

TIA ANALYSIS REPORT (STEP 4): RESIDENTIAL DEVELOPMENT AT 147 LANGSTAFF DRIVE



Project No.: OCP-19-0025

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TABLE OF CONTENTS

| | | |
|-------------|---|-----------|
| 1.0 | SCREENING FORM | 1 |
| 1.1 | <i>Trip Generation Triggers</i> | 1 |
| 1.2 | <i>Location Triggers</i> | 1 |
| 1.3 | <i>Safety Triggers.....</i> | 1 |
| 2.0 | DESCRIPTION OF PROPOSED DEVELOPMENT | 2 |
| 3.0 | EXISTING CONDITIONS | 3 |
| 3.1 | <i>Roadways</i> | 3 |
| 3.2 | <i>Study Area Intersections</i> | 3 |
| 3.3 | <i>Existing Pedestrian and Cycling Facilities.....</i> | 5 |
| 3.4 | <i>Existing Transit System</i> | 6 |
| 3.5 | <i>Existing Driveways</i> | 7 |
| 3.6 | <i>Collision History</i> | 8 |
| 3.7 | <i>Traffic Volume</i> | 10 |
| 4.0 | PLANNED CONDITIONS..... | 12 |
| 5.0 | STUDY AREA | 12 |
| 6.0 | TIME PERIODS | 12 |
| 7.0 | HORIZON YEARS | 12 |
| 8.0 | EXEMPTIONS REVIEW..... | 13 |
| 9.0 | DEVELOPMENT GENERATED TRAFFIC..... | 13 |
| 9.1 | <i>Trip Generation.....</i> | 13 |
| 9.1.1 | <i>Trip Generation Rates</i> | 13 |
| 9.1.2 | <i>Mode Shares</i> | 14 |
| 9.2 | <i>Trip Distribution.....</i> | 16 |
| 9.3 | <i>Trip Assignment.....</i> | 19 |
| 10.0 | BACKGROUND NETWORK TRAFFIC..... | 21 |
| 10.1 | <i>Changes to the Background Transportation Network</i> | 21 |
| 10.2 | <i>General Background Growth Rates</i> | 21 |
| 10.3 | <i>Other Area Development</i> | 21 |

| | |
|---|-----------|
| 11.0 DEMAND RATIONALIZATION | 21 |
| 11.1 Intersection Capacity Analysis Methodology | 21 |
| 11.2 Description of Capacity Issue (s)..... | 22 |
| 11.3 Adjustment to Development Generated Demands..... | 28 |
| 11.4 Adjustments to Background Network Demands | 28 |
| 12.0 DEVELOPMENT DESIGN | 28 |
| 12.1 Design for Sustainable Modes..... | 28 |
| 12.2 New Street Networks | 29 |
| 13.0 BOUNDARY STREETS | 30 |
| 13.1 Mobility..... | 30 |
| 13.1.1 Pedestrian Level of Service (PLOS)..... | 30 |
| 13.1.2 Bicycle Level of Service (BLOS) | 30 |
| 13.1.3 Transit Level of Service (TLOS)..... | 30 |
| 13.1.4 Truck Level of Service (TkLOS) | 31 |
| 13.1.5 Vehicular Level of Service (LOS)..... | 31 |
| 13.2 Road Safety | 31 |
| 13.3 Neighborhood Traffic Management | 31 |
| 14.0 TRANSPORTATION DEMAND MANAGEMENT | 32 |
| 14.1 Context for TDM | 32 |
| 14.2 Need and Opportunity | 32 |
| 14.3 TDM Program | 32 |
| 15.0 ACCESS INTERSECTIONS | 33 |
| 15.1 Location and Design of Access | 33 |
| 15.2 Intersection Control | 33 |
| 15.3 Intersection Design | 33 |
| 16.0 TRANSIT..... | 33 |
| 16.1 Route Capacity | 33 |
| 16.2 Transit Priority..... | 34 |
| 17.0 INTERSECTION DESIGN | 34 |

| | | |
|-------------|---|-----------|
| 17.1 | Intersection Control | 34 |
| 17.2 | Intersection Design | 34 |
| 17.2.1 | Intersection Pedestrian Level of Service (PLOS) | 34 |
| 17.2.2 | Intersection Bicycle Level of Service (BLOS) | 34 |
| 17.2.3 | Intersection Transit Level of Service (TLOS) | 35 |
| 17.2.4 | Intersection Truck Level of Service (TkLOS)..... | 35 |
| 18.0 | SUMMARY OF IMPROVEMENTS INDICATED AND MODIFICATION OPTIONS | 35 |

LIST OF TABLES

| | |
|-----------------|--|
| Table 1.1: | Person-Trips for Inverness Homes |
| Table 3.6.1: | Collisions by Location and Year |
| Table 3.6.2: | Highlighted Collision Data |
| Table 3.7.1: | Origin Destination Survey Travel Mode Percentages |
| Table 9.1.1.1: | Person-Trips for Inverness Homes |
| Table 9.1.2.1: | Trips by Primary Travel Mode – AM |
| Table 9.1.2.2: | Trips by Primary Travel Mode – PM |
| Table 9.1.2.3: | Future Mode Share Targets for the Development |
| Table 9.1.2.4: | Projected Trips by Primary Travel Mode - AM |
| Table 9.1.2.5: | Projected Trips by Primary Travel Mode - AM |
| Table 11.1.1: | Level of Service vs. Volume to Capacity Ratio |
| Table 11.2.1: | Intersection Operation, Existing Conditions (2019) |
| Table 11.2.2: | Intersection Operation, Background Growth (2023) |
| Table 11.2.3: | Intersection Operation, Background Growth (2028) |
| Table 11.2.4: | Intersection Operation, Total Traffic (2023) |
| Table 11.2.4: | Intersection Operation, Total Traffic (2028) |
| Table 13.1.5.1: | Vehicular Level of Service (LOS) by Approach |

LIST OF FIGURES

- Figure 2.1: 147 Langstaff Drive surrounding Area (Courtesy of Google Earth)
- Figure 3.2.1: Study area intersections (Courtesy of Google Earth)
- Figure 3.3.1: Pedestrian and Cycling Facilities in the study area (Background c/o Google Earth)
- Figure 3.4.1: Bus stops near the Site Development
- Figure 3.5.1: Existing Driveways within the vicinity of the proposed Site (Courtesy of Google Earth)
- Figure 3.6.1: Illustration of the three corridors analyzed (Background courtesy of Google Earth)
- Figure 3.7.1: Existing (2019) Traffic Volumes
- Figure 9.2.1: Trip Distribution Network for trips going IN to the development
- Figure 9.2.2: Trip Distribution Network for trips going OUT of the development
- Figure 9.3.1: Development-Generated Vehicle Demand
- Figure 12.1.1: Site plan layout separation

LIST OF APPENDICES

- Appendix A: TIA Screening Form
- Appendix B: Site Plan
- Appendix C: City of Ottawa Traffic Data
- Appendix D: Traffic Volume Figures
- Appendix E: Synchro Reports
- Appendix F: Bus Route
- Appendix G: TDM Checklist

1.0 SCREENING FORM

The following section describes the initial assessment of the proposed development with respect to the Traffic Impact Assessment (TIA) Screening Form and will provide reasoning for potential triggers. The TIA screening form has been attached in [Appendix A](#).

1.1 Trip Generation Triggers

Trip generation was calculated based on data from the Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition. The development is expected to have an overall area of approximately 81,000 m² containing 108 apartment units and 84 townhome units. As shown below in [Table 1.1](#), it is estimated that the site will generate a total of 112 person-trips during the AM peak hour and 125 person-trips during the PM peak hour. For the Mid-rise apartments, a 26% IN and 74% OUT distribution of the person-trips was used for the AM peak and a 61% IN and 39% OUT for the PM peak hour. For the attached town homes, a 23% IN and 77% OUT distribution of the person-trips was used for the AM peak and a 63% IN and 37% OUT for the PM peak hour. Based on Module 1.2, from the Transportation Impact Assessment Guidelines (2017), since the development is expected to generate more than 60 person-trips during its peak hour; the criteria for the trip generation trigger is satisfied.

Table 1.1: Person-Trips for Inverness Homes

| ITE Land Use | Unit of Measure | Quantity | Rate | | AM Peak Hour | | | PM Peak Hour | | |
|---|-----------------|----------|------|------|--------------|-----|-------|--------------|-----|-------|
| | | | AM | PM | In | Out | Total | In | Out | Total |
| Mid-rise apartments (Code 223) | Dwelling Units | 114 | 0.35 | 0.41 | 14 | 38 | 52 | 37 | 23 | 60 |
| Semi-detached dwellings, townhouses, rowhouses (Code 224) | Dwelling Units | 75 | 0.62 | 0.67 | 14 | 46 | 60 | 41 | 24 | 65 |
| Development Totals: | | | | | 112 | | | 125 | | |
| * Rates shown are recommended trip generation rates for residential land uses as per "TRANS Trip Generation Residential Rates report" prepared by McCormick Rankin Corp. (August, 2009) | | | | | | | | | | |
| * Directional splits are published within ITE Trip Generation 10th Edition | | | | | | | | | | |
| *A factor of 1.28 has been applied to convert into person-trips (City of Ottawa factor) | | | | | | | | | | |

1.2 Location Triggers

The development is in a Designated Village Design Priority Area (DPA) as seen in Section 2.5.1, Schedule A, and Annex 6 of the City of Ottawa Official Plan. The proposed new driveways will not be located on a boundary street that is designed as part of the Transit Priority, Rapid Transit, or Spline Bicycle Network as reported in the City of Ottawa Transportation Master Plan (2013). Because of the development in a Designated Village DPA, the criteria for the location trigger is met.

1.3 Safety Triggers

Langstaff Road has a posted speed limit of 40 km/h within the vicinity of the development and does not have horizontal or vertical curvature at the proposed site access points. None of the safety triggers were satisfied.

2.0 DESCRIPTION OF PROPOSED DEVELOPMENT

The proposed development is located at 147 Langstaff Road, between the intersection of Donald B. Munro Drive and Juanita Avenue. The site development area is designated as a “Village” area as per the City of Ottawa Official Plan. The site has three (3) proposed access points with the southern most access point located approximately 175 m from the intersection of Donald B. Munro Drive and Langstaff Drive. The remaining two access points are located approximately 50 m and 270 m from the southern most access point, respectively. Refer to [Figure 2.1](#) below for a map of the existing site.



Figure 2.1: 147 Langstaff Drive surrounding Area (Courtesy of Google Earth)

The site will consist of 108 apartments and 84 townhomes as well as a parkland and a clubhouse which will be available to only the residents of the complex. The residential development is expected to have a lot area of approximately of 81,000 m² (8.1 ha). There is no current structure on the development site. Site Plans have been attached in [Appendix B](#) for reference.

The proposed development is in an area designated as a Village in Schedule A of the City of Ottawa Official Plan. In accordance with Section 3.7.1 of the Official Plan, permitted developments include residential, retail, and commercial service facilities, restaurants, offices and personal service establishments light industrial uses, institutional services, places of worship, and public open space.

3.0 EXISTING CONDITIONS

The following outlines the existing site characteristics and a summary of the expected development transportation conditions.

3.1 Roadways

- As obtained from the City of Ottawa Official Plan, Annex 1 – Road Classification and Rights-of-Way; Langstaff Drive is designated as a collector village roadway with a protected right-of-way of 26 m. Cavanagh Drive and Frances Colbert Avenue are designated as local streets with a protected right-of-way of 20 m. Donald B. Munro Drive is designated as a collector village roadway with a protected right-of-way of 16 m and 23 m west and east of Langstaff Drive respectively. Carp Road is a designated as an arterial village road with a protected right-of-way of 23 m.
- Langstaff Drive is a two-lane undivided village collector roadway that runs north-south from Donald B. Munro Drive in the south to Juanita Avenue in the north. The roadway has a posted speed limit of 40 km/h due to a public school located on the road. Vertical centreline treatments are installed as a traffic calming measure in order to reduce speeds on the road in the vicinity of the school. A pedestrian sidewalk is provided on the east side only.
- Donald B. Munro Drive is a two-lane undivided village collector roadway that runs east-west from Thomas Argue Road in the west to March Road in the east. The posted speed limit within the vicinity of the project is 40 km/hr and has several private entrances along the roadway. Pedestrian sidewalks are provided on both sides to the west of Langstaff Drive and only on the south side east of Langstaff Drive.
- Carp Road is a two-lane undivided village arterial roadway that runs north-south from Craig Side Road in the north to Stittsville Main Street in the south. Within the vicinity of the project, the roadway has a posted speed limit of 50 km/h with several residential and commercial private entrances. Pedestrian sidewalks are provided on both the east and west side of the road. On-street parking is available north of Donald B. Munro Drive.
- Cavanagh Drive and Frances Colbert Avenue are two-lane local streets with a posted speed limit of 40 km/h. The roads serve residential communities. The roads do not provide pedestrian sidewalks.

3.2 Study Area Intersections

For the purpose of the scoping report it is expected that the study area will include the Carp Road and Donald B. Munro Drive intersection, Carp Road and Juanita Avenue, Donald B. Munro Drive and Langstaff Drive intersection, Langstaff Drive and Cavanagh Drive intersection, and Langstaff Drive and Frances Colbert Avenue intersection. Below is a description of the five above noted intersections while **Figure 3.2.1** provide a visual reference.

1. The intersection of Carp Road and Donald B. Munro Drive is a four-leg All-Way Stop Controlled (AWSC) intersection. The following is a description of the lane configuration:
 - The north approach has one shared left-through-right turn lane;
 - The south approach has one shared left-through-right turn lane;
 - The east approach has one shared left-through-right turn lane;
 - The west approach has one shared left-through-right turn lane.
2. The intersection of Donald B. Munro Drive and Langstaff Drive is a four-leg All-Way Stop Controlled (AWSC) intersection with a slight offset in the intersection alignment. This is due to Langstaff Drive and Deugo Street being mis-aligned in the east west direction. The following is a description of the lane configuration:
 - The north approach has one shared left-through-right turn lane;
 - The south approach has one shared left-through-right turn lane;
 - The east approach has one shared left-through-right turn lane;
 - The west approach has one shared left-through-right turn lane.
3. The intersection of Langstaff Drive and Cavanagh Drive is a T-intersection with only Cavanagh Drive stop controlled. The following is a description of the lane configuration:
 - The north approach has one shared left-through turn lane;
 - The south approach has one shared through-right turn lane;
 - The east approach has one shared left-right turn lane.
4. The intersection of Langstaff Drive and Frances Colbert Avenue is a T-intersection with only Frances Colbert Avenue stop controlled. The following is a description of the lane configuration:
 - The north approach has one shared left-through turn lane;
 - The south approach has one shared through-right turn lane;
 - The east approach has one shared left-right turn lane.
5. The intersection of Carp Road and Juanita Avenue is a T-intersection with only Juanita Avenue stop controlled. The following is a description of the lane configuration:
 - The north approach has one shared left-through turn lane;

- The south approach has one shared through-right turn lane;
- The east approach has one shared left-right turn lane.

