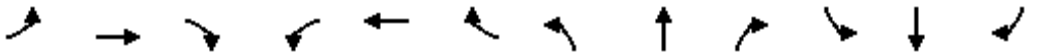
(fp): Fully Protected Left Turn

◄·····► Pedestrian signal

Cost is $61.16 ($54.12 + HST)

APPENDIX I

Existing Synchro Analysis



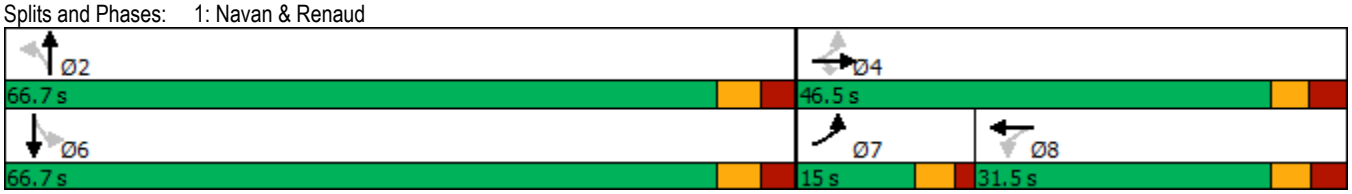
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	109	110	33	31	337	108	124	321	31	47	110	2
Future Volume (vph)	109	110	33	31	337	108	124	321	31	47	110	2
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	125.0		30.0	20.0		0.0	40.0		0.0	25.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	35.0			45.0			60.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97	0.99	0.99		1.00	1.00		1.00	1.00	
Frt			0.850		0.964			0.987			0.998	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1537	1664	1469	1353	1672	0	1642	1635	0	1510	1484	0
Flt Permitted	0.202			0.679			0.677			0.347		
Satd. Flow (perm)	327	1664	1424	958	1672	0	1167	1635	0	551	1484	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			37		13			6			1	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		492.5			382.5			712.0			235.8	
Travel Time (s)		35.5			27.5			42.7			14.1	
Confl. Peds. (#/hr)	4		3	3		4	2		2	2		2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	10%	7%	3%	25%	2%	1%	3%	6%	20%	12%	20%	1%
Adj. Flow (vph)	121	122	37	34	374	120	138	357	34	52	122	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	121	122	37	34	494	0	138	391	0	52	124	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		10.0			10.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	7	4	4	8	8		2	2		6	6	
Switch Phase												

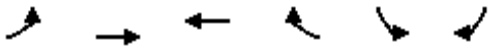
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	10.0	24.6	24.6	24.5	24.5		41.7	41.7		41.7	41.7	
Total Split (s)	15.0	46.5	46.5	31.5	31.5		66.7	66.7		66.7	66.7	
Total Split (%)	13.3%	41.1%	41.1%	27.8%	27.8%		58.9%	58.9%		58.9%	58.9%	
Maximum Green (s)	10.0	39.9	39.9	25.0	25.0		60.0	60.0		60.0	60.0	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	1.7	3.3	3.3	3.2	3.2		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.6	6.6	6.5	6.5		6.7	6.7		6.7	6.7	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min		Min	Min	
Walk Time (s)		7.0	7.0	7.0	7.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		9.0	9.0	9.0	9.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		3	3	4	4		2	2		2	2	
Act Effct Green (s)	41.1	39.5	39.5	25.3	25.3		22.9	22.9		22.9	22.9	
Actuated g/C Ratio	0.54	0.52	0.52	0.33	0.33		0.30	0.30		0.30	0.30	
v/c Ratio	0.37	0.14	0.05	0.11	0.87		0.39	0.79		0.31	0.28	
Control Delay	13.9	11.8	4.7	21.9	44.0		24.0	35.6		25.3	21.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	13.9	11.8	4.7	21.9	44.0		24.0	35.6		25.3	21.0	
LOS	B	B	A	C	D		C	D		C	C	
Approach Delay		11.8			42.6			32.6			22.3	
Approach LOS		B			D			C			C	
Queue Length 50th (m)	7.1	7.6	0.0	3.1	58.7		14.4	46.3		5.3	12.3	
Queue Length 95th (m)	19.6	20.2	4.6	10.5	#135.2		27.0	72.9		13.4	23.2	
Internal Link Dist (m)		468.5			358.5			688.0			211.8	
Turn Bay Length (m)	125.0		30.0	20.0			40.0			25.0		
Base Capacity (vph)	338	885	774	319	566		933	1309		440	1187	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.36	0.14	0.05	0.11	0.87		0.15	0.30		0.12	0.10	

Intersection Summary

Area Type: Other
Cycle Length: 113.2
Actuated Cycle Length: 75.8
Natural Cycle: 80
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 31.0 Intersection LOS: C
Intersection Capacity Utilization 81.7% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

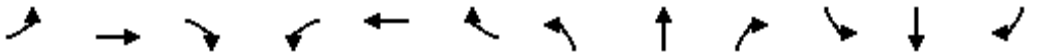
Splits and Phases: 1: Navan & Renaud





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	28	178	253	6	7	104
Future Volume (vph)	28	178	253	6	7	104
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.997		0.874	
Flt Protected		0.993			0.997	
Satd. Flow (prot)	0	1662	1723	0	1521	0
Flt Permitted		0.993			0.997	
Satd. Flow (perm)	0	1662	1723	0	1521	0
Link Speed (k/h)		40	40		40	
Link Distance (m)		250.5	316.5		385.8	
Travel Time (s)		22.5	28.5		34.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	2%	7%	3%	2%	2%	2%
Adj. Flow (vph)	31	198	281	7	8	116
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	229	288	0	124	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	5.0		5.0	
Two way Left Turn Lane						
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	43.2%	ICU Level of Service	A
Analysis Period (min)	15		



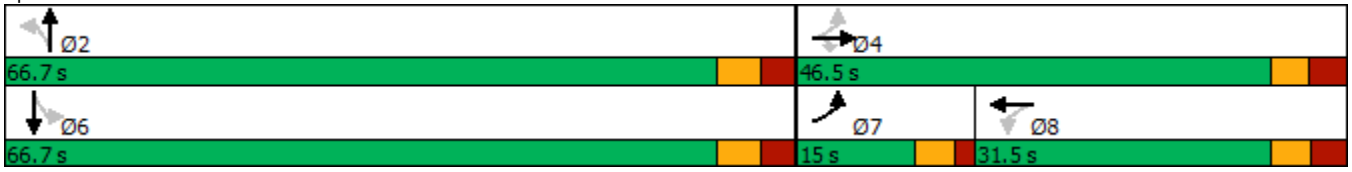
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	189	383	157	26	119	54	37	138	41	104	368	4
Future Volume (vph)	189	383	157	26	119	54	37	138	41	104	368	4
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	125.0		30.0	20.0		0.0	40.0		0.0	25.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	35.0			45.0			60.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99		0.95	0.98	0.98		1.00	0.99		1.00	1.00	
Frt			0.850		0.953			0.965			0.999	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1642	1745	1455	1626	1638	0	1642	1587	0	1674	1632	0
Flt Permitted	0.460			0.514			0.389			0.633		
Satd. Flow (perm)	784	1745	1385	866	1638	0	671	1587	0	1111	1632	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			106		19			20			1	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		492.5			382.5			712.0			235.8	
Travel Time (s)		35.5			27.5			42.7			14.1	
Confl. Peds. (#/hr)	7		8	8		7	3		3	3		3
Confl. Bikes (#/hr)						3			1			
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	3%	2%	4%	4%	2%	2%	3%	9%	3%	1%	9%	1%
Adj. Flow (vph)	210	426	174	29	132	60	41	153	46	116	409	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	210	426	174	29	192	0	41	199	0	116	413	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		10.0			10.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	7	4	4	8	8		2	2		6	6	

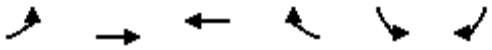
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	10.0	24.6	24.6	24.5	24.5		41.7	41.7		41.7	41.7	
Total Split (s)	15.0	46.5	46.5	31.5	31.5		66.7	66.7		66.7	66.7	
Total Split (%)	13.3%	41.1%	41.1%	27.8%	27.8%		58.9%	58.9%		58.9%	58.9%	
Maximum Green (s)	10.0	39.9	39.9	25.0	25.0		60.0	60.0		60.0	60.0	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	1.7	3.3	3.3	3.2	3.2		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.6	6.6	6.5	6.5		6.7	6.7		6.7	6.7	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min		Min	Min	
Walk Time (s)		7.0	7.0	7.0	7.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		9.0	9.0	9.0	9.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		3	3	4	4		2	2		2	2	
Act Effct Green (s)	29.5	27.8	27.8	12.9	12.9		22.0	22.0		22.0	22.0	
Actuated g/C Ratio	0.46	0.44	0.44	0.20	0.20		0.35	0.35		0.35	0.35	
v/c Ratio	0.42	0.56	0.26	0.17	0.55		0.18	0.35		0.30	0.73	
Control Delay	15.3	18.4	7.3	26.2	28.9		16.5	15.6		17.4	26.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	15.3	18.4	7.3	26.2	28.9		16.5	15.6		17.4	26.4	
LOS	B	B	A	C	C		B	B		B	C	
Approach Delay		15.2			28.5			15.7			24.5	
Approach LOS		B			C			B			C	
Queue Length 50th (m)	12.7	31.4	4.0	2.6	16.4		2.9	13.4		8.6	36.7	
Queue Length 95th (m)	33.2	73.3	17.2	9.6	39.7		9.4	29.4		20.7	70.1	
Internal Link Dist (m)		468.5			358.5			688.0			211.8	
Turn Bay Length (m)	125.0		30.0	20.0			40.0			25.0		
Base Capacity (vph)	502	1130	934	351	676		613	1452		1015	1492	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.42	0.38	0.19	0.08	0.28		0.07	0.14		0.11	0.28	

Intersection Summary

Area Type: Other
Cycle Length: 113.2
Actuated Cycle Length: 63.6
Natural Cycle: 80
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 19.6 Intersection LOS: B
Intersection Capacity Utilization 81.5% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 1: Navan & Renaud



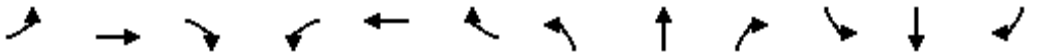


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	62	429	205	11	7	25
Future Volume (vph)	62	429	205	11	7	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.993		0.895	
Flt Protected		0.994			0.989	
Satd. Flow (prot)	0	1720	1717	0	1545	0
Flt Permitted		0.994			0.989	
Satd. Flow (perm)	0	1720	1717	0	1545	0
Link Speed (k/h)		40	40		40	
Link Distance (m)		250.5	316.5		385.8	
Travel Time (s)		22.5	28.5		34.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	2%	3%	3%	2%	2%	2%
Adj. Flow (vph)	69	477	228	12	8	28
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	546	240	0	36	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	5.0		5.0	
Two way Left Turn Lane						
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 52.9%		ICU Level of Service A	
Analysis Period (min) 15			

APPENDIX J

Background Synchro Analysis



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	152	134	38	38	395	164	139	417	43	70	152	2
Future Volume (vph)	152	134	38	38	395	164	139	417	43	70	152	2
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	125.0		30.0	20.0		0.0	40.0		0.0	25.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	35.0			45.0			60.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97	0.99	0.99		1.00	1.00		1.00	1.00	
Frt			0.850		0.956			0.986			0.998	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1537	1664	1469	1353	1657	0	1642	1632	0	1510	1483	0
Flt Permitted	0.132			0.671			0.659			0.287		
Satd. Flow (perm)	214	1664	1424	947	1657	0	1136	1632	0	455	1483	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			38		17			7			1	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		492.5			382.5			712.0			235.8	
Travel Time (s)		35.5			27.5			42.7			14.1	
Confl. Peds. (#/hr)	4		3	3		4	2		2	2		2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	10%	7%	3%	25%	2%	1%	3%	6%	20%	12%	20%	1%
Adj. Flow (vph)	152	134	38	38	395	164	139	417	43	70	152	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	152	134	38	38	559	0	139	460	0	70	154	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		10.0			10.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	7	4	4	8	8		2	2		6	6	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	10.0	24.6	24.6	24.5	24.5		41.7	41.7		41.7	41.7	
Total Split (s)	15.0	46.5	46.5	31.5	31.5		66.7	66.7		66.7	66.7	
Total Split (%)	13.3%	41.1%	41.1%	27.8%	27.8%		58.9%	58.9%		58.9%	58.9%	
Maximum Green (s)	10.0	39.9	39.9	25.0	25.0		60.0	60.0		60.0	60.0	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	1.7	3.3	3.3	3.2	3.2		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.6	6.6	6.5	6.5		6.7	6.7		6.7	6.7	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min		Min	Min	
Walk Time (s)		7.0	7.0	7.0	7.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		9.0	9.0	9.0	9.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		3	3	4	4		2	2		2	2	
Act Effct Green (s)	41.7	40.1	40.1	25.2	25.2		27.4	27.4		27.4	27.4	
Actuated g/C Ratio	0.52	0.50	0.50	0.31	0.31		0.34	0.34		0.34	0.34	
v/c Ratio	0.56	0.16	0.05	0.13	1.06		0.36	0.83		0.45	0.31	
Control Delay	22.4	13.9	5.3	24.7	85.5		22.3	37.1		30.7	20.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	22.4	13.9	5.3	24.7	85.5		22.3	37.1		30.7	20.6	
LOS	C	B	A	C	F		C	D		C	C	
Approach Delay		16.9			81.6			33.7			23.7	
Approach LOS		B			F			C			C	
Queue Length 50th (m)	10.8	9.7	0.0	3.8	~85.9		14.6	57.8		7.6	15.7	
Queue Length 95th (m)	#32.3	24.2	5.0	12.1	#169.9		27.1	88.7		18.6	27.9	
Internal Link Dist (m)		468.5			358.5			688.0			211.8	
Turn Bay Length (m)	125.0		30.0	20.0			40.0			25.0		
Base Capacity (vph)	275	828	728	295	528		850	1224		340	1111	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.55	0.16	0.05	0.13	1.06		0.16	0.38		0.21	0.14	

