

**TRANSPORTATION IMPACT ASSESSMENT (TIA)**

**THUNDER ROAD & BOUNDARY ROAD  
PROPOSED INDUSTRIAL DEVELOPMENT  
CITY OF OTTAWA**

**PREPARED FOR:  
THUNDER ROAD DEVELOPMENTS (2019) INC.**

**PREPARED BY:  
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- 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;
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Dated at  this  day of , 20 .  
(City)

Name :

Professional title:



Signature of individual certifier that s/he meets the above criteria

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**Stamp**



## **Executive Summary**

### **Background**

C.F. Crozier & Associates Inc. (Crozier) was retained by Thunder Road Developments (2019) Inc. to prepare a Transportation Impact Assessment in support of the Official Plan Amendment (OPA), Zoning By-Law Amendment (ZBA) and Site Plan Approval (SPA) applications for the proposed industrial development located at Thunder Road and Boundary Road in the City of Ottawa.

An original TIA (dated April 2021) was previously submitted assessing the site specific requirements and impacts of the proposed industrial development on the boundary road network and recommended required mitigation measures, as warranted. This Updated TIA Study addresses the City and MTO comments regarding the first submission TIA. A comments response letter highlighting how each comment was addressed is provided separately as part of this resubmission to ease the review process.

The proposed development has an anticipated buildout by 2025 and includes 5 industrial buildings with a total Gross Floor Area (GFA) of 41,625 sq. m. This current proposal is a reduction from the original site plan with a 58,771 sq. m GFA used for the previous submission.

- Industrial Buildings A,B,C and D consists of a combined 37,165 sq. m of GFA, 288 auto parking spaces and two full-moves accesses to Thunder Road. The previous site plan had a single building with 55,799 sq. m of GFA.
- Industrial Building E: consists of 4,460 sq. m of GFA, 36 auto parking spaces and a full-moves access to Boundary Road opposite the South Amazon access.

Industrial Building 2 is outside of this site plan; however, the building was maintained as part of analysis herein as done in the original study. The site consists of 3,850.8 sq. m of GFA, 33 auto parking spaces and a separate full-moves access to Thunder Road.

The proposed industrial development (including site 2) is projected to generate a total of 134 and 143 two-way auto trips during the weekday a.m. and p.m. peak hours, respectively.

### **Existing Traffic Operations**

Under 2020 existing traffic conditions, the study intersections are projected to operate at the Level of Services (LOS) below.

- The stop-controlled Highway 417 Westbound Ramp Terminal at Boundary Road is operating below capacity at a LOS "C" or better during the a.m. and p.m. peak hours.
- The signalized intersections of Boundary Road with Highway 417 Eastbound Ramp Terminal and Thunder Road/Amazon Way are operating at a LOS "D" or better during the a.m. and p.m. peak hours.
- The stop-controlled South Amazon Access at Boundary Road is operating below capacity at a LOS "D" or better during the a.m. and p.m. peak hours.
- The stop-controlled Mitch Owens Road connection to Boundary Road is operating below capacity at a LOS "E" for the eastbound left turn during the a.m. and p.m. peak hours. All other movements at the intersection are at a LOS "A".

### **Future Background Traffic Operations**

Under the 2025, 2030 and 2035 future background conditions:

- The stop-controlled Highway 417 Westbound Ramp Terminal at Boundary Road is forecast to operate at a LOS "F" during the a.m. peak hour of 2035 and LOS "E" or better under remaining study horizons. The intersection is forecast to operate at a LOS "B" or better during the p.m. peak hour.
- The signalized intersections of Boundary Road with Highway 417 Eastbound Ramp Terminal and Thunder Road/Amazon Way are both forecast to operate at a LOS "E" or better during the a.m. and p.m. peak hours. Both intersections are forecast to have at least one turning movement near or at capacity.
- The stop-controlled South Amazon Access at Boundary Road is projected to operate at a LOS "E" and "F" during the a.m. and p.m. peak hours, respectively.
- The stop-controlled Mitch Owens Road connection to Boundary Road is expected to operate at a LOS "F" during the a.m. and p.m. peak hours. However, similar to Novatech's recommendation, adding a northbound left turn lane (2025 horizon) and implementing traffic signals (2035 horizon) is expected to result in a forecasted LOS "D" and average traffic delays less than 18 seconds during the a.m. and p.m. peak hours.

### **Future Total Traffic Operations**

For the 2025, 2030 and 2035 total traffic conditions (includes site generated trips), the study intersections are projected to operate similarly to their respective future background conditions as follows:

- The stop-controlled Highway 417 Westbound Ramp Terminal at Boundary Road is forecast to operate at a LOS "F" or better during the a.m. peak hour and a LOS "B" or better during the p.m. peak hour.
- The signalized intersections of Boundary Road with Highway 417 Eastbound Ramp Terminal and Thunder Road/Amazon Way are both forecast to operate at a LOS "E" or better during the a.m. and p.m. peak hours, similar to the future background conditions.
- The stop-controlled Mitch Owens Road connection to Boundary Road is expected to operate at a LOS "F" during the a.m. and p.m. peak hours under the ultimate 2035 horizon. Similar to the future background conditions, adding the northbound left turn lane (2025 horizon) and implementing traffic signals (2035 horizon) is expected to result in a forecasted LOS "D" or better during the a.m. and p.m. peak hours.
- The stop-controlled South Amazon Access at Boundary Road is projected to operate at a LOS "F" during the a.m. and p.m. peak hours under the ultimate 2035 horizon. This is a future background issue and is attributable to an increase in through volumes on Boundary Road and associated future delays to traffic from the Amazon access.
- The proposed three stop-controlled site access connections to Thunder Road are projected to operate below capacity at a LOS "B" or better during the a.m. and p.m. peak hours, under all study horizons.

A signal warrant assessment based on the ultimate 2035 traffic volumes indicates that traffic signals are not warranted at the intersections of Boundary Road and South Amazon Access / Site Access and Thunder Road with the proposed three Site Accesses. Additionally, no left or right turn auxiliary lanes are warranted on Thunder Road or Boundary Road at the site access connections.

The proposed site accesses are projected to operate efficiently and safely without any issues related to sight-lines, corner clearance, access conflicts, truck movements and transit operational conflicts.

The vehicle parking supply of for each of the three buildings exceeds the City's Zoning By-Law minimum parking requirements.

**Recommendations and Conclusion**

Given the analysis herein, the recommendations presented in the Table E-1 should be considered to support the proposed development.

**Table E-1: Summary of Recommendations for Development Full build-Out**

| Category                    | Improvement   | Responsibility | Timeline              |
|-----------------------------|---|----------------|-----------------------|
| <b>Parking</b>              | Provide bicycle parking spaces for each building per City of Ottawa Zoning By-Law 2008-250 requirements   | Developer      | Full build-out (2025) |
| <b>Roadway Improvements</b> | <b>Boundary Road and Site Access / South Amazon Access:</b><br>Repurpose existing runout lane at south approach to provide auxiliary northbound left-turn with 15 metres of storage | Developer      | Full build-out (2025) |
| <b>TDM Measures</b>         | Provide cycling provisions such as secure bicycle parking, lockers, and showers   | Developer      | Full build-out (2025) |
|                             | Provide preferred carpool parking spaces to promote carpooling  | Developer      | Full build-out (2025) |
|                             | Co-ordinate with City to list development on the City's ride-matching portal and/or implement an internal ride-matching service to help employees find carpool partners             | Tenant         | Full build-out (2025) |
|                             | Implement an Emergency Ride Home program to guarantee employees a ride home in the case of an emergency   | Tenant         | Full build-out (2025) |
|                             | Provide information on available TDM opportunities through promotion and education  | Tenant         | Full build-out (2025) |
|                             | Establish a TDM program to monitor implementation and effectiveness of TDM measures   | Tenant         | Full build-out (2025) |

Further, given the future background traffic operations, we recommend that the City and MTO consider the following in future:

- Similar to the Novatech's recommendation, we recommend adding a northbound left turn lane (in 2025 horizon) and implementing traffic signals (in 2035 horizon) at the intersection of Boundary Road and Mitch Owens Road.
- Signals are not warranted at Boundary Road intersections with Highway 417 Westbound Ramp Terminal and the South Amazon Access; however, signals may be considered in future if the City and MTO identify safety issues from extended delays to the minor street.

- Signal optimization to redistribute intersection capacity (effective green time) may be required in the future (i.e., 2030 onwards) to maintain the target LOS "D" at the intersections of Boundary Road with Highway 417 Eastbound Ramp Terminal and Thunder Road/Amazon Way.
- Boundary Road and Highway 417 Eastbound Ramp Terminal: The EBR movement is expected to experience v/c ratios greater than 0.75, largely due to limited capacity for the yield EBR movement created by through traffic on Boundary Road. The MTO and City may consider optimizing the existing signal timing plan in future to create more capacity for the yield controlled EBR movement.
- The southbound traffic queues on Boundary Road at the Thunder Road intersection are forecast to occasionally extend beyond the Highway 417 Ramp in the 2035 horizon during the p.m. peak hours. However, this is a future background condition and not attributable to the proposed development. This issue is a long-term forecast and should be monitored by the City and reviewed as part of the City's ongoing Transportation Master Plan Update.
- It is noted the City is currently completing its Official Plan Update, as well as undertaking a Transportation Master Plan and Infrastructure Master Plan updates. Any potential widening of Boundary Road and major road improvements should be monitored and may be reviewed as part of the ongoing Plan updates.
- In addition to the City's existing road network volume monitoring program to assess capacity constrained zones, given the potential long term impact of the Covid-19 pandemic on home-work trips, the forecasted future volumes herein may be overstated, it is important to monitor intersection volumes in future to confirm if any roadway improvements and or traffic signal modifications are needed for optimal performance of the relevant surrounding intersections.

Based on this study findings, it is our conclusion that the traffic generated by the proposed industrial development at Thunder Road and Boundary Road can be accommodated by the boundary road network. The Official Plan Amendment (OPA), Zoning By-Law Amendment (ZBA) and Site Plan Approval (SPA) applications can be supported from a traffic operations perspective as the boundary road system is forecast to adequately accommodate the increase in traffic volumes attributable to the proposed development.

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## 1.0 Introduction

### 1.1 Background

Crozier & Associates Inc. (Crozier) was retained by Thunder Road Developments (2019) Inc. to prepare a Transportation Impact Assessment in support of the Official Plan Amendment (OPA), Zoning By-Law Amendment (ZBA) and Site Plan Approval (SPA) applications for the proposed industrial development located at 6150 Thunder Road and 5368 Boundary Road in the City of Ottawa.

Based on the City of Ottawa's "Transportation Impact Assessment Guidelines (2017)" requirements a Transportation Impact Assessment (TIA) Screening and Scoping Report, a Forecasting Report and a Strategy Report were all submitted and confirmed by the City of Ottawa as part of the first four steps of the TIA submission process.

As required by the City's TIA Guidelines, a TIA report fulfilling the final step of the TIA submission by compiling the TIA Screening and Scoping, Forecasting and Strategy Reports into a single document to support the proposed development application was made in April 2021.

The subject property is within the Ministry of Transportation of Ontario (MTO) Permit Controlled Area and therefore subject to MTO review and approval, including conformance to the MTO's "Traffic Impact Study Guideline" (September 2014). Thus, the scope of work presented in the original TIA report conforms to both the City and MTO's guidelines.

This Updated TIA Study addresses the City and MTO comments regarding the first submission TIA. A comments response letter highlighting how each comment was addressed is provided separately as part of this resubmission to ease the review process. This updated TIA further incorporates the additional Industrial background development located at 5494, 5500, and 5510 Boundary Road as requested by the City and MTO via email dated July 29, 2021.

### 1.2 Subject Property

The subject property covers an area of approximately 43.15 acres and is located in a rural area east of the urban core of Ottawa. The subject property is located south of Highway 417 and near the Amazon Facility east of Boundary Road that was constructed in 2019. Highway 417 functions as the transportation link between Ottawa and Quebec.

The subject property is designated as "General Rural Area" per the City's Official Plan which permits farms, rural housing, wood lots and forests, small industries, golf courses and existing clusters of residential subdivisions and severances and commercial development. It is noted that the east side of Boundary Road is identified as "Employment Area" per the City's Official Plan.

The subject property is currently zoned as "Rural Countryside Zone" (RU) per the City's Zoning By-Law 2008-250. The purpose of the RU zone is to "accommodate agricultural, forestry, country residential lots created by severance and other land uses characteristic of Ottawa's countryside, in areas designated as General Rural Area, Rural Natural Features and Greenbelt Rural in the Official Plan..."

The subject property is bound by Thunder Road to the north, treed areas to the south and west, and Boundary Road to the east. With the exception of two residences at Boundary Road and a residential dwelling on Thunder Road, the subject property is primarily vacant. **Figure 1** contains the Site Location Plan.

## 1.3 Development Proposal

Per the Conceptual Site Plan prepared by Ware Malcomb dated July 21, 2021 (see **Appendix A**), the development proposes 5 industrial buildings with a total Gross Floor Area (GFA) of 41,625 sq. m (400,004 sq. ft). This current proposal is a reduction from the original site plan with a 58,771 sq. m GFA used for the previous submission.

- Industrial Buildings A,B,C and D consists of a combined 37,165 sq. m of GFA, 288 auto parking spaces and two full-moves accesses to Thunder Road. The previous site plan had a single building with 55,799 sq. m of GFA.
- Industrial Building E: consists of 4,460 sq. m of GFA, 36 auto parking spaces and a full-moves access to Boundary Road opposite the South Amazon access.

Industrial Building 2 is outside of this site plan; however, the building was maintained as part of analysis herein as done in the original study. The site consists of 3,850.8 sq. m of GFA, 33 auto parking spaces and a separate full-moves access to Thunder Road.

The development is expected to be built-out and occupied within a five-year horizon (i.e., 2025).

## 2.0 Screening

The City's TIA Guidelines contain a screening form that must be reviewed and completed to determine if a TIA is required for the proposed development. There are three triggers as part of the screening analysis: trip generation trigger, location trigger and safety trigger.

The **trip generation trigger** is satisfied as the proposed industrial development exceeds the 5,000 sq. m threshold.

The **location trigger** is not satisfied as the subject property is not located in a Design Priority Area (DPA), Transit-Oriented Development (TOD) zone, nor fronting a roadway that is part of the City's Transit Priority, Rapid Transit or Spine Bicycle Networks.

The **safety trigger** is satisfied as the posted speed limit on Boundary Road is 80 km/h and three of the proposed site accesses are within 300 metres of the signalized intersection of Thunder Road and Boundary Road. Additionally, City staff identified concerns per the pre-application notes dated December 23, 2019, regarding the location of the proposed site accesses to Thunder Road particularly near the horizontal curve.

Therefore, a TIA is required to support the proposed development leading into the next step of scoping the work. The completed screening form is included as **Appendix B**.

## 3.0 Scoping

### 3.1 Existing Conditions

#### 3.1.1. Roadways

The boundary road network is described in **Table 3-1**.

**Table 3-1: Boundary Road Network – Roadways**

| Feature                             | Roadway   |   |  |                                   |                                  |
|-------------------------------------|---|---|--|-----------------------------------|----------------------------------|
|                                     | Highway 417   | Thunder Road  | Boundary Road  | Mitch Owens Road                  | Amazon Way                       |
| Direction                           | Two-way (East-West)   | Two-way (East-West)   | Two-way (North-South)  | Two-way (East-West)               | Two-way (East-West)              |
| Jurisdiction                        | MTO   | Ottawa  | Ottawa   | Ottawa                            | Private                          |
| Classification                      | Highway   | Collector   | Arterial (Regional Road 41)  | Arterial (Regional Road 8)        | Private Road                     |
| Speed Limit                         | 110 km/h posted <sup>1</sup><br>40 km/h advised for ramps         | 60 km/h posted  | 80 km/h posted   | 80 km/h posted                    | 15 km/h posted                   |
| Span                                | Highway 17 to Quebec  | Ramsayville Road to Boundary Road   | Russel Road to Craig Street  | Regional Road 49 to Boundary Road | Boundary Road to within the site |
| Alignment in Study Area             | Straight and Flat   | 45m radius curve west of Boundary Road, straight westerly Flat  | Straight and Flat  | Straight and Flat                 | Straight and Flat                |
| Existing Developments in Study Area | None  | Residential dwellings on south side, gas-station at southwest corner of intersection with Boundary Road | Distribution centre and other commercial uses, gas-station at southwest corner of intersection with Thunder Road | None                              | Distribution centre (Amazon)     |
| Number of travel lanes              | Four  | Two   | Two  | Two                               | Two                              |
| Divided?                            | Yes   | No  | No   | No                                | No                               |
| Intersection Control                | Signal control at East Terminal and stop control at West Terminal | Signal control at Boundary Road   | Signal control at Thunder Road and Amazon Way  | Stop control at Boundary Road     | Signal control at Boundary Road  |

Note 1: The posted speed limit of 110 km/h is a part of an MTO Pilot Project for 110 km/h speed limits within Ontario.

**Figure 2** illustrates the existing boundary road network lane configurations and intersection control.

### 3.1.2. Intersections

**Table 3-2** outlines the existing traffic control, configurations, and pedestrian crossing provisions at the intersections on the boundary road network.

**Table 3-2: Boundary Road Network – Intersections**

| Intersection                                     | Control             | Approaches | Major Street  | Lane Configurations                                      | Pedestrian Crossing       |
|--|---------------------|------------|---------------|--|---------------------------|
| Boundary Road and Highway 417 Westbound Terminal | Stop (Minor Street) | 3          | Boundary Road | NBTR<br>SBLT<br>WBLR                                     | None                      |
| Boundary Road and Highway 417 Eastbound Terminal | Signal              | 3          | Boundary Road | NBL<br>NBT<br>SBTR<br>EBL<br>EBR – channelized           | South and West Approaches |
| Boundary Road and Thunder Road / Amazon Way      | Signal              | 4          | Boundary Road | SBL<br>SBTR<br>NBL<br>NBT<br>NBR<br>WBTL<br>WBR<br>EBTLR | All Approaches            |
| Boundary Road and South Amazon Access            | Stop (Minor Street) | 3          | Boundary Road | NBTR<br>SBL<br>SBT<br>WBLR                               | East Approach             |
| Boundary Road and Mitch Owens Road               | Stop (Minor Road)   | 3          | Boundary Road | EBR<br>EBL<br>NBTL<br>SBR<br>SBT                         | None                      |

The Amazon Facility Y0W1 has recently been constructed in the study area. A review of the supporting “Transportation Impact Study Addendum #1” prepared by Novatech (dated April 2018, herein referred to as the Novatech study) indicates that roadway improvements were recommended along Boundary Road at the Amazon site accesses, and the Highway 417 south ramp terminal. The intersection improvements were implemented in 2019 including auxiliary turn lanes at the intersections, as well as traffic signal control at the intersections of Boundary Road and Thunder Road / Amazon Access, and Boundary Road and Highway 417 south ramp terminal.

### 3.1.3. Adjacent Driveways

There are several existing driveways on the boundary road network within 200 metres of the proposed site accesses as described below:

- Four driveways to residential dwellings on the south side of Thunder Road, west of the proposed site access to Building 2;
- One driveway to a residential dwelling on the south side of Thunder Road, between the proposed site accesses to Buildings A, B, C, D and 2. This driveway will be removed as part of the development proposal;
- One driveway to a gas station on the south side of Thunder Road, at the southwest corner of Thunder Road and Boundary Road;
- One driveway to a gas station on the west side of Boundary Road, at the southwest corner of Thunder Road and Boundary Road;

- One driveway to a restaurant on the west side of Boundary Road, north of the proposed site access to Building E;
- Two driveways to residential dwellings on the west side of Boundary Road, south of the proposed site access to Building E (these dwelling units are within the development boundary and thus would be replaced by the development build-out);
- One driveway to a commercial use on the west side of Boundary Road, south of the proposed site access to Building E;
- One driveway to a residential dwelling on the east side of Boundary Road at the southeast corner of Thunder Road and Amazon Way;
- Two driveways to a commercial use on the east side of Boundary Road, north of the proposed site access to Building E;
- One driveway to the Amazon Facility on the east side of Boundary Road, opposite the proposed site access to Building E;
- Two driveways to commercial properties on the east side of Boundary Road, south of the proposed site access to Building E; and
- One driveway to a residential dwelling on the east side of Boundary Road, south of the proposed site access to Building E.

### 3.1.4. Existing Transit Services

OC Transpo operates one transit route within the study area. **Table 3-3** outlines the existing transit route, direction, days of operation, peak hour headways, and the location of bus stops in the study area.

**Table 3-3: Existing Transit Services**

| Route                     | Direction                        | Span                           | Days of Operation   | Peak Hour Headways (min) | Bus Stops in Study Area   |
|---------------------------|----------------------------------|--------------------------------|---|--------------------------|---|
| Route 222<br>(OC Transpo) | West (AM Peak)<br>East (PM Peak) | Rockdale Road to Blair Station | Monday to Friday<br>(6:00AM - 9:00AM<br>and<br>3:00PM – 6:00PM) | 60                       | None<br>(Bus stop 1.25 km north of site on Boundary Road at GreyHawk Golf Club) |

As outlined above, one bus route operates within the study area but does not actually service the immediate site frontage nor the nearby distribution centre. As there are no pedestrian facilities on Boundary Road between the site and the existing bus stop at GreyHawk Golf Club, there is a lack of convenient transit accessibility to and from the immediate study area. Additionally, the route only operates westbound (from Rockdale Road to Blair Station) during the weekday a.m. peak period and vice versa during the weekday p.m. peak period.

### 3.1.5. Existing Active Transportation Facilities

The existing active transportation facilities on the boundary road network are described in **Table 3-4**.



**Table 3-4: Existing Active Transportation Network**

| Roadway          | Pedestrian Facilities | Separation from Roadway | Cycling Facilities  | Separation from Roadway |
|------------------|-----------------------|-------------------------|---|-------------------------|
| Highway 417      | None                  | N/A                     | None  | N/A                     |
| Thunder Road     | None                  | N/A                     | None  | N/A                     |
| Boundary Road    | None                  | N/A                     | Paved Shoulders – Highway 417 Eastbound Terminal to South Amazon Access | None                    |
| Mitch Owens Road | None                  | N/A                     | None  | N/A                     |

As outlined above, the only existing pedestrian or cycling facilities in the study area are paved shoulders on Boundary Road between Highway 417 Eastbound Terminal to the South Amazon Access.

**3.1.6. Area Traffic Management**

There are no Area Traffic Management measures in the study area nor are there any Area Traffic Management studies in progress.

**3.1.7. Existing Traffic Volumes**

Commissioned traffic counts were provided by the proponent and collected during the weekday peak periods (6:00 a.m. – 10:00 a.m. and 3:00 p.m. – 7:00 p.m.) on January 7, 2020. The existing traffic volumes are illustrated in **Figure 3** and the traffic count data is included as **Appendix C**.

The recorded volumes on the boundary road network were auto traffic including heavy trucks. No pedestrian volumes were observed during the weekday a.m. and p.m. count periods.

**3.1.8. Collision History**

Historical collision data was provided by the proponent from January 1, 2014, to December 31, 2018. A collision analysis was conducted to identify any existing collision trends in the area, with the critical threshold per the City’s guidelines being more than six collisions within a five-year time frame for any collision type. The collision data is included as **Appendix D**.

**Table 3-5** outlines the collision frequency by type, severity, and weather conditions in the area.

**Table 3-5: Collision History**

| <b>Intersection</b>                                   | <b>Collision Type</b>   | <b>Severity</b>                            | <b>Weather Conditions</b>                     |
|---|---|--|---|
| Boundary Road and Highway 417 Westbound Ramp Terminal | Angle – 2<br>Rear-End – 5<br>Sideswipe – 1<br>Single Manned Vehicle (SMV)/Other – 1<br><b>Total - 9</b> | Fatal – 1<br>Property Damage (PD) Only - 8 | Rain – 1<br>Clear - 8                         |
| Boundary Road and Highway 417 Eastbound Ramp Terminal | Rear-End – 3<br>SMV/Other – 1<br><b>Total - 4</b>   | Injury – 1<br>PD Only - 3                  | Rain – 2<br>Clear – 2                         |
| Boundary Road and Thunder Road                        | Turning Movement – 2<br><b>Total - 2</b>  | PD Only - 2                                | Snow – 1<br>Clear – 1                         |
| Boundary Road and Mitch Owens Road                    | Angle – 7<br>Rear-End – 3<br>SMV/Other – 8<br><b>Total - 18</b>   | Injury – 3<br>PD Only – 15                 | Rain – 1<br>Snow – 2<br>Fog – 3<br>Clear - 12 |

As outlined above, the only collision patterns in the area that exceeds the City's threshold of six collisions within five years are angle collisions and SMV / other collisions at the intersection of Boundary Road and Mitch Owens Road, with seven and eight collisions (respectively) in the five-year time period.

Therefore, the TIA will include a safety analysis of the intersection of Boundary Road and Mitch Owens Road to identify existing conditions at the intersection and opportunities to address the pattern of angle collisions and SMV / other collisions, particularly under future conditions with the inclusion of development generated traffic.

### **3.2 Future Planned Conditions**

#### **3.2.1. Roadway Improvements**

No future roadway capacity improvements nor alternative transportation infrastructure plans have been identified on Thunder Road nor Boundary Road in the study area per the City's Transportation Master Plan (2013). Further, several roadway improvements have recently been implemented on Boundary Road to support the Amazon Facility build-out.

However, the City is currently updating their Transportation Master Plan which may include improvements to Thunder Road or Boundary Road. The City can confirm if any future improvements are planned in the study area.

#### **3.2.2. Background Developments**

A review of the City's development applications map indicates a background development located on the properties at 5471-5613 Boundary Road and 5508-5800 Frontier Road. The development application is for Site Plan Control and is for a future waste management facility for the Capital Region Resource Recovery Centre (CRRRC). Thus, this development will be accounted for in the TIA. In the absence of current anticipated development build-out timing, build-out of the development will be accounted for under all future horizon years.

Additionally, as requested by the City and MTO, the background development located at 5494, 5500

& 5510 Boundary Road was included in our analysis. Per the TIA dated April 2021 (prepared by Novatech), the background development proposes a freight dock and warehouse facility of approximately 5,593 m<sup>2</sup> and 120 employees. The TIA was in support of an Official Plan Amendment and Zoning By-Law Amendment applications with an anticipated buildout year of 2021. As such, the development is accounted for within the TIA under all future horizon years.

### 3.3 Study Area

The study area for the TIA will consist of the following study intersections:

- Highway 417 and Westbound Terminal
- Highway 417 and Eastbound Terminal
- Thunder Road and Boundary Road / Amazon Way
- Boundary Road and South Amazon Access / future site access
- Boundary Road and Mitch Owens Road

### 3.4 Time Periods

The employment nature of the proposed development will result in additional traffic on the boundary road network during the critical weekday commuter peak hours. Per typical TIS practice for employment developments, the TIA will analyze the weekday a.m. and p.m. peak periods.

### 3.5 Horizon Years

Per the City's guidelines, the year of full build-out and the five-year horizon must be analyzed. However, the MTO requires analysis of the year of full build-out, the five-year horizon and ten-year horizon. It can reasonably be assumed that the development will be built-out by 2025. Therefore, the TIA will analyze the 2025, 2030 and 2035 horizon years.

### 3.6 Exemptions Review

This section reviews possible exemptions in the scope of work elements of the TIA study per the City's guidelines. **Table 3-6** summarizes the City's possible exemptions and the developments status in meeting the exemption.

**Table 3-6: Possible Exemptions**

| Module                           | Element                        | Exemption Condition  | Development Status |
|----------------------------------|--------------------------------|--|--------------------|
| <b>Design Review Component</b>   |                                |  |                    |
| Development Design               | Circulation and Access         | Only required for Site Plans   | Not exempt         |
|                                  | <b>New Street Networks</b>     | <b>Only required for Plans of Subdivision</b>  | <b>Exempt</b>      |
| Parking                          | Parking Supply                 | Only required for Site Plans   | Not exempt         |
|                                  | <b>Spillover Parking</b>       | <b>Only required for Site Plans where parking supply is 15% below unconstrained demand</b>   | <b>Exempt</b>      |
| Transportation Demand Management | All elements                   | Not required for Site Plans expected to have fewer than 60 employees and/or students on location at any given time   | Not exempt         |
| Neighbourhood Traffic Management | <b>Adjacent Neighbourhoods</b> | <b>Only required when the development relies on local or collector streets for access and total volumes exceed ATM capacity thresholds</b>                           | <b>Exempt</b>      |
| Network Concept                  | ---                            | Only required when proposed development generates more than 200 person-trips during the peak hour in excess of the equivalent volume permitted by established zoning | Not exempt         |

Therefore, the TIA will contain analysis of circulation and access, parking supply and demand, Transportation Demand management, and Network Concept (changes to Transportation Master Plan concepts for auto and transit use).

## 4.0 Forecasting

### 4.1 Trip Generation Forecasts

Trip generation for the proposed development was forecasted using the latest published data from the Institute of Transportation Engineers (ITE) Trip Generation Manual, 10<sup>th</sup> Edition. The ITE Trip Generation Manual is a compendium of industry collected trip generation data across North America for a variety of land uses and is used industry wide as a source for trip generation forecasts.

#### 4.1.1. Auto Trip Generation

The trip generation rates for Land Use Category (LUC) 150 “Warehousing” were applied to the proposed industrial buildings to forecast auto trips generated by the buildings. The fitted curve equation was applied to the proposed building GFAs from which a trip generation rate (trips generated per 1,000 sq. ft) was reverse calculated to determine non-auto trip generation rates.

The total trip generation for the proposed industrial buildings was categorized into passenger cars and heavy truck traffic. Per the ITE Trip Generation Handbook (3<sup>rd</sup> Edition), Table I.1, approximately 20% of site traffic generated by LUC 150 “Warehousing” on a weekday is heavy truck traffic. Site traffic generated by similar land use LUC 130 “Industrial Park” consists of between 1-31% of heavy truck traffic during the weekday peak hours with an average of 13%, and site traffic generated by similar land use LUC 152 “High-Cube Warehouse/Distribution Centre” consists of between 9-29% of heavy truck traffic during the weekday peak hours. Therefore, an estimate of 20% for heavy truck traffic is considered

reasonable.

**Table 4-1** outlines the auto trip generation for the proposed development.

**Table 4-1: Auto Trip Generation**

| Building                                   | GFA            | Land use   | Trips Generated – A.M. Peak |                    |                     | Trips Generated – P.M. Peak |                    |                     |
|--|----------------|------------|-----------------------------|--------------------|---------------------|-----------------------------|--------------------|---------------------|
|  |                |            | In                          | Out                | Total               | In                          | Out                | Total               |
| <b>Total Auto Trip Generation</b>          |                |            |                             |                    |                     |                             |                    |                     |
| A, B, C, D                                 | 400,041 sq. ft | Industrial | <b>56</b><br>(77%)          | <b>17</b><br>(23%) | <b>73</b><br>(0.17) | <b>20</b><br>(27%)          | <b>56</b><br>(73%) | <b>76</b><br>(0.17) |
| 2  | 41,449 sq. ft  | Industrial | <b>23</b><br>(77%)          | <b>7</b><br>(23%)  | <b>30</b><br>(0.72) | <b>9</b><br>(27%)           | <b>24</b><br>(73%) | <b>33</b><br>(0.80) |
| E  | 48,007 sq. ft  | Industrial | <b>24</b><br>(77%)          | <b>7</b><br>(23%)  | <b>31</b><br>(0.91) | <b>9</b><br>(27%)           | <b>25</b><br>(73%) | <b>34</b><br>(1.00) |
| <b>DEVELOPMENT TOTAL:</b>                  |                |            | <b>103</b>                  | <b>31</b>          | <b>134</b>          | <b>38</b>                   | <b>105</b>         | <b>143</b>          |
| <b>Passenger Car Trip Generation (80%)</b> |                |            |                             |                    |                     |                             |                    |                     |
| A, B, C, D                                 | 400,041 sq. ft | Industrial | <b>45</b>                   | <b>14</b>          | <b>59</b>           | <b>16</b>                   | <b>45</b>          | <b>61</b>           |
| 2  | 41,449 sq. ft  | Industrial | <b>18</b>                   | <b>6</b>           | <b>24</b>           | <b>7</b>                    | <b>19</b>          | <b>26</b>           |
| E  | 48,007 sq. ft  | Industrial | <b>19</b>                   | <b>6</b>           | <b>25</b>           | <b>7</b>                    | <b>20</b>          | <b>27</b>           |
| <b>DEVELOPMENT TOTAL:</b>                  |                |            | <b>82</b>                   | <b>26</b>          | <b>108</b>          | <b>30</b>                   | <b>84</b>          | <b>114</b>          |
| <b>Heavy Truck Trip Generation (20%)</b>   |                |            |                             |                    |                     |                             |                    |                     |
| A, B, C, D                                 | 400,041 sq. ft | Industrial | <b>11</b>                   | <b>3</b>           | <b>14</b>           | <b>4</b>                    | <b>11</b>          | <b>15</b>           |
| 2  | 41,449 sq. ft  | Industrial | <b>5</b>                    | <b>1</b>           | <b>6</b>            | <b>2</b>                    | <b>5</b>           | <b>7</b>            |
| E  | 48,007 sq. ft  | Industrial | <b>5</b>                    | <b>1</b>           | <b>6</b>            | <b>2</b>                    | <b>5</b>           | <b>7</b>            |
| <b>DEVELOPMENT TOTAL:</b>                  |                |            | <b>21</b>                   | <b>5</b>           | <b>26</b>           | <b>8</b>                    | <b>21</b>          | <b>29</b>           |

The full build-out of the proposed development is expected to generate approximately 108 and 114 total two-way passenger car trips during the weekday a.m. and p.m. peak hour, respectively, and approximately 26 and 29 total two-way heavy truck trips during the weekday a.m. and p.m. peak hour, respectively.

Given that the proposed development is solely industrial use, no trip synergy is expected between the buildings and no pass-by trips are expected to be generated by the development. Therefore, no internal trip synergy reductions or pass-by trip reductions were applied.

#### **4.1.2. Non-Auto Trip Generation**

The City's TIA Guidelines provide methodology for forecasting non-auto trips using the ITE Trip Generation Rates, as follows:

- Assume a 10% non-auto mode share for trips generated by the proposed development for low-density areas with low transit mode shares; and
- Assume an average vehicle occupancy of 1.15 for the purposes of translating auto trips to person trips.

The methodology outlined above equates to a factor of 1.28 to be applied to the ITE auto trip rates outlined in **Table 1** to forecast person trips. **Table 4-2** outlines the non-auto trip generation for the proposed development.

**Table 4-2: Non-Auto Trip Generation**

| Building                              | GFA            | Land use   | Trips Generated – A.M. Peak |                           |                            | Trips Generated – P.M. Peak |                           |                            |
|---------------------------------------|----------------|------------|-----------------------------|---------------------------|----------------------------|-----------------------------|---------------------------|----------------------------|
|                                       |                |            | In                          | Out                       | Total                      | In                          | Out                       | Total                      |
| <b>Total Person Trip Generation</b>   |                |            |                             |                           |                            |                             |                           |                            |
| A, B, C, D                            | 400,041 sq. ft | Industrial | <b>72</b><br><i>(77%)</i>   | <b>22</b><br><i>(23%)</i> | <b>94</b><br><i>(0.21)</i> | <b>26</b><br><i>(27%)</i>   | <b>72</b><br><i>(73%)</i> | <b>98</b><br><i>(0.21)</i> |
| 2                                     | 41,449 sq. ft  | Industrial | <b>29</b><br><i>(77%)</i>   | <b>9</b><br><i>(23%)</i>  | <b>38</b><br><i>(0.93)</i> | <b>11</b><br><i>(27%)</i>   | <b>31</b><br><i>(73%)</i> | <b>42</b><br><i>(1.02)</i> |
| E                                     | 48,007 sq. ft  | Industrial | <b>31</b><br><i>(77%)</i>   | <b>9</b><br><i>(23%)</i>  | <b>40</b><br><i>(1.16)</i> | <b>12</b><br><i>(27%)</i>   | <b>32</b><br><i>(73%)</i> | <b>44</b><br><i>(1.28)</i> |
| <b>DEVELOPMENT TOTAL:</b>             |                |            | <b>132</b>                  | <b>40</b>                 | <b>172</b>                 | <b>49</b>                   | <b>135</b>                | <b>184</b>                 |
| <b>Non-Auto Trip Generation (10%)</b> |                |            |                             |                           |                            |                             |                           |                            |
| A, B, C, D                            | 400,041 sq. ft | Industrial | <b>7</b>                    | <b>2</b>                  | <b>9</b>                   | <b>3</b>                    | <b>7</b>                  | <b>10</b>                  |
| 2                                     | 41,449 sq. ft  | Industrial | <b>3</b>                    | <b>1</b>                  | <b>4</b>                   | <b>1</b>                    | <b>3</b>                  | <b>4</b>                   |
| E                                     | 48,007 sq. ft  | Industrial | <b>3</b>                    | <b>1</b>                  | <b>4</b>                   | <b>1</b>                    | <b>3</b>                  | <b>4</b>                   |
| <b>DEVELOPMENT TOTAL:</b>             |                |            | <b>13</b>                   | <b>4</b>                  | <b>17</b>                  | <b>5</b>                    | <b>13</b>                 | <b>18</b>                  |

The full build-out of the proposed development is expected to generate approximately 172 and 184 total person trips during the weekday a.m. and p.m. peak hour, respectively, and approximately 17 and 18 total non-auto trips during the weekday a.m. and p.m. peak hour, respectively.

## 4.2 Mode Shares

### 4.2.1 Existing Mode Shares

The National Capital Region (NCR) Origin-Destination survey was reviewed to identify existing mode shares in the study area for transit, walking, cycling, auto passengers and auto trips for the Traffic Assessment Zone (TAZ) that contains the proposed development.

The subject property is located in the Rural Southeast TAZ. Thus, the latest census data (2011) was analyzed for the Rural Southeast TAZ. Specifically, the mode shares for trips entering and exiting the Rural Southeast TAZ during the weekday a.m. and p.m. peak periods (6:30 a.m. – 9:00 a.m., and 3:30 p.m. – 6:00 p.m.) were analyzed and are outlined in **Table 4-3**.

**Appendix E** contains the NCR survey data.

**Table 4-3: Existing Mode Share**

| Travel Mode        | Weekday A.M. Peak Period |             | Weekday P.M. Peak Period |             | Average     | Assumed Existing for Study Area |
|--------------------|--------------------------|-------------|--------------------------|-------------|-------------|---------------------------------|
|                    | Inbound                  | Outbound    | Inbound                  | Outbound    |             |                                 |
| Auto Driver        | 69%                      | 68%         | 73%                      | 64%         | 69%         | 77%                             |
| Auto Passenger     | 9%                       | 14%         | 18%                      | 30%         | 18%         | 20%                             |
| Transit            | 0%                       | 6%          | 5%                       | 3%          | 3%          | 3%                              |
| Cycling            | 0%                       | 0%          | 0%                       | 0%          | 0%          | 0%                              |
| Walking            | 2%                       | 0%          | 0%                       | 0%          | 0%          | 0%                              |
| Other <sup>1</sup> | 20%                      | 12%         | 4%                       | 3%          | 10%         | 0%                              |
| <b>Total</b>       | <b>100%</b>              | <b>100%</b> | <b>100%</b>              | <b>100%</b> | <b>100%</b> | <b>100%</b>                     |

Note 1: Per the NCR survey methodology, "other" refers to trips made by school bus, paratransit, taxi, motorcycle/scooter, intercity/chartered bus, ferry, rail transit or air.

As outlined above, the average auto mode share is approximately 87% and the average non-auto mode share is approximately 13%. It is noted that the mode share for "other" is significantly higher during the weekday a.m. peak hour compared to the weekday p.m. peak hour. This could be attributed to school bus activity during the morning school hours which overlap with the weekday a.m. commuter peak hours, whereas afternoon school hours do not typically overlap with weekday p.m. commuter peak hours.

It is further noted that the Rural Southeast TAZ consists of suburban areas such as Greely and Metcave which may act as the origin or destination points for walking and other trips such as school bus and taxi. The subject lands are located in a rural area with no nearby suburban areas that would act as origin or destination points for walking trips and other trips made by school bus, ferry, rail, or air.

Therefore, the existing "other" mode share for the immediate study area would realistically be expected to be none or negligible at best. Thus, the mode share for auto driver and auto passenger would be expected to be higher than the average from the census data. The transit mode share assumption of 3% is also considered conservative as the nearest transit facility in the study area is the Route 222 (OC Transpo) bus stop at the GreyHawk Golf Club located 1.25 kilometres north of the subject property and there are no existing pedestrian facilities on Boundary Road in the area. Additionally, the route only operates westbound (from Rockdale Road to Blair Station) during the weekday a.m. peak period and vice versa during the weekday p.m. peak period, further limiting transit service availability for employees of the proposed future development.

Based on these assumptions, the existing non-auto mode share in the study area is only 3% which is less than the City's standard base assumption of 10% for low-density areas. This means that the person and non-auto trip generation forecasts outlined in **Table 4-2** may be overstated.

#### **4.2.2. Future Mode Shares Targets**

Future mode share targets have been established for the proposed development considering the context of the development proposal, the assumed horizon year of 2025 for build-out, planned future roadway capacity and alternative transportation infrastructure improvements in the study area, and non-auto trip generation opportunities of the proposed development.

**Table 4-4** outlines the future mode share targets for the proposed development.

**Table 4-4: Future Mode Share Targets**

| Travel Mode    | Assumed Existing Mode Share for Study Area | Target Mode Share (2025) | Rationale  |
|----------------|--|--------------------------|--|
| Auto Driver    | 77%  | 70% (-7%)                | Potential to increase auto passenger and transit mode shares may result in reductions in single-occupant vehicle (SOV) trips   |
| Auto Passenger | 20%  | 27% (+7%)                | Potential for development to promote carpooling (e.g., provide preferred carpool parking spaces) to reduce SOV trips   |
| Transit        | 3%   | 3%                       | Nearest transit stop is 1.25 kilometres north of site with no pedestrian facilities on Boundary Road, and weekday peak hour transit services are limited to westbound only in a.m. peak hour and eastbound only in p.m. peak hour                                  |
| Cycling        | 0%   | 0%                       | Rural area with no nearby origin/destination points for cycling or walking trips, no planned cycling or walking infrastructure improvements in the study area, warehouse distribution nature of development typically not associated with cycling or walking trips |
| Walking        | 0%   | 0%                       |  |
| <b>Total</b>   | <b>100%</b>                                | <b>100%</b>              | --   |

As outlined above, a heavy reliance on auto travel is still expected in the future given the warehouse distribution nature of the proposed development, the rural context of the study area with no nearby origin or destination points for walking or cycling trips, and the absence of planned alternative transportation infrastructure improvements in the study area.

However, there are potential opportunities for the proposed development to reduce single-occupant vehicle (SOV) trips by promoting carpooling (e.g., provide preferred carpool parking spaces and incentives for employees to travel together), thus reducing the SOV trips generated by the proposed development. Co-ordination with City staff should also occur to list the proposed future development on the City's ride-matching portal to increase and encourage carpooling opportunities for employees.

### 4.3 Trip Distribution and Assignment

#### 4.3.1. Employee Trip Distribution

The employee trips generated by the proposed development will be distributed to the road network based on origin and destination data from the NCR survey (2011) for the Rural Southeast and Rural East TAZ, given that the subject property is adjacent to the Rural East TAZ. The percentage of trips from origin points outside of the study area entering the study area during the weekday a.m. peak hour were analyzed, and the following trip distribution was derived:

- 35% to and from the south via Boundary Road
- 5% to and from the south/west via Mitch Owens Road
- 20% to and from the north via Boundary Road
- 25% to and from the west via Highway 417
- 15% to and from the east via Highway 417



**Appendix E** contains the NCR survey data and **Appendix F** contains the trip distribution analysis based on percentage of trips from various origin points.

It is noted that this trip distribution is similar to the trip distribution that was applied to the "Transportation Impact Study Addendum #1" prepared by Novatech for the Amazon Warehouse and Distribution Facility (Y0W1) that was recently constructed in the study area. The study was prepared in April 2018 and is herein referred to as the Novatech study.

Employee trip distribution was derived in the Novatech study based on:

- origin and destination data provided by the proponent;
- origin and destination data from the NCR survey (2011) for the Rural Southeast and Rural East TAZ; and
- the population of surrounding communities per Statistics Canada.

The rationale listed above are accepted justification for trip distribution assumptions per the City's TIA Guidelines. Additionally, the 2011 NCR survey data used in the Novatech study still reflects the latest NCR survey data that is currently available.

The assumed trip distribution for employees in the Novatech study is as follows:

- 30% to and from the south via Boundary Road
- 5% to and from the south/west via Mitch Owens Road
- 20% to and from the north via Boundary Road
- 25% to and from the west via Highway 417
- 20% to and from the east via Highway 417

The study was approved by the City in 2018 and the proposed development will operate similarly to this warehouse and distribution facility. Therefore, given the similar land use and the similar trip distributions, the employee trip distribution in the Novatech study will be applied to this TIA for consistency.

#### **4.3.2. Heavy Truck Trip Distribution**

The heavy truck trips generated by the proposed development will be distributed to the road network based on expected catchment areas for heavy trucks. The City of Ottawa and surrounding areas, as well as the Gatineau areas of Quebec are considered to be the major truck origin and destination points to the west, and the Montreal and surrounding areas are considered to be the major truck origin and destination point to the east. Therefore, a reasonable truck distribution is as follows:

- 60% to and from the west via Highway 417
- 40% to and from the east via Highway 417

Heavy truck trip distribution was derived in the Novatech study based on logical routing assumptions (given Ottawa to the west and Quebec to the east via Highway 417), as follows:

- 65% to and from the west via Highway 417
- 35% to and from the east via Highway 417

Given the similar land use and the similar assumed trip distributions, the heavy truck trip distribution in the Novatech study will be applied to this TIA for consistency.

### **4.3.3. Trip Assignment**

Employee and truck trips generated by the proposed development will be assigned to the road network based on the trip distribution outlined in subsequent Sections. Trips are assumed to travel to and from their origin and destination points based on the most convenient route available and the route with the shortest travel time.

For Building 1, employees are expected to enter and exit the site via the easterly access to Thunder Road (located at the horizontal curve) and the proposed access to Boundary Road. Heavy trucks are expected to enter and exit the site via the westerly access to Thunder Road. The westerly access extends within the site as a drive aisle solely connecting to the truck loading area while employee parking connects solely to the drive aisle extending from the easterly access.

For Building 2, all employees and heavy trucks will enter and exit the site via the sole proposed access to Thunder Road.

For Building 3, all employees and heavy trucks are expected to enter the site via the proposed access to Boundary Road. Most employees and heavy trucks are expected to exit the site via the proposed easterly access to Thunder Road to turn left onto Boundary Road at the signalized intersection.

**Figures 8 and 9** outline the employee and heavy truck trip assignment, respectively.

## **4.4 Background Network Travel Demands**

### **4.4.1. Background Transportation Network Plans**

No future roadway capacity improvements nor alternative transportation infrastructure plans have been identified on Thunder Road nor Boundary Road in the study area per the City's Transportation Master Plan (2013). Further, several roadway improvements have recently been implemented on Boundary Road to support the Amazon Facility build-out.

As mentioned in the Screening and Scoping Report, the City is currently updating their Transportation Master Plan which may include improvements to Thunder Road or Boundary Road. The City can confirm if any future improvements are planned in the study area. However, for the purposes of this study, no background roadway improvements are assumed to occur.

The Novatech study that was prepared for the Amazon Facility recommended that the City consider implementing traffic signal control and an auxiliary northbound left-turn lane at the intersection of Boundary Road and Mitch Owens Road. The study found that under 2017 existing conditions, traffic signals and an auxiliary left-turn lane were warranted at the intersection, and that under future total conditions, the forecasted operations at the intersection were poor and indicated the need for traffic signal control. While this improvement has not been implemented as have the Novatech recommended improvements on Boundary Road at Highway 417 Eastbound Ramp Terminal and at Thunder Road / Amazon Way, this TIA will consider this recommendation. Therefore, the TIA will analyze the intersection of Boundary Road and Mitch Owens Road with and without the recommended improvements to compare operations and validate the Novatech recommendation.

#### **4.4.2. Background Growth**

Historical growth rates were derived from Annual Average Daily Traffic (AADT) and Summer Average Daily Traffic (SADT) trends on Highway 417 at the Boundary Road Interchange. The latest AADT and SADT data available are for 2016; thus, growth rates from 2012 to 2016 were analyzed. **Appendix G** contains the growth rate analysis.

A compounded growth rate of 0.19% compounded annually was determined from the AADT for Highway 417 between 2012 and 2016, and a compounded growth rate of 0.66% compounded annually was determined from the SADT for Highway 417 between 2012 and 2016. These low growth rates indicate low traffic growth in the study area.

The Novatech study applied a conservative growth rate of 2% compounded annually to existing traffic volumes to forecast future background traffic volumes. This growth rate is exclusive of background development generated traffic in the study area. Additionally, the "Traffic Impact Study – Addendum 2" prepared by Taggart Group of Companies for the future Capital Region Resource Recovery Centre (CRRRC) in the study area also applied a growth rate of 2% compounded annually.

Therefore, given the calculated growth rates in the study area and the growth rate applied in background studies, the 2% growth rate compounded annually will be applied in this TIA for consistency.

#### **4.4.3. Background Developments**

As discussed in section 3.2.2, two background developments were considered in this TIA study. The background developments are the Capital Region Resource Recovery Centre (CRRRC) waste facility at 5471-5613 Boundary Road & 5508-5800 Frontier Road; and the industrial warehouse development proposed at 5494, 5500, and 5510 Boundary Road.

Per Figure 3.1 from the "Traffic Impact Study – Addendum 2" prepared by Taggart Group of Companies for the CRRRC, the development is expected to add site traffic to the study intersections herein. The weekday peak hour volumes outlined in Figure 3.1 of the CRRRC were added to the boundary road network under 2025, 2030 and 2035 future background conditions. **Appendix H.1** contains excerpts from the CRRRC TIS. **Figure 4.1** outlines the CRRRC background site traffic.

Per Figure 3 of the 5494, 5500, and 5510 Boundary Road Transportation Impact Assessment (prepared by Novatech), the background development is expected to add traffic to the study intersections herein. The weekday peak hour volumes outlined in Figure 3 of the 5494, 5500, and 5510 Boundary Road TIA were added to the boundary road network under 2025, 2030, and 2035 future background conditions. **Appendix H.2** contains excerpts from the Novatech TIS. **Figure 4.2** outlines the background development site traffic.

#### **4.5 Demand Rationalization**

Preliminary capacity analysis was conducted for this forecasting report to determine if there are any locations or movements under future analysis scenarios where the forecasted demand exceeds capacity. Per the City's TIA guidelines, if the forecasted demand for a location or movement is expected to exceed capacity (i.e., volume-to-capacity ratio exceeding 1.00), then future travel demands must be rationalized to account for capacity limitations on the transportation network.

For the purposes of this analysis, the ultimate build-out scenario (2035 future total conditions) was analyzed. The analysis methodology follows the City's TIA guidelines for Synchro 9.2 inputs and modelling parameters and will be detailed in the TIA Strategy Report as part of the next step in the TIA process.

**Figures 5, 6 and 7** outline the 2025, 2030 and 2035 future background traffic volumes, respectively, on the road network (with the growth rate outlined in Section 4.4.2 applied to the existing volumes plus the CRRC and Novatech background site traffic outlined in **Figures 4.1 and 4.2**). **Figures 10, 11 and 12** outline the 2025, 2030 and 2035 future total traffic volumes, respectively (with the site trip assignment outlined in **Figures 8 and 9** added to the future background traffic volumes).

Preliminary modelling of 2035 future total conditions indicates that the only movement expected to operate with a volume-to-capacity ratio exceeding 1.00 is the eastbound left-turn movement at Boundary Road and Mitch Owens Road during the weekday p.m. peak hour, with a ratio of 1.01. These operations are attributed to the reduced available capacity for the eastbound left-turn movement given the stop-controlled approach and the heavy through volumes on Boundary Road, as evidenced by the high forecasted average delay of 85 seconds.

However, these results are consistent with the findings of the Novatech study and as discussed earlier, the Novatech study recommended that the City implement traffic signal control and an auxiliary northbound left-turn lane at the intersection to improve traffic operations. If traffic signals are implemented, then the intersection is expected to operate with an average delay less than 20 seconds and a maximum volume-to-capacity ratio less than 0.80, thus resulting in no movements on the road network under 2035 future total conditions expected to exceed capacity.

Therefore, the TIA will analyze the intersection of Boundary Road and Mitch Owens Road with and without the recommended improvements to rationalize the future forecasted demand at the intersection.

## **5.0 Analysis**

### **5.1 Development Design**

#### **5.1.1. Design for Sustainable Modes**

As detailed in the Forecasting Report (March 2021), there is a heavy reliance on auto travel in the study area given the rural industrial nature of the area and the lack of existing dedicated pedestrian, cycling, and transit facilities. However, there are opportunities for the proposed development to promote non-auto mode of travel as detailed further in Section 5.5.

#### **5.1.2. Circulation and Access**

For Building 1, employees are expected to enter and exit the site via the easterly access to Thunder Road (located at the horizontal curve) and the proposed access to Boundary Road. Heavy trucks are expected to enter and exit the site via the westerly access to Thunder Road. The westerly access extends within the site as a drive aisle solely connecting to the truck loading area while employee parking connects solely to the drive aisle extending from the easterly access.

For Building 2, all employees and heavy trucks will enter and exit the site via the sole proposed access to Thunder Road.

For Building 3, all employees and heavy trucks are expected to enter the site via the proposed access to Boundary Road. Most employees and heavy trucks are expected to exit the site via the proposed easterly access to Thunder Road to turn left onto Boundary Road at the signalized intersection.

Vehicle turning analysis was conducted at the site accesses and within the sites for the most constrained vehicle profiles expected to navigate within the site. The purpose of this analysis is to determine if there are any expected vehicle maneuverability issues within the site.

Analysis was conducted for the following vehicle profiles:

- a passenger car (per TAC GDGCR standards) navigating the passenger car parking areas;
- a WB-20 tractor semi-trailer (per TAC GDGCR standards) navigating the heavy truck areas; and
- a pumper firetruck navigating around the industrial buildings.

Vehicle turning analysis indicates that there are generally no expected maneuverability constraints within the site. Internal site geometrics and details will be finalized at a later stage in the project.

**Appendix I** contains the vehicle turning diagrams for each vehicle profile.

## 5.2 Parking Analysis

The proposed parking supply for the industrial buildings is outlined in **Table 5-1**.

**Table 5-1: Proposed Passenger Car Parking Supply**

| Building | GFA (sq. m) | Proposed Passenger Car Parking Supply |
|----------|-------------|---------------------------------------|
| A        | 8,920       | 83 spaces + 2 accessible spaces       |
| B        | 8,920       | 59 spaces + 2 accessible spaces       |
| C        | 8,920       | 62 spaces + 2 accessible spaces       |
| D        | 10,405      | 76 spaces + 2 accessible spaces       |
| E        | 4,460       | 34 spaces + 2 accessible spaces       |
| 2        | 3,850       | 31 spaces + 2 accessible spaces       |

### 5.2.1. Auto Parking

The minimum parking requirements for warehouse land uses in Area D "Rural" per the City of Ottawa Zoning By-Law 2008-250 (consolidated) is:

- 0.8 spaces per 100 sq. m for the first 5,000 sq. m of GFA, and
- 0.4 spaces per 100 sq. m for GFA greater than 5,000 sq. m.

**Table 5-2** outlines the minimum auto parking required for each building compared to the proposed supply for each building.

**Table 5-2: City of Ottawa Zoning By-Law Minimum Auto Parking Requirements**

| Building | GFA (sq. m) | Zoning Land Use | Minimum Spaces Required | Proposed Supply | Surplus or Deficiency |
|----------|-------------|-----------------|-------------------------|-----------------|-----------------------|
| A        | 8,920       | Warehouse       | 56 spaces               | 85 spaces       | +29                   |
| B        | 8,920       | Warehouse       | 56 spaces               | 61 spaces       | +5                    |
| C        | 8,920       | Warehouse       | 56 spaces               | 64 spaces       | +8                    |
| D        | 10,405      | Warehouse       | 62 spaces               | 78 spaces       | +16                   |
| E        | 4,460       | Warehouse       | 36 spaces               | 36 spaces       | 0                     |
| 2        | 3,850       | Warehouse       | 31 spaces               | 33 spaces       | +2                    |

As outlined above, the proposed parking supply for each building exceeds or meets the minimum requirements per the City's Zoning By-Law. Therefore, the proposed auto parking supply is sufficient.

### 5.2.2. Bicycle Parking

The minimum bicycle parking requirements for the proposed warehouse development per the City's Zoning By-Law are calculated as: 1 space per 2,000 sq. m of GFA. **Table 5-3** outlines the minimum bicycle parking required for each building.

**Table 5-3: City of Ottawa Zoning By-Law Minimum Bicycle Parking Requirements**

| Building | GFA (sq. m) | Zoning Land Use | Minimum Bicycle Parking Spaces Required |
|----------|-------------|-----------------|---|
| A        | 8,920       | Warehouse       | 5                                       |
| B        | 8,920       | Warehouse       | 5                                       |
| C        | 8,920       | Warehouse       | 5                                       |
| D        | 10,405      | Warehouse       | 6                                       |
| E        | 4,460       | Warehouse       | 3                                       |
| 2        | 3,850       | Warehouse       | 2                                       |

Bicycle parking spaces should be provided for each building in conformance with the City's Zoning By-law to encourage cycling as a viable mode of transportation to and from the site.

## 5.3 Boundary Streets

### 5.3.1. Multi-modal Level of Service

A multi-modal level of service (MMLOS) assessment was conducted for non-auto modes of transportation in the study area following the City's MMLOS guidelines. **Table 5-4** outlines the MMLOS for pedestrian, cycling, transit and truck modes.

**Table 5-4: Boundary Street Multi-Modal Levels of Service**

| Intersection   | Approach / Direction | Pedestrian LOS   | Cycling LOS      | Transit LOS      | Truck LOS        |
|--|----------------------|------------------|------------------|------------------|------------------|
| Boundary Road between Highway 417 Eastbound Ramp Terminal      | Northbound           | F                | F                | E                | C                |
|  | Southbound           | F                | F                | E                | C                |
| Boundary Road and Thunder Road / Amazon Way                    | East Approach        | C                | F                | N/A <sup>2</sup> | E                |
|  | West Approach        | B                | D                | N/A <sup>2</sup> | E                |
|  | North Approach       | E                | F                | N/A <sup>2</sup> | E                |
|  | South Approach       | E                | F                | N/A <sup>2</sup> | E                |
| Thunder Road west of Boundary Road                             | Eastbound            | F                | F                | E                | C                |
|  | Westbound            | F                | F                | E                | C                |
| Boundary Road between Thunder Road and South Amazon Access     | Northbound           | F                | F                | E                | C                |
|  | Southbound           | F                | F                | E                | C                |
| Boundary Road and Thunder Road / South Amazon Access           | East Approach        | N/A <sup>1</sup> | D                | N/A <sup>2</sup> | C                |
|  | West Approach        | N/A <sup>1</sup> | N/A <sup>3</sup> | N/A <sup>2</sup> | N/A <sup>3</sup> |
|  | North Approach       | N/A <sup>1</sup> | D                | N/A <sup>2</sup> | N/A <sup>3</sup> |
|  | South Approach       | N/A <sup>1</sup> | N/A <sup>3</sup> | N/A <sup>2</sup> | C                |
| Boundary Road between South Amazon Access and Mitch Owens Road | Northbound           | F                | F                | E                | C                |
|  | Southbound           | F                | F                | E                | C                |

Note 1: Analysis not completed due to intersection constraints with unsignalized intersection while calculations require a signalized intersection per the City of Ottawa's "The Multimodal Level of Service (MMLoS) Guidelines".

Note 2: Transit Level of Service at intersections not required for Rural areas per City of Ottawa's "The Multimodal Level of Service (MMLoS) Guidelines".

Note 3: Leg of intersection required to complete analysis is not constructed (i.e., no leg for cyclists to turn left onto or from, or no leg for trucks to turn right onto or from).

The multi-modal level of service analysis results reflects the existing rural industrial nature of the area and the lack of existing dedicated pedestrian, cycling, and transit facilities on the road network. Additionally, no future multi-modal improvements are currently identified in the study area.

### 5.3.2. Road Safety Analysis

As identified in the Screening and Scoping Report, safety analysis was conducted for the intersection of Boundary Road and Mitch Owens Road to address the existing pattern of angle collisions and SMV / other collisions.

The dominant trend in the reported angle collisions is driver right-of-way conflicts with drivers turning left from the stop-controlled approach of Mitch Owens Road onto Boundary Road and colliding with northbound or southbound through traffic during clear weather and road surface conditions. There was no dominant trend in the reported SMV / other collisions, as they were observed to be relatively evenly distributed by direction, weather and road surface condition, time of day and driver action. These types of collisions are not uncommon on high-speed rural roadways.

A desktop review of the existing intersection indicates that the intersection is illuminated, the pavement markings and signage at the intersection appear to be in good condition, and there appears to be proper warning signs of the intersection at each intersection approach (stop ahead sign on Mitch Owens Road, and intersection ahead signs on Boundary Road). There is also a

checkerboard sign at the east leg of the intersection facing eastbound traffic approaching from Mitch Owens Road. The intersection also features an overhead flashing beacon (flashing amber on Boundary Road and flashing red on Mitch Owens Road) to further emphasize the three-legged intersection and provide caution to approaching drivers. These measures appear to have been in place since 2012 (per desktop historical imagery), suggesting that these reported collisions are more attributed to driver error and inclement weather conditions (e.g., snow and ice) as opposed to insufficient traffic control at the intersection.

However, as discussed in the Forecasting Report, the Novatech study recommended the implementation of traffic signals and an auxiliary northbound left-turn lane at the intersection of Boundary Road and Mitch Owens Road (warranted as a "background" improvement without the Amazon Facility build-out). If these improvements were to be implemented by the City (as recommended in this TIA), then the traffic signal control would evenly distribute right-of-way at the intersection and address the angle collision trend observed at the intersection. The traffic signal control implementation would "interrupt flow" on Boundary Road and thus force drivers to stop on the red indication, thus potentially addressing the SMV / other collisions occurring from drivers along Boundary Road. The implementation of the proper traffic control signage and pavement markings at the signalized intersection per OTM standards will further reduce the potential of SMV / other collisions occurring at the intersection.

## **5.4 Access Intersections Analysis and Design**

### **5.4.1 Access Location**

#### 5.4.1.1 Adjacent Driveways

As detailed in the Screening & Scoping Report (March 2021), there are several existing driveways on the boundary road network within 200 metres of the proposed site accesses as described below:

- Four driveways to residential dwellings on the south side of Thunder Road, west of the proposed site access to Building 2;
- One driveway to a residential dwelling on the south side of Thunder Road, between the proposed site accesses to Buildings 1 and 2. This driveway will be removed as part of the development proposal;
- One driveway to a gas station on the south side of Thunder Road, at the southwest corner of Thunder Road and Boundary Road;
- One driveway to a gas station on the west side of Boundary Road, at the southwest corner of Thunder Road and Boundary Road;
- One driveway to a restaurant on the west side of Boundary Road, north of the proposed site access to Building 3;
- Two driveways to residential dwellings on the west side of Boundary Road, south of the proposed site access to Building 3 (these dwelling units are within the development boundary and thus would be replaced by the development build-out);
- One driveway to a commercial use on the west side of Boundary Road, south of the proposed site access to Building 3;
- One driveway to a residential dwelling on the east side of Boundary Road at the southeast corner of Thunder Road and Amazon Way;
- Two driveways to a commercial use on the east side of Boundary Road, north of the proposed site access to Building 3;
- One driveway to the Amazon Facility on the east side of Boundary Road, opposite the



- proposed site access to Building 3;
- Two driveways to commercial properties on the east side of Boundary Road, south of the proposed site access to Building 3; and
- One driveway to a residential dwelling on the east side of Boundary Road, south of the proposed site access to Building 3.

The existing private driveways not located within the subject property limits are spaced more than 15 metres from the proposed Building 2 and 3 site accesses to Thunder Road and Boundary Road and spaced more than 60 metres from the proposed Building 1 site accesses to Thunder Road (per the City's Private Approach By-law No. 2003-477, Section 25.1.m.ii).

#### 5.4.1.2 Number of Proposed Accesses

Per the City's Private Approach By-law No. 2003-477, Section 25.1.a., the maximum number of private approaches permitted to a property is:

- One two-way access with frontage less than 35 metres;
- Two two-way accesses with frontage between 35 – 150 metres; and
- An additional two-way access for every 90 metres of frontage exceeding 150 metres.

The property frontage to Building 1 along Thunder Road is approximately 300 metres; thus, technically permitting four two-way accesses to Thunder Road. The development proposes two two-way accesses to Thunder Road, thus satisfying the City's By-law.

The property frontage to Building 2 along Thunder Road is approximately 135 metres; thus, technically permitting two two-way accesses to Thunder Road. The development proposes one two-way access to Thunder Road, thus satisfying the City's By-law.

The property frontage to Building 3 along Boundary Road is approximately 85 metres; thus, technically permitting two two-way accesses to Boundary Road. The development proposes one two-way access to Boundary Road, thus satisfying the City's By-law.

#### 5.4.1.3 Sight Distance Analysis

The available sightlines at the proposed accesses were assessed for conformance with the minimum sight distance requirements set out in the TAC GDGCR. The design speed of a collector roadway in a rural environment is typically 10-20 km/h greater than the posted speed limit. The posted speed limit on Thunder Road is 60 km/h.

However, the sharp horizontal curve on Thunder Road approaching Boundary Road currently has a curve advisory speed of 30 km/h which would lower design speeds as a result. Thus, a conservative design speed of 50 km/h was applied to Site Access C facing east.

There is another horizontal curve on Thunder Road west of the subject property which, while not as tight as the horizontal curve approaching Boundary Road, would reduce operating speeds along Thunder Road approaching the curve and within the straight segment between the two curves. Therefore, a design speed of 70 km/h was applied to the site accesses west of Site Access C.

A design speed of 100 km/h was assumed for Boundary Road given the 80 km/h posted speed limit. **Table 5-5** outlines the required sight distance at the site accesses.

**Table 5-5: Sight Distance Requirements**

| Parameter                              | Thunder Road and Site Access A   | Thunder Road and Site Access B           | Thunder Road and Site Access C                                       | Boundary Road and Site Access / South Amazon Access |
|--|--|--|--|---|
| <b>Design Vehicle</b>                  | WB-20 Tractor Semi-Trailer   | WB-20 Tractor Semi-Trailer               | WB-20 Tractor Semi-Trailer   | WB-20 Tractor Semi-Trailer                          |
| <b>Posted Speed Limit of Roadway</b>   | 60 km/h  | 60 km/h                                  | 60 km/h  | 80 km/h   |
| <b>Assumed Design Speed</b>            | 70 km/h  | 70 km/h                                  | 70 km/h facing west)<br>50 km/h (facing east)                        | 100 km/h  |
| <b>Base Time Gap</b>                   | 11.5 s <sup>-1</sup>   | 11.5 s <sup>-1</sup>                     | 11.5 s <sup>-1</sup>   | 11.5 s <sup>-1</sup>                                |
| <b>Additional Time Gap</b>             | None   | None                                     | None   | None  |
| <b>Vertical Alignment of Roadway</b>   | Relatively flat  | Relatively flat                          | Relatively flat  | Relatively flat                                     |
| <b>Horizontal Alignment of Roadway</b> | Curves east and west of subject property   | Curves east and west of subject property | Curves east and west of subject property                             | Straight  |
| <b>Sight Distance Required</b>         | 225 m <sup>2</sup>   | 225 m <sup>2</sup>                       | 225 m <sup>2</sup> (facing west)<br>160 m <sup>2</sup> (facing east) | 320 m <sup>2</sup>                                  |
| <b>Sight Distance Available</b>        | >250 m (facing west)<br>To Boundary Road / Thunder Road intersection (facing east) | >250 m (facing east and west)            | >250 m (facing east and west)  | >350 m (facing north and south)                     |

Note 1: Time gap for left-turning WB-20 trucks from a stop onto a two-lane highway with no median and with a grade less than 3%. Value from Table 9.9.3 in the GDGCR.

Note 2: Sight distance values calculated from Intersection Sight Distance equation 9.9.1 in the GDGCR.

The proposed site access locations satisfy minimum sight distance requirements, as demonstrated in the Sight Distance assessment drawings included in **Appendix O**. Further, the sight distance requirements herein are conservative as speed is expected to be lower than the design speed given the curvature on Thunder Road and the higher driver eye height of the design vehicle may further improve available sightlines.

#### 5.4.2. Access Width

Per the City's Private Approach By-law No. 2003-477, the maximum width of a private approach cannot exceed 9.0 metres, but a higher width may be permitted for transport loading areas.

The proposed accesses to Thunder Road and Boundary Road range in width from 8.0 – 9.4 metres, thus exceeding 9.0 metres. However, these accesses will be utilized by heavy trucks to access the trucking areas for each building, thus justifying the excess width of 0.4 metres.

Access alignment and geometrics can be confirmed at a later stage in the project.

### 5.4.3. Traffic Control and Turn Lane Warrant Assessment

#### 5.4.3.1 Signal Warrant Analysis

A signal warrant analysis was conducted for the proposed site accesses to Thunder Road and proposed site access to Boundary Road under the ultimate 2035 horizon year. The TAC signal warrant analysis was applied per the City's TIA Guidelines.

Given the rural nature of the study area and the higher speed limits, a "free flow" type was applied to this warrant. **Table 5-6** outlines the results of the signal warrant analysis.

**Table 5-6: Signal Warrant Analysis Results**

| Location  | Flow Type | Horizon Year | Number of lanes on major road | Traffic Signals Warranted? |
|---|-----------|--------------|-------------------------------|----------------------------|
| Thunder Road and Site Access A                      | Free Flow | 2035         | Two                           | No                         |
| Thunder Road and Site Access B                      | Free Flow | 2035         | Two                           | No                         |
| Thunder Road and Site Access C                      | Free Flow | 2035         | Two                           | No                         |
| Boundary Road and South Amazon Access / Site Access | Free Flow | 2035         | Two                           | No                         |
| Boundary Road and Highway 417 Westbound Ramp        | Free Flow | 2035         | Two                           | No                         |

The results of the signal warrant analysis indicate that traffic signals are not warranted at the proposed site accesses to Thunder Road and proposed site access to Boundary Road opposite the South Amazon access. These results are attributed to the low forecasted minor-street volumes at the site accesses not triggering the minimum thresholds for traffic signal justification.

**Appendix J** contains the signal warrant sheets.

#### 5.4.3.2 Left-Turn Lane Warrant Analysis

Auxiliary left-turn lane warrant analysis was conducted for the proposed site accesses to Thunder Road and proposed site access to Boundary Road under 2035 future total conditions. The analysis was conducted using the Ministry of Transportation (MTO)'s "Design Supplement for TAC Geometric Design Guide for Canadian Roads – April 2020."

Consistent with the sight distance analysis, a design speed of 70 km/h and 100 km/h was assumed for Thunder Road and Boundary Road, respectively. **Table 5-7** outlines the results of the left-turn lane warrant analysis.

**Table 5-7: Left-Turn Lane Warrant Analysis Results**

| Location   | Movement                      | Design Speed | Horizon Year | Number of lanes on major road | Left-Turn Lane Storage Requirement? |
|--|-------------------------------|--------------|--------------|-------------------------------|-------------------------------------|
| <b>Thunder Road and Site Access A</b>                      | Westbound left-turn movement  | 70 km/h      | 2035         | Two                           | None                                |
| <b>Thunder Road and Site Access B</b>                      | Westbound left-turn movement  | 70 km/h      | 2035         | Two                           | None                                |
| <b>Thunder Road and Site Access C</b>                      | Westbound left-turn movement  | 70 km/h      | 2035         | Two                           | None                                |
| <b>Boundary Road and South Amazon Access / Site Access</b> | Northbound left-turn movement | 100 km/h     | 2035         | Two                           | None                                |

The results of the left-turn lane analysis indicate that auxiliary westbound left-turn lanes are not required on Thunder Road at the site accesses given the low forecasted approaching and opposing volumes along Thunder Road.

An auxiliary northbound left-turn lane is also not warranted on Boundary Road at the site access opposite the South Amazon access given the low forecasted northbound left-turn volumes not triggering the minimum thresholds for the left-turn lane warrant. However, there is an existing runout lane and taper at the south approach from the existing southbound left-turn lane on Boundary Road entering the South Amazon access that could be repurposed to provide a northbound left-turn lane into the site access. Left-turn lanes should be provided on opposing approaches at an intersection even if a left-turn lane is only warranted or existing at one approach, as to maintain geometric alignment along the roadway through the intersection. **Appendix K** contains the left-turn lane warrant analysis worksheets.

Therefore, it is recommended that the existing runout lane at the south approach of Boundary Road and South Amazon Access / Site Access be repurposed to provide an auxiliary northbound left-turn lane with a minimum storage length of 15 metres for passenger cars (as heavy trucks are not expected to arrive from the south).

#### 5.4.3.3 Right-Turn Lane Warrant Analysis

Auxiliary right-turn lane warrant analysis was conducted for the proposed site accesses to Thunder Road and proposed site access to Boundary Road under 2035 future total conditions. Per the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GFGCR), June 2017, a right-turn auxiliary lane on an urban or rural road should be implemented at unsignalized intersections when the volume of decelerating or accelerating vehicles compared with the through traffic volume causes undue hazard.

It is a common convention in traffic engineering that an auxiliary right-turn lane should be considered where the right-turn volume exceeds 60 vehicles per hour. Therefore, this threshold was applied to the proposed site accesses to gauge right-turn lane requirements.

**Table 5- 8** outlines the results of the right-turn lane warrant analysis.

**Table 5-8: Right-Turn Lane Warrant Analysis Results**

| Location   | Movement                       | Design Speed | Horizon Year | Forecasted Critical Right-Turn Volume <sup>1</sup> | Right-Turn Lane Storage Requirement? |
|--|--------------------------------|--------------|--------------|--|--------------------------------------|
| <b>Thunder Road and Site Access A</b>                      | Eastbound right-turn movement  | 70 km/h      | 2035         | 0 veh/hr   | None                                 |
| <b>Thunder Road and Site Access B</b>                      | Eastbound right-turn movement  | 70 km/h      | 2035         | 0 veh/hr   | None                                 |
| <b>Thunder Road and Site Access C</b>                      | Eastbound right-turn movement  | 70 km/h      | 2035         | 0 veh/hr   | None                                 |
| <b>Boundary Road and South Amazon Access / Site Access</b> | Southbound right-turn movement | 100 km/h     | 2035         | 17 veh/hr (13 passenger cars, 4 heavy trucks)      | None                                 |

Note 1: Volumes forecasted for 2035 future total conditions.

The results of the right-turn lane analysis indicate that auxiliary right-turn lanes are not required at the proposed site accesses given the low forecasted right-turning volumes at the site accesses.

#### 5.4.3.4 Access Operations

The traffic operations at the proposed site accesses are detailed in Section 5.7.7 of this report.

### 5.5 Transportation Demand Management (TDM) Analysis

As detailed in the Forecasting Report (March 2021), there is a heavy reliance on auto travel in the study area given the rural industrial nature of the area and the lack of existing dedicated pedestrian, cycling, and transit facilities. The existing auto modal split is assumed to be 97% and the non-auto modal split is assumed to be 3% (per the Forecasting Report).

A heavy reliance on auto travel is still expected in the future given the warehouse distribution nature of the proposed development, the rural context of the study area with no nearby origin or destination points for walking or cycling trips, and the absence of planned alternative transportation infrastructure improvements in the study area. Given the warehousing and distribution focus of the proposed development, employees would be required to physically work at the site during set hours, thus further restricting TDM opportunities such as flexible working hours and telework.

However, there are potential opportunities for the proposed development to reduce single-occupant vehicle (SOV) trips as described in this section.

#### 5.5.1. Active Transportation

The development could encourage cycling to and from the proposed development via the provision of bicycle parking spaces in conformance with the City's Zoning By-Law requirements. Additionally, further cycling provisions such as secure bicycle parking, lockers and showers could be implemented to encourage employees to bike to and from work.

#### 5.5.2. Carpooling

The development could promote carpooling by providing preferred carpool parking spaces and

incentives for employees to travel together. The provision of carpool parking spaces will encourage carpooling as an alternate mode of transportation with benefits such as cost savings, reduced environmental pollution, and reduced commuting stress. Encouraging carpooling would contribute to a reduction in SOV trips and a reduction in peak hour auto trip generation and peak auto parking demand on site.

Co-ordination with City staff should occur to list the proposed future development on the City's ride-matching portal to help employees find carpool partners and increase and encourage carpooling opportunities for employees.

An internal ride-matching service to employees could also be implemented to maximize carpooling opportunities for employees, as carpooling with coworkers may be more appealing to employees compared to carpooling with strangers.

### **5.5.3. Emergency Ride Home**

The employer could set up an Emergency Ride Home program that guarantees non-driving commuters that they will be taken home immediately and in a convenient manner in the case of unplanned circumstances which require employees to get home immediately. This program would provide reimbursements to employees for taxi, carshare or rental car usage to facilitate this Emergency Ride Home incentive, which may encourage employees to carpool.

### **5.5.4. Promotion and Education**

There are opportunities for the implementation of other "soft" TDM measures. For example, the employer could provide information on available TDM opportunities such as preferred carpool parking, ride-matching opportunities, and programs such as Emergency Ride Home to educate employees of alternate modes of transportation. This promoted awareness of TDM opportunities can encourage the use of alternate modes of transportation, reduce SOV trip to and from the site, and reduce peak parking demand at the site.

### **5.5.5. TDM Program Management**

A TDM program could be established by the employer (tenant) to monitor the implementation and effectiveness of proposed TDM measures. This could include an internal or external program co-ordinator to oversee performance monitoring (e.g., in the form of employee feedback surveys or parking utilization surveys to determine if the TDM measures are effective in reducing auto demand), and to co-ordinate with the City on available TDM opportunities.

### **5.5.6. Summary of Potential TDM Measures**

**Table 5-9** outlines the recommended TDM measures to reduce single-occupant vehicle (SOV) trips.

**Table 5-9: Summary of Potential TDM Measures and Implementation**

| Measure   | Implementation        |
|---|-----------------------|
| Bicycle Storage and Amenities   | Full build-out (2025) |
| Preferential parking for Carpooling                                     | Full build-out (2025) |
| Ride-Matching Service (co-ordination with City and/or internal service) | Full build-out (2025) |
| Emergency Ride Home   | Full build-out (2025) |
| Promotion and Education   | Full build-out (2025) |
| TDM Program Management  | Full build-out (2025) |

**Appendix N** highlights the TDM measures that may be applied to the proposed development to further capitalize on the existing and future TDM opportunities in the area.

## 5.6 Review of Network Concept

As detailed in the Forecasting Report and Screening & Scoping Reports, no future roadway capacity improvements nor alternative transportation infrastructure plans have been identified on Thunder Road nor Boundary Road in the study area per the City's Transportation Master Plan (2013) and proposed 2031 network concept. Further, several roadway improvements have recently been implemented on Boundary Road to support the Amazon Facility build-out.

The City is currently updating their Transportation Master Plan which may include improvements to Thunder Road or Boundary Road. The City can confirm if any future improvements are planned in the study area. However, for the purposes of this study, no background roadway improvements are assumed to occur.

However, forecasts of 2025, 2030 and 2035 future background traffic volumes indicate heavy through volumes along Boundary Road that exceed the typical capacity of 900 vehicles per hour per lane during the weekday a.m. and p.m. peak hours.

**Table 5-10** outlines the forecasted 2030 future background traffic volumes on Boundary Road by direction and time period, in line with the horizon year for the network concept. Volumes exceeding 900 veh/hr are highlighted.

**Table 5-10: 2030 Future Background – Boundary Road Through Volumes Forecasts**

| Segment   | Weekday A.M. Peak Hour Volume (veh/hr) |            | Weekday P.M. Peak Hour Volume (veh/hr) |            |
|---|--|------------|--|------------|
|   | Northbound                             | Southbound | Northbound                             | Southbound |
| Boundary Road north of Highway 417 Westbound Ramp Terminal  | 139                                    | 197        | 160                                    | 160        |
| Boundary Road between Highway 417 Westbound Ramp Terminal and Highway 417 Eastbound Ramp Terminal | 1052                                   | 224        | 361                                    | 250        |
| Boundary Road between Highway 417 Eastbound Ramp Terminal   | 1069                                   | 534        | 441                                    | 1037       |
| Boundary Road between Thunder Road and South Amazon Access  | 1043                                   | 268        | 349                                    | 991        |
| Boundary Road between South Amazon Access and Mitch Owens Road                                    | 1033                                   | 253        | 283                                    | 999        |
| Boundary Road south of Mitch Owens Road   | 1094                                   | 168        | 205                                    | 977        |

These volumes suggest that Boundary Road is expected to operate beyond capacity during the weekday a.m. and p.m. peak hours from the Highway 417 Eastbound Ramp Terminal southerly in both directions, and that the northbound segment between the ramp terminals is expected to operate beyond capacity during the weekday a.m. peak hour.

Based on this network concept review, it is recommended that the City monitor future traffic growth and demand on Boundary Road (south of the Highway 417 Westbound Ramp Terminal) to identify any future potential network concept changes to accommodate the forecasted volumes from a capacity perspective (e.g., road widening to add additional through lanes).

## 5.7 Intersection Analysis and Design

The methodology outlined in the Screening & Scoping Reports, and Forecasting Reports was applied to this analysis to forecast future traffic volumes and analyze traffic operations on the road network to determine required improvements to the road network, if required.

### 5.7.1. Traffic Modelling

The boundary road network was modelled in Synchro 11.0 using January 2020 weekday a.m. and p.m. peak hour traffic data in the study area (outlined in **Figure 2**), existing signal timing plans obtained from the City in January 2021, existing roadway geometric conditions and per the Synchro modelling guidelines outlined in the City's TIA guidelines.

The synchro assessment of auto intersection operations is based on the "Highway Capacity Manual (HCM)" methodology. Intersections are assessed using a Level of Service (LOS) metric with ranges of delay assigned a letter from "A" to "F"; "A" representing low delays and "F" representing heavy delays. As required by the City of Ottawa, the LOS for signalized intersection were based on the intersection volume to capacity ratio as per the City of Ottawa Multi-Modal Levels of Service (MMLOS) Guidelines. The LOS of an unsignalized intersection is based on the worst average approach delay. The LOS definitions for signalized and unsignalized intersections are included in **Appendix L**. The 95<sup>th</sup> percentile queue lengths were derived from Synchro.

A critical volume-to-capacity threshold of 0.90 was applied to all movements (representing a target



LOS "D") on the road network to flag any movements nearing capacity, except for the off-ramp movements at the ramp terminals for which a threshold of 0.75 was applied per the MTO's TIS guidelines.

### 5.7.2. Existing Auto Operations

The existing auto intersection operations at the study intersections were analyzed using the existing traffic volumes illustrated in **Figure 3**. Detailed capacity analysis worksheets are included in **Appendix M**.

**Table 5-11** outlines the 2020 existing traffic operations.

**Table 5-11: 2020 Existing Traffic Operations**

| Intersection  | Control      | Peak Hour | Intersection v/c Ratio | Level of Service | Control Delay | Critical v/c ratio | 95 <sup>th</sup> Percentile Queue Length > Storage Length |
|---|--------------|-----------|------------------------|------------------|---------------|--------------------|---|
| Boundary Road and Highway 417 Westbound Ramp Terminal | Stop (Minor) | A.M.      | 0.80                   | C                | 22.2s (WBLR)  | 0.39 (WBLR)        | None  |
|   |              | P.M.      | 0.36                   | B                | 12.3s (WBLR)  | 0.09 (WBLR)        | None  |
| Boundary Road and Highway 417 Eastbound Ramp Terminal | Signal       | A.M.      | 0.62                   | B                | 13.5 s        | 0.80 (NBT)         | None  |
|   |              | P.M.      | 0.82                   | D                | 14.3 s        | 0.88 (EBR)         | 66.1 m > 25 m (EBR)                                       |
| Boundary Road and Thunder Road/Amazon Way             | Signal       | A.M.      | 0.79                   | C                | 18.9 s        | 0.83 (NBT)         | 243.6m (NBT)  |
|   |              | P.M.      | 0.67                   | B                | 9.7 s         | 0.72 (SBTR)        | None  |
| Boundary Road and South Amazon Access                 | Stop (Minor) | A.M.      | 0.56                   | D                | 27.7s (WBLR)  | 0.05 (WBLR)        | None  |
|   |              | P.M.      | 0.52                   | C                | 20.0s (WBLR)  | 0.07 (WBLR)        | None  |
| Boundary Road and Mitch Owens Road                    | Stop (Minor) | A.M.      | 0.68                   | E                | 45.1s (EBL)   | 0.47 (EBL)         | None  |
|   |              | P.M.      | 0.65                   | E                | 38.6s (EBL)   | 0.55 (EBL)         | None  |

Notes:

[1] Level of Service – The Level of Service (LOS) of a signalized intersection is based on the intersection volume to capacity ratio as per the City of Ottawa Multi-Modal Levels of Service (MMLOS) Guidelines. The LOS of an unsignalized intersection is based on the worst average approach delay.

[2] Critical V/C Ratio – illustrates the maximum and other lane volume to capacity ratios greater than 0.90.

The road network is currently operating at overall acceptable levels of service with minor control delays.

The Novatech study that was prepared for the Amazon Facility recommended that the City consider implementing traffic signal control and an auxiliary northbound left-turn lane at the intersection of Boundary Road and Mitch Owens Road. The study found that under 2017 existing conditions, traffic signals and an auxiliary left-turn lane were warranted at the intersection, and that under future total conditions, the forecasted operations at the intersection were poor and indicated the need for traffic

signal control. While this improvement has not been implemented as have the Novatech recommended improvements on Boundary Road at Highway 417 Eastbound Ramp Terminal and at Thunder Road / Amazon Way, this improvement has been accounted for under future background and future total conditions in this analysis and is found to significantly improve traffic operations.

No movements on the existing road network are operating over capacity, albeit the eastbound right-turn movement at the Highway 417 Eastbound Ramp Terminal (which currently experiences a peak hour volume of 631 vehicles per hour during the weekday p.m. peak period). The existing traffic operations on the road network are acceptable.

### **5.7.3. Future Background Volumes Forecasting**

As detailed in the Forecasting Report, growth rate of 2% compounded annually has been applied to all movements on the road network (as consistent with background studies in the area) to forecast 2025, 2030 and 2035 future background traffic volumes. This analysis also accounts for background traffic generated by the future Capital Region Resource Recovery Centre (CRRC) waste management facility south of the Amazon Facility and from the proposed industrial development located at 5494, 5500 and 5510 Boundary Road.

**Figure 4.1 and 4.2** outlines the CRRC and Novatech industrial background development's generated traffic. **Figures 5, 6 and 7** outline the 2025, 2030 and 2035 future background traffic volumes, respectively, on the road network (with the growth rate outlined in Section 4.4.2 applied to the existing volumes plus the CRRC and Novatech industrial background site traffic outlined in **Figures 4.1 and 4.2**).

### **5.7.4. Future Background Auto Operations**

The future background auto intersection operations at the study intersections were analyzed using the 2025, 2030 and 2035 future background traffic volumes illustrated in **Figures 5, 6 and 7**, respectively, and optimized signal timings. Detailed capacity analysis worksheets are included in **Appendix M**.

It is noted that the existing cycle length at the intersection of Boundary Road and Highway 417 Eastbound Ramp Terminal is 80 seconds, which is typically reflective of low-medium volume intersections and not typically reflective of high-volume arterial intersections. Additionally, the existing cycle length at the intersection of Boundary Road and Thunder Road / Amazon Way is 100 seconds. For consistency with the existing cycle length at Boundary Road and Thunder Road / Amazon Way (which is ideal for corridor progression between signalized intersections), the Highway 417 Eastbound Ramp Terminal was modelled with a cycle length of 100 seconds under all future background and total scenarios.

The intersection of Boundary Road and Mitch Owens Road was analyzed under 2035 future background and total conditions under two scenarios: with the recommended Novatech improvements, and with the existing side-street stop control.

**Tables 5-12, 5-13 and 5-14** outline the 2025, 2030 and 2035 future background traffic operations, respectively.

**Table 5-12: 2025 Future Background Traffic Operations**

| Intersection  | Control      | Peak Hour | Intersection V/C Ratio | Level of Service | Control Delay | Critical v/c ratio | 95 <sup>th</sup> Percentile Queue Length > Storage Length |
|---|--------------|-----------|------------------------|------------------|---------------|--------------------|---|
| Boundary Road and Highway 417 Westbound Ramp Terminal | Stop (Minor) | A.M.      | <b>0.93</b>            | C                | 26.1s (WBLR)  | 0.50 (WBLR)        | None  |
|   |              | P.M.      | 0.40                   | B                | 13.1 s (WBLR) | 0.11 (WBLR)        | None  |
| Boundary Road and Highway 417 Eastbound Ramp Terminal | Signal       | A.M.      | 0.69                   | B                | 14.5 s        | 0.83 (NBT)         | None  |
|   |              | P.M.      | 0.88                   | D                | 19.8 s        | 0.92 (EBR)         | 84.2m > 25 m (EBR)  |
| Boundary Road and Thunder Road/Amazon Way             | Signal       | A.M.      | 0.88                   | D                | 20.1 s        | 0.88 (NBT)         | 245.8m (NBT)  |
|   |              | P.M.      | 0.75                   | C                | 9.8 s         | 0.74 (SBTR)        | None  |
| Boundary Road and South Amazon Access                 | Stop (Minor) | A.M.      | 0.64                   | D                | 33.8s (WBLR)  | 0.07 (WBLR)        | None  |
|   |              | P.M.      | 0.60                   | C                | 26.5s (WBLR)  | 0.10 (WBLR)        | None  |
| Boundary Road and Mitch Owens Road                    | Stop (Minor) | A.M.      | 0.78                   | E                | 47.5s (EBL)   | 0.49 (EBL)         | None  |
|   |              | P.M.      | 0.72                   | E                | 39.8s (EBL)   | 0.57 (EBL)         | None  |

Notes:

- [1] Level of Service – The Level of Service (LOS) of a signalized intersection is based on the intersection volume to capacity ratio as per the City of Ottawa Multi-Modal Levels of Service (MMLOS) Guidelines. The LOS of an unsignalized intersection is based on the worst average approach delay.
- [2] Critical V/C Ratio – illustrates the maximum and other lane volume to capacity ratios greater than 0.90.

**Table 5-13: 2030 Future Background Traffic Operations**

| Intersection  | Control      | Peak Hour | Intersection V/C Ratio | Level of Service | Control Delay | Critical v/c ratio | 95 <sup>th</sup> Percentile Queue Length > Storage Length |
|---|--------------|-----------|------------------------|------------------|---------------|--------------------|---|
| Boundary Road and Highway 417 Westbound Ramp Terminal | Stop (Minor) | A.M.      | <b>1.01</b>            | D                | 35.6s (WBLR)  | 0.63 (WBLR)        | None  |
|   |              | P.M.      | 0.42                   | B                | 13.8 s (WBLR) | 0.12 (WBLR)        | None  |
| Boundary Road and Highway 417 Eastbound Ramp Terminal | Signal       | A.M.      | 0.75                   | C                | 16.5 s        | <b>0.88 (NBT)</b>  | 29.2m > 25m (EBR)   |
|   |              | P.M.      | <b>0.94</b>            | <b>E</b>         | 25.6 s        | <b>0.96 (EBR)</b>  | 151.0 m > 25 m (EBR)                                      |
| Boundary Road and Thunder Road/Amazon Way             | Signal       | A.M.      | <b>0.94</b>            | <b>E</b>         | 30.0 s        | <b>0.95 (NBT)</b>  | 286.9m (NBT)  |
|   |              | P.M.      | 0.81                   | D                | 10.4 s        | 0.78 (SBTR)        | None  |
| Boundary Road and South Amazon Access                 | Stop (Minor) | A.M.      | 0.69                   | D                | 39.2s (WBLR)  | 0.09 (WBLR)        | None  |
|   |              | P.M.      | 0.65                   | D                | 35.5s (WBLR)  | 0.14 (WBLR)        | None  |
| Boundary Road and Mitch Owens Road                    | Stop (Minor) | A.M.      | 0.85                   | F                | 73.8s (EBL)   | 0.66 (EBL)         | 28.4m > 25m (EBL)   |
|   |              | P.M.      | 0.78                   | F                | 63.1s (EBL)   | 0.74 (EBL)         | 38.1m > 25m (EBL)   |

Notes:

- [1] Level of Service – The Level of Service (LOS) of a signalized intersection is based on the intersection volume to capacity ratio as per the City of Ottawa Multi-Modal Levels of Service (MMLOS) Guidelines. The LOS of an unsignalized intersection is based on the worst average approach delay.
- [2] Critical V/C Ratio – illustrates the maximum and other lane volume to capacity ratios greater than 0.90.

**Table 5-14: 2035 Future Background Traffic Operations**

| Intersection  | Control      | Peak Hour | Intersection V/C Ratio | Level of Service | Control Delay | Critical v/c ratio       | 95 <sup>th</sup> Percentile Queue Length > Storage Length |
|---|--------------|-----------|------------------------|------------------|---------------|--------------------------|---|
| Boundary Road and Highway 417 Westbound Ramp Terminal | Stop (Minor) | A.M.      | <b>1.10</b>            | <b>F</b>         | 47.5s (WBLR)  | 0.79 (WBLR)              | None  |
|   |              | P.M.      | 0.46                   | B                | 14.7 s (WBLR) | 0.15 (WBLR)              | None  |
| Boundary Road and Highway 417 Eastbound Ramp Terminal | Signal       | A.M.      | 0.81                   | D                | 20.1 s        | 0.93 (NBT)<br>0.77 (EBR) | 32.0m > 25m (EBR)   |
|   |              | P.M.      | <b>0.99</b>            | <b>E</b>         | 36.0 s        | 1.02 (EBR)               | 195.8m > 25m (EBR)  |
| Boundary Road and Thunder Road/Amazon Way             | Signal       | A.M.      | <b>1.02</b>            | <b>F</b>         | 48.7 s        | 1.05 (NBT)<br>0.97 (SBL) | 332.7m (NBT)  |
|   |              | P.M.      | 0.88                   | D                | 12.6 s        | 0.83 (SBTR)              | 284.0m (SBTR)   |
| Boundary Road and South Amazon Access                 | Stop (Minor) | A.M.      | 0.75                   | E                | 49.8s (WBLR)  | 0.12 (WBLR)              | None  |
|   |              | P.M.      | 0.71                   | F                | 208.7s (WBLR) | 0.62 (WBLR)              | None  |
| Boundary Road and Mitch Owens Road                    | Stop (Minor) | A.M.      | <b>0.92</b>            | <b>F</b>         | 138.6s (EBL)  | 0.91 (EBL)               | 43.5m > 25m (EBL)   |
|   |              | P.M.      | 0.85                   | F                | 122.8s (EBL)  | 0.98 (EBL)               | 59.3m > 25m (EBL)   |
|   | Signal       | A.M.      | 0.81                   | D                | 13.9s         | 0.80 (NBT)               | 33.5m > 25m (EBL)   |
|   |              | P.M.      | 0.82                   | D                | 18.0 s        | 0.85 (SBT)               | 50.8m > 25m (EBL)   |

Notes:

- [1] Level of Service – The Level of Service (LOS) of a signalized intersection is based on the intersection volume to capacity ratio as per the City of Ottawa Multi-Modal Levels of Service (MMLOS) Guidelines. The LOS of an unsignalized intersection is based on the worst average approach delay.
- [2] Critical V/C Ratio – illustrates the maximum and other lane volume to capacity ratios greater than 0.90.

The intersections of Boundary Road and Highway 417 Westbound Ramp Terminal, Boundary Road and Thunder Road / Amazon Way, and Boundary Road and South Amazon Access are expected to operate near or at capacity under 2035 future background conditions. Several movements on the road network are expected to operate near capacity and with 95<sup>th</sup> percentile queue lengths exceeding available storage lengths. These results are mainly attributed to fifteen years of steady traffic growth in the study area, and heavy forecasted volumes on Boundary Road exceeding typical arterial roadway capacity.

Network concept changes such as identifying improvements to Boundary Road (e.g., road widening) would be expected to significantly improve traffic operations on the road network and increase capacity for individual movements. Additionally, the implementation of the recommended Novatech improvements at the intersection of Boundary Road and Mitch Owens Road is expected to improve the LOS from "F" to "B."

### 5.7.5. Target Auto Operations

Given the subject site's classification as a "General Rural Area" and surrounding are east oof Boundary Road classified as "Employment Area" per the City's Official Plan; the target auto LOS for the study intersections is a LOS "D" per Exhibit 22 of the MMLOS guidelines (see **Appendix L** for MMLOS excerpts). As presented in Tables 5-12 to 5-14, a couple improvements listed below may be required in future to maintain the required target LOS "D".

- Boundary Road and Highway 417 Westbound Ramp Terminal: As presented in Table 5-6, signals are not warranted and delays to the minor westbound are typical of a high left turn volume minor approach. However, signals may be considered in future if safety issues exist.
- Boundary Road intersections with Highway 417 Eastbound Ramp Terminal and Thunder Road/Amazon Way: Signal optimization may be required in the future to maintain the target LOS.
- Boundary Road and Mitch Owens Road: Implementation of a traffic signal control and an auxiliary northbound left-turn lane as recommended by the Novatech study is expected to meet target LOS in future.
- As presented in Table 5-6, signals are not warranted at Boundary Road and South Amazon Access under all study horizons. The intersection should however be monitored in future to ensure no safety issues by the delays to the minor street traffic.
- Boundary Road and Highway 417 Eastbound Ramp Terminal: The EBR movement is expected to experience v/c ratios greater than 0.75, largely due to limited capacity for the yield EBR movement created by through traffic on Boundary Road. The MTO and City may consider optimizing the existing signal timing plan in future to create more capacity for the yield controlled EBR movement.
- The southbound traffic queues on Boundary Road at the Thunder Road intersection are forecast to occasionally extend beyond the Highway 417 Ramp in the 2035 horizon during the p.m. peak hours. However, this is a future background condition and not attributable to the proposed development. This issue is a long-term forecast and should be monitored by the City and reviewed as part of the City's ongoing Transportation Master Plan Update.

It is recommended the City and the MTO monitor traffic volumes at the subject intersections in future to confirm if the noted improvements are optimal.

### 5.7.6. Site Traffic

As presented in Table 4-2 herein, the full build-out of the proposed development (including site 2) is expected to generate approximately 172 and 184 total person trips during the weekday a.m. and p.m. peak hours, respectively, of which approximately 17 and 18 total non-auto trips during the weekday a.m. and p.m. peak hours, respectively. The current trip forecast is a reduction compared to the previous submission's total of 199 and 211 total person trips.

Employee trips generated by the proposed development were distributed to the road network based on origin-destination data from the National Capital Region (NCR) survey (2011) and the population of surrounding communities per Statistics Canada. Heavy truck trips generated by the proposed development were distributed to the road network based on expected catchment areas and logical routing assumptions for heavy trucks.

**Figures 8 and 9** outline the employee and heavy truck trip assignment, respectively.

### **5.7.7. Basis of Future Total Assessment**

The site generated traffic volumes illustrated in **Figures 8 and 9** were added to the 2025, 2030 and 2035 future background traffic volumes in **Figures 5, 6 and 7**, respectively, to determine the 2025, 2030 and 2035 future total traffic volumes. **Figures 10, 11 and 12** outline the 2025, 2030 and 2035 future total traffic volumes, respectively.

### **5.7.8. Future Total Auto Operations**

The future total auto intersection operations at the study intersections were analyzed using the 2025, 2030 and 2035 future total traffic volumes illustrated in **Figures 10, 11 and 12**, respectively, and optimized signal timings. Detailed capacity analysis worksheets are included in **Appendix M**.

Given that a significant portion of site traffic entering and exiting the site accesses is heavy truck traffic, heavy truck percentages were calculated and modelled for all movements on the road network to reflect the increase in heavy truck percentages under future total conditions.

**Tables 5-15, 5-16 and 5-17** outline the 2025, 2030 and 2035 future total traffic operations, respectively.

**Table 5-15: 2025 Future Total Traffic Operations**

| Intersection  | Control      | Peak Hour | Intersection V/C Ratio | Level of Service | Control Delay | Critical v/c ratio | 95 <sup>th</sup> Percentile Queue Length > Storage Length |
|---|--------------|-----------|------------------------|------------------|---------------|--------------------|---|
| Boundary Road and Highway 417 Westbound Ramp Terminal | Stop (Minor) | A.M.      | <b>0.97</b>            | D                | 33.3s (WBLR)  | 0.62 (WBLR)        | None  |
|   |              | P.M.      | 0.43                   | B                | 13.9s (WBLR)  | 0.13 (WBLR)        | None  |
| Boundary Road and Highway 417 Eastbound Ramp Terminal | Signal       | A.M.      | 0.71                   | C                | 14.5 s        | 0.83 (NBT)         | 32.3m > 25 m (EBR)  |
|   |              | P.M.      | 0.90                   | D                | 22.0 s        | 0.94 (EBR)         | 122.7 m > 25 m (EBR)                                      |
| Boundary Road and Thunder Road/Amazon Way             | Signal       | A.M.      | 0.90                   | D                | 22.6 s        | 0.90 (NBT)         | 261.7m(NBT)   |
|   |              | P.M.      | 0.82                   | D                | 18.1 s        | 0.88 (SBT)         | None  |
| Boundary Road and South Amazon Access / Site Access   | Stop (Minor) | A.M.      | 0.65                   | E                | 44.6s (WBLR)  | 0.09 (WBLR)        | None  |
|   |              | P.M.      | 0.62                   | D                | 38.0s (WBLTR) | 0.14 (WBLTR)       | None  |
| Boundary Road and Mitch Owens Road                    | Stop (Minor) | A.M.      | 0.79                   | F                | 53.0s (EBL)   | 0.54 (EBL)         | None  |
|   |              | P.M.      | 0.74                   | E                | 44.2s (EBL)   | 0.60 (EBL)         | 27.4m > 25m (EBL)   |
| Site Access A and Thunder Road                        | Stop (Minor) | A.M.      | 0.25                   | A                | 8.7s (NBLR)   | 0.02 (NBLR)        | None  |
|   |              | P.M.      | 0.22                   | A                | 9.2s (NBLR)   | 0.07 (NBLR)        | None  |
| Site Access B and Thunder Road                        | Stop (Minor) | A.M.      | 0.22                   | A                | 9.6s (NBLR)   | 0.01 (NBLR)        | None  |
|   |              | P.M.      | 0.18                   | A                | 10.0s (NBLR)  | 0.04 (NBLR)        | None  |
| Site Access C and Thunder Road                        | Stop (Minor) | A.M.      | 0.22                   | A                | 8.7s (NBLR)   | 0.01 (NBLR)        | None  |
|   |              | P.M.      | 0.21                   | A                | 9.0s (NBLR)   | 0.03 (NBLR)        | None  |

Notes:

[1] Level of Service – The Level of Service (LOS) of a signalized intersection is based on the intersection volume to capacity ratio as per the City of Ottawa Multi-Modal Levels of Service (MMLOS) Guidelines. The LOS of an unsignalized intersection is based on the worst average approach delay.

[2] Critical V/C Ratio – illustrates the maximum and other lane volume to capacity ratios greater than 0.90.



**Table 5-16: 2030 Future Total Traffic Operations**

| Intersection  | Control      | Peak Hour | Intersection V/C Ratio | Level of Service | Control Delay | Critical v/c ratio       | 95 <sup>th</sup> Percentile Queue Length > Storage Length |
|---|--------------|-----------|------------------------|------------------|---------------|--------------------------|---|
| Boundary Road and Highway 417 Westbound Ramp Terminal | Stop (Minor) | A.M.      | <b>1.05</b>            | E                | 49.5s (WBLR)  | 0.76 (WBLR)              | None  |
|   |              | P.M.      | 0.46                   | B                | 14.7s (WBLR)  | 0.15 (WBLR)              | None  |
| Boundary Road and Highway 417 Eastbound Ramp Terminal | Signal       | A.M.      | 0.76                   | C                | 17.2 s        | 0.89 (NBT)<br>0.77 (EBR) | 35.3m > 25 m (EBR)  |
|   |              | P.M.      | <b>0.94</b>            | <b>E</b>         | 27.9 s        | 0.97 (EBR)               | 163.6 m > 25 m (EBR)                                      |
| Boundary Road and Thunder Road/Amazon Way             | Signal       | A.M.      | <b>0.97</b>            | <b>E</b>         | 34.0 s        | 0.97 (NBT)               | 304.8m(NBT)   |
|   |              | P.M.      | 0.88                   | D                | 21.3 s        | 0.91 (SBT)               | 291.1m (SBT)  |
| Boundary Road and South Amazon Access / Site Access   | Stop (Minor) | A.M.      | 0.70                   | F                | 52.8s (WBLR)  | 0.12 (WBLR)              | None  |
|   |              | P.M.      | 0.66                   | E                | 65.0s (WBLTR) | 0.24 (WBLTR)             | None  |
| Boundary Road and Mitch Owens Road                    | Stop (Minor) | A.M.      | 0.87                   | F                | 85.3s (EBL)   | 0.72 (EBL)               | 32.3m > 25m (EBL)   |
|   |              | P.M.      | 0.80                   | F                | 72.4.s (EBL)  | 0.78 (EBL)               | 41.8m > 25m (EBL)   |
| Site Access A and Thunder Road                        | Stop (Minor) | A.M.      | 0.25                   | A                | 8.7s (NBLR)   | 0.02 (NBLR)              | None  |
|   |              | P.M.      | 0.26                   | A                | 9.2s (NBLR)   | 0.06 (NBLR)              | None  |
| Site Access B and Thunder Road                        | Stop (Minor) | A.M.      | 0.23                   | A                | 9.6s (NBLR)   | 0.01 (NBLR)              | None  |
|   |              | P.M.      | 0.18                   | B                | 10.0s (NBLR)  | 0.02 (NBLR)              | None  |
| Site Access C and Thunder Road                        | Stop (Minor) | A.M.      | 0.22                   | A                | 8.7s (NBLR)   | 0.01 (NBLR)              | None  |
|   |              | P.M.      | 0.21                   | A                | 9.0s (NBLR)   | 0.06 (NBLR)              | None  |

Notes:

- [1] Level of Service – The Level of Service (LOS) of a signalized intersection is based on the intersection volume to capacity ratio as per the City of Ottawa Multi-Modal Levels of Service (MMLOS) Guidelines. The LOS of an unsignalized intersection is based on the worst average approach delay.
- [2] Critical V/C Ratio – illustrates the maximum and other lane volume to capacity ratios greater than 0.90.

**Table 5-17: 2035 Future Total Traffic Operations**

| Intersection  | Control      | Peak Hour | Intersection V/C Ratio | Level of Service | Control Delay  | Critical v/c ratio                     | 95 <sup>th</sup> Percentile Queue Length > Storage Length |
|---|--------------|-----------|------------------------|------------------|----------------|--|---|
| Boundary Road and Highway 417 Westbound Ramp Terminal | Stop (Minor) | A.M.      | <b>1.14</b>            | F                | 88.3s (WBLR)   | <b>0.94 (WBLR)</b>                     | None  |
|   |              | P.M.      | 0.49                   | B                | 15.8s (WBLR)   | 0.18 (WBLR)                            | None  |
| Boundary Road and Highway 417 Eastbound Ramp Terminal | Signal       | A.M.      | 0.82                   | D                | 20.7 s         | <b>0.94 (NBT)</b><br><b>0.80 (EBR)</b> | 42.6m > 25 m (EBR)  |
|   |              | P.M.      | <b>1.00</b>            | <b>E</b>         | 41.8 s         | <b>1.06 (EBR)</b>                      | 208.2 m > 25 m (EBR)                                      |
| Boundary Road and Thunder Road/Amazon Way             | Signal       | A.M.      | <b>1.03</b>            | <b>F</b>         | 53.1 s         | <b>1.07 (NBT)</b><br><b>1.00 (SBL)</b> | 352.5 m (NBT)   |
|   |              | P.M.      | <b>0.94</b>            | <b>E</b>         | 29.2 s         | <b>0.95 (SBT)</b>                      | 337.6m (SBT)  |
| Boundary Road and South Amazon Access / Site Access   | Stop (Minor) | A.M.      | 0.76                   | F                | 71.9s (WBLR)   | 0.17 (WBLR)                            | None  |
|   |              | P.M.      | 0.72                   | F                | 387.0s (WBLTR) | 0.92 (WBLTR)                           | None  |
| Boundary Road and Mitch Owens Road                    | Stop (Minor) | A.M.      | <b>0.94</b>            | <b>F</b>         | 164.1s (EBL)   | <b>0.99 (EBL)</b>                      | 48.4m > 25m (EBL)   |
|   |              | P.M.      | 0.87                   | F                | 143.8.s (EBL)  | <b>1.04 (EBL)</b>                      | 64.1m > 25m (EBL)   |
|   | Signal       | A.M.      | 0.81                   | D                | 14.6s          | 0.81 (NBT)                             | 34.3m > 25m (EBL)<br>18.5m > 15m (NBL)                    |
|   |              | P.M.      | 0.82                   | D                | 18.9s          | 0.87 (SBT)                             | 51.1m > 25m (EBL)   |
| Site Access A and Thunder Road                        | Stop (Minor) | A.M.      | 0.25                   | A                | 8.8s (NBLR)    | 0.04 (NBLR)                            | None  |
|   |              | P.M.      | 0.27                   | A                | 9.3s (NBLR)    | 0.06 (NBLR)                            | None  |
| Site Access B and Thunder Road                        | Stop (Minor) | A.M.      | 0.23                   | A                | 9.7s (NBLR)    | 0.01 (NBLR)                            | None  |
|   |              | P.M.      | 0.18                   | B                | 10.1s (NBLR)   | 0.04 (NBLR)                            | None  |
| Site Access C and Thunder Road                        | Stop (Minor) | A.M.      | 0.23                   | A                | 8.8s (NBLR)    | 0.01 (NBLR)                            | None  |
|   |              | P.M.      | 0.22                   | A                | 9.1s (NBLR)    | 0.03 (NBLR)                            | None  |

Notes:

[1] Level of Service – The Level of Service (LOS) of a signalized intersection is based on the intersection volume to capacity ratio as per the City of Ottawa Multi-Modal Levels of Service (MMLOS) Guidelines. The LOS of an unsignalized intersection is based on the worst average approach delay.

[2] Critical V/C Ratio – illustrates the maximum and other lane volume to capacity ratios greater than 0.90.

The intersections of Boundary Road and Highway 417 Westbound Ramp Terminal, Boundary Road and Thunder Road / Amazon Way, and Boundary Road and South Amazon Access / Site Access are expected to operate beyond capacity under 2035 future total conditions. Several movements on the road network are expected to operate near capacity and with 95<sup>th</sup> percentile queue lengths exceeding available storage lengths. These results are mainly attributed to fifteen years of steady

traffic growth in the study area, and heavy forecasted volumes on Boundary Road exceeding typical arterial roadway capacity and are overall consistent with 2035 future background conditions.

When intersections are operating near or beyond capacity under future background conditions, the addition of even a minor amount of site traffic to the intersection can exponentially increase control delays. Therefore, even with the forecasted 2035 future total operations, the addition of site traffic to the road network is not expected to significantly impact traffic operations.

Network concept changes such as identifying future background improvements to Boundary Road (e.g., road widening) would be expected to significantly improve traffic operations on the road network and increase capacity for individual movements. Additionally, the implementation of the recommended Novatech improvements at the intersection of Boundary Road and Mitch Owens Road is expected to improve the LOS from "F" to "D."

The proposed site accesses to Thunder Road are expected to operate at LOS "B" or better with minor control delays and no critical movements nor 95<sup>th</sup> percentile queue lengths.

As presented in Tables 5-15 to 5-17, improvements may be required in future to ensure the required target LOS "D" is met at some of the study intersections. However, these issues are future background related as noted in section 5.7.5, and it is recommended that the City and the MTO monitor traffic volumes at the subject intersections in future to confirm if the noted improvements under section 5.7.5 are optimal.

## 6.0 Conclusions and Recommendations

This Transportation Impact Assessment (TIA) has assessed the transportation impacts of the proposed industrial development at the Thunder Road and Boundary Road site in the City of Ottawa. The analysis contained within this report has resulted in the following key findings:

- The proposed industrial development is projected to generate a total of 134 and 143 two-way auto trips during the weekday a.m. and p.m. peak hours, respectively.
- Under 2020 existing traffic conditions, the study intersections are projected to operate at the Level of Services (LOS) below.
  - The stop-controlled Highway 417 Westbound Ramp Terminal at Boundary Road is operating below capacity at a LOS "C" or better during the a.m. and p.m. peak hours.
  - The signalized intersections of Boundary Road with Highway 417 Eastbound Ramp Terminal and Thunder Road/Amazon Way are operating at a LOS "D" or better during the a.m. and p.m. peak hours.
  - The stop-controlled South Amazon Access at Boundary Road is operating below capacity at a LOS "D" or better during the a.m. and p.m. peak hours.
  - The stop-controlled Mitch Owens Road connection to Boundary Road is operating below capacity at a LOS "E" for the eastbound left turn during the a.m. and p.m. peak hours. All other movements at the intersection are at a LOS "A".

- Under the 2025, 2030 and 2035 future background conditions:
  - The stop-controlled Highway 417 Westbound Ramp Terminal at Boundary Road is forecast to operate at a LOS "F" during the a.m. peak hour of 2035 and LOS "E" or better under remaining study horizons. The intersection is forecast to operate at a LOS "B" or better during the p.m. peak hour.
  - The signalized intersections of Boundary Road with Highway 417 Eastbound Ramp Terminal and Thunder Road/Amazon Way are both forecast to operate at a LOS "E" or better during the a.m. and p.m. peak hours. Both intersections are forecast to have at least one turning movement near or at capacity.
  - The stop-controlled South Amazon Access at Boundary Road is projected to operate at a LOS "E" and "F" during the a.m. and p.m. peak hours, respectively.
  - The stop-controlled Mitch Owens Road connection to Boundary Road is expected to operate at a LOS "F" during the a.m. and p.m. peak hours. However, similar to Novatech's recommendation, adding a northbound left turn lane (2025 horizon) and implementing traffic signals (2035 horizon) is expected to result in a forecasted LOS "D" and average traffic delays less than 18 seconds during the a.m. and p.m. peak hours.
- For the 2025, 2030 and 2035 total traffic conditions (includes site generated trips), the study intersections are projected to operate similarly to their respective future background conditions as follows:
  - The stop-controlled Highway 417 Westbound Ramp Terminal at Boundary Road is forecast to operate at a LOS "F" or better during the a.m. peak hour and a LOS "B" or better during the p.m. peak hour.
  - The signalized intersections of Boundary Road with Highway 417 Eastbound Ramp Terminal and Thunder Road/Amazon Way are both forecast to operate at a LOS "E" or better during the a.m. and p.m. peak hours, similar to the future background conditions.
  - The stop-controlled Mitch Owens Road connection to Boundary Road is expected to operate at a LOS "F" during the a.m. and p.m. peak hours under the ultimate 2035 horizon. Similar to the future background conditions, adding the northbound left turn lane (2025 horizon) and implementing traffic signals (2035 horizon) is expected to result in a forecasted LOS "D" or better during the a.m. and p.m. peak hours.
  - The stop-controlled South Amazon Access at Boundary Road is projected to operate at a LOS "F" during the a.m. and p.m. peak hours under the ultimate 2035 horizon. This is a future background issue and is attributable to an increase in through volumes on Boundary Road and associated future delays to traffic from the Amazon access.
  - The proposed three stop-controlled site access connections to Thunder Road are projected to operate below capacity at a LOS "B" or better during the a.m. and p.m. peak hours, under all study horizons.

- A signal warrant assessment based on the ultimate 2035 traffic volumes indicates that traffic signals are not warranted at the intersections of Boundary Road and South Amazon Access / Site Access and Thunder Road with the proposed three Site Accesses. Additionally, no left or right turn auxiliary lanes are warranted on the major roads at the site access connections.
- The proposed site accesses are projected to operate efficiently and safely without any issues related to sight-lines, corner clearance, access conflicts, truck movements and transit operational conflicts. The vehicle parking supply of for each of the three buildings exceeds the City's Zoning By-Law minimum parking requirements.
- It is recommended that the following be considered to support the proposed development:
  - Though not warranted, consideration should be given to repurposing the existing runoff lane at the south approach of the intersection of Boundary Road and Site Access / South Amazon Access to provide an auxiliary 15-metre northbound left-turn storage lane. The NBL lane addition along with a potential traffic signalization in the 2035 horizon is expected to improve the intersection performance in the long-term.
  - To support sustainable transportation, the owner may consider TDM measures such as provision of a good internal connection of pedestrian sidewalks and to municipal sidewalks where available, provision of bicycle parking/amenity, carpooling and liaise with the City to implement TDM promotion/ education programs. These TDM measures are expected to encourage employees and visitors to be less dependent on single occupant auto trips.
- Further, based on the future background traffic operations, we recommend that the City and MTO consider the following in future:
  - Similar to the Novatech's recommendation, we recommend adding a northbound left turn lane (in 2025 horizon) and implementing traffic signals (in 2035 horizon) at the intersection of Boundary Road and Mitch Owens Road.
  - Signals are not warranted at Boundary Road intersections with Highway 417 Westbound Ramp Terminal and the South Amazon Access; however, signals may be considered in future if the City and MTO identify safety issues from extended delays to the minor street.
  - Signal optimization to redistribute intersection capacity (effective green time) may be required in the future (i.e., 2030 onwards) to maintain the target LOS "D" at the intersections of Boundary Road with Highway 417 Eastbound Ramp Terminal and Thunder Road/Amazon Way.
  - Boundary Road and Highway 417 Eastbound Ramp Terminal: The EBR movement is expected to experience v/c ratios greater than 0.75, largely due to limited capacity for the yield EBR movement created by through traffic on Boundary Road. The MTO and City may consider optimizing the existing signal timing plan in future to create more capacity for the yield controlled EBR movement.
  - The southbound traffic queues on Boundary Road at the Thunder Road intersection are forecast to occasionally extend beyond the Highway 417 Ramp in the 2035 horizon during the p.m. peak hours. However, this is a future background condition and not

attributable to the proposed development. This issue is a long-term forecast and should be monitored by the City and reviewed as part of the City's ongoing Transportation Master Plan Update.

- o In addition to the City's existing road network volume monitoring program to assess capacity constrained zones, given the potential long term impact of the Covid-19 pandemic on home-work trips, the forecasted future volumes herein may be overstated, it is important to monitor intersection volumes in future to confirm if any roadway improvements and or traffic signal modifications are needed for optimal performance of the relevant surrounding intersections.

In conclusion, the traffic generated by the proposed industrial development at Thunder Road and Boundary Road can be accommodated by the boundary road network. The Official Plan Amendment (OPA), Zoning By-Law Amendment (ZBA) and Site Plan Approval (SPA) applications can be supported from a traffic operations perspective as the boundary road system is forecast to adequately accommodate the increase in traffic volumes attributable to the proposed development.

Minor changes to the site plan will not materially affect the conclusions contained within this Study. Should you have any questions or require further information, please contact the undersigned.

Respectfully submitted by,

**C.F. CROZIER & ASSOCIATES INC.**



Peter Apasnore MASc., P.Eng., PTOE  
Project Engineer

**C.F. CROZIER & ASSOCIATES INC.**



Alexander Fleming, MBA, P. Eng.  
Associate

/sk/ah

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# APPENDIX A

## Conceptual Site Plan



SITE 2

WASTE TREATMENT

30m

WATERCOURSE

SWM POND

BUILDING A

Area: 8,920 m<sup>2</sup>  
Height: 6.1 m

BUILDING C

BUILDING C

Area: 8,920 m<sup>2</sup>  
Height: 6.1 m

OPEN STORAGE

FIRE FIGHTING  
WATER TANKS

OPEN STORAGE

BUILDING B

Area: 8,920 m<sup>2</sup>  
Height: 7.3 m

BUILDING D

Area: 10,405 m<sup>2</sup>  
Height: 7.3 m

BUILDING E

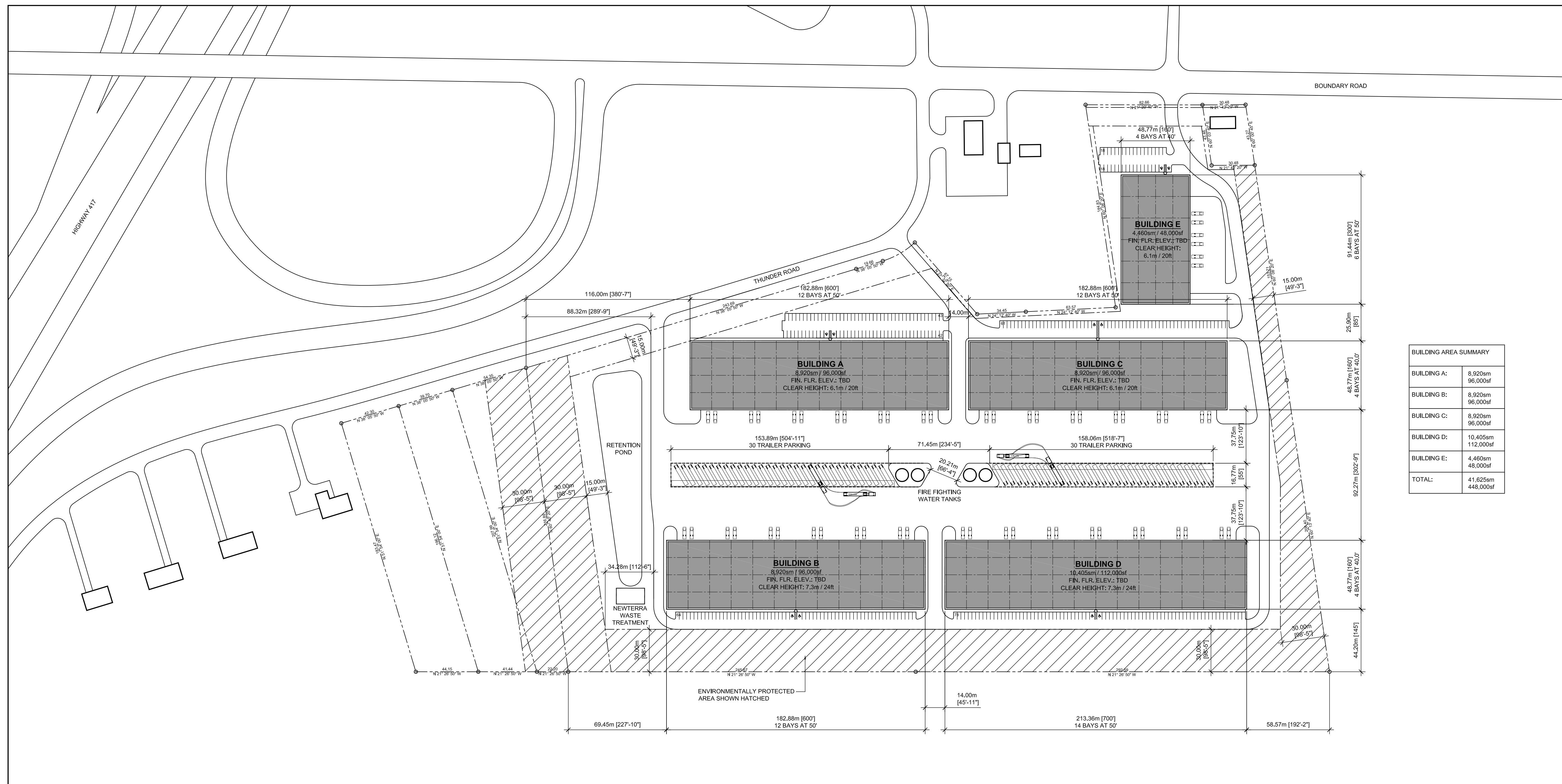
Area: 4,460 m<sup>2</sup>  
Height: 6.1 m

30m

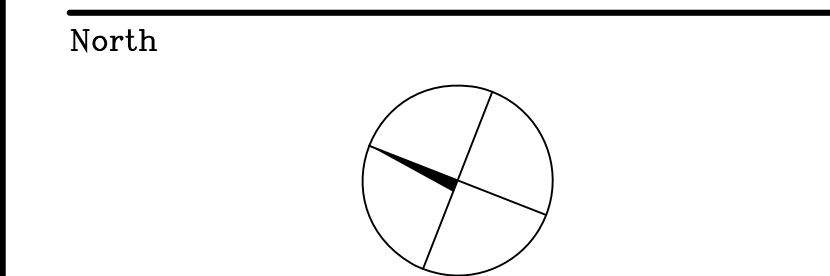
15m

30m





| BUILDING AREA SUMMARY |                             |
|-----------------------|-----------------------------|
| BUILDING A:           | 8,920sm / 96,000sf          |
| BUILDING B:           | 8,920sm / 96,000sf          |
| BUILDING C:           | 8,920sm / 96,000sf          |
| BUILDING D:           | 10,405sm / 112,000sf        |
| BUILDING E:           | 4,460sm / 48,000sf          |
| <b>TOTAL:</b>         | <b>41,625sm / 448,000sf</b> |



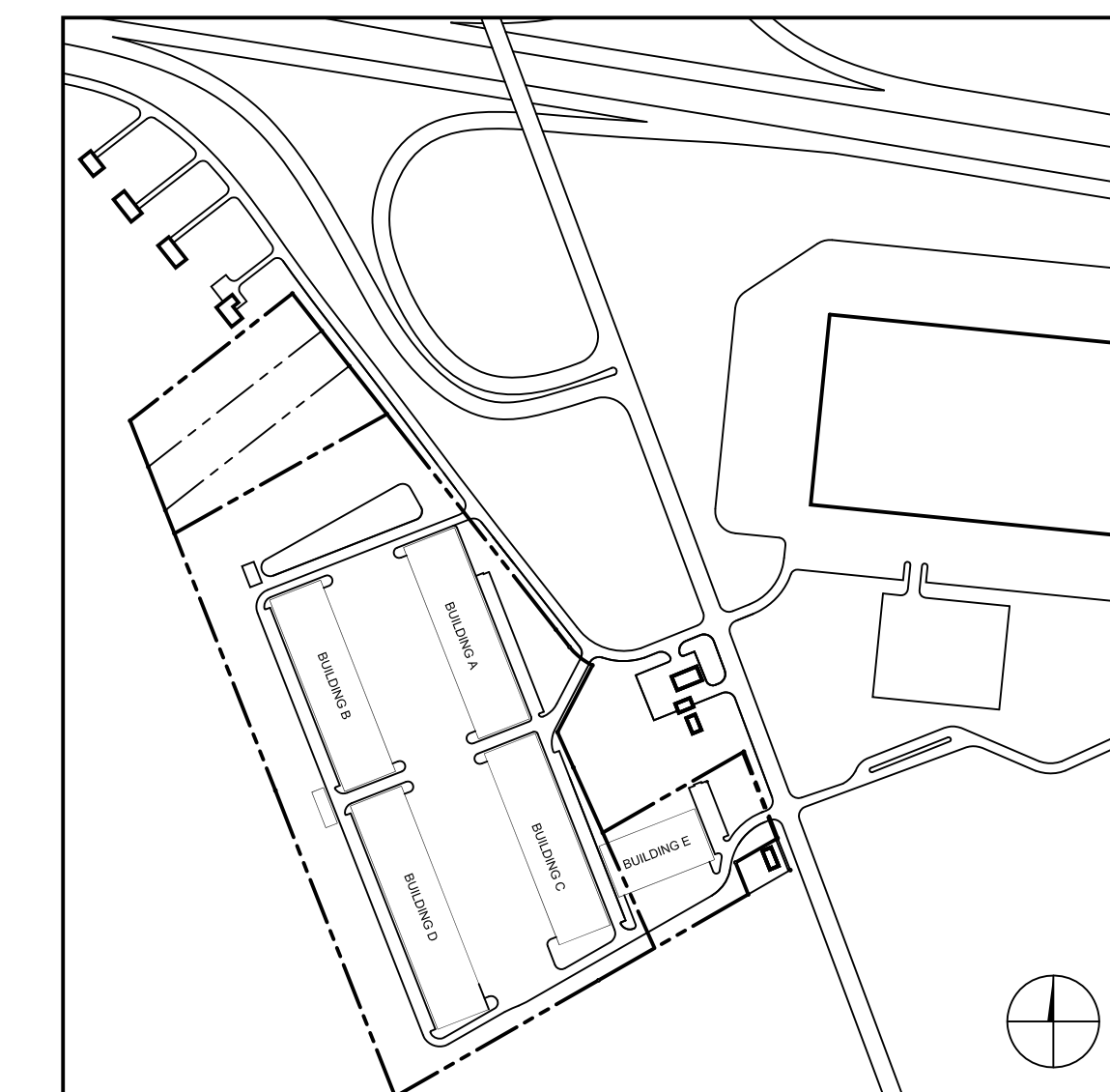
| Revisions |     |                    |            |
|-----------|-----|--------------------|------------|
| No.       | By  | Description        | Date       |
| 03        | ERM | REVISED FOR REVIEW | 2021-05-12 |
| 04        | ERM | REVISED FOR REVIEW | 2021-05-19 |
| 05        | ERM | REVISED FOR REVIEW | 2021-06-01 |
| 06        | ERM | REVISED FOR REVIEW | 2021-06-03 |
| 07        | ERM | REVISED FOR REVIEW | 2021-06-14 |
| 08        | ERM | REVISED FOR REVIEW | 2021-06-15 |
| 09        | ERM | REVISED FOR REVIEW | 2021-06-23 |

**03 SITE PLAN - OPTION B2r8**  
SPA-01 SCALE: 1:1500

| ZONING MECHANISM:                        | REQUIRED  | PROVIDED                               |
|--|---|--|
| ZONING: RG RURAL GENERAL INDUSTRIAL ZONE | LIGHT INDUSTRIAL LIMITED COMMERCIAL   | LIGHT INDUSTRIAL USE WAREHOUSE (N95)   |
| MINIMUM LOT AREA                         | 0.4HA   | 15.35HA / 37.93 ACRES AREAS 1 & 3 ONLY |
| MINIMUM LOT WIDTH                        | 30m   | 425m THUNDER ROAD 82m BOUNDARY ROAD    |
| MAXIMUM LOT COVERAGE                     | 50.0%   | 27.1% (4.16HA)                         |
| MINIMUM FRONT YARD                       | 15m   | COMPLIANT WITH ZONING                  |
| MINIMUM CORNER SIDE YARD                 | 12m   | COMPLIANT WITH ZONING                  |
| MINIMUM INTERIOR YARD SETBACK            | ABUTTING A RG, RH OR RC ZONE: 3m<br>ALL OTHER CASES: 8m   | COMPLIANT WITH ZONING                  |
| MINIMUM REAR YARD                        | 15m   | COMPLIANT WITH ZONING                  |
| MAXIMUM FLOOR SPACE INDEX                | 2   | COMPLIANT WITH ZONING                  |
| MAXIMUM BUILDING HEIGHT                  | 15m   | TO BE DETERMINED                       |
| OUTDOOR STORAGE                          | NOT PERMITTED WITHIN ANY REQUIRED FRONT OR CORNER YARD<br>STORAGE MUST BE SCREEN WHEN ABUTTING RESIDENTIAL ZONES AND PUBLIC STREETS | COMPLIANT WITH ZONING                  |

| ZONING MECHANISM:  | REQUIRED  | PROVIDED   |
|--|---|--|
| MINIMUM WIDTH OF LANDSCAPING                                       | NO MINIMUM SPECIFIED  | TO BE DETERMINED   |
| PARKING - TYPICAL SECTION 101                                      | BUILDING A: 8920sm<br>BUILDING B: 8920sm<br>BUILDING C: 8920sm<br>BUILDING D: 10405sm                       | 55 TYPICAL 1 BARRIER-FREE<br>55 TYPICAL 1 BARRIER-FREE<br>55 TYPICAL 1 BARRIER-FREE<br>61 TYPICAL 1 BARRIER-FREE |
| PARKING - BARRIER FREE SECTION 111 BY-LAW 2017-301 1 PER 99 SPACES | BUILDING E: 4460sm<br>TOTAL   | 35 TYPICAL 1 BARRIER-FREE<br>34 TYPICAL 2 BARRIER-FREE<br>261 TYPICAL 5 BARRIER-FREE                             |
| BICYCLE PARKING SECTION 111  | BUILDING A: 8920sm<br>BUILDING B: 8920sm<br>BUILDING C: 8920sm<br>BUILDING D: 10405sm<br>BUILDING E: 4460sm | 4 SPACES<br>4 SPACES<br>4 SPACES<br>5 SPACES<br>2 SPACES   |
| WAREHOUSE 1 SPACE PER 2000m2 BY-LAW 2015-190                       |   | TO BE DETERMINED   |

| ZONING MECHANISM:         | REQUIRED   | PROVIDED   |
|---------------------------|--|--|
| LOADING SPACE SECTION 113 | BUILDING A: 2 OVERSIZED (4.3m X 13m)<br>BUILDING B: 2 OVERSIZED (4.3m X 13m)<br>BUILDING C: 2 OVERSIZED (4.3m X 13m)<br>BUILDING D: 2 OVERSIZED (4.3m X 13m)<br>BUILDING E: 2 OVERSIZED (4.3m X 13m)   | 12 OVERSIZED (1 PER 8000sf)<br>12 OVERSIZED (1 PER 8000sf)<br>12 OVERSIZED (1 PER 8000sf)<br>14 OVERSIZED (1 PER 8000sf)<br>4 OVERSIZED (1 PER 12,000sf) |
| LIGHT INDUSTRIAL USE      |  |  |
| BUILDING CLASSIFICATION:  | GROUP F, DIVISION 2, ANY HEIGHT, ANY AREA SPRINKLERED<br>NON-COMBUSTIBLE CONSTRUCTION<br>FLOOR ASSEMBLIES SHALL HAVE A MIN 2HR FIRE RESISTANCE RATING<br>MEZZANINES SHALL HAVE A MIN 1HR FIRE RESISTANCE RATING<br>LOAD BEARING WALLS AND COLUMNS SHALL HAVE A FIRE RESISTANCE RATING NOT LESS THAN SUPPORTED ASSEMBLIES | 314 TYPICAL 10 BARRIER-FREE  |
| 3.2.2.67:                 |  |  |
| 3.2.3.1:                  | SPATIAL SEPARATION - TABLE 3.2.3.1.E<br>15m MINIMUM SPATIAL SEPARATION FOR 100% AREA OF UNPROTECTED OPENING (EBF > 200m2)  |  |
| 3.4.2.5:                  | LOCATION OF EXITS<br>45m MAXIMUM TRAVEL DISTANCE   |  |



**01 LOCATION PLAN**  
SP-A01 SCALE: NTS

Project  
**THUNDER ROAD INDUSTRIAL PARK**

6150 THUNDER ROAD, OTTAWA  
Drawing  
**LOCATION PLAN, ZONING REVIEW AND SITE PLAN B2 r8**

Scale AS NOTED  
Stamp  
Drawn ERM  
Checked JAS

Project No. 21-135  
Drawing No. SPA-01  
Date APRIL 2021

# APPENDIX B

## Screening Form

## City of Ottawa 2017 TIA Guidelines Screening Form

### 1. Description of Proposed Development

|                                    |   |
|------------------------------------|---|
| Municipal Address                  | 6150 Thunder Road, Ottawa, ON K0A 1K0   |
| Description of Location            | Bound by Thunder Road, forested areas and Boundary Road                           |
| Land Use Classification            | ZBL - Rural Countryside Zone (RU), OP - General Rural Area                        |
| Development Size (units)           |   |
| Development Size (m <sup>2</sup> ) | Industrial Buildings = 45,476 sq. m   |
| Number of Accesses and Locations   | Three full-moves accesses to Thunder Road, one full-moves access to Boundary Road |
| Phase of Development               | TBD   |
| Buildout Year                      | TBD (2025 assumed)  |

**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.

| Land Use Type                       | Minimum Development Size  |
|-------------------------------------|---|
| Single-family homes                 | 40 units  |
| Townhomes or apartments             | 90 units  |
| Office                              | 3,500 m <sup>2</sup>  |
| Industrial                          | 5,000 m <sup>2</sup> <span style="color: red;">EXCEEDS 5,000 sq. m</span> |
| Fast-food restaurant or coffee shop | 100 m <sup>2</sup>  |
| Destination retail                  | 1,000 m <sup>2</sup>  |
| Gas station or convenience market   | 75 m <sup>2</sup>   |

*\* If the development has a land use type other than what is presented in the table above, estimates of person-trip generation may be made based on average trip generation characteristics represented in the current edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual.*

**If the proposed development size is 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 City's Transit Priority, Rapid Transit or Spine Bicycle Networks? |     | X  |
| Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?*  |     | X  |

\*DPA and TOD are identified in the City of Ottawa Official Plan (DPA in Section 2.5.1 and Schedules A and B; TOD in Annex 6). See Chapter 4 for a list of City of Ottawa Planning and Engineering documents that support the completion of TIA).