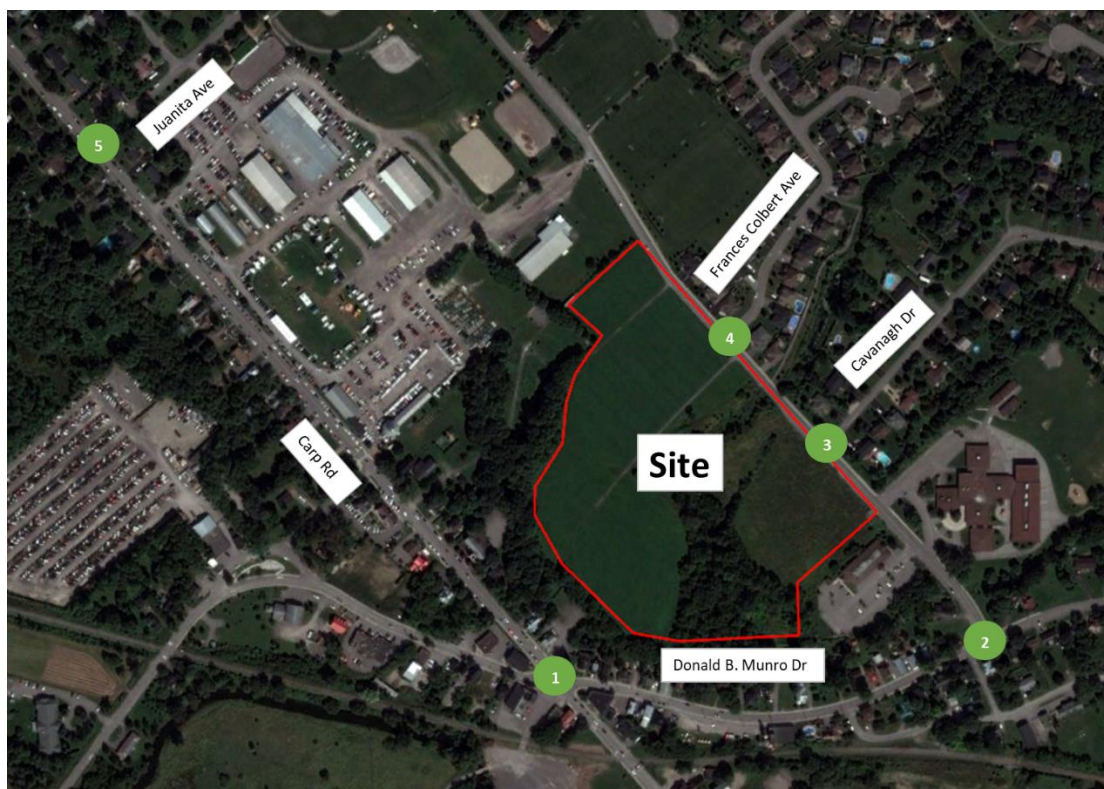


Figure 3.2.1: Study area intersections (Courtesy of Google Earth)

3.3 Existing Pedestrian and Cycling Facilities

Currently, there are a number of pedestrian and cycling related facilities in the study area, they are illustrated in [Figure 3.3.1](#). As illustrated, there are scenic entry routes for cyclists within the vicinity of the proposed site in which the vehicles are expected to share the road. Pedestrian Sidewalks are provided on both sides of the roadway along Donald B. Munro Drive and Carp Road and only on the east side along Langstaff Drive as shown in [Figure 3.3.1](#).

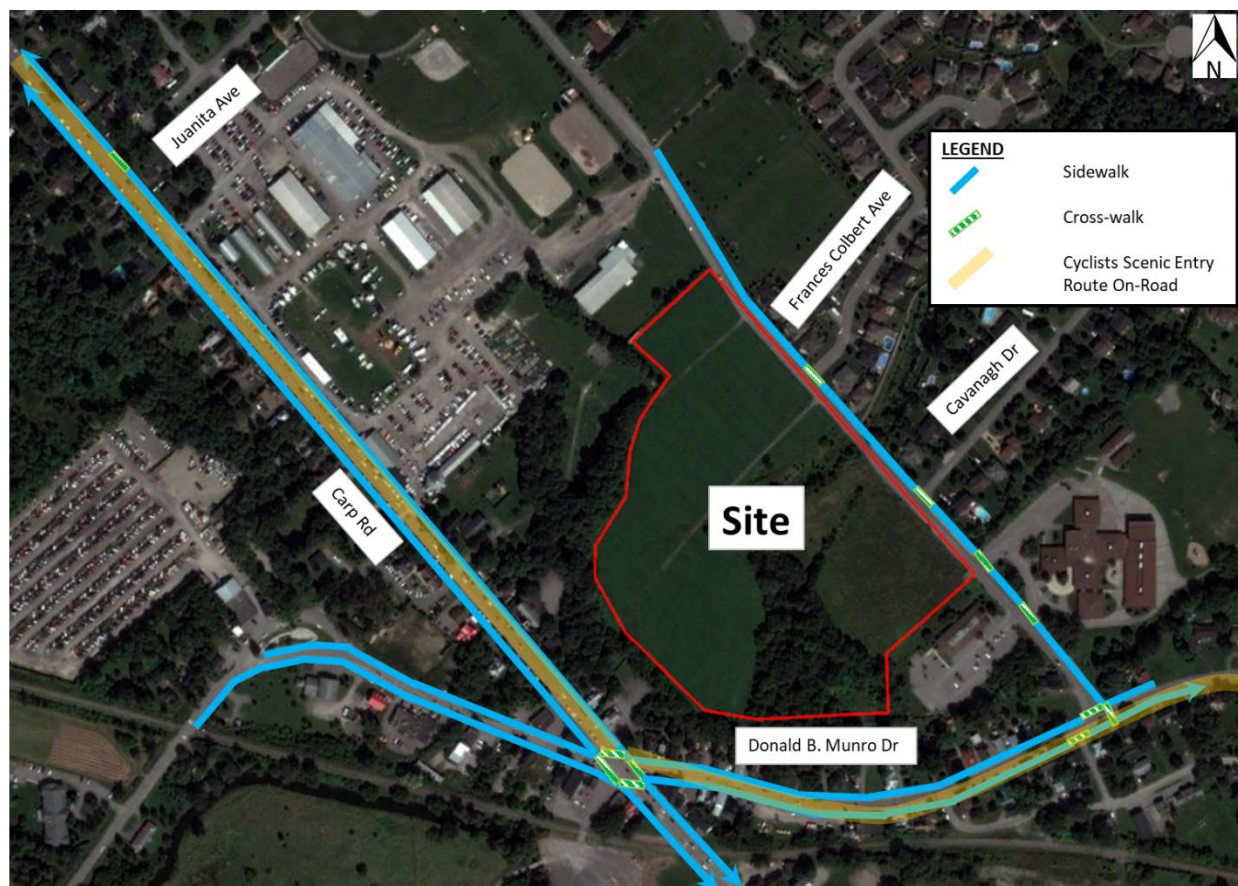


Figure 3.3.1: Pedestrian and Cycling Facilities in the study area (Background c/o Google Earth)

3.4 Existing Transit System

Currently, there is one bus route 303 with limited service (operates on Wednesday only) that operates near the surrounding area of the development site. Figure 3.4.1 identifies the bus stops within the vicinity of the site. The main means of travel would be via private automobile, Ride-share service, or Taxi to get to the destination. The full bus route can be found in Appendix F.

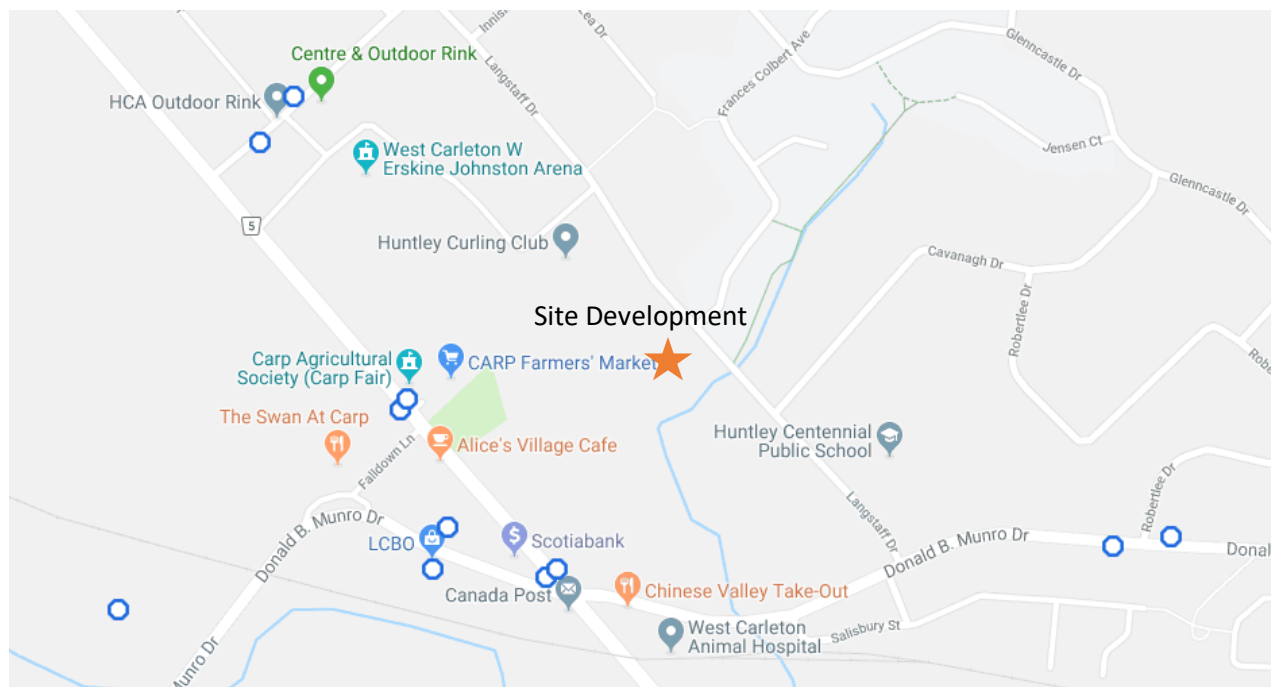


Figure 3.4.1: Bus stops near the Site Development

3.5 Existing Driveways

The following are existing driveways within 200 m to the proposed development site. Figure 3.5.1 provides a visual reference.

- There are some private driveways of residential households across the site on Langstaff Drive.
- North of the northern most limit of the proposed site, at ± 90 m is an entrance that provides access to several facilities including Huntley Curling Club, Carp Agricultural Society, and a Sports Arena.
- Adjacent to the south of the southern most limit of the proposed site, at ± 45 m is an entrance to a Medical Dental Centre.
- Across the south limit of the proposed site is an access point to a public school.

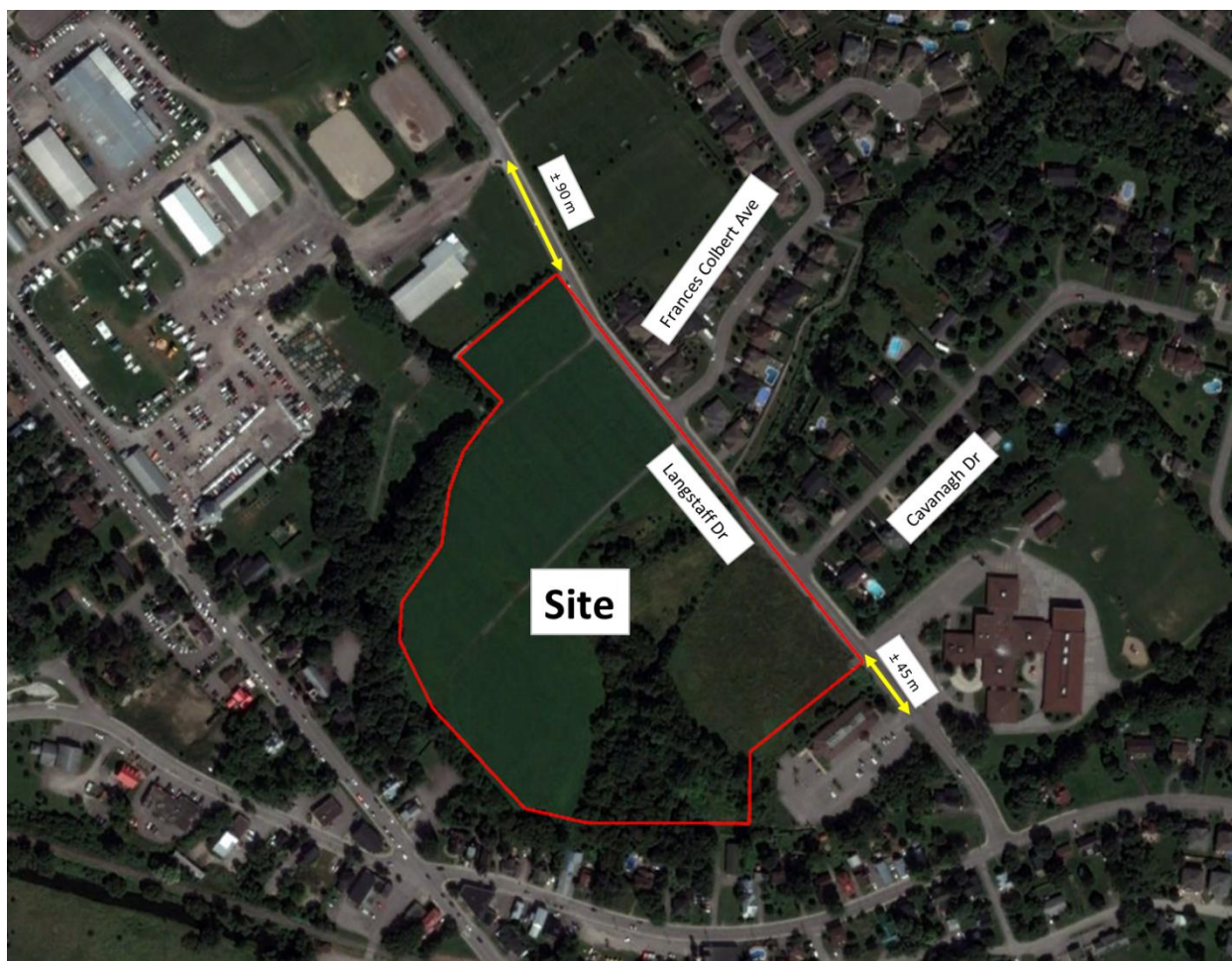


Figure 3.5.1: Existing Driveways within the vicinity of the proposed Site (Courtesy of Google Earth)

3.6 Collision History

The 2014, 2015, 2016, 2017 and 2018 collision data was reviewed with regards to collision severity, road surface, light condition, collision classification, and impact type. The summarized findings of the collision data can be found in [Table 3.6.1](#) and [Table 3.6.2](#). The collision analysis was broken down into three segments; Carp Road corridor, Langstaff Drive corridor, and Donald B. Munro Drive corridor. This provides a better collision history analysis within the vicinity of the proposed site. An illustration of the three corridors is presented in [Figure 3.6.1](#).