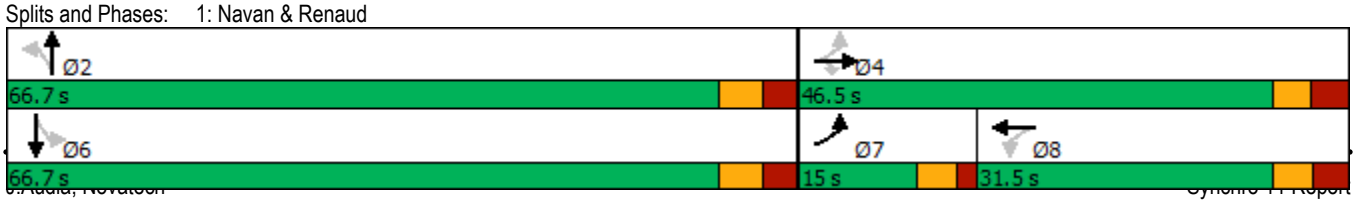
Intersection Summary

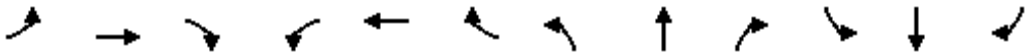
Area Type: Other
Cycle Length: 113.2
Actuated Cycle Length: 80.9
Natural Cycle: 90
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.06
Intersection Signal Delay: 45.7 Intersection LOS: D
Intersection Capacity Utilization 96.7% ICU Level of Service F
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

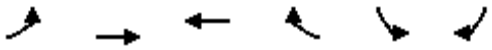
Splits and Phases: 1: Navan & Renaud





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	208	25	24	293	6	63	0	59	7	0	104
Future Volume (vph)	28	208	25	24	293	6	63	0	59	7	0	104
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.987			0.997			0.935			0.874	
Flt Protected		0.995			0.996			0.975			0.997	
Satd. Flow (prot)	0	1649	0	0	1718	0	0	1591	0	0	1521	0
Flt Permitted		0.995			0.996			0.975			0.997	
Satd. Flow (perm)	0	1649	0	0	1718	0	0	1591	0	0	1521	0
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		250.5			316.5			464.6			385.8	
Travel Time (s)		22.5			28.5			41.8			34.7	
Confl. Peds. (#/hr)	5		5	5		5						
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	7%	2%	2%	3%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	28	208	25	24	293	6	63	0	59	7	0	104
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	261	0	0	323	0	0	122	0	0	111	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		5.0			5.0			5.0			5.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	42.8%	ICU Level of Service	A
Analysis Period (min)	15		



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	21	183	497	4	10	52
Future Volume (vph)	21	183	497	4	10	52
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.999		0.887	
Flt Protected		0.995			0.992	
Satd. Flow (prot)	0	1721	1727	0	1536	0
Flt Permitted		0.995			0.992	
Satd. Flow (perm)	0	1721	1727	0	1536	0
Link Speed (k/h)		60	60		50	
Link Distance (m)		712.0	313.1		172.6	
Travel Time (s)		42.7	18.8		12.4	
Confl. Peds. (#/hr)	5			5		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	3%	2%	2%	2%
Adj. Flow (vph)	21	183	497	4	10	52
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	204	501	0	62	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.5	3.5		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	5.0		5.0	
Two way Left Turn Lane						
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 39.3%		ICU Level of Service A	
Analysis Period (min) 15			

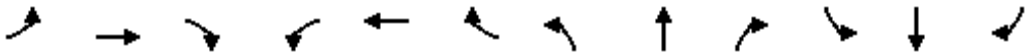
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	229	443	174	38	154	88	44	201	52	161	466	4
Future Volume (vph)	229	443	174	38	154	88	44	201	52	161	466	4
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	125.0		30.0	20.0		0.0	40.0		0.0	25.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	35.0			45.0			60.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99		0.95	0.99	0.98		1.00	0.99		1.00	1.00	
Frt			0.850		0.945			0.969			0.999	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1642	1745	1455	1626	1620	0	1642	1592	0	1674	1632	0
Flt Permitted	0.401			0.506			0.328			0.591		
Satd. Flow (perm)	685	1745	1385	854	1620	0	566	1592	0	1038	1632	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			102		23			18			1	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		492.5			382.5			712.0			235.8	
Travel Time (s)		35.5			27.5			42.7			14.1	
Confl. Peds. (#/hr)	7		8	8		7	3		3	3		3
Confl. Bikes (#/hr)						3			1			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	2%	4%	4%	2%	2%	3%	9%	3%	1%	9%	1%
Adj. Flow (vph)	229	443	174	38	154	88	44	201	52	161	466	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	229	443	174	38	242	0	44	253	0	161	470	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		10.0			10.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	7	4	4	8	8		2	2		6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	10.0	24.6	24.6	24.5	24.5		41.7	41.7		41.7	41.7	
Total Split (s)	15.0	46.5	46.5	31.5	31.5		66.7	66.7		66.7	66.7	
Total Split (%)	13.3%	41.1%	41.1%	27.8%	27.8%		58.9%	58.9%		58.9%	58.9%	
Maximum Green (s)	10.0	39.9	39.9	25.0	25.0		60.0	60.0		60.0	60.0	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	1.7	3.3	3.3	3.2	3.2		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.6	6.6	6.5	6.5		6.7	6.7		6.7	6.7	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min		Min	Min	
Walk Time (s)		7.0	7.0	7.0	7.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		9.0	9.0	9.0	9.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		3	3	4	4		2	2		2	2	
Act Effct Green (s)	32.5	30.8	30.8	15.5	15.5		26.4	26.4		26.4	26.4	
Actuated g/C Ratio	0.46	0.43	0.43	0.22	0.22		0.37	0.37		0.37	0.37	
v/c Ratio	0.51	0.59	0.26	0.20	0.65		0.21	0.42		0.42	0.77	
Control Delay	18.7	20.8	8.3	28.3	33.4		18.4	17.7		20.5	29.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	18.7	20.8	8.3	28.3	33.4		18.4	17.7		20.5	29.4	
LOS	B	C	A	C	C		B	B		C	C	
Approach Delay		17.7			32.7			17.8			27.1	
Approach LOS		B			C			B			C	
Queue Length 50th (m)	16.4	38.4	4.9	3.7	23.8		3.4	19.9		13.7	47.4	
Queue Length 95th (m)	39.8	84.4	19.2	12.5	53.2		11.1	41.8		31.6	90.5	
Internal Link Dist (m)		468.5			358.5			688.0			211.8	
Turn Bay Length (m)	125.0		30.0	20.0			40.0			25.0		
Base Capacity (vph)	452	1018	851	312	607		480	1355		882	1387	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.51	0.44	0.20	0.12	0.40		0.09	0.19		0.18	0.34	

Intersection Summary

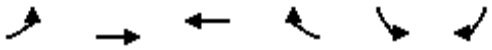
Area Type: Other
Cycle Length: 113.2
Actuated Cycle Length: 71.1
Natural Cycle: 80
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 22.6 Intersection LOS: C
Intersection Capacity Utilization 89.8% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 1: Navan & Renaud



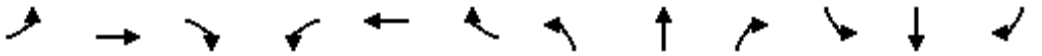
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	62	479	63	59	241	11	39	0	36	7	0	25
Future Volume (vph)	62	479	63	59	241	11	39	0	36	7	0	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.986			0.995			0.935			0.895	
Flt Protected		0.995			0.991			0.975			0.989	
Satd. Flow (prot)	0	1699	0	0	1708	0	0	1591	0	0	1545	0
Flt Permitted		0.995			0.991			0.975			0.989	
Satd. Flow (perm)	0	1699	0	0	1708	0	0	1591	0	0	1545	0
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		250.5			316.5			464.6			385.8	
Travel Time (s)		22.5			28.5			41.8			34.7	
Confl. Peds. (#/hr)	5		5	5		5						
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	2%	2%	3%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	62	479	63	59	241	11	39	0	36	7	0	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	604	0	0	311	0	0	75	0	0	32	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		5.0			5.0			5.0			5.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 56.1%		ICU Level of Service B	
Analysis Period (min) 15			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	53	576	228	11	6	32
Future Volume (vph)	53	576	228	11	6	32
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.994		0.886	
Flt Protected		0.996			0.992	
Satd. Flow (prot)	0	1723	1719	0	1534	0
Flt Permitted		0.996			0.992	
Satd. Flow (perm)	0	1723	1719	0	1534	0
Link Speed (k/h)		60	60		50	
Link Distance (m)		712.0	313.1		172.6	
Travel Time (s)		42.7	18.8		12.4	
Confl. Peds. (#/hr)	5			5		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	3%	2%	2%	2%
Adj. Flow (vph)	53	576	228	11	6	32
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	629	239	0	38	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.5	3.5		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	5.0		5.0	
Two way Left Turn Lane						
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	61.8%	ICU Level of Service	B
Analysis Period (min)	15		

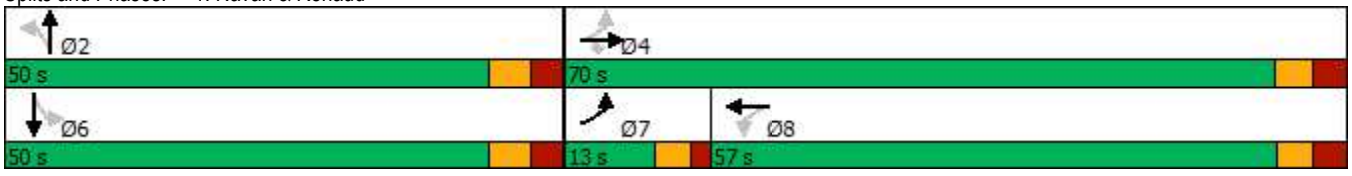


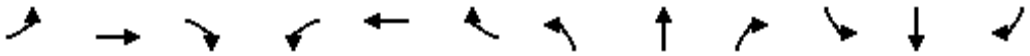
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	152	134	38	38	395	164	139	417	43	70	152	2
Future Volume (vph)	152	134	38	38	395	164	139	417	43	70	152	2
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	125.0		30.0	20.0		0.0	40.0		0.0	25.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	35.0			45.0			60.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97	0.99	0.99		1.00	1.00		1.00	1.00	
Frt			0.850		0.956			0.986			0.998	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1537	1664	1469	1353	1656	0	1642	1632	0	1510	1483	0
Flt Permitted	0.185			0.671			0.659			0.263		
Satd. Flow (perm)	299	1664	1423	947	1656	0	1136	1632	0	417	1483	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			38		22			5			1	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		492.5			382.5			712.0			235.8	
Travel Time (s)		35.5			27.5			42.7			14.1	
Confl. Peds. (#/hr)	4		3	3		4	2		2	2		2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	10%	7%	3%	25%	2%	1%	3%	6%	20%	12%	20%	1%
Adj. Flow (vph)	152	134	38	38	395	164	139	417	43	70	152	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	152	134	38	38	559	0	139	460	0	70	154	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		10.0			10.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	7	4	4	8	8		2	2		6	6	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	10.0	24.6	24.6	24.5	24.5		41.7	41.7		41.7	41.7	
Total Split (s)	13.0	70.0	70.0	57.0	57.0		50.0	50.0		50.0	50.0	
Total Split (%)	10.8%	58.3%	58.3%	47.5%	47.5%		41.7%	41.7%		41.7%	41.7%	
Maximum Green (s)	8.0	63.4	63.4	50.5	50.5		43.3	43.3		43.3	43.3	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	1.7	3.3	3.3	3.2	3.2		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.6	6.6	6.5	6.5		6.7	6.7		6.7	6.7	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min		Min	Min	
Walk Time (s)		7.0	7.0	7.0	7.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		9.0	9.0	9.0	9.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		3	3	4	4		2	2		2	2	
Act Effct Green (s)	52.2	50.5	50.5	36.9	36.9		32.2	32.2		32.2	32.2	
Actuated g/C Ratio	0.54	0.52	0.52	0.38	0.38		0.33	0.33		0.33	0.33	
v/c Ratio	0.57	0.15	0.05	0.11	0.87		0.37	0.84		0.51	0.31	
Control Delay	21.9	13.8	4.5	21.4	42.1		29.3	45.9		43.0	27.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	21.9	13.8	4.5	21.4	42.1		29.3	45.9		43.0	27.2	
LOS	C	B	A	C	D		C	D		D	C	
Approach Delay		16.5			40.8			42.0			32.1	
Approach LOS		B			D			D			C	
Queue Length 50th (m)	12.7	11.4	0.0	4.1	83.5		17.9	71.5		9.5	19.3	
Queue Length 95th (m)	26.7	24.2	4.8	11.5	142.8		37.8	125.3		26.3	39.0	
Internal Link Dist (m)		468.5			358.5			688.0			211.8	
Turn Bay Length (m)	125.0		30.0	20.0			40.0			25.0		
Base Capacity (vph)	269	1149	994	521	920		535	772		196	700	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.57	0.12	0.04	0.07	0.61		0.26	0.60		0.36	0.22	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 96.7			
Natural Cycle: 90			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.87			
Intersection Signal Delay: 35.6		Intersection LOS: D	
Intersection Capacity Utilization 96.7%		ICU Level of Service F	
Analysis Period (min) 15			

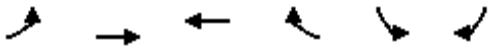
Splits and Phases: 1: Navan & Renaud





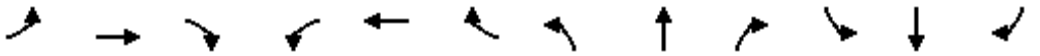
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	208	25	24	293	6	63	0	59	7	0	104
Future Volume (vph)	28	208	25	24	293	6	63	0	59	7	0	104
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.987			0.997			0.935			0.874	
Flt Protected		0.995			0.996			0.975			0.997	
Satd. Flow (prot)	0	1649	0	0	1718	0	0	1591	0	0	1521	0
Flt Permitted		0.995			0.996			0.975			0.997	
Satd. Flow (perm)	0	1649	0	0	1718	0	0	1591	0	0	1521	0
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		250.5			316.5			464.6			385.8	
Travel Time (s)		22.5			28.5			41.8			34.7	
Confl. Peds. (#/hr)	5		5	5		5						
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	7%	2%	2%	3%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	28	208	25	24	293	6	63	0	59	7	0	104
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	261	0	0	323	0	0	122	0	0	111	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		5.0			5.0			5.0			5.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	42.8%	ICU Level of Service	A
Analysis Period (min)	15		



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	21	183	497	4	10	52
Future Volume (vph)	21	183	497	4	10	52
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.999		0.887	
Flt Protected		0.995			0.992	
Satd. Flow (prot)	0	1721	1727	0	1536	0
Flt Permitted		0.995			0.992	
Satd. Flow (perm)	0	1721	1727	0	1536	0
Link Speed (k/h)		60	60		50	
Link Distance (m)		712.0	313.1		172.6	
Travel Time (s)		42.7	18.8		12.4	
Confl. Peds. (#/hr)	5			5		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	3%	2%	2%	2%
Adj. Flow (vph)	21	183	497	4	10	52
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	204	501	0	62	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.5	3.5		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	5.0		5.0	
Two way Left Turn Lane						
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 39.3%		ICU Level of Service A	
Analysis Period (min) 15			