**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 km/hr or greater?   | X   |    |
| Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway?  |     | X  |
| Is the proposed driveway within the area of influence of an adjacent traffic signal or roundabout (i.e. within 300 m of intersection in rural conditions, or within 150 m of intersection in urban/ suburban conditions)? | X   |    |
| Is the proposed driveway within auxiliary lanes of an intersection?   |     | X  |
| Does the proposed driveway make use of an existing median break that serves an existing site?   |     | X  |
| Is there is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?  |     | X  |
| Does the development include a drive-thru facility?   |     | X  |

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

### 5. Summary

|   | Yes | No |
|---|-----|----|
| Does the development satisfy the Trip Generation Trigger? | X   |    |
| Does the development satisfy the Location Trigger?        |     | X  |
| Does the development satisfy the Safety Trigger?          | X   |    |

**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

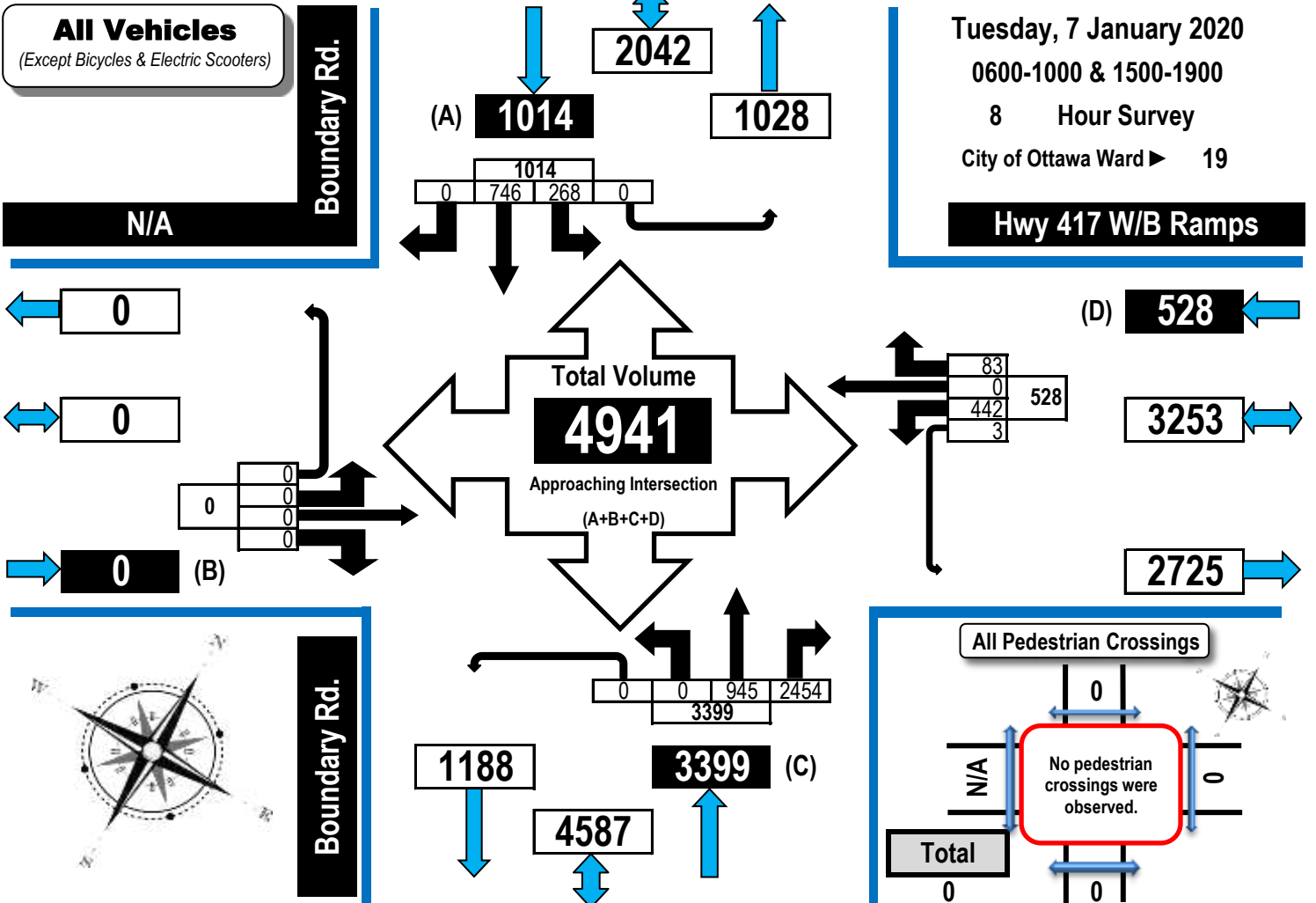
## Traffic Data



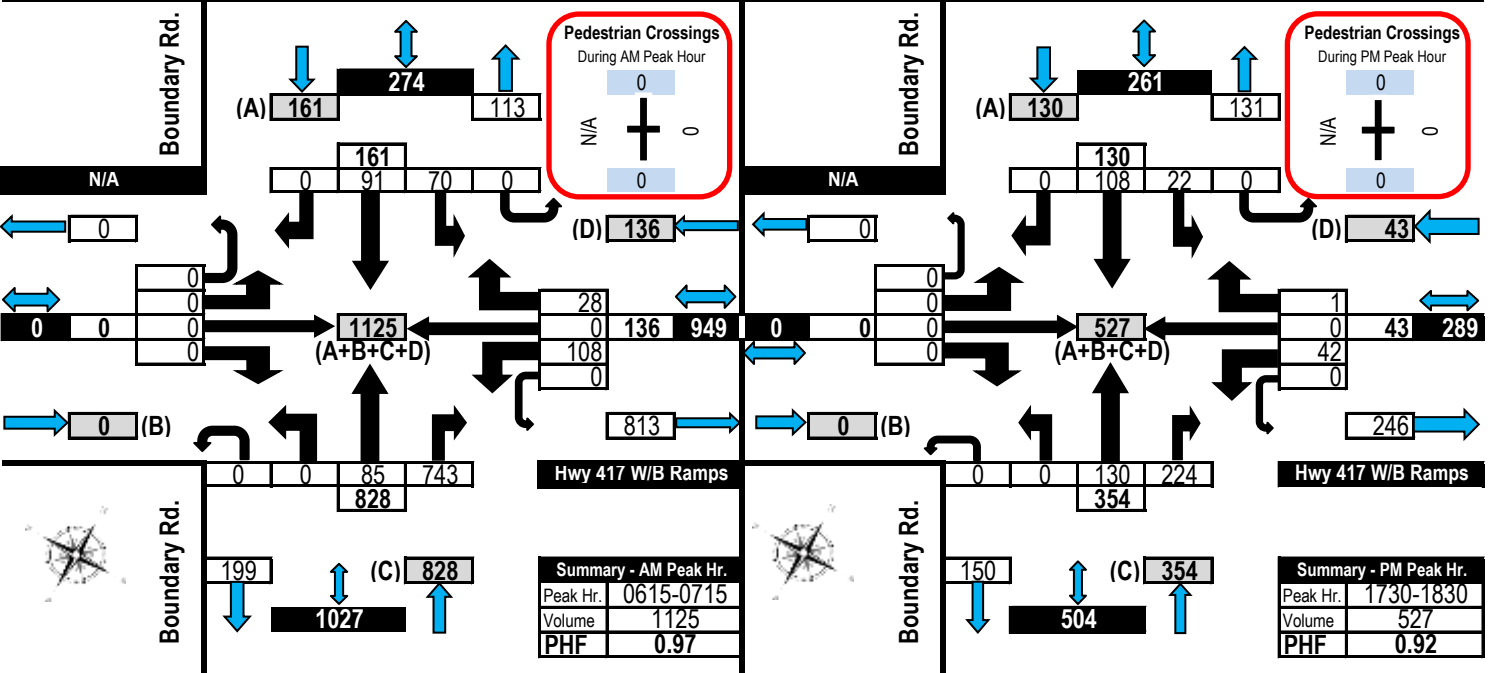
# Turning Movement Count Summary, AM and PM Peak Hour Flow Diagrams

Automobiles, Taxis, Light Trucks, Vans, SUV's, Motorcycles, Heavy Trucks, Buses, and School Buses

## Boundary Road & Highway 417 North Ramps Carlsbad Springs, ON



### AM Peak Hour Flow Diagram PM Peak Hour Flow Diagram





# Turning Movement Count Heavy Vehicle Summary Flow Diagram



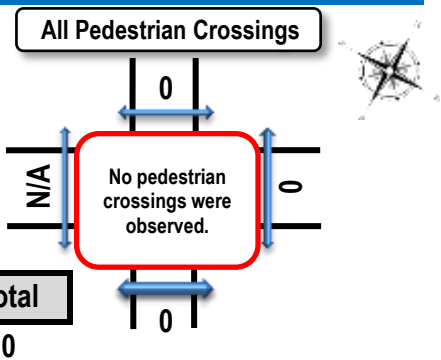
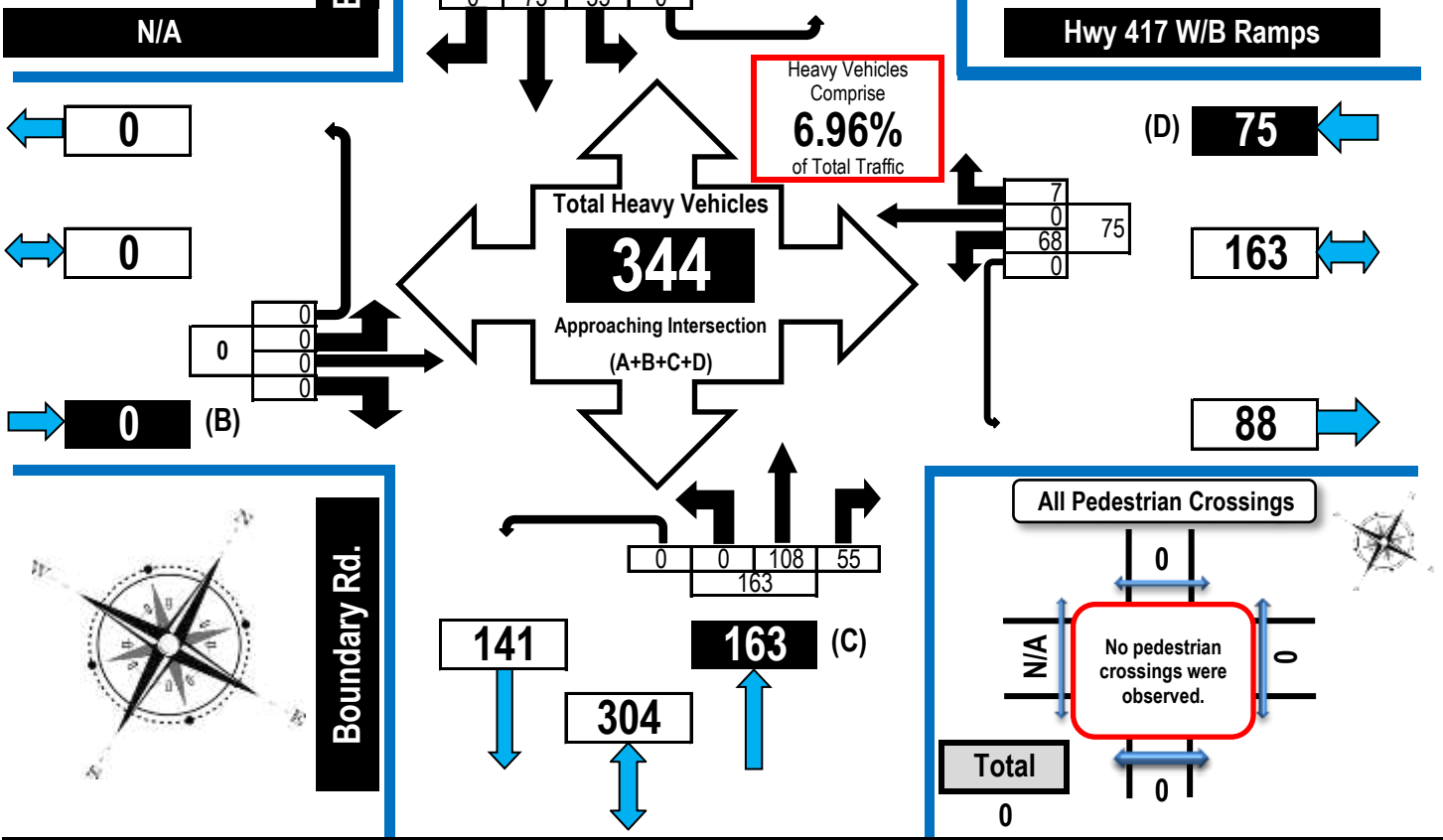
## Boundary Road & Highway 417 North Ramps Carlsbad Springs, ON

**Heavy Vehicles**  
(Construction Vehicles, Heavy Trucks, Buses & School Buses).  
Heavy vehicle totals **ARE** included in the all vehicles summary and flow diagrams.

Boundary Rd.

Tuesday, 7 January 2020  
0600-1000 & 1500-1900  
8 Hour Survey  
City of Ottawa Ward 19

Hwy 417 W/B Ramps



| Time Period | N/A Eastbound |    |    |    |        | Hwy 417 W/B Ramps Westbound |    |    |    |        | Boundary Rd. Northbound |    |    |    |        | Boundary Rd. Southbound |    |    |    |        | S. Tot | G.Tot. |
|-------------|---------------|----|----|----|--------|-----------------------------|----|----|----|--------|-------------------------|----|----|----|--------|-------------------------|----|----|----|--------|--------|--------|
|             | LT            | ST | RT | UT | S. Tot | LT                          | ST | RT | UT | S. Tot | LT                      | ST | RT | UT | S. Tot | LT                      | ST | RT | UT | S. Tot |        |        |

| Time Period   | N/A Eastbound |          |          |          |          | Hwy 417 W/B Ramps Westbound |          |          |          |           | Boundary Rd. Northbound |            |           |          |            | Boundary Rd. Southbound |           |          |          |            | S. Tot     | G.Tot. |
|---------------|---------------|----------|----------|----------|----------|-----------------------------|----------|----------|----------|-----------|-------------------------|------------|-----------|----------|------------|-------------------------|-----------|----------|----------|------------|------------|--------|
|               | LT            | ST       | RT       | UT       | S. Tot   | LT                          | ST       | RT       | UT       | S. Tot    | LT                      | ST         | RT        | UT       | S. Tot     | LT                      | ST        | RT       | UT       | S. Tot     |            |        |
| 0600-0700     | 0             | 0        | 0        | 0        | 0        | 4                           | 0        | 4        | 0        | 8         | 0                       | 12         | 8         | 0        | 20         | 6                       | 10        | 0        | 0        | 16         | 44         |        |
| 0700-0800     | 0             | 0        | 0        | 0        | 0        | 10                          | 0        | 2        | 0        | 12        | 0                       | 9          | 12        | 0        | 21         | 4                       | 10        | 0        | 0        | 14         | 47         |        |
| 0800-0900     | 0             | 0        | 0        | 0        | 0        | 8                           | 0        | 0        | 0        | 8         | 0                       | 25         | 8         | 0        | 33         | 11                      | 19        | 0        | 0        | 30         | 71         |        |
| 0900-1000     | 0             | 0        | 0        | 0        | 0        | 8                           | 0        | 1        | 0        | 9         | 0                       | 25         | 10        | 0        | 35         | 5                       | 9         | 0        | 0        | 14         | 58         |        |
| 1500-1600     | 0             | 0        | 0        | 0        | 0        | 12                          | 0        | 0        | 0        | 12        | 0                       | 11         | 3         | 0        | 14         | 0                       | 6         | 0        | 0        | 6          | 32         |        |
| 1600-1700     | 0             | 0        | 0        | 0        | 0        | 16                          | 0        | 0        | 0        | 16        | 0                       | 14         | 5         | 0        | 19         | 4                       | 6         | 0        | 0        | 10         | 45         |        |
| 1700-1800     | 0             | 0        | 0        | 0        | 0        | 8                           | 0        | 0        | 0        | 8         | 0                       | 8          | 6         | 0        | 14         | 1                       | 10        | 0        | 0        | 11         | 33         |        |
| 1800-1900     | 0             | 0        | 0        | 0        | 0        | 2                           | 0        | 0        | 0        | 2         | 0                       | 4          | 3         | 0        | 7          | 2                       | 3         | 0        | 0        | 5          | 14         |        |
| <b>Totals</b> | <b>0</b>      | <b>0</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>68</b>                   | <b>0</b> | <b>7</b> | <b>0</b> | <b>75</b> | <b>0</b>                | <b>108</b> | <b>55</b> | <b>0</b> | <b>163</b> | <b>33</b>               | <b>73</b> | <b>0</b> | <b>0</b> | <b>106</b> | <b>344</b> |        |



# Turning Movement Count

## Summary Report Including AM, OFF Peak, PM, Evening Peak Hours, and PHF

Automobiles, Taxis,  
Light Trucks, Vans,  
SUV's, Motorcycles,  
Heavy Trucks, Buses,  
and School Buses

### Boundary Road & Highway 417 North Ramps Carlsbad Springs, ON

**Survey Date:** Tuesday, 7 January 2020      **Start Time:** 0600      **AADT Factor:** 1.1  
**Weather AM:** Overcast -4° C      **Survey Duration:** 8 Hrs.      **Survey Hours:** 0600-1000 & 1500-1900  
**Weather PM:** Cloudy -1° C      **Surveyor(s):** Carmody

| Time Period   | N/A       |          |          |          |          | Hwy 417 W/B Ramps |          |           |          |            | Street Total | Boundary Rd. |            |             |          | Boundary Rd. |            |            |          | Street Total | Grand Total |             |             |
|---------------|-----------|----------|----------|----------|----------|-------------------|----------|-----------|----------|------------|--------------|--------------|------------|-------------|----------|--------------|------------|------------|----------|--------------|-------------|-------------|-------------|
|               | Eastbound |          |          |          |          | Westbound         |          |           |          |            |              | Northbound   |            |             |          | Southbound   |            |            |          |              |             |             |             |
|               | LT        | ST       | RT       | UT       | E/B Tot  | LT                | ST       | RT        | UT       | W/B Tot    |              | LT           | ST         | RT          | UT       | N/B Tot      | LT         | ST         | RT       | UT           | S/B Tot     |             |             |
| 0600-0700     | 0         | 0        | 0        | 0        | 0        | 100               | 0        | 19        | 1        | 120        | 120          | 0            | 87         | 685         | 0        | 772          | 72         | 85         | 0        | 0            | 157         | 929         | 1049        |
| 0700-0800     | 0         | 0        | 0        | 0        | 0        | 79                | 0        | 31        | 0        | 110        | 110          | 0            | 112        | 632         | 0        | 744          | 48         | 81         | 0        | 0            | 129         | 873         | 983         |
| 0800-0900     | 0         | 0        | 0        | 0        | 0        | 57                | 0        | 9         | 0        | 66         | 66           | 0            | 108        | 360         | 0        | 468          | 54         | 84         | 0        | 0            | 138         | 606         | 672         |
| 0900-1000     | 0         | 0        | 0        | 0        | 0        | 32                | 0        | 5         | 1        | 38         | 38           | 0            | 89         | 223         | 0        | 312          | 29         | 52         | 0        | 0            | 81          | 393         | 431         |
| 1500-1600     | 0         | 0        | 0        | 0        | 0        | 44                | 0        | 10        | 1        | 55         | 55           | 0            | 155        | 122         | 0        | 277          | 18         | 95         | 0        | 0            | 113         | 390         | 445         |
| 1600-1700     | 0         | 0        | 0        | 0        | 0        | 57                | 0        | 5         | 0        | 62         | 62           | 0            | 148        | 106         | 0        | 254          | 15         | 131        | 0        | 0            | 146         | 400         | 462         |
| 1700-1800     | 0         | 0        | 0        | 0        | 0        | 44                | 0        | 1         | 0        | 45         | 45           | 0            | 156        | 156         | 0        | 312          | 18         | 138        | 0        | 0            | 156         | 468         | 513         |
| 1800-1900     | 0         | 0        | 0        | 0        | 0        | 29                | 0        | 3         | 0        | 32         | 32           | 0            | 90         | 170         | 0        | 260          | 14         | 80         | 0        | 0            | 94          | 354         | 386         |
| <b>Totals</b> | <b>0</b>  | <b>0</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>442</b>        | <b>0</b> | <b>83</b> | <b>3</b> | <b>528</b> | <b>528</b>   | <b>0</b>     | <b>945</b> | <b>2454</b> | <b>0</b> | <b>3399</b>  | <b>268</b> | <b>746</b> | <b>0</b> | <b>0</b>     | <b>1014</b> | <b>4413</b> | <b>4941</b> |

**Expansion factors are applied exclusively to standard weekday 8-hour turning movement counts conducted during the hours of 0700h - 1000h, 1130h - 1330h and 1500h - 1800h**

|                                    |    |    |    |    |     |     |    |    |    |     |  |    |     |     |    |     |    |     |    |    |     |       |       |
|------------------------------------|----|----|----|----|-----|-----|----|----|----|-----|--|----|-----|-----|----|-----|----|-----|----|----|-----|-------|-------|
| <b>AM Peak Hour Factor</b> → 0.97  |    |    |    |    |     |     |    |    |    |     | <b>Highest Hourly Vehicle Volume Between 0500h &amp; 1000h</b> |    |     |     |    |     |    |     |    |    |     |       |       |
| <b>AM Peak Hr</b>                  | LT | ST | RT | UT | TOT | LT  | ST | RT | UT | TOT | S.TOT  | LT | ST  | RT  | UT | TOT | LT | ST  | RT | UT | TOT | S.TOT | G.TOT |
| 0615-0715                          | 0  | 0  | 0  | 0  | 0   | 108 | 0  | 28 | 0  | 136 | 136  | 0  | 85  | 743 | 0  | 828 | 70 | 91  | 0  | 0  | 161 | 989   | 1125  |
| <b>OFF Peak Hour Factor</b> → N/A  |    |    |    |    |     |     |    |    |    |     | <b>Highest Hourly Vehicle Volume Between 1000h &amp; 1500h</b> |    |     |     |    |     |    |     |    |    |     |       |       |
| <b>OFF Peak Hr</b>                 | LT | ST | RT | UT | TOT | LT  | ST | RT | UT | TOT | S.TOT  | LT | ST  | RT  | UT | TOT | LT | ST  | RT | UT | TOT | S.TOT | G.TOT |
| N/A                                | 0  | 0  | 0  | 0  | 0   | 0   | 0  | 0  | 0  | 0   | 0  | 0  | 0   | 0   | 0  | 0   | 0  | 0   | 0  | 0  | 0   | 0     | 0     |
| <b>PM Peak Hour Factor</b> → 0.92  |    |    |    |    |     |     |    |    |    |     | <b>Highest Hourly Vehicle Volume Between 1500h &amp; 1900h</b> |    |     |     |    |     |    |     |    |    |     |       |       |
| <b>PM Peak Hr</b>                  | LT | ST | RT | UT | TOT | LT  | ST | RT | UT | TOT | S.TOT  | LT | ST  | RT  | UT | TOT | LT | ST  | RT | UT | TOT | S.TOT | G.TOT |
| 1730-1830                          | 0  | 0  | 0  | 0  | 0   | 42  | 0  | 1  | 0  | 43  | 43   | 0  | 130 | 224 | 0  | 354 | 22 | 108 | 0  | 0  | 130 | 484   | 527   |
| <b>EVNG Peak Hour Factor</b> → N/A |    |    |    |    |     |     |    |    |    |     | <b>Highest Hourly Vehicle Volume Between 1900h &amp; 0000h</b> |    |     |     |    |     |    |     |    |    |     |       |       |
| <b>EVNG Pk Hr</b>                  | LT | ST | RT | UT | TOT | LT  | ST | RT | UT | TOT | S.TOT  | LT | ST  | RT  | UT | TOT | LT | ST  | RT | UT | TOT | S.TOT | G.TOT |
| N/A                                | 0  | 0  | 0  | 0  | 0   | 0   | 0  | 0  | 0  | 0   | 0  | 0  | 0   | 0   | 0  | 0   | 0  | 0   | 0  | 0  | 0   | 0     | 0     |

**Comments:**

No pedestrian crossings or bicycles were observed. Street lights are not present at this intersection.

- Notes:**
1. Includes all vehicle types except bicycles and electric scooters.
  2. When expansion and AADT factors are applied, the results will differ slightly due to rounding.

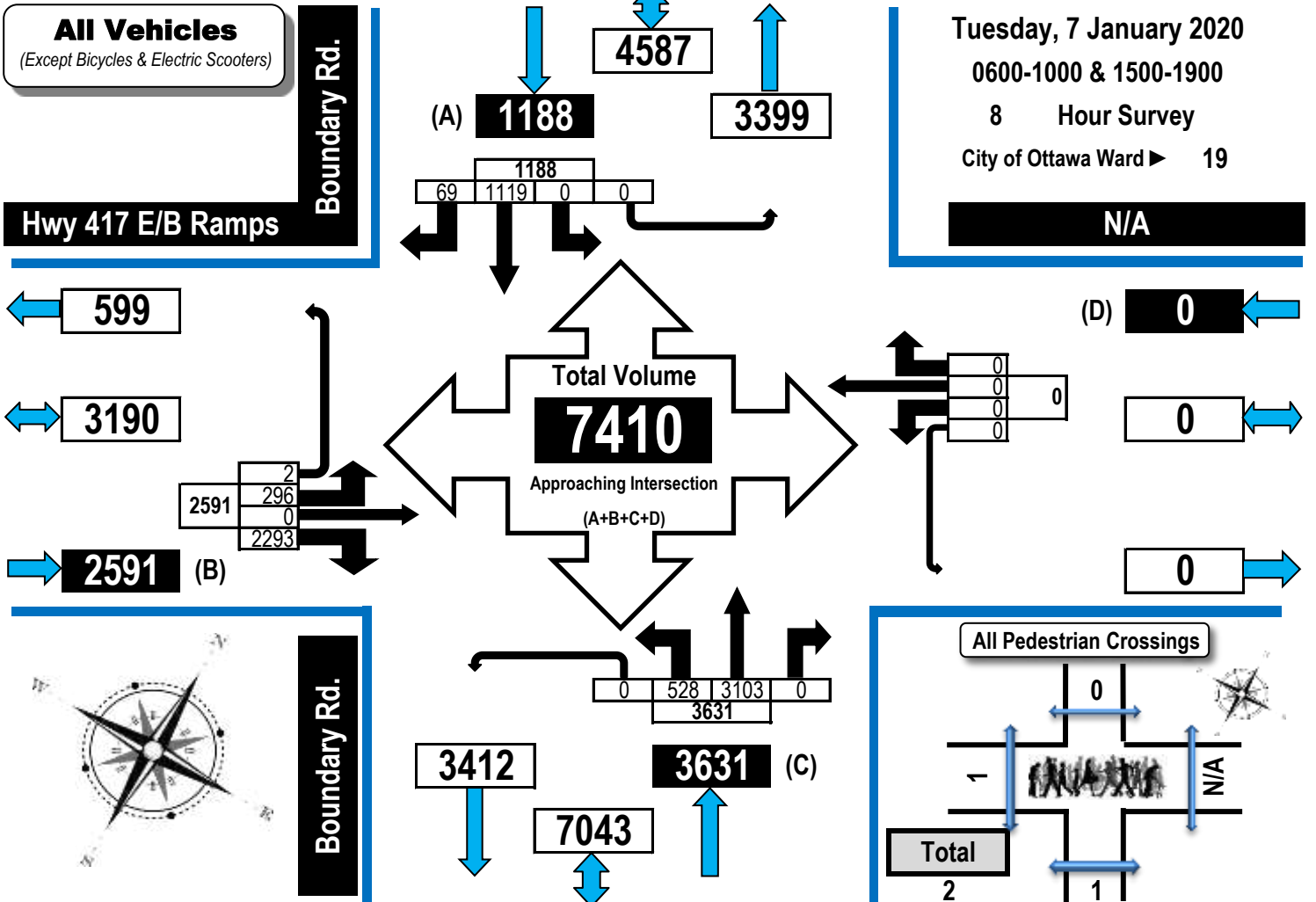




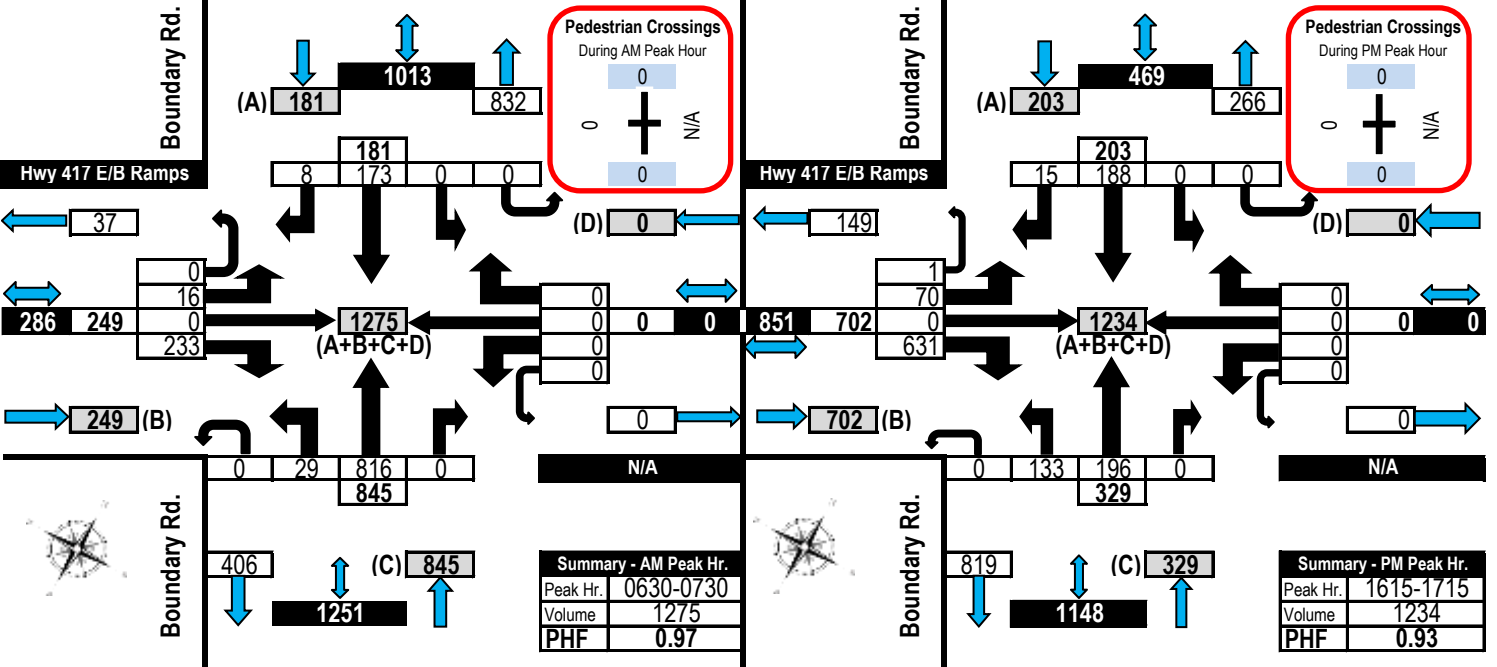
# Turning Movement Count Summary, AM and PM Peak Hour Flow Diagrams

Automobiles, Taxis, Light Trucks, Vans, SUV's, Motorcycles, Heavy Trucks, Buses, and School Buses

## Boundary Road & Highway 417 South Ramps Carlsbad Springs, ON



### AM Peak Hour Flow Diagram PM Peak Hour Flow Diagram

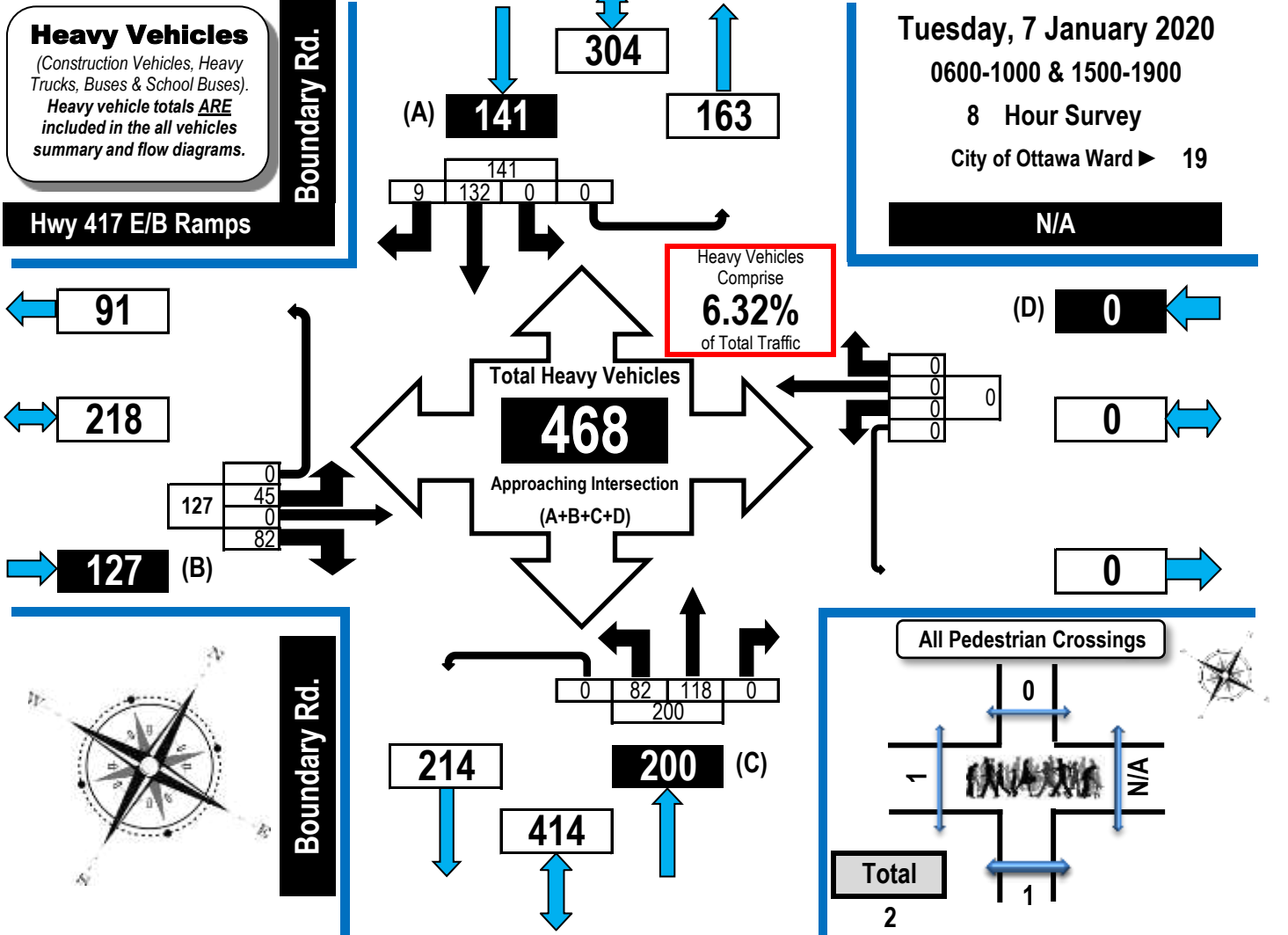




# Turning Movement Count Heavy Vehicle Summary Flow Diagram



## Boundary Road & Highway 417 South Ramps Carlsbad Springs, ON



| Time Period   | Hwy 417 E/B Ramps Eastbound |          |           |          |            | N/A Westbound |          |          |          |          | Boundary Rd. Northbound |            |          |          |            | Boundary Rd. Southbound |            |          |          |            | S. Tot     | G.Tot. |
|---------------|-----------------------------|----------|-----------|----------|------------|---------------|----------|----------|----------|----------|-------------------------|------------|----------|----------|------------|-------------------------|------------|----------|----------|------------|------------|--------|
|               | LT                          | ST       | RT        | UT       | S. Tot     | LT            | ST       | RT       | UT       | S. Tot   | LT                      | ST         | RT       | UT       | S. Tot     | LT                      | ST         | RT       | UT       | S. Tot     |            |        |
| 0600-0700     | 5                           | 0        | 9         | 0        | 14         | 0             | 0        | 0        | 0        | 0        | 4                       | 16         | 0        | 0        | 20         | 0                       | 14         | 0        | 0        | 14         | 48         |        |
| 0700-0800     | 5                           | 0        | 14        | 0        | 19         | 0             | 0        | 0        | 0        | 0        | 9                       | 16         | 0        | 0        | 25         | 0                       | 19         | 1        | 0        | 20         | 64         |        |
| 0800-0900     | 8                           | 0        | 11        | 0        | 19         | 0             | 0        | 0        | 0        | 0        | 13                      | 25         | 0        | 0        | 38         | 0                       | 27         | 1        | 0        | 28         | 85         |        |
| 0900-1000     | 9                           | 0        | 6         | 0        | 15         | 0             | 0        | 0        | 0        | 0        | 13                      | 26         | 0        | 0        | 39         | 0                       | 15         | 2        | 0        | 17         | 71         |        |
| 1500-1600     | 7                           | 0        | 12        | 0        | 19         | 0             | 0        | 0        | 0        | 0        | 10                      | 6          | 0        | 0        | 16         | 0                       | 18         | 1        | 0        | 19         | 54         |        |
| 1600-1700     | 6                           | 0        | 16        | 0        | 22         | 0             | 0        | 0        | 0        | 0        | 13                      | 13         | 0        | 0        | 26         | 0                       | 20         | 1        | 0        | 21         | 69         |        |
| 1700-1800     | 4                           | 0        | 6         | 0        | 10         | 0             | 0        | 0        | 0        | 0        | 15                      | 10         | 0        | 0        | 25         | 0                       | 15         | 2        | 0        | 17         | 52         |        |
| 1800-1900     | 1                           | 0        | 8         | 0        | 9          | 0             | 0        | 0        | 0        | 0        | 5                       | 6          | 0        | 0        | 11         | 0                       | 4          | 1        | 0        | 5          | 25         |        |
| <b>Totals</b> | <b>45</b>                   | <b>0</b> | <b>82</b> | <b>0</b> | <b>127</b> | <b>0</b>      | <b>0</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>82</b>               | <b>118</b> | <b>0</b> | <b>0</b> | <b>200</b> | <b>0</b>                | <b>132</b> | <b>9</b> | <b>0</b> | <b>141</b> | <b>468</b> |        |



# Turning Movement Count

## Summary Report Including AM, OFF Peak, PM, Evening Peak Hours, and PHF

Automobiles, Taxis,  
Light Trucks, Vans,  
SUV's, Motorcycles,  
Heavy Trucks, Buses,  
and School Buses

### Boundary Road & Highway 417 South Ramps Carlsbad Springs, ON

**Survey Date:** Tuesday, 7 January 2020      **Start Time:** 0600      **AADT Factor:** 1.1  
**Weather AM:** Overcast -4° C      **Survey Duration:** 8 Hrs.      **Survey Hours:** 0600-1000 & 1500-1900  
**Weather PM:** Cloudy -1° C      **Surveyor(s):** Carmody

| Hwy 417 E/B Ramps | N/A       | Boundary Rd. | Boundary Rd. |
|-------------------|-----------|--------------|--------------|
| Eastbound         | Westbound | Northbound   | Southbound   |

| Time Period   | Hwy 417 E/B Ramps |          |             |          |             | N/A      |          |          |          |          | Boundary Rd. Northbound |            |             |          |          | Boundary Rd. Southbound |          |             |           |          | Street Total | Grand Total |             |             |
|---------------|-------------------|----------|-------------|----------|-------------|----------|----------|----------|----------|----------|-------------------------|------------|-------------|----------|----------|-------------------------|----------|-------------|-----------|----------|--------------|-------------|-------------|-------------|
|               | LT                | ST       | RT          | UT       | E/B Tot     | LT       | ST       | RT       | UT       | W/B Tot  | LT                      | ST         | RT          | UT       | N/B Tot  | LT                      | ST       | RT          | UT        | S/B Tot  |              |             |             |             |
| 0600-0700     | 16                | 0        | 172         | 0        | 188         | 0        | 0        | 0        | 0        | 0        | 188                     | 21         | 756         | 0        | 0        | 777                     | 0        | 178         | 7         | 0        | 185          | 188         | 962         | 1150        |
| 0700-0800     | 15                | 0        | 171         | 0        | 186         | 0        | 0        | 0        | 0        | 0        | 186                     | 39         | 729         | 0        | 0        | 768                     | 0        | 151         | 9         | 0        | 160          | 186         | 928         | 1114        |
| 0800-0900     | 18                | 0        | 86          | 1        | 105         | 0        | 0        | 0        | 0        | 0        | 105                     | 55         | 450         | 0        | 0        | 505                     | 0        | 135         | 6         | 0        | 141          | 105         | 646         | 751         |
| 0900-1000     | 21                | 0        | 60          | 0        | 81          | 0        | 0        | 0        | 0        | 0        | 81                      | 44         | 291         | 0        | 0        | 335                     | 0        | 80          | 4         | 0        | 84           | 81          | 419         | 500         |
| 1500-1600     | 75                | 0        | 489         | 0        | 564         | 0        | 0        | 0        | 0        | 0        | 564                     | 79         | 202         | 0        | 0        | 281                     | 0        | 134         | 5         | 0        | 139          | 564         | 420         | 984         |
| 1600-1700     | 70                | 0        | 641         | 1        | 712         | 0        | 0        | 0        | 0        | 0        | 712                     | 126        | 184         | 0        | 0        | 310                     | 0        | 171         | 17        | 0        | 188          | 712         | 498         | 1210        |
| 1700-1800     | 51                | 0        | 406         | 0        | 457         | 0        | 0        | 0        | 0        | 0        | 457                     | 116        | 261         | 0        | 0        | 377                     | 0        | 168         | 14        | 0        | 182          | 457         | 559         | 1016        |
| 1800-1900     | 30                | 0        | 268         | 0        | 298         | 0        | 0        | 0        | 0        | 0        | 298                     | 48         | 230         | 0        | 0        | 278                     | 0        | 102         | 7         | 0        | 109          | 298         | 387         | 685         |
| <b>Totals</b> | <b>296</b>        | <b>0</b> | <b>2293</b> | <b>2</b> | <b>2591</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>2591</b>             | <b>528</b> | <b>3103</b> | <b>0</b> | <b>0</b> | <b>3631</b>             | <b>0</b> | <b>1119</b> | <b>69</b> | <b>0</b> | <b>1188</b>  | <b>2591</b> | <b>4819</b> | <b>7410</b> |

**Expansion factors are applied exclusively to standard weekday 8-hour turning movement counts conducted during the hours of 0700h - 1000h, 1130h - 1330h and 1500h - 1800h**

| <b>AM Peak Hour Factor → 0.97</b>  |    |    |     |    |     |    |    |    |    |     | <b>Highest Hourly Vehicle Volume Between 0500h &amp; 1000h</b> |     |     |    |    |     |    |     |    |    |     |       |       |
|------------------------------------|----|----|-----|----|-----|----|----|----|----|-----|--|-----|-----|----|----|-----|----|-----|----|----|-----|-------|-------|
| AM Peak Hr                         | LT | ST | RT  | UT | TOT | LT | ST | RT | UT | TOT | S.TOT  | LT  | ST  | RT | UT | TOT | LT | ST  | RT | UT | TOT | S.TOT | G.TOT |
| 0630-0730                          | 16 | 0  | 233 | 0  | 249 | 0  | 0  | 0  | 0  | 0   | 249  | 29  | 816 | 0  | 0  | 845 | 0  | 173 | 8  | 0  | 181 | 1026  | 1275  |
| <b>OFF Peak Hour Factor → N/A</b>  |    |    |     |    |     |    |    |    |    |     | <b>Highest Hourly Vehicle Volume Between 1000h &amp; 1500h</b> |     |     |    |    |     |    |     |    |    |     |       |       |
| OFF Peak Hr                        | LT | ST | RT  | UT | TOT | LT | ST | RT | UT | TOT | S.TOT  | LT  | ST  | RT | UT | TOT | LT | ST  | RT | UT | TOT | S.TOT | G.TOT |
| N/A                                | 0  | 0  | 0   | 0  | 0   | 0  | 0  | 0  | 0  | 0   | 0  | 0   | 0   | 0  | 0  | 0   | 0  | 0   | 0  | 0  | 0   | 0     | 0     |
| <b>PM Peak Hour Factor → 0.93</b>  |    |    |     |    |     |    |    |    |    |     | <b>Highest Hourly Vehicle Volume Between 1500h &amp; 1900h</b> |     |     |    |    |     |    |     |    |    |     |       |       |
| PM Peak Hr                         | LT | ST | RT  | UT | TOT | LT | ST | RT | UT | TOT | S.TOT  | LT  | ST  | RT | UT | TOT | LT | ST  | RT | UT | TOT | S.TOT | G.TOT |
| 1615-1715                          | 70 | 0  | 631 | 1  | 702 | 0  | 0  | 0  | 0  | 0   | 702  | 133 | 196 | 0  | 0  | 329 | 0  | 188 | 15 | 0  | 203 | 532   | 1234  |
| <b>EVNG Peak Hour Factor → N/A</b> |    |    |     |    |     |    |    |    |    |     | <b>Highest Hourly Vehicle Volume Between 1900h &amp; 0000h</b> |     |     |    |    |     |    |     |    |    |     |       |       |
| EVNG Pk Hr                         | LT | ST | RT  | UT | TOT | LT | ST | RT | UT | TOT | S.TOT  | LT  | ST  | RT | UT | TOT | LT | ST  | RT | UT | TOT | S.TOT | G.TOT |
| N/A                                | 0  | 0  | 0   | 0  | 0   | 0  | 0  | 0  | 0  | 0   | 0  | 0   | 0   | 0  | 0  | 0   | 0  | 0   | 0  | 0  | 0   | 0     | 0     |

**Comments:**  
No bicycles were observed.

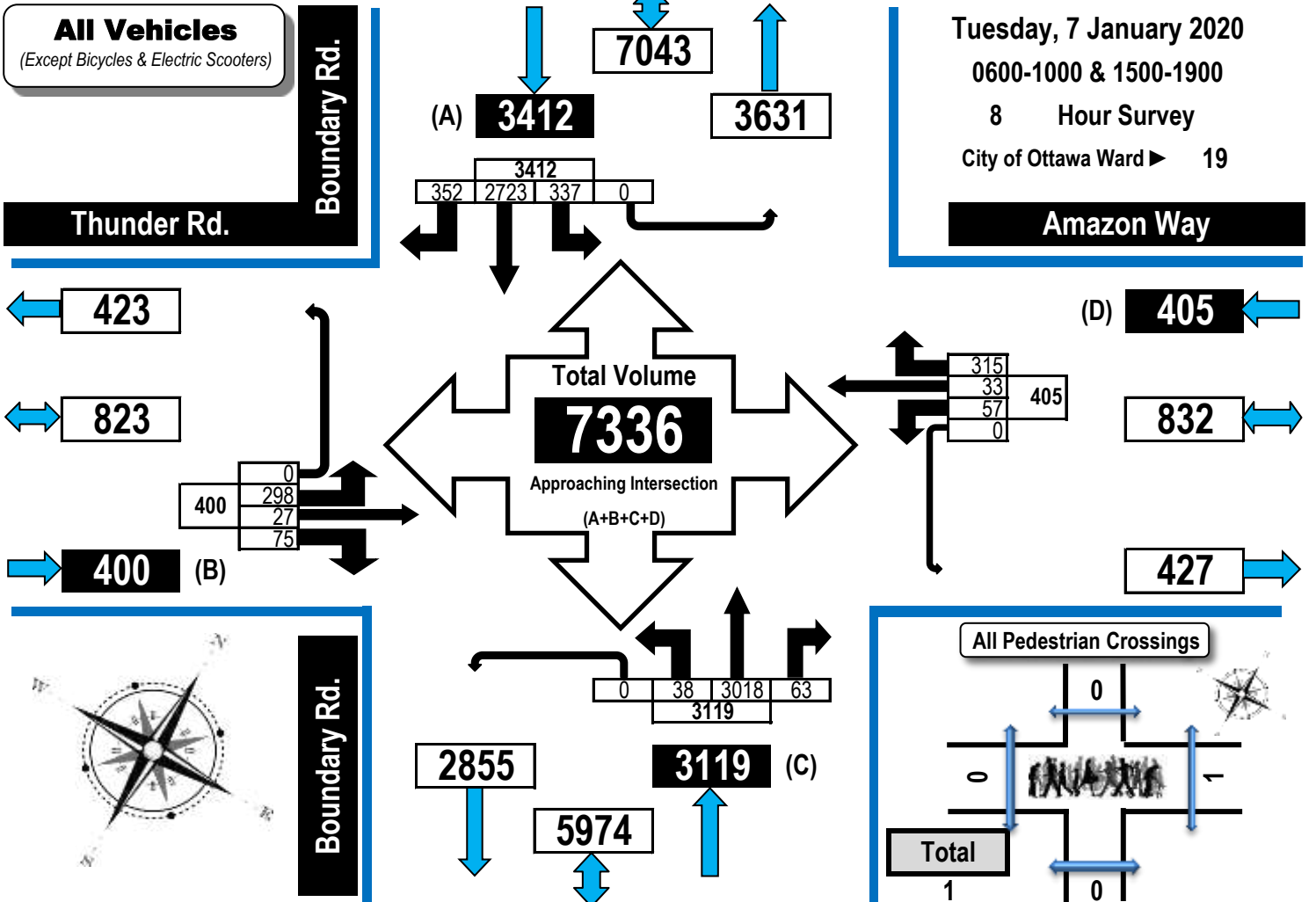
- Notes:**
1. Includes all vehicle types except bicycles and electric scooters.
  2. When expansion and AADT factors are applied, the results will differ slightly due to rounding.



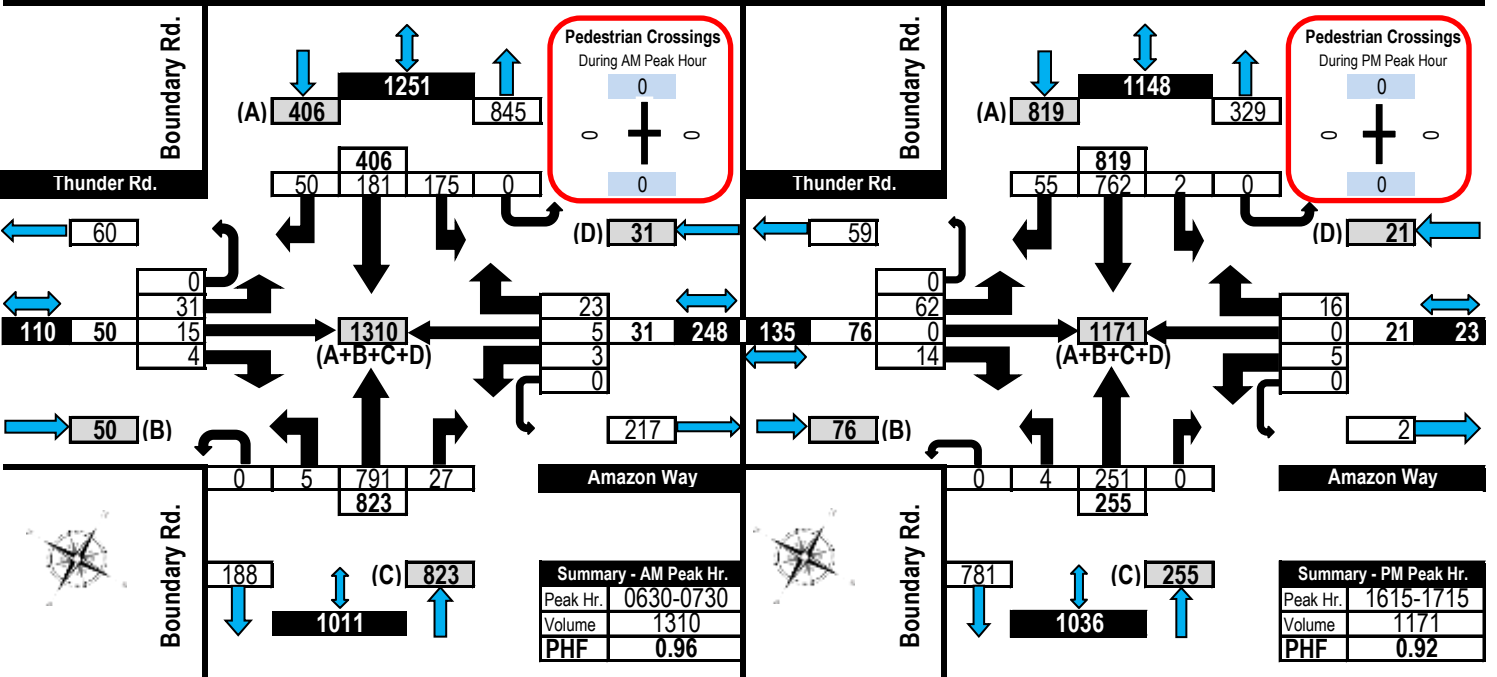
# Turning Movement Count Summary, AM and PM Peak Hour Flow Diagrams

Automobiles, Taxis, Light Trucks, Vans, SUV's, Motorcycles, Heavy Trucks, Buses, and School Buses

## Boundary Road & Amazon Way/Thunder Road Carlsbad Springs, ON



### AM Peak Hour Flow Diagram PM Peak Hour Flow Diagram





# Turning Movement Count Heavy Vehicle Summary Flow Diagram

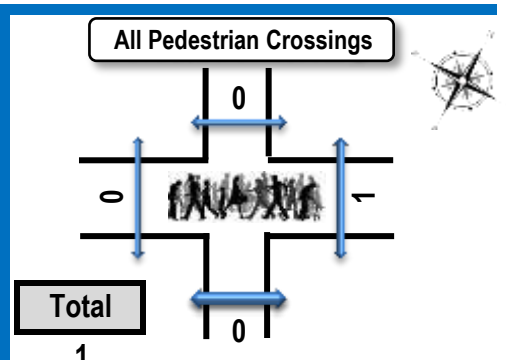
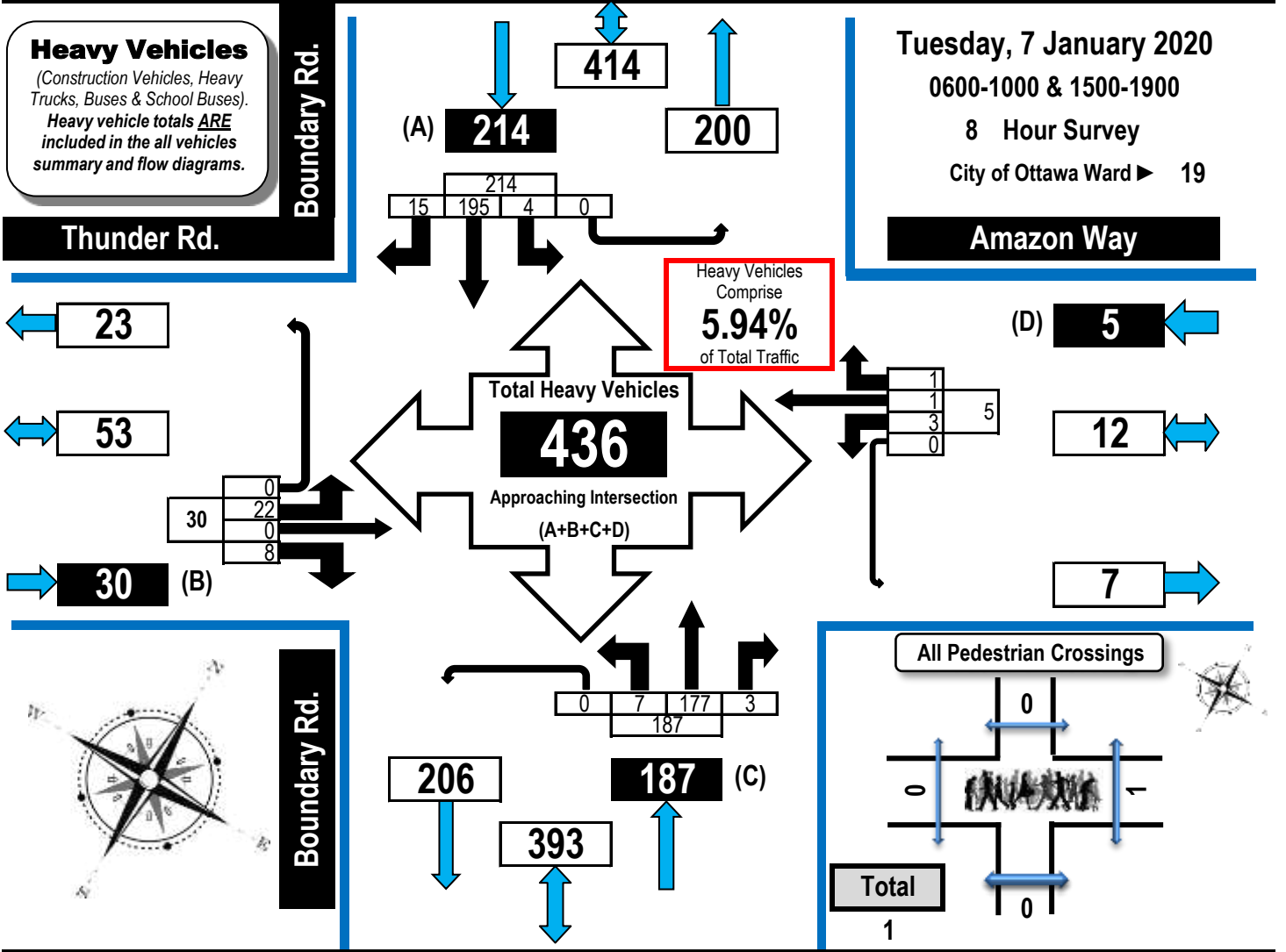


## Boundary Road & Amazon Way/Thunder Road Carlsbad Springs, ON

Tuesday, 7 January 2020  
0600-1000 & 1500-1900  
8 Hour Survey  
City of Ottawa Ward ► 19

**Heavy Vehicles**  
(Construction Vehicles, Heavy Trucks, Buses & School Buses).  
Heavy vehicle totals **ARE** included in the all vehicles summary and flow diagrams.

Boundary Rd.



| Time Period   | Thunder Rd. Eastbound |          |          |          |           | Amazon Way Westbound |          |          |          |          | Boundary Rd. Northbound |            |          |          |            | Boundary Rd. Southbound |            |           |          |            | G.Tot.     |
|---------------|-----------------------|----------|----------|----------|-----------|----------------------|----------|----------|----------|----------|-------------------------|------------|----------|----------|------------|-------------------------|------------|-----------|----------|------------|------------|
|               | LT                    | ST       | RT       | UT       | S. Tot.   | LT                   | ST       | RT       | UT       | S. Tot.  | LT                      | ST         | RT       | UT       | S. Tot.    | LT                      | ST         | RT        | UT       | S. Tot.    |            |
| 0600-0700     | 1                     | 0        | 0        | 0        | 1         | 0                    | 0        | 0        | 0        | 0        | 1                       | 19         | 0        | 0        | 20         | 0                       | 23         | 0         | 0        | 23         | 44         |
| 0700-0800     | 2                     | 0        | 1        | 0        | 3         | 0                    | 0        | 0        | 0        | 0        | 1                       | 22         | 0        | 0        | 23         | 0                       | 28         | 4         | 0        | 32         | 58         |
| 0800-0900     | 8                     | 0        | 2        | 0        | 10        | 0                    | 0        | 1        | 0        | 1        | 3                       | 30         | 1        | 0        | 34         | 1                       | 33         | 5         | 0        | 39         | 84         |
| 0900-1000     | 2                     | 0        | 1        | 0        | 3         | 0                    | 1        | 0        | 0        | 1        | 1                       | 37         | 0        | 0        | 38         | 1                       | 19         | 2         | 0        | 22         | 64         |
|               |                       |          |          |          |           |                      |          |          |          |          |                         |            |          |          |            |                         |            |           |          |            |            |
|               |                       |          |          |          |           |                      |          |          |          |          |                         |            |          |          |            |                         |            |           |          |            |            |
|               |                       |          |          |          |           |                      |          |          |          |          |                         |            |          |          |            |                         |            |           |          |            |            |
| 1500-1600     | 2                     | 0        | 3        | 0        | 5         | 1                    | 0        | 0        | 0        | 1        | 0                       | 14         | 2        | 0        | 16         | 1                       | 27         | 2         | 0        | 30         | 52         |
| 1600-1700     | 4                     | 0        | 0        | 0        | 4         | 2                    | 0        | 0        | 0        | 2        | 1                       | 22         | 0        | 0        | 23         | 1                       | 34         | 0         | 0        | 35         | 64         |
| 1700-1800     | 2                     | 0        | 1        | 0        | 3         | 0                    | 0        | 0        | 0        | 0        | 0                       | 23         | 0        | 0        | 23         | 0                       | 20         | 1         | 0        | 21         | 47         |
| 1800-1900     | 1                     | 0        | 0        | 0        | 1         | 0                    | 0        | 0        | 0        | 0        | 0                       | 10         | 0        | 0        | 10         | 0                       | 11         | 1         | 0        | 12         | 23         |
|               |                       |          |          |          |           |                      |          |          |          |          |                         |            |          |          |            |                         |            |           |          |            |            |
|               |                       |          |          |          |           |                      |          |          |          |          |                         |            |          |          |            |                         |            |           |          |            |            |
|               |                       |          |          |          |           |                      |          |          |          |          |                         |            |          |          |            |                         |            |           |          |            |            |
| <b>Totals</b> | <b>22</b>             | <b>0</b> | <b>8</b> | <b>0</b> | <b>30</b> | <b>3</b>             | <b>1</b> | <b>1</b> | <b>0</b> | <b>5</b> | <b>7</b>                | <b>177</b> | <b>3</b> | <b>0</b> | <b>187</b> | <b>4</b>                | <b>195</b> | <b>15</b> | <b>0</b> | <b>214</b> | <b>436</b> |



# Turning Movement Count

## Summary Report Including AM, OFF Peak, PM, Evening Peak Hours, and PHF

Automobiles, Taxis,  
Light Trucks, Vans,  
SUV's, Motorcycles,  
Heavy Trucks, Buses,  
and School Buses

### Boundary Road & Amazon Way/Thunder Road

**Carlsbad Springs, ON**

Survey Date: Tuesday, 7 January 2020

Start Time: 0600

AADT Factor: 1.1

Weather AM: Overcast - 4° C

Survey Duration: 8 Hrs.

Survey Hours: 0600-1000 & 1500-1900

Weather PM: Cloudy - 1° C

Surveyor(s): Carmody

#### Thunder Rd.

#### Amazon Way

#### Boundary Rd.

#### Boundary Rd.

Eastbound

Westbound

Northbound

Southbound

| Time Period | Thunder Rd. Eastbound |    |    |    |         | Amazon Way Westbound |    |     |    |         | Street Total | Boundary Rd. Northbound |      |    |    |         | Boundary Rd. Southbound |      |     |    |         | Street Total | Grand Total |
|-------------|-----------------------|----|----|----|---------|----------------------|----|-----|----|---------|--------------|-------------------------|------|----|----|---------|-------------------------|------|-----|----|---------|--------------|-------------|
|             | LT                    | ST | RT | UT | E/B Tot | LT                   | ST | RT  | UT | W/B Tot |              | LT                      | ST   | RT | UT | N/B Tot | LT                      | ST   | RT  | UT | S/B Tot |              |             |
| 0600-0700   | 29                    | 5  | 3  | 0  | 37      | 10                   | 4  | 78  | 0  | 92      | 129          | 7                       | 670  | 18 | 0  | 695     | 131                     | 163  | 56  | 0  | 350     | 1045         | 1174        |
| 0700-0800   | 30                    | 10 | 3  | 0  | 43      | 1                    | 3  | 14  | 0  | 18      | 61           | 3                       | 724  | 15 | 0  | 742     | 87                      | 193  | 42  | 0  | 322     | 1064         | 1125        |
| 0800-0900   | 33                    | 5  | 4  | 0  | 42      | 1                    | 1  | 3   | 0  | 5       | 47           | 7                       | 469  | 6  | 0  | 482     | 18                      | 170  | 33  | 0  | 221     | 703          | 750         |
| 0900-1000   | 24                    | 0  | 6  | 0  | 30      | 0                    | 2  | 5   | 0  | 7       | 37           | 4                       | 306  | 2  | 0  | 312     | 3                       | 122  | 15  | 0  | 140     | 452          | 489         |
|             |                       |    |    |    |         |                      |    |     |    |         |              |                         |      |    |    |         |                         |      |     |    |         |              |             |
|             |                       |    |    |    |         |                      |    |     |    |         |              |                         |      |    |    |         |                         |      |     |    |         |              |             |
|             |                       |    |    |    |         |                      |    |     |    |         |              |                         |      |    |    |         |                         |      |     |    |         |              |             |
|             |                       |    |    |    |         |                      |    |     |    |         |              |                         |      |    |    |         |                         |      |     |    |         |              |             |
| 1500-1600   | 49                    | 0  | 11 | 0  | 60      | 5                    | 4  | 15  | 0  | 24      | 84           | 4                       | 217  | 6  | 0  | 227     | 8                       | 557  | 58  | 0  | 623     | 850          | 934         |
| 1600-1700   | 59                    | 0  | 19 | 0  | 78      | 6                    | 0  | 14  | 0  | 20      | 98           | 9                       | 237  | 0  | 0  | 246     | 2                       | 745  | 65  | 0  | 812     | 1058         | 1156        |
| 1700-1800   | 55                    | 1  | 15 | 0  | 71      | 11                   | 4  | 67  | 0  | 82      | 153          | 1                       | 255  | 5  | 0  | 261     | 16                      | 509  | 49  | 0  | 574     | 835          | 988         |
| 1800-1900   | 19                    | 6  | 14 | 0  | 39      | 23                   | 15 | 119 | 0  | 157     | 196          | 3                       | 140  | 11 | 0  | 154     | 72                      | 264  | 34  | 0  | 370     | 524          | 720         |
|             |                       |    |    |    |         |                      |    |     |    |         |              |                         |      |    |    |         |                         |      |     |    |         |              |             |
|             |                       |    |    |    |         |                      |    |     |    |         |              |                         |      |    |    |         |                         |      |     |    |         |              |             |
|             |                       |    |    |    |         |                      |    |     |    |         |              |                         |      |    |    |         |                         |      |     |    |         |              |             |
|             |                       |    |    |    |         |                      |    |     |    |         |              |                         |      |    |    |         |                         |      |     |    |         |              |             |
| Totals      | 298                   | 27 | 75 | 0  | 400     | 57                   | 33 | 315 | 0  | 405     | 805          | 38                      | 3018 | 63 | 0  | 3119    | 337                     | 2723 | 352 | 0  | 3412    | 6531         | 7336        |

**Expansion factors are applied exclusively to standard weekday 8-hour turning movement counts conducted during the hours of 0700h - 1000h, 1130h - 1330h and 1500h - 1800h**

|                                    |    |    |    |    |     |    |    |    |    |     |   |    |     |    |    |     |     |     |    |    |     |       |       |
|------------------------------------|----|----|----|----|-----|----|----|----|----|-----|---|----|-----|----|----|-----|-----|-----|----|----|-----|-------|-------|
| AM Peak Hour Factor → <b>0.96</b>  |    |    |    |    |     |    |    |    |    |     | Highest Hourly Vehicle Volume Between 0500h & 1000h |    |     |    |    |     |     |     |    |    |     |       |       |
| AM Peak Hr                         | LT | ST | RT | UT | TOT | LT | ST | RT | UT | TOT | S.TOT   | LT | ST  | RT | UT | TOT | LT  | ST  | RT | UT | TOT | S.TOT | G.TOT |
| 0630-0730                          | 31 | 15 | 4  | 0  | 50  | 3  | 5  | 23 | 0  | 31  | 81  | 5  | 791 | 27 | 0  | 823 | 175 | 181 | 50 | 0  | 406 | 1229  | 1310  |
| OFF Peak Hour Factor → <b>N/A</b>  |    |    |    |    |     |    |    |    |    |     | Highest Hourly Vehicle Volume Between 1000h & 1500h |    |     |    |    |     |     |     |    |    |     |       |       |
| OFF Peak Hr                        | LT | ST | RT | UT | TOT | LT | ST | RT | UT | TOT | S.TOT   | LT | ST  | RT | UT | TOT | LT  | ST  | RT | UT | TOT | S.TOT | G.TOT |
| N/A                                | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0   | 0   | 0  | 0   | 0  | 0  | 0   | 0   | 0   | 0  | 0  | 0   | 0     | 0     |
| PM Peak Hour Factor → <b>0.92</b>  |    |    |    |    |     |    |    |    |    |     | Highest Hourly Vehicle Volume Between 1500h & 1900h |    |     |    |    |     |     |     |    |    |     |       |       |
| PM Peak Hr                         | LT | ST | RT | UT | TOT | LT | ST | RT | UT | TOT | S.TOT   | LT | ST  | RT | UT | TOT | LT  | ST  | RT | UT | TOT | S.TOT | G.TOT |
| 1615-1715                          | 62 | 0  | 14 | 0  | 76  | 5  | 0  | 16 | 0  | 21  | 97  | 4  | 251 | 0  | 0  | 255 | 2   | 762 | 55 | 0  | 819 | 1074  | 1171  |
| EVNG Peak Hour Factor → <b>N/A</b> |    |    |    |    |     |    |    |    |    |     | Highest Hourly Vehicle Volume Between 1900h & 0000h |    |     |    |    |     |     |     |    |    |     |       |       |
| EVNG Pk Hr                         | LT | ST | RT | UT | TOT | LT | ST | RT | UT | TOT | S.TOT   | LT | ST  | RT | UT | TOT | LT  | ST  | RT | UT | TOT | S.TOT | G.TOT |
| N/A                                | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0   | 0   | 0  | 0   | 0  | 0  | 0   | 0   | 0   | 0  | 0  | 0   | 0     | 0     |

**Comments:**

Much of the traffic, including the majority of the heavy vehicles, to and from Thunder Road is associated with the Petro Canada gas station on the southwest corner. The heavy vehicle total includes 29 school buses and 7 private buses. There were no bicycles observed during this traffic count.

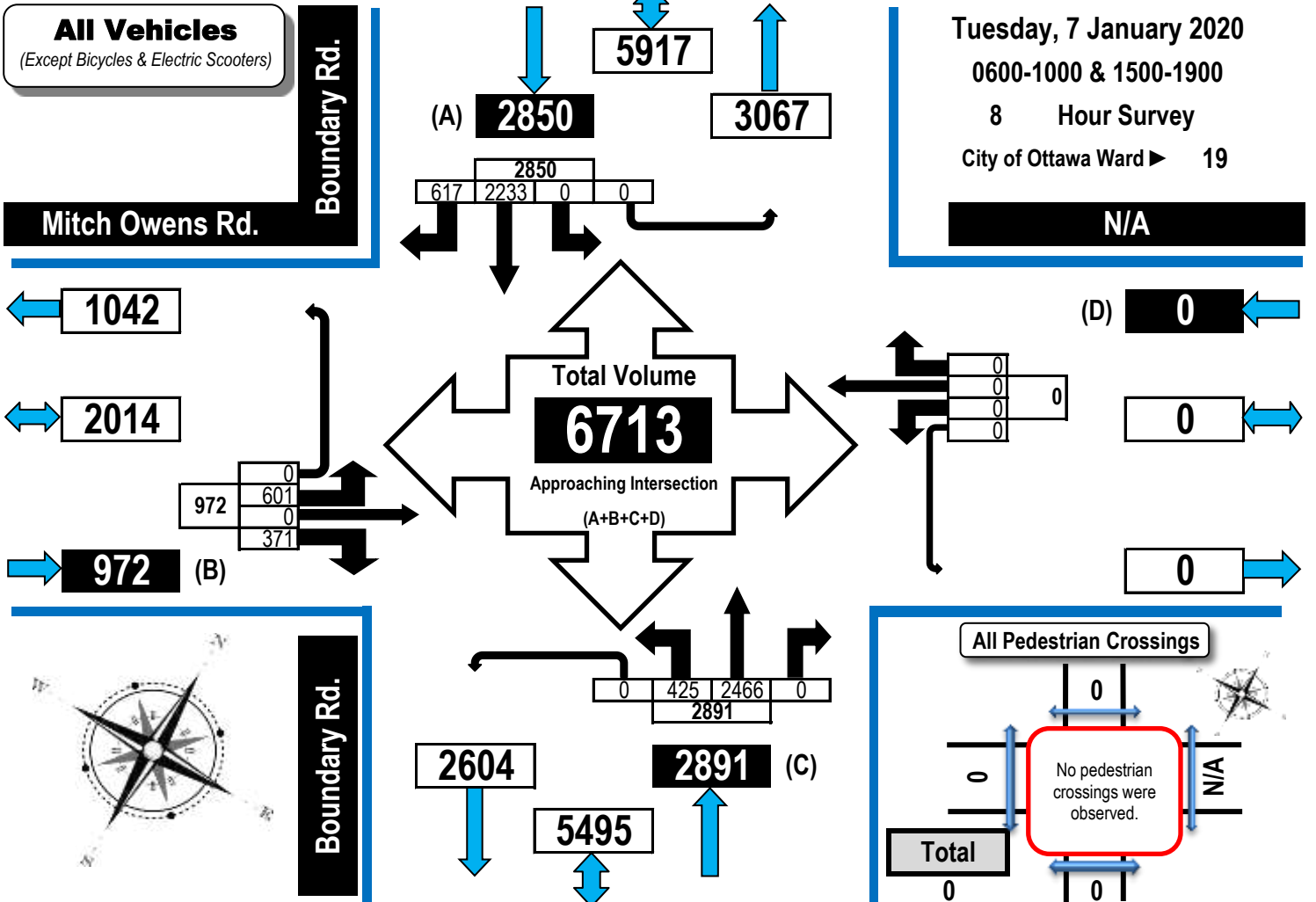
- Notes:**
1. Includes all vehicle types except bicycles and electric scooters.
  2. When expansion and AADT factors are applied, the results will differ slightly due to rounding.



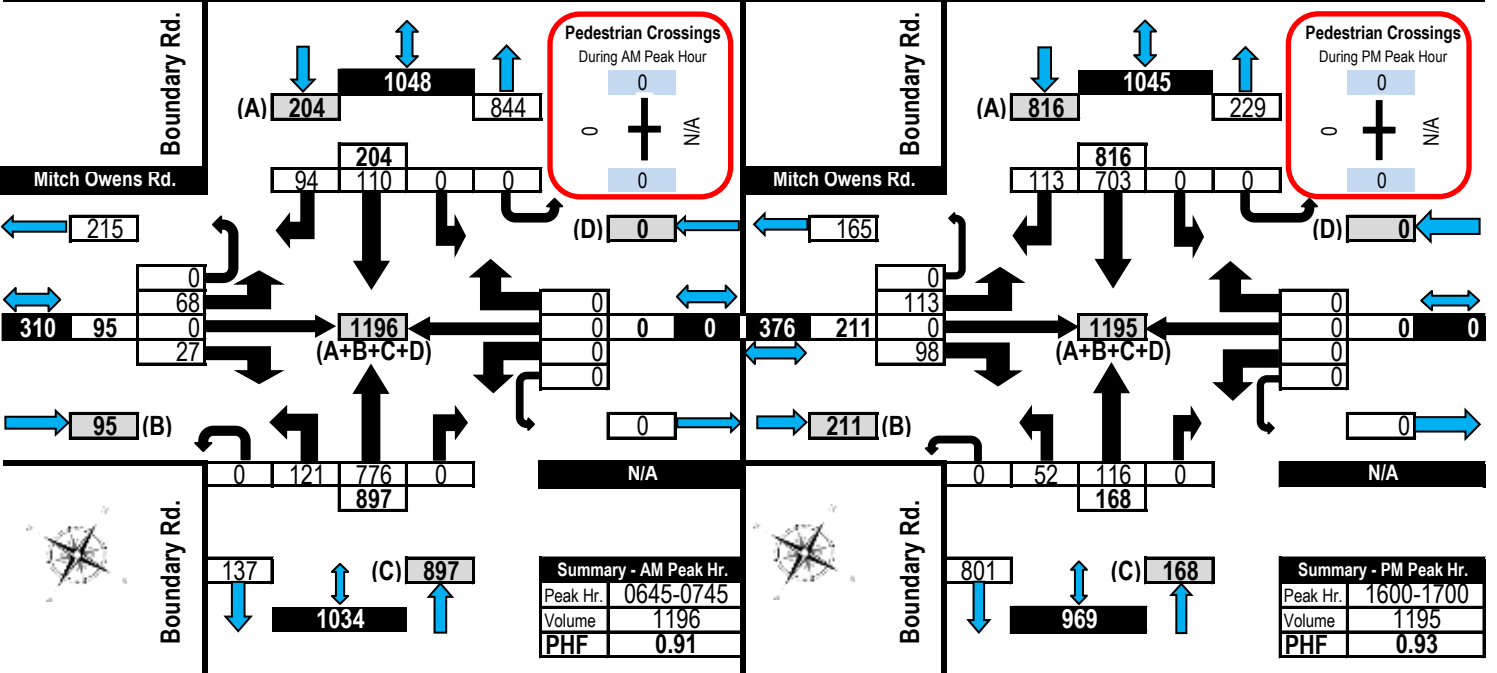
# Turning Movement Count Summary, AM and PM Peak Hour Flow Diagrams

Automobiles, Taxis, Light Trucks, Vans, SUV's, Motorcycles, Heavy Trucks, Buses, and School Buses

## Boundary Road & Mitch Owens Road Carlsbad Springs, ON



### AM Peak Hour Flow Diagram      PM Peak Hour Flow Diagram





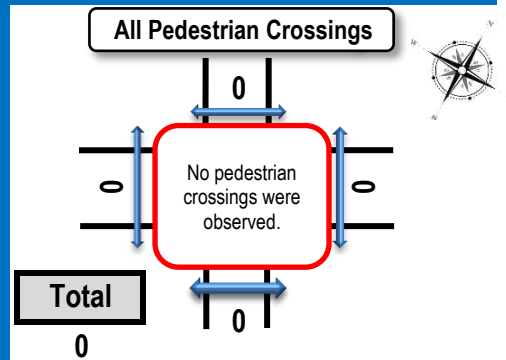
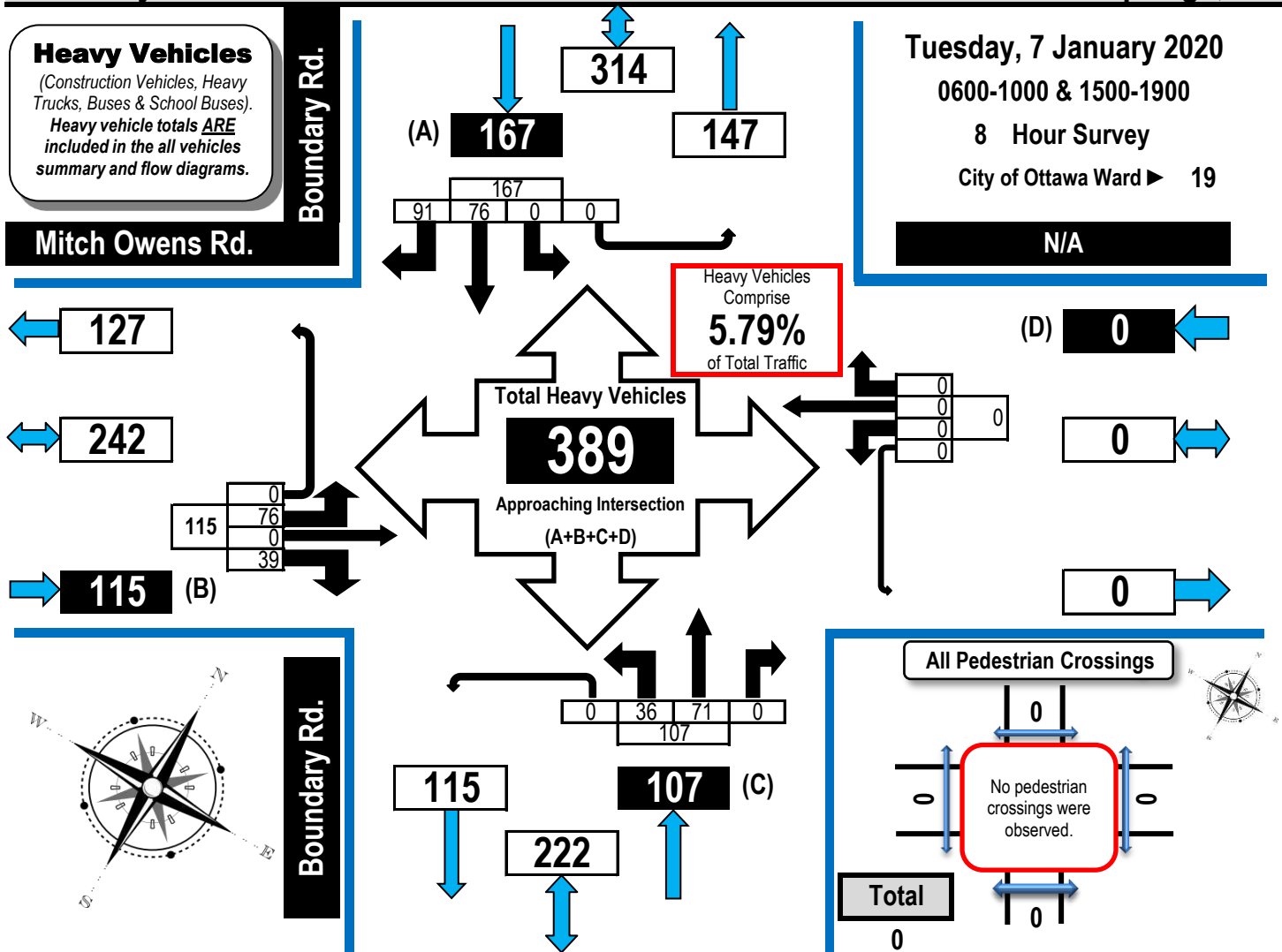
# Turning Movement Count Heavy Vehicle Summary Flow Diagram



**Boundary Road & Mitch Owens Road** **Carlsbad Springs, ON**

**Heavy Vehicles**  
(Construction Vehicles, Heavy Trucks, Buses & School Buses).  
Heavy vehicle totals ARE included in the all vehicles summary and flow diagrams.

**Tuesday, 7 January 2020**  
**0600-1000 & 1500-1900**  
**8 Hour Survey**  
City of Ottawa Ward ► **19**



Mitch Owens Rd. Eastbound
N/A Westbound
Boundary Rd. Northbound
Boundary Rd. Southbound

| Time Period   | Mitch Owens Rd. Eastbound |          |           |          |            | N/A Westbound |          |          |          |          | Boundary Rd. Northbound |           |          |          |            | Boundary Rd. Southbound |           |           |          |            | S. Tot     | G.Tot. |
|---------------|---------------------------|----------|-----------|----------|------------|---------------|----------|----------|----------|----------|-------------------------|-----------|----------|----------|------------|-------------------------|-----------|-----------|----------|------------|------------|--------|
|               | LT                        | ST       | RT        | UT       | S. Tot     | LT            | ST       | RT       | UT       | S. Tot   | LT                      | ST        | RT       | UT       | S. Tot     | LT                      | ST        | RT        | UT       | S. Tot     |            |        |
| 0600-0700     | 6                         | 0        | 6         | 0        | 12         | 0             | 0        | 0        | 0        | 0        | 4                       | 12        | 0        | 0        | 16         | 0                       | 4         | 6         | 0        | 10         | 38         |        |
| 0700-0800     | 8                         | 0        | 4         | 0        | 12         | 0             | 0        | 0        | 0        | 0        | 10                      | 10        | 0        | 0        | 20         | 0                       | 15        | 16        | 0        | 31         | 63         |        |
| 0800-0900     | 12                        | 0        | 6         | 0        | 18         | 0             | 0        | 0        | 0        | 0        | 7                       | 18        | 0        | 0        | 25         | 0                       | 8         | 17        | 0        | 25         | 68         |        |
| 0900-1000     | 21                        | 0        | 4         | 0        | 25         | 0             | 0        | 0        | 0        | 0        | 3                       | 10        | 0        | 0        | 13         | 0                       | 9         | 14        | 0        | 23         | 61         |        |
| 1500-1600     | 4                         | 0        | 11        | 0        | 15         | 0             | 0        | 0        | 0        | 0        | 5                       | 5         | 0        | 0        | 10         | 0                       | 18        | 12        | 0        | 30         | 55         |        |
| 1600-1700     | 15                        | 0        | 6         | 0        | 21         | 0             | 0        | 0        | 0        | 0        | 4                       | 5         | 0        | 0        | 9          | 0                       | 10        | 14        | 0        | 24         | 54         |        |
| 1700-1800     | 5                         | 0        | 2         | 0        | 7          | 0             | 0        | 0        | 0        | 0        | 2                       | 7         | 0        | 0        | 9          | 0                       | 10        | 10        | 0        | 20         | 36         |        |
| 1800-1900     | 5                         | 0        | 0         | 0        | 5          | 0             | 0        | 0        | 0        | 0        | 1                       | 4         | 0        | 0        | 5          | 0                       | 2         | 2         | 0        | 4          | 14         |        |
| <b>Totals</b> | <b>76</b>                 | <b>0</b> | <b>39</b> | <b>0</b> | <b>115</b> | <b>0</b>      | <b>0</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>36</b>               | <b>71</b> | <b>0</b> | <b>0</b> | <b>107</b> | <b>0</b>                | <b>76</b> | <b>91</b> | <b>0</b> | <b>167</b> | <b>389</b> |        |





# Turning Movement Count

## Summary Report Including AM, OFF Peak, PM, Evening Peak Hours, and PHF

Automobiles, Taxis,  
Light Trucks, Vans,  
SUV's, Motorcycles,  
Heavy Trucks, Buses,  
and School Buses

### Boundary Road & Mitch Owens Road

### Carlsbad Springs, ON

Survey Date: Tuesday, 7 January 2020

Start Time: 0600 AADT Factor: 1.1

Weather AM: Overcast - 4° C

Survey Duration: 8 Hrs.

Survey Hours: 0600-1000 & 1500-1900

Weather PM: Cloudy - 1° C

Surveyor(s): Carmody

#### Mitch Owens Rd.

N/A

#### Boundary Rd.

#### Boundary Rd.

Eastbound

Westbound

Northbound

Southbound

| Time Period | LT  | ST | RT  | UT | E/B Tot | LT | ST | RT | UT | W/B Tot | Street Total | LT  | ST   | RT | UT | N/B Tot | LT | ST   | RT  | UT | S/B Tot | Street Total | Grand Total |
|-------------|-----|----|-----|----|---------|----|----|----|----|---------|--------------|-----|------|----|----|---------|----|------|-----|----|---------|--------------|-------------|
| 0600-0700   | 51  | 0  | 28  | 0  | 79      | 0  | 0  | 0  | 0  | 0       | 79           | 81  | 670  | 0  | 0  | 751     | 0  | 57   | 88  | 0  | 145     | 896          | 975         |
| 0700-0800   | 63  | 0  | 19  | 0  | 82      | 0  | 0  | 0  | 0  | 0       | 82           | 118 | 681  | 0  | 0  | 799     | 0  | 115  | 95  | 0  | 210     | 1009         | 1091        |
| 0800-0900   | 80  | 0  | 30  | 0  | 110     | 0  | 0  | 0  | 0  | 0       | 110          | 52  | 412  | 0  | 0  | 464     | 0  | 92   | 75  | 0  | 167     | 631          | 741         |
| 0900-1000   | 58  | 0  | 16  | 0  | 74      | 0  | 0  | 0  | 0  | 0       | 74           | 29  | 239  | 0  | 0  | 268     | 0  | 67   | 48  | 0  | 115     | 383          | 457         |
| 1500-1600   | 75  | 0  | 74  | 0  | 149     | 0  | 0  | 0  | 0  | 0       | 149          | 45  | 125  | 0  | 0  | 170     | 0  | 488  | 66  | 0  | 554     | 724          | 873         |
| 1600-1700   | 113 | 0  | 98  | 0  | 211     | 0  | 0  | 0  | 0  | 0       | 211          | 52  | 116  | 0  | 0  | 168     | 0  | 703  | 113 | 0  | 816     | 984          | 1195        |
| 1700-1800   | 113 | 0  | 74  | 0  | 187     | 0  | 0  | 0  | 0  | 0       | 187          | 30  | 128  | 0  | 0  | 158     | 0  | 459  | 75  | 0  | 534     | 692          | 879         |
| 1800-1900   | 48  | 0  | 32  | 0  | 80      | 0  | 0  | 0  | 0  | 0       | 80           | 18  | 95   | 0  | 0  | 113     | 0  | 252  | 57  | 0  | 309     | 422          | 502         |
| Totals      | 601 | 0  | 371 | 0  | 972     | 0  | 0  | 0  | 0  | 0       | 972          | 425 | 2466 | 0  | 0  | 2891    | 0  | 2233 | 617 | 0  | 2850    | 5741         | 6713        |

**Expansion factors are applied exclusively to standard weekday 8-hour turning movement counts conducted during the hours of 0700h - 1000h, 1130h - 1330h and 1500h - 1800h**

|                         |      |    |    |    |     |    |    |    |    |     |       |   |     |    |    |     |    |     |     |    |     |       |       |
|-------------------------|------|----|----|----|-----|----|----|----|----|-----|-------|---|-----|----|----|-----|----|-----|-----|----|-----|-------|-------|
| AM Peak Hour Factor →   | 0.91 |    |    |    |     |    |    |    |    |     |       | Highest Hourly Vehicle Volume Between 0500h & 1000h |     |    |    |     |    |     |     |    |     |       |       |
| AM Peak Hr              | LT   | ST | RT | UT | TOT | LT | ST | RT | UT | TOT | S.TOT | LT  | ST  | RT | UT | TOT | LT | ST  | RT  | UT | TOT | S.TOT | G.TOT |
| 0645-0745               | 68   | 0  | 27 | 0  | 95  | 0  | 0  | 0  | 0  | 0   | 95    | 121   | 776 | 0  | 0  | 897 | 0  | 110 | 94  | 0  | 204 | 1101  | 1196  |
| OFF Peak Hour Factor →  | N/A  |    |    |    |     |    |    |    |    |     |       | Highest Hourly Vehicle Volume Between 1000h & 1500h |     |    |    |     |    |     |     |    |     |       |       |
| OFF Peak Hr             | LT   | ST | RT | UT | TOT | LT | ST | RT | UT | TOT | S.TOT | LT  | ST  | RT | UT | TOT | LT | ST  | RT  | UT | TOT | S.TOT | G.TOT |
| N/A                     | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0   | 0     | 0   | 0   | 0  | 0  | 0   | 0  | 0   | 0   | 0  | 0   | 0     | 0     |
| PM Peak Hour Factor →   | 0.93 |    |    |    |     |    |    |    |    |     |       | Highest Hourly Vehicle Volume Between 1500h & 1900h |     |    |    |     |    |     |     |    |     |       |       |
| PM Peak Hr              | LT   | ST | RT | UT | TOT | LT | ST | RT | UT | TOT | S.TOT | LT  | ST  | RT | UT | TOT | LT | ST  | RT  | UT | TOT | S.TOT | G.TOT |
| 1600-1700               | 113  | 0  | 98 | 0  | 211 | 0  | 0  | 0  | 0  | 0   | 211   | 52  | 116 | 0  | 0  | 168 | 0  | 703 | 113 | 0  | 816 | 984   | 1195  |
| EVNG Peak Hour Factor → | N/A  |    |    |    |     |    |    |    |    |     |       | Highest Hourly Vehicle Volume Between 1900h & 0000h |     |    |    |     |    |     |     |    |     |       |       |
| EVNG Pk Hr              | LT   | ST | RT | UT | TOT | LT | ST | RT | UT | TOT | S.TOT | LT  | ST  | RT | UT | TOT | LT | ST  | RT  | UT | TOT | S.TOT | G.TOT |
| N/A                     | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0   | 0     | 0   | 0   | 0  | 0  | 0   | 0  | 0   | 0   | 0  | 0   | 0     | 0     |

#### Comments:

Large heavy vehicles cannot complete their turns without driving into adjacent lanes. The lack of a northbound left-turn lane results in some northbound drivers using the shoulder to pass vehicles waiting to turn. Some southbound drivers pass southbound heavy vehicles turning right onto Mitch Owens Road as the heavy vehicle turns from the southbound through lane.

- Notes:**
1. Includes all vehicle types except bicycles and electric scooters.
  2. When expansion and AADT factors are applied, the results will differ slightly due to rounding.

# APPENDIX D

## Collision Data



# City Operations - Transportation Services

## Collision Details Report - Public Version

**From:** January 1, 2014 **To:** December 31, 2018

**Location:** BOUNDARY RD @ HWY 417 BOUNDARY IC96R15

**Traffic Control:** No control

**Total Collisions:** 3

| Date/Day/Time          | Environment | Impact Type | Classification   | Surface Cond'n | Veh. Dir | Vehicle Manoeuvre | Vehicle type              | First Event         | No. Ped |
|------------------------|-------------|-------------|------------------|----------------|----------|-------------------|---------------------------|---------------------|---------|
| 2016-May-01, Sun,22:14 | Rain        | SMV other   | P.D. only        | Wet            | North    | Turning left      | Automobile, station wagon | Ran off road        |         |
| 2016-Nov-13, Sun,11:05 | Clear       | Rear end    | P.D. only        | Dry            | North    | Going ahead       | Automobile, station wagon | Other motor vehicle |         |
|                        |             |             |                  |                | North    | Turning left      | Automobile, station wagon | Other motor vehicle |         |
| 2018-Mar-22, Thu,14:00 | Clear       | Rear end    | Non-fatal injury | Dry            | North    | Turning left      | Automobile, station wagon | Other motor vehicle |         |
|                        |             |             |                  |                | North    | Turning left      | Automobile, station wagon | Other motor vehicle |         |

**Location:** BOUNDARY RD @ HWY 417 BOUNDARY IC96R16

**Traffic Control:** No control

**Total Collisions:** 1

| Date/Day/Time          | Environment | Impact Type | Classification | Surface Cond'n | Veh. Dir | Vehicle Manoeuvre | Vehicle type  | First Event         | No. Ped |
|------------------------|-------------|-------------|----------------|----------------|----------|-------------------|---------------|---------------------|---------|
| 2015-Sep-12, Sat,11:19 | Rain        | Rear end    | P.D. only      | Wet            | North    | Going ahead       | Pick-up truck | Other motor vehicle |         |
|                        |             |             |                |                | North    | Turning right     | Pick-up truck | Other motor vehicle |         |

**Location:** BOUNDARY RD @ HWY 417 BOUNDARY IC96R51

**Traffic Control:** Stop sign

**Total Collisions:** 7

| Date/Day/Time | Environment | Impact Type | Classification | Surface Cond'n | Veh. Dir | Vehicle Manoeuvre | Vehicle type | First Event | No. Ped |
|---------------|-------------|-------------|----------------|----------------|----------|-------------------|--------------|-------------|---------|
|---------------|-------------|-------------|----------------|----------------|----------|-------------------|--------------|-------------|---------|

|                        |       |           |              |     |       |                     |                           |                     |
|------------------------|-------|-----------|--------------|-----|-------|---------------------|---------------------------|---------------------|
| 2014-Jun-21, Sat,23:06 | Clear | Rear end  | P.D. only    | Dry | North | Going ahead         | Unknown                   | Other motor vehicle |
|                        |       |           |              |     | North | Going ahead         | Automobile, station wagon | Other motor vehicle |
| 2014-Aug-22, Fri,16:15 | Clear | Rear end  | P.D. only    | Dry | East  | Going ahead         | Automobile, station wagon | Other motor vehicle |
|                        |       |           |              |     | East  | Slowing or stopping | Automobile, station wagon | Other motor vehicle |
| 2015-May-27, Wed,18:10 | Clear | Rear end  | P.D. only    | Dry | East  | Going ahead         | Automobile, station wagon | Other motor vehicle |
|                        |       |           |              |     | East  | Going ahead         | Pick-up truck             | Other motor vehicle |
| 2017-Oct-04, Wed,00:19 | Rain  | Angle     | Fatal injury | Wet | East  | Turning right       | Automobile, station wagon | Other motor vehicle |
|                        |       |           |              |     | South | Going ahead         | Automobile, station wagon | Other motor vehicle |
|                        |       |           |              |     | North | Going ahead         | Automobile, station wagon | Other motor vehicle |
| 2017-Nov-08, Wed,10:30 | Clear | Sideswipe | P.D. only    | Dry | East  | Turning right       | Automobile, station wagon | Other motor vehicle |
|                        |       |           |              |     | East  | Turning right       | Truck and trailer         | Other motor vehicle |
| 2018-Sep-06, Thu,15:10 | Clear | Angle     | P.D. only    | Dry | East  | Turning left        | Automobile, station wagon | Other motor vehicle |
|                        |       |           |              |     | North | Going ahead         | Automobile, station wagon | Other motor vehicle |
| 2018-Apr-11, Wed,17:10 | Clear | Rear end  | P.D. only    | Dry | East  | Going ahead         | Automobile, station wagon | Other motor vehicle |
|                        |       |           |              |     | East  | Slowing or stopping | Automobile, station wagon | Other motor vehicle |

**Location:** BOUNDARY RD @ HWY 417 BOUNDARY IC96R61

**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 |
|------------------------|-------------|-------------|----------------|----------------|----------|-------------------|---------------------------|----------------------------|---------|
| 2015-May-02, Sat,02:58 | Clear       | SMV other   | P.D. only      | Dry            | South    | Going ahead       | Pick-up truck             | Pole (sign, parking meter) |         |
| 2015-Feb-15, Sun,15:20 | Clear       | Rear end    | P.D. only      | Dry            | West     | Going ahead       | Pick-up truck             | Other motor vehicle        |         |
|                        |             |             |                |                | West     | Stopped           | Automobile, station wagon | Other motor vehicle        |         |

**Location:** BOUNDARY RD @ MITCH OWENS RD

**Traffic Control:** Stop sign

**Total Collisions:** 18

| Date/Day/Time          | Environment | Impact Type | Classification | Surface Cond'n | Veh. Dir | Vehicle Manoeuver | Vehicle type              | First Event         | No. Ped |
|------------------------|-------------|-------------|----------------|----------------|----------|-------------------|---------------------------|---------------------|---------|
| 2014-Feb-03, Mon,21:45 | Clear       | SMV other   | P.D. only      | Dry            | North    | Going ahead       | Pick-up truck             | Animal - wild       |         |
| 2014-Mar-29, Sat,10:14 | Clear       | SMV other   | P.D. only      | Dry            | East     | Going ahead       | Automobile, station wagon | Ran off road        |         |
| 2014-Nov-08, Sat,02:00 | Clear       | SMV other   | P.D. only      | Dry            | East     | Turning right     | Pick-up truck             | Ran off road        |         |
| 2014-Sep-27, Sat,08:57 | Clear       | SMV other   | P.D. only      | Dry            | East     | Going ahead       | Pick-up truck             | Fence/noice barrier |         |
| 2015-Feb-25, Wed,16:28 | Clear       | Angle       | P.D. only      | Dry            | East     | Going ahead       | Delivery van              | Other motor vehicle |         |
|                        |             |             |                |                | South    | Going ahead       | Automobile, station wagon | Other motor vehicle |         |
| 2016-Jun-18, Sat,14:34 | Clear       | Angle       | P.D. only      | Dry            | East     | Turning left      | Passenger van             | Other motor vehicle |         |
|                        |             |             |                |                | South    | Going ahead       | Automobile, station wagon | Other motor vehicle |         |

|                         |                                 |           |                  |            |       |              |                           |                     |
|-------------------------|---------------------------------|-----------|------------------|------------|-------|--------------|---------------------------|---------------------|
| 2015-Oct-30, Fri, 17:16 | Clear                           | Rear end  | Non-fatal injury | Dry        | North | Going ahead  | Delivery van              | Other motor vehicle |
|                         |                                 |           |                  |            | North | Turning left | Automobile, station wagon | Other motor vehicle |
| 2015-Oct-13, Tue, 11:34 | Rain                            | SMV other | P.D. only        | Wet        | North | Overtaking   | Automobile, station wagon | Skidding/sliding    |
| 2015-Oct-19, Mon, 07:35 | Clear                           | Angle     | P.D. only        | Dry        | East  | Turning left | Automobile, station wagon | Other motor vehicle |
|                         |                                 |           |                  |            | North | Turning left | Automobile, station wagon | Other motor vehicle |
| 2016-Jan-17, Sun, 17:07 | Snow                            | SMV other | P.D. only        | Loose snow | South | Going ahead  | Automobile, station wagon | Ditch               |
| 2016-Jan-01, Fri, 12:28 | Snow                            | Angle     | P.D. only        | Wet        | East  | Turning left | Delivery van              | Other motor vehicle |
|                         |                                 |           |                  |            | South | Going ahead  | Automobile, station wagon | Other motor vehicle |
| 2016-Aug-18, Thu, 17:57 | Clear                           | Angle     | P.D. only        | Dry        | East  | Turning left | Pick-up truck             | Other motor vehicle |
|                         |                                 |           |                  |            | South | Going ahead  | Automobile, station wagon | Other motor vehicle |
| 2016-Nov-08, Tue, 17:42 | Clear                           | Angle     | P.D. only        | Dry        | East  | Turning left | Automobile, station wagon | Other motor vehicle |
|                         |                                 |           |                  |            | North | Going ahead  | Automobile, station wagon | Other motor vehicle |
| 2016-Nov-25, Fri, 16:38 | Fog, mist, smoke, Rear end dust |           | Non-fatal injury | Wet        | North | Going ahead  | Pick-up truck             | Other motor vehicle |

|                         |                        |           |                  |     |       |                     |                              |                        |
|-------------------------|------------------------|-----------|------------------|-----|-------|---------------------|------------------------------|------------------------|
|                         |                        |           |                  |     | North | Turning left        | Automobile,<br>station wagon | Other motor<br>vehicle |
| 2017-Jun-01, Thu, 17:20 | Clear                  | Angle     | P.D. only        | Dry | East  | Turning left        | Automobile,<br>station wagon | Other motor<br>vehicle |
|                         |                        |           |                  |     | South | Going ahead         | Automobile,<br>station wagon | Other motor<br>vehicle |
| 2017-Jun-09, Fri, 09:25 | Clear                  | SMV other | P.D. only        | Dry | South | Going ahead         | Automobile,<br>station wagon | Skidding/sliding       |
| 2018-Dec-02, Sun, 22:30 | Fog, mist, smoke, dust | Rear end  | Non-fatal injury | Dry | East  | Going ahead         | Automobile,<br>station wagon | Other motor<br>vehicle |
|                         |                        |           |                  |     | East  | Slowing or stopping | Automobile,<br>station wagon | Other motor<br>vehicle |
| 2018-Dec-21, Fri, 19:00 | Fog, mist, smoke, dust | SMV other | P.D. only        | Ice | South | Going ahead         | Automobile,<br>station wagon | Skidding/sliding       |

**Location:** BOUNDARY RD @ NINTH LINE 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 |
|-------------------------|-------------|------------------|----------------|----------------|----------|---------------------|------------------------------|------------------------|---------|
| 2017-Sep-06, Wed, 15:07 | Clear       | Turning movement | P.D. only      | Dry            | North    | Turning left        | Automobile,<br>station wagon | Other motor<br>vehicle |         |
|                         |             |                  |                |                | South    | Slowing or stopping | Automobile,<br>station wagon | Other motor<br>vehicle |         |
| 2017-Feb-13, Mon, 15:44 | Snow        | Turning movement | P.D. only      | Loose snow     | North    | Turning left        | Automobile,<br>station wagon | Other motor<br>vehicle |         |
|                         |             |                  |                |                | North    | Going ahead         | Automobile,<br>station wagon | Other motor<br>vehicle |         |

# APPENDIX E

## NCR Survey Data



# Rural East

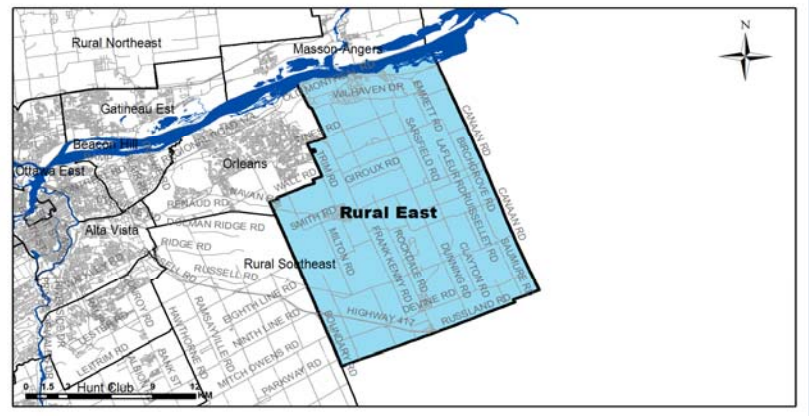
## Demographic Characteristics

|                     |        |                         |       |
|---------------------|--------|-------------------------|-------|
| Population          | 11,420 | Actively Travelled      | 9,090 |
| Employed Population | 5,480  | Number of Vehicles      | 9,320 |
| Households          | 4,090  | Area (km <sup>2</sup> ) | 287.5 |

| Occupation Status (age 5+) | Male         | Female       | Total         |
|----------------------------|--------------|--------------|---------------|
| Full Time Employed         | 2,850        | 2,180        | 5,040         |
| Part Time Employed         | 90           | 360          | 450           |
| Student                    | 1,280        | 1,320        | 2,600         |
| Retiree                    | 1,010        | 1,020        | 2,030         |
| Unemployed                 | 130          | 100          | 240           |
| Homemaker                  | 0            | 400          | 400           |
| Other                      | 50           | 90           | 150           |
| <b>Total:</b>              | <b>5,410</b> | <b>5,480</b> | <b>10,900</b> |

| Traveller Characteristics | Male   | Female | Total  |
|---------------------------|--------|--------|--------|
| Transit Pass Holders      | 500    | 490    | 990    |
| Licensed Drivers          | 4,450  | 4,410  | 8,850  |
| Telecommuters             | 0      | 80     | 80     |
| Trips made by residents   | 13,710 | 14,700 | 28,410 |

| Selected Indicators                       |      |
|---|------|
| Daily Trips per Person (age 5+)           | 2.61 |
| Vehicles per Person                       | 0.82 |
| Number of Persons per Household           | 2.79 |
| Daily Trips per Household                 | 6.95 |
| Vehicles per Household                    | 2.28 |
| Workers per Household                     | 1.34 |
| Population Density (Pop/km <sup>2</sup> ) | 40   |

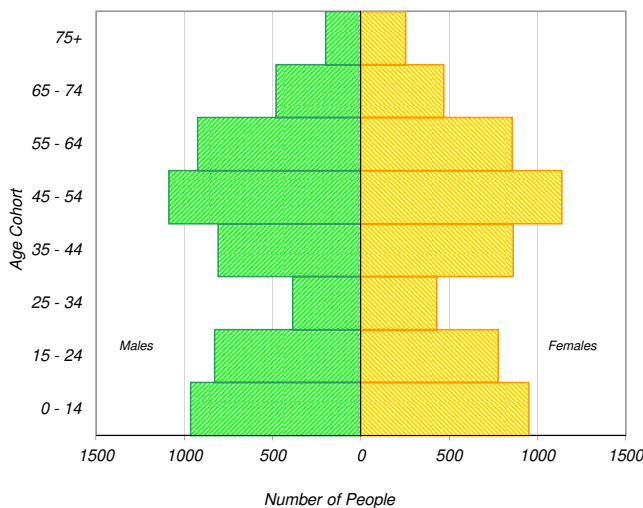


| Household Size |              |             |
|----------------|--------------|-------------|
| 1 person       | 580          | 14%         |
| 2 persons      | 1,280        | 31%         |
| 3 persons      | 780          | 19%         |
| 4 persons      | 990          | 24%         |
| 5+ persons     | 460          | 11%         |
| <b>Total:</b>  | <b>4,090</b> | <b>100%</b> |

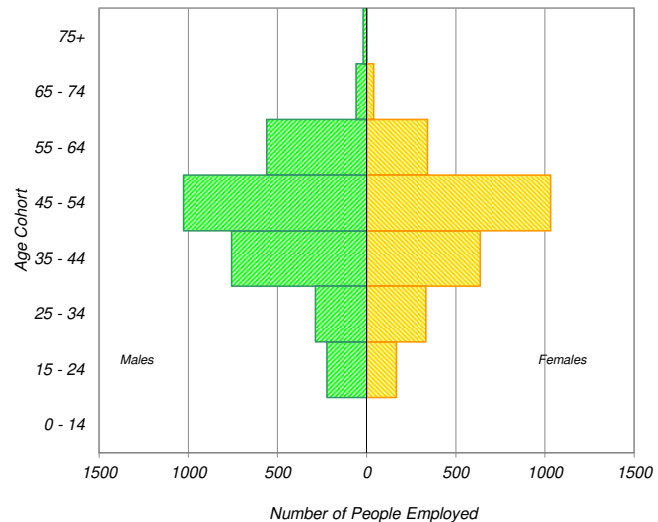
| Households by Vehicle Availability |              |             |
|------------------------------------|--------------|-------------|
| 0 vehicles                         | 60           | 1%          |
| 1 vehicle                          | 810          | 20%         |
| 2 vehicles                         | 1,820        | 44%         |
| 3 vehicles                         | 910          | 22%         |
| 4+ vehicles                        | 490          | 12%         |
| <b>Total:</b>                      | <b>4,090</b> | <b>100%</b> |

| Households by Dwelling Type |              |             |
|-----------------------------|--------------|-------------|
| Single-detached             | 3,270        | 80%         |
| Semi-detached               | 270          | 7%          |
| Townhouse                   | 220          | 5%          |
| Apartment/Condo             | 330          | 8%          |
| <b>Total:</b>               | <b>4,090</b> | <b>100%</b> |

Population



Employed Population

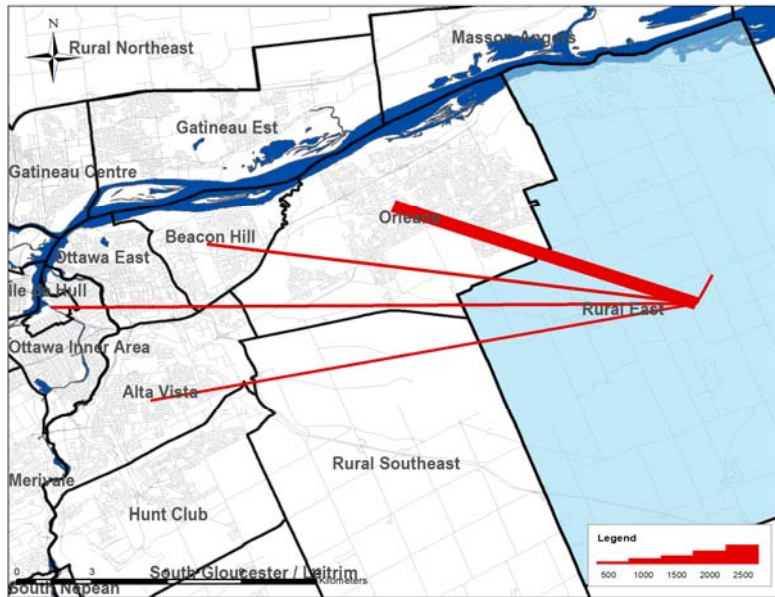


\* In 2005 data was only collected for household members aged 11+ therefore these results cannot be compared to the 2011 data.

## Travel Patterns

### Top Five Destinations of Trips from Rural East

#### AM Peak Period



### Summary of Trips to and from Rural East

#### AM Peak Period (6:30 - 8:59)

| Districts                  | Destinations of Trips From |             | Origins of Trips To |             |
|----------------------------|----------------------------|-------------|---------------------|-------------|
|                            | District                   | % Total     | District            | % Total     |
| Ottawa Centre              | 450                        | 8%          | 0                   | 0%          |
| Ottawa Inner Area          | 250                        | 5%          | 70                  | 3%          |
| Ottawa East                | 160                        | 3%          | 70                  | 3%          |
| Beacon Hill                | 350                        | 7%          | 60                  | 2%          |
| Alta Vista                 | 430                        | 8%          | 110                 | 4%          |
| Hunt Club                  | 140                        | 3%          | 50                  | 2%          |
| Merivale                   | 340                        | 6%          | 10                  | 0%          |
| Ottawa West                | 60                         | 1%          | 40                  | 2%          |
| Bayshore / Cedarview       | 50                         | 1%          | 20                  | 1%          |
| Orléans                    | 1,970                      | 37%         | 1,000               | 38%         |
| Rural East                 | 820                        | 15%         | 820                 | 31%         |
| Rural Southeast            | 30                         | 1%          | 170                 | 6%          |
| South Gloucester / Leitrim | 10                         | 0%          | 0                   | 0%          |
| South Nepean               | 60                         | 1%          | 20                  | 1%          |
| Rural Southwest            | 20                         | 0%          | 0                   | 0%          |
| Kanata / Stittsville       | 30                         | 1%          | 100                 | 4%          |
| Rural West                 | 0                          | 0%          | 0                   | 0%          |
| Île de Hull                | 70                         | 1%          | 10                  | 0%          |
| Hull Périphérie            | 30                         | 1%          | 10                  | 0%          |
| Plateau                    | 0                          | 0%          | 0                   | 0%          |
| Aylmer                     | 0                          | 0%          | 30                  | 1%          |
| Rural Northwest            | 0                          | 0%          | 0                   | 0%          |
| Pointe Gatineau            | 0                          | 0%          | 30                  | 1%          |
| Gatineau Est               | 0                          | 0%          | 20                  | 1%          |
| Rural Northeast            | 40                         | 1%          | 0                   | 0%          |
| Buckingham / Masson-Angers | 0                          | 0%          | 0                   | 0%          |
| <b>Ontario Sub-Total:</b>  | <b>5,170</b>               | <b>97%</b>  | <b>2,540</b>        | <b>96%</b>  |
| <b>Québec Sub-Total:</b>   | <b>140</b>                 | <b>3%</b>   | <b>100</b>          | <b>4%</b>   |
| <b>Total:</b>              | <b>5,310</b>               | <b>100%</b> | <b>2,640</b>        | <b>100%</b> |

### Trips by Trip Purpose

| 24 Hours                  | From District |             | To District   |             | Within District |             |
|---------------------------|---------------|-------------|---------------|-------------|-----------------|-------------|
| Work or related           | 3,600         | 27%         | 1,100         | 8%          | 710             | 19%         |
| School                    | 1,590         | 12%         | 790           | 6%          | 320             | 9%          |
| Shopping                  | 1,460         | 11%         | 300           | 2%          | 90              | 2%          |
| Leisure                   | 1,290         | 10%         | 1,160         | 9%          | 410             | 11%         |
| Medical                   | 480           | 4%          | 90            | 1%          | 0               | 0%          |
| Pick-up / drive passenger | 1,150         | 9%          | 580           | 4%          | 350             | 9%          |
| Return Home               | 3,120         | 23%         | 8,900         | 67%         | 1,620           | 43%         |
| Other                     | 670           | 5%          | 460           | 3%          | 250             | 7%          |
| <b>Total:</b>             | <b>13,360</b> | <b>100%</b> | <b>13,380</b> | <b>100%</b> | <b>3,750</b>    | <b>100%</b> |

| AM Peak (06:30 - 08:59)   | From District |             | To District  |             | Within District |             |
|---------------------------|---------------|-------------|--------------|-------------|-----------------|-------------|
| Work or related           | 2,280         | 51%         | 660          | 36%         | 270             | 33%         |
| School                    | 1,370         | 30%         | 740          | 41%         | 310             | 38%         |
| Shopping                  | 70            | 2%          | 0            | 0%          | 0               | 0%          |
| Leisure                   | 70            | 2%          | 100          | 5%          | 10              | 1%          |
| Medical                   | 120           | 3%          | 40           | 2%          | 0               | 0%          |
| Pick-up / drive passenger | 380           | 8%          | 50           | 3%          | 120             | 15%         |
| Return Home               | 30            | 1%          | 130          | 7%          | 70              | 9%          |
| Other                     | 180           | 4%          | 100          | 5%          | 40              | 5%          |
| <b>Total:</b>             | <b>4,500</b>  | <b>100%</b> | <b>1,820</b> | <b>100%</b> | <b>820</b>      | <b>100%</b> |

| PM Peak (15:30 - 17:59)   | From District |             | To District  |             | Within District |             |
|---------------------------|---------------|-------------|--------------|-------------|-----------------|-------------|
| Work or related           | 60            | 3%          | 90           | 2%          | 60              | 9%          |
| School                    | 10            | 0%          | 0            | 0%          | 0               | 0%          |
| Shopping                  | 180           | 8%          | 20           | 0%          | 30              | 5%          |
| Leisure                   | 250           | 11%         | 340          | 8%          | 110             | 17%         |
| Medical                   | 120           | 5%          | 30           | 1%          | 0               | 0%          |
| Pick-up / drive passenger | 250           | 11%         | 150          | 4%          | 40              | 6%          |
| Return Home               | 1,290         | 58%         | 3,510        | 85%         | 400             | 61%         |
| Other                     | 60            | 3%          | 10           | 0%          | 20              | 3%          |
| <b>Total:</b>             | <b>2,220</b>  | <b>100%</b> | <b>4,150</b> | <b>100%</b> | <b>660</b>      | <b>100%</b> |

| Peak Period (%) | Total: | % of 24 Hours | Within District (%) |
|-----------------|--------|---------------|---------------------|
| 24 Hours        | 30,490 |               | 12%                 |
| AM Peak Period  | 7,140  | 23%           | 11%                 |
| PM Peak Period  | 7,030  | 23%           | 9%                  |

### Trips by Primary Travel Mode

| 24 Hours       | From District |             | To District   |             | Within District |             |
|----------------|---------------|-------------|---------------|-------------|-----------------|-------------|
| Auto Driver    | 8,560         | 64%         | 8,540         | 64%         | 2,210           | 59%         |
| Auto Passenger | 2,530         | 19%         | 2,660         | 20%         | 650             | 17%         |
| Transit        | 1,210         | 9%          | 1,220         | 9%          | 20              | 1%          |
| Bicycle        | 30            | 0%          | 30            | 0%          | 100             | 3%          |
| Walk           | 20            | 0%          | 20            | 0%          | 440             | 12%         |
| Other          | 1,000         | 7%          | 920           | 7%          | 330             | 9%          |
| <b>Total:</b>  | <b>13,350</b> | <b>100%</b> | <b>13,390</b> | <b>100%</b> | <b>3,750</b>    | <b>100%</b> |

| AM Peak (06:30 - 08:59) | From District |             | To District  |             | Within District |             |
|-------------------------|---------------|-------------|--------------|-------------|-----------------|-------------|
| Auto Driver             | 2,510         | 56%         | 830          | 46%         | 400             | 49%         |
| Auto Passenger          | 750           | 17%         | 240          | 13%         | 170             | 21%         |
| Transit                 | 420           | 9%          | 550          | 30%         | 10              | 1%          |
| Bicycle                 | 0             | 0%          | 20           | 1%          | 10              | 1%          |
| Walk                    | 0             | 0%          | 20           | 1%          | 70              | 9%          |
| Other                   | 810           | 18%         | 150          | 8%          | 160             | 20%         |
| <b>Total:</b>           | <b>4,490</b>  | <b>100%</b> | <b>1,810</b> | <b>100%</b> | <b>820</b>      | <b>100%</b> |

| PM Peak (15:30 - 17:59) | From District |             | To District  |             | Within District |             |
|-------------------------|---------------|-------------|--------------|-------------|-----------------|-------------|
| Auto Driver             | 1,280         | 58%         | 2,770        | 67%         | 360             | 55%         |
| Auto Passenger          | 390           | 18%         | 730          | 18%         | 150             | 23%         |
| Transit                 | 420           | 19%         | 440          | 11%         | 10              | 2%          |
| Bicycle                 | 10            | 0%          | 10           | 0%          | 10              | 2%          |
| Walk                    | 20            | 1%          | 0            | 0%          | 60              | 9%          |
| Other                   | 100           | 5%          | 210          | 5%          | 70              | 11%         |
| <b>Total:</b>           | <b>2,220</b>  | <b>100%</b> | <b>4,160</b> | <b>100%</b> | <b>660</b>      | <b>100%</b> |

| Avg Vehicle Occupancy | From District |  | To District |  | Within District |  |
|-----------------------|---------------|--|-------------|--|-----------------|--|
| 24 Hours              | 1.30          |  | 1.31        |  | 1.29            |  |
| AM Peak Period        | 1.30          |  | 1.29        |  | 1.43            |  |
| PM Peak Period        | 1.30          |  | 1.26        |  | 1.42            |  |

| Transit Modal Split | From District |  | To District |  | Within District |  |
|---------------------|---------------|--|-------------|--|-----------------|--|
| 24 Hours            | 10%           |  | 10%         |  | 1%              |  |
| AM Peak Period      | 11%           |  | 34%         |  | 2%              |  |
| PM Peak Period      | 20%           |  | 11%         |  | 2%              |  |

# Rural Southeast

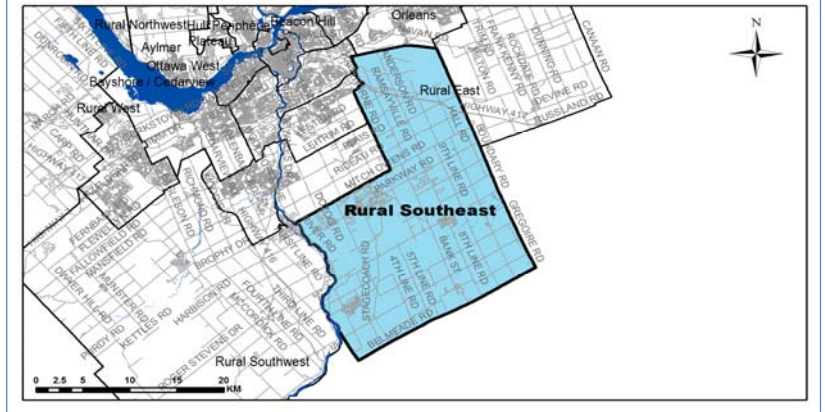
## Demographic Characteristics

|                     |        |                         |        |
|---------------------|--------|-------------------------|--------|
| Population          | 26,840 | Actively Travelled      | 21,350 |
| Employed Population | 13,620 | Number of Vehicles      | 19,650 |
| Households          | 9,320  | Area (km <sup>2</sup> ) | 508.6  |

| Occupation Status (age 5+) | Male          | Female        | Total         |
|----------------------------|---------------|---------------|---------------|
| Full Time Employed         | 6,760         | 5,460         | 12,230        |
| Part Time Employed         | 310           | 1,080         | 1,390         |
| Student                    | 3,300         | 2,860         | 6,160         |
| Retiree                    | 2,000         | 2,150         | 4,150         |
| Unemployed                 | 230           | 190           | 420           |
| Homemaker                  | 10            | 610           | 630           |
| Other                      | 200           | 290           | 490           |
| <b>Total:</b>              | <b>12,820</b> | <b>12,640</b> | <b>25,460</b> |

| Traveller Characteristics | Male   | Female | Total  |
|---------------------------|--------|--------|--------|
| Transit Pass Holders      | 590    | 700    | 1,290  |
| Licensed Drivers          | 10,120 | 10,110 | 20,230 |
| Telecommuters             | 10     | 80     | 100    |
| Trips made by residents   | 32,130 | 35,050 | 67,170 |

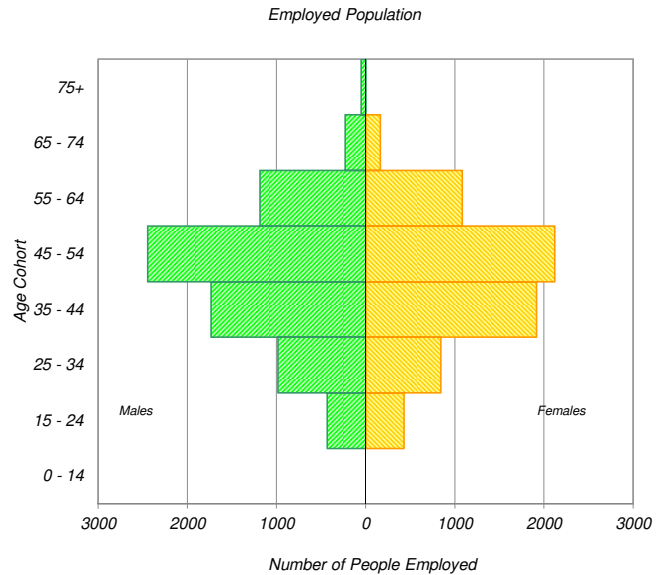
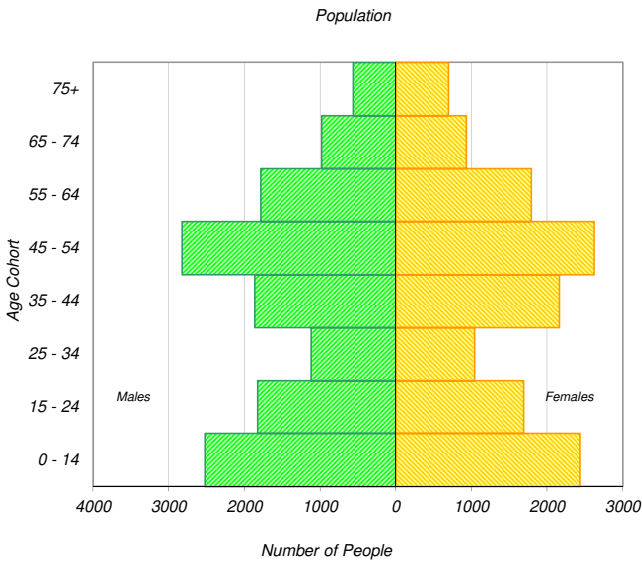
| Selected Indicators                       |      |
|---|------|
| Daily Trips per Person (age 5+)           | 2.64 |
| Vehicles per Person                       | 0.73 |
| Number of Persons per Household           | 2.88 |
| Daily Trips per Household                 | 7.21 |
| Vehicles per Household                    | 2.11 |
| Workers per Household                     | 1.46 |
| Population Density (Pop/km <sup>2</sup> ) | 50   |



| Household Size |              |             |
|----------------|--------------|-------------|
| 1 person       | 1,210        | 13%         |
| 2 persons      | 3,390        | 36%         |
| 3 persons      | 1,730        | 19%         |
| 4 persons      | 2,120        | 23%         |
| 5+ persons     | 880          | 9%          |
| <b>Total:</b>  | <b>9,320</b> | <b>100%</b> |

| Households by Vehicle Availability |              |             |
|------------------------------------|--------------|-------------|
| 0 vehicles                         | 200          | 2%          |
| 1 vehicle                          | 1,760        | 19%         |
| 2 vehicles                         | 5,180        | 56%         |
| 3 vehicles                         | 1,470        | 16%         |
| 4+ vehicles                        | 710          | 8%          |
| <b>Total:</b>                      | <b>9,320</b> | <b>100%</b> |

| Households by Dwelling Type |              |             |
|-----------------------------|--------------|-------------|
| Single-detached             | 9,020        | 97%         |
| Semi-detached               | 70           | 1%          |
| Townhouse                   | 140          | 2%          |
| Apartment/Condo             | 90           | 1%          |
| <b>Total:</b>               | <b>9,320</b> | <b>100%</b> |

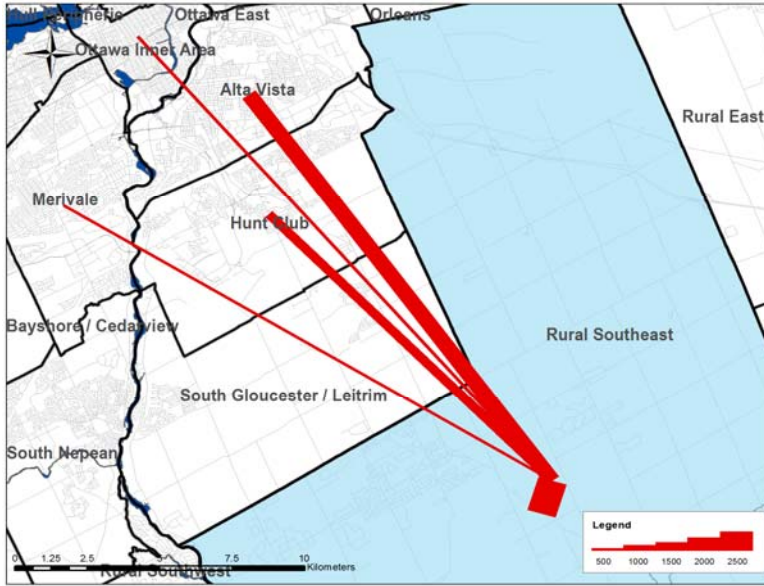


\* In 2005 data was only collected for household members aged 11+ therefore these results cannot be compared to the 2011 data.

## Travel Patterns

### Top Five Destinations of Trips from Rural Southeast

#### AM Peak Period



### Summary of Trips to and from Rural Southeast

| Districts                   | Destinations of Trips From |         | Origins of Trips To |         |
|-----------------------------|----------------------------|---------|---------------------|---------|
|                             | District                   | % Total | District            | % Total |
| Ottawa Centre               | 690                        | 5%      | 20                  | 0%      |
| Ottawa Inner Area           | 830                        | 6%      | 6                   | 1%      |
| Ottawa East                 | 260                        | 2%      | 40                  | 1%      |
| Beacon Hill                 | 480                        | 4%      | 10                  | 0%      |
| Alta Vista                  | 1,550                      | 12%     | 140                 | 2%      |
| Hunt Club                   | 1,210                      | 9%      | 190                 | 3%      |
| Merivale                    | 960                        | 7%      | 10                  | 0%      |
| Ottawa West                 | 190                        | 1%      | 50                  | 1%      |
| Bayshore / Cedarview        | 180                        | 1%      | 40                  | 1%      |
| Orléans                     | 290                        | 2%      | 70                  | 1%      |
| Rural East                  | 170                        | 1%      | 30                  | 0%      |
| Rural Southeast             | 4,440                      | 33%     | 4,440               | 73%     |
| South Gloucester / Leirtrim | 570                        | 4%      | 210                 | 3%      |
| South Nepean                | 580                        | 4%      | 250                 | 4%      |
| Rural Southwest             | 520                        | 4%      | 390                 | 6%      |
| Kanata / Stittsville        | 260                        | 2%      | 50                  | 1%      |
| Rural West                  | 0                          | 0%      | 20                  | 0%      |
| Île de Hull                 | 110                        | 1%      | 0                   | 0%      |
| Hull Périphérie             | 0                          | 0%      | 30                  | 0%      |
| Plateau                     | 0                          | 0%      | 0                   | 0%      |
| Aylmer                      | 0                          | 0%      | 0                   | 0%      |
| Rural Northwest             | 0                          | 0%      | 0                   | 0%      |
| Pointe Gatineau             | 0                          | 0%      | 0                   | 0%      |
| Gatineau Est                | 0                          | 0%      | 0                   | 0%      |
| Rural Northeast             | 0                          | 0%      | 70                  | 1%      |
| Buckingham / Masson-Angers  | 0                          | 0%      | 0                   | 0%      |
| Ontario Sub-Total:          | 13,180                     | 99%     | 6,020               | 98%     |
| Québec Sub-Total:           | 110                        | 1%      | 100                 | 2%      |
| Total:                      | 13,290                     | 100%    | 6,120               | 100%    |

### Trips by Trip Purpose

| 24 Hours                  | From District |      | To District |      | Within District |      |
|---------------------------|---------------|------|-------------|------|-----------------|------|
| Work or related           | 7,950         | 34%  | 1,470       | 6%   | 2,180           | 13%  |
| School                    | 2,360         | 10%  | 440         | 2%   | 2,570           | 16%  |
| Shopping                  | 2,600         | 11%  | 490         | 2%   | 620             | 4%   |
| Leisure                   | 2,230         | 9%   | 1,950       | 8%   | 1,270           | 8%   |
| Medical                   | 850           | 4%   | 300         | 1%   | 130             | 1%   |
| Pick-up / drive passenger | 2,180         | 9%   | 810         | 3%   | 1,170           | 7%   |
| Return Home               | 3,780         | 16%  | 17,300      | 74%  | 7,300           | 45%  |
| Other                     | 1,580         | 7%   | 670         | 3%   | 1,110           | 7%   |
| Total:                    | 23,530        | 100% | 23,430      | 100% | 16,350          | 100% |

| AM Peak (06:30 - 08:59)   | From District |      | To District |      | Within District |      |
|---------------------------|---------------|------|-------------|------|-----------------|------|
| Work or related           | 4,930         | 56%  | 710         | 42%  | 1,000           | 23%  |
| School                    | 1,870         | 21%  | 380         | 22%  | 2,280           | 51%  |
| Shopping                  | 270           | 3%   | 30          | 2%   | 30              | 1%   |
| Leisure                   | 140           | 2%   | 130         | 8%   | 130             | 3%   |
| Medical                   | 260           | 3%   | 20          | 1%   | 10              | 0%   |
| Pick-up / drive passenger | 800           | 9%   | 140         | 8%   | 380             | 9%   |
| Return Home               | 160           | 2%   | 170         | 10%  | 230             | 5%   |
| Other                     | 440           | 5%   | 120         | 7%   | 370             | 8%   |
| Total:                    | 8,870         | 100% | 1,700       | 100% | 4,430           | 100% |

| PM Peak (15:30 - 17:59)   | From District |      | To District |      | Within District |      |
|---------------------------|---------------|------|-------------|------|-----------------|------|
| Work or related           | 220           | 8%   | 60          | 1%   | 170             | 5%   |
| School                    | 50            | 2%   | 20          | 0%   | 0               | 0%   |
| Shopping                  | 450           | 16%  | 160         | 2%   | 110             | 3%   |
| Leisure                   | 530           | 19%  | 590         | 7%   | 240             | 7%   |
| Medical                   | 70            | 2%   | 70          | 1%   | 0               | 0%   |
| Pick-up / drive passenger | 390           | 14%  | 350         | 4%   | 210             | 6%   |
| Return Home               | 830           | 29%  | 6,970       | 84%  | 2,670           | 75%  |
| Other                     | 320           | 11%  | 120         | 1%   | 150             | 4%   |
| Total:                    | 2,860         | 100% | 8,340       | 100% | 3,550           | 100% |

| Peak Period (%) | Total: | % of 24 Hours | Within District (%) |
|-----------------|--------|---------------|---------------------|
| 24 Hours        | 63,310 |               | 26%                 |
| AM Peak Period  | 15,000 | 24%           | 30%                 |
| PM Peak Period  | 14,750 | 23%           | 24%                 |

### Trips by Primary Travel Mode

| 24 Hours       | From District |      | To District |      | Within District |      |
|----------------|---------------|------|-------------|------|-----------------|------|
| Auto Driver    | 16,890        | 72%  | 16,830      | 72%  | 7,750           | 47%  |
| Auto Passenger | 4,160         | 18%  | 4,250       | 18%  | 2,670           | 16%  |
| Transit        | 970           | 4%   | 960         | 4%   | 40              | 0%   |
| Bicycle        | 50            | 0%   | 20          | 0%   | 0               | 0%   |
| Walk           | 30            | 0%   | 40          | 0%   | 1,630           | 10%  |
| Other          | 1,460         | 6%   | 1,320       | 6%   | 4,260           | 26%  |
| Total:         | 23,560        | 100% | 23,420      | 100% | 16,350          | 100% |

| AM Peak (06:30 - 08:59) | From District |      | To District |      | Within District |      |
|-------------------------|---------------|------|-------------|------|-----------------|------|
| Auto Driver             | 5,960         | 67%  | 1,170       | 69%  | 1,550           | 35%  |
| Auto Passenger          | 1,270         | 14%  | 150         | 9%   | 530             | 12%  |
| Transit                 | 530           | 6%   | 0           | 0%   | 20              | 0%   |
| Bicycle                 | 20            | 0%   | 0           | 0%   | 0               | 0%   |
| Walk                    | 0             | 0%   | 30          | 2%   | 400             | 9%   |
| Other                   | 1,070         | 12%  | 350         | 21%  | 1,940           | 44%  |
| Total:                  | 8,850         | 100% | 1,700       | 100% | 4,440           | 100% |

| PM Peak (15:30 - 17:59) | From District |      | To District |      | Within District |      |
|-------------------------|---------------|------|-------------|------|-----------------|------|
| Auto Driver             | 1,830         | 64%  | 6,110       | 73%  | 1,530           | 43%  |
| Auto Passenger          | 860           | 30%  | 1,450       | 17%  | 640             | 18%  |
| Transit                 | 90            | 3%   | 430         | 5%   | 20              | 1%   |
| Bicycle                 | 0             | 0%   | 0           | 0%   | 0               | 0%   |
| Walk                    | 0             | 0%   | 0           | 0%   | 310             | 9%   |
| Other                   | 100           | 3%   | 340         | 4%   | 1,040           | 29%  |
| Total:                  | 2,880         | 100% | 8,330       | 100% | 3,540           | 100% |

| Avg Vehicle Occupancy | From District |  | To District |  | Within District |  |
|-----------------------|---------------|--|-------------|--|-----------------|--|
| 24 Hours              | 1.25          |  | 1.25        |  | 1.34            |  |
| AM Peak Period        | 1.21          |  | 1.13        |  | 1.34            |  |
| PM Peak Period        | 1.47          |  | 1.24        |  | 1.42            |  |

| Transit Modal Split | From District |  | To District |  | Within District |  |
|---------------------|---------------|--|-------------|--|-----------------|--|
| 24 Hours            | 4%            |  | 4%          |  | 0%              |  |
| AM Peak Period      | 7%            |  | 0%          |  | 1%              |  |
| PM Peak Period      | 3%            |  | 5%          |  | 1%              |  |

# APPENDIX F

## Trip Distribution Analysis

**EMPLOYEE TRIP DISTRIBUTION ANALYSIS**

| <b>District</b>            | <b>Trips entering district (am)</b> | <b>% Total</b> | <b>Arriving From:</b>   | <b>Route</b>            | <b>Total %</b> | <b>Rounded %</b> |
|----------------------------|-------------------------------------|----------------|---|-------------------------|----------------|------------------|
| Ottawa Inner Area          | 130                                 | 1%             | Highway 417 (West)  |                         |                |                  |
| Ottawa East                | 110                                 | 1%             | Highway 417 (West)  | Highway 417 (West)      | 24%            | 25%              |
| Beacon Hill                | 60                                  | 1%             | Highway 417 (West)  | Highway 417 (East)      | 17%            | 15%              |
| Alta Vista                 | 250                                 | 3%             | Highway 417 (West)  | Boundary Road (North)   | 18%            | 20%              |
| Hunt Club                  | 240                                 | 3%             | Highway 417 (West)  | Mitch Owens Road (West) | 5%             | 5%               |
| Ottawa West                | 90                                  | 1%             | Highway 417 (West)  | Boundary Road (South)   | 36%            | 35%              |
| Bayshore / Cedarview       | 60                                  | 1%             | Highway 417 (West)  |                         |                |                  |
| Orleans                    | 1070                                | 12%            | Boundary Road (North)   |                         |                |                  |
| Rural East                 | 820                                 | 9%             | Highway 417 (East)  |                         |                |                  |
| Rural Southeast            | 4570                                | 52%            | <i>10% Highway 417 (West), 5% Highway 417 (East), 5% Boundary Road (North), 32% Boundary Road (South)</i> |                         |                |                  |
| South Gloucester / Leitrim | 210                                 | 2%             | Mitch Owens Road (West)   |                         |                |                  |
| South Nepean               | 270                                 | 3%             | Mitch Owens Road (West)   |                         |                |                  |
| Rural Southwest            | 390                                 | 4%             | Boundary Road (South)   |                         |                |                  |
| Kanata / Stittsville       | 150                                 | 2%             | Highway 417 (West)  |                         |                |                  |
| Ile de Hull                | 10                                  | 0%             | Highway 417 (West)  |                         |                |                  |
| Hull Periphère             | 10                                  | 0%             | Highway 417 (West)  |                         |                |                  |
| Alymer                     | 30                                  | 0%             | Highway 417 (West)  |                         |                |                  |
| Pointe Gatineau            | 30                                  | 0%             | Highway 417 (West)  |                         |                |                  |
| Gatineau Est               | 20                                  | 0%             | Highway 417 (West)  |                         |                |                  |
| Rural Northeast            | 70                                  | 1%             | Boundary Road (North)   |                         |                |                  |
| Quebec                     | 200                                 | 2%             | Highway 417 (East)  |                         |                |                  |
|                            | 8790                                | 100%           |   |                         |                |                  |

# APPENDIX G

## Growth Rate Analysis

**Highway 417 and Boundary Road Interchange***MTO Data*

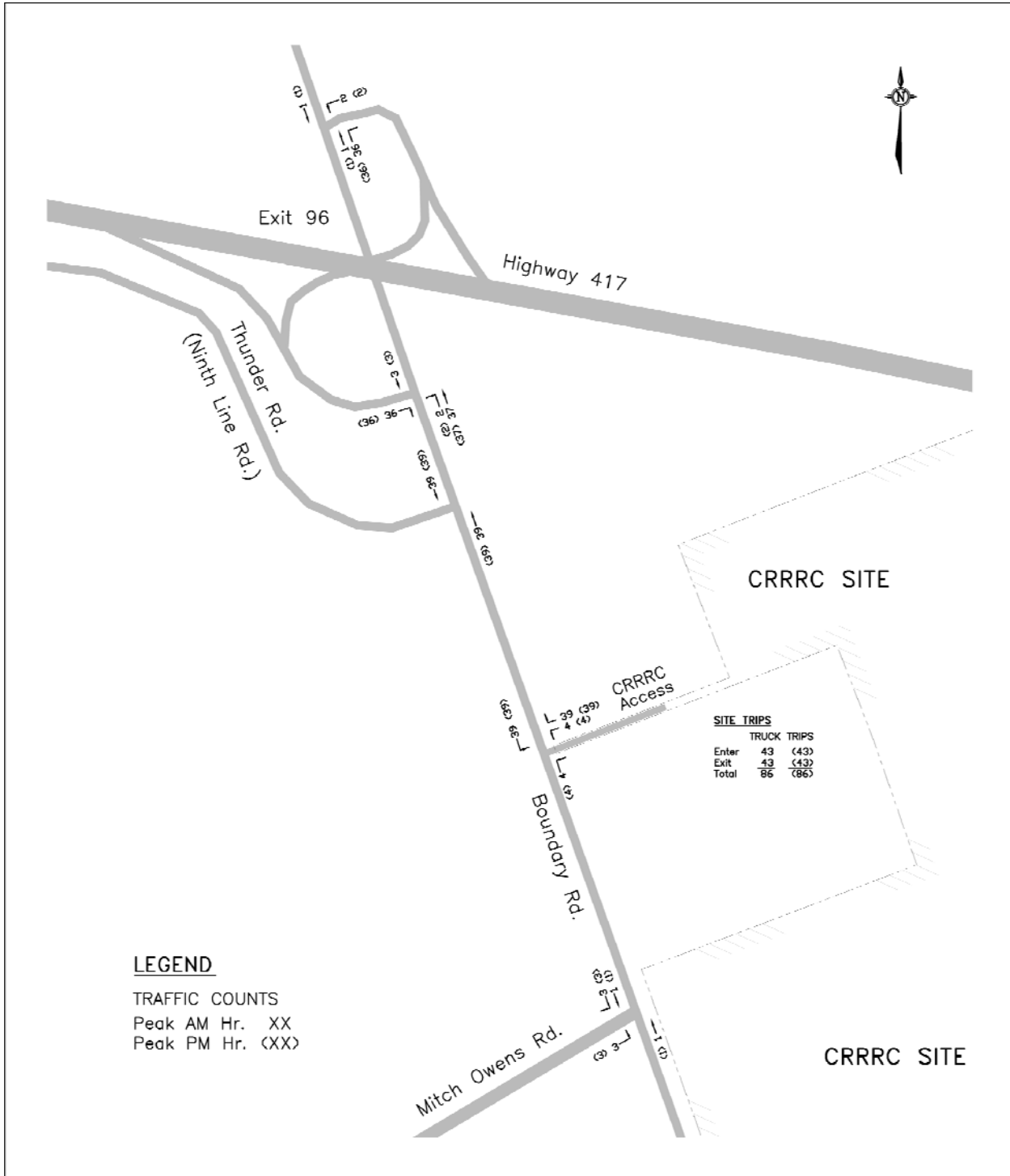
| <b>Year</b> | <b>AADT</b> | <b>Year-to-Year Increase</b> | <b>Average Increase</b> |
|-------------|-------------|------------------------------|-------------------------|
| 2012        | 44200       | -6.56%                       | 0.19%                   |
| 2013        | 41300       | 2.66%                        |                         |
| 2014        | 42400       | 2.36%                        |                         |
| 2015        | 43400       | 2.30%                        |                         |
| 2016        | 44400       |                              |                         |

| <b>Year</b> | <b>SADT</b> | <b>Year-to-Year Increase</b> | <b>Average Increase</b> |
|-------------|-------------|------------------------------|-------------------------|
| 2012        | 65,000      | -4.62%                       | 0.66%                   |
| 2013        | 62,000      | 2.42%                        |                         |
| 2014        | 63,500      | 2.52%                        |                         |
| 2015        | 65,100      | 2.30%                        |                         |
| 2016        | 66,600      |                              |                         |



# APPENDIX H.1

## CRRRC TIS Excerpts



NOT TO SCALE

Figure 3.1: Weekday Peak AM and PM Hour Site Generated Trips

## 4.0 FUTURE TRAFFIC VOLUMES

This Addendum has assumed an annual compounded growth rate of 2 percent as discussed in the TIS. The growth rate was applied to all lane movements shown in the traffic counts presented in Figure 2.1 for the weekday peak AM and PM hour. Figure 4.1 shows the expected 2022 background traffic, which would represent traffic five years beyond build out from growth outside the immediate area.