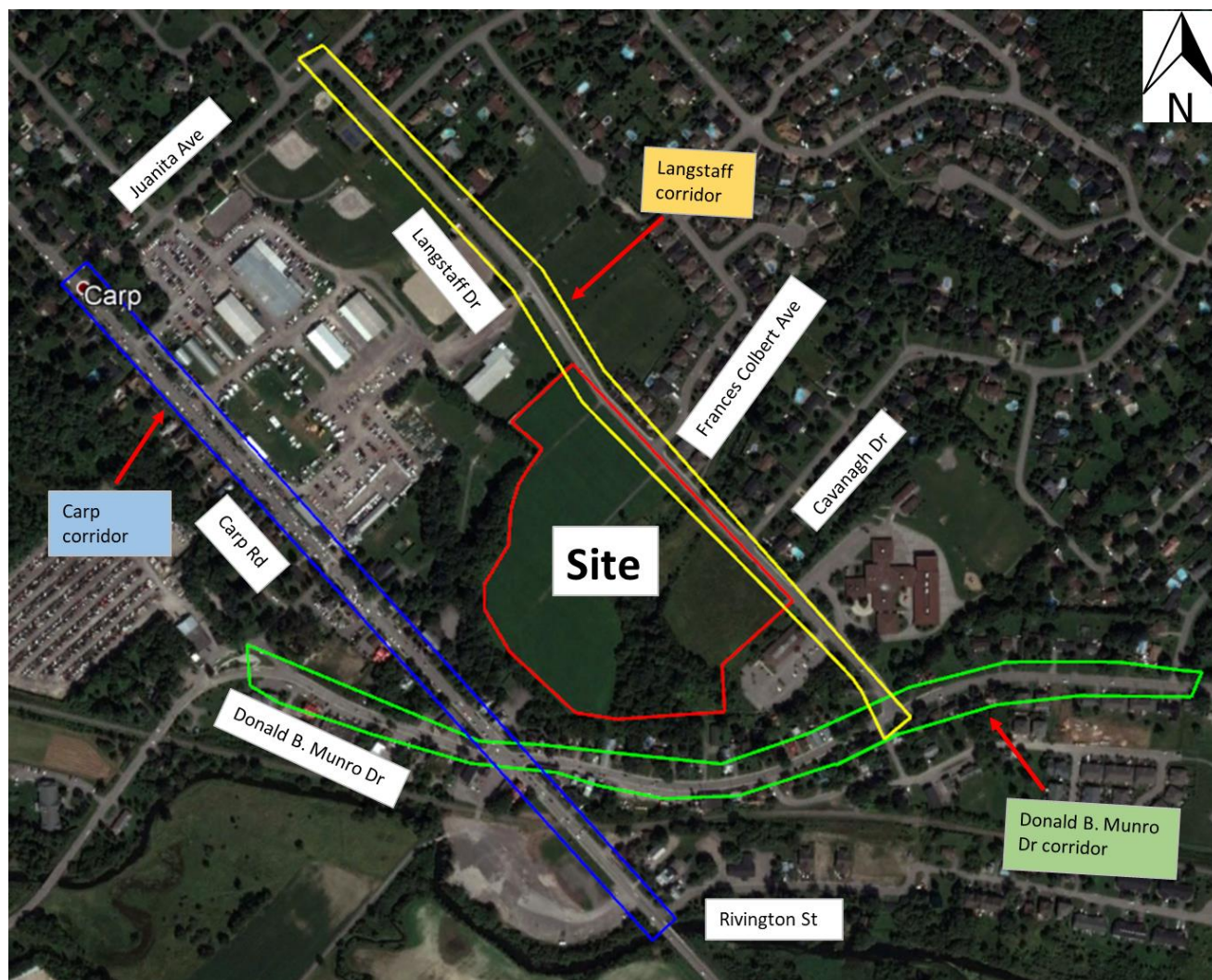


Figure 3.6.1: Illustration of the three corridors analyzed (Background courtesy of Google Earth)

Findings of the collision data analysis are as follows:

- There were a total of 22 collisions within the vicinity of the proposed site. The highest number of collisions occurred at the intersection of Carp Road and Donald B. Munro Drive with 8 collisions followed by the midblock segment between Rivington St and Juanita Avenue along Carp Road with 7 collisions. The Langstaff corridor did not have any collisions over the course of 5 years from 2014 to 2018.
- The most common type of collision in terms of classification was property damage only (PD) with the segments analyzed yielding 62% or higher.
- Out of the total 22 collisions, 17 occurred in daylight conditions.
- The most frequent impact type was 'angle' within the vicinity of the proposed site with 9 collisions followed by Single Motor Vehicle (SMV) with 6 collisions.

Table 3.6.1: Collisions by Location and Year

| Year | Number Of Collisions | | | | | | |
|-------|------------------------------|------------------------|-----------------------|---|------------------------------------|---|--|
| | Carp Rd @ Donald B. Munro Dr | Carp Rd @ Rivington St | Carp Rd @ Juanita Ave | Carp Rd between Rivington St to Juanita Ave | Donald B. Munro Dr @ Robert Lee Dr | Donald B. Munro Dr between Falldown Ln to Robert Lee Dr | Langstaff Dr between Donald B. Munro Dr to Juanita Ave |
| 2014 | 3 | 0 | 0 | 2 | 0 | 0 | 0 |
| 2015 | 2 | 2 | 0 | 3 | 1 | 0 | 0 |
| 2016 | 2 | 0 | 0 | 1 | 0 | 0 | 0 |
| 2017 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 2018 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Total | 8 | 3 | 1 | 7 | 1 | 2 | 0 |

Table 3.6.2: Highlighted Collision Data

| | | Carp Rd @ Donald B. Munro Dr | Carp Rd @ Rivington St | Carp Rd @ Juanita Ave | Carp Rd between Rivington St to Juanita Ave | Donald B. Munro Dr @ Robert Lee Dr | Donald B. Munro Dr between Falldown Ln to Robert Lee Dr |
|---------------------------|--------------------|------------------------------|------------------------|-----------------------|---|------------------------------------|---|
| Number of Collisions | | 8 | 3 | 1 | 7 | 1 | 2 |
| Collisions Classification | P.D. Only | 62% | 67% | 100% | 86% | 100% | 100% |
| | Injury | 38% | 33% | 0% | 14% | 0% | 0% |
| Road Surface | Dry | 88% | 33% | 100% | 86% | 0% | 50% |
| | Wet | 0% | 0% | 0% | 0% | 100% | 0% |
| | *Winter Conditions | 12% | 67% | 0% | 14% | 0% | 50% |
| Light Conditions | Daylight | 88% | 67% | 0% | 86% | 100% | 50% |
| | Dark | 12% | 33% | 100% | 0% | 0% | 50% |
| | Dawn | 0% | 0% | 0% | 0% | 0% | 0% |
| | Dusk | 0% | 0% | 0% | 14% | 0% | 0% |
| Impact Type | Rear End | 25% | 0% | 0% | 14% | 0% | 0% |
| | Angle | 50% | 67% | 100% | 14% | 100% | 0% |
| | Turning Movement | 25% | 0% | 0% | 29% | 0% | 0% |
| | Sideswipe | 0% | 0% | 0% | 0% | 0% | 0% |
| | SMV Other | 0% | 33% | 0% | 43% | 0% | 100% |

*Winter Conditions includes Ice and loose snow,

3.7 Traffic Volume

The traffic data provided by the City of Ottawa included Turning Movement Counts (TMC) at the intersections of Carp Road and Donald B. Munro Drive and Carp Road and Juanita Avenue which were conducted in April 2019. The remaining three intersections TMCs were recorded by MP surveyors in August 2019. **Figure 3.7.1** below, illustrates the 2019 AM and PM peak hour vehicle volumes. The AM and PM peak hour for the intersection of Langstaff Drive and Frances Colbert Avenue and Langstaff Drive and Cavanagh Drive was from 7:45 – 8:45 AM and 4:30 – 5:30 PM respectively. At the intersection of Langstaff Drive and Donald B. Munro Drive the AM and PM peak was from 8:00 – 9:00 AM and 4:00 – 5:00 PM respectively. At the intersection of Donald B. Munro Drive and Carp Road the AM peak was from 7:30 – 8:30 AM and the PM peak was from 4:30 – 5:30 PM respectively.

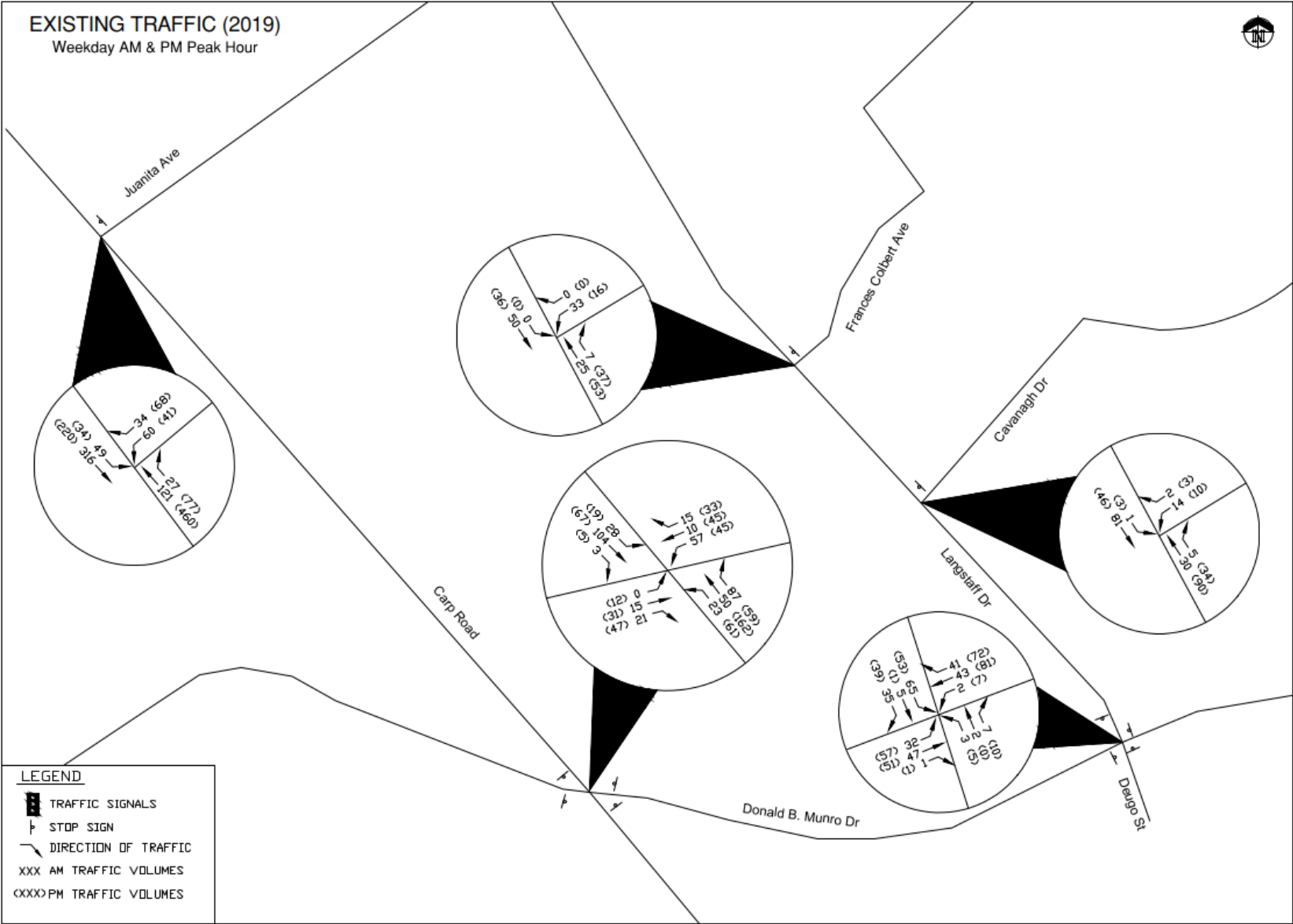


Figure 3.7.1: Existing (2019) Traffic Volumes

Table 3.7.1 below, shows the expected travel mode percentages based on the most recent Capital Region Origin-Destination survey which was conducted in the fall of 2011 for the Rural West Trans District and can be found in Appendix C.

Table 3.7.1: Origin Destination Survey Travel Mode Percentages

| % of Person Trips | | |
|-------------------|-----------------------|-------------------------|
| Travel Mode | AM Peak (6:30 - 8:59) | PM Peak (15:30 - 17:59) |
| Auto Driver | 60% | 71% |
| Auto Passenger | 10% | 17% |
| Transit | 5% | 3% |
| Bicycle | 0% | 0% |
| Walk | 1% | 1% |
| Other | 24% | 8% |

4.0 PLANNED CONDITIONS

Currently there is a registered agreement for a Site Plan Control application located at 150 and 170 Salisbury street south of the proposed site development. The developer would like to accommodate development of 15 townhouse units, with one run of seven (7) units & two separate runs of four (4) units each. The units will be three storeys tall. Units will have range of gross floor areas between 150 m² and 168 m². The units will be served by 30 parking spaces contained within garages and on driveways.

5.0 STUDY AREA

The study area for the purposes of this report, is expected to be the intersections of Carp Road and Donald B. Munro Drive, Carp Road and Juanita Avenue, Donald B. Munro Drive and Langstaff Drive, Langstaff Drive and Cavanagh Drive, and Langstaff Drive and Frances Colbert Avenue.

6.0 TIME PERIODS

For the purposes of the operational analysis, both morning and afternoon peak hours will be considered for background travel demand and development-generated trips. Travel demand will be limited to Langstaff Drive as it is the only adjacent roadway. Time periods for the analysis will be determined as part of the pre consultation process.

7.0 HORIZON YEARS

At the time of writing, the occupancy and full build-out are anticipated to occur in 2023. As such, the horizon years analyzed will include 2023 (build-out year) and 2028 (build-out year + 5 years).

8.0 EXEMPTIONS REVIEW

Table 4 of Section 2.3 in the Transportation Impact Assessment Guidelines (2017) lists several possible exemptions that would reduce the scope of the TIA study.