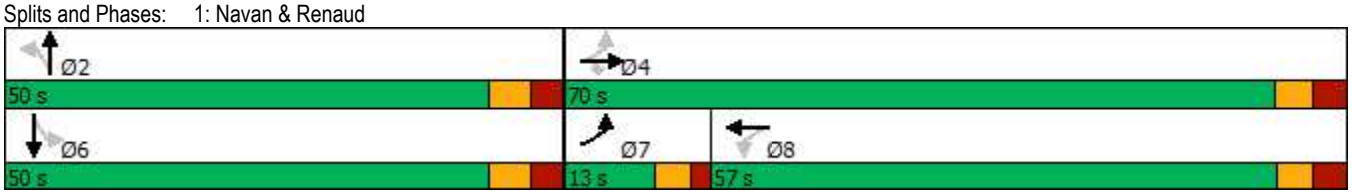
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	188	151	45	41	442	215	158	490	46	95	182	8
Future Volume (vph)	188	151	45	41	442	215	158	490	46	95	182	8
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	125.0		30.0	20.0		0.0	40.0		0.0	25.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	35.0			45.0			60.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97	0.99	0.99		1.00	1.00		1.00	1.00	
Frt			0.850		0.951			0.987			0.994	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1537	1664	1469	1353	1646	0	1642	1636	0	1510	1483	0
Flt Permitted	0.121			0.661			0.607			0.183		
Satd. Flow (perm)	196	1664	1423	933	1646	0	1046	1636	0	291	1483	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			45		25			4			2	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		492.5			382.5			712.0			235.8	
Travel Time (s)		35.5			27.5			42.7			14.1	
Confl. Peds. (#/hr)	4		3	3		4	2		2	2		2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	10%	7%	3%	25%	2%	1%	3%	6%	20%	12%	20%	1%
Adj. Flow (vph)	188	151	45	41	442	215	158	490	46	95	182	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	188	151	45	41	657	0	158	536	0	95	190	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		10.0			10.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	7	4	4	8	8		2	2		6	6	
Switch Phase												

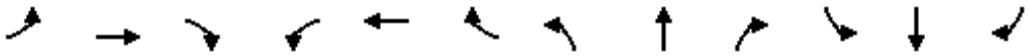
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	10.0	24.6	24.6	24.5	24.5		41.7	41.7		41.7	41.7	
Total Split (s)	13.0	70.0	70.0	57.0	57.0		50.0	50.0		50.0	50.0	
Total Split (%)	10.8%	58.3%	58.3%	47.5%	47.5%		41.7%	41.7%		41.7%	41.7%	
Maximum Green (s)	8.0	63.4	63.4	50.5	50.5		43.3	43.3		43.3	43.3	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	1.7	3.3	3.3	3.2	3.2		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.6	6.6	6.5	6.5		6.7	6.7		6.7	6.7	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min		Min	Min	
Walk Time (s)		7.0	7.0	7.0	7.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		9.0	9.0	9.0	9.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		3	3	4	4		2	2		2	2	
Act Effct Green (s)	61.5	59.9	59.9	46.8	46.8		40.2	40.2		40.2	40.2	
Actuated g/C Ratio	0.54	0.53	0.53	0.41	0.41		0.35	0.35		0.35	0.35	
v/c Ratio	0.94	0.17	0.06	0.11	0.95		0.43	0.92		0.92	0.36	
Control Delay	68.0	15.1	4.1	22.1	55.7		32.9	58.6		109.8	29.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	68.0	15.1	4.1	22.1	55.7		32.9	58.6		109.8	29.8	
LOS	E	B	A	C	E		C	E		F	C	
Approach Delay		39.7			53.7			52.8			56.5	
Approach LOS		D			D			D			E	
Queue Length 50th (m)	20.4	16.4	0.0	5.3	129.5		25.6	108.7		19.4	29.6	
Queue Length 95th (m)	#54.5	27.0	5.1	12.2	#198.4		43.8	#169.0		#50.8	47.7	
Internal Link Dist (m)		468.5			358.5			688.0			211.8	
Turn Bay Length (m)	125.0		30.0	20.0			40.0			25.0		
Base Capacity (vph)	201	941	824	420	755		404	634		112	574	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.94	0.16	0.05	0.10	0.87		0.39	0.85		0.85	0.33	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 113.6
Natural Cycle: 100
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 51.2 Intersection LOS: D
Intersection Capacity Utilization 108.8% ICU Level of Service G
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

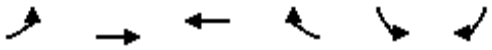
Splits and Phases: 1: Navan & Renaud





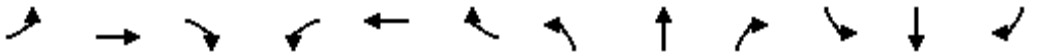
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	253	21	11	376	6	72	0	28	7	0	104
Future Volume (vph)	28	253	21	11	376	6	72	0	28	7	0	104
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.991			0.998			0.962			0.874	
Flt Protected		0.995			0.999			0.965			0.997	
Satd. Flow (prot)	0	1653	0	0	1724	0	0	1620	0	0	1521	0
Flt Permitted		0.995			0.999			0.965			0.997	
Satd. Flow (perm)	0	1653	0	0	1724	0	0	1620	0	0	1521	0
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		250.5			316.5			464.6			385.8	
Travel Time (s)		22.5			28.5			41.8			34.7	
Confl. Peds. (#/hr)	5		5	5		5						
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	7%	2%	2%	3%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	28	253	21	11	376	6	72	0	28	7	0	104
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	302	0	0	393	0	0	100	0	0	111	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		5.0			5.0			5.0			5.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	48.9%	ICU Level of Service	A
Analysis Period (min)	15		



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	21	206	551	7	17	52
Future Volume (vph)	21	206	551	7	17	52
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.998		0.898	
Flt Protected		0.995			0.988	
Satd. Flow (prot)	0	1721	1725	0	1548	0
Flt Permitted		0.995			0.988	
Satd. Flow (perm)	0	1721	1725	0	1548	0
Link Speed (k/h)		60	60		50	
Link Distance (m)		712.0	313.1		172.6	
Travel Time (s)		42.7	18.8		12.4	
Confl. Peds. (#/hr)	5			5		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	3%	2%	2%	2%
Adj. Flow (vph)	21	206	551	7	17	52
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	227	558	0	69	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.5	3.5		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	5.0		5.0	
Two way Left Turn Lane						
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		



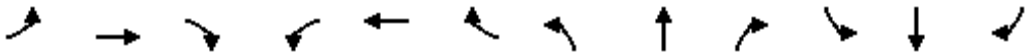
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	272	496	196	41	175	122	53	243	56	211	543	11
Future Volume (vph)	272	496	196	41	175	122	53	243	56	211	543	11
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	125.0		30.0	20.0		0.0	40.0		0.0	25.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	35.0			45.0			60.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99		0.95	0.99	0.98		1.00	1.00		1.00	1.00	
Frt			0.850		0.938			0.972			0.997	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1642	1745	1455	1626	1604	0	1642	1596	0	1674	1630	0
Flt Permitted	0.319			0.482			0.261			0.529		
Satd. Flow (perm)	547	1745	1385	816	1604	0	450	1596	0	929	1630	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			103		28			16			1	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		492.5			382.5			712.0			235.8	
Travel Time (s)		35.5			27.5			42.7			14.1	
Confl. Peds. (#/hr)	7		8	8		7	3		3	3		3
Confl. Bikes (#/hr)						3			1			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	2%	4%	4%	2%	2%	3%	9%	3%	1%	9%	1%
Adj. Flow (vph)	272	496	196	41	175	122	53	243	56	211	543	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	272	496	196	41	297	0	53	299	0	211	554	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		10.0			10.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	7	4	4	8	8		2	2		6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	10.0	24.6	24.6	24.5	24.5		41.7	41.7		41.7	41.7	
Total Split (s)	15.0	46.5	46.5	31.5	31.5		66.7	66.7		66.7	66.7	
Total Split (%)	13.3%	41.1%	41.1%	27.8%	27.8%		58.9%	58.9%		58.9%	58.9%	
Maximum Green (s)	10.0	39.9	39.9	25.0	25.0		60.0	60.0		60.0	60.0	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	1.7	3.3	3.3	3.2	3.2		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.6	6.6	6.5	6.5		6.7	6.7		6.7	6.7	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min		Min	Min	
Walk Time (s)		7.0	7.0	7.0	7.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		9.0	9.0	9.0	9.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		3	3	4	4		2	2		2	2	
Act Effct Green (s)	36.4	34.7	34.7	19.2	19.2		34.1	34.1		34.1	34.1	
Actuated g/C Ratio	0.44	0.42	0.42	0.23	0.23		0.41	0.41		0.41	0.41	
v/c Ratio	0.72	0.68	0.31	0.22	0.75		0.29	0.45		0.55	0.82	
Control Delay	31.9	27.2	10.9	32.1	41.6		20.9	18.7		24.6	32.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	31.9	27.2	10.9	32.1	41.6		20.9	18.7		24.6	32.8	
LOS	C	C	B	C	D		C	B		C	C	
Approach Delay		25.2			40.5			19.0			30.5	
Approach LOS		C			D			B			C	
Queue Length 50th (m)	25.8	57.2	8.2	4.8	36.4		4.9	28.4		22.4	68.7	
Queue Length 95th (m)	#73.3	116.1	27.1	15.1	#80.6		13.5	50.0		44.0	113.3	
Internal Link Dist (m)		468.5			358.5			688.0			211.8	
Turn Bay Length (m)	125.0		30.0	20.0			40.0			25.0		
Base Capacity (vph)	378	876	747	256	524		339	1207		700	1229	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.72	0.57	0.26	0.16	0.57		0.16	0.25		0.30	0.45	

Intersection Summary

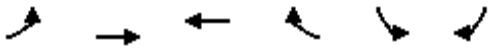
Area Type: Other
Cycle Length: 113.2
Actuated Cycle Length: 82.6
Natural Cycle: 80
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 28.1 Intersection LOS: C
Intersection Capacity Utilization 97.2% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Navan & Renaud



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	62	579	52	28	300	11	45	0	17	7	0	25
Future Volume (vph)	62	579	52	28	300	11	45	0	17	7	0	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.990			0.996			0.963			0.895	
Flt Protected		0.996			0.996			0.965			0.989	
Satd. Flow (prot)	0	1707	0	0	1716	0	0	1622	0	0	1545	0
Flt Permitted		0.996			0.996			0.965			0.989	
Satd. Flow (perm)	0	1707	0	0	1716	0	0	1622	0	0	1545	0
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		250.5			316.5			464.6			385.8	
Travel Time (s)		22.5			28.5			41.8			34.7	
Confl. Peds. (#/hr)	5		5	5		5						
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	2%	2%	3%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	62	579	52	28	300	11	45	0	17	7	0	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	693	0	0	339	0	0	62	0	0	32	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		5.0			5.0			5.0			5.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 69.1%		ICU Level of Service C	
Analysis Period (min) 15			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	52	638	256	17	11	32
Future Volume (vph)	52	638	256	17	11	32
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.992		0.900	
Flt Protected		0.996			0.987	
Satd. Flow (prot)	0	1723	1715	0	1550	0
Flt Permitted		0.996			0.987	
Satd. Flow (perm)	0	1723	1715	0	1550	0
Link Speed (k/h)		60	60		50	
Link Distance (m)		712.0	313.1		172.6	
Travel Time (s)		42.7	18.8		12.4	
Confl. Peds. (#/hr)	5			5		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	3%	2%	2%	2%
Adj. Flow (vph)	52	638	256	17	11	32
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	690	273	0	43	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.5	3.5		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	5.0		5.0	
Two way Left Turn Lane						
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 67.2%		ICU Level of Service C	
Analysis Period (min) 15			

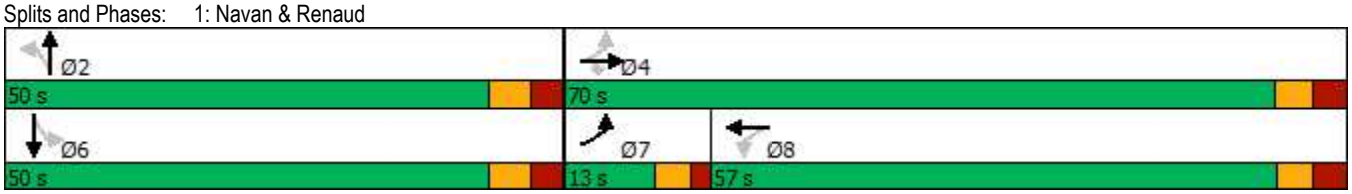
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	188	151	45	41	382	215	158	470	46	95	182	8
Future Volume (vph)	188	151	45	41	382	215	158	470	46	95	182	8
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	125.0		30.0	20.0		0.0	40.0		0.0	25.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	35.0			45.0			60.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97	0.99	0.99		1.00	1.00		1.00	1.00	
Frt			0.850		0.946			0.987			0.994	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1537	1664	1469	1353	1636	0	1642	1635	0	1510	1483	0
Flt Permitted	0.156			0.661			0.615			0.209		
Satd. Flow (perm)	252	1664	1423	933	1636	0	1060	1635	0	332	1483	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			45		29			5			2	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		492.5			382.5			712.0			235.8	
Travel Time (s)		35.5			27.5			42.7			14.1	
Confl. Peds. (#/hr)	4		3	3		4	2		2	2		2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	10%	7%	3%	25%	2%	1%	3%	6%	20%	12%	20%	1%
Adj. Flow (vph)	188	151	45	41	382	215	158	470	46	95	182	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	188	151	45	41	597	0	158	516	0	95	190	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		10.0			10.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	7	4	4	8	8		2	2		6	6	
Switch Phase												