The East Gateway Properties truck transfer terminal is proposed to be located on the east side of Boundary Road north of the CRRRC Site. The truck transfer terminal will have an access that will form the east access to the intersection of Boundary Road and Thunder Road. It is understood that the terminal facility expects build out by the year 2026. For the expected background traffic at the year 2027, which represents ten years beyond opening of the CRRRC Site, this Addendum has increased the existing traffic (Figure 2.1) at a 2 percent compounded rate to the year 2027, and added the expected traffic from the truck transfer terminal. The volume and distribution of trips from the proposed terminal were determined from the Transportation Impact Study report dated October 2014 for 5341 Boundary Road Transport prepared by Dillon Consulting Limited (Dillon). The Dillon TIS examined both a “Low Building Coverage” and a “High Building Coverage” scenario. As discussed at the meeting of April 22, 2015, this Addendum has utilized the traffic associated with the average of both scenarios and added the expected terminal trips to the 2027 background traffic, which is shown in Figure 4.2.

The expected total traffic volumes at the year 2022, which are shown in Figure 4.3, were determined by the addition of the expected background traffic of Figure 4.1 and the expected Site generated trips of Figure 3.1. For the expected 2027 total traffic shown in Figure 4.4, the 2027 background traffic (Figure 4.2) was added to the Site generated trips (Figure 3.1).

### 4.1 Traffic Analysis

The following are the results of the intersection analysis at the year 2022 (5 years beyond CRRRC Site opening), and at the year 2027 (10 years beyond opening), including the East Gateway Properties truck transfer terminal trips.

#### Boundary Road and CRRRC Site Access

A left turn lane warrant analysis was conducted at the Site access using the procedure documented in the MTO publication, *Geometric Design Standards for Ontario Highways*. The analysis utilized the expected 2027 traffic and a design speed of 90 km/h. (80 km./h. posted speed) at the access. The warrant analysis, which is presented in the Appendix as Exhibit 5, determined that a southbound left turn lane with 25 m for passenger car storage was required during the both the peak AM and PM hour. Utilizing a passenger car equivalent for heavy vehicles of 2.0 as documented in the MTO publication, the required length of the southbound left turn lane at the CRRRC truck access would therefore be 50 m. The following is the recommended lane configuration:

# APPENDIX H.2

## Novatech TIS Excerpts

April 30, 2021

Ministry of Transportation - Eastern Region  
Corridor Management Planner  
1355 John Counter Blvd.  
Kingston, Ontario K7L 5A3

**Attention: Mr. Stephen Kapusta**

City of Ottawa  
Planning and Growth Management Department  
110 Laurier Ave. W., 4<sup>th</sup> Floor,  
Ottawa, Ontario K1P 1J1

**Attention: Mr. Mike Giampa**

Dear Sirs:

**Reference: 5494, 5500, and 5510 Boundary Road  
Transportation Impact Assessment  
Novatech File No. 118168**

---

We are pleased to submit the following Transportation Impact Assessment for Official Plan Amendment and Zoning By-Law Amendment applications for the development of a freight dock and warehouse facility at 5494, 5500, and 5510 Boundary Road. The structure and format of this report is in accordance with the City of Ottawa Transportation Impact Assessment Guidelines (June 2017) and the MTO General Guidelines for the Preparation of Traffic Impact Studies (September 2014).

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, B.Sc.  
E.I.T. | Transportation/Traffic

## 1.0 SITE LOCATION

This Transportation Impact Assessment (TIA) has been prepared in support of Official Plan Amendment and Zoning By-Law Amendment applications for a freight dock and warehouse facility at 5494, 5500, and 5510 Boundary Road (see **Figure 1**). The site is currently occupied with one single-family dwelling, and the remainder of the site is undeveloped and has been used for stockpiling of fill. There are two existing accesses to the site, one for the single-family dwelling and one at the south limit. The site is surrounded by the following:

- Woodland, commercial development, Thunder Road, and Highway 417 to the north;
- Boundary Road, planned waste management facility, industrial development, and the Amazon Distribution Centre to the east;
- Woodland and Mitch Owens Road to the south; and,
- Agricultural land to the west.

**Figure 1: Site Location and Study Area**



## 2.0 PROPOSED DEVELOPMENT

The subject site is designated as 'Rural Natural Features Area' in Schedule A of the City of Ottawa's Official Plan and zoned RU (Rural Countryside) and RH1[260r] (Rural Heavy Industrial). Exception 260r prohibits all uses, except for a waste processing and transfer facility, and heavy equipment/vehicle sales. A zoning amendment is required for a warehouse and truck facility.

The proposed development (see **Appendix A**) is planned to be completed by 2021, and includes an approximately 5,593 m<sup>2</sup> freight dock and warehouse facility with 96 loading docks, 141 parking spaces, 55 tractor parking spaces, and 134 trailer parking spaces. The facility will have about 120 employees.

The development is planned to include two accesses to Boundary Road.

## 5.0 FORECASTING

### 5.1 Development-Generated Traffic

#### 5.1.1 Trip Generation

The proposed development consists of an approximately 5,593 m<sup>2</sup> freight dock and warehouse. The site will accommodate long combination vehicles and provide surface parking for approximately 141 cars, 55 tractors and 134 trailers. The facility will operate with day, evening, and night shifts and employ approximately 120 employees. Two accesses are proposed along Boundary Road, one opposite the future CRRRC site access and one to the south.

Trips generated by the site were determined using first principles. The owner provided hourly volumes for both employee and truck movements to and from the facility. The facility will operate with three shifts, day (8:00am to 5:00pm), evening (4:00pm to 12:00am), and night (1:00am to 8:00am).

Consistent with the traffic studies for the Amazon Distribution Centre and the truck facility at 9460 Mitch Owens Road, no reduction in vehicle trips have been assumed for pedestrian, cyclist, and transit modes, given the lack of facilities for these modes. Additionally, no ridesharing has been assumed. These assumptions represent the ‘worst case’ scenario, and therefore, the results shown in this TIA are conservative.

The peak hour of site traffic is generally expected to coincide with the weekday PM peak hour of the adjacent road traffic. While the AM peak hour of the adjacent street (6:30am to 7:30am) was found to occur just before the anticipated peak hour site traffic, the site trips have been overlaid onto the peak hour of adjacent street. This assumption is conservative. The following table indicates the number of employee vehicles and delivery trucks accessing the site during each weekday peak hour.

**Table 3: Site Generated Vehicle Trips**

| Trip Type    | AM Peak   |           |            | PM Peak   |           |           |
|--------------|-----------|-----------|------------|-----------|-----------|-----------|
|              | IN        | OUT       | TOTAL      | IN        | OUT       | TOTAL     |
| Employee     | 79        | 18        | 97         | 12        | 79        | 91        |
| Truck        | 2         | 4         | 6          | 6         | 2         | 8         |
| <b>Total</b> | <b>81</b> | <b>22</b> | <b>103</b> | <b>18</b> | <b>81</b> | <b>99</b> |

#### 5.1.2 Trip Distribution

The distribution of employee trips generated by the proposed development is anticipated to be consistent with the observed traffic patterns at the Amazon driveway, as well as the AM inbound/PM outbound trips at the ramp terminals and on Boundary Road (as shown in **Figure 2**). The distribution of truck trips is based on information provided by the owner. Site trips have been assigned to the study area, with distribution for the trips generated by the site described as follows:

##### Employee

- 20% to/from the east via Hwy 417;
- 45% to/from the west via Hwy 417;
- 20% to/from the north via Boundary Road;
- 15% to/from the south via Boundary Road.

### Truck

- 75% to/from the west via Hwy 417;
- 25% to/from the east via Hwy 417.

### **5.1.3 Trip Assignment**

The proposed development includes one full-movement access near the northerly limit of the subject site and one right-out egress approximately 90m south of the full-movement access. All trips to/from Highway 417 and Boundary Road to the north and all trips arriving from the south via Boundary Road have been assigned to the full-movement access, as this is the only access that can accommodate arrivals, as well as departures to the north. Trips departing to the south via Boundary Road have been split among the full-movement access and the right-out access.

Site trips generated by employees and trucks have been assigned to the proposed accesses as follows:

#### Full-Movement Access

- 100% of employees arriving from and destined to the north (Hwy 417 and Boundary Road);
- 100% of employees arriving from the south (Boundary Road);
- 20% of employees destined to the south (Boundary Road);
- 100% of truck traffic arriving from and destined to the north (Highway 417).

#### Right-Out Egress

- 80% of employees destined to the south (Boundary Road).

The site-generated traffic within the study area is shown in **Figure 3**.

## **5.2 Background Traffic**

### **5.2.1 General Background Traffic Growth Rate**

Consistent with the addendum to the Dillon TIS prepared in support of the development at 5371 Boundary Road, an annual 2% background growth rate was applied to the existing traffic volumes.

### **5.2.2 Background Developments**

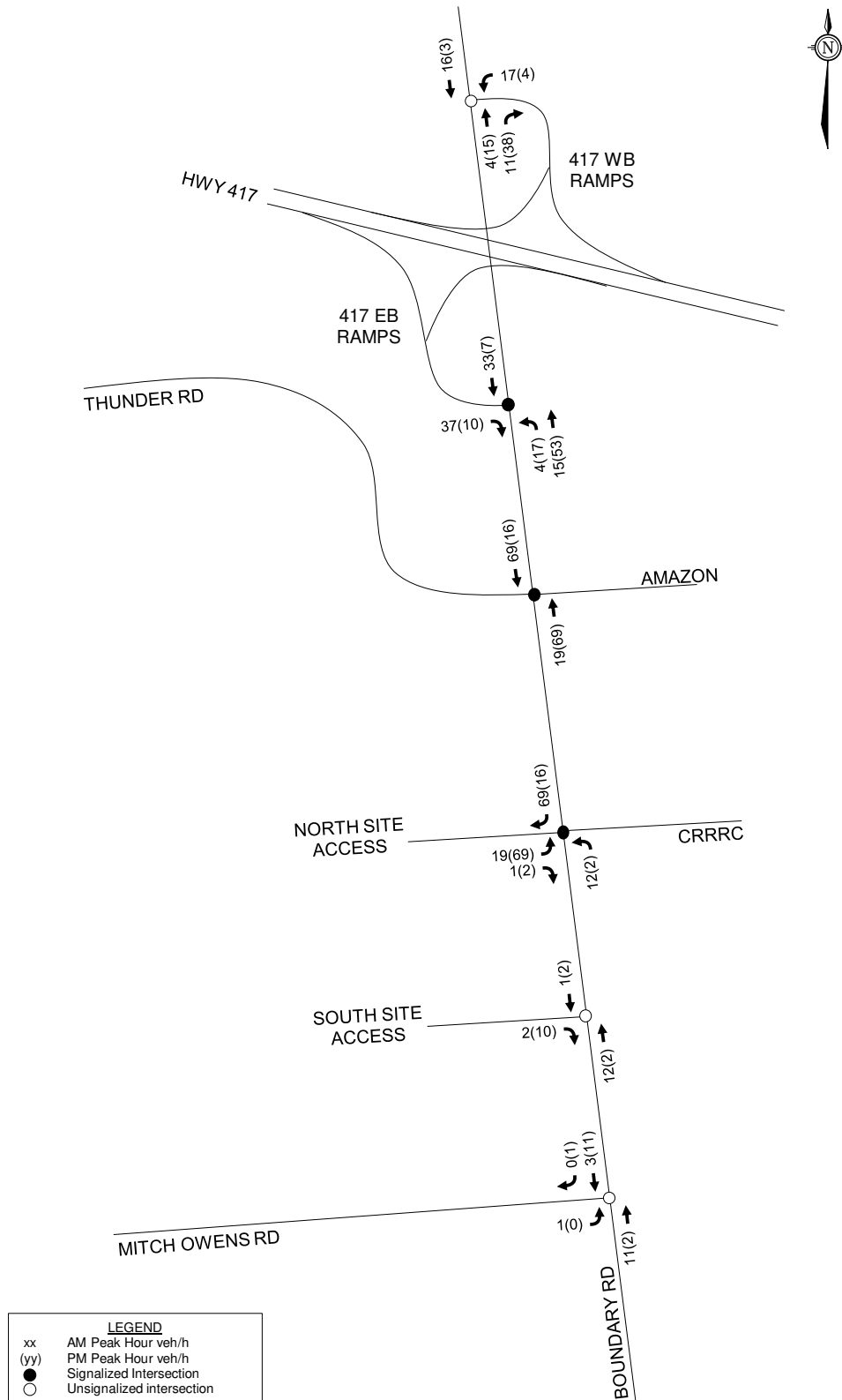
The 5471 Boundary Road development is assumed to be operational by 2021. Trips estimated to be generated by this development have been distributed and assigned to the boundary road network based on the assumptions of that development's traffic study, and the estimated trips have been added to the 2021, 2026, and 2031 background traffic projections. Relevant excerpts from this study are included in **Appendix F**.

### **5.2.3 Future Background and Total Traffic Volume Projections**

Future background traffic volumes have been projected for the 2021, 2026, and 2031 (see **Figures 4, 5, and 6**, respectively) and include the annual background growth and background development trips. Total traffic volumes have been projected for the study area intersections for the weekday AM and PM peak hours in 2021, 2026, and 2031 (**Figures 7, 8, and 9**, respectively), and include future background traffic and site generated trips.



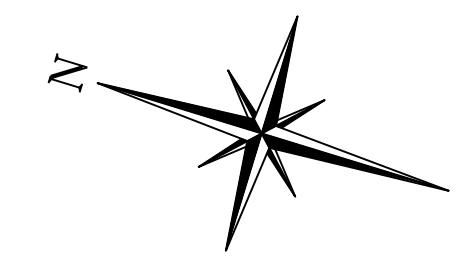
Figure 3: Site Generated Trips



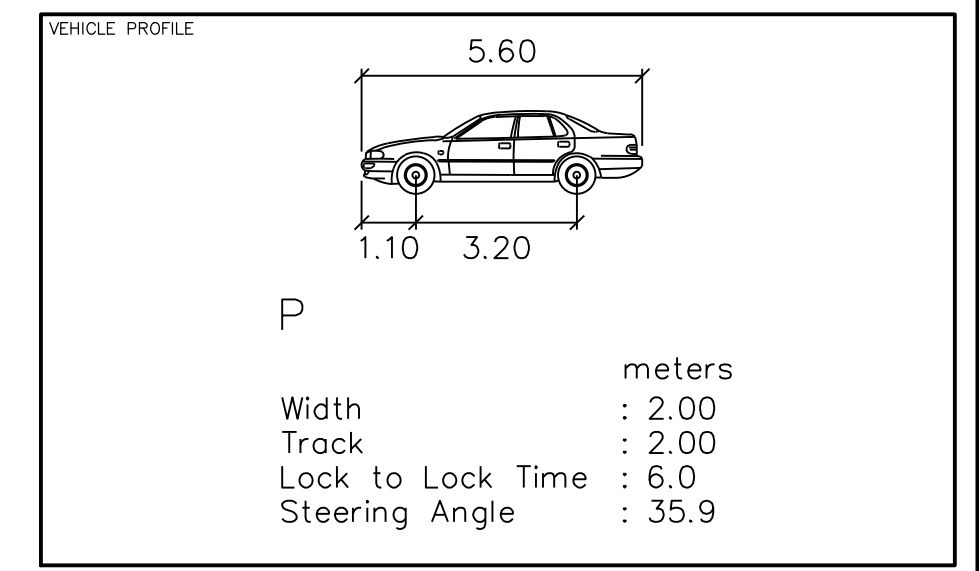
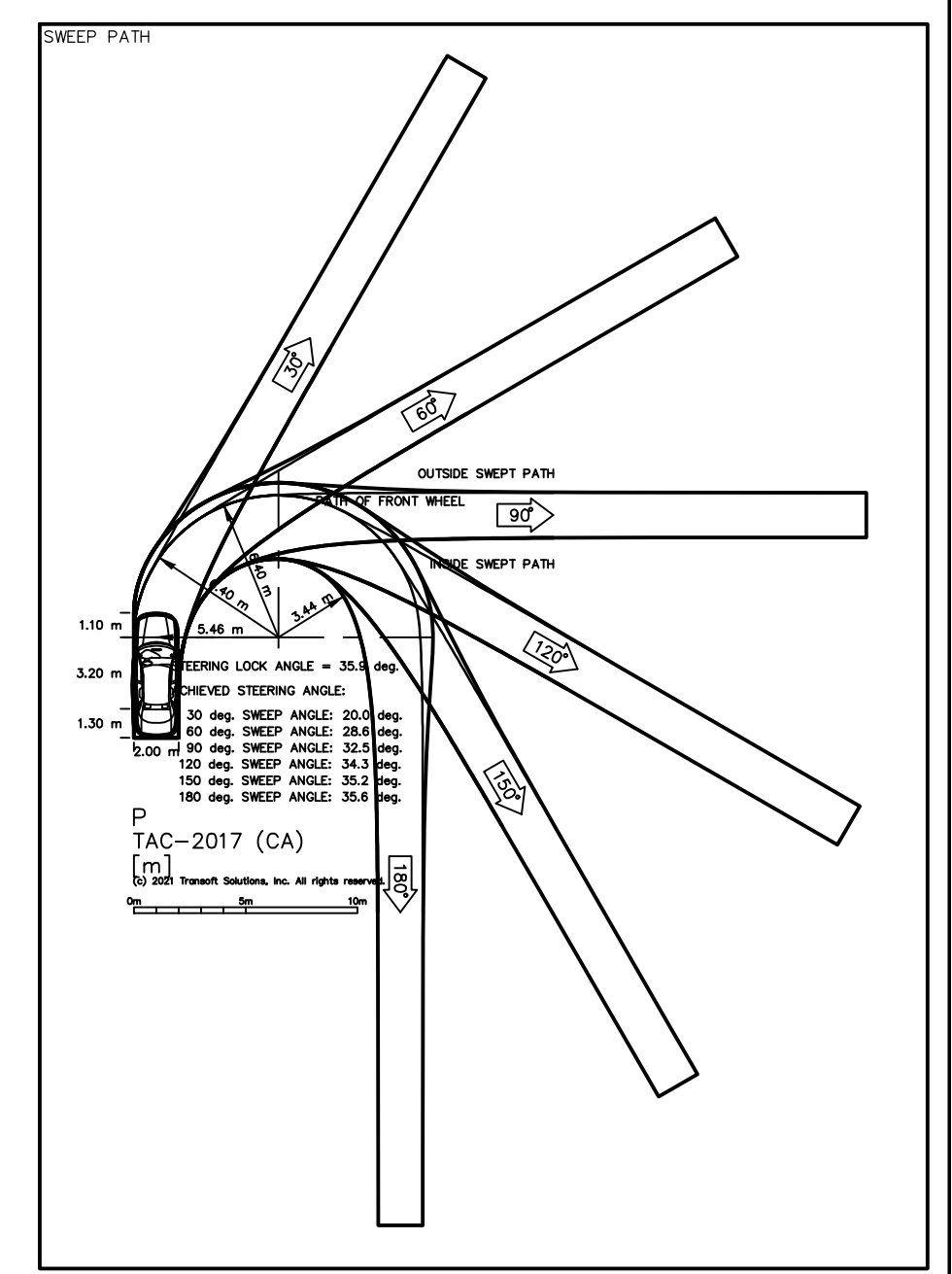
# APPENDIX I

## Vehicle Turning Analysis

STORAGE  
YARD



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Project  
**THUNDER ROAD & BOUNDARY ROAD**  
CITY OF OTTAWA

Drawing  
**PASSENGER CAR TURNING ANALYSIS**  
BUILDING C

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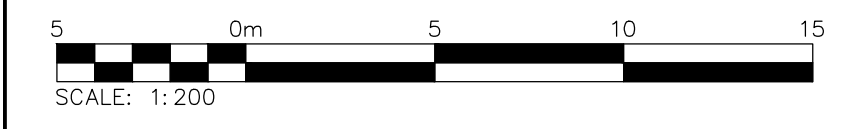
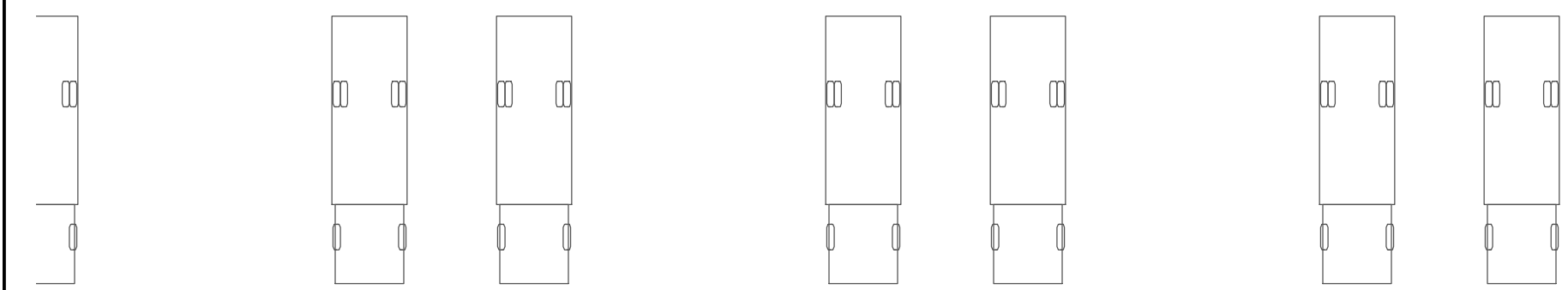
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|----------|------|-----------|---------|------------------|
| Drawn By | S.K. | Design By | Project | <b>1909-5772</b> |
| Check By | P.A. | Check By  | Scale   | 1:200            |
|          |      |           | Drawing | <b>TT 01.1</b>   |

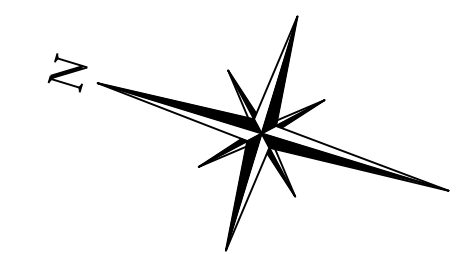
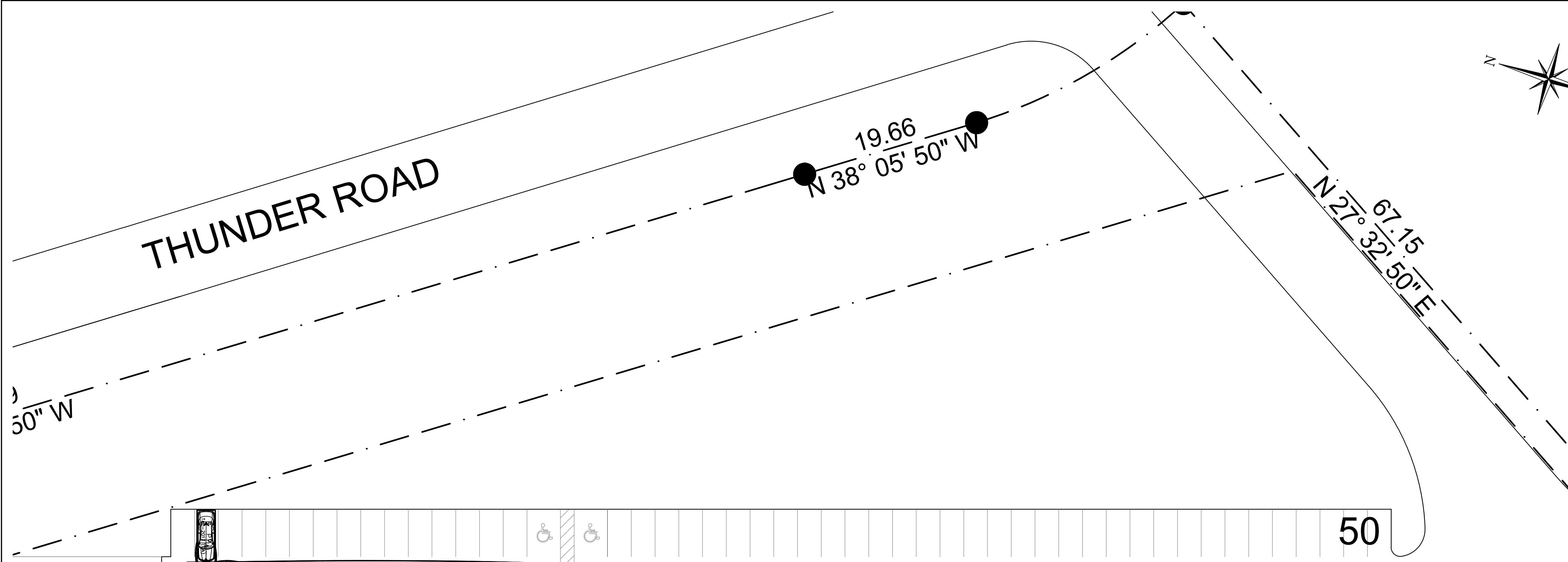
**NG C**

96,000sf

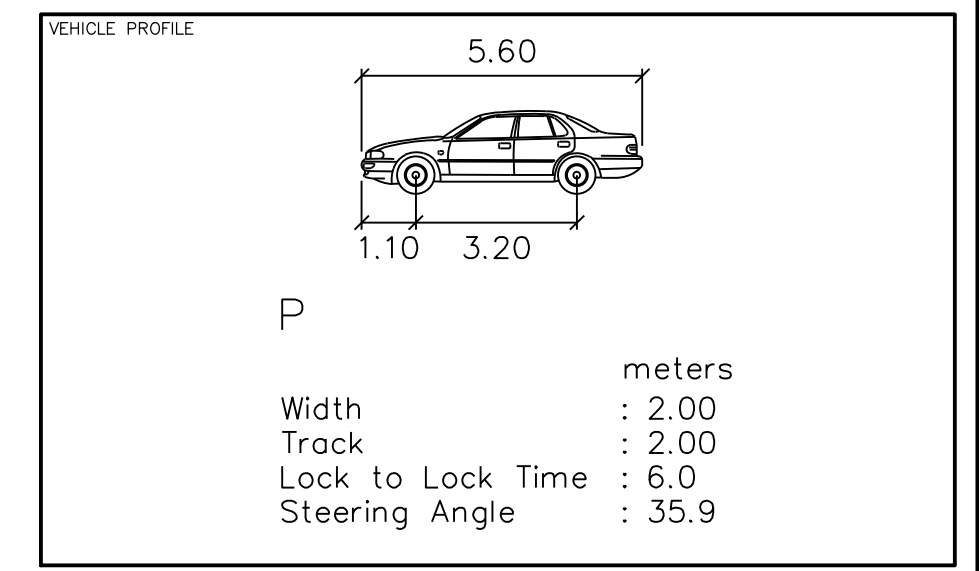
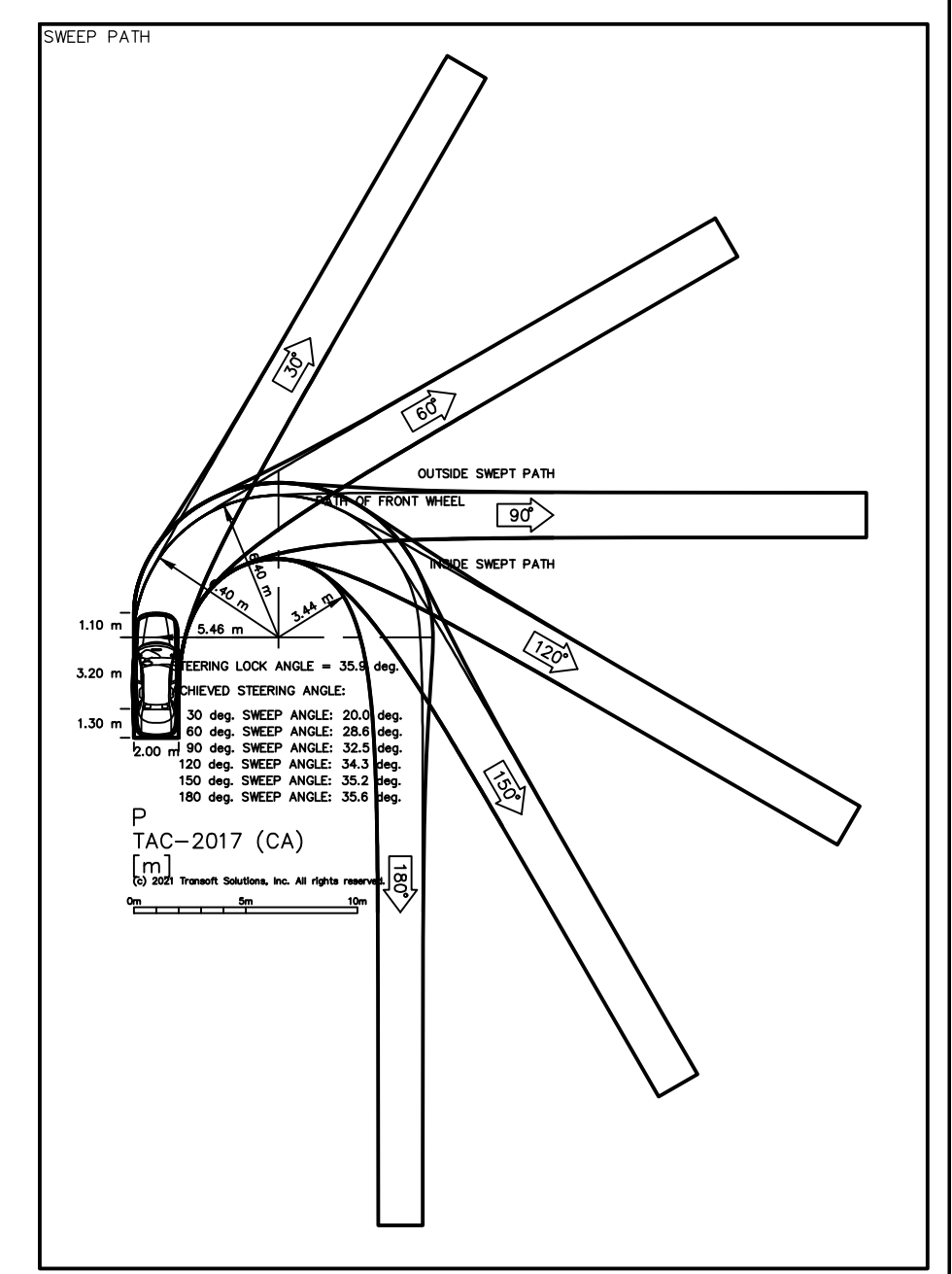
EV.: TBD

T: 6.1m / 20ft





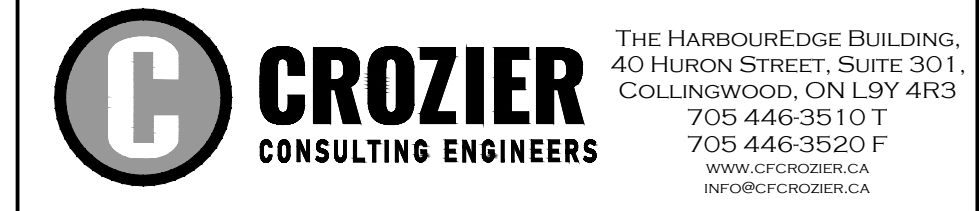
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CITY OF OTTAWA

**Drawing**  
PASSENGER CAR TURNING ANALYSIS  
BUILDING A



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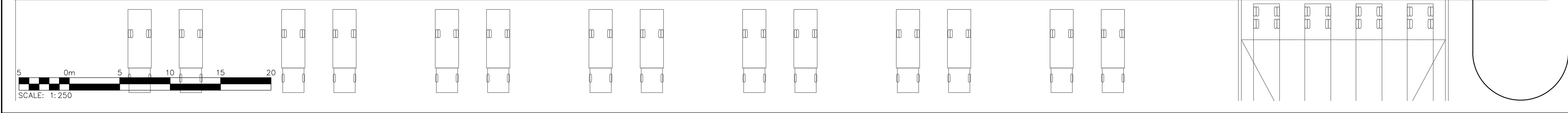
Drawn By: S.K. Design By: P.A. Project: 1909-5772  
Check By: P.A. Scale: 1:250 Drawing: TT 01

# BUILDING A

GFA: 8,920sm / 96,000sf

FIN. FL. ELEV.: TBD

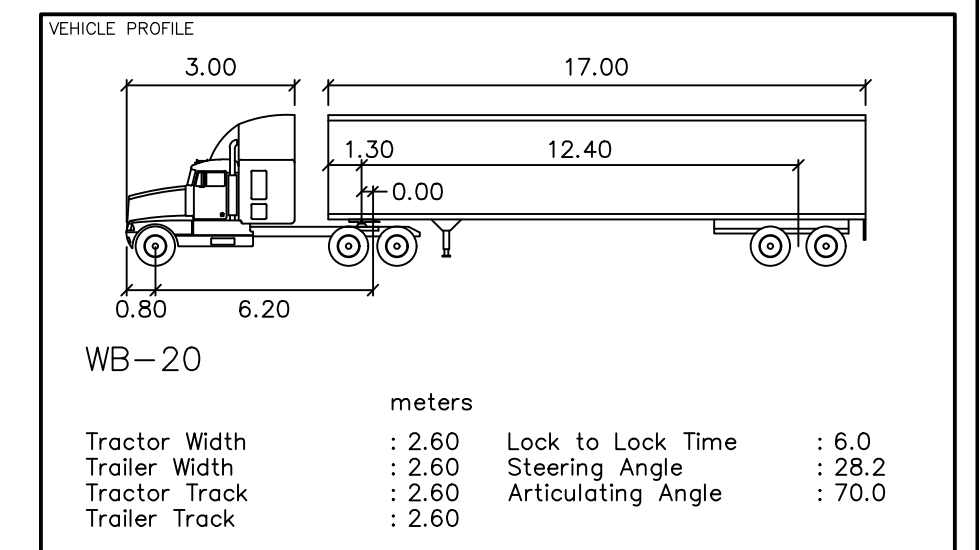
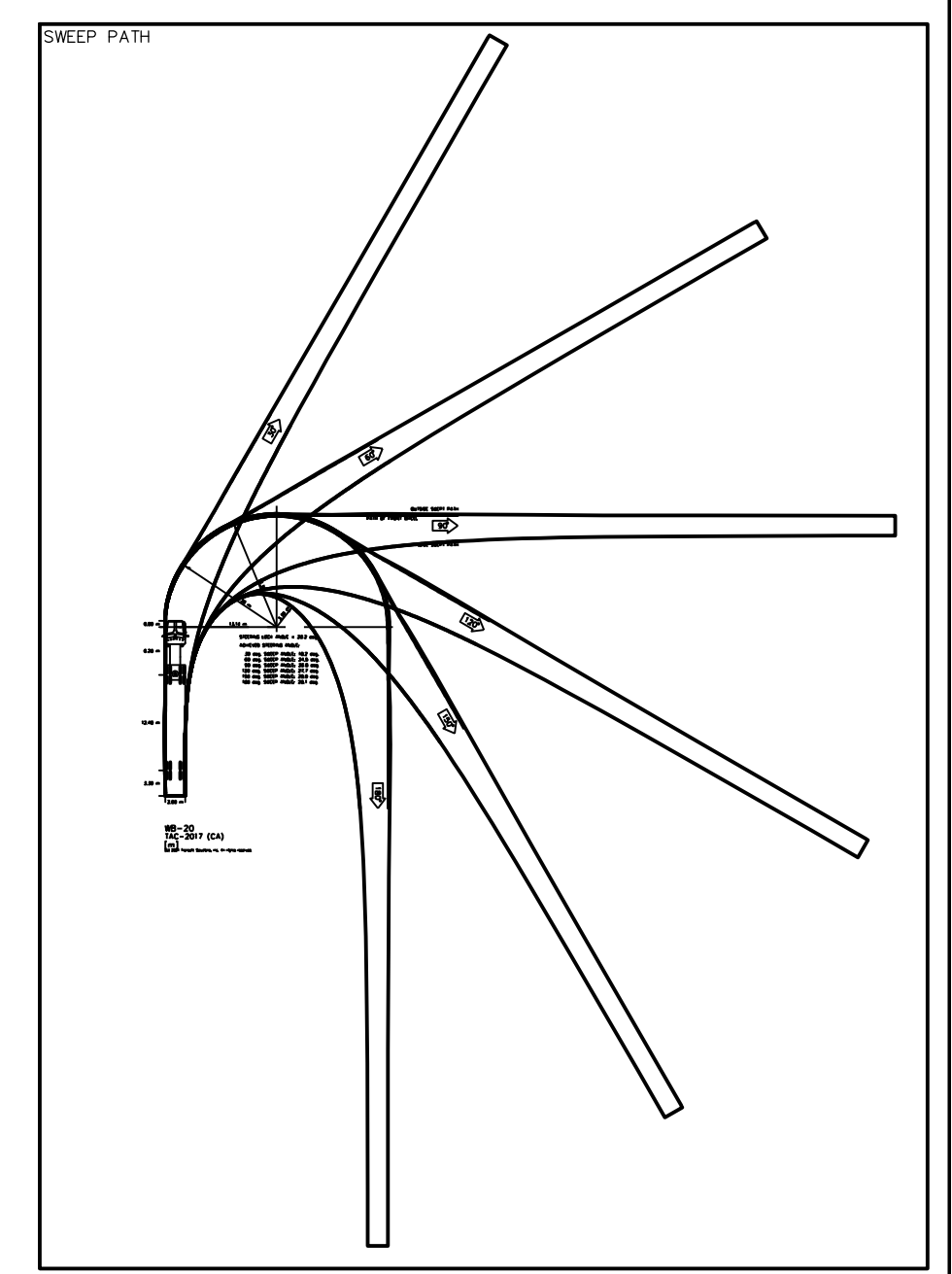
CLEAR HEIGHT: 6.1m / 20ft



# THUNDER ROAD

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243.69  
N 38° 05' 50" W



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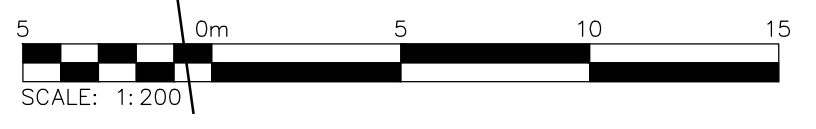
Project  
**THUNDER ROAD & BOUNDARY ROAD**  
CITY OF OTTAWA

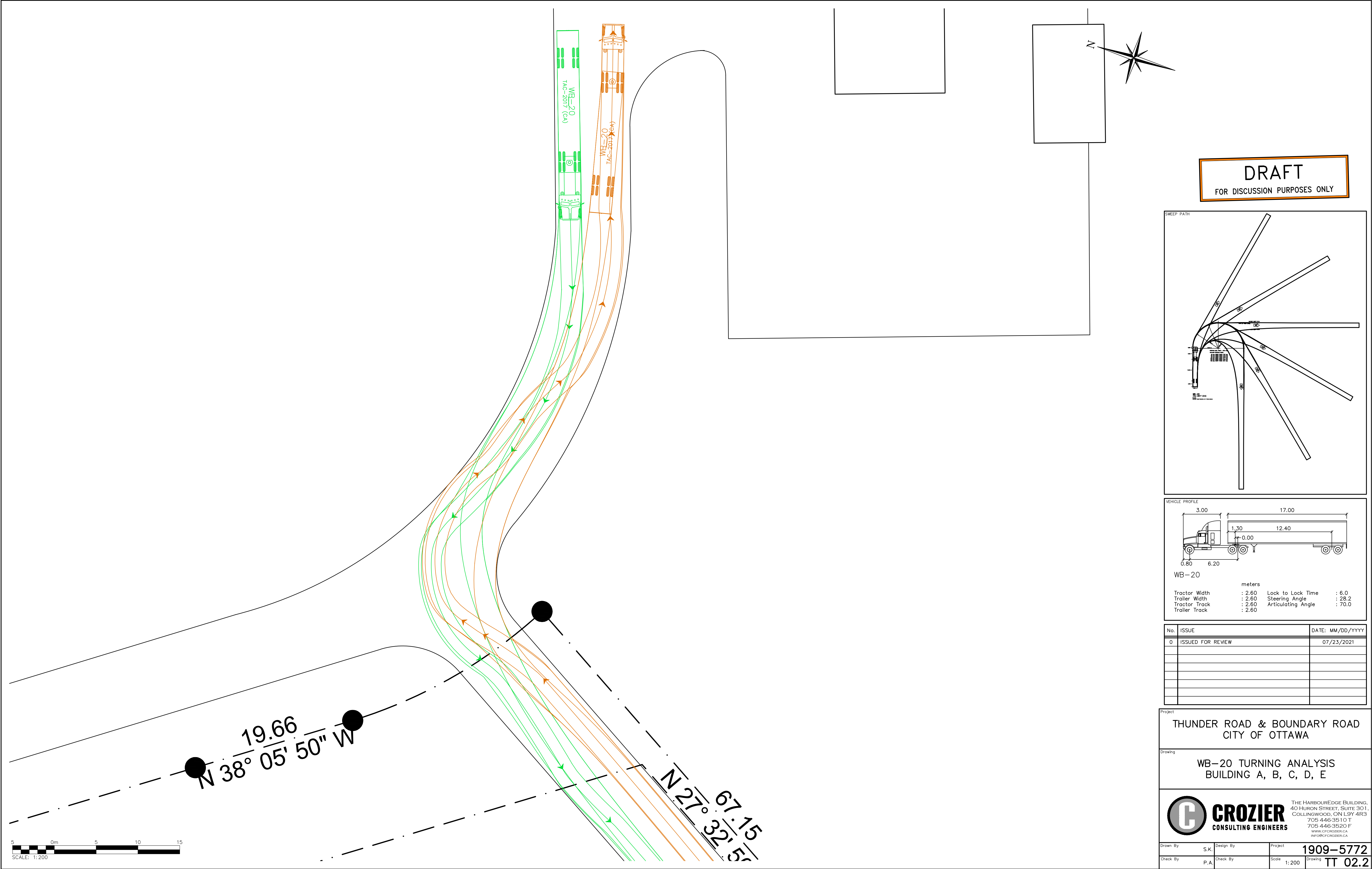
Drawing  
**WB-20 TURNING ANALYSIS**  
BUILDING A, B, C, D, E

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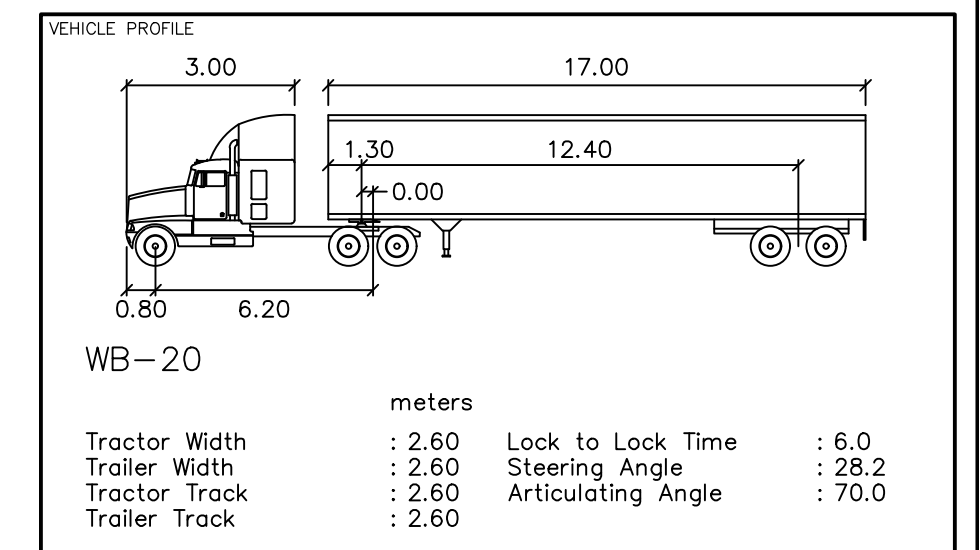
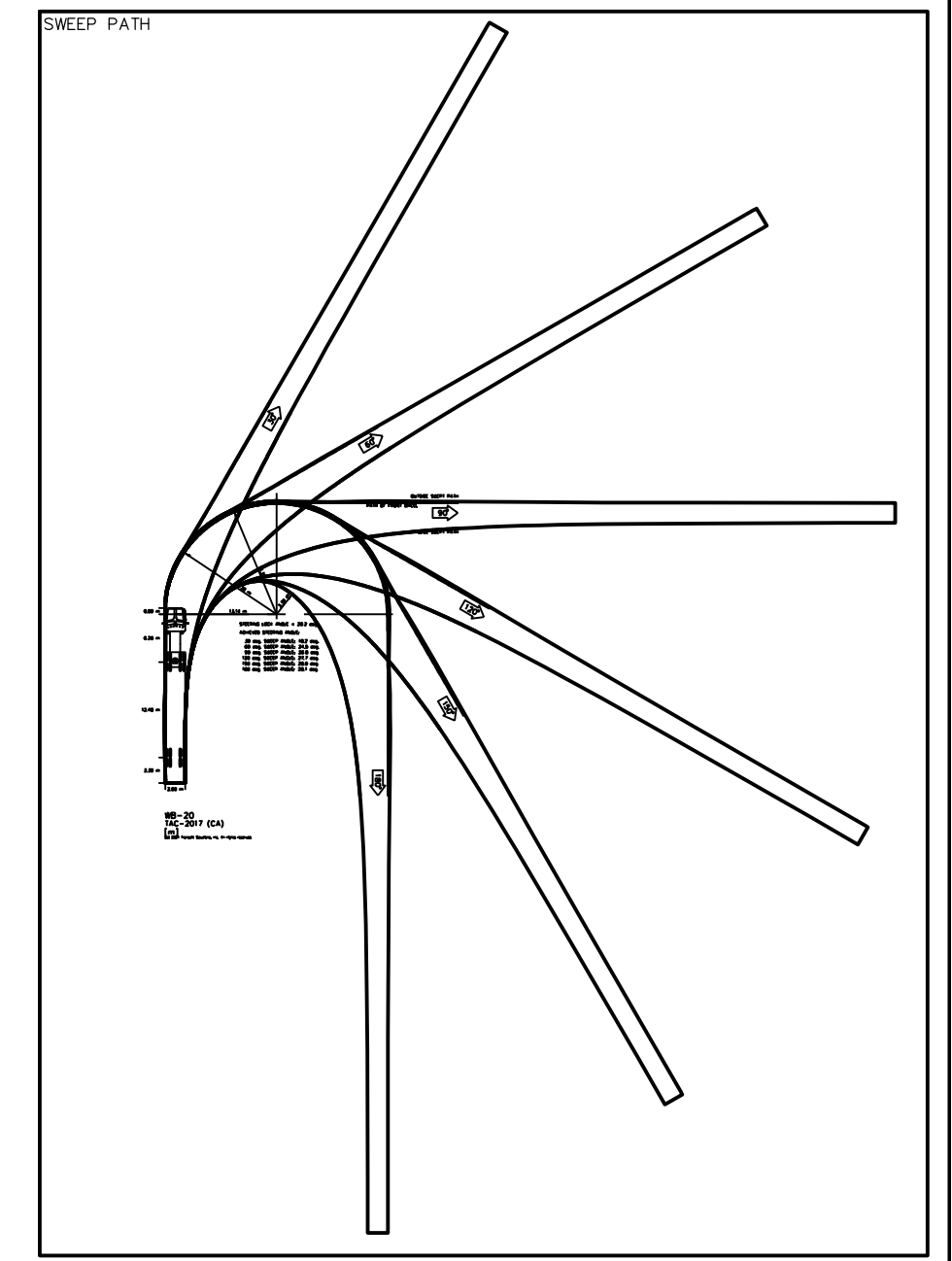
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|----------|------|-----------|---------|------------------------|
| Drawn By | S.K. | Design By | Project | <b>1909-5772</b>       |
| Check By | P.A. | Scale     | 1:200   | Drawing <b>TT 02.1</b> |

**B**  
**GFA:**  
**FIN**  
**CLEAR**





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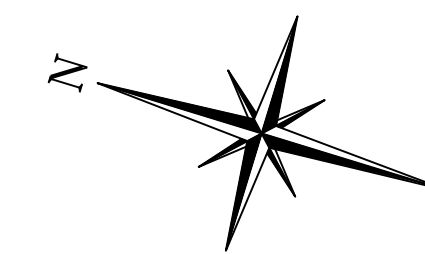
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CITY OF OTTAWA

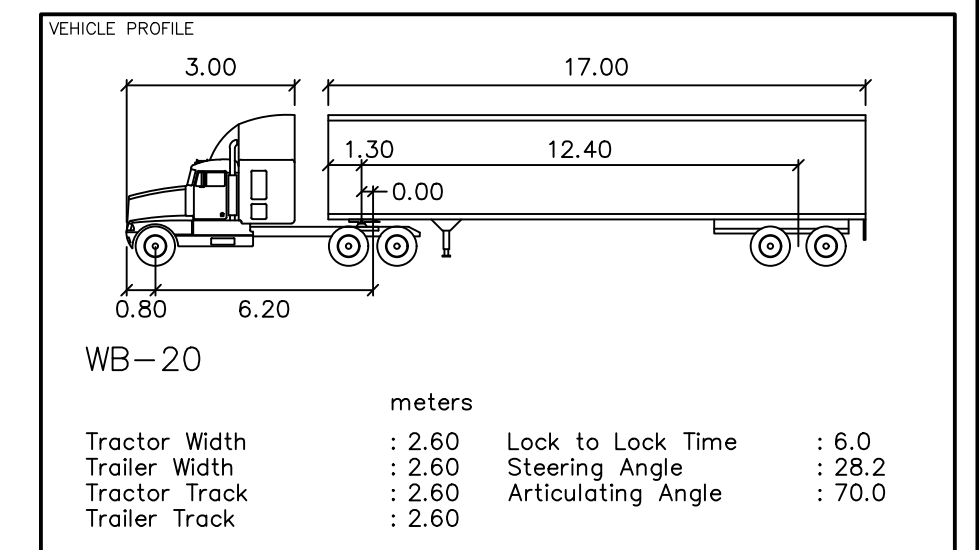
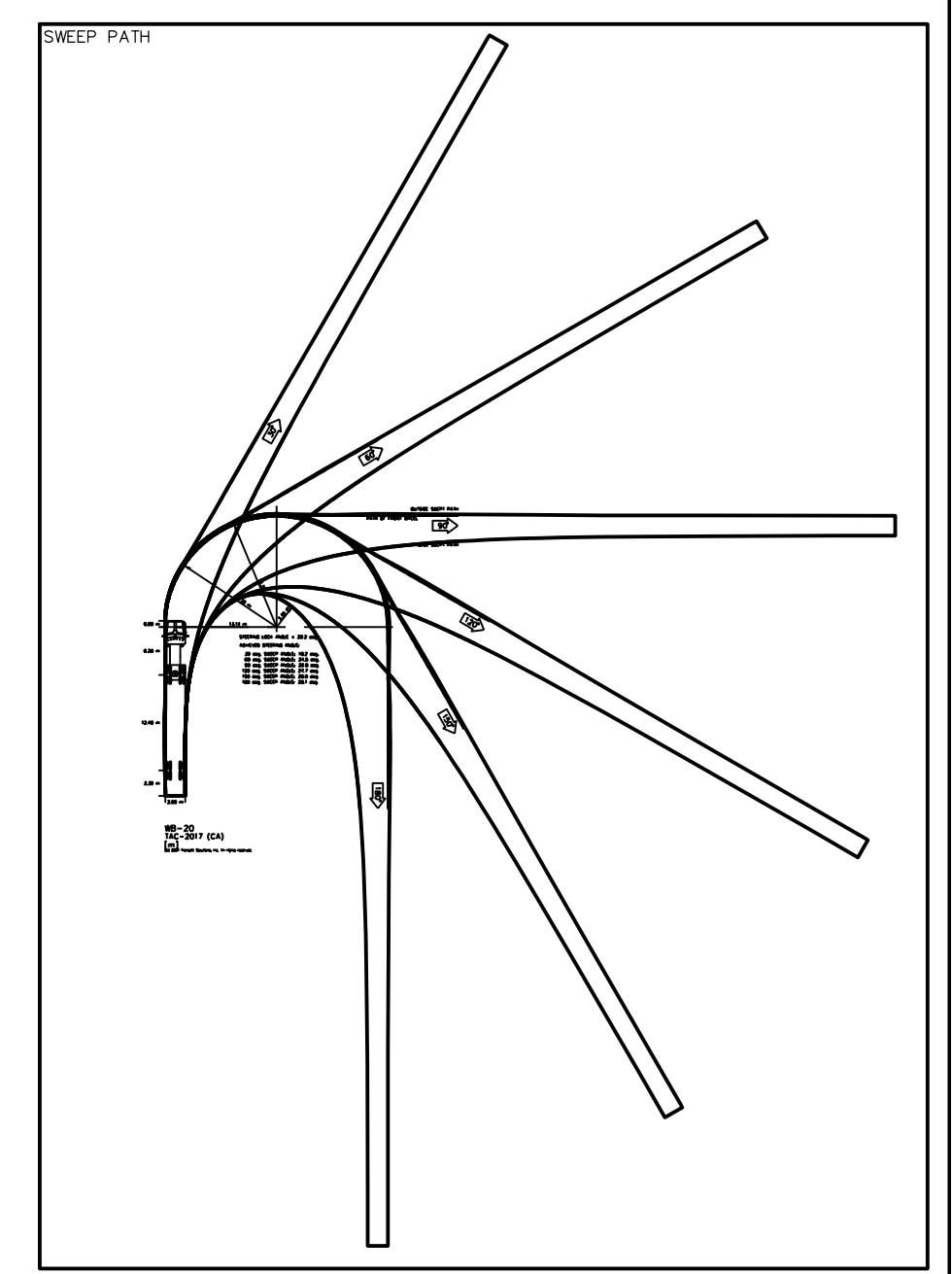
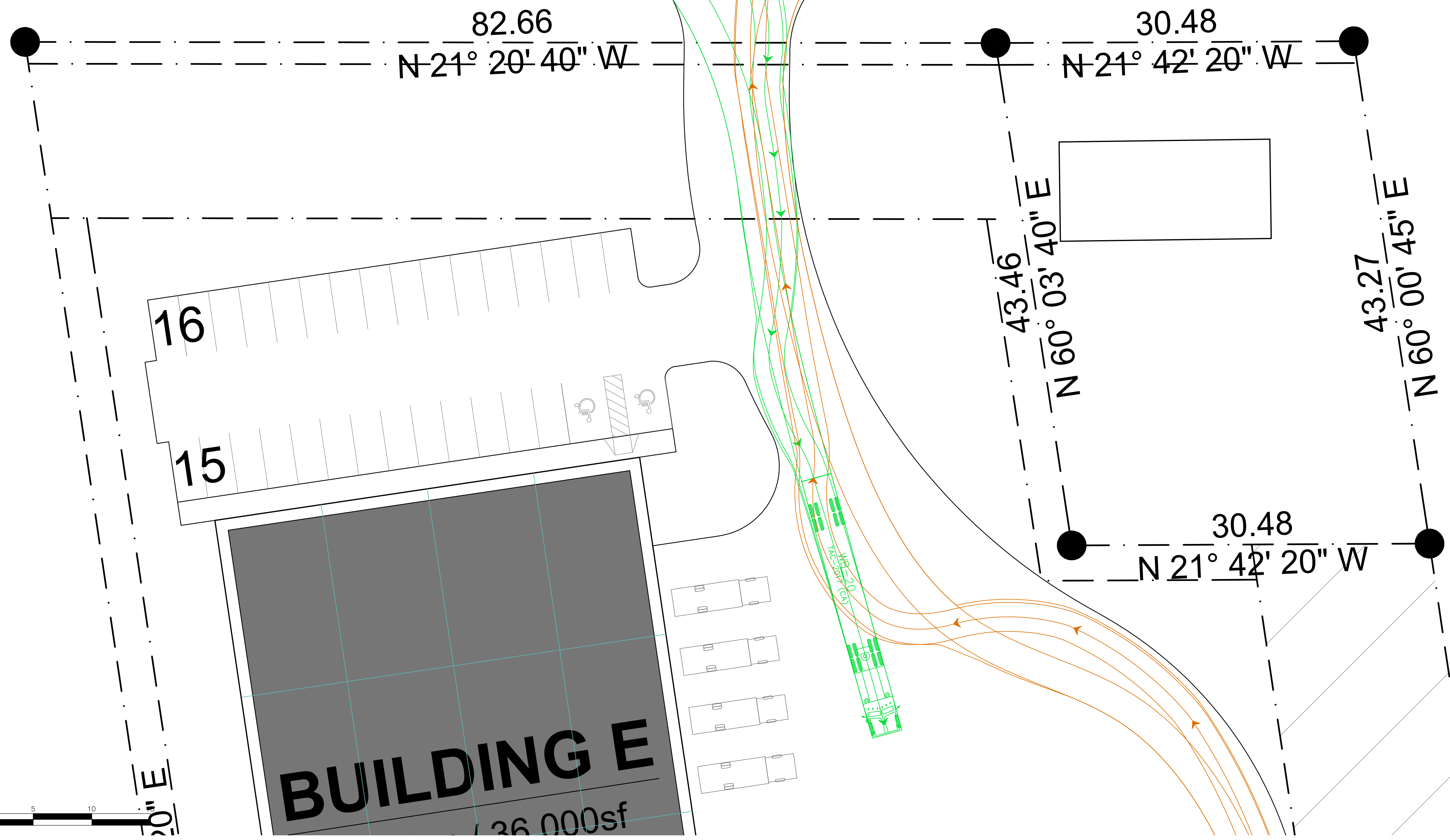
Drawing  
**WB-20 TURNING ANALYSIS**  
BUILDING A, B, C, D, E

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|----------|------|-----------|---------|------------------|
| Drawn By | S.K. | Design By | Project | <b>1909-5772</b> |
| Check By | P.A. | Check By  | Scale   | 1:200            |
|          |      |           | Drawing | <b>TT 02.2</b>   |



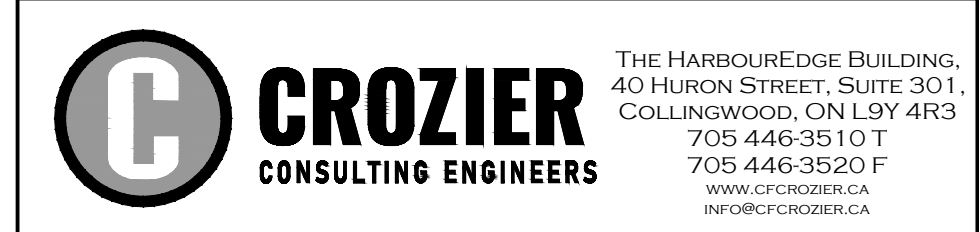
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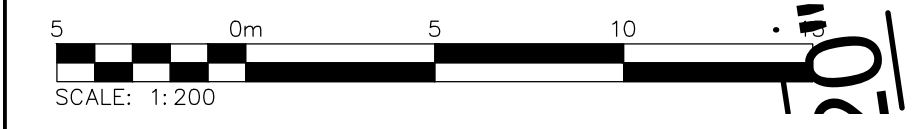
| No. | ISSUE             | DATE: MM/DD/YYYY |
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**THUNDER ROAD & BOUNDARY ROAD**  
CITY OF OTTAWA

Drawing  
**WB-20 TURNING ANALYSIS**  
BUILDING E

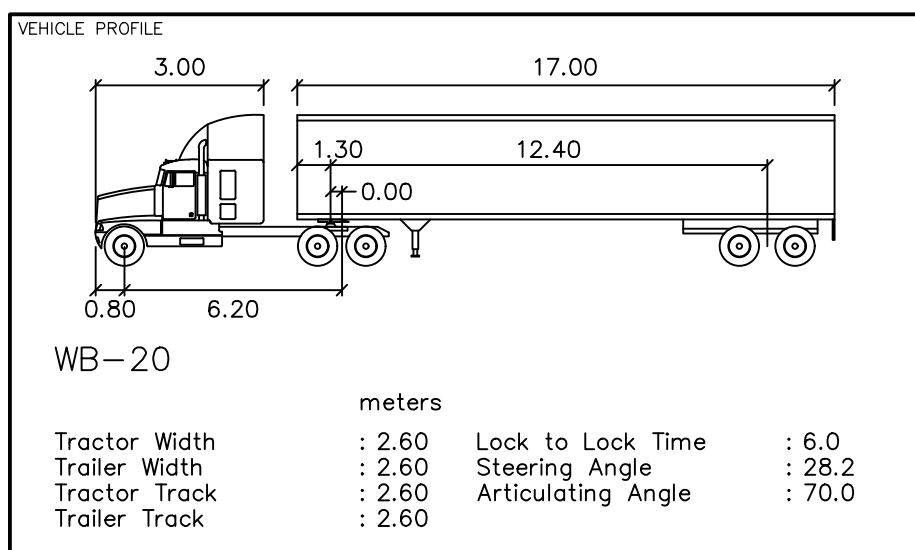
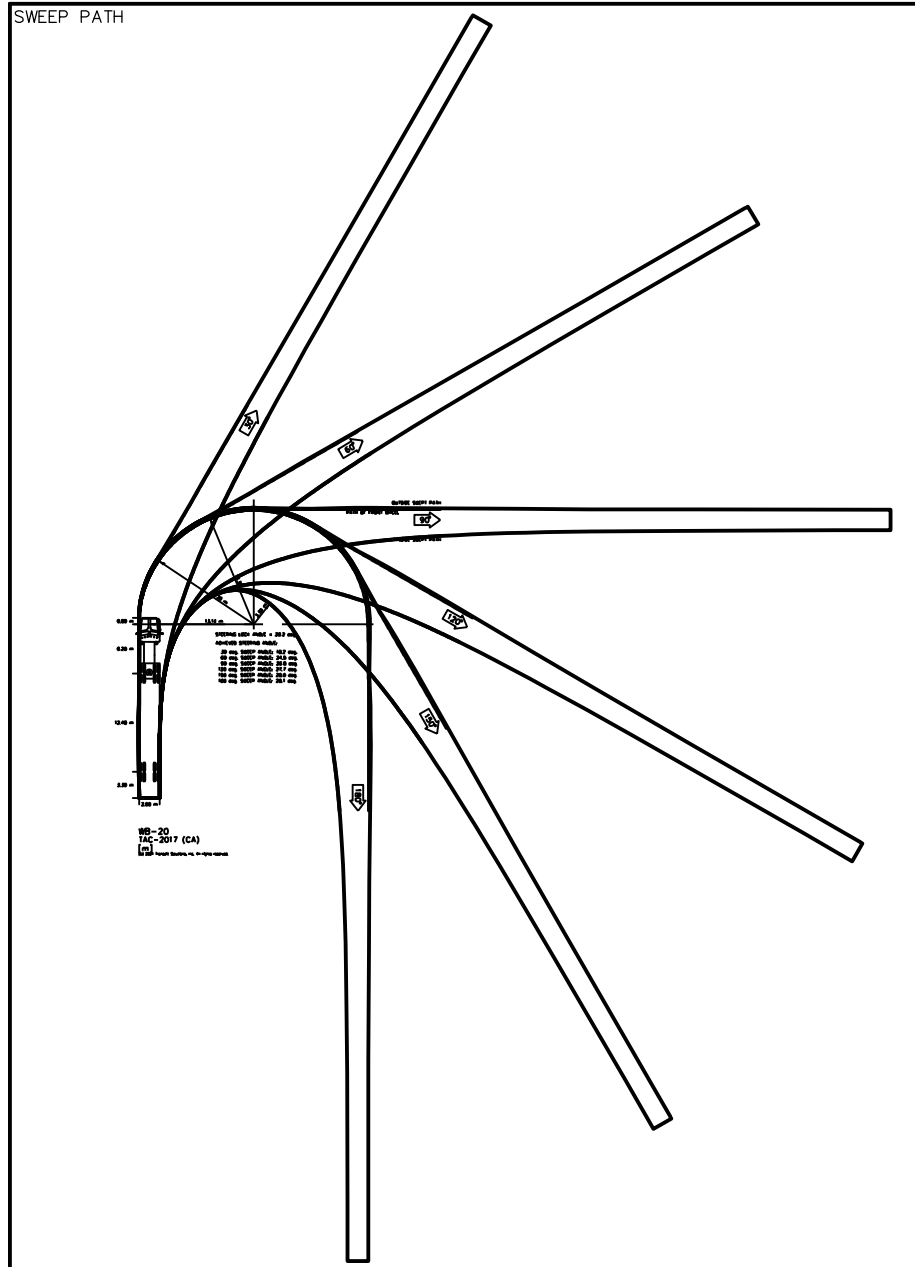


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|----------|------|-----------|---------|------------------|
| Drawn By | S.K. | Design By | Project | <b>1909-5772</b> |
| Check By | P.A. | Check By  | Scale   | 1:200            |
|          |      |           | Drawing | <b>TT 02.3</b>   |





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**Project**  
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CITY OF OTTAWA

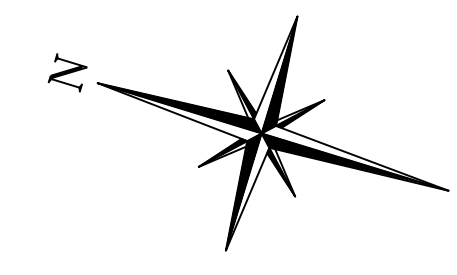
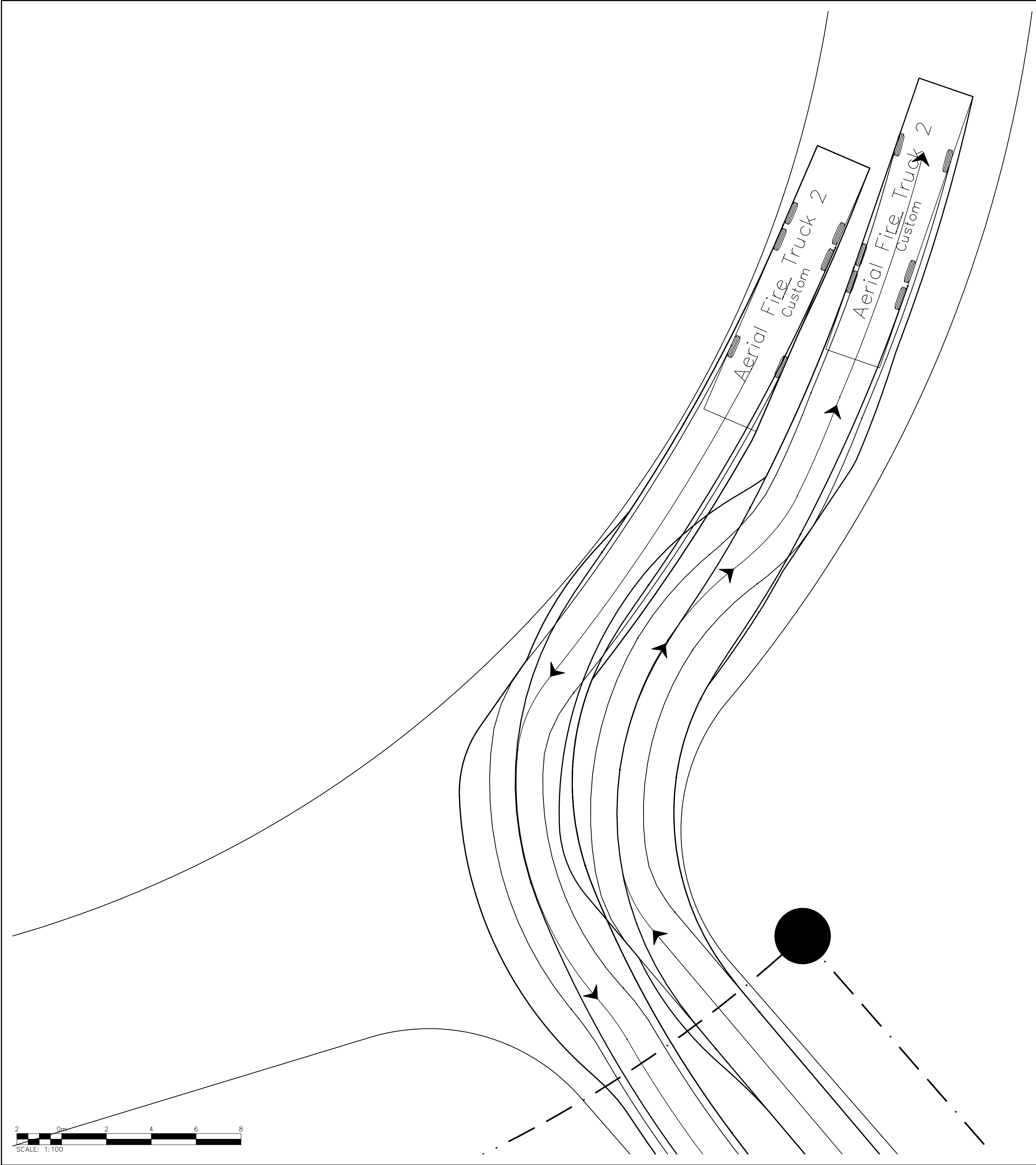
**Drawing**  
WB-20 TURNING ANALYSIS  
BUILDING A, B, C, D, E

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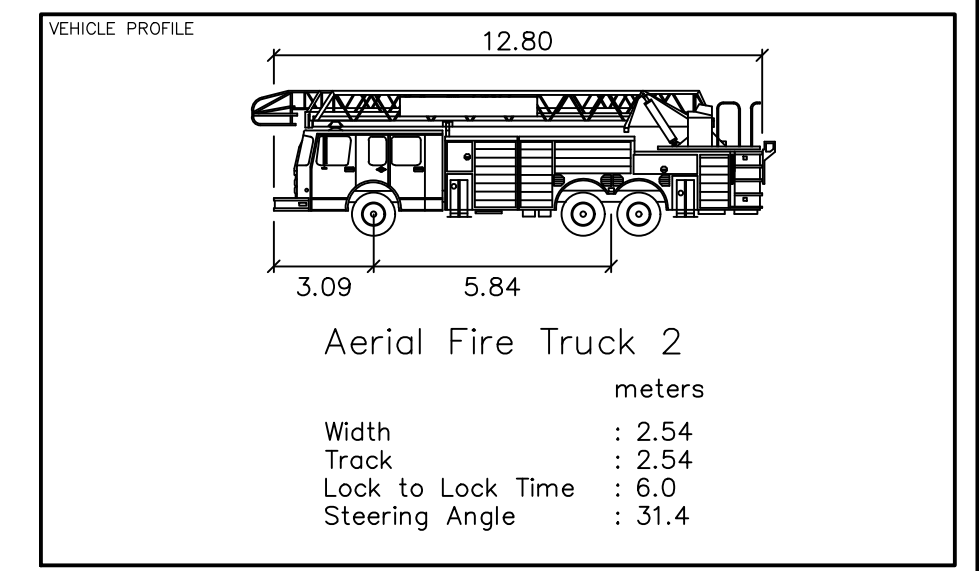
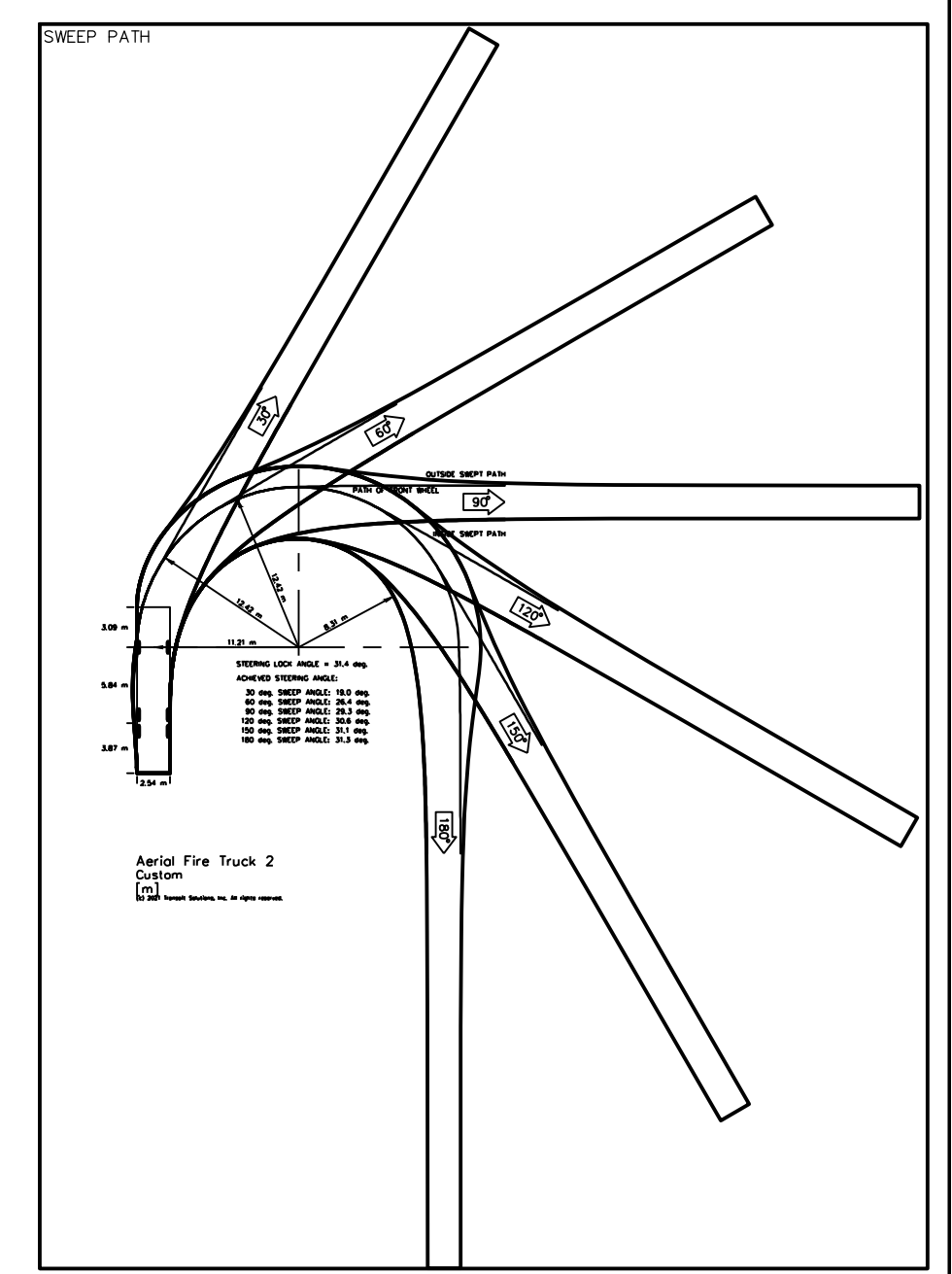
THE HARBOUREEDGE BUILDING,  
40 HURON STREET, SUITE 301,  
COLLINGWOOD, ON L9Y 4R3  
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705 446-3520 F  
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INFO@CFCROZIER.CA

|          |      |           |         |           |
|----------|------|-----------|---------|-----------|
| Drawn By | S.K. | Design By | Project | 1909-5772 |
| Check By | P.A. | Check By  | Scale   | 1:750     |
|          |      |           | Drawing | TT 02     |





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Project  
**THUNDER ROAD & BOUNDARY ROAD**  
CITY OF OTTAWA

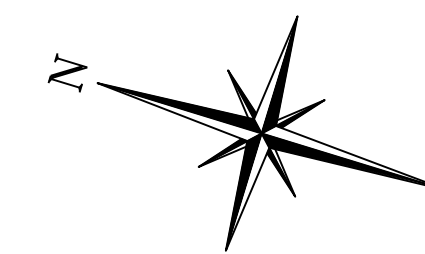
Drawing  
**FIRE TRUCK TURNING ANALYSIS**  
BUILDING A, B, C, D

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|----------|------|-----------|---------|------------------------------|
| Drawn By | S.K. | Design By | Project | <b>1909-5772</b>             |
| Check By | P.A. | Check By  | Scale   | 1:100 Drawing <b>TT 03.1</b> |





Aerial Fire Truck 2 Custom

82.66  
N 21° 20' 40" W

30.48  
N 21° 42' 20" W

43.46  
N 60° 03' 40" E

43.27  
N 60° 00' 45" E

30.48  
N 21° 42' 20" W

144.83  
60° 08' 20" E

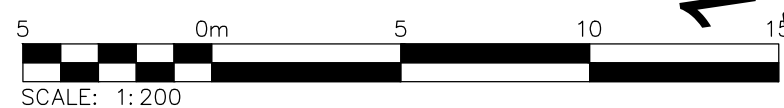
16  
15

Aerial Fire Truck 2 Custom

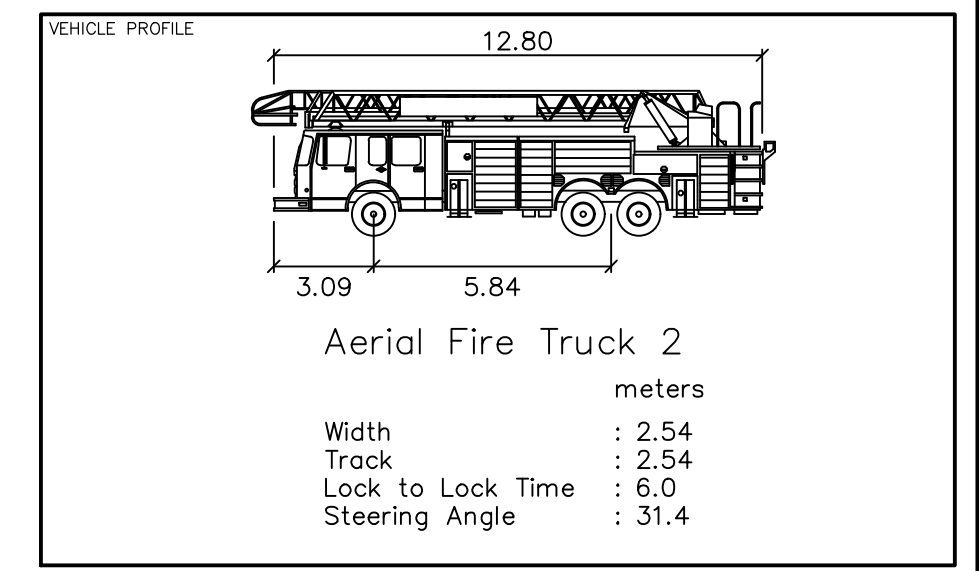
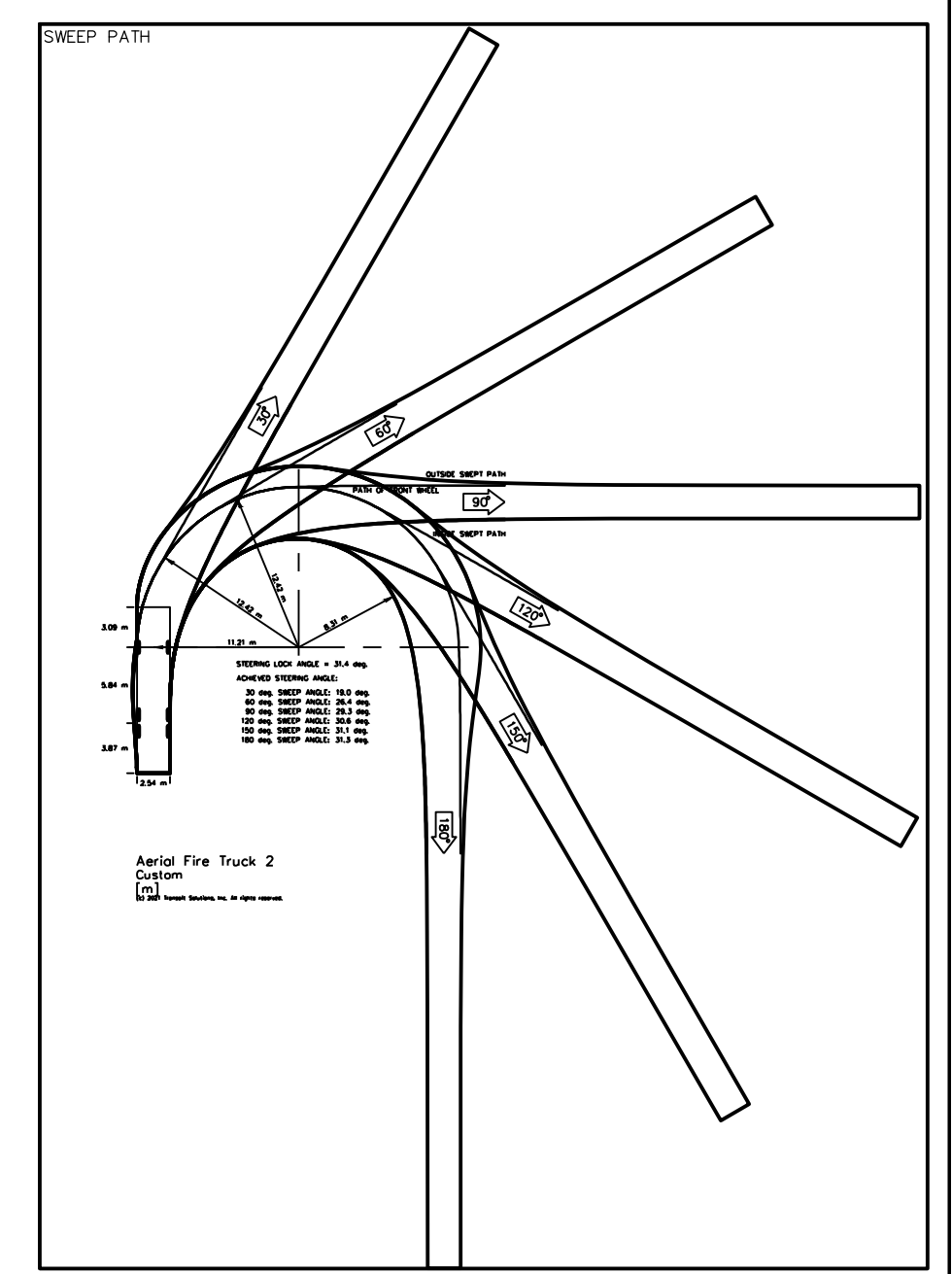
Aerial Fire Truck 2 Custom

Aerial Fire Truck 2 Custom

**BUILDING E**  
3,345sm / 36,000sf  
FIN. FLR. ELEV.: TBD  
CLEAR HEIGHT:



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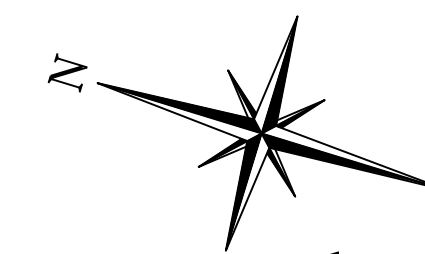
Project  
**THUNDER ROAD & BOUNDARY ROAD**  
CITY OF OTTAWA

Drawing  
**FIRE TRUCK TURNING ANALYSIS**  
BUILDING E

**CROZIER**  
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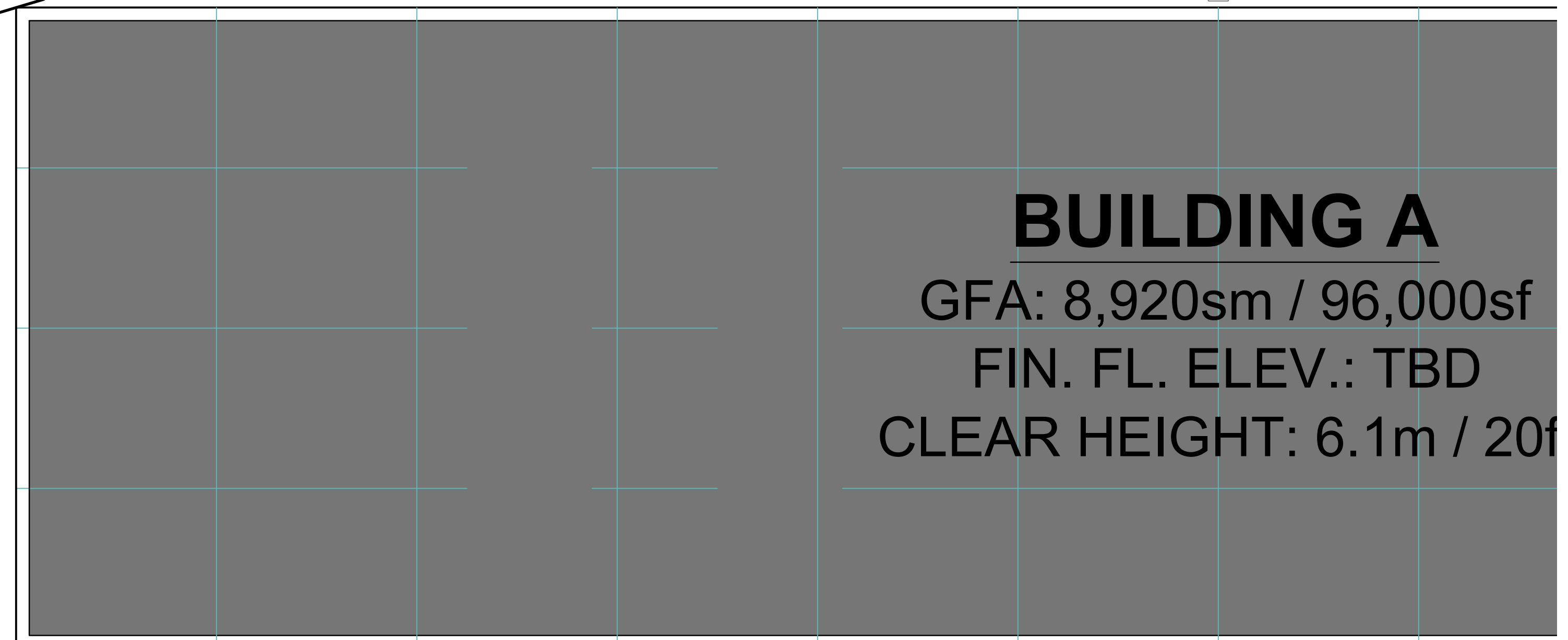
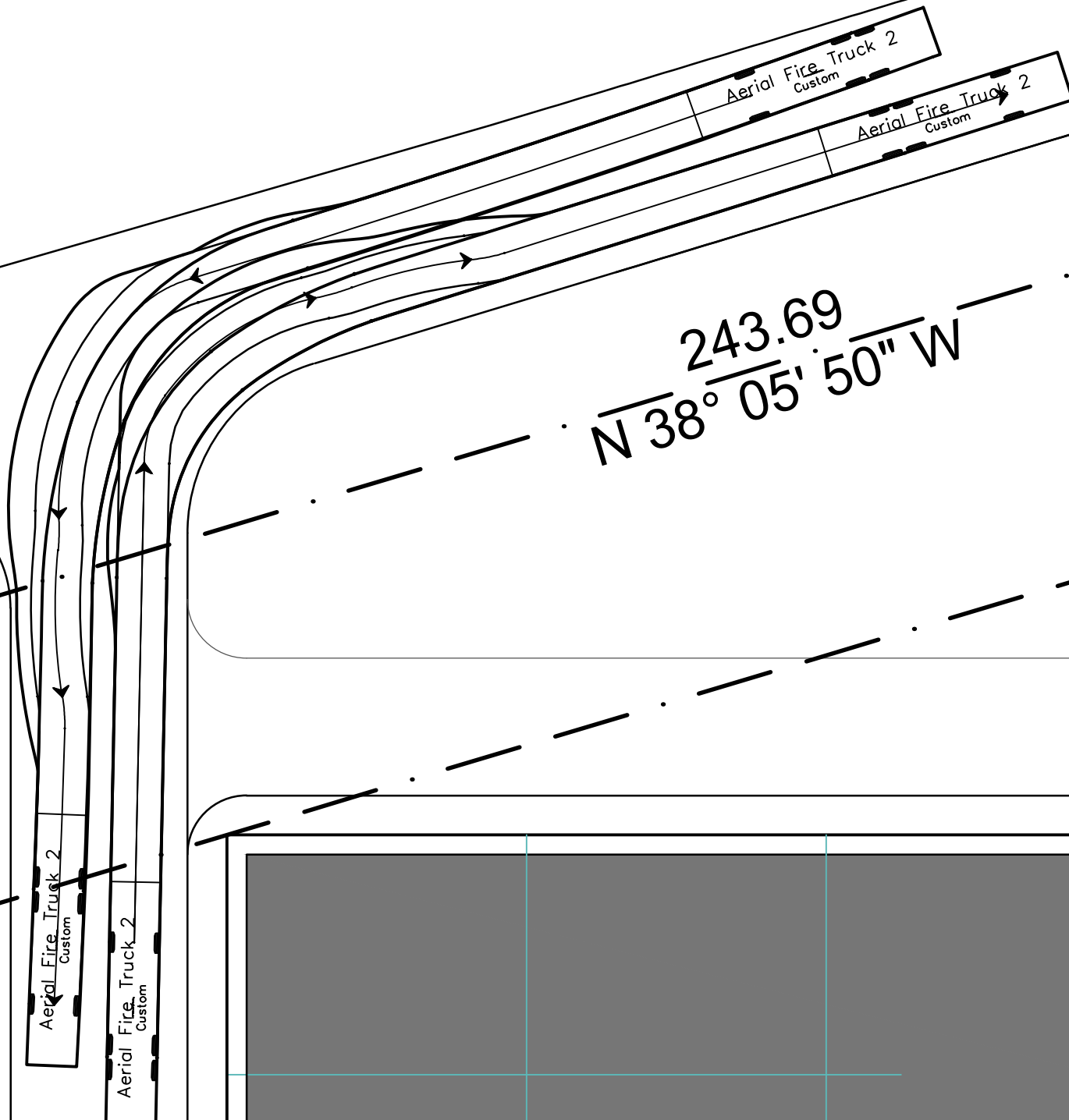
THE HARBOUREdge BUILDING,  
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|----------|------|-----------|---------|------------------|
| Drawn By | S.K. | Design By | Project | <b>1909-5772</b> |
| Check By | P.A. | Check By  | Scale   | 1:200            |
|          |      |           | Drawing | <b>TT 03.2</b>   |



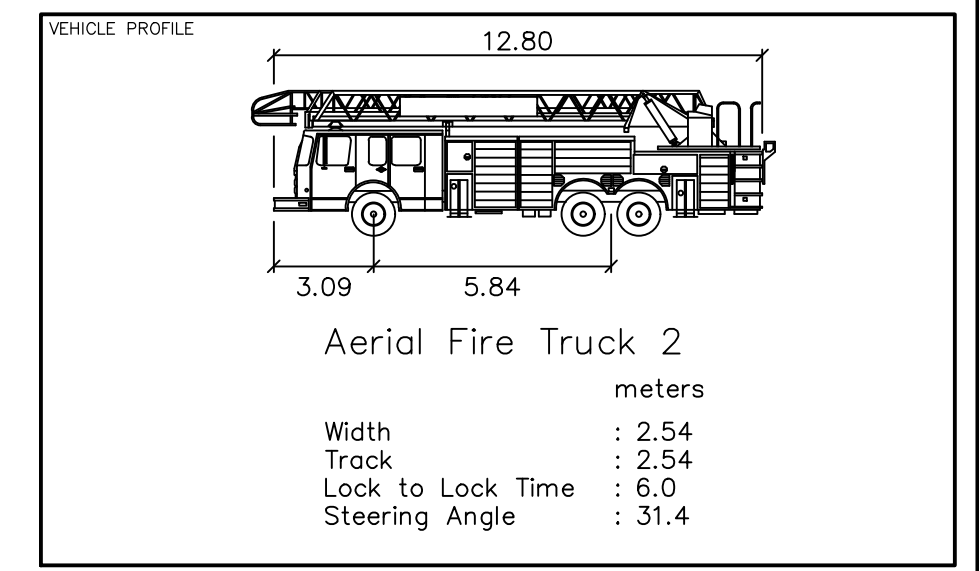
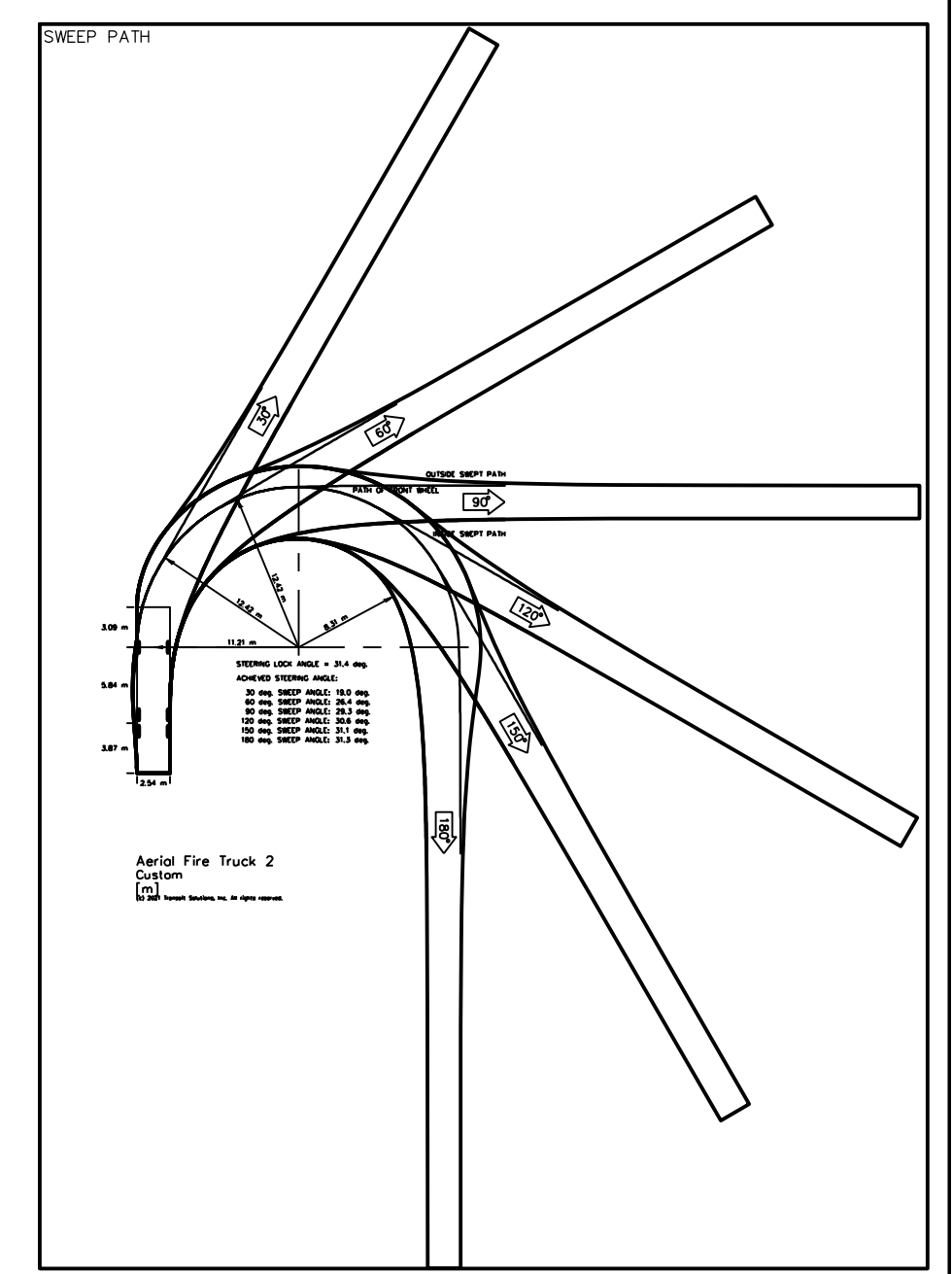
THUNDER ROAD

243.69  
N 38° 05' 50" W



**BUILDING A**  
GFA: 8,920sm / 96,000sf  
FIN. FL. ELEV.: TBD  
CLEAR HEIGHT: 6.1m / 20'

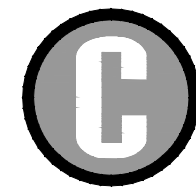
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CITY OF OTTAWA

Drawing  
**FIRE TRUCK TURNING ANALYSIS**  
BUILDING A

 **CROZIER**  
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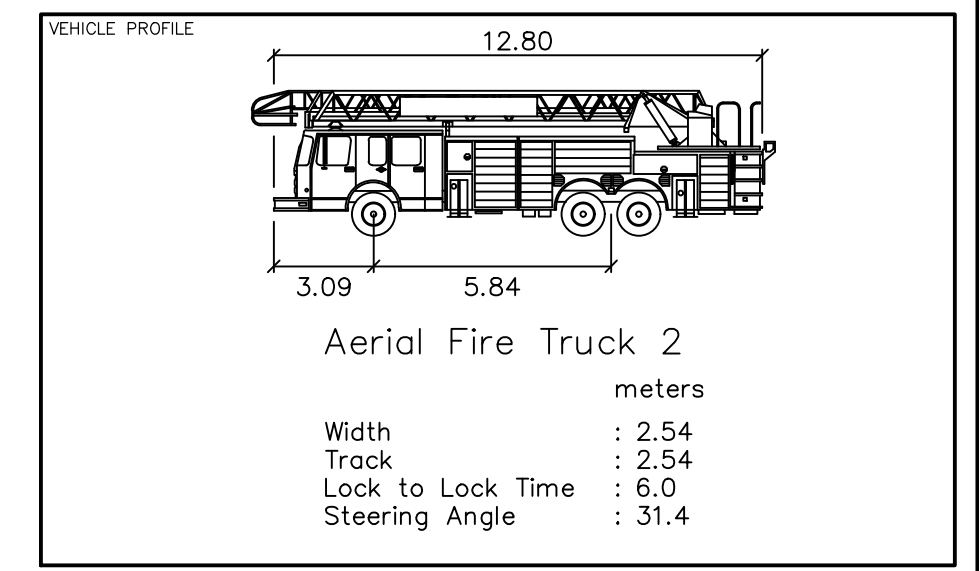
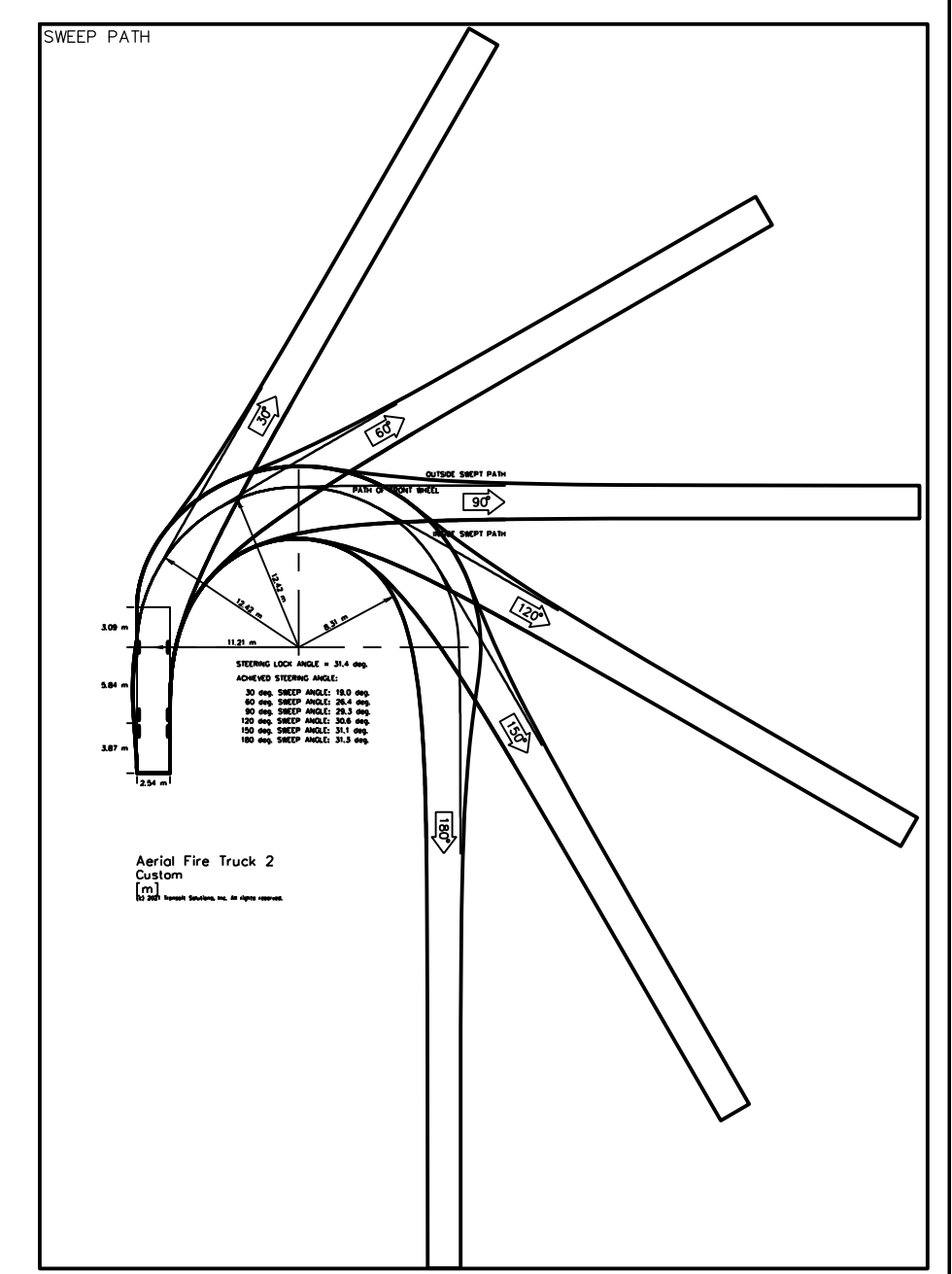
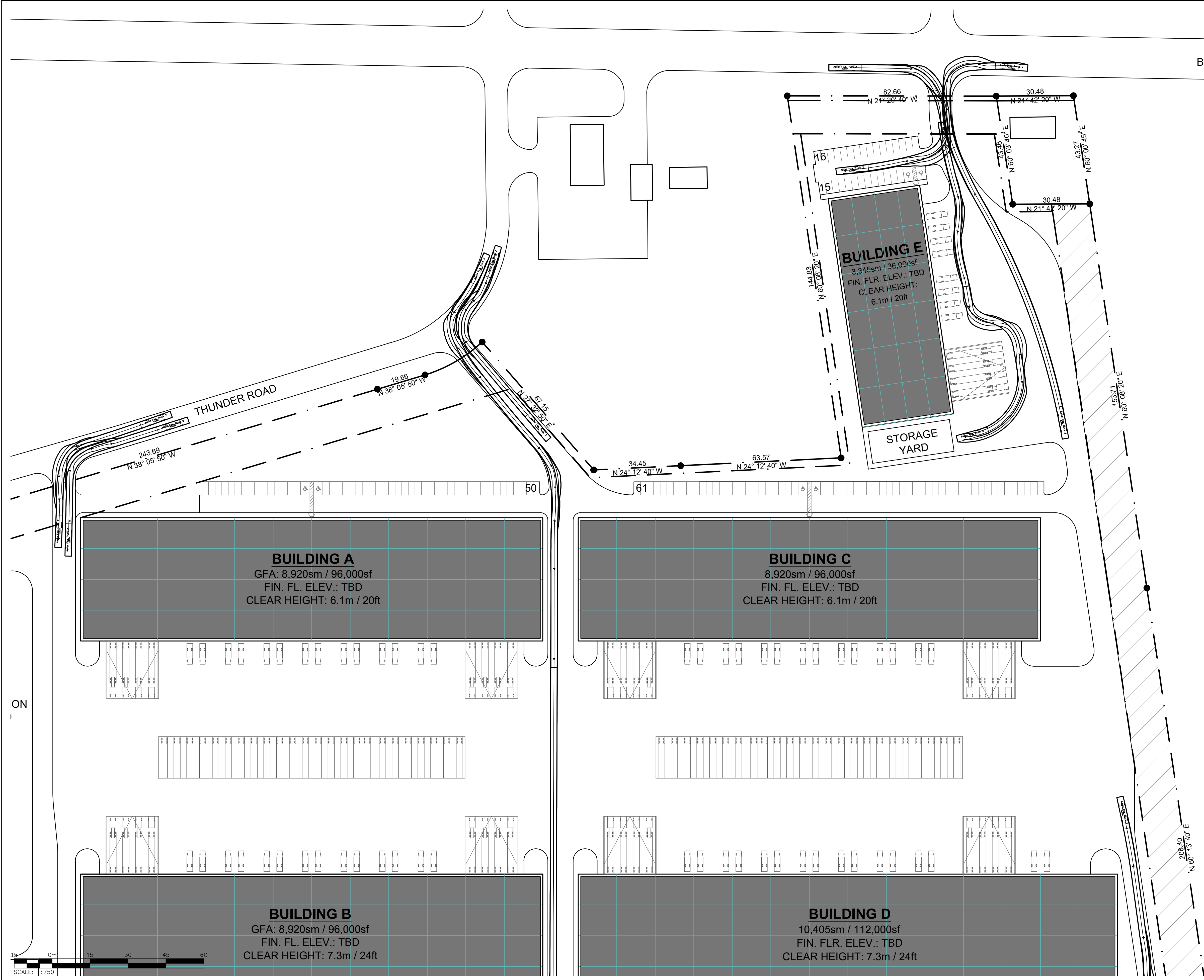
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705 446-3520 F  
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|          |      |           |         |                  |
|----------|------|-----------|---------|------------------|
| Drawn By | S.K. | Design By | Project | <b>1909-5772</b> |
| Check By | P.A. | Check By  | Scale   | 1:300            |
|          |      |           | Drawing | <b>TT 03.3</b>   |





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Project  
**THUNDER ROAD & BOUNDARY ROAD**  
CITY OF OTTAWA

Drawing  
**FIRE TRUCK TURNING ANALYSIS**  
BUILDING 1

**CROZIER**  
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705 446-3520 F  
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INFO@CROZIER.CA

|          |      |           |         |                  |
|----------|------|-----------|---------|------------------|
| Drawn By | S.K. | Design By | Project | <b>1909-5772</b> |
| Check By | P.A. | Check By  | Scale   | 1:750            |
|          |      |           | Drawing | <b>TT 03</b>     |



# APPENDIX J

## Signal Warrant Analysis Worksheets



# Canadian Traffic Signal Warrant Analysis

Main Street  
Side Street

|                        |        |       |
|------------------------|--------|-------|
| MainStreet1Lanes       | (#)    | 1     |
| MainStreet2Lanes       | (#)    | 1     |
| MainStreetLT Lanes     | (#)    | 1     |
| SideStreet1Lanes       | (#)    | 1     |
| SideStreet2Lanes       | (#)    | 1     |
| MainStreetSpeedLimit   | (km/h) | 80    |
| MainStreetTrucks/Buses | (%)    | 30.0% |
| Refuge Width on Median | (m)    | 0.0   |

| Boundary Road                     |       |  |         |
|-----------------------------------|-------|--|---------|
| South Amazon Access / Site Access |       |  |         |
| Distance to next signal           | (m)   |  | 165     |
| Elementary School                 | (y/n) |  | n       |
| Senior's Complex                  | (y/n) |  | n       |
| Pathway to School                 | (y/n) |  | n       |
| Metro Area Population             | (#)   |  | 994,837 |
| Side Street Bus Route             | (y/n) |  | n       |
| Side Street Trucks                | (%)   |  | 40.0%   |
| T or 1-Way Intersection           | (y/n) |  | n       |
| Central Business District         | (y/n) |  | n       |

Date: September 17, 2021

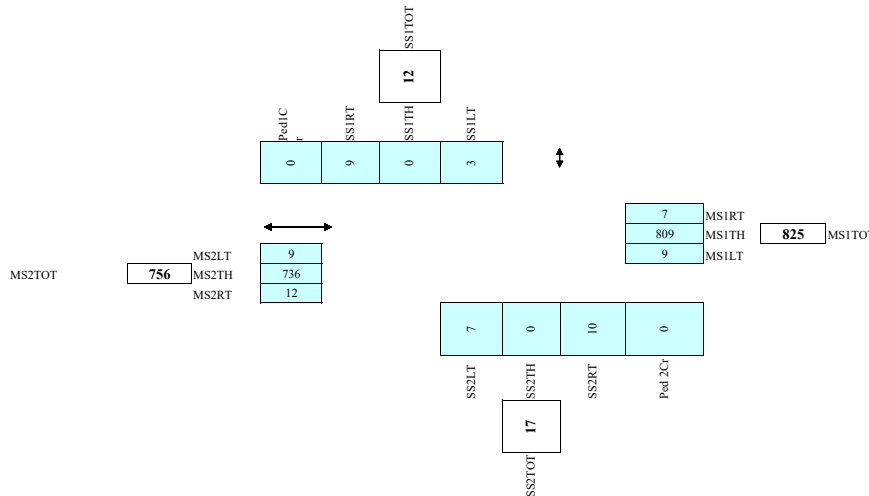
City: City of Ottawa

|       |                                 |       |                            |
|-------|---------------------------------|-------|----------------------------|
| Vm =  | 1,581 (MainSt Vol Total)        | Cs =  | 0.900 (Int SpacingFactor)  |
| Vs =  | 17 (SideSt Vol Highest)         | Cmt = | 1.150 (MainStTruckFactor)  |
| Pc =  | 0 Peds Crossing Main            | Cv =  | 1.100 (SpeedFactor)        |
| K1 =  | 1,400 veh/veh const             | Cp =  | 1.000 (PopDemoFactor)      |
| K2 =  | 5,000 veh/ped const             | Csb = | 1.000 (SideStBusFactor)    |
| L =   | 3.0 TotalMainStLanes            | Cst = | 1.050 (SideStTruckFactor)  |
| F =   | 1,000 (PedDemoFactor)           | Vmx = | 825 (MainStHighest)        |
| Vm1 = | 1,581 (MainStVeh-Veh#)          | Vm2 = | 1,581 (MainStVeh-Ped#)     |
| Cvp = | 1,139 (product of Cs,Cmt,Cv,Cp) | Cbt = | 1.050 (maximum of Csb,Cst) |
| Ct1 = | 1,000 T Int / one way Factor    |       |                            |

|               | ←     |       |       | →     |       |       | ↓     |       |       | ↑     |       |       | PedC1 | PedC2 |
|---------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|               | MS1LT | MS1TH | MS1RT | MS2LT | MS2TH | MS2RT | SS1LT | SS1TH | SS1RT | SS2LT | SS2TH | SS2RT |       |       |
| 7:00 - 8:00   | 14    | 1177  | 7     | 1     | 365   | 17    | 1     | 0     | 4     | 7     | 0     | 4     | 0     | 0     |
| 8:00 - 9:00   | 14    | 1177  | 7     | 1     | 365   | 17    | 1     | 0     | 4     | 7     | 0     | 4     | 0     | 0     |
| 11:00 - 12:00 | 14    | 1177  | 7     | 1     | 365   | 17    | 1     | 0     | 4     | 7     | 0     | 4     | 0     | 0     |
| 12:00 - 13:00 | 4     | 441   | 7     | 16    | 1106  | 7     | 4     | 0     | 14    | 7     | 0     | 15    | 0     | 0     |
| 16:00 - 17:00 | 4     | 441   | 7     | 16    | 1106  | 7     | 4     | 0     | 14    | 7     | 0     | 15    | 0     | 0     |
| 17:00 - 18:00 | 4     | 441   | 7     | 16    | 1106  | 7     | 4     | 0     | 14    | 7     | 0     | 15    | 0     | 0     |
| Average       | 9     | 809   | 7     | 9     | 736   | 12    | 3     | 0     | 9     | 7     | 0     | 10    | 0     | 0     |

\*\*\* Enter the hourly turning movement counts averaged over the peak six hours of a typical week day

\*\*\* Enter the peak pedestrian volume crossing the main street averaged over the same hours



$$W = [Ct1xCbt(Vm1 \times Vs)/K1 + (F(Vm2 \times PcL)/K2)] \times Cvp$$

$$W = 22 \quad 22 \quad 0$$

Not Warranted - Vs < 75

Veh Ped

| Roadway, Vehicle and Pedestrian Factors | Range             |          |      |          |
|---|-------------------|----------|------|----------|
|   | Min               | @        | Max  | @        |
| Cs = (Int SpacingFactor)                | 0.90              | <200 m   | 1.10 | isolated |
| Cmt = (MainStTruckFactor)               | 1.00              | <5%      | 1.15 | >20%     |
| Cv = (SpeedFactor)                      | 1.00              | <60 km/h | 1.10 | >80 km/h |
| Cp = (PopDemoFactor)                    | 1.00              | >250,000 | 1.20 | <10,000  |
| Csb = (SideStBusFactor)                 | 1.00              | no       | 1.05 | yes      |
| Cst = (SideStTruckFactor)               | 1.00              | <10%     | 1.05 | >10%     |
| F = (Ped DemoFactor)                    |                   |          |      |          |
| (max of )                               |                   |          |      |          |
|   | Elementary School | 1.20     |      |          |
|   | Seniors Complex   | 1.10     |      |          |
|   | Path to School    | 1.10     |      |          |

### Explanation of Factors:

- Cbt** = 1.05 if the side street either is a bus route, or has more than 10% trucks, otherwise = 1.00. (it is assumed that these two factors only affect the side street vehicles trying to cross the main street, not the pedestrians)
- Ci** = the product of the other 4 geographic factors (Cs = intersection spacing, Cmt = main street truck, Cv = Speed, Cp = Population)
- Vm1** = the main street volume - either the total of the two approaches or the highest single approach (if the median is >=10.0 metres) (averaged over 6 peak hours)
- Vm2** = the main street volume - either the total of the two approaches or the highest single approach (if the median is >=6.0 metres) (averaged over 6 peak hours)
- Vs** = the highest side street approach volume (averaged over 6 peak hours)
- \*\*\* note: it has been determined that Vs must be > 75 for signals to be considered \*\*\*
- F** = Pedestrian demographic factor - the maximum of the 3 individual pedestrian demographic factors
- Pc** = the total pedestrian volume crossing the mainstreet (averaged over 6 peak hours)
- L** = number of lanes that the pedestrians have to cross (only half the street if the median is >=5.0 metres)
- Kv** = Vehicle - Vehicle denominator constant (Kv = 1,100 if L <= 3, Kv = 1,400 if L > 3)
- Kp** = Vehicle - Pedestrian denominator constant (Kp = 2,000 if L <= 3, Kp = 5,000 if L > 3)



# Canadian Traffic Signal Warrant Analysis

## Main Street Side Street

MainStreet1Lanes (#) 1  
 MainStreet2Lanes (#) 1  
 MainStreet.LT.Lanes (#) 0  
 SideStreet1Lanes (#) 0  
 SideStreet2Lanes (#) 1  
 MainStreetSpeedLimit (km/h) 60  
 MainStreetTrucks/Buses (%) 30.0%  
 Refuge Width on Median (m) 0.0

| Thunder Raod                    |         |  |  |
|---------------------------------|---------|--|--|
| Site Access A                   |         |  |  |
| Distance to next signal (m)     | 100     |  |  |
| Elementary School (y/n)         | n       |  |  |
| Senior's Complex (y/n)          | n       |  |  |
| Pathway to School (y/n)         | n       |  |  |
| Metro Area Population (#)       | 994,837 |  |  |
| Side Street Bus Route (y/n)     | n       |  |  |
| Side Street Trucks (%)          | 40.0%   |  |  |
| T or 1-Way Intersection (y/n)   | y       |  |  |
| Central Business District (y/n) | n       |  |  |

Date: July 22, 2021

City: City of Ottawa

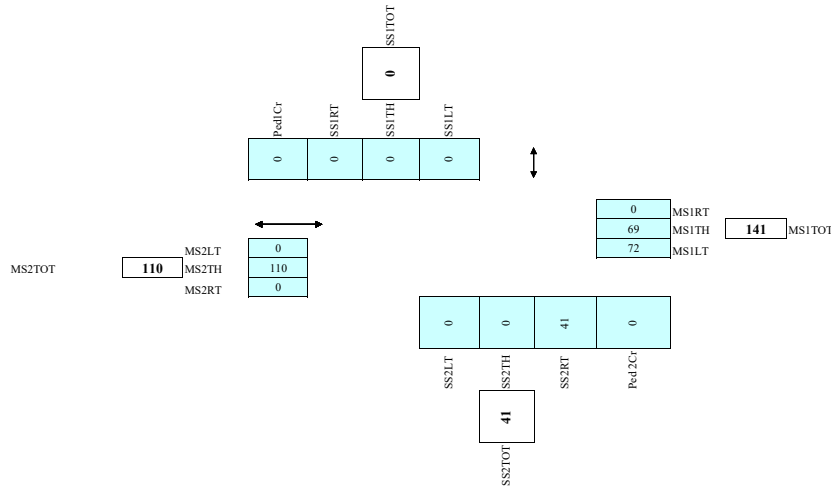
Vm = 251 (MainSt Vol Total)  
 Vs = 41 (SideSt Vol Highest)  
 Pc = 0 Peds Crossing Main  
 K1 = 1,100 veh/veh const  
 K2 = 2,000 veh/ped const  
 L = 2.0 TotalMainStLanes  
 F = 1.000 (PedDemoFactor)  
 Vm1 = 251 (MainStVeh-Veh#)  
 Cvp = 1.035 (product of Cs,Cmt,Cv,Cp)  
 Ct1 = 0.667 T Int / one way Factor

Cs = 0.900 (Int SpacingFactor)  
 Cmt = 1.150 (MainStTruckFactor)  
 Cv = 1.000 (SpeedFactor)  
 Cp = 1.000 (PopDemoFactor)  
 Csb = 1.000 (SideStBusFactor)  
 Cst = 1.050 (SideStTruckFactor)  
 Vmx = 141 (MainStHighest)  
 Vm2 = 251 (MainStVeh-Ped#)  
 Cbt = 1.050 (maximum of Csb,Cst)

|               | ←                 | →                 | ↓                 | ↑                 | PedC1 | PedC2 |
|---------------|-------------------|-------------------|-------------------|-------------------|-------|-------|
|               | MS1LT MS1TH MS1RT | MS2LT MS2TH MS2RT | SS1LT SS1TH SS1RT | SS2LT SS2TH SS2RT |       |       |
| 7:00 - 8:00   | 51 119 0          | 0 78 0            | 0 0 0             | 0 0 19            | 0     | 0     |
| 8:00 - 9:00   | 51 119 0          | 0 78 0            | 0 0 0             | 0 0 19            | 0     | 0     |
| 11:00 - 12:00 | 51 119 0          | 0 78 0            | 0 0 0             | 0 0 19            | 0     | 0     |
| 12:00 - 13:00 | 93 19 0           | 0 141 0           | 0 0 0             | 0 0 62            | 0     | 0     |
| 16:00 - 17:00 | 93 19 0           | 0 141 0           | 0 0 0             | 0 0 62            | 0     | 0     |
| 17:00 - 18:00 | 93 19 0           | 0 141 0           | 0 0 0             | 0 0 62            | 0     | 0     |
| Average       | 72 69 0           | 0 110 0           | 0 0 0             | 0 0 41            | 0     | 0     |

\*\*\* Enter the hourly turning movement counts averaged over the peak six hours of a typical week day

\*\*\* Enter the peak pedestrian volume crossing the main street averaged over the same hours



$$W = [Ct1xCbt(Vm1 \times Vs)/K1 + (F(Vm2 \times Pc)L)/K2] \times Cvp$$

$$W = 7 \quad 7 \quad 0$$

Not Warranted - Vs < 75

Veh Ped

| Roadway, Vehicle and Pedestrian Factors | Range             |          |      |          |
|---|-------------------|----------|------|----------|
|   | Min               | @        | Max  | @        |
| Cs = (Int SpacingFactor)                | 0.90              | <200 m   | 1.10 | isolated |
| Cmt = (MainStTruckFactor)               | 1.00              | <5%      | 1.15 | >20%     |
| Cv = (SpeedFactor)                      | 1.00              | <60 km/h | 1.10 | >80 km/h |
| Cp = (PopDemoFactor)                    | 1.00              | >250,000 | 1.20 | <10,000  |
| Csb = (SideStBusFactor)                 | 1.00              | no       | 1.05 | yes      |
| Cst = (SideStTruckFactor)               | 1.00              | <10%     | 1.05 | >10%     |
| F = (Ped DemoFactor)                    |                   |          |      |          |
| (max of)                                | Elementary School | 1.20     |      |          |
|   | Seniors Complex   | 1.10     |      |          |
|   | Path to School    | 1.10     |      |          |

### Explanation of Factors:

- Cbt = 1.05 if the side street either is a bus route, or has more than 10% trucks, otherwise = 1.00.
- (it is assumed that these two factors only affect the side street vehicles trying to cross the main street, not the pedestrians)
- Ci = the product of the other 4 geographic factors
- (Cs = intersection spacing, Cmt = main street truck, Cv = Speed, Cp = Population)
- Vm1 = the main street volume - either the total of the two approaches or the highest single approach (if the median is >=10.0 metres) (averaged over 6 peak hours)
- Vm2 = the main street volume - either the total of the two approaches or the highest single approach (if the median is >=6.0 metres) (averaged over 6 peak hours)
- Vs = the highest side street approach volume (averaged over 6 peak hours)
- \*\*\* note: it has been determined that Vs must be > 75 for signals to be considered \*\*\*
- F = Pedestrian demographic factor - the maximum of the 3 individual pedestrian demographic factors
- Pc = the total pedestrian volume crossing the mainstreet (averaged over 6 peak hours)
- L = number of lanes that the pedestrians have to cross (only half the street if the median is >=5.0 metres)
- Kv = Vehicle - Vehicle denominator constant (Kv = 1,100 if L <= 3, Kv = 1,400 if L > 3)
- Kp = Vehicle - Pedestrian denominator constant (Kp = 2,000 if L <= 3, Kp = 5,000 if L > 3)



# Canadian Traffic Signal Warrant Analysis

## Main Street Side Street

MainStreet1Lanes  
MainStreet2Lanes  
MainStreet.LT.Lanes  
SideStreet1Lanes  
SideStreet2Lanes  
MainStreetSpeedLimit  
MainStreetTrucks/Buses  
Refuge Width on Median

| Thunder Raod  |       |   |                                 |
|---------------|-------|---|---------------------------------|
| Site Access B |       |   |                                 |
| (#)           | 1     | ← | Distance to next signal (m)     |
| (#)           | 1     | → | Elementary School (y/n)         |
| (#)           | 0     | ↕ | Senior's Complex (y/n)          |
| (#)           | 0     | ↕ | Pathway to School (y/n)         |
| (#)           | 1     | ↑ | Metro Area Population (#)       |
| (km/h)        | 60    |   | Side Street Bus Route (y/n)     |
| (%)           | 30.0% |   | Side Street Trucks (%)          |
| (m)           | 0.0   |   | T or 1-Way Intersection (y/n)   |
|               |       |   | Central Business District (y/n) |

Date: July 22, 2021

City: City of Ottawa

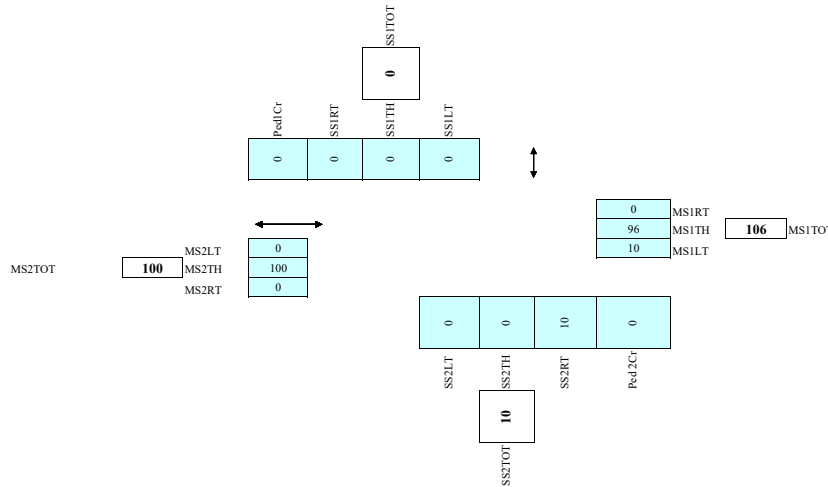
Vm = 206 (MainSt Vol Total)  
Vs = 10 (SideSt Vol Highest)  
Pc = 0 Peds Crossing Main  
K1 = 1,100 veh/veh const  
K2 = 2,000 veh/ped const  
L = 2.0 TotalMainStLanes  
F = 1.000 (PedDemoFactor)  
Vm1 = 206 (MainStVeh-Veh#)  
Cvp = 1.035 (product of Cs,Cmt,Cv,Cp)  
Ct1 = 0.667 T Int / one way Factor

Cs = 0.900 (Int SpacingFactor)  
Cmt = 1.150 (MainStTruckFactor)  
Cv = 1.000 (SpeedFactor)  
Cp = 1.000 (PopDemoFactor)  
Csb = 1.000 (SideStBusFactor)  
Cst = 1.050 (SideStTruckFactor)  
Vmx = 106 (MainStHighest)  
Vm2 = 206 (MainStVeh-Ped#)  
Cbt = 1.050 (maximum of Csb,Cst)

|               | MS1LT | MS1TH | MS1RT | MS2LT | MS2TH | MS2RT | SS1LT | SS1TH | SS1RT | SS2LT | SS2TH | SS2RT | PedC1 | PedC2 |
|---------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 7:00 - 8:00   | 15    | 104   | 0     | 0     | 74    | 0     | 0     | 0     | 0     | 0     | 0     | 4     | 0     | 0     |
| 8:00 - 9:00   | 15    | 104   | 0     | 0     | 74    | 0     | 0     | 0     | 0     | 0     | 0     | 4     | 0     | 0     |
| 11:00 - 12:00 | 15    | 104   | 0     | 0     | 74    | 0     | 0     | 0     | 0     | 0     | 0     | 4     | 0     | 0     |
| 12:00 - 13:00 | 5     | 88    | 0     | 0     | 126   | 0     | 0     | 0     | 0     | 0     | 0     | 15    | 0     | 0     |
| 16:00 - 17:00 | 5     | 88    | 0     | 0     | 126   | 0     | 0     | 0     | 0     | 0     | 0     | 15    | 0     | 0     |
| 17:00 - 18:00 | 5     | 88    | 0     | 0     | 126   | 0     | 0     | 0     | 0     | 0     | 0     | 15    | 0     | 0     |
| Average       | 10    | 96    | 0     | 0     | 100   | 0     | 0     | 0     | 0     | 0     | 0     | 10    | 0     | 0     |

\*\*\* Enter the hourly turning movement counts averaged over the peak six hours of a typical week day

\*\*\* Enter the peak pedestrian volume crossing the main street averaged over the same hours



$$W = [Ct1xCbt(Vm1 \times Vs)/K1 + (F(Vm2 \times Pc)L)/K2] \times Cvp$$

$$W = 1 \quad 1 \quad 0$$

Not Warranted - Vs < 75

Veh Ped

| Roadway, Vehicle and Pedestrian Factors | Range             |          |      |          |
|---|-------------------|----------|------|----------|
|   | Min               | @        | Max  | @        |
| Cs = (Int SpacingFactor)                | 0.90              | <200 m   | 1.10 | isolated |
| Cmt = (MainStTruckFactor)               | 1.00              | <5%      | 1.15 | >20%     |
| Cv = (SpeedFactor)                      | 1.00              | <60 km/h | 1.10 | >80 km/h |
| Cp = (PopDemoFactor)                    | 1.00              | >250,000 | 1.20 | <10,000  |
| Csb = (SideStBusFactor)                 | 1.00              | no       | 1.05 | yes      |
| Cst = (SideStTruckFactor)               | 1.00              | <10%     | 1.05 | >10%     |
| F = (Ped DemoFactor)                    |                   |          |      |          |
| (max of)                                | Elementary School | 1.20     |      |          |
|   | Seniors Complex   | 1.10     |      |          |
|   | Path to School    | 1.10     |      |          |

### Explanation of Factors:

- Cbt = 1.05 if the side street either is a bus route, or has more than 10% trucks, otherwise = 1.00.
- (it is assumed that these two factors only affect the side street vehicles trying to cross the main street, not the pedestrians)
- Ci = the product of the other 4 geographic factors
- (Cs = intersection spacing, Cmt = main street truck, Cv = Speed, Cp = Population)
- Vm1 = the main street volume - either the total of the two approaches or the highest single approach (if the median is >=10.0 metres) (averaged over 6 peak hours)
- Vm2 = the main street volume - either the total of the two approaches or the highest single approach (if the median is >=6.0 metres) (averaged over 6 peak hours)
- Vs = the highest side street approach volume (averaged over 6 peak hours)
- \*\*\* note: it has been determined that Vs must be > 75 for signals to be considered \*\*\*
- F = Pedestrian demographic factor - the maximum of the 3 individual pedestrian demographic factors
- Pc = the total pedestrian volume crossing the mainstreet (averaged over 6 peak hours)
- L = number of lanes that the pedestrians have to cross (only half the street if the median is >=5.0 metres)
- Kv = Vehicle - Vehicle denominator constant (Kv = 1,100 if L <= 3, Kv = 1,400 if L > 3)
- Kp = Vehicle - Pedestrian denominator constant (Kp = 2,000 if L <= 3, Kp = 5,000 if L > 3)





# Canadian Traffic Signal Warrant Analysis

## Main Street Side Street

MainStreet1Lanes (#) 1  
 MainStreet2Lanes (#) 1  
 MainStreet.LT.Lanes (#) 0  
 SideStreet1Lanes (#) 0  
 SideStreet2Lanes (#) 1  
 MainStreetSpeedLimit (km/h) 60  
 MainStreetTrucks/Buses (%) 30.0%  
 Refuge Width on Median (m) 0.0

| Thunder Raod |       | Site Access C                   |         |
|--------------|-------|---------------------------------|---------|
| (#)          | 1     | Distance to next signal (m)     | 100     |
| (#)          | 1     | Elementary School (y/n)         | n       |
| (#)          | 0     | Senior's Complex (y/n)          | n       |
| (#)          | 0     | Pathway to School (y/n)         | n       |
| (#)          | 1     | Metro Area Population (#)       | 994,837 |
| (km/h)       | 60    | Side Street Bus Route (y/n)     | n       |
| (%)          | 30.0% | Side Street Trucks (%)          | 40.0%   |
| (m)          | 0.0   | T or 1-Way Intersection (y/n)   | y       |
|              |       | Central Business District (y/n) | n       |

Date: July 22, 2021

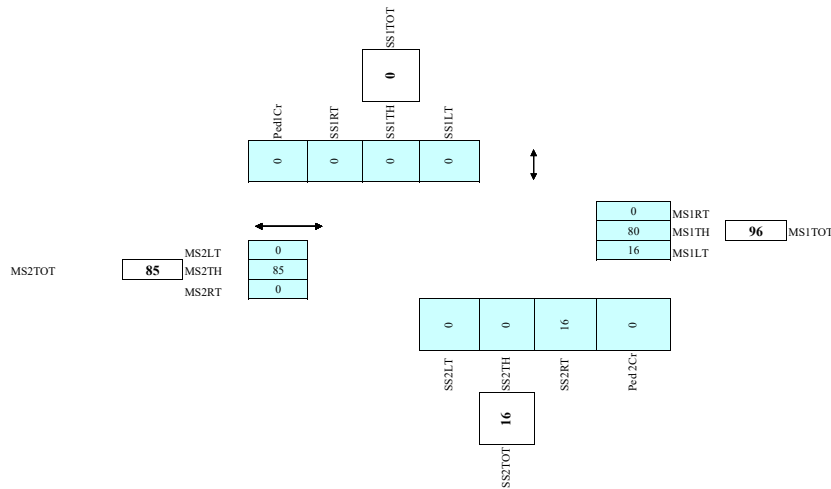
City: City of Ottawa

Vm = 181 (MainSt Vol Total) Cs = 0.900 (Int SpacingFactor)  
 Vs = 16 (SideSt Vol Highest) Cmt = 1.150 (MainStTruckFactor)  
 Pc = 0 Peds Crossing Main Cv = 1.000 (SpeedFactor)  
 K1 = 1,100 veh/veh const Cp = 1.000 (PopDemoFactor)  
 K2 = 2,000 veh/ped const Csb = 1.000 (SideStBusFactor)  
 L = 2.0 TotalMainStLanes Cst = 1.050 (SideStTruckFactor)  
 F = 1.000 (PedDemoFactor) Vmx = 96 (MainStHighest)  
 Vm1 = 181 (MainStVeh-Veh#) Vm2 = 181 (MainStVeh-Ped#)  
 Cvp = 1.035 (product of Cs,Cmt,Cv,Cp) Cbt = 1.050 (maximum of Csb,Cst)  
 Ct1 = 0.667 T Int / one way Factor

|               | MS1LT | MS1TH | MS1RT | MS2LT | MS2TH | MS2RT | SS1LT | SS1TH | SS1RT | SS2LT | SS2TH | SS2RT | PedC1 | PedC2 |
|---------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 7:00 - 8:00   | 23    | 81    | 0     | 0     | 67    | 0     | 0     | 0     | 0     | 0     | 0     | 7     | 0     | 0     |
| 8:00 - 9:00   | 23    | 81    | 0     | 0     | 67    | 0     | 0     | 0     | 0     | 0     | 0     | 7     | 0     | 0     |
| 11:00 - 12:00 | 23    | 81    | 0     | 0     | 67    | 0     | 0     | 0     | 0     | 0     | 0     | 7     | 0     | 0     |
| 12:00 - 13:00 | 9     | 79    | 0     | 0     | 102   | 0     | 0     | 0     | 0     | 0     | 0     | 24    | 0     | 0     |
| 16:00 - 17:00 | 9     | 79    | 0     | 0     | 102   | 0     | 0     | 0     | 0     | 0     | 0     | 24    | 0     | 0     |
| 17:00 - 18:00 | 9     | 79    | 0     | 0     | 102   | 0     | 0     | 0     | 0     | 0     | 0     | 24    | 0     | 0     |
| Average       | 16    | 80    | 0     | 0     | 85    | 0     | 0     | 0     | 0     | 0     | 0     | 16    | 0     | 0     |

\*\*\* Enter the hourly turning movement counts averaged over the peak six hours of a typical week day

\*\*\* Enter the peak pedestrian volume crossing the main street averaged over the same hours



$$W = [Ct1xCbt(Vm1 \times Vs)/K1 + (F(Vm2 \times Pe)L)/K2] \times Cvp$$

$$W = 2 \quad 2 \quad 0$$

Not Warranted - Vs < 75

Veh Ped

| Roadway, Vehicle and Pedestrian Factors | Range             |          |      |          |
|---|-------------------|----------|------|----------|
|   | Min               | @        | Max  | @        |
| Cs = (Int SpacingFactor)                | 0.90              | <200 m   | 1.10 | isolated |
| Cmt = (MainStTruckFactor)               | 1.00              | <5%      | 1.15 | >20%     |
| Cv = (SpeedFactor)                      | 1.00              | <60 km/h | 1.10 | >80 km/h |
| Cp = (PopDemoFactor)                    | 1.00              | >250,000 | 1.20 | <10,000  |
| Csb = (SideStBusFactor)                 | 1.00              | no       | 1.05 | yes      |
| Cst = (SideStTruckFactor)               | 1.00              | <10%     | 1.05 | >10%     |
| F = (Ped DemoFactor)                    |                   |          |      |          |
| (max of)                                | Elementary School | 1.20     |      |          |
|   | Seniors Complex   | 1.10     |      |          |
|   | Path to School    | 1.10     |      |          |

### Explanation of Factors:

- Cbt = 1.05 if the side street either is a bus route, or has more than 10% trucks, otherwise = 1.00.
- (it is assumed that these two factors only affect the side street vehicles trying to cross the main street, not the pedestrians)
- Ci = the product of the other 4 geographic factors
- (Cs = intersection spacing, Cmt = main street truck, Cv = Speed, Cp = Population)
- Vm1 = the main street volume - either the total of the two approaches or the highest single approach (if the median is >=10.0 metres) (averaged over 6 peak hours)
- Vm2 = the main street volume - either the total of the two approaches or the highest single approach (if the median is >=6.0 metres) (averaged over 6 peak hours)
- Vs = the highest side street approach volume (averaged over 6 peak hours)
- \*\*\* note: it has been determined that Vs must be > 75 for signals to be considered \*\*\*
- F = Pedestrian demographic factor - the maximum of the 3 individual pedestrian demographic factors
- Pe = the total pedestrian volume crossing the mainstreet (averaged over 6 peak hours)
- L = number of lanes that the pedestrians have to cross (only half the street if the median is >=5.0 metres)
- Kv = Vehicle - Vehicle denominator constant (Kv = 1,100 if L <= 3, Kv = 1,400 if L > 3)
- Kp = Vehicle - Pedestrian denominator constant (Kp = 2,000 if L <= 3, Kp = 5,000 if L > 3)



# Canadian Traffic Signal Warrant Analysis

## Main Street Side Street

MainStreet1Lanes (#) 1  
 MainStreet2Lanes (#) 1  
 MainStreet.LT.Lanes (#) 0  
 SideStreet1Lanes (#) 1  
 SideStreet2Lanes (#) 0  
 MainStreetSpeedLimit (km/h) 80  
 MainStreetTrucks/Buses (%) 40.0%  
 Refuge Width on Median (m) 0.0

| Thunder Road                    |         |  |  |
|---------------------------------|---------|--|--|
| Mitchel Owens                   |         |  |  |
| Distance to next signal (m)     | 1,000   |  |  |
| Elementary School (y/n)         | n       |  |  |
| Senior's Complex (y/n)          | n       |  |  |
| Pathway to School (y/n)         | n       |  |  |
| Metro Area Population (#)       | 994,837 |  |  |
| Side Street Bus Route (y/n)     | n       |  |  |
| Side Street Trucks (%)          | 25.0%   |  |  |
| T or 1-Way Intersection (y/n)   | y       |  |  |
| Central Business District (y/n) | n       |  |  |