- Section 4.1.2 concerning circulation and access is not expected to be included in the TIS study as the development site is a subdivision.
- Section 4.2 concerning parking is not expected to be included in the TIS as it is not required for a subdivision plan.
- Section 4.6 is exempt even though Langstaff Drive is classified as a collector street, the total volume on the road does not exceed the capacity threshold of 300 vph for collector roads as specified per guidelines.
- Section 4.8 concerning network concept is not expected to be included in the TIS study. Based on ITE Trip Generation Manual, it is expected the site will generate 102 and 125 person-trips during the AM and PM peak hour, respectively. As such the proposed development will not generate 200 person-trips in excess of the equivalent volume permitted by established by zoning.

9.0 DEVELOPMENT GENERATED TRAFFIC

9.1 Trip Generation

9.1.1 Trip Generation Rates

Trip generation was calculated in accordance with the “TRANS Trip Generation Residential Trip Rates” completed by McCormick Rankin Corporation for the City of Ottawa (August 2009) and institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition. The City of Ottawa TIS Guidelines (2017) recommends that when using ITE Trip Generation Manual, assume 10% non-auto mode share and an average vehicle occupancy of 1.15. As such, a factor of 1.28 was applied to the site generated trips in order to estimate the total site generated person-trips. As stated previously in [Section 1.1](#), the estimated site generated person-trips will be a total of 116 person-trips during the AM peak hour conditions and 130 person-trips during the PM peak hour conditions.

Table 9.1.1.1: Person-Trips for Inverness Homes

| ITE Land Use | Unit of Measure | Quantity | Rate | | AM Peak Hour | | | PM Peak Hour | | |
|---|-----------------|----------|------|------|--------------|-----|-------|--------------|-----|-------|
| | | | AM | PM | In | Out | Total | In | Out | Total |
| Mid-rise apartments (Code 223) | Dwelling Units | 114 | 0.35 | 0.41 | 14 | 38 | 52 | 37 | 23 | 60 |
| Semi-detached dwellings, townhouses, rowhouses (Code 224) | Dwelling Units | 75 | 0.62 | 0.67 | 14 | 46 | 60 | 41 | 24 | 65 |
| Development Totals: | | | | | 112 | | | 125 | | |
| * Rates shown are recommended trip generation rates for residential land uses as per "TRANS Trip Generation Residential Rates report" prepared by McCormick Rankin Corp. (August, 2009) | | | | | | | | | | |
| * Directional splits are published within ITE Trip Generation 10th Edition | | | | | | | | | | |
| *A factor of 1.28 has been applied to convert into person-trips (City of Ottawa factor) | | | | | | | | | | |

9.1.2 Mode Shares

The most recent National Capital Region (NCR) Origin-Destination Survey was conducted in Fall of 2011 and can be found in [Appendix C. Table 9.1.2.1](#) and [Table 9.1.2.2](#) below, displays the trips by primary travel mode from/within the NCR during the AM and to/within the NCR during the PM peak hour.

Table 9.1.2.1: Trips by Primary Travel Mode – AM

| Travel Mode | AM Peak (06:30 - 08:59) | | | |
|----------------|-------------------------|--------------|-----|-------|
| | % of Person Trips | Person Trips | | |
| | | In | Out | Total |
| Auto Driver | 57% | 16 | 48 | 64 |
| Auto Passenger | 10% | 3 | 9 | 12 |
| Transit | 6% | 2 | 5 | 7 |
| Bicycle | 0% | 0 | 0 | 0 |
| Walk | 1% | 0 | 1 | 1 |
| Other | 25% | 7 | 21 | 28 |

Table 9.1.2.2: Trips by Primary Travel Mode – PM

| Travel Mode | PM Peak (15:30 - 17:59) | | | |
|----------------|-------------------------|--------------|-----|-------|
| | % of Person Trips | Person Trips | | |
| | | In | Out | Total |
| Auto Driver | 68% | 53 | 32 | 84 |
| Auto Passenger | 17% | 13 | 8 | 21 |
| Transit | 4% | 3 | 2 | 5 |
| Bicycle | 0% | 0 | 0 | 0 |
| Walk | 2% | 1 | 1 | 2 |
| Other | 10% | 8 | 5 | 12 |

As stated previously in this report, the expected build out year is 2023. There is no regular City transit network within the vicinity of the development. Since the development is a townhouse/mid-rise multi family housing, it is expected that attendees would mainly use a car to reach the development. As such the future mode shares are expected to be as follows:

Table 9.1.2.3: Future Mode Share Targets for the Development

| Travel Mode | Mode Share Target | | Rationale |
|----------------|-------------------|-----|---|
| | AM | PM | |
| Auto Driver | 60% | 70% | Auto Driver person trips are expected to slightly increase due to the nature of the development |
| Auto Passenger | 11% | 18% | % of auto passenger person trips is expected to slightly increase due to more guests and/or family trips |
| Transit | 2% | 2% | % of Transit person trips is expected to decrease due to limited transit service |
| Bicycle | 1% | 2% | % of bicycle person trips is expected to increase slightly due to the nature and location of the development |
| Walk | 5% | 6% | % of walking person trips is expected to increase slightly due to the nature and location of the development as well as school within the vicinity of the development |
| Other | 21% | 2% | % of other person trips is expected to change due to more auto trips as a result of the development |

Based on the future mode share targets, [Table 9.1.2.4](#) and [Table 9.1.2.5](#) have been updated with the projected development-generated trips for the year 2028 (5-years after the build out year of 2023).

Table 9.1.2.4: Projected Trips by Primary Travel Mode - AM

| Travel Mode | AM Peak (06:30 - 08:59) | | | |
|----------------|-------------------------|--------------|-----|-------|
| | % of Person Trips | Person Trips | | |
| | | In | Out | Total |
| Auto Driver | 60% | 17 | 50 | 67 |
| Auto Passenger | 11% | 3 | 9 | 12 |
| Transit | 2% | 1 | 2 | 3 |
| Bicycle | 1% | 0 | 1 | 1 |
| Walk | 5% | 1 | 4 | 5 |
| Other | 21% | 6 | 18 | 24 |

Table 9.1.2.5: Projected Trips by Primary Travel Mode - AM

| Travel Mode | PM Peak (15:30 - 17:59) | | | |
|----------------|-------------------------|--------------|-----|-------|
| | % of Person Trips | Person Trips | | |
| | | In | Out | Total |
| Auto Driver | 70% | 55 | 33 | 88 |
| Auto Passenger | 18% | 14 | 8 | 22 |
| Transit | 2% | 2 | 1 | 3 |
| Bicycle | 2% | 2 | 1 | 3 |
| Walk | 6% | 5 | 3 | 8 |
| Other | 2% | 2 | 1 | 3 |

No trip reduction factors have been assigned to the proposed development. Currently the site is not in use and due to the nature of the development, it is not expected to generate any pass-by vehicle trips.

9.2 Trip Distribution

A number of assumptions were made to better represent the distribution of trips to and from the development. The assumptions were based on the turning movement counts received from the City of Ottawa, and site visits performed by MP during both the AM and PM peak hour. All traffic data provided by the City of Ottawa can be found [Appendix C](#).

It was observed that during the peak hours, no substantial queuing developed along any of the approaches of the study intersections. Due to the complexity of the number of entrances for the site development which spans across two other local intersections (Frances Colbert Avenue and Cavanagh Drive). The distribution has been split into two diagrams, one for the vehicles going IN to the development and the other going OUT of the development as shown in [Figure 9.2.1](#) and [Figure 9.2.2](#) respectively.

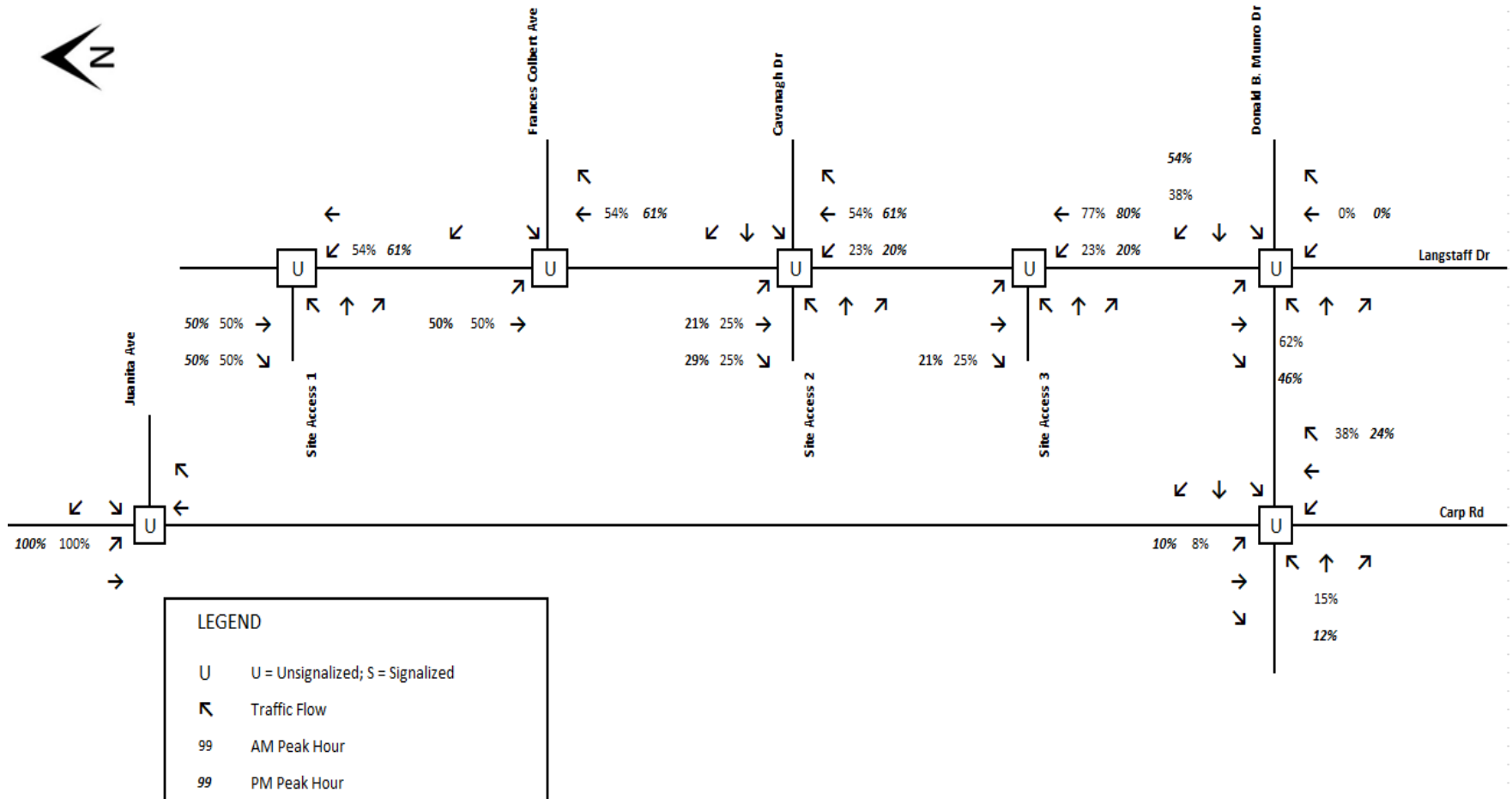


Figure 9.2.1: Trip Distribution Network for trips going IN to the development

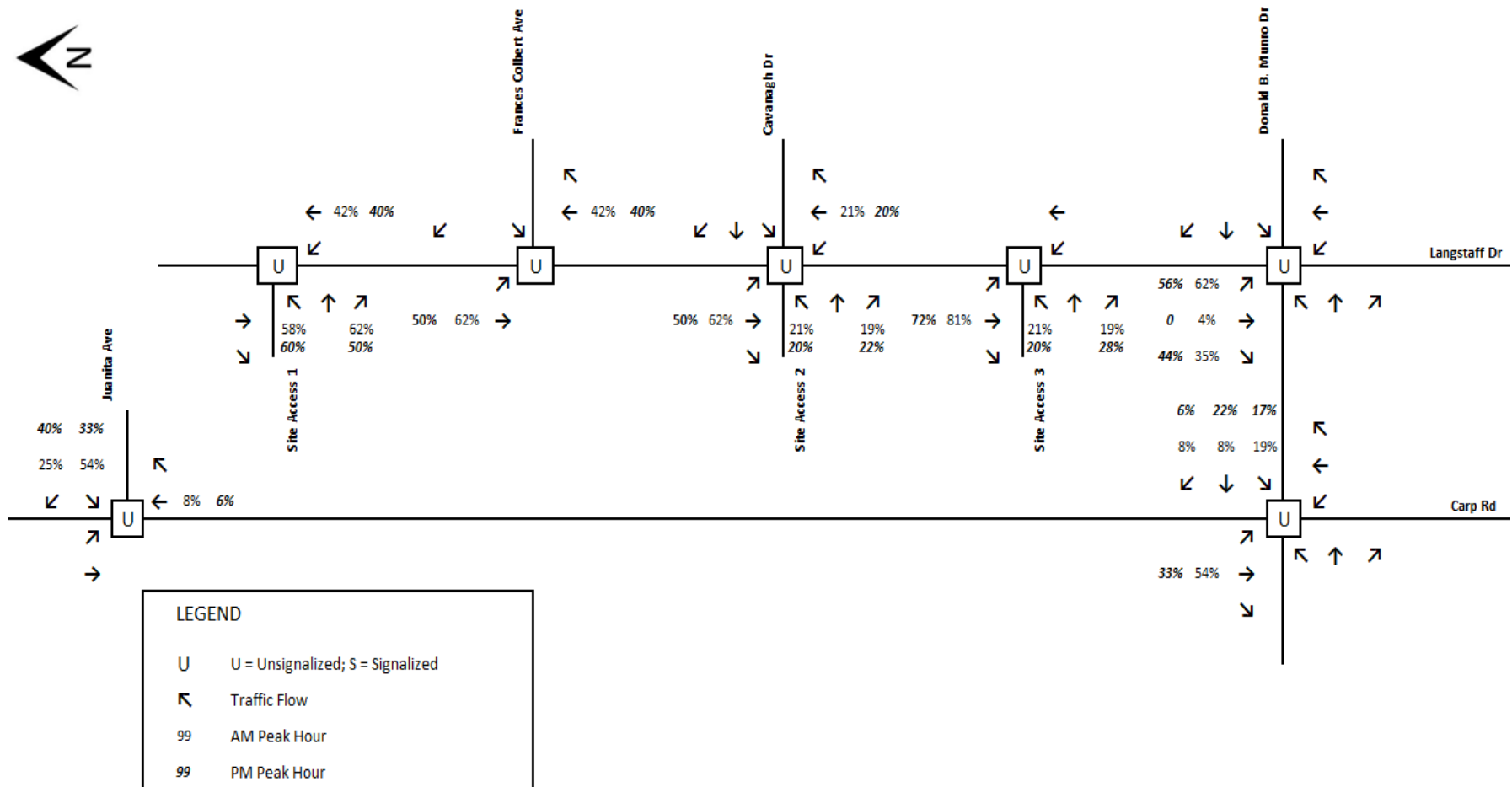


Figure 9.2.2: Trip Distribution Network for trips going OUT of the development

9.3 Trip Assignment

The trips generated by the proposed development were assigned to the transportation network to reflect the traffic patterns shown in the turning movement counts. **Figure 9.3.1** below shows development-generated vehicle demands applied to the surrounding transportation network. It should be noted that it was assumed that 80 % of the development generated trips travelling northbound on Langstaff Drive will end up going towards the intersection of Carp Road and Juanita Avenue. All trip assignment figures can be found in **Appendix D**.