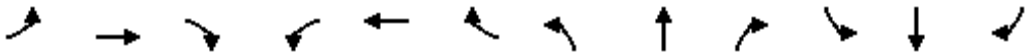
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	10.0	24.6	24.6	24.5	24.5		41.7	41.7		41.7	41.7	
Total Split (s)	13.0	70.0	70.0	57.0	57.0		50.0	50.0		50.0	50.0	
Total Split (%)	10.8%	58.3%	58.3%	47.5%	47.5%		41.7%	41.7%		41.7%	41.7%	
Maximum Green (s)	8.0	63.4	63.4	50.5	50.5		43.3	43.3		43.3	43.3	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	1.7	3.3	3.3	3.2	3.2		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.6	6.6	6.5	6.5		6.7	6.7		6.7	6.7	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min		Min	Min	
Walk Time (s)		7.0	7.0	7.0	7.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		9.0	9.0	9.0	9.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		3	3	4	4		2	2		2	2	
Act Effct Green (s)	56.6	54.9	54.9	41.6	41.6		37.1	37.1		37.1	37.1	
Actuated g/C Ratio	0.53	0.52	0.52	0.39	0.39		0.35	0.35		0.35	0.35	
v/c Ratio	0.80	0.17	0.06	0.11	0.90		0.43	0.89		0.82	0.36	
Control Delay	42.2	14.9	4.2	22.2	47.7		31.8	52.8		82.2	28.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	42.2	14.9	4.2	22.2	47.7		31.8	52.8		82.2	28.8	
LOS	D	B	A	C	D		C	D		F	C	
Approach Delay		27.0			46.1			47.8			46.6	
Approach LOS		C			D			D			D	
Queue Length 50th (m)	20.4	16.4	0.0	5.3	109.9		24.2	97.1		17.3	28.0	
Queue Length 95th (m)	#47.8	27.0	5.1	12.2	#168.9		43.6	#158.7		#47.4	47.7	
Internal Link Dist (m)		468.5			358.5			688.0			211.8	
Turn Bay Length (m)	125.0		30.0	20.0			40.0			25.0		
Base Capacity (vph)	235	1028	897	459	820		447	693		139	627	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.80	0.15	0.05	0.09	0.73		0.35	0.74		0.68	0.30	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 105.8
Natural Cycle: 90
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 43.1 Intersection LOS: D
Intersection Capacity Utilization 104.4% ICU Level of Service G
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

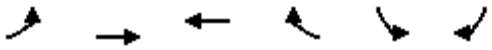
Splits and Phases: 1: Navan & Renaud





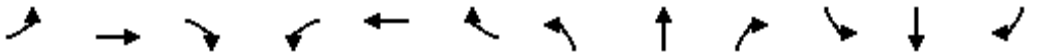
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	253	21	11	376	6	72	0	28	7	0	104
Future Volume (vph)	28	253	21	11	376	6	72	0	28	7	0	104
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.991			0.998			0.962			0.874	
Flt Protected		0.995			0.999			0.965			0.997	
Satd. Flow (prot)	0	1653	0	0	1724	0	0	1620	0	0	1521	0
Flt Permitted		0.995			0.999			0.965			0.997	
Satd. Flow (perm)	0	1653	0	0	1724	0	0	1620	0	0	1521	0
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		250.5			316.5			464.6			385.8	
Travel Time (s)		22.5			28.5			41.8			34.7	
Confl. Peds. (#/hr)	5		5	5		5						
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	7%	2%	2%	3%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	28	253	21	11	376	6	72	0	28	7	0	104
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	302	0	0	393	0	0	100	0	0	111	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		5.0			5.0			5.0			5.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	48.9%	ICU Level of Service	A
Analysis Period (min)	15		



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	21	206	551	7	17	52
Future Volume (vph)	21	206	551	7	17	52
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.998		0.898	
Flt Protected		0.995			0.988	
Satd. Flow (prot)	0	1721	1725	0	1548	0
Flt Permitted		0.995			0.988	
Satd. Flow (perm)	0	1721	1725	0	1548	0
Link Speed (k/h)		60	60		50	
Link Distance (m)		712.0	313.1		172.6	
Travel Time (s)		42.7	18.8		12.4	
Confl. Peds. (#/hr)	5			5		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	3%	2%	2%	2%
Adj. Flow (vph)	21	206	551	7	17	52
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	227	558	0	69	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.5	3.5		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	5.0		5.0	
Two way Left Turn Lane						
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		



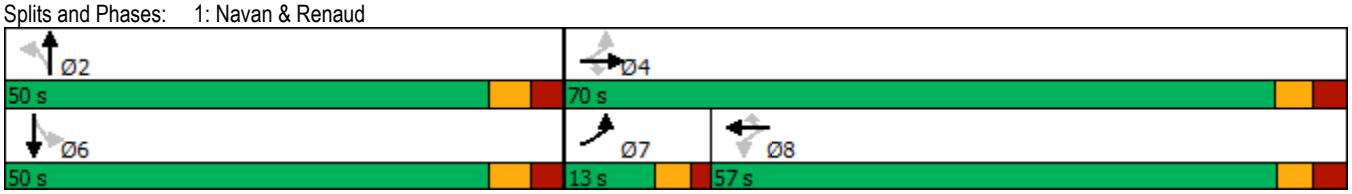
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	188	151	45	41	442	215	158	490	46	95	182	8
Future Volume (vph)	188	151	45	41	442	215	158	490	46	95	182	8
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	125.0		30.0	20.0		50.0	40.0		0.0	25.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	35.0			45.0			60.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97	0.99		0.97	1.00	1.00		1.00	1.00	
Frt			0.850			0.850		0.987			0.994	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1537	1664	1469	1353	1745	1498	1642	1636	0	1510	1483	0
Flt Permitted	0.226			0.661			0.638			0.251		
Satd. Flow (perm)	366	1664	1423	933	1745	1446	1100	1636	0	399	1483	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			45			196		4			2	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		492.5			382.5			712.0			235.8	
Travel Time (s)		35.5			27.5			42.7			14.1	
Confl. Peds. (#/hr)	4		3	3		4	2		2	2		2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	10%	7%	3%	25%	2%	1%	3%	6%	20%	12%	20%	1%
Adj. Flow (vph)	188	151	45	41	442	215	158	490	46	95	182	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	188	151	45	41	442	215	158	536	0	95	190	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		10.0			10.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8		8	2			6		
Detector Phase	7	4	4	8	8	8	2	2		6	6	
Switch Phase												

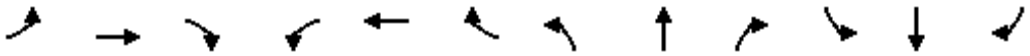
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	10.0	24.6	24.6	24.5	24.5	24.5	41.7	41.7		41.7	41.7	
Total Split (s)	13.0	70.0	70.0	57.0	57.0	57.0	50.0	50.0		50.0	50.0	
Total Split (%)	10.8%	58.3%	58.3%	47.5%	47.5%	47.5%	41.7%	41.7%		41.7%	41.7%	
Maximum Green (s)	8.0	63.4	63.4	50.5	50.5	50.5	43.3	43.3		43.3	43.3	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7		3.7	3.7	
All-Red Time (s)	1.7	3.3	3.3	3.2	3.2	3.2	3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.6	6.6	6.5	6.5	6.5	6.7	6.7		6.7	6.7	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	Min	Min		Min	Min	
Walk Time (s)		7.0	7.0	7.0	7.0	7.0	12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		9.0	9.0	9.0	9.0	9.0	23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		3	3	4	4	4	2	2		2	2	
Act Effct Green (s)	45.2	43.5	43.5	30.2	30.2	30.2	37.9	37.9		37.9	37.9	
Actuated g/C Ratio	0.48	0.46	0.46	0.32	0.32	0.32	0.40	0.40		0.40	0.40	
v/c Ratio	0.68	0.20	0.07	0.14	0.80	0.36	0.36	0.82		0.60	0.32	
Control Delay	30.9	17.0	4.7	25.0	41.9	6.5	24.5	38.4		43.7	22.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	30.9	17.0	4.7	25.0	41.9	6.5	24.5	38.4		43.7	22.7	
LOS	C	B	A	C	D	A	C	D		D	C	
Approach Delay		22.3			30.0			35.3			29.7	
Approach LOS		C			C			D			C	
Queue Length 50th (m)	20.4	16.4	0.0	5.3	73.1	2.4	18.3	78.6		12.4	21.4	
Queue Length 95th (m)	#36.3	27.4	5.2	12.3	105.3	16.2	39.9	#154.5		#38.9	44.1	
Internal Link Dist (m)		468.5			358.5			688.0			211.8	
Turn Bay Length (m)	125.0		30.0	20.0		50.0	40.0			25.0		
Base Capacity (vph)	275	1146	994	511	957	881	517	771		187	698	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.68	0.13	0.05	0.08	0.46	0.24	0.31	0.70		0.51	0.27	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 95.1
Natural Cycle: 80
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 30.3 Intersection LOS: C
Intersection Capacity Utilization 94.8% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

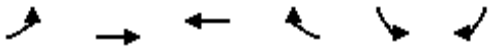
Splits and Phases: 1: Navan & Renaud





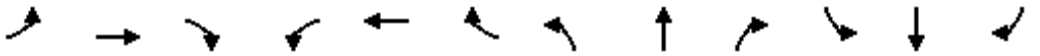
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	253	21	11	376	6	72	0	28	7	0	104
Future Volume (vph)	28	253	21	11	376	6	72	0	28	7	0	104
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.991			0.998			0.962			0.874	
Flt Protected		0.995			0.999			0.965			0.997	
Satd. Flow (prot)	0	1653	0	0	1724	0	0	1620	0	0	1521	0
Flt Permitted		0.995			0.999			0.965			0.997	
Satd. Flow (perm)	0	1653	0	0	1724	0	0	1620	0	0	1521	0
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		250.5			316.5			464.6			385.8	
Travel Time (s)		22.5			28.5			41.8			34.7	
Confl. Peds. (#/hr)	5		5	5		5						
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	7%	2%	2%	3%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	28	253	21	11	376	6	72	0	28	7	0	104
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	302	0	0	393	0	0	100	0	0	111	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		5.0			5.0			5.0			5.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	48.9%	ICU Level of Service	A
Analysis Period (min)	15		



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	21	206	551	7	17	52
Future Volume (vph)	21	206	551	7	17	52
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.998		0.898	
Flt Protected		0.995			0.988	
Satd. Flow (prot)	0	1721	1725	0	1548	0
Flt Permitted		0.995			0.988	
Satd. Flow (perm)	0	1721	1725	0	1548	0
Link Speed (k/h)		60	60		50	
Link Distance (m)		712.0	313.1		172.6	
Travel Time (s)		42.7	18.8		12.4	
Confl. Peds. (#/hr)	5			5		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	3%	2%	2%	2%
Adj. Flow (vph)	21	206	551	7	17	52
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	227	558	0	69	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.5	3.5		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	5.0		5.0	
Two way Left Turn Lane						
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		



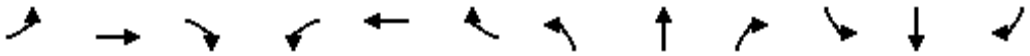
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	272	496	196	41	175	122	53	243	56	211	543	11
Future Volume (vph)	272	496	196	41	175	122	53	243	56	211	543	11
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	125.0		30.0	20.0		50.0	40.0		0.0	25.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	35.0			45.0			60.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99		0.95	0.99		0.95	1.00	1.00		1.00	1.00	
Frt			0.850			0.850		0.972			0.997	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1642	1745	1455	1626	1745	1483	1642	1596	0	1674	1630	0
Flt Permitted	0.483			0.482			0.278			0.541		
Satd. Flow (perm)	823	1745	1385	816	1745	1410	480	1596	0	951	1630	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			103			122		16			1	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		492.5			382.5			712.0			235.8	
Travel Time (s)		35.5			27.5			42.7			14.1	
Confl. Peds. (#/hr)	7		8	8		7	3		3	3		3
Confl. Bikes (#/hr)						3			1			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	2%	4%	4%	2%	2%	3%	9%	3%	1%	9%	1%
Adj. Flow (vph)	272	496	196	41	175	122	53	243	56	211	543	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	272	496	196	41	175	122	53	299	0	211	554	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		10.0			10.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8		8	2			6		
Detector Phase	7	4	4	8	8	8	2	2		6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	10.0	24.6	24.6	24.5	24.5	24.5	41.7	41.7		41.7	41.7	
Total Split (s)	15.0	46.5	46.5	31.5	31.5	31.5	66.7	66.7		66.7	66.7	
Total Split (%)	13.3%	41.1%	41.1%	27.8%	27.8%	27.8%	58.9%	58.9%		58.9%	58.9%	
Maximum Green (s)	10.0	39.9	39.9	25.0	25.0	25.0	60.0	60.0		60.0	60.0	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7		3.7	3.7	
All-Red Time (s)	1.7	3.3	3.3	3.2	3.2	3.2	3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.6	6.6	6.5	6.5	6.5	6.7	6.7		6.7	6.7	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	Min	Min		Min	Min	
Walk Time (s)		7.0	7.0	7.0	7.0	7.0	12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		9.0	9.0	9.0	9.0	9.0	23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		3	3	4	4	4	2	2		2	2	
Act Effct Green (s)	32.5	30.8	30.8	15.1	15.1	15.1	32.9	32.9		32.9	32.9	
Actuated g/C Ratio	0.42	0.40	0.40	0.19	0.19	0.19	0.42	0.42		0.42	0.42	
v/c Ratio	0.60	0.72	0.32	0.26	0.52	0.33	0.26	0.44		0.52	0.80	
Control Delay	25.4	29.1	11.3	34.3	36.1	8.9	18.4	16.9		21.8	29.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	25.4	29.1	11.3	34.3	36.1	8.9	18.4	16.9		21.8	29.2	
LOS	C	C	B	C	D	A	B	B		C	C	
Approach Delay		24.5			26.1			17.1			27.2	
Approach LOS		C			C			B			C	
Queue Length 50th (m)	25.1	55.5	8.0	4.7	21.2	0.0	4.1	23.5		18.4	57.0	
Queue Length 95th (m)	56.9	116.1	27.1	15.1	46.4	12.7	13.3	50.0		43.5	113.3	
Internal Link Dist (m)		468.5			358.5			688.0			211.8	
Turn Bay Length (m)	125.0		30.0	20.0		50.0	40.0			25.0		
Base Capacity (vph)	454	942	795	276	590	557	383	1276		758	1300	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.60	0.53	0.25	0.15	0.30	0.22	0.14	0.23		0.28	0.43	

Intersection Summary

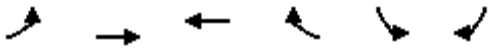
Area Type: Other
Cycle Length: 113.2
Actuated Cycle Length: 77.7
Natural Cycle: 80
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 24.5 Intersection LOS: C
Intersection Capacity Utilization 97.2% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 1: Navan & Renaud



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	62	579	52	28	300	11	45	0	17	7	0	25
Future Volume (vph)	62	579	52	28	300	11	45	0	17	7	0	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.990			0.996			0.963			0.895	
Flt Protected		0.996			0.996			0.965			0.989	
Satd. Flow (prot)	0	1707	0	0	1716	0	0	1622	0	0	1545	0
Flt Permitted		0.996			0.996			0.965			0.989	
Satd. Flow (perm)	0	1707	0	0	1716	0	0	1622	0	0	1545	0
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		250.5			316.5			464.6			385.8	
Travel Time (s)		22.5			28.5			41.8			34.7	
Confl. Peds. (#/hr)	5		5	5		5						
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	2%	2%	3%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	62	579	52	28	300	11	45	0	17	7	0	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	693	0	0	339	0	0	62	0	0	32	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		5.0			5.0			5.0			5.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 69.1%		ICU Level of Service C	
Analysis Period (min) 15			