Date: July 22, 2021

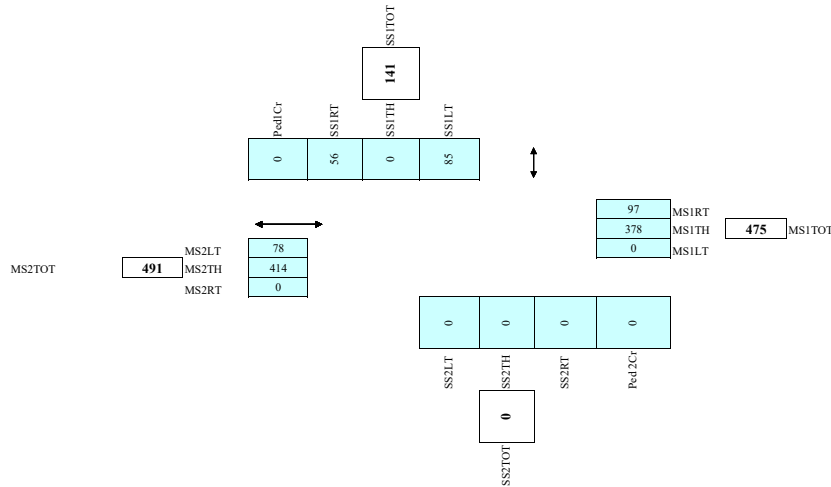
City: City of Ottawa

Vm = 966 (MainSt Vol Total) Cs = 1.041 (Int SpacingFactor)  
 Vs = 141 (SideSt Vol Highest) Cmt = 1.150 (MainStTruckFactor)  
 Pc = 0 Peds Crossing Main Cv = 1.100 (SpeedFactor)  
 K1 = 1,100 veh/veh const Cp = 1.000 (PopDemoFactor)  
 K2 = 2,000 veh/ped const Csb = 1.000 (SideStBusFactor)  
 L = 2.0 TotalMainStLanes Cst = 1.050 (SideStTruckFactor)  
 F = 1.000 (PedDemoFactor) Vmx = 491 (MainStHighest)  
 Vm1 = 966 (MainStVeh-Veh#) Vm2 = 966 (MainStVeh-Ped#)  
 Cvp = 1.316 (product of Cs,Cmt,Cv,Cp) Cbt = 1.050 (maximum of Csb,Cst)  
 Ct1 = 0.667 T Int / one way Factor

|               | ←                 | →                 | ↓                 | ↑                 | PedC1 | PedC2 |
|---------------|-------------------|-------------------|-------------------|-------------------|-------|-------|
|               | MS1LT MS1TH MS1RT | MS2LT MS2TH MS2RT | SS1LT SS1TH SS1RT | SS2LT SS2TH SS2RT |       |       |
| 7:00 - 8:00   | 0 158 131         | 163 1073 0        | 100 0 36          | 0 0 0             | 0     | 0     |
| 8:00 - 9:00   | 0 283 73          | 58 310 0          | 64 0 42           | 0 0 0             | 0     | 0     |
| 11:00 - 12:00 | 0 283 73          | 58 310 0          | 64 0 42           | 0 0 0             | 0     | 0     |
| 12:00 - 13:00 | 0 283 73          | 58 310 0          | 64 0 42           | 0 0 0             | 0     | 0     |
| 16:00 - 17:00 | 0 283 73          | 58 310 0          | 64 0 42           | 0 0 0             | 0     | 0     |
| 17:00 - 18:00 | 0 975 160         | 70 168 0          | 156 0 132         | 0 0 0             | 0     | 0     |
| Average       | 0 378 97          | 78 414 0          | 85 0 56           | 0 0 0             | 0     | 0     |

\*\*\* Enter the hourly turning movement counts averaged over the peak six hours of a typical week day

\*\*\* Enter the peak pedestrian volume crossing the main street averaged over the same hours



$$W = [Ct1xCbt(Vm1 \times Vs)/K1 + (F(Vm2 \times Pe)L)/K2] \times Cvp$$

W = 114 Warranted Veh Ped

| Roadway, Vehicle and Pedestrian Factors | Range             |          |      |          |
|---|-------------------|----------|------|----------|
|   | Min               | @        | Max  | @        |
| Cs = (Int SpacingFactor)                | 0.90              | <200 m   | 1.10 | isolated |
| Cmt = (MainStTruckFactor)               | 1.00              | <5%      | 1.15 | >20%     |
| Cv = (SpeedFactor)                      | 1.00              | <60 km/h | 1.10 | >80 km/h |
| Cp = (PopDemoFactor)                    | 1.00              | >250,000 | 1.20 | <10,000  |
| Csb = (SideStBusFactor)                 | 1.00              | no       | 1.05 | yes      |
| Cst = (SideStTruckFactor)               | 1.00              | <10%     | 1.05 | >10%     |
| F = (Ped DemoFactor)                    |                   |          |      |          |
| (max of)                                |                   |          |      |          |
|   | Elementary School | 1.20     |      |          |
|   | Seniors Complex   | 1.10     |      |          |
|   | Path to School    | 1.10     |      |          |

### Explanation of Factors:

- Cbt = 1.05 if the side street either is a bus route, or has more than 10% trucks, otherwise = 1.00. (it is assumed that these two factors only affect the side street vehicles trying to cross the main street, not the pedestrians)
- Ci = the product of the other 4 geographic factors (Cs = intersection spacing, Cmt = main street truck, Cv = Speed, Cp = Population)
- Vm1 = the main street volume - either the total of the two approaches or the highest single approach (if the median is >=10.0 metres) (averaged over 6 peak hours)
- Vm2 = the main street volume - either the total of the two approaches or the highest single approach (if the median is >=6.0 metres) (averaged over 6 peak hours)
- Vs = the highest side street approach volume (averaged over 6 peak hours)
- \*\*\* note: it has been determined that Vs must be > 75 for signals to be considered \*\*\*
- F = Pedestrian demographic factor - the maximum of the 3 individual pedestrian demographic factors
- Pc = the total pedestrian volume crossing the mainstreet (averaged over 6 peak hours)
- L = number of lanes that the pedestrians have to cross (only half the street if the median is >=5.0 metres)
- Kv = Vehicle - Vehicle denominator constant (Kv = 1,100 if L<=3, Kv = 1,400 if L >3)
- Kp = Vehicle - Pedestrian denominator constant (Kp = 2,000 if L<=3, Kp = 5,000 if L >3)



# Canadian Traffic Signal Warrant Analysis

## Main Street Side Street

|                        |        |       |
|------------------------|--------|-------|
| MainStreet1Lanes       | (#)    | 1     |
| MainStreet2Lanes       | (#)    | 1     |
| MainStreetLT Lanes     | (#)    | 0     |
| SideStreet1Lanes       | (#)    | 0     |
| SideStreet2Lanes       | (#)    | 1     |
| MainStreetSpeedLimit   | (km/h) | 80    |
| MainStreetTrucks/Buses | (%)    | 13.0% |
| Refuge Width on Median | (m)    | 0.0   |

| Thunder Road              |       |         |  |
|---------------------------|-------|---------|--|
| Highway 417 WB Ramp       |       |         |  |
| Distance to next signal   | (m)   | 550     |  |
| Elementary School         | (y/n) | n       |  |
| Senior's Complex          | (y/n) | n       |  |
| Pathway to School         | (y/n) | n       |  |
| Metro Area Population     | (#)   | 994,837 |  |
| Side Street Bus Route     | (y/n) | n       |  |
| Side Street Trucks        | (%)   | 20.0%   |  |
| T or 1-Way Intersection   | (y/n) | y       |  |
| Central Business District | (y/n) | n       |  |

Date: September 17, 2021

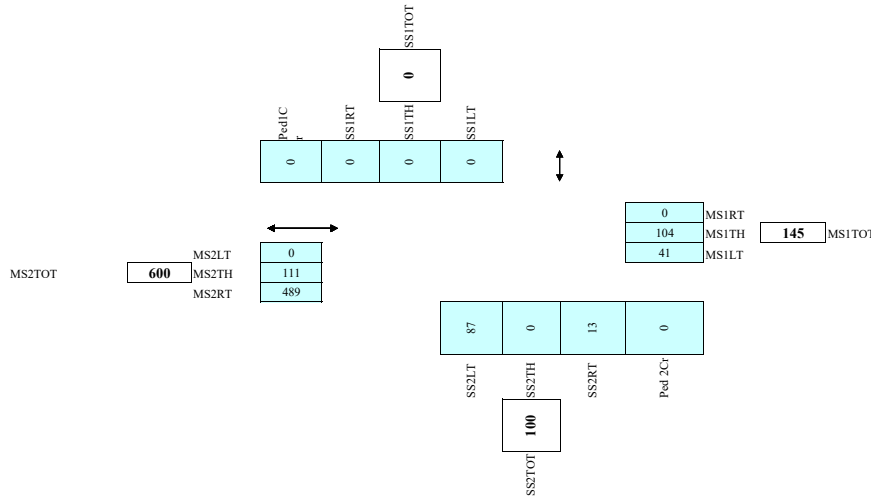
City: City of Ottawa

|       |                                 |       |                            |
|-------|---------------------------------|-------|----------------------------|
| Vm =  | 745 (MainSt Vol Total)          | Cs =  | 1.005 (Int SpacingFactor)  |
| Vs =  | 100 (SideSt Vol Highest)        | Cmt = | 1.080 (MainStTruckFactor)  |
| Pc =  | 0 Peds Crossing Main            | Cv =  | 1.100 (SpeedFactor)        |
| K1 =  | 1,100 veh/veh const             | Cp =  | 1.000 (PopDemoFactor)      |
| K2 =  | 2,000 veh/ped const             | Csb = | 1.000 (SideStBusFactor)    |
| L =   | 2.0 TotalMainStLanes            | Cst = | 1.050 (SideStTruckFactor)  |
| F =   | 1.000 (PedDemoFactor)           | Vmx = | 600 (MainStHighest)        |
| Vm1 = | 745 (MainStVeh-Veh#)            | Vm2 = | 745 (MainStVeh-Ped#)       |
| Cvp = | 1.194 (product of Cs,Cmt,Cv,Cp) | Cbt = | 1.050 (maximum of Csb,Cst) |
| Ct1 = | 0.667 T Int / one way Factor    |       |                            |

|               | ←     |       |       | →     |       |       | ↓     |       |       | ↑     |       |       | PedC1 | PedC2 |
|---------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|               | MS1LT | MS1TH | MS1RT | MS2LT | MS2TH | MS2RT | SS1LT | SS1TH | SS1RT | SS2LT | SS2TH | SS2RT |       |       |
| 7:00 - 8:00   | 94    | 156   | 0     | 0     | 124   | 1059  | 0     | 0     | 0     | 189   | 0     | 38    | 0     | 0     |
| 8:00 - 9:00   | 31    | 78    | 0     | 0     | 83    | 367   | 0     | 0     | 0     | 65    | 0     | 10    | 0     | 0     |
| 11:00 - 12:00 | 31    | 78    | 0     | 0     | 83    | 367   | 0     | 0     | 0     | 65    | 0     | 10    | 0     | 0     |
| 12:00 - 13:00 | 31    | 78    | 0     | 0     | 83    | 367   | 0     | 0     | 0     | 65    | 0     | 10    | 0     | 0     |
| 16:00 - 17:00 | 31    | 78    | 0     | 0     | 83    | 367   | 0     | 0     | 0     | 65    | 0     | 10    | 0     | 0     |
| 17:00 - 18:00 | 30    | 154   | 0     | 0     | 208   | 409   | 0     | 0     | 0     | 71    | 0     | 1     | 0     | 0     |
| Average       | 41    | 104   | 0     | 0     | 111   | 489   | 0     | 0     | 0     | 87    | 0     | 13    | 0     | 0     |

\*\*\* Enter the hourly turning movement counts averaged over the peak six hours of a typical week day

\*\*\* Enter the peak pedestrian volume crossing the main street averaged over the same hours



$$W = [Ct1xCbt(Vm1 \times Vs)/K1 + (F(Vm2 \times PcL)/K2)] \times Cvp$$

$$W = 57 \quad 57 \quad 0$$

**NOT Warranted** Veh Ped

| Roadway, Vehicle and Pedestrian Factors | Range             |          |      |          |
|---|-------------------|----------|------|----------|
|   | Min               | @        | Max  | @        |
| Cs = (Int SpacingFactor)                | 0.90              | <200 m   | 1.10 | isolated |
| Cmt = (MainStTruckFactor)               | 1.00              | <5%      | 1.15 | >20%     |
| Cv = (SpeedFactor)                      | 1.00              | <60 km/h | 1.10 | >80 km/h |
| Cp = (PopDemoFactor)                    | 1.00              | >250,000 | 1.20 | <10,000  |
| Csb = (SideStBusFactor)                 | 1.00              | no       | 1.05 | yes      |
| Cst = (SideStTruckFactor)               | 1.00              | <10%     | 1.05 | >10%     |
| F = (Ped DemoFactor)                    |                   |          |      |          |
| (max of )                               |                   |          |      |          |
|   | Elementary School | 1.20     |      |          |
|   | Seniors Complex   | 1.10     |      |          |
|   | Path to School    | 1.10     |      |          |

### Explanation of Factors:

- Cbt** = 1.05 if the side street either is a bus route, or has more than 10% trucks, otherwise = 1.00. (it is assumed that these two factors only affect the side street vehicles trying to cross the main street, not the pedestrians)
- Ci** = the product of the other 4 geographic factors (Cs = intersection spacing, Cmt = main street truck, Cv = Speed, Cp = Population)
- Vm1** = the main street volume - either the total of the two approaches or the highest single approach (if the median is >=10.0 metres) (averaged over 6 peak hours)
- Vm2** = the main street volume - either the total of the two approaches or the highest single approach (if the median is >=6.0 metres) (averaged over 6 peak hours)
- Vs** = the highest side street approach volume (averaged over 6 peak hours)
- \*\*\* note: it has been determined that Vs must be > 75 for signals to be considered \*\*\*
- F** = Pedestrian demographic factor - the maximum of the 3 individual pedestrian demographic factors
- Pc** = the total pedestrian volume crossing the mainstreet (averaged over 6 peak hours)
- L** = number of lanes that the pedestrians have to cross (only half the street if the median is >=5.0 metres)
- Kv** = Vehicle - Vehicle denominator constant (Kv = 1,100 if L<=3, Kv = 1,400 if L >3)
- Kp** = Vehicle - Pedestrian denominator constant (Kp = 2,000 if L<=3, Kp = 5,000 if L >3)

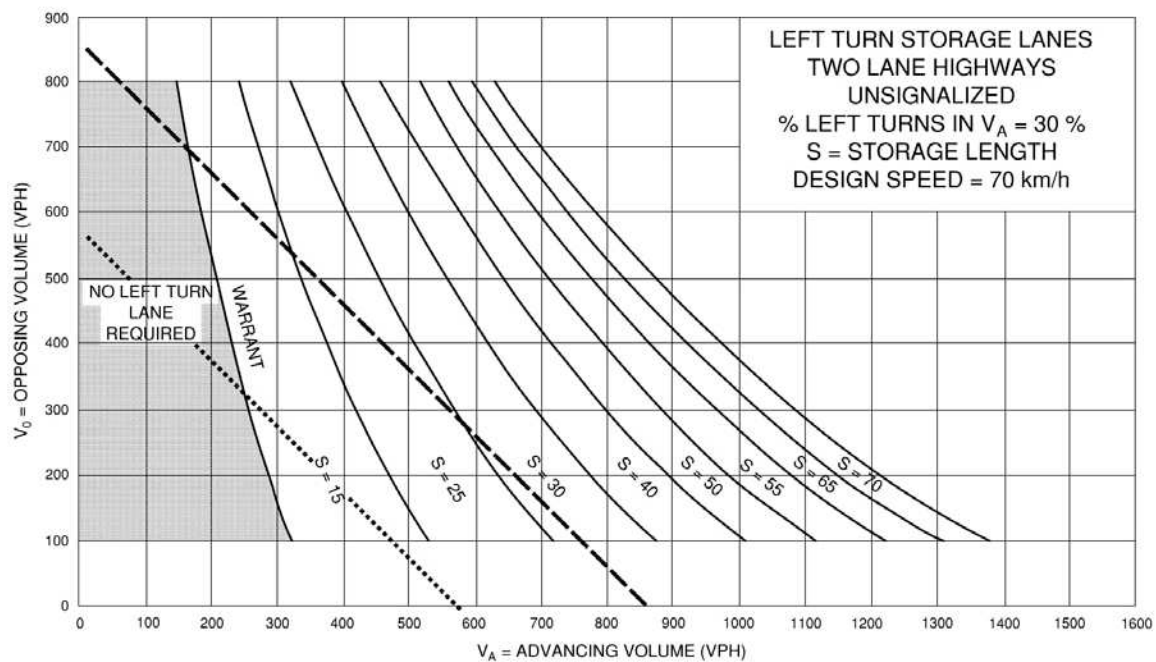
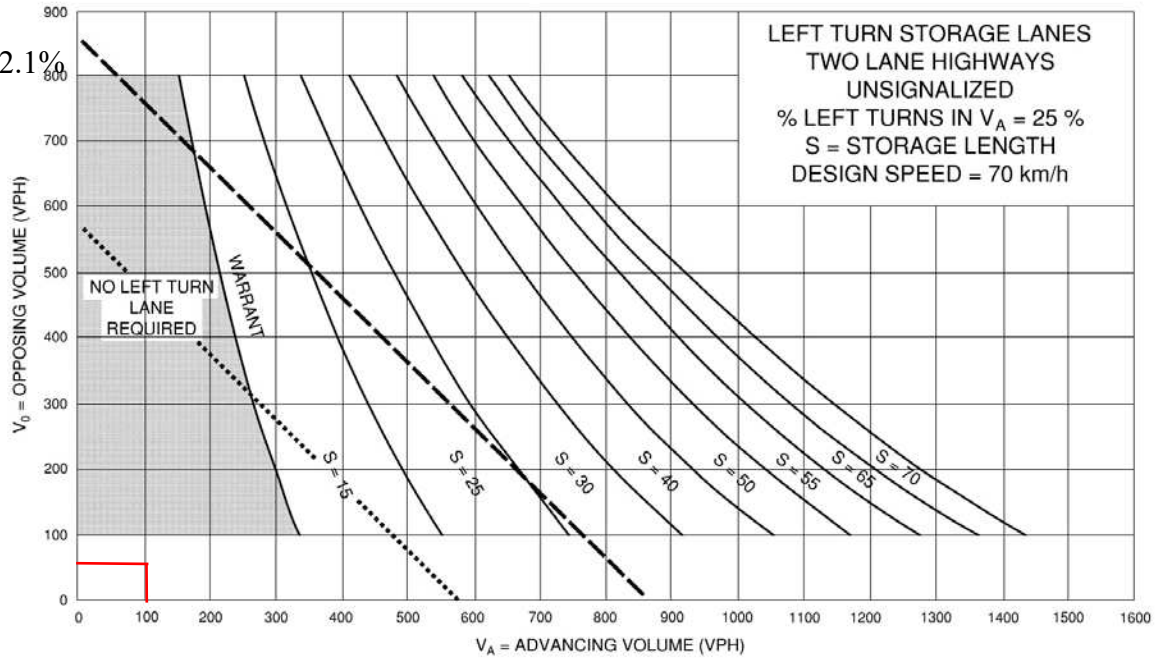
# APPENDIX K

## Left-Turn Lane Warrant Analysis Worksheets

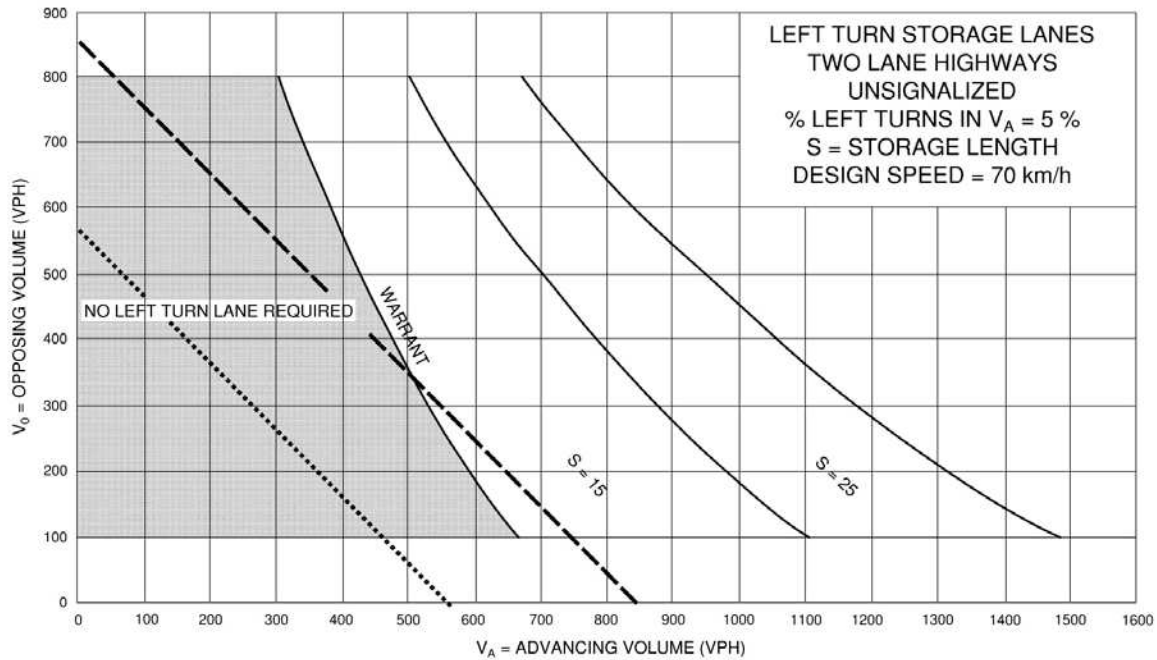
AM PEAK - Site Access C:

**Exhibit 9A-13**

VA = 104 veh/hr  
 VL = 23 veh/hr  
 % LT in VA = 22.1%  
 VO = 67 veh/hr  
 REQ = 0 metres



**Exhibit 9A-11**



**PM PEAK - Site Access C:**

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

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

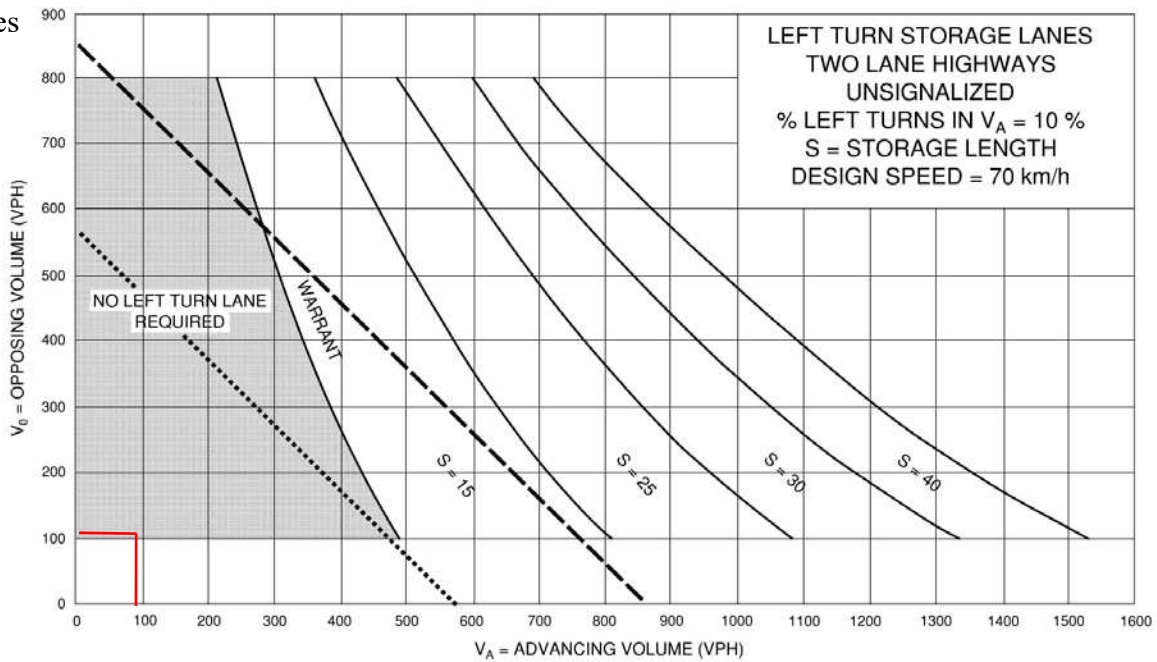
$V_A = 88$  veh/hr

$V_L = 9$  veh/hr

% LT in  $V_A = 10.23\%$

$V_O = 102$  veh/hr

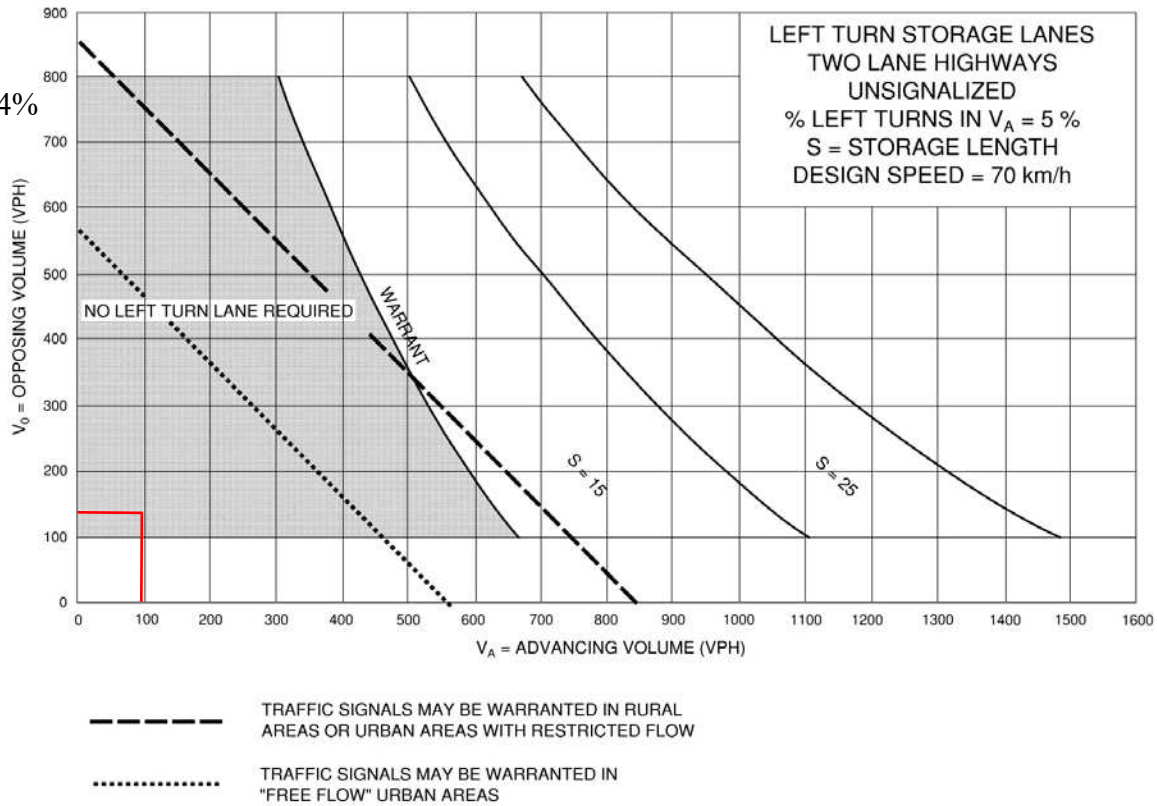
REQ = 0 metres



PM PEAK - Site Access B:

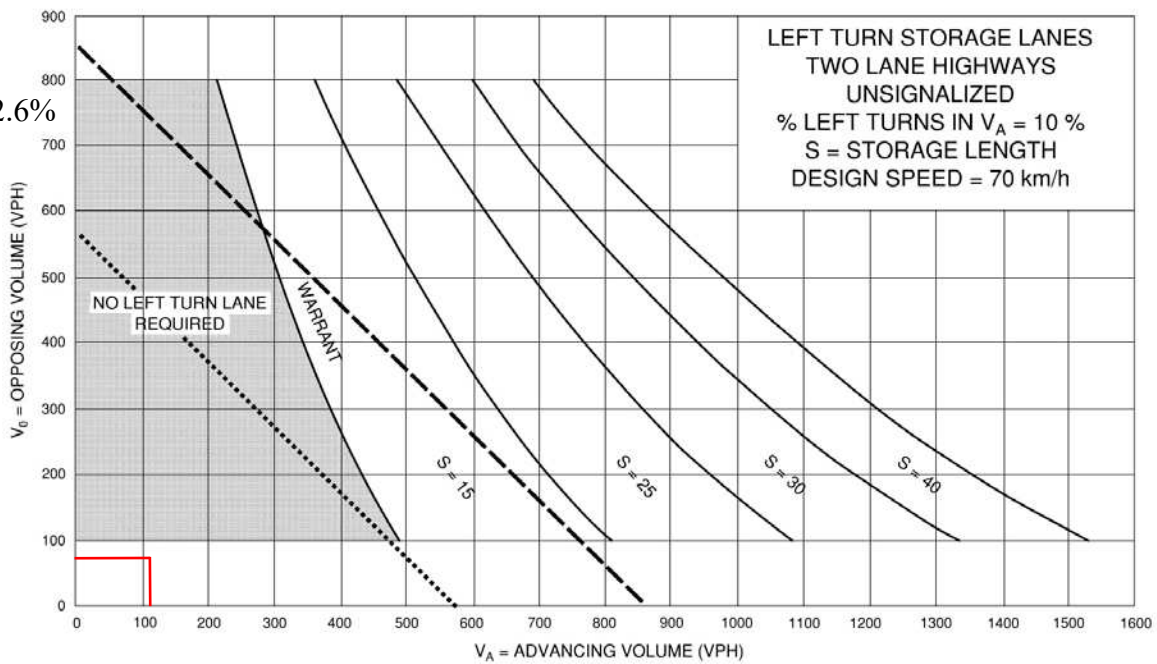
**Exhibit 9A-11**

VA = 93 veh/hr  
 VL = 5 veh/hr  
 % LT in VA = 5.4%  
 VO = 126 veh/hr  
 REQ = 0 metres

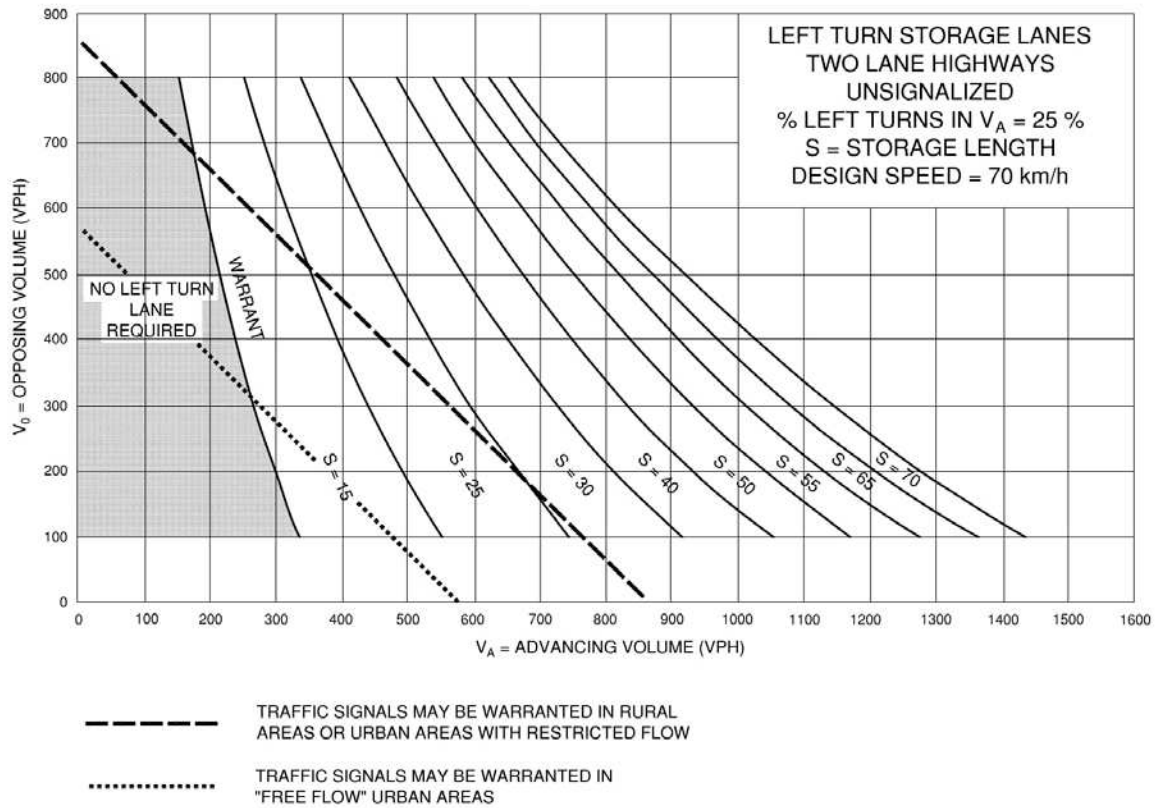


AM PEAK - Site Access B:

VA = 119 veh/hr  
 VL = 159 veh/hr  
 % LT in VA = 12.6%  
 VO = 74 veh/hr  
 REQ = 0 metres

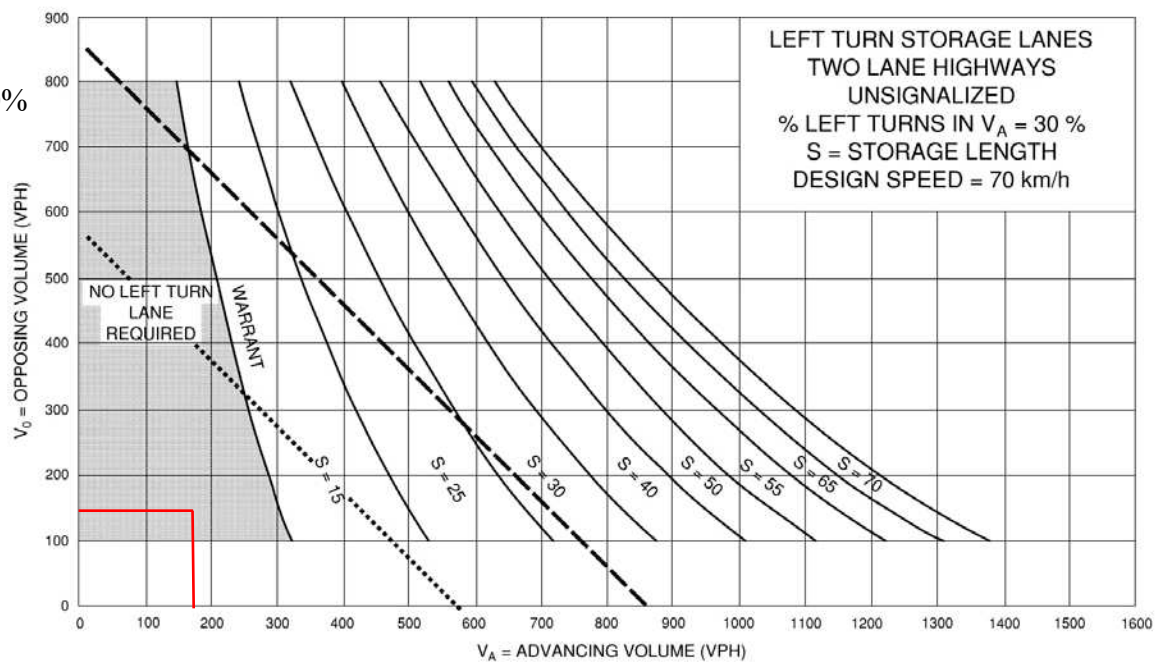


**Exhibit 9A-13**



AM PEAK - Site Access A:

$V_A = 170$  veh/hr  
 $V_L = 51$  veh/hr  
 % LT in  $V_A = 30\%$   
 $V_O = 141$  veh/hr  
 $REQ = 0$  metres

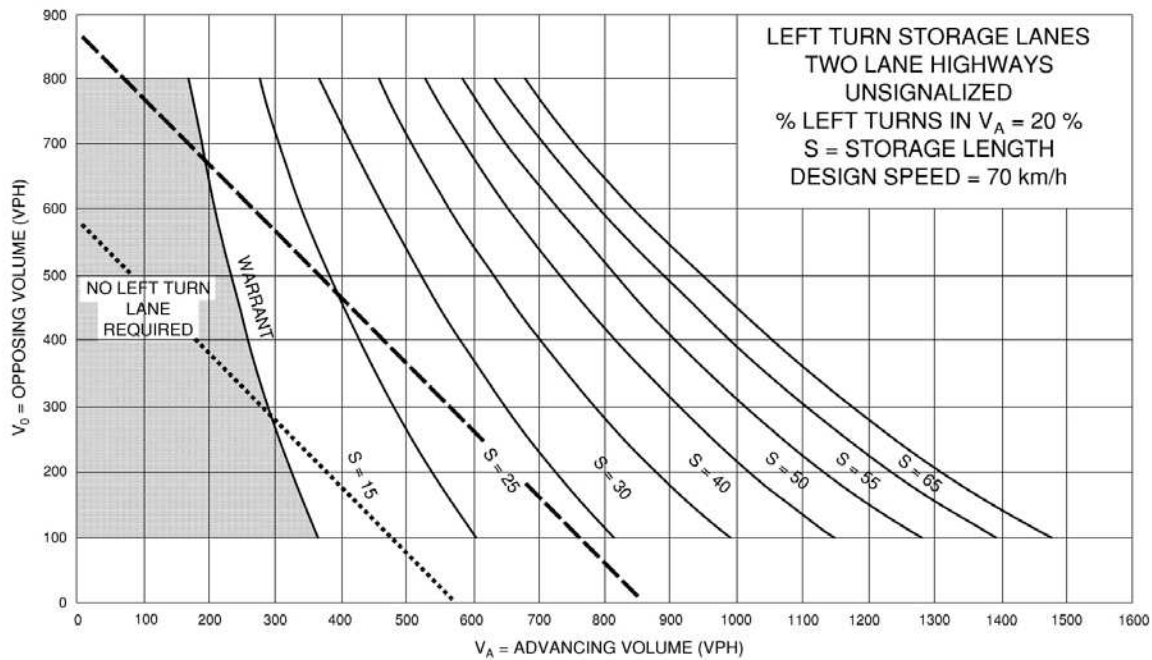
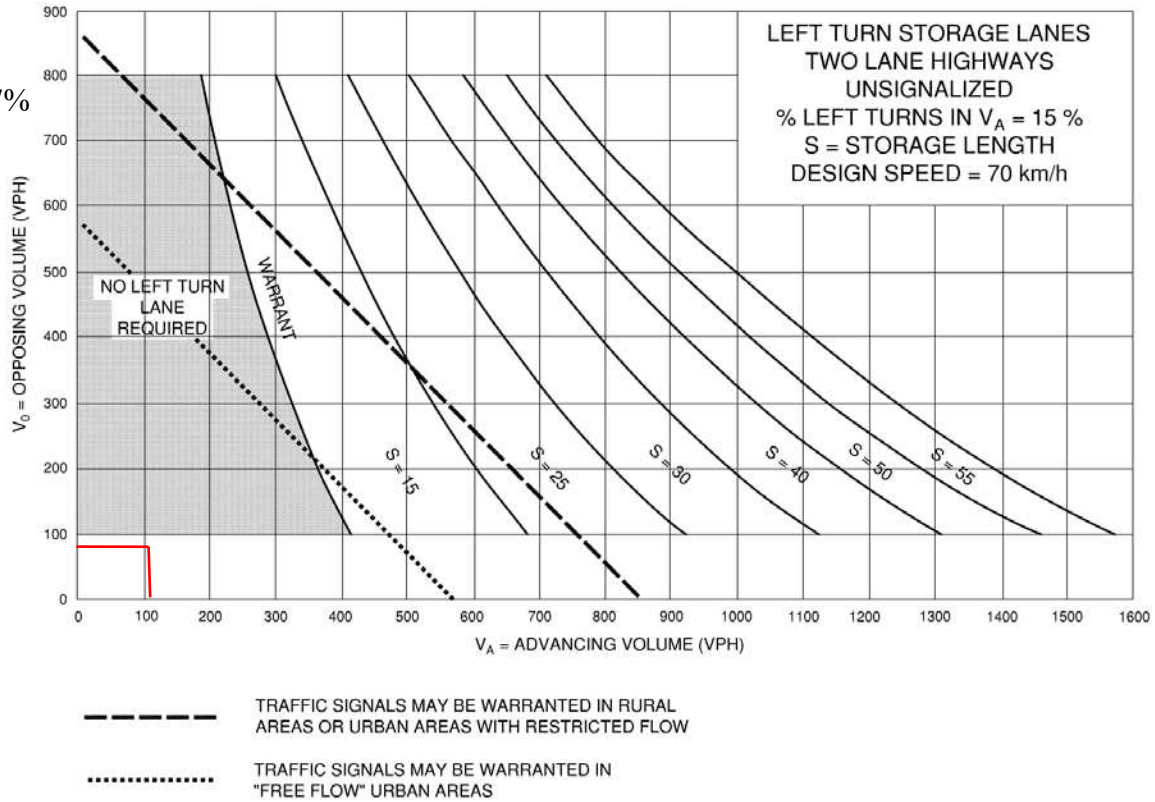




PM PEAK - Site Access A:

**Exhibit 9A-12**

VA = 112 veh/hr  
 VL = 19 veh/hr  
 % LT in VA = 17%  
 VO = 78 veh/hr  
 REQ = 0 metres



# APPENDIX L

## Level of Service Definitions

DRAFT REPORT

# Multi-Modal Level of Service (MMLoS) Guidelines

---

Supplement to the TIA Guidelines



Prepared for City of Ottawa  
by IBI Group  
September 15, 2015

## 6 Vehicular Level of Service (LOS)

The following details outlining the evaluation of Vehicular Level of Service are extracted from the 2009 Transportation Impact Assessment Guidelines. As the TIA update is carried out, these parameters may be updated.

### 6.1 Intersection Capacity Analysis

An evaluation is required of any critical intersection within the study area that will potentially be affected by site generated traffic volumes during any or all of the relevant time periods and scenarios. Summaries are to be provided in tabular format clearly identifying intersection performance under existing and future traffic conditions. Where development is anticipated to proceed in phases or stages, projected performance for all intersections must be documented for the end of each phase.

Detailed output from analysis software is to be provided in an appendix to the report and copies of the electronic files should be provided on CD. Appendix B outlines parameters to be used in operational analysis of signalized intersections.

All volume to capacity (V/C) calculations relating to future conditions should be determined using signal timing optimized for the volume conditions being studied. The V/C ratio for an intersection is defined as the sum of equivalent volumes for all critical movements divided by the sum of capacities for all critical movements assuming that the V/C ratios for critical movements can be equalized. In cases where minimum pedestrian phase times prevent equalizing the level of service for critical movements, then the V/C ratio for the most heavily saturated critical movement should be considered as the V/C ratio for the intersection. Adjustment for the impact of pedestrian activated control is permitted provided detailed supporting analysis including projected pedestrian volumes is provided and discussed in advance with traffic engineering staff.

In the case of planning level or functional design projects, practitioners should undertake a two and a half hour peak period observation of volumes (typically 6:30 – 9:00 AM) to verify that the traffic volumes through the intersections reflect existing demands and to identify unusual operating conditions. For operational studies, peak hour observations are acceptable. Timing of observations and conditions observed should be documented in writing in the report.

| LEVEL OF SERVICE | VOLUME TO CAPACITY RATIO |
|------------------|--------------------------|
| A                | 0 to 0.60                |
| B                | 0.61 to 0.70             |
| C                | 0.71 to 0.80             |
| D                | 0.81 to 0.90             |
| E                | 0.91 to 1.00             |
| F                | > 1.00                   |

Intersection evaluations should identify:

- Signalized Intersections – V/C ratios for the overall intersection, as defined above, and individual movements; and
- Unsignalized Intersections - Level of service (LOS) where the LOS is between A and E; V/C where capacity is based on gap analysis if intersection LOS is F.

Existing signal timing information such as phasing, pedestrian minimums and clearance intervals must be used as a base to analyze the existing capacity of signalized intersections. This signal timing data should be obtained from the City of Ottawa Traffic Operations Division. Operational design of the signals analyzed should be in accordance with City of Ottawa signal operation practices.

## Level of Service Definitions

### Two-Way Stop Controlled Intersections

| <b>Level of Service</b> | <b>Control Delay per Vehicle (seconds)</b> | <b>Interpretation</b>   |
|-------------------------|--|---|
| A                       | $\leq 10$                                  | EXCELLENT. Large and frequent gaps in traffic on the main roadway. Queuing on the minor street is rare.                           |
| B                       | $> 10$ and $\leq 15$                       | VERY GOOD. Many gaps exist in traffic on the main roadway. Queuing on the minor street is minimal.                                |
| C                       | $> 15$ and $\leq 25$                       | GOOD. Fewer gaps exist in traffic on the main roadway. Delay on minor approach becomes more noticeable.                           |
| D                       | $> 25$ and $\leq 35$                       | FAIR. Infrequent and shorter gaps in traffic on the main roadway. Queue lengths develop on the minor street.                      |
| E                       | $> 35$ and $\leq 50$                       | POOR. Very infrequent gaps in traffic on the main roadway. Queue lengths become noticeable.                                       |
| F                       | $> 50$                                     | UNSATISFACTORY. Very few gaps in traffic on the main roadway. Excessive delay with significant queue lengths on the minor street. |

Adapted from Highway Capacity Manual 2000, Transportation Research Board

## Level of Service Definitions

### Signalized Intersections

| <b>Level of Service</b> | <b>Control Delay per Vehicle (seconds)</b> | <b>Interpretation</b>  |
|-------------------------|--|--|
| A                       | $\leq 10$                                  | EXCELLENT. Extremely favourable progression with most vehicles arriving during the green phase. Most vehicles do not stop and short cycle lengths may contribute to low delay.                             |
| B                       | $> 10$ and $\leq 20$                       | VERY GOOD. Very good progression and/or short cycle lengths with slightly more vehicles stopping than LOS "A" causing slightly higher levels of average delay.   |
| C                       | $> 20$ and $\leq 35$                       | GOOD. Fair progression and longer cycle lengths lead to a greater number of vehicles stopping than LOS "B".  |
| D                       | $> 35$ and $\leq 55$                       | FAIR. Congestion becomes noticeable with higher average delays resulting from a combination of long cycle lengths, high volume-to-capacity ratios and unfavourable progression.                            |
| E                       | $> 55$ and $\leq 80$                       | POOR. Lengthy delays values are indicative of poor progression, long cycle lengths and high volume-to-capacity ratios. Individual cycle failures are common with individual movement failures also common. |
| F                       | $> 80$                                     | UNSATISFACTORY. Indicative of oversaturated conditions with vehicular demand greater than the capacity of the intersection.  |

Adapted from Highway Capacity Manual 2000, Transportation Research Board

# APPENDIX M

## Detailed Capacity Analysis Worksheets

Lanes, Volumes, Timings  
1: Boundary Road & Hwy 417 WB Ramp Terminal

Existing Conditions AM  
04-08-2021



| Lane Group                 | WBL   | WBR   | NBT   | NBR   | SBL  | SBT   |
|----------------------------|-------|-------|-------|-------|------|-------|
| Lane Configurations        |       |       |       |       |      |       |
| Traffic Volume (vph)       | 108   | 28    | 85    | 743   | 70   | 91    |
| Future Volume (vph)        | 108   | 28    | 85    | 743   | 70   | 91    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  |
| Lane Width (m)             | 4.5   | 4.5   | 3.5   | 3.5   | 3.5  | 3.5   |
| Storage Length (m)         | 0.0   | 10.0  |       | 0.0   | 0.0  |       |
| Storage Lanes              | 1     | 0     |       | 0     | 0    |       |
| Taper Length (m)           | 7.5   |       |       |       | 7.5  |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Frt                        | 0.972 |       | 0.879 |       |      |       |
| Flt Protected              | 0.962 |       |       |       |      | 0.979 |
| Satd. Flow (prot)          | 1746  | 0     | 1529  | 0     | 0    | 1582  |
| Flt Permitted              | 0.962 |       |       |       |      | 0.979 |
| Satd. Flow (perm)          | 1746  | 0     | 1529  | 0     | 0    | 1582  |
| Link Speed (k/h)           | 40    |       | 80    |       |      | 80    |
| Link Distance (m)          | 155.0 |       | 545.7 |       |      | 134.1 |
| Travel Time (s)            | 14.0  |       | 24.6  |       |      | 6.0   |
| Peak Hour Factor           | 0.90  | 0.90  | 0.90  | 0.90  | 0.90 | 0.90  |
| Heavy Vehicles (%)         | 4%    | 14%   | 14%   | 1%    | 9%   | 11%   |
| Adj. Flow (vph)            | 120   | 31    | 94    | 826   | 78   | 101   |
| Shared Lane Traffic (%)    |       |       |       |       |      |       |
| Lane Group Flow (vph)      | 151   | 0     | 920   | 0     | 0    | 179   |
| Enter Blocked Intersection | No    | No    | No    | No    | No   | No    |
| Lane Alignment             | Left  | Right | Left  | Right | Left | Left  |
| Median Width(m)            | 4.5   |       | 0.0   |       |      | 0.0   |
| Link Offset(m)             | 0.0   |       | 0.0   |       |      | 0.0   |
| Crosswalk Width(m)         | 4.8   |       | 4.8   |       |      | 4.8   |
| Two way Left Turn Lane     |       |       |       |       |      |       |
| Headway Factor             | 0.95  | 0.95  | 1.09  | 1.09  | 1.09 | 1.09  |
| Turning Speed (k/h)        | 25    | 15    |       | 15    | 25   |       |
| Sign Control               | Stop  |       | Free  |       |      | Free  |

Intersection Summary

Area Type: Other  
 Control Type: Unsignalized  
 Intersection Capacity Utilization 80.4% ICU Level of Service D  
 Analysis Period (min) 15



HCM Unsignalized Intersection Capacity Analysis  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

Existing Conditions AM  
 04-08-2021



| Movement                          | WBL  | WBR   | NBT  | NBR                  | SBL  | SBT  |
|-----------------------------------|------|-------|------|----------------------|------|------|
| Lane Configurations               |      |       |      |                      |      |      |
| Traffic Volume (veh/h)            | 108  | 28    | 85   | 743                  | 70   | 91   |
| Future Volume (Veh/h)             | 108  | 28    | 85   | 743                  | 70   | 91   |
| Sign Control                      | Stop |       | Free |                      |      | Free |
| Grade                             | 0%   |       | 0%   |                      |      | 0%   |
| Peak Hour Factor                  | 0.90 | 0.90  | 0.90 | 0.90                 | 0.90 | 0.90 |
| Hourly flow rate (vph)            | 120  | 31    | 94   | 826                  | 78   | 101  |
| Pedestrians                       |      |       |      |                      |      |      |
| Lane Width (m)                    |      |       |      |                      |      |      |
| Walking Speed (m/s)               |      |       |      |                      |      |      |
| Percent Blockage                  |      |       |      |                      |      |      |
| Right turn flare (veh)            |      |       |      |                      |      |      |
| Median type                       |      |       | None | None                 |      |      |
| Median storage (veh)              |      |       |      |                      |      |      |
| Upstream signal (m)               |      |       |      |                      |      |      |
| pX, platoon unblocked             |      |       |      |                      |      |      |
| vC, conflicting volume            | 764  | 507   |      |                      | 920  |      |
| vC1, stage 1 conf vol             |      |       |      |                      |      |      |
| vC2, stage 2 conf vol             |      |       |      |                      |      |      |
| vCu, unblocked vol                | 764  | 507   |      |                      | 920  |      |
| tC, single (s)                    | 6.4  | 6.3   |      |                      | 4.2  |      |
| tC, 2 stage (s)                   |      |       |      |                      |      |      |
| tF (s)                            | 3.5  | 3.4   |      |                      | 2.3  |      |
| p0 queue free %                   | 63   | 94    |      |                      | 89   |      |
| cM capacity (veh/h)               | 329  | 542   |      |                      | 714  |      |
| <b>Direction, Lane #</b>          |      |       |      |                      |      |      |
|                                   | WB 1 | NB 1  | SB 1 |                      |      |      |
| Volume Total                      | 151  | 920   | 179  |                      |      |      |
| Volume Left                       | 120  | 0     | 78   |                      |      |      |
| Volume Right                      | 31   | 826   | 0    |                      |      |      |
| cSH                               | 358  | 1700  | 714  |                      |      |      |
| Volume to Capacity                | 0.42 | 0.54  | 0.11 |                      |      |      |
| Queue Length 95th (m)             | 16.3 | 0.0   | 2.9  |                      |      |      |
| Control Delay (s)                 | 22.2 | 0.0   | 5.3  |                      |      |      |
| Lane LOS                          | C    |       | A    |                      |      |      |
| Approach Delay (s)                | 22.2 | 0.0   | 5.3  |                      |      |      |
| Approach LOS                      | C    |       |      |                      |      |      |
| <b>Intersection Summary</b>       |      |       |      |                      |      |      |
| Average Delay                     |      |       | 3.5  |                      |      |      |
| Intersection Capacity Utilization |      | 80.4% |      | ICU Level of Service |      | D    |
| Analysis Period (min)             |      |       | 15   |                      |      |      |

Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

Existing Conditions AM  
04-08-2021



| Lane Group                 | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |
| Traffic Volume (vph)       | 16    | 233   | 29    | 816   | 173   | 8     |
| Future Volume (vph)        | 16    | 233   | 29    | 816   | 173   | 8     |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.3   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   | 25.0  | 50.0  |       |       | 0.0   |
| Storage Lanes              | 1     | 1     | 1     |       |       | 0     |
| Taper Length (m)           | 7.5   |       | 75.0  |       |       |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Frt                        |       | 0.850 |       |       | 0.994 |       |
| Flt Protected              | 0.950 |       | 0.950 |       |       |       |
| Satd. Flow (prot)          | 1291  | 1395  | 1291  | 1745  | 1593  | 0     |
| Flt Permitted              | 0.950 |       | 0.543 |       |       |       |
| Satd. Flow (perm)          | 1291  | 1395  | 738   | 1745  | 1593  | 0     |
| Right Turn on Red          |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 259   |       |       | 4     |       |
| Link Speed (k/h)           | 40    |       |       | 80    | 80    |       |
| Link Distance (m)          | 154.2 |       |       | 243.1 | 545.7 |       |
| Travel Time (s)            | 13.9  |       |       | 10.9  | 24.6  |       |
| Peak Hour Factor           | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  |
| Heavy Vehicles (%)         | 31%   | 6%    | 31%   | 2%    | 11%   | 13%   |
| Adj. Flow (vph)            | 18    | 259   | 32    | 907   | 192   | 9     |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 18    | 259   | 32    | 907   | 201   | 0     |
| Enter Blocked Intersection | No    | No    | No    | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left  | Left  | Left  | Right |
| Median Width(m)            | 3.5   |       |       | 3.5   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |       | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |       | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |
| Headway Factor             | 1.09  | 1.12  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25    |       |       | 15    |
| Number of Detectors        | 1     | 1     | 1     | 2     | 2     |       |
| Detector Template          | Left  | Right | Left  | Thru  | Thru  |       |
| Leading Detector (m)       | 2.0   | 2.0   | 2.0   | 10.0  | 10.0  |       |
| Trailing Detector (m)      | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Position(m)     | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Size(m)         | 2.0   | 2.0   | 2.0   | 0.6   | 0.6   |       |
| Detector 1 Type            | 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   |       |
| Detector 1 Queue (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Delay (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 2 Position(m)     |       |       |       | 9.4   | 9.4   |       |
| Detector 2 Size(m)         |       |       |       | 0.6   | 0.6   |       |
| Detector 2 Type            |       |       |       | Cl+Ex | Cl+Ex |       |
| Detector 2 Channel         |       |       |       |       |       |       |
| Detector 2 Extend (s)      |       |       |       | 0.0   | 0.0   |       |
| Turn Type                  | Prot  | Perm  | pm+pt | NA    | NA    |       |

Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

Existing Conditions AM  
04-08-2021



| Lane Group              | EBL   | EBR   | NBL   | NBT   | SBT   | SBR |
|-------------------------|-------|-------|-------|-------|-------|-----|
| Protected Phases        | 4     |       | 5     | 2     | 6     |     |
| Permitted Phases        |       | 4     | 2     |       |       |     |
| Detector Phase          | 4     | 4     | 5     | 2     | 6     |     |
| Switch Phase            |       |       |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0   | 7.0   | 35.0  | 35.0  |     |
| Minimum Split (s)       | 17.8  | 17.8  | 13.0  | 41.6  | 41.6  |     |
| Total Split (s)         | 20.0  | 20.0  | 12.0  | 60.0  | 48.0  |     |
| Total Split (%)         | 25.0% | 25.0% | 15.0% | 75.0% | 60.0% |     |
| Maximum Green (s)       | 13.2  | 13.2  | 6.0   | 53.4  | 41.4  |     |
| Yellow Time (s)         | 3.0   | 3.0   | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 3.8   | 3.8   | 1.4   | 2.0   | 2.0   |     |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     | 6.8   | 6.8   | 6.0   | 6.6   | 6.6   |     |
| Lead/Lag                |       |       | Lead  |       | Lag   |     |
| Lead-Lag Optimize?      |       |       | Yes   |       | Yes   |     |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |     |
| Recall Mode             | None  | None  | None  | Min   | Min   |     |
| Walk Time (s)           | 5.0   | 5.0   |       | 0.0   | 7.0   |     |
| Flash Dont Walk (s)     | 6.0   | 6.0   |       | 0.0   | 21.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0     |       | 0     | 0     |     |
| Act Effct Green (s)     | 8.5   | 8.5   | 41.5  | 40.9  | 36.8  |     |
| Actuated g/C Ratio      | 0.13  | 0.13  | 0.66  | 0.65  | 0.58  |     |
| v/c Ratio               | 0.10  | 0.63  | 0.06  | 0.80  | 0.22  |     |
| Control Delay           | 28.3  | 12.0  | 4.2   | 15.0  | 8.6   |     |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |     |
| Total Delay             | 28.3  | 12.0  | 4.2   | 15.0  | 8.6   |     |
| LOS                     | C     | B     | A     | B     | A     |     |
| Approach Delay          | 13.0  |       |       | 14.6  | 8.6   |     |
| Approach LOS            | B     |       |       | B     | A     |     |
| Queue Length 50th (m)   | 1.7   | 0.0   | 1.0   | 60.6  | 7.2   |     |
| Queue Length 95th (m)   | 8.4   | 20.5  | 4.1   | 141.6 | 28.7  |     |
| Internal Link Dist (m)  | 130.2 |       |       | 219.1 | 521.7 |     |
| Turn Bay Length (m)     |       | 25.0  | 50.0  |       |       |     |
| Base Capacity (vph)     | 276   | 502   | 539   | 1511  | 1071  |     |
| Starvation Cap Reductn  | 0     | 0     | 0     | 0     | 0     |     |
| Spillback Cap Reductn   | 0     | 0     | 0     | 0     | 0     |     |
| Storage Cap Reductn     | 0     | 0     | 0     | 0     | 0     |     |
| Reduced v/c Ratio       | 0.07  | 0.52  | 0.06  | 0.60  | 0.19  |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 80               |
| Actuated Cycle Length:             | 63.1             |
| Natural Cycle:                     | 75               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.80             |
| Intersection Signal Delay:         | 13.5             |
| Intersection LOS:                  | B                |
| Intersection Capacity Utilization: | 62.3%            |
| ICU Level of Service:              | B                |
| Analysis Period (min):             | 15               |

Splits and Phases: 2: Boundary Road & Hwy 417 EB Ramp Terminal



Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

Existing Conditions AM  
04-08-2021

| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |       |       |       |       |       |       |
| Traffic Volume (vph)       | 31    | 15    | 4     | 3     | 5     | 23    | 5     | 791   | 27    | 175   | 181   | 50    |
| Future Volume (vph)        | 31    | 15    | 4     | 3     | 5     | 23    | 5     | 791   | 27    | 175   | 181   | 50    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.3   | 3.5   | 3.3   | 3.3   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   |       | 0.0   | 0.0   |       | 0.0   | 35.0  |       | 7.5   | 100.0 |       | 0.0   |
| Storage Lanes              | 0     |       | 0     | 0     |       | 1     | 1     |       | 1     | 1     |       | 0     |
| Taper Length (m)           | 7.5   |       |       | 7.5   |       |       | 45.0  |       |       | 75.0  |       |       |
| 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  |
| Frt                        |       | 0.990 |       |       |       | 0.850 |       |       | 0.850 |       | 0.967 |       |
| Flt Protected              |       | 0.970 |       |       | 0.984 |       | 0.950 |       |       | 0.950 |       |       |
| Satd. Flow (prot)          | 0     | 1620  | 0     | 0     | 1752  | 1513  | 1378  | 1728  | 1479  | 1653  | 1517  | 0     |
| Flt Permitted              |       | 0.806 |       |       | 0.867 |       | 0.600 |       |       | 0.142 |       |       |
| Satd. Flow (perm)          | 0     | 1346  | 0     | 0     | 1543  | 1513  | 870   | 1728  | 1479  | 247   | 1517  | 0     |
| Right Turn on Red          |       |       | Yes   |       |       | Yes   |       |       | Yes   |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 3     |       |       |       | 100   |       |       | 96    |       |       | 32    |
| Link Speed (k/h)           |       | 60    |       |       | 20    |       |       | 80    |       |       |       | 80    |
| Link Distance (m)          |       | 642.8 |       |       | 170.6 |       |       | 174.7 |       |       |       | 243.1 |
| Travel Time (s)            |       | 38.6  |       |       | 30.7  |       |       | 7.9   |       |       |       | 10.9  |
| 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 (%)         | 6%    | 0%    | 25%   | 0%    | 0%    | 0%    | 20%   | 3%    | 0%    | 0%    | 15%   | 8%    |
| Adj. Flow (vph)            | 34    | 17    | 4     | 3     | 6     | 26    | 6     | 879   | 30    | 194   | 201   | 56    |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 0     | 55    | 0     | 0     | 9     | 26    | 6     | 879   | 30    | 194   | 257   | 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   |       |       | 3.5   |       |       | 3.5   |       |
| Link Offset(m)             |       | 0.0   |       |       | 0.0   |       |       | 0.0   |       |       | 0.0   |       |
| Crosswalk Width(m)         |       | 4.8   |       |       | 4.8   |       |       | 4.8   |       |       | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |       |       |       |       |       |       |
| Headway Factor             | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.12  | 1.09  | 1.12  | 1.12  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    |       | 15    | 25    |       | 15    | 25    |       | 15    | 25    |       | 15    |
| Number of Detectors        | 1     | 2     |       | 1     | 2     | 1     | 1     | 2     | 1     | 1     |       | 2     |
| Detector Template          | Left  | Thru  |       | Left  | Thru  | Right | Left  | Thru  | Right | Left  | Thru  |       |
| Leading Detector (m)       | 2.0   | 10.0  |       | 2.0   | 10.0  | 2.0   | 2.0   | 10.0  | 2.0   | 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   | 0.6   | 2.0   | 2.0   | 0.6   | 2.0   | 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                  | Perm  | NA    |       | Perm  | NA    | Perm  | Perm  | NA    | Perm  | pm+pt | NA    |       |

Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

Existing Conditions AM  
04-08-2021



| Lane Group              | EBL   | EBT   | EBR | WBL   | WBT   | WBR   | NBL   | NBT    | NBR   | SBL   | SBT   | SBR |
|-------------------------|-------|-------|-----|-------|-------|-------|-------|--------|-------|-------|-------|-----|
| Protected Phases        |       | 4     |     |       | 8     |       |       | 2      |       | 1     | 6     |     |
| Permitted Phases        | 4     |       |     | 8     |       | 8     | 2     |        | 2     | 6     |       |     |
| Detector Phase          | 4     | 4     |     | 8     | 8     | 8     | 2     | 2      | 2     | 1     | 6     |     |
| Switch Phase            |       |       |     |       |       |       |       |        |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 20.0  | 20.0   | 20.0  | 7.0   | 20.0  |     |
| Minimum Split (s)       | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 26.2  | 26.2   | 26.2  | 13.0  | 26.2  |     |
| Total Split (s)         | 25.0  | 25.0  |     | 25.0  | 25.0  | 25.0  | 55.0  | 55.0   | 55.0  | 20.0  | 75.0  |     |
| Total Split (%)         | 25.0% | 25.0% |     | 25.0% | 25.0% | 25.0% | 55.0% | 55.0%  | 55.0% | 20.0% | 75.0% |     |
| Maximum Green (s)       | 19.2  | 19.2  |     | 19.2  | 19.2  | 19.2  | 48.8  | 48.8   | 48.8  | 14.0  | 68.8  |     |
| Yellow Time (s)         | 3.7   | 3.7   |     | 3.7   | 3.7   | 3.7   | 4.6   | 4.6    | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 2.1   | 2.1   |     | 2.1   | 2.1   | 2.1   | 1.6   | 1.6    | 1.6   | 1.4   | 1.6   |     |
| Lost Time Adjust (s)    |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     |       | 5.8   |     |       | 5.8   | 5.8   | 6.2   | 6.2    | 6.2   | 6.0   | 6.2   |     |
| Lead/Lag                |       |       |     |       |       |       | Lag   | Lag    | Lag   | Lead  |       |     |
| 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  | Min   | Min    | Min   | None  | Min   |     |
| Walk Time (s)           | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 7.0   | 7.0    | 7.0   |       | 7.0   |     |
| Flash Dont Walk (s)     | 12.0  | 12.0  |     | 12.0  | 12.0  | 12.0  | 10.0  | 10.0   | 10.0  |       | 10.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0     |     | 0     | 0     | 0     | 0     | 0      | 0     |       | 0     |     |
| Act Effct Green (s)     |       | 9.0   |     |       | 9.0   | 9.0   | 50.2  | 50.2   | 50.2  | 67.0  | 69.7  |     |
| Actuated g/C Ratio      |       | 0.11  |     |       | 0.11  | 0.11  | 0.61  | 0.61   | 0.61  | 0.82  | 0.85  |     |
| v/c Ratio               |       | 0.37  |     |       | 0.05  | 0.10  | 0.01  | 0.83   | 0.03  | 0.51  | 0.20  |     |
| Control Delay           |       | 42.0  |     |       | 36.4  | 0.8   | 10.2  | 25.2   | 0.1   | 9.5   | 2.8   |     |
| Queue Delay             |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Delay             |       | 42.0  |     |       | 36.4  | 0.8   | 10.2  | 25.2   | 0.1   | 9.5   | 2.8   |     |
| LOS                     |       | D     |     |       | D     | A     | B     | C      | A     | A     | A     |     |
| Approach Delay          |       | 42.0  |     |       | 10.0  |       |       | 24.3   |       |       | 5.7   |     |
| Approach LOS            |       | D     |     |       | A     |       |       | C      |       |       | A     |     |
| Queue Length 50th (m)   |       | 8.6   |     |       | 1.4   | 0.0   | 0.4   | 125.1  | 0.0   | 7.1   | 8.6   |     |
| Queue Length 95th (m)   |       | 20.9  |     |       | 6.1   | 0.0   | 2.5   | #243.6 | 0.0   | 23.4  | 18.6  |     |
| Internal Link Dist (m)  |       | 618.8 |     |       | 146.6 |       |       | 150.7  |       |       | 219.1 |     |
| Turn Bay Length (m)     |       |       |     |       |       |       | 35.0  |        | 7.5   | 100.0 |       |     |
| Base Capacity (vph)     |       | 322   |     |       | 367   | 436   | 532   | 1057   | 942   | 446   | 1298  |     |
| Starvation Cap Reductn  |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Spillback Cap Reductn   |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Storage Cap Reductn     |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Reduced v/c Ratio       |       | 0.17  |     |       | 0.02  | 0.06  | 0.01  | 0.83   | 0.03  | 0.43  | 0.20  |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 82               |
| Natural Cycle:                     | 90               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.83             |
| Intersection Signal Delay:         | 18.9             |
| Intersection LOS:                  | B                |
| Intersection Capacity Utilization: | 78.7%            |
| 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: 3: Boundary Road & Thunder Road/Amazon Way



Lanes, Volumes, Timings  
4: Boundary Road & South Amazon Access











Existing Conditions AM  
04-08-2021

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Lane Group                        | WBL   | WBR   | NBT   | NBR   | SBL   | SBT   |
| Lane Configurations               |  |   |  |   |  |  |
| Traffic Volume (vph)              | 5   | 3   | 820   | 5   | 1   | 187   |
| Future Volume (vph)               | 5   | 3   | 820   | 5   | 1   | 187   |
| Ideal Flow (vphpl)                | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)                    | 3.6   | 3.6   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)                | 0.0   | 0.0   |   | 0.0   | 70.0  |   |
| Storage Lanes                     | 1   | 0   |   | 0   | 1   |   |
| Taper Length (m)                  | 7.5   |   |   |   | 45.0  |   |
| Lane Util. Factor                 | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Frt                               | 0.955   |   | 0.999   |   |   |   |
| Flt Protected                     | 0.968   |   |   |   | 0.950   |   |
| Satd. Flow (prot)                 | 832   | 0   | 1732  | 0   | 846   | 1561  |
| Flt Permitted                     | 0.968   |   |   |   | 0.950   |   |
| Satd. Flow (perm)                 | 832   | 0   | 1732  | 0   | 846   | 1561  |
| Link Speed (k/h)                  | 20  |   | 80  |   |   | 80  |
| Link Distance (m)                 | 151.5   |   | 1150.2  |   |   | 174.7   |
| Travel Time (s)                   | 27.3  |   | 51.8  |   |   | 7.9   |
| Peak Hour Factor                  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  |
| Heavy Vehicles (%)                | 100%  | 100%  | 2%  | 100%  | 100%  | 14%   |
| Adj. Flow (vph)                   | 6   | 3   | 911   | 6   | 1   | 208   |
| Shared Lane Traffic (%)           |   |   |   |   |   |   |
| Lane Group Flow (vph)             | 9   | 0   | 917   | 0   | 1   | 208   |
| Enter Blocked Intersection        | No  | No  | No  | No  | No  | No  |
| Lane Alignment                    | Left  | Right   | Left  | Right   | Left  | Left  |
| Median Width(m)                   | 3.6   |   | 3.5   |   |   | 3.5   |
| Link Offset(m)                    | 0.0   |   | 0.0   |   |   | 0.0   |
| Crosswalk Width(m)                | 4.8   |   | 4.8   |   |   | 4.8   |
| Two way Left Turn Lane            |   |   |   |   |   |   |
| Headway Factor                    | 1.07  | 1.07  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)               | 25  | 15  |   | 15  | 25  |   |
| Sign Control                      | Stop  |   | Free  |   |   | Free  |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |
| Area Type:                        | Other   |   |   |   |   |   |
| Control Type:                     | Unsignalized  |   |   |   |   |   |
| Intersection Capacity Utilization | 55.9%   |   |   | ICU Level of Service B  |   |   |
| Analysis Period (min)             | 15  |   |   |   |   |   |



HCM Unsignalized Intersection Capacity Analysis  
4: Boundary Road & South Amazon Access

Existing Conditions AM  
04-08-2021

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement                          | WBL   | WBR   | NBT   | NBR   | SBL   | SBT   |
| Lane Configurations               |  |   |  |   |  |  |
| Traffic Volume (veh/h)            | 5   | 3   | 820   | 5   | 1   | 187   |
| Future Volume (Veh/h)             | 5   | 3   | 820   | 5   | 1   | 187   |
| Sign Control                      | Stop  |   | Free  |   | Free  |   |
| Grade                             | 0%  |   | 0%  |   | 0%  |   |
| Peak Hour Factor                  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  |
| Hourly flow rate (vph)            | 6   | 3   | 911   | 6   | 1   | 208   |
| Pedestrians                       |   |   |   |   |   |   |
| Lane Width (m)                    |   |   |   |   |   |   |
| Walking Speed (m/s)               |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |
| Median type                       | None  |   |   | None  |   |   |
| Median storage (veh)              |   |   |   |   |   |   |
| Upstream signal (m)               | 175   |   |   |   |   |   |
| pX, platoon unblocked             |   |   |   |   |   |   |
| vC, conflicting volume            | 1124  | 914   |   |   | 917   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |
| vCu, unblocked vol                | 1124  | 914   |   |   | 917   |   |
| tC, single (s)                    | 7.4   | 7.2   |   |   | 5.1   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |
| tF (s)                            | 4.4   | 4.2   |   |   | 3.1   |   |
| p0 queue free %                   | 96  | 99  |   |   | 100   |   |
| cM capacity (veh/h)               | 149   | 224   |   |   | 458   |   |
| Direction, Lane #                 | WB 1  | NB 1  | SB 1  | SB 2  |   |   |
| Volume Total                      | 9   | 917   | 1   | 208   |   |   |
| Volume Left                       | 6   | 0   | 1   | 0   |   |   |
| Volume Right                      | 3   | 6   | 0   | 0   |   |   |
| cSH                               | 168   | 1700  | 458   | 1700  |   |   |
| Volume to Capacity                | 0.05  | 0.54  | 0.00  | 0.12  |   |   |
| Queue Length 95th (m)             | 1.3   | 0.0   | 0.1   | 0.0   |   |   |
| Control Delay (s)                 | 27.7  | 0.0   | 12.9  | 0.0   |   |   |
| Lane LOS                          | D   |   | B   |   |   |   |
| Approach Delay (s)                | 27.7  | 0.0   | 0.1   |   |   |   |
| Approach LOS                      | D   |   |   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |
| Average Delay                     | 0.2   |   |   |   |   |   |
| Intersection Capacity Utilization | 55.9%   |   | ICU Level of Service  |   | B   |   |
| Analysis Period (min)             | 15  |   |   |   |   |   |

Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road

Existing Conditions AM  
04-08-2021



| Lane Group                 | EBL   | EBR   | NBL  | NBT   | SBT    | SBR   |
|----------------------------|-------|-------|------|-------|--------|-------|
| Lane Configurations        |       |       |      |       |        |       |
| Traffic Volume (vph)       | 68    | 27    | 121  | 776   | 110    | 94    |
| Future Volume (vph)        | 68    | 27    | 121  | 776   | 110    | 94    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800   | 1800  |
| Lane Width (m)             | 3.3   | 3.3   | 3.5  | 3.5   | 3.5    | 3.5   |
| Storage Length (m)         | 25.0  | 0.0   | 0.0  |       |        | 30.0  |
| Storage Lanes              | 1     | 1     | 0    |       |        | 1     |
| Taper Length (m)           | 47.5  |       | 7.5  |       |        |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Frt                        |       | 0.850 |      |       |        | 0.850 |
| Flt Protected              | 0.950 |       |      | 0.993 |        |       |
| Satd. Flow (prot)          | 1476  | 1286  | 0    | 1734  | 1561   | 1293  |
| Flt Permitted              | 0.950 |       |      | 0.993 |        |       |
| Satd. Flow (perm)          | 1476  | 1286  | 0    | 1734  | 1561   | 1293  |
| Link Speed (k/h)           | 80    |       |      | 80    | 80     |       |
| Link Distance (m)          | 180.5 |       |      | 135.8 | 1150.2 |       |
| Travel Time (s)            | 8.1   |       |      | 6.1   | 51.8   |       |
| Peak Hour Factor           | 0.90  | 0.90  | 0.90 | 0.90  | 0.90   | 0.90  |
| Heavy Vehicles (%)         | 12%   | 15%   | 8%   | 1%    | 14%    | 17%   |
| Adj. Flow (vph)            | 76    | 30    | 134  | 862   | 122    | 104   |
| Shared Lane Traffic (%)    |       |       |      |       |        |       |
| Lane Group Flow (vph)      | 76    | 30    | 0    | 996   | 122    | 104   |
| Enter Blocked Intersection | No    | No    | No   | No    | No     | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left   | Right |
| Median Width(m)            | 3.3   |       |      | 0.0   | 0.0    |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0    |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8    |       |
| Two way Left Turn Lane     |       |       |      |       |        |       |
| Headway Factor             | 1.12  | 1.12  | 1.09 | 1.09  | 1.09   | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25   |       |        | 15    |
| Sign Control               | Stop  |       |      | Free  | Free   |       |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 67.5%        |
| ICU Level of Service              | C            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
5: Boundary Road & Mitch Owens Road

Existing Conditions AM  
04-08-2021



| Movement                          | EBL         | EBR         | NBL         | NBT                  | SBT         | SBR  |
|-----------------------------------|-------------|-------------|-------------|----------------------|-------------|------|
| Lane Configurations               |             |             |             |                      |             |      |
| Traffic Volume (veh/h)            | 68          | 27          | 121         | 776                  | 110         | 94   |
| Future Volume (Veh/h)             | 68          | 27          | 121         | 776                  | 110         | 94   |
| Sign Control                      | Stop        |             |             | Free                 | Free        |      |
| Grade                             | 0%          |             |             | 0%                   | 0%          |      |
| Peak Hour Factor                  | 0.90        | 0.90        | 0.90        | 0.90                 | 0.90        | 0.90 |
| Hourly flow rate (vph)            | 76          | 30          | 134         | 862                  | 122         | 104  |
| <b>Pedestrians</b>                |             |             |             |                      |             |      |
| Lane Width (m)                    |             |             |             |                      |             |      |
| Walking Speed (m/s)               |             |             |             |                      |             |      |
| Percent Blockage                  |             |             |             |                      |             |      |
| Right turn flare (veh)            |             |             |             |                      |             |      |
| Median type                       |             |             |             | None                 | None        |      |
| Median storage (veh)              |             |             |             |                      |             |      |
| Upstream signal (m)               |             |             |             |                      |             |      |
| pX, platoon unblocked             |             |             |             |                      |             |      |
| vC, conflicting volume            | 1252        | 122         | 226         |                      |             |      |
| vC1, stage 1 conf vol             |             |             |             |                      |             |      |
| vC2, stage 2 conf vol             |             |             |             |                      |             |      |
| vCu, unblocked vol                | 1252        | 122         | 226         |                      |             |      |
| tC, single (s)                    | 6.5         | 6.4         | 4.2         |                      |             |      |
| tC, 2 stage (s)                   |             |             |             |                      |             |      |
| tF (s)                            | 3.6         | 3.4         | 2.3         |                      |             |      |
| p0 queue free %                   | 53          | 97          | 90          |                      |             |      |
| cM capacity (veh/h)               | 163         | 895         | 1308        |                      |             |      |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>EB 2</b> | <b>NB 1</b> | <b>SB 1</b>          | <b>SB 2</b> |      |
| Volume Total                      | 76          | 30          | 996         | 122                  | 104         |      |
| Volume Left                       | 76          | 0           | 134         | 0                    | 0           |      |
| Volume Right                      | 0           | 30          | 0           | 0                    | 104         |      |
| cSH                               | 163         | 895         | 1308        | 1700                 | 1700        |      |
| Volume to Capacity                | 0.47        | 0.03        | 0.10        | 0.07                 | 0.06        |      |
| Queue Length 95th (m)             | 17.5        | 0.8         | 2.7         | 0.0                  | 0.0         |      |
| Control Delay (s)                 | 45.1        | 9.2         | 2.5         | 0.0                  | 0.0         |      |
| Lane LOS                          | E           | A           | A           |                      |             |      |
| Approach Delay (s)                | 34.9        |             | 2.5         | 0.0                  |             |      |
| Approach LOS                      | D           |             |             |                      |             |      |
| <b>Intersection Summary</b>       |             |             |             |                      |             |      |
| Average Delay                     |             |             | 4.7         |                      |             |      |
| Intersection Capacity Utilization |             |             | 67.5%       | ICU Level of Service | C           |      |
| Analysis Period (min)             |             |             | 15          |                      |             |      |

Lanes, Volumes, Timings  
1: Boundary Road & Hwy 417 WB Ramp Terminal

Existing Conditions PM  
04-07-2021



| Lane Group                 | WBL   | WBR   | NBT   | NBR   | SBL  | SBT   |
|----------------------------|-------|-------|-------|-------|------|-------|
| Lane Configurations        |       |       |       |       |      |       |
| Traffic Volume (vph)       | 42    | 1     | 130   | 224   | 22   | 108   |
| Future Volume (vph)        | 42    | 1     | 130   | 224   | 22   | 108   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  |
| Lane Width (m)             | 4.5   | 4.5   | 3.5   | 3.5   | 3.5  | 3.5   |
| Storage Length (m)         | 0.0   | 10.0  |       | 0.0   | 0.0  |       |
| Storage Lanes              | 1     | 0     |       | 0     | 0    |       |
| Taper Length (m)           | 7.5   |       |       |       | 7.5  |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Frt                        | 0.997 |       | 0.914 |       |      |       |
| Flt Protected              | 0.953 |       |       |       |      | 0.992 |
| Satd. Flow (prot)          | 1586  | 0     | 1563  | 0     | 0    | 1630  |
| Flt Permitted              | 0.953 |       |       |       |      | 0.992 |
| Satd. Flow (perm)          | 1586  | 0     | 1563  | 0     | 0    | 1630  |
| Link Speed (k/h)           | 40    |       | 80    |       |      | 80    |
| Link Distance (m)          | 155.0 |       | 545.7 |       |      | 134.1 |
| Travel Time (s)            | 14.0  |       | 24.6  |       |      | 6.0   |
| Peak Hour Factor           | 0.90  | 0.90  | 0.90  | 0.90  | 0.90 | 0.90  |
| Heavy Vehicles (%)         | 19%   | 0%    | 6%    | 3%    | 5%   | 9%    |
| Adj. Flow (vph)            | 47    | 1     | 144   | 249   | 24   | 120   |
| Shared Lane Traffic (%)    |       |       |       |       |      |       |
| Lane Group Flow (vph)      | 48    | 0     | 393   | 0     | 0    | 144   |
| Enter Blocked Intersection | No    | No    | No    | No    | No   | No    |
| Lane Alignment             | Left  | Right | Left  | Right | Left | Left  |
| Median Width(m)            | 4.5   |       | 0.0   |       |      | 0.0   |
| Link Offset(m)             | 0.0   |       | 0.0   |       |      | 0.0   |
| Crosswalk Width(m)         | 4.8   |       | 4.8   |       |      | 4.8   |
| Two way Left Turn Lane     |       |       |       |       |      |       |
| Headway Factor             | 0.95  | 0.95  | 1.09  | 1.09  | 1.09 | 1.09  |
| Turning Speed (k/h)        | 25    | 15    |       | 15    | 25   |       |
| Sign Control               | Stop  |       | Free  |       |      | Free  |

Intersection Summary

|                                   |                        |
|-----------------------------------|------------------------|
| Area Type:                        | Other                  |
| Control Type:                     | Unsignalized           |
| Intersection Capacity Utilization | 35.9%                  |
| Analysis Period (min)             | 15                     |
|                                   | ICU Level of Service A |

HCM Unsignalized Intersection Capacity Analysis  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

Existing Conditions PM  
 04-07-2021



| Movement                          | WBL  | WBR   | NBT  | NBR                  | SBL  | SBT  |
|-----------------------------------|------|-------|------|----------------------|------|------|
| Lane Configurations               |      |       |      |                      |      |      |
| Traffic Volume (veh/h)            | 42   | 1     | 130  | 224                  | 22   | 108  |
| Future Volume (Veh/h)             | 42   | 1     | 130  | 224                  | 22   | 108  |
| Sign Control                      | Stop |       | Free |                      |      | Free |
| Grade                             | 0%   |       | 0%   |                      |      | 0%   |
| Peak Hour Factor                  | 0.90 | 0.90  | 0.90 | 0.90                 | 0.90 | 0.90 |
| Hourly flow rate (vph)            | 47   | 1     | 144  | 249                  | 24   | 120  |
| Pedestrians                       |      |       |      |                      |      |      |
| Lane Width (m)                    |      |       |      |                      |      |      |
| Walking Speed (m/s)               |      |       |      |                      |      |      |
| Percent Blockage                  |      |       |      |                      |      |      |
| Right turn flare (veh)            |      |       |      |                      |      |      |
| Median type                       |      |       | None | None                 |      |      |
| Median storage (veh)              |      |       |      |                      |      |      |
| Upstream signal (m)               |      |       |      |                      |      |      |
| pX, platoon unblocked             |      |       |      |                      |      |      |
| vC, conflicting volume            | 436  | 268   |      |                      | 393  |      |
| vC1, stage 1 conf vol             |      |       |      |                      |      |      |
| vC2, stage 2 conf vol             |      |       |      |                      |      |      |
| vCu, unblocked vol                | 436  | 268   |      |                      | 393  |      |
| tC, single (s)                    | 6.6  | 6.2   |      |                      | 4.1  |      |
| tC, 2 stage (s)                   |      |       |      |                      |      |      |
| tF (s)                            | 3.7  | 3.3   |      |                      | 2.2  |      |
| p0 queue free %                   | 91   | 100   |      |                      | 98   |      |
| cM capacity (veh/h)               | 535  | 775   |      |                      | 1149 |      |
| <b>Direction, Lane #</b>          |      |       |      |                      |      |      |
|                                   | WB 1 | NB 1  | SB 1 |                      |      |      |
| Volume Total                      | 48   | 393   | 144  |                      |      |      |
| Volume Left                       | 47   | 0     | 24   |                      |      |      |
| Volume Right                      | 1    | 249   | 0    |                      |      |      |
| cSH                               | 539  | 1700  | 1149 |                      |      |      |
| Volume to Capacity                | 0.09 | 0.23  | 0.02 |                      |      |      |
| Queue Length 95th (m)             | 2.3  | 0.0   | 0.5  |                      |      |      |
| Control Delay (s)                 | 12.3 | 0.0   | 1.5  |                      |      |      |
| Lane LOS                          | B    |       | A    |                      |      |      |
| Approach Delay (s)                | 12.3 | 0.0   | 1.5  |                      |      |      |
| Approach LOS                      | B    |       |      |                      |      |      |
| <b>Intersection Summary</b>       |      |       |      |                      |      |      |
| Average Delay                     |      |       | 1.4  |                      |      |      |
| Intersection Capacity Utilization |      | 35.9% |      | ICU Level of Service |      | A    |
| Analysis Period (min)             |      |       | 15   |                      |      |      |

Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

Existing Conditions PM  
04-07-2021



| Lane Group                 | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |
| Traffic Volume (vph)       | 70    | 631   | 133   | 196   | 188   | 15    |
| Future Volume (vph)        | 70    | 631   | 133   | 196   | 188   | 15    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.3   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   | 25.0  | 50.0  |       |       | 0.0   |
| Storage Lanes              | 1     | 1     | 1     |       |       | 0     |
| Taper Length (m)           | 7.5   |       | 75.0  |       |       |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |       |       | 0.990 |       |
| Fl <sub>t</sub> Protected  | 0.950 |       | 0.950 |       |       |       |
| Satd. Flow (prot)          | 1551  | 1436  | 1537  | 1664  | 1592  | 0     |
| Fl <sub>t</sub> Permitted  | 0.950 |       | 0.527 |       |       |       |
| Satd. Flow (perm)          | 1551  | 1436  | 853   | 1664  | 1592  | 0     |
| Right Turn on Red          |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 674   |       |       | 7     |       |
| Link Speed (k/h)           | 40    |       |       | 80    | 80    |       |
| Link Distance (m)          | 154.2 |       |       | 243.1 | 545.7 |       |
| Travel Time (s)            | 13.9  |       |       | 10.9  | 24.6  |       |
| Peak Hour Factor           | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  |
| Heavy Vehicles (%)         | 9%    | 3%    | 10%   | 7%    | 11%   | 7%    |
| Adj. Flow (vph)            | 78    | 701   | 148   | 218   | 209   | 17    |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 78    | 701   | 148   | 218   | 226   | 0     |
| Enter Blocked Intersection | No    | No    | No    | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left  | Left  | Left  | Right |
| Median Width(m)            | 3.5   |       |       | 3.5   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |       | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |       | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |
| Headway Factor             | 1.09  | 1.12  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25    |       |       | 15    |
| Number of Detectors        | 1     | 1     | 1     | 2     | 2     |       |
| Detector Template          | Left  | Right | Left  | Thru  | Thru  |       |
| Leading Detector (m)       | 2.0   | 2.0   | 2.0   | 10.0  | 10.0  |       |
| Trailing Detector (m)      | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Position(m)     | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Size(m)         | 2.0   | 2.0   | 2.0   | 0.6   | 0.6   |       |
| Detector 1 Type            | 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   |       |
| Detector 1 Queue (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Delay (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 2 Position(m)     |       |       |       | 9.4   | 9.4   |       |
| Detector 2 Size(m)         |       |       |       | 0.6   | 0.6   |       |
| Detector 2 Type            |       |       |       | Cl+Ex | Cl+Ex |       |
| Detector 2 Channel         |       |       |       |       |       |       |
| Detector 2 Extend (s)      |       |       |       | 0.0   | 0.0   |       |
| Turn Type                  | Prot  | Perm  | pm+pt | NA    | NA    |       |

Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

Existing Conditions PM  
04-07-2021



| Lane Group              | EBL   | EBR   | NBL   | NBT   | SBT   | SBR |
|-------------------------|-------|-------|-------|-------|-------|-----|
| Protected Phases        | 4     |       | 5     | 2     | 6     |     |
| Permitted Phases        |       | 4     | 2     |       |       |     |
| Detector Phase          | 4     | 4     | 5     | 2     | 6     |     |
| Switch Phase            |       |       |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0   | 7.0   | 35.0  | 35.0  |     |
| Minimum Split (s)       | 23.0  | 23.0  | 13.0  | 41.6  | 41.6  |     |
| Total Split (s)         | 25.0  | 25.0  | 12.0  | 55.0  | 43.0  |     |
| Total Split (%)         | 31.3% | 31.3% | 15.0% | 68.8% | 53.8% |     |
| Maximum Green (s)       | 18.2  | 18.2  | 6.0   | 48.4  | 36.4  |     |
| Yellow Time (s)         | 3.0   | 3.0   | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 3.8   | 3.8   | 1.4   | 2.0   | 2.0   |     |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     | 6.8   | 6.8   | 6.0   | 6.6   | 6.6   |     |
| Lead/Lag                |       |       | Lead  |       | Lag   |     |
| Lead-Lag Optimize?      |       |       | Yes   |       | Yes   |     |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |     |
| Recall Mode             | None  | None  | None  | Min   | Min   |     |
| Walk Time (s)           | 7.0   | 7.0   |       | 0.0   | 7.0   |     |
| Flash Dont Walk (s)     | 5.0   | 5.0   |       | 0.0   | 21.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0     |       | 0     | 0     |     |
| Act Effct Green (s)     | 12.1  | 12.1  | 47.8  | 47.2  | 35.2  |     |
| Actuated g/C Ratio      | 0.17  | 0.17  | 0.66  | 0.65  | 0.48  |     |
| v/c Ratio               | 0.30  | 0.88  | 0.24  | 0.20  | 0.29  |     |
| Control Delay           | 29.0  | 17.0  | 6.8   | 6.6   | 13.3  |     |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |     |
| Total Delay             | 29.0  | 17.0  | 6.8   | 6.6   | 13.3  |     |
| LOS                     | C     | B     | A     | A     | B     |     |
| Approach Delay          | 18.2  |       |       | 6.7   | 13.3  |     |
| Approach LOS            | B     |       |       | A     | B     |     |
| Queue Length 50th (m)   | 9.9   | 3.3   | 6.5   | 10.3  | 17.2  |     |
| Queue Length 95th (m)   | 21.3  | #66.1 | 17.0  | 24.7  | 37.2  |     |
| Internal Link Dist (m)  | 130.2 |       |       | 219.1 | 521.7 |     |
| Turn Bay Length (m)     |       | 25.0  | 50.0  |       |       |     |
| Base Capacity (vph)     | 389   | 865   | 616   | 1111  | 803   |     |
| Starvation Cap Reductn  | 0     | 0     | 0     | 0     | 0     |     |
| Spillback Cap Reductn   | 0     | 0     | 0     | 0     | 0     |     |
| Storage Cap Reductn     | 0     | 0     | 0     | 0     | 0     |     |
| Reduced v/c Ratio       | 0.20  | 0.81  | 0.24  | 0.20  | 0.28  |     |

Intersection Summary

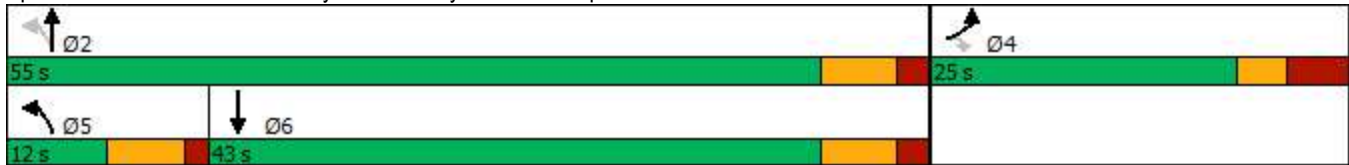
|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 80               |
| Actuated Cycle Length:             | 72.8             |
| Natural Cycle:                     | 80               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.88             |
| Intersection Signal Delay:         | 14.3             |
| Intersection LOS:                  | B                |
| Intersection Capacity Utilization: | 81.6%            |
| ICU Level of Service:              | D                |
| Analysis Period (min):             | 15               |

Lanes, Volumes, Timings  
 2: Boundary Road & Hwy 417 EB Ramp Terminal

Exisitng Conditions PM  
 04-07-2021

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

Splits and Phases: 2: Boundary Road & Hwy 417 EB Ramp Terminal





Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

Existing Conditions PM  
04-07-2021

| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |       |       |       |       |       |       |
| Traffic Volume (vph)       | 62    | 0     | 14    | 5     | 0     | 16    | 4     | 251   | 0     | 2     | 762   | 55    |
| Future Volume (vph)        | 62    | 0     | 14    | 5     | 0     | 16    | 4     | 251   | 0     | 2     | 762   | 55    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.3   | 3.5   | 3.3   | 3.3   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   |       | 0.0   | 0.0   |       | 0.0   | 35.0  |       | 7.5   | 100.0 |       | 0.0   |
| Storage Lanes              | 0     |       | 0     | 0     |       | 1     | 1     |       | 1     | 1     |       | 0     |
| Taper Length (m)           | 7.5   |       |       | 7.5   |       |       | 45.0  |       |       | 75.0  |       |       |
| 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  |
| Frt                        |       | 0.975 |       |       |       | 0.850 |       |       |       |       |       | 0.990 |
| Flt Protected              |       | 0.961 |       |       | 0.950 |       | 0.950 |       |       | 0.950 |       |       |
| Satd. Flow (prot)          | 0     | 1590  | 0     | 0     | 1208  | 1513  | 1322  | 1633  | 1740  | 1102  | 1699  | 0     |
| Flt Permitted              |       | 0.762 |       |       | 0.856 |       | 0.287 |       |       | 0.509 |       |       |
| Satd. Flow (perm)          | 0     | 1261  | 0     | 0     | 1088  | 1513  | 400   | 1633  | 1740  | 590   | 1699  | 0     |
| Right Turn on Red          |       |       | Yes   |       |       | Yes   |       |       | Yes   |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 100   |       |       |       | 100   |       |       |       |       |       | 8     |
| Link Speed (k/h)           |       | 60    |       |       | 20    |       |       | 80    |       |       |       | 80    |
| Link Distance (m)          |       | 642.8 |       |       | 170.6 |       |       | 174.7 |       |       |       | 243.1 |
| Travel Time (s)            |       | 38.6  |       |       | 30.7  |       |       | 7.9   |       |       |       | 10.9  |
| 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 (%)         | 6%    | 0%    | 0%    | 40%   | 0%    | 0%    | 25%   | 9%    | 0%    | 50%   | 4%    | 0%    |
| Adj. Flow (vph)            | 69    | 0     | 16    | 6     | 0     | 18    | 4     | 279   | 0     | 2     | 847   | 61    |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 0     | 85    | 0     | 0     | 6     | 18    | 4     | 279   | 0     | 2     | 908   | 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   |       |       | 3.5   |       |       | 3.5   |       |
| Link Offset(m)             |       | 0.0   |       |       | 0.0   |       |       | 0.0   |       |       | 0.0   |       |
| Crosswalk Width(m)         |       | 4.8   |       |       | 4.8   |       |       | 4.8   |       |       | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |       |       |       |       |       |       |
| Headway Factor             | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.12  | 1.09  | 1.12  | 1.12  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    |       | 15    | 25    |       | 15    | 25    |       | 15    | 25    |       | 15    |
| Number of Detectors        | 1     | 2     |       | 1     | 2     | 1     | 1     | 2     | 1     | 1     | 2     |       |
| Detector Template          | Left  | Thru  |       | Left  | Thru  | Right | Left  | Thru  | Right | Left  | Thru  |       |
| Leading Detector (m)       | 2.0   | 10.0  |       | 2.0   | 10.0  | 2.0   | 2.0   | 10.0  | 2.0   | 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   | 0.6   | 2.0   | 2.0   | 0.6   | 2.0   | 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                  | Perm  | NA    |       | Perm  | NA    | Perm  | Perm  | NA    | Perm  | pm+pt | NA    |       |

Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

Existing Conditions PM  
04-07-2021

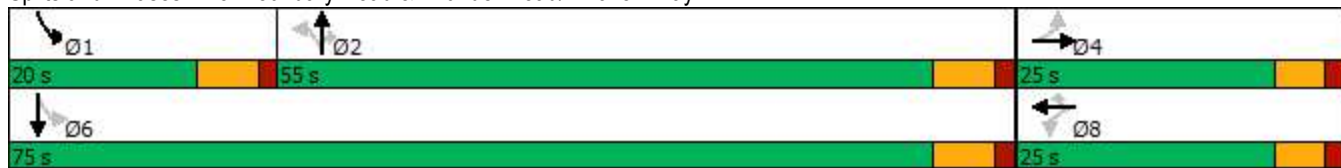


| Lane Group              | EBL   | EBT   | EBR | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR |
|-------------------------|-------|-------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-----|
| Protected Phases        |       | 4     |     |       | 8     |       |       | 2     |       | 1     | 6     |     |
| Permitted Phases        | 4     |       |     | 8     |       | 8     | 2     |       | 2     | 6     |       |     |
| Detector Phase          | 4     | 4     |     | 8     | 8     | 8     | 2     | 2     | 2     | 1     | 6     |     |
| Switch Phase            |       |       |     |       |       |       |       |       |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 20.0  | 20.0  | 20.0  | 7.0   | 20.0  |     |
| Minimum Split (s)       | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 26.2  | 26.2  | 26.2  | 13.0  | 26.2  |     |
| Total Split (s)         | 25.0  | 25.0  |     | 25.0  | 25.0  | 25.0  | 55.0  | 55.0  | 55.0  | 20.0  | 75.0  |     |
| Total Split (%)         | 25.0% | 25.0% |     | 25.0% | 25.0% | 25.0% | 55.0% | 55.0% | 55.0% | 20.0% | 75.0% |     |
| Maximum Green (s)       | 19.2  | 19.2  |     | 19.2  | 19.2  | 19.2  | 48.8  | 48.8  | 48.8  | 14.0  | 68.8  |     |
| Yellow Time (s)         | 3.7   | 3.7   |     | 3.7   | 3.7   | 3.7   | 4.6   | 4.6   | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 2.1   | 2.1   |     | 2.1   | 2.1   | 2.1   | 1.6   | 1.6   | 1.6   | 1.4   | 1.6   |     |
| Lost Time Adjust (s)    |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     |       | 5.8   |     |       | 5.8   | 5.8   | 6.2   | 6.2   | 6.2   | 6.0   | 6.2   |     |
| Lead/Lag                |       |       |     |       |       |       | Lag   | Lag   | Lag   | Lead  |       |     |
| 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  | Min   | Min   | Min   | None  | Min   |     |
| Walk Time (s)           | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   |       | 7.0   |     |
| Flash Dont Walk (s)     | 12.0  | 12.0  |     | 12.0  | 12.0  | 12.0  | 10.0  | 10.0  | 10.0  |       | 10.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0     |     | 0     | 0     | 0     | 0     | 0     | 0     |       | 0     |     |
| Act Effct Green (s)     |       | 7.7   |     |       | 7.7   | 7.7   | 40.3  | 40.3  |       | 40.7  | 42.2  |     |
| Actuated g/C Ratio      |       | 0.13  |     |       | 0.13  | 0.13  | 0.70  | 0.70  |       | 0.71  | 0.74  |     |
| v/c Ratio               |       | 0.33  |     |       | 0.04  | 0.06  | 0.01  | 0.24  |       | 0.00  | 0.72  |     |
| Control Delay           |       | 9.6   |     |       | 27.0  | 0.4   | 6.2   | 6.3   |       | 3.0   | 10.6  |     |
| Queue Delay             |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0   |       | 0.0   | 0.3   |     |
| Total Delay             |       | 9.6   |     |       | 27.0  | 0.4   | 6.2   | 6.3   |       | 3.0   | 10.9  |     |
| LOS                     |       | A     |     |       | C     | A     | A     | A     |       | A     | B     |     |
| Approach Delay          |       | 9.6   |     |       | 7.1   |       |       | 6.3   |       |       | 10.8  |     |
| Approach LOS            |       | A     |     |       | A     |       |       | A     |       |       | B     |     |
| Queue Length 50th (m)   |       | 0.0   |     |       | 0.5   | 0.0   | 0.1   | 9.8   |       | 0.1   | 55.9  |     |
| Queue Length 95th (m)   |       | 10.2  |     |       | 4.3   | 0.0   | 1.6   | 36.0  |       | 0.6   | 114.0 |     |
| Internal Link Dist (m)  |       | 618.8 |     |       | 146.6 |       |       | 150.7 |       |       | 219.1 |     |
| Turn Bay Length (m)     |       |       |     |       |       |       | 35.0  |       |       | 100.0 |       |     |
| Base Capacity (vph)     |       | 507   |     |       | 382   | 596   | 342   | 1397  |       | 550   | 1658  |     |
| Starvation Cap Reductn  |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 249   |     |
| Spillback Cap Reductn   |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 0     |     |
| Storage Cap Reductn     |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 0     |     |
| Reduced v/c Ratio       |       | 0.17  |     |       | 0.02  | 0.03  | 0.01  | 0.20  |       | 0.00  | 0.64  |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 57.2             |
| Natural Cycle:                     | 80               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.72             |
| Intersection Signal Delay:         | 9.7              |
| Intersection LOS:                  | A                |
| Intersection Capacity Utilization: | 67.0%            |
| ICU Level of Service:              | C                |
| Analysis Period (min):             | 15               |

Splits and Phases: 3: Boundary Road & Thunder Road/Amazon Way



Lanes, Volumes, Timings  
4: Boundary Road & South Amazon Access

Existing Conditions PM  
04-07-2021













| Lane Group                 | WBL   | WBR   | NBT    | NBR   | SBL   | SBT   |
|----------------------------|-------|-------|--------|-------|-------|-------|
| Lane Configurations        |       |       |        |       |       |       |
| Traffic Volume (vph)       | 5     | 11    | 244    | 5     | 12    | 769   |
| Future Volume (vph)        | 5     | 11    | 244    | 5     | 12    | 769   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800   | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.6   | 3.6   | 3.5    | 3.5   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   | 0.0   |        | 0.0   | 70.0  |       |
| Storage Lanes              | 1     | 0     |        | 0     | 1     |       |
| Taper Length (m)           | 7.5   |       |        |       | 45.0  |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00   | 1.00  | 1.00  | 1.00  |
| Frt                        | 0.910 |       | 0.997  |       |       |       |
| Flt Protected              | 0.984 |       |        |       | 0.950 |       |
| Satd. Flow (prot)          | 806   | 0     | 1643   | 0     | 846   | 1745  |
| Flt Permitted              | 0.984 |       |        |       | 0.950 |       |
| Satd. Flow (perm)          | 806   | 0     | 1643   | 0     | 846   | 1745  |
| Link Speed (k/h)           | 20    |       | 80     |       |       | 80    |
| Link Distance (m)          | 151.5 |       | 1150.2 |       |       | 174.7 |
| Travel Time (s)            | 27.3  |       | 51.8   |       |       | 7.9   |
| Peak Hour Factor           | 0.90  | 0.90  | 0.90   | 0.90  | 0.90  | 0.90  |
| Heavy Vehicles (%)         | 100%  | 100%  | 6%     | 100%  | 100%  | 2%    |
| Adj. Flow (vph)            | 6     | 12    | 271    | 6     | 13    | 854   |
| Shared Lane Traffic (%)    |       |       |        |       |       |       |
| Lane Group Flow (vph)      | 18    | 0     | 277    | 0     | 13    | 854   |
| Enter Blocked Intersection | No    | No    | No     | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left   | Right | Left  | Left  |
| Median Width(m)            | 3.6   |       | 3.5    |       |       | 3.5   |
| Link Offset(m)             | 0.0   |       | 0.0    |       |       | 0.0   |
| Crosswalk Width(m)         | 4.8   |       | 4.8    |       |       | 4.8   |
| Two way Left Turn Lane     |       |       |        |       |       |       |
| Headway Factor             | 1.07  | 1.07  | 1.09   | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    | 15    |        | 15    | 25    |       |
| Sign Control               | Stop  |       | Free   |       |       | Free  |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 52.7%        |
| ICU Level of Service              | A            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
4: Boundary Road & South Amazon Access

Existing Conditions PM  
04-07-2021

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement                          | WBL   | WBR   | NBT   | NBR   | SBL   | SBT   |
| Lane Configurations               |  |   |  |   |  |  |
| Traffic Volume (veh/h)            | 5   | 11  | 244   | 5   | 12  | 769   |
| Future Volume (Veh/h)             | 5   | 11  | 244   | 5   | 12  | 769   |
| Sign Control                      | Stop  |   | Free  |   |   | Free  |
| Grade                             | 0%  |   | 0%  |   |   | 0%  |
| Peak Hour Factor                  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  |
| Hourly flow rate (vph)            | 6   | 12  | 271   | 6   | 13  | 854   |
| Pedestrians                       |   |   |   |   |   |   |
| Lane Width (m)                    |   |   |   |   |   |   |
| Walking Speed (m/s)               |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |
| Median type                       |   |   | None  |   |   | None  |
| Median storage (veh)              |   |   |   |   |   |   |
| Upstream signal (m)               |   |   |   |   |   | 175   |
| pX, platoon unblocked             | 0.66  |   |   |   |   |   |
| vC, conflicting volume            | 1154  | 274   |   |   | 277   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |
| vCu, unblocked vol                | 975   | 274   |   |   | 277   |   |
| tC, single (s)                    | 7.4   | 7.2   |   |   | 5.1   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |
| tF (s)                            | 4.4   | 4.2   |   |   | 3.1   |   |
| p0 queue free %                   | 95  | 98  |   |   | 99  |   |
| cM capacity (veh/h)               | 123   | 579   |   |   | 882   |   |
| Direction, Lane #                 | WB 1  | NB 1  | SB 1  | SB 2  |   |   |
| Volume Total                      | 18  | 277   | 13  | 854   |   |   |
| Volume Left                       | 6   | 0   | 13  | 0   |   |   |
| Volume Right                      | 12  | 6   | 0   | 0   |   |   |
| cSH                               | 258   | 1700  | 882   | 1700  |   |   |
| Volume to Capacity                | 0.07  | 0.16  | 0.01  | 0.50  |   |   |
| Queue Length 95th (m)             | 1.8   | 0.0   | 0.4   | 0.0   |   |   |
| Control Delay (s)                 | 20.0  | 0.0   | 9.1   | 0.0   |   |   |
| Lane LOS                          | C   |   | A   |   |   |   |
| Approach Delay (s)                | 20.0  | 0.0   | 0.1   |   |   |   |
| Approach LOS                      | C   |   |   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |
| Average Delay                     |   |   | 0.4   |   |   |   |
| Intersection Capacity Utilization |   |   | 52.7%   |   | ICU Level of Service  | A   |
| Analysis Period (min)             |   |   | 15  |   |   |   |

Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road

Existing Conditions PM  
04-07-2021



| Lane Group                 | EBL   | EBR   | NBL  | NBT   | SBT    | SBR   |
|----------------------------|-------|-------|------|-------|--------|-------|
| Lane Configurations        |       |       |      |       |        |       |
| Traffic Volume (vph)       | 113   | 98    | 52   | 116   | 703    | 113   |
| Future Volume (vph)        | 113   | 98    | 52   | 116   | 703    | 113   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800   | 1800  |
| Lane Width (m)             | 3.3   | 3.3   | 3.5  | 3.5   | 3.5    | 3.5   |
| Storage Length (m)         | 25.0  | 0.0   | 0.0  |       |        | 30.0  |
| Storage Lanes              | 1     | 1     | 0    |       |        | 1     |
| Taper Length (m)           | 47.5  |       | 7.5  |       |        |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Frt                        |       | 0.850 |      |       |        | 0.850 |
| Flt Protected              | 0.950 |       |      | 0.985 |        |       |
| Satd. Flow (prot)          | 1463  | 1395  | 0    | 1666  | 1762   | 1351  |
| Flt Permitted              | 0.950 |       |      | 0.985 |        |       |
| Satd. Flow (perm)          | 1463  | 1395  | 0    | 1666  | 1762   | 1351  |
| Link Speed (k/h)           | 80    |       |      | 80    | 80     |       |
| Link Distance (m)          | 180.5 |       |      | 135.8 | 1150.2 |       |
| Travel Time (s)            | 8.1   |       |      | 6.1   | 51.8   |       |
| Peak Hour Factor           | 0.90  | 0.90  | 0.90 | 0.90  | 0.90   | 0.90  |
| Heavy Vehicles (%)         | 13%   | 6%    | 8%   | 4%    | 1%     | 12%   |
| Adj. Flow (vph)            | 126   | 109   | 58   | 129   | 781    | 126   |
| Shared Lane Traffic (%)    |       |       |      |       |        |       |
| Lane Group Flow (vph)      | 126   | 109   | 0    | 187   | 781    | 126   |
| Enter Blocked Intersection | No    | No    | No   | No    | No     | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left   | Right |
| Median Width(m)            | 3.3   |       |      | 0.0   | 0.0    |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0    |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8    |       |
| Two way Left Turn Lane     |       |       |      |       |        |       |
| Headway Factor             | 1.12  | 1.12  | 1.09 | 1.09  | 1.09   | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25   |       |        | 15    |
| Sign Control               | Stop  |       |      | Free  | Free   |       |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 65.1%        |
| ICU Level of Service              | C            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
5: Boundary Road & Mitch Owens Road

Existing Conditions PM  
04-07-2021



| Movement                          | EBL         | EBR         | NBL         | NBT                  | SBT         | SBR  |
|-----------------------------------|-------------|-------------|-------------|----------------------|-------------|------|
| Lane Configurations               |             |             |             |                      |             |      |
| Traffic Volume (veh/h)            | 113         | 98          | 52          | 116                  | 703         | 113  |
| Future Volume (Veh/h)             | 113         | 98          | 52          | 116                  | 703         | 113  |
| Sign Control                      | Stop        |             |             | Free                 | Free        |      |
| Grade                             | 0%          |             |             | 0%                   | 0%          |      |
| Peak Hour Factor                  | 0.90        | 0.90        | 0.90        | 0.90                 | 0.90        | 0.90 |
| Hourly flow rate (vph)            | 126         | 109         | 58          | 129                  | 781         | 126  |
| <b>Pedestrians</b>                |             |             |             |                      |             |      |
| Lane Width (m)                    |             |             |             |                      |             |      |
| Walking Speed (m/s)               |             |             |             |                      |             |      |
| Percent Blockage                  |             |             |             |                      |             |      |
| Right turn flare (veh)            |             |             |             |                      |             |      |
| Median type                       |             |             |             | None                 | None        |      |
| Median storage (veh)              |             |             |             |                      |             |      |
| Upstream signal (m)               |             |             |             |                      |             |      |
| pX, platoon unblocked             |             |             |             |                      |             |      |
| vC, conflicting volume            | 1026        | 781         | 907         |                      |             |      |
| vC1, stage 1 conf vol             |             |             |             |                      |             |      |
| vC2, stage 2 conf vol             |             |             |             |                      |             |      |
| vCu, unblocked vol                | 1026        | 781         | 907         |                      |             |      |
| tC, single (s)                    | 6.5         | 6.3         | 4.2         |                      |             |      |
| tC, 2 stage (s)                   |             |             |             |                      |             |      |
| tF (s)                            | 3.6         | 3.4         | 2.3         |                      |             |      |
| p0 queue free %                   | 45          | 72          | 92          |                      |             |      |
| cM capacity (veh/h)               | 228         | 389         | 726         |                      |             |      |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>EB 2</b> | <b>NB 1</b> | <b>SB 1</b>          | <b>SB 2</b> |      |
| Volume Total                      | 126         | 109         | 187         | 781                  | 126         |      |
| Volume Left                       | 126         | 0           | 58          | 0                    | 0           |      |
| Volume Right                      | 0           | 109         | 0           | 0                    | 126         |      |
| cSH                               | 228         | 389         | 726         | 1700                 | 1700        |      |
| Volume to Capacity                | 0.55        | 0.28        | 0.08        | 0.46                 | 0.07        |      |
| Queue Length 95th (m)             | 24.0        | 9.1         | 2.1         | 0.0                  | 0.0         |      |
| Control Delay (s)                 | 38.6        | 17.8        | 3.8         | 0.0                  | 0.0         |      |
| Lane LOS                          | E           | C           | A           |                      |             |      |
| Approach Delay (s)                | 29.0        |             | 3.8         | 0.0                  |             |      |
| Approach LOS                      | D           |             |             |                      |             |      |
| <b>Intersection Summary</b>       |             |             |             |                      |             |      |
| Average Delay                     |             |             | 5.7         |                      |             |      |
| Intersection Capacity Utilization |             |             | 65.1%       | ICU Level of Service | C           |      |
| Analysis Period (min)             |             |             | 15          |                      |             |      |

Lanes, Volumes, Timings  
1: Boundary Road & Hwy 417 WB Ramp Terminal

2025 Future Background AM  
08-06-2021



| Lane Group                 | WBL   | WBR   | NBT   | NBR   | SBL  | SBT   |
|----------------------------|-------|-------|-------|-------|------|-------|
| Lane Configurations        |       |       |       |       |      |       |
| Traffic Volume (vph)       | 138   | 31    | 99    | 867   | 77   | 117   |
| Future Volume (vph)        | 138   | 31    | 99    | 867   | 77   | 117   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  |
| Lane Width (m)             | 4.5   | 4.5   | 3.5   | 3.5   | 3.5  | 3.5   |
| Storage Length (m)         | 0.0   | 10.0  |       | 0.0   | 0.0  |       |
| Storage Lanes              | 1     | 0     |       | 0     | 0    |       |
| Taper Length (m)           | 7.5   |       |       |       | 7.5  |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Frt                        | 0.975 |       | 0.879 |       |      |       |
| Flt Protected              | 0.961 |       |       |       |      | 0.981 |
| Satd. Flow (prot)          | 1753  | 0     | 1529  | 0     | 0    | 1584  |
| Flt Permitted              | 0.961 |       |       |       |      | 0.981 |
| Satd. Flow (perm)          | 1753  | 0     | 1529  | 0     | 0    | 1584  |
| Link Speed (k/h)           | 40    |       | 80    |       |      | 80    |
| Link Distance (m)          | 155.0 |       | 545.7 |       |      | 134.1 |
| Travel Time (s)            | 14.0  |       | 24.6  |       |      | 6.0   |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Heavy Vehicles (%)         | 4%    | 14%   | 14%   | 1%    | 9%   | 11%   |
| Adj. Flow (vph)            | 138   | 31    | 99    | 867   | 77   | 117   |
| Shared Lane Traffic (%)    |       |       |       |       |      |       |
| Lane Group Flow (vph)      | 169   | 0     | 966   | 0     | 0    | 194   |
| Enter Blocked Intersection | No    | No    | No    | No    | No   | No    |
| Lane Alignment             | Left  | Right | Left  | Right | Left | Left  |
| Median Width(m)            | 4.5   |       | 0.0   |       |      | 0.0   |
| Link Offset(m)             | 0.0   |       | 0.0   |       |      | 0.0   |
| Crosswalk Width(m)         | 4.8   |       | 4.8   |       |      | 4.8   |
| Two way Left Turn Lane     |       |       |       |       |      |       |
| Headway Factor             | 0.95  | 0.95  | 1.09  | 1.09  | 1.09 | 1.09  |
| Turning Speed (k/h)        | 25    | 15    |       | 15    | 25   |       |
| Sign Control               | Stop  |       | Free  |       |      | Free  |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 93.1%        |
| ICU Level of Service              | F            |
| Analysis Period (min)             | 15           |



HCM Unsignalized Intersection Capacity Analysis  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

2025 Future Background AM  
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| Movement                          | WBL         | WBR         | NBT         | NBR                  | SBL  | SBT  |
|-----------------------------------|-------------|-------------|-------------|----------------------|------|------|
| Lane Configurations               |             |             |             |                      |      |      |
| Traffic Volume (veh/h)            | 138         | 31          | 99          | 867                  | 77   | 117  |
| Future Volume (Veh/h)             | 138         | 31          | 99          | 867                  | 77   | 117  |
| Sign Control                      | Stop        |             | Free        |                      |      | Free |
| Grade                             | 0%          |             | 0%          |                      |      | 0%   |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 138         | 31          | 99          | 867                  | 77   | 117  |
| <b>Pedestrians</b>                |             |             |             |                      |      |      |
| Lane Width (m)                    |             |             |             |                      |      |      |
| Walking Speed (m/s)               |             |             |             |                      |      |      |
| Percent Blockage                  |             |             |             |                      |      |      |
| Right turn flare (veh)            |             |             |             |                      |      |      |
| Median type                       | None        |             |             | None                 |      |      |
| Median storage (veh)              |             |             |             |                      |      |      |
| Upstream signal (m)               |             |             |             |                      |      |      |
| pX, platoon unblocked             |             |             |             |                      |      |      |
| vC, conflicting volume            | 804         | 532         |             |                      | 966  |      |
| vC1, stage 1 conf vol             |             |             |             |                      |      |      |
| vC2, stage 2 conf vol             |             |             |             |                      |      |      |
| vCu, unblocked vol                | 804         | 532         |             |                      | 966  |      |
| tC, single (s)                    | 6.4         | 6.3         |             |                      | 4.2  |      |
| tC, 2 stage (s)                   |             |             |             |                      |      |      |
| tF (s)                            | 3.5         | 3.4         |             |                      | 2.3  |      |
| p0 queue free %                   | 56          | 94          |             |                      | 89   |      |
| cM capacity (veh/h)               | 310         | 524         |             |                      | 686  |      |
| <b>Direction, Lane #</b>          | <b>WB 1</b> | <b>NB 1</b> | <b>SB 1</b> |                      |      |      |
| Volume Total                      | 169         | 966         | 194         |                      |      |      |
| Volume Left                       | 138         | 0           | 77          |                      |      |      |
| Volume Right                      | 31          | 867         | 0           |                      |      |      |
| cSH                               | 336         | 1700        | 686         |                      |      |      |
| Volume to Capacity                | 0.50        | 0.57        | 0.11        |                      |      |      |
| Queue Length 95th (m)             | 21.6        | 0.0         | 3.0         |                      |      |      |
| Control Delay (s)                 | 26.1        | 0.0         | 5.1         |                      |      |      |
| Lane LOS                          | D           |             | A           |                      |      |      |
| Approach Delay (s)                | 26.1        | 0.0         | 5.1         |                      |      |      |
| Approach LOS                      | D           |             |             |                      |      |      |
| <b>Intersection Summary</b>       |             |             |             |                      |      |      |
| Average Delay                     |             |             | 4.1         |                      |      |      |
| Intersection Capacity Utilization |             |             | 93.1%       | ICU Level of Service | F    |      |
| Analysis Period (min)             |             |             | 15          |                      |      |      |

Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

2025 Future Background AM  
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| Lane Group                 | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |
| Traffic Volume (vph)       | 18    | 330   | 38    | 953   | 227   | 9     |
| Future Volume (vph)        | 18    | 330   | 38    | 953   | 227   | 9     |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.3   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   | 25.0  | 50.0  |       |       | 0.0   |
| Storage Lanes              | 1     | 1     | 1     |       |       | 0     |
| Taper Length (m)           | 7.5   |       | 75.0  |       |       |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |       |       | 0.995 |       |
| Fl <sub>t</sub> Protected  | 0.950 |       | 0.950 |       |       |       |
| Satd. Flow (prot)          | 1291  | 1395  | 1291  | 1745  | 1594  | 0     |
| Fl <sub>t</sub> Permitted  | 0.950 |       | 0.531 |       |       |       |
| Satd. Flow (perm)          | 1291  | 1395  | 722   | 1745  | 1594  | 0     |
| Right Turn on Red          |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 330   |       |       | 4     |       |
| Link Speed (k/h)           | 40    |       |       | 80    | 80    |       |
| Link Distance (m)          | 154.2 |       |       | 243.1 | 545.7 |       |
| Travel Time (s)            | 13.9  |       |       | 10.9  | 24.6  |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 31%   | 6%    | 31%   | 2%    | 11%   | 13%   |
| Adj. Flow (vph)            | 18    | 330   | 38    | 953   | 227   | 9     |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 18    | 330   | 38    | 953   | 236   | 0     |
| Enter Blocked Intersection | No    | No    | No    | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left  | Left  | Left  | Right |
| Median Width(m)            | 3.5   |       |       | 3.5   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |       | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |       | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |
| Headway Factor             | 1.09  | 1.12  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25    |       |       | 15    |
| Number of Detectors        | 1     | 1     | 1     | 2     | 2     |       |
| Detector Template          | Left  | Right | Left  | Thru  | Thru  |       |
| Leading Detector (m)       | 2.0   | 2.0   | 2.0   | 10.0  | 10.0  |       |
| Trailing Detector (m)      | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Position(m)     | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Size(m)         | 2.0   | 2.0   | 2.0   | 0.6   | 0.6   |       |
| Detector 1 Type            | 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   |       |
| Detector 1 Queue (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Delay (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 2 Position(m)     |       |       |       | 9.4   | 9.4   |       |
| Detector 2 Size(m)         |       |       |       | 0.6   | 0.6   |       |
| Detector 2 Type            |       |       |       | Cl+Ex | Cl+Ex |       |
| Detector 2 Channel         |       |       |       |       |       |       |
| Detector 2 Extend (s)      |       |       |       | 0.0   | 0.0   |       |
| Turn Type                  | Prot  | Perm  | pm+pt | NA    | NA    |       |

Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

2025 Future Background AM  
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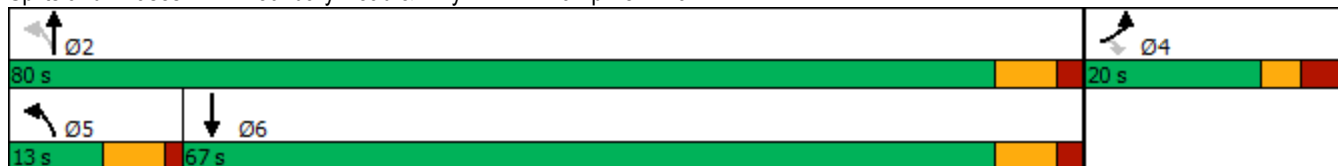


| Lane Group              | EBL   | EBR   | NBL   | NBT   | SBT   | SBR |
|-------------------------|-------|-------|-------|-------|-------|-----|
| Protected Phases        | 4     |       | 5     | 2     | 6     |     |
| Permitted Phases        |       | 4     | 2     |       |       |     |
| Detector Phase          | 4     | 4     | 5     | 2     | 6     |     |
| Switch Phase            |       |       |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0   | 7.0   | 35.0  | 35.0  |     |
| Minimum Split (s)       | 17.8  | 17.8  | 13.0  | 41.6  | 41.6  |     |
| Total Split (s)         | 20.0  | 20.0  | 13.0  | 80.0  | 67.0  |     |
| Total Split (%)         | 20.0% | 20.0% | 13.0% | 80.0% | 67.0% |     |
| Maximum Green (s)       | 13.2  | 13.2  | 7.0   | 73.4  | 60.4  |     |
| Yellow Time (s)         | 3.0   | 3.0   | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 3.8   | 3.8   | 1.4   | 2.0   | 2.0   |     |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     | 6.8   | 6.8   | 6.0   | 6.6   | 6.6   |     |
| Lead/Lag                |       |       | Lead  |       | Lag   |     |
| Lead-Lag Optimize?      |       |       | Yes   |       | Yes   |     |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |     |
| Recall Mode             | None  | None  | None  | Min   | Min   |     |
| Walk Time (s)           | 5.0   | 5.0   |       | 0.0   | 7.0   |     |
| Flash Dont Walk (s)     | 6.0   | 6.0   |       | 0.0   | 21.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0     |       | 0     | 0     |     |
| Act Effct Green (s)     | 8.6   | 8.6   | 44.6  | 44.0  | 39.7  |     |
| Actuated g/C Ratio      | 0.13  | 0.13  | 0.67  | 0.66  | 0.60  |     |
| v/c Ratio               | 0.11  | 0.71  | 0.07  | 0.83  | 0.25  |     |
| Control Delay           | 32.6  | 13.6  | 3.9   | 15.8  | 8.4   |     |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.7   | 0.0   |     |
| Total Delay             | 32.6  | 13.6  | 3.9   | 16.5  | 8.4   |     |
| LOS                     | C     | B     | A     | B     | A     |     |
| Approach Delay          | 14.6  |       |       | 16.0  | 8.4   |     |
| Approach LOS            | B     |       |       | B     | A     |     |
| Queue Length 50th (m)   | 1.7   | 0.0   | 1.2   | 67.5  | 8.7   |     |
| Queue Length 95th (m)   | 9.9   | 27.3  | 4.3   | 149.7 | 33.2  |     |
| Internal Link Dist (m)  | 130.2 |       |       | 219.1 | 521.7 |     |
| Turn Bay Length (m)     |       | 25.0  | 50.0  |       |       |     |
| Base Capacity (vph)     | 268   | 550   | 545   | 1662  | 1429  |     |
| Starvation Cap Reductn  | 0     | 0     | 0     | 357   | 0     |     |
| Spillback Cap Reductn   | 0     | 0     | 0     | 0     | 0     |     |
| Storage Cap Reductn     | 0     | 0     | 0     | 0     | 0     |     |
| Reduced v/c Ratio       | 0.07  | 0.60  | 0.07  | 0.73  | 0.17  |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 66.7             |
| Natural Cycle:                     | 75               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.83             |
| Intersection Signal Delay:         | 14.5             |
| Intersection LOS:                  | B                |
| Intersection Capacity Utilization: | 69.9%            |
| ICU Level of Service:              | C                |
| Analysis Period (min):             | 15               |

Splits and Phases: 2: Boundary Road & Hwy 417 EB Ramp Terminal



Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

2025 Future Background AM  
08-06-2021



| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       | ↕     |       |       | ↕     | ↕     | ↕     | ↑     | ↕     | ↕     | ↕     | ↕     |
| Traffic Volume (vph)       | 34    | 17    | 4     | 3     | 6     | 25    | 6     | 931   | 30    | 193   | 308   | 55    |
| Future Volume (vph)        | 34    | 17    | 4     | 3     | 6     | 25    | 6     | 931   | 30    | 193   | 308   | 55    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.3   | 3.5   | 3.3   | 3.3   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   |       | 0.0   | 0.0   |       | 0.0   | 35.0  |       | 7.5   | 100.0 |       | 0.0   |
| Storage Lanes              | 0     |       | 0     | 0     |       | 1     | 1     |       | 1     | 1     |       | 0     |
| Taper Length (m)           | 7.5   |       |       | 7.5   |       |       | 45.0  |       |       | 75.0  |       |       |
| 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  |
| Fr <sub>t</sub>            |       | 0.990 |       |       |       | 0.850 |       |       | 0.850 |       | 0.977 |       |
| Fl <sub>t</sub> Protected  |       | 0.970 |       |       | 0.984 |       | 0.950 |       |       | 0.950 |       |       |
| Satd. Flow (prot)          | 0     | 1620  | 0     | 0     | 1752  | 1513  | 1378  | 1728  | 1479  | 1653  | 1526  | 0     |
| Fl <sub>t</sub> Permitted  |       | 0.806 |       |       | 0.875 |       | 0.545 |       |       | 0.122 |       |       |
| Satd. Flow (perm)          | 0     | 1346  | 0     | 0     | 1558  | 1513  | 790   | 1728  | 1479  | 212   | 1526  | 0     |
| Right Turn on Red          |       |       | Yes   |       |       | Yes   |       |       | Yes   |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 3     |       |       |       | 100   |       |       | 96    |       |       | 21    |
| Link Speed (k/h)           |       | 60    |       |       | 20    |       |       | 80    |       |       |       | 80    |
| Link Distance (m)          |       | 642.8 |       |       | 170.6 |       |       | 174.7 |       |       |       | 243.1 |
| Travel Time (s)            |       | 38.6  |       |       | 30.7  |       |       | 7.9   |       |       |       | 10.9  |
| 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 (%)         | 6%    | 0%    | 25%   | 0%    | 0%    | 0%    | 20%   | 3%    | 0%    | 0%    | 15%   | 8%    |
| Adj. Flow (vph)            | 34    | 17    | 4     | 3     | 6     | 25    | 6     | 931   | 30    | 193   | 308   | 55    |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 0     | 55    | 0     | 0     | 9     | 25    | 6     | 931   | 30    | 193   | 363   | 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   |       |       | 3.5   |       |       | 3.5   |       |
| Link Offset(m)             |       | 0.0   |       |       | 0.0   |       |       | 0.0   |       |       | 0.0   |       |
| Crosswalk Width(m)         |       | 4.8   |       |       | 4.8   |       |       | 4.8   |       |       | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |       |       |       |       |       |       |
| Headway Factor             | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.12  | 1.09  | 1.12  | 1.12  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    |       | 15    | 25    |       | 15    | 25    |       | 15    | 25    |       | 15    |
| Number of Detectors        | 1     | 2     |       | 1     | 2     | 1     | 1     | 2     | 1     | 1     | 2     |       |
| Detector Template          | Left  | Thru  |       | Left  | Thru  | Right | Left  | Thru  | Right | Left  | Thru  |       |
| Leading Detector (m)       | 2.0   | 10.0  |       | 2.0   | 10.0  | 2.0   | 2.0   | 10.0  | 2.0   | 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   | 0.6   | 2.0   | 2.0   | 0.6   | 2.0   | 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                  | Perm  | NA    |       | Perm  | NA    | Perm  | Perm  | NA    | Perm  | pm+pt | NA    |       |

Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

2025 Future Background AM  
08-06-2021



| Lane Group              | EBL   | EBT   | EBR | WBL   | WBT   | WBR   | NBL   | NBT    | NBR   | SBL   | SBT   | SBR |
|-------------------------|-------|-------|-----|-------|-------|-------|-------|--------|-------|-------|-------|-----|
| Protected Phases        |       | 4     |     |       | 8     |       |       | 2      |       | 1     | 6     |     |
| Permitted Phases        | 4     |       |     | 8     |       | 8     | 2     |        | 2     | 6     |       |     |
| Detector Phase          | 4     | 4     |     | 8     | 8     | 8     | 2     | 2      | 2     | 1     | 6     |     |
| Switch Phase            |       |       |     |       |       |       |       |        |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 20.0  | 20.0   | 20.0  | 7.0   | 20.0  |     |
| Minimum Split (s)       | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 26.2  | 26.2   | 26.2  | 13.0  | 26.2  |     |
| Total Split (s)         | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 60.5  | 60.5   | 60.5  | 14.7  | 75.2  |     |
| Total Split (%)         | 24.8% | 24.8% |     | 24.8% | 24.8% | 24.8% | 60.5% | 60.5%  | 60.5% | 14.7% | 75.2% |     |
| Maximum Green (s)       | 19.0  | 19.0  |     | 19.0  | 19.0  | 19.0  | 54.3  | 54.3   | 54.3  | 8.7   | 69.0  |     |
| Yellow Time (s)         | 3.7   | 3.7   |     | 3.7   | 3.7   | 3.7   | 4.6   | 4.6    | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 2.1   | 2.1   |     | 2.1   | 2.1   | 2.1   | 1.6   | 1.6    | 1.6   | 1.4   | 1.6   |     |
| Lost Time Adjust (s)    |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     |       | 5.8   |     |       | 5.8   | 5.8   | 6.2   | 6.2    | 6.2   | 6.0   | 6.2   |     |
| Lead/Lag                |       |       |     |       |       |       | Lag   | Lag    | Lag   | Lead  |       |     |
| 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  | Min   | Min    | Min   | None  | Min   |     |
| Walk Time (s)           | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 7.0   | 7.0    | 7.0   |       | 7.0   |     |
| Flash Dont Walk (s)     | 12.0  | 12.0  |     | 12.0  | 12.0  | 12.0  | 10.0  | 10.0   | 10.0  |       | 10.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0     |     | 0     | 0     | 0     | 0     | 0      | 0     |       | 0     |     |
| Act Effct Green (s)     |       | 9.1   |     |       | 9.1   | 9.1   | 52.6  | 52.6   | 52.6  | 67.7  | 69.2  |     |
| Actuated g/C Ratio      |       | 0.11  |     |       | 0.11  | 0.11  | 0.62  | 0.62   | 0.62  | 0.79  | 0.81  |     |
| v/c Ratio               |       | 0.38  |     |       | 0.05  | 0.10  | 0.01  | 0.88   | 0.03  | 0.61  | 0.29  |     |
| Control Delay           |       | 43.7  |     |       | 36.8  | 0.8   | 8.0   | 26.8   | 0.1   | 16.6  | 3.8   |     |
| Queue Delay             |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Delay             |       | 43.7  |     |       | 36.8  | 0.8   | 8.0   | 26.8   | 0.1   | 16.6  | 3.8   |     |
| LOS                     |       | D     |     |       | D     | A     | A     | C      | A     | B     | A     |     |
| Approach Delay          |       | 43.7  |     |       | 10.3  |       |       | 25.9   |       |       | 8.2   |     |
| Approach LOS            |       | D     |     |       | B     |       |       | C      |       |       | A     |     |
| Queue Length 50th (m)   |       | 9.0   |     |       | 1.5   | 0.0   | 0.4   | 132.1  | 0.0   | 7.1   | 14.4  |     |
| Queue Length 95th (m)   |       | 21.0  |     |       | 6.2   | 0.0   | 2.2   | #245.8 | 0.0   | #34.0 | 29.2  |     |
| Internal Link Dist (m)  |       | 618.8 |     |       | 146.6 |       |       | 150.7  |       |       | 219.1 |     |
| Turn Bay Length (m)     |       |       |     |       |       |       | 35.0  |        | 7.5   | 100.0 |       |     |
| Base Capacity (vph)     |       | 307   |     |       | 353   | 420   | 511   | 1118   | 991   | 317   | 1238  |     |
| Starvation Cap Reductn  |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Spillback Cap Reductn   |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Storage Cap Reductn     |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Reduced v/c Ratio       |       | 0.18  |     |       | 0.03  | 0.06  | 0.01  | 0.83   | 0.03  | 0.61  | 0.29  |     |

Intersection Summary











|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 85.5             |
| Natural Cycle:                     | 90               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.88             |
| Intersection Signal Delay:         | 20.1             |
| Intersection LOS:                  | C                |
| Intersection Capacity Utilization: | 87.9%            |
| ICU Level of Service:              | E                |
| Analysis Period (min):             | 15               |

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

Splits and Phases: 3: Boundary Road & Thunder Road/Amazon Way

|  |  |  |
|--|--|--|
|  Ø1<br>14.7 s |  Ø2<br>60.5 s   |  Ø4<br>24.8 s |
|  Ø6<br>75.2 s |  Ø8<br>24.8 s |  |











Lanes, Volumes, Timings  
4: Boundary Road & South Amazon Access

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Lane Group                        | WBL   | WBR   | NBT   | NBR   | SBL   | SBT   |
| Lane Configurations               |  |   |  |   |  |  |
| Traffic Volume (vph)              | 6   | 3   | 963   | 6   | 1   | 314   |
| Future Volume (vph)               | 6   | 3   | 963   | 6   | 1   | 314   |
| Ideal Flow (vphpl)                | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)                    | 3.6   | 3.6   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)                | 0.0   | 0.0   |   | 0.0   | 70.0  |   |
| Storage Lanes                     | 1   | 0   |   | 0   | 1   |   |
| Taper Length (m)                  | 7.5   |   |   |   | 45.0  |   |
| Lane Util. Factor                 | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Frt                               | 0.955   |   | 0.999   |   |   |   |
| Flt Protected                     | 0.968   |   |   |   | 0.950   |   |
| Satd. Flow (prot)                 | 832   | 0   | 1750  | 0   | 846   | 1589  |
| Flt Permitted                     | 0.968   |   |   |   | 0.950   |   |
| Satd. Flow (perm)                 | 832   | 0   | 1750  | 0   | 846   | 1589  |
| Link Speed (k/h)                  | 20  |   | 80  |   |   | 80  |
| Link Distance (m)                 | 151.5   |   | 1150.2  |   |   | 174.7   |
| Travel Time (s)                   | 27.3  |   | 51.8  |   |   | 7.9   |
| Peak Hour Factor                  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)                | 100%  | 100%  | 1%  | 100%  | 100%  | 12%   |
| Adj. Flow (vph)                   | 6   | 3   | 963   | 6   | 1   | 314   |
| Shared Lane Traffic (%)           |   |   |   |   |   |   |
| Lane Group Flow (vph)             | 9   | 0   | 969   | 0   | 1   | 314   |
| Enter Blocked Intersection        | No  | No  | No  | No  | No  | No  |
| Lane Alignment                    | Left  | Right   | Left  | Right   | Left  | Left  |
| Median Width(m)                   | 3.6   |   | 3.5   |   |   | 3.5   |
| Link Offset(m)                    | 0.0   |   | 0.0   |   |   | 0.0   |
| Crosswalk Width(m)                | 4.8   |   | 4.8   |   |   | 4.8   |
| Two way Left Turn Lane            |   |   |   |   |   |   |
| Headway Factor                    | 1.07  | 1.07  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)               | 25  | 15  |   | 15  | 25  |   |
| Sign Control                      | Stop  |   | Free  |   |   | Free  |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |
| Area Type:                        | Other   |   |   |   |   |   |
| Control Type:                     | Unsignalized  |   |   |   |   |   |
| Intersection Capacity Utilization | 63.9%   |   |   | ICU Level of Service B  |   |   |
| Analysis Period (min)             | 15  |   |   |   |   |   |



HCM Unsignalized Intersection Capacity Analysis  
4: Boundary Road & South Amazon Access

2025 Future Background AM  
08-06-2021

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement                          | WBL   | WBR   | NBT   | NBR   | SBL   | SBT   |
| Lane Configurations               |  |   |  |   |  |  |
| Traffic Volume (veh/h)            | 6   | 3   | 963   | 6   | 1   | 314   |
| Future Volume (Veh/h)             | 6   | 3   | 963   | 6   | 1   | 314   |
| Sign Control                      | Stop  |   | Free  |   |   | Free  |
| Grade                             | 0%  |   | 0%  |   |   | 0%  |
| Peak Hour Factor                  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Hourly flow rate (vph)            | 6   | 3   | 963   | 6   | 1   | 314   |
| Pedestrians                       |   |   |   |   |   |   |
| Lane Width (m)                    |   |   |   |   |   |   |
| Walking Speed (m/s)               |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |
| Median type                       |   |   | None  |   |   | None  |
| Median storage veh                |   |   |   |   |   |   |
| Upstream signal (m)               |   |   |   |   |   | 175   |
| pX, platoon unblocked             | 0.97  |   |   |   |   |   |
| vC, conflicting volume            | 1282  | 966   |   |   | 969   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |
| vCu, unblocked vol                | 1276  | 966   |   |   | 969   |   |
| tC, single (s)                    | 7.4   | 7.2   |   |   | 5.1   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |
| tF (s)                            | 4.4   | 4.2   |   |   | 3.1   |   |
| p0 queue free %                   | 95  | 99  |   |   | 100   |   |
| cM capacity (veh/h)               | 114   | 207   |   |   | 434   |   |
| Direction, Lane #                 | WB 1  | NB 1  | SB 1  | SB 2  |   |   |
| Volume Total                      | 9   | 969   | 1   | 314   |   |   |
| Volume Left                       | 6   | 0   | 1   | 0   |   |   |
| Volume Right                      | 3   | 6   | 0   | 0   |   |   |
| cSH                               | 134   | 1700  | 434   | 1700  |   |   |
| Volume to Capacity                | 0.07  | 0.57  | 0.00  | 0.18  |   |   |
| Queue Length 95th (m)             | 1.7   | 0.0   | 0.1   | 0.0   |   |   |
| Control Delay (s)                 | 33.8  | 0.0   | 13.3  | 0.0   |   |   |
| Lane LOS                          | D   |   | B   |   |   |   |
| Approach Delay (s)                | 33.8  | 0.0   | 0.0   |   |   |   |
| Approach LOS                      | D   |   |   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |
| Average Delay                     |   |   | 0.2   |   |   |   |
| Intersection Capacity Utilization |   |   | 63.9%   |   | ICU Level of Service  | B   |
| Analysis Period (min)             |   |   | 15  |   |   |   |

Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road



| Lane Group                        | EBL          | EBR   | NBL  | NBT                    | SBT    | SBR   |
|-----------------------------------|--------------|-------|------|------------------------|--------|-------|
| Lane Configurations               |              |       |      |                        |        |       |
| Traffic Volume (vph)              | 79           | 30    | 134  | 869                    | 125    | 107   |
| Future Volume (vph)               | 79           | 30    | 134  | 869                    | 125    | 107   |
| Ideal Flow (vphpl)                | 1800         | 1800  | 1800 | 1800                   | 1800   | 1800  |
| Lane Width (m)                    | 3.3          | 3.3   | 3.5  | 3.5                    | 3.5    | 3.5   |
| Storage Length (m)                | 25.0         | 0.0   | 0.0  |                        |        | 30.0  |
| Storage Lanes                     | 1            | 1     | 0    |                        |        | 1     |
| Taper Length (m)                  | 47.5         |       | 7.5  |                        |        |       |
| Lane Util. Factor                 | 1.00         | 1.00  | 1.00 | 1.00                   | 1.00   | 1.00  |
| Fr <sub>t</sub>                   |              | 0.850 |      |                        |        | 0.850 |
| Fl <sub>t</sub> Protected         | 0.950        |       |      | 0.993                  |        |       |
| Satd. Flow (prot)                 | 1476         | 1286  | 0    | 1734                   | 1561   | 1293  |
| Fl <sub>t</sub> Permitted         | 0.950        |       |      | 0.993                  |        |       |
| Satd. Flow (perm)                 | 1476         | 1286  | 0    | 1734                   | 1561   | 1293  |
| Link Speed (k/h)                  | 80           |       |      | 80                     | 80     |       |
| Link Distance (m)                 | 180.5        |       |      | 135.8                  | 1150.2 |       |
| Travel Time (s)                   | 8.1          |       |      | 6.1                    | 51.8   |       |
| Peak Hour Factor                  | 1.00         | 1.00  | 1.00 | 1.00                   | 1.00   | 1.00  |
| Heavy Vehicles (%)                | 12%          | 15%   | 8%   | 1%                     | 14%    | 17%   |
| Adj. Flow (vph)                   | 79           | 30    | 134  | 869                    | 125    | 107   |
| Shared Lane Traffic (%)           |              |       |      |                        |        |       |
| Lane Group Flow (vph)             | 79           | 30    | 0    | 1003                   | 125    | 107   |
| Enter Blocked Intersection        | No           | No    | No   | No                     | No     | No    |
| Lane Alignment                    | Left         | Right | Left | Left                   | Left   | Right |
| Median Width(m)                   | 3.3          |       |      | 0.0                    | 0.0    |       |
| Link Offset(m)                    | 0.0          |       |      | 0.0                    | 0.0    |       |
| Crosswalk Width(m)                | 4.8          |       |      | 4.8                    | 4.8    |       |
| Two way Left Turn Lane            |              |       |      |                        |        |       |
| Headway Factor                    | 1.12         | 1.12  | 1.09 | 1.09                   | 1.09   | 1.09  |
| Turning Speed (k/h)               | 25           | 15    | 25   |                        |        | 15    |
| Sign Control                      | Stop         |       |      | Free                   | Free   |       |
| <b>Intersection Summary</b>       |              |       |      |                        |        |       |
| Area Type:                        | Other        |       |      |                        |        |       |
| Control Type:                     | Unsignalized |       |      |                        |        |       |
| Intersection Capacity Utilization | 77.7%        |       |      | ICU Level of Service D |        |       |
| Analysis Period (min)             | 15           |       |      |                        |        |       |

HCM Unsignalized Intersection Capacity Analysis  
5: Boundary Road & Mitch Owens Road

2025 Future Background AM  
08-06-2021



| Movement                          | EBL  | EBR  | NBL   | NBT                  | SBT  | SBR  |
|-----------------------------------|------|------|-------|----------------------|------|------|
| Lane Configurations               |      |      |       |                      |      |      |
| Traffic Volume (veh/h)            | 79   | 30   | 134   | 869                  | 125  | 107  |
| Future Volume (Veh/h)             | 79   | 30   | 134   | 869                  | 125  | 107  |
| Sign Control                      | Stop |      |       | Free                 | Free |      |
| Grade                             | 0%   |      |       | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00 | 1.00 | 1.00  | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 79   | 30   | 134   | 869                  | 125  | 107  |
| <b>Pedestrians</b>                |      |      |       |                      |      |      |
| Lane Width (m)                    |      |      |       |                      |      |      |
| Walking Speed (m/s)               |      |      |       |                      |      |      |
| Percent Blockage                  |      |      |       |                      |      |      |
| Right turn flare (veh)            |      |      |       |                      |      |      |
| Median type                       |      |      |       | None                 | None |      |
| Median storage veh)               |      |      |       |                      |      |      |
| Upstream signal (m)               |      |      |       |                      |      |      |
| pX, platoon unblocked             |      |      |       |                      |      |      |
| vC, conflicting volume            | 1262 | 125  | 232   |                      |      |      |
| vC1, stage 1 conf vol             |      |      |       |                      |      |      |
| vC2, stage 2 conf vol             |      |      |       |                      |      |      |
| vCu, unblocked vol                | 1262 | 125  | 232   |                      |      |      |
| tC, single (s)                    | 6.5  | 6.4  | 4.2   |                      |      |      |
| tC, 2 stage (s)                   |      |      |       |                      |      |      |
| tF (s)                            | 3.6  | 3.4  | 2.3   |                      |      |      |
| p0 queue free %                   | 51   | 97   | 90    |                      |      |      |
| cM capacity (veh/h)               | 160  | 892  | 1301  |                      |      |      |
| Direction, Lane #                 | EB 1 | EB 2 | NB 1  | SB 1                 | SB 2 |      |
| Volume Total                      | 79   | 30   | 1003  | 125                  | 107  |      |
| Volume Left                       | 79   | 0    | 134   | 0                    | 0    |      |
| Volume Right                      | 0    | 30   | 0     | 0                    | 107  |      |
| cSH                               | 160  | 892  | 1301  | 1700                 | 1700 |      |
| Volume to Capacity                | 0.49 | 0.03 | 0.10  | 0.07                 | 0.06 |      |
| Queue Length 95th (m)             | 18.9 | 0.8  | 2.7   | 0.0                  | 0.0  |      |
| Control Delay (s)                 | 47.5 | 9.2  | 2.6   | 0.0                  | 0.0  |      |
| Lane LOS                          | E    | A    | A     |                      |      |      |
| Approach Delay (s)                | 36.9 |      | 2.6   | 0.0                  |      |      |
| Approach LOS                      | E    |      |       |                      |      |      |
| <b>Intersection Summary</b>       |      |      |       |                      |      |      |
| Average Delay                     |      |      | 4.9   |                      |      |      |
| Intersection Capacity Utilization |      |      | 77.7% | ICU Level of Service |      | D    |
| Analysis Period (min)             |      |      | 15    |                      |      |      |

Lanes, Volumes, Timings  
1: Boundary Road & Hwy 417 WB Ramp Terminal

2025 Future Background PM  
08-06-2021



| Lane Group                 | WBL   | WBR   | NBT   | NBR   | SBL  | SBT   |
|----------------------------|-------|-------|-------|-------|------|-------|
| Lane Configurations        |       |       |       |       |      |       |
| Traffic Volume (vph)       | 52    | 1     | 160   | 321   | 24   | 123   |
| Future Volume (vph)        | 52    | 1     | 160   | 321   | 24   | 123   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  |
| Lane Width (m)             | 4.5   | 4.5   | 3.5   | 3.5   | 3.5  | 3.5   |
| Storage Length (m)         | 0.0   | 10.0  |       | 0.0   | 0.0  |       |
| Storage Lanes              | 1     | 0     |       | 0     | 0    |       |
| Taper Length (m)           | 7.5   |       |       |       | 7.5  |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Frt                        | 0.997 |       | 0.910 |       |      |       |
| Flt Protected              | 0.953 |       |       |       |      | 0.992 |
| Satd. Flow (prot)          | 1586  | 0     | 1558  | 0     | 0    | 1630  |
| Flt Permitted              | 0.953 |       |       |       |      | 0.992 |
| Satd. Flow (perm)          | 1586  | 0     | 1558  | 0     | 0    | 1630  |
| Link Speed (k/h)           | 40    |       | 80    |       |      | 80    |
| Link Distance (m)          | 155.0 |       | 545.7 |       |      | 134.1 |
| Travel Time (s)            | 14.0  |       | 24.6  |       |      | 6.0   |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Heavy Vehicles (%)         | 19%   | 0%    | 6%    | 3%    | 5%   | 9%    |
| Adj. Flow (vph)            | 52    | 1     | 160   | 321   | 24   | 123   |
| Shared Lane Traffic (%)    |       |       |       |       |      |       |
| Lane Group Flow (vph)      | 53    | 0     | 481   | 0     | 0    | 147   |
| Enter Blocked Intersection | No    | No    | No    | No    | No   | No    |
| Lane Alignment             | Left  | Right | Left  | Right | Left | Left  |
| Median Width(m)            | 4.5   |       | 0.0   |       |      | 0.0   |
| Link Offset(m)             | 0.0   |       | 0.0   |       |      | 0.0   |
| Crosswalk Width(m)         | 4.8   |       | 4.8   |       |      | 4.8   |
| Two way Left Turn Lane     |       |       |       |       |      |       |
| Headway Factor             | 0.95  | 0.95  | 1.09  | 1.09  | 1.09 | 1.09  |
| Turning Speed (k/h)        | 25    | 15    |       | 15    | 25   |       |
| Sign Control               | Stop  |       | Free  |       |      | Free  |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 39.7%        |
| ICU Level of Service              | A            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

2025 Future Background PM  
 08-06-2021



| Movement                          | WBL  | WBR  | NBT   | NBR  | SBL                  | SBT  |
|-----------------------------------|------|------|-------|------|----------------------|------|
| Lane Configurations               |      |      |       |      |                      |      |
| Traffic Volume (veh/h)            | 52   | 1    | 160   | 321  | 24                   | 123  |
| Future Volume (Veh/h)             | 52   | 1    | 160   | 321  | 24                   | 123  |
| Sign Control                      | Stop |      | Free  |      |                      | Free |
| Grade                             | 0%   |      | 0%    |      |                      | 0%   |
| Peak Hour Factor                  | 1.00 | 1.00 | 1.00  | 1.00 | 1.00                 | 1.00 |
| Hourly flow rate (vph)            | 52   | 1    | 160   | 321  | 24                   | 123  |
| Pedestrians                       |      |      |       |      |                      |      |
| Lane Width (m)                    |      |      |       |      |                      |      |
| Walking Speed (m/s)               |      |      |       |      |                      |      |
| Percent Blockage                  |      |      |       |      |                      |      |
| Right turn flare (veh)            |      |      |       |      |                      |      |
| Median type                       |      |      | None  |      |                      | None |
| Median storage veh                |      |      |       |      |                      |      |
| Upstream signal (m)               |      |      |       |      |                      |      |
| pX, platoon unblocked             |      |      |       |      |                      |      |
| vC, conflicting volume            | 492  | 320  |       |      | 481                  |      |
| vC1, stage 1 conf vol             |      |      |       |      |                      |      |
| vC2, stage 2 conf vol             |      |      |       |      |                      |      |
| vCu, unblocked vol                | 492  | 320  |       |      | 481                  |      |
| tC, single (s)                    | 6.6  | 6.2  |       |      | 4.1                  |      |
| tC, 2 stage (s)                   |      |      |       |      |                      |      |
| tF (s)                            | 3.7  | 3.3  |       |      | 2.2                  |      |
| p0 queue free %                   | 90   | 100  |       |      | 98                   |      |
| cM capacity (veh/h)               | 496  | 725  |       |      | 1066                 |      |
| Direction, Lane #                 | WB 1 | NB 1 | SB 1  |      |                      |      |
| Volume Total                      | 53   | 481  | 147   |      |                      |      |
| Volume Left                       | 52   | 0    | 24    |      |                      |      |
| Volume Right                      | 1    | 321  | 0     |      |                      |      |
| cSH                               | 499  | 1700 | 1066  |      |                      |      |
| Volume to Capacity                | 0.11 | 0.28 | 0.02  |      |                      |      |
| Queue Length 95th (m)             | 2.8  | 0.0  | 0.6   |      |                      |      |
| Control Delay (s)                 | 13.1 | 0.0  | 1.6   |      |                      |      |
| Lane LOS                          | B    |      | A     |      |                      |      |
| Approach Delay (s)                | 13.1 | 0.0  | 1.6   |      |                      |      |
| Approach LOS                      | B    |      |       |      |                      |      |
| Intersection Summary              |      |      |       |      |                      |      |
| Average Delay                     |      |      | 1.4   |      |                      |      |
| Intersection Capacity Utilization |      |      | 39.7% |      | ICU Level of Service | A    |
| Analysis Period (min)             |      |      | 15    |      |                      |      |

Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

2025 Future Background PM  
08-06-2021



| Lane Group                 | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |
| Traffic Volume (vph)       | 77    | 743   | 166   | 306   | 218   | 17    |
| Future Volume (vph)        | 77    | 743   | 166   | 306   | 218   | 17    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.3   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   | 25.0  | 50.0  |       |       | 0.0   |
| Storage Lanes              | 1     | 1     | 1     |       |       | 0     |
| Taper Length (m)           | 7.5   |       | 75.0  |       |       |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |       |       | 0.990 |       |
| Fl <sub>t</sub> Protected  | 0.950 |       | 0.950 |       |       |       |
| Satd. Flow (prot)          | 1551  | 1436  | 1537  | 1664  | 1592  | 0     |
| Fl <sub>t</sub> Permitted  | 0.950 |       | 0.518 |       |       |       |
| Satd. Flow (perm)          | 1551  | 1436  | 838   | 1664  | 1592  | 0     |
| Right Turn on Red          |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 600   |       |       | 4     |       |
| Link Speed (k/h)           | 40    |       |       | 80    | 80    |       |
| Link Distance (m)          | 154.2 |       |       | 243.1 | 545.7 |       |
| Travel Time (s)            | 13.9  |       |       | 10.9  | 24.6  |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 9%    | 3%    | 10%   | 7%    | 11%   | 7%    |
| Adj. Flow (vph)            | 77    | 743   | 166   | 306   | 218   | 17    |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 77    | 743   | 166   | 306   | 235   | 0     |
| Enter Blocked Intersection | No    | No    | No    | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left  | Left  | Left  | Right |
| Median Width(m)            | 3.5   |       |       | 3.5   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |       | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |       | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |
| Headway Factor             | 1.09  | 1.12  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25    |       |       | 15    |
| Number of Detectors        | 1     | 1     | 1     | 2     | 2     |       |
| Detector Template          | Left  | Right | Left  | Thru  | Thru  |       |
| Leading Detector (m)       | 2.0   | 2.0   | 2.0   | 10.0  | 10.0  |       |
| Trailing Detector (m)      | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Position(m)     | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Size(m)         | 2.0   | 2.0   | 2.0   | 0.6   | 0.6   |       |
| Detector 1 Type            | 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   |       |
| Detector 1 Queue (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Delay (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 2 Position(m)     |       |       |       | 9.4   | 9.4   |       |
| Detector 2 Size(m)         |       |       |       | 0.6   | 0.6   |       |
| Detector 2 Type            |       |       |       | Cl+Ex | Cl+Ex |       |
| Detector 2 Channel         |       |       |       |       |       |       |
| Detector 2 Extend (s)      |       |       |       | 0.0   | 0.0   |       |
| Turn Type                  | Prot  | Perm  | pm+pt | NA    | NA    |       |

Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

2025 Future Background PM  
08-06-2021



| Lane Group              | EBL   | EBR   | NBL   | NBT   | SBT   | SBR |
|-------------------------|-------|-------|-------|-------|-------|-----|
| Protected Phases        | 4     |       | 5     | 2     | 6     |     |
| Permitted Phases        |       | 4     | 2     |       |       |     |
| Detector Phase          | 4     | 4     | 5     | 2     | 6     |     |
| Switch Phase            |       |       |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0   | 7.0   | 35.0  | 35.0  |     |
| Minimum Split (s)       | 23.0  | 23.0  | 13.0  | 41.6  | 41.6  |     |
| Total Split (s)         | 44.0  | 44.0  | 13.0  | 56.0  | 43.0  |     |
| Total Split (%)         | 44.0% | 44.0% | 13.0% | 56.0% | 43.0% |     |
| Maximum Green (s)       | 37.2  | 37.2  | 7.0   | 49.4  | 36.4  |     |
| Yellow Time (s)         | 3.0   | 3.0   | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 3.8   | 3.8   | 1.4   | 2.0   | 2.0   |     |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     | 6.8   | 6.8   | 6.0   | 6.6   | 6.6   |     |
| Lead/Lag                |       |       | Lead  |       | Lag   |     |
| Lead-Lag Optimize?      |       |       | Yes   |       | Yes   |     |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |     |
| Recall Mode             | None  | None  | None  | Min   | Min   |     |
| Walk Time (s)           | 7.0   | 7.0   |       | 0.0   | 7.0   |     |
| Flash Dont Walk (s)     | 5.0   | 5.0   |       | 0.0   | 21.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0     |       | 0     | 0     |     |
| Act Effct Green (s)     | 20.6  | 20.6  | 49.5  | 48.9  | 35.7  |     |
| Actuated g/C Ratio      | 0.25  | 0.25  | 0.59  | 0.59  | 0.43  |     |
| v/c Ratio               | 0.20  | 0.92  | 0.30  | 0.31  | 0.34  |     |
| Control Delay           | 23.7  | 23.9  | 12.2  | 12.5  | 20.5  |     |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |     |
| Total Delay             | 23.7  | 23.9  | 12.2  | 12.5  | 20.5  |     |
| LOS                     | C     | C     | B     | B     | C     |     |
| Approach Delay          | 23.9  |       |       | 12.4  | 20.5  |     |
| Approach LOS            | C     |       |       | B     | C     |     |
| Queue Length 50th (m)   | 10.0  | 19.9  | 11.6  | 23.9  | 25.0  |     |
| Queue Length 95th (m)   | 20.2  | 84.2  | 31.4  | 57.9  | 56.2  |     |
| Internal Link Dist (m)  | 130.2 |       |       | 219.1 | 521.7 |     |
| Turn Bay Length (m)     |       | 25.0  | 50.0  |       |       |     |
| Base Capacity (vph)     | 706   | 980   | 558   | 1007  | 712   |     |
| Starvation Cap Reductn  | 0     | 0     | 0     | 0     | 0     |     |
| Spillback Cap Reductn   | 0     | 0     | 0     | 0     | 0     |     |
| Storage Cap Reductn     | 0     | 0     | 0     | 0     | 0     |     |
| Reduced v/c Ratio       | 0.11  | 0.76  | 0.30  | 0.30  | 0.33  |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 83.2             |
| Natural Cycle:                     | 80               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.92             |
| Intersection Signal Delay:         | 19.8             |
| Intersection LOS:                  | B                |
| Intersection Capacity Utilization: | 88.9%            |
| ICU Level of Service:              | E                |
| Analysis Period (min):             | 15               |

Splits and Phases: 2: Boundary Road & Hwy 417 EB Ramp Terminal


























Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

2025 Future Background PM

08-06-2021

|                            |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |   |  |   |   |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)       | 68  | 0   | 15  | 6   | 0   | 18  | 4  | 385   | 0   | 2   | 896   | 61  |
| Future Volume (vph)        | 68  | 0   | 15  | 6   | 0   | 18  | 4  | 385   | 0   | 2   | 896   | 61  |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800   | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.3  | 3.5   | 3.3   | 3.3   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 35.0   |   | 7.5   | 100.0   |   | 0.0   |
| Storage Lanes              | 0   |   | 0   | 0   |   | 1   | 1  |   | 1   | 1   |   | 0   |
| Taper Length (m)           | 7.5   |   |   | 7.5   |   |   | 45.0   |   |   | 75.0  |   |   |
| 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  |
| Fr <sub>t</sub>            |   | 0.976   |   |   |   | 0.850   |  |   |   |   |   | 0.990   |
| Fl <sub>t</sub> Protected  |   | 0.961   |   |   | 0.950   |   | 0.950  |   |   | 0.950   |   |   |
| Satd. Flow (prot)          | 0   | 1591  | 0   | 0   | 1208  | 1513  | 1322   | 1633  | 1740  | 1102  | 1699  | 0   |
| Fl <sub>t</sub> Permitted  |   | 0.761   |   |   | 0.849   |   | 0.263  |   |   | 0.462   |   |   |
| Satd. Flow (perm)          | 0   | 1260  | 0   | 0   | 1079  | 1513  | 366  | 1633  | 1740  | 536   | 1699  | 0   |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |  |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 100   |   |   |   | 100   |  |   |   |   |   | 8   |
| Link Speed (k/h)           |   | 60  |   |   | 20  |   |  | 80  |   |   |   | 80  |
| Link Distance (m)          |   | 642.8   |   |   | 170.6   |   |  | 174.7   |   |   |   | 243.1   |
| Travel Time (s)            |   | 38.6  |   |   | 30.7  |   |  | 7.9   |   |   |   | 10.9  |
| 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 (%)         | 6%  | 0%  | 0%  | 40%   | 0%  | 0%  | 25%  | 9%  | 0%  | 50%   | 4%  | 0%  |
| Adj. Flow (vph)            | 68  | 0   | 15  | 6   | 0   | 18  | 4  | 385   | 0   | 2   | 896   | 61  |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Group Flow (vph)      | 0   | 83  | 0   | 0   | 6   | 18  | 4  | 385   | 0   | 2   | 957   | 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   |   |  | 3.5   |   |   | 3.5   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |  | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.8   |   |   | 4.8   |   |  | 4.8   |   |   | 4.8   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |  |   |   |   |   |   |
| Headway Factor             | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.12   | 1.09  | 1.12  | 1.12  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25  |   | 15  | 25  |   | 15  | 25   |   | 15  | 25  |   | 15  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   | 1   | 1  | 2   | 1   | 1   | 2   |   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  | Right   | Left   | Thru  | Right   | Left  | Thru  |   |
| Leading Detector (m)       | 2.0   | 10.0  |   | 2.0   | 10.0  | 2.0   | 2.0  | 10.0  | 2.0   | 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   | 0.6   | 2.0   | 2.0  | 0.6   | 2.0   | 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                  | Perm  | NA  |   | Perm  | NA  | Perm  | Perm   | NA  | Perm  | pm+pt   | NA  |   |

Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

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| Lane Group              | EBL   | EBT   | EBR | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR |
|-------------------------|-------|-------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-----|
| Protected Phases        |       | 4     |     |       | 8     |       |       | 2     |       | 1     | 6     |     |
| Permitted Phases        | 4     |       |     | 8     |       | 8     | 2     |       | 2     | 6     |       |     |
| Detector Phase          | 4     | 4     |     | 8     | 8     | 8     | 2     | 2     | 2     | 1     | 6     |     |
| Switch Phase            |       |       |     |       |       |       |       |       |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 20.0  | 20.0  | 20.0  | 7.0   | 20.0  |     |
| Minimum Split (s)       | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 26.2  | 26.2  | 26.2  | 13.0  | 26.2  |     |
| Total Split (s)         | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 62.2  | 62.2  | 62.2  | 13.0  | 75.2  |     |
| Total Split (%)         | 24.8% | 24.8% |     | 24.8% | 24.8% | 24.8% | 62.2% | 62.2% | 62.2% | 13.0% | 75.2% |     |
| Maximum Green (s)       | 19.0  | 19.0  |     | 19.0  | 19.0  | 19.0  | 56.0  | 56.0  | 56.0  | 7.0   | 69.0  |     |
| Yellow Time (s)         | 3.7   | 3.7   |     | 3.7   | 3.7   | 3.7   | 4.6   | 4.6   | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 2.1   | 2.1   |     | 2.1   | 2.1   | 2.1   | 1.6   | 1.6   | 1.6   | 1.4   | 1.6   |     |
| Lost Time Adjust (s)    |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     |       | 5.8   |     |       | 5.8   | 5.8   | 6.2   | 6.2   | 6.2   | 6.0   | 6.2   |     |
| Lead/Lag                |       |       |     |       |       |       | Lag   | Lag   | Lag   | Lead  |       |     |
| 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  | Min   | Min   | Min   | None  | Min   |     |
| Walk Time (s)           | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   |       | 7.0   |     |
| Flash Dont Walk (s)     | 12.0  | 12.0  |     | 12.0  | 12.0  | 12.0  | 10.0  | 10.0  | 10.0  |       | 10.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0     |     | 0     | 0     | 0     | 0     | 0     | 0     |       | 0     |     |
| Act Effct Green (s)     |       | 7.7   |     |       | 7.7   | 7.7   | 44.3  | 44.3  |       | 44.6  | 46.2  |     |
| Actuated g/C Ratio      |       | 0.13  |     |       | 0.13  | 0.13  | 0.73  | 0.73  |       | 0.73  | 0.76  |     |
| v/c Ratio               |       | 0.34  |     |       | 0.04  | 0.06  | 0.02  | 0.32  |       | 0.00  | 0.74  |     |
| Control Delay           |       | 9.9   |     |       | 30.2  | 0.4   | 5.5   | 6.3   |       | 3.0   | 10.7  |     |
| Queue Delay             |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0   |       | 0.0   | 0.5   |     |
| Total Delay             |       | 9.9   |     |       | 30.2  | 0.4   | 5.5   | 6.3   |       | 3.0   | 11.2  |     |
| LOS                     |       | A     |     |       | C     | A     | A     | A     |       | A     | B     |     |
| Approach Delay          |       | 9.9   |     |       | 7.9   |       |       | 6.3   |       |       | 11.2  |     |
| Approach LOS            |       | A     |     |       | A     |       |       | A     |       |       | B     |     |
| Queue Length 50th (m)   |       | 0.0   |     |       | 0.6   | 0.0   | 0.1   | 14.6  |       | 0.1   | 62.7  |     |
| Queue Length 95th (m)   |       | 10.1  |     |       | 4.6   | 0.0   | 1.6   | 50.4  |       | 0.5   | 124.2 |     |
| Internal Link Dist (m)  |       | 618.8 |     |       | 146.6 |       |       | 150.7 |       |       | 219.1 |     |
| Turn Bay Length (m)     |       |       |     |       |       |       | 35.0  |       |       | 100.0 |       |     |
| Base Capacity (vph)     |       | 481   |     |       | 355   | 565   | 325   | 1453  |       | 460   | 1635  |     |
| Starvation Cap Reductn  |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 299   |     |
| Spillback Cap Reductn   |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 0     |     |
| Storage Cap Reductn     |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 0     |     |
| Reduced v/c Ratio       |       | 0.17  |     |       | 0.02  | 0.03  | 0.01  | 0.26  |       | 0.00  | 0.72  |     |











Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 61               |
| Natural Cycle:                     | 80               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.74             |
| Intersection Signal Delay:         | 9.8              |
| Intersection LOS:                  | A                |
| Intersection Capacity Utilization: | 75.3%            |
| ICU Level of Service:              | D                |
| Analysis Period (min):             | 15               |

Splits and Phases: 3: Boundary Road & Thunder Road/Amazon Way













Lanes, Volumes, Timings  
4: Boundary Road & South Amazon Access

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Lane Group                        | WBL   | WBR   | NBT   | NBR   | SBL   | SBT   |
| Lane Configurations               |  |   |  |   |  |  |
| Traffic Volume (vph)              | 6   | 12  | 377   | 6   | 13  | 904   |
| Future Volume (vph)               | 6   | 12  | 377   | 6   | 13  | 904   |
| Ideal Flow (vphpl)                | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)                    | 3.6   | 3.6   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)                | 0.0   | 0.0   |   | 0.0   | 70.0  |   |
| Storage Lanes                     | 1   | 0   |   | 0   | 1   |   |
| Taper Length (m)                  | 7.5   |   |   |   | 45.0  |   |
| Lane Util. Factor                 | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Frt                               | 0.910   |   | 0.998   |   |   |   |
| Flt Protected                     | 0.984   |   |   |   | 0.950   |   |
| Satd. Flow (prot)                 | 806   | 0   | 1668  | 0   | 846   | 1745  |
| Flt Permitted                     | 0.984   |   |   |   | 0.950   |   |
| Satd. Flow (perm)                 | 806   | 0   | 1668  | 0   | 846   | 1745  |
| Link Speed (k/h)                  | 20  |   | 80  |   |   | 80  |
| Link Distance (m)                 | 151.5   |   | 1150.2  |   |   | 174.7   |
| Travel Time (s)                   | 27.3  |   | 51.8  |   |   | 7.9   |
| Peak Hour Factor                  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)                | 100%  | 100%  | 5%  | 100%  | 100%  | 2%  |
| Adj. Flow (vph)                   | 6   | 12  | 377   | 6   | 13  | 904   |
| Shared Lane Traffic (%)           |   |   |   |   |   |   |
| Lane Group Flow (vph)             | 18  | 0   | 383   | 0   | 13  | 904   |
| Enter Blocked Intersection        | No  | No  | No  | No  | No  | No  |
| Lane Alignment                    | Left  | Right   | Left  | Right   | Left  | Left  |
| Median Width(m)                   | 3.6   |   | 3.5   |   |   | 3.5   |
| Link Offset(m)                    | 0.0   |   | 0.0   |   |   | 0.0   |
| Crosswalk Width(m)                | 4.8   |   | 4.8   |   |   | 4.8   |
| Two way Left Turn Lane            |   |   |   |   |   |   |
| Headway Factor                    | 1.07  | 1.07  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)               | 25  | 15  |   | 15  | 25  |   |
| Sign Control                      | Stop  |   | Free  |   |   | Free  |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |
| Area Type:                        | Other   |   |   |   |   |   |
| Control Type:                     | Unsignalized  |   |   |   |   |   |
| Intersection Capacity Utilization | 60.2%   |   |   | ICU Level of Service B  |   |   |
| Analysis Period (min)             | 15  |   |   |   |   |   |

HCM Unsignalized Intersection Capacity Analysis  
4: Boundary Road & South Amazon Access

2025 Future Background PM  
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|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement                          | WBL   | WBR   | NBT   | NBR   | SBL   | SBT   |
| Lane Configurations               |  |   |  |   |  |  |
| Traffic Volume (veh/h)            | 6   | 12  | 377   | 6   | 13  | 904   |
| Future Volume (Veh/h)             | 6   | 12  | 377   | 6   | 13  | 904   |
| Sign Control                      | Stop  |   | Free  |   | Free  |   |
| Grade                             | 0%  |   | 0%  |   | 0%  |   |
| Peak Hour Factor                  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Hourly flow rate (vph)            | 6   | 12  | 377   | 6   | 13  | 904   |
| Pedestrians                       |   |   |   |   |   |   |
| Lane Width (m)                    |   |   |   |   |   |   |
| Walking Speed (m/s)               |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |
| Median type                       | None  |   |   | None  |   |   |
| Median storage veh                |   |   |   |   |   |   |
| Upstream signal (m)               |   |   |   |   |   | 175   |
| pX, platoon unblocked             | 0.63  |   |   |   |   |   |
| vC, conflicting volume            | 1310  | 380   |   |   | 383   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |
| vCu, unblocked vol                | 1198  | 380   |   |   | 383   |   |
| tC, single (s)                    | 7.4   | 7.2   |   |   | 5.1   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |
| tF (s)                            | 4.4   | 4.2   |   |   | 3.1   |   |
| p0 queue free %                   | 93  | 98  |   |   | 98  |   |
| cM capacity (veh/h)               | 82  | 496   |   |   | 792   |   |
| Direction, Lane #                 | WB 1  | NB 1  | SB 1  | SB 2  |   |   |
| Volume Total                      | 18  | 383   | 13  | 904   |   |   |
| Volume Left                       | 6   | 0   | 13  | 0   |   |   |
| Volume Right                      | 12  | 6   | 0   | 0   |   |   |
| cSH                               | 185   | 1700  | 792   | 1700  |   |   |
| Volume to Capacity                | 0.10  | 0.23  | 0.02  | 0.53  |   |   |
| Queue Length 95th (m)             | 2.5   | 0.0   | 0.4   | 0.0   |   |   |
| Control Delay (s)                 | 26.5  | 0.0   | 9.6   | 0.0   |   |   |
| Lane LOS                          | D   |   | A   |   |   |   |
| Approach Delay (s)                | 26.5  | 0.0   | 0.1   |   |   |   |
| Approach LOS                      | D   |   |   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |
| Average Delay                     |   |   | 0.5   |   |   |   |
| Intersection Capacity Utilization |   |   | 60.2%   | ICU Level of Service  | B   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |

Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road

2025 Future Background PM  
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| Lane Group                 | EBL   | EBR   | NBL  | NBT   | SBT    | SBR   |
|----------------------------|-------|-------|------|-------|--------|-------|
| Lane Configurations        |       |       |      |       |        |       |
| Traffic Volume (vph)       | 128   | 108   | 57   | 131   | 788    | 129   |
| Future Volume (vph)        | 128   | 108   | 57   | 131   | 788    | 129   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800   | 1800  |
| Lane Width (m)             | 3.3   | 3.3   | 3.5  | 3.5   | 3.5    | 3.5   |
| Storage Length (m)         | 25.0  | 0.0   | 0.0  |       |        | 30.0  |
| Storage Lanes              | 1     | 1     | 0    |       |        | 1     |
| Taper Length (m)           | 47.5  |       | 7.5  |       |        |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |      |       |        | 0.850 |
| Fl <sub>t</sub> Protected  | 0.950 |       |      | 0.985 |        |       |
| Satd. Flow (prot)          | 1463  | 1395  | 0    | 1666  | 1762   | 1351  |
| Fl <sub>t</sub> Permitted  | 0.950 |       |      | 0.985 |        |       |
| Satd. Flow (perm)          | 1463  | 1395  | 0    | 1666  | 1762   | 1351  |
| Link Speed (k/h)           | 80    |       |      | 80    | 80     |       |
| Link Distance (m)          | 180.5 |       |      | 135.8 | 1150.2 |       |
| Travel Time (s)            | 8.1   |       |      | 6.1   | 51.8   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Heavy Vehicles (%)         | 13%   | 6%    | 8%   | 4%    | 1%     | 12%   |
| Adj. Flow (vph)            | 128   | 108   | 57   | 131   | 788    | 129   |
| Shared Lane Traffic (%)    |       |       |      |       |        |       |
| Lane Group Flow (vph)      | 128   | 108   | 0    | 188   | 788    | 129   |
| Enter Blocked Intersection | No    | No    | No   | No    | No     | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left   | Right |
| Median Width(m)            | 3.3   |       |      | 0.0   | 0.0    |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0    |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8    |       |
| Two way Left Turn Lane     |       |       |      |       |        |       |
| Headway Factor             | 1.12  | 1.12  | 1.09 | 1.09  | 1.09   | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25   |       |        | 15    |
| Sign Control               | Stop  |       |      | Free  | Free   |       |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 71.9%        |
| ICU Level of Service              | C            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
5: Boundary Road & Mitch Owens Road

2025 Future Background PM  
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| Movement                          | EBL         | EBR         | NBL                  | NBT         | SBT         | SBR  |
|-----------------------------------|-------------|-------------|----------------------|-------------|-------------|------|
| Lane Configurations               |             |             |                      |             |             |      |
| Traffic Volume (veh/h)            | 128         | 108         | 57                   | 131         | 788         | 129  |
| Future Volume (Veh/h)             | 128         | 108         | 57                   | 131         | 788         | 129  |
| Sign Control                      | Stop        |             |                      | Free        | Free        |      |
| Grade                             | 0%          |             |                      | 0%          | 0%          |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00                 | 1.00        | 1.00        | 1.00 |
| Hourly flow rate (vph)            | 128         | 108         | 57                   | 131         | 788         | 129  |
| <b>Pedestrians</b>                |             |             |                      |             |             |      |
| Lane Width (m)                    |             |             |                      |             |             |      |
| Walking Speed (m/s)               |             |             |                      |             |             |      |
| Percent Blockage                  |             |             |                      |             |             |      |
| Right turn flare (veh)            |             |             |                      |             |             |      |
| Median type                       |             |             |                      | None        | None        |      |
| Median storage (veh)              |             |             |                      |             |             |      |
| Upstream signal (m)               |             |             |                      |             |             |      |
| pX, platoon unblocked             |             |             |                      |             |             |      |
| vC, conflicting volume            | 1033        | 788         | 917                  |             |             |      |
| vC1, stage 1 conf vol             |             |             |                      |             |             |      |
| vC2, stage 2 conf vol             |             |             |                      |             |             |      |
| vCu, unblocked vol                | 1033        | 788         | 917                  |             |             |      |
| tC, single (s)                    | 6.5         | 6.3         | 4.2                  |             |             |      |
| tC, 2 stage (s)                   |             |             |                      |             |             |      |
| tF (s)                            | 3.6         | 3.4         | 2.3                  |             |             |      |
| p0 queue free %                   | 43          | 72          | 92                   |             |             |      |
| cM capacity (veh/h)               | 226         | 385         | 720                  |             |             |      |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>EB 2</b> | <b>NB 1</b>          | <b>SB 1</b> | <b>SB 2</b> |      |
| Volume Total                      | 128         | 108         | 188                  | 788         | 129         |      |
| Volume Left                       | 128         | 0           | 57                   | 0           | 0           |      |
| Volume Right                      | 0           | 108         | 0                    | 0           | 129         |      |
| cSH                               | 226         | 385         | 720                  | 1700        | 1700        |      |
| Volume to Capacity                | 0.57        | 0.28        | 0.08                 | 0.46        | 0.08        |      |
| Queue Length 95th (m)             | 25.0        | 9.1         | 2.1                  | 0.0         | 0.0         |      |
| Control Delay (s)                 | 39.8        | 18.0        | 3.8                  | 0.0         | 0.0         |      |
| Lane LOS                          | E           | C           | A                    |             |             |      |
| Approach Delay (s)                | 29.8        | 3.8         |                      | 0.0         |             |      |
| Approach LOS                      | D           |             |                      |             |             |      |
| <b>Intersection Summary</b>       |             |             |                      |             |             |      |
| Average Delay                     | 5.8         |             |                      |             |             |      |
| Intersection Capacity Utilization | 71.9%       |             | ICU Level of Service | C           |             |      |
| Analysis Period (min)             | 15          |             |                      |             |             |      |

Lanes, Volumes, Timings  
1: Boundary Road & Hwy 417 WB Ramp Terminal

2030 Future Background AM  
08-06-2021



| Lane Group                 | WBL   | WBR   | NBT   | NBR   | SBL  | SBT   |
|----------------------------|-------|-------|-------|-------|------|-------|
| Lane Configurations        |       |       |       |       |      |       |
| Traffic Volume (vph)       | 151   | 34    | 109   | 953   | 85   | 128   |
| Future Volume (vph)        | 151   | 34    | 109   | 953   | 85   | 128   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  |
| Lane Width (m)             | 4.5   | 4.5   | 3.5   | 3.5   | 3.5  | 3.5   |
| Storage Length (m)         | 0.0   | 10.0  |       | 0.0   | 0.0  |       |
| Storage Lanes              | 1     | 0     |       | 0     | 0    |       |
| Taper Length (m)           | 7.5   |       |       |       | 7.5  |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Frt                        | 0.975 |       | 0.879 |       |      |       |
| Flt Protected              | 0.961 |       |       |       |      | 0.980 |
| Satd. Flow (prot)          | 1753  | 0     | 1529  | 0     | 0    | 1583  |
| Flt Permitted              | 0.961 |       |       |       |      | 0.980 |
| Satd. Flow (perm)          | 1753  | 0     | 1529  | 0     | 0    | 1583  |
| Link Speed (k/h)           | 40    |       | 80    |       |      | 80    |
| Link Distance (m)          | 155.0 |       | 545.7 |       |      | 134.1 |
| Travel Time (s)            | 14.0  |       | 24.6  |       |      | 6.0   |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Heavy Vehicles (%)         | 4%    | 14%   | 14%   | 1%    | 9%   | 11%   |
| Adj. Flow (vph)            | 151   | 34    | 109   | 953   | 85   | 128   |
| Shared Lane Traffic (%)    |       |       |       |       |      |       |
| Lane Group Flow (vph)      | 185   | 0     | 1062  | 0     | 0    | 213   |
| Enter Blocked Intersection | No    | No    | No    | No    | No   | No    |
| Lane Alignment             | Left  | Right | Left  | Right | Left | Left  |
| Median Width(m)            | 4.5   |       | 0.0   |       |      | 0.0   |
| Link Offset(m)             | 0.0   |       | 0.0   |       |      | 0.0   |
| Crosswalk Width(m)         | 4.8   |       | 4.8   |       |      | 4.8   |
| Two way Left Turn Lane     |       |       |       |       |      |       |
| Headway Factor             | 0.95  | 0.95  | 1.09  | 1.09  | 1.09 | 1.09  |
| Turning Speed (k/h)        | 25    | 15    |       | 15    | 25   |       |
| Sign Control               | Stop  |       | Free  |       |      | Free  |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 101.3%       |
| ICU Level of Service              | G            |
| Analysis Period (min)             | 15           |



HCM Unsignalized Intersection Capacity Analysis  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

2030 Future Background AM  
 08-06-2021



| Movement                          | WBL  | WBR  | NBT    | NBR  | SBL                  | SBT  |
|-----------------------------------|------|------|--------|------|----------------------|------|
| Lane Configurations               |      |      |        |      |                      |      |
| Traffic Volume (veh/h)            | 151  | 34   | 109    | 953  | 85                   | 128  |
| Future Volume (Veh/h)             | 151  | 34   | 109    | 953  | 85                   | 128  |
| Sign Control                      | Stop |      | Free   |      |                      | Free |
| Grade                             | 0%   |      | 0%     |      |                      | 0%   |
| Peak Hour Factor                  | 1.00 | 1.00 | 1.00   | 1.00 | 1.00                 | 1.00 |
| Hourly flow rate (vph)            | 151  | 34   | 109    | 953  | 85                   | 128  |
| Pedestrians                       |      |      |        |      |                      |      |
| Lane Width (m)                    |      |      |        |      |                      |      |
| Walking Speed (m/s)               |      |      |        |      |                      |      |
| Percent Blockage                  |      |      |        |      |                      |      |
| Right turn flare (veh)            |      |      |        |      |                      |      |
| Median type                       |      |      | None   |      |                      | None |
| Median storage (veh)              |      |      |        |      |                      |      |
| Upstream signal (m)               |      |      |        |      |                      |      |
| pX, platoon unblocked             |      |      |        |      |                      |      |
| vC, conflicting volume            | 884  | 586  |        |      | 1062                 |      |
| vC1, stage 1 conf vol             |      |      |        |      |                      |      |
| vC2, stage 2 conf vol             |      |      |        |      |                      |      |
| vCu, unblocked vol                | 884  | 586  |        |      | 1062                 |      |
| tC, single (s)                    | 6.4  | 6.3  |        |      | 4.2                  |      |
| tC, 2 stage (s)                   |      |      |        |      |                      |      |
| tF (s)                            | 3.5  | 3.4  |        |      | 2.3                  |      |
| p0 queue free %                   | 44   | 93   |        |      | 87                   |      |
| cM capacity (veh/h)               | 271  | 489  |        |      | 630                  |      |
| Direction, Lane #                 | WB 1 | NB 1 | SB 1   |      |                      |      |
| Volume Total                      | 185  | 1062 | 213    |      |                      |      |
| Volume Left                       | 151  | 0    | 85     |      |                      |      |
| Volume Right                      | 34   | 953  | 0      |      |                      |      |
| cSH                               | 295  | 1700 | 630    |      |                      |      |
| Volume to Capacity                | 0.63 | 0.62 | 0.13   |      |                      |      |
| Queue Length 95th (m)             | 31.3 | 0.0  | 3.7    |      |                      |      |
| Control Delay (s)                 | 35.6 | 0.0  | 5.6    |      |                      |      |
| Lane LOS                          | E    |      | A      |      |                      |      |
| Approach Delay (s)                | 35.6 | 0.0  | 5.6    |      |                      |      |
| Approach LOS                      | E    |      |        |      |                      |      |
| Intersection Summary              |      |      |        |      |                      |      |
| Average Delay                     |      |      | 5.3    |      |                      |      |
| Intersection Capacity Utilization |      |      | 101.3% |      | ICU Level of Service | G    |
| Analysis Period (min)             |      |      | 15     |      |                      |      |

Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

2030 Future Background AM  
08-06-2021



| Lane Group                 | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |
| Traffic Volume (vph)       | 20    | 357   | 41    | 1047  | 247   | 10    |
| Future Volume (vph)        | 20    | 357   | 41    | 1047  | 247   | 10    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.3   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   | 25.0  | 50.0  |       |       | 0.0   |
| Storage Lanes              | 1     | 1     | 1     |       |       | 0     |
| Taper Length (m)           | 7.5   |       | 75.0  |       |       |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |       |       | 0.995 |       |
| Fl <sub>t</sub> Protected  | 0.950 |       | 0.950 |       |       |       |
| Satd. Flow (prot)          | 1291  | 1395  | 1291  | 1745  | 1594  | 0     |
| Fl <sub>t</sub> Permitted  | 0.950 |       | 0.526 |       |       |       |
| Satd. Flow (perm)          | 1291  | 1395  | 715   | 1745  | 1594  | 0     |
| Right Turn on Red          |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 357   |       |       | 4     |       |
| Link Speed (k/h)           | 40    |       |       | 80    | 80    |       |
| Link Distance (m)          | 154.2 |       |       | 243.1 | 545.7 |       |
| Travel Time (s)            | 13.9  |       |       | 10.9  | 24.6  |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 31%   | 6%    | 31%   | 2%    | 11%   | 13%   |
| Adj. Flow (vph)            | 20    | 357   | 41    | 1047  | 247   | 10    |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 20    | 357   | 41    | 1047  | 257   | 0     |
| Enter Blocked Intersection | No    | No    | No    | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left  | Left  | Left  | Right |
| Median Width(m)            | 3.5   |       |       | 3.5   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |       | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |       | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |
| Headway Factor             | 1.09  | 1.12  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25    |       |       | 15    |
| Number of Detectors        | 1     | 1     | 1     | 2     | 2     |       |
| Detector Template          | Left  | Right | Left  | Thru  | Thru  |       |
| Leading Detector (m)       | 2.0   | 2.0   | 2.0   | 10.0  | 10.0  |       |
| Trailing Detector (m)      | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Position(m)     | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Size(m)         | 2.0   | 2.0   | 2.0   | 0.6   | 0.6   |       |
| Detector 1 Type            | 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   |       |
| Detector 1 Queue (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Delay (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 2 Position(m)     |       |       |       | 9.4   | 9.4   |       |
| Detector 2 Size(m)         |       |       |       | 0.6   | 0.6   |       |
| Detector 2 Type            |       |       |       | Cl+Ex | Cl+Ex |       |
| Detector 2 Channel         |       |       |       |       |       |       |
| Detector 2 Extend (s)      |       |       |       | 0.0   | 0.0   |       |
| Turn Type                  | Prot  | Perm  | pm+pt | NA    | NA    |       |

Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

2030 Future Background AM  
08-06-2021



| Lane Group              | EBL   | EBR   | NBL   | NBT   | SBT   | SBR |
|-------------------------|-------|-------|-------|-------|-------|-----|
| Protected Phases        | 4     |       | 5     | 2     | 6     |     |
| Permitted Phases        |       | 4     | 2     |       |       |     |
| Detector Phase          | 4     | 4     | 5     | 2     | 6     |     |
| Switch Phase            |       |       |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0   | 7.0   | 35.0  | 35.0  |     |
| Minimum Split (s)       | 17.8  | 17.8  | 13.0  | 41.6  | 41.6  |     |
| Total Split (s)         | 20.0  | 20.0  | 13.0  | 80.0  | 67.0  |     |
| Total Split (%)         | 20.0% | 20.0% | 13.0% | 80.0% | 67.0% |     |
| Maximum Green (s)       | 13.2  | 13.2  | 7.0   | 73.4  | 60.4  |     |
| Yellow Time (s)         | 3.0   | 3.0   | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 3.8   | 3.8   | 1.4   | 2.0   | 2.0   |     |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     | 6.8   | 6.8   | 6.0   | 6.6   | 6.6   |     |
| Lead/Lag                |       |       | Lead  |       | Lag   |     |
| Lead-Lag Optimize?      |       |       | Yes   |       | Yes   |     |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |     |
| Recall Mode             | None  | None  | None  | Min   | Min   |     |
| Walk Time (s)           | 5.0   | 5.0   |       | 0.0   | 7.0   |     |
| Flash Dont Walk (s)     | 6.0   | 6.0   |       | 0.0   | 21.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0     |       | 0     | 0     |     |
| Act Effct Green (s)     | 8.9   | 8.9   | 50.3  | 49.6  | 42.7  |     |
| Actuated g/C Ratio      | 0.12  | 0.12  | 0.69  | 0.68  | 0.59  |     |
| v/c Ratio               | 0.13  | 0.74  | 0.07  | 0.88  | 0.27  |     |
| Control Delay           | 36.7  | 14.7  | 3.7   | 19.0  | 9.3   |     |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |     |
| Total Delay             | 36.7  | 14.7  | 3.7   | 19.0  | 9.3   |     |
| LOS                     | D     | B     | A     | B     | A     |     |
| Approach Delay          | 15.9  |       |       | 18.5  | 9.3   |     |
| Approach LOS            | B     |       |       | B     | A     |     |
| Queue Length 50th (m)   | 2.5   | 0.0   | 1.3   | 84.1  | 18.4  |     |
| Queue Length 95th (m)   | 10.9  | 29.2  | 4.5   | 190.8 | 36.1  |     |
| Internal Link Dist (m)  | 130.2 |       |       | 219.1 | 521.7 |     |
| Turn Bay Length (m)     |       | 25.0  | 50.0  |       |       |     |
| Base Capacity (vph)     | 247   | 556   | 553   | 1607  | 1341  |     |
| Starvation Cap Reductn  | 0     | 0     | 0     | 26    | 0     |     |
| Spillback Cap Reductn   | 0     | 0     | 0     | 0     | 0     |     |
| Storage Cap Reductn     | 0     | 0     | 0     | 0     | 0     |     |
| Reduced v/c Ratio       | 0.08  | 0.64  | 0.07  | 0.66  | 0.19  |     |

Intersection Summary






















|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 72.7             |
| Natural Cycle:                     | 75               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.88             |
| Intersection Signal Delay:         | 16.5             |
| Intersection LOS:                  | B                |
| Intersection Capacity Utilization: | 75.2%            |
| ICU Level of Service:              | D                |
| Analysis Period (min):             | 15               |

Splits and Phases: 2: Boundary Road & Hwy 417 EB Ramp Terminal



Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

2030 Future Background AM  
08-06-2021

|                            |  |  |  |  |  |  |   |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |   |  |   |   |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)       | 38  | 18  | 5   | 4   | 6   | 28  | 6   | 1022  | 33  | 213   | 329   | 61  |
| Future Volume (vph)        | 38  | 18  | 5   | 4   | 6   | 28  | 6   | 1022  | 33  | 213   | 329   | 61  |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.3   | 3.5   | 3.3   | 3.3   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 35.0  |   | 7.5   | 100.0   |   | 0.0   |
| Storage Lanes              | 0   |   | 0   | 0   |   | 1   | 1   |   | 1   | 1   |   | 0   |
| Taper Length (m)           | 7.5   |   |   | 7.5   |   |   | 45.0  |   |   | 75.0  |   |   |
| 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  |
| Frt                        |   | 0.989   |   |   |   | 0.850   |   |   | 0.850   |   | 0.977   |   |
| Flt Protected              |   | 0.970   |   |   | 0.980   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)          | 0   | 1614  | 0   | 0   | 1744  | 1513  | 1378  | 1728  | 1479  | 1653  | 1527  | 0   |
| Flt Permitted              |   | 0.805   |   |   | 0.854   |   | 0.531   |   |   | 0.075   |   |   |
| Satd. Flow (perm)          | 0   | 1340  | 0   | 0   | 1520  | 1513  | 770   | 1728  | 1479  | 130   | 1527  | 0   |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |   |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 4   |   |   |   | 100   |   |   | 96  |   |   | 22  |
| Link Speed (k/h)           |   | 60  |   |   | 20  |   |   | 80  |   |   |   | 80  |
| Link Distance (m)          |   | 642.8   |   |   | 170.6   |   |   | 174.7   |   |   |   | 243.1   |
| Travel Time (s)            |   | 38.6  |   |   | 30.7  |   |   | 7.9   |   |   |   | 10.9  |
| 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 (%)         | 6%  | 0%  | 25%   | 0%  | 0%  | 0%  | 20%   | 3%  | 0%  | 0%  | 15%   | 8%  |
| Adj. Flow (vph)            | 38  | 18  | 5   | 4   | 6   | 28  | 6   | 1022  | 33  | 213   | 329   | 61  |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)      | 0   | 61  | 0   | 0   | 10  | 28  | 6   | 1022  | 33  | 213   | 390   | 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   |   |   | 3.5   |   |   | 3.5   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |   |   |   |   |   |   |
| Headway Factor             | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.12  | 1.09  | 1.12  | 1.12  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   | 1   | 1   | 2   | 1   | 1   | 2   |   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  | Right   | Left  | Thru  | Right   | Left  | Thru  |   |
| Leading Detector (m)       | 2.0   | 10.0  |   | 2.0   | 10.0  | 2.0   | 2.0   | 10.0  | 2.0   | 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   | 0.6   | 2.0   | 2.0   | 0.6   | 2.0   | 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                  | Perm  | NA  |   | Perm  | NA  | Perm  | Perm  | NA  | Perm  | pm+pt   | NA  |   |

Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

2030 Future Background AM  
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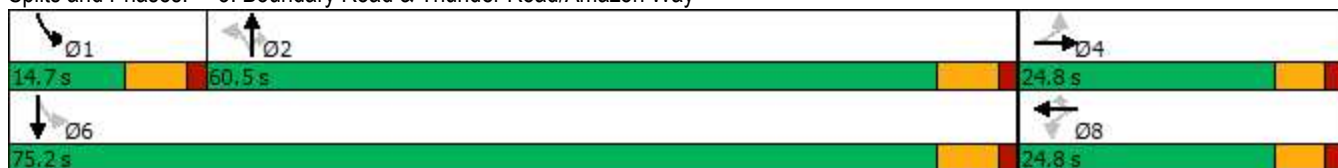
| Lane Group              | EBL   | EBT   | EBR | WBL   | WBT   | WBR   | NBL   | NBT    | NBR   | SBL   | SBT   | SBR |
|-------------------------|-------|-------|-----|-------|-------|-------|-------|--------|-------|-------|-------|-----|
| Protected Phases        |       | 4     |     |       | 8     |       |       | 2      |       | 1     | 6     |     |
| Permitted Phases        | 4     |       |     | 8     |       | 8     | 2     |        | 2     | 6     |       |     |
| Detector Phase          | 4     | 4     |     | 8     | 8     | 8     | 2     | 2      | 2     | 1     | 6     |     |
| Switch Phase            |       |       |     |       |       |       |       |        |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 20.0  | 20.0   | 20.0  | 7.0   | 20.0  |     |
| Minimum Split (s)       | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 26.2  | 26.2   | 26.2  | 13.0  | 26.2  |     |
| Total Split (s)         | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 60.5  | 60.5   | 60.5  | 14.7  | 75.2  |     |
| Total Split (%)         | 24.8% | 24.8% |     | 24.8% | 24.8% | 24.8% | 60.5% | 60.5%  | 60.5% | 14.7% | 75.2% |     |
| Maximum Green (s)       | 19.0  | 19.0  |     | 19.0  | 19.0  | 19.0  | 54.3  | 54.3   | 54.3  | 8.7   | 69.0  |     |
| Yellow Time (s)         | 3.7   | 3.7   |     | 3.7   | 3.7   | 3.7   | 4.6   | 4.6    | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 2.1   | 2.1   |     | 2.1   | 2.1   | 2.1   | 1.6   | 1.6    | 1.6   | 1.4   | 1.6   |     |
| Lost Time Adjust (s)    |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     |       | 5.8   |     |       | 5.8   | 5.8   | 6.2   | 6.2    | 6.2   | 6.0   | 6.2   |     |
| Lead/Lag                |       |       |     |       |       |       | Lag   | Lag    | Lag   | Lead  |       |     |
| 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  | Min   | Min    | Min   | None  | Min   |     |
| Walk Time (s)           | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 7.0   | 7.0    | 7.0   |       | 7.0   |     |
| Flash Dont Walk (s)     | 12.0  | 12.0  |     | 12.0  | 12.0  | 12.0  | 10.0  | 10.0   | 10.0  |       | 10.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0     |     | 0     | 0     | 0     | 0     | 0      | 0     |       | 0     |     |
| Act Effct Green (s)     |       | 9.4   |     |       | 9.4   | 9.4   | 54.7  | 54.7   | 54.7  | 69.7  | 70.9  |     |
| Actuated g/C Ratio      |       | 0.11  |     |       | 0.11  | 0.11  | 0.62  | 0.62   | 0.62  | 0.79  | 0.81  |     |
| v/c Ratio               |       | 0.41  |     |       | 0.06  | 0.11  | 0.01  | 0.95   | 0.03  | 0.84  | 0.32  |     |
| Control Delay           |       | 44.6  |     |       | 36.7  | 0.9   | 8.3   | 37.1   | 0.1   | 48.2  | 4.0   |     |
| Queue Delay             |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Delay             |       | 44.6  |     |       | 36.7  | 0.9   | 8.3   | 37.1   | 0.1   | 48.2  | 4.0   |     |
| LOS                     |       | D     |     |       | D     | A     | A     | D      | A     | D     | A     |     |
| Approach Delay          |       | 44.6  |     |       | 10.3  |       |       | 35.8   |       |       | 19.6  |     |
| Approach LOS            |       | D     |     |       | B     |       |       | D      |       |       | B     |     |
| Queue Length 50th (m)   |       | 9.9   |     |       | 1.7   | 0.0   | 0.4   | 165.9  | 0.0   | 20.9  | 16.3  |     |
| Queue Length 95th (m)   |       | 22.4  |     |       | 6.5   | 0.0   | 2.2   | #286.9 | 0.0   | #66.4 | 33.1  |     |
| Internal Link Dist (m)  |       | 618.8 |     |       | 146.6 |       |       | 150.7  |       |       | 219.1 |     |
| Turn Bay Length (m)     |       |       |     |       |       |       | 35.0  |        | 7.5   | 100.0 |       |     |
| Base Capacity (vph)     |       | 294   |     |       | 330   | 407   | 478   | 1073   | 955   | 254   | 1235  |     |
| Starvation Cap Reductn  |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Spillback Cap Reductn   |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Storage Cap Reductn     |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Reduced v/c Ratio       |       | 0.21  |     |       | 0.03  | 0.07  | 0.01  | 0.95   | 0.03  | 0.84  | 0.32  |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 88               |
| Natural Cycle:                     | 110              |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.95             |
| Intersection Signal Delay:         | 30.0             |
| Intersection LOS:                  | C                |
| Intersection Capacity Utilization: | 94.4%            |
| 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: 3: Boundary Road & Thunder Road/Amazon Way



Lanes, Volumes, Timings  
4: Boundary Road & South Amazon Access











2030 Future Background AM  
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|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Lane Group                        | WBL   | WBR   | NBT   | NBR   | SBL   | SBT   |
| Lane Configurations               |  |   |  |   |  |  |
| Traffic Volume (vph)              | 6   | 4   | 1058  | 6   | 1   | 336   |
| Future Volume (vph)               | 6   | 4   | 1058  | 6   | 1   | 336   |
| Ideal Flow (vphpl)                | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)                    | 3.6   | 3.6   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)                | 0.0   | 0.0   |   | 0.0   | 70.0  |   |
| Storage Lanes                     | 1   | 0   |   | 0   | 1   |   |
| Taper Length (m)                  | 7.5   |   |   |   | 45.0  |   |
| Lane Util. Factor                 | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Frt                               | 0.946   |   | 0.999   |   |   |   |
| Flt Protected                     | 0.971   |   |   |   | 0.950   |   |
| Satd. Flow (prot)                 | 827   | 0   | 1751  | 0   | 846   | 1589  |
| Flt Permitted                     | 0.971   |   |   |   | 0.950   |   |
| Satd. Flow (perm)                 | 827   | 0   | 1751  | 0   | 846   | 1589  |
| Link Speed (k/h)                  | 20  |   | 80  |   |   | 80  |
| Link Distance (m)                 | 151.5   |   | 1150.2  |   |   | 174.7   |
| Travel Time (s)                   | 27.3  |   | 51.8  |   |   | 7.9   |
| Peak Hour Factor                  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)                | 100%  | 100%  | 1%  | 100%  | 100%  | 12%   |
| Adj. Flow (vph)                   | 6   | 4   | 1058  | 6   | 1   | 336   |
| Shared Lane Traffic (%)           |   |   |   |   |   |   |
| Lane Group Flow (vph)             | 10  | 0   | 1064  | 0   | 1   | 336   |
| Enter Blocked Intersection        | No  | No  | No  | No  | No  | No  |
| Lane Alignment                    | Left  | Right   | Left  | Right   | Left  | Left  |
| Median Width(m)                   | 3.6   |   | 3.5   |   |   | 3.5   |
| Link Offset(m)                    | 0.0   |   | 0.0   |   |   | 0.0   |
| Crosswalk Width(m)                | 4.8   |   | 4.8   |   |   | 4.8   |
| Two way Left Turn Lane            |   |   |   |   |   |   |
| Headway Factor                    | 1.07  | 1.07  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)               | 25  | 15  |   | 15  | 25  |   |
| Sign Control                      | Stop  |   | Free  |   |   | Free  |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |
| Area Type:                        | Other   |   |   |   |   |   |
| Control Type:                     | Unsignalized  |   |   |   |   |   |
| Intersection Capacity Utilization | 69.2%   |   |   | ICU Level of Service C  |   |   |
| Analysis Period (min)             | 15  |   |   |   |   |   |



HCM Unsignalized Intersection Capacity Analysis  
4: Boundary Road & South Amazon Access

2030 Future Background AM  
08-06-2021

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement                          | WBL   | WBR   | NBT   | NBR   | SBL   | SBT   |
| Lane Configurations               |  |   |  |   |  |  |
| Traffic Volume (veh/h)            | 6   | 4   | 1058  | 6   | 1   | 336   |
| Future Volume (Veh/h)             | 6   | 4   | 1058  | 6   | 1   | 336   |
| Sign Control                      | Stop  |   | Free  |   |   | Free  |
| Grade                             | 0%  |   | 0%  |   |   | 0%  |
| Peak Hour Factor                  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Hourly flow rate (vph)            | 6   | 4   | 1058  | 6   | 1   | 336   |
| Pedestrians                       |   |   |   |   |   |   |
| Lane Width (m)                    |   |   |   |   |   |   |
| Walking Speed (m/s)               |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |
| Median type                       |   |   | None  |   |   | None  |
| Median storage veh                |   |   |   |   |   |   |
| Upstream signal (m)               |   |   |   |   |   | 175   |
| pX, platoon unblocked             | 0.96  |   |   |   |   |   |
| vC, conflicting volume            | 1399  | 1061  |   |   | 1064  |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |
| vCu, unblocked vol                | 1395  | 1061  |   |   | 1064  |   |
| tC, single (s)                    | 7.4   | 7.2   |   |   | 5.1   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |
| tF (s)                            | 4.4   | 4.2   |   |   | 3.1   |   |
| p0 queue free %                   | 94  | 98  |   |   | 100   |   |
| cM capacity (veh/h)               | 93  | 179   |   |   | 393   |   |
| Direction, Lane #                 | WB 1  | NB 1  | SB 1  | SB 2  |   |   |
| Volume Total                      | 10  | 1064  | 1   | 336   |   |   |
| Volume Left                       | 6   | 0   | 1   | 0   |   |   |
| Volume Right                      | 4   | 6   | 0   | 0   |   |   |
| cSH                               | 115   | 1700  | 393   | 1700  |   |   |
| Volume to Capacity                | 0.09  | 0.63  | 0.00  | 0.20  |   |   |
| Queue Length 95th (m)             | 2.2   | 0.0   | 0.1   | 0.0   |   |   |
| Control Delay (s)                 | 39.2  | 0.0   | 14.2  | 0.0   |   |   |
| Lane LOS                          | E   |   | B   |   |   |   |
| Approach Delay (s)                | 39.2  | 0.0   | 0.0   |   |   |   |
| Approach LOS                      | E   |   |   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |
| Average Delay                     |   |   | 0.3   |   |   |   |
| Intersection Capacity Utilization |   |   | 69.2%   |   | ICU Level of Service  | C   |
| Analysis Period (min)             |   |   | 15  |   |   |   |

Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road

2030 Future Background AM  
08-06-2021



| Lane Group                 | EBL   | EBR   | NBL  | NBT   | SBT    | SBR   |
|----------------------------|-------|-------|------|-------|--------|-------|
| Lane Configurations        |       |       |      |       |        |       |
| Traffic Volume (vph)       | 87    | 33    | 147  | 958   | 138    | 118   |
| Future Volume (vph)        | 87    | 33    | 147  | 958   | 138    | 118   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800   | 1800  |
| Lane Width (m)             | 3.3   | 3.3   | 3.5  | 3.5   | 3.5    | 3.5   |
| Storage Length (m)         | 25.0  | 0.0   | 0.0  |       |        | 30.0  |
| Storage Lanes              | 1     | 1     | 0    |       |        | 1     |
| Taper Length (m)           | 47.5  |       | 7.5  |       |        |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |      |       |        | 0.850 |
| Fl <sub>t</sub> Protected  | 0.950 |       |      | 0.993 |        |       |
| Satd. Flow (prot)          | 1476  | 1286  | 0    | 1734  | 1561   | 1293  |
| Fl <sub>t</sub> Permitted  | 0.950 |       |      | 0.993 |        |       |
| Satd. Flow (perm)          | 1476  | 1286  | 0    | 1734  | 1561   | 1293  |
| Link Speed (k/h)           | 80    |       |      | 80    | 80     |       |
| Link Distance (m)          | 180.5 |       |      | 135.8 | 1150.2 |       |
| Travel Time (s)            | 8.1   |       |      | 6.1   | 51.8   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Heavy Vehicles (%)         | 12%   | 15%   | 8%   | 1%    | 14%    | 17%   |
| Adj. Flow (vph)            | 87    | 33    | 147  | 958   | 138    | 118   |
| Shared Lane Traffic (%)    |       |       |      |       |        |       |
| Lane Group Flow (vph)      | 87    | 33    | 0    | 1105  | 138    | 118   |
| Enter Blocked Intersection | No    | No    | No   | No    | No     | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left   | Right |
| Median Width(m)            | 3.3   |       |      | 0.0   | 0.0    |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0    |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8    |       |
| Two way Left Turn Lane     |       |       |      |       |        |       |
| Headway Factor             | 1.12  | 1.12  | 1.09 | 1.09  | 1.09   | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25   |       |        | 15    |
| Sign Control               | Stop  |       |      | Free  | Free   |       |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 84.6%        |
| ICU Level of Service              | E            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
5: Boundary Road & Mitch Owens Road

2030 Future Background AM  
08-06-2021



| Movement                          | EBL         | EBR         | NBL         | NBT                  | SBT         | SBR  |
|-----------------------------------|-------------|-------------|-------------|----------------------|-------------|------|
| Lane Configurations               |             |             |             |                      |             |      |
| Traffic Volume (veh/h)            | 87          | 33          | 147         | 958                  | 138         | 118  |
| Future Volume (Veh/h)             | 87          | 33          | 147         | 958                  | 138         | 118  |
| Sign Control                      | Stop        |             |             | Free                 | Free        |      |
| Grade                             | 0%          |             |             | 0%                   | 0%          |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00        | 1.00 |
| Hourly flow rate (vph)            | 87          | 33          | 147         | 958                  | 138         | 118  |
| <b>Pedestrians</b>                |             |             |             |                      |             |      |
| Lane Width (m)                    |             |             |             |                      |             |      |
| Walking Speed (m/s)               |             |             |             |                      |             |      |
| Percent Blockage                  |             |             |             |                      |             |      |
| Right turn flare (veh)            |             |             |             |                      |             |      |
| Median type                       |             |             |             | None                 | None        |      |
| Median storage veh                |             |             |             |                      |             |      |
| Upstream signal (m)               |             |             |             |                      |             |      |
| pX, platoon unblocked             |             |             |             |                      |             |      |
| vC, conflicting volume            | 1390        | 138         | 256         |                      |             |      |
| vC1, stage 1 conf vol             |             |             |             |                      |             |      |
| vC2, stage 2 conf vol             |             |             |             |                      |             |      |
| vCu, unblocked vol                | 1390        | 138         | 256         |                      |             |      |
| tC, single (s)                    | 6.5         | 6.4         | 4.2         |                      |             |      |
| tC, 2 stage (s)                   |             |             |             |                      |             |      |
| tF (s)                            | 3.6         | 3.4         | 2.3         |                      |             |      |
| p0 queue free %                   | 34          | 96          | 88          |                      |             |      |
| cM capacity (veh/h)               | 132         | 877         | 1275        |                      |             |      |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>EB 2</b> | <b>NB 1</b> | <b>SB 1</b>          | <b>SB 2</b> |      |
| Volume Total                      | 87          | 33          | 1105        | 138                  | 118         |      |
| Volume Left                       | 87          | 0           | 147         | 0                    | 0           |      |
| Volume Right                      | 0           | 33          | 0           | 0                    | 118         |      |
| cSH                               | 132         | 877         | 1275        | 1700                 | 1700        |      |
| Volume to Capacity                | 0.66        | 0.04        | 0.12        | 0.08                 | 0.07        |      |
| Queue Length 95th (m)             | 28.4        | 0.9         | 3.1         | 0.0                  | 0.0         |      |
| Control Delay (s)                 | 73.8        | 9.3         | 3.0         | 0.0                  | 0.0         |      |
| Lane LOS                          | F           | A           | A           |                      |             |      |
| Approach Delay (s)                | 56.1        |             | 3.0         | 0.0                  |             |      |
| Approach LOS                      | F           |             |             |                      |             |      |
| <b>Intersection Summary</b>       |             |             |             |                      |             |      |
| Average Delay                     |             |             | 6.8         |                      |             |      |
| Intersection Capacity Utilization |             |             | 84.6%       | ICU Level of Service | E           |      |
| Analysis Period (min)             |             |             | 15          |                      |             |      |

Lanes, Volumes, Timings  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

2030 Future Background PM  
 08-06-2021



| Lane Group                 | WBL   | WBR   | NBT   | NBR   | SBL  | SBT   |
|----------------------------|-------|-------|-------|-------|------|-------|
| Lane Configurations        |       |       |       |       |      |       |
| Traffic Volume (vph)       | 57    | 1     | 174   | 347   | 27   | 136   |
| Future Volume (vph)        | 57    | 1     | 174   | 347   | 27   | 136   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  |
| Lane Width (m)             | 4.5   | 4.5   | 3.5   | 3.5   | 3.5  | 3.5   |
| Storage Length (m)         | 0.0   | 10.0  |       | 0.0   | 0.0  |       |
| Storage Lanes              | 1     | 0     |       | 0     | 0    |       |
| Taper Length (m)           | 7.5   |       |       |       | 7.5  |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Frt                        | 0.998 |       | 0.910 |       |      |       |
| Flt Protected              | 0.953 |       |       |       |      | 0.992 |
| Satd. Flow (prot)          | 1587  | 0     | 1557  | 0     | 0    | 1630  |
| Flt Permitted              | 0.953 |       |       |       |      | 0.992 |
| Satd. Flow (perm)          | 1587  | 0     | 1557  | 0     | 0    | 1630  |
| Link Speed (k/h)           | 40    |       | 80    |       |      | 80    |
| Link Distance (m)          | 155.0 |       | 545.7 |       |      | 134.1 |
| Travel Time (s)            | 14.0  |       | 24.6  |       |      | 6.0   |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Heavy Vehicles (%)         | 19%   | 0%    | 6%    | 3%    | 5%   | 9%    |
| Adj. Flow (vph)            | 57    | 1     | 174   | 347   | 27   | 136   |
| Shared Lane Traffic (%)    |       |       |       |       |      |       |
| Lane Group Flow (vph)      | 58    | 0     | 521   | 0     | 0    | 163   |
| Enter Blocked Intersection | No    | No    | No    | No    | No   | No    |
| Lane Alignment             | Left  | Right | Left  | Right | Left | Left  |
| Median Width(m)            | 4.5   |       | 0.0   |       |      | 0.0   |
| Link Offset(m)             | 0.0   |       | 0.0   |       |      | 0.0   |
| Crosswalk Width(m)         | 4.8   |       | 4.8   |       |      | 4.8   |
| Two way Left Turn Lane     |       |       |       |       |      |       |
| Headway Factor             | 0.95  | 0.95  | 1.09  | 1.09  | 1.09 | 1.09  |
| Turning Speed (k/h)        | 25    | 15    |       | 15    | 25   |       |
| Sign Control               | Stop  |       | Free  |       |      | Free  |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 42.2%        |
| ICU Level of Service              | A            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

2030 Future Background PM  
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| Movement                          | WBL  | WBR   | NBT  | NBR                  | SBL  | SBT  |
|-----------------------------------|------|-------|------|----------------------|------|------|
| Lane Configurations               |      |       |      |                      |      |      |
| Traffic Volume (veh/h)            | 57   | 1     | 174  | 347                  | 27   | 136  |
| Future Volume (Veh/h)             | 57   | 1     | 174  | 347                  | 27   | 136  |
| Sign Control                      | Stop |       | Free |                      | Free |      |
| Grade                             | 0%   |       | 0%   |                      | 0%   |      |
| Peak Hour Factor                  | 1.00 | 1.00  | 1.00 | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 57   | 1     | 174  | 347                  | 27   | 136  |
| Pedestrians                       |      |       |      |                      |      |      |
| Lane Width (m)                    |      |       |      |                      |      |      |
| Walking Speed (m/s)               |      |       |      |                      |      |      |
| Percent Blockage                  |      |       |      |                      |      |      |
| Right turn flare (veh)            |      |       |      |                      |      |      |
| Median type                       |      |       | None |                      | None |      |
| Median storage veh                |      |       |      |                      |      |      |
| Upstream signal (m)               |      |       |      |                      |      |      |
| pX, platoon unblocked             |      |       |      |                      |      |      |
| vC, conflicting volume            | 538  | 348   |      |                      | 521  |      |
| vC1, stage 1 conf vol             |      |       |      |                      |      |      |
| vC2, stage 2 conf vol             |      |       |      |                      |      |      |
| vCu, unblocked vol                | 538  | 348   |      |                      | 521  |      |
| tC, single (s)                    | 6.6  | 6.2   |      |                      | 4.1  |      |
| tC, 2 stage (s)                   |      |       |      |                      |      |      |
| tF (s)                            | 3.7  | 3.3   |      |                      | 2.2  |      |
| p0 queue free %                   | 88   | 100   |      |                      | 97   |      |
| cM capacity (veh/h)               | 464  | 700   |      |                      | 1030 |      |
| <b>Direction, Lane #</b>          |      |       |      |                      |      |      |
|                                   | WB 1 | NB 1  | SB 1 |                      |      |      |
| Volume Total                      | 58   | 521   | 163  |                      |      |      |
| Volume Left                       | 57   | 0     | 27   |                      |      |      |
| Volume Right                      | 1    | 347   | 0    |                      |      |      |
| cSH                               | 466  | 1700  | 1030 |                      |      |      |
| Volume to Capacity                | 0.12 | 0.31  | 0.03 |                      |      |      |
| Queue Length 95th (m)             | 3.4  | 0.0   | 0.6  |                      |      |      |
| Control Delay (s)                 | 13.8 | 0.0   | 1.6  |                      |      |      |
| Lane LOS                          | B    |       | A    |                      |      |      |
| Approach Delay (s)                | 13.8 | 0.0   | 1.6  |                      |      |      |
| Approach LOS                      | B    |       |      |                      |      |      |
| <b>Intersection Summary</b>       |      |       |      |                      |      |      |
| Average Delay                     |      |       | 1.4  |                      |      |      |
| Intersection Capacity Utilization |      | 42.2% |      | ICU Level of Service |      | A    |
| Analysis Period (min)             |      |       | 15   |                      |      |      |

Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

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| Lane Group                 | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |
| Traffic Volume (vph)       | 85    | 815   | 181   | 329   | 239   | 18    |
| Future Volume (vph)        | 85    | 815   | 181   | 329   | 239   | 18    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.3   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   | 25.0  | 50.0  |       |       | 0.0   |
| Storage Lanes              | 1     | 1     | 1     |       |       | 0     |
| Taper Length (m)           | 7.5   |       | 75.0  |       |       |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |       |       | 0.991 |       |
| Fl <sub>t</sub> Protected  | 0.950 |       | 0.950 |       |       |       |
| Satd. Flow (prot)          | 1551  | 1436  | 1537  | 1664  | 1593  | 0     |
| Fl <sub>t</sub> Permitted  | 0.950 |       | 0.472 |       |       |       |
| Satd. Flow (perm)          | 1551  | 1436  | 764   | 1664  | 1593  | 0     |
| Right Turn on Red          |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 568   |       |       | 4     |       |
| Link Speed (k/h)           | 40    |       |       | 80    | 80    |       |
| Link Distance (m)          | 154.2 |       |       | 243.1 | 545.7 |       |
| Travel Time (s)            | 13.9  |       |       | 10.9  | 24.6  |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 9%    | 3%    | 10%   | 7%    | 11%   | 7%    |
| Adj. Flow (vph)            | 85    | 815   | 181   | 329   | 239   | 18    |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 85    | 815   | 181   | 329   | 257   | 0     |
| Enter Blocked Intersection | No    | No    | No    | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left  | Left  | Left  | Right |
| Median Width(m)            | 3.5   |       |       | 3.5   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |       | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |       | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |
| Headway Factor             | 1.09  | 1.12  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25    |       |       | 15    |
| Number of Detectors        | 1     | 1     | 1     | 2     | 2     |       |
| Detector Template          | Left  | Right | Left  | Thru  | Thru  |       |
| Leading Detector (m)       | 2.0   | 2.0   | 2.0   | 10.0  | 10.0  |       |
| Trailing Detector (m)      | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Position(m)     | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Size(m)         | 2.0   | 2.0   | 2.0   | 0.6   | 0.6   |       |
| Detector 1 Type            | 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   |       |
| Detector 1 Queue (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Delay (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 2 Position(m)     |       |       |       | 9.4   | 9.4   |       |
| Detector 2 Size(m)         |       |       |       | 0.6   | 0.6   |       |
| Detector 2 Type            |       |       |       | Cl+Ex | Cl+Ex |       |
| Detector 2 Channel         |       |       |       |       |       |       |
| Detector 2 Extend (s)      |       |       |       | 0.0   | 0.0   |       |
| Turn Type                  | Prot  | Perm  | pm+pt | NA    | NA    |       |

Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

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| Lane Group              | EBL   | EBR    | NBL   | NBT   | SBT   | SBR |
|-------------------------|-------|--------|-------|-------|-------|-----|
| Protected Phases        | 4     |        | 5     | 2     | 6     |     |
| Permitted Phases        |       | 4      | 2     |       |       |     |
| Detector Phase          | 4     | 4      | 5     | 2     | 6     |     |
| Switch Phase            |       |        |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0    | 7.0   | 35.0  | 35.0  |     |
| Minimum Split (s)       | 23.0  | 23.0   | 13.0  | 41.6  | 41.6  |     |
| Total Split (s)         | 44.0  | 44.0   | 13.0  | 56.0  | 43.0  |     |
| Total Split (%)         | 44.0% | 44.0%  | 13.0% | 56.0% | 43.0% |     |
| Maximum Green (s)       | 37.2  | 37.2   | 7.0   | 49.4  | 36.4  |     |
| Yellow Time (s)         | 3.0   | 3.0    | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 3.8   | 3.8    | 1.4   | 2.0   | 2.0   |     |
| Lost Time Adjust (s)    | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     | 6.8   | 6.8    | 6.0   | 6.6   | 6.6   |     |
| Lead/Lag                |       |        | Lead  |       | Lag   |     |
| Lead-Lag Optimize?      |       |        | Yes   |       | Yes   |     |
| Vehicle Extension (s)   | 3.0   | 3.0    | 3.0   | 3.0   | 3.0   |     |
| Recall Mode             | None  | None   | None  | Min   | Min   |     |
| Walk Time (s)           | 7.0   | 7.0    |       | 0.0   | 7.0   |     |
| Flash Dont Walk (s)     | 5.0   | 5.0    |       | 0.0   | 21.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0      |       | 0     | 0     |     |
| Act Effct Green (s)     | 30.0  | 30.0   | 49.1  | 48.5  | 35.4  |     |
| Actuated g/C Ratio      | 0.33  | 0.33   | 0.53  | 0.53  | 0.38  |     |
| v/c Ratio               | 0.17  | 0.96   | 0.39  | 0.38  | 0.42  |     |
| Control Delay           | 21.7  | 32.1   | 16.2  | 16.2  | 25.1  |     |
| Queue Delay             | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Delay             | 21.7  | 32.1   | 16.2  | 16.2  | 25.1  |     |
| LOS                     | C     | C      | B     | B     | C     |     |
| Approach Delay          | 31.1  |        |       | 16.2  | 25.1  |     |
| Approach LOS            | C     |        |       | B     | C     |     |
| Queue Length 50th (m)   | 11.1  | 53.0   | 20.1  | 40.6  | 38.6  |     |
| Queue Length 95th (m)   | 21.8  | #151.0 | 34.1  | 62.7  | 61.9  |     |
| Internal Link Dist (m)  | 130.2 |        |       | 219.1 | 521.7 |     |
| Turn Bay Length (m)     |       | 25.0   | 50.0  |       |       |     |
| Base Capacity (vph)     | 633   | 922    | 467   | 902   | 639   |     |
| Starvation Cap Reductn  | 0     | 0      | 0     | 0     | 0     |     |
| Spillback Cap Reductn   | 0     | 0      | 0     | 0     | 0     |     |
| Storage Cap Reductn     | 0     | 0      | 0     | 0     | 0     |     |
| Reduced v/c Ratio       | 0.13  | 0.88   | 0.39  | 0.36  | 0.40  |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 92.1             |
| Natural Cycle:                     | 90               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.96             |
| Intersection Signal Delay:         | 25.6             |
| Intersection LOS:                  | C                |
| Intersection Capacity Utilization: | 93.6%            |
| 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: 2: Boundary Road & Hwy 417 EB Ramp Terminal





Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

2030 Future Background PM  
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|                            |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |   |  |   |   |  |  |  |  |  |  |  |   |
| Traffic Volume (vph)       | 76  | 0   | 17  | 6   | 0   | 20  | 5  | 414   | 0   | 2   | 984   | 67  |
| Future Volume (vph)        | 76  | 0   | 17  | 6   | 0   | 20  | 5  | 414   | 0   | 2   | 984   | 67  |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800   | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.3  | 3.5   | 3.3   | 3.3   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 35.0   |   | 7.5   | 100.0   |   | 0.0   |
| Storage Lanes              | 0   |   | 0   | 0   |   | 1   | 1  |   | 1   | 1   |   | 0   |
| Taper Length (m)           | 7.5   |   |   | 7.5   |   |   | 45.0   |   |   | 75.0  |   |   |
| 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  |
| Frt                        |   | 0.975   |   |   |   | 0.850   |  |   |   |   |   | 0.990   |
| Flt Protected              |   | 0.961   |   |   | 0.950   |   | 0.950  |   |   | 0.950   |   |   |
| Satd. Flow (prot)          | 0   | 1590  | 0   | 0   | 1208  | 1513  | 1322   | 1633  | 1740  | 1102  | 1699  | 0   |
| Flt Permitted              |   | 0.761   |   |   | 0.808   |   | 0.221  |   |   | 0.453   |   |   |
| Satd. Flow (perm)          | 0   | 1259  | 0   | 0   | 1027  | 1513  | 308  | 1633  | 1740  | 525   | 1699  | 0   |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |  |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 100   |   |   |   | 100   |  |   |   |   |   | 8   |
| Link Speed (k/h)           |   | 60  |   |   | 20  |   |  | 80  |   |   |   | 80  |
| Link Distance (m)          |   | 642.8   |   |   | 170.6   |   |  | 174.7   |   |   |   | 243.1   |
| Travel Time (s)            |   | 38.6  |   |   | 30.7  |   |  | 7.9   |   |   |   | 10.9  |
| 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 (%)         | 6%  | 0%  | 0%  | 40%   | 0%  | 0%  | 25%  | 9%  | 0%  | 50%   | 4%  | 0%  |
| Adj. Flow (vph)            | 76  | 0   | 17  | 6   | 0   | 20  | 5  | 414   | 0   | 2   | 984   | 67  |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Group Flow (vph)      | 0   | 93  | 0   | 0   | 6   | 20  | 5  | 414   | 0   | 2   | 1051  | 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   |   |  | 3.5   |   |   | 3.5   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |  | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.8   |   |   | 4.8   |   |  | 4.8   |   |   | 4.8   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |  |   |   |   |   |   |
| Headway Factor             | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.12   | 1.09  | 1.12  | 1.12  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25  |   | 15  | 25  |   | 15  | 25   |   | 15  | 25  |   | 15  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   | 1   | 1  | 2   | 1   | 1   | 2   |   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  | Right   | Left   | Thru  | Right   | Left  | Thru  |   |
| Leading Detector (m)       | 2.0   | 10.0  |   | 2.0   | 10.0  | 2.0   | 2.0  | 10.0  | 2.0   | 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   | 0.6   | 2.0   | 2.0  | 0.6   | 2.0   | 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                  | Perm  | NA  |   | Perm  | NA  | Perm  | Perm   | NA  | Perm  | pm+pt   | NA  |   |

Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

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| Lane Group              | EBL   | EBT   | EBR | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR |
|-------------------------|-------|-------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-----|
| Protected Phases        |       | 4     |     |       | 8     |       |       | 2     |       | 1     | 6     |     |
| Permitted Phases        | 4     |       |     | 8     |       | 8     | 2     |       | 2     | 6     |       |     |
| Detector Phase          | 4     | 4     |     | 8     | 8     | 8     | 2     | 2     | 2     | 1     | 6     |     |
| Switch Phase            |       |       |     |       |       |       |       |       |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 20.0  | 20.0  | 20.0  | 7.0   | 20.0  |     |
| Minimum Split (s)       | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 26.2  | 26.2  | 26.2  | 13.0  | 26.2  |     |
| Total Split (s)         | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 62.2  | 62.2  | 62.2  | 13.0  | 75.2  |     |
| Total Split (%)         | 24.8% | 24.8% |     | 24.8% | 24.8% | 24.8% | 62.2% | 62.2% | 62.2% | 13.0% | 75.2% |     |
| Maximum Green (s)       | 19.0  | 19.0  |     | 19.0  | 19.0  | 19.0  | 56.0  | 56.0  | 56.0  | 7.0   | 69.0  |     |
| Yellow Time (s)         | 3.7   | 3.7   |     | 3.7   | 3.7   | 3.7   | 4.6   | 4.6   | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 2.1   | 2.1   |     | 2.1   | 2.1   | 2.1   | 1.6   | 1.6   | 1.6   | 1.4   | 1.6   |     |
| Lost Time Adjust (s)    |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     |       | 5.8   |     |       | 5.8   | 5.8   | 6.2   | 6.2   | 6.2   | 6.0   | 6.2   |     |
| Lead/Lag                |       |       |     |       |       |       | Lag   | Lag   | Lag   | Lead  |       |     |
| 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  | Min   | Min   | Min   | None  | Min   |     |
| Walk Time (s)           | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   |       | 7.0   |     |
| Flash Dont Walk (s)     | 12.0  | 12.0  |     | 12.0  | 12.0  | 12.0  | 10.0  | 10.0  | 10.0  |       | 10.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0     |     | 0     | 0     | 0     | 0     | 0     | 0     |       | 0     |     |
| Act Effct Green (s)     |       | 8.1   |     |       | 8.1   | 8.1   | 52.1  | 52.1  |       | 52.2  | 54.1  |     |
| Actuated g/C Ratio      |       | 0.12  |     |       | 0.12  | 0.12  | 0.76  | 0.76  |       | 0.76  | 0.79  |     |
| v/c Ratio               |       | 0.39  |     |       | 0.05  | 0.08  | 0.02  | 0.33  |       | 0.00  | 0.78  |     |
| Control Delay           |       | 12.9  |     |       | 34.8  | 0.6   | 5.4   | 6.0   |       | 2.5   | 12.0  |     |
| Queue Delay             |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0   |       | 0.0   | 0.0   |     |
| Total Delay             |       | 12.9  |     |       | 34.8  | 0.6   | 5.4   | 6.0   |       | 2.5   | 12.1  |     |
| LOS                     |       | B     |     |       | C     | A     | A     | A     |       | A     | B     |     |
| Approach Delay          |       | 12.9  |     |       | 8.5   |       |       | 6.0   |       |       | 12.1  |     |
| Approach LOS            |       | B     |     |       | A     |       |       | A     |       |       | B     |     |
| Queue Length 50th (m)   |       | 0.0   |     |       | 0.7   | 0.0   | 0.1   | 16.1  |       | 0.1   | 79.0  |     |
| Queue Length 95th (m)   |       | 12.9  |     |       | 4.8   | 0.0   | 1.8   | 56.4  |       | 0.6   | 171.8 |     |
| Internal Link Dist (m)  |       | 618.8 |     |       | 146.6 |       |       | 150.7 |       |       | 219.1 |     |
| Turn Bay Length (m)     |       |       |     |       |       |       | 35.0  |       |       | 100.0 |       |     |
| Base Capacity (vph)     |       | 444   |     |       | 304   | 519   | 249   | 1322  |       | 462   | 1578  |     |
| Starvation Cap Reductn  |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 16    |     |
| Spillback Cap Reductn   |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 0     |     |
| Storage Cap Reductn     |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 0     |     |
| Reduced v/c Ratio       |       | 0.21  |     |       | 0.02  | 0.04  | 0.02  | 0.31  |       | 0.00  | 0.67  |     |

Intersection Summary











|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 68.7             |
| Natural Cycle:                     | 90               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.78             |
| Intersection Signal Delay:         | 10.4             |
| Intersection LOS:                  | B                |
| Intersection Capacity Utilization: | 81.2%            |
| ICU Level of Service:              | D                |
| Analysis Period (min):             | 15               |

Splits and Phases: 3: Boundary Road & Thunder Road/Amazon Way













Lanes, Volumes, Timings  
4: Boundary Road & South Amazon Access

2030 Future Background PM  
08-06-2021

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Lane Group                        | WBL   | WBR   | NBT   | NBR   | SBL   | SBT   |
| Lane Configurations               |  |   |  |   |  |  |
| Traffic Volume (vph)              | 6   | 13  | 405   | 6   | 15  | 992   |
| Future Volume (vph)               | 6   | 13  | 405   | 6   | 15  | 992   |
| Ideal Flow (vphpl)                | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)                    | 3.6   | 3.6   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)                | 0.0   | 0.0   |   | 0.0   | 70.0  |   |
| Storage Lanes                     | 1   | 0   |   | 0   | 1   |   |
| Taper Length (m)                  | 7.5   |   |   |   | 45.0  |   |
| Lane Util. Factor                 | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Frt                               | 0.908   |   | 0.998   |   |   |   |
| Flt Protected                     | 0.984   |   |   |   | 0.950   |   |
| Satd. Flow (prot)                 | 804   | 0   | 1670  | 0   | 846   | 1745  |
| Flt Permitted                     | 0.984   |   |   |   | 0.950   |   |
| Satd. Flow (perm)                 | 804   | 0   | 1670  | 0   | 846   | 1745  |
| Link Speed (k/h)                  | 20  |   | 80  |   |   | 80  |
| Link Distance (m)                 | 151.5   |   | 1150.2  |   |   | 174.7   |
| Travel Time (s)                   | 27.3  |   | 51.8  |   |   | 7.9   |
| Peak Hour Factor                  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)                | 100%  | 100%  | 5%  | 100%  | 100%  | 2%  |
| Adj. Flow (vph)                   | 6   | 13  | 405   | 6   | 15  | 992   |
| Shared Lane Traffic (%)           |   |   |   |   |   |   |
| Lane Group Flow (vph)             | 19  | 0   | 411   | 0   | 15  | 992   |
| Enter Blocked Intersection        | No  | No  | No  | No  | No  | No  |
| Lane Alignment                    | Left  | Right   | Left  | Right   | Left  | Left  |
| Median Width(m)                   | 3.6   |   | 3.5   |   |   | 3.5   |
| Link Offset(m)                    | 0.0   |   | 0.0   |   |   | 0.0   |
| Crosswalk Width(m)                | 4.8   |   | 4.8   |   |   | 4.8   |
| Two way Left Turn Lane            |   |   |   |   |   |   |
| Headway Factor                    | 1.07  | 1.07  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)               | 25  | 15  |   | 15  | 25  |   |
| Sign Control                      | Stop  |   | Free  |   |   | Free  |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |
| Area Type:                        | Other   |   |   |   |   |   |
| Control Type:                     | Unsignalized  |   |   |   |   |   |
| Intersection Capacity Utilization | 65.1%   |   |   | ICU Level of Service C  |   |   |
| Analysis Period (min)             | 15  |   |   |   |   |   |

HCM Unsignalized Intersection Capacity Analysis  
4: Boundary Road & South Amazon Access

2030 Future Background PM  
08-06-2021

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement                          | WBL   | WBR   | NBT   | NBR   | SBL   | SBT   |
| Lane Configurations               |  |   |  |   |  |  |
| Traffic Volume (veh/h)            | 6   | 13  | 405   | 6   | 15  | 992   |
| Future Volume (Veh/h)             | 6   | 13  | 405   | 6   | 15  | 992   |
| Sign Control                      | Stop  |   | Free  |   | Free  |   |
| Grade                             | 0%  |   | 0%  |   | 0%  |   |
| Peak Hour Factor                  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Hourly flow rate (vph)            | 6   | 13  | 405   | 6   | 15  | 992   |
| Pedestrians                       |   |   |   |   |   |   |
| Lane Width (m)                    |   |   |   |   |   |   |
| Walking Speed (m/s)               |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |
| Median type                       | None  |   |   | None  |   |   |
| Median storage veh                |   |   |   |   |   |   |
| Upstream signal (m)               | 175   |   |   |   |   |   |
| pX, platoon unblocked             | 0.55  |   |   |   |   |   |
| vC, conflicting volume            | 1430  | 408   |   |   | 411   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |
| vCu, unblocked vol                | 1372  | 408   |   |   | 411   |   |
| tC, single (s)                    | 7.4   | 7.2   |   |   | 5.1   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |
| tF (s)                            | 4.4   | 4.2   |   |   | 3.1   |   |
| p0 queue free %                   | 89  | 97  |   |   | 98  |   |
| cM capacity (veh/h)               | 54  | 476   |   |   | 770   |   |
| Direction, Lane #                 | WB 1  | NB 1  | SB 1  | SB 2  |   |   |
| Volume Total                      | 19  | 411   | 15  | 992   |   |   |
| Volume Left                       | 6   | 0   | 15  | 0   |   |   |
| Volume Right                      | 13  | 6   | 0   | 0   |   |   |
| cSH                               | 137   | 1700  | 770   | 1700  |   |   |
| Volume to Capacity                | 0.14  | 0.24  | 0.02  | 0.58  |   |   |
| Queue Length 95th (m)             | 3.7   | 0.0   | 0.5   | 0.0   |   |   |
| Control Delay (s)                 | 35.5  | 0.0   | 9.8   | 0.0   |   |   |
| Lane LOS                          | E   |   | A   |   |   |   |
| Approach Delay (s)                | 35.5  | 0.0   | 0.1   |   |   |   |
| Approach LOS                      | E   |   |   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |
| Average Delay                     |   |   | 0.6   |   |   |   |
| Intersection Capacity Utilization |   |   | 65.1%   |   | ICU Level of Service  | C   |
| Analysis Period (min)             | 15  |   |   |   |   |   |

Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road

2030 Future Background PM  
08-06-2021



| Lane Group                 | EBL   | EBR   | NBL  | NBT   | SBT    | SBR   |
|----------------------------|-------|-------|------|-------|--------|-------|
| Lane Configurations        |       |       |      |       |        |       |
| Traffic Volume (vph)       | 141   | 119   | 63   | 144   | 869    | 142   |
| Future Volume (vph)        | 141   | 119   | 63   | 144   | 869    | 142   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800   | 1800  |
| Lane Width (m)             | 3.3   | 3.3   | 3.5  | 3.5   | 3.5    | 3.5   |
| Storage Length (m)         | 25.0  | 0.0   | 0.0  |       |        | 30.0  |
| Storage Lanes              | 1     | 1     | 0    |       |        | 1     |
| Taper Length (m)           | 47.5  |       | 7.5  |       |        |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Frt                        |       | 0.850 |      |       |        | 0.850 |
| Flt Protected              | 0.950 |       |      | 0.985 |        |       |
| Satd. Flow (prot)          | 1463  | 1395  | 0    | 1666  | 1762   | 1351  |
| Flt Permitted              | 0.950 |       |      | 0.985 |        |       |
| Satd. Flow (perm)          | 1463  | 1395  | 0    | 1666  | 1762   | 1351  |
| Link Speed (k/h)           | 80    |       |      | 80    | 80     |       |
| Link Distance (m)          | 180.5 |       |      | 135.8 | 1150.2 |       |
| Travel Time (s)            | 8.1   |       |      | 6.1   | 51.8   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Heavy Vehicles (%)         | 13%   | 6%    | 8%   | 4%    | 1%     | 12%   |
| Adj. Flow (vph)            | 141   | 119   | 63   | 144   | 869    | 142   |
| Shared Lane Traffic (%)    |       |       |      |       |        |       |
| Lane Group Flow (vph)      | 141   | 119   | 0    | 207   | 869    | 142   |
| Enter Blocked Intersection | No    | No    | No   | No    | No     | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left   | Right |
| Median Width(m)            | 3.3   |       |      | 0.0   | 0.0    |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0    |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8    |       |
| Two way Left Turn Lane     |       |       |      |       |        |       |
| Headway Factor             | 1.12  | 1.12  | 1.09 | 1.09  | 1.09   | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25   |       |        | 15    |
| Sign Control               | Stop  |       |      | Free  | Free   |       |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 78.2%        |
| ICU Level of Service              | D            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
5: Boundary Road & Mitch Owens Road

2030 Future Background PM  
08-06-2021



| Movement                          | EBL         | EBR         | NBL         | NBT                  | SBT         | SBR  |
|-----------------------------------|-------------|-------------|-------------|----------------------|-------------|------|
| Lane Configurations               |             |             |             |                      |             |      |
| Traffic Volume (veh/h)            | 141         | 119         | 63          | 144                  | 869         | 142  |
| Future Volume (Veh/h)             | 141         | 119         | 63          | 144                  | 869         | 142  |
| Sign Control                      | Stop        |             |             | Free                 | Free        |      |
| Grade                             | 0%          |             |             | 0%                   | 0%          |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00        | 1.00 |
| Hourly flow rate (vph)            | 141         | 119         | 63          | 144                  | 869         | 142  |
| <b>Pedestrians</b>                |             |             |             |                      |             |      |
| Lane Width (m)                    |             |             |             |                      |             |      |
| Walking Speed (m/s)               |             |             |             |                      |             |      |
| Percent Blockage                  |             |             |             |                      |             |      |
| Right turn flare (veh)            |             |             |             |                      |             |      |
| Median type                       |             |             |             | None                 | None        |      |
| Median storage (veh)              |             |             |             |                      |             |      |
| Upstream signal (m)               |             |             |             |                      |             |      |
| pX, platoon unblocked             |             |             |             |                      |             |      |
| vC, conflicting volume            | 1139        | 869         | 1011        |                      |             |      |
| vC1, stage 1 conf vol             |             |             |             |                      |             |      |
| vC2, stage 2 conf vol             |             |             |             |                      |             |      |
| vCu, unblocked vol                | 1139        | 869         | 1011        |                      |             |      |
| tC, single (s)                    | 6.5         | 6.3         | 4.2         |                      |             |      |
| tC, 2 stage (s)                   |             |             |             |                      |             |      |
| tF (s)                            | 3.6         | 3.4         | 2.3         |                      |             |      |
| p0 queue free %                   | 26          | 66          | 90          |                      |             |      |
| cM capacity (veh/h)               | 192         | 346         | 663         |                      |             |      |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>EB 2</b> | <b>NB 1</b> | <b>SB 1</b>          | <b>SB 2</b> |      |
| Volume Total                      | 141         | 119         | 207         | 869                  | 142         |      |
| Volume Left                       | 141         | 0           | 63          | 0                    | 0           |      |
| Volume Right                      | 0           | 119         | 0           | 0                    | 142         |      |
| cSH                               | 192         | 346         | 663         | 1700                 | 1700        |      |
| Volume to Capacity                | 0.74        | 0.34        | 0.10        | 0.51                 | 0.08        |      |
| Queue Length 95th (m)             | 38.1        | 12.0        | 2.5         | 0.0                  | 0.0         |      |
| Control Delay (s)                 | 63.1        | 20.8        | 4.1         | 0.0                  | 0.0         |      |
| Lane LOS                          | F           | C           | A           |                      |             |      |
| Approach Delay (s)                | 43.8        |             | 4.1         | 0.0                  |             |      |
| Approach LOS                      | E           |             |             |                      |             |      |
| <b>Intersection Summary</b>       |             |             |             |                      |             |      |
| Average Delay                     |             |             | 8.3         |                      |             |      |
| Intersection Capacity Utilization |             |             | 78.2%       | ICU Level of Service | D           |      |
| Analysis Period (min)             |             |             | 15          |                      |             |      |

Lanes, Volumes, Timings  
1: Boundary Road & Hwy 417 WB Ramp Terminal

2035 Future Background AM  
08-09-2021



| Lane Group                 | WBL   | WBR   | NBT   | NBR   | SBL  | SBT   |
|----------------------------|-------|-------|-------|-------|------|-------|
| Lane Configurations        |       |       |       |       |      |       |
| Traffic Volume (vph)       | 164   | 38    | 119   | 1047  | 94   | 139   |
| Future Volume (vph)        | 164   | 38    | 119   | 1047  | 94   | 139   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  |
| Lane Width (m)             | 4.5   | 4.5   | 3.5   | 3.5   | 3.5  | 3.5   |
| Storage Length (m)         | 0.0   | 10.0  |       | 0.0   | 0.0  |       |
| Storage Lanes              | 1     | 0     |       | 0     | 0    |       |
| Taper Length (m)           | 7.5   |       |       |       | 7.5  |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Frt                        | 0.975 |       | 0.879 |       |      |       |
| Flt Protected              | 0.961 |       |       |       |      | 0.980 |
| Satd. Flow (prot)          | 1752  | 0     | 1529  | 0     | 0    | 1583  |
| Flt Permitted              | 0.961 |       |       |       |      | 0.980 |
| Satd. Flow (perm)          | 1752  | 0     | 1529  | 0     | 0    | 1583  |
| Link Speed (k/h)           | 40    |       | 80    |       |      | 80    |
| Link Distance (m)          | 155.0 |       | 545.7 |       |      | 134.1 |
| Travel Time (s)            | 14.0  |       | 24.6  |       |      | 6.0   |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Heavy Vehicles (%)         | 4%    | 14%   | 14%   | 1%    | 9%   | 11%   |
| Adj. Flow (vph)            | 164   | 38    | 119   | 1047  | 94   | 139   |
| Shared Lane Traffic (%)    |       |       |       |       |      |       |
| Lane Group Flow (vph)      | 202   | 0     | 1166  | 0     | 0    | 233   |
| Enter Blocked Intersection | No    | No    | No    | No    | No   | No    |
| Lane Alignment             | Left  | Right | Left  | Right | Left | Left  |
| Median Width(m)            | 4.5   |       | 0.0   |       |      | 0.0   |
| Link Offset(m)             | 0.0   |       | 0.0   |       |      | 0.0   |
| Crosswalk Width(m)         | 4.8   |       | 4.8   |       |      | 4.8   |
| Two way Left Turn Lane     |       |       |       |       |      |       |
| Headway Factor             | 0.95  | 0.95  | 1.09  | 1.09  | 1.09 | 1.09  |
| Turning Speed (k/h)        | 25    | 15    |       | 15    | 25   |       |
| Sign Control               | Stop  |       | Free  |       |      | Free  |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 110.1%       |
| ICU Level of Service              | H            |
| Analysis Period (min)             | 15           |



HCM Unsignalized Intersection Capacity Analysis  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

2035 Future Background AM  
 08-09-2021



| Movement                          | WBL  | WBR    | NBT  | NBR                  | SBL  | SBT  |
|-----------------------------------|------|--------|------|----------------------|------|------|
| Lane Configurations               |      |        |      |                      |      |      |
| Traffic Volume (veh/h)            | 164  | 38     | 119  | 1047                 | 94   | 139  |
| Future Volume (Veh/h)             | 164  | 38     | 119  | 1047                 | 94   | 139  |
| Sign Control                      | Stop |        | Free |                      |      | Free |
| Grade                             | 0%   |        | 0%   |                      |      | 0%   |
| Peak Hour Factor                  | 1.00 | 1.00   | 1.00 | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 164  | 38     | 119  | 1047                 | 94   | 139  |
| Pedestrians                       |      |        |      |                      |      |      |
| Lane Width (m)                    |      |        |      |                      |      |      |
| Walking Speed (m/s)               |      |        |      |                      |      |      |
| Percent Blockage                  |      |        |      |                      |      |      |
| Right turn flare (veh)            |      |        |      |                      |      |      |
| Median type                       |      |        | None |                      |      | None |
| Median storage veh                |      |        |      |                      |      |      |
| Upstream signal (m)               |      |        |      |                      |      |      |
| pX, platoon unblocked             |      |        |      |                      |      |      |
| vC, conflicting volume            | 970  | 642    |      |                      | 1166 |      |
| vC1, stage 1 conf vol             |      |        |      |                      |      |      |
| vC2, stage 2 conf vol             |      |        |      |                      |      |      |
| vCu, unblocked vol                | 970  | 642    |      |                      | 1166 |      |
| tC, single (s)                    | 6.4  | 6.3    |      |                      | 4.2  |      |
| tC, 2 stage (s)                   |      |        |      |                      |      |      |
| tF (s)                            | 3.5  | 3.4    |      |                      | 2.3  |      |
| p0 queue free %                   | 30   | 92     |      |                      | 84   |      |
| cM capacity (veh/h)               | 233  | 453    |      |                      | 575  |      |
| Direction, Lane #                 | WB 1 | NB 1   | SB 1 |                      |      |      |
| Volume Total                      | 202  | 1166   | 233  |                      |      |      |
| Volume Left                       | 164  | 0      | 94   |                      |      |      |
| Volume Right                      | 38   | 1047   | 0    |                      |      |      |
| cSH                               | 257  | 1700   | 575  |                      |      |      |
| Volume to Capacity                | 0.79 | 0.69   | 0.16 |                      |      |      |
| Queue Length 95th (m)             | 47.5 | 0.0    | 4.6  |                      |      |      |
| Control Delay (s)                 | 56.4 | 0.0    | 6.4  |                      |      |      |
| Lane LOS                          | F    |        | A    |                      |      |      |
| Approach Delay (s)                | 56.4 | 0.0    | 6.4  |                      |      |      |
| Approach LOS                      | F    |        |      |                      |      |      |
| Intersection Summary              |      |        |      |                      |      |      |
| Average Delay                     |      |        | 8.0  |                      |      |      |
| Intersection Capacity Utilization |      | 110.1% |      | ICU Level of Service |      | H    |
| Analysis Period (min)             |      |        | 15   |                      |      |      |

Lanes, Volumes, Timings  
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| Lane Group                 | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |
| Traffic Volume (vph)       | 22    | 387   | 45    | 1150  | 269   | 11    |
| Future Volume (vph)        | 22    | 387   | 45    | 1150  | 269   | 11    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.3   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   | 25.0  | 50.0  |       |       | 0.0   |
| Storage Lanes              | 1     | 1     | 1     |       |       | 0     |
| Taper Length (m)           | 7.5   |       | 75.0  |       |       |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Frt                        |       | 0.850 |       |       | 0.995 |       |
| Flt Protected              | 0.950 |       | 0.950 |       |       |       |
| Satd. Flow (prot)          | 1291  | 1395  | 1291  | 1745  | 1594  | 0     |
| Flt Permitted              | 0.950 |       | 0.524 |       |       |       |
| Satd. Flow (perm)          | 1291  | 1395  | 712   | 1745  | 1594  | 0     |
| Right Turn on Red          |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 387   |       |       | 4     |       |
| Link Speed (k/h)           | 40    |       |       | 80    | 80    |       |
| Link Distance (m)          | 154.2 |       |       | 243.1 | 545.7 |       |
| Travel Time (s)            | 13.9  |       |       | 10.9  | 24.6  |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 31%   | 6%    | 31%   | 2%    | 11%   | 13%   |
| Adj. Flow (vph)            | 22    | 387   | 45    | 1150  | 269   | 11    |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 22    | 387   | 45    | 1150  | 280   | 0     |
| Enter Blocked Intersection | No    | No    | No    | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left  | Left  | Left  | Right |
| Median Width(m)            | 3.5   |       |       | 3.5   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |       | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |       | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |
| Headway Factor             | 1.09  | 1.12  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25    |       |       | 15    |
| Number of Detectors        | 1     | 1     | 1     | 2     | 2     |       |
| Detector Template          | Left  | Right | Left  | Thru  | Thru  |       |
| Leading Detector (m)       | 2.0   | 2.0   | 2.0   | 10.0  | 10.0  |       |
| Trailing Detector (m)      | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Position(m)     | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Size(m)         | 2.0   | 2.0   | 2.0   | 0.6   | 0.6   |       |
| Detector 1 Type            | 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   |       |
| Detector 1 Queue (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Delay (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 2 Position(m)     |       |       |       | 9.4   | 9.4   |       |
| Detector 2 Size(m)         |       |       |       | 0.6   | 0.6   |       |
| Detector 2 Type            |       |       |       | Cl+Ex | Cl+Ex |       |
| Detector 2 Channel         |       |       |       |       |       |       |
| Detector 2 Extend (s)      |       |       |       | 0.0   | 0.0   |       |
| Turn Type                  | Prot  | Perm  | pm+pt | NA    | NA    |       |

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| Lane Group              | EBL   | EBR   | NBL   | NBT    | SBT   | SBR |
|-------------------------|-------|-------|-------|--------|-------|-----|
| Protected Phases        | 4     |       | 5     | 2      | 6     |     |
| Permitted Phases        |       | 4     | 2     |        |       |     |
| Detector Phase          | 4     | 4     | 5     | 2      | 6     |     |
| Switch Phase            |       |       |       |        |       |     |
| Minimum Initial (s)     | 7.0   | 7.0   | 7.0   | 35.0   | 35.0  |     |
| Minimum Split (s)       | 17.8  | 17.8  | 13.0  | 41.6   | 41.6  |     |
| Total Split (s)         | 20.0  | 20.0  | 13.0  | 80.0   | 67.0  |     |
| Total Split (%)         | 20.0% | 20.0% | 13.0% | 80.0%  | 67.0% |     |
| Maximum Green (s)       | 13.2  | 13.2  | 7.0   | 73.4   | 60.4  |     |
| Yellow Time (s)         | 3.0   | 3.0   | 4.6   | 4.6    | 4.6   |     |
| All-Red Time (s)        | 3.8   | 3.8   | 1.4   | 2.0    | 2.0   |     |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0    | 0.0   |     |
| Total Lost Time (s)     | 6.8   | 6.8   | 6.0   | 6.6    | 6.6   |     |
| Lead/Lag                |       |       | Lead  |        | Lag   |     |
| Lead-Lag Optimize?      |       |       | Yes   |        | Yes   |     |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0    | 3.0   |     |
| Recall Mode             | None  | None  | None  | Min    | Min   |     |
| Walk Time (s)           | 5.0   | 5.0   |       | 0.0    | 7.0   |     |
| Flash Dont Walk (s)     | 6.0   | 6.0   |       | 0.0    | 21.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0     |       | 0      | 0     |     |
| Act Effct Green (s)     | 9.1   | 9.1   | 57.2  | 56.6   | 49.7  |     |
| Actuated g/C Ratio      | 0.11  | 0.11  | 0.72  | 0.71   | 0.62  |     |
| v/c Ratio               | 0.15  | 0.77  | 0.08  | 0.93   | 0.28  |     |
| Control Delay           | 39.9  | 15.9  | 3.5   | 24.4   | 8.8   |     |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.1    | 0.0   |     |
| Total Delay             | 39.9  | 15.9  | 3.5   | 24.5   | 8.8   |     |
| LOS                     | D     | B     | A     | C      | A     |     |
| Approach Delay          | 17.2  |       |       | 23.7   | 8.8   |     |
| Approach LOS            | B     |       |       | C      | A     |     |
| Queue Length 50th (m)   | 3.2   | 0.0   | 1.4   | 108.2  | 20.4  |     |
| Queue Length 95th (m)   | 11.5  | #32.0 | 4.8   | #297.4 | 39.5  |     |
| Internal Link Dist (m)  | 130.2 |       |       | 219.1  | 521.7 |     |
| Turn Bay Length (m)     |       | 25.0  | 50.0  |        |       |     |
| Base Capacity (vph)     | 224   | 562   | 563   | 1541   | 1272  |     |
| Starvation Cap Reductn  | 0     | 0     | 0     | 30     | 0     |     |
| Spillback Cap Reductn   | 0     | 0     | 0     | 0      | 0     |     |
| Storage Cap Reductn     | 0     | 0     | 0     | 0      | 0     |     |
| Reduced v/c Ratio       | 0.10  | 0.69  | 0.08  | 0.76   | 0.22  |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 79.8             |
| Natural Cycle:                     | 90               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.93             |
| Intersection Signal Delay:         | 20.1             |
| Intersection LOS:                  | C                |
| Intersection Capacity Utilization: | 80.9%            |
| 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: 2: Boundary Road & Hwy 417 EB Ramp Terminal



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|                            |  |  |  |  |  |  |   |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |   |  |   |   |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)       | 42  | 20  | 5   | 4   | 7   | 31  | 7   | 1123  | 36  | 236   | 352   | 67  |
| Future Volume (vph)        | 42  | 20  | 5   | 4   | 7   | 31  | 7   | 1123  | 36  | 236   | 352   | 67  |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.3   | 3.5   | 3.3   | 3.3   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 35.0  |   | 7.5   | 100.0   |   | 0.0   |
| Storage Lanes              | 0   |   | 0   | 0   |   | 1   | 1   |   | 1   | 1   |   | 0   |
| Taper Length (m)           | 7.5   |   |   | 7.5   |   |   | 45.0  |   |   | 75.0  |   |   |
| 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  |
| Fr <sub>t</sub>            |   | 0.990   |   |   |   | 0.850   |   |   | 0.850   |   | 0.976   |   |
| Fl <sub>t</sub> Protected  |   | 0.970   |   |   | 0.982   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)          | 0   | 1618  | 0   | 0   | 1748  | 1513  | 1378  | 1728  | 1479  | 1653  | 1526  | 0   |
| Fl <sub>t</sub> Permitted  |   | 0.803   |   |   | 0.868   |   | 0.517   |   |   | 0.066   |   |   |
| Satd. Flow (perm)          | 0   | 1340  | 0   | 0   | 1545  | 1513  | 750   | 1728  | 1479  | 115   | 1526  | 0   |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |   |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 4   |   |   |   | 100   |   |   | 96  |   |   | 22  |
| Link Speed (k/h)           |   | 60  |   |   | 20  |   |   | 80  |   |   |   | 80  |
| Link Distance (m)          |   | 642.8   |   |   | 170.6   |   |   | 174.7   |   |   |   | 243.1   |
| Travel Time (s)            |   | 38.6  |   |   | 30.7  |   |   | 7.9   |   |   |   | 10.9  |
| 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 (%)         | 6%  | 0%  | 25%   | 0%  | 0%  | 0%  | 20%   | 3%  | 0%  | 0%  | 15%   | 8%  |
| Adj. Flow (vph)            | 42  | 20  | 5   | 4   | 7   | 31  | 7   | 1123  | 36  | 236   | 352   | 67  |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)      | 0   | 67  | 0   | 0   | 11  | 31  | 7   | 1123  | 36  | 236   | 419   | 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   |   |   | 3.5   |   |   | 3.5   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |   |   |   |   |   |   |
| Headway Factor             | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.12  | 1.09  | 1.12  | 1.12  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   | 1   | 1   | 2   | 1   | 1   | 2   |   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  | Right   | Left  | Thru  | Right   | Left  | Thru  |   |
| Leading Detector (m)       | 2.0   | 10.0  |   | 2.0   | 10.0  | 2.0   | 2.0   | 10.0  | 2.0   | 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   | 0.6   | 2.0   | 2.0   | 0.6   | 2.0   | 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                  | Perm  | NA  |   | Perm  | NA  | Perm  | Perm  | NA  | Perm  | pm+pt   | NA  |   |

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| Lane Group              | EBL   | EBT   | EBR | WBL   | WBT   | WBR   | NBL   | NBT    | NBR   | SBL   | SBT   | SBR |
|-------------------------|-------|-------|-----|-------|-------|-------|-------|--------|-------|-------|-------|-----|
| Protected Phases        |       | 4     |     |       | 8     |       |       | 2      |       | 1     | 6     |     |
| Permitted Phases        | 4     |       |     | 8     |       | 8     | 2     |        | 2     | 6     |       |     |
| Detector Phase          | 4     | 4     |     | 8     | 8     | 8     | 2     | 2      | 2     | 1     | 6     |     |
| Switch Phase            |       |       |     |       |       |       |       |        |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 20.0  | 20.0   | 20.0  | 7.0   | 20.0  |     |
| Minimum Split (s)       | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 26.2  | 26.2   | 26.2  | 13.0  | 26.2  |     |
| Total Split (s)         | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 60.5  | 60.5   | 60.5  | 14.7  | 75.2  |     |
| Total Split (%)         | 24.8% | 24.8% |     | 24.8% | 24.8% | 24.8% | 60.5% | 60.5%  | 60.5% | 14.7% | 75.2% |     |
| Maximum Green (s)       | 19.0  | 19.0  |     | 19.0  | 19.0  | 19.0  | 54.3  | 54.3   | 54.3  | 8.7   | 69.0  |     |
| Yellow Time (s)         | 3.7   | 3.7   |     | 3.7   | 3.7   | 3.7   | 4.6   | 4.6    | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 2.1   | 2.1   |     | 2.1   | 2.1   | 2.1   | 1.6   | 1.6    | 1.6   | 1.4   | 1.6   |     |
| Lost Time Adjust (s)    |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     |       | 5.8   |     |       | 5.8   | 5.8   | 6.2   | 6.2    | 6.2   | 6.0   | 6.2   |     |
| Lead/Lag                |       |       |     |       |       |       | Lag   | Lag    | Lag   | Lead  |       |     |
| 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  | Min   | Min    | Min   | None  | Min   |     |
| Walk Time (s)           | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 7.0   | 7.0    | 7.0   |       | 7.0   |     |
| Flash Dont Walk (s)     | 12.0  | 12.0  |     | 12.0  | 12.0  | 12.0  | 10.0  | 10.0   | 10.0  |       | 10.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0     |     | 0     | 0     | 0     | 0     | 0      | 0     |       | 0     |     |
| Act Effct Green (s)     |       | 9.8   |     |       | 9.8   | 9.8   | 54.7  | 54.7   | 54.7  | 69.7  | 71.0  |     |
| Actuated g/C Ratio      |       | 0.11  |     |       | 0.11  | 0.11  | 0.62  | 0.62   | 0.62  | 0.79  | 0.80  |     |
| v/c Ratio               |       | 0.44  |     |       | 0.06  | 0.12  | 0.02  | 1.05   | 0.04  | 0.97  | 0.34  |     |
| Control Delay           |       | 45.3  |     |       | 36.5  | 1.0   | 8.6   | 62.6   | 0.1   | 77.2  | 4.3   |     |
| Queue Delay             |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Delay             |       | 45.3  |     |       | 36.5  | 1.0   | 8.6   | 62.6   | 0.1   | 77.2  | 4.3   |     |
| LOS                     |       | D     |     |       | D     | A     | A     | E      | A     | E     | A     |     |
| Approach Delay          |       | 45.3  |     |       | 10.3  |       |       | 60.4   |       |       | 30.6  |     |
| Approach LOS            |       | D     |     |       | B     |       |       | E      |       |       | C     |     |
| Queue Length 50th (m)   |       | 11.0  |     |       | 1.9   | 0.0   | 0.5   | ~232.6 | 0.0   | ~28.4 | 18.6  |     |
| Queue Length 95th (m)   |       | 24.2  |     |       | 7.0   | 0.0   | 2.5   | #332.7 | 0.0   | #83.1 | 37.7  |     |
| Internal Link Dist (m)  |       | 618.8 |     |       | 146.6 |       |       | 150.7  |       |       | 219.1 |     |
| Turn Bay Length (m)     |       |       |     |       |       |       | 35.0  |        | 7.5   | 100.0 |       |     |
| Base Capacity (vph)     |       | 293   |     |       | 334   | 405   | 464   | 1068   | 951   | 243   | 1229  |     |
| Starvation Cap Reductn  |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Spillback Cap Reductn   |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Storage Cap Reductn     |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Reduced v/c Ratio       |       | 0.23  |     |       | 0.03  | 0.08  | 0.02  | 1.05   | 0.04  | 0.97  | 0.34  |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 88.4             |
| Natural Cycle:                     | 150              |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 1.05             |
| Intersection Signal Delay:         | 48.7             |
| Intersection LOS:                  | D                |
| Intersection Capacity Utilization: | 101.7%           |
| ICU Level of Service:              | G                |
| Analysis Period (min):             | 15               |

Lanes, Volumes, Timings  
 3: Boundary Road & Thunder Road/Amazon Way











- ~ 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: 3: Boundary Road & Thunder Road/Amazon Way

|        |        |        |
|--------|--------|--------|
| ↙ Ø1   | ↖ Ø2   | → Ø4   |
| 14.7 s | 60.5 s | 24.8 s |
| ↓ Ø6   |        | ↙ Ø8   |
| 75.2 s |        | 24.8 s |

Lanes, Volumes, Timings  
4: Boundary Road & South Amazon Access











2035 Future Background AM  
08-09-2021

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Lane Group                        | WBL   | WBR   | NBT   | NBR   | SBL   | SBT   |
| Lane Configurations               |  |   |  |   |  |  |
| Traffic Volume (vph)              | 7   | 4   | 1162  | 7   | 1   | 360   |
| Future Volume (vph)               | 7   | 4   | 1162  | 7   | 1   | 360   |
| Ideal Flow (vphpl)                | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)                    | 3.6   | 3.6   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)                | 0.0   | 0.0   |   | 0.0   | 70.0  |   |
| Storage Lanes                     | 1   | 0   |   | 0   | 1   |   |
| Taper Length (m)                  | 7.5   |   |   |   | 45.0  |   |
| Lane Util. Factor                 | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Frt                               | 0.951   |   | 0.999   |   |   |   |
| Flt Protected                     | 0.969   |   |   |   | 0.950   |   |
| Satd. Flow (prot)                 | 829   | 0   | 1750  | 0   | 846   | 1589  |
| Flt Permitted                     | 0.969   |   |   |   | 0.950   |   |
| Satd. Flow (perm)                 | 829   | 0   | 1750  | 0   | 846   | 1589  |
| Link Speed (k/h)                  | 20  |   | 80  |   |   | 80  |
| Link Distance (m)                 | 151.5   |   | 1150.2  |   |   | 174.7   |
| Travel Time (s)                   | 27.3  |   | 51.8  |   |   | 7.9   |
| Peak Hour Factor                  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)                | 100%  | 100%  | 1%  | 100%  | 100%  | 12%   |
| Adj. Flow (vph)                   | 7   | 4   | 1162  | 7   | 1   | 360   |
| Shared Lane Traffic (%)           |   |   |   |   |   |   |
| Lane Group Flow (vph)             | 11  | 0   | 1169  | 0   | 1   | 360   |
| Enter Blocked Intersection        | No  | No  | No  | No  | No  | No  |
| Lane Alignment                    | Left  | Right   | Left  | Right   | Left  | Left  |
| Median Width(m)                   | 3.6   |   | 3.5   |   |   | 3.5   |
| Link Offset(m)                    | 0.0   |   | 0.0   |   |   | 0.0   |
| Crosswalk Width(m)                | 4.8   |   | 4.8   |   |   | 4.8   |
| Two way Left Turn Lane            |   |   |   |   |   |   |
| Headway Factor                    | 1.07  | 1.07  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)               | 25  | 15  |   | 15  | 25  |   |
| Sign Control                      | Stop  |   | Free  |   |   | Free  |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |
| Area Type:                        | Other   |   |   |   |   |   |
| Control Type:                     | Unsignalized  |   |   |   |   |   |
| Intersection Capacity Utilization | 75.0%   |   |   | ICU Level of Service D  |   |   |
| Analysis Period (min)             | 15  |   |   |   |   |   |



HCM Unsignalized Intersection Capacity Analysis  
4: Boundary Road & South Amazon Access

2035 Future Background AM  
08-09-2021

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement                          | WBL   | WBR   | NBT   | NBR   | SBL   | SBT   |
| Lane Configurations               |  |   |  |   |  |  |
| Traffic Volume (veh/h)            | 7   | 4   | 1162  | 7   | 1   | 360   |
| Future Volume (Veh/h)             | 7   | 4   | 1162  | 7   | 1   | 360   |
| Sign Control                      | Stop  |   | Free  |   |   | Free  |
| Grade                             | 0%  |   | 0%  |   |   | 0%  |
| Peak Hour Factor                  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Hourly flow rate (vph)            | 7   | 4   | 1162  | 7   | 1   | 360   |
| Pedestrians                       |   |   |   |   |   |   |
| Lane Width (m)                    |   |   |   |   |   |   |
| Walking Speed (m/s)               |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |
| Median type                       |   |   | None  |   |   | None  |
| Median storage veh                |   |   |   |   |   |   |
| Upstream signal (m)               |   |   |   |   |   | 175   |
| pX, platoon unblocked             | 0.95  |   |   |   |   |   |
| vC, conflicting volume            | 1528  | 1166  |   |   | 1169  |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |
| vCu, unblocked vol                | 1529  | 1166  |   |   | 1169  |   |
| tC, single (s)                    | 7.4   | 7.2   |   |   | 5.1   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |
| tF (s)                            | 4.4   | 4.2   |   |   | 3.1   |   |
| p0 queue free %                   | 91  | 97  |   |   | 100   |   |
| cM capacity (veh/h)               | 74  | 152   |   |   | 352   |   |
| Direction, Lane #                 | WB 1  | NB 1  | SB 1  | SB 2  |   |   |
| Volume Total                      | 11  | 1169  | 1   | 360   |   |   |
| Volume Left                       | 7   | 0   | 1   | 0   |   |   |
| Volume Right                      | 4   | 7   | 0   | 0   |   |   |
| cSH                               | 91  | 1700  | 352   | 1700  |   |   |
| Volume to Capacity                | 0.12  | 0.69  | 0.00  | 0.21  |   |   |
| Queue Length 95th (m)             | 3.2   | 0.0   | 0.1   | 0.0   |   |   |
| Control Delay (s)                 | 49.8  | 0.0   | 15.3  | 0.0   |   |   |
| Lane LOS                          | E   |   | C   |   |   |   |
| Approach Delay (s)                | 49.8  | 0.0   | 0.0   |   |   |   |
| Approach LOS                      | E   |   |   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |
| Average Delay                     |   |   | 0.4   |   |   |   |
| Intersection Capacity Utilization |   |   | 75.0%   |   | ICU Level of Service  | D   |
| Analysis Period (min)             |   |   | 15  |   |   |   |

Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road

2035 Future Background AM  
08-09-2021



| Lane Group                 | EBL   | EBR   | NBL  | NBT   | SBT    | SBR   |
|----------------------------|-------|-------|------|-------|--------|-------|
| Lane Configurations        |       |       |      |       |        |       |
| Traffic Volume (vph)       | 96    | 36    | 163  | 1056  | 152    | 130   |
| Future Volume (vph)        | 96    | 36    | 163  | 1056  | 152    | 130   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800   | 1800  |
| Lane Width (m)             | 3.3   | 3.3   | 3.5  | 3.5   | 3.5    | 3.5   |
| Storage Length (m)         | 25.0  | 0.0   | 0.0  |       |        | 30.0  |
| Storage Lanes              | 1     | 1     | 0    |       |        | 1     |
| Taper Length (m)           | 47.5  |       | 7.5  |       |        |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |      |       |        | 0.850 |
| Fl <sub>t</sub> Protected  | 0.950 |       |      | 0.993 |        |       |
| Satd. Flow (prot)          | 1476  | 1286  | 0    | 1734  | 1561   | 1293  |
| Fl <sub>t</sub> Permitted  | 0.950 |       |      | 0.993 |        |       |
| Satd. Flow (perm)          | 1476  | 1286  | 0    | 1734  | 1561   | 1293  |
| Link Speed (k/h)           | 80    |       |      | 80    | 80     |       |
| Link Distance (m)          | 180.5 |       |      | 135.8 | 1150.2 |       |
| Travel Time (s)            | 8.1   |       |      | 6.1   | 51.8   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Heavy Vehicles (%)         | 12%   | 15%   | 8%   | 1%    | 14%    | 17%   |
| Adj. Flow (vph)            | 96    | 36    | 163  | 1056  | 152    | 130   |
| Shared Lane Traffic (%)    |       |       |      |       |        |       |
| Lane Group Flow (vph)      | 96    | 36    | 0    | 1219  | 152    | 130   |
| Enter Blocked Intersection | No    | No    | No   | No    | No     | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left   | Right |
| Median Width(m)            | 3.3   |       |      | 0.0   | 0.0    |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0    |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8    |       |
| Two way Left Turn Lane     |       |       |      |       |        |       |
| Headway Factor             | 1.12  | 1.12  | 1.09 | 1.09  | 1.09   | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25   |       |        | 15    |
| Sign Control               | Stop  |       |      | Free  | Free   |       |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 92.2%        |
| ICU Level of Service              | F            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
5: Boundary Road & Mitch Owens Road

2035 Future Background AM  
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| Movement                          | EBL         | EBR         | NBL         | NBT                  | SBT         | SBR  |
|-----------------------------------|-------------|-------------|-------------|----------------------|-------------|------|
| Lane Configurations               |             |             |             |                      |             |      |
| Traffic Volume (veh/h)            | 96          | 36          | 163         | 1056                 | 152         | 130  |
| Future Volume (Veh/h)             | 96          | 36          | 163         | 1056                 | 152         | 130  |
| Sign Control                      | Stop        |             |             | Free                 | Free        |      |
| Grade                             | 0%          |             |             | 0%                   | 0%          |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00        | 1.00 |
| Hourly flow rate (vph)            | 96          | 36          | 163         | 1056                 | 152         | 130  |
| <b>Pedestrians</b>                |             |             |             |                      |             |      |
| Lane Width (m)                    |             |             |             |                      |             |      |
| Walking Speed (m/s)               |             |             |             |                      |             |      |
| Percent Blockage                  |             |             |             |                      |             |      |
| Right turn flare (veh)            |             |             |             |                      |             |      |
| Median type                       |             |             |             | None                 | None        |      |
| Median storage veh                |             |             |             |                      |             |      |
| Upstream signal (m)               |             |             |             |                      |             |      |
| pX, platoon unblocked             |             |             |             |                      |             |      |
| vC, conflicting volume            | 1534        | 152         | 282         |                      |             |      |
| vC1, stage 1 conf vol             |             |             |             |                      |             |      |
| vC2, stage 2 conf vol             |             |             |             |                      |             |      |
| vCu, unblocked vol                | 1534        | 152         | 282         |                      |             |      |
| tC, single (s)                    | 6.5         | 6.4         | 4.2         |                      |             |      |
| tC, 2 stage (s)                   |             |             |             |                      |             |      |
| tF (s)                            | 3.6         | 3.4         | 2.3         |                      |             |      |
| p0 queue free %                   | 9           | 96          | 87          |                      |             |      |
| cM capacity (veh/h)               | 106         | 861         | 1247        |                      |             |      |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>EB 2</b> | <b>NB 1</b> | <b>SB 1</b>          | <b>SB 2</b> |      |
| Volume Total                      | 96          | 36          | 1219        | 152                  | 130         |      |
| Volume Left                       | 96          | 0           | 163         | 0                    | 0           |      |
| Volume Right                      | 0           | 36          | 0           | 0                    | 130         |      |
| cSH                               | 106         | 861         | 1247        | 1700                 | 1700        |      |
| Volume to Capacity                | 0.91        | 0.04        | 0.13        | 0.09                 | 0.08        |      |
| Queue Length 95th (m)             | 43.5        | 1.0         | 3.6         | 0.0                  | 0.0         |      |
| Control Delay (s)                 | 138.6       | 9.4         | 3.6         | 0.0                  | 0.0         |      |
| Lane LOS                          | F           | A           | A           |                      |             |      |
| Approach Delay (s)                | 103.4       |             | 3.6         | 0.0                  |             |      |
| Approach LOS                      | F           |             |             |                      |             |      |
| <b>Intersection Summary</b>       |             |             |             |                      |             |      |
| Average Delay                     |             |             | 11.0        |                      |             |      |
| Intersection Capacity Utilization |             |             | 92.2%       | ICU Level of Service | F           |      |
| Analysis Period (min)             |             |             | 15          |                      |             |      |

Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road

2035 Future Background AM - Signal Test  
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| Lane Group                 | EBL   | EBR   | NBL   | NBT   | SBT    | SBR   |
|----------------------------|-------|-------|-------|-------|--------|-------|
| Lane Configurations        |       |       |       |       |        |       |
| Traffic Volume (vph)       | 96    | 36    | 163   | 1056  | 152    | 130   |
| Future Volume (vph)        | 96    | 36    | 163   | 1056  | 152    | 130   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800   | 1800  |
| Lane Width (m)             | 3.3   | 3.3   | 3.5   | 3.5   | 3.5    | 3.5   |
| Storage Length (m)         | 25.0  | 0.0   | 15.0  |       |        | 30.0  |
| Storage Lanes              | 1     | 1     | 1     |       |        | 1     |
| Taper Length (m)           | 47.5  |       | 100.0 |       |        |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00   | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |       |       |        | 0.850 |
| Fl <sub>t</sub> Protected  | 0.950 |       | 0.950 |       |        |       |
| Satd. Flow (prot)          | 1476  | 1286  | 1566  | 1762  | 1561   | 1293  |
| Fl <sub>t</sub> Permitted  | 0.950 |       | 0.660 |       |        |       |
| Satd. Flow (perm)          | 1476  | 1286  | 1088  | 1762  | 1561   | 1293  |
| Right Turn on Red          |       | Yes   |       |       |        | Yes   |
| Satd. Flow (RTOR)          |       | 36    |       |       |        | 130   |
| Link Speed (k/h)           | 80    |       |       | 80    | 80     |       |
| Link Distance (m)          | 180.5 |       |       | 135.8 | 1150.2 |       |
| Travel Time (s)            | 8.1   |       |       | 6.1   | 51.8   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00   | 1.00  |
| Heavy Vehicles (%)         | 12%   | 15%   | 8%    | 1%    | 14%    | 17%   |
| Adj. Flow (vph)            | 96    | 36    | 163   | 1056  | 152    | 130   |
| Shared Lane Traffic (%)    |       |       |       |       |        |       |
| Lane Group Flow (vph)      | 96    | 36    | 163   | 1056  | 152    | 130   |
| Enter Blocked Intersection | No    | No    | No    | No    | No     | No    |
| Lane Alignment             | Left  | Right | Left  | Left  | Left   | Right |
| Median Width(m)            | 3.3   |       |       | 3.5   | 3.5    |       |
| Link Offset(m)             | 0.0   |       |       | 0.0   | 0.0    |       |
| Crosswalk Width(m)         | 4.8   |       |       | 4.8   | 4.8    |       |
| Two way Left Turn Lane     |       |       |       |       |        |       |
| Headway Factor             | 1.12  | 1.12  | 1.09  | 1.09  | 1.09   | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25    |       |        | 15    |
| Number of Detectors        | 1     | 1     | 1     | 2     | 2      | 1     |
| Detector Template          | Left  | Right | Left  | Thru  | Thru   | Right |
| Leading Detector (m)       | 2.0   | 2.0   | 2.0   | 10.0  | 10.0   | 2.0   |
| Trailing Detector (m)      | 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   |
| Detector 1 Size(m)         | 2.0   | 2.0   | 2.0   | 0.6   | 0.6    | 2.0   |
| Detector 1 Type            | 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   |
| Detector 1 Queue (s)       | 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   |
| Detector 2 Position(m)     |       |       |       | 9.4   | 9.4    |       |
| Detector 2 Size(m)         |       |       |       | 0.6   | 0.6    |       |
| Detector 2 Type            |       |       |       | Cl+Ex | Cl+Ex  |       |
| Detector 2 Channel         |       |       |       |       |        |       |
| Detector 2 Extend (s)      |       |       |       | 0.0   | 0.0    |       |
| Turn Type                  | Prot  | Perm  | Perm  | NA    | NA     | Perm  |

Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road

2035 Future Background AM - Signal Test

08-09-2021



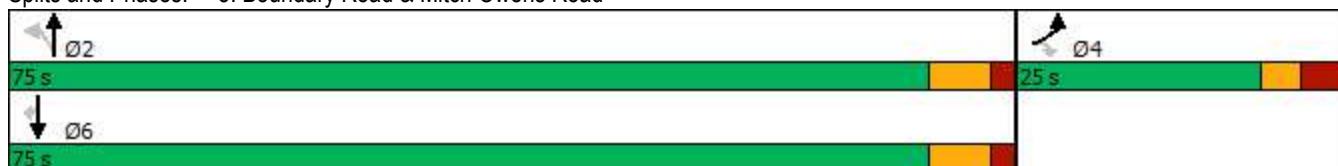
| Lane Group              | EBL   | EBR   | NBL   | NBT    | SBT    | SBR   |
|-------------------------|-------|-------|-------|--------|--------|-------|
| Protected Phases        | 4     |       |       | 2      | 6      |       |
| Permitted Phases        |       | 4     | 2     |        |        | 6     |
| Detector Phase          | 4     | 4     | 2     | 2      | 6      | 6     |
| Switch Phase            |       |       |       |        |        |       |
| Minimum Initial (s)     | 7.0   | 7.0   | 35.0  | 35.0   | 35.0   | 35.0  |
| Minimum Split (s)       | 24.8  | 24.8  | 41.6  | 41.6   | 41.6   | 41.6  |
| Total Split (s)         | 25.0  | 25.0  | 75.0  | 75.0   | 75.0   | 75.0  |
| Total Split (%)         | 25.0% | 25.0% | 75.0% | 75.0%  | 75.0%  | 75.0% |
| Maximum Green (s)       | 18.2  | 18.2  | 68.4  | 68.4   | 68.4   | 68.4  |
| Yellow Time (s)         | 3.0   | 3.0   | 4.6   | 4.6    | 4.6    | 4.6   |
| All-Red Time (s)        | 3.8   | 3.8   | 2.0   | 2.0    | 2.0    | 2.0   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0    | 0.0    | 0.0   |
| Total Lost Time (s)     | 6.8   | 6.8   | 6.6   | 6.6    | 6.6    | 6.6   |
| Lead/Lag                |       |       |       |        |        |       |
| Lead-Lag Optimize?      |       |       |       |        |        |       |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0    | 3.0    | 3.0   |
| Recall Mode             | None  | None  | Min   | Min    | Min    | Min   |
| Walk Time (s)           | 7.0   | 7.0   | 7.0   | 7.0    | 7.0    | 7.0   |
| Flash Dont Walk (s)     | 11.0  | 11.0  | 11.0  | 11.0   | 11.0   | 11.0  |
| Pedestrian Calls (#/hr) | 0     | 0     | 0     | 0      | 0      | 0     |
| Act Effct Green (s)     | 11.1  | 11.1  | 58.4  | 58.4   | 58.4   | 58.4  |
| Actuated g/C Ratio      | 0.14  | 0.14  | 0.75  | 0.75   | 0.75   | 0.75  |
| v/c Ratio               | 0.46  | 0.17  | 0.20  | 0.80   | 0.13   | 0.13  |
| Control Delay           | 42.0  | 14.3  | 5.4   | 15.5   | 4.7    | 1.2   |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0    | 0.0    | 0.0   |
| Total Delay             | 42.0  | 14.3  | 5.4   | 15.5   | 4.7    | 1.2   |
| LOS                     | D     | B     | A     | B      | A      | A     |
| Approach Delay          | 34.5  |       |       | 14.2   | 3.1    |       |
| Approach LOS            | C     |       |       | B      | A      |       |
| Queue Length 50th (m)   | 13.7  | 0.0   | 7.8   | 107.6  | 6.9    | 0.0   |
| Queue Length 95th (m)   | 33.5  | 8.8   | 18.3  | #232.9 | 15.7   | 5.2   |
| Internal Link Dist (m)  | 156.5 |       |       | 111.8  | 1126.2 |       |
| Turn Bay Length (m)     | 25.0  |       | 15.0  |        |        | 30.0  |
| Base Capacity (vph)     | 362   | 342   | 936   | 1516   | 1343   | 1131  |
| Starvation Cap Reductn  | 0     | 0     | 0     | 0      | 0      | 0     |
| Spillback Cap Reductn   | 0     | 0     | 0     | 0      | 0      | 0     |
| Storage Cap Reductn     | 0     | 0     | 0     | 0      | 0      | 0     |
| Reduced v/c Ratio       | 0.27  | 0.11  | 0.17  | 0.70   | 0.11   | 0.11  |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 77.9             |
| Natural Cycle:                     | 90               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.80             |
| Intersection Signal Delay:         | 13.9             |
| Intersection LOS:                  | B                |
| Intersection Capacity Utilization: | 80.8%            |
| 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: 5: Boundary Road & Mitch Owens Road



Lanes, Volumes, Timings  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

2035 Future Background PM  
 08-09-2021



| Lane Group                 | WBL   | WBR   | NBT   | NBR   | SBL  | SBT   |
|----------------------------|-------|-------|-------|-------|------|-------|
| Lane Configurations        |       |       |       |       |      |       |
| Traffic Volume (vph)       | 63    | 1     | 191   | 375   | 30   | 149   |
| Future Volume (vph)        | 63    | 1     | 191   | 375   | 30   | 149   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  |
| Lane Width (m)             | 4.5   | 4.5   | 3.5   | 3.5   | 3.5  | 3.5   |
| Storage Length (m)         | 0.0   | 10.0  |       | 0.0   | 0.0  |       |
| Storage Lanes              | 1     | 0     |       | 0     | 0    |       |
| Taper Length (m)           | 7.5   |       |       |       | 7.5  |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Frt                        | 0.998 |       | 0.911 |       |      |       |
| Flt Protected              | 0.953 |       |       |       |      | 0.992 |
| Satd. Flow (prot)          | 1586  | 0     | 1559  | 0     | 0    | 1630  |
| Flt Permitted              | 0.953 |       |       |       |      | 0.992 |
| Satd. Flow (perm)          | 1586  | 0     | 1559  | 0     | 0    | 1630  |
| Link Speed (k/h)           | 40    |       | 80    |       |      | 80    |
| Link Distance (m)          | 155.0 |       | 545.7 |       |      | 134.1 |
| Travel Time (s)            | 14.0  |       | 24.6  |       |      | 6.0   |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Heavy Vehicles (%)         | 19%   | 0%    | 6%    | 3%    | 5%   | 9%    |
| Adj. Flow (vph)            | 63    | 1     | 191   | 375   | 30   | 149   |
| Shared Lane Traffic (%)    |       |       |       |       |      |       |
| Lane Group Flow (vph)      | 64    | 0     | 566   | 0     | 0    | 179   |
| Enter Blocked Intersection | No    | No    | No    | No    | No   | No    |
| Lane Alignment             | Left  | Right | Left  | Right | Left | Left  |
| Median Width(m)            | 4.5   |       | 0.0   |       |      | 0.0   |
| Link Offset(m)             | 0.0   |       | 0.0   |       |      | 0.0   |
| Crosswalk Width(m)         | 4.8   |       | 4.8   |       |      | 4.8   |
| Two way Left Turn Lane     |       |       |       |       |      |       |
| Headway Factor             | 0.95  | 0.95  | 1.09  | 1.09  | 1.09 | 1.09  |
| Turning Speed (k/h)        | 25    | 15    |       | 15    | 25   |       |
| Sign Control               | Stop  |       | Free  |       |      | Free  |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 45.8%        |
| ICU Level of Service              | A            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

2035 Future Background PM  
 08-09-2021



| Movement                          | WBL         | WBR         | NBT         | NBR                  | SBL  | SBT  |
|-----------------------------------|-------------|-------------|-------------|----------------------|------|------|
| Lane Configurations               |             |             |             |                      |      |      |
| Traffic Volume (veh/h)            | 63          | 1           | 191         | 375                  | 30   | 149  |
| Future Volume (Veh/h)             | 63          | 1           | 191         | 375                  | 30   | 149  |
| Sign Control                      | Stop        |             | Free        |                      | Free |      |
| Grade                             | 0%          |             | 0%          |                      | 0%   |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 63          | 1           | 191         | 375                  | 30   | 149  |
| <b>Pedestrians</b>                |             |             |             |                      |      |      |
| Lane Width (m)                    |             |             |             |                      |      |      |
| Walking Speed (m/s)               |             |             |             |                      |      |      |
| Percent Blockage                  |             |             |             |                      |      |      |
| Right turn flare (veh)            |             |             |             |                      |      |      |
| Median type                       | None        |             |             | None                 |      |      |
| Median storage (veh)              |             |             |             |                      |      |      |
| Upstream signal (m)               |             |             |             |                      |      |      |
| pX, platoon unblocked             |             |             |             |                      |      |      |
| vC, conflicting volume            | 588         | 378         |             |                      | 566  |      |
| vC1, stage 1 conf vol             |             |             |             |                      |      |      |
| vC2, stage 2 conf vol             |             |             |             |                      |      |      |
| vCu, unblocked vol                | 588         | 378         |             |                      | 566  |      |
| tC, single (s)                    | 6.6         | 6.2         |             |                      | 4.1  |      |
| tC, 2 stage (s)                   |             |             |             |                      |      |      |
| tF (s)                            | 3.7         | 3.3         |             |                      | 2.2  |      |
| p0 queue free %                   | 85          | 100         |             |                      | 97   |      |
| cM capacity (veh/h)               | 431         | 673         |             |                      | 991  |      |
| <b>Direction, Lane #</b>          | <b>WB 1</b> | <b>NB 1</b> | <b>SB 1</b> |                      |      |      |
| Volume Total                      | 64          | 566         | 179         |                      |      |      |
| Volume Left                       | 63          | 0           | 30          |                      |      |      |
| Volume Right                      | 1           | 375         | 0           |                      |      |      |
| cSH                               | 434         | 1700        | 991         |                      |      |      |
| Volume to Capacity                | 0.15        | 0.33        | 0.03        |                      |      |      |
| Queue Length 95th (m)             | 4.1         | 0.0         | 0.7         |                      |      |      |
| Control Delay (s)                 | 14.7        | 0.0         | 1.7         |                      |      |      |
| Lane LOS                          | B           |             | A           |                      |      |      |
| Approach Delay (s)                | 14.7        | 0.0         | 1.7         |                      |      |      |
| Approach LOS                      | B           |             |             |                      |      |      |
| <b>Intersection Summary</b>       |             |             |             |                      |      |      |
| Average Delay                     |             |             | 1.5         |                      |      |      |
| Intersection Capacity Utilization |             |             | 45.8%       | ICU Level of Service | A    |      |
| Analysis Period (min)             |             |             | 15          |                      |      |      |



Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

2035 Future Background PM  
08-09-2021



| Lane Group                 | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |
| Traffic Volume (vph)       | 94    | 895   | 198   | 354   | 263   | 20    |
| Future Volume (vph)        | 94    | 895   | 198   | 354   | 263   | 20    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.3   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   | 25.0  | 50.0  |       |       | 0.0   |
| Storage Lanes              | 1     | 1     | 1     |       |       | 0     |
| Taper Length (m)           | 7.5   |       | 75.0  |       |       |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Frt                        |       | 0.850 |       |       | 0.990 |       |
| Flt Protected              | 0.950 |       | 0.950 |       |       |       |
| Satd. Flow (prot)          | 1551  | 1436  | 1537  | 1664  | 1592  | 0     |
| Flt Permitted              | 0.950 |       | 0.425 |       |       |       |
| Satd. Flow (perm)          | 1551  | 1436  | 688   | 1664  | 1592  | 0     |
| Right Turn on Red          |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 536   |       |       | 4     |       |
| Link Speed (k/h)           | 40    |       |       | 80    | 80    |       |
| Link Distance (m)          | 154.2 |       |       | 243.1 | 545.7 |       |
| Travel Time (s)            | 13.9  |       |       | 10.9  | 24.6  |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 9%    | 3%    | 10%   | 7%    | 11%   | 7%    |
| Adj. Flow (vph)            | 94    | 895   | 198   | 354   | 263   | 20    |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 94    | 895   | 198   | 354   | 283   | 0     |
| Enter Blocked Intersection | No    | No    | No    | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left  | Left  | Left  | Right |
| Median Width(m)            | 3.5   |       |       | 3.5   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |       | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |       | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |
| Headway Factor             | 1.09  | 1.12  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25    |       |       | 15    |
| Number of Detectors        | 1     | 1     | 1     | 2     | 2     |       |
| Detector Template          | Left  | Right | Left  | Thru  | Thru  |       |
| Leading Detector (m)       | 2.0   | 2.0   | 2.0   | 10.0  | 10.0  |       |
| Trailing Detector (m)      | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Position(m)     | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Size(m)         | 2.0   | 2.0   | 2.0   | 0.6   | 0.6   |       |
| Detector 1 Type            | 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   |       |
| Detector 1 Queue (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Delay (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 2 Position(m)     |       |       |       | 9.4   | 9.4   |       |
| Detector 2 Size(m)         |       |       |       | 0.6   | 0.6   |       |
| Detector 2 Type            |       |       |       | Cl+Ex | Cl+Ex |       |
| Detector 2 Channel         |       |       |       |       |       |       |
| Detector 2 Extend (s)      |       |       |       | 0.0   | 0.0   |       |
| Turn Type                  | Prot  | Perm  | pm+pt | NA    | NA    |       |

Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

2035 Future Background PM  
08-09-2021



| Lane Group              | EBL   | EBR    | NBL   | NBT   | SBT   | SBR |
|-------------------------|-------|--------|-------|-------|-------|-----|
| Protected Phases        | 4     |        | 5     | 2     | 6     |     |
| Permitted Phases        |       | 4      | 2     |       |       |     |
| Detector Phase          | 4     | 4      | 5     | 2     | 6     |     |
| Switch Phase            |       |        |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0    | 7.0   | 35.0  | 35.0  |     |
| Minimum Split (s)       | 23.0  | 23.0   | 13.0  | 41.6  | 41.6  |     |
| Total Split (s)         | 44.0  | 44.0   | 13.0  | 56.0  | 43.0  |     |
| Total Split (%)         | 44.0% | 44.0%  | 13.0% | 56.0% | 43.0% |     |
| Maximum Green (s)       | 37.2  | 37.2   | 7.0   | 49.4  | 36.4  |     |
| Yellow Time (s)         | 3.0   | 3.0    | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 3.8   | 3.8    | 1.4   | 2.0   | 2.0   |     |
| Lost Time Adjust (s)    | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     | 6.8   | 6.8    | 6.0   | 6.6   | 6.6   |     |
| Lead/Lag                |       |        | Lead  |       | Lag   |     |
| Lead-Lag Optimize?      |       |        | Yes   |       | Yes   |     |
| Vehicle Extension (s)   | 3.0   | 3.0    | 3.0   | 3.0   | 3.0   |     |
| Recall Mode             | None  | None   | None  | Min   | Min   |     |
| Walk Time (s)           | 7.0   | 7.0    |       | 0.0   | 7.0   |     |
| Flash Dont Walk (s)     | 5.0   | 5.0    |       | 0.0   | 21.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0      |       | 0     | 0     |     |
| Act Effct Green (s)     | 37.2  | 37.2   | 48.6  | 48.0  | 35.0  |     |
| Actuated g/C Ratio      | 0.38  | 0.38   | 0.49  | 0.49  | 0.35  |     |
| v/c Ratio               | 0.16  | 1.02   | 0.50  | 0.44  | 0.50  |     |
| Control Delay           | 21.3  | 50.4   | 19.8  | 18.6  | 28.3  |     |
| Queue Delay             | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Delay             | 21.3  | 50.4   | 19.8  | 18.6  | 28.3  |     |
| LOS                     | C     | D      | B     | B     | C     |     |
| Approach Delay          | 47.6  |        |       | 19.0  | 28.3  |     |
| Approach LOS            | D     |        |       | B     | C     |     |
| Queue Length 50th (m)   | 12.3  | ~119.4 | 22.3  | 44.6  | 43.4  |     |
| Queue Length 95th (m)   | 23.7  | #195.8 | 37.1  | 68.2  | 68.8  |     |
| Internal Link Dist (m)  | 130.2 |        |       | 219.1 | 521.7 |     |
| Turn Bay Length (m)     |       | 25.0   | 50.0  |       |       |     |
| Base Capacity (vph)     | 585   | 875    | 399   | 833   | 590   |     |
| Starvation Cap Reductn  | 0     | 0      | 0     | 0     | 0     |     |
| Spillback Cap Reductn   | 0     | 0      | 0     | 0     | 0     |     |
| Storage Cap Reductn     | 0     | 0      | 0     | 0     | 0     |     |
| Reduced v/c Ratio       | 0.16  | 1.02   | 0.50  | 0.42  | 0.48  |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 98.6             |
| Natural Cycle:                     | 100              |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 1.02             |
| Intersection Signal Delay:         | 36.0             |
| Intersection LOS:                  | D                |
| Intersection Capacity Utilization: | 98.8%            |
| 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: 2: Boundary Road & Hwy 417 EB Ramp Terminal



Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

2035 Future Background PM

08-09-2021

|                            |  |  |  |  |  |  |   |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |   |  |   |   |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)       | 83  | 0   | 19  | 7   | 0   | 22  | 5   | 446   | 0   | 3   | 1081  | 74  |
| Future Volume (vph)        | 83  | 0   | 19  | 7   | 0   | 22  | 5   | 446   | 0   | 3   | 1081  | 74  |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.3   | 3.5   | 3.3   | 3.3   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 35.0  |   | 7.5   | 100.0   |   | 0.0   |
| Storage Lanes              | 0   |   | 0   | 0   |   | 1   | 1   |   | 1   | 1   |   | 0   |
| Taper Length (m)           | 7.5   |   |   | 7.5   |   |   | 45.0  |   |   | 75.0  |   |   |
| 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  |
| Frt                        |   | 0.975   |   |   |   | 0.850   |   |   |   |   |   | 0.990   |
| Flt Protected              |   | 0.961   |   |   | 0.950   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)          | 0   | 1590  | 0   | 0   | 1208  | 1513  | 1322  | 1633  | 1740  | 1102  | 1699  | 0   |
| Flt Permitted              |   | 0.761   |   |   | 0.785   |   | 0.183   |   |   | 0.446   |   |   |
| Satd. Flow (perm)          | 0   | 1259  | 0   | 0   | 998   | 1513  | 255   | 1633  | 1740  | 517   | 1699  | 0   |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |   |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 100   |   |   |   | 100   |   |   |   |   |   | 8   |
| Link Speed (k/h)           |   | 60  |   |   | 20  |   |   | 80  |   |   |   | 80  |
| Link Distance (m)          |   | 642.8   |   |   | 170.6   |   |   | 174.7   |   |   |   | 243.1   |
| Travel Time (s)            |   | 38.6  |   |   | 30.7  |   |   | 7.9   |   |   |   | 10.9  |
| 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 (%)         | 6%  | 0%  | 0%  | 40%   | 0%  | 0%  | 25%   | 9%  | 0%  | 50%   | 4%  | 0%  |
| Adj. Flow (vph)            | 83  | 0   | 19  | 7   | 0   | 22  | 5   | 446   | 0   | 3   | 1081  | 74  |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)      | 0   | 102   | 0   | 0   | 7   | 22  | 5   | 446   | 0   | 3   | 1155  | 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   |   |   | 3.5   |   |   | 3.5   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |   |   |   |   |   |   |
| Headway Factor             | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.12  | 1.09  | 1.12  | 1.12  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   | 1   | 1   | 2   | 1   | 1   | 2   |   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  | Right   | Left  | Thru  | Right   | Left  | Thru  |   |
| Leading Detector (m)       | 2.0   | 10.0  |   | 2.0   | 10.0  | 2.0   | 2.0   | 10.0  | 2.0   | 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   | 0.6   | 2.0   | 2.0   | 0.6   | 2.0   | 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                  | Perm  | NA  |   | Perm  | NA  | Perm  | Perm  | NA  | Perm  | pm+pt   | NA  |   |

Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

2035 Future Background PM  
08-09-2021



| Lane Group              | EBL   | EBT   | EBR | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT    | SBR |
|-------------------------|-------|-------|-----|-------|-------|-------|-------|-------|-------|-------|--------|-----|
| Protected Phases        |       | 4     |     |       | 8     |       |       | 2     |       | 1     | 6      |     |
| Permitted Phases        | 4     |       |     | 8     |       | 8     | 2     |       | 2     | 6     |        |     |
| Detector Phase          | 4     | 4     |     | 8     | 8     | 8     | 2     | 2     | 2     | 1     | 6      |     |
| Switch Phase            |       |       |     |       |       |       |       |       |       |       |        |     |
| Minimum Initial (s)     | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 20.0  | 20.0  | 20.0  | 7.0   | 20.0   |     |
| Minimum Split (s)       | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 26.2  | 26.2  | 26.2  | 13.0  | 26.2   |     |
| Total Split (s)         | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 62.2  | 62.2  | 62.2  | 13.0  | 75.2   |     |
| Total Split (%)         | 24.8% | 24.8% |     | 24.8% | 24.8% | 24.8% | 62.2% | 62.2% | 62.2% | 13.0% | 75.2%  |     |
| Maximum Green (s)       | 19.0  | 19.0  |     | 19.0  | 19.0  | 19.0  | 56.0  | 56.0  | 56.0  | 7.0   | 69.0   |     |
| Yellow Time (s)         | 3.7   | 3.7   |     | 3.7   | 3.7   | 3.7   | 4.6   | 4.6   | 4.6   | 4.6   | 4.6    |     |
| All-Red Time (s)        | 2.1   | 2.1   |     | 2.1   | 2.1   | 2.1   | 1.6   | 1.6   | 1.6   | 1.4   | 1.6    |     |
| Lost Time Adjust (s)    |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0    |     |
| Total Lost Time (s)     |       | 5.8   |     |       | 5.8   | 5.8   | 6.2   | 6.2   | 6.2   | 6.0   | 6.2    |     |
| Lead/Lag                |       |       |     |       |       |       | Lag   | Lag   | Lag   | Lead  |        |     |
| 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  | Min   | Min   | Min   | None  | Min    |     |
| Walk Time (s)           | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   |       | 7.0    |     |
| Flash Dont Walk (s)     | 12.0  | 12.0  |     | 12.0  | 12.0  | 12.0  | 10.0  | 10.0  | 10.0  |       | 10.0   |     |
| Pedestrian Calls (#/hr) | 0     | 0     |     | 0     | 0     | 0     | 0     | 0     | 0     |       | 0      |     |
| Act Effct Green (s)     |       | 8.2   |     |       | 8.2   | 8.2   | 66.7  | 66.7  |       | 67.5  | 69.0   |     |
| Actuated g/C Ratio      |       | 0.10  |     |       | 0.10  | 0.10  | 0.79  | 0.79  |       | 0.80  | 0.82   |     |
| v/c Ratio               |       | 0.48  |     |       | 0.07  | 0.09  | 0.02  | 0.35  |       | 0.01  | 0.83   |     |
| Control Delay           |       | 16.9  |     |       | 38.3  | 0.8   | 5.8   | 5.8   |       | 2.7   | 14.3   |     |
| Queue Delay             |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0   |       | 0.0   | 0.7    |     |
| Total Delay             |       | 16.9  |     |       | 38.3  | 0.8   | 5.8   | 5.8   |       | 2.7   | 15.0   |     |
| LOS                     |       | B     |     |       | D     | A     | A     | A     |       | A     | B      |     |
| Approach Delay          |       | 16.9  |     |       | 9.8   |       |       | 5.8   |       |       | 14.9   |     |
| Approach LOS            |       | B     |     |       | A     |       |       | A     |       |       | B      |     |
| Queue Length 50th (m)   |       | 0.3   |     |       | 1.2   | 0.0   | 0.1   | 17.8  |       | 0.1   | 103.5  |     |
| Queue Length 95th (m)   |       | 15.2  |     |       | 5.3   | 0.0   | 1.9   | 64.0  |       | 0.8   | #284.0 |     |
| Internal Link Dist (m)  |       | 618.8 |     |       | 146.6 |       |       | 150.7 |       |       | 219.1  |     |
| Turn Bay Length (m)     |       |       |     |       |       |       | 35.0  |       |       | 100.0 |        |     |
| Base Capacity (vph)     |       | 367   |     |       | 230   | 426   | 197   | 1263  |       | 463   | 1392   |     |
| Starvation Cap Reductn  |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 60     |     |
| Spillback Cap Reductn   |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 0      |     |
| Storage Cap Reductn     |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 0      |     |
| Reduced v/c Ratio       |       | 0.28  |     |       | 0.03  | 0.05  | 0.03  | 0.35  |       | 0.01  | 0.87   |     |

Intersection Summary











|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 84.3             |
| Natural Cycle:                     | 90               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.83             |
| Intersection Signal Delay:         | 12.6             |
| Intersection LOS:                  | B                |
| Intersection Capacity Utilization: | 87.5%            |
| ICU Level of Service:              | E                |
| Analysis Period (min):             | 15               |

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

Splits and Phases: 3: Boundary Road & Thunder Road/Amazon Way













Lanes, Volumes, Timings  
4: Boundary Road & South Amazon Access

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Lane Group                        | WBL   | WBR   | NBT   | NBR   | SBL   | SBT   |
| Lane Configurations               |  |   |  |   |  |  |
| Traffic Volume (vph)              | 7   | 15  | 436   | 7   | 16  | 1090  |
| Future Volume (vph)               | 7   | 15  | 436   | 7   | 16  | 1090  |
| Ideal Flow (vphpl)                | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)                    | 3.6   | 3.6   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)                | 0.0   | 0.0   |   | 0.0   | 70.0  |   |
| Storage Lanes                     | 1   | 0   |   | 0   | 1   |   |
| Taper Length (m)                  | 7.5   |   |   |   | 45.0  |   |
| Lane Util. Factor                 | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Frt                               | 0.908   |   | 0.998   |   |   |   |
| Flt Protected                     | 0.984   |   |   |   | 0.950   |   |
| Satd. Flow (prot)                 | 804   | 0   | 1668  | 0   | 846   | 1745  |
| Flt Permitted                     | 0.984   |   |   |   | 0.950   |   |
| Satd. Flow (perm)                 | 804   | 0   | 1668  | 0   | 846   | 1745  |
| Link Speed (k/h)                  | 20  |   | 80  |   |   | 80  |
| Link Distance (m)                 | 151.5   |   | 1150.2  |   |   | 174.7   |
| Travel Time (s)                   | 27.3  |   | 51.8  |   |   | 7.9   |
| Peak Hour Factor                  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)                | 100%  | 100%  | 5%  | 100%  | 100%  | 2%  |
| Adj. Flow (vph)                   | 7   | 15  | 436   | 7   | 16  | 1090  |
| Shared Lane Traffic (%)           |   |   |   |   |   |   |
| Lane Group Flow (vph)             | 22  | 0   | 443   | 0   | 16  | 1090  |
| Enter Blocked Intersection        | No  | No  | No  | No  | No  | No  |
| Lane Alignment                    | Left  | Right   | Left  | Right   | Left  | Left  |
| Median Width(m)                   | 3.6   |   | 3.5   |   |   | 3.5   |
| Link Offset(m)                    | 0.0   |   | 0.0   |   |   | 0.0   |
| Crosswalk Width(m)                | 4.8   |   | 4.8   |   |   | 4.8   |
| Two way Left Turn Lane            |   |   |   |   |   |   |
| Headway Factor                    | 1.07  | 1.07  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)               | 25  | 15  |   | 15  | 25  |   |
| Sign Control                      | Stop  |   | Free  |   |   | Free  |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |
| Area Type:                        | Other   |   |   |   |   |   |
| Control Type:                     | Unsignalized  |   |   |   |   |   |
| Intersection Capacity Utilization | 70.6%   |   |   | ICU Level of Service C  |   |   |
| Analysis Period (min)             | 15  |   |   |   |   |   |

HCM Unsignalized Intersection Capacity Analysis  
4: Boundary Road & South Amazon Access

2035 Future Background PM  
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|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement                          | WBL   | WBR   | NBT   | NBR   | SBL   | SBT   |
| Lane Configurations               |  |   |  |   |  |  |
| Traffic Volume (veh/h)            | 7   | 15  | 436   | 7   | 16  | 1090  |
| Future Volume (Veh/h)             | 7   | 15  | 436   | 7   | 16  | 1090  |
| Sign Control                      | Stop  |   | Free  |   | Free  |   |
| Grade                             | 0%  |   | 0%  |   | 0%  |   |
| Peak Hour Factor                  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Hourly flow rate (vph)            | 7   | 15  | 436   | 7   | 16  | 1090  |
| Pedestrians                       |   |   |   |   |   |   |
| Lane Width (m)                    |   |   |   |   |   |   |
| Walking Speed (m/s)               |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |
| Median type                       | None  |   |   | None  |   |   |
| Median storage veh                |   |   |   |   |   |   |
| Upstream signal (m)               |   |   |   |   |   | 175   |
| pX, platoon unblocked             | 0.23  |   |   |   |   |   |
| vC, conflicting volume            | 1562  | 440   |   |   | 443   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |
| vCu, unblocked vol                | 1766  | 440   |   |   | 443   |   |
| tC, single (s)                    | 7.4   | 7.2   |   |   | 5.1   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |
| tF (s)                            | 4.4   | 4.2   |   |   | 3.1   |   |
| p0 queue free %                   | 41  | 97  |   |   | 98  |   |
| cM capacity (veh/h)               | 12  | 455   |   |   | 746   |   |
| Direction, Lane #                 | WB 1  | NB 1  | SB 1  | SB 2  |   |   |
| Volume Total                      | 22  | 443   | 16  | 1090  |   |   |
| Volume Left                       | 7   | 0   | 16  | 0   |   |   |
| Volume Right                      | 15  | 7   | 0   | 0   |   |   |
| cSH                               | 36  | 1700  | 746   | 1700  |   |   |
| Volume to Capacity                | 0.62  | 0.26  | 0.02  | 0.64  |   |   |
| Queue Length 95th (m)             | 17.2  | 0.0   | 0.5   | 0.0   |   |   |
| Control Delay (s)                 | 208.7   | 0.0   | 9.9   | 0.0   |   |   |
| Lane LOS                          | F   |   | A   |   |   |   |
| Approach Delay (s)                | 208.7   | 0.0   | 0.1   |   |   |   |
| Approach LOS                      | F   |   |   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |
| Average Delay                     |   |   | 3.0   |   |   |   |
| Intersection Capacity Utilization |   |   | 70.6%   | ICU Level of Service  | C   |   |
| Analysis Period (min)             | 15  |   |   |   |   |   |



Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road

2035 Future Background PM  
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| Lane Group                 | EBL   | EBR   | NBL  | NBT   | SBT    | SBR   |
|----------------------------|-------|-------|------|-------|--------|-------|
| Lane Configurations        |       |       |      |       |        |       |
| Traffic Volume (vph)       | 155   | 132   | 70   | 159   | 958    | 156   |
| Future Volume (vph)        | 155   | 132   | 70   | 159   | 958    | 156   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800   | 1800  |
| Lane Width (m)             | 3.3   | 3.3   | 3.5  | 3.5   | 3.5    | 3.5   |
| Storage Length (m)         | 25.0  | 0.0   | 0.0  |       |        | 30.0  |
| Storage Lanes              | 1     | 1     | 0    |       |        | 1     |
| Taper Length (m)           | 47.5  |       | 7.5  |       |        |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |      |       |        | 0.850 |
| Fl <sub>t</sub> Protected  | 0.950 |       |      | 0.985 |        |       |
| Satd. Flow (prot)          | 1463  | 1395  | 0    | 1666  | 1762   | 1351  |
| Fl <sub>t</sub> Permitted  | 0.950 |       |      | 0.985 |        |       |
| Satd. Flow (perm)          | 1463  | 1395  | 0    | 1666  | 1762   | 1351  |
| Link Speed (k/h)           | 80    |       |      | 80    | 80     |       |
| Link Distance (m)          | 180.5 |       |      | 135.8 | 1150.2 |       |
| Travel Time (s)            | 8.1   |       |      | 6.1   | 51.8   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Heavy Vehicles (%)         | 13%   | 6%    | 8%   | 4%    | 1%     | 12%   |
| Adj. Flow (vph)            | 155   | 132   | 70   | 159   | 958    | 156   |
| Shared Lane Traffic (%)    |       |       |      |       |        |       |
| Lane Group Flow (vph)      | 155   | 132   | 0    | 229   | 958    | 156   |
| Enter Blocked Intersection | No    | No    | No   | No    | No     | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left   | Right |
| Median Width(m)            | 3.3   |       |      | 0.0   | 0.0    |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0    |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8    |       |
| Two way Left Turn Lane     |       |       |      |       |        |       |
| Headway Factor             | 1.12  | 1.12  | 1.09 | 1.09  | 1.09   | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25   |       |        | 15    |
| Sign Control               | Stop  |       |      | Free  | Free   |       |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 85.2%        |
| ICU Level of Service              | E            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
5: Boundary Road & Mitch Owens Road

2035 Future Background PM  
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| Movement                          | EBL   | EBR  | NBL   | NBT                  | SBT  | SBR  |
|-----------------------------------|-------|------|-------|----------------------|------|------|
| Lane Configurations               |       |      |       |                      |      |      |
| Traffic Volume (veh/h)            | 155   | 132  | 70    | 159                  | 958  | 156  |
| Future Volume (Veh/h)             | 155   | 132  | 70    | 159                  | 958  | 156  |
| Sign Control                      | Stop  |      |       | Free                 | Free |      |
| Grade                             | 0%    |      |       | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00  | 1.00 | 1.00  | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 155   | 132  | 70    | 159                  | 958  | 156  |
| Pedestrians                       |       |      |       |                      |      |      |
| Lane Width (m)                    |       |      |       |                      |      |      |
| Walking Speed (m/s)               |       |      |       |                      |      |      |
| Percent Blockage                  |       |      |       |                      |      |      |
| Right turn flare (veh)            |       |      |       |                      |      |      |
| Median type                       |       |      |       | None                 | None |      |
| Median storage veh)               |       |      |       |                      |      |      |
| Upstream signal (m)               |       |      |       |                      |      |      |
| pX, platoon unblocked             |       |      |       |                      |      |      |
| vC, conflicting volume            | 1257  | 958  | 1114  |                      |      |      |
| vC1, stage 1 conf vol             |       |      |       |                      |      |      |
| vC2, stage 2 conf vol             |       |      |       |                      |      |      |
| vCu, unblocked vol                | 1257  | 958  | 1114  |                      |      |      |
| tC, single (s)                    | 6.5   | 6.3  | 4.2   |                      |      |      |
| tC, 2 stage (s)                   |       |      |       |                      |      |      |
| tF (s)                            | 3.6   | 3.4  | 2.3   |                      |      |      |
| p0 queue free %                   | 2     | 57   | 88    |                      |      |      |
| cM capacity (veh/h)               | 159   | 307  | 605   |                      |      |      |
| Direction, Lane #                 | EB 1  | EB 2 | NB 1  | SB 1                 | SB 2 |      |
| Volume Total                      | 155   | 132  | 229   | 958                  | 156  |      |
| Volume Left                       | 155   | 0    | 70    | 0                    | 0    |      |
| Volume Right                      | 0     | 132  | 0     | 0                    | 156  |      |
| cSH                               | 159   | 307  | 605   | 1700                 | 1700 |      |
| Volume to Capacity                | 0.98  | 0.43 | 0.12  | 0.56                 | 0.09 |      |
| Queue Length 95th (m)             | 59.3  | 16.6 | 3.1   | 0.0                  | 0.0  |      |
| Control Delay (s)                 | 122.8 | 25.3 | 4.6   | 0.0                  | 0.0  |      |
| Lane LOS                          | F     | D    | A     |                      |      |      |
| Approach Delay (s)                | 78.0  |      | 4.6   | 0.0                  |      |      |
| Approach LOS                      | F     |      |       |                      |      |      |
| Intersection Summary              |       |      |       |                      |      |      |
| Average Delay                     |       |      | 14.4  |                      |      |      |
| Intersection Capacity Utilization |       |      | 85.2% | ICU Level of Service |      | E    |
| Analysis Period (min)             |       |      | 15    |                      |      |      |

Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road



| Lane Group                 | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |
| Traffic Volume (vph)       | 155   | 132   | 70    | 159   | 958   | 156   |
| Future Volume (vph)        | 155   | 132   | 70    | 159   | 958   | 156   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.3   | 3.3   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)         | 25.0  | 0.0   | 15.0  |       |       | 30.0  |
| Storage Lanes              | 1     | 1     | 1     |       |       | 1     |
| Taper Length (m)           | 47.5  |       | 100.0 |       |       |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Frt                        |       | 0.850 |       |       |       | 0.850 |
| Flt Protected              | 0.950 |       | 0.950 |       |       |       |
| Satd. Flow (prot)          | 1463  | 1395  | 1566  | 1712  | 1762  | 1351  |
| Flt Permitted              | 0.950 |       | 0.160 |       |       |       |
| Satd. Flow (perm)          | 1463  | 1395  | 264   | 1712  | 1762  | 1351  |
| Right Turn on Red          |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 132   |       |       |       | 88    |
| Link Speed (k/h)           | 80    |       |       | 80    | 80    |       |
| Link Distance (m)          | 180.5 |       |       | 135.8 | 784.0 |       |
| Travel Time (s)            | 8.1   |       |       | 6.1   | 35.3  |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 13%   | 6%    | 8%    | 4%    | 1%    | 12%   |
| Adj. Flow (vph)            | 155   | 132   | 70    | 159   | 958   | 156   |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 155   | 132   | 70    | 159   | 958   | 156   |
| Enter Blocked Intersection | No    | No    | No    | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left  | Left  | Left  | Right |
| Median Width(m)            | 3.3   |       |       | 3.5   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |       | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |       | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |
| Headway Factor             | 1.12  | 1.12  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25    |       |       | 15    |
| Number of Detectors        | 1     | 1     | 1     | 2     | 2     | 1     |
| Detector Template          | Left  | Right | Left  | Thru  | Thru  | Right |
| Leading Detector (m)       | 2.0   | 2.0   | 2.0   | 10.0  | 10.0  | 2.0   |
| Trailing Detector (m)      | 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   |
| Detector 1 Size(m)         | 2.0   | 2.0   | 2.0   | 0.6   | 0.6   | 2.0   |
| Detector 1 Type            | 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   |
| Detector 1 Queue (s)       | 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   |
| Detector 2 Position(m)     |       |       |       | 9.4   | 9.4   |       |
| Detector 2 Size(m)         |       |       |       | 0.6   | 0.6   |       |
| Detector 2 Type            |       |       |       | Cl+Ex | Cl+Ex |       |
| Detector 2 Channel         |       |       |       |       |       |       |
| Detector 2 Extend (s)      |       |       |       | 0.0   | 0.0   |       |
| Turn Type                  | Prot  | Perm  | Perm  | NA    | NA    | Perm  |

Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road

2035 Future Background PM - Signal Test

08-09-2021



| Lane Group              | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
|-------------------------|-------|-------|-------|-------|-------|-------|
| Protected Phases        | 4     |       |       | 2     | 6     |       |
| Permitted Phases        |       | 4     | 2     |       |       | 6     |
| Detector Phase          | 4     | 4     | 2     | 2     | 6     | 6     |
| Switch Phase            |       |       |       |       |       |       |
| Minimum Initial (s)     | 7.0   | 7.0   | 35.0  | 35.0  | 35.0  | 35.0  |
| Minimum Split (s)       | 24.8  | 24.8  | 41.6  | 41.6  | 41.6  | 41.6  |
| Total Split (s)         | 25.0  | 25.0  | 75.0  | 75.0  | 75.0  | 75.0  |
| Total Split (%)         | 25.0% | 25.0% | 75.0% | 75.0% | 75.0% | 75.0% |
| Maximum Green (s)       | 18.2  | 18.2  | 68.4  | 68.4  | 68.4  | 68.4  |
| Yellow Time (s)         | 3.0   | 3.0   | 4.6   | 4.6   | 4.6   | 4.6   |
| All-Red Time (s)        | 3.8   | 3.8   | 2.0   | 2.0   | 2.0   | 2.0   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.8   | 6.8   | 6.6   | 6.6   | 6.6   | 6.6   |
| Lead/Lag                |       |       |       |       |       |       |
| Lead-Lag Optimize?      |       |       |       |       |       |       |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None  | None  | Min   | Min   | Min   | Min   |
| Walk Time (s)           | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   |
| Flash Dont Walk (s)     | 11.0  | 11.0  | 11.0  | 11.0  | 11.0  | 11.0  |
| Pedestrian Calls (#/hr) | 0     | 0     | 0     | 0     | 0     | 0     |
| Act Effct Green (s)     | 13.0  | 13.0  | 48.0  | 48.0  | 48.0  | 48.0  |
| Actuated g/C Ratio      | 0.17  | 0.17  | 0.64  | 0.64  | 0.64  | 0.64  |
| v/c Ratio               | 0.62  | 0.38  | 0.42  | 0.15  | 0.85  | 0.17  |
| Control Delay           | 43.1  | 10.0  | 15.8  | 5.8   | 19.6  | 3.1   |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Delay             | 43.1  | 10.0  | 15.8  | 5.8   | 19.6  | 3.1   |
| LOS                     | D     | B     | B     | A     | B     | A     |
| Approach Delay          | 27.9  |       |       | 8.9   | 17.3  |       |
| Approach LOS            | C     |       |       | A     | B     |       |
| Queue Length 50th (m)   | 20.1  | 0.0   | 4.3   | 8.0   | 95.3  | 3.3   |
| Queue Length 95th (m)   | 50.8  | 16.0  | 16.5  | 17.1  | 182.6 | 10.6  |
| Internal Link Dist (m)  | 156.5 |       |       | 111.8 | 760.0 |       |
| Turn Bay Length (m)     | 25.0  |       | 15.0  |       |       | 30.0  |
| Base Capacity (vph)     | 373   | 454   | 232   | 1509  | 1554  | 1202  |
| Starvation Cap Reductn  | 0     | 0     | 0     | 0     | 0     | 0     |
| Spillback Cap Reductn   | 0     | 0     | 0     | 0     | 0     | 0     |
| Storage Cap Reductn     | 0     | 0     | 0     | 0     | 0     | 0     |
| Reduced v/c Ratio       | 0.42  | 0.29  | 0.30  | 0.11  | 0.62  | 0.13  |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 75.1             |
| Natural Cycle:                     | 80               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.85             |
| Intersection Signal Delay:         | 18.0             |
| Intersection LOS:                  | B                |
| Intersection Capacity Utilization: | 81.6%            |
| ICU Level of Service:              | D                |
| Analysis Period (min):             | 15               |

Splits and Phases: 5: Boundary Road & Mitch Owens Road



Lanes, Volumes, Timings  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

2025 Future Total AM  
 08-06-2021



| Lane Group                 | WBL   | WBR   | NBT   | NBR   | SBL  | SBT   |
|----------------------------|-------|-------|-------|-------|------|-------|
| Lane Configurations        |       |       |       |       |      |       |
| Traffic Volume (vph)       | 163   | 31    | 104   | 879   | 77   | 134   |
| Future Volume (vph)        | 163   | 31    | 104   | 879   | 77   | 134   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  |
| Lane Width (m)             | 4.5   | 4.5   | 3.5   | 3.5   | 3.5  | 3.5   |
| Storage Length (m)         | 0.0   | 10.0  |       | 0.0   | 0.0  |       |
| Storage Lanes              | 1     | 0     |       | 0     | 0    |       |
| Taper Length (m)           | 7.5   |       |       |       | 7.5  |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Frt                        | 0.978 |       | 0.879 |       |      |       |
| Flt Protected              | 0.960 |       |       |       |      | 0.982 |
| Satd. Flow (prot)          | 1696  | 0     | 1517  | 0     | 0    | 1604  |
| Flt Permitted              | 0.960 |       |       |       |      | 0.982 |
| Satd. Flow (perm)          | 1696  | 0     | 1517  | 0     | 0    | 1604  |
| Link Speed (k/h)           | 40    |       | 80    |       |      | 80    |
| Link Distance (m)          | 155.0 |       | 545.7 |       |      | 134.1 |
| Travel Time (s)            | 14.0  |       | 24.6  |       |      | 6.0   |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Heavy Vehicles (%)         | 9%    | 13%   | 13%   | 2%    | 9%   | 9%    |
| Adj. Flow (vph)            | 163   | 31    | 104   | 879   | 77   | 134   |
| Shared Lane Traffic (%)    |       |       |       |       |      |       |
| Lane Group Flow (vph)      | 194   | 0     | 983   | 0     | 0    | 211   |
| Enter Blocked Intersection | No    | No    | No    | No    | No   | No    |
| Lane Alignment             | Left  | Right | Left  | Right | Left | Left  |
| Median Width(m)            | 4.5   |       | 0.0   |       |      | 0.0   |
| Link Offset(m)             | 0.0   |       | 0.0   |       |      | 0.0   |
| Crosswalk Width(m)         | 4.8   |       | 4.8   |       |      | 4.8   |
| Two way Left Turn Lane     |       |       |       |       |      |       |
| Headway Factor             | 0.95  | 0.95  | 1.09  | 1.09  | 1.09 | 1.09  |
| Turning Speed (k/h)        | 25    | 15    |       | 15    | 25   |       |
| Sign Control               | Stop  |       | Free  |       |      | Free  |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 96.5%        |
| ICU Level of Service              | F            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

2025 Future Total AM  
 08-06-2021



| Movement                          | WBL  | WBR  | NBT   | NBR  | SBL                  | SBT  |
|-----------------------------------|------|------|-------|------|----------------------|------|
| Lane Configurations               |      |      |       |      |                      |      |
| Traffic Volume (veh/h)            | 163  | 31   | 104   | 879  | 77                   | 134  |
| Future Volume (Veh/h)             | 163  | 31   | 104   | 879  | 77                   | 134  |
| Sign Control                      | Stop |      | Free  |      |                      | Free |
| Grade                             | 0%   |      | 0%    |      |                      | 0%   |
| Peak Hour Factor                  | 1.00 | 1.00 | 1.00  | 1.00 | 1.00                 | 1.00 |
| Hourly flow rate (vph)            | 163  | 31   | 104   | 879  | 77                   | 134  |
| Pedestrians                       |      |      |       |      |                      |      |
| Lane Width (m)                    |      |      |       |      |                      |      |
| Walking Speed (m/s)               |      |      |       |      |                      |      |
| Percent Blockage                  |      |      |       |      |                      |      |
| Right turn flare (veh)            |      |      |       |      |                      |      |
| Median type                       |      |      | None  |      |                      | None |
| Median storage (veh)              |      |      |       |      |                      |      |
| Upstream signal (m)               |      |      |       |      |                      |      |
| pX, platoon unblocked             |      |      |       |      |                      |      |
| vC, conflicting volume            | 832  | 544  |       |      | 983                  |      |
| vC1, stage 1 conf vol             |      |      |       |      |                      |      |
| vC2, stage 2 conf vol             |      |      |       |      |                      |      |
| vCu, unblocked vol                | 832  | 544  |       |      | 983                  |      |
| tC, single (s)                    | 6.5  | 6.3  |       |      | 4.2                  |      |
| tC, 2 stage (s)                   |      |      |       |      |                      |      |
| tF (s)                            | 3.6  | 3.4  |       |      | 2.3                  |      |
| p0 queue free %                   | 44   | 94   |       |      | 89                   |      |
| cM capacity (veh/h)               | 292  | 519  |       |      | 675                  |      |
| Direction, Lane #                 | WB 1 | NB 1 | SB 1  |      |                      |      |
| Volume Total                      | 194  | 983  | 211   |      |                      |      |
| Volume Left                       | 163  | 0    | 77    |      |                      |      |
| Volume Right                      | 31   | 879  | 0     |      |                      |      |
| cSH                               | 314  | 1700 | 675   |      |                      |      |
| Volume to Capacity                | 0.62 | 0.58 | 0.11  |      |                      |      |
| Queue Length 95th (m)             | 30.8 | 0.0  | 3.1   |      |                      |      |
| Control Delay (s)                 | 33.3 | 0.0  | 4.9   |      |                      |      |
| Lane LOS                          | D    |      | A     |      |                      |      |
| Approach Delay (s)                | 33.3 | 0.0  | 4.9   |      |                      |      |
| Approach LOS                      | D    |      |       |      |                      |      |
| Intersection Summary              |      |      |       |      |                      |      |
| Average Delay                     |      |      | 5.4   |      |                      |      |
| Intersection Capacity Utilization |      |      | 96.5% |      | ICU Level of Service | F    |
| Analysis Period (min)             |      |      | 15    |      |                      |      |

Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

2025 Future Total AM  
08-06-2021



| Lane Group                 | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |
| Traffic Volume (vph)       | 18    | 364   | 44    | 969   | 268   | 9     |
| Future Volume (vph)        | 18    | 364   | 44    | 969   | 268   | 9     |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.3   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   | 25.0  | 50.0  |       |       | 0.0   |
| Storage Lanes              | 1     | 1     | 1     |       |       | 0     |
| Taper Length (m)           | 7.5   |       | 75.0  |       |       |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |       |       | 0.996 |       |
| Fl <sub>t</sub> Protected  | 0.950 |       | 0.950 |       |       |       |
| Satd. Flow (prot)          | 1271  | 1332  | 1311  | 1728  | 1583  | 0     |
| Fl <sub>t</sub> Permitted  | 0.950 |       | 0.514 |       |       |       |
| Satd. Flow (perm)          | 1271  | 1332  | 709   | 1728  | 1583  | 0     |
| Right Turn on Red          |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 364   |       |       | 3     |       |
| Link Speed (k/h)           | 40    |       |       | 80    | 80    |       |
| Link Distance (m)          | 154.2 |       |       | 243.1 | 545.7 |       |
| Travel Time (s)            | 13.9  |       |       | 10.9  | 24.6  |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 33%   | 11%   | 29%   | 3%    | 12%   | 11%   |
| Adj. Flow (vph)            | 18    | 364   | 44    | 969   | 268   | 9     |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 18    | 364   | 44    | 969   | 277   | 0     |
| Enter Blocked Intersection | No    | No    | No    | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left  | Left  | Left  | Right |
| Median Width(m)            | 3.5   |       |       | 3.5   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |       | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |       | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |
| Headway Factor             | 1.09  | 1.12  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25    |       |       | 15    |
| Number of Detectors        | 1     | 1     | 1     | 2     | 2     |       |
| Detector Template          | Left  | Right | Left  | Thru  | Thru  |       |
| Leading Detector (m)       | 2.0   | 2.0   | 2.0   | 10.0  | 10.0  |       |
| Trailing Detector (m)      | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Position(m)     | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Size(m)         | 2.0   | 2.0   | 2.0   | 0.6   | 0.6   |       |
| Detector 1 Type            | 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   |       |
| Detector 1 Queue (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Delay (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 2 Position(m)     |       |       |       | 9.4   | 9.4   |       |
| Detector 2 Size(m)         |       |       |       | 0.6   | 0.6   |       |
| Detector 2 Type            |       |       |       | Cl+Ex | Cl+Ex |       |
| Detector 2 Channel         |       |       |       |       |       |       |
| Detector 2 Extend (s)      |       |       |       | 0.0   | 0.0   |       |
| Turn Type                  | Prot  | Perm  | pm+pt | NA    | NA    |       |



Lanes, Volumes, Timings  
 2: Boundary Road & Hwy 417 EB Ramp Terminal

2025 Future Total AM  
 08-06-2021



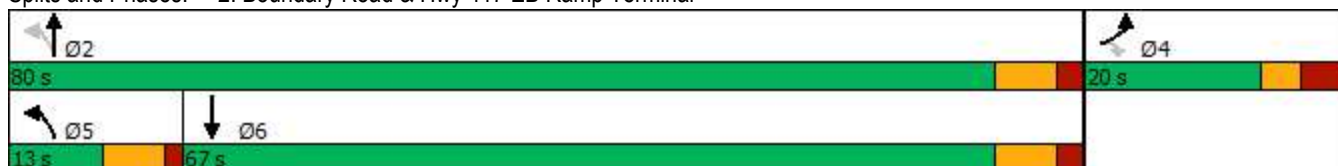
| Lane Group              | EBL   | EBR   | NBL   | NBT   | SBT   | SBR |
|-------------------------|-------|-------|-------|-------|-------|-----|
| Protected Phases        | 4     |       | 5     | 2     | 6     |     |
| Permitted Phases        |       | 4     | 2     |       |       |     |
| Detector Phase          | 4     | 4     | 5     | 2     | 6     |     |
| Switch Phase            |       |       |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0   | 7.0   | 35.0  | 35.0  |     |
| Minimum Split (s)       | 17.8  | 17.8  | 13.0  | 41.6  | 41.6  |     |
| Total Split (s)         | 20.0  | 20.0  | 13.0  | 80.0  | 67.0  |     |
| Total Split (%)         | 20.0% | 20.0% | 13.0% | 80.0% | 67.0% |     |
| Maximum Green (s)       | 13.2  | 13.2  | 7.0   | 73.4  | 60.4  |     |
| Yellow Time (s)         | 3.0   | 3.0   | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 3.8   | 3.8   | 1.4   | 2.0   | 2.0   |     |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     | 6.8   | 6.8   | 6.0   | 6.6   | 6.6   |     |
| Lead/Lag                |       |       | Lead  |       | Lag   |     |
| Lead-Lag Optimize?      |       |       | Yes   |       | Yes   |     |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |     |
| Recall Mode             | None  | None  | None  | Min   | Min   |     |
| Walk Time (s)           | 5.0   | 5.0   |       | 0.0   | 7.0   |     |
| Flash Dont Walk (s)     | 6.0   | 6.0   |       | 0.0   | 21.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0     |       | 0     | 0     |     |
| Act Effct Green (s)     | 8.9   | 8.9   | 48.8  | 48.1  | 41.2  |     |
| Actuated g/C Ratio      | 0.13  | 0.13  | 0.69  | 0.68  | 0.58  |     |
| v/c Ratio               | 0.11  | 0.75  | 0.08  | 0.83  | 0.30  |     |
| Control Delay           | 35.4  | 15.3  | 3.8   | 15.6  | 9.9   |     |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |     |
| Total Delay             | 35.4  | 15.3  | 3.8   | 15.7  | 9.9   |     |
| LOS                     | D     | B     | A     | B     | A     |     |
| Approach Delay          | 16.2  |       |       | 15.2  | 9.9   |     |
| Approach LOS            | B     |       |       | B     | A     |     |
| Queue Length 50th (m)   | 2.3   | 0.0   | 1.4   | 71.0  | 20.2  |     |
| Queue Length 95th (m)   | 10.1  | #32.3 | 4.7   | 157.0 | 39.2  |     |
| Internal Link Dist (m)  | 130.2 |       |       | 219.1 | 521.7 |     |
| Turn Bay Length (m)     |       | 25.0  | 50.0  |       |       |     |
| Base Capacity (vph)     | 247   | 552   | 548   | 1623  | 1355  |     |
| Starvation Cap Reductn  | 0     | 0     | 0     | 30    | 0     |     |
| Spillback Cap Reductn   | 0     | 0     | 0     | 0     | 0     |     |
| Storage Cap Reductn     | 0     | 0     | 0     | 0     | 0     |     |
| Reduced v/c Ratio       | 0.07  | 0.66  | 0.08  | 0.61  | 0.20  |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 71.1             |
| Natural Cycle:                     | 75               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.83             |
| Intersection Signal Delay:         | 14.5             |
| Intersection LOS:                  | B                |
| Intersection Capacity Utilization: | 70.8%            |
| ICU Level of Service:              | C                |
| Analysis Period (min):             | 15               |

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

Splits and Phases: 2: Boundary Road & Hwy 417 EB Ramp Terminal



Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

2025 Future Total AM  
08-06-2021

| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |       |       |       |       |       |       |
| Traffic Volume (vph)       | 55    | 17    | 9     | 3     | 6     | 25    | 21    | 932   | 30    | 193   | 325   | 112   |
| Future Volume (vph)        | 55    | 17    | 9     | 3     | 6     | 25    | 21    | 932   | 30    | 193   | 325   | 112   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.3   | 3.5   | 3.3   | 3.3   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   |       | 15.0  | 0.0   |       | 0.0   | 35.0  |       | 7.5   | 100.0 |       | 35.0  |
| Storage Lanes              | 0     |       | 0     | 0     |       | 1     | 1     |       | 1     | 1     |       | 0     |
| Taper Length (m)           | 7.5   |       |       | 7.5   |       |       | 45.0  |       |       | 75.0  |       |       |
| 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  |
| Frt                        |       | 0.985 |       |       |       | 0.850 |       |       | 0.850 |       | 0.962 |       |
| Flt Protected              |       | 0.967 |       |       | 0.984 |       | 0.950 |       |       | 0.950 |       |       |
| Satd. Flow (prot)          | 0     | 1533  | 0     | 0     | 1752  | 1513  | 1589  | 1728  | 1479  | 1653  | 1466  | 0     |
| Flt Permitted              |       | 0.791 |       |       | 0.886 |       | 0.509 |       |       | 0.110 |       |       |
| Satd. Flow (perm)          | 0     | 1254  | 0     | 0     | 1577  | 1513  | 852   | 1728  | 1479  | 191   | 1466  | 0     |
| Right Turn on Red          |       |       | Yes   |       |       | Yes   |       |       | Yes   |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 6     |       |       |       | 100   |       |       | 96    |       |       | 40    |
| Link Speed (k/h)           |       | 60    |       |       | 20    |       |       | 80    |       |       |       | 80    |
| Link Distance (m)          |       | 198.6 |       |       | 170.6 |       |       | 174.7 |       |       |       | 243.1 |
| Travel Time (s)            |       | 11.9  |       |       | 30.7  |       |       | 7.9   |       |       |       | 10.9  |
| 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 (%)         | 14%   | 0%    | 10%   | 0%    | 0%    | 0%    | 4%    | 3%    | 0%    | 0%    | 16%   | 19%   |
| Adj. Flow (vph)            | 55    | 17    | 9     | 3     | 6     | 25    | 21    | 932   | 30    | 193   | 325   | 112   |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 0     | 81    | 0     | 0     | 9     | 25    | 21    | 932   | 30    | 193   | 437   | 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   |       |       | 3.5   |       |       | 3.5   |       |
| Link Offset(m)             |       | 0.0   |       |       | 0.0   |       |       | 0.0   |       |       | 0.0   |       |
| Crosswalk Width(m)         |       | 4.8   |       |       | 4.8   |       |       | 4.8   |       |       | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |       |       |       |       |       |       |
| Headway Factor             | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.12  | 1.09  | 1.12  | 1.12  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    |       | 15    | 25    |       | 15    | 25    |       | 15    | 25    |       | 15    |
| Number of Detectors        | 1     | 2     |       | 1     | 2     | 1     | 1     | 2     | 1     | 1     | 2     |       |
| Detector Template          | Left  | Thru  |       | Left  | Thru  | Right | Left  | Thru  | Right | Left  | Thru  |       |
| Leading Detector (m)       | 2.0   | 10.0  |       | 2.0   | 10.0  | 2.0   | 2.0   | 10.0  | 2.0   | 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   | 0.6   | 2.0   | 2.0   | 0.6   | 2.0   | 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                  | Perm  | NA    |       | Perm  | NA    | Perm  | Perm  | NA    | Perm  | pm+pt | NA    |       |

Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

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| Lane Group              | EBL   | EBT   | EBR | WBL   | WBT   | WBR   | NBL   | NBT    | NBR   | SBL   | SBT   | SBR |
|-------------------------|-------|-------|-----|-------|-------|-------|-------|--------|-------|-------|-------|-----|
| Protected Phases        |       | 4     |     |       | 8     |       |       | 2      |       | 1     | 6     |     |
| Permitted Phases        | 4     |       |     | 8     |       | 8     | 2     |        | 2     | 6     |       |     |
| Detector Phase          | 4     | 4     |     | 8     | 8     | 8     | 2     | 2      | 2     | 1     | 6     |     |
| Switch Phase            |       |       |     |       |       |       |       |        |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 20.0  | 20.0   | 20.0  | 7.0   | 20.0  |     |
| Minimum Split (s)       | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 26.2  | 26.2   | 26.2  | 13.0  | 26.2  |     |
| Total Split (s)         | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 60.5  | 60.5   | 60.5  | 14.7  | 75.2  |     |
| Total Split (%)         | 24.8% | 24.8% |     | 24.8% | 24.8% | 24.8% | 60.5% | 60.5%  | 60.5% | 14.7% | 75.2% |     |
| Maximum Green (s)       | 19.0  | 19.0  |     | 19.0  | 19.0  | 19.0  | 54.3  | 54.3   | 54.3  | 8.7   | 69.0  |     |
| Yellow Time (s)         | 3.7   | 3.7   |     | 3.7   | 3.7   | 3.7   | 4.6   | 4.6    | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 2.1   | 2.1   |     | 2.1   | 2.1   | 2.1   | 1.6   | 1.6    | 1.6   | 1.4   | 1.6   |     |
| Lost Time Adjust (s)    |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     |       | 5.8   |     |       | 5.8   | 5.8   | 6.2   | 6.2    | 6.2   | 6.0   | 6.2   |     |
| Lead/Lag                |       |       |     |       |       |       | Lag   | Lag    | Lag   | Lead  |       |     |
| 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  | Min   | Min    | Min   | None  | Min   |     |
| Walk Time (s)           | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 7.0   | 7.0    | 7.0   |       | 7.0   |     |
| Flash Dont Walk (s)     | 12.0  | 12.0  |     | 12.0  | 12.0  | 12.0  | 10.0  | 10.0   | 10.0  |       | 10.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0     |     | 0     | 0     | 0     | 0     | 0      | 0     |       | 0     |     |
| Act Effct Green (s)     |       | 11.0  |     |       | 11.0  | 11.0  | 52.2  | 52.2   | 52.2  | 67.5  | 69.0  |     |
| Actuated g/C Ratio      |       | 0.13  |     |       | 0.13  | 0.13  | 0.60  | 0.60   | 0.60  | 0.78  | 0.79  |     |
| v/c Ratio               |       | 0.50  |     |       | 0.05  | 0.09  | 0.04  | 0.90   | 0.03  | 0.65  | 0.37  |     |
| Control Delay           |       | 46.1  |     |       | 35.3  | 0.6   | 9.3   | 30.6   | 0.1   | 21.5  | 4.9   |     |
| Queue Delay             |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Delay             |       | 46.1  |     |       | 35.3  | 0.6   | 9.3   | 30.6   | 0.1   | 21.5  | 4.9   |     |
| LOS                     |       | D     |     |       | D     | A     | A     | C      | A     | C     | A     |     |
| Approach Delay          |       | 46.1  |     |       | 9.8   |       |       | 29.2   |       |       | 10.0  |     |
| Approach LOS            |       | D     |     |       | A     |       |       | C      |       |       | B     |     |
| Queue Length 50th (m)   |       | 13.3  |     |       | 1.5   | 0.0   | 1.5   | 142.0  | 0.0   | 8.4   | 20.4  |     |
| Queue Length 95th (m)   |       | 28.0  |     |       | 6.0   | 0.0   | 5.3   | #261.7 | 0.0   | #43.4 | 43.5  |     |
| Internal Link Dist (m)  |       | 174.6 |     |       | 146.6 |       |       | 150.7  |       |       | 219.1 |     |
| Turn Bay Length (m)     |       |       |     |       |       |       | 35.0  |        | 7.5   | 100.0 |       |     |
| Base Capacity (vph)     |       | 285   |     |       | 353   | 416   | 545   | 1107   | 982   | 298   | 1170  |     |
| Starvation Cap Reductn  |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Spillback Cap Reductn   |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Storage Cap Reductn     |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Reduced v/c Ratio       |       | 0.28  |     |       | 0.03  | 0.06  | 0.04  | 0.84   | 0.03  | 0.65  | 0.37  |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 87               |
| Natural Cycle:                     | 90               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.90             |
| Intersection Signal Delay:         | 22.6             |
| Intersection LOS:                  | C                |
| Intersection Capacity Utilization: | 89.5%            |
| ICU Level of Service:              | E                |
| Analysis Period (min):             | 15               |



















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

Splits and Phases: 3: Boundary Road & Thunder Road/Amazon Way



Lanes, Volumes, Timings  
4: Boundary Road & Site Access/South Amazon Access

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|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group                        | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |  |  |   |  |  |   |
| Traffic Volume (vph)              | 1   | 0   | 4   | 6   | 0   | 3   | 14  | 978   | 6   | 1   | 319   | 17  |
| Future Volume (vph)               | 1   | 0   | 4   | 6   | 0   | 3   | 14  | 978   | 6   | 1   | 319   | 17  |
| Ideal Flow (vphpl)                | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)                    | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.6   |
| Storage Length (m)                | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 15.0  |   | 0.0   | 70.0  |   | 0.0   |
| Storage Lanes                     | 0   |   | 0   | 0   |   | 0   | 1   |   | 0   | 1   |   | 0   |
| Taper Length (m)                  | 7.5   |   |   | 7.5   |   |   | 45.0  |   |   | 45.0  |   |   |
| 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  |
| Frt                               |   | 0.892   |   |   | 0.955   |   |   | 0.999   |   |   | 0.992   |   |
| Flt Protected                     |   | 0.990   |   |   | 0.968   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)                 | 0   | 1572  | 0   | 0   | 823   | 0   | 1691  | 1750  | 0   | 846   | 1585  | 0   |
| Flt Permitted                     |   | 0.990   |   |   | 0.968   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (perm)                 | 0   | 1572  | 0   | 0   | 823   | 0   | 1691  | 1750  | 0   | 846   | 1585  | 0   |
| Link Speed (k/h)                  |   | 50  |   |   | 20  |   |   | 80  |   |   | 80  |   |
| Link Distance (m)                 |   | 105.7   |   |   | 151.5   |   |   | 1150.2  |   |   | 174.7   |   |
| Travel Time (s)                   |   | 7.6   |   |   | 27.3  |   |   | 51.8  |   |   | 7.9   |   |
| 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 (%)                | 0%  | 0%  | 0%  | 100%  | 0%  | 100%  | 0%  | 1%  | 100%  | 100%  | 12%   | 0%  |
| Adj. Flow (vph)                   | 1   | 0   | 4   | 6   | 0   | 3   | 14  | 978   | 6   | 1   | 319   | 17  |
| Shared Lane Traffic (%)           |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)             | 0   | 5   | 0   | 0   | 9   | 0   | 14  | 984   | 0   | 1   | 336   | 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   |   |   | 3.5   |   |   | 3.5   |   |
| Link Offset(m)                    |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)                |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |
| 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  | 1.07  |
| Turning Speed (k/h)               | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  |
| Sign Control                      |   | Stop  |   |   | Stop  |   |   | Free  |   |   | Free  |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |   |   |   |   |   |   |
| Area Type:                        | Other   |   |   |   |   |   |   |   |   |   |   |   |
| Control Type:                     | Unsignalized  |   |   |   |   |   |   |   |   |   |   |   |
| Intersection Capacity Utilization | 64.7%   |   |   |   |   |   | ICU Level of Service C  |   |   |   |   |   |
| Analysis Period (min)             | 15  |   |   |   |   |   |   |   |   |   |   |   |

HCM Unsignalized Intersection Capacity Analysis  
 4: Boundary Road & Site Access/South Amazon Access

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| Movement                          | EBL  | EBT  | EBR   | WBL  | WBT                  | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|-----------------------------------|------|------|-------|------|----------------------|------|------|------|------|------|------|------|
| Lane Configurations               |      |      |       |      |                      |      |      |      |      |      |      |      |
| Traffic Volume (veh/h)            | 1    | 0    | 4     | 6    | 0                    | 3    | 14   | 978  | 6    | 1    | 319  | 17   |
| Future Volume (Veh/h)             | 1    | 0    | 4     | 6    | 0                    | 3    | 14   | 978  | 6    | 1    | 319  | 17   |
| Sign Control                      |      | Stop |       |      | Stop                 |      |      | Free |      |      | Free |      |
| Grade                             |      | 0%   |       |      | 0%                   |      |      | 0%   |      |      | 0%   |      |
| 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 |
| Hourly flow rate (vph)            | 1    | 0    | 4     | 6    | 0                    | 3    | 14   | 978  | 6    | 1    | 319  | 17   |
| Pedestrians                       |      |      |       |      |                      |      |      |      |      |      |      |      |
| Lane Width (m)                    |      |      |       |      |                      |      |      |      |      |      |      |      |
| Walking Speed (m/s)               |      |      |       |      |                      |      |      |      |      |      |      |      |
| Percent Blockage                  |      |      |       |      |                      |      |      |      |      |      |      |      |
| Right turn flare (veh)            |      |      |       |      |                      |      |      |      |      |      |      |      |
| Median type                       |      |      |       |      |                      |      |      | None |      |      | None |      |
| Median storage (veh)              |      |      |       |      |                      |      |      |      |      |      |      |      |
| Upstream signal (m)               |      |      |       |      |                      |      |      |      |      |      |      | 175  |
| pX, platoon unblocked             | 0.97 | 0.97 | 0.97  | 0.97 | 0.97                 |      | 0.97 |      |      |      |      |      |
| vC, conflicting volume            | 1338 | 1342 | 328   | 1334 | 1347                 | 981  | 336  |      |      | 984  |      |      |
| vC1, stage 1 conf vol             |      |      |       |      |                      |      |      |      |      |      |      |      |
| vC2, stage 2 conf vol             |      |      |       |      |                      |      |      |      |      |      |      |      |
| vCu, unblocked vol                | 1334 | 1337 | 297   | 1330 | 1343                 | 981  | 306  |      |      | 984  |      |      |
| tC, single (s)                    | 7.1  | 6.5  | 6.2   | 8.1  | 6.5                  | 7.2  | 4.1  |      |      | 5.1  |      |      |
| tC, 2 stage (s)                   |      |      |       |      |                      |      |      |      |      |      |      |      |
| tF (s)                            | 3.5  | 4.0  | 3.3   | 4.4  | 4.0                  | 4.2  | 2.2  |      |      | 3.1  |      |      |
| p0 queue free %                   | 99   | 100  | 99    | 92   | 100                  | 99   | 99   |      |      | 100  |      |      |
| cM capacity (veh/h)               | 126  | 149  | 728   | 80   | 147                  | 202  | 1234 |      |      | 427  |      |      |
| Direction, Lane #                 | EB 1 | WB 1 | NB 1  | NB 2 | SB 1                 | SB 2 |      |      |      |      |      |      |
| Volume Total                      | 5    | 9    | 14    | 984  | 1                    | 336  |      |      |      |      |      |      |
| Volume Left                       | 1    | 6    | 14    | 0    | 1                    | 0    |      |      |      |      |      |      |
| Volume Right                      | 4    | 3    | 0     | 6    | 0                    | 17   |      |      |      |      |      |      |
| cSH                               | 372  | 100  | 1234  | 1700 | 427                  | 1700 |      |      |      |      |      |      |
| Volume to Capacity                | 0.01 | 0.09 | 0.01  | 0.58 | 0.00                 | 0.20 |      |      |      |      |      |      |
| Queue Length 95th (m)             | 0.3  | 2.3  | 0.3   | 0.0  | 0.1                  | 0.0  |      |      |      |      |      |      |
| Control Delay (s)                 | 14.8 | 44.6 | 7.9   | 0.0  | 13.4                 | 0.0  |      |      |      |      |      |      |
| Lane LOS                          | B    | E    | A     |      | B                    |      |      |      |      |      |      |      |
| Approach Delay (s)                | 14.8 | 44.6 | 0.1   |      | 0.0                  |      |      |      |      |      |      |      |
| Approach LOS                      | B    | E    |       |      |                      |      |      |      |      |      |      |      |
| Intersection Summary              |      |      |       |      |                      |      |      |      |      |      |      |      |
| Average Delay                     |      |      | 0.4   |      |                      |      |      |      |      |      |      |      |
| Intersection Capacity Utilization |      |      | 64.7% |      | ICU Level of Service |      |      |      |      | C    |      |      |
| Analysis Period (min)             |      |      | 15    |      |                      |      |      |      |      |      |      |      |

Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road

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| Lane Group                 | EBL   | EBR   | NBL  | NBT   | SBT    | SBR   |
|----------------------------|-------|-------|------|-------|--------|-------|
| Lane Configurations        |       |       |      |       |        |       |
| Traffic Volume (vph)       | 83    | 30    | 134  | 894   | 133    | 108   |
| Future Volume (vph)        | 83    | 30    | 134  | 894   | 133    | 108   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800   | 1800  |
| Lane Width (m)             | 3.3   | 3.3   | 3.5  | 3.5   | 3.5    | 3.5   |
| Storage Length (m)         | 25.0  | 0.0   | 0.0  |       |        | 30.0  |
| Storage Lanes              | 1     | 1     | 0    |       |        | 1     |
| Taper Length (m)           | 47.5  |       | 7.5  |       |        |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |      |       |        | 0.850 |
| Fl <sub>t</sub> Protected  | 0.950 |       |      | 0.994 |        |       |
| Satd. Flow (prot)          | 1489  | 1264  | 0    | 1736  | 1575   | 1293  |
| Fl <sub>t</sub> Permitted  | 0.950 |       |      | 0.994 |        |       |
| Satd. Flow (perm)          | 1489  | 1264  | 0    | 1736  | 1575   | 1293  |
| Link Speed (k/h)           | 80    |       |      | 80    | 80     |       |
| Link Distance (m)          | 180.5 |       |      | 135.8 | 1150.2 |       |
| Travel Time (s)            | 8.1   |       |      | 6.1   | 51.8   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Heavy Vehicles (%)         | 11%   | 17%   | 8%   | 1%    | 13%    | 17%   |
| Adj. Flow (vph)            | 83    | 30    | 134  | 894   | 133    | 108   |
| Shared Lane Traffic (%)    |       |       |      |       |        |       |
| Lane Group Flow (vph)      | 83    | 30    | 0    | 1028  | 133    | 108   |
| Enter Blocked Intersection | No    | No    | No   | No    | No     | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left   | Right |
| Median Width(m)            | 3.3   |       |      | 3.5   | 3.5    |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0    |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8    |       |
| Two way Left Turn Lane     |       |       |      |       |        |       |
| Headway Factor             | 1.12  | 1.12  | 1.09 | 1.09  | 1.09   | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25   |       |        | 15    |
| Sign Control               | Stop  |       |      | Free  | Free   |       |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 79.7%        |
| ICU Level of Service              | D            |
| Analysis Period (min)             | 15           |



HCM Unsignalized Intersection Capacity Analysis  
5: Boundary Road & Mitch Owens Road

2025 Future Total AM  
08-06-2021



| Movement                          | EBL         | EBR         | NBL         | NBT                  | SBT         | SBR  |
|-----------------------------------|-------------|-------------|-------------|----------------------|-------------|------|
| Lane Configurations               |             |             |             |                      |             |      |
| Traffic Volume (veh/h)            | 83          | 30          | 134         | 894                  | 133         | 108  |
| Future Volume (Veh/h)             | 83          | 30          | 134         | 894                  | 133         | 108  |
| Sign Control                      | Stop        |             |             | Free                 | Free        |      |
| Grade                             | 0%          |             |             | 0%                   | 0%          |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00        | 1.00 |
| Hourly flow rate (vph)            | 83          | 30          | 134         | 894                  | 133         | 108  |
| <b>Pedestrians</b>                |             |             |             |                      |             |      |
| Lane Width (m)                    |             |             |             |                      |             |      |
| Walking Speed (m/s)               |             |             |             |                      |             |      |
| Percent Blockage                  |             |             |             |                      |             |      |
| Right turn flare (veh)            |             |             |             |                      |             |      |
| Median type                       |             |             |             | None                 | None        |      |
| Median storage (veh)              |             |             |             |                      |             |      |
| Upstream signal (m)               |             |             |             |                      |             |      |
| pX, platoon unblocked             |             |             |             |                      |             |      |
| vC, conflicting volume            | 1295        | 133         | 241         |                      |             |      |
| vC1, stage 1 conf vol             |             |             |             |                      |             |      |
| vC2, stage 2 conf vol             |             |             |             |                      |             |      |
| vCu, unblocked vol                | 1295        | 133         | 241         |                      |             |      |
| tC, single (s)                    | 6.5         | 6.4         | 4.2         |                      |             |      |
| tC, 2 stage (s)                   |             |             |             |                      |             |      |
| tF (s)                            | 3.6         | 3.5         | 2.3         |                      |             |      |
| p0 queue free %                   | 46          | 97          | 90          |                      |             |      |
| cM capacity (veh/h)               | 154         | 878         | 1291        |                      |             |      |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>EB 2</b> | <b>NB 1</b> | <b>SB 1</b>          | <b>SB 2</b> |      |
| Volume Total                      | 83          | 30          | 1028        | 133                  | 108         |      |
| Volume Left                       | 83          | 0           | 134         | 0                    | 0           |      |
| Volume Right                      | 0           | 30          | 0           | 0                    | 108         |      |
| cSH                               | 154         | 878         | 1291        | 1700                 | 1700        |      |
| Volume to Capacity                | 0.54        | 0.03        | 0.10        | 0.08                 | 0.06        |      |
| Queue Length 95th (m)             | 21.6        | 0.8         | 2.8         | 0.0                  | 0.0         |      |
| Control Delay (s)                 | 53.0        | 9.2         | 2.6         | 0.0                  | 0.0         |      |
| Lane LOS                          | F           | A           | A           |                      |             |      |
| Approach Delay (s)                | 41.4        |             | 2.6         | 0.0                  |             |      |
| Approach LOS                      | E           |             |             |                      |             |      |
| <b>Intersection Summary</b>       |             |             |             |                      |             |      |
| Average Delay                     |             |             | 5.3         |                      |             |      |
| Intersection Capacity Utilization |             |             | 79.7%       | ICU Level of Service | D           |      |
| Analysis Period (min)             |             |             | 15          |                      |             |      |

Lanes, Volumes, Timings  
6: Site Access A & Thunder Road

2025 Future Total AM  
08-06-2021



| Lane Group                 | EBT   | EBR   | WBL  | WBT   | NBL   | NBR   |
|----------------------------|-------|-------|------|-------|-------|-------|
| Lane Configurations        |       |       |      |       |       |       |
| Traffic Volume (vph)       | 65    | 0     | 38   | 101   | 0     | 16    |
| Future Volume (vph)        | 65    | 0     | 38   | 101   | 0     | 16    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5  | 3.5   | 3.5   | 3.5   |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Flt                        |       |       |      |       | 0.865 |       |
| Flt Protected              |       |       |      | 0.987 |       |       |
| Satd. Flow (prot)          | 1589  | 0     | 0    | 1496  | 1466  | 0     |
| Flt Permitted              |       |       |      | 0.987 |       |       |
| Satd. Flow (perm)          | 1589  | 0     | 0    | 1496  | 1466  | 0     |
| Link Speed (k/h)           | 60    |       |      | 50    | 50    |       |
| Link Distance (m)          | 163.7 |       |      | 198.6 | 103.6 |       |
| Travel Time (s)            | 9.8   |       |      | 14.3  | 7.5   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 12%   | 0%    | 0%   | 24%   | 0%    | 5%    |
| Adj. Flow (vph)            | 65    | 0     | 38   | 101   | 0     | 16    |
| Shared Lane Traffic (%)    |       |       |      |       |       |       |
| Lane Group Flow (vph)      | 65    | 0     | 0    | 139   | 16    | 0     |
| Enter Blocked Intersection | No    | No    | No   | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left  | Right |
| Median Width(m)            | 0.0   |       |      | 0.0   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |      |       |       |       |
| Headway Factor             | 1.09  | 1.09  | 1.09 | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        |       | 15    | 25   |       | 25    | 15    |
| Sign Control               | Free  |       |      | Free  | Stop  |       |

Intersection Summary

|                                   |                        |
|-----------------------------------|------------------------|
| Area Type:                        | Other                  |
| Control Type:                     | Unsignalized           |
| Intersection Capacity Utilization | 24.5%                  |
| Analysis Period (min)             | 15                     |
|                                   | ICU Level of Service A |

HCM Unsignalized Intersection Capacity Analysis  
6: Site Access A & Thunder Road

2025 Future Total AM  
08-06-2021



| Movement                          | EBT         | EBR         | WBL         | WBT                  | NBL  | NBR  |
|-----------------------------------|-------------|-------------|-------------|----------------------|------|------|
| Lane Configurations               | →           |             |             | ←                    | ↘    | ↙    |
| Traffic Volume (veh/h)            | 65          | 0           | 38          | 101                  | 0    | 16   |
| Future Volume (Veh/h)             | 65          | 0           | 38          | 101                  | 0    | 16   |
| Sign Control                      | Free        |             |             | Free                 | Stop |      |
| Grade                             | 0%          |             |             | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 65          | 0           | 38          | 101                  | 0    | 16   |
| <b>Pedestrians</b>                |             |             |             |                      |      |      |
| Lane Width (m)                    |             |             |             |                      |      |      |
| Walking Speed (m/s)               |             |             |             |                      |      |      |
| Percent Blockage                  |             |             |             |                      |      |      |
| Right turn flare (veh)            |             |             |             |                      |      |      |
| Median type                       | None        |             |             | None                 |      |      |
| Median storage (veh)              |             |             |             |                      |      |      |
| Upstream signal (m)               | 199         |             |             |                      |      |      |
| pX, platoon unblocked             |             |             |             |                      |      |      |
| vC, conflicting volume            |             |             | 65          | 242                  |      | 65   |
| vC1, stage 1 conf vol             |             |             |             |                      |      |      |
| vC2, stage 2 conf vol             |             |             |             |                      |      |      |
| vCu, unblocked vol                |             |             | 65          | 242                  |      | 65   |
| tC, single (s)                    |             |             | 4.1         | 6.4                  |      | 6.2  |
| tC, 2 stage (s)                   |             |             |             |                      |      |      |
| tF (s)                            |             |             | 2.2         | 3.5                  |      | 3.3  |
| p0 queue free %                   |             |             | 98          | 100                  |      | 98   |
| cM capacity (veh/h)               |             |             | 1550        | 732                  |      | 991  |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>WB 1</b> | <b>NB 1</b> |                      |      |      |
| Volume Total                      | 65          | 139         | 16          |                      |      |      |
| Volume Left                       | 0           | 38          | 0           |                      |      |      |
| Volume Right                      | 0           | 0           | 16          |                      |      |      |
| cSH                               | 1700        | 1550        | 991         |                      |      |      |
| Volume to Capacity                | 0.04        | 0.02        | 0.02        |                      |      |      |
| Queue Length 95th (m)             | 0.0         | 0.6         | 0.4         |                      |      |      |
| Control Delay (s)                 | 0.0         | 2.2         | 8.7         |                      |      |      |
| Lane LOS                          |             |             | A           |                      | A    |      |
| Approach Delay (s)                | 0.0         | 2.2         | 8.7         |                      |      |      |
| Approach LOS                      |             |             | A           |                      |      |      |
| <b>Intersection Summary</b>       |             |             |             |                      |      |      |
| Average Delay                     |             |             | 2.0         |                      |      |      |
| Intersection Capacity Utilization |             |             | 24.5%       | ICU Level of Service |      | A    |
| Analysis Period (min)             |             |             | 15          |                      |      |      |

Lanes, Volumes, Timings  
7: Site Access B & Thunder Road

2025 Future Total AM  
08-06-2021



| Lane Group                 | EBT   | EBR   | WBL  | WBT   | NBL   | NBR   |
|----------------------------|-------|-------|------|-------|-------|-------|
| Lane Configurations        |       |       |      |       |       |       |
| Traffic Volume (vph)       | 62    | 0     | 11   | 90    | 0     | 3     |
| Future Volume (vph)        | 62    | 0     | 11   | 90    | 0     | 3     |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5  | 3.5   | 3.5   | 3.5   |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Flt                        |       |       |      |       | 0.865 |       |
| Flt Protected              |       |       |      | 0.995 |       |       |
| Satd. Flow (prot)          | 1679  | 0     | 0    | 1467  | 770   | 0     |
| Flt Permitted              |       |       |      | 0.995 |       |       |
| Satd. Flow (perm)          | 1679  | 0     | 0    | 1467  | 770   | 0     |
| Link Speed (k/h)           | 60    |       |      | 50    | 50    |       |
| Link Distance (m)          | 185.0 |       |      | 163.7 | 105.8 |       |
| Travel Time (s)            | 11.1  |       |      | 11.8  | 7.6   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 6%    | 0%    | 100% | 11%   | 0%    | 100%  |
| Adj. Flow (vph)            | 62    | 0     | 11   | 90    | 0     | 3     |
| Shared Lane Traffic (%)    |       |       |      |       |       |       |
| Lane Group Flow (vph)      | 62    | 0     | 0    | 101   | 3     | 0     |
| Enter Blocked Intersection | No    | No    | No   | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left  | Right |
| Median Width(m)            | 0.0   |       |      | 0.0   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |      |       |       |       |
| Headway Factor             | 1.09  | 1.09  | 1.09 | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        |       | 15    | 25   |       | 25    | 15    |
| Sign Control               | Free  |       |      | Free  | Stop  |       |

Intersection Summary

|                                   |                        |
|-----------------------------------|------------------------|
| Area Type:                        | Other                  |
| Control Type:                     | Unsignalized           |
| Intersection Capacity Utilization | 22.3%                  |
| Analysis Period (min)             | 15                     |
|                                   | ICU Level of Service A |

HCM Unsignalized Intersection Capacity Analysis  
7: Site Access B & Thunder Road

2025 Future Total AM  
08-06-2021



| Movement                          | EBT         | EBR         | WBL         | WBT                  | NBL  | NBR  |
|-----------------------------------|-------------|-------------|-------------|----------------------|------|------|
| Lane Configurations               | →           |             |             | ←                    | ←    | ↘    |
| Traffic Volume (veh/h)            | 62          | 0           | 11          | 90                   | 0    | 3    |
| Future Volume (Veh/h)             | 62          | 0           | 11          | 90                   | 0    | 3    |
| Sign Control                      | Free        |             |             | Free                 | Stop |      |
| Grade                             | 0%          |             |             | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 62          | 0           | 11          | 90                   | 0    | 3    |
| <b>Pedestrians</b>                |             |             |             |                      |      |      |
| Lane Width (m)                    |             |             |             |                      |      |      |
| Walking Speed (m/s)               |             |             |             |                      |      |      |
| Percent Blockage                  |             |             |             |                      |      |      |
| Right turn flare (veh)            |             |             |             |                      |      |      |
| Median type                       | None        |             |             | None                 |      |      |
| Median storage (veh)              |             |             |             |                      |      |      |
| Upstream signal (m)               | 362         |             |             |                      |      |      |
| pX, platoon unblocked             |             |             |             |                      |      |      |
| vC, conflicting volume            |             |             | 62          |                      | 174  | 62   |
| vC1, stage 1 conf vol             |             |             |             |                      |      |      |
| vC2, stage 2 conf vol             |             |             |             |                      |      |      |
| vCu, unblocked vol                |             |             | 62          |                      | 174  | 62   |
| tC, single (s)                    |             |             | 5.1         |                      | 6.4  | 7.2  |
| tC, 2 stage (s)                   |             |             |             |                      |      |      |
| tF (s)                            |             |             | 3.1         |                      | 3.5  | 4.2  |
| p0 queue free %                   |             |             | 99          |                      | 100  | 100  |
| cM capacity (veh/h)               |             |             | 1092        |                      | 812  | 785  |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>WB 1</b> | <b>NB 1</b> |                      |      |      |
| Volume Total                      | 62          | 101         | 3           |                      |      |      |
| Volume Left                       | 0           | 11          | 0           |                      |      |      |
| Volume Right                      | 0           | 0           | 3           |                      |      |      |
| cSH                               | 1700        | 1092        | 785         |                      |      |      |
| Volume to Capacity                | 0.04        | 0.01        | 0.00        |                      |      |      |
| Queue Length 95th (m)             | 0.0         | 0.2         | 0.1         |                      |      |      |
| Control Delay (s)                 | 0.0         | 1.0         | 9.6         |                      |      |      |
| Lane LOS                          |             | A           | A           |                      |      |      |
| Approach Delay (s)                | 0.0         | 1.0         | 9.6         |                      |      |      |
| Approach LOS                      |             |             | A           |                      |      |      |
| <b>Intersection Summary</b>       |             |             |             |                      |      |      |
| Average Delay                     |             |             | 0.8         |                      |      |      |
| Intersection Capacity Utilization |             |             | 22.3%       | ICU Level of Service | A    |      |
| Analysis Period (min)             |             |             | 15          |                      |      |      |

Lanes, Volumes, Timings  
8: Site Access C & Thunder Road

2025 Future Total AM  
08-06-2021



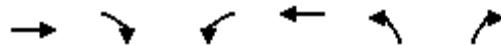
| Lane Group                 | EBT  | EBR   | WBL  | WBT   | NBL   | NBR   |
|----------------------------|------|-------|------|-------|-------|-------|
| Lane Configurations        |      |       |      |       |       |       |
| Traffic Volume (vph)       | 55   | 0     | 23   | 67    | 0     | 7     |
| Future Volume (vph)        | 55   | 0     | 23   | 67    | 0     | 7     |
| Ideal Flow (vphpl)         | 1800 | 1800  | 1800 | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5  | 3.5   | 3.5  | 3.5   | 3.5   | 3.5   |
| Lane Util. Factor          | 1.00 | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Frt                        |      |       |      |       | 0.865 |       |
| Flt Protected              |      |       |      | 0.987 |       |       |
| Satd. Flow (prot)          | 1695 | 0     | 0    | 1585  | 1351  | 0     |
| Flt Permitted              |      |       |      | 0.987 |       |       |
| Satd. Flow (perm)          | 1695 | 0     | 0    | 1585  | 1351  | 0     |
| Link Speed (k/h)           | 60   |       |      | 50    | 50    |       |
| Link Distance (m)          | 95.5 |       |      | 185.0 | 109.7 |       |
| Travel Time (s)            | 5.7  |       |      | 13.3  | 7.9   |       |
| Peak Hour Factor           | 1.00 | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 5%   | 0%    | 22%  | 7%    | 0%    | 14%   |
| Adj. Flow (vph)            | 55   | 0     | 23   | 67    | 0     | 7     |
| Shared Lane Traffic (%)    |      |       |      |       |       |       |
| Lane Group Flow (vph)      | 55   | 0     | 0    | 90    | 7     | 0     |
| Enter Blocked Intersection | No   | No    | No   | No    | No    | No    |
| Lane Alignment             | Left | Right | Left | Left  | Left  | Right |
| Median Width(m)            | 0.0  |       |      | 0.0   | 3.5   |       |
| Link Offset(m)             | 0.0  |       |      | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8  |       |      | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |      |       |      |       |       |       |
| Headway Factor             | 1.09 | 1.09  | 1.09 | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        |      | 15    | 25   |       | 25    | 15    |
| Sign Control               | Free |       |      | Free  | Stop  |       |

Intersection Summary

|                                   |                        |
|-----------------------------------|------------------------|
| Area Type:                        | Other                  |
| Control Type:                     | Unsignalized           |
| Intersection Capacity Utilization | 21.7%                  |
| Analysis Period (min)             | 15                     |
|                                   | ICU Level of Service A |

HCM Unsignalized Intersection Capacity Analysis  
8: Site Access C & Thunder Road

2025 Future Total AM  
08-06-2021



| Movement                          | EBT  | EBR  | WBL   | WBT                  | NBL  | NBR  |
|-----------------------------------|------|------|-------|----------------------|------|------|
| Lane Configurations               | →    |      |       | ←                    | ↘    | ↙    |
| Traffic Volume (veh/h)            | 55   | 0    | 23    | 67                   | 0    | 7    |
| Future Volume (Veh/h)             | 55   | 0    | 23    | 67                   | 0    | 7    |
| Sign Control                      | Free |      |       | Free                 | Stop |      |
| Grade                             | 0%   |      |       | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00 | 1.00 | 1.00  | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 55   | 0    | 23    | 67                   | 0    | 7    |
| Pedestrians                       |      |      |       |                      |      |      |
| Lane Width (m)                    |      |      |       |                      |      |      |
| Walking Speed (m/s)               |      |      |       |                      |      |      |
| Percent Blockage                  |      |      |       |                      |      |      |
| Right turn flare (veh)            |      |      |       |                      |      |      |
| Median type                       | None |      |       | None                 |      |      |
| Median storage (veh)              |      |      |       |                      |      |      |
| Upstream signal (m)               |      |      |       |                      |      |      |
| pX, platoon unblocked             |      |      |       |                      |      |      |
| vC, conflicting volume            |      |      | 55    |                      | 168  | 55   |
| vC1, stage 1 conf vol             |      |      |       |                      |      |      |
| vC2, stage 2 conf vol             |      |      |       |                      |      |      |
| vCu, unblocked vol                |      |      | 55    |                      | 168  | 55   |
| tC, single (s)                    |      |      | 4.3   |                      | 6.4  | 6.3  |
| tC, 2 stage (s)                   |      |      |       |                      |      |      |
| tF (s)                            |      |      | 2.4   |                      | 3.5  | 3.4  |
| p0 queue free %                   |      |      | 98    |                      | 100  | 99   |
| cM capacity (veh/h)               |      |      | 1431  |                      | 814  | 979  |
| Direction, Lane #                 | EB 1 | WB 1 | NB 1  |                      |      |      |
| Volume Total                      | 55   | 90   | 7     |                      |      |      |
| Volume Left                       | 0    | 23   | 0     |                      |      |      |
| Volume Right                      | 0    | 0    | 7     |                      |      |      |
| cSH                               | 1700 | 1431 | 979   |                      |      |      |
| Volume to Capacity                | 0.03 | 0.02 | 0.01  |                      |      |      |
| Queue Length 95th (m)             | 0.0  | 0.4  | 0.2   |                      |      |      |
| Control Delay (s)                 | 0.0  | 2.0  | 8.7   |                      |      |      |
| Lane LOS                          |      |      | A     |                      |      |      |
| Approach Delay (s)                | 0.0  | 2.0  | 8.7   |                      |      |      |
| Approach LOS                      |      |      | A     |                      |      |      |
| Intersection Summary              |      |      |       |                      |      |      |
| Average Delay                     |      |      | 1.6   |                      |      |      |
| Intersection Capacity Utilization |      |      | 21.7% | ICU Level of Service | A    |      |
| Analysis Period (min)             |      |      | 15    |                      |      |      |

Lanes, Volumes, Timings  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

2025 Future Total PM  
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| Lane Group                 | WBL   | WBR   | NBT   | NBR   | SBL  | SBT   |
|----------------------------|-------|-------|-------|-------|------|-------|
| Lane Configurations        |       |       |       |       |      |       |
| Traffic Volume (vph)       | 60    | 1     | 177   | 355   | 24   | 128   |
| Future Volume (vph)        | 60    | 1     | 177   | 355   | 24   | 128   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  |
| Lane Width (m)             | 4.5   | 4.5   | 3.5   | 3.5   | 3.5  | 3.5   |
| Storage Length (m)         | 0.0   | 10.0  |       | 0.0   | 0.0  |       |
| Storage Lanes              | 1     | 0     |       | 0     | 0    |       |
| Taper Length (m)           | 7.5   |       |       |       | 7.5  |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Frt                        | 0.998 |       | 0.910 |       |      |       |
| Flt Protected              | 0.953 |       |       |       |      | 0.992 |
| Satd. Flow (prot)          | 1548  | 0     | 1523  | 0     | 0    | 1632  |
| Flt Permitted              | 0.953 |       |       |       |      | 0.992 |
| Satd. Flow (perm)          | 1548  | 0     | 1523  | 0     | 0    | 1632  |
| Link Speed (k/h)           | 40    |       | 80    |       |      | 80    |
| Link Distance (m)          | 155.0 |       | 545.7 |       |      | 134.1 |
| Travel Time (s)            | 14.0  |       | 24.6  |       |      | 6.0   |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Heavy Vehicles (%)         | 22%   | 0%    | 5%    | 7%    | 4%   | 9%    |
| Adj. Flow (vph)            | 60    | 1     | 177   | 355   | 24   | 128   |
| Shared Lane Traffic (%)    |       |       |       |       |      |       |
| Lane Group Flow (vph)      | 61    | 0     | 532   | 0     | 0    | 152   |
| Enter Blocked Intersection | No    | No    | No    | No    | No   | No    |
| Lane Alignment             | Left  | Right | Left  | Right | Left | Left  |
| Median Width(m)            | 4.5   |       | 0.0   |       |      | 0.0   |
| Link Offset(m)             | 0.0   |       | 0.0   |       |      | 0.0   |
| Crosswalk Width(m)         | 4.8   |       | 4.8   |       |      | 4.8   |
| Two way Left Turn Lane     |       |       |       |       |      |       |
| Headway Factor             | 0.95  | 0.95  | 1.09  | 1.09  | 1.09 | 1.09  |
| Turning Speed (k/h)        | 25    | 15    |       | 15    | 25   |       |
| Sign Control               | Stop  |       | Free  |       |      | Free  |

Intersection Summary

Area Type: Other  
 Control Type: Unsignalized  
 Intersection Capacity Utilization 43.1% ICU Level of Service A  
 Analysis Period (min) 15



HCM Unsignalized Intersection Capacity Analysis  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

2025 Future Total PM  
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| Movement                          | WBL  | WBR   | NBT  | NBR                  | SBL  | SBT  |
|-----------------------------------|------|-------|------|----------------------|------|------|
| Lane Configurations               |      |       |      |                      |      |      |
| Traffic Volume (veh/h)            | 60   | 1     | 177  | 355                  | 24   | 128  |
| Future Volume (Veh/h)             | 60   | 1     | 177  | 355                  | 24   | 128  |
| Sign Control                      | Stop |       | Free |                      |      | Free |
| Grade                             | 0%   |       | 0%   |                      |      | 0%   |
| Peak Hour Factor                  | 1.00 | 1.00  | 1.00 | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 60   | 1     | 177  | 355                  | 24   | 128  |
| Pedestrians                       |      |       |      |                      |      |      |
| Lane Width (m)                    |      |       |      |                      |      |      |
| Walking Speed (m/s)               |      |       |      |                      |      |      |
| Percent Blockage                  |      |       |      |                      |      |      |
| Right turn flare (veh)            |      |       |      |                      |      |      |
| Median type                       |      |       | None | None                 |      |      |
| Median storage veh                |      |       |      |                      |      |      |
| Upstream signal (m)               |      |       |      |                      |      |      |
| pX, platoon unblocked             |      |       |      |                      |      |      |
| vC, conflicting volume            | 530  | 354   |      |                      | 532  |      |
| vC1, stage 1 conf vol             |      |       |      |                      |      |      |
| vC2, stage 2 conf vol             |      |       |      |                      |      |      |
| vCu, unblocked vol                | 530  | 354   |      |                      | 532  |      |
| tC, single (s)                    | 6.6  | 6.2   |      |                      | 4.1  |      |
| tC, 2 stage (s)                   |      |       |      |                      |      |      |
| tF (s)                            | 3.7  | 3.3   |      |                      | 2.2  |      |
| p0 queue free %                   | 87   | 100   |      |                      | 98   |      |
| cM capacity (veh/h)               | 465  | 694   |      |                      | 1025 |      |
| <b>Direction, Lane #</b>          |      |       |      |                      |      |      |
|                                   | WB 1 | NB 1  | SB 1 |                      |      |      |
| Volume Total                      | 61   | 532   | 152  |                      |      |      |
| Volume Left                       | 60   | 0     | 24   |                      |      |      |
| Volume Right                      | 1    | 355   | 0    |                      |      |      |
| cSH                               | 467  | 1700  | 1025 |                      |      |      |
| Volume to Capacity                | 0.13 | 0.31  | 0.02 |                      |      |      |
| Queue Length 95th (m)             | 3.6  | 0.0   | 0.6  |                      |      |      |
| Control Delay (s)                 | 13.9 | 0.0   | 1.5  |                      |      |      |
| Lane LOS                          | B    |       | A    |                      |      |      |
| Approach Delay (s)                | 13.9 | 0.0   | 1.5  |                      |      |      |
| Approach LOS                      | B    |       |      |                      |      |      |
| <b>Intersection Summary</b>       |      |       |      |                      |      |      |
| Average Delay                     |      |       | 1.4  |                      |      |      |
| Intersection Capacity Utilization |      | 43.1% |      | ICU Level of Service |      | A    |
| Analysis Period (min)             |      |       | 15   |                      |      |      |

Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

2025 Future Total PM  
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| Lane Group                 | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |
| Traffic Volume (vph)       | 77    | 756   | 191   | 357   | 233   | 17    |
| Future Volume (vph)        | 77    | 756   | 191   | 357   | 233   | 17    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.3   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   | 25.0  | 50.0  |       |       | 0.0   |
| Storage Lanes              | 1     | 1     | 1     |       |       | 0     |
| Taper Length (m)           | 7.5   |       | 75.0  |       |       |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |       |       | 0.991 |       |
| Fl <sub>t</sub> Protected  | 0.950 |       | 0.950 |       |       |       |
| Satd. Flow (prot)          | 1551  | 1422  | 1496  | 1604  | 1581  | 0     |
| Fl <sub>t</sub> Permitted  | 0.950 |       | 0.496 |       |       |       |
| Satd. Flow (perm)          | 1551  | 1422  | 781   | 1604  | 1581  | 0     |
| Right Turn on Red          |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 577   |       |       | 4     |       |
| Link Speed (k/h)           | 40    |       |       | 80    | 80    |       |
| Link Distance (m)          | 154.2 |       |       | 243.1 | 545.7 |       |
| Travel Time (s)            | 13.9  |       |       | 10.9  | 24.6  |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 9%    | 4%    | 13%   | 11%   | 12%   | 6%    |
| Adj. Flow (vph)            | 77    | 756   | 191   | 357   | 233   | 17    |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 77    | 756   | 191   | 357   | 250   | 0     |
| Enter Blocked Intersection | No    | No    | No    | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left  | Left  | Left  | Right |
| Median Width(m)            | 3.5   |       |       | 3.5   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |       | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |       | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |
| Headway Factor             | 1.09  | 1.12  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25    |       |       | 15    |
| Number of Detectors        | 1     | 1     | 1     | 2     | 2     |       |
| Detector Template          | Left  | Right | Left  | Thru  | Thru  |       |
| Leading Detector (m)       | 2.0   | 2.0   | 2.0   | 10.0  | 10.0  |       |
| Trailing Detector (m)      | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Position(m)     | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Size(m)         | 2.0   | 2.0   | 2.0   | 0.6   | 0.6   |       |
| Detector 1 Type            | 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   |       |
| Detector 1 Queue (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Delay (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 2 Position(m)     |       |       |       | 9.4   | 9.4   |       |
| Detector 2 Size(m)         |       |       |       | 0.6   | 0.6   |       |
| Detector 2 Type            |       |       |       | Cl+Ex | Cl+Ex |       |
| Detector 2 Channel         |       |       |       |       |       |       |
| Detector 2 Extend (s)      |       |       |       | 0.0   | 0.0   |       |
| Turn Type                  | Prot  | Perm  | pm+pt | NA    | NA    |       |

Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

2025 Future Total PM  
08-06-2021



| Lane Group              | EBL   | EBR    | NBL   | NBT   | SBT   | SBR |
|-------------------------|-------|--------|-------|-------|-------|-----|
| Protected Phases        | 4     |        | 5     | 2     | 6     |     |
| Permitted Phases        |       | 4      | 2     |       |       |     |
| Detector Phase          | 4     | 4      | 5     | 2     | 6     |     |
| Switch Phase            |       |        |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0    | 7.0   | 35.0  | 35.0  |     |
| Minimum Split (s)       | 23.0  | 23.0   | 13.0  | 41.6  | 41.6  |     |
| Total Split (s)         | 44.0  | 44.0   | 13.0  | 56.0  | 43.0  |     |
| Total Split (%)         | 44.0% | 44.0%  | 13.0% | 56.0% | 43.0% |     |
| Maximum Green (s)       | 37.2  | 37.2   | 7.0   | 49.4  | 36.4  |     |
| Yellow Time (s)         | 3.0   | 3.0    | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 3.8   | 3.8    | 1.4   | 2.0   | 2.0   |     |
| Lost Time Adjust (s)    | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     | 6.8   | 6.8    | 6.0   | 6.6   | 6.6   |     |
| Lead/Lag                |       |        | Lead  |       | Lag   |     |
| Lead-Lag Optimize?      |       |        | Yes   |       | Yes   |     |
| Vehicle Extension (s)   | 3.0   | 3.0    | 3.0   | 3.0   | 3.0   |     |
| Recall Mode             | None  | None   | None  | Min   | Min   |     |
| Walk Time (s)           | 7.0   | 7.0    |       | 0.0   | 7.0   |     |
| Flash Dont Walk (s)     | 5.0   | 5.0    |       | 0.0   | 21.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0      |       | 0     | 0     |     |
| Act Effct Green (s)     | 23.7  | 23.7   | 49.6  | 49.0  | 35.7  |     |
| Actuated g/C Ratio      | 0.27  | 0.27   | 0.57  | 0.57  | 0.41  |     |
| v/c Ratio               | 0.18  | 0.94   | 0.38  | 0.39  | 0.38  |     |
| Control Delay           | 22.6  | 27.1   | 14.5  | 14.8  | 22.4  |     |
| Queue Delay             | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Delay             | 22.6  | 27.1   | 14.5  | 14.8  | 22.4  |     |
| LOS                     | C     | C      | B     | B     | C     |     |
| Approach Delay          | 26.7  |        |       | 14.7  | 22.4  |     |
| Approach LOS            | C     |        |       | B     | C     |     |
| Queue Length 50th (m)   | 10.0  | 30.7   | 16.2  | 34.6  | 30.4  |     |
| Queue Length 95th (m)   | 20.2  | #122.7 | 36.0  | 70.2  | 60.2  |     |
| Internal Link Dist (m)  | 130.2 |        |       | 219.1 | 521.7 |     |
| Turn Bay Length (m)     |       | 25.0   | 50.0  |       |       |     |
| Base Capacity (vph)     | 682   | 948    | 507   | 936   | 682   |     |
| Starvation Cap Reductn  | 0     | 0      | 0     | 0     | 0     |     |
| Spillback Cap Reductn   | 0     | 0      | 0     | 0     | 0     |     |
| Storage Cap Reductn     | 0     | 0      | 0     | 0     | 0     |     |
| Reduced v/c Ratio       | 0.11  | 0.80   | 0.38  | 0.38  | 0.37  |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 86.3             |
| Natural Cycle:                     | 80               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.94             |
| Intersection Signal Delay:         | 22.0             |
| Intersection LOS:                  | C                |
| Intersection Capacity Utilization: | 89.7%            |
| ICU Level of Service:              | E                |
| Analysis Period (min):             | 15               |






















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

Splits and Phases: 2: Boundary Road & Hwy 417 EB Ramp Terminal



Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

2025 Future Total PM  
08-06-2021

|                            |  |  |  |  |  |  |   |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |   |  |   |   |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)       | 139   | 0   | 31  | 6   | 0   | 18  | 9   | 389   | 0   | 2   | 903   | 82  |
| Future Volume (vph)        | 139   | 0   | 31  | 6   | 0   | 18  | 9   | 389   | 0   | 2   | 903   | 82  |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.3   | 3.5   | 3.3   | 3.3   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   |   | 15.0  | 0.0   |   | 0.0   | 35.0  |   | 7.5   | 100.0   |   | 35.0  |
| Storage Lanes              | 0   |   | 0   | 0   |   | 1   | 1   |   | 1   | 1   |   | 0   |
| Taper Length (m)           | 7.5   |   |   | 7.5   |   |   | 45.0  |   |   | 75.0  |   |   |
| 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  |
| Fr <sub>t</sub>            |   | 0.975   |   |   |   | 0.850   |   |   |   |   |   | 0.988   |
| Fl <sub>t</sub> Protected  |   | 0.961   |   |   | 0.950   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)          | 0   | 1444  | 0   | 0   | 1271  | 1513  | 1503  | 1633  | 1740  | 1102  | 1686  | 0   |
| Fl <sub>t</sub> Permitted  |   | 0.761   |   |   | 0.732   |   | 0.206   |   |   | 0.449   |   |   |
| Satd. Flow (perm)          | 0   | 1143  | 0   | 0   | 980   | 1513  | 326   | 1633  | 1740  | 521   | 1686  | 0   |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |   |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 100   |   |   |   | 100   |   |   |   |   |   | 10  |
| Link Speed (k/h)           |   | 60  |   |   | 20  |   |   | 80  |   |   |   | 80  |
| Link Distance (m)          |   | 198.6   |   |   | 170.6   |   |   | 174.7   |   |   |   | 243.1   |
| Travel Time (s)            |   | 11.9  |   |   | 30.7  |   |   | 7.9   |   |   |   | 10.9  |
| 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 (%)         | 19%   | 0%  | 0%  | 33%   | 0%  | 0%  | 10%   | 9%  | 0%  | 50%   | 4%  | 8%  |
| Adj. Flow (vph)            | 139   | 0   | 31  | 6   | 0   | 18  | 9   | 389   | 0   | 2   | 903   | 82  |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)      | 0   | 170   | 0   | 0   | 6   | 18  | 9   | 389   | 0   | 2   | 985   | 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   |   |   | 3.5   |   |   | 3.5   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |   |   |   |   |   |   |
| Headway Factor             | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.12  | 1.09  | 1.12  | 1.12  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   | 1   | 1   | 2   | 1   | 1   |   | 2   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  | Right   | Left  | Thru  | Right   | Left  | Thru  |   |
| Leading Detector (m)       | 2.0   | 10.0  |   | 2.0   | 10.0  | 2.0   | 2.0   | 10.0  | 2.0   | 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   | 0.6   | 2.0   | 2.0   | 0.6   | 2.0   | 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                  | Perm  | NA  |   | Perm  | NA  | Perm  | Perm  | NA  | Perm  | pm+pt   | NA  |   |

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| Lane Group              | EBL   | EBT   | EBR | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT    | SBR |
|-------------------------|-------|-------|-----|-------|-------|-------|-------|-------|-------|-------|--------|-----|
| Protected Phases        |       | 4     |     |       | 8     |       |       | 2     |       | 1     | 6      |     |
| Permitted Phases        | 4     |       |     | 8     |       | 8     | 2     |       | 2     | 6     |        |     |
| Detector Phase          | 4     | 4     |     | 8     | 8     | 8     | 2     | 2     | 2     | 1     | 6      |     |
| Switch Phase            |       |       |     |       |       |       |       |       |       |       |        |     |
| Minimum Initial (s)     | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 20.0  | 20.0  | 20.0  | 7.0   | 20.0   |     |
| Minimum Split (s)       | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 26.2  | 26.2  | 26.2  | 13.0  | 26.2   |     |
| Total Split (s)         | 25.0  | 25.0  |     | 25.0  | 25.0  | 25.0  | 62.0  | 62.0  | 62.0  | 13.0  | 75.0   |     |
| Total Split (%)         | 25.0% | 25.0% |     | 25.0% | 25.0% | 25.0% | 62.0% | 62.0% | 62.0% | 13.0% | 75.0%  |     |
| Maximum Green (s)       | 19.2  | 19.2  |     | 19.2  | 19.2  | 19.2  | 55.8  | 55.8  | 55.8  | 7.0   | 68.8   |     |
| Yellow Time (s)         | 3.7   | 3.7   |     | 3.7   | 3.7   | 3.7   | 4.6   | 4.6   | 4.6   | 4.6   | 4.6    |     |
| All-Red Time (s)        | 2.1   | 2.1   |     | 2.1   | 2.1   | 2.1   | 1.6   | 1.6   | 1.6   | 1.4   | 1.6    |     |
| Lost Time Adjust (s)    |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0    |     |
| Total Lost Time (s)     |       | 5.8   |     |       | 5.8   | 5.8   | 6.2   | 6.2   | 6.2   | 6.0   | 6.2    |     |
| Lead/Lag                |       |       |     |       |       |       | Lag   | Lag   | Lag   | Lead  |        |     |
| 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  | Min   | Min   | Min   | None  | Min    |     |
| Walk Time (s)           | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   |       | 7.0    |     |
| Flash Dont Walk (s)     | 12.0  | 12.0  |     | 12.0  | 12.0  | 12.0  | 10.0  | 10.0  | 10.0  |       | 10.0   |     |
| Pedestrian Calls (#/hr) | 0     | 0     |     | 0     | 0     | 0     | 0     | 0     | 0     |       | 0      |     |
| Act Effct Green (s)     |       | 11.5  |     |       | 11.5  | 11.5  | 46.5  | 46.5  |       | 48.7  | 48.4   |     |
| Actuated g/C Ratio      |       | 0.16  |     |       | 0.16  | 0.16  | 0.64  | 0.64  |       | 0.67  | 0.66   |     |
| v/c Ratio               |       | 0.64  |     |       | 0.04  | 0.06  | 0.04  | 0.37  |       | 0.00  | 0.88   |     |
| Control Delay           |       | 27.4  |     |       | 32.2  | 0.3   | 8.1   | 8.7   |       | 4.5   | 20.5   |     |
| Queue Delay             |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0   |       | 0.0   | 0.0    |     |
| Total Delay             |       | 27.4  |     |       | 32.2  | 0.3   | 8.1   | 8.7   |       | 4.5   | 20.6   |     |
| LOS                     |       | C     |     |       | C     | A     | A     | A     |       | A     | C      |     |
| Approach Delay          |       | 27.4  |     |       | 8.3   |       |       | 8.7   |       |       | 20.5   |     |
| Approach LOS            |       | C     |     |       | A     |       |       | A     |       |       | C      |     |
| Queue Length 50th (m)   |       | 8.6   |     |       | 0.7   | 0.0   | 0.4   | 18.8  |       | 0.1   | 86.5   |     |
| Queue Length 95th (m)   |       | 35.0  |     |       | 4.6   | 0.0   | 3.3   | 66.0  |       | 0.8   | #212.3 |     |
| Internal Link Dist (m)  |       | 174.6 |     |       | 146.6 |       |       | 150.7 |       |       | 219.1  |     |
| Turn Bay Length (m)     |       |       |     |       |       |       | 35.0  |       |       | 100.0 |        |     |
| Base Capacity (vph)     |       | 395   |     |       | 277   | 500   | 265   | 1330  |       | 408   | 1500   |     |
| Starvation Cap Reductn  |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 17     |     |
| Spillback Cap Reductn   |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 0      |     |
| Storage Cap Reductn     |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 0      |     |
| Reduced v/c Ratio       |       | 0.43  |     |       | 0.02  | 0.04  | 0.03  | 0.29  |       | 0.00  | 0.66   |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 72.8             |
| Natural Cycle:                     | 90               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.88             |
| Intersection Signal Delay:         | 18.1             |
| Intersection Capacity Utilization: | 82.2%            |
| Analysis Period (min):             | 15               |
| Intersection LOS:                  | B                |
| ICU Level of Service:              | E                |



















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

Splits and Phases: 3: Boundary Road & Thunder Road/Amazon Way



Lanes, Volumes, Timings  
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

















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|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group                        | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |  |  |   |  |  |   |
| Traffic Volume (vph)              | 4   | 0   | 14  | 6   | 0   | 12  | 4   | 382   | 6   | 13  | 920   | 7   |
| Future Volume (vph)               | 4   | 0   | 14  | 6   | 0   | 12  | 4   | 382   | 6   | 13  | 920   | 7   |
| Ideal Flow (vphpl)                | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)                    | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.6   |
| Storage Length (m)                | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 15.0  |   | 0.0   | 70.0  |   | 0.0   |
| Storage Lanes                     | 0   |   | 0   | 0   |   | 0   | 1   |   | 0   | 1   |   | 0   |
| Taper Length (m)                  | 7.5   |   |   | 7.5   |   |   | 45.0  |   |   | 45.0  |   |   |
| 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  |
| Frt                               |   | 0.895   |   |   | 0.910   |   |   | 0.998   |   |   | 0.999   |   |
| Flt Protected                     |   | 0.989   |   |   | 0.984   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)                 | 0   | 1576  | 0   | 0   | 797   | 0   | 1691  | 1669  | 0   | 846   | 1744  | 0   |
| Flt Permitted                     |   | 0.989   |   |   | 0.984   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (perm)                 | 0   | 1576  | 0   | 0   | 797   | 0   | 1691  | 1669  | 0   | 846   | 1744  | 0   |
| Link Speed (k/h)                  |   | 50  |   |   | 20  |   |   | 80  |   |   | 80  |   |
| Link Distance (m)                 |   | 105.7   |   |   | 151.5   |   |   | 1150.2  |   |   | 174.7   |   |
| Travel Time (s)                   |   | 7.6   |   |   | 27.3  |   |   | 51.8  |   |   | 7.9   |   |
| 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 (%)                | 0%  | 0%  | 0%  | 100%  | 0%  | 100%  | 0%  | 5%  | 100%  | 100%  | 2%  | 0%  |
| Adj. Flow (vph)                   | 4   | 0   | 14  | 6   | 0   | 12  | 4   | 382   | 6   | 13  | 920   | 7   |
| Shared Lane Traffic (%)           |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)             | 0   | 18  | 0   | 0   | 18  | 0   | 4   | 388   | 0   | 13  | 927   | 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   |   |   | 3.5   |   |   | 3.5   |   |
| Link Offset(m)                    |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)                |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |
| 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  | 1.07  |
| Turning Speed (k/h)               | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  |
| Sign Control                      |   | Stop  |   |   | Stop  |   |   | Free  |   |   | Free  |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |   |   |   |   |   |   |
| Area Type:                        | Other   |   |   |   |   |   |   |   |   |   |   |   |
| Control Type:                     | Unsignalized  |   |   |   |   |   |   |   |   |   |   |   |
| Intersection Capacity Utilization | 61.6%   |   |   |   |   |   | ICU Level of Service B  |   |   |   |   |   |
| Analysis Period (min)             | 15  |   |   |   |   |   |   |   |   |   |   |   |



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|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |  |  |   |  |  |  |
| Traffic Volume (veh/h)            | 4   | 0   | 14  | 6   | 0   | 12  | 4   | 382   | 6   | 13  | 920   | 7   |
| Future Volume (Veh/h)             | 4   | 0   | 14  | 6   | 0   | 12  | 4   | 382   | 6   | 13  | 920   | 7   |
| Sign Control                      |   | Stop  |   |   | Stop  |   |   | Free  |   |   | Free  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |   | 0%  |   |   | 0%  |   |
| 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  |
| Hourly flow rate (vph)            | 4   | 0   | 14  | 6   | 0   | 12  | 4   | 382   | 6   | 13  | 920   | 7   |
| Pedestrians                       |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Width (m)                    |   |   |   |   |   |   |   |   |   |   |   |   |
| Walking Speed (m/s)               |   |   |   |   |   |   |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |   |   |   |   |   |   |
| Median type                       |   |   |   |   |   |   |   | None  |   |   | None  |   |
| Median storage (veh)              |   |   |   |   |   |   |   |   |   |   |   |   |
| Upstream signal (m)               |   |   |   |   |   |   |   |   |   |   |   | 175   |
| pX, platoon unblocked             | 0.55  | 0.55  | 0.55  | 0.55  | 0.55  |   | 0.55  |   |   |   |   |   |
| vC, conflicting volume            | 1352  | 1346  | 924   | 1353  | 1346  | 385   | 927   |   |   | 388   |   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vCu, unblocked vol                | 1228  | 1217  | 446   | 1231  | 1218  | 385   | 452   |   |   | 388   |   |   |
| tC, single (s)                    | 7.1   | 6.5   | 6.2   | 8.1   | 6.5   | 7.2   | 4.1   |   |   | 5.1   |   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |   |   |   |   |   |   |
| tF (s)                            | 3.5   | 4.0   | 3.3   | 4.4   | 4.0   | 4.2   | 2.2   |   |   | 3.1   |   |   |
| p0 queue free %                   | 95  | 100   | 96  | 88  | 100   | 98  | 99  |   |   | 98  |   |   |
| cM capacity (veh/h)               | 82  | 97  | 337   | 51  | 97  | 493   | 612   |   |   | 788   |   |   |
| Direction, Lane #                 | EB 1  | WB 1  | NB 1  | NB 2  | SB 1  | SB 2  |   |   |   |   |   |   |
| Volume Total                      | 18  | 18  | 4   | 388   | 13  | 927   |   |   |   |   |   |   |
| Volume Left                       | 4   | 6   | 4   | 0   | 13  | 0   |   |   |   |   |   |   |
| Volume Right                      | 14  | 12  | 0   | 6   | 0   | 7   |   |   |   |   |   |   |
| cSH                               | 199   | 127   | 612   | 1700  | 788   | 1700  |   |   |   |   |   |   |
| Volume to Capacity                | 0.09  | 0.14  | 0.01  | 0.23  | 0.02  | 0.55  |   |   |   |   |   |   |
| Queue Length 95th (m)             | 2.4   | 3.8   | 0.2   | 0.0   | 0.4   | 0.0   |   |   |   |   |   |   |
| Control Delay (s)                 | 24.9  | 38.0  | 10.9  | 0.0   | 9.6   | 0.0   |   |   |   |   |   |   |
| Lane LOS                          | C   | E   | B   |   | A   |   |   |   |   |   |   |   |
| Approach Delay (s)                | 24.9  | 38.0  | 0.1   |   | 0.1   |   |   |   |   |   |   |   |
| Approach LOS                      | C   | E   |   |   |   |   |   |   |   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |   |   |   |   |   |   |
| Average Delay                     |   |   | 1.0   |   |   |   |   |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 61.6%   |   | ICU Level of Service  |   |   |   | B   |   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |   |   |   |   |   |   |

Lanes, Volumes, Timings  
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| Lane Group                 | EBL   | EBR   | NBL  | NBT   | SBT    | SBR   |
|----------------------------|-------|-------|------|-------|--------|-------|
| Lane Configurations        |       |       |      |       |        |       |
| Traffic Volume (vph)       | 129   | 108   | 57   | 140   | 814    | 133   |
| Future Volume (vph)        | 129   | 108   | 57   | 140   | 814    | 133   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800   | 1800  |
| Lane Width (m)             | 3.3   | 3.3   | 3.5  | 3.5   | 3.5    | 3.5   |
| Storage Length (m)         | 25.0  | 0.0   | 0.0  |       |        | 30.0  |
| Storage Lanes              | 1     | 1     | 0    |       |        | 1     |
| Taper Length (m)           | 47.5  |       | 7.5  |       |        |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |      |       |        | 0.850 |
| Fl <sub>t</sub> Protected  | 0.950 |       |      | 0.986 |        |       |
| Satd. Flow (prot)          | 1463  | 1395  | 0    | 1664  | 1762   | 1363  |
| Fl <sub>t</sub> Permitted  | 0.950 |       |      | 0.986 |        |       |
| Satd. Flow (perm)          | 1463  | 1395  | 0    | 1664  | 1762   | 1363  |
| Link Speed (k/h)           | 80    |       |      | 80    | 80     |       |
| Link Distance (m)          | 180.5 |       |      | 135.8 | 1150.2 |       |
| Travel Time (s)            | 8.1   |       |      | 6.1   | 51.8   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Heavy Vehicles (%)         | 13%   | 6%    | 9%   | 4%    | 1%     | 11%   |
| Adj. Flow (vph)            | 129   | 108   | 57   | 140   | 814    | 133   |
| Shared Lane Traffic (%)    |       |       |      |       |        |       |
| Lane Group Flow (vph)      | 129   | 108   | 0    | 197   | 814    | 133   |
| Enter Blocked Intersection | No    | No    | No   | No    | No     | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left   | Right |
| Median Width(m)            | 3.3   |       |      | 3.5   | 3.5    |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0    |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8    |       |
| Two way Left Turn Lane     |       |       |      |       |        |       |
| Headway Factor             | 1.12  | 1.12  | 1.09 | 1.09  | 1.09   | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25   |       |        | 15    |
| Sign Control               | Stop  |       |      | Free  | Free   |       |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 73.9%        |
| ICU Level of Service              | D            |
| Analysis Period (min)             | 15           |

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| Movement                          | EBL  | EBR  | NBL   | NBT                  | SBT  | SBR  |
|-----------------------------------|------|------|-------|----------------------|------|------|
| Lane Configurations               |      |      |       |                      |      |      |
| Traffic Volume (veh/h)            | 129  | 108  | 57    | 140                  | 814  | 133  |
| Future Volume (Veh/h)             | 129  | 108  | 57    | 140                  | 814  | 133  |
| Sign Control                      | Stop |      |       | Free                 | Free |      |
| Grade                             | 0%   |      |       | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00 | 1.00 | 1.00  | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 129  | 108  | 57    | 140                  | 814  | 133  |
| Pedestrians                       |      |      |       |                      |      |      |
| Lane Width (m)                    |      |      |       |                      |      |      |
| Walking Speed (m/s)               |      |      |       |                      |      |      |
| Percent Blockage                  |      |      |       |                      |      |      |
| Right turn flare (veh)            |      |      |       |                      |      |      |
| Median type                       |      |      |       | None                 | None |      |
| Median storage (veh)              |      |      |       |                      |      |      |
| Upstream signal (m)               |      |      |       |                      |      |      |
| pX, platoon unblocked             |      |      |       |                      |      |      |
| vC, conflicting volume            | 1068 | 814  | 947   |                      |      |      |
| vC1, stage 1 conf vol             |      |      |       |                      |      |      |
| vC2, stage 2 conf vol             |      |      |       |                      |      |      |
| vCu, unblocked vol                | 1068 | 814  | 947   |                      |      |      |
| tC, single (s)                    | 6.5  | 6.3  | 4.2   |                      |      |      |
| tC, 2 stage (s)                   |      |      |       |                      |      |      |
| tF (s)                            | 3.6  | 3.4  | 2.3   |                      |      |      |
| p0 queue free %                   | 40   | 71   | 92    |                      |      |      |
| cM capacity (veh/h)               | 215  | 372  | 697   |                      |      |      |
| Direction, Lane #                 | EB 1 | EB 2 | NB 1  | SB 1                 | SB 2 |      |
| Volume Total                      | 129  | 108  | 197   | 814                  | 133  |      |
| Volume Left                       | 129  | 0    | 57    | 0                    | 0    |      |
| Volume Right                      | 0    | 108  | 0     | 0                    | 133  |      |
| cSH                               | 215  | 372  | 697   | 1700                 | 1700 |      |
| Volume to Capacity                | 0.60 | 0.29 | 0.08  | 0.48                 | 0.08 |      |
| Queue Length 95th (m)             | 27.4 | 9.5  | 2.1   | 0.0                  | 0.0  |      |
| Control Delay (s)                 | 44.2 | 18.6 | 3.7   | 0.0                  | 0.0  |      |
| Lane LOS                          | E    | C    | A     |                      |      |      |
| Approach Delay (s)                | 32.5 |      | 3.7   | 0.0                  |      |      |
| Approach LOS                      | D    |      |       |                      |      |      |
| Intersection Summary              |      |      |       |                      |      |      |
| Average Delay                     |      |      | 6.1   |                      |      |      |
| Intersection Capacity Utilization |      |      | 73.9% | ICU Level of Service | D    |      |
| Analysis Period (min)             |      |      | 15    |                      |      |      |

Lanes, Volumes, Timings  
6: Site Access A & Thunder Road

2025 Future Total PM  
08-06-2021



| Lane Group                 | EBT   | EBR   | WBL  | WBT   | NBL   | NBR   |
|----------------------------|-------|-------|------|-------|-------|-------|
| Lane Configurations        |       |       |      |       |       |       |
| Traffic Volume (vph)       | 118   | 0     | 14   | 78    | 0     | 52    |
| Future Volume (vph)        | 118   | 0     | 14   | 78    | 0     | 52    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5  | 3.5   | 3.5   | 3.5   |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Flt                        |       |       |      |       | 0.865 |       |
| Flt Protected              |       |       |      | 0.992 |       |       |
| Satd. Flow (prot)          | 1483  | 0     | 0    | 1628  | 1426  | 0     |
| Flt Permitted              |       |       |      | 0.992 |       |       |
| Satd. Flow (perm)          | 1483  | 0     | 0    | 1628  | 1426  | 0     |
| Link Speed (k/h)           | 60    |       |      | 50    | 50    |       |
| Link Distance (m)          | 163.7 |       |      | 198.6 | 103.6 |       |
| Travel Time (s)            | 9.8   |       |      | 14.3  | 7.5   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 20%   | 0%    | 0%   | 10%   | 0%    | 8%    |
| Adj. Flow (vph)            | 118   | 0     | 14   | 78    | 0     | 52    |
| Shared Lane Traffic (%)    |       |       |      |       |       |       |
| Lane Group Flow (vph)      | 118   | 0     | 0    | 92    | 52    | 0     |
| Enter Blocked Intersection | No    | No    | No   | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left  | Right |
| Median Width(m)            | 0.0   |       |      | 0.0   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |      |       |       |       |
| Headway Factor             | 1.09  | 1.09  | 1.09 | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        |       | 15    | 25   |       | 25    | 15    |
| Sign Control               | Free  |       |      | Free  | Stop  |       |

Intersection Summary

|                                   |                        |
|-----------------------------------|------------------------|
| Area Type:                        | Other                  |
| Control Type:                     | Unsignalized           |
| Intersection Capacity Utilization | 21.9%                  |
| Analysis Period (min)             | 15                     |
|                                   | ICU Level of Service A |

HCM Unsignalized Intersection Capacity Analysis  
6: Site Access A & Thunder Road

2025 Future Total PM  
08-06-2021



| Movement                          | EBT         | EBR         | WBL         | WBT                  | NBL  | NBR  |
|-----------------------------------|-------------|-------------|-------------|----------------------|------|------|
| Lane Configurations               | →           |             |             | ←                    | ↘    | ↙    |
| Traffic Volume (veh/h)            | 118         | 0           | 14          | 78                   | 0    | 52   |
| Future Volume (Veh/h)             | 118         | 0           | 14          | 78                   | 0    | 52   |
| Sign Control                      | Free        |             |             | Free                 | Stop |      |
| Grade                             | 0%          |             |             | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 118         | 0           | 14          | 78                   | 0    | 52   |
| <b>Pedestrians</b>                |             |             |             |                      |      |      |
| Lane Width (m)                    |             |             |             |                      |      |      |
| Walking Speed (m/s)               |             |             |             |                      |      |      |
| Percent Blockage                  |             |             |             |                      |      |      |
| Right turn flare (veh)            |             |             |             |                      |      |      |
| Median type                       | None        |             |             | None                 |      |      |
| Median storage (veh)              |             |             |             |                      |      |      |
| Upstream signal (m)               | 199         |             |             |                      |      |      |
| pX, platoon unblocked             |             |             |             |                      |      |      |
| vC, conflicting volume            |             |             | 118         |                      |      | 118  |
| vC1, stage 1 conf vol             |             |             |             |                      |      |      |
| vC2, stage 2 conf vol             |             |             |             |                      |      |      |
| vCu, unblocked vol                |             |             | 118         |                      |      | 118  |
| tC, single (s)                    |             |             | 4.1         |                      |      | 6.3  |
| tC, 2 stage (s)                   |             |             |             |                      |      |      |
| tF (s)                            |             |             | 2.2         |                      |      | 3.4  |
| p0 queue free %                   |             |             | 99          |                      |      | 94   |
| cM capacity (veh/h)               |             |             | 1483        |                      |      | 918  |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>WB 1</b> | <b>NB 1</b> |                      |      |      |
| Volume Total                      | 118         | 92          | 52          |                      |      |      |
| Volume Left                       | 0           | 14          | 0           |                      |      |      |
| Volume Right                      | 0           | 0           | 52          |                      |      |      |
| cSH                               | 1700        | 1483        | 918         |                      |      |      |
| Volume to Capacity                | 0.07        | 0.01        | 0.06        |                      |      |      |
| Queue Length 95th (m)             | 0.0         | 0.2         | 1.4         |                      |      |      |
| Control Delay (s)                 | 0.0         | 1.2         | 9.2         |                      |      |      |
| Lane LOS                          |             |             | A           |                      | A    |      |
| Approach Delay (s)                | 0.0         | 1.2         | 9.2         |                      |      |      |
| Approach LOS                      |             |             | A           |                      |      |      |
| <b>Intersection Summary</b>       |             |             |             |                      |      |      |
| Average Delay                     |             |             | 2.2         |                      |      |      |
| Intersection Capacity Utilization |             |             | 21.9%       | ICU Level of Service |      | A    |
| Analysis Period (min)             |             |             | 15          |                      |      |      |

Lanes, Volumes, Timings  
7: Site Access B & Thunder Road

2025 Future Total PM  
08-06-2021



| Lane Group                 | EBT   | EBR   | WBL  | WBT   | NBL   | NBR   |
|----------------------------|-------|-------|------|-------|-------|-------|
| Lane Configurations        |       |       |      |       |       |       |
| Traffic Volume (vph)       | 107   | 0     | 4    | 74    | 0     | 11    |
| Future Volume (vph)        | 107   | 0     | 4    | 74    | 0     | 11    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5  | 3.5   | 3.5   | 3.5   |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Flt                        |       |       |      |       | 0.865 |       |
| Flt Protected              |       |       |      | 0.997 |       |       |
| Satd. Flow (prot)          | 1648  | 0     | 0    | 1629  | 770   | 0     |
| Flt Permitted              |       |       |      | 0.997 |       |       |
| Satd. Flow (perm)          | 1648  | 0     | 0    | 1629  | 770   | 0     |
| Link Speed (k/h)           | 60    |       |      | 50    | 50    |       |
| Link Distance (m)          | 185.0 |       |      | 163.7 | 105.8 |       |
| Travel Time (s)            | 11.1  |       |      | 11.8  | 7.6   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 8%    | 0%    | 100% | 4%    | 0%    | 100%  |
| Adj. Flow (vph)            | 107   | 0     | 4    | 74    | 0     | 11    |
| Shared Lane Traffic (%)    |       |       |      |       |       |       |
| Lane Group Flow (vph)      | 107   | 0     | 0    | 78    | 11    | 0     |
| Enter Blocked Intersection | No    | No    | No   | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left  | Right |
| Median Width(m)            | 0.0   |       |      | 0.0   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |      |       |       |       |
| Headway Factor             | 1.09  | 1.09  | 1.09 | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        |       | 15    | 25   |       | 25    | 15    |
| Sign Control               | Free  |       |      | Free  | Stop  |       |

Intersection Summary

|                                   |                        |
|-----------------------------------|------------------------|
| Area Type:                        | Other                  |
| Control Type:                     | Unsignalized           |
| Intersection Capacity Utilization | 17.6%                  |
| Analysis Period (min)             | 15                     |
|                                   | ICU Level of Service A |

HCM Unsignalized Intersection Capacity Analysis  
7: Site Access B & Thunder Road

2025 Future Total PM  
08-06-2021



| Movement                          | EBT  | EBR  | WBL   | WBT                  | NBL  | NBR  |
|-----------------------------------|------|------|-------|----------------------|------|------|
| Lane Configurations               | →    |      |       | ←                    | ←    | ↘    |
| Traffic Volume (veh/h)            | 107  | 0    | 4     | 74                   | 0    | 11   |
| Future Volume (Veh/h)             | 107  | 0    | 4     | 74                   | 0    | 11   |
| Sign Control                      | Free |      |       | Free                 | Stop |      |
| Grade                             | 0%   |      |       | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00 | 1.00 | 1.00  | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 107  | 0    | 4     | 74                   | 0    | 11   |
| Pedestrians                       |      |      |       |                      |      |      |
| Lane Width (m)                    |      |      |       |                      |      |      |
| Walking Speed (m/s)               |      |      |       |                      |      |      |
| Percent Blockage                  |      |      |       |                      |      |      |
| Right turn flare (veh)            |      |      |       |                      |      |      |
| Median type                       | None |      |       | None                 |      |      |
| Median storage (veh)              |      |      |       |                      |      |      |
| Upstream signal (m)               | 362  |      |       |                      |      |      |
| pX, platoon unblocked             |      |      |       |                      |      |      |
| vC, conflicting volume            |      |      | 107   | 189                  |      | 107  |
| vC1, stage 1 conf vol             |      |      |       |                      |      |      |
| vC2, stage 2 conf vol             |      |      |       |                      |      |      |
| vCu, unblocked vol                |      |      | 107   | 189                  |      | 107  |
| tC, single (s)                    |      |      | 5.1   | 6.4                  |      | 7.2  |
| tC, 2 stage (s)                   |      |      |       |                      |      |      |
| tF (s)                            |      |      | 3.1   | 3.5                  |      | 4.2  |
| p0 queue free %                   |      |      | 100   | 100                  |      | 99   |
| cM capacity (veh/h)               |      |      | 1045  | 802                  |      | 736  |
| Direction, Lane #                 | EB 1 | WB 1 | NB 1  |                      |      |      |
| Volume Total                      | 107  | 78   | 11    |                      |      |      |
| Volume Left                       | 0    | 4    | 0     |                      |      |      |
| Volume Right                      | 0    | 0    | 11    |                      |      |      |
| cSH                               | 1700 | 1045 | 736   |                      |      |      |
| Volume to Capacity                | 0.06 | 0.00 | 0.01  |                      |      |      |
| Queue Length 95th (m)             | 0.0  | 0.1  | 0.4   |                      |      |      |
| Control Delay (s)                 | 0.0  | 0.5  | 10.0  |                      |      |      |
| Lane LOS                          |      |      | A     |                      | A    |      |
| Approach Delay (s)                | 0.0  | 0.5  | 10.0  |                      |      |      |
| Approach LOS                      |      |      | A     |                      |      |      |
| Intersection Summary              |      |      |       |                      |      |      |
| Average Delay                     |      |      | 0.7   |                      |      |      |
| Intersection Capacity Utilization |      |      | 17.6% | ICU Level of Service |      | A    |
| Analysis Period (min)             |      |      | 15    |                      |      |      |

Lanes, Volumes, Timings  
8: Site Access C & Thunder Road

2025 Future Total PM  
08-06-2021



| Lane Group                 | EBT  | EBR   | WBL  | WBT   | NBL   | NBR   |
|----------------------------|------|-------|------|-------|-------|-------|
| Lane Configurations        |      |       |      |       |       |       |
| Traffic Volume (vph)       | 83   | 0     | 9    | 65    | 0     | 24    |
| Future Volume (vph)        | 83   | 0     | 9    | 65    | 0     | 24    |
| Ideal Flow (vphpl)         | 1800 | 1800  | 1800 | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5  | 3.5   | 3.5  | 3.5   | 3.5   | 3.5   |
| Lane Util. Factor          | 1.00 | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Flt                        |      |       |      |       | 0.865 |       |
| Flt Protected              |      |       |      | 0.994 |       |       |
| Satd. Flow (prot)          | 1695 | 0     | 0    | 1694  | 1272  | 0     |
| Flt Permitted              |      |       |      | 0.994 |       |       |
| Satd. Flow (perm)          | 1695 | 0     | 0    | 1694  | 1272  | 0     |
| Link Speed (k/h)           | 60   |       |      | 50    | 50    |       |
| Link Distance (m)          | 95.5 |       |      | 185.0 | 109.7 |       |
| Travel Time (s)            | 5.7  |       |      | 13.3  | 7.9   |       |
| Peak Hour Factor           | 1.00 | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 5%   | 0%    | 22%  | 2%    | 0%    | 21%   |
| Adj. Flow (vph)            | 83   | 0     | 9    | 65    | 0     | 24    |
| Shared Lane Traffic (%)    |      |       |      |       |       |       |
| Lane Group Flow (vph)      | 83   | 0     | 0    | 74    | 24    | 0     |
| Enter Blocked Intersection | No   | No    | No   | No    | No    | No    |
| Lane Alignment             | Left | Right | Left | Left  | Left  | Right |
| Median Width(m)            | 0.0  |       |      | 0.0   | 3.5   |       |
| Link Offset(m)             | 0.0  |       |      | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8  |       |      | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |      |       |      |       |       |       |
| Headway Factor             | 1.09 | 1.09  | 1.09 | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        |      | 15    | 25   |       | 25    | 15    |
| Sign Control               | Free |       |      | Free  | Stop  |       |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 20.8%        |
| ICU Level of Service              | A            |
| Analysis Period (min)             | 15           |



HCM Unsignalized Intersection Capacity Analysis  
8: Site Access C & Thunder Road

2025 Future Total PM  
08-06-2021



| Movement                          | EBT         | EBR         | WBL         | WBT  | NBL                  | NBR  |
|-----------------------------------|-------------|-------------|-------------|------|----------------------|------|
| Lane Configurations               | →           |             |             | ←    | ↔                    |      |
| Traffic Volume (veh/h)            | 83          | 0           | 9           | 65   | 0                    | 24   |
| Future Volume (Veh/h)             | 83          | 0           | 9           | 65   | 0                    | 24   |
| Sign Control                      | Free        |             |             | Free | Stop                 |      |
| Grade                             | 0%          |             |             | 0%   | 0%                   |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00 | 1.00                 | 1.00 |
| Hourly flow rate (vph)            | 83          | 0           | 9           | 65   | 0                    | 24   |
| <b>Pedestrians</b>                |             |             |             |      |                      |      |
| Lane Width (m)                    |             |             |             |      |                      |      |
| Walking Speed (m/s)               |             |             |             |      |                      |      |
| Percent Blockage                  |             |             |             |      |                      |      |
| Right turn flare (veh)            |             |             |             |      |                      |      |
| Median type                       | None        |             |             | None |                      |      |
| Median storage (veh)              |             |             |             |      |                      |      |
| Upstream signal (m)               |             |             |             |      |                      |      |
| pX, platoon unblocked             |             |             |             |      |                      |      |
| vC, conflicting volume            |             |             | 83          | 166  |                      | 83   |
| vC1, stage 1 conf vol             |             |             |             |      |                      |      |
| vC2, stage 2 conf vol             |             |             |             |      |                      |      |
| vCu, unblocked vol                |             |             | 83          | 166  |                      | 83   |
| tC, single (s)                    |             |             | 4.3         | 6.4  |                      | 6.4  |
| tC, 2 stage (s)                   |             |             |             |      |                      |      |
| tF (s)                            |             |             | 2.4         | 3.5  |                      | 3.5  |
| p0 queue free %                   |             |             | 99          | 100  |                      | 97   |
| cM capacity (veh/h)               |             |             | 1397        | 824  |                      | 926  |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>WB 1</b> | <b>NB 1</b> |      |                      |      |
| Volume Total                      | 83          | 74          | 24          |      |                      |      |
| Volume Left                       | 0           | 9           | 0           |      |                      |      |
| Volume Right                      | 0           | 0           | 24          |      |                      |      |
| cSH                               | 1700        | 1397        | 926         |      |                      |      |
| Volume to Capacity                | 0.05        | 0.01        | 0.03        |      |                      |      |
| Queue Length 95th (m)             | 0.0         | 0.2         | 0.6         |      |                      |      |
| Control Delay (s)                 | 0.0         | 1.0         | 9.0         |      |                      |      |
| Lane LOS                          |             |             | A           |      | A                    |      |
| Approach Delay (s)                | 0.0         | 1.0         | 9.0         |      |                      |      |
| Approach LOS                      |             |             | A           |      |                      |      |
| <b>Intersection Summary</b>       |             |             |             |      |                      |      |
| Average Delay                     |             |             | 1.6         |      |                      |      |
| Intersection Capacity Utilization |             |             | 20.8%       |      | ICU Level of Service | A    |
| Analysis Period (min)             |             |             | 15          |      |                      |      |