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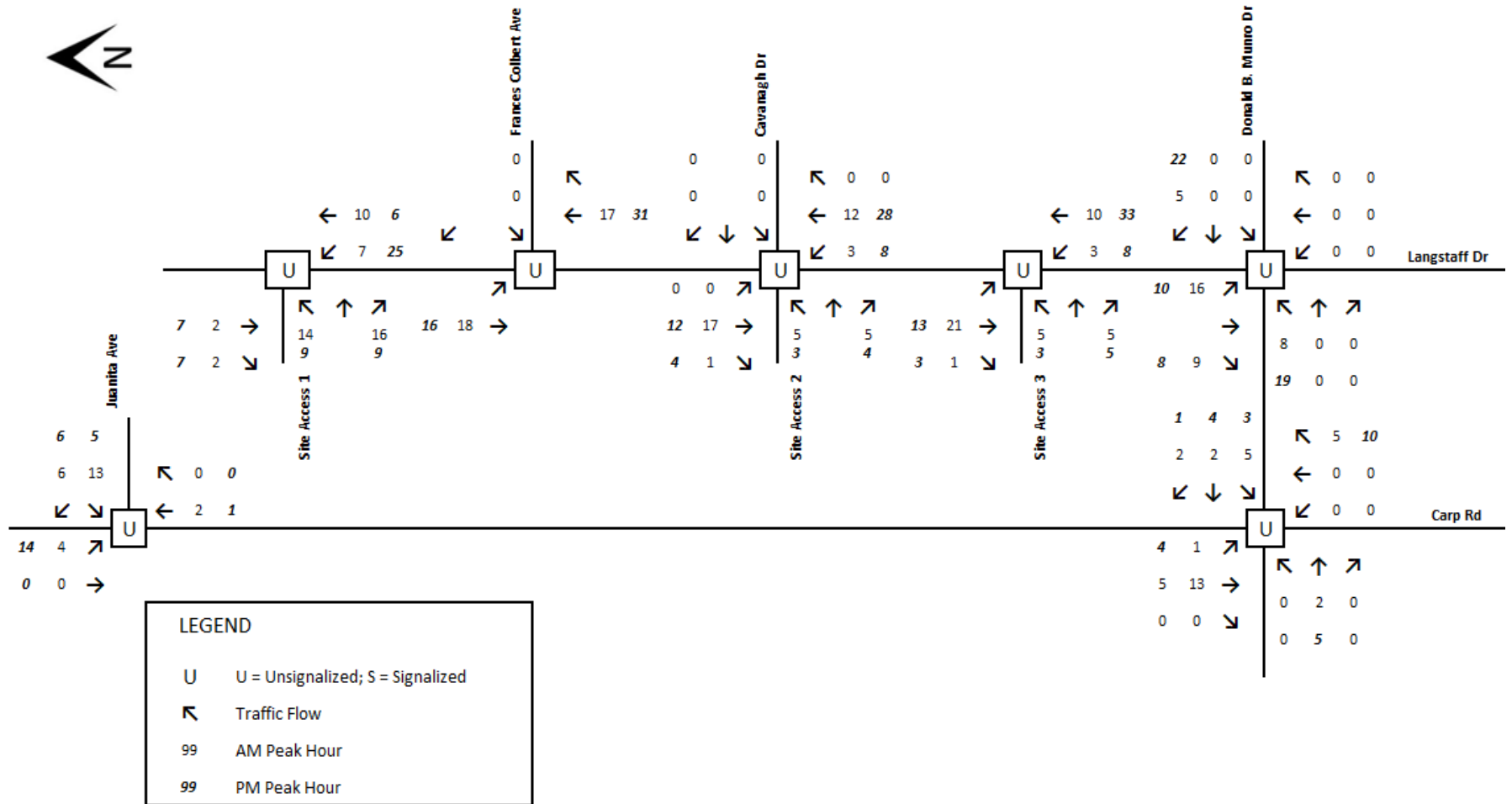


Figure 9.3.1: Development-Generated Vehicle Demand

10.0 BACKGROUND NETWORK TRAFFIC

MP received turning movement counts from the City of Ottawa taken at the intersections of Carp Road and Donald B. Munro Drive and Carp Road and Juanita Avenue on Tuesday, April 2nd, 2019. Additionally, MP performed TMC counts at the intersections of Langstaff Drive and Frances Colbert Avenue, Langstaff Drive and Cavanagh Drive, and Langstaff Drive and Donald B. Munro Drive during both the AM and PM peak hours on Thursday, August 15th, 2019. The traffic volumes for the AM and PM peak were applied to the network and balanced accordingly.

10.1 Changes to the Background Transportation Network

As stated previously in this report, the only significant change expected to the transportation network including the road and transit route component is the slight increase in trips of automobiles and auto passengers. It is expected that the network will experience a slight increase in vehicles due to the development attracting guests visiting people living in the area as well as the flat increase in vehicles of people living in the development. This is expected to occur during the build out year of 2023. It was estimated previously, that an increase in approximately 3% in automobile drivers and auto passengers was appropriate. Additionally, the bicycle travel mode will slightly increase due to the nature of the development and the transit travel mode is expected to slightly decrease due to limited service and no future improvements within the vicinity of the development.

10.2 General Background Growth Rates

To project the traffic volume to the future years, a 1.0 % annual background growth rate was applied. The growth rate was calculated based on the Trans OD-survey for the Rural West region. The population change was compared for 2005 and 2011 Trans OD-survey and the growth rate was found to be 1.0%. This growth rate is appropriate for the development as it is located in the rural subarea of the City of Ottawa.

10.3 Other Area Development

Currently there are two registered agreement for a Site Plan Control application located at 150 and 170 Salisbury street south of the proposed site development as explained in [Section 4.0](#). It is assumed that traffic generated from the two planned developments within the vicinity of the site are considered as part of the 1.0% background growth rate.

11.0 DEMAND RATIONALIZATION

11.1 Intersection Capacity Analysis Methodology

Analysis of traffic operations were performed in accordance with The City of Ottawa's TIA Guidelines (2017) and MMLOS Guidelines. Level of Service (LOS) descriptions for the analysis are provided below in Table 11.1.1. All existing and projected traffic operations were modelled in Synchro 10.

Table 11.1.1: Level of Service vs. Volume to Capacity Ratio

| 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 |

Volume to Capacity (V/C) ratios were analyzed for all signalized intersections overall as well as by individual movements. For unsignalized intersections with a LOS of F, the capacity was based on gap analysis.

All Synchro 10 parameters were taken in accordance with Appendix C: Synchro Analysis Parameters of the City of Ottawa TIA Guidelines (2017).

11.2 Description of Capacity Issue (s)

The background traffic auto demands and the total traffic auto demands can be found in [Appendix D](#). Synchro 10 reports for all analysis periods can be found in [Appendix E](#).

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Table 11.2.1 below, shows the traffic operations analysis summary for the existing 2018 background traffic. All movements are expected to operate at a LOS A. It should be noted that the midblock imbalance based on the TMC provided by the City of Ottawa which were recorded on April 2, 2019 along Carp Rd from Donald B. Munro Dr and Juanita Ave was found to be high. An explanation for this imbalance may be the high development between the two intersections. There are a number of residential houses along Carp Road as well as a multi-storey condo. Additionally, there are some commercial and recreational facilities. While still higher than expected for this area, this provides a possible explanation for the imbalance observed.

Table 11.2.1: Intersection Operation, Existing Conditions (2019)

| Intersection/Approach | AM Peak Hour | | PM Peak Hour | |
|---|--------------|-----------|--------------|-----------|
| | LOS | V/C Ratio | LOS | V/C Ratio |
| Langstaff Dr & Donald B. Munro Dr | A | | A | |
| Northbound | A | 0.02 | A | 0.02 |
| Southbound | A | 0.14 | A | 0.13 |
| Westbound | A | 0.11 | A | 0.2 |
| Eastbound | A | 0.17 | A | 0.15 |
| Langstaff Dr & Frances Colbert Ave | A | | A | |
| Northbound | A | 0.05 | A | 0.06 |
| Southbound | A | 0 | A | 0 |
| Westbound | A | 0.04 | A | 0.03 |
| Langstaff Dr & Cavanagh Dr | A | | A | |
| Northbound | A | 0.06 | A | 0.08 |
| Southbound | A | 0 | A | 0 |
| Westbound | A | 0.02 | A | 0.02 |
| Eastbound | - | - | - | - |
| Carp Rd & Donald B. Munro Dr | A | | A | |
| Northbound | A | 0.2 | A | 0.39 |
| Southbound | A | 0.18 | A | 0.14 |
| Westbound | A | 0.12 | A | 0.18 |
| Eastbound | A | 0.05 | A | 0.13 |
| Carp Rd & Juanita Ave | A | | A | |
| Northbound | A | 0.09 | A | 0.34 |
| Southbound | A | 0.04 | A | 0.04 |
| Westbound | A | 0.19 | A | 0.28 |

Table 11.2.2 below, is a summary of the operating conditions during the build-out year of 2023 with only the background growth applied. All movements are expected to be operating well with a LOS A.

Table 11.2.2: Intersection Operation, Background Growth (2023)

| Intersection/Approach | AM Peak Hour | | PM Peak Hour | |
|---|--------------|-----------|--------------|-----------|
| | LOS | V/C Ratio | LOS | V/C Ratio |
| Langstaff Dr & Donald B. Munro Dr | A | | A | |
| Northbound | A | 0.02 | A | 0.02 |
| Southbound | A | 0.15 | A | 0.14 |
| Westbound | A | 0.12 | A | 0.21 |
| Eastbound | A | 0.19 | A | 0.16 |
| Langstaff Dr & Frances Colbert Ave | A | | A | |
| Northbound | A | 0.06 | A | 0.06 |
| Southbound | A | 0 | A | 0 |
| Westbound | A | 0.05 | A | 0.03 |
| Langstaff Dr & Cavanagh Dr | A | | A | |
| Northbound | A | 0.06 | A | 0.08 |
| Southbound | A | 0 | A | 0 |
| Westbound | A | 0.02 | A | 0.03 |
| Carp Rd & Donald B. Munro Dr | A | | A | |
| Northbound | A | 0.22 | A | 0.42 |
| Southbound | A | 0.2 | A | 0.15 |
| Westbound | A | 0.13 | A | 0.2 |
| Eastbound | A | 0.05 | A | 0.14 |
| Carp Rd & Juanita Ave | A | | A | |
| Northbound | A | 0.1 | A | 0.37 |
| Southbound | A | 0.04 | A | 0.04 |
| Westbound | A | 0.22 | A | 0.32 |

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Table 11.2.3 below, is a summary of the operating conditions during the future horizon year of 2028 with only the background growth applied. All movements are expected to operate at a LOS A.

Table 11.2.3: Intersection Operation, Background Growth (2028)

| Intersection/Approach | AM Peak Hour | | PM Peak Hour | |
|---|--------------|-----------|--------------|-----------|
| | LOS | V/C Ratio | LOS | V/C Ratio |
| Langstaff Dr & Donald B. Munro Dr | A | | A | |
| Northbound | A | 0.02 | A | 0.02 |
| Southbound | A | 0.16 | A | 0.14 |
| Westbound | A | 0.12 | A | 0.23 |
| Eastbound | A | 0.2 | A | 0.17 |
| Langstaff Dr & Frances Colbert Ave | A | | A | |
| Northbound | A | 0.06 | A | 0.07 |
| Southbound | A | 0 | A | 0 |
| Westbound | A | 0.05 | A | 0.03 |
| Langstaff Dr & Cavanagh Dr | A | | A | |
| Northbound | A | 0.07 | A | 0.09 |
| Southbound | A | 0 | A | 0 |
| Westbound | A | 0.02 | A | 0.03 |
| Carp Rd & Donald B. Munro Dr | A | | A | |
| Northbound | A | 0.23 | A | 0.45 |
| Southbound | A | 0.21 | A | 0.16 |
| Westbound | A | 0.14 | A | 0.21 |
| Eastbound | A | 0.06 | A | 0.15 |
| Carp Rd & Juanita Ave | A | | A | |
| Northbound | A | 0.11 | A | 0.39 |
| Southbound | A | 0.04 | A | 0.04 |
| Westbound | A | 0.24 | A | 0.35 |

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Table 11.2.4 below, is a summary of the operating conditions during the build-out year of 2023 with both the site-generated traffic and background growth applied. All movements are expected to operate at a LOS A.

Table 11.2.4: Intersection Operation, Total Traffic (2023)

| Intersection/Approach | AM Peak Hour | | PM Peak Hour | |
|---|--------------|-----------|--------------|-----------|
| | LOS | V/C Ratio | LOS | V/C Ratio |
| Langstaff Dr & Donald B. Munro Dr | A | | A | |
| Northbound | A | 0.02 | A | 0.02 |
| Southbound | A | 0.19 | A | 0.16 |
| Westbound | A | 0.13 | A | 0.24 |
| Eastbound | A | 0.2 | A | 0.19 |
| Langstaff Dr & Site Access 1 | A | | A | |
| Northbound | A | 0.01 | A | 0.02 |
| Southbound | A | 0.04 | A | 0.05 |
| Eastbound | A | 0.04 | A | 0.02 |
| Langstaff Dr & Frances Colbert Ave | A | | A | |
| Northbound | A | 0.07 | A | 0.08 |
| Southbound | A | 0 | A | 0 |
| Westbound | A | 0.05 | A | 0.04 |
| Langstaff Dr & Cavanagh Dr | A | | A | |
| Northbound | A | 0 | A | 0.01 |
| Southbound | A | 0 | A | 0 |
| Westbound | A | 0.03 | A | 0.03 |
| Eastbound | A | 0.01 | A | 0.01 |
| Langstaff Dr & Site Access 3 | A | | A | |
| Northbound | A | 0 | A | 0.01 |
| Southbound | A | 0.09 | A | 0.07 |
| Eastbound | A | 0.01 | A | 0.01 |
| Carp Rd & Donald B. Munro Dr | A | | A | |
| Northbound | A | 0.23 | A | 0.44 |
| Southbound | A | 0.22 | A | 0.16 |
| Westbound | A | 0.14 | A | 0.22 |
| Eastbound | A | 0.06 | A | 0.15 |
| Carp Rd & Juanita Ave | A | | A | |
| Northbound | A | 0.1 | A | 0.37 |
| Southbound | A | 0.05 | A | 0.06 |
| Westbound | A | 0.26 | A | 0.36 |

Table 11.2.5 below, is a summary of the operating conditions during future horizon year of 2028 with both the site-generated traffic and background growth applied. All movements are expected to operate at a LOS A.