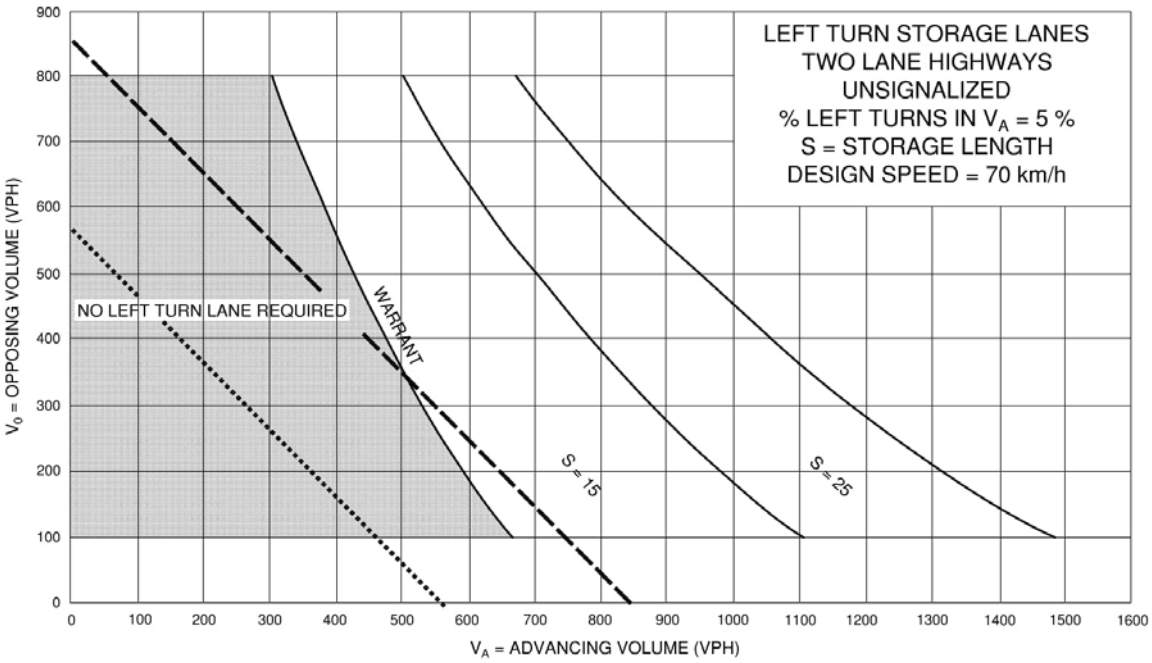
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	52	638	256	17	11	32
Future Volume (vph)	52	638	256	17	11	32
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.992		0.900	
Flt Protected		0.996			0.987	
Satd. Flow (prot)	0	1723	1715	0	1550	0
Flt Permitted		0.996			0.987	
Satd. Flow (perm)	0	1723	1715	0	1550	0
Link Speed (k/h)		60	60		50	
Link Distance (m)		712.0	313.1		172.6	
Travel Time (s)		42.7	18.8		12.4	
Confl. Peds. (#/hr)	5			5		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	3%	2%	2%	2%
Adj. Flow (vph)	52	638	256	17	11	32
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	690	273	0	43	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.5	3.5		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	5.0		5.0	
Two way Left Turn Lane						
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 67.2%		ICU Level of Service C	
Analysis Period (min) 15			

APPENDIX K

MTO Left Turn Lane Warrants

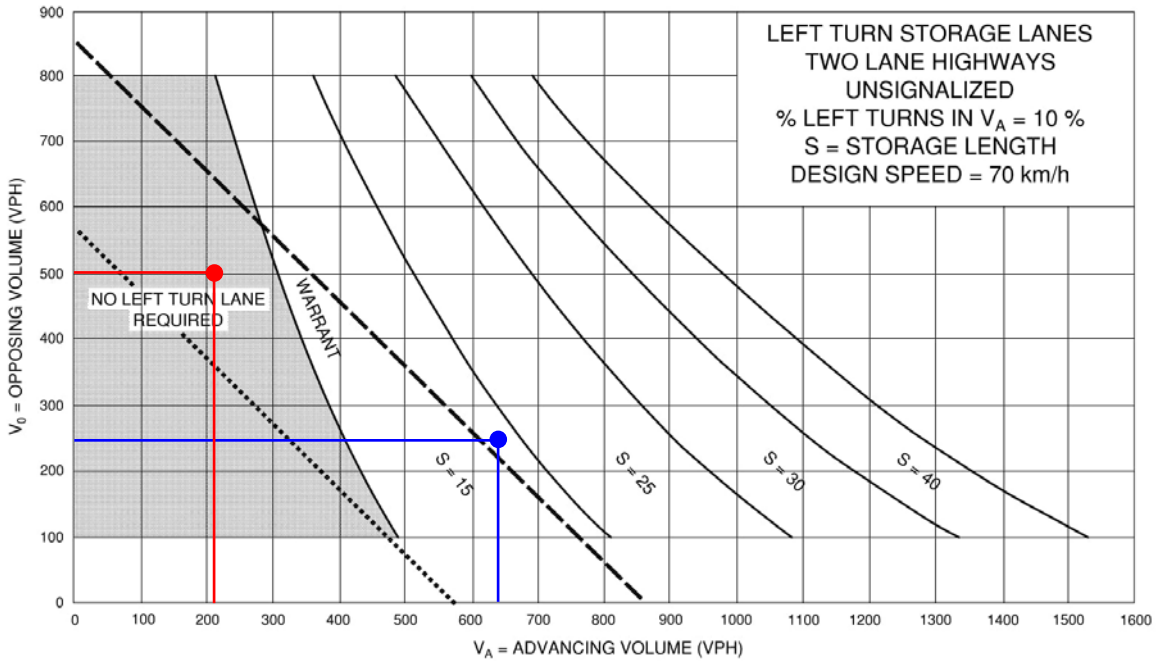
Exhibit 9A-10



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

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

AM Peak Hour
PM Peak Hour



APPENDIX L

Transportation Demand Management

TDM-Supportive Development Design and Infrastructure Checklist:
Residential Developments (multi-family or condominium)

Legend

REQUIRED	The Official Plan or Zoning By-law provides related guidance that must be followed
BASIC	The measure is generally feasible and effective, and in most cases would benefit the development and its users
BETTER	The measure could maximize support for users of sustainable modes, and optimize development performance

		TDM-supportive design & infrastructure measures: *Residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	1.	**WALKING & CYCLING: ROUTES**	
	1.1	**Building location & access points**	
BASIC	1.1.1	Locate building close to the street, and do not locate parking areas between the street and building entrances	☑
BASIC	1.1.2	Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	☐
BASIC	1.1.3	Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	☑
	1.2	**Facilities for walking & cycling**	
REQUIRED	1.2.1	Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations *(see Official Plan policy 4.3.3)*	☐ - N/A
REQUIRED	1.2.2	Provide safe, direct and attractive pedestrian access from public sidewalks to building entrances through such measures as: reducing distances between public sidewalks and major building entrances; providing walkways from public streets to major building entrances; within a site, providing walkways along the front of adjoining buildings, between adjacent buildings, and connecting areas where people may congregate, such as courtyards and transit stops; and providing weather protection through canopies, colonnades, and other design elements wherever possible *(see Official Plan policy 4.3.12)*	☑

TDM-supportive design & infrastructure measures: *Residential developments*			Check if completed & add descriptions, explanations or plan/drawing references
REQUIRED	1.2.3	Provide sidewalks of smooth, well-drained walking surfaces of contrasting materials or treatments to differentiate pedestrian areas from vehicle areas, and provide marked pedestrian crosswalks at intersection sidewalks *(see Official Plan policy 4.3.10)*	☑
REQUIRED	1.2.4	Make sidewalks and open space areas easily accessible through features such as gradual grade transition, depressed curbs at street corners and convenient access to extra-wide parking spaces and ramps *(see Official Plan policy 4.3.10)*	☑
REQUIRED	1.2.5	Include adequately spaced inter-block/street cycling and pedestrian connections to facilitate travel by active transportation. Provide links to the existing or planned network of public sidewalks, multi-use pathways and on-road cycle routes. Where public sidewalks and multi-use pathways intersect with roads, consider providing traffic control devices to give priority to cyclists and pedestrians *(see Official Plan policy 4.3.11)*	☑
BASIC	1.2.6	Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	☐
BASIC	1.2.7	Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	☐
BASIC	1.2.8	Design roads used for access or circulation by cyclists using a target operating speed of no more than 30 km/h, or provide a separated cycling facility	☐
	1.3	**Amenities for walking & cycling**	
BASIC	1.3.1	Provide lighting, landscaping and benches along walking and cycling routes between building entrances and streets, sidewalks and trails	☐
BASIC	1.3.2	Provide wayfinding signage for site access (where required, e.g. when multiple buildings or entrances exist) and egress (where warranted, such as when directions to reach transit stops/stations, trails or other common destinations are not obvious)	☐

		TDM-supportive design & infrastructure measures: *Residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	2.	**WALKING & CYCLING: END-OF-TRIP FACILITIES**	
	2.1	**Bicycle parking**	
REQUIRED	2.1.1	Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible *(see Official Plan policy 4.3.6)*	☑
REQUIRED	2.1.2	Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas *(see Zoning By-law Section 111)*	☑
REQUIRED	2.1.3	Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored *(see Zoning By-law Section 111)*	☑
BASIC	2.1.4	Provide bicycle parking spaces equivalent to the expected number of resident-owned bicycles, plus the expected peak number of visitor cyclists	☐
	2.2	**Secure bicycle parking**	
REQUIRED	2.2.1	Where more than 50 bicycle parking spaces are provided for a single residential building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers *(see Zoning By-law Section 111)*	☑
BETTER	2.2.2	Provide secure bicycle parking spaces equivalent to at least the number of units at condominiums or multi-family residential developments	☐
	2.3	**Bicycle repair station**	
BETTER	2.3.1	Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	☐
	3.	**TRANSIT**	
	3.1	**Customer amenities**	
BASIC	3.1.1	Provide shelters, lighting and benches at any on-site transit stops	☐
BASIC	3.1.2	Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	☐
BETTER	3.1.3	Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	☐

		TDM-supportive design & infrastructure measures: *Residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	4.	**RIDESHARING**	
	4.1	**Pick-up & drop-off facilities**	
BASIC	4.1.1	Provide a designated area for carpool drivers (plus taxis and ride-hailing services) to drop off or pick up passengers without using fire lanes or other no-stopping zones	☐
	5.	**CARSHARING & BIKESHARING**	
	5.1	**Carshare parking spaces**	
BETTER	5.1.1	Provide up to three carshare parking spaces in an R3, R4 or R5 Zone for specified residential uses *(see Zoning By-law Section 94)*	☐
	5.2	**Bikeshare station location**	
BETTER	5.2.1	Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection	☐
	6.	**PARKING**	
	6.1	**Number of parking spaces**	
REQUIRED	6.1.1	Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	☑
BASIC	6.1.2	Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	☐
BASIC	6.1.3	Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly *(see Zoning By-law Section 104)*	☐
BETTER	6.1.4	Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking *(see Zoning By-law Section 111)*	☐
	6.2	**Separate long-term & short-term parking areas**	
BETTER	6.2.1	Provide separate areas for short-term and long-term parking (using signage or physical barriers) to permit access controls and simplify enforcement (i.e. to discourage residents from parking in visitor spaces, and vice versa)	☐

TDM Measures Checklist:
Residential Developments (multi-family, condominium or subdivision)

Legend

BASIC — The measure is generally feasible and effective, and in most cases would benefit the development and its users

BETTER — The measure could maximize support for users of sustainable modes, and optimize development performance

★ — The measure is one of the most dependably effective tools to encourage the use of sustainable modes

			TDM measures: *Residential developments*	Check if proposed & add descriptions
		1.	**TDM PROGRAM MANAGEMENT**	
		1.1	**Program coordinator**	
BASIC	★	1.1.1	Designate an internal coordinator, or contract with an external coordinator	☐
		1.2	**Travel surveys**	
BETTER		1.2.1	Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☐
		2.	**WALKING AND CYCLING**	
		2.1	**Information on walking/cycling routes & destinations**	
BASIC		2.1.1	Display local area maps with walking/cycling access routes and key destinations at major entrances *(multi-family, condominium)*	☐
		2.2	**Bicycle skills training**	
BETTER		2.2.1	Offer on-site cycling courses for residents, or subsidize off-site courses	☐

			TDM measures: *Residential developments*	Check if proposed & add descriptions
		3.	**TRANSIT**	
		3.1	**Transit information**	
BASIC		3.1.1	Display relevant transit schedules and route maps at entrances *(multi-family, condominium)*	☐
BETTER		3.1.2	Provide real-time arrival information display at entrances *(multi-family, condominium)*	☐
		3.2	**Transit fare incentives**	
BASIC	★	3.2.1	Offer PRESTO cards preloaded with one monthly transit pass on residence purchase/move-in, to encourage residents to use transit	☐
BETTER		3.2.2	Offer at least one year of free monthly transit passes on residence purchase/move-in	☐
		3.3	**Enhanced public transit service**	
BETTER	★	3.3.1	Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels *(subdivision)*	☐
		3.4	**Private transit service**	
BETTER		3.4.1	Provide shuttle service for seniors homes or lifestyle communities (e.g. scheduled mall or supermarket runs)	☐
		4.	**CARSHARING & BIKESHARING**	
		4.1	**Bikeshare stations & memberships**	
BETTER		4.1.1	Contract with provider to install on-site bikeshare station (*multi-family)*	☐
BETTER		4.1.2	Provide residents with bikeshare memberships, either free or subsidized *(multi-family)*	☐
		4.2	**Carshare vehicles & memberships**	
BETTER		4.2.1	Contract with provider to install on-site carshare vehicles and promote their use by residents	☑
BETTER		4.2.2	Provide residents with carshare memberships, either free or subsidized	☐
		5.	**PARKING**	
		5.1	**Priced parking**	
BASIC	★	5.1.1	Unbundle parking cost from purchase price *(condominium)*	☐
BASIC	★	5.1.2	Unbundle parking cost from monthly rent *(multi-family)*	☐

TDM measures: *Residential developments*				Check if proposed & add descriptions
		6.	**TDM MARKETING & COMMUNICATIONS**	
		6.1	**Multimodal travel information**	
BASIC	★	6.1.1	Provide a multimodal travel option information package to new residents	☐
		6.2	**Personalized trip planning**	
BETTER	★	6.2.1	Offer personalized trip planning to new residents	☐

APPENDIX M

MMLOS Analysis

Segment MMLOS Analysis

This section provides a review of the boundary street Navan Road, using complete streets principles. The *Multi-Modal Level of Service (MMLOS) Guidelines* were used to evaluate the levels of service for each alternative mode of transportation on Navan Road between Spring Valley Drive and Markinch Road. The targets associated with the General Urban Area have been considered.