Lanes, Volumes, Timings  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

2030 Future Total AM  
 08-06-2021



| Lane Group                 | WBL   | WBR   | NBT   | NBR   | SBL  | SBT   |
|----------------------------|-------|-------|-------|-------|------|-------|
| Lane Configurations        |       |       |       |       |      |       |
| Traffic Volume (vph)       | 176   | 34    | 114   | 965   | 85   | 145   |
| Future Volume (vph)        | 176   | 34    | 114   | 965   | 85   | 145   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  |
| Lane Width (m)             | 4.5   | 4.5   | 3.5   | 3.5   | 3.5  | 3.5   |
| Storage Length (m)         | 0.0   | 10.0  |       | 0.0   | 0.0  |       |
| Storage Lanes              | 1     | 0     |       | 0     | 0    |       |
| Taper Length (m)           | 7.5   |       |       |       | 7.5  |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Frt                        | 0.978 |       | 0.879 |       |      |       |
| Flt Protected              | 0.960 |       |       |       |      | 0.982 |
| Satd. Flow (prot)          | 1703  | 0     | 1528  | 0     | 0    | 1604  |
| Flt Permitted              | 0.960 |       |       |       |      | 0.982 |
| Satd. Flow (perm)          | 1703  | 0     | 1528  | 0     | 0    | 1604  |
| Link Speed (k/h)           | 40    |       | 80    |       |      | 80    |
| Link Distance (m)          | 155.0 |       | 545.7 |       |      | 134.1 |
| Travel Time (s)            | 14.0  |       | 24.6  |       |      | 6.0   |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Heavy Vehicles (%)         | 8%    | 15%   | 14%   | 1%    | 9%   | 9%    |
| Adj. Flow (vph)            | 176   | 34    | 114   | 965   | 85   | 145   |
| Shared Lane Traffic (%)    |       |       |       |       |      |       |
| Lane Group Flow (vph)      | 210   | 0     | 1079  | 0     | 0    | 230   |
| Enter Blocked Intersection | No    | No    | No    | No    | No   | No    |
| Lane Alignment             | Left  | Right | Left  | Right | Left | Left  |
| Median Width(m)            | 4.5   |       | 0.0   |       |      | 0.0   |
| Link Offset(m)             | 0.0   |       | 0.0   |       |      | 0.0   |
| Crosswalk Width(m)         | 4.8   |       | 4.8   |       |      | 4.8   |
| Two way Left Turn Lane     |       |       |       |       |      |       |
| Headway Factor             | 0.95  | 0.95  | 1.09  | 1.09  | 1.09 | 1.09  |
| Turning Speed (k/h)        | 25    | 15    |       | 15    | 25   |       |
| Sign Control               | Stop  |       | Free  |       |      | Free  |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 104.7%       |
| ICU Level of Service              | G            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

2030 Future Total AM  
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| Movement                          | WBL  | WBR  | NBT    | NBR                  | SBL  | SBT  |
|-----------------------------------|------|------|--------|----------------------|------|------|
| Lane Configurations               |      |      |        |                      |      |      |
| Traffic Volume (veh/h)            | 176  | 34   | 114    | 965                  | 85   | 145  |
| Future Volume (Veh/h)             | 176  | 34   | 114    | 965                  | 85   | 145  |
| Sign Control                      | Stop |      | Free   |                      | Free |      |
| Grade                             | 0%   |      | 0%     |                      | 0%   |      |
| Peak Hour Factor                  | 1.00 | 1.00 | 1.00   | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 176  | 34   | 114    | 965                  | 85   | 145  |
| Pedestrians                       |      |      |        |                      |      |      |
| Lane Width (m)                    |      |      |        |                      |      |      |
| Walking Speed (m/s)               |      |      |        |                      |      |      |
| Percent Blockage                  |      |      |        |                      |      |      |
| Right turn flare (veh)            |      |      |        |                      |      |      |
| Median type                       | None |      |        | None                 |      |      |
| Median storage (veh)              |      |      |        |                      |      |      |
| Upstream signal (m)               |      |      |        |                      |      |      |
| pX, platoon unblocked             |      |      |        |                      |      |      |
| vC, conflicting volume            | 912  | 596  |        |                      | 1079 |      |
| vC1, stage 1 conf vol             |      |      |        |                      |      |      |
| vC2, stage 2 conf vol             |      |      |        |                      |      |      |
| vCu, unblocked vol                | 912  | 596  |        |                      | 1079 |      |
| tC, single (s)                    | 6.5  | 6.4  |        |                      | 4.2  |      |
| tC, 2 stage (s)                   |      |      |        |                      |      |      |
| tF (s)                            | 3.6  | 3.4  |        |                      | 2.3  |      |
| p0 queue free %                   | 31   | 93   |        |                      | 86   |      |
| cM capacity (veh/h)               | 256  | 480  |        |                      | 621  |      |
| Direction, Lane #                 | WB 1 | NB 1 | SB 1   |                      |      |      |
| Volume Total                      | 210  | 1079 | 230    |                      |      |      |
| Volume Left                       | 176  | 0    | 85     |                      |      |      |
| Volume Right                      | 34   | 965  | 0      |                      |      |      |
| cSH                               | 277  | 1700 | 621    |                      |      |      |
| Volume to Capacity                | 0.76 | 0.63 | 0.14   |                      |      |      |
| Queue Length 95th (m)             | 45.0 | 0.0  | 3.8    |                      |      |      |
| Control Delay (s)                 | 49.5 | 0.0  | 5.4    |                      |      |      |
| Lane LOS                          | E    |      | A      |                      |      |      |
| Approach Delay (s)                | 49.5 | 0.0  | 5.4    |                      |      |      |
| Approach LOS                      | E    |      |        |                      |      |      |
| Intersection Summary              |      |      |        |                      |      |      |
| Average Delay                     |      |      | 7.7    |                      |      |      |
| Intersection Capacity Utilization |      |      | 104.7% | ICU Level of Service |      | G    |
| Analysis Period (min)             |      |      | 15     |                      |      |      |

Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

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| Lane Group                 | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |
| Traffic Volume (vph)       | 20    | 391   | 47    | 1063  | 288   | 10    |
| Future Volume (vph)        | 20    | 391   | 47    | 1063  | 288   | 10    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.3   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   | 25.0  | 50.0  |       |       | 0.0   |
| Storage Lanes              | 1     | 1     | 1     |       |       | 0     |
| Taper Length (m)           | 7.5   |       | 75.0  |       |       |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Frt                        |       | 0.850 |       |       | 0.995 |       |
| Flt Protected              | 0.950 |       | 0.950 |       |       |       |
| Satd. Flow (prot)          | 1301  | 1345  | 1331  | 1745  | 1582  | 0     |
| Flt Permitted              | 0.950 |       | 0.509 |       |       |       |
| Satd. Flow (perm)          | 1301  | 1345  | 713   | 1745  | 1582  | 0     |
| Right Turn on Red          |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 391   |       |       | 3     |       |
| Link Speed (k/h)           | 40    |       |       | 80    | 80    |       |
| Link Distance (m)          | 154.2 |       |       | 243.1 | 545.7 |       |
| Travel Time (s)            | 13.9  |       |       | 10.9  | 24.6  |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 30%   | 10%   | 27%   | 2%    | 12%   | 10%   |
| Adj. Flow (vph)            | 20    | 391   | 47    | 1063  | 288   | 10    |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 20    | 391   | 47    | 1063  | 298   | 0     |
| Enter Blocked Intersection | No    | No    | No    | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left  | Left  | Left  | Right |
| Median Width(m)            | 3.5   |       |       | 3.5   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |       | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |       | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |
| Headway Factor             | 1.09  | 1.12  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25    |       |       | 15    |
| Number of Detectors        | 1     | 1     | 1     | 2     | 2     |       |
| Detector Template          | Left  | Right | Left  | Thru  | Thru  |       |
| Leading Detector (m)       | 2.0   | 2.0   | 2.0   | 10.0  | 10.0  |       |
| Trailing Detector (m)      | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Position(m)     | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Size(m)         | 2.0   | 2.0   | 2.0   | 0.6   | 0.6   |       |
| Detector 1 Type            | 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   |       |
| Detector 1 Queue (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Delay (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 2 Position(m)     |       |       |       | 9.4   | 9.4   |       |
| Detector 2 Size(m)         |       |       |       | 0.6   | 0.6   |       |
| Detector 2 Type            |       |       |       | Cl+Ex | Cl+Ex |       |
| Detector 2 Channel         |       |       |       |       |       |       |
| Detector 2 Extend (s)      |       |       |       | 0.0   | 0.0   |       |
| Turn Type                  | Prot  | Perm  | pm+pt | NA    | NA    |       |

Lanes, Volumes, Timings  
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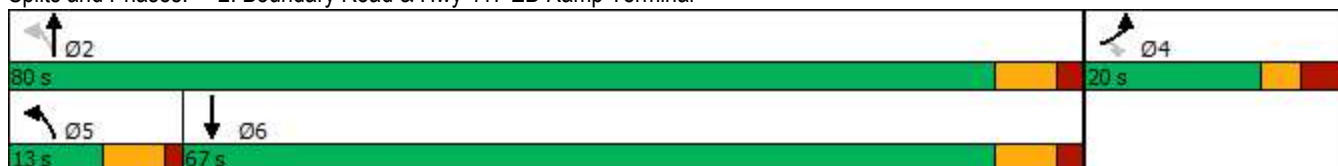
| Lane Group              | EBL   | EBR   | NBL   | NBT   | SBT   | SBR |
|-------------------------|-------|-------|-------|-------|-------|-----|
| Protected Phases        | 4     |       | 5     | 2     | 6     |     |
| Permitted Phases        |       | 4     | 2     |       |       |     |
| Detector Phase          | 4     | 4     | 5     | 2     | 6     |     |
| Switch Phase            |       |       |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0   | 7.0   | 35.0  | 35.0  |     |
| Minimum Split (s)       | 17.8  | 17.8  | 13.0  | 41.6  | 41.6  |     |
| Total Split (s)         | 20.0  | 20.0  | 13.0  | 80.0  | 67.0  |     |
| Total Split (%)         | 20.0% | 20.0% | 13.0% | 80.0% | 67.0% |     |
| Maximum Green (s)       | 13.2  | 13.2  | 7.0   | 73.4  | 60.4  |     |
| Yellow Time (s)         | 3.0   | 3.0   | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 3.8   | 3.8   | 1.4   | 2.0   | 2.0   |     |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     | 6.8   | 6.8   | 6.0   | 6.6   | 6.6   |     |
| Lead/Lag                |       |       | Lead  |       | Lag   |     |
| Lead-Lag Optimize?      |       |       | Yes   |       | Yes   |     |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |     |
| Recall Mode             | None  | None  | None  | Min   | Min   |     |
| Walk Time (s)           | 5.0   | 5.0   |       | 0.0   | 7.0   |     |
| Flash Dont Walk (s)     | 6.0   | 6.0   |       | 0.0   | 21.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0     |       | 0     | 0     |     |
| Act Effct Green (s)     | 9.2   | 9.2   | 51.5  | 50.8  | 44.0  |     |
| Actuated g/C Ratio      | 0.12  | 0.12  | 0.69  | 0.68  | 0.59  |     |
| v/c Ratio               | 0.12  | 0.77  | 0.08  | 0.89  | 0.32  |     |
| Control Delay           | 37.4  | 15.7  | 3.8   | 20.1  | 9.7   |     |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |     |
| Total Delay             | 37.4  | 15.7  | 3.8   | 20.1  | 9.7   |     |
| LOS                     | D     | B     | A     | C     | A     |     |
| Approach Delay          | 16.8  |       |       | 19.4  | 9.7   |     |
| Approach LOS            | B     |       |       | B     | A     |     |
| Queue Length 50th (m)   | 2.5   | 0.0   | 1.5   | 87.0  | 22.1  |     |
| Queue Length 95th (m)   | 10.9  | #35.3 | 5.0   | 200.8 | 42.6  |     |
| Internal Link Dist (m)  | 130.2 |       |       | 219.1 | 521.7 |     |
| Turn Bay Length (m)     |       | 25.0  | 50.0  |       |       |     |
| Base Capacity (vph)     | 245   | 571   | 556   | 1583  | 1313  |     |
| Starvation Cap Reductn  | 0     | 0     | 0     | 25    | 0     |     |
| Spillback Cap Reductn   | 0     | 0     | 0     | 0     | 0     |     |
| Storage Cap Reductn     | 0     | 0     | 0     | 0     | 0     |     |
| Reduced v/c Ratio       | 0.08  | 0.68  | 0.08  | 0.68  | 0.23  |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 74.2             |
| Natural Cycle:                     | 90               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.89             |
| Intersection Signal Delay:         | 17.2             |
| Intersection LOS:                  | B                |
| Intersection Capacity Utilization: | 76.1%            |
| 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: 2: Boundary Road & Hwy 417 EB Ramp Terminal



Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

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|                            |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |   |  |   |   |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)       | 59  | 18  | 10  | 4   | 6   | 28  | 21   | 1023  | 33  | 213   | 346   | 118   |
| Future Volume (vph)        | 59  | 18  | 10  | 4   | 6   | 28  | 21   | 1023  | 33  | 213   | 346   | 118   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800   | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.3  | 3.5   | 3.3   | 3.3   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   |   | 15.0  | 0.0   |   | 0.0   | 35.0   |   | 7.5   | 100.0   |   | 35.0  |
| Storage Lanes              | 0   |   | 0   | 0   |   | 1   | 1  |   | 1   | 1   |   | 0   |
| Taper Length (m)           | 7.5   |   |   | 7.5   |   |   | 45.0   |   |   | 75.0  |   |   |
| 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  |
| Fr <sub>t</sub>            |   | 0.984   |   |   |   | 0.850   |  |   | 0.850   |   | 0.962   |   |
| Fl <sub>t</sub> Protected  |   | 0.967   |   |   | 0.980   |   | 0.950  |   |   | 0.950   |   |   |
| Satd. Flow (prot)          | 0   | 1542  | 0   | 0   | 1744  | 1513  | 1589   | 1728  | 1479  | 1653  | 1467  | 0   |
| Fl <sub>t</sub> Permitted  |   | 0.791   |   |   | 0.876   |   | 0.496  |   |   | 0.066   |   |   |
| Satd. Flow (perm)          | 0   | 1261  | 0   | 0   | 1559  | 1513  | 830  | 1728  | 1479  | 115   | 1467  | 0   |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |  |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 6   |   |   |   | 100   |  |   | 96  |   |   | 40  |
| Link Speed (k/h)           |   | 60  |   |   | 20  |   |  | 80  |   |   |   | 80  |
| Link Distance (m)          |   | 198.6   |   |   | 170.6   |   |  | 174.7   |   |   |   | 243.1   |
| Travel Time (s)            |   | 11.9  |   |   | 30.7  |   |  | 7.9   |   |   |   | 10.9  |
| 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 (%)         | 13%   | 0%  | 9%  | 0%  | 0%  | 0%  | 4%   | 3%  | 0%  | 0%  | 16%   | 19%   |
| Adj. Flow (vph)            | 59  | 18  | 10  | 4   | 6   | 28  | 21   | 1023  | 33  | 213   | 346   | 118   |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Group Flow (vph)      | 0   | 87  | 0   | 0   | 10  | 28  | 21   | 1023  | 33  | 213   | 464   | 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   |   |  | 3.5   |   |   | 3.5   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |  | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.8   |   |   | 4.8   |   |  | 4.8   |   |   | 4.8   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |  |   |   |   |   |   |
| Headway Factor             | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.12   | 1.09  | 1.12  | 1.12  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25  |   | 15  | 25  |   | 15  | 25   |   | 15  | 25  |   | 15  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   | 1   | 1  | 2   | 1   | 1   | 2   |   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  | Right   | Left   | Thru  | Right   | Left  | Thru  |   |
| Leading Detector (m)       | 2.0   | 10.0  |   | 2.0   | 10.0  | 2.0   | 2.0  | 10.0  | 2.0   | 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   | 0.6   | 2.0   | 2.0  | 0.6   | 2.0   | 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                  | Perm  | NA  |   | Perm  | NA  | Perm  | Perm   | NA  | Perm  | pm+pt   | NA  |   |

Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

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| Lane Group              | EBL   | EBT   | EBR | WBL   | WBT   | WBR   | NBL   | NBT    | NBR   | SBL   | SBT   | SBR |
|-------------------------|-------|-------|-----|-------|-------|-------|-------|--------|-------|-------|-------|-----|
| Protected Phases        |       | 4     |     |       | 8     |       |       | 2      |       | 1     | 6     |     |
| Permitted Phases        | 4     |       |     | 8     |       | 8     | 2     |        | 2     | 6     |       |     |
| Detector Phase          | 4     | 4     |     | 8     | 8     | 8     | 2     | 2      | 2     | 1     | 6     |     |
| Switch Phase            |       |       |     |       |       |       |       |        |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 20.0  | 20.0   | 20.0  | 7.0   | 20.0  |     |
| Minimum Split (s)       | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 26.2  | 26.2   | 26.2  | 13.0  | 26.2  |     |
| Total Split (s)         | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 60.5  | 60.5   | 60.5  | 14.7  | 75.2  |     |
| Total Split (%)         | 24.8% | 24.8% |     | 24.8% | 24.8% | 24.8% | 60.5% | 60.5%  | 60.5% | 14.7% | 75.2% |     |
| Maximum Green (s)       | 19.0  | 19.0  |     | 19.0  | 19.0  | 19.0  | 54.3  | 54.3   | 54.3  | 8.7   | 69.0  |     |
| Yellow Time (s)         | 3.7   | 3.7   |     | 3.7   | 3.7   | 3.7   | 4.6   | 4.6    | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 2.1   | 2.1   |     | 2.1   | 2.1   | 2.1   | 1.6   | 1.6    | 1.6   | 1.4   | 1.6   |     |
| Lost Time Adjust (s)    |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     |       | 5.8   |     |       | 5.8   | 5.8   | 6.2   | 6.2    | 6.2   | 6.0   | 6.2   |     |
| Lead/Lag                |       |       |     |       |       |       | Lag   | Lag    | Lag   | Lead  |       |     |
| 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  | Min   | Min    | Min   | None  | Min   |     |
| Walk Time (s)           | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 7.0   | 7.0    | 7.0   |       | 7.0   |     |
| Flash Dont Walk (s)     | 12.0  | 12.0  |     | 12.0  | 12.0  | 12.0  | 10.0  | 10.0   | 10.0  |       | 10.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0     |     | 0     | 0     | 0     | 0     | 0      | 0     |       | 0     |     |
| Act Effct Green (s)     |       | 11.4  |     |       | 11.4  | 11.4  | 54.8  | 54.8   | 54.8  | 69.8  | 71.1  |     |
| Actuated g/C Ratio      |       | 0.13  |     |       | 0.13  | 0.13  | 0.61  | 0.61   | 0.61  | 0.78  | 0.79  |     |
| v/c Ratio               |       | 0.53  |     |       | 0.05  | 0.10  | 0.04  | 0.97   | 0.04  | 0.89  | 0.40  |     |
| Control Delay           |       | 47.3  |     |       | 35.2  | 0.7   | 9.6   | 42.8   | 0.1   | 60.8  | 5.3   |     |
| Queue Delay             |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Delay             |       | 47.3  |     |       | 35.2  | 0.7   | 9.6   | 42.8   | 0.1   | 60.8  | 5.3   |     |
| LOS                     |       | D     |     |       | D     | A     | A     | D      | A     | E     | A     |     |
| Approach Delay          |       | 47.3  |     |       | 9.8   |       |       | 40.8   |       |       | 22.8  |     |
| Approach LOS            |       | D     |     |       | A     |       |       | D      |       |       | C     |     |
| Queue Length 50th (m)   |       | 14.4  |     |       | 1.7   | 0.0   | 1.5   | ~180.4 | 0.0   | 24.4  | 23.0  |     |
| Queue Length 95th (m)   |       | 29.7  |     |       | 6.5   | 0.0   | 5.4   | #304.8 | 0.0   | #75.0 | 49.1  |     |
| Internal Link Dist (m)  |       | 174.6 |     |       | 146.6 |       |       | 150.7  |       |       | 219.1 |     |
| Turn Bay Length (m)     |       |       |     |       |       |       | 35.0  |        | 7.5   | 100.0 |       |     |
| Base Capacity (vph)     |       | 273   |     |       | 331   | 400   | 504   | 1051   | 937   | 238   | 1166  |     |
| Starvation Cap Reductn  |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Spillback Cap Reductn   |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Storage Cap Reductn     |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Reduced v/c Ratio       |       | 0.32  |     |       | 0.03  | 0.07  | 0.04  | 0.97   | 0.04  | 0.89  | 0.40  |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 90               |
| Natural Cycle:                     | 110              |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.97             |
| Intersection Signal Delay:         | 34.0             |
| Intersection LOS:                  | C                |
| Intersection Capacity Utilization: | 96.0%            |
| ICU Level of Service:              | F                |
| Analysis Period (min):             | 15               |



Lanes, Volumes, Timings  
 3: Boundary Road & Thunder Road/Amazon Way

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
















- ~ 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: 3: Boundary Road & Thunder Road/Amazon Way

|   |   |   |
|---|---|---|
| <br>Ø1 | <br>Ø2 | <br>Ø4 |
| 14.7 s  | 60.5 s  | 24.8 s  |
| <br>Ø6 |   | <br>Ø8 |
| 75.2 s  |   | 24.8 s  |



















Lanes, Volumes, Timings  
4: Boundary Road & Site Access/South Amazon Access

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|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group                        | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |  |  |   |  |  |   |
| Traffic Volume (vph)              | 1   | 0   | 4   | 6   | 0   | 4   | 14  | 1073  | 6   | 1   | 341   | 17  |
| Future Volume (vph)               | 1   | 0   | 4   | 6   | 0   | 4   | 14  | 1073  | 6   | 1   | 341   | 17  |
| Ideal Flow (vphpl)                | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)                    | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.6   |
| Storage Length (m)                | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 15.0  |   | 0.0   | 70.0  |   | 0.0   |
| Storage Lanes                     | 0   |   | 0   | 0   |   | 0   | 1   |   | 0   | 1   |   | 0   |
| Taper Length (m)                  | 7.5   |   |   | 7.5   |   |   | 45.0  |   |   | 45.0  |   |   |
| 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  |
| Frt                               |   | 0.892   |   |   | 0.946   |   |   | 0.999   |   |   | 0.993   |   |
| Flt Protected                     |   | 0.990   |   |   | 0.971   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)                 | 0   | 1572  | 0   | 0   | 818   | 0   | 1691  | 1751  | 0   | 846   | 1586  | 0   |
| Flt Permitted                     |   | 0.990   |   |   | 0.971   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (perm)                 | 0   | 1572  | 0   | 0   | 818   | 0   | 1691  | 1751  | 0   | 846   | 1586  | 0   |
| Link Speed (k/h)                  |   | 50  |   |   | 20  |   |   | 80  |   |   | 80  |   |
| Link Distance (m)                 |   | 105.7   |   |   | 151.5   |   |   | 1150.2  |   |   | 174.7   |   |
| Travel Time (s)                   |   | 7.6   |   |   | 27.3  |   |   | 51.8  |   |   | 7.9   |   |
| 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 (%)                | 0%  | 0%  | 0%  | 100%  | 0%  | 100%  | 0%  | 1%  | 100%  | 100%  | 12%   | 0%  |
| Adj. Flow (vph)                   | 1   | 0   | 4   | 6   | 0   | 4   | 14  | 1073  | 6   | 1   | 341   | 17  |
| Shared Lane Traffic (%)           |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)             | 0   | 5   | 0   | 0   | 10  | 0   | 14  | 1079  | 0   | 1   | 358   | 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   |   |   | 3.5   |   |   | 3.5   |   |
| Link Offset(m)                    |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)                |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |
| 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  | 1.07  |
| Turning Speed (k/h)               | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  |
| Sign Control                      |   | Stop  |   |   | Stop  |   |   | Free  |   |   | Free  |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |   |   |   |   |   |   |
| Area Type:                        | Other   |   |   |   |   |   |   |   |   |   |   |   |
| Control Type:                     | Unsignalized  |   |   |   |   |   |   |   |   |   |   |   |
| Intersection Capacity Utilization | 70.0%   |   |   |   |   |   | ICU Level of Service C  |   |   |   |   |   |
| Analysis Period (min)             | 15  |   |   |   |   |   |   |   |   |   |   |   |

HCM Unsignalized Intersection Capacity Analysis  
 4: Boundary Road & Site Access/South Amazon Access

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|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |  |  |   |  |  |   |
| Traffic Volume (veh/h)            | 1   | 0   | 4   | 6   | 0   | 4   | 14  | 1073  | 6   | 1   | 341   | 17  |
| Future Volume (Veh/h)             | 1   | 0   | 4   | 6   | 0   | 4   | 14  | 1073  | 6   | 1   | 341   | 17  |
| Sign Control                      |   | Stop  |   |   | Stop  |   |   | Free  |   |   | Free  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |   | 0%  |   |   | 0%  |   |
| 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  |
| Hourly flow rate (vph)            | 1   | 0   | 4   | 6   | 0   | 4   | 14  | 1073  | 6   | 1   | 341   | 17  |
| Pedestrians                       |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Width (m)                    |   |   |   |   |   |   |   |   |   |   |   |   |
| Walking Speed (m/s)               |   |   |   |   |   |   |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |   |   |   |   |   |   |
| Median type                       |   |   |   |   |   |   |   | None  |   |   |   | None  |
| Median storage (veh)              |   |   |   |   |   |   |   |   |   |   |   |   |
| Upstream signal (m)               |   |   |   |   |   |   |   |   |   |   |   | 175   |
| pX, platoon unblocked             | 0.96  | 0.96  | 0.96  | 0.96  | 0.96  |   | 0.96  |   |   |   |   |   |
| vC, conflicting volume            | 1456  | 1458  | 350   | 1451  | 1464  | 1076  | 358   |   |   | 1079  |   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vCu, unblocked vol                | 1455  | 1457  | 305   | 1449  | 1463  | 1076  | 314   |   |   | 1079  |   |   |
| tC, single (s)                    | 7.1   | 6.5   | 6.2   | 8.1   | 6.5   | 7.2   | 4.1   |   |   | 5.1   |   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |   |   |   |   |   |   |
| tF (s)                            | 3.5   | 4.0   | 3.3   | 4.4   | 4.0   | 4.2   | 2.2   |   |   | 3.1   |   |   |
| p0 queue free %                   | 99  | 100   | 99  | 91  | 100   | 98  | 99  |   |   | 100   |   |   |
| cM capacity (veh/h)               | 101   | 124   | 712   | 63  | 123   | 175   | 1211  |   |   | 387   |   |   |
| Direction, Lane #                 | EB 1  | WB 1  | NB 1  | NB 2  | SB 1  | SB 2  |   |   |   |   |   |   |
| Volume Total                      | 5   | 10  | 14  | 1079  | 1   | 358   |   |   |   |   |   |   |
| Volume Left                       | 1   | 6   | 14  | 0   | 1   | 0   |   |   |   |   |   |   |
| Volume Right                      | 4   | 4   | 0   | 6   | 0   | 17  |   |   |   |   |   |   |
| cSH                               | 323   | 85  | 1211  | 1700  | 387   | 1700  |   |   |   |   |   |   |
| Volume to Capacity                | 0.02  | 0.12  | 0.01  | 0.63  | 0.00  | 0.21  |   |   |   |   |   |   |
| Queue Length 95th (m)             | 0.4   | 3.1   | 0.3   | 0.0   | 0.1   | 0.0   |   |   |   |   |   |   |
| Control Delay (s)                 | 16.3  | 52.8  | 8.0   | 0.0   | 14.3  | 0.0   |   |   |   |   |   |   |
| Lane LOS                          | C   | F   | A   |   | B   |   |   |   |   |   |   |   |
| Approach Delay (s)                | 16.3  | 52.8  | 0.1   |   | 0.0   |   |   |   |   |   |   |   |
| Approach LOS                      | C   | F   |   |   |   |   |   |   |   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |   |   |   |   |   |   |
| Average Delay                     |   |   | 0.5   |   |   |   |   |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 70.0%   |   | ICU Level of Service  |   |   |   |   | C   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |   |   |   |   |   |   |

Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road

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| Lane Group                 | EBL   | EBR   | NBL  | NBT   | SBT    | SBR   |
|----------------------------|-------|-------|------|-------|--------|-------|
| Lane Configurations        |       |       |      |       |        |       |
| Traffic Volume (vph)       | 91    | 33    | 147  | 983   | 146    | 119   |
| Future Volume (vph)        | 91    | 33    | 147  | 983   | 146    | 119   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800   | 1800  |
| Lane Width (m)             | 3.3   | 3.3   | 3.5  | 3.5   | 3.5    | 3.5   |
| Storage Length (m)         | 25.0  | 0.0   | 0.0  |       |        | 30.0  |
| Storage Lanes              | 1     | 1     | 0    |       |        | 1     |
| Taper Length (m)           | 47.5  |       | 7.5  |       |        |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |      |       |        | 0.850 |
| Fl <sub>t</sub> Protected  | 0.950 |       |      | 0.994 |        |       |
| Satd. Flow (prot)          | 1489  | 1286  | 0    | 1736  | 1575   | 1293  |
| Fl <sub>t</sub> Permitted  | 0.950 |       |      | 0.994 |        |       |
| Satd. Flow (perm)          | 1489  | 1286  | 0    | 1736  | 1575   | 1293  |
| Link Speed (k/h)           | 80    |       |      | 80    | 80     |       |
| Link Distance (m)          | 180.5 |       |      | 135.8 | 1150.2 |       |
| Travel Time (s)            | 8.1   |       |      | 6.1   | 51.8   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Heavy Vehicles (%)         | 11%   | 15%   | 8%   | 1%    | 13%    | 17%   |
| Adj. Flow (vph)            | 91    | 33    | 147  | 983   | 146    | 119   |
| Shared Lane Traffic (%)    |       |       |      |       |        |       |
| Lane Group Flow (vph)      | 91    | 33    | 0    | 1130  | 146    | 119   |
| Enter Blocked Intersection | No    | No    | No   | No    | No     | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left   | Right |
| Median Width(m)            | 3.3   |       |      | 3.5   | 3.5    |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0    |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8    |       |
| Two way Left Turn Lane     |       |       |      |       |        |       |
| Headway Factor             | 1.12  | 1.12  | 1.09 | 1.09  | 1.09   | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25   |       |        | 15    |
| Sign Control               | Stop  |       |      | Free  | Free   |       |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 86.6%        |
| ICU Level of Service              | E            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
5: Boundary Road & Mitch Owens Road

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| Movement                          | EBL         | EBR         | NBL         | NBT                  | SBT         | SBR  |
|-----------------------------------|-------------|-------------|-------------|----------------------|-------------|------|
| Lane Configurations               |             |             |             |                      |             |      |
| Traffic Volume (veh/h)            | 91          | 33          | 147         | 983                  | 146         | 119  |
| Future Volume (Veh/h)             | 91          | 33          | 147         | 983                  | 146         | 119  |
| Sign Control                      | Stop        |             |             | Free                 | Free        |      |
| Grade                             | 0%          |             |             | 0%                   | 0%          |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00        | 1.00 |
| Hourly flow rate (vph)            | 91          | 33          | 147         | 983                  | 146         | 119  |
| <b>Pedestrians</b>                |             |             |             |                      |             |      |
| Lane Width (m)                    |             |             |             |                      |             |      |
| Walking Speed (m/s)               |             |             |             |                      |             |      |
| Percent Blockage                  |             |             |             |                      |             |      |
| Right turn flare (veh)            |             |             |             |                      |             |      |
| Median type                       |             |             |             | None                 | None        |      |
| Median storage (veh)              |             |             |             |                      |             |      |
| Upstream signal (m)               |             |             |             |                      |             |      |
| pX, platoon unblocked             |             |             |             |                      |             |      |
| vC, conflicting volume            | 1423        | 146         | 265         |                      |             |      |
| vC1, stage 1 conf vol             |             |             |             |                      |             |      |
| vC2, stage 2 conf vol             |             |             |             |                      |             |      |
| vCu, unblocked vol                | 1423        | 146         | 265         |                      |             |      |
| tC, single (s)                    | 6.5         | 6.4         | 4.2         |                      |             |      |
| tC, 2 stage (s)                   |             |             |             |                      |             |      |
| tF (s)                            | 3.6         | 3.4         | 2.3         |                      |             |      |
| p0 queue free %                   | 28          | 96          | 88          |                      |             |      |
| cM capacity (veh/h)               | 126         | 868         | 1265        |                      |             |      |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>EB 2</b> | <b>NB 1</b> | <b>SB 1</b>          | <b>SB 2</b> |      |
| Volume Total                      | 91          | 33          | 1130        | 146                  | 119         |      |
| Volume Left                       | 91          | 0           | 147         | 0                    | 0           |      |
| Volume Right                      | 0           | 33          | 0           | 0                    | 119         |      |
| cSH                               | 126         | 868         | 1265        | 1700                 | 1700        |      |
| Volume to Capacity                | 0.72        | 0.04        | 0.12        | 0.09                 | 0.07        |      |
| Queue Length 95th (m)             | 32.3        | 0.9         | 3.1         | 0.0                  | 0.0         |      |
| Control Delay (s)                 | 85.3        | 9.3         | 3.0         | 0.0                  | 0.0         |      |
| Lane LOS                          | F           | A           | A           |                      |             |      |
| Approach Delay (s)                | 65.1        |             | 3.0         | 0.0                  |             |      |
| Approach LOS                      | F           |             |             |                      |             |      |
| <b>Intersection Summary</b>       |             |             |             |                      |             |      |
| Average Delay                     |             |             | 7.6         |                      |             |      |
| Intersection Capacity Utilization |             |             | 86.6%       | ICU Level of Service | E           |      |
| Analysis Period (min)             |             |             | 15          |                      |             |      |

Lanes, Volumes, Timings  
6: Site Access A & Thunder Road

2030 Future Total AM  
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| Lane Group                 | EBT   | EBR   | WBL  | WBT   | NBL   | NBR   |
|----------------------------|-------|-------|------|-------|-------|-------|
| Lane Configurations        |       |       |      |       |       |       |
| Traffic Volume (vph)       | 71    | 0     | 38   | 107   | 0     | 16    |
| Future Volume (vph)        | 71    | 0     | 38   | 107   | 0     | 16    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5  | 3.5   | 3.5   | 3.5   |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Flt                        |       |       |      |       | 0.865 |       |
| Flt Protected              |       |       |      | 0.987 |       |       |
| Satd. Flow (prot)          | 1604  | 0     | 0    | 1502  | 1466  | 0     |
| Flt Permitted              |       |       |      | 0.987 |       |       |
| Satd. Flow (perm)          | 1604  | 0     | 0    | 1502  | 1466  | 0     |
| Link Speed (k/h)           | 60    |       |      | 50    | 50    |       |
| Link Distance (m)          | 163.7 |       |      | 198.6 | 103.6 |       |
| Travel Time (s)            | 9.8   |       |      | 14.3  | 7.5   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 11%   | 0%    | 0%   | 23%   | 0%    | 5%    |
| Adj. Flow (vph)            | 71    | 0     | 38   | 107   | 0     | 16    |
| Shared Lane Traffic (%)    |       |       |      |       |       |       |
| Lane Group Flow (vph)      | 71    | 0     | 0    | 145   | 16    | 0     |
| Enter Blocked Intersection | No    | No    | No   | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left  | Right |
| Median Width(m)            | 0.0   |       |      | 0.0   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |      |       |       |       |
| Headway Factor             | 1.09  | 1.09  | 1.09 | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        |       | 15    | 25   |       | 25    | 15    |
| Sign Control               | Free  |       |      | Free  | Stop  |       |

Intersection Summary

|                                   |                        |
|-----------------------------------|------------------------|
| Area Type:                        | Other                  |
| Control Type:                     | Unsignalized           |
| Intersection Capacity Utilization | 24.8%                  |
| Analysis Period (min)             | 15                     |
|                                   | ICU Level of Service A |

HCM Unsignalized Intersection Capacity Analysis  
6: Site Access A & Thunder Road

2030 Future Total AM  
08-06-2021



| Movement                          | EBT         | EBR         | WBL         | WBT                  | NBL  | NBR  |
|-----------------------------------|-------------|-------------|-------------|----------------------|------|------|
| Lane Configurations               | ↩           |             |             | ↩                    | ↩    |      |
| Traffic Volume (veh/h)            | 71          | 0           | 38          | 107                  | 0    | 16   |
| Future Volume (Veh/h)             | 71          | 0           | 38          | 107                  | 0    | 16   |
| Sign Control                      | Free        |             |             | Free                 | Stop |      |
| Grade                             | 0%          |             |             | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 71          | 0           | 38          | 107                  | 0    | 16   |
| <b>Pedestrians</b>                |             |             |             |                      |      |      |
| Lane Width (m)                    |             |             |             |                      |      |      |
| Walking Speed (m/s)               |             |             |             |                      |      |      |
| Percent Blockage                  |             |             |             |                      |      |      |
| Right turn flare (veh)            |             |             |             |                      |      |      |
| Median type                       | None        |             |             | None                 |      |      |
| Median storage (veh)              |             |             |             |                      |      |      |
| Upstream signal (m)               | 199         |             |             |                      |      |      |
| pX, platoon unblocked             |             |             |             |                      |      |      |
| vC, conflicting volume            |             |             | 71          |                      | 254  | 71   |
| vC1, stage 1 conf vol             |             |             |             |                      |      |      |
| vC2, stage 2 conf vol             |             |             |             |                      |      |      |
| vCu, unblocked vol                |             |             | 71          |                      | 254  | 71   |
| tC, single (s)                    |             |             | 4.1         |                      | 6.4  | 6.2  |
| tC, 2 stage (s)                   |             |             |             |                      |      |      |
| tF (s)                            |             |             | 2.2         |                      | 3.5  | 3.3  |
| p0 queue free %                   |             |             | 98          |                      | 100  | 98   |
| cM capacity (veh/h)               |             |             | 1542        |                      | 721  | 983  |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>WB 1</b> | <b>NB 1</b> |                      |      |      |
| Volume Total                      | 71          | 145         | 16          |                      |      |      |
| Volume Left                       | 0           | 38          | 0           |                      |      |      |
| Volume Right                      | 0           | 0           | 16          |                      |      |      |
| cSH                               | 1700        | 1542        | 983         |                      |      |      |
| Volume to Capacity                | 0.04        | 0.02        | 0.02        |                      |      |      |
| Queue Length 95th (m)             | 0.0         | 0.6         | 0.4         |                      |      |      |
| Control Delay (s)                 | 0.0         | 2.1         | 8.7         |                      |      |      |
| Lane LOS                          |             | A           | A           |                      |      |      |
| Approach Delay (s)                | 0.0         | 2.1         | 8.7         |                      |      |      |
| Approach LOS                      |             |             | A           |                      |      |      |
| <b>Intersection Summary</b>       |             |             |             |                      |      |      |
| Average Delay                     |             |             | 1.9         |                      |      |      |
| Intersection Capacity Utilization |             |             | 24.8%       | ICU Level of Service | A    |      |
| Analysis Period (min)             |             |             | 15          |                      |      |      |

Lanes, Volumes, Timings  
7: Site Access B & Thunder Road

2030 Future Total AM  
08-06-2021



| Lane Group                 | EBT   | EBR   | WBL  | WBT   | NBL   | NBR   |
|----------------------------|-------|-------|------|-------|-------|-------|
| Lane Configurations        |       |       |      |       |       |       |
| Traffic Volume (vph)       | 68    | 0     | 11   | 96    | 0     | 3     |
| Future Volume (vph)        | 68    | 0     | 11   | 96    | 0     | 3     |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5  | 3.5   | 3.5   | 3.5   |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Flt                        |       |       |      |       | 0.865 |       |
| Flt Protected              |       |       |      | 0.995 |       |       |
| Satd. Flow (prot)          | 1679  | 0     | 0    | 1474  | 770   | 0     |
| Flt Permitted              |       |       |      | 0.995 |       |       |
| Satd. Flow (perm)          | 1679  | 0     | 0    | 1474  | 770   | 0     |
| Link Speed (k/h)           | 60    |       |      | 50    | 50    |       |
| Link Distance (m)          | 185.0 |       |      | 163.7 | 105.8 |       |
| Travel Time (s)            | 11.1  |       |      | 11.8  | 7.6   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 6%    | 0%    | 100% | 11%   | 0%    | 100%  |
| Adj. Flow (vph)            | 68    | 0     | 11   | 96    | 0     | 3     |
| Shared Lane Traffic (%)    |       |       |      |       |       |       |
| Lane Group Flow (vph)      | 68    | 0     | 0    | 107   | 3     | 0     |
| Enter Blocked Intersection | No    | No    | No   | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left  | Right |
| Median Width(m)            | 0.0   |       |      | 0.0   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |      |       |       |       |
| Headway Factor             | 1.09  | 1.09  | 1.09 | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        |       | 15    | 25   |       | 25    | 15    |
| Sign Control               | Free  |       |      | Free  | Stop  |       |

Intersection Summary

|                                   |                        |
|-----------------------------------|------------------------|
| Area Type:                        | Other                  |
| Control Type:                     | Unsignalized           |
| Intersection Capacity Utilization | 22.6%                  |
| Analysis Period (min)             | 15                     |
|                                   | ICU Level of Service A |



HCM Unsignalized Intersection Capacity Analysis  
7: Site Access B & Thunder Road

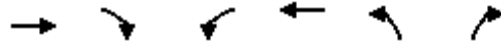
2030 Future Total AM  
08-06-2021



| Movement                          | EBT         | EBR         | WBL         | WBT                  | NBL  | NBR  |
|-----------------------------------|-------------|-------------|-------------|----------------------|------|------|
| Lane Configurations               | →           |             |             | ←                    | ↘    | ↙    |
| Traffic Volume (veh/h)            | 68          | 0           | 11          | 96                   | 0    | 3    |
| Future Volume (Veh/h)             | 68          | 0           | 11          | 96                   | 0    | 3    |
| Sign Control                      | Free        |             |             | Free                 | Stop |      |
| Grade                             | 0%          |             |             | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 68          | 0           | 11          | 96                   | 0    | 3    |
| <b>Pedestrians</b>                |             |             |             |                      |      |      |
| Lane Width (m)                    |             |             |             |                      |      |      |
| Walking Speed (m/s)               |             |             |             |                      |      |      |
| Percent Blockage                  |             |             |             |                      |      |      |
| Right turn flare (veh)            |             |             |             |                      |      |      |
| Median type                       | None        |             |             | None                 |      |      |
| Median storage (veh)              |             |             |             |                      |      |      |
| Upstream signal (m)               | 362         |             |             |                      |      |      |
| pX, platoon unblocked             |             |             |             |                      |      |      |
| vC, conflicting volume            |             |             | 68          | 186                  |      | 68   |
| vC1, stage 1 conf vol             |             |             |             |                      |      |      |
| vC2, stage 2 conf vol             |             |             |             |                      |      |      |
| vCu, unblocked vol                |             |             | 68          | 186                  |      | 68   |
| tC, single (s)                    |             |             | 5.1         | 6.4                  |      | 7.2  |
| tC, 2 stage (s)                   |             |             |             |                      |      |      |
| tF (s)                            |             |             | 3.1         | 3.5                  |      | 4.2  |
| p0 queue free %                   |             |             | 99          | 100                  |      | 100  |
| cM capacity (veh/h)               |             |             | 1086        | 800                  |      | 778  |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>WB 1</b> | <b>NB 1</b> |                      |      |      |
| Volume Total                      | 68          | 107         | 3           |                      |      |      |
| Volume Left                       | 0           | 11          | 0           |                      |      |      |
| Volume Right                      | 0           | 0           | 3           |                      |      |      |
| cSH                               | 1700        | 1086        | 778         |                      |      |      |
| Volume to Capacity                | 0.04        | 0.01        | 0.00        |                      |      |      |
| Queue Length 95th (m)             | 0.0         | 0.2         | 0.1         |                      |      |      |
| Control Delay (s)                 | 0.0         | 0.9         | 9.6         |                      |      |      |
| Lane LOS                          |             |             | A           |                      | A    |      |
| Approach Delay (s)                | 0.0         | 0.9         | 9.6         |                      |      |      |
| Approach LOS                      |             |             | A           |                      |      |      |
| <b>Intersection Summary</b>       |             |             |             |                      |      |      |
| Average Delay                     |             |             | 0.7         |                      |      |      |
| Intersection Capacity Utilization |             |             | 22.6%       | ICU Level of Service |      | A    |
| Analysis Period (min)             |             |             | 15          |                      |      |      |

Lanes, Volumes, Timings  
8: Site Access C & Thunder Road

2030 Future Total AM  
08-06-2021



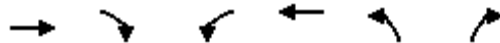
| Lane Group                 | EBT  | EBR   | WBL  | WBT   | NBL   | NBR   |
|----------------------------|------|-------|------|-------|-------|-------|
| Lane Configurations        |      |       |      |       |       |       |
| Traffic Volume (vph)       | 61   | 0     | 23   | 73    | 0     | 7     |
| Future Volume (vph)        | 61   | 0     | 23   | 73    | 0     | 7     |
| Ideal Flow (vphpl)         | 1800 | 1800  | 1800 | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5  | 3.5   | 3.5  | 3.5   | 3.5   | 3.5   |
| Lane Util. Factor          | 1.00 | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Flt                        |      |       |      |       | 0.865 |       |
| Flt Protected              |      |       |      | 0.988 |       |       |
| Satd. Flow (prot)          | 1695 | 0     | 0    | 1579  | 1351  | 0     |
| Flt Permitted              |      |       |      | 0.988 |       |       |
| Satd. Flow (perm)          | 1695 | 0     | 0    | 1579  | 1351  | 0     |
| Link Speed (k/h)           | 60   |       |      | 50    | 50    |       |
| Link Distance (m)          | 95.5 |       |      | 185.0 | 109.7 |       |
| Travel Time (s)            | 5.7  |       |      | 13.3  | 7.9   |       |
| Peak Hour Factor           | 1.00 | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 5%   | 0%    | 22%  | 8%    | 0%    | 14%   |
| Adj. Flow (vph)            | 61   | 0     | 23   | 73    | 0     | 7     |
| Shared Lane Traffic (%)    |      |       |      |       |       |       |
| Lane Group Flow (vph)      | 61   | 0     | 0    | 96    | 7     | 0     |
| Enter Blocked Intersection | No   | No    | No   | No    | No    | No    |
| Lane Alignment             | Left | Right | Left | Left  | Left  | Right |
| Median Width(m)            | 0.0  |       |      | 0.0   | 3.5   |       |
| Link Offset(m)             | 0.0  |       |      | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8  |       |      | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |      |       |      |       |       |       |
| Headway Factor             | 1.09 | 1.09  | 1.09 | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        |      | 15    | 25   |       | 25    | 15    |
| Sign Control               | Free |       |      | Free  | Stop  |       |

Intersection Summary

|                                   |                        |
|-----------------------------------|------------------------|
| Area Type:                        | Other                  |
| Control Type:                     | Unsignalized           |
| Intersection Capacity Utilization | 22.1%                  |
| Analysis Period (min)             | 15                     |
|                                   | ICU Level of Service A |

HCM Unsignalized Intersection Capacity Analysis  
8: Site Access C & Thunder Road

2030 Future Total AM  
08-06-2021



| Movement                          | EBT  | EBR  | WBL   | WBT                  | NBL  | NBR  |
|-----------------------------------|------|------|-------|----------------------|------|------|
| Lane Configurations               | →    |      |       | ←                    | ↘    | ↙    |
| Traffic Volume (veh/h)            | 61   | 0    | 23    | 73                   | 0    | 7    |
| Future Volume (Veh/h)             | 61   | 0    | 23    | 73                   | 0    | 7    |
| Sign Control                      | Free |      |       | Free                 | Stop |      |
| Grade                             | 0%   |      |       | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00 | 1.00 | 1.00  | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 61   | 0    | 23    | 73                   | 0    | 7    |
| Pedestrians                       |      |      |       |                      |      |      |
| Lane Width (m)                    |      |      |       |                      |      |      |
| Walking Speed (m/s)               |      |      |       |                      |      |      |
| Percent Blockage                  |      |      |       |                      |      |      |
| Right turn flare (veh)            |      |      |       |                      |      |      |
| Median type                       | None |      | None  |                      |      |      |
| Median storage (veh)              |      |      |       |                      |      |      |
| Upstream signal (m)               |      |      |       |                      |      |      |
| pX, platoon unblocked             |      |      |       |                      |      |      |
| vC, conflicting volume            |      |      | 61    | 180                  | 61   |      |
| vC1, stage 1 conf vol             |      |      |       |                      |      |      |
| vC2, stage 2 conf vol             |      |      |       |                      |      |      |
| vCu, unblocked vol                |      |      | 61    | 180                  | 61   |      |
| tC, single (s)                    |      |      | 4.3   | 6.4                  | 6.3  |      |
| tC, 2 stage (s)                   |      |      |       |                      |      |      |
| tF (s)                            |      |      | 2.4   | 3.5                  | 3.4  |      |
| p0 queue free %                   |      |      | 98    | 100                  | 99   |      |
| cM capacity (veh/h)               |      |      | 1424  | 801                  | 971  |      |
| Direction, Lane #                 | EB 1 | WB 1 | NB 1  |                      |      |      |
| Volume Total                      | 61   | 96   | 7     |                      |      |      |
| Volume Left                       | 0    | 23   | 0     |                      |      |      |
| Volume Right                      | 0    | 0    | 7     |                      |      |      |
| cSH                               | 1700 | 1424 | 971   |                      |      |      |
| Volume to Capacity                | 0.04 | 0.02 | 0.01  |                      |      |      |
| Queue Length 95th (m)             | 0.0  | 0.4  | 0.2   |                      |      |      |
| Control Delay (s)                 | 0.0  | 1.9  | 8.7   |                      |      |      |
| Lane LOS                          |      |      | A     | A                    |      |      |
| Approach Delay (s)                | 0.0  | 1.9  | 8.7   |                      |      |      |
| Approach LOS                      |      |      | A     |                      |      |      |
| Intersection Summary              |      |      |       |                      |      |      |
| Average Delay                     |      |      | 1.5   |                      |      |      |
| Intersection Capacity Utilization |      |      | 22.1% | ICU Level of Service |      | A    |
| Analysis Period (min)             |      |      | 15    |                      |      |      |

Lanes, Volumes, Timings  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

2030 Future Total PM  
 08-06-2021



| Lane Group                 | WBL   | WBR   | NBT   | NBR   | SBL  | SBT   |
|----------------------------|-------|-------|-------|-------|------|-------|
| Lane Configurations        |       |       |       |       |      |       |
| Traffic Volume (vph)       | 65    | 1     | 191   | 381   | 27   | 141   |
| Future Volume (vph)        | 65    | 1     | 191   | 381   | 27   | 141   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  |
| Lane Width (m)             | 4.5   | 4.5   | 3.5   | 3.5   | 3.5  | 3.5   |
| Storage Length (m)         | 0.0   | 10.0  |       | 0.0   | 0.0  |       |
| Storage Lanes              | 1     | 0     |       | 0     | 0    |       |
| Taper Length (m)           | 7.5   |       |       |       | 7.5  |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Frt                        | 0.998 |       | 0.910 |       |      |       |
| Flt Protected              | 0.953 |       |       |       |      | 0.992 |
| Satd. Flow (prot)          | 1548  | 0     | 1519  | 0     | 0    | 1632  |
| Flt Permitted              | 0.953 |       |       |       |      | 0.992 |
| Satd. Flow (perm)          | 1548  | 0     | 1519  | 0     | 0    | 1632  |
| Link Speed (k/h)           | 40    |       | 80    |       |      | 80    |
| Link Distance (m)          | 155.0 |       | 545.7 |       |      | 134.1 |
| Travel Time (s)            | 14.0  |       | 24.6  |       |      | 6.0   |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Heavy Vehicles (%)         | 22%   | 0%    | 6%    | 7%    | 4%   | 9%    |
| Adj. Flow (vph)            | 65    | 1     | 191   | 381   | 27   | 141   |
| Shared Lane Traffic (%)    |       |       |       |       |      |       |
| Lane Group Flow (vph)      | 66    | 0     | 572   | 0     | 0    | 168   |
| Enter Blocked Intersection | No    | No    | No    | No    | No   | No    |
| Lane Alignment             | Left  | Right | Left  | Right | Left | Left  |
| Median Width(m)            | 4.5   |       | 0.0   |       |      | 0.0   |
| Link Offset(m)             | 0.0   |       | 0.0   |       |      | 0.0   |
| Crosswalk Width(m)         | 4.8   |       | 4.8   |       |      | 4.8   |
| Two way Left Turn Lane     |       |       |       |       |      |       |
| Headway Factor             | 0.95  | 0.95  | 1.09  | 1.09  | 1.09 | 1.09  |
| Turning Speed (k/h)        | 25    | 15    |       | 15    | 25   |       |
| Sign Control               | Stop  |       | Free  |       |      | Free  |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 45.8%        |
| ICU Level of Service              | A            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

2030 Future Total PM  
 08-06-2021



| Movement                          | WBL         | WBR         | NBT         | NBR                  | SBL  | SBT  |
|-----------------------------------|-------------|-------------|-------------|----------------------|------|------|
| Lane Configurations               |             |             |             |                      |      |      |
| Traffic Volume (veh/h)            | 65          | 1           | 191         | 381                  | 27   | 141  |
| Future Volume (Veh/h)             | 65          | 1           | 191         | 381                  | 27   | 141  |
| Sign Control                      | Stop        |             | Free        |                      |      | Free |
| Grade                             | 0%          |             | 0%          |                      |      | 0%   |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 65          | 1           | 191         | 381                  | 27   | 141  |
| <b>Pedestrians</b>                |             |             |             |                      |      |      |
| Lane Width (m)                    |             |             |             |                      |      |      |
| Walking Speed (m/s)               |             |             |             |                      |      |      |
| Percent Blockage                  |             |             |             |                      |      |      |
| Right turn flare (veh)            |             |             |             |                      |      |      |
| Median type                       | None        |             |             | None                 |      |      |
| Median storage (veh)              |             |             |             |                      |      |      |
| Upstream signal (m)               |             |             |             |                      |      |      |
| pX, platoon unblocked             |             |             |             |                      |      |      |
| vC, conflicting volume            | 576         | 382         |             |                      | 572  |      |
| vC1, stage 1 conf vol             |             |             |             |                      |      |      |
| vC2, stage 2 conf vol             |             |             |             |                      |      |      |
| vCu, unblocked vol                | 576         | 382         |             |                      | 572  |      |
| tC, single (s)                    | 6.6         | 6.2         |             |                      | 4.1  |      |
| tC, 2 stage (s)                   |             |             |             |                      |      |      |
| tF (s)                            | 3.7         | 3.3         |             |                      | 2.2  |      |
| p0 queue free %                   | 85          | 100         |             |                      | 97   |      |
| cM capacity (veh/h)               | 435         | 670         |             |                      | 991  |      |
| <b>Direction, Lane #</b>          | <b>WB 1</b> | <b>NB 1</b> | <b>SB 1</b> |                      |      |      |
| Volume Total                      | 66          | 572         | 168         |                      |      |      |
| Volume Left                       | 65          | 0           | 27          |                      |      |      |
| Volume Right                      | 1           | 381         | 0           |                      |      |      |
| cSH                               | 437         | 1700        | 991         |                      |      |      |
| Volume to Capacity                | 0.15        | 0.34        | 0.03        |                      |      |      |
| Queue Length 95th (m)             | 4.2         | 0.0         | 0.7         |                      |      |      |
| Control Delay (s)                 | 14.7        | 0.0         | 1.6         |                      |      |      |
| Lane LOS                          | B           |             | A           |                      |      |      |
| Approach Delay (s)                | 14.7        | 0.0         | 1.6         |                      |      |      |
| Approach LOS                      | B           |             |             |                      |      |      |
| <b>Intersection Summary</b>       |             |             |             |                      |      |      |
| Average Delay                     |             |             | 1.5         |                      |      |      |
| Intersection Capacity Utilization |             |             | 45.8%       | ICU Level of Service | A    |      |
| Analysis Period (min)             |             |             | 15          |                      |      |      |

Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

2030 Future Total PM  
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| Lane Group                 | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |
| Traffic Volume (vph)       | 85    | 828   | 206   | 380   | 254   | 18    |
| Future Volume (vph)        | 85    | 828   | 206   | 380   | 254   | 18    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.3   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   | 25.0  | 50.0  |       |       | 0.0   |
| Storage Lanes              | 1     | 1     | 1     |       |       | 0     |
| Taper Length (m)           | 7.5   |       | 75.0  |       |       |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |       |       | 0.991 |       |
| Fl <sub>t</sub> Protected  | 0.950 |       | 0.950 |       |       |       |
| Satd. Flow (prot)          | 1551  | 1422  | 1496  | 1618  | 1581  | 0     |
| Fl <sub>t</sub> Permitted  | 0.950 |       | 0.448 |       |       |       |
| Satd. Flow (perm)          | 1551  | 1422  | 706   | 1618  | 1581  | 0     |
| Right Turn on Red          |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 548   |       |       | 4     |       |
| Link Speed (k/h)           | 40    |       |       | 80    | 80    |       |
| Link Distance (m)          | 154.2 |       |       | 243.1 | 545.7 |       |
| Travel Time (s)            | 13.9  |       |       | 10.9  | 24.6  |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 9%    | 4%    | 13%   | 10%   | 12%   | 6%    |
| Adj. Flow (vph)            | 85    | 828   | 206   | 380   | 254   | 18    |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 85    | 828   | 206   | 380   | 272   | 0     |
| Enter Blocked Intersection | No    | No    | No    | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left  | Left  | Left  | Right |
| Median Width(m)            | 3.5   |       |       | 3.5   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |       | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |       | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |
| Headway Factor             | 1.09  | 1.12  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25    |       |       | 15    |
| Number of Detectors        | 1     | 1     | 1     | 2     | 2     |       |
| Detector Template          | Left  | Right | Left  | Thru  | Thru  |       |
| Leading Detector (m)       | 2.0   | 2.0   | 2.0   | 10.0  | 10.0  |       |
| Trailing Detector (m)      | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Position(m)     | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Size(m)         | 2.0   | 2.0   | 2.0   | 0.6   | 0.6   |       |
| Detector 1 Type            | 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   |       |
| Detector 1 Queue (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Delay (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 2 Position(m)     |       |       |       | 9.4   | 9.4   |       |
| Detector 2 Size(m)         |       |       |       | 0.6   | 0.6   |       |
| Detector 2 Type            |       |       |       | Cl+Ex | Cl+Ex |       |
| Detector 2 Channel         |       |       |       |       |       |       |
| Detector 2 Extend (s)      |       |       |       | 0.0   | 0.0   |       |
| Turn Type                  | Prot  | Perm  | pm+pt | NA    | NA    |       |

Lanes, Volumes, Timings  
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| Lane Group              | EBL   | EBR    | NBL   | NBT   | SBT   | SBR |
|-------------------------|-------|--------|-------|-------|-------|-----|
| Protected Phases        | 4     |        | 5     | 2     | 6     |     |
| Permitted Phases        |       | 4      | 2     |       |       |     |
| Detector Phase          | 4     | 4      | 5     | 2     | 6     |     |
| Switch Phase            |       |        |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0    | 7.0   | 35.0  | 35.0  |     |
| Minimum Split (s)       | 23.0  | 23.0   | 13.0  | 41.6  | 41.6  |     |
| Total Split (s)         | 44.0  | 44.0   | 13.0  | 56.0  | 43.0  |     |
| Total Split (%)         | 44.0% | 44.0%  | 13.0% | 56.0% | 43.0% |     |
| Maximum Green (s)       | 37.2  | 37.2   | 7.0   | 49.4  | 36.4  |     |
| Yellow Time (s)         | 3.0   | 3.0    | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 3.8   | 3.8    | 1.4   | 2.0   | 2.0   |     |
| Lost Time Adjust (s)    | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     | 6.8   | 6.8    | 6.0   | 6.6   | 6.6   |     |
| Lead/Lag                |       |        | Lead  |       | Lag   |     |
| Lead-Lag Optimize?      |       |        | Yes   |       | Yes   |     |
| Vehicle Extension (s)   | 3.0   | 3.0    | 3.0   | 3.0   | 3.0   |     |
| Recall Mode             | None  | None   | None  | Min   | Min   |     |
| Walk Time (s)           | 7.0   | 7.0    |       | 0.0   | 7.0   |     |
| Flash Dont Walk (s)     | 5.0   | 5.0    |       | 0.0   | 21.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0      |       | 0     | 0     |     |
| Act Effct Green (s)     | 33.6  | 33.6   | 48.9  | 48.3  | 35.2  |     |
| Actuated g/C Ratio      | 0.35  | 0.35   | 0.51  | 0.51  | 0.37  |     |
| v/c Ratio               | 0.16  | 0.97   | 0.49  | 0.46  | 0.46  |     |
| Control Delay           | 21.3  | 35.2   | 19.2  | 18.6  | 26.9  |     |
| Queue Delay             | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Delay             | 21.3  | 35.2   | 19.2  | 18.6  | 26.9  |     |
| LOS                     | C     | D      | B     | B     | C     |     |
| Approach Delay          | 33.9  |        |       | 18.8  | 26.9  |     |
| Approach LOS            | C     |        |       | B     | C     |     |
| Queue Length 50th (m)   | 11.1  | 65.2   | 23.4  | 49.3  | 41.4  |     |
| Queue Length 95th (m)   | 21.8  | #163.6 | 38.8  | 75.3  | 66.0  |     |
| Internal Link Dist (m)  | 130.2 |        |       | 219.1 | 521.7 |     |
| Turn Bay Length (m)     |       | 25.0   | 50.0  |       |       |     |
| Base Capacity (vph)     | 608   | 890    | 420   | 843   | 609   |     |
| Starvation Cap Reductn  | 0     | 0      | 0     | 0     | 0     |     |
| Spillback Cap Reductn   | 0     | 0      | 0     | 0     | 0     |     |
| Storage Cap Reductn     | 0     | 0      | 0     | 0     | 0     |     |
| Reduced v/c Ratio       | 0.14  | 0.93   | 0.49  | 0.45  | 0.45  |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 95.3             |
| Natural Cycle:                     | 90               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.97             |
| Intersection Signal Delay:         | 27.9             |
| Intersection LOS:                  | C                |
| Intersection Capacity Utilization: | 94.5%            |
| 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: 2: Boundary Road & Hwy 417 EB Ramp Terminal





Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

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|                            |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |   |  |   |   |  |  |  |  |  |  |  |   |
| Traffic Volume (vph)       | 147   | 0   | 33  | 6   | 0   | 20  | 10   | 418   | 0   | 2   | 991   | 88  |
| Future Volume (vph)        | 147   | 0   | 33  | 6   | 0   | 20  | 10   | 418   | 0   | 2   | 991   | 88  |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800   | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.3  | 3.5   | 3.3   | 3.3   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   |   | 15.0  | 0.0   |   | 0.0   | 35.0   |   | 7.5   | 100.0   |   | 35.0  |
| Storage Lanes              | 0   |   | 0   | 0   |   | 1   | 1  |   | 1   | 1   |   | 0   |
| Taper Length (m)           | 7.5   |   |   | 7.5   |   |   | 45.0   |   |   | 75.0  |   |   |
| 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  |
| Fr <sub>t</sub>            |   | 0.975   |   |   |   | 0.850   |  |   |   |   |   | 0.988   |
| Fl <sub>t</sub> Protected  |   | 0.961   |   |   | 0.950   |   | 0.950  |   |   | 0.950   |   |   |
| Satd. Flow (prot)          | 0   | 1444  | 0   | 0   | 1271  | 1513  | 1517   | 1633  | 1740  | 1102  | 1686  | 0   |
| Fl <sub>t</sub> Permitted  |   | 0.761   |   |   | 0.745   |   | 0.164  |   |   | 0.439   |   |   |
| Satd. Flow (perm)          | 0   | 1143  | 0   | 0   | 997   | 1513  | 262  | 1633  | 1740  | 509   | 1686  | 0   |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |  |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 100   |   |   |   | 100   |  |   |   |   |   | 10  |
| Link Speed (k/h)           |   | 60  |   |   | 20  |   |  | 80  |   |   |   | 80  |
| Link Distance (m)          |   | 198.6   |   |   | 170.6   |   |  | 174.7   |   |   |   | 243.1   |
| Travel Time (s)            |   | 11.9  |   |   | 30.7  |   |  | 7.9   |   |   |   | 10.9  |
| 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 (%)         | 19%   | 0%  | 0%  | 33%   | 0%  | 0%  | 9%   | 9%  | 0%  | 50%   | 4%  | 8%  |
| Adj. Flow (vph)            | 147   | 0   | 33  | 6   | 0   | 20  | 10   | 418   | 0   | 2   | 991   | 88  |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Group Flow (vph)      | 0   | 180   | 0   | 0   | 6   | 20  | 10   | 418   | 0   | 2   | 1079  | 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   |   |  | 3.5   |   |   | 3.5   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |  | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.8   |   |   | 4.8   |   |  | 4.8   |   |   | 4.8   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |  |   |   |   |   |   |
| Headway Factor             | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.12   | 1.09  | 1.12  | 1.12  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25  |   | 15  | 25  |   | 15  | 25   |   | 15  | 25  |   | 15  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   | 1   | 1  | 2   | 1   | 1   |   | 2   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  | Right   | Left   | Thru  | Right   | Left  | Thru  |   |
| Leading Detector (m)       | 2.0   | 10.0  |   | 2.0   | 10.0  | 2.0   | 2.0  | 10.0  | 2.0   | 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   | 0.6   | 2.0   | 2.0  | 0.6   | 2.0   | 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                  | Perm  | NA  |   | Perm  | NA  | Perm  | Perm   | NA  | Perm  | pm+pt   | NA  |   |

Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

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| Lane Group              | EBL   | EBT   | EBR | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT    | SBR |
|-------------------------|-------|-------|-----|-------|-------|-------|-------|-------|-------|-------|--------|-----|
| Protected Phases        |       | 4     |     |       | 8     |       |       | 2     |       | 1     | 6      |     |
| Permitted Phases        | 4     |       |     | 8     |       | 8     | 2     |       | 2     | 6     |        |     |
| Detector Phase          | 4     | 4     |     | 8     | 8     | 8     | 2     | 2     | 2     | 1     | 6      |     |
| Switch Phase            |       |       |     |       |       |       |       |       |       |       |        |     |
| Minimum Initial (s)     | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 20.0  | 20.0  | 20.0  | 7.0   | 20.0   |     |
| Minimum Split (s)       | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 26.2  | 26.2  | 26.2  | 13.0  | 26.2   |     |
| Total Split (s)         | 25.0  | 25.0  |     | 25.0  | 25.0  | 25.0  | 62.0  | 62.0  | 62.0  | 13.0  | 75.0   |     |
| Total Split (%)         | 25.0% | 25.0% |     | 25.0% | 25.0% | 25.0% | 62.0% | 62.0% | 62.0% | 13.0% | 75.0%  |     |
| Maximum Green (s)       | 19.2  | 19.2  |     | 19.2  | 19.2  | 19.2  | 55.8  | 55.8  | 55.8  | 7.0   | 68.8   |     |
| Yellow Time (s)         | 3.7   | 3.7   |     | 3.7   | 3.7   | 3.7   | 4.6   | 4.6   | 4.6   | 4.6   | 4.6    |     |
| All-Red Time (s)        | 2.1   | 2.1   |     | 2.1   | 2.1   | 2.1   | 1.6   | 1.6   | 1.6   | 1.4   | 1.6    |     |
| Lost Time Adjust (s)    |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0    |     |
| Total Lost Time (s)     |       | 5.8   |     |       | 5.8   | 5.8   | 6.2   | 6.2   | 6.2   | 6.0   | 6.2    |     |
| Lead/Lag                |       |       |     |       |       |       | Lag   | Lag   | Lag   | Lead  |        |     |
| 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  | Min   | Min   | Min   | None  | Min    |     |
| Walk Time (s)           | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   |       | 7.0    |     |
| Flash Dont Walk (s)     | 12.0  | 12.0  |     | 12.0  | 12.0  | 12.0  | 10.0  | 10.0  | 10.0  |       | 10.0   |     |
| Pedestrian Calls (#/hr) | 0     | 0     |     | 0     | 0     | 0     | 0     | 0     | 0     |       | 0      |     |
| Act Effct Green (s)     |       | 12.3  |     |       | 12.3  | 12.3  | 55.6  | 55.6  |       | 57.9  | 57.7   |     |
| Actuated g/C Ratio      |       | 0.15  |     |       | 0.15  | 0.15  | 0.67  | 0.67  |       | 0.70  | 0.70   |     |
| v/c Ratio               |       | 0.71  |     |       | 0.04  | 0.06  | 0.06  | 0.38  |       | 0.00  | 0.91   |     |
| Control Delay           |       | 33.4  |     |       | 34.2  | 0.4   | 8.5   | 8.6   |       | 4.5   | 24.4   |     |
| Queue Delay             |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0   |       | 0.0   | 0.3    |     |
| Total Delay             |       | 33.4  |     |       | 34.2  | 0.4   | 8.5   | 8.6   |       | 4.5   | 24.7   |     |
| LOS                     |       | C     |     |       | C     | A     | A     | A     |       | A     | C      |     |
| Approach Delay          |       | 33.4  |     |       | 8.2   |       |       | 8.6   |       |       | 24.7   |     |
| Approach LOS            |       | C     |     |       | A     |       |       | A     |       |       | C      |     |
| Queue Length 50th (m)   |       | 13.6  |     |       | 1.0   | 0.0   | 0.4   | 23.0  |       | 0.1   | 121.2  |     |
| Queue Length 95th (m)   |       | 38.2  |     |       | 4.6   | 0.0   | 3.7   | 72.0  |       | 0.8   | #291.1 |     |
| Internal Link Dist (m)  |       | 174.6 |     |       | 146.6 |       |       | 150.7 |       |       | 219.1  |     |
| Turn Bay Length (m)     |       |       |     |       |       |       | 35.0  |       |       | 100.0 |        |     |
| Base Capacity (vph)     |       | 353   |     |       | 242   | 443   | 197   | 1232  |       | 409   | 1406   |     |
| Starvation Cap Reductn  |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 47     |     |
| Spillback Cap Reductn   |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 0      |     |
| Storage Cap Reductn     |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 0      |     |
| Reduced v/c Ratio       |       | 0.51  |     |       | 0.02  | 0.05  | 0.05  | 0.34  |       | 0.00  | 0.79   |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 82.5             |
| Natural Cycle:                     | 90               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.91             |
| Intersection Signal Delay:         | 21.3             |
| Intersection LOS:                  | C                |
| Intersection Capacity Utilization: | 88.1%            |
| ICU Level of Service:              | E                |
| Analysis Period (min):             | 15               |



















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

Splits and Phases: 3: Boundary Road & Thunder Road/Amazon Way





















Lanes, Volumes, Timings  
4: Boundary Road & Site Access/South Amazon Access

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|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group                        | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |  |  |   |  |  |   |
| Traffic Volume (vph)              | 4   | 0   | 14  | 6   | 0   | 13  | 4   | 410   | 6   | 15  | 1008  | 7   |
| Future Volume (vph)               | 4   | 0   | 14  | 6   | 0   | 13  | 4   | 410   | 6   | 15  | 1008  | 7   |
| Ideal Flow (vphpl)                | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)                    | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.6   |
| Storage Length (m)                | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 15.0  |   | 0.0   | 70.0  |   | 0.0   |
| Storage Lanes                     | 0   |   | 0   | 0   |   | 0   | 1   |   | 0   | 1   |   | 0   |
| Taper Length (m)                  | 7.5   |   |   | 7.5   |   |   | 45.0  |   |   | 45.0  |   |   |
| 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  |
| Frt                               |   | 0.895   |   |   | 0.908   |   |   | 0.998   |   |   | 0.999   |   |
| Flt Protected                     |   | 0.989   |   |   | 0.984   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)                 | 0   | 1576  | 0   | 0   | 795   | 0   | 1691  | 1670  | 0   | 846   | 1744  | 0   |
| Flt Permitted                     |   | 0.989   |   |   | 0.984   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (perm)                 | 0   | 1576  | 0   | 0   | 795   | 0   | 1691  | 1670  | 0   | 846   | 1744  | 0   |
| Link Speed (k/h)                  |   | 50  |   |   | 20  |   |   | 80  |   |   | 80  |   |
| Link Distance (m)                 |   | 105.7   |   |   | 151.5   |   |   | 1150.2  |   |   | 174.7   |   |
| Travel Time (s)                   |   | 7.6   |   |   | 27.3  |   |   | 51.8  |   |   | 7.9   |   |
| 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 (%)                | 0%  | 0%  | 0%  | 100%  | 0%  | 100%  | 0%  | 5%  | 100%  | 100%  | 2%  | 0%  |
| Adj. Flow (vph)                   | 4   | 0   | 14  | 6   | 0   | 13  | 4   | 410   | 6   | 15  | 1008  | 7   |
| Shared Lane Traffic (%)           |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)             | 0   | 18  | 0   | 0   | 19  | 0   | 4   | 416   | 0   | 15  | 1015  | 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   |   |   | 3.5   |   |   | 3.5   |   |
| Link Offset(m)                    |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)                |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |
| 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  | 1.07  |
| Turning Speed (k/h)               | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  |
| Sign Control                      |   | Stop  |   |   | Stop  |   |   | Free  |   |   | Free  |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |   |   |   |   |   |   |
| Area Type:                        | Other   |   |   |   |   |   |   |   |   |   |   |   |
| Control Type:                     | Unsignalized  |   |   |   |   |   |   |   |   |   |   |   |
| Intersection Capacity Utilization | 66.4%   |   |   |   |   |   | ICU Level of Service C  |   |   |   |   |   |
| Analysis Period (min)             | 15  |   |   |   |   |   |   |   |   |   |   |   |

HCM Unsignalized Intersection Capacity Analysis  
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|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |  |  |   |  |  |   |
| Traffic Volume (veh/h)            | 4   | 0   | 14  | 6   | 0   | 13  | 4   | 410   | 6   | 15  | 1008  | 7   |
| Future Volume (Veh/h)             | 4   | 0   | 14  | 6   | 0   | 13  | 4   | 410   | 6   | 15  | 1008  | 7   |
| Sign Control                      |   | Stop  |   |   | Stop  |   |   | Free  |   |   | Free  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |   | 0%  |   |   | 0%  |   |
| 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  |
| Hourly flow rate (vph)            | 4   | 0   | 14  | 6   | 0   | 13  | 4   | 410   | 6   | 15  | 1008  | 7   |
| Pedestrians                       |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Width (m)                    |   |   |   |   |   |   |   |   |   |   |   |   |
| Walking Speed (m/s)               |   |   |   |   |   |   |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |   |   |   |   |   |   |
| Median type                       |   |   |   |   |   |   |   | None  |   |   | None  |   |
| Median storage (veh)              |   |   |   |   |   |   |   |   |   |   |   |   |
| Upstream signal (m)               |   |   |   |   |   |   |   |   |   |   |   | 175   |
| pX, platoon unblocked             | 0.44  | 0.44  | 0.44  | 0.44  | 0.44  |   | 0.44  |   |   |   |   |   |
| vC, conflicting volume            | 1472  | 1466  | 1012  | 1473  | 1466  | 413   | 1015  |   |   | 416   |   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vCu, unblocked vol                | 1437  | 1421  | 387   | 1438  | 1423  | 413   | 394   |   |   | 416   |   |   |
| tC, single (s)                    | 7.1   | 6.5   | 6.2   | 8.1   | 6.5   | 7.2   | 4.1   |   |   | 5.1   |   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |   |   |   |   |   |   |
| tF (s)                            | 3.5   | 4.0   | 3.3   | 4.4   | 4.0   | 4.2   | 2.2   |   |   | 3.1   |   |   |
| p0 queue free %                   | 91  | 100   | 95  | 79  | 100   | 97  | 99  |   |   | 98  |   |   |
| cM capacity (veh/h)               | 47  | 59  | 292   | 28  | 59  | 473   | 516   |   |   | 766   |   |   |
| Direction, Lane #                 | EB 1  | WB 1  | NB 1  | NB 2  | SB 1  | SB 2  |   |   |   |   |   |   |
| Volume Total                      | 18  | 19  | 4   | 416   | 15  | 1015  |   |   |   |   |   |   |
| Volume Left                       | 4   | 6   | 4   | 0   | 15  | 0   |   |   |   |   |   |   |
| Volume Right                      | 14  | 13  | 0   | 6   | 0   | 7   |   |   |   |   |   |   |
| cSH                               | 135   | 78  | 516   | 1700  | 766   | 1700  |   |   |   |   |   |   |
| Volume to Capacity                | 0.13  | 0.24  | 0.01  | 0.24  | 0.02  | 0.60  |   |   |   |   |   |   |
| Queue Length 95th (m)             | 3.6   | 6.9   | 0.2   | 0.0   | 0.5   | 0.0   |   |   |   |   |   |   |
| Control Delay (s)                 | 35.7  | 65.0  | 12.0  | 0.0   | 9.8   | 0.0   |   |   |   |   |   |   |
| Lane LOS                          | E   | F   | B   |   | A   |   |   |   |   |   |   |   |
| Approach Delay (s)                | 35.7  | 65.0  | 0.1   |   | 0.1   |   |   |   |   |   |   |   |
| Approach LOS                      | E   | F   |   |   |   |   |   |   |   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |   |   |   |   |   |   |
| Average Delay                     |   |   | 1.4   |   |   |   |   |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 66.4%   |   | ICU Level of Service  |   |   |   |   | C   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |   |   |   |   |   |   |

Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road

2030 Future Total PM  
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| Lane Group                 | EBL   | EBR   | NBL  | NBT   | SBT    | SBR   |
|----------------------------|-------|-------|------|-------|--------|-------|
| Lane Configurations        |       |       |      |       |        |       |
| Traffic Volume (vph)       | 142   | 119   | 63   | 153   | 895    | 146   |
| Future Volume (vph)        | 142   | 119   | 63   | 153   | 895    | 146   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800   | 1800  |
| Lane Width (m)             | 3.3   | 3.3   | 3.5  | 3.5   | 3.5    | 3.5   |
| Storage Length (m)         | 25.0  | 0.0   | 0.0  |       |        | 30.0  |
| Storage Lanes              | 1     | 1     | 0    |       |        | 1     |
| Taper Length (m)           | 47.5  |       | 7.5  |       |        |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |      |       |        | 0.850 |
| Fl <sub>t</sub> Protected  | 0.950 |       |      | 0.986 |        |       |
| Satd. Flow (prot)          | 1463  | 1395  | 0    | 1669  | 1762   | 1351  |
| Fl <sub>t</sub> Permitted  | 0.950 |       |      | 0.986 |        |       |
| Satd. Flow (perm)          | 1463  | 1395  | 0    | 1669  | 1762   | 1351  |
| Link Speed (k/h)           | 80    |       |      | 80    | 80     |       |
| Link Distance (m)          | 180.5 |       |      | 135.8 | 1150.2 |       |
| Travel Time (s)            | 8.1   |       |      | 6.1   | 51.8   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Heavy Vehicles (%)         | 13%   | 6%    | 8%   | 4%    | 1%     | 12%   |
| Adj. Flow (vph)            | 142   | 119   | 63   | 153   | 895    | 146   |
| Shared Lane Traffic (%)    |       |       |      |       |        |       |
| Lane Group Flow (vph)      | 142   | 119   | 0    | 216   | 895    | 146   |
| Enter Blocked Intersection | No    | No    | No   | No    | No     | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left   | Right |
| Median Width(m)            | 3.3   |       |      | 3.5   | 3.5    |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0    |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8    |       |
| Two way Left Turn Lane     |       |       |      |       |        |       |
| Headway Factor             | 1.12  | 1.12  | 1.09 | 1.09  | 1.09   | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25   |       |        | 15    |
| Sign Control               | Stop  |       |      | Free  | Free   |       |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 80.2%        |
| ICU Level of Service              | D            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
5: Boundary Road & Mitch Owens Road

2030 Future Total PM  
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| Movement                          | EBL  | EBR  | NBL   | NBT                  | SBT  | SBR  |
|-----------------------------------|------|------|-------|----------------------|------|------|
| Lane Configurations               |      |      |       |                      |      |      |
| Traffic Volume (veh/h)            | 142  | 119  | 63    | 153                  | 895  | 146  |
| Future Volume (Veh/h)             | 142  | 119  | 63    | 153                  | 895  | 146  |
| Sign Control                      | Stop |      |       | Free                 | Free |      |
| Grade                             | 0%   |      |       | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00 | 1.00 | 1.00  | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 142  | 119  | 63    | 153                  | 895  | 146  |
| Pedestrians                       |      |      |       |                      |      |      |
| Lane Width (m)                    |      |      |       |                      |      |      |
| Walking Speed (m/s)               |      |      |       |                      |      |      |
| Percent Blockage                  |      |      |       |                      |      |      |
| Right turn flare (veh)            |      |      |       |                      |      |      |
| Median type                       |      |      |       | None                 | None |      |
| Median storage (veh)              |      |      |       |                      |      |      |
| Upstream signal (m)               |      |      |       |                      |      |      |
| pX, platoon unblocked             |      |      |       |                      |      |      |
| vC, conflicting volume            | 1174 | 895  | 1041  |                      |      |      |
| vC1, stage 1 conf vol             |      |      |       |                      |      |      |
| vC2, stage 2 conf vol             |      |      |       |                      |      |      |
| vCu, unblocked vol                | 1174 | 895  | 1041  |                      |      |      |
| tC, single (s)                    | 6.5  | 6.3  | 4.2   |                      |      |      |
| tC, 2 stage (s)                   |      |      |       |                      |      |      |
| tF (s)                            | 3.6  | 3.4  | 2.3   |                      |      |      |
| p0 queue free %                   | 22   | 64   | 90    |                      |      |      |
| cM capacity (veh/h)               | 182  | 334  | 645   |                      |      |      |
| Direction, Lane #                 | EB 1 | EB 2 | NB 1  | SB 1                 | SB 2 |      |
| Volume Total                      | 142  | 119  | 216   | 895                  | 146  |      |
| Volume Left                       | 142  | 0    | 63    | 0                    | 0    |      |
| Volume Right                      | 0    | 119  | 0     | 0                    | 146  |      |
| cSH                               | 182  | 334  | 645   | 1700                 | 1700 |      |
| Volume to Capacity                | 0.78 | 0.36 | 0.10  | 0.53                 | 0.09 |      |
| Queue Length 95th (m)             | 41.8 | 12.6 | 2.6   | 0.0                  | 0.0  |      |
| Control Delay (s)                 | 72.4 | 21.6 | 4.1   | 0.0                  | 0.0  |      |
| Lane LOS                          | F    | C    | A     |                      |      |      |
| Approach Delay (s)                | 49.2 |      | 4.1   | 0.0                  |      |      |
| Approach LOS                      | E    |      |       |                      |      |      |
| Intersection Summary              |      |      |       |                      |      |      |
| Average Delay                     |      |      | 9.1   |                      |      |      |
| Intersection Capacity Utilization |      |      | 80.2% | ICU Level of Service | D    |      |
| Analysis Period (min)             |      |      | 15    |                      |      |      |

Lanes, Volumes, Timings  
6: Site Access A & Thunder Road

2030 Future Total PM  
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| Lane Group                 | EBT   | EBR   | WBL  | WBT   | NBL   | NBR   |
|----------------------------|-------|-------|------|-------|-------|-------|
| Lane Configurations        |       |       |      |       |       |       |
| Traffic Volume (vph)       | 128   | 0     | 14   | 85    | 0     | 52    |
| Future Volume (vph)        | 128   | 0     | 14   | 85    | 0     | 52    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5  | 3.5   | 3.5   | 3.5   |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Flt                        |       |       |      |       | 0.865 |       |
| Flt Protected              |       |       |      | 0.993 |       |       |
| Satd. Flow (prot)          | 1496  | 0     | 0    | 1641  | 1426  | 0     |
| Flt Permitted              |       |       |      | 0.993 |       |       |
| Satd. Flow (perm)          | 1496  | 0     | 0    | 1641  | 1426  | 0     |
| Link Speed (k/h)           | 60    |       |      | 50    | 50    |       |
| Link Distance (m)          | 163.7 |       |      | 198.6 | 103.6 |       |
| Travel Time (s)            | 9.8   |       |      | 14.3  | 7.5   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 19%   | 0%    | 0%   | 9%    | 0%    | 8%    |
| Adj. Flow (vph)            | 128   | 0     | 14   | 85    | 0     | 52    |
| Shared Lane Traffic (%)    |       |       |      |       |       |       |
| Lane Group Flow (vph)      | 128   | 0     | 0    | 99    | 52    | 0     |
| Enter Blocked Intersection | No    | No    | No   | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left  | Right |
| Median Width(m)            | 0.0   |       |      | 0.0   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |      |       |       |       |
| Headway Factor             | 1.09  | 1.09  | 1.09 | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        |       | 15    | 25   |       | 25    | 15    |
| Sign Control               | Free  |       |      | Free  | Stop  |       |

Intersection Summary

|                                   |                        |
|-----------------------------------|------------------------|
| Area Type:                        | Other                  |
| Control Type:                     | Unsignalized           |
| Intersection Capacity Utilization | 26.0%                  |
| Analysis Period (min)             | 15                     |
|                                   | ICU Level of Service A |



HCM Unsignalized Intersection Capacity Analysis  
6: Site Access A & Thunder Road

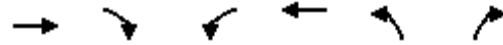
2030 Future Total PM  
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| Movement                          | EBT         | EBR         | WBL         | WBT                  | NBL  | NBR  |
|-----------------------------------|-------------|-------------|-------------|----------------------|------|------|
| Lane Configurations               | →           |             |             | ←                    | ←    | ↘    |
| Traffic Volume (veh/h)            | 128         | 0           | 14          | 85                   | 0    | 52   |
| Future Volume (Veh/h)             | 128         | 0           | 14          | 85                   | 0    | 52   |
| Sign Control                      | Free        |             |             | Free                 | Stop |      |
| Grade                             | 0%          |             |             | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 128         | 0           | 14          | 85                   | 0    | 52   |
| <b>Pedestrians</b>                |             |             |             |                      |      |      |
| Lane Width (m)                    |             |             |             |                      |      |      |
| Walking Speed (m/s)               |             |             |             |                      |      |      |
| Percent Blockage                  |             |             |             |                      |      |      |
| Right turn flare (veh)            |             |             |             |                      |      |      |
| Median type                       | None        |             |             | None                 |      |      |
| Median storage (veh)              |             |             |             |                      |      |      |
| Upstream signal (m)               | 199         |             |             |                      |      |      |
| pX, platoon unblocked             |             |             |             |                      |      |      |
| vC, conflicting volume            |             |             | 128         |                      |      | 128  |
| vC1, stage 1 conf vol             |             |             |             |                      |      |      |
| vC2, stage 2 conf vol             |             |             |             |                      |      |      |
| vCu, unblocked vol                |             |             | 128         |                      |      | 128  |
| tC, single (s)                    |             |             | 4.1         |                      |      | 6.3  |
| tC, 2 stage (s)                   |             |             |             |                      |      |      |
| tF (s)                            |             |             | 2.2         |                      |      | 3.4  |
| p0 queue free %                   |             |             | 99          |                      |      | 94   |
| cM capacity (veh/h)               |             |             | 1470        |                      |      | 906  |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>WB 1</b> | <b>NB 1</b> |                      |      |      |
| Volume Total                      | 128         | 99          | 52          |                      |      |      |
| Volume Left                       | 0           | 14          | 0           |                      |      |      |
| Volume Right                      | 0           | 0           | 52          |                      |      |      |
| cSH                               | 1700        | 1470        | 906         |                      |      |      |
| Volume to Capacity                | 0.08        | 0.01        | 0.06        |                      |      |      |
| Queue Length 95th (m)             | 0.0         | 0.2         | 1.5         |                      |      |      |
| Control Delay (s)                 | 0.0         | 1.1         | 9.2         |                      |      |      |
| Lane LOS                          |             |             | A           |                      | A    |      |
| Approach Delay (s)                | 0.0         | 1.1         | 9.2         |                      |      |      |
| Approach LOS                      |             |             | A           |                      |      |      |
| <b>Intersection Summary</b>       |             |             |             |                      |      |      |
| Average Delay                     |             |             | 2.1         |                      |      |      |
| Intersection Capacity Utilization |             |             | 26.0%       | ICU Level of Service |      | A    |
| Analysis Period (min)             |             |             | 15          |                      |      |      |

Lanes, Volumes, Timings  
7: Site Access B & Thunder Road

2030 Future Total PM  
08-06-2021



| Lane Group                 | EBT   | EBR   | WBL  | WBT   | NBL   | NBR   |
|----------------------------|-------|-------|------|-------|-------|-------|
| Lane Configurations        |       |       |      |       |       |       |
| Traffic Volume (vph)       | 117   | 0     | 4    | 81    | 0     | 11    |
| Future Volume (vph)        | 117   | 0     | 4    | 81    | 0     | 11    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5  | 3.5   | 3.5   | 3.5   |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Frt                        |       |       |      |       | 0.865 |       |
| Flt Protected              |       |       |      | 0.998 |       |       |
| Satd. Flow (prot)          | 1633  | 0     | 0    | 1637  | 770   | 0     |
| Flt Permitted              |       |       |      | 0.998 |       |       |
| Satd. Flow (perm)          | 1633  | 0     | 0    | 1637  | 770   | 0     |
| Link Speed (k/h)           | 60    |       |      | 50    | 50    |       |
| Link Distance (m)          | 185.0 |       |      | 163.7 | 105.8 |       |
| Travel Time (s)            | 11.1  |       |      | 11.8  | 7.6   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 9%    | 0%    | 100% | 4%    | 0%    | 100%  |
| Adj. Flow (vph)            | 117   | 0     | 4    | 81    | 0     | 11    |
| Shared Lane Traffic (%)    |       |       |      |       |       |       |
| Lane Group Flow (vph)      | 117   | 0     | 0    | 85    | 11    | 0     |
| Enter Blocked Intersection | No    | No    | No   | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left  | Right |
| Median Width(m)            | 0.0   |       |      | 0.0   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |      |       |       |       |
| Headway Factor             | 1.09  | 1.09  | 1.09 | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        |       | 15    | 25   |       | 25    | 15    |
| Sign Control               | Free  |       |      | Free  | Stop  |       |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 17.9%        |
| ICU Level of Service              | A            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
7: Site Access B & Thunder Road

2030 Future Total PM  
08-06-2021



| Movement                          | EBT         | EBR         | WBL         | WBT                  | NBL  | NBR  |
|-----------------------------------|-------------|-------------|-------------|----------------------|------|------|
| Lane Configurations               | ↩           |             |             | ↩                    | ↩    |      |
| Traffic Volume (veh/h)            | 117         | 0           | 4           | 81                   | 0    | 11   |
| Future Volume (Veh/h)             | 117         | 0           | 4           | 81                   | 0    | 11   |
| Sign Control                      | Free        |             |             | Free                 | Stop |      |
| Grade                             | 0%          |             |             | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 117         | 0           | 4           | 81                   | 0    | 11   |
| <b>Pedestrians</b>                |             |             |             |                      |      |      |
| Lane Width (m)                    |             |             |             |                      |      |      |
| Walking Speed (m/s)               |             |             |             |                      |      |      |
| Percent Blockage                  |             |             |             |                      |      |      |
| Right turn flare (veh)            |             |             |             |                      |      |      |
| Median type                       | None        |             |             | None                 |      |      |
| Median storage (veh)              |             |             |             |                      |      |      |
| Upstream signal (m)               | 362         |             |             |                      |      |      |
| pX, platoon unblocked             |             |             |             |                      |      |      |
| vC, conflicting volume            |             |             | 117         | 206                  |      | 117  |
| vC1, stage 1 conf vol             |             |             |             |                      |      |      |
| vC2, stage 2 conf vol             |             |             |             |                      |      |      |
| vCu, unblocked vol                |             |             | 117         | 206                  |      | 117  |
| tC, single (s)                    |             |             | 5.1         | 6.4                  |      | 7.2  |
| tC, 2 stage (s)                   |             |             |             |                      |      |      |
| tF (s)                            |             |             | 3.1         | 3.5                  |      | 4.2  |
| p0 queue free %                   |             |             | 100         | 100                  |      | 98   |
| cM capacity (veh/h)               |             |             | 1034        | 784                  |      | 726  |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>WB 1</b> | <b>NB 1</b> |                      |      |      |
| Volume Total                      | 117         | 85          | 11          |                      |      |      |
| Volume Left                       | 0           | 4           | 0           |                      |      |      |
| Volume Right                      | 0           | 0           | 11          |                      |      |      |
| cSH                               | 1700        | 1034        | 726         |                      |      |      |
| Volume to Capacity                | 0.07        | 0.00        | 0.02        |                      |      |      |
| Queue Length 95th (m)             | 0.0         | 0.1         | 0.4         |                      |      |      |
| Control Delay (s)                 | 0.0         | 0.4         | 10.0        |                      |      |      |
| Lane LOS                          |             |             | A           | B                    |      |      |
| Approach Delay (s)                | 0.0         | 0.4         | 10.0        |                      |      |      |
| Approach LOS                      |             |             | B           |                      |      |      |
| <b>Intersection Summary</b>       |             |             |             |                      |      |      |
| Average Delay                     |             |             | 0.7         |                      |      |      |
| Intersection Capacity Utilization |             |             | 17.9%       | ICU Level of Service |      | A    |
| Analysis Period (min)             |             |             | 15          |                      |      |      |

Lanes, Volumes, Timings  
8: Site Access C & Thunder Road

2030 Future Total PM  
08-06-2021



| Lane Group                 | EBT  | EBR   | WBL  | WBT   | NBL   | NBR   |
|----------------------------|------|-------|------|-------|-------|-------|
| Lane Configurations        |      |       |      |       |       |       |
| Traffic Volume (vph)       | 93   | 0     | 9    | 72    | 0     | 24    |
| Future Volume (vph)        | 93   | 0     | 9    | 72    | 0     | 24    |
| Ideal Flow (vphpl)         | 1800 | 1800  | 1800 | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5  | 3.5   | 3.5  | 3.5   | 3.5   | 3.5   |
| Lane Util. Factor          | 1.00 | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Flt                        |      |       |      |       | 0.865 |       |
| Flt Protected              |      |       |      | 0.994 |       |       |
| Satd. Flow (prot)          | 1695 | 0     | 0    | 1712  | 1272  | 0     |
| Flt Permitted              |      |       |      | 0.994 |       |       |
| Satd. Flow (perm)          | 1695 | 0     | 0    | 1712  | 1272  | 0     |
| Link Speed (k/h)           | 60   |       |      | 50    | 50    |       |
| Link Distance (m)          | 95.5 |       |      | 185.0 | 109.7 |       |
| Travel Time (s)            | 5.7  |       |      | 13.3  | 7.9   |       |
| Peak Hour Factor           | 1.00 | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 5%   | 0%    | 22%  | 1%    | 0%    | 21%   |
| Adj. Flow (vph)            | 93   | 0     | 9    | 72    | 0     | 24    |
| Shared Lane Traffic (%)    |      |       |      |       |       |       |
| Lane Group Flow (vph)      | 93   | 0     | 0    | 81    | 24    | 0     |
| Enter Blocked Intersection | No   | No    | No   | No    | No    | No    |
| Lane Alignment             | Left | Right | Left | Left  | Left  | Right |
| Median Width(m)            | 0.0  |       |      | 0.0   | 3.5   |       |
| Link Offset(m)             | 0.0  |       |      | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8  |       |      | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |      |       |      |       |       |       |
| Headway Factor             | 1.09 | 1.09  | 1.09 | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        |      | 15    | 25   |       | 25    | 15    |
| Sign Control               | Free |       |      | Free  | Stop  |       |

Intersection Summary

|                                   |                        |
|-----------------------------------|------------------------|
| Area Type:                        | Other                  |
| Control Type:                     | Unsignalized           |
| Intersection Capacity Utilization | 21.2%                  |
| Analysis Period (min)             | 15                     |
|                                   | ICU Level of Service A |

HCM Unsignalized Intersection Capacity Analysis  
8: Site Access C & Thunder Road

2030 Future Total PM  
08-06-2021



| Movement                          | EBT         | EBR         | WBL         | WBT                  | NBL  | NBR  |
|-----------------------------------|-------------|-------------|-------------|----------------------|------|------|
| Lane Configurations               | ↩           |             |             | ↩                    | ↩    |      |
| Traffic Volume (veh/h)            | 93          | 0           | 9           | 72                   | 0    | 24   |
| Future Volume (Veh/h)             | 93          | 0           | 9           | 72                   | 0    | 24   |
| Sign Control                      | Free        |             |             | Free                 | Stop |      |
| Grade                             | 0%          |             |             | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 93          | 0           | 9           | 72                   | 0    | 24   |
| <b>Pedestrians</b>                |             |             |             |                      |      |      |
| Lane Width (m)                    |             |             |             |                      |      |      |
| Walking Speed (m/s)               |             |             |             |                      |      |      |
| Percent Blockage                  |             |             |             |                      |      |      |
| Right turn flare (veh)            |             |             |             |                      |      |      |
| Median type                       | None        |             |             | None                 |      |      |
| Median storage (veh)              |             |             |             |                      |      |      |
| Upstream signal (m)               |             |             |             |                      |      |      |
| pX, platoon unblocked             |             |             |             |                      |      |      |
| vC, conflicting volume            |             |             | 93          |                      | 183  | 93   |
| vC1, stage 1 conf vol             |             |             |             |                      |      |      |
| vC2, stage 2 conf vol             |             |             |             |                      |      |      |
| vCu, unblocked vol                |             |             | 93          |                      | 183  | 93   |
| tC, single (s)                    |             |             | 4.3         |                      | 6.4  | 6.4  |
| tC, 2 stage (s)                   |             |             |             |                      |      |      |
| tF (s)                            |             |             | 2.4         |                      | 3.5  | 3.5  |
| p0 queue free %                   |             |             | 99          |                      | 100  | 97   |
| cM capacity (veh/h)               |             |             | 1385        |                      | 806  | 914  |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>WB 1</b> | <b>NB 1</b> |                      |      |      |
| Volume Total                      | 93          | 81          | 24          |                      |      |      |
| Volume Left                       | 0           | 9           | 0           |                      |      |      |
| Volume Right                      | 0           | 0           | 24          |                      |      |      |
| cSH                               | 1700        | 1385        | 914         |                      |      |      |
| Volume to Capacity                | 0.05        | 0.01        | 0.03        |                      |      |      |
| Queue Length 95th (m)             | 0.0         | 0.2         | 0.6         |                      |      |      |
| Control Delay (s)                 | 0.0         | 0.9         | 9.0         |                      |      |      |
| Lane LOS                          |             |             | A           |                      |      |      |
| Approach Delay (s)                | 0.0         | 0.9         | 9.0         |                      |      |      |
| Approach LOS                      |             |             | A           |                      |      |      |
| <b>Intersection Summary</b>       |             |             |             |                      |      |      |
| Average Delay                     |             |             | 1.5         |                      |      |      |
| Intersection Capacity Utilization |             |             | 21.2%       | ICU Level of Service | A    |      |
| Analysis Period (min)             |             |             | 15          |                      |      |      |

Lanes, Volumes, Timings  
1: Boundary Road & Hwy 417 WB Ramp Terminal

2035 Future Total AM  
08-09-2021



| Lane Group                 | WBL   | WBR   | NBT   | NBR   | SBL  | SBT   |
|----------------------------|-------|-------|-------|-------|------|-------|
| Lane Configurations        |       |       |       |       |      |       |
| Traffic Volume (vph)       | 189   | 38    | 124   | 1059  | 94   | 156   |
| Future Volume (vph)        | 189   | 38    | 124   | 1059  | 94   | 156   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  |
| Lane Width (m)             | 4.5   | 4.5   | 3.5   | 3.5   | 3.5  | 3.5   |
| Storage Length (m)         | 0.0   | 10.0  |       | 0.0   | 0.0  |       |
| Storage Lanes              | 1     | 0     |       | 0     | 0    |       |
| Taper Length (m)           | 7.5   |       |       |       | 7.5  |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Frt                        | 0.977 |       | 0.879 |       |      |       |
| Flt Protected              | 0.960 |       |       |       |      | 0.982 |
| Satd. Flow (prot)          | 1706  | 0     | 1530  | 0     | 0    | 1595  |
| Flt Permitted              | 0.960 |       |       |       |      | 0.982 |
| Satd. Flow (perm)          | 1706  | 0     | 1530  | 0     | 0    | 1595  |
| Link Speed (k/h)           | 40    |       | 80    |       |      | 80    |
| Link Distance (m)          | 155.0 |       | 545.7 |       |      | 134.1 |
| Travel Time (s)            | 14.0  |       | 24.6  |       |      | 6.0   |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Heavy Vehicles (%)         | 8%    | 13%   | 13%   | 1%    | 9%   | 10%   |
| Adj. Flow (vph)            | 189   | 38    | 124   | 1059  | 94   | 156   |
| Shared Lane Traffic (%)    |       |       |       |       |      |       |
| Lane Group Flow (vph)      | 227   | 0     | 1183  | 0     | 0    | 250   |
| Enter Blocked Intersection | No    | No    | No    | No    | No   | No    |
| Lane Alignment             | Left  | Right | Left  | Right | Left | Left  |
| Median Width(m)            | 4.5   |       | 0.0   |       |      | 0.0   |
| Link Offset(m)             | 0.0   |       | 0.0   |       |      | 0.0   |
| Crosswalk Width(m)         | 4.8   |       | 4.8   |       |      | 4.8   |
| Two way Left Turn Lane     |       |       |       |       |      |       |
| Headway Factor             | 0.95  | 0.95  | 1.09  | 1.09  | 1.09 | 1.09  |
| Turning Speed (k/h)        | 25    | 15    |       | 15    | 25   |       |
| Sign Control               | Stop  |       | Free  |       |      | Free  |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 113.6%       |
| ICU Level of Service              | H            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

2035 Future Total AM  
 08-09-2021



| Movement                          | WBL         | WBR         | NBT         | NBR                  | SBL  | SBT  |
|-----------------------------------|-------------|-------------|-------------|----------------------|------|------|
| Lane Configurations               |             |             |             |                      |      |      |
| Traffic Volume (veh/h)            | 189         | 38          | 124         | 1059                 | 94   | 156  |
| Future Volume (Veh/h)             | 189         | 38          | 124         | 1059                 | 94   | 156  |
| Sign Control                      | Stop        |             | Free        |                      |      | Free |
| Grade                             | 0%          |             | 0%          |                      |      | 0%   |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 189         | 38          | 124         | 1059                 | 94   | 156  |
| <b>Pedestrians</b>                |             |             |             |                      |      |      |
| Lane Width (m)                    |             |             |             |                      |      |      |
| Walking Speed (m/s)               |             |             |             |                      |      |      |
| Percent Blockage                  |             |             |             |                      |      |      |
| Right turn flare (veh)            |             |             |             |                      |      |      |
| Median type                       | None        |             |             | None                 |      |      |
| Median storage (veh)              |             |             |             |                      |      |      |
| Upstream signal (m)               |             |             |             |                      |      |      |
| pX, platoon unblocked             |             |             |             |                      |      |      |
| vC, conflicting volume            | 998         | 654         |             |                      | 1183 |      |
| vC1, stage 1 conf vol             |             |             |             |                      |      |      |
| vC2, stage 2 conf vol             |             |             |             |                      |      |      |
| vCu, unblocked vol                | 998         | 654         |             |                      | 1183 |      |
| tC, single (s)                    | 6.5         | 6.3         |             |                      | 4.2  |      |
| tC, 2 stage (s)                   |             |             |             |                      |      |      |
| tF (s)                            | 3.6         | 3.4         |             |                      | 2.3  |      |
| p0 queue free %                   | 14          | 92          |             |                      | 83   |      |
| cM capacity (veh/h)               | 220         | 448         |             |                      | 566  |      |
| <b>Direction, Lane #</b>          | <b>WB 1</b> | <b>NB 1</b> | <b>SB 1</b> |                      |      |      |
| Volume Total                      | 227         | 1183        | 250         |                      |      |      |
| Volume Left                       | 189         | 0           | 94          |                      |      |      |
| Volume Right                      | 38          | 1059        | 0           |                      |      |      |
| cSH                               | 240         | 1700        | 566         |                      |      |      |
| Volume to Capacity                | 0.94        | 0.70        | 0.17        |                      |      |      |
| Queue Length 95th (m)             | 67.4        | 0.0         | 4.7         |                      |      |      |
| Control Delay (s)                 | 88.3        | 0.0         | 6.2         |                      |      |      |
| Lane LOS                          | F           |             | A           |                      |      |      |
| Approach Delay (s)                | 88.3        | 0.0         | 6.2         |                      |      |      |
| Approach LOS                      | F           |             |             |                      |      |      |
| <b>Intersection Summary</b>       |             |             |             |                      |      |      |
| Average Delay                     |             |             | 13.0        |                      |      |      |
| Intersection Capacity Utilization |             |             | 113.6%      | ICU Level of Service | H    |      |
| Analysis Period (min)             |             |             | 15          |                      |      |      |

Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

2035 Future Total AM  
08-09-2021



| Lane Group                 | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |
| Traffic Volume (vph)       | 22    | 421   | 51    | 1166  | 310   | 11    |
| Future Volume (vph)        | 22    | 421   | 51    | 1166  | 310   | 11    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.3   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   | 25.0  | 50.0  |       |       | 0.0   |
| Storage Lanes              | 1     | 1     | 1     |       |       | 0     |
| Taper Length (m)           | 7.5   |       | 75.0  |       |       |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |       |       | 0.995 |       |
| Fl <sub>t</sub> Protected  | 0.950 |       | 0.950 |       |       |       |
| Satd. Flow (prot)          | 1281  | 1357  | 1311  | 1745  | 1583  | 0     |
| Fl <sub>t</sub> Permitted  | 0.950 |       | 0.503 |       |       |       |
| Satd. Flow (perm)          | 1281  | 1357  | 694   | 1745  | 1583  | 0     |
| Right Turn on Red          |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 421   |       |       | 3     |       |
| Link Speed (k/h)           | 40    |       |       | 80    | 80    |       |
| Link Distance (m)          | 154.2 |       |       | 243.1 | 545.7 |       |
| Travel Time (s)            | 13.9  |       |       | 10.9  | 24.6  |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 32%   | 9%    | 29%   | 2%    | 12%   | 9%    |
| Adj. Flow (vph)            | 22    | 421   | 51    | 1166  | 310   | 11    |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 22    | 421   | 51    | 1166  | 321   | 0     |
| Enter Blocked Intersection | No    | No    | No    | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left  | Left  | Left  | Right |
| Median Width(m)            | 3.5   |       |       | 3.5   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |       | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |       | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |
| Headway Factor             | 1.09  | 1.12  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25    |       |       | 15    |
| Number of Detectors        | 1     | 1     | 1     | 2     | 2     |       |
| Detector Template          | Left  | Right | Left  | Thru  | Thru  |       |
| Leading Detector (m)       | 2.0   | 2.0   | 2.0   | 10.0  | 10.0  |       |
| Trailing Detector (m)      | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Position(m)     | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Size(m)         | 2.0   | 2.0   | 2.0   | 0.6   | 0.6   |       |
| Detector 1 Type            | 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   |       |
| Detector 1 Queue (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Delay (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 2 Position(m)     |       |       |       | 9.4   | 9.4   |       |
| Detector 2 Size(m)         |       |       |       | 0.6   | 0.6   |       |
| Detector 2 Type            |       |       |       | Cl+Ex | Cl+Ex |       |
| Detector 2 Channel         |       |       |       |       |       |       |
| Detector 2 Extend (s)      |       |       |       | 0.0   | 0.0   |       |
| Turn Type                  | Prot  | Perm  | pm+pt | NA    | NA    |       |



Lanes, Volumes, Timings  
2: Boundary Road & Hwy 417 EB Ramp Terminal

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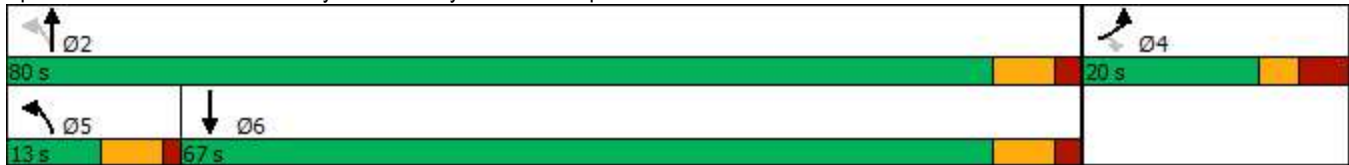
| Lane Group              | EBL   | EBR   | NBL   | NBT    | SBT   | SBR |
|-------------------------|-------|-------|-------|--------|-------|-----|
| Protected Phases        | 4     |       | 5     | 2      | 6     |     |
| Permitted Phases        |       | 4     | 2     |        |       |     |
| Detector Phase          | 4     | 4     | 5     | 2      | 6     |     |
| Switch Phase            |       |       |       |        |       |     |
| Minimum Initial (s)     | 7.0   | 7.0   | 7.0   | 35.0   | 35.0  |     |
| Minimum Split (s)       | 17.8  | 17.8  | 13.0  | 41.6   | 41.6  |     |
| Total Split (s)         | 20.0  | 20.0  | 13.0  | 80.0   | 67.0  |     |
| Total Split (%)         | 20.0% | 20.0% | 13.0% | 80.0%  | 67.0% |     |
| Maximum Green (s)       | 13.2  | 13.2  | 7.0   | 73.4   | 60.4  |     |
| Yellow Time (s)         | 3.0   | 3.0   | 4.6   | 4.6    | 4.6   |     |
| All-Red Time (s)        | 3.8   | 3.8   | 1.4   | 2.0    | 2.0   |     |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0    | 0.0   |     |
| Total Lost Time (s)     | 6.8   | 6.8   | 6.0   | 6.6    | 6.6   |     |
| Lead/Lag                |       |       | Lead  |        | Lag   |     |
| Lead-Lag Optimize?      |       |       | Yes   |        | Yes   |     |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0    | 3.0   |     |
| Recall Mode             | None  | None  | None  | Min    | Min   |     |
| Walk Time (s)           | 5.0   | 5.0   |       | 0.0    | 7.0   |     |
| Flash Dont Walk (s)     | 6.0   | 6.0   |       | 0.0    | 21.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0     |       | 0      | 0     |     |
| Act Effct Green (s)     | 9.3   | 9.3   | 59.1  | 58.5   | 51.7  |     |
| Actuated g/C Ratio      | 0.11  | 0.11  | 0.72  | 0.71   | 0.63  |     |
| v/c Ratio               | 0.15  | 0.80  | 0.09  | 0.94   | 0.32  |     |
| Control Delay           | 40.3  | 16.9  | 3.6   | 25.4   | 9.2   |     |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.2    | 0.0   |     |
| Total Delay             | 40.3  | 16.9  | 3.6   | 25.6   | 9.2   |     |
| LOS                     | D     | B     | A     | C      | A     |     |
| Approach Delay          | 18.0  |       |       | 24.7   | 9.2   |     |
| Approach LOS            | B     |       |       | C      | A     |     |
| Queue Length 50th (m)   | 3.4   | 0.0   | 1.6   | 112.8  | 24.3  |     |
| Queue Length 95th (m)   | 11.5  | #42.6 | 5.3   | #304.2 | 46.4  |     |
| Internal Link Dist (m)  | 130.2 |       |       | 219.1  | 521.7 |     |
| Turn Bay Length (m)     |       | 25.0  | 50.0  |        |       |     |
| Base Capacity (vph)     | 216   | 579   | 556   | 1522   | 1205  |     |
| Starvation Cap Reductn  | 0     | 0     | 0     | 47     | 0     |     |
| Spillback Cap Reductn   | 0     | 0     | 0     | 0      | 0     |     |
| Storage Cap Reductn     | 0     | 0     | 0     | 0      | 0     |     |
| Reduced v/c Ratio       | 0.10  | 0.73  | 0.09  | 0.79   | 0.27  |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 81.9             |
| Natural Cycle:                     | 90               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.94             |
| Intersection Signal Delay:         | 20.7             |
| Intersection LOS:                  | C                |
| Intersection Capacity Utilization: | 81.8%            |
| 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: 2: Boundary Road & Hwy 417 EB Ramp Terminal



Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

2035 Future Total AM  
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|                            |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |   |  |   |   |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)       | 63  | 20  | 10  | 4   | 7   | 31  | 22   | 1124  | 36  | 236   | 369   | 124   |
| Future Volume (vph)        | 63  | 20  | 10  | 4   | 7   | 31  | 22   | 1124  | 36  | 236   | 369   | 124   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800   | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.3  | 3.5   | 3.3   | 3.3   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   |   | 15.0  | 0.0   |   | 0.0   | 35.0   |   | 7.5   | 100.0   |   | 35.0  |
| Storage Lanes              | 0   |   | 0   | 0   |   | 1   | 1  |   | 1   | 1   |   | 0   |
| Taper Length (m)           | 7.5   |   |   | 7.5   |   |   | 45.0   |   |   | 75.0  |   |   |
| 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  |
| Frt                        |   | 0.985   |   |   |   | 0.850   |  |   | 0.850   |   | 0.962   |   |
| Flt Protected              |   | 0.967   |   |   | 0.982   |   | 0.950  |   |   | 0.950   |   |   |
| Satd. Flow (prot)          | 0   | 1544  | 0   | 0   | 1748  | 1513  | 1589   | 1728  | 1479  | 1653  | 1479  | 0   |
| Flt Permitted              |   | 0.790   |   |   | 0.891   |   | 0.483  |   |   | 0.066   |   |   |
| Satd. Flow (perm)          | 0   | 1262  | 0   | 0   | 1586  | 1513  | 808  | 1728  | 1479  | 115   | 1479  | 0   |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |  |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 5   |   |   |   | 100   |  |   | 96  |   |   | 39  |
| Link Speed (k/h)           |   | 60  |   |   | 20  |   |  | 80  |   |   |   | 80  |
| Link Distance (m)          |   | 198.6   |   |   | 170.6   |   |  | 174.7   |   |   |   | 243.1   |
| Travel Time (s)            |   | 11.9  |   |   | 30.7  |   |  | 7.9   |   |   |   | 10.9  |
| 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 (%)         | 13%   | 0%  | 9%  | 0%  | 0%  | 0%  | 4%   | 3%  | 0%  | 0%  | 15%   | 18%   |
| Adj. Flow (vph)            | 63  | 20  | 10  | 4   | 7   | 31  | 22   | 1124  | 36  | 236   | 369   | 124   |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Group Flow (vph)      | 0   | 93  | 0   | 0   | 11  | 31  | 22   | 1124  | 36  | 236   | 493   | 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   |   |  | 3.5   |   |   | 3.5   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |  | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.8   |   |   | 4.8   |   |  | 4.8   |   |   | 4.8   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |  |   |   |   |   |   |
| Headway Factor             | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.12   | 1.09  | 1.12  | 1.12  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25  |   | 15  | 25  |   | 15  | 25   |   | 15  | 25  |   | 15  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   | 1   | 1  | 2   | 1   | 1   | 2   |   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  | Right   | Left   | Thru  | Right   | Left  | Thru  |   |
| Leading Detector (m)       | 2.0   | 10.0  |   | 2.0   | 10.0  | 2.0   | 2.0  | 10.0  | 2.0   | 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   | 0.6   | 2.0   | 2.0  | 0.6   | 2.0   | 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                  | Perm  | NA  |   | Perm  | NA  | Perm  | Perm   | NA  | Perm  | pm+pt   | NA  |   |

Lanes, Volumes, Timings  
3: Boundary Road & Thunder Road/Amazon Way

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| Lane Group              | EBL   | EBT   | EBR | WBL   | WBT   | WBR   | NBL   | NBT    | NBR   | SBL   | SBT   | SBR |
|-------------------------|-------|-------|-----|-------|-------|-------|-------|--------|-------|-------|-------|-----|
| Protected Phases        |       | 4     |     |       | 8     |       |       | 2      |       | 1     | 6     |     |
| Permitted Phases        | 4     |       |     | 8     |       | 8     | 2     |        | 2     | 6     |       |     |
| Detector Phase          | 4     | 4     |     | 8     | 8     | 8     | 2     | 2      | 2     | 1     | 6     |     |
| Switch Phase            |       |       |     |       |       |       |       |        |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 20.0  | 20.0   | 20.0  | 7.0   | 20.0  |     |
| Minimum Split (s)       | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 26.2  | 26.2   | 26.2  | 13.0  | 26.2  |     |
| Total Split (s)         | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 60.5  | 60.5   | 60.5  | 14.7  | 75.2  |     |
| Total Split (%)         | 24.8% | 24.8% |     | 24.8% | 24.8% | 24.8% | 60.5% | 60.5%  | 60.5% | 14.7% | 75.2% |     |
| Maximum Green (s)       | 19.0  | 19.0  |     | 19.0  | 19.0  | 19.0  | 54.3  | 54.3   | 54.3  | 8.7   | 69.0  |     |
| Yellow Time (s)         | 3.7   | 3.7   |     | 3.7   | 3.7   | 3.7   | 4.6   | 4.6    | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 2.1   | 2.1   |     | 2.1   | 2.1   | 2.1   | 1.6   | 1.6    | 1.6   | 1.4   | 1.6   |     |
| Lost Time Adjust (s)    |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     |       | 5.8   |     |       | 5.8   | 5.8   | 6.2   | 6.2    | 6.2   | 6.0   | 6.2   |     |
| Lead/Lag                |       |       |     |       |       |       | Lag   | Lag    | Lag   | Lead  |       |     |
| 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  | Min   | Min    | Min   | None  | Min   |     |
| Walk Time (s)           | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 7.0   | 7.0    | 7.0   |       | 7.0   |     |
| Flash Dont Walk (s)     | 12.0  | 12.0  |     | 12.0  | 12.0  | 12.0  | 10.0  | 10.0   | 10.0  |       | 10.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0     |     | 0     | 0     | 0     | 0     | 0      | 0     |       | 0     |     |
| Act Effct Green (s)     |       | 11.8  |     |       | 11.8  | 11.8  | 54.8  | 54.8   | 54.8  | 69.9  | 71.1  |     |
| Actuated g/C Ratio      |       | 0.13  |     |       | 0.13  | 0.13  | 0.61  | 0.61   | 0.61  | 0.77  | 0.79  |     |
| v/c Ratio               |       | 0.55  |     |       | 0.05  | 0.11  | 0.04  | 1.07   | 0.04  | 1.00  | 0.42  |     |
| Control Delay           |       | 48.3  |     |       | 35.0  | 0.8   | 9.8   | 71.9   | 0.1   | 83.9  | 5.7   |     |
| Queue Delay             |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Delay             |       | 48.3  |     |       | 35.0  | 0.8   | 9.8   | 71.9   | 0.1   | 83.9  | 5.7   |     |
| LOS                     |       | D     |     |       | C     | A     | A     | E      | A     | F     | A     |     |
| Approach Delay          |       | 48.3  |     |       | 9.7   |       |       | 68.6   |       |       | 31.0  |     |
| Approach LOS            |       | D     |     |       | A     |       |       | E      |       |       | C     |     |
| Queue Length 50th (m)   |       | 15.8  |     |       | 1.9   | 0.0   | 1.6   | ~243.7 | 0.0   | ~32.3 | 26.0  |     |
| Queue Length 95th (m)   |       | 31.7  |     |       | 6.8   | 0.0   | 5.8   | #352.5 | 0.0   | #87.7 | 55.4  |     |
| Internal Link Dist (m)  |       | 174.6 |     |       | 146.6 |       |       | 150.7  |       |       | 219.1 |     |
| Turn Bay Length (m)     |       |       |     |       |       |       | 35.0  |        | 7.5   | 100.0 |       |     |
| Base Capacity (vph)     |       | 271   |     |       | 336   | 399   | 489   | 1046   | 933   | 237   | 1170  |     |
| Starvation Cap Reductn  |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Spillback Cap Reductn   |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Storage Cap Reductn     |       | 0     |     |       | 0     | 0     | 0     | 0      | 0     | 0     | 0     |     |
| Reduced v/c Ratio       |       | 0.34  |     |       | 0.03  | 0.08  | 0.04  | 1.07   | 0.04  | 1.00  | 0.42  |     |

Intersection Summary


|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 90.5             |
| Natural Cycle:                     | 140              |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 1.07             |
| Intersection Signal Delay:         | 53.1             |
| Intersection LOS:                  | D                |
| Intersection Capacity Utilization: | 103.3%           |
| ICU Level of Service:              | G                |
| Analysis Period (min):             | 15               |

Lanes, Volumes, Timings  
 3: Boundary Road & Thunder Road/Amazon Way

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
















- ~ 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: 3: Boundary Road & Thunder Road/Amazon Way

|   |   |   |
|---|---|---|
| <br>Ø1 | <br>Ø2 | <br>Ø4 |
| 14.7 s  | 60.5 s  | 24.8 s  |
| <br>Ø6 |   | <br>Ø8 |
| 75.2 s  |   | 24.8 s  |




















Lanes, Volumes, Timings  
4: Boundary Road & Site Access/South Amazon Access

2035 Future Total AM  
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|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group                        | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |  |  |   |  |  |   |
| Traffic Volume (vph)              | 1   | 0   | 4   | 7   | 0   | 4   | 14  | 1177  | 7   | 1   | 365   | 17  |
| Future Volume (vph)               | 1   | 0   | 4   | 7   | 0   | 4   | 14  | 1177  | 7   | 1   | 365   | 17  |
| Ideal Flow (vphpl)                | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)                    | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.6   |
| Storage Length (m)                | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 15.0  |   | 0.0   | 70.0  |   | 0.0   |
| Storage Lanes                     | 0   |   | 0   | 0   |   | 0   | 1   |   | 0   | 1   |   | 0   |
| Taper Length (m)                  | 7.5   |   |   | 7.5   |   |   | 45.0  |   |   | 45.0  |   |   |
| 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  |
| Frt                               |   | 0.892   |   |   | 0.951   |   |   | 0.999   |   |   | 0.993   |   |
| Flt Protected                     |   | 0.990   |   |   | 0.969   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)                 | 0   | 1572  | 0   | 0   | 820   | 0   | 1691  | 1750  | 0   | 846   | 1586  | 0   |
| Flt Permitted                     |   | 0.990   |   |   | 0.969   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (perm)                 | 0   | 1572  | 0   | 0   | 820   | 0   | 1691  | 1750  | 0   | 846   | 1586  | 0   |
| Link Speed (k/h)                  |   | 50  |   |   | 20  |   |   | 80  |   |   | 80  |   |
| Link Distance (m)                 |   | 105.7   |   |   | 151.5   |   |   | 1150.2  |   |   | 174.7   |   |
| Travel Time (s)                   |   | 7.6   |   |   | 27.3  |   |   | 51.8  |   |   | 7.9   |   |
| 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 (%)                | 0%  | 0%  | 0%  | 100%  | 0%  | 100%  | 0%  | 1%  | 100%  | 100%  | 12%   | 0%  |
| Adj. Flow (vph)                   | 1   | 0   | 4   | 7   | 0   | 4   | 14  | 1177  | 7   | 1   | 365   | 17  |
| Shared Lane Traffic (%)           |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)             | 0   | 5   | 0   | 0   | 11  | 0   | 14  | 1184  | 0   | 1   | 382   | 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   |   |   | 3.5   |   |   | 3.5   |   |
| Link Offset(m)                    |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)                |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |
| 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  | 1.07  |
| Turning Speed (k/h)               | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  |
| Sign Control                      |   | Stop  |   |   | Stop  |   |   | Free  |   |   | Free  |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |   |   |   |   |   |   |
| Area Type:                        | Other   |   |   |   |   |   |   |   |   |   |   |   |
| Control Type:                     | Unsignalized  |   |   |   |   |   |   |   |   |   |   |   |
| Intersection Capacity Utilization | 75.8%   |   |   |   |   |   | ICU Level of Service D  |   |   |   |   |   |
| Analysis Period (min)             | 15  |   |   |   |   |   |   |   |   |   |   |   |

HCM Unsignalized Intersection Capacity Analysis  
 4: Boundary Road & Site Access/South Amazon Access

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|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |  |  |   |  |  |  |
| Traffic Volume (veh/h)            | 1   | 0   | 4   | 7   | 0   | 4   | 14  | 1177  | 7   | 1   | 365   | 17  |
| Future Volume (Veh/h)             | 1   | 0   | 4   | 7   | 0   | 4   | 14  | 1177  | 7   | 1   | 365   | 17  |
| Sign Control                      |   | Stop  |   |   | Stop  |   |   | Free  |   |   | Free  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |   | 0%  |   |   | 0%  |   |
| 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  |
| Hourly flow rate (vph)            | 1   | 0   | 4   | 7   | 0   | 4   | 14  | 1177  | 7   | 1   | 365   | 17  |
| Pedestrians                       |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Width (m)                    |   |   |   |   |   |   |   |   |   |   |   |   |
| Walking Speed (m/s)               |   |   |   |   |   |   |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |   |   |   |   |   |   |
| Median type                       |   |   |   |   |   |   |   |   |   |   |   |   |
|                                   |   |   |   |   |   |   |   | None  |   |   |   | None  |
| Median storage veh                |   |   |   |   |   |   |   |   |   |   |   |   |
| Upstream signal (m)               |   |   |   |   |   |   |   |   |   |   |   |   |
|                                   |   |   |   |   |   |   |   |   |   |   |   | 175   |
| pX, platoon unblocked             | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  |   | 0.95  |   |   |   |   |   |
| vC, conflicting volume            | 1584  | 1588  | 374   | 1580  | 1592  | 1180  | 382   |   |   | 1184  |   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vCu, unblocked vol                | 1589  | 1592  | 309   | 1584  | 1598  | 1180  | 318   |   |   | 1184  |   |   |
| tC, single (s)                    | 7.1   | 6.5   | 6.2   | 8.1   | 6.5   | 7.2   | 4.1   |   |   | 5.1   |   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |   |   |   |   |   |   |
| tF (s)                            | 3.5   | 4.0   | 3.3   | 4.4   | 4.0   | 4.2   | 2.2   |   |   | 3.1   |   |   |
| p0 queue free %                   | 99  | 100   | 99  | 86  | 100   | 97  | 99  |   |   | 100   |   |   |
| cM capacity (veh/h)               | 80  | 101   | 696   | 49  | 100   | 149   | 1186  |   |   | 346   |   |   |
| Direction, Lane #                 | EB 1  | WB 1  | NB 1  | NB 2  | SB 1  | SB 2  |   |   |   |   |   |   |
| Volume Total                      | 5   | 11  | 14  | 1184  | 1   | 382   |   |   |   |   |   |   |
| Volume Left                       | 1   | 7   | 14  | 0   | 1   | 0   |   |   |   |   |   |   |
| Volume Right                      | 4   | 4   | 0   | 7   | 0   | 17  |   |   |   |   |   |   |
| cSH                               | 274   | 65  | 1186  | 1700  | 346   | 1700  |   |   |   |   |   |   |
| Volume to Capacity                | 0.02  | 0.17  | 0.01  | 0.70  | 0.00  | 0.22  |   |   |   |   |   |   |
| Queue Length 95th (m)             | 0.4   | 4.5   | 0.3   | 0.0   | 0.1   | 0.0   |   |   |   |   |   |   |
| Control Delay (s)                 | 18.4  | 71.9  | 8.1   | 0.0   | 15.4  | 0.0   |   |   |   |   |   |   |
| Lane LOS                          | C   | F   | A   |   | C   |   |   |   |   |   |   |   |
| Approach Delay (s)                | 18.4  | 71.9  | 0.1   |   | 0.0   |   |   |   |   |   |   |   |
| Approach LOS                      | C   | F   |   |   |   |   |   |   |   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |   |   |   |   |   |   |
| Average Delay                     |   |   | 0.6   |   |   |   |   |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 75.8%   | ICU Level of Service  |   | D   |   |   |   |   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |   |   |   |   |   |   |

Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road

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| Lane Group                 | EBL   | EBR   | NBL  | NBT   | SBT    | SBR   |
|----------------------------|-------|-------|------|-------|--------|-------|
| Lane Configurations        |       |       |      |       |        |       |
| Traffic Volume (vph)       | 100   | 36    | 163  | 1081  | 160    | 131   |
| Future Volume (vph)        | 100   | 36    | 163  | 1081  | 160    | 131   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800   | 1800  |
| Lane Width (m)             | 3.3   | 3.3   | 3.5  | 3.5   | 3.5    | 3.5   |
| Storage Length (m)         | 25.0  | 0.0   | 0.0  |       |        | 30.0  |
| Storage Lanes              | 1     | 1     | 0    |       |        | 1     |
| Taper Length (m)           | 47.5  |       | 7.5  |       |        |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |      |       |        | 0.850 |
| Fl <sub>t</sub> Protected  | 0.950 |       |      | 0.993 |        |       |
| Satd. Flow (prot)          | 1489  | 1297  | 0    | 1734  | 1575   | 1293  |
| Fl <sub>t</sub> Permitted  | 0.950 |       |      | 0.993 |        |       |
| Satd. Flow (perm)          | 1489  | 1297  | 0    | 1734  | 1575   | 1293  |
| Link Speed (k/h)           | 80    |       |      | 80    | 80     |       |
| Link Distance (m)          | 180.5 |       |      | 135.8 | 1150.2 |       |
| Travel Time (s)            | 8.1   |       |      | 6.1   | 51.8   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Heavy Vehicles (%)         | 11%   | 14%   | 8%   | 1%    | 13%    | 17%   |
| Adj. Flow (vph)            | 100   | 36    | 163  | 1081  | 160    | 131   |
| Shared Lane Traffic (%)    |       |       |      |       |        |       |
| Lane Group Flow (vph)      | 100   | 36    | 0    | 1244  | 160    | 131   |
| Enter Blocked Intersection | No    | No    | No   | No    | No     | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left   | Right |
| Median Width(m)            | 3.3   |       |      | 3.5   | 3.5    |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0    |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8    |       |
| Two way Left Turn Lane     |       |       |      |       |        |       |
| Headway Factor             | 1.12  | 1.12  | 1.09 | 1.09  | 1.09   | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25   |       |        | 15    |
| Sign Control               | Stop  |       |      | Free  | Free   |       |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 94.3%        |
| ICU Level of Service              | F            |
| Analysis Period (min)             | 15           |



HCM Unsignalized Intersection Capacity Analysis  
5: Boundary Road & Mitch Owens Road

2035 Future Total AM  
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| Movement                          | EBL   | EBR  | NBL   | NBT                  | SBT  | SBR  |
|-----------------------------------|-------|------|-------|----------------------|------|------|
| Lane Configurations               |       |      |       |                      |      |      |
| Traffic Volume (veh/h)            | 100   | 36   | 163   | 1081                 | 160  | 131  |
| Future Volume (Veh/h)             | 100   | 36   | 163   | 1081                 | 160  | 131  |
| Sign Control                      | Stop  |      |       | Free                 | Free |      |
| Grade                             | 0%    |      |       | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00  | 1.00 | 1.00  | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 100   | 36   | 163   | 1081                 | 160  | 131  |
| Pedestrians                       |       |      |       |                      |      |      |
| Lane Width (m)                    |       |      |       |                      |      |      |
| Walking Speed (m/s)               |       |      |       |                      |      |      |
| Percent Blockage                  |       |      |       |                      |      |      |
| Right turn flare (veh)            |       |      |       |                      |      |      |
| Median type                       |       |      |       | None                 | None |      |
| Median storage veh                |       |      |       |                      |      |      |
| Upstream signal (m)               |       |      |       |                      |      |      |
| pX, platoon unblocked             |       |      |       |                      |      |      |
| vC, conflicting volume            | 1567  | 160  | 291   |                      |      |      |
| vC1, stage 1 conf vol             |       |      |       |                      |      |      |
| vC2, stage 2 conf vol             |       |      |       |                      |      |      |
| vCu, unblocked vol                | 1567  | 160  | 291   |                      |      |      |
| tC, single (s)                    | 6.5   | 6.3  | 4.2   |                      |      |      |
| tC, 2 stage (s)                   |       |      |       |                      |      |      |
| tF (s)                            | 3.6   | 3.4  | 2.3   |                      |      |      |
| p0 queue free %                   | 1     | 96   | 87    |                      |      |      |
| cM capacity (veh/h)               | 101   | 855  | 1237  |                      |      |      |
| Direction, Lane #                 | EB 1  | EB 2 | NB 1  | SB 1                 | SB 2 |      |
| Volume Total                      | 100   | 36   | 1244  | 160                  | 131  |      |
| Volume Left                       | 100   | 0    | 163   | 0                    | 0    |      |
| Volume Right                      | 0     | 36   | 0     | 0                    | 131  |      |
| cSH                               | 101   | 855  | 1237  | 1700                 | 1700 |      |
| Volume to Capacity                | 0.99  | 0.04 | 0.13  | 0.09                 | 0.08 |      |
| Queue Length 95th (m)             | 48.4  | 1.1  | 3.6   | 0.0                  | 0.0  |      |
| Control Delay (s)                 | 164.1 | 9.4  | 3.7   | 0.0                  | 0.0  |      |
| Lane LOS                          | F     | A    | A     |                      |      |      |
| Approach Delay (s)                | 123.1 |      | 3.7   | 0.0                  |      |      |
| Approach LOS                      | F     |      |       |                      |      |      |
| Intersection Summary              |       |      |       |                      |      |      |
| Average Delay                     |       |      | 12.8  |                      |      |      |
| Intersection Capacity Utilization |       |      | 94.3% | ICU Level of Service |      | F    |
| Analysis Period (min)             |       |      | 15    |                      |      |      |

Lanes, Volumes, Timings  
6: Site Access A & Thunder Road

2035 Future Total AM  
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| Lane Group                 | EBT   | EBR   | WBL  | WBT   | NBL   | NBR   |
|----------------------------|-------|-------|------|-------|-------|-------|
| Lane Configurations        |       |       |      |       |       |       |
| Traffic Volume (vph)       | 77    | 0     | 38   | 115   | 0     | 16    |
| Future Volume (vph)        | 77    | 0     | 38   | 115   | 0     | 16    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5  | 3.5   | 3.5   | 3.5   |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Flt                        |       |       |      |       | 0.865 |       |
| Flt Protected              |       |       |      | 0.988 |       |       |
| Satd. Flow (prot)          | 1589  | 0     | 0    | 1509  | 1466  | 0     |
| Flt Permitted              |       |       |      | 0.988 |       |       |
| Satd. Flow (perm)          | 1589  | 0     | 0    | 1509  | 1466  | 0     |
| Link Speed (k/h)           | 60    |       |      | 50    | 50    |       |
| Link Distance (m)          | 163.7 |       |      | 198.6 | 103.6 |       |
| Travel Time (s)            | 9.8   |       |      | 14.3  | 7.5   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 12%   | 0%    | 0%   | 22%   | 0%    | 5%    |
| Adj. Flow (vph)            | 77    | 0     | 38   | 115   | 0     | 16    |
| Shared Lane Traffic (%)    |       |       |      |       |       |       |
| Lane Group Flow (vph)      | 77    | 0     | 0    | 153   | 16    | 0     |
| Enter Blocked Intersection | No    | No    | No   | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left  | Right |
| Median Width(m)            | 0.0   |       |      | 0.0   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |      |       |       |       |
| Headway Factor             | 1.09  | 1.09  | 1.09 | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        |       | 15    | 25   |       | 25    | 15    |
| Sign Control               | Free  |       |      | Free  | Stop  |       |

Intersection Summary

|                                   |                        |
|-----------------------------------|------------------------|
| Area Type:                        | Other                  |
| Control Type:                     | Unsignalized           |
| Intersection Capacity Utilization | 25.3%                  |
| Analysis Period (min)             | 15                     |
|                                   | ICU Level of Service A |

HCM Unsignalized Intersection Capacity Analysis  
6: Site Access A & Thunder Road

2035 Future Total AM  
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| Movement                          | EBT         | EBR         | WBL         | WBT  | NBL                  | NBR  |
|-----------------------------------|-------------|-------------|-------------|------|----------------------|------|
| Lane Configurations               | →           |             |             | ←    | ←                    | ↘    |
| Traffic Volume (veh/h)            | 77          | 0           | 38          | 115  | 0                    | 16   |
| Future Volume (Veh/h)             | 77          | 0           | 38          | 115  | 0                    | 16   |
| Sign Control                      | Free        |             |             | Free | Stop                 |      |
| Grade                             | 0%          |             |             | 0%   | 0%                   |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00 | 1.00                 | 1.00 |
| Hourly flow rate (vph)            | 77          | 0           | 38          | 115  | 0                    | 16   |
| <b>Pedestrians</b>                |             |             |             |      |                      |      |
| Lane Width (m)                    |             |             |             |      |                      |      |
| Walking Speed (m/s)               |             |             |             |      |                      |      |
| Percent Blockage                  |             |             |             |      |                      |      |
| Right turn flare (veh)            |             |             |             |      |                      |      |
| Median type                       | None        |             |             | None |                      |      |
| Median storage (veh)              |             |             |             |      |                      |      |
| Upstream signal (m)               | 199         |             |             |      |                      |      |
| pX, platoon unblocked             |             |             |             |      |                      |      |
| vC, conflicting volume            |             |             | 77          | 268  |                      | 77   |
| vC1, stage 1 conf vol             |             |             |             |      |                      |      |
| vC2, stage 2 conf vol             |             |             |             |      |                      |      |
| vCu, unblocked vol                |             |             | 77          | 268  |                      | 77   |
| tC, single (s)                    |             |             | 4.1         | 6.4  |                      | 6.2  |
| tC, 2 stage (s)                   |             |             |             |      |                      |      |
| tF (s)                            |             |             | 2.2         | 3.5  |                      | 3.3  |
| p0 queue free %                   |             |             | 98          | 100  |                      | 98   |
| cM capacity (veh/h)               |             |             | 1535        | 708  |                      | 976  |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>WB 1</b> | <b>NB 1</b> |      |                      |      |
| Volume Total                      | 77          | 153         | 16          |      |                      |      |
| Volume Left                       | 0           | 38          | 0           |      |                      |      |
| Volume Right                      | 0           | 0           | 16          |      |                      |      |
| cSH                               | 1700        | 1535        | 976         |      |                      |      |
| Volume to Capacity                | 0.05        | 0.02        | 0.02        |      |                      |      |
| Queue Length 95th (m)             | 0.0         | 0.6         | 0.4         |      |                      |      |
| Control Delay (s)                 | 0.0         | 2.0         | 8.8         |      |                      |      |
| Lane LOS                          | A           |             | A           |      |                      |      |
| Approach Delay (s)                | 0.0         | 2.0         | 8.8         |      |                      |      |
| Approach LOS                      | A           |             | A           |      |                      |      |
| <b>Intersection Summary</b>       |             |             |             |      |                      |      |
| Average Delay                     |             |             | 1.8         |      |                      |      |
| Intersection Capacity Utilization |             |             | 25.3%       |      | ICU Level of Service |      |
| Analysis Period (min)             |             |             | 15          |      |                      |      |
|                                   |             |             | A           |      |                      |      |