Table 11.2.4: Intersection Operation, Total Traffic (2028)

| Intersection/Approach | AM Peak Hour | | PM Peak Hour | |
|---|--------------|-----------|--------------|-----------|
| | LOS | V/C Ratio | LOS | V/C Ratio |
| Langstaff Dr & Donald B. Munro Dr | A | | A | |
| Northbound | A | 0.02 | A | 0.02 |
| Southbound | A | 0.2 | A | 0.17 |
| Westbound | A | 0.13 | A | 0.26 |
| Eastbound | A | 0.21 | A | 0.2 |
| Langstaff Dr & Site Access 1 | A | | A | |
| Northbound | A | 0.01 | A | 0.02 |
| Southbound | A | 0.04 | A | 0.05 |
| Eastbound | A | 0.04 | A | 0.02 |
| Langstaff Dr & Frances Colbert Ave | A | | A | |
| Northbound | A | 0.07 | A | 0.09 |
| Southbound | A | 0 | A | 0 |
| Westbound | A | 0.05 | A | 0.04 |
| Langstaff Dr & Cavanagh Dr | A | | A | |
| Northbound | A | 0 | A | 0.01 |
| Southbound | A | 0 | A | 0 |
| Westbound | B | 0.03 | A | 0.03 |
| Eastbound | A | 0.02 | A | 0.01 |
| Langstaff Dr & Site Access 3 | A | | A | |
| Northbound | A | 0 | A | 0.01 |
| Southbound | A | 0.09 | A | 0.08 |
| Eastbound | A | 0.02 | A | 0.01 |
| Carp Rd & Donald B. Munro Dr | A | | A | |
| Northbound | A | 0.24 | A | 0.47 |
| Southbound | A | 0.23 | A | 0.18 |
| Westbound | A | 0.15 | A | 0.23 |
| Eastbound | A | 0.06 | A | 0.16 |
| Carp Rd & Juanita Ave | A | | A | |
| Northbound | A | 0.11 | A | 0.39 |
| Southbound | A | 0.05 | A | 0.06 |
| Westbound | A | 0.29 | A | 0.4 |

From the analysis and comparison of background and total traffic for the future horizon year of 2023 and 2028, the change in traffic operations observed is negligible. All the movements are expected to operate at a LOS A during all scenarios which indicates traffic operations within the vicinity of the site can be expected to operate at acceptable levels of service. As such, the development-generated traffic demand is expected to have very little impact on the study network intersections. Additionally, the three site entrances are operating well at a LOS A in the both the build-out year and horizon year.

11.3 Adjustment to Development Generated Demands

At this time, no adjustments are expected to be applied to the development generated demands. In the AM and PM peak hours all movements of the study intersections and site entrances are expected to operate at a LOS A during the 2023 and 2028 total traffic scenarios. As such, the site generated motorists are not expected to adjust their travel patterns.

11.4 Adjustments to Background Network Demands

Due to the rural nature of the study area, background motorists are not expected to adjust their travel times, routes, or modes. As stated in [Section 11.2](#), the study intersections reviewed as part of this TIA are currently operating at a LOS A during both the 2023 and 2028 total traffic scenarios.

12.0 DEVELOPMENT DESIGN

This section will review the proposed development and its transportation network elements in order to ensure that a safe and efficient design has been proposed that will encourage walking, cycling, and transit use. The City of Ottawa's TDM-supportive Development Design and Infrastructure checklist has been completed and attached in [Appendix G](#) for reference. The TDM-supportive Development Design and Infrastructure checklist outlines the TDM elements expected to be included in the proposed development.

12.1 Design for Sustainable Modes

The proposed development is expected to have a surface parking lot as well as underground parking spots for the mid-rise apartment buildings. According to the site plan, there will be a total of 83 underground spaces, 53 surface parking spaces, and 58 bicycle stalls provided for the all three mid-rise apartments. It is anticipated that this will provide adequate bicycle parking spaces for the projected peak hour volume of cyclists.

As described in [Section 3.4](#), there are multiple transit stops within the vicinity of the development site with bus stops on Juanita Ave, Carp Rd, and Donald B. Munro Dr. The development is split into two sections due to a small stream running through the development site with two proposed pedestrian crossings provided over the creek. The north and south section are approximately 400m and 360m respectively from the transit stop due to the multi-use pathway provided that provides a connection between the proposed development and the intersection of Carp Rd and Donald B. Munro Dr. The site plan with labels is shown below in [Figure 12.1.1](#). It should also be noted that there is currently only one bus route in the area of the subject site (Route 303), which operates on a limited schedule.



Figure 12.1.1: Site plan layout separation

12.2 New Street Networks

It is anticipated that there will be two new streets for the subject site as shown previously in Figure 12.1.1. Both of the new streets are expected to be dead end streets, preventing the possibility of cut through traffic in the sub-division. Additionally, the land features greenspace area with a parkland provided for the residents living in the subdivision. It is expected that trees will be planted along the street in consistent pattern throughout the site. The subdivision is connected to the intersection of Carp Road and Donald B. Munro Drive

via a Multi-use pathway encouraging travel by sustainable modes with bus stops located at the intersection as well as providing connection to on-road bicycle facilities.

13.0 BOUNDARY STREETS

This section will examine the design elements of the noted boundary streets and their ability to accommodate the proposed development as well as their alignment with the City of Ottawa's Complete Streets policy and urban design objectives.

The boundary street for this development is Langstaff Drive. At this time, the City has not prepared a complete street concept for this street.

13.1 Mobility

13.1.1 Pedestrian Level of Service (PLOS)

Langstaff Drive currently has a 2.0m sidewalk on the east side of the road with a posted speed limit of 40 km/h within the vicinity of the subject site as noted in [Section 3.1](#). Historical Average Annual Daily Traffic (AADT) was not available for this segment of Langstaff Drive, however based on available data from TMCS completed as part of this investigation it was determined that Langstaff Drive has an AADT/lane less than 3000 veh/day. On-street parking is not permitted in the vicinity of the planned development site.

Upon review of Exhibit 4 of the City of Ottawa's Multi-Modal Level of Service (MMLOS) Guidelines, Langstaff Drive has a PLOS of B.

13.1.2 Bicycle Level of Service (BLOS)

Langstaff Drive currently does not have any designated bike lanes. As, such Exhibit 11, of the MMLOS guidelines states that for mixed traffic, the BLOS is dependant on the number of travel lanes, travel speed, and lane separation for unsignalized roadway segments. The segment of Langstaff Drive located along the proposed development has a BLOS of A since Langstaff Drive has two travel lanes and a posted speed of 40 km/h.

13.1.3 Transit Level of Service (TLOS)

This segment of Langstaff Drive is a mixed traffic facility and currently does not have any dedicated transit lanes. While the TLOS methodology employed by the City of Ottawa's MMLOS Guidelines is intended primarily for corridors with existing or planned rapid transit or transit priority measures, this segment of Langstaff Drive can be evaluated as it is serviced by a regular bus route. Parking / driveway friction is minimal within the vicinity of the subject site and can be considered low for the purposes of this evaluation.

Upon review of Exhibit 15 of the City of Ottawa's MMLOS Guidelines, this segment of Langstaff Drive has a TLOS of D.

13.1.4 Truck Level of Service (TkLOS)

This segment of Colonnade Road currently has two travel lanes (one in each direction) with a curb lane width of approximately 3.3m at its narrowest point.

Upon review of Exhibit 20 of the City of Ottawa's MMLOS Guidelines, this segment of Colonnade Road has a TkLOS of D.

13.1.5 Vehicular Level of Service (LOS)

The vehicular LOS and associated volume to capacity (v/c) ratio for study area intersections is presented in [Section 11.2](#). The segment LOS for the boundary street was taken as the critical v/c ratios for the northbound and southbound movements at the intersections of Langstaff Drive and Frances Colbert Avenue and Langstaff Drive and Donald B. Munro Drive, respectively. A summary of the approach v/c and associated LOS for all analysis periods, as determined per City of Ottawa TIA Guidelines (2017), are presented in [Table 13.1.5.1](#). Detailed analysis reports are presented in [Appendix E](#).

Table 13.1.5.1: Vehicular Level of Service (LOS) by Approach

| Analysis Period | Approach | AM Peak Hour | | PM Peak Hour | |
|------------------------------|----------|--------------|-----------|--------------|-----------|
| | | LOS | v/c Ratio | LOS | v/c Ratio |
| Existing Conditions (2019) | NB | A | 0.05 | A | 0.06 |
| | SB | A | 0.14 | A | 0.13 |
| Background Conditions (2023) | NB | A | 0.06 | A | 0.06 |
| | SB | A | 0.16 | A | 0.14 |
| Background Conditions (2028) | NB | A | 0.06 | A | 0.07 |
| | SB | A | 0.17 | A | 0.14 |
| Total Traffic (2023) | NB | A | 0.07 | A | 0.08 |
| | SB | A | 0.19 | A | 0.16 |
| Total Traffic (2028) | NB | A | 0.07 | A | 0.09 |
| | SB | A | 0.2 | A | 0.17 |

As shown, all approaches are anticipated to operate at acceptable levels of service throughout the 2028 horizon year.

13.2 Road Safety

Available collision data within the study area was reviewed and is presented in [Section 3.6](#). No road safety concerns were identified on boundary streets or within the study area. As City of Ottawa collision records do not indicate direction of travel for vehicles involved, collision diagrams are not feasible.

13.3 Neighborhood Traffic Management

Available background data suggests that there are no known operational concerns on boundary streets.

14.0 TRANSPORTATION DEMAND MANAGEMENT

This section will identify any post occupancy TDM program measures that could benefit the developments proposed design and infrastructure elements.

14.1 Context for TDM

Previous sections of this report outlined trip generation and distribution for multiple travel modes. As stated, the mode shares were estimated based on the multiple factors such as existing Traffic Assessment Zone (TAZ) studies and knowledge of surrounding transit and pedestrian facilities. The expected mode shares for the proposed development are not expected to differ much from the TAZ study conducted for the area containing the subject site.

As stated previously, the proposed development is in a Designated Village DPA.

14.2 Need and Opportunity

Currently Langstaff Drive is expected to be operating well with all the movements expected to operate at a LOS of A in the future horizon year of 2028. Langstaff Drive within the vicinity of the subject site has a PLOS, BLOS, and TLOS of B, A, and D respectively. As such, implementing TDM measures, it is unlikely that it would be enough to achieve higher sustainable mode share targets by reducing vehicle trips since the traffic operation are operating well. Additionally, the village nature of the area surrounding the development site in a rural area may encourage higher sustainable modes from recreational trips by utilizing the multi-use pathway from the development to the intersection of Carp Road and Donald B. Munro Drive.

The proposed development is not expected to have a significant number of visitors. Instead, it is likely most occupants will be residents who will have to commute on a daily basis. Many of the ride sharing services provided elsewhere in the City of Ottawa would not be beneficial for long term commuting. As such, the greatest improvement to the MMLOS would be to encourage public transit and providing service throughout the week rather than a limited service.

14.3 TDM Program

The City of Ottawa's TDM Measures Checklist has been attached in [Appendix G](#) for reference. The checklist outlines if any TDM measures would be beneficial in increasing alternate modes of transportation other than vehicle driver. However, due to the location of the proposed subject site and the lack of available transit, many of the TDM measures are not applicable or would have minimal impacts. The TDM measure that is provided by the proposed development which is expected to lessen the impacts on the transportation network is bicycle stalls. This would encourage the residents of mid-rise apartments to cycle to nearby stores and recreational facilities as well as the employees that manage the club house and parkland within the subdivision to cycle to work. Another TDM measure that will encourage sustainable modes is the multi-use pathway connecting the sub-division to the intersection of Carp Road and Donald B. Munro Drive with most of the trips expected to be recreational.

15.0 ACCESS INTERSECTIONS

This section will examine design elements of the proposed development's access points and assess their alignment with the City of Ottawa's Complete Streets philosophy, MMLOS Guidelines and urban design objectives.

15.1 Location and Design of Access

The proposed development is anticipated to have three full-move accesses with all of them located on Langstaff Drive. The southern two entrances (Access 2 and 3) near the intersection of Langstaff Drive and Cavanagh Drive are expected to serve the southern development section whereas the Access 1 is expected to serve only the northern section as shown previously in [Figure 12.1.1](#). It is not anticipated that the design parameters of the existing access will change.

15.2 Intersection Control

In consideration of existing and projected volumes of traffic anticipated to utilize the site accesses, stop control at the minor approach (site driveway) is recommended. No other traffic control measures are warranted at the proposed site accesses.

15.3 Intersection Design

The proposed site accesses were analyzed under existing, background and total future traffic conditions in [Section 11.2](#). No concerns were noted with regards to approach LOS at the existing site access, which is anticipated to continue operating at LOS A through to the 2028 horizon year.

As the site accesses will not be signalized, the MMLOS for all modes at the intersection of Langstaff Drive and the site entrances will be the same as that for the boundary road segment presented in [Section 13.0](#).

16.0 TRANSIT

This section will review the potential impacts of the proposed development on existing and planned transit networks and services in order to ensure TLOS is not negatively impacted.

16.1 Route Capacity

As noted in [Section 9.1.2](#), it is anticipated that the proposed development will generate approximately 3 transit trips in both the AM and PM peak hours, respectively. It is expected that the relatively low number of development-generated transit trips can be accommodated by the existing transit routes and is not anticipated to result in any requirements for additional transit capacity. Further, it is not anticipated that the existing transit routes will require modification as a result of the proposed development.

16.2 Transit Priority

As noted in [Section 3.4](#), the area of the subject site is serviced by one bus route, Route 303 which operates only on Wednesdays for a limited time. It is expected that the relatively low number of development-generated transit trips can be accommodated and is not anticipated that any additional transit trips will result in impacts to travel time.

As noted previously, the site will have three (3) accesses on Langstaff Drive. Two of the accesses will serve the southern section of the development whereas one of the access will serve the northern section. It is not anticipated that the addition of three development driveways on Langstaff Drive will impact transit travel times.