Exhibit 4 of the *MMLOS Guidelines* has been used to evaluate the segment pedestrian level of service (PLOS) of Navan Road. Exhibit 22 of the *MMLOS Guidelines* identifies a target PLOS C for all roadways within the General Urban Area. The results of the segment PLOS analysis are summarized in **Table 1**.

Exhibit 11 of the *MMLOS Guidelines* has been used to evaluate the segment bicycle level of service (BLOS) of Navan Road. Exhibit 22 of the *MMLOS Guidelines* identifies a target BLOS C for Spine Routes within the General Urban Area. The results of the segment BLOS analysis are summarized in **Table 2**.

Exhibit 15 of the *MMLOS Guidelines* has been used to evaluate the segment transit level of service (TLOS) of Navan Road. Exhibit 22 of the *MMLOS Guidelines* does not identify a target TLOS for Navan Road. The results of the segment TLOS analysis are summarized in **Table 3**.

Exhibit 20 of the *MMLOS Guidelines* has been used to evaluate the segment truck level of service (TkLOS) of Navan Road. Exhibit 22 of the *MMLOS Guidelines* identifies a target TkLOS D for Truck Routes within the General Urban Area. The results of the segment TkLOS analysis are summarized in **Table 4**.

Table 1: PLOS Segment Analysis – Navan Road

Sidewalk Width	Boulevard Width	Avg. Daily Curb Lane Traffic Volume	Presence of On-Street Parking	Operating Speed[1]	PLOS
North side					
No sidewalk (paved shoulder)		> 3,000 vpd	No	70 km/h	**F**
South side					
No sidewalk (paved shoulder)		> 3,000 vpd	No	70 km/h	**F**

1. Operating speed taken as posted speed plus 10 km/h

Table 2: BLOS Segment Analysis – Navan Road

Road Class	Route Type	Bikeway Type	Travel Lanes	Operating Speed	Bike Lane Width	Bike Lane Blockage	BLOS
Arterial	Spine Route	Paved Shoulder	2	70 km/h	$\geq$ 1.8m	Rare	**E**

Table 3: TLOS Segment Analysis – Navan Road

Facility Type	Exposure to Congestion Delay, Friction, and Incidents			TLOS
	Congestion	Friction	Incident Potential	
Mixed Traffic – Limited Parking/Driveway Friction	Yes	Low	Medium	D

Table 4: TkLOS Segment Analysis – Navan Road

Curb Lane Width	Number of Travel Lanes Per Direction	TkLOS
3.3m to 3.5m	1	C

Intersection MMLOS Analysis

The following is a review of the intersection MMLOS of Navan Road/Renaud Road, using complete streets principles. This intersection has been evaluated based on existing conditions, using the targets for the General Urban Area.

Exhibit 5 of the *Addendum to the MMLOS Guidelines* has been used to evaluate the existing PLOS at Navan Road/Renaud Road. Exhibit 22 of the *MMLOS Guidelines* suggest a target PLOS C for all roadways within the General Urban Area. The results of the intersection PLOS analysis are summarized in **Table 5**.

Exhibit 12 of the *MMLOS Guidelines* has been used to evaluate the existing BLOS at Navan Road/ Renaud Road. Exhibit 22 of the *MMLOS Guidelines* suggest a target BLOS B for Local Routes in the General Urban Area (Renaud Road), and a target BLOS C for Spine Routes in the General Urban Area (Navan Road). The results of the intersection BLOS analysis are summarized in **Table 6**.

Exhibit 16 of the *MMLOS Guidelines* has been used to evaluate the existing TLOS at Navan Road/ Renaud Road. Exhibit 22 of the *MMLOS Guidelines* does not identify a target TLOS for roadways with no rapid transit or transit priority designations. However, Navan Road and Renaud Road have been evaluated for TLOS, as transit service is provided on both roadways. The results of the intersection TLOS analysis are summarized in **Table 7**.

Exhibit 21 of the *MMLOS Guidelines* has been used to evaluate the existing TkLOS at Navan Road/ Renaud Road. For the General Urban Area, Exhibit 22 of the *MMLOS Guidelines* suggest a target TkLOS D for arterial roadways with a truck route designation (Navan Road), and no target for collector roadways without a truck route designation (Renaud Road). The results of the intersection TkLOS analysis are summarized in **Table 8**.

Consideration of bike boxes for cyclists at Navan Road/Renaud Road has been included, with the results shown in **Table 9**. This scenario restricts right turns on red at the north and east approaches of the intersection.

Table 5: PLOS Intersection Analysis – Navan Road/Renaud Road

CRITERIA	North Approach		South Approach		East Approach		West Approach	
PETSI SCORE								
CROSSING DISTANCE CONDITIONS								
Median > 2.4m in Width	No	88	No	6	No	-10	No	23
Lanes Crossed (3.5m Lane Width)	4		9		10 +		8	
SIGNAL PHASING AND TIMING								
Left Turn Conflict	Perm + Prot	-8	Permissive	-8	Permissive	-8	Permissive	-8
Right Turn Conflict	Permissive or Yield	-5	Permissive or Yield	-5	Permissive or Yield	-5	Permissive or Yield	-5
Right Turn on Red	RTOR Allowed	-3	N/A	0	RTOR Allowed	-3	RTOR Allowed	-3
Leading Pedestrian Interval	No	-2	No	-2	No	-2	No	-2
CORNER RADIUS								
Parallel Radius	> 15m to 25m	-8	> 15m to 25m	-8	> 10m to 15m	-6	<3m	-3
Parallel Right Turn Channel	No Right Turn Channel	-4	No Right Turn Channel	-4	Conventional without Receiving	0	No Right Turn Channel	-4
Perpendicular Radius	N/A	0	> 10m to 15m	-6	N/A	0	N/A	0
Perpendicular Right Turn Channel	N/A	0	Conventional without Receiving	0	N/A	0	N/A	0
CROSSING TREATMENT								
Treatment	Standard	-7	Standard	-7	Standard	-7	Standard	-7
PETSI SCORE		**51**		**-34**		**-41**		**-9**
LOS		**D**		**F**		**F**		**F**
DELAY SCORE								
Cycle Length		113.2		113.2		113.2		113.2
Pedestrian Walk Time		16.0		31.0		37.0		37.0
DELAY SCORE		**41.7**		**29.8**		**25.6**		**25.6**
LOS		**E**		**C**		**C**		**C**
OVERALL		**E**		**F**		**F**		**F**

Table 6: BLOS Intersection Analysis

Approach	Facility Type	Criteria	Travel Lanes and/or Speed	BLOS
Navan Road/Renaud Road				
North Approach	Mixed Traffic	Right Turn Lane Characteristics	Shared through/right turn lane	A
		Left Turn Accommodation	One lane crossed, ≥ 60 km/h	**F**
South Approach	Mixed Traffic	Right Turn Lane Characteristics	Shared through/right turn lane	A
		Left Turn Accommodation	One lane crossed, ≥ 60 km/h	**F**
East Approach	Mixed Traffic	Right Turn Lane Characteristics	Shared through/right turn lane	A
		Left Turn Accommodation	One lane crossed, ≥ 60 km/h	**F**
West Approach	Pocket Bike Lane	Right Turn Lane Characteristics	Right turn lane ≤ 50m and introduced to the right	B
		Left Turn Accommodation	One lane crossed, ≥ 60 km/h	**E**

Table 7: TLOS Intersection Analysis

Approach	Delay[1]		TLOS
	AM Peak	PM Peak	
Navan Road/Renaud Road			
North Approach	22 sec	25 sec	D
South Approach	33 sec	16 sec	E
East Approach	43 sec	29 sec	F
West Approach	12 sec	15 sec	C

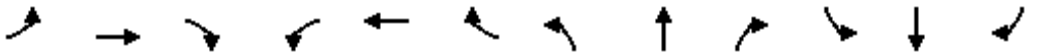
1. Delay based on outputs from Synchro analysis of existing conditions

Table 8: TkLOS Intersection Analysis

Approach	Effective Corner Radius	Number of Receiving Lanes Departing Intersection	TkLOS
Navan Road/Renaud Road			
North Approach	< 10m	1	**F**
South Approach	10m to 15m	1	**E**
East Approach	> 15m	1	C
West Approach	> 15m	1	C

Table 9: Auto LOS Intersection Analysis – Bike Boxes Implemented

Intersection	Mvmt [Scenario]	AM Peak			PM Peak		
		v/c [Delay]	50% Queue (m)	95% Queue (m)	v/c [Delay]	50% Queue (m)	95% Queue (m)
Navan Road/ Renaud Road	SBT/R [Existing]	0.28 [21 s]	12	23	0.73 [26 s]	37	70
	SBT/R [Bike Box]	0.28 [21 s]	12	23	0.73 [27 s]	38	72
	WBT/R [Existing]	0.87 [44 s]	59	#135	0.55 [29 s]	16	40
	WBT/R [Bike Box]	0.89 [47 s]	61	#137	0.56 [32 s]	19	43



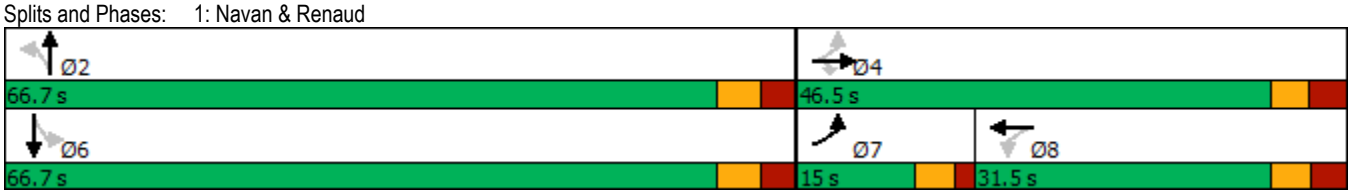
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	109	110	33	31	337	108	124	321	31	47	110	2
Future Volume (vph)	109	110	33	31	337	108	124	321	31	47	110	2
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	125.0		30.0	20.0		0.0	40.0		0.0	25.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	35.0			45.0			60.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97	0.99	0.99		1.00	1.00		1.00	1.00	
Frt			0.850		0.964			0.987			0.998	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1537	1664	1469	1353	1672	0	1642	1635	0	1510	1484	0
Flt Permitted	0.202			0.679			0.677			0.347		
Satd. Flow (perm)	327	1664	1424	958	1672	0	1167	1635	0	551	1484	0
Right Turn on Red			Yes			No			Yes			No
Satd. Flow (RTOR)			37					6				
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		492.5			382.5			712.0			235.8	
Travel Time (s)		35.5			27.5			42.7			14.1	
Confl. Peds. (#/hr)	4		3	3		4	2		2	2		2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	10%	7%	3%	25%	2%	1%	3%	6%	20%	12%	20%	1%
Adj. Flow (vph)	121	122	37	34	374	120	138	357	34	52	122	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	121	122	37	34	494	0	138	391	0	52	124	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		10.0			10.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	7	4	4	8	8		2	2		6	6	
Switch Phase												

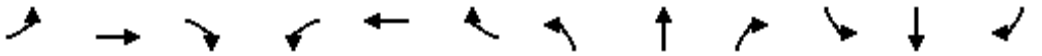
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	10.0	24.6	24.6	24.5	24.5		41.7	41.7		41.7	41.7	
Total Split (s)	15.0	46.5	46.5	31.5	31.5		66.7	66.7		66.7	66.7	
Total Split (%)	13.3%	41.1%	41.1%	27.8%	27.8%		58.9%	58.9%		58.9%	58.9%	
Maximum Green (s)	10.0	39.9	39.9	25.0	25.0		60.0	60.0		60.0	60.0	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	1.7	3.3	3.3	3.2	3.2		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.6	6.6	6.5	6.5		6.7	6.7		6.7	6.7	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min		Min	Min	
Walk Time (s)		7.0	7.0	7.0	7.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		9.0	9.0	9.0	9.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		3	3	4	4		2	2		2	2	
Act Effct Green (s)	41.1	39.5	39.5	25.3	25.3		22.9	22.9		22.9	22.9	
Actuated g/C Ratio	0.54	0.52	0.52	0.33	0.33		0.30	0.30		0.30	0.30	
v/c Ratio	0.37	0.14	0.05	0.11	0.89		0.39	0.79		0.31	0.28	
Control Delay	13.9	11.8	4.7	21.9	46.7		24.0	35.6		25.3	21.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	13.9	11.8	4.7	21.9	46.7		24.0	35.6		25.3	21.2	
LOS	B	B	A	C	D		C	D		C	C	
Approach Delay		11.8			45.1			32.6			22.4	
Approach LOS		B			D			C			C	
Queue Length 50th (m)	7.1	7.6	0.0	3.1	60.6		14.4	46.3		5.3	12.4	
Queue Length 95th (m)	19.6	20.2	4.6	10.5	#137.0		27.0	72.9		13.4	23.4	
Internal Link Dist (m)		468.5			358.5			688.0			211.8	
Turn Bay Length (m)	125.0		30.0	20.0			40.0			25.0		
Base Capacity (vph)	338	885	774	319	557		933	1309		440	1187	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.36	0.14	0.05	0.11	0.89		0.15	0.30		0.12	0.10	

Intersection Summary

Area Type: Other
Cycle Length: 113.2
Actuated Cycle Length: 75.8
Natural Cycle: 90
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 31.9 — Intersection LOS: C
Intersection Capacity Utilization 81.7% — ICU Level of Service D
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Navan & Renaud