Lanes, Volumes, Timings  
7: Site Access B & Thunder Road

2035 Future Total AM  
08-09-2021



| Lane Group                 | EBT   | EBR   | WBL  | WBT   | NBL   | NBR   |
|----------------------------|-------|-------|------|-------|-------|-------|
| Lane Configurations        |       |       |      |       |       |       |
| Traffic Volume (vph)       | 74    | 0     | 11   | 104   | 0     | 3     |
| Future Volume (vph)        | 74    | 0     | 11   | 104   | 0     | 3     |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5  | 3.5   | 3.5   | 3.5   |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Frt                        |       |       |      |       | 0.865 |       |
| Flt Protected              |       |       |      | 0.995 |       |       |
| Satd. Flow (prot)          | 1664  | 0     | 0    | 1482  | 770   | 0     |
| Flt Permitted              |       |       |      | 0.995 |       |       |
| Satd. Flow (perm)          | 1664  | 0     | 0    | 1482  | 770   | 0     |
| Link Speed (k/h)           | 60    |       |      | 50    | 50    |       |
| Link Distance (m)          | 185.0 |       |      | 163.7 | 105.8 |       |
| Travel Time (s)            | 11.1  |       |      | 11.8  | 7.6   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 7%    | 0%    | 100% | 11%   | 0%    | 100%  |
| Adj. Flow (vph)            | 74    | 0     | 11   | 104   | 0     | 3     |
| Shared Lane Traffic (%)    |       |       |      |       |       |       |
| Lane Group Flow (vph)      | 74    | 0     | 0    | 115   | 3     | 0     |
| Enter Blocked Intersection | No    | No    | No   | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left  | Right |
| Median Width(m)            | 0.0   |       |      | 0.0   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |      |       |       |       |
| Headway Factor             | 1.09  | 1.09  | 1.09 | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        |       | 15    | 25   |       | 25    | 15    |
| Sign Control               | Free  |       |      | Free  | Stop  |       |

Intersection Summary

|                                   |                        |
|-----------------------------------|------------------------|
| Area Type:                        | Other                  |
| Control Type:                     | Unsignalized           |
| Intersection Capacity Utilization | 23.1%                  |
| Analysis Period (min)             | 15                     |
|                                   | ICU Level of Service A |

HCM Unsignalized Intersection Capacity Analysis  
7: Site Access B & Thunder Road

2035 Future Total AM  
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| Movement                          | EBT  | EBR  | WBL   | WBT                  | NBL  | NBR  |
|-----------------------------------|------|------|-------|----------------------|------|------|
| Lane Configurations               | ↩    |      |       | ↩                    | ↩    |      |
| Traffic Volume (veh/h)            | 74   | 0    | 11    | 104                  | 0    | 3    |
| Future Volume (Veh/h)             | 74   | 0    | 11    | 104                  | 0    | 3    |
| Sign Control                      | Free |      |       | Free                 | Stop |      |
| Grade                             | 0%   |      |       | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00 | 1.00 | 1.00  | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 74   | 0    | 11    | 104                  | 0    | 3    |
| Pedestrians                       |      |      |       |                      |      |      |
| Lane Width (m)                    |      |      |       |                      |      |      |
| Walking Speed (m/s)               |      |      |       |                      |      |      |
| Percent Blockage                  |      |      |       |                      |      |      |
| Right turn flare (veh)            |      |      |       |                      |      |      |
| Median type                       | None |      |       | None                 |      |      |
| Median storage (veh)              |      |      |       |                      |      |      |
| Upstream signal (m)               | 362  |      |       |                      |      |      |
| pX, platoon unblocked             |      |      |       |                      |      |      |
| vC, conflicting volume            |      |      | 74    |                      | 200  | 74   |
| vC1, stage 1 conf vol             |      |      |       |                      |      |      |
| vC2, stage 2 conf vol             |      |      |       |                      |      |      |
| vCu, unblocked vol                |      |      | 74    |                      | 200  | 74   |
| tC, single (s)                    |      |      | 5.1   |                      | 6.4  | 7.2  |
| tC, 2 stage (s)                   |      |      |       |                      |      |      |
| tF (s)                            |      |      | 3.1   |                      | 3.5  | 4.2  |
| p0 queue free %                   |      |      | 99    |                      | 100  | 100  |
| cM capacity (veh/h)               |      |      | 1079  |                      | 785  | 772  |
| Direction, Lane #                 | EB 1 | WB 1 | NB 1  |                      |      |      |
| Volume Total                      | 74   | 115  | 3     |                      |      |      |
| Volume Left                       | 0    | 11   | 0     |                      |      |      |
| Volume Right                      | 0    | 0    | 3     |                      |      |      |
| cSH                               | 1700 | 1079 | 772   |                      |      |      |
| Volume to Capacity                | 0.04 | 0.01 | 0.00  |                      |      |      |
| Queue Length 95th (m)             | 0.0  | 0.2  | 0.1   |                      |      |      |
| Control Delay (s)                 | 0.0  | 0.9  | 9.7   |                      |      |      |
| Lane LOS                          |      |      | A     |                      |      |      |
| Approach Delay (s)                | 0.0  | 0.9  | 9.7   |                      |      |      |
| Approach LOS                      |      |      | A     |                      |      |      |
| Intersection Summary              |      |      |       |                      |      |      |
| Average Delay                     |      |      | 0.7   |                      |      |      |
| Intersection Capacity Utilization |      |      | 23.1% | ICU Level of Service | A    |      |
| Analysis Period (min)             |      |      | 15    |                      |      |      |

Lanes, Volumes, Timings  
8: Site Access C & Thunder Road

2035 Future Total AM  
08-09-2021



| Lane Group                 | EBT  | EBR   | WBL  | WBT   | NBL   | NBR   |
|----------------------------|------|-------|------|-------|-------|-------|
| Lane Configurations        |      |       |      |       |       |       |
| Traffic Volume (vph)       | 67   | 0     | 23   | 81    | 0     | 7     |
| Future Volume (vph)        | 67   | 0     | 23   | 81    | 0     | 7     |
| Ideal Flow (vphpl)         | 1800 | 1800  | 1800 | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5  | 3.5   | 3.5  | 3.5   | 3.5   | 3.5   |
| Lane Util. Factor          | 1.00 | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Flt                        |      |       |      |       | 0.865 |       |
| Flt Protected              |      |       |      | 0.989 |       |       |
| Satd. Flow (prot)          | 1679 | 0     | 0    | 1596  | 1351  | 0     |
| Flt Permitted              |      |       |      | 0.989 |       |       |
| Satd. Flow (perm)          | 1679 | 0     | 0    | 1596  | 1351  | 0     |
| Link Speed (k/h)           | 60   |       |      | 50    | 50    |       |
| Link Distance (m)          | 95.5 |       |      | 185.0 | 109.7 |       |
| Travel Time (s)            | 5.7  |       |      | 13.3  | 7.9   |       |
| Peak Hour Factor           | 1.00 | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 6%   | 0%    | 22%  | 7%    | 0%    | 14%   |
| Adj. Flow (vph)            | 67   | 0     | 23   | 81    | 0     | 7     |
| Shared Lane Traffic (%)    |      |       |      |       |       |       |
| Lane Group Flow (vph)      | 67   | 0     | 0    | 104   | 7     | 0     |
| Enter Blocked Intersection | No   | No    | No   | No    | No    | No    |
| Lane Alignment             | Left | Right | Left | Left  | Left  | Right |
| Median Width(m)            | 0.0  |       |      | 0.0   | 3.5   |       |
| Link Offset(m)             | 0.0  |       |      | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8  |       |      | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |      |       |      |       |       |       |
| Headway Factor             | 1.09 | 1.09  | 1.09 | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        |      | 15    | 25   |       | 25    | 15    |
| Sign Control               | Free |       |      | Free  | Stop  |       |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 22.5%        |
| ICU Level of Service              | A            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
 8: Site Access C & Thunder Road

2035 Future Total AM  
 08-09-2021



| Movement                          | EBT         | EBR         | WBL         | WBT                  | NBL  | NBR  |
|-----------------------------------|-------------|-------------|-------------|----------------------|------|------|
| Lane Configurations               |             |             |             |                      |      |      |
| Traffic Volume (veh/h)            | 67          | 0           | 23          | 81                   | 0    | 7    |
| Future Volume (Veh/h)             | 67          | 0           | 23          | 81                   | 0    | 7    |
| Sign Control                      | Free        |             |             | Free                 | Stop |      |
| Grade                             | 0%          |             |             | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 67          | 0           | 23          | 81                   | 0    | 7    |
| <b>Pedestrians</b>                |             |             |             |                      |      |      |
| Lane Width (m)                    |             |             |             |                      |      |      |
| Walking Speed (m/s)               |             |             |             |                      |      |      |
| Percent Blockage                  |             |             |             |                      |      |      |
| Right turn flare (veh)            |             |             |             |                      |      |      |
| Median type                       | None        |             |             | None                 |      |      |
| Median storage (veh)              |             |             |             |                      |      |      |
| Upstream signal (m)               |             |             |             |                      |      |      |
| pX, platoon unblocked             |             |             |             |                      |      |      |
| vC, conflicting volume            |             |             | 67          |                      | 194  | 67   |
| vC1, stage 1 conf vol             |             |             |             |                      |      |      |
| vC2, stage 2 conf vol             |             |             |             |                      |      |      |
| vCu, unblocked vol                |             |             | 67          |                      | 194  | 67   |
| tC, single (s)                    |             |             | 4.3         |                      | 6.4  | 6.3  |
| tC, 2 stage (s)                   |             |             |             |                      |      |      |
| tF (s)                            |             |             | 2.4         |                      | 3.5  | 3.4  |
| p0 queue free %                   |             |             | 98          |                      | 100  | 99   |
| cM capacity (veh/h)               |             |             | 1416        |                      | 786  | 964  |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>WB 1</b> | <b>NB 1</b> |                      |      |      |
| Volume Total                      | 67          | 104         | 7           |                      |      |      |
| Volume Left                       | 0           | 23          | 0           |                      |      |      |
| Volume Right                      | 0           | 0           | 7           |                      |      |      |
| cSH                               | 1700        | 1416        | 964         |                      |      |      |
| Volume to Capacity                | 0.04        | 0.02        | 0.01        |                      |      |      |
| Queue Length 95th (m)             | 0.0         | 0.4         | 0.2         |                      |      |      |
| Control Delay (s)                 | 0.0         | 1.8         | 8.8         |                      |      |      |
| Lane LOS                          |             | A           | A           |                      |      |      |
| Approach Delay (s)                | 0.0         | 1.8         | 8.8         |                      |      |      |
| Approach LOS                      |             |             | A           |                      |      |      |
| <b>Intersection Summary</b>       |             |             |             |                      |      |      |
| Average Delay                     |             |             | 1.4         |                      |      |      |
| Intersection Capacity Utilization |             |             | 22.5%       | ICU Level of Service | A    |      |
| Analysis Period (min)             |             |             | 15          |                      |      |      |

Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road

2035 Future Total AM - Signal test  
08-09-2021



| Lane Group                 | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |
| Traffic Volume (vph)       | 100   | 36    | 163   | 1081  | 160   | 131   |
| Future Volume (vph)        | 100   | 36    | 163   | 1081  | 160   | 131   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.3   | 3.3   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)         | 25.0  | 0.0   | 15.0  |       |       | 30.0  |
| Storage Lanes              | 1     | 1     | 1     |       |       | 1     |
| Taper Length (m)           | 47.5  |       | 100.0 |       |       |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |       |       |       | 0.850 |
| Fl <sub>t</sub> Protected  | 0.950 |       | 0.950 |       |       |       |
| Satd. Flow (prot)          | 1489  | 1297  | 1566  | 1762  | 1575  | 1293  |
| Fl <sub>t</sub> Permitted  | 0.950 |       | 0.656 |       |       |       |
| Satd. Flow (perm)          | 1489  | 1297  | 1081  | 1762  | 1575  | 1293  |
| Right Turn on Red          |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 36    |       |       |       | 131   |
| Link Speed (k/h)           | 80    |       |       | 80    | 80    |       |
| Link Distance (m)          | 180.5 |       |       | 135.8 | 575.1 |       |
| Travel Time (s)            | 8.1   |       |       | 6.1   | 25.9  |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 11%   | 14%   | 8%    | 1%    | 13%   | 17%   |
| Adj. Flow (vph)            | 100   | 36    | 163   | 1081  | 160   | 131   |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 100   | 36    | 163   | 1081  | 160   | 131   |
| Enter Blocked Intersection | No    | No    | No    | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left  | Left  | Left  | Right |
| Median Width(m)            | 3.3   |       |       | 3.5   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |       | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |       | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |
| Headway Factor             | 1.12  | 1.12  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25    |       |       | 15    |
| Number of Detectors        | 1     | 1     | 1     | 2     | 2     | 1     |
| Detector Template          | Left  | Right | Left  | Thru  | Thru  | Right |
| Leading Detector (m)       | 2.0   | 2.0   | 2.0   | 10.0  | 10.0  | 2.0   |
| Trailing Detector (m)      | 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   |
| Detector 1 Size(m)         | 2.0   | 2.0   | 2.0   | 0.6   | 0.6   | 2.0   |
| Detector 1 Type            | 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   |
| Detector 1 Queue (s)       | 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   |
| Detector 2 Position(m)     |       |       |       | 9.4   | 9.4   |       |
| Detector 2 Size(m)         |       |       |       | 0.6   | 0.6   |       |
| Detector 2 Type            |       |       |       | Cl+Ex | Cl+Ex |       |
| Detector 2 Channel         |       |       |       |       |       |       |
| Detector 2 Extend (s)      |       |       |       | 0.0   | 0.0   |       |
| Turn Type                  | Prot  | Perm  | Perm  | NA    | NA    | Perm  |



Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road

2035 Future Total AM - Signal test  
08-09-2021



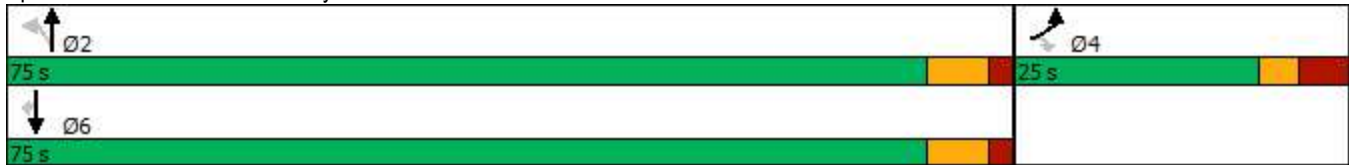
| Lane Group              | EBL   | EBR   | NBL   | NBT    | SBT   | SBR   |
|-------------------------|-------|-------|-------|--------|-------|-------|
| Protected Phases        | 4     |       |       | 2      | 6     |       |
| Permitted Phases        |       | 4     | 2     |        |       | 6     |
| Detector Phase          | 4     | 4     | 2     | 2      | 6     | 6     |
| Switch Phase            |       |       |       |        |       |       |
| Minimum Initial (s)     | 7.0   | 7.0   | 35.0  | 35.0   | 35.0  | 35.0  |
| Minimum Split (s)       | 24.8  | 24.8  | 41.6  | 41.6   | 41.6  | 41.6  |
| Total Split (s)         | 25.0  | 25.0  | 75.0  | 75.0   | 75.0  | 75.0  |
| Total Split (%)         | 25.0% | 25.0% | 75.0% | 75.0%  | 75.0% | 75.0% |
| Maximum Green (s)       | 18.2  | 18.2  | 68.4  | 68.4   | 68.4  | 68.4  |
| Yellow Time (s)         | 3.0   | 3.0   | 4.6   | 4.6    | 4.6   | 4.6   |
| All-Red Time (s)        | 3.8   | 3.8   | 2.0   | 2.0    | 2.0   | 2.0   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0    | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.8   | 6.8   | 6.6   | 6.6    | 6.6   | 6.6   |
| Lead/Lag                |       |       |       |        |       |       |
| Lead-Lag Optimize?      |       |       |       |        |       |       |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0    | 3.0   | 3.0   |
| Recall Mode             | None  | None  | Min   | Min    | Min   | Min   |
| Walk Time (s)           | 7.0   | 7.0   | 7.0   | 7.0    | 7.0   | 7.0   |
| Flash Dont Walk (s)     | 11.0  | 11.0  | 11.0  | 11.0   | 11.0  | 11.0  |
| Pedestrian Calls (#/hr) | 0     | 0     | 0     | 0      | 0     | 0     |
| Act Effct Green (s)     | 11.4  | 11.4  | 60.2  | 60.2   | 60.2  | 60.2  |
| Actuated g/C Ratio      | 0.14  | 0.14  | 0.75  | 0.75   | 0.75  | 0.75  |
| v/c Ratio               | 0.47  | 0.17  | 0.20  | 0.81   | 0.13  | 0.13  |
| Control Delay           | 43.0  | 14.0  | 5.4   | 16.4   | 4.7   | 1.2   |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0    | 0.0   | 0.0   |
| Total Delay             | 43.0  | 14.0  | 5.4   | 16.4   | 4.7   | 1.2   |
| LOS                     | D     | B     | A     | B      | A     | A     |
| Approach Delay          | 35.3  |       |       | 15.0   | 3.2   |       |
| Approach LOS            | D     |       |       | B      | A     |       |
| Queue Length 50th (m)   | 15.4  | 0.0   | 8.1   | 117.8  | 7.5   | 0.0   |
| Queue Length 95th (m)   | 34.3  | 8.8   | 18.5  | #275.9 | 16.5  | 5.2   |
| Internal Link Dist (m)  | 156.5 |       |       | 111.8  | 551.1 |       |
| Turn Bay Length (m)     | 25.0  |       | 15.0  |        |       | 30.0  |
| Base Capacity (vph)     | 355   | 337   | 917   | 1495   | 1336  | 1117  |
| Starvation Cap Reductn  | 0     | 0     | 0     | 0      | 0     | 0     |
| Spillback Cap Reductn   | 0     | 0     | 0     | 0      | 0     | 0     |
| Storage Cap Reductn     | 0     | 0     | 0     | 0      | 0     | 0     |
| Reduced v/c Ratio       | 0.28  | 0.11  | 0.18  | 0.72   | 0.12  | 0.12  |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 79.8             |
| Natural Cycle:                     | 90               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.81             |
| Intersection Signal Delay:         | 14.6             |
| Intersection LOS:                  | B                |
| Intersection Capacity Utilization: | 80.8%            |
| 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: 5: Boundary Road & Mitch Owens Road



Lanes, Volumes, Timings  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

2035 Future Total PM  
 08-09-2021



| Lane Group                 | WBL   | WBR   | NBT   | NBR   | SBL  | SBT   |
|----------------------------|-------|-------|-------|-------|------|-------|
| Lane Configurations        |       |       |       |       |      |       |
| Traffic Volume (vph)       | 71    | 1     | 208   | 409   | 30   | 154   |
| Future Volume (vph)        | 71    | 1     | 208   | 409   | 30   | 154   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  |
| Lane Width (m)             | 4.5   | 4.5   | 3.5   | 3.5   | 3.5  | 3.5   |
| Storage Length (m)         | 0.0   | 10.0  |       | 0.0   | 0.0  |       |
| Storage Lanes              | 1     | 0     |       | 0     | 0    |       |
| Taper Length (m)           | 7.5   |       |       |       | 7.5  |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Frt                        | 0.998 |       | 0.911 |       |      |       |
| Flt Protected              | 0.953 |       |       |       |      | 0.992 |
| Satd. Flow (prot)          | 1547  | 0     | 1520  | 0     | 0    | 1625  |
| Flt Permitted              | 0.953 |       |       |       |      | 0.992 |
| Satd. Flow (perm)          | 1547  | 0     | 1520  | 0     | 0    | 1625  |
| Link Speed (k/h)           | 40    |       | 80    |       |      | 80    |
| Link Distance (m)          | 155.0 |       | 545.7 |       |      | 134.1 |
| Travel Time (s)            | 14.0  |       | 24.6  |       |      | 6.0   |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  |
| Heavy Vehicles (%)         | 22%   | 0%    | 6%    | 7%    | 7%   | 9%    |
| Adj. Flow (vph)            | 71    | 1     | 208   | 409   | 30   | 154   |
| Shared Lane Traffic (%)    |       |       |       |       |      |       |
| Lane Group Flow (vph)      | 72    | 0     | 617   | 0     | 0    | 184   |
| Enter Blocked Intersection | No    | No    | No    | No    | No   | No    |
| Lane Alignment             | Left  | Right | Left  | Right | Left | Left  |
| Median Width(m)            | 4.5   |       | 0.0   |       |      | 0.0   |
| Link Offset(m)             | 0.0   |       | 0.0   |       |      | 0.0   |
| Crosswalk Width(m)         | 4.8   |       | 4.8   |       |      | 4.8   |
| Two way Left Turn Lane     |       |       |       |       |      |       |
| Headway Factor             | 0.95  | 0.95  | 1.09  | 1.09  | 1.09 | 1.09  |
| Turning Speed (k/h)        | 25    | 15    |       | 15    | 25   |       |
| Sign Control               | Stop  |       | Free  |       |      | Free  |

Intersection Summary

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

HCM Unsignalized Intersection Capacity Analysis  
 1: Boundary Road & Hwy 417 WB Ramp Terminal

2035 Future Total PM  
 08-09-2021



| Movement                          | WBL  | WBR   | NBT  | NBR                  | SBL  | SBT  |
|-----------------------------------|------|-------|------|----------------------|------|------|
| Lane Configurations               |      |       |      |                      |      |      |
| Traffic Volume (veh/h)            | 71   | 1     | 208  | 409                  | 30   | 154  |
| Future Volume (Veh/h)             | 71   | 1     | 208  | 409                  | 30   | 154  |
| Sign Control                      | Stop |       | Free |                      |      | Free |
| Grade                             | 0%   |       | 0%   |                      |      | 0%   |
| Peak Hour Factor                  | 1.00 | 1.00  | 1.00 | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 71   | 1     | 208  | 409                  | 30   | 154  |
| Pedestrians                       |      |       |      |                      |      |      |
| Lane Width (m)                    |      |       |      |                      |      |      |
| Walking Speed (m/s)               |      |       |      |                      |      |      |
| Percent Blockage                  |      |       |      |                      |      |      |
| Right turn flare (veh)            |      |       |      |                      |      |      |
| Median type                       |      |       |      |                      |      |      |
| Median storage veh                |      |       |      |                      |      |      |
| Upstream signal (m)               |      |       |      |                      |      |      |
| pX, platoon unblocked             |      |       |      |                      |      |      |
| vC, conflicting volume            | 626  | 412   |      |                      | 617  |      |
| vC1, stage 1 conf vol             |      |       |      |                      |      |      |
| vC2, stage 2 conf vol             |      |       |      |                      |      |      |
| vCu, unblocked vol                | 626  | 412   |      |                      | 617  |      |
| tC, single (s)                    | 6.6  | 6.2   |      |                      | 4.2  |      |
| tC, 2 stage (s)                   |      |       |      |                      |      |      |
| tF (s)                            | 3.7  | 3.3   |      |                      | 2.3  |      |
| p0 queue free %                   | 82   | 100   |      |                      | 97   |      |
| cM capacity (veh/h)               | 404  | 644   |      |                      | 939  |      |
| Direction, Lane #                 |      |       |      |                      |      |      |
|                                   | WB 1 | NB 1  | SB 1 |                      |      |      |
| Volume Total                      | 72   | 617   | 184  |                      |      |      |
| Volume Left                       | 71   | 0     | 30   |                      |      |      |
| Volume Right                      | 1    | 409   | 0    |                      |      |      |
| cSH                               | 406  | 1700  | 939  |                      |      |      |
| Volume to Capacity                | 0.18 | 0.36  | 0.03 |                      |      |      |
| Queue Length 95th (m)             | 5.1  | 0.0   | 0.8  |                      |      |      |
| Control Delay (s)                 | 15.8 | 0.0   | 1.7  |                      |      |      |
| Lane LOS                          | C    |       | A    |                      |      |      |
| Approach Delay (s)                | 15.8 | 0.0   | 1.7  |                      |      |      |
| Approach LOS                      | C    |       |      |                      |      |      |
| Intersection Summary              |      |       |      |                      |      |      |
| Average Delay                     |      |       | 1.7  |                      |      |      |
| Intersection Capacity Utilization |      | 48.9% |      | ICU Level of Service |      | A    |
| Analysis Period (min)             |      |       | 15   |                      |      |      |

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| Lane Group                 | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |
| Traffic Volume (vph)       | 94    | 908   | 223   | 405   | 278   | 20    |
| Future Volume (vph)        | 94    | 908   | 223   | 405   | 278   | 20    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.3   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   | 25.0  | 50.0  |       |       | 0.0   |
| Storage Lanes              | 1     | 1     | 1     |       |       | 0     |
| Taper Length (m)           | 7.5   |       | 75.0  |       |       |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |       |       | 0.991 |       |
| Fl <sub>t</sub> Protected  | 0.950 |       | 0.950 |       |       |       |
| Satd. Flow (prot)          | 1551  | 1422  | 1496  | 1618  | 1582  | 0     |
| Fl <sub>t</sub> Permitted  | 0.950 |       | 0.409 |       |       |       |
| Satd. Flow (perm)          | 1551  | 1422  | 644   | 1618  | 1582  | 0     |
| Right Turn on Red          |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 517   |       |       | 4     |       |
| Link Speed (k/h)           | 40    |       |       | 80    | 80    |       |
| Link Distance (m)          | 154.2 |       |       | 243.1 | 545.7 |       |
| Travel Time (s)            | 13.9  |       |       | 10.9  | 24.6  |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 9%    | 4%    | 13%   | 10%   | 12%   | 5%    |
| Adj. Flow (vph)            | 94    | 908   | 223   | 405   | 278   | 20    |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 94    | 908   | 223   | 405   | 298   | 0     |
| Enter Blocked Intersection | No    | No    | No    | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left  | Left  | Left  | Right |
| Median Width(m)            | 3.5   |       |       | 3.5   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |       | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |       | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |
| Headway Factor             | 1.09  | 1.12  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25    |       |       | 15    |
| Number of Detectors        | 1     | 1     | 1     | 2     | 2     |       |
| Detector Template          | Left  | Right | Left  | Thru  | Thru  |       |
| Leading Detector (m)       | 2.0   | 2.0   | 2.0   | 10.0  | 10.0  |       |
| Trailing Detector (m)      | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Position(m)     | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Size(m)         | 2.0   | 2.0   | 2.0   | 0.6   | 0.6   |       |
| Detector 1 Type            | 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   |       |
| Detector 1 Queue (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 1 Delay (s)       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       |
| Detector 2 Position(m)     |       |       |       | 9.4   | 9.4   |       |
| Detector 2 Size(m)         |       |       |       | 0.6   | 0.6   |       |
| Detector 2 Type            |       |       |       | Cl+Ex | Cl+Ex |       |
| Detector 2 Channel         |       |       |       |       |       |       |
| Detector 2 Extend (s)      |       |       |       | 0.0   | 0.0   |       |
| Turn Type                  | Prot  | Perm  | pm+pt | NA    | NA    |       |

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| Lane Group              | EBL   | EBR    | NBL   | NBT   | SBT   | SBR |
|-------------------------|-------|--------|-------|-------|-------|-----|
| Protected Phases        | 4     |        | 5     | 2     | 6     |     |
| Permitted Phases        |       | 4      | 2     |       |       |     |
| Detector Phase          | 4     | 4      | 5     | 2     | 6     |     |
| Switch Phase            |       |        |       |       |       |     |
| Minimum Initial (s)     | 7.0   | 7.0    | 7.0   | 35.0  | 35.0  |     |
| Minimum Split (s)       | 23.0  | 23.0   | 13.0  | 41.6  | 41.6  |     |
| Total Split (s)         | 44.0  | 44.0   | 13.0  | 56.0  | 43.0  |     |
| Total Split (%)         | 44.0% | 44.0%  | 13.0% | 56.0% | 43.0% |     |
| Maximum Green (s)       | 37.2  | 37.2   | 7.0   | 49.4  | 36.4  |     |
| Yellow Time (s)         | 3.0   | 3.0    | 4.6   | 4.6   | 4.6   |     |
| All-Red Time (s)        | 3.8   | 3.8    | 1.4   | 2.0   | 2.0   |     |
| Lost Time Adjust (s)    | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Lost Time (s)     | 6.8   | 6.8    | 6.0   | 6.6   | 6.6   |     |
| Lead/Lag                |       |        | Lead  |       | Lag   |     |
| Lead-Lag Optimize?      |       |        | Yes   |       | Yes   |     |
| Vehicle Extension (s)   | 3.0   | 3.0    | 3.0   | 3.0   | 3.0   |     |
| Recall Mode             | None  | None   | None  | Min   | Min   |     |
| Walk Time (s)           | 7.0   | 7.0    |       | 0.0   | 7.0   |     |
| Flash Dont Walk (s)     | 5.0   | 5.0    |       | 0.0   | 21.0  |     |
| Pedestrian Calls (#/hr) | 0     | 0      |       | 0     | 0     |     |
| Act Effct Green (s)     | 37.2  | 37.2   | 48.6  | 48.0  | 35.0  |     |
| Actuated g/C Ratio      | 0.38  | 0.38   | 0.49  | 0.49  | 0.35  |     |
| v/c Ratio               | 0.16  | 1.06   | 0.59  | 0.51  | 0.53  |     |
| Control Delay           | 21.3  | 62.3   | 23.1  | 20.2  | 29.1  |     |
| Queue Delay             | 0.0   | 0.0    | 0.0   | 0.0   | 0.0   |     |
| Total Delay             | 21.3  | 62.3   | 23.1  | 20.2  | 29.1  |     |
| LOS                     | C     | E      | C     | C     | C     |     |
| Approach Delay          | 58.5  |        |       | 21.2  | 29.1  |     |
| Approach LOS            | E     |        |       | C     | C     |     |
| Queue Length 50th (m)   | 12.3  | ~131.3 | 25.7  | 53.5  | 46.3  |     |
| Queue Length 95th (m)   | 23.7  | #208.2 | 42.1  | 81.6  | 73.2  |     |
| Internal Link Dist (m)  | 130.2 |        |       | 219.1 | 521.7 |     |
| Turn Bay Length (m)     |       | 25.0   | 50.0  |       |       |     |
| Base Capacity (vph)     | 585   | 858    | 377   | 810   | 586   |     |
| Starvation Cap Reductn  | 0     | 0      | 0     | 0     | 0     |     |
| Spillback Cap Reductn   | 0     | 0      | 0     | 0     | 0     |     |
| Storage Cap Reductn     | 0     | 0      | 0     | 0     | 0     |     |
| Reduced v/c Ratio       | 0.16  | 1.06   | 0.59  | 0.50  | 0.51  |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 98.6             |
| Natural Cycle:                     | 110              |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 1.06             |
| Intersection Signal Delay:         | 41.8             |
| Intersection LOS:                  | D                |
| Intersection Capacity Utilization: | 99.7%            |
| ICU Level of Service:              | F                |
| Analysis Period (min):             | 15               |

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



















- ~ 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: 2: Boundary Road & Hwy 417 EB Ramp Terminal



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|                            |  |  |  |  |  |  |   |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |   |  |   |   |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)       | 154   | 0   | 35  | 7   | 0   | 22  | 10  | 450   | 0   | 3   | 1088  | 95  |
| Future Volume (vph)        | 154   | 0   | 35  | 7   | 0   | 22  | 10  | 450   | 0   | 3   | 1088  | 95  |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.3   | 3.5   | 3.3   | 3.3   | 3.5   | 3.5   |
| Storage Length (m)         | 0.0   |   | 15.0  | 0.0   |   | 0.0   | 35.0  |   | 7.5   | 100.0   |   | 0.0   |
| Storage Lanes              | 0   |   | 0   | 0   |   | 1   | 1   |   | 1   | 1   |   | 0   |
| Taper Length (m)           | 7.5   |   |   | 7.5   |   |   | 45.0  |   |   | 75.0  |   |   |
| 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  |
| Fr <sub>t</sub>            |   | 0.975   |   |   |   | 0.850   |   |   |   |   |   | 0.988   |
| Fl <sub>t</sub> Protected  |   | 0.961   |   |   | 0.950   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)          | 0   | 1454  | 0   | 0   | 1183  | 1513  | 1517  | 1633  | 1740  | 990   | 1687  | 0   |
| Fl <sub>t</sub> Permitted  |   | 0.761   |   |   | 0.764   |   | 0.124   |   |   | 0.430   |   |   |
| Satd. Flow (perm)          | 0   | 1152  | 0   | 0   | 951   | 1513  | 198   | 1633  | 1740  | 448   | 1687  | 0   |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |   |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 100   |   |   |   | 100   |   |   |   |   |   | 10  |
| Link Speed (k/h)           |   | 60  |   |   | 20  |   |   | 80  |   |   |   | 80  |
| Link Distance (m)          |   | 198.6   |   |   | 170.6   |   |   | 174.7   |   |   |   | 243.1   |
| Travel Time (s)            |   | 11.9  |   |   | 30.7  |   |   | 7.9   |   |   |   | 10.9  |
| 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 (%)         | 18%   | 0%  | 0%  | 43%   | 0%  | 0%  | 9%  | 9%  | 0%  | 67%   | 4%  | 7%  |
| Adj. Flow (vph)            | 154   | 0   | 35  | 7   | 0   | 22  | 10  | 450   | 0   | 3   | 1088  | 95  |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)      | 0   | 189   | 0   | 0   | 7   | 22  | 10  | 450   | 0   | 3   | 1183  | 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   |   |   | 3.5   |   |   | 3.5   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |   |   |   |   |   |   |
| Headway Factor             | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.09  | 1.12  | 1.09  | 1.12  | 1.12  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   | 1   | 1   | 2   | 1   | 1   | 2   |   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  | Right   | Left  | Thru  | Right   | Left  | Thru  |   |
| Leading Detector (m)       | 2.0   | 10.0  |   | 2.0   | 10.0  | 2.0   | 2.0   | 10.0  | 2.0   | 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   | 0.6   | 2.0   | 2.0   | 0.6   | 2.0   | 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                  | Perm  | NA  |   | Perm  | NA  | Perm  | Perm  | NA  | Perm  | pm+pt   | NA  |   |



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| Lane Group              | EBL   | EBT   | EBR | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT    | SBR |
|-------------------------|-------|-------|-----|-------|-------|-------|-------|-------|-------|-------|--------|-----|
| Protected Phases        |       | 4     |     |       | 8     |       |       | 2     |       | 1     | 6      |     |
| Permitted Phases        | 4     |       |     | 8     |       | 8     | 2     |       | 2     | 6     |        |     |
| Detector Phase          | 4     | 4     |     | 8     | 8     | 8     | 2     | 2     | 2     | 1     | 6      |     |
| Switch Phase            |       |       |     |       |       |       |       |       |       |       |        |     |
| Minimum Initial (s)     | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 20.0  | 20.0  | 20.0  | 7.0   | 20.0   |     |
| Minimum Split (s)       | 24.8  | 24.8  |     | 24.8  | 24.8  | 24.8  | 26.2  | 26.2  | 26.2  | 13.0  | 26.2   |     |
| Total Split (s)         | 25.0  | 25.0  |     | 25.0  | 25.0  | 25.0  | 62.0  | 62.0  | 62.0  | 13.0  | 75.0   |     |
| Total Split (%)         | 25.0% | 25.0% |     | 25.0% | 25.0% | 25.0% | 62.0% | 62.0% | 62.0% | 13.0% | 75.0%  |     |
| Maximum Green (s)       | 19.2  | 19.2  |     | 19.2  | 19.2  | 19.2  | 55.8  | 55.8  | 55.8  | 7.0   | 68.8   |     |
| Yellow Time (s)         | 3.7   | 3.7   |     | 3.7   | 3.7   | 3.7   | 4.6   | 4.6   | 4.6   | 4.6   | 4.6    |     |
| All-Red Time (s)        | 2.1   | 2.1   |     | 2.1   | 2.1   | 2.1   | 1.6   | 1.6   | 1.6   | 1.4   | 1.6    |     |
| Lost Time Adjust (s)    |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0    |     |
| Total Lost Time (s)     |       | 5.8   |     |       | 5.8   | 5.8   | 6.2   | 6.2   | 6.2   | 6.0   | 6.2    |     |
| Lead/Lag                |       |       |     |       |       |       | Lag   | Lag   | Lag   | Lead  |        |     |
| 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  | Min   | Min   | Min   | None  | Min    |     |
| Walk Time (s)           | 7.0   | 7.0   |     | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   |       | 7.0    |     |
| Flash Dont Walk (s)     | 12.0  | 12.0  |     | 12.0  | 12.0  | 12.0  | 10.0  | 10.0  | 10.0  |       | 10.0   |     |
| Pedestrian Calls (#/hr) | 0     | 0     |     | 0     | 0     | 0     | 0     | 0     | 0     |       | 0      |     |
| Act Effct Green (s)     |       | 13.0  |     |       | 13.0  | 13.0  | 67.2  | 67.2  |       | 69.8  | 69.6   |     |
| Actuated g/C Ratio      |       | 0.14  |     |       | 0.14  | 0.14  | 0.71  | 0.71  |       | 0.74  | 0.73   |     |
| v/c Ratio               |       | 0.77  |     |       | 0.05  | 0.07  | 0.07  | 0.39  |       | 0.01  | 0.95   |     |
| Control Delay           |       | 40.0  |     |       | 34.6  | 0.5   | 9.3   | 8.5   |       | 4.7   | 30.4   |     |
| Queue Delay             |       | 0.0   |     |       | 0.0   | 0.0   | 0.0   | 0.0   |       | 0.0   | 5.7    |     |
| Total Delay             |       | 40.0  |     |       | 34.6  | 0.5   | 9.3   | 8.5   |       | 4.7   | 36.1   |     |
| LOS                     |       | D     |     |       | C     | A     | A     | A     |       | A     | D      |     |
| Approach Delay          |       | 40.0  |     |       | 8.7   |       |       | 8.5   |       |       | 36.0   |     |
| Approach LOS            |       | D     |     |       | A     |       |       | A     |       |       | D      |     |
| Queue Length 50th (m)   |       | 16.1  |     |       | 1.2   | 0.0   | 0.5   | 26.4  |       | 0.2   | 166.5  |     |
| Queue Length 95th (m)   |       | 41.3  |     |       | 5.2   | 0.0   | 3.9   | 79.1  |       | 1.0   | #337.6 |     |
| Internal Link Dist (m)  |       | 174.6 |     |       | 146.6 |       |       | 150.7 |       |       | 219.1  |     |
| Turn Bay Length (m)     |       |       |     |       |       |       | 35.0  |       |       | 100.0 |        |     |
| Base Capacity (vph)     |       | 313   |     |       | 192   | 387   | 140   | 1158  |       | 370   | 1243   |     |
| Starvation Cap Reductn  |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 49     |     |
| Spillback Cap Reductn   |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 0      |     |
| Storage Cap Reductn     |       | 0     |     |       | 0     | 0     | 0     | 0     |       | 0     | 0      |     |
| Reduced v/c Ratio       |       | 0.60  |     |       | 0.04  | 0.06  | 0.07  | 0.39  |       | 0.01  | 0.99   |     |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 94.7             |
| Natural Cycle:                     | 100              |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.95             |
| Intersection Signal Delay:         | 29.2             |
| Intersection LOS:                  | C                |
| Intersection Capacity Utilization: | 94.4%            |
| 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: 3: Boundary Road & Thunder Road/Amazon Way





















Lanes, Volumes, Timings  
4: Boundary Road & Site Access/South Amazon Access

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|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group                        | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |  |  |   |  |  |   |
| Traffic Volume (vph)              | 4   | 0   | 14  | 7   | 0   | 15  | 4   | 441   | 7   | 16  | 1106  | 7   |
| Future Volume (vph)               | 4   | 0   | 14  | 7   | 0   | 15  | 4   | 441   | 7   | 16  | 1106  | 7   |
| Ideal Flow (vphpl)                | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)                    | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.6   |
| Storage Length (m)                | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 15.0  |   | 0.0   | 70.0  |   | 0.0   |
| Storage Lanes                     | 0   |   | 0   | 0   |   | 0   | 1   |   | 0   | 1   |   | 0   |
| Taper Length (m)                  | 7.5   |   |   | 7.5   |   |   | 45.0  |   |   | 45.0  |   |   |
| 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  |
| Frt                               |   | 0.895   |   |   | 0.908   |   |   | 0.998   |   |   | 0.999   |   |
| Flt Protected                     |   | 0.989   |   |   | 0.984   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)                 | 0   | 1576  | 0   | 0   | 795   | 0   | 1691  | 1668  | 0   | 846   | 1744  | 0   |
| Flt Permitted                     |   | 0.989   |   |   | 0.984   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (perm)                 | 0   | 1576  | 0   | 0   | 795   | 0   | 1691  | 1668  | 0   | 846   | 1744  | 0   |
| Link Speed (k/h)                  |   | 50  |   |   | 20  |   |   | 80  |   |   | 80  |   |
| Link Distance (m)                 |   | 105.7   |   |   | 151.5   |   |   | 1150.2  |   |   | 174.7   |   |
| Travel Time (s)                   |   | 7.6   |   |   | 27.3  |   |   | 51.8  |   |   | 7.9   |   |
| 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 (%)                | 0%  | 0%  | 0%  | 100%  | 0%  | 100%  | 0%  | 5%  | 100%  | 100%  | 2%  | 0%  |
| Adj. Flow (vph)                   | 4   | 0   | 14  | 7   | 0   | 15  | 4   | 441   | 7   | 16  | 1106  | 7   |
| Shared Lane Traffic (%)           |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)             | 0   | 18  | 0   | 0   | 22  | 0   | 4   | 448   | 0   | 16  | 1113  | 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   |   |   | 3.5   |   |   | 3.5   |   |
| Link Offset(m)                    |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)                |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |   | 4.8   |   |
| 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  | 1.07  |
| Turning Speed (k/h)               | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  | 25  |   | 15  |
| Sign Control                      |   | Stop  |   |   | Stop  |   |   | Free  |   |   | Free  |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |   |   |   |   |   |   |
| Area Type:                        | Other   |   |   |   |   |   |   |   |   |   |   |   |
| Control Type:                     | Unsignalized  |   |   |   |   |   |   |   |   |   |   |   |
| Intersection Capacity Utilization | 71.9%   |   |   |   |   |   | ICU Level of Service C  |   |   |   |   |   |
| Analysis Period (min)             | 15  |   |   |   |   |   |   |   |   |   |   |   |

HCM Unsignalized Intersection Capacity Analysis  
 4: Boundary Road & Site Access/South Amazon Access

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|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |  |  |   |  |  |   |
| Traffic Volume (veh/h)            | 4   | 0   | 14  | 7   | 0   | 15  | 4   | 441   | 7   | 16  | 1106  | 7   |
| Future Volume (Veh/h)             | 4   | 0   | 14  | 7   | 0   | 15  | 4   | 441   | 7   | 16  | 1106  | 7   |
| Sign Control                      |   | Stop  |   |   | Stop  |   |   | Free  |   |   | Free  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |   | 0%  |   |   | 0%  |   |
| 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  |
| Hourly flow rate (vph)            | 4   | 0   | 14  | 7   | 0   | 15  | 4   | 441   | 7   | 16  | 1106  | 7   |
| Pedestrians                       |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Width (m)                    |   |   |   |   |   |   |   |   |   |   |   |   |
| Walking Speed (m/s)               |   |   |   |   |   |   |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |   |   |   |   |   |   |
| Median type                       |   |   |   |   |   |   |   | None  |   |   | None  |   |
| Median storage (veh)              |   |   |   |   |   |   |   |   |   |   |   |   |
| Upstream signal (m)               |   |   |   |   |   |   |   |   |   |   |   | 175   |
| pX, platoon unblocked             | 0.28  | 0.28  | 0.28  | 0.28  | 0.28  |   | 0.28  |   |   |   |   |   |
| vC, conflicting volume            | 1606  | 1598  | 1110  | 1604  | 1598  | 444   | 1113  |   |   | 448   |   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vCu, unblocked vol                | 1879  | 1850  | 98  | 1875  | 1850  | 444   | 110   |   |   | 448   |   |   |
| tC, single (s)                    | 7.1   | 6.5   | 6.2   | 8.1   | 6.5   | 7.2   | 4.1   |   |   | 5.1   |   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |   |   |   |   |   |   |
| tF (s)                            | 3.5   | 4.0   | 3.3   | 4.4   | 4.0   | 4.2   | 2.2   |   |   | 3.1   |   |   |
| p0 queue free %                   | 72  | 100   | 95  | 11  | 100   | 97  | 99  |   |   | 98  |   |   |
| cM capacity (veh/h)               | 14  | 20  | 268   | 8   | 20  | 452   | 416   |   |   | 742   |   |   |
| Direction, Lane #                 | EB 1  | WB 1  | NB 1  | NB 2  | SB 1  | SB 2  |   |   |   |   |   |   |
| Volume Total                      | 18  | 22  | 4   | 448   | 16  | 1113  |   |   |   |   |   |   |
| Volume Left                       | 4   | 7   | 4   | 0   | 16  | 0   |   |   |   |   |   |   |
| Volume Right                      | 14  | 15  | 0   | 7   | 0   | 7   |   |   |   |   |   |   |
| cSH                               | 55  | 24  | 416   | 1700  | 742   | 1700  |   |   |   |   |   |   |
| Volume to Capacity                | 0.33  | 0.92  | 0.01  | 0.26  | 0.02  | 0.65  |   |   |   |   |   |   |
| Queue Length 95th (m)             | 9.4   | 22.0  | 0.2   | 0.0   | 0.5   | 0.0   |   |   |   |   |   |   |
| Control Delay (s)                 | 100.0   | 387.0   | 13.7  | 0.0   | 10.0  | 0.0   |   |   |   |   |   |   |
| Lane LOS                          | F   | F   | B   |   | A   |   |   |   |   |   |   |   |
| Approach Delay (s)                | 100.0   | 387.0   | 0.1   |   | 0.1   |   |   |   |   |   |   |   |
| Approach LOS                      | F   | F   |   |   |   |   |   |   |   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |   |   |   |   |   |   |
| Average Delay                     |   |   | 6.5   |   |   |   |   |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 71.9%   |   | ICU Level of Service  |   |   |   |   | C   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |   |   |   |   |   |   |

Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road

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| Lane Group                 | EBL   | EBR   | NBL  | NBT   | SBT    | SBR   |
|----------------------------|-------|-------|------|-------|--------|-------|
| Lane Configurations        |       |       |      |       |        |       |
| Traffic Volume (vph)       | 156   | 132   | 70   | 168   | 984    | 160   |
| Future Volume (vph)        | 156   | 132   | 70   | 168   | 984    | 160   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800   | 1800  |
| Lane Width (m)             | 3.3   | 3.3   | 3.5  | 3.5   | 3.5    | 3.5   |
| Storage Length (m)         | 25.0  | 0.0   | 0.0  |       |        | 30.0  |
| Storage Lanes              | 1     | 1     | 0    |       |        | 1     |
| Taper Length (m)           | 47.5  |       | 7.5  |       |        |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |      |       |        | 0.850 |
| Fl <sub>t</sub> Protected  | 0.950 |       |      | 0.986 |        |       |
| Satd. Flow (prot)          | 1463  | 1395  | 0    | 1664  | 1762   | 1351  |
| Fl <sub>t</sub> Permitted  | 0.950 |       |      | 0.986 |        |       |
| Satd. Flow (perm)          | 1463  | 1395  | 0    | 1664  | 1762   | 1351  |
| Link Speed (k/h)           | 80    |       |      | 80    | 80     |       |
| Link Distance (m)          | 180.5 |       |      | 135.8 | 1150.2 |       |
| Travel Time (s)            | 8.1   |       |      | 6.1   | 51.8   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00   | 1.00  |
| Heavy Vehicles (%)         | 13%   | 6%    | 9%   | 4%    | 1%     | 12%   |
| Adj. Flow (vph)            | 156   | 132   | 70   | 168   | 984    | 160   |
| Shared Lane Traffic (%)    |       |       |      |       |        |       |
| Lane Group Flow (vph)      | 156   | 132   | 0    | 238   | 984    | 160   |
| Enter Blocked Intersection | No    | No    | No   | No    | No     | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left   | Right |
| Median Width(m)            | 3.3   |       |      | 3.5   | 3.5    |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0    |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8    |       |
| Two way Left Turn Lane     |       |       |      |       |        |       |
| Headway Factor             | 1.12  | 1.12  | 1.09 | 1.09  | 1.09   | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25   |       |        | 15    |
| Sign Control               | Stop  |       |      | Free  | Free   |       |

Intersection Summary

|                                   |              |
|-----------------------------------|--------------|
| Area Type:                        | Other        |
| Control Type:                     | Unsignalized |
| Intersection Capacity Utilization | 87.2%        |
| ICU Level of Service              | E            |
| Analysis Period (min)             | 15           |

HCM Unsignalized Intersection Capacity Analysis  
5: Boundary Road & Mitch Owens Road

2035 Future Total PM  
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| Movement                          | EBL   | EBR  | NBL   | NBT                  | SBT  | SBR  |
|-----------------------------------|-------|------|-------|----------------------|------|------|
| Lane Configurations               |       |      |       |                      |      |      |
| Traffic Volume (veh/h)            | 156   | 132  | 70    | 168                  | 984  | 160  |
| Future Volume (Veh/h)             | 156   | 132  | 70    | 168                  | 984  | 160  |
| Sign Control                      | Stop  |      |       | Free                 | Free |      |
| Grade                             | 0%    |      |       | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00  | 1.00 | 1.00  | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 156   | 132  | 70    | 168                  | 984  | 160  |
| Pedestrians                       |       |      |       |                      |      |      |
| Lane Width (m)                    |       |      |       |                      |      |      |
| Walking Speed (m/s)               |       |      |       |                      |      |      |
| Percent Blockage                  |       |      |       |                      |      |      |
| Right turn flare (veh)            |       |      |       |                      |      |      |
| Median type                       |       |      |       | None                 | None |      |
| Median storage veh)               |       |      |       |                      |      |      |
| Upstream signal (m)               |       |      |       |                      |      |      |
| pX, platoon unblocked             |       |      |       |                      |      |      |
| vC, conflicting volume            | 1292  | 984  | 1144  |                      |      |      |
| vC1, stage 1 conf vol             |       |      |       |                      |      |      |
| vC2, stage 2 conf vol             |       |      |       |                      |      |      |
| vCu, unblocked vol                | 1292  | 984  | 1144  |                      |      |      |
| tC, single (s)                    | 6.5   | 6.3  | 4.2   |                      |      |      |
| tC, 2 stage (s)                   |       |      |       |                      |      |      |
| tF (s)                            | 3.6   | 3.4  | 2.3   |                      |      |      |
| p0 queue free %                   | 0     | 55   | 88    |                      |      |      |
| cM capacity (veh/h)               | 150   | 296  | 586   |                      |      |      |
| Direction, Lane #                 | EB 1  | EB 2 | NB 1  | SB 1                 | SB 2 |      |
| Volume Total                      | 156   | 132  | 238   | 984                  | 160  |      |
| Volume Left                       | 156   | 0    | 70    | 0                    | 0    |      |
| Volume Right                      | 0     | 132  | 0     | 0                    | 160  |      |
| cSH                               | 150   | 296  | 586   | 1700                 | 1700 |      |
| Volume to Capacity                | 1.04  | 0.45 | 0.12  | 0.58                 | 0.09 |      |
| Queue Length 95th (m)             | 64.1  | 17.4 | 3.2   | 0.0                  | 0.0  |      |
| Control Delay (s)                 | 143.8 | 26.6 | 4.6   | 0.0                  | 0.0  |      |
| Lane LOS                          | F     | D    | A     |                      |      |      |
| Approach Delay (s)                | 90.1  |      | 4.6   | 0.0                  |      |      |
| Approach LOS                      | F     |      |       |                      |      |      |
| Intersection Summary              |       |      |       |                      |      |      |
| Average Delay                     |       |      | 16.2  |                      |      |      |
| Intersection Capacity Utilization |       |      | 87.2% | ICU Level of Service |      | E    |
| Analysis Period (min)             |       |      | 15    |                      |      |      |

Lanes, Volumes, Timings  
6: Site Access A & Thunder Road

2035 Future Total PM  
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| Lane Group                 | EBT   | EBR   | WBL  | WBT   | NBL   | NBR   |
|----------------------------|-------|-------|------|-------|-------|-------|
| Lane Configurations        |       |       |      |       |       |       |
| Traffic Volume (vph)       | 137   | 0     | 14   | 92    | 0     | 52    |
| Future Volume (vph)        | 137   | 0     | 14   | 92    | 0     | 52    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5  | 3.5   | 3.5   | 3.5   |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Flt                        |       |       |      |       | 0.865 |       |
| Flt Protected              |       |       |      | 0.993 |       |       |
| Satd. Flow (prot)          | 1508  | 0     | 0    | 1639  | 1426  | 0     |
| Flt Permitted              |       |       |      | 0.993 |       |       |
| Satd. Flow (perm)          | 1508  | 0     | 0    | 1639  | 1426  | 0     |
| Link Speed (k/h)           | 60    |       |      | 60    | 50    |       |
| Link Distance (m)          | 163.7 |       |      | 198.6 | 103.6 |       |
| Travel Time (s)            | 9.8   |       |      | 11.9  | 7.5   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 18%   | 0%    | 0%   | 9%    | 0%    | 8%    |
| Adj. Flow (vph)            | 137   | 0     | 14   | 92    | 0     | 52    |
| Shared Lane Traffic (%)    |       |       |      |       |       |       |
| Lane Group Flow (vph)      | 137   | 0     | 0    | 106   | 52    | 0     |
| Enter Blocked Intersection | No    | No    | No   | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left  | Right |
| Median Width(m)            | 0.0   |       |      | 0.0   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |      |       |       |       |
| Headway Factor             | 1.09  | 1.09  | 1.09 | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        |       | 15    | 25   |       | 25    | 15    |
| Sign Control               | Free  |       |      | Free  | Stop  |       |

Intersection Summary

|                                   |                        |
|-----------------------------------|------------------------|
| Area Type:                        | Other                  |
| Control Type:                     | Unsignalized           |
| Intersection Capacity Utilization | 26.9%                  |
| Analysis Period (min)             | 15                     |
|                                   | ICU Level of Service A |

HCM Unsignalized Intersection Capacity Analysis  
6: Site Access A & Thunder Road

2035 Future Total PM  
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| Movement                          | EBT  | EBR  | WBL   | WBT                  | NBL  | NBR  |
|-----------------------------------|------|------|-------|----------------------|------|------|
| Lane Configurations               |      |      |       |                      |      |      |
| Traffic Volume (veh/h)            | 137  | 0    | 14    | 92                   | 0    | 52   |
| Future Volume (Veh/h)             | 137  | 0    | 14    | 92                   | 0    | 52   |
| Sign Control                      | Free |      |       | Free                 | Stop |      |
| Grade                             | 0%   |      |       | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00 | 1.00 | 1.00  | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 137  | 0    | 14    | 92                   | 0    | 52   |
| Pedestrians                       |      |      |       |                      |      |      |
| Lane Width (m)                    |      |      |       |                      |      |      |
| Walking Speed (m/s)               |      |      |       |                      |      |      |
| Percent Blockage                  |      |      |       |                      |      |      |
| Right turn flare (veh)            |      |      |       |                      |      |      |
| Median type                       | None |      |       | None                 |      |      |
| Median storage (veh)              |      |      |       |                      |      |      |
| Upstream signal (m)               | 199  |      |       |                      |      |      |
| pX, platoon unblocked             |      |      |       |                      |      |      |
| vC, conflicting volume            |      |      | 137   |                      |      | 137  |
| vC1, stage 1 conf vol             |      |      |       |                      |      |      |
| vC2, stage 2 conf vol             |      |      |       |                      |      |      |
| vCu, unblocked vol                |      |      | 137   |                      |      | 137  |
| tC, single (s)                    |      |      | 4.1   |                      |      | 6.3  |
| tC, 2 stage (s)                   |      |      |       |                      |      |      |
| tF (s)                            |      |      | 2.2   |                      |      | 3.4  |
| p0 queue free %                   |      |      | 99    |                      |      | 94   |
| cM capacity (veh/h)               |      |      | 1459  |                      |      | 896  |
| Direction, Lane #                 | EB 1 | WB 1 | NB 1  |                      |      |      |
| Volume Total                      | 137  | 106  | 52    |                      |      |      |
| Volume Left                       | 0    | 14   | 0     |                      |      |      |
| Volume Right                      | 0    | 0    | 52    |                      |      |      |
| cSH                               | 1700 | 1459 | 896   |                      |      |      |
| Volume to Capacity                | 0.08 | 0.01 | 0.06  |                      |      |      |
| Queue Length 95th (m)             | 0.0  | 0.2  | 1.5   |                      |      |      |
| Control Delay (s)                 | 0.0  | 1.1  | 9.3   |                      |      |      |
| Lane LOS                          |      |      | A     |                      |      |      |
| Approach Delay (s)                | 0.0  | 1.1  | 9.3   |                      |      |      |
| Approach LOS                      |      |      | A     |                      |      |      |
| Intersection Summary              |      |      |       |                      |      |      |
| Average Delay                     |      |      | 2.0   |                      |      |      |
| Intersection Capacity Utilization |      |      | 26.9% | ICU Level of Service |      | A    |
| Analysis Period (min)             |      |      | 15    |                      |      |      |



Lanes, Volumes, Timings  
7: Site Access B & Thunder Road

2035 Future Total PM  
08-09-2021



| Lane Group                 | EBT   | EBR   | WBL  | WBT   | NBL   | NBR   |
|----------------------------|-------|-------|------|-------|-------|-------|
| Lane Configurations        |       |       |      |       |       |       |
| Traffic Volume (vph)       | 126   | 0     | 4    | 88    | 0     | 11    |
| Future Volume (vph)        | 126   | 0     | 4    | 88    | 0     | 11    |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5   | 3.5   | 3.5  | 3.5   | 3.5   | 3.5   |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Flt                        |       |       |      |       | 0.865 |       |
| Flt Protected              |       |       |      | 0.998 |       |       |
| Satd. Flow (prot)          | 1648  | 0     | 0    | 1657  | 770   | 0     |
| Flt Permitted              |       |       |      | 0.998 |       |       |
| Satd. Flow (perm)          | 1648  | 0     | 0    | 1657  | 770   | 0     |
| Link Speed (k/h)           | 60    |       |      | 60    | 50    |       |
| Link Distance (m)          | 185.0 |       |      | 163.7 | 105.8 |       |
| Travel Time (s)            | 11.1  |       |      | 9.8   | 7.6   |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 8%    | 0%    | 100% | 3%    | 0%    | 100%  |
| Adj. Flow (vph)            | 126   | 0     | 4    | 88    | 0     | 11    |
| Shared Lane Traffic (%)    |       |       |      |       |       |       |
| Lane Group Flow (vph)      | 126   | 0     | 0    | 92    | 11    | 0     |
| Enter Blocked Intersection | No    | No    | No   | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left | Left  | Left  | Right |
| Median Width(m)            | 0.0   |       |      | 0.0   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |      | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |      | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |      |       |       |       |
| Headway Factor             | 1.09  | 1.09  | 1.09 | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        |       | 15    | 25   |       | 25    | 15    |
| Sign Control               | Free  |       |      | Free  | Stop  |       |

Intersection Summary

|                                   |                        |
|-----------------------------------|------------------------|
| Area Type:                        | Other                  |
| Control Type:                     | Unsignalized           |
| Intersection Capacity Utilization | 18.3%                  |
| Analysis Period (min)             | 15                     |
|                                   | ICU Level of Service A |

HCM Unsignalized Intersection Capacity Analysis  
7: Site Access B & Thunder Road

2035 Future Total PM  
08-09-2021



| Movement                          | EBT         | EBR         | WBL         | WBT                  | NBL  | NBR  |
|-----------------------------------|-------------|-------------|-------------|----------------------|------|------|
| Lane Configurations               | →           |             |             | ←                    | ↘    | ↙    |
| Traffic Volume (veh/h)            | 126         | 0           | 4           | 88                   | 0    | 11   |
| Future Volume (Veh/h)             | 126         | 0           | 4           | 88                   | 0    | 11   |
| Sign Control                      | Free        |             |             | Free                 | Stop |      |
| Grade                             | 0%          |             |             | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 126         | 0           | 4           | 88                   | 0    | 11   |
| <b>Pedestrians</b>                |             |             |             |                      |      |      |
| Lane Width (m)                    |             |             |             |                      |      |      |
| Walking Speed (m/s)               |             |             |             |                      |      |      |
| Percent Blockage                  |             |             |             |                      |      |      |
| Right turn flare (veh)            |             |             |             |                      |      |      |
| Median type                       | None        |             |             | None                 |      |      |
| Median storage (veh)              |             |             |             |                      |      |      |
| Upstream signal (m)               | 362         |             |             |                      |      |      |
| pX, platoon unblocked             |             |             |             |                      |      |      |
| vC, conflicting volume            |             |             | 126         |                      | 222  | 126  |
| vC1, stage 1 conf vol             |             |             |             |                      |      |      |
| vC2, stage 2 conf vol             |             |             |             |                      |      |      |
| vCu, unblocked vol                |             |             | 126         |                      | 222  | 126  |
| tC, single (s)                    |             |             | 5.1         |                      | 6.4  | 7.2  |
| tC, 2 stage (s)                   |             |             |             |                      |      |      |
| tF (s)                            |             |             | 3.1         |                      | 3.5  | 4.2  |
| p0 queue free %                   |             |             | 100         |                      | 100  | 98   |
| cM capacity (veh/h)               |             |             | 1025        |                      | 768  | 716  |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>WB 1</b> | <b>NB 1</b> |                      |      |      |
| Volume Total                      | 126         | 92          | 11          |                      |      |      |
| Volume Left                       | 0           | 4           | 0           |                      |      |      |
| Volume Right                      | 0           | 0           | 11          |                      |      |      |
| cSH                               | 1700        | 1025        | 716         |                      |      |      |
| Volume to Capacity                | 0.07        | 0.00        | 0.02        |                      |      |      |
| Queue Length 95th (m)             | 0.0         | 0.1         | 0.4         |                      |      |      |
| Control Delay (s)                 | 0.0         | 0.4         | 10.1        |                      |      |      |
| Lane LOS                          |             |             | A           | B                    |      |      |
| Approach Delay (s)                | 0.0         | 0.4         | 10.1        |                      |      |      |
| Approach LOS                      |             |             | B           |                      |      |      |
| <b>Intersection Summary</b>       |             |             |             |                      |      |      |
| Average Delay                     |             |             | 0.6         |                      |      |      |
| Intersection Capacity Utilization |             |             | 18.3%       | ICU Level of Service |      | A    |
| Analysis Period (min)             |             |             | 15          |                      |      |      |

Lanes, Volumes, Timings  
8: Site Access C & Thunder Road

2035 Future Total PM  
08-09-2021



| Lane Group                 | EBT  | EBR   | WBL  | WBT   | NBL   | NBR   |
|----------------------------|------|-------|------|-------|-------|-------|
| Lane Configurations        |      |       |      |       |       |       |
| Traffic Volume (vph)       | 102  | 0     | 9    | 79    | 0     | 24    |
| Future Volume (vph)        | 102  | 0     | 9    | 79    | 0     | 24    |
| Ideal Flow (vphpl)         | 1800 | 1800  | 1800 | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.5  | 3.5   | 3.5  | 3.5   | 3.5   | 3.5   |
| Lane Util. Factor          | 1.00 | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Flt                        |      |       |      |       | 0.865 |       |
| Flt Protected              |      |       |      | 0.995 |       |       |
| Satd. Flow (prot)          | 1695 | 0     | 0    | 1717  | 1272  | 0     |
| Flt Permitted              |      |       |      | 0.995 |       |       |
| Satd. Flow (perm)          | 1695 | 0     | 0    | 1717  | 1272  | 0     |
| Link Speed (k/h)           | 60   |       |      | 60    | 50    |       |
| Link Distance (m)          | 95.5 |       |      | 185.0 | 109.7 |       |
| Travel Time (s)            | 5.7  |       |      | 11.1  | 7.9   |       |
| Peak Hour Factor           | 1.00 | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 5%   | 0%    | 22%  | 1%    | 0%    | 21%   |
| Adj. Flow (vph)            | 102  | 0     | 9    | 79    | 0     | 24    |
| Shared Lane Traffic (%)    |      |       |      |       |       |       |
| Lane Group Flow (vph)      | 102  | 0     | 0    | 88    | 24    | 0     |
| Enter Blocked Intersection | No   | No    | No   | No    | No    | No    |
| Lane Alignment             | Left | Right | Left | Left  | Left  | Right |
| Median Width(m)            | 0.0  |       |      | 0.0   | 3.5   |       |
| Link Offset(m)             | 0.0  |       |      | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8  |       |      | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |      |       |      |       |       |       |
| Headway Factor             | 1.09 | 1.09  | 1.09 | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        |      | 15    | 25   |       | 25    | 15    |
| Sign Control               | Free |       |      | Free  | Stop  |       |

Intersection Summary

|                                   |                        |
|-----------------------------------|------------------------|
| Area Type:                        | Other                  |
| Control Type:                     | Unsignalized           |
| Intersection Capacity Utilization | 21.6%                  |
| Analysis Period (min)             | 15                     |
|                                   | ICU Level of Service A |

HCM Unsignalized Intersection Capacity Analysis  
 8: Site Access C & Thunder Road

2035 Future Total PM  
 08-09-2021



| Movement                          | EBT         | EBR         | WBL         | WBT                  | NBL  | NBR  |
|-----------------------------------|-------------|-------------|-------------|----------------------|------|------|
| Lane Configurations               | ↩           |             |             | ↩                    | ↩    |      |
| Traffic Volume (veh/h)            | 102         | 0           | 9           | 79                   | 0    | 24   |
| Future Volume (Veh/h)             | 102         | 0           | 9           | 79                   | 0    | 24   |
| Sign Control                      | Free        |             |             | Free                 | Stop |      |
| Grade                             | 0%          |             |             | 0%                   | 0%   |      |
| Peak Hour Factor                  | 1.00        | 1.00        | 1.00        | 1.00                 | 1.00 | 1.00 |
| Hourly flow rate (vph)            | 102         | 0           | 9           | 79                   | 0    | 24   |
| <b>Pedestrians</b>                |             |             |             |                      |      |      |
| Lane Width (m)                    |             |             |             |                      |      |      |
| Walking Speed (m/s)               |             |             |             |                      |      |      |
| Percent Blockage                  |             |             |             |                      |      |      |
| Right turn flare (veh)            |             |             |             |                      |      |      |
| Median type                       | None        |             |             | None                 |      |      |
| Median storage (veh)              |             |             |             |                      |      |      |
| Upstream signal (m)               |             |             |             |                      |      |      |
| pX, platoon unblocked             |             |             |             |                      |      |      |
| vC, conflicting volume            |             |             | 102         |                      | 199  | 102  |
| vC1, stage 1 conf vol             |             |             |             |                      |      |      |
| vC2, stage 2 conf vol             |             |             |             |                      |      |      |
| vCu, unblocked vol                |             |             | 102         |                      | 199  | 102  |
| tC, single (s)                    |             |             | 4.3         |                      | 6.4  | 6.4  |
| tC, 2 stage (s)                   |             |             |             |                      |      |      |
| tF (s)                            |             |             | 2.4         |                      | 3.5  | 3.5  |
| p0 queue free %                   |             |             | 99          |                      | 100  | 97   |
| cM capacity (veh/h)               |             |             | 1374        |                      | 789  | 904  |
| <b>Direction, Lane #</b>          | <b>EB 1</b> | <b>WB 1</b> | <b>NB 1</b> |                      |      |      |
| Volume Total                      | 102         | 88          | 24          |                      |      |      |
| Volume Left                       | 0           | 9           | 0           |                      |      |      |
| Volume Right                      | 0           | 0           | 24          |                      |      |      |
| cSH                               | 1700        | 1374        | 904         |                      |      |      |
| Volume to Capacity                | 0.06        | 0.01        | 0.03        |                      |      |      |
| Queue Length 95th (m)             | 0.0         | 0.2         | 0.7         |                      |      |      |
| Control Delay (s)                 | 0.0         | 0.8         | 9.1         |                      |      |      |
| Lane LOS                          |             |             | A           |                      |      |      |
| Approach Delay (s)                | 0.0         | 0.8         | 9.1         |                      |      |      |
| Approach LOS                      |             |             | A           |                      |      |      |
| <b>Intersection Summary</b>       |             |             |             |                      |      |      |
| Average Delay                     |             |             | 1.4         |                      |      |      |
| Intersection Capacity Utilization |             |             | 21.6%       | ICU Level of Service | A    |      |
| Analysis Period (min)             |             |             | 15          |                      |      |      |

Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road

2035 Future Total PM - Signal Test  
08-09-2021



| Lane Group                 | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
|----------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations        |       |       |       |       |       |       |
| Traffic Volume (vph)       | 156   | 132   | 70    | 168   | 984   | 160   |
| Future Volume (vph)        | 156   | 132   | 70    | 168   | 984   | 160   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Lane Width (m)             | 3.3   | 3.3   | 3.5   | 3.5   | 3.5   | 3.5   |
| Storage Length (m)         | 25.0  | 0.0   | 15.0  |       |       | 30.0  |
| Storage Lanes              | 1     | 1     | 1     |       |       | 1     |
| Taper Length (m)           | 47.5  |       | 100.0 |       |       |       |
| Lane Util. Factor          | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Fr <sub>t</sub>            |       | 0.850 |       |       |       | 0.850 |
| Fl <sub>t</sub> Protected  | 0.950 |       | 0.950 |       |       |       |
| Satd. Flow (prot)          | 1463  | 1395  | 1551  | 1712  | 1762  | 1351  |
| Fl <sub>t</sub> Permitted  | 0.950 |       | 0.149 |       |       |       |
| Satd. Flow (perm)          | 1463  | 1395  | 243   | 1712  | 1762  | 1351  |
| Right Turn on Red          |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)          |       | 132   |       |       |       | 88    |
| Link Speed (k/h)           | 80    |       |       | 80    | 80    |       |
| Link Distance (m)          | 180.5 |       |       | 135.8 | 575.1 |       |
| Travel Time (s)            | 8.1   |       |       | 6.1   | 25.9  |       |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 13%   | 6%    | 9%    | 4%    | 1%    | 12%   |
| Adj. Flow (vph)            | 156   | 132   | 70    | 168   | 984   | 160   |
| Shared Lane Traffic (%)    |       |       |       |       |       |       |
| Lane Group Flow (vph)      | 156   | 132   | 70    | 168   | 984   | 160   |
| Enter Blocked Intersection | No    | No    | No    | No    | No    | No    |
| Lane Alignment             | Left  | Right | Left  | Left  | Left  | Right |
| Median Width(m)            | 3.3   |       |       | 3.5   | 3.5   |       |
| Link Offset(m)             | 0.0   |       |       | 0.0   | 0.0   |       |
| Crosswalk Width(m)         | 4.8   |       |       | 4.8   | 4.8   |       |
| Two way Left Turn Lane     |       |       |       |       |       |       |
| Headway Factor             | 1.12  | 1.12  | 1.09  | 1.09  | 1.09  | 1.09  |
| Turning Speed (k/h)        | 25    | 15    | 25    |       |       | 15    |
| Number of Detectors        | 1     | 1     | 1     | 2     | 2     | 1     |
| Detector Template          | Left  | Right | Left  | Thru  | Thru  | Right |
| Leading Detector (m)       | 2.0   | 2.0   | 2.0   | 10.0  | 10.0  | 2.0   |
| Trailing Detector (m)      | 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   |
| Detector 1 Size(m)         | 2.0   | 2.0   | 2.0   | 0.6   | 0.6   | 2.0   |
| Detector 1 Type            | 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   |
| Detector 1 Queue (s)       | 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   |
| Detector 2 Position(m)     |       |       |       | 9.4   | 9.4   |       |
| Detector 2 Size(m)         |       |       |       | 0.6   | 0.6   |       |
| Detector 2 Type            |       |       |       | Cl+Ex | Cl+Ex |       |
| Detector 2 Channel         |       |       |       |       |       |       |
| Detector 2 Extend (s)      |       |       |       | 0.0   | 0.0   |       |
| Turn Type                  | Prot  | Perm  | Perm  | NA    | NA    | Perm  |

Lanes, Volumes, Timings  
5: Boundary Road & Mitch Owens Road

2035 Future Total PM - Signal Test  
08-09-2021



| Lane Group              | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
|-------------------------|-------|-------|-------|-------|-------|-------|
| Protected Phases        | 4     |       |       | 2     | 6     |       |
| Permitted Phases        |       | 4     | 2     |       |       | 6     |
| Detector Phase          | 4     | 4     | 2     | 2     | 6     | 6     |
| Switch Phase            |       |       |       |       |       |       |
| Minimum Initial (s)     | 7.0   | 7.0   | 35.0  | 35.0  | 35.0  | 35.0  |
| Minimum Split (s)       | 24.8  | 24.8  | 41.6  | 41.6  | 41.6  | 41.6  |
| Total Split (s)         | 25.0  | 25.0  | 75.0  | 75.0  | 75.0  | 75.0  |
| Total Split (%)         | 25.0% | 25.0% | 75.0% | 75.0% | 75.0% | 75.0% |
| Maximum Green (s)       | 18.2  | 18.2  | 68.4  | 68.4  | 68.4  | 68.4  |
| Yellow Time (s)         | 3.0   | 3.0   | 4.6   | 4.6   | 4.6   | 4.6   |
| All-Red Time (s)        | 3.8   | 3.8   | 2.0   | 2.0   | 2.0   | 2.0   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.8   | 6.8   | 6.6   | 6.6   | 6.6   | 6.6   |
| Lead/Lag                |       |       |       |       |       |       |
| Lead-Lag Optimize?      |       |       |       |       |       |       |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None  | None  | Min   | Min   | Min   | Min   |
| Walk Time (s)           | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   |
| Flash Dont Walk (s)     | 11.0  | 11.0  | 11.0  | 11.0  | 11.0  | 11.0  |
| Pedestrian Calls (#/hr) | 0     | 0     | 0     | 0     | 0     | 0     |
| Act Effct Green (s)     | 13.3  | 13.3  | 49.9  | 49.9  | 49.9  | 49.9  |
| Actuated g/C Ratio      | 0.17  | 0.17  | 0.65  | 0.65  | 0.65  | 0.65  |
| v/c Ratio               | 0.62  | 0.38  | 0.45  | 0.15  | 0.87  | 0.18  |
| Control Delay           | 44.5  | 10.1  | 17.9  | 5.9   | 20.8  | 3.2   |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Delay             | 44.5  | 10.1  | 17.9  | 5.9   | 20.8  | 3.2   |
| LOS                     | D     | B     | B     | A     | C     | A     |
| Approach Delay          | 28.7  |       |       | 9.4   | 18.3  |       |
| Approach LOS            | C     |       |       | A     | B     |       |
| Queue Length 50th (m)   | 21.5  | 0.0   | 4.6   | 8.7   | 103.8 | 3.6   |
| Queue Length 95th (m)   | 51.1  | 16.0  | 18.2  | 17.9  | 195.9 | 11.0  |
| Internal Link Dist (m)  | 156.5 |       |       | 111.8 | 551.1 |       |
| Turn Bay Length (m)     | 25.0  |       | 15.0  |       |       | 30.0  |
| Base Capacity (vph)     | 363   | 445   | 210   | 1480  | 1523  | 1179  |
| Starvation Cap Reductn  | 0     | 0     | 0     | 0     | 0     | 0     |
| Spillback Cap Reductn   | 0     | 0     | 0     | 0     | 0     | 0     |
| Storage Cap Reductn     | 0     | 0     | 0     | 0     | 0     | 0     |
| Reduced v/c Ratio       | 0.43  | 0.30  | 0.33  | 0.11  | 0.65  | 0.14  |

Intersection Summary

|                                    |                  |
|------------------------------------|------------------|
| Area Type:                         | Other            |
| Cycle Length:                      | 100              |
| Actuated Cycle Length:             | 77.3             |
| Natural Cycle:                     | 80               |
| Control Type:                      | Semi Act-Uncoord |
| Maximum v/c Ratio:                 | 0.87             |
| Intersection Signal Delay:         | 18.9             |
| Intersection LOS:                  | B                |
| Intersection Capacity Utilization: | 81.7%            |
| ICU Level of Service:              | D                |
| Analysis Period (min):             | 15               |

Splits and Phases: 5: Boundary Road & Mitch Owens Road



# APPENDIX N

## TDM Checklist



**TDM-Supportive Development Design and Infrastructure Checklist:**  
*Non-Residential Developments (office, institutional, retail or industrial)*

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

| TDM-supportive design & infrastructure measures:<br><i>Non-residential developments</i> |   | Check if completed &<br>add descriptions, explanations<br>or plan/drawing references                            |
|---|---|---|
| <b>1. WALKING &amp; CYCLING: ROUTES</b>   |   |   |
| <b>1.1 Building location &amp; access points</b>  |   |   |
| BASIC   | 1.1.1 Locate building close to the street, and do not locate parking areas between the street and building entrances  | <input type="checkbox"/>  |
| BASIC   | 1.1.2 Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations  | <input type="checkbox"/> To be incorporated   |
| BASIC   | 1.1.3 Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort   | <input type="checkbox"/> To be incorporated   |
| <b>1.2 Facilities for walking &amp; cycling</b>   |   |   |
| 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 ( <i>see Official Plan policy 4.3.3</i> )  | <input type="checkbox"/><br><br>To be provided as applicable for site location.                                 |
| 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 ( <i>see Official Plan policy 4.3.12</i> ) | <input type="checkbox"/><br><br>No public sidewalks. However, will be provided as applicable for site location. |

| <b>TDM-supportive design &amp; infrastructure measures:<br/><i>Non-residential developments</i></b> |  | <b>Check if completed &amp;<br/>add descriptions, explanations<br/>or plan/drawing references</b> |
|---|--|---|
| <b>REQUIRED</b>   | 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 ( <i>see Official Plan policy 4.3.10</i> )  | <input type="checkbox"/><br>Yes. To be provided as applicable for site location.                  |
| <b>REQUIRED</b>   | 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 ( <i>see Official Plan policy 4.3.10</i> )   | <input type="checkbox"/><br>Yes. To be provided as applicable for site location.                  |
| <b>REQUIRED</b>   | 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 ( <i>see Official Plan policy 4.3.11</i> ) | <input type="checkbox"/><br>Not Applicable  |
| <b>BASIC</b>  | 1.2.6 Provide safe, direct and attractive walking routes from building entrances to nearby transit stops   | <input type="checkbox"/>  |
| <b>BASIC</b>  | 1.2.7 Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible  | <input type="checkbox"/>  |
| <b>BASIC</b>  | 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  | <input type="checkbox"/>  |
| <b>1.3 Amenities for walking &amp; cycling</b>  |  |   |
| <b>BASIC</b>  | 1.3.1 Provide lighting, landscaping and benches along walking and cycling routes between building entrances and streets, sidewalks and trails  | <input type="checkbox"/>  |
| <b>BASIC</b>  | 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)  | <input type="checkbox"/>  |

| TDM-supportive design & infrastructure measures:<br><i>Non-residential developments</i> |   | Check if completed & add descriptions, explanations or plan/drawing references |
|---|---|--|
| <b>2. WALKING &amp; CYCLING: END-OF-TRIP FACILITIES</b>                                 |   |  |
| <b>2.1 Bicycle parking</b>  |   |  |
| REQUIRED  | 2.1.1 Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible (see <i>Official Plan policy 4.3.6</i> )  | <input type="checkbox"/><br>To be Included.                                    |
| 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 <i>Zoning By-law Section 111</i> )   | <input type="checkbox"/><br>To be Included.                                    |
| 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 <i>Zoning By-law Section 111</i> )   | <input type="checkbox"/><br>To be Incorporated.                                |
| BASIC   | 2.1.4 Provide bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met), plus the expected peak number of customer/visitor cyclists   | <input type="checkbox"/><br>To be Incorporated.                                |
| BETTER  | 2.1.5 Provide bicycle parking spaces equivalent to the expected number of commuter and customer/visitor cyclists, plus an additional buffer (e.g. 25 percent extra) to encourage other cyclists and ensure adequate capacity in peak cycling season                       | <input type="checkbox"/>   |
| <b>2.2 Secure bicycle parking</b>   |   |  |
| REQUIRED  | 2.2.1 Where more than 50 bicycle parking spaces are provided for a single office 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 <i>Zoning By-law Section 111</i> ) | <input type="checkbox"/><br>Not applicable                                     |
| BETTER  | 2.2.2 Provide secure bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met)  | <input type="checkbox"/>   |
| <b>2.3 Shower &amp; change facilities</b>   |   |  |
| BASIC   | 2.3.1 Provide shower and change facilities for the use of active commuters  | <input type="checkbox"/>   |
| BETTER  | 2.3.2 In addition to shower and change facilities, provide dedicated lockers, grooming stations, drying racks and laundry facilities for the use of active commuters  | <input type="checkbox"/>   |
| <b>2.4 Bicycle repair station</b>   |   |  |
| BETTER  | 2.4.1 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)  | <input type="checkbox"/>   |


| <b>TDM-supportive design &amp; infrastructure measures:<br/><i>Non-residential developments</i></b> |   | <b>Check if completed &amp;<br/>add descriptions, explanations<br/>or plan/drawing references</b> |
|---|---|---|
| <b>3. TRANSIT</b>   |   |   |
| <b>3.1 Customer amenities</b>   |   |   |
| <b>BASIC</b>  | 3.1.1 Provide shelters, lighting and benches at any on-site transit stops   | <input type="checkbox"/>  |
| <b>BASIC</b>  | 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 | <input type="checkbox"/>  |
| <b>BETTER</b>   | 3.1.3 Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building   | <input type="checkbox"/>  |
| <b>4. RIDESHARING</b>   |   |   |
| <b>4.1 Pick-up &amp; drop-off facilities</b>  |   |   |
| <b>BASIC</b>  | 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        | <input type="checkbox"/>  |
| <b>4.2 Carpool parking</b>  |   |   |
| <b>BASIC</b>  | 4.2.1 Provide signed parking spaces for carpools in a priority location close to a major building entrance, sufficient in number to accommodate the mode share target for carpools      | <input type="checkbox"/>  |
| <b>BETTER</b>   | 4.2.2 At large developments, provide spaces for carpools in a separate, access-controlled parking area to simplify enforcement  | <input type="checkbox"/>  |
| <b>5. CARSHARING &amp; BIKESHARING</b>  |   |   |
| <b>5.1 Carshare parking spaces</b>  |   |   |
| <b>BETTER</b>   | 5.1.1 Provide carshare parking spaces in permitted non-residential zones, occupying either required or provided parking spaces ( <i>see Zoning By-law Section 94</i> )                  | <input type="checkbox"/>  |
| <b>5.2 Bikeshare station location</b>   |   |   |
| <b>BETTER</b>   | 5.2.1 Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection                                     | <input type="checkbox"/>  |

| TDM-supportive design & infrastructure measures:<br><i>Non-residential developments</i> |   | Check if completed &<br>add descriptions, explanations<br>or plan/drawing references               |
|---|---|--|
| <b>6. PARKING</b>   |   |  |
| <b>6.1 Number of parking spaces</b>   |   |  |
| <b>REQUIRED</b>   | 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  | <input type="checkbox"/> The slight parking supply surplus due to ZBL updated will be coordinated. |
| <b>BASIC</b>  | 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  | <input type="checkbox"/>   |
| <b>BASIC</b>  | 6.1.3 Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly ( <i>see Zoning By-law Section 104</i> )   | <input type="checkbox"/>   |
| <b>BETTER</b>   | 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 ( <i>see Zoning By-law Section 111</i> ) | <input type="checkbox"/>   |
| <b>6.2 Separate long-term &amp; short-term parking areas</b>                            |   |  |
| <b>BETTER</b>   | 6.2.1 Separate short-term and long-term parking areas using signage or physical barriers, to permit access controls and simplify enforcement (i.e. to discourage employees from parking in visitor spaces, and vice versa)  | <input type="checkbox"/>   |
| <b>7. OTHER</b>   |   |  |
| <b>7.1 On-site amenities to minimize off-site trips</b>                                 |   |  |
| <b>BETTER</b>   | 7.1.1 Provide on-site amenities to minimize mid-day or mid-commute errands  | <input type="checkbox"/>   |

# APPENDIX O


## Sight Distance Assessment Drawings



| LEGEND  |                          |
|---|--------------------------|
|  | AVAILABLE SIGHT DISTANCE |
|  | REQUIRED SIGHT DISTANCE  |

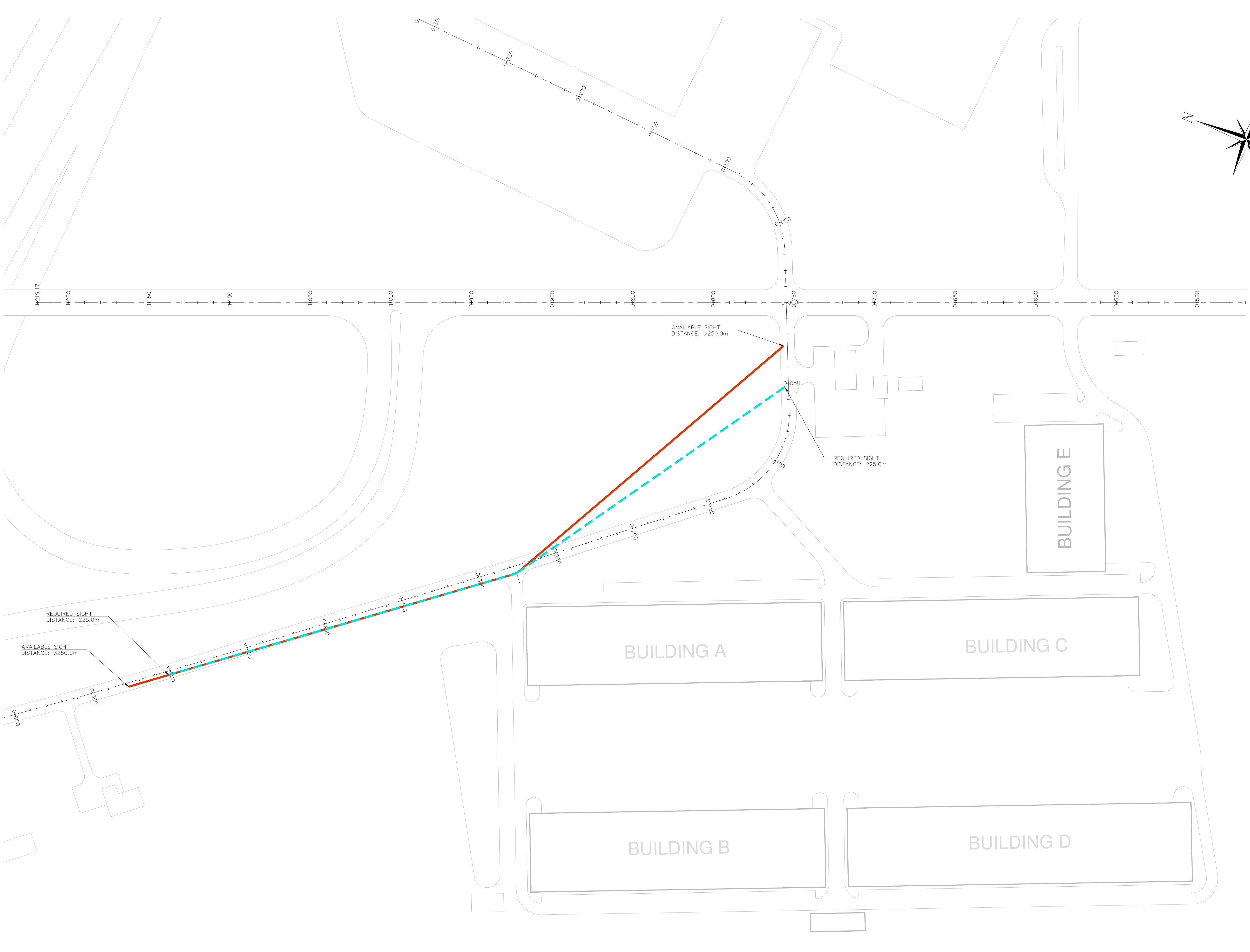
Project  
 THUNDER ROAD & BOUNDARY ROAD  
 CITY OF OTTAWA

Drawing  
 SIGHT LINE ANALYSIS

 **CROZIER**  
 CONSULTING ENGINEERS

Admiral Building  
 1 First Street, Suite 200  
 Collingwood, ON L9Y 1A1  
 705-446-3510 T  
 705-446-3520 F  
 www.crozier.ca  
 info@crozier.ca

|       |      |        |              |             |           |
|-------|------|--------|--------------|-------------|-----------|
| Drawn | R.L. | Design | R.L.         | Project No. | 1909-5772 |
| Check | A.H. | DATE   | SEPT/16/2021 | Scale       | N.T.S.    |
|       |      |        |              | Dwg.        | S 1       |



| LEGEND |                          |
|--------|--------------------------|
|        | AVAILABLE SIGHT DISTANCE |
|        | REQUIRED SIGHT DISTANCE  |

Project  
 THUNDER ROAD & BOUNDARY ROAD  
 CITY OF OTTAWA

Drawing  
 SIGHT LINE ANALYSIS

**CROZIER**  
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 705-446-3520 F  
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|       |      |        |              |             |           |     |
|-------|------|--------|--------------|-------------|-----------|-----|
| Drawn | R.L. | Design | R.L.         | Project No. | 1909-5772 |     |
| Check | A.H. | DATE   | SEPT/16/2021 | Scale       | N.T.S.    |     |
|       |      |        |              |             | Dwg.      | S 2 |



# FIGURES



THUNDER ROAD & BOUNDARY ROAD  
CITY OF OTTAWA



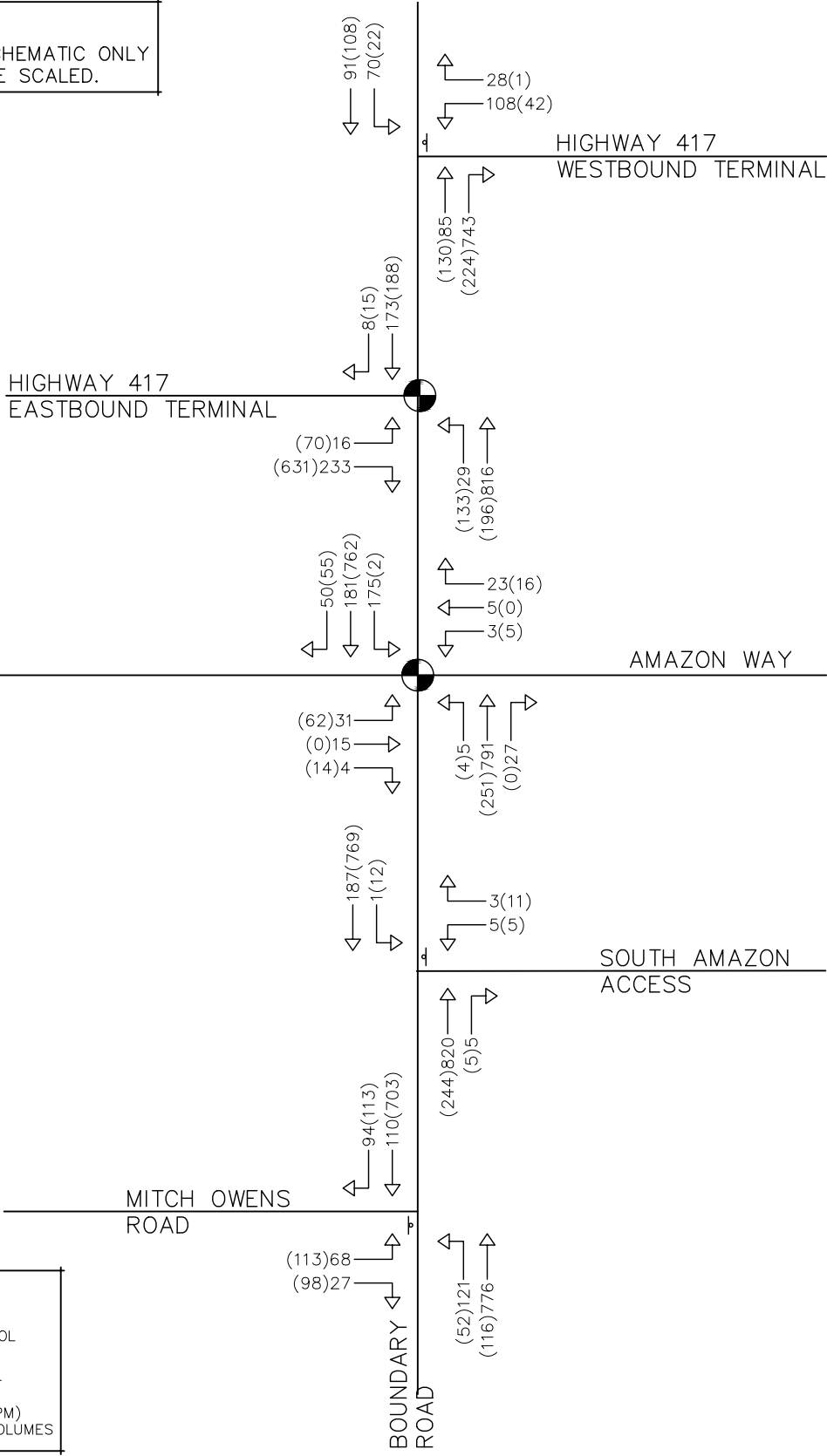
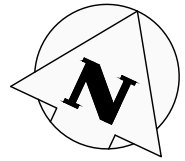
**CROZIER  
& ASSOCIATES**  
Consulting Engineers

2800 HIGH POINT DRIVE  
SUITE 100  
MILTON, ON L9T 6P4  
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SITE LOCATION PLAN

|       |            |             |           |
|-------|------------|-------------|-----------|
| Drawn | T.D.S.     | Project No. | 1909-5772 |
| Date  | 2021/07/23 | Scale       | N.T.S     |
|       |            | Dwg.        | FIG. 01   |

NOTE:  
THIS FIGURE IS SCHEMATIC ONLY  
AND IS NOT TO BE SCALED.



**LEGEND:**

SIGNAL CONTROL

STOP CONTROL

AM(PM) WEEKDAY AM(PM)  
PEAK HOUR VOLUMES

THUNDER ROAD & BOUNDARY ROAD  
CITY OF OTTAWA

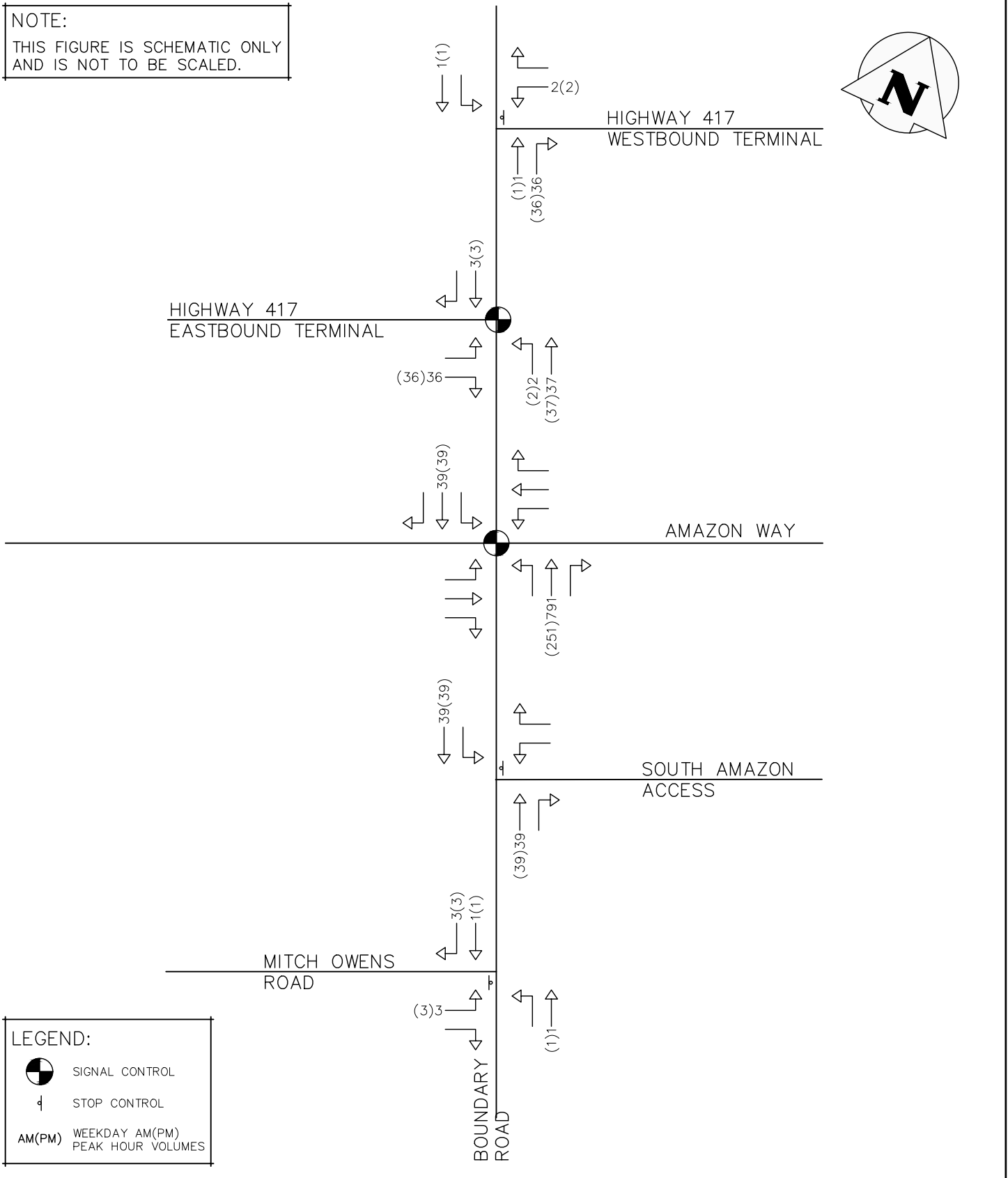
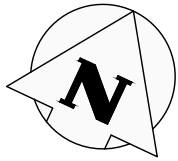


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SUITE 100  
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2020 EXISTING TRAFFIC VOLUMES

|                      |                |                          |
|----------------------|----------------|--------------------------|
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| Date<br>2021/07/23   | Check<br>P.A.  | Scale<br>N.T.S.          |
|                      |                | Dwg.<br>FIG. 03          |

NOTE:  
THIS FIGURE IS SCHEMATIC ONLY  
AND IS NOT TO BE SCALED.



LEGEND:  
 SIGNAL CONTROL  
 STOP CONTROL  
 AM(PM) WEEKDAY AM(PM)  
 PEAK HOUR VOLUMES

THUNDER ROAD & BOUNDARY ROAD  
CITY OF OTTAWA



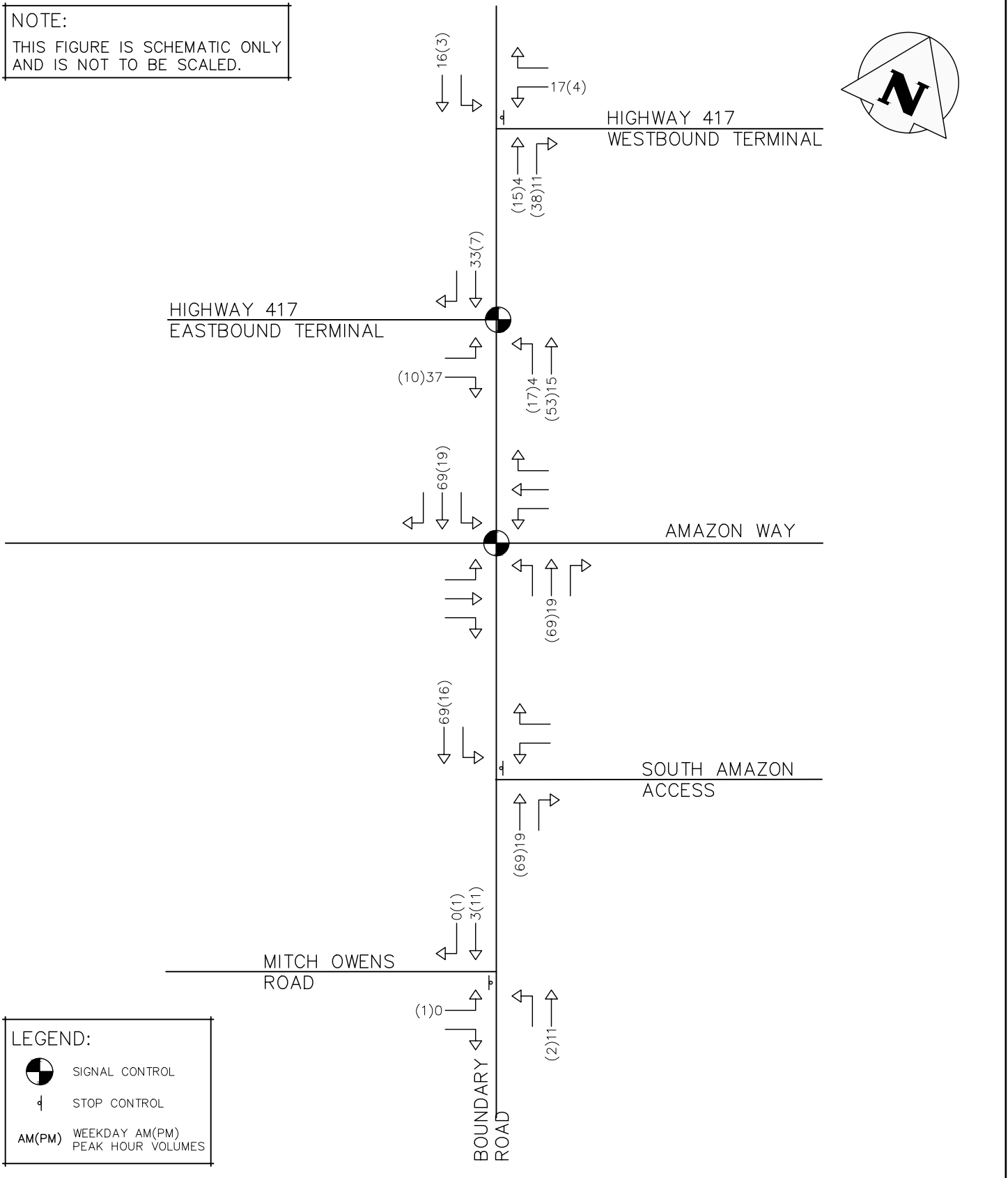
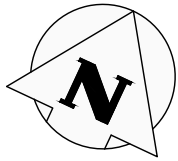
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SUITE 100  
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CRRc BACKGROUND TRIP ASSIGNMENT

|                      |                |                          |
|----------------------|----------------|--------------------------|
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| Date<br>2021/07/23   | Check<br>P.A.  | Scale<br>N.T.S.          |
|                      |                | Dwg.<br>FIG. 04.1        |

NOTE:  
THIS FIGURE IS SCHEMATIC ONLY  
AND IS NOT TO BE SCALED.



LEGEND:  
 SIGNAL CONTROL  
 STOP CONTROL  
 AM(PM) WEEKDAY AM(PM)  
 PEAK HOUR VOLUMES

THUNDER ROAD & BOUNDARY ROAD  
CITY OF OTTAWA



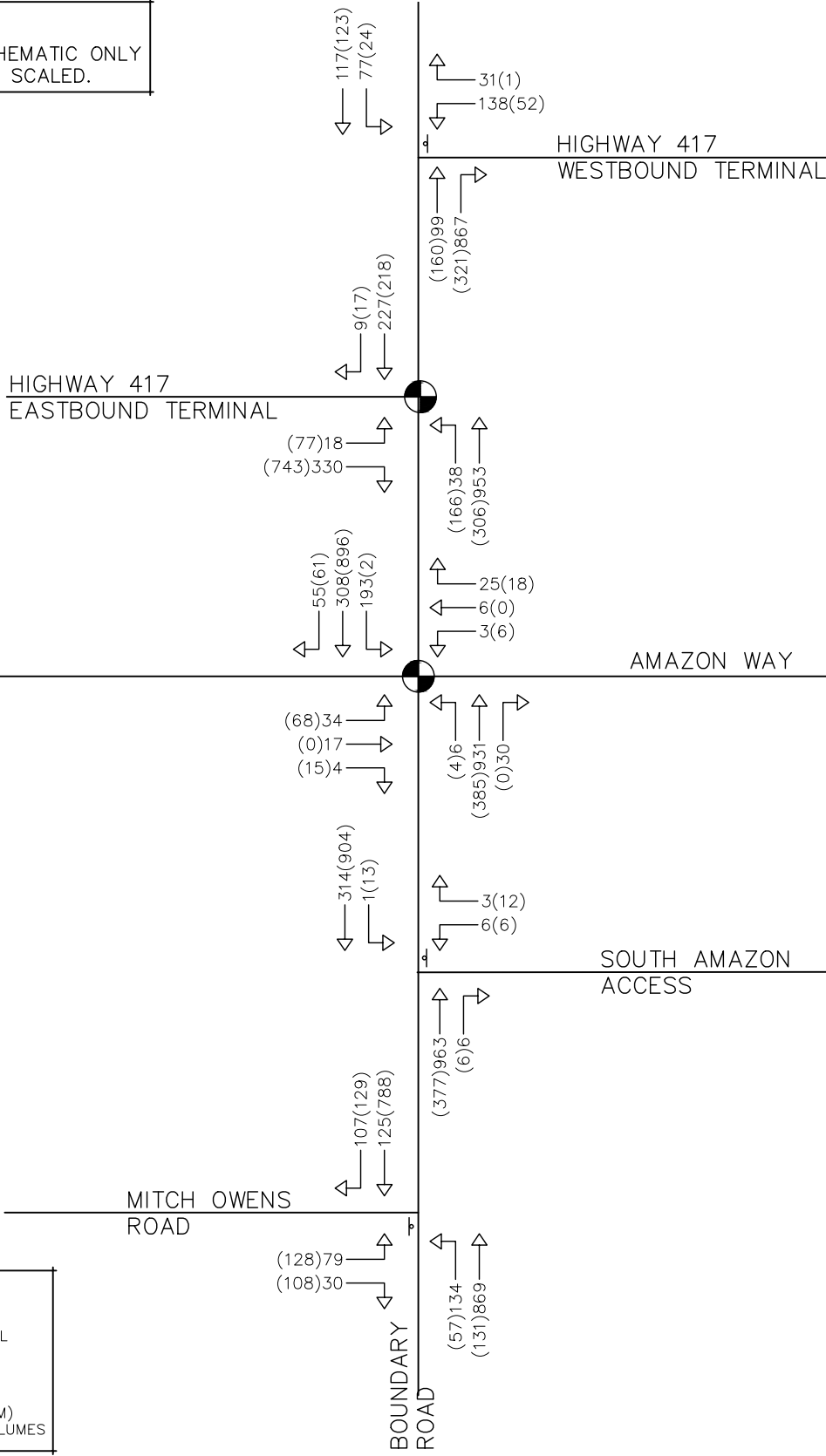
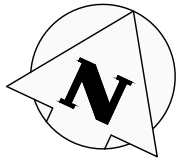
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5494, 5500 AND 5510 BOUNDARY ROAD  
BACKGROUND TRIP ASSIGNMENT

|                      |                |                          |
|----------------------|----------------|--------------------------|
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| Date<br>2021/07/23   | Check<br>P.A.  | Scale<br>N.T.S.          |
|                      |                | Dwg.<br>FIG. 04.2        |

NOTE:  
THIS FIGURE IS SCHEMATIC ONLY  
AND IS NOT TO BE SCALED.



**LEGEND:**

- SIGNAL CONTROL
- STOP CONTROL
- AM(PM) WEEKDAY AM(PM) PEAK HOUR VOLUMES

THUNDER ROAD & BOUNDARY ROAD  
CITY OF OTTAWA

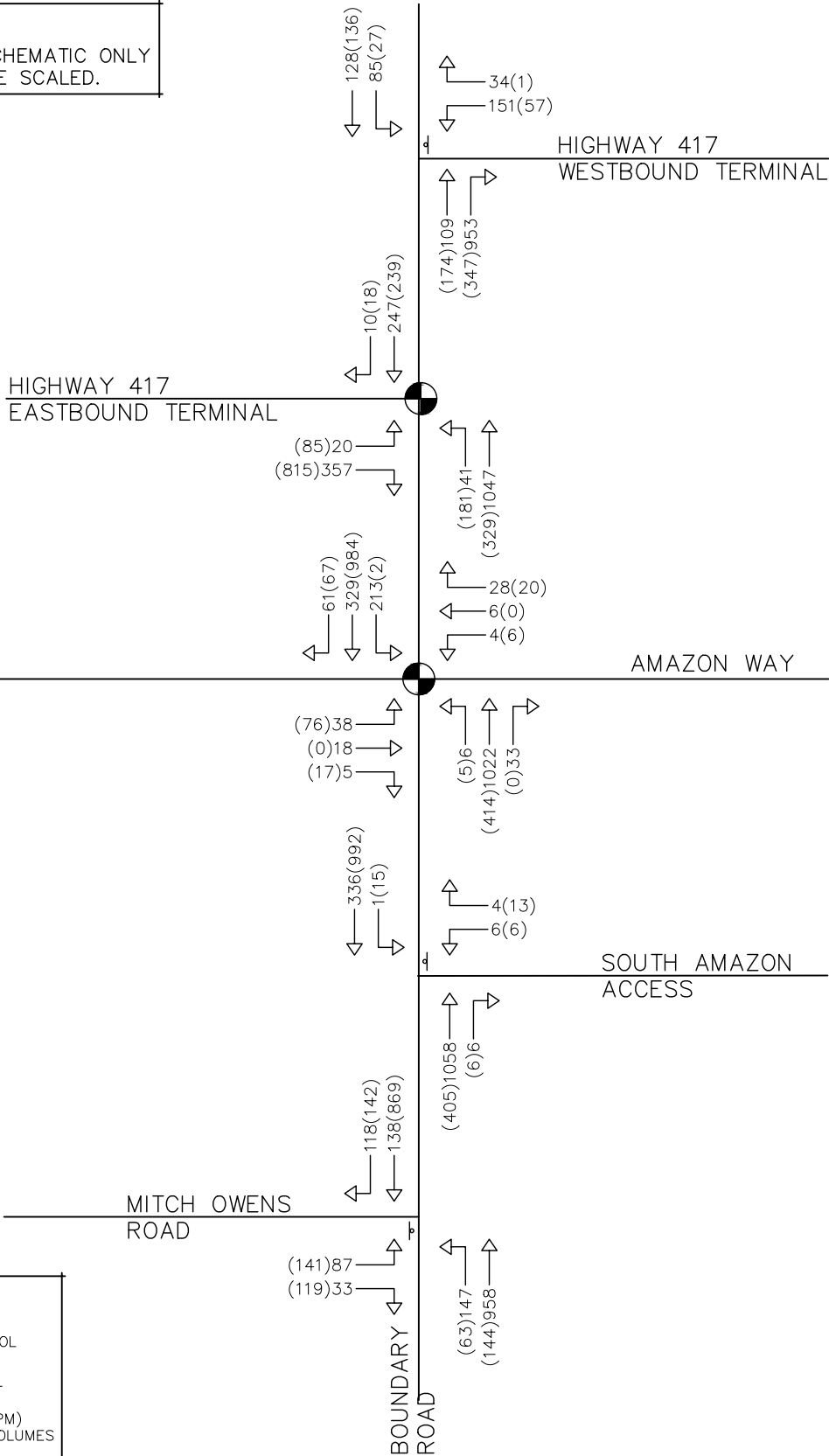
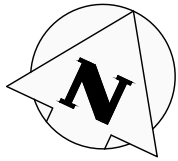
2025 FUTURE BACKGROUND  
TRAFFIC VOLUMES



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SUITE 100  
MILTON, ON L9T 6P4  
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|                      |                |                          |
|----------------------|----------------|--------------------------|
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| Date<br>2021/07/23   | Check<br>P.A.  | Scale<br>N.T.S.          |
|                      |                | Dwg.<br>FIG. 05          |

NOTE:  
THIS FIGURE IS SCHEMATIC ONLY  
AND IS NOT TO BE SCALED.



LEGEND:  
 SIGNAL CONTROL  
 STOP CONTROL  
 AM(PM) WEEKDAY AM(PM)  
 PEAK HOUR VOLUMES

THUNDER ROAD & BOUNDARY ROAD  
CITY OF OTTAWA

2030 FUTURE BACKGROUND  
TRAFFIC VOLUMES

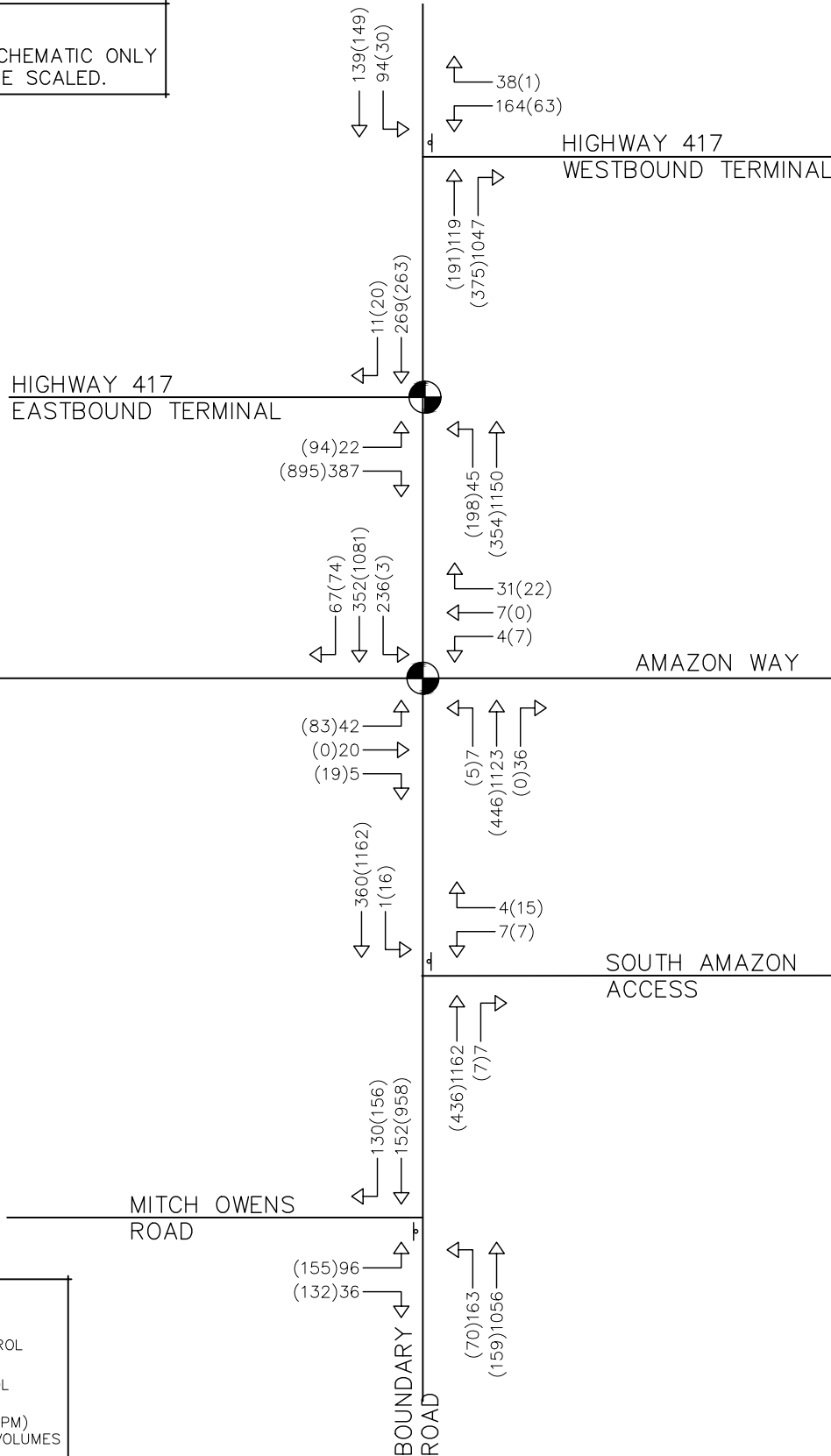
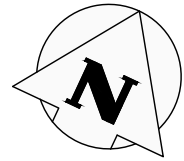


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|                      |                |                          |
|----------------------|----------------|--------------------------|
| Drawn<br>S.K./T.D.S. | Design<br>S.K. | Project No.<br>1909-5772 |
| Date<br>2021/07/23   | Check<br>P.A.  | Scale<br>N.T.S.          |
|                      |                | Dwg.<br>FIG. 06          |

**NOTE:**  
THIS FIGURE IS SCHEMATIC ONLY  
AND IS NOT TO BE SCALED.



**LEGEND:**

- SIGNAL CONTROL
- STOP CONTROL
- AM(PM) WEEKDAY AM(PM) PEAK HOUR VOLUMES

THUNDER ROAD & BOUNDARY ROAD  
CITY OF OTTAWA



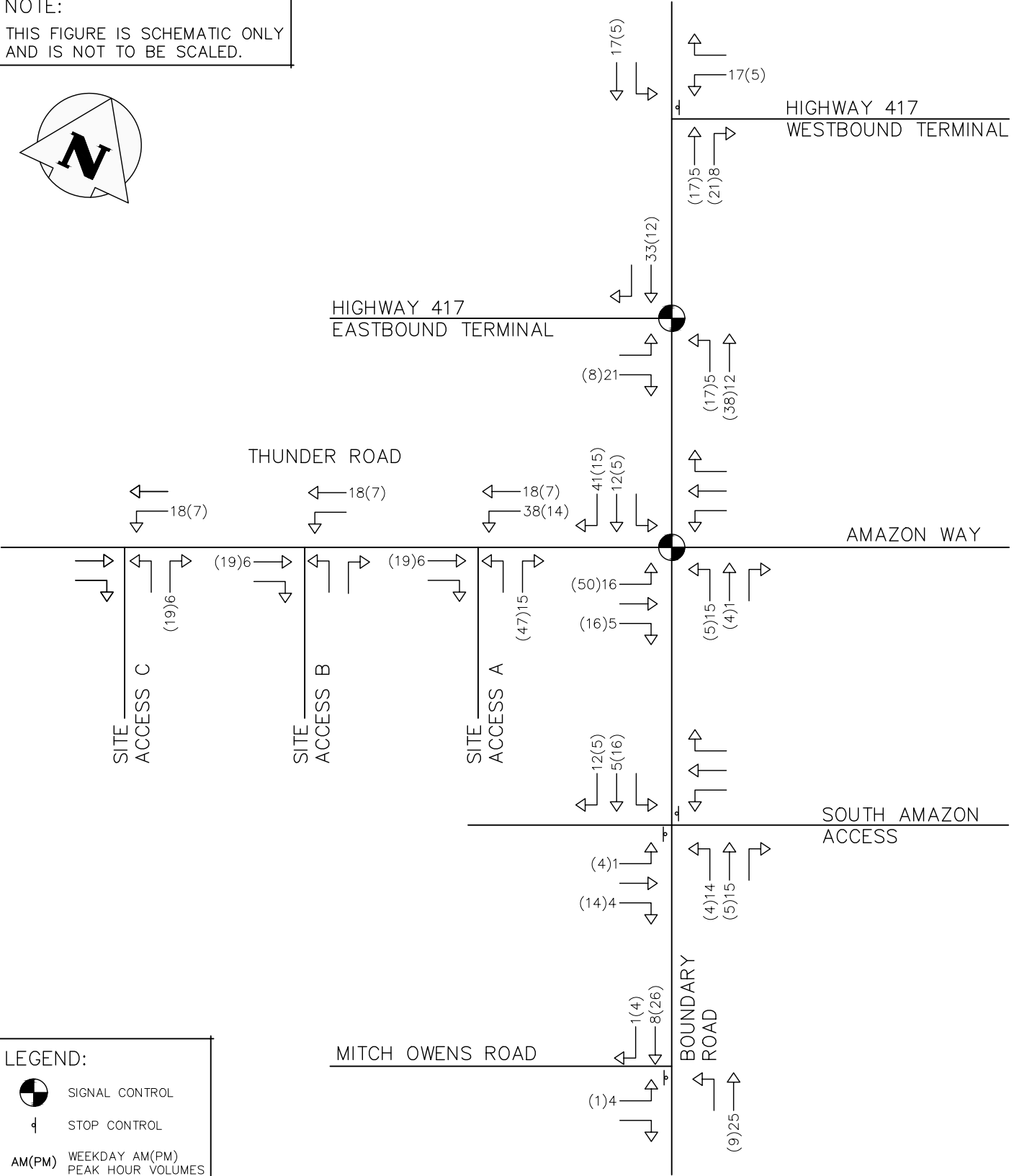
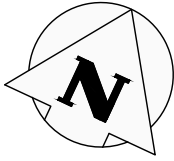
2800 HIGH POINT DRIVE  
SUITE 100  
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2035 FUTURE BACKGROUND  
TRAFFIC VOLUMES

|                      |                |                          |
|----------------------|----------------|--------------------------|
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| Date<br>2021/07/23   | Check<br>P.A.  | Scale<br>N.T.S.          |
|                      |                | Dwg.<br>FIG. 07          |



NOTE:  
THIS FIGURE IS SCHEMATIC ONLY  
AND IS NOT TO BE SCALED.



LEGEND:  
 SIGNAL CONTROL  
 STOP CONTROL  
 AM(PM) WEEKDAY AM(PM)  
 PEAK HOUR VOLUMES

THUNDER ROAD & BOUNDARY ROAD  
CITY OF OTTAWA

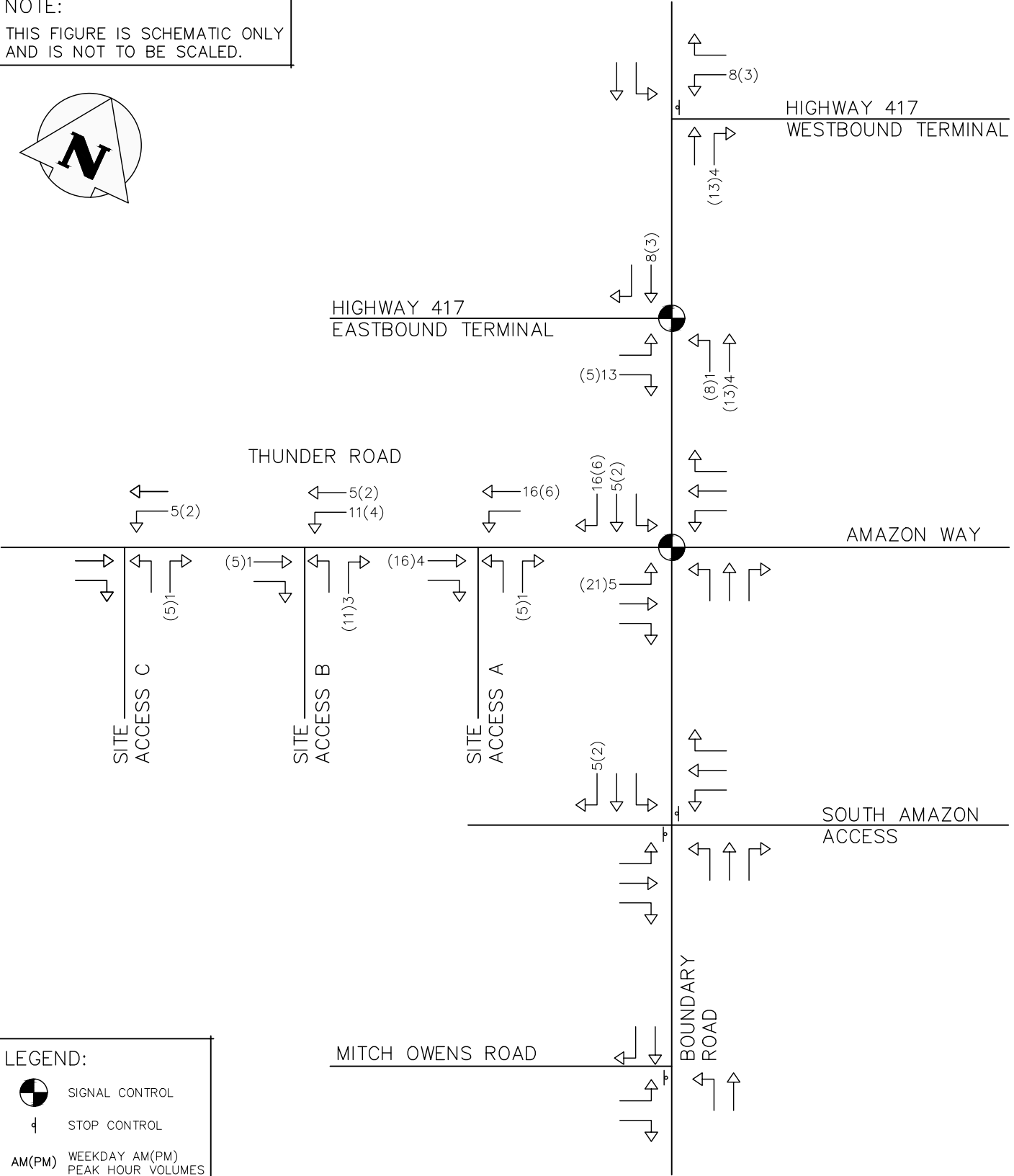
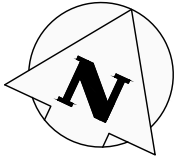


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SITE TRIP ASSIGNMENT – EMPLOYEES

|                      |                |                          |
|----------------------|----------------|--------------------------|
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| Date<br>2021/07/23   | Check<br>P.A.  | Scale<br>N.T.S.          |
|                      |                | Dwg.<br>FIG. 08          |

NOTE:  
THIS FIGURE IS SCHEMATIC ONLY  
AND IS NOT TO BE SCALED.



**LEGEND:**

-  SIGNAL CONTROL
-  STOP CONTROL
- AM(PM) WEEKDAY AM(PM)  
PEAK HOUR VOLUMES

THUNDER ROAD & BOUNDARY ROAD  
CITY OF OTTAWA

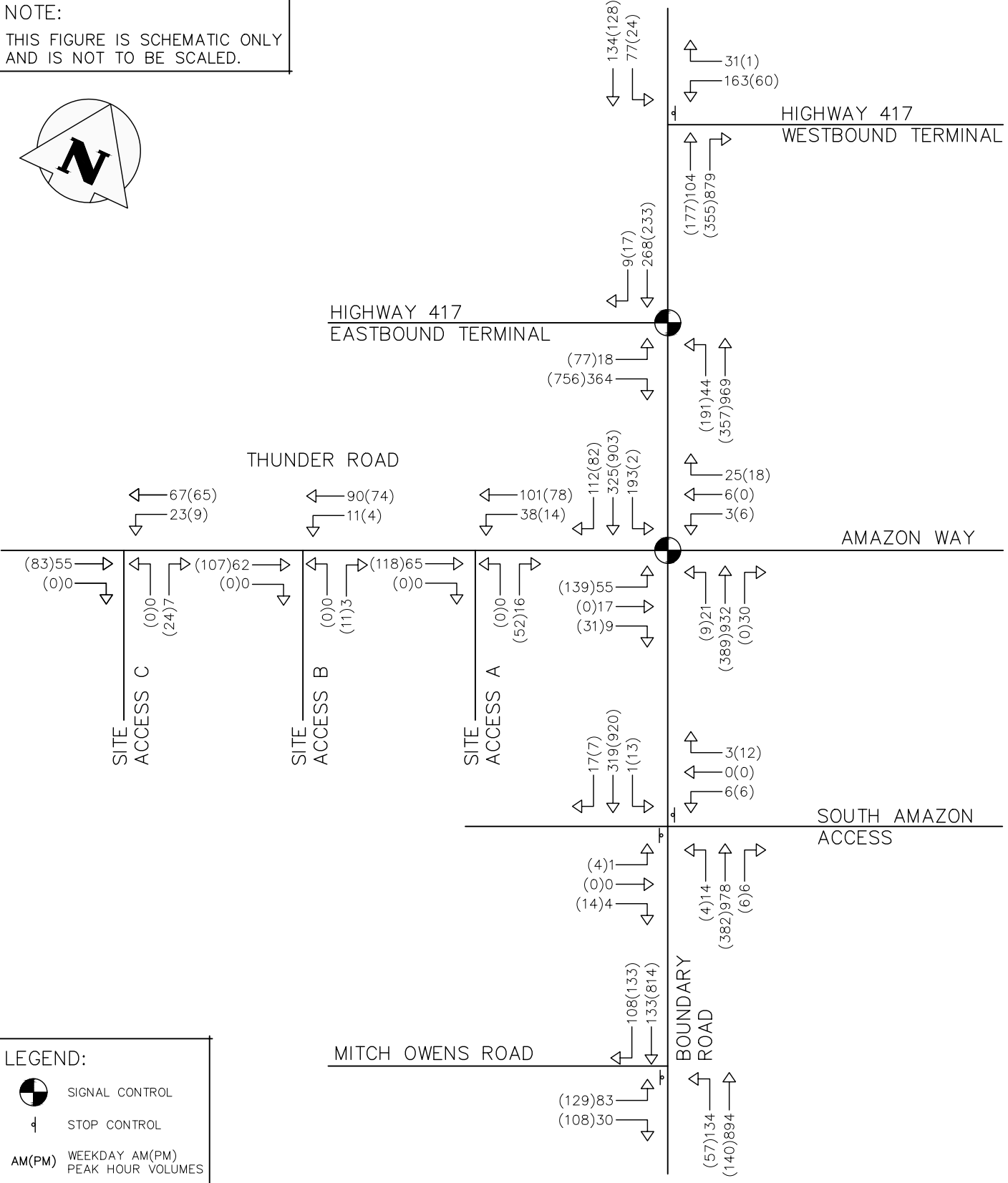
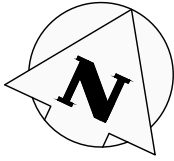


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SUITE 100  
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SITE TRIP ASSIGNMENT – TRUCKS

|                      |                |                          |
|----------------------|----------------|--------------------------|
| Drawn<br>S.K./T.D.S. | Design<br>S.K. | Project No.<br>1909-5772 |
| Date<br>2021/07/23   | Check<br>P.A.  | Scale<br>N.T.S.          |
|                      |                | Dwg.<br>FIG. 09          |

NOTE:  
THIS FIGURE IS SCHEMATIC ONLY  
AND IS NOT TO BE SCALED.



**LEGEND:**

- SIGNAL CONTROL
- STOP CONTROL
- AM(PM) WEEKDAY AM(PM) PEAK HOUR VOLUMES

THUNDER ROAD & BOUNDARY ROAD  
CITY OF OTTAWA

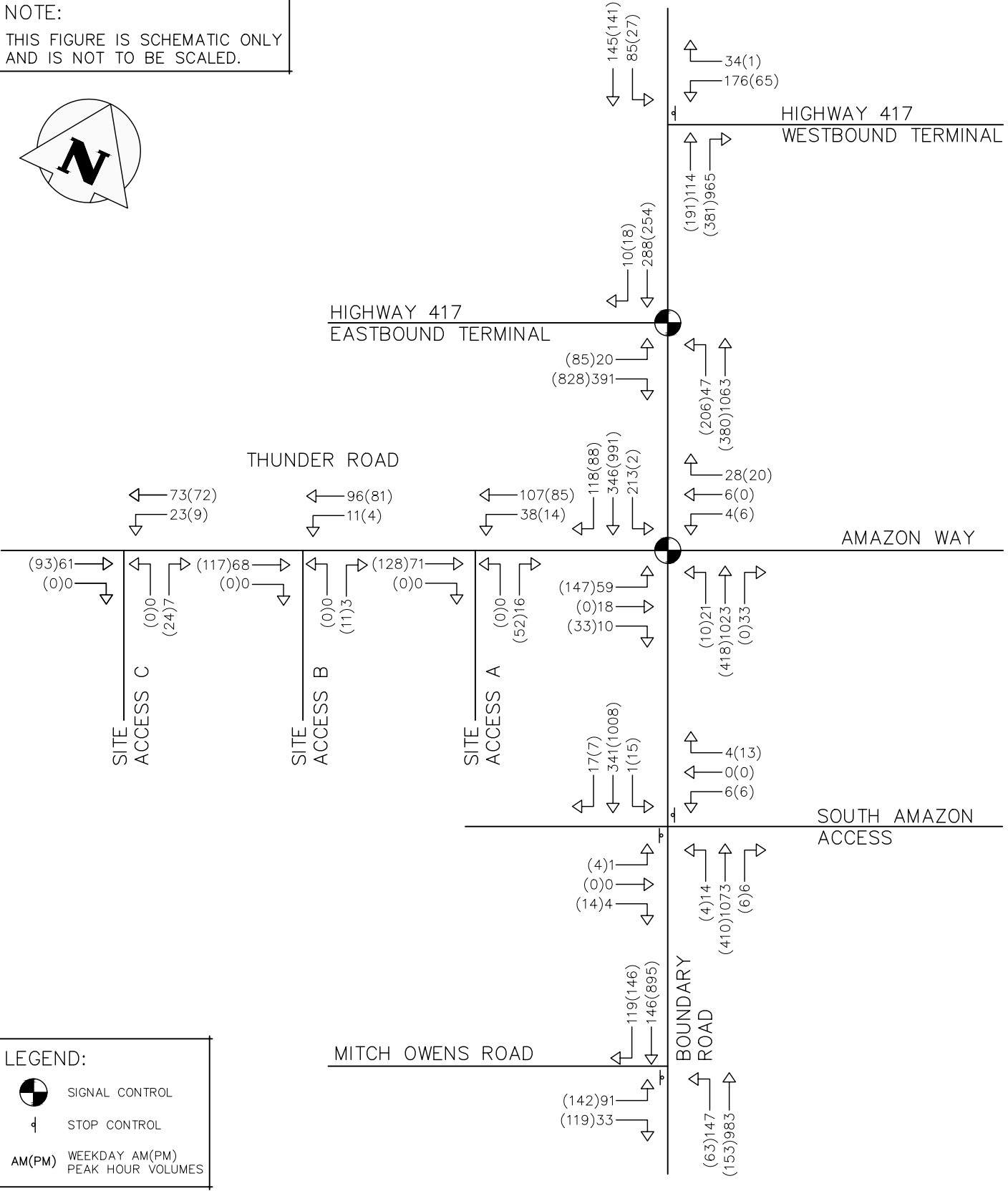
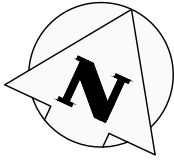
2025 FUTURE TOTAL  
TRAFFIC VOLUMES



2800 HIGH POINT DRIVE  
SUITE 100  
MILTON, ON L9T 6P4  
905 875-0026 T  
905 875-4915 F  
WWW.CFCROZIER.CA

|                      |                |                          |
|----------------------|----------------|--------------------------|
| Drawn<br>S.K./T.D.S. | Design<br>S.K. | Project No.<br>1909-5772 |
| Date<br>2021/07/23   | Check<br>P.A.  | Scale<br>N.T.S.          |
|                      |                | Dwg.<br>FIG. 10          |

NOTE:  
THIS FIGURE IS SCHEMATIC ONLY  
AND IS NOT TO BE SCALED.



**LEGEND:**

- SIGNAL CONTROL
- STOP CONTROL
- AM(PM) WEEKDAY AM(PM) PEAK HOUR VOLUMES

THUNDER ROAD & BOUNDARY ROAD  
CITY OF OTTAWA

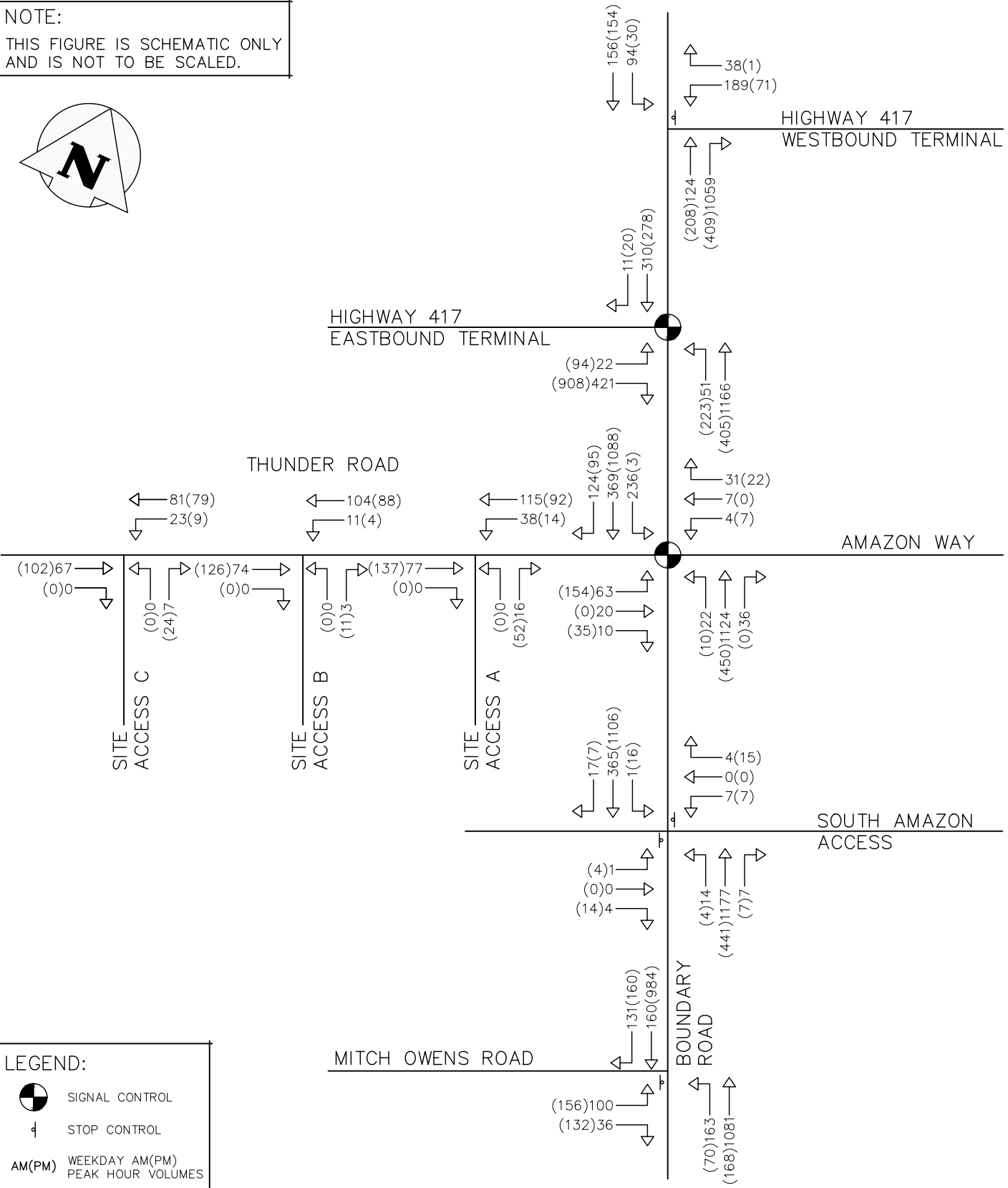
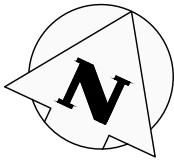
2030 FUTURE TOTAL  
TRAFFIC VOLUMES



2800 HIGH POINT DRIVE  
SUITE 100  
MILTON, ON L9T 6P4  
905 875-0026 T  
905 875-4915 F  
WWW.CFCROZIER.CA

|                      |                |                          |
|----------------------|----------------|--------------------------|
| Drawn<br>S.K./T.D.S. | Design<br>S.K. | Project No.<br>1909-5772 |
| Date<br>2021/07/23   | Check<br>P.A.  | Scale<br>N.T.S           |
|                      |                | Dwg.<br>FIG. 11          |

NOTE:  
THIS FIGURE IS SCHEMATIC ONLY  
AND IS NOT TO BE SCALED.



**LEGEND:**

- SIGNAL CONTROL
- STOP CONTROL
- AM(PM) WEEKDAY AM(PM) PEAK HOUR VOLUMES

THUNDER ROAD & BOUNDARY ROAD  
CITY OF OTTAWA

2035 FUTURE TOTAL  
TRAFFIC VOLUMES



2800 HIGH POINT DRIVE  
SUITE 100  
MILTON, ON L9T 6P4  
905 875-0026 T  
905 875-4915 F  
WWW.CFCROZIER.CA

|                      |                |                          |
|----------------------|----------------|--------------------------|
| Drawn<br>S.K./T.D.S. | Design<br>S.K. | Project No.<br>1909-5772 |
| Date<br>2021/07/23   | Check<br>P.A.  | Scale<br>N.T.S.          |
|                      |                | Dwg.<br>FIG. 12          |