17.0 INTERSECTION DESIGN

This section will determine the design elements of study area intersections required to accommodate the proposed development, ensuring they are consistent with the City of Ottawa's Complete Streets philosophy and MMLOS Practices.

17.1 Intersection Control

The five study area intersections are currently either two-way stop controlled or all-way stop controlled, and are anticipated to operate at acceptable levels of service through to the 2028 horizon year. As such, no adjustments to the existing intersection controls are recommended.

17.2 Intersection Design

17.2.1 Intersection Pedestrian Level of Service (PLOS)

The Pedestrian Level of Service (PLOS) for study area intersections is determined using the City of Ottawa's Multi-Modal Level of Service Guidelines. However, since all the study area intersections are stop controlled, the Pedestrian Exposure to Traffic at Signalized Intersection (PETSI) (Exhibit 5), PETSI Evaluation Table (Exhibit 6), and Pedestrian Delay Evaluation Table (Exhibit 7) is not applicable.

17.2.2 Intersection Bicycle Level of Service (BLOS)

The Bicycle Level of Service (BLOS) for study area intersections was determined in accordance with the City of Ottawa's Multi-Modal Level of Service Guidelines.

All of the study area intersections are unsignalized with no median refuge and cross-sections of two lanes (one lane in each direction) at each approach. As noted previously in [Section 3.1](#), Langstaff Drive, Cavanagh Drive, Frances Colbert Avenue, and Donald B. Munro Drive have a posted speed limit of 40 km/h whereas Carp Road has a speed limit of 50 km/h. Based on Exhibit 11 of the City of Ottawa's MMLOS guidelines for unsignalized crossing with no median refuge, Langstaff Drive, Cavanagh Drive, Frances Colbert Avenue, and Donald B. Munro Drive is expected to have BLOS of A while Carp Road is expected to have a BLOS of B.

17.2.3 Intersection Transit Level of Service (TLOS)

TLOS for intersection is only applicable for signalized intersection based on Exhibit 16 of the City of Ottawa's Multi-Modal Level of Service (MMLOS) Guidelines. Therefore, the TLOS at the study area intersections is not applicable as all the intersections are unsignalized.

17.2.4 Intersection Truck Level of Service (TkLOS)

TkLOS for intersection is only applicable for signalized intersection based on Exhibit 21 of the City of Ottawa's Multi-Modal Level of Service (MMLOS) Guidelines. Therefore, the TkLOS at the study area intersections is not applicable as all the intersections are unsignalized.

18.0 SUMMARY OF IMPROVEMENTS INDICATED AND MODIFICATION OPTIONS

The TIA Strategy Report evaluated the proposed development and its expected impact on the existing transportation network. Based on the analysis presented, the area of the subject site is currently operating at acceptable levels of service and is anticipated to continue operating at acceptable levels of service through to the 2028 horizon year based on projected traffic growth, site generated traffic and mode share targets.

The proposed development site plan meets or exceeds the City's minimum By-Law requirements for both vehicle and bicycle parking spaces. Further, direct links to the surrounding pedestrian network are provided and the proposed multi-use pathway to the southwest of the development provides a connection to the intersection of Carp Road and Donald B. Munro Drive. No issues with respect to site circulation or truck turning movements are noted.

Upon review of boundary streets, the pedestrian and cycling facilities are anticipated to operate at PLOS and BLOS of B and A, respectively. There is no transit priority present in the study area, however based on mixed traffic conditions the boundary street is anticipated to operate at a TLOS of D. No issues with transit service capacity are noted for the existing or projected conditions. No improvements are recommended to address existing MMLOS for the adjacent study area intersections.

Prepared by,

Reviewed by,

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Submitted by,

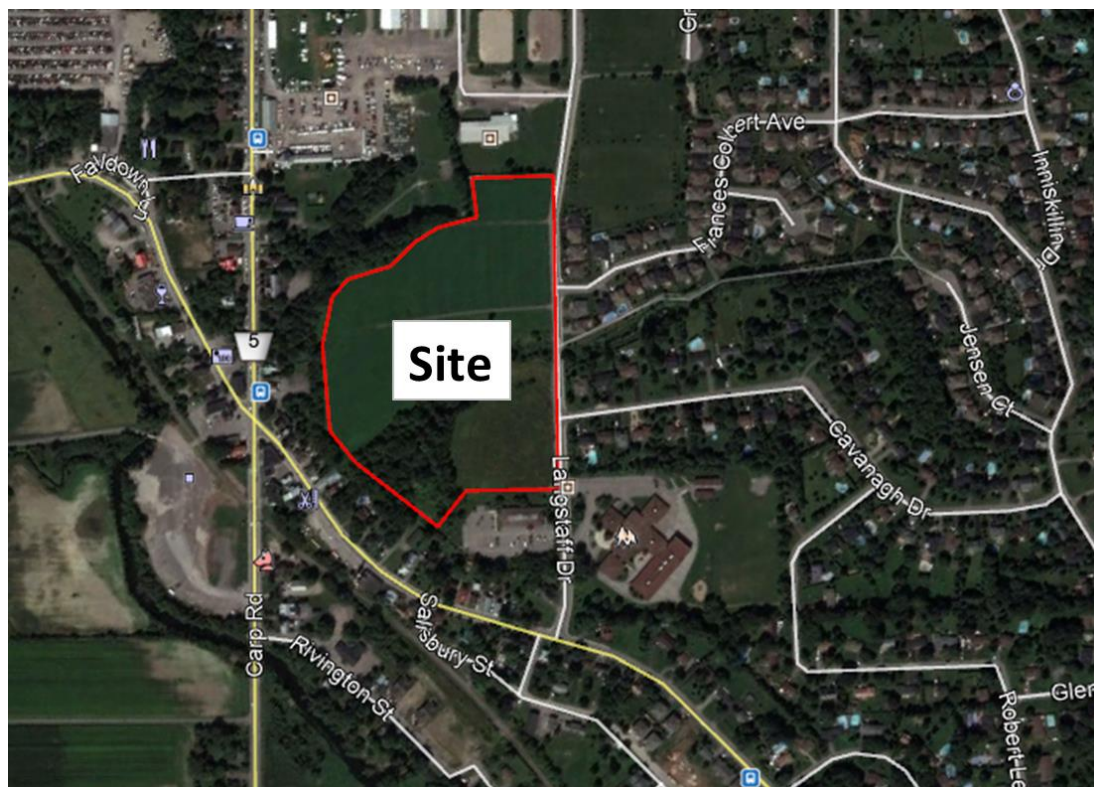
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TIA ANALYSIS REPORT: RESIDENTIAL DEVELOPMENT AT 147 LANGSTAFF ROAD



APPENDIX A – TIA SCREENING FORM

City of Ottawa 2017 TIA Guidelines Screening Form

1. Description of Proposed Development

| | |
|------------------------------------|--|
| Municipal Address | 147 Langstaff Drive |
| Description of Location | Langstaff Drive at Donald B. Munro Drive |
| Land Use Classification | Residential |
| Development Size (units) | 192 units (108 Apartments + 84 Townhomes) |
| Development Size (m ²) | 8.1 ha |
| Number of Accesses and Locations | 3 on Langstaff Drive |
| Phase of Development | 1 |
| Buildout Year | 2023 |

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 ² |
| Industrial | 5,000 m ² |
| Fast-food restaurant or coffee shop | 100 m ² |
| Destination retail | 1,000 m ² |
| Gas station or convenience market | 75 m ² |

** 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? | | NO |
| Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?* | YES** | |

*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).

** Designated Village DPA

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? | | NO |
| Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway? | | NO |
| 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)? | | NO |
| Is the proposed driveway within auxiliary lanes of an intersection? | | NO |
| Does the proposed driveway make use of an existing median break that serves an existing site? | | NO |
| Is there is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development? | | NO |
| Does the development include a drive-thru facility? | | NO |

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

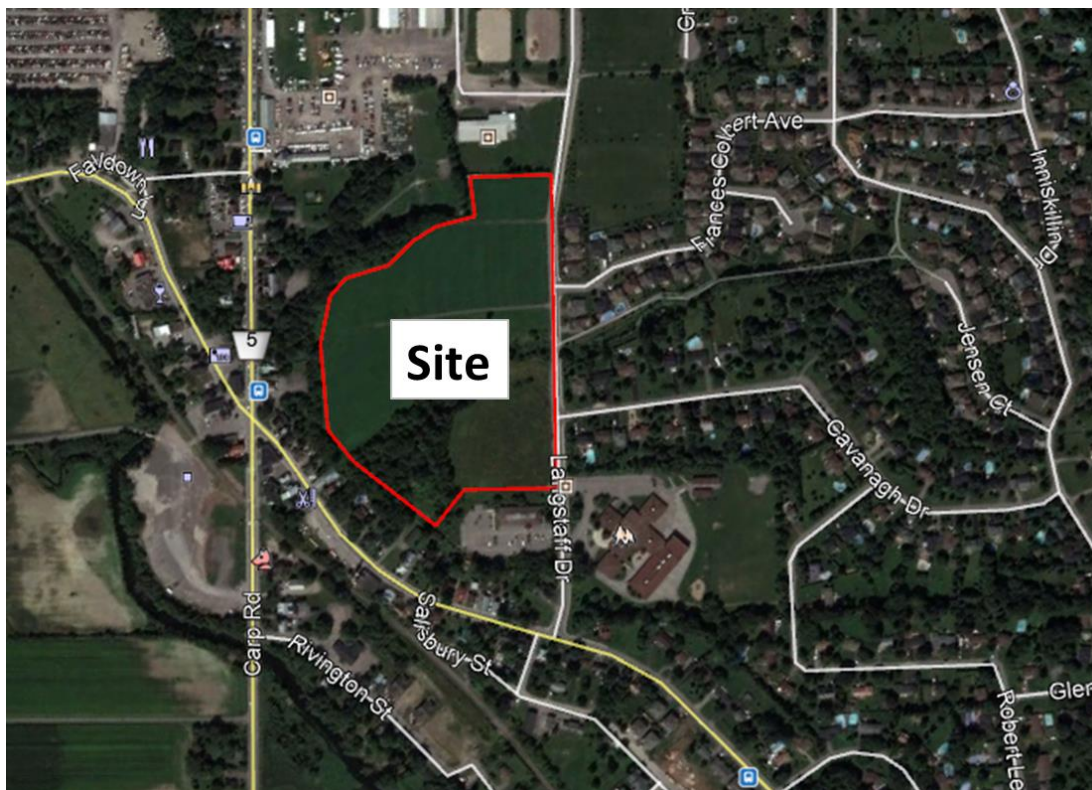
5. Summary

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

Transportation Impact Assessment Screening Form

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).

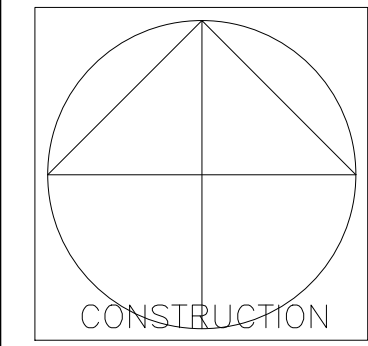
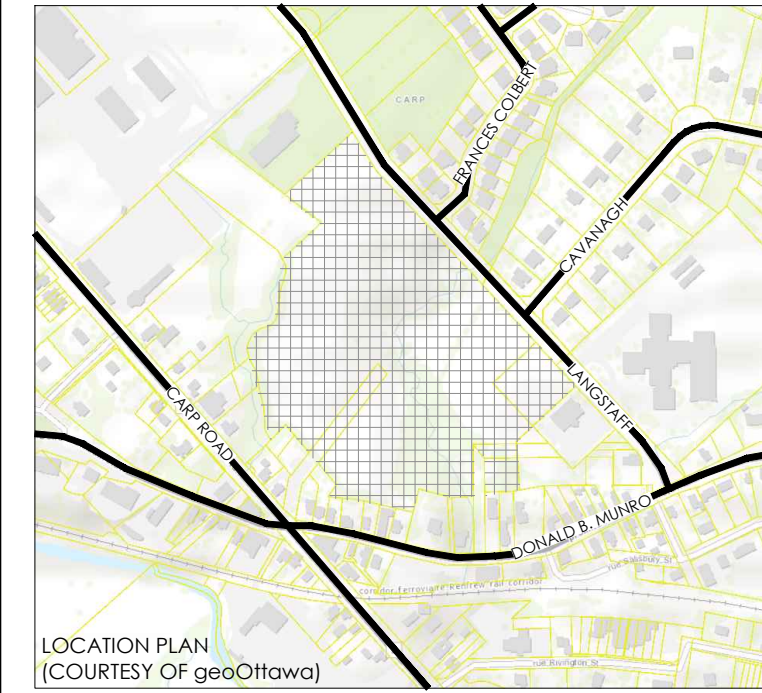
TIA ANALYSIS REPORT: RESIDENTIAL DEVELOPMENT AT 147 LANGSTAFF ROAD



APPENDIX B – SITE PLAN



| NO. | REVISION | DATE |
|-----|-------------------|------------|
| 1 | ISSUED FOR REVIEW | NOV. 14/19 |
| | | |
| | | |



**Vandenberg & Wildeboer**
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THE OLD STONE LODGE - 160 RABBITCROFT WAY - OTTAWA, ONTARIO - K1E 3H9

PROJECT TITLE
LANGSTAFF RESIDENTIAL
147 LANGSTAFF DRIVE, CARP, ON K0A 1L0

DRAWING TITLE
SITE PLAN

DESIGNED BY: MALCOLM WILDEBOER
DRAWN BY: SC, JN
START DATE: JUNE 2019
SCALE: AS SHOWN
PROJECT NO. 1916

drawing No.
A001

TIA ANALYSIS REPORT: RESIDENTIAL DEVELOPMENT AT 147 LANGSTAFF ROAD



APPENDIX C – CITY OF OTTAWA TRAFFIC DATA

Rural West

Demographic Characteristics

| | | | |
|---------------------|--------|-------------------------|--------|
| Population | 24,960 | Actively Travelled | 19,280 |
| Employed Population | 12,280 | Number of Vehicles | 18,930 |
| Households | 8,750 | Area (km ²) | 744.4 |

| Occupation Status (age 5+) | Male | Female | Total |
|----------------------------|--------|--------|--------|
| Full Time Employed | 6,190 | 4,610 | 10,800 |
| Part Time Employed | 480 | 990 | 1,470 |
| Student | 2,720 | 2,970 | 5,680 |
| Retiree | 1,920 | 1,900 | 3,820 |
| Unemployed | 300 | 150 | 450 |
| Homemaker | 60 | 970 | 1,030 |
| Other | 260 | 140 | 390 |
| Total: | 11,920 | 11,730 | 23,660 |