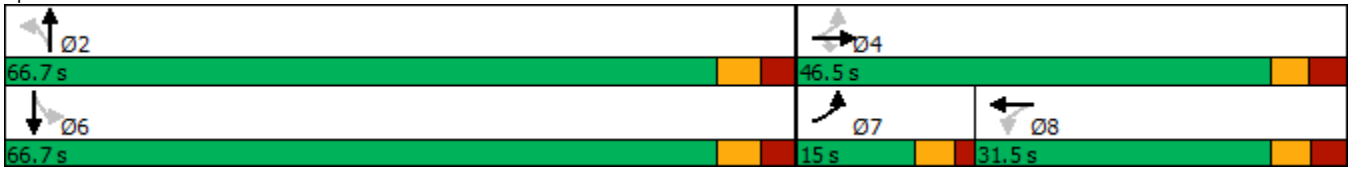
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	189	383	157	26	119	54	37	138	41	104	368	4
Future Volume (vph)	189	383	157	26	119	54	37	138	41	104	368	4
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	125.0		30.0	20.0		0.0	40.0		0.0	25.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	35.0			45.0			60.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99		0.95	0.98	0.98		1.00	0.99		1.00	1.00	
Frt			0.850		0.953			0.965			0.999	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1642	1745	1455	1626	1638	0	1642	1587	0	1674	1632	0
Flt Permitted	0.465			0.514			0.387			0.633		
Satd. Flow (perm)	793	1745	1385	866	1638	0	667	1587	0	1111	1632	0
Right Turn on Red			Yes			No			Yes			No
Satd. Flow (RTOR)			106					20				
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		492.5			382.5			712.0			235.8	
Travel Time (s)		35.5			27.5			42.7			14.1	
Confl. Peds. (#/hr)	7		8	8		7	3		3	3		3
Confl. Bikes (#/hr)						3			1			
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	3%	2%	4%	4%	2%	2%	3%	9%	3%	1%	9%	1%
Adj. Flow (vph)	210	426	174	29	132	60	41	153	46	116	409	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	210	426	174	29	192	0	41	199	0	116	413	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		10.0			10.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	7	4	4	8	8		2	2		6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	10.0	24.6	24.6	24.5	24.5		41.7	41.7		41.7	41.7	
Total Split (s)	15.0	46.5	46.5	31.5	31.5		66.7	66.7		66.7	66.7	
Total Split (%)	13.3%	41.1%	41.1%	27.8%	27.8%		58.9%	58.9%		58.9%	58.9%	
Maximum Green (s)	10.0	39.9	39.9	25.0	25.0		60.0	60.0		60.0	60.0	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	1.7	3.3	3.3	3.2	3.2		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.6	6.6	6.5	6.5		6.7	6.7		6.7	6.7	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min		Min	Min	
Walk Time (s)		7.0	7.0	7.0	7.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		9.0	9.0	9.0	9.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		3	3	4	4		2	2		2	2	
Act Effct Green (s)	30.1	28.4	28.4	13.5	13.5		22.3	22.3		22.3	22.3	
Actuated g/C Ratio	0.47	0.44	0.44	0.21	0.21		0.35	0.35		0.35	0.35	
v/c Ratio	0.42	0.55	0.26	0.16	0.56		0.18	0.35		0.30	0.73	
Control Delay	15.1	18.2	7.3	25.8	31.6		16.9	15.9		17.8	27.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	15.1	18.2	7.3	25.8	31.6		16.9	15.9		17.8	27.0	
LOS	B	B	A	C	C		B	B		B	C	
Approach Delay		15.0			30.8			16.1			25.0	
Approach LOS		B			C			B			C	
Queue Length 50th (m)	12.9	31.9	4.1	2.6	18.6		3.0	13.7		8.8	37.6	
Queue Length 95th (m)	33.2	73.1	17.1	9.6	42.6		9.5	29.9		21.0	71.6	
Internal Link Dist (m)		468.5			358.5			688.0			211.8	
Turn Bay Length (m)	125.0		30.0	20.0			40.0			25.0		
Base Capacity (vph)	506	1116	924	347	656		604	1440		1007	1479	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.42	0.38	0.19	0.08	0.29		0.07	0.14		0.12	0.28	

Intersection Summary

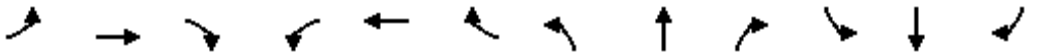
Area Type: Other
Cycle Length: 113.2
Actuated Cycle Length: 64.4
Natural Cycle: 80
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 20.0 Intersection LOS: C
Intersection Capacity Utilization 81.5% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 1: Navan & Renaud



APPENDIX N

Total Synchro Analysis



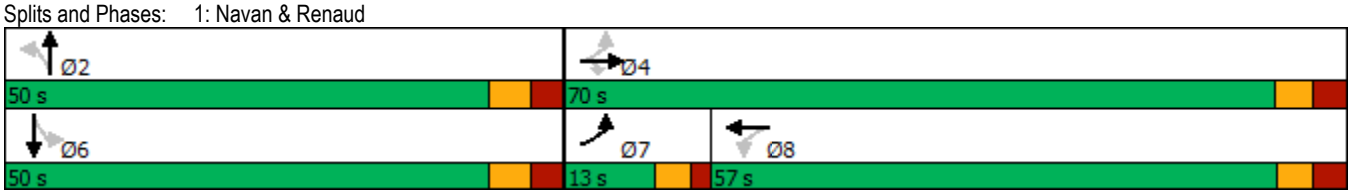
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	152	136	40	38	400	169	144	422	43	72	154	2
Future Volume (vph)	152	136	40	38	400	169	144	422	43	72	154	2
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	125.0		30.0	20.0		0.0	40.0		0.0	25.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	35.0			45.0			60.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97	0.99	0.99		1.00	1.00		1.00	1.00	
Frt			0.850		0.955			0.986			0.998	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1537	1664	1469	1353	1654	0	1642	1632	0	1510	1483	0
Flt Permitted	0.180			0.670			0.658			0.255		
Satd. Flow (perm)	291	1664	1423	945	1654	0	1134	1632	0	405	1483	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			40		22			5			1	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		492.5			382.5			712.0			235.8	
Travel Time (s)		35.5			27.5			42.7			14.1	
Confl. Peds. (#/hr)	4		3	3		4	2		2	2		2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	10%	7%	3%	25%	2%	1%	3%	6%	20%	12%	20%	1%
Adj. Flow (vph)	152	136	40	38	400	169	144	422	43	72	154	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	152	136	40	38	569	0	144	465	0	72	156	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		10.0			10.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	7	4	4	8	8		2	2		6	6	
Switch Phase												

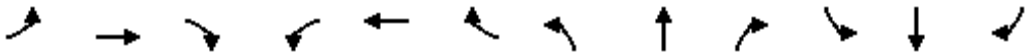
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	10.0	24.6	24.6	24.5	24.5		41.7	41.7		41.7	41.7	
Total Split (s)	13.0	70.0	70.0	57.0	57.0		50.0	50.0		50.0	50.0	
Total Split (%)	10.8%	58.3%	58.3%	47.5%	47.5%		41.7%	41.7%		41.7%	41.7%	
Maximum Green (s)	8.0	63.4	63.4	50.5	50.5		43.3	43.3		43.3	43.3	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	1.7	3.3	3.3	3.2	3.2		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.6	6.6	6.5	6.5		6.7	6.7		6.7	6.7	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min		Min	Min	
Walk Time (s)		7.0	7.0	7.0	7.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		9.0	9.0	9.0	9.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		3	3	4	4		2	2		2	2	
Act Effct Green (s)	53.2	51.6	51.6	38.0	38.0		32.8	32.8		32.8	32.8	
Actuated g/C Ratio	0.54	0.52	0.52	0.39	0.39		0.33	0.33		0.33	0.33	
v/c Ratio	0.58	0.16	0.05	0.10	0.87		0.38	0.85		0.53	0.32	
Control Delay	22.6	13.9	4.4	21.4	42.8		30.0	47.0		45.6	27.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	22.6	13.9	4.4	21.4	42.8		30.0	47.0		45.6	27.6	
LOS	C	B	A	C	D		C	D		D	C	
Approach Delay		16.8			41.5			42.9			33.3	
Approach LOS		B			D			D			C	
Queue Length 50th (m)	13.1	12.0	0.0	4.2	87.8		19.1	74.5		10.2	20.1	
Queue Length 95th (m)	26.7	24.5	4.8	11.5	147.0		39.0	#127.3		27.3	39.6	
Internal Link Dist (m)		468.5			358.5			688.0			211.8	
Turn Bay Length (m)	125.0		30.0	20.0			40.0			25.0		
Base Capacity (vph)	263	1126	976	509	901		524	757		187	686	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.58	0.12	0.04	0.07	0.63		0.27	0.61		0.39	0.23	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 98.3
Natural Cycle: 90
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 36.3 Intersection LOS: D
Intersection Capacity Utilization 97.6% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

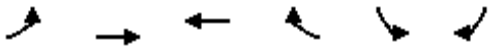
Splits and Phases: 1: Navan & Renaud





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	208	29	26	293	6	73	0	62	7	0	104
Future Volume (vph)	28	208	29	26	293	6	73	0	62	7	0	104
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.985			0.998			0.938			0.874	
Flt Protected		0.995			0.996			0.974			0.997	
Satd. Flow (prot)	0	1647	0	0	1719	0	0	1594	0	0	1521	0
Flt Permitted		0.995			0.996			0.974			0.997	
Satd. Flow (perm)	0	1647	0	0	1719	0	0	1594	0	0	1521	0
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		250.5			316.5			464.6			385.8	
Travel Time (s)		22.5			28.5			41.8			34.7	
Confl. Peds. (#/hr)	5		5	5		5						
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	7%	2%	2%	3%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	28	208	29	26	293	6	73	0	62	7	0	104
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	265	0	0	325	0	0	135	0	0	111	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		5.0			5.0			5.0			5.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	44.1%	ICU Level of Service	A
Analysis Period (min)	15		



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	25	183	497	5	11	62
Future Volume (vph)	25	183	497	5	11	62
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.999		0.885	
Flt Protected		0.994			0.993	
Satd. Flow (prot)	0	1720	1727	0	1534	0
Flt Permitted		0.994			0.993	
Satd. Flow (perm)	0	1720	1727	0	1534	0
Link Speed (k/h)		60	60		50	
Link Distance (m)		712.0	313.1		172.6	
Travel Time (s)		42.7	18.8		12.4	
Confl. Peds. (#/hr)	5			5		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	3%	2%	2%	2%
Adj. Flow (vph)	25	183	497	5	11	62
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	208	502	0	73	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.5	3.5		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	5.0		5.0	
Two way Left Turn Lane						
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	43.7%	ICU Level of Service	A
Analysis Period (min)	15		

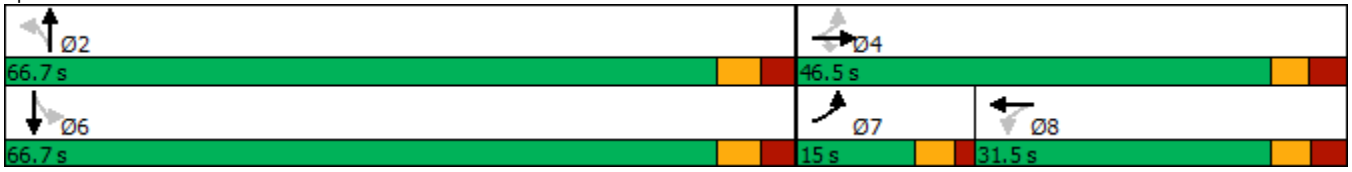
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	229	447	178	38	157	91	47	204	52	165	470	4
Future Volume (vph)	229	447	178	38	157	91	47	204	52	165	470	4
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	125.0		30.0	20.0		0.0	40.0		0.0	25.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	35.0			45.0			60.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99		0.95	0.99	0.98		1.00	0.99		1.00	1.00	
Frt			0.850		0.945			0.970			0.999	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1642	1745	1455	1626	1619	0	1642	1594	0	1674	1632	0
Flt Permitted	0.394			0.504			0.323			0.586		
Satd. Flow (perm)	674	1745	1385	851	1619	0	557	1594	0	1029	1632	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			103		24			17			1	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		492.5			382.5			712.0			235.8	
Travel Time (s)		35.5			27.5			42.7			14.1	
Confl. Peds. (#/hr)	7		8	8		7	3		3	3		3
Confl. Bikes (#/hr)						3			1			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	2%	4%	4%	2%	2%	3%	9%	3%	1%	9%	1%
Adj. Flow (vph)	229	447	178	38	157	91	47	204	52	165	470	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	229	447	178	38	248	0	47	256	0	165	474	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		10.0			10.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	7	4	4	8	8		2	2		6	6	

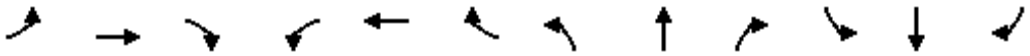
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	10.0	24.6	24.6	24.5	24.5		41.7	41.7		41.7	41.7	
Total Split (s)	15.0	46.5	46.5	31.5	31.5		66.7	66.7		66.7	66.7	
Total Split (%)	13.3%	41.1%	41.1%	27.8%	27.8%		58.9%	58.9%		58.9%	58.9%	
Maximum Green (s)	10.0	39.9	39.9	25.0	25.0		60.0	60.0		60.0	60.0	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	1.7	3.3	3.3	3.2	3.2		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.6	6.6	6.5	6.5		6.7	6.7		6.7	6.7	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min		Min	Min	
Walk Time (s)		7.0	7.0	7.0	7.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		9.0	9.0	9.0	9.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		3	3	4	4		2	2		2	2	
Act Effct Green (s)	32.8	31.2	31.2	15.8	15.8		26.8	26.8		26.8	26.8	
Actuated g/C Ratio	0.46	0.43	0.43	0.22	0.22		0.37	0.37		0.37	0.37	
v/c Ratio	0.51	0.59	0.27	0.20	0.66		0.23	0.42		0.43	0.78	
Control Delay	19.0	21.0	8.4	28.3	33.7		18.9	18.0		21.0	29.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	19.0	21.0	8.4	28.3	33.7		18.9	18.0		21.0	29.7	
LOS	B	C	A	C	C		B	B		C	C	
Approach Delay		17.8			33.0			18.1			27.5	
Approach LOS		B			C			B			C	
Queue Length 50th (m)	16.6	39.3	5.2	3.8	24.6		3.7	20.5		14.3	48.4	
Queue Length 95th (m)	40.1	85.9	19.8	12.6	54.6		11.9	42.8		32.9	92.8	
Internal Link Dist (m)		468.5			358.5			688.0			211.8	
Turn Bay Length (m)	125.0		30.0	20.0			40.0			25.0		
Base Capacity (vph)	448	1008	844	308	601		469	1346		867	1376	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.51	0.44	0.21	0.12	0.41		0.10	0.19		0.19	0.34	

Intersection Summary

Area Type: Other
Cycle Length: 113.2
Actuated Cycle Length: 71.8
Natural Cycle: 80
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.78
Intersection Signal Delay: 22.9 Intersection LOS: C
Intersection Capacity Utilization 90.2% ICU Level of Service E
Analysis Period (min) 15

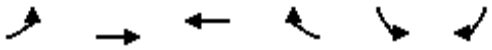
Splits and Phases: 1: Navan & Renaud





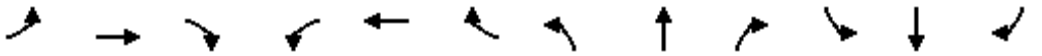
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	62	479	71	63	241	11	45	0	38	7	0	25
Future Volume (vph)	62	479	71	63	241	11	45	0	38	7	0	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.984			0.995			0.938			0.895	
Flt Protected		0.995			0.990			0.974			0.989	
Satd. Flow (prot)	0	1696	0	0	1706	0	0	1594	0	0	1545	0
Flt Permitted		0.995			0.990			0.974			0.989	
Satd. Flow (perm)	0	1696	0	0	1706	0	0	1594	0	0	1545	0
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		250.5			316.5			464.6			385.8	
Travel Time (s)		22.5			28.5			41.8			34.7	
Confl. Peds. (#/hr)	5		5	5		5						
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	2%	2%	3%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	62	479	71	63	241	11	45	0	38	7	0	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	612	0	0	315	0	0	83	0	0	32	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		5.0			5.0			5.0			5.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 57.6%		ICU Level of Service B	
Analysis Period (min) 15			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	61	576	228	12	7	38
Future Volume (vph)	61	576	228	12	7	38
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.993		0.886	
Flt Protected		0.995			0.992	
Satd. Flow (prot)	0	1721	1717	0	1534	0
Flt Permitted		0.995			0.992	
Satd. Flow (perm)	0	1721	1717	0	1534	0
Link Speed (k/h)		60	60		50	
Link Distance (m)		712.0	313.1		172.6	
Travel Time (s)		42.7	18.8		12.4	
Confl. Peds. (#/hr)	5			5		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	3%	2%	2%	2%
Adj. Flow (vph)	61	576	228	12	7	38
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	637	240	0	45	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.5	3.5		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	5.0		5.0	
Two way Left Turn Lane						
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 62.4%		ICU Level of Service B	
Analysis Period (min) 15			



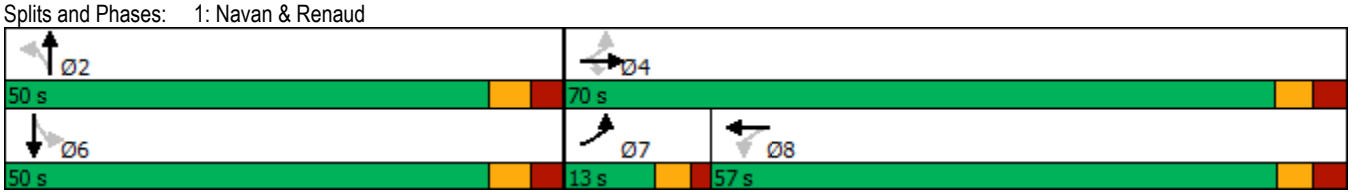
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	188	153	47	41	447	220	163	495	46	97	184	8
Future Volume (vph)	188	153	47	41	447	220	163	495	46	97	184	8
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	125.0		30.0	20.0		0.0	40.0		0.0	25.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	35.0			45.0			60.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97	0.99	0.99		1.00	1.00		1.00	1.00	
Frt			0.850		0.951			0.987			0.994	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1537	1664	1469	1353	1646	0	1642	1636	0	1510	1483	0
Flt Permitted	0.114			0.660			0.604			0.179		
Satd. Flow (perm)	184	1664	1423	931	1646	0	1041	1636	0	284	1483	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			47		25			4			2	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		492.5			382.5			712.0			235.8	
Travel Time (s)		35.5			27.5			42.7			14.1	
Confl. Peds. (#/hr)	4		3	3		4	2		2	2		2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	10%	7%	3%	25%	2%	1%	3%	6%	20%	12%	20%	1%
Adj. Flow (vph)	188	153	47	41	447	220	163	495	46	97	184	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	188	153	47	41	667	0	163	541	0	97	192	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		10.0			10.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	7	4	4	8	8		2	2		6	6	
Switch Phase												

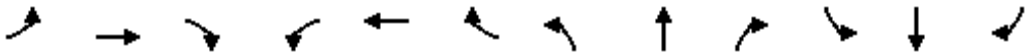
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	10.0	24.6	24.6	24.5	24.5		41.7	41.7		41.7	41.7	
Total Split (s)	13.0	70.0	70.0	57.0	57.0		50.0	50.0		50.0	50.0	
Total Split (%)	10.8%	58.3%	58.3%	47.5%	47.5%		41.7%	41.7%		41.7%	41.7%	
Maximum Green (s)	8.0	63.4	63.4	50.5	50.5		43.3	43.3		43.3	43.3	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	1.7	3.3	3.3	3.2	3.2		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.6	6.6	6.5	6.5		6.7	6.7		6.7	6.7	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min		Min	Min	
Walk Time (s)		7.0	7.0	7.0	7.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		9.0	9.0	9.0	9.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		3	3	4	4		2	2		2	2	
Act Effct Green (s)	62.3	60.7	60.7	47.7	47.7		40.9	40.9		40.9	40.9	
Actuated g/C Ratio	0.54	0.53	0.53	0.41	0.41		0.36	0.36		0.36	0.36	
v/c Ratio	0.97	0.17	0.06	0.11	0.96		0.44	0.93		0.96	0.36	
Control Delay	78.5	15.2	4.1	22.1	57.5		33.5	59.5		120.9	30.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	78.5	15.2	4.1	22.1	57.5		33.5	59.5		120.9	30.0	
LOS	E	B	A	C	E		C	E		F	C	
Approach Delay		44.5			55.5			53.5			60.5	
Approach LOS		D			E			D			E	
Queue Length 50th (m)	20.9	16.6	0.0	5.3	132.9		26.6	110.3		20.3	30.0	
Queue Length 95th (m)	#64.3	27.3	5.2	12.2	#203.4		45.2	#171.3		#52.3	48.2	
Internal Link Dist (m)		468.5			358.5			688.0			211.8	
Turn Bay Length (m)	125.0		30.0	20.0			40.0			25.0		
Base Capacity (vph)	194	925	811	412	743		395	623		107	564	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.97	0.17	0.06	0.10	0.90		0.41	0.87		0.91	0.34	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 115
Natural Cycle: 110
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.97
Intersection Signal Delay: 53.5 Intersection LOS: D
Intersection Capacity Utilization 109.7% ICU Level of Service H
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

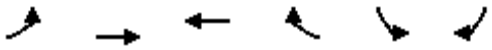
Splits and Phases: 1: Navan & Renaud





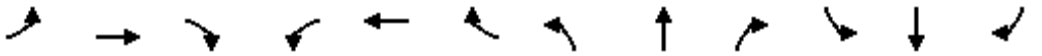
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	253	25	13	376	6	82	0	31	7	0	104
Future Volume (vph)	28	253	25	13	376	6	82	0	31	7	0	104
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.989			0.998			0.963			0.874	
Flt Protected		0.995			0.998			0.965			0.997	
Satd. Flow (prot)	0	1650	0	0	1722	0	0	1622	0	0	1521	0
Flt Permitted		0.995			0.998			0.965			0.997	
Satd. Flow (perm)	0	1650	0	0	1722	0	0	1622	0	0	1521	0
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		250.5			316.5			464.6			385.8	
Travel Time (s)		22.5			28.5			41.8			34.7	
Confl. Peds. (#/hr)	5		5	5		5						
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	7%	2%	2%	3%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	28	253	25	13	376	6	82	0	31	7	0	104
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	306	0	0	395	0	0	113	0	0	111	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		5.0			5.0			5.0			5.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	48.9%	ICU Level of Service	A
Analysis Period (min)	15		



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	25	206	551	8	18	62
Future Volume (vph)	25	206	551	8	18	62
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.998		0.895	
Flt Protected		0.995			0.989	
Satd. Flow (prot)	0	1721	1725	0	1545	0
Flt Permitted		0.995			0.989	
Satd. Flow (perm)	0	1721	1725	0	1545	0
Link Speed (k/h)		60	60		50	
Link Distance (m)		712.0	313.1		172.6	
Travel Time (s)		42.7	18.8		12.4	
Confl. Peds. (#/hr)	5			5		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	3%	2%	2%	2%
Adj. Flow (vph)	25	206	551	8	18	62
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	231	559	0	80	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.5	3.5		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	5.0		5.0	
Two way Left Turn Lane						
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	45.3%	ICU Level of Service	A
Analysis Period (min)	15		



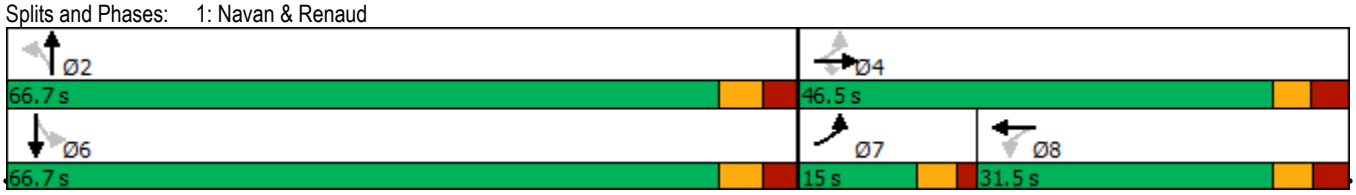
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	272	500	200	41	178	125	56	246	56	215	547	11
Future Volume (vph)	272	500	200	41	178	125	56	246	56	215	547	11
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	125.0		30.0	20.0		0.0	40.0		0.0	25.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	35.0			45.0			60.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.95	0.99	0.98		1.00	1.00		1.00	1.00	
Frt			0.850		0.938			0.972			0.997	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1642	1745	1455	1626	1604	0	1642	1596	0	1674	1630	0
Flt Permitted	0.312			0.480			0.257			0.525		
Satd. Flow (perm)	539	1745	1385	812	1604	0	443	1596	0	922	1630	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			104		29			15			1	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		492.5			382.5			712.0			235.8	
Travel Time (s)		35.5			27.5			42.7			14.1	
Confl. Peds. (#/hr)	7		8	8		7	3		3	3		3
Confl. Bikes (#/hr)						3			1			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	2%	4%	4%	2%	2%	3%	9%	3%	1%	9%	1%
Adj. Flow (vph)	272	500	200	41	178	125	56	246	56	215	547	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	272	500	200	41	303	0	56	302	0	215	558	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		10.0			10.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	7	4	4	8	8		2	2		6	6	

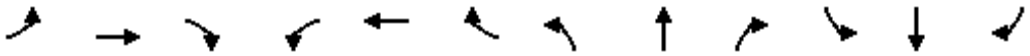
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	10.0	24.6	24.6	24.5	24.5		41.7	41.7		41.7	41.7	
Total Split (s)	15.0	46.5	46.5	31.5	31.5		66.7	66.7		66.7	66.7	
Total Split (%)	13.3%	41.1%	41.1%	27.8%	27.8%		58.9%	58.9%		58.9%	58.9%	
Maximum Green (s)	10.0	39.9	39.9	25.0	25.0		60.0	60.0		60.0	60.0	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	1.7	3.3	3.3	3.2	3.2		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	6.6	6.6	6.5	6.5		6.7	6.7		6.7	6.7	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min		Min	Min	
Walk Time (s)		7.0	7.0	7.0	7.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		9.0	9.0	9.0	9.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		3	3	4	4		2	2		2	2	
Act Effct Green (s)	36.7	35.0	35.0	19.5	19.5		34.5	34.5		34.5	34.5	
Actuated g/C Ratio	0.44	0.42	0.42	0.23	0.23		0.41	0.41		0.41	0.41	
v/c Ratio	0.73	0.68	0.31	0.22	0.76		0.31	0.45		0.56	0.83	
Control Delay	32.6	27.6	11.1	32.3	42.2		21.6	18.9		25.2	33.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	32.6	27.6	11.1	32.3	42.2		21.6	18.9		25.2	33.1	
LOS	C	C	B	C	D		C	B		C	C	
Approach Delay		25.6			41.1			19.3			30.9	
Approach LOS		C			D			B			C	
Queue Length 50th (m)	26.1	58.2	8.6	4.8	37.4		5.3	29.2		23.3	70.4	
Queue Length 95th (m)	#74.6	118.7	27.9	15.1	#83.6		14.3	50.6		45.0	114.5	
Internal Link Dist (m)		468.5			358.5			688.0			211.8	
Turn Bay Length (m)	125.0		30.0	20.0			40.0			25.0		
Base Capacity (vph)	374	868	741	253	520		331	1198		690	1220	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.73	0.58	0.27	0.16	0.58		0.17	0.25		0.31	0.46	

Intersection Summary

Area Type: Other
Cycle Length: 113.2
Actuated Cycle Length: 83.3
Natural Cycle: 80
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 28.5 Intersection LOS: C
Intersection Capacity Utilization 97.6% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

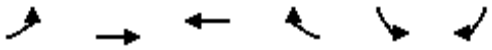
Splits and Phases: 1: Navan & Renaud





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	62	579	60	32	300	11	51	0	19	7	0	25
Future Volume (vph)	62	579	60	32	300	11	51	0	19	7	0	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.988			0.996			0.963			0.895	
Flt Protected		0.996			0.995			0.965			0.989	
Satd. Flow (prot)	0	1703	0	0	1715	0	0	1622	0	0	1545	0
Flt Permitted		0.996			0.995			0.965			0.989	
Satd. Flow (perm)	0	1703	0	0	1715	0	0	1622	0	0	1545	0
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		250.5			316.5			464.6			385.8	
Travel Time (s)		22.5			28.5			41.8			34.7	
Confl. Peds. (#/hr)	5		5	5		5						
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	2%	2%	3%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	62	579	60	32	300	11	51	0	19	7	0	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	701	0	0	343	0	0	70	0	0	32	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		5.0			5.0			5.0			5.0	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 69.1%		ICU Level of Service C	
Analysis Period (min) 15			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	60	638	256	18	12	38
Future Volume (vph)	60	638	256	18	12	38
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.991		0.897	
Flt Protected		0.996			0.988	
Satd. Flow (prot)	0	1723	1714	0	1547	0
Flt Permitted		0.996			0.988	
Satd. Flow (perm)	0	1723	1714	0	1547	0
Link Speed (k/h)		60	60		50	
Link Distance (m)		712.0	313.1		172.6	
Travel Time (s)		42.7	18.8		12.4	
Confl. Peds. (#/hr)	5			5		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	3%	2%	2%	2%
Adj. Flow (vph)	60	638	256	18	12	38
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	698	274	0	50	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.5	3.5		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	5.0		5.0	
Two way Left Turn Lane						
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 67.7%		ICU Level of Service C	
Analysis Period (min) 15			