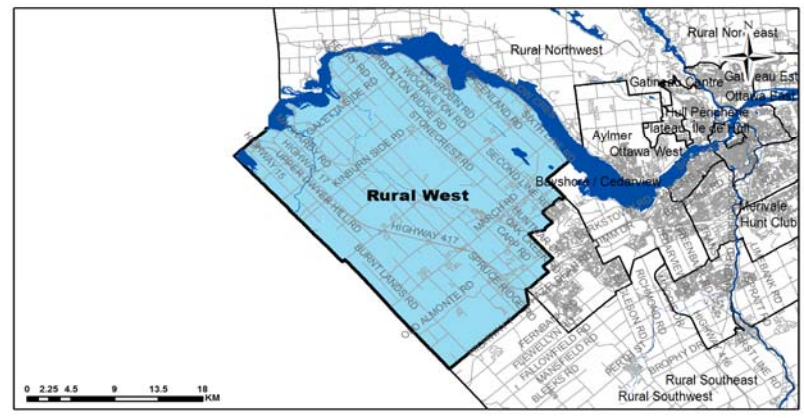
| Traveller Characteristics | Male | Female | Total |
|---------------------------|------|--------|-------|
| Transit Pass Holders | 620 | 550 | 1,170 |

| | | | |
|------------------|-------|-------|--------|
| Licensed Drivers | 9,590 | 9,180 | 18,770 |
|------------------|-------|-------|--------|

| | | | |
|---------------|----|-----|-----|
| Telecommuters | 90 | 100 | 190 |
|---------------|----|-----|-----|

| | | | |
|-------------------------|--------|--------|--------|
| Trips made by residents | 28,240 | 31,610 | 59,850 |
|-------------------------|--------|--------|--------|

| Selected Indicators | |
|---|------|
| Daily Trips per Person (age 5+) | 2.53 |
| Vehicles per Person | 0.76 |
| Number of Persons per Household | 2.85 |
| Daily Trips per Household | 6.84 |
| Vehicles per Household | 2.16 |
| Workers per Household | 1.40 |
| Population Density (Pop/km ²) | 30 |

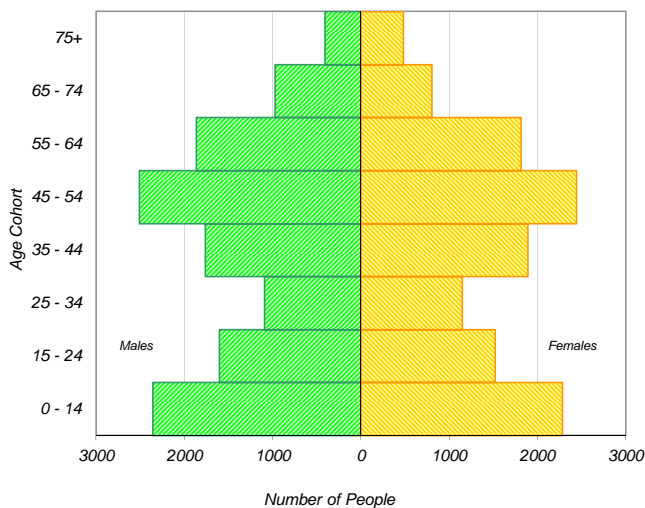


| Household Size | | |
|----------------|-------|------|
| 1 person | 1,280 | 15% |
| 2 persons | 3,330 | 38% |
| 3 persons | 1,520 | 17% |
| 4 persons | 1,800 | 21% |
| 5+ persons | 820 | 9% |
| Total: | 8,750 | 100% |

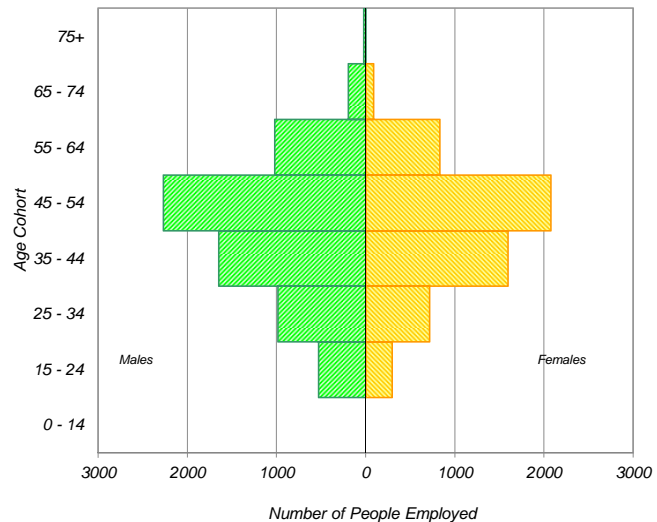
| Households by Vehicle Availability | | |
|------------------------------------|-------|------|
| 0 vehicles | 90 | 1% |
| 1 vehicle | 1,820 | 21% |
| 2 vehicles | 4,540 | 52% |
| 3 vehicles | 1,530 | 17% |
| 4+ vehicles | 770 | 9% |
| Total: | 8,750 | 100% |

| Households by Dwelling Type | | |
|-----------------------------|-------|------|
| Single-detached | 8,330 | 95% |
| Semi-detached | 160 | 2% |
| Townhouse | 170 | 2% |
| Apartment/Condo | 90 | 1% |
| Total: | 8,750 | 100% |

Population



Employed Population

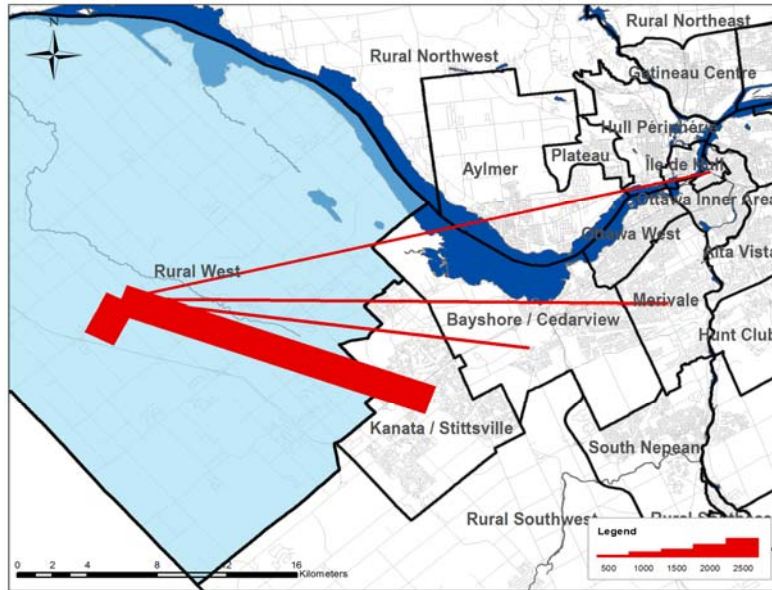


* In 2005 data was only collected for household members aged 11+ therefore these results cannot be compared to the 2011 data.

Travel Patterns

Top Five Destinations of Trips from Rural West

AM Peak Period



Summary of Trips to and from Rural West

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

| Districts | Destinations of Trips From | | Origins of Trips To | |
|-----------------------------|----------------------------|---------|---------------------|---------|
| | District | % Total | District | % Total |
| Ottawa Centre | 430 | 4% | 0 | 0% |
| Ottawa Inner Area | 380 | 4% | 0 | 0% |
| Ottawa East | 80 | 1% | 90 | 1% |
| Beacon Hill | 70 | 1% | 40 | 1% |
| Alta Vista | 180 | 2% | 20 | 0% |
| Hunt Club | 80 | 1% | 60 | 1% |
| Merivale | 720 | 7% | 70 | 1% |
| Ottawa West | 170 | 2% | 70 | 1% |
| Bayshore / Cedarview | 760 | 7% | 380 | 6% |
| Orléans | 0 | 0% | 70 | 1% |
| Rural East | 0 | 0% | 0 | 0% |
| Rural Southeast | 20 | 0% | 0 | 0% |
| South Gloucester / Leirtrim | 60 | 1% | 40 | 1% |
| South Nepean | 30 | 0% | 80 | 1% |
| Rural Southwest | 160 | 2% | 80 | 1% |
| Kanata / Stittsville | 3,250 | 31% | 1,050 | 17% |
| Rural West | 4,020 | 38% | 4,020 | 65% |
| Île de Hull | 140 | 1% | 0 | 0% |
| Hull Périphérie | 50 | 0% | 0 | 0% |
| Plateau | 0 | 0% | 0 | 0% |
| Aylmer | 0 | 0% | 50 | 1% |
| Rural Northwest | 10 | 0% | 0 | 0% |
| Pointe Gatineau | 20 | 0% | 10 | 0% |
| Gatineau Est | 0 | 0% | 20 | 0% |
| Rural Northeast | 0 | 0% | 0 | 0% |
| Buckingham / Masson-Angers | 0 | 0% | 0 | 0% |
| Ontario Sub-Total: | 10,410 | 98% | 6,090 | 99% |
| Québec Sub-Total: | 220 | 2% | 80 | 1% |
| Total: | 10,630 | 100% | 6,170 | 100% |

Trips by Trip Purpose

| 24 Hours | From District | | To District | | Within District | |
|---------------------------|---------------|------|-------------|------|-----------------|------|
| Work or related | 6,640 | 32% | 2,300 | 11% | 1,860 | 12% |
| School | 1,930 | 9% | 460 | 2% | 2,220 | 14% |
| Shopping | 2,930 | 14% | 220 | 1% | 750 | 5% |
| Leisure | 2,240 | 11% | 1,440 | 7% | 1,310 | 8% |
| Medical | 680 | 3% | 150 | 1% | 420 | 3% |
| Pick-up / drive passenger | 1,610 | 8% | 800 | 4% | 1,400 | 9% |
| Return Home | 3,570 | 17% | 14,860 | 72% | 6,720 | 43% |
| Other | 1,080 | 5% | 370 | 2% | 880 | 6% |
| Total: | 20,680 | 100% | 20,600 | 100% | 15,560 | 100% |

| AM Peak (06:30 - 08:59) | From District | | To District | | Within District | |
|---------------------------|---------------|------|-------------|------|-----------------|------|
| Work or related | 4,090 | 62% | 1,410 | 65% | 1,140 | 28% |
| School | 1,480 | 22% | 420 | 19% | 2,010 | 50% |
| Shopping | 130 | 2% | 0 | 0% | 90 | 2% |
| Leisure | 110 | 2% | 40 | 2% | 40 | 1% |
| Medical | 120 | 2% | 30 | 1% | 0 | 0% |
| Pick-up / drive passenger | 460 | 7% | 50 | 2% | 430 | 11% |
| Return Home | 0 | 0% | 150 | 7% | 170 | 4% |
| Other | 230 | 3% | 60 | 3% | 140 | 3% |
| Total: | 6,620 | 100% | 2,160 | 100% | 4,020 | 100% |

| PM Peak (15:30 - 17:59) | From District | | To District | | Within District | |
|---------------------------|---------------|------|-------------|------|-----------------|------|
| Work or related | 40 | 1% | 30 | 0% | 50 | 1% |
| School | 40 | 1% | 0 | 0% | 0 | 0% |
| Shopping | 550 | 17% | 30 | 0% | 140 | 4% |
| Leisure | 510 | 16% | 290 | 4% | 510 | 14% |
| Medical | 170 | 5% | 40 | 1% | 0 | 0% |
| Pick-up / drive passenger | 360 | 11% | 360 | 5% | 430 | 12% |
| Return Home | 1,380 | 42% | 5,950 | 88% | 2,310 | 63% |
| Other | 200 | 6% | 40 | 1% | 230 | 6% |
| Total: | 3,250 | 100% | 6,740 | 100% | 3,670 | 100% |

| Peak Period (%) | Total: | % of 24 Hours | Within District (%) |
|-----------------|--------|---------------|---------------------|
| 24 Hours | 56,840 | | 27% |
| AM Peak Period | 12,800 | 23% | 31% |
| PM Peak Period | 13,660 | 24% | 27% |

Trips by Primary Travel Mode

| 24 Hours | From District | | To District | | Within District | |
|----------------|---------------|------|-------------|------|-----------------|------|
| Auto Driver | 15,110 | 73% | 15,000 | 73% | 8,640 | 55% |
| Auto Passenger | 3,170 | 15% | 3,310 | 16% | 2,320 | 15% |
| Transit | 790 | 4% | 680 | 3% | 0 | 0% |
| Bicycle | 190 | 1% | 180 | 1% | 50 | 0% |
| Walk | 0 | 0% | 0 | 0% | 720 | 5% |
| Other | 1,430 | 7% | 1,430 | 7% | 3,840 | 25% |
| Total: | 20,690 | 100% | 20,600 | 100% | 15,570 | 100% |

| AM Peak (06:30 - 08:59) | From District | | To District | | Within District | |
|-------------------------|---------------|------|-------------|------|-----------------|------|
| Auto Driver | 4,400 | 67% | 1,570 | 73% | 1,670 | 42% |
| Auto Passenger | 610 | 9% | 180 | 8% | 490 | 12% |
| Transit | 650 | 10% | 0 | 0% | 0 | 0% |
| Bicycle | 0 | 0% | 0 | 0% | 0 | 0% |
| Walk | 0 | 0% | 0 | 0% | 140 | 3% |
| Other | 950 | 14% | 400 | 19% | 1,720 | 43% |
| Total: | 6,610 | 100% | 2,150 | 100% | 4,020 | 100% |

| PM Peak (15:30 - 17:59) | From District | | To District | | Within District | |
|-------------------------|---------------|------|-------------|------|-----------------|------|
| Auto Driver | 2,590 | 80% | 5,070 | 75% | 1,960 | 54% |
| Auto Passenger | 540 | 17% | 850 | 13% | 870 | 24% |
| Transit | 0 | 0% | 450 | 7% | 0 | 0% |
| Bicycle | 10 | 0% | 0 | 0% | 20 | 1% |
| Walk | 0 | 0% | 0 | 0% | 180 | 5% |
| Other | 100 | 3% | 370 | 5% | 630 | 17% |
| Total: | 3,240 | 100% | 6,740 | 100% | 3,660 | 100% |

| Avg Vehicle Occupancy | From District | | To District | | Within District | |
|-----------------------|---------------|--|-------------|--|-----------------|--|
| 24 Hours | 1.21 | | 1.22 | | 1.27 | |
| AM Peak Period | 1.14 | | 1.11 | | 1.29 | |
| PM Peak Period | 1.21 | | 1.17 | | 1.44 | |

| Transit Modal Split | From District | | To District | | Within District | |
|---------------------|---------------|--|-------------|--|-----------------|--|
| 24 Hours | 4% | | 4% | | 0% | |
| AM Peak Period | 11% | | 0% | | 0% | |
| PM Peak Period | 0% | | 7% | | 0% | |



Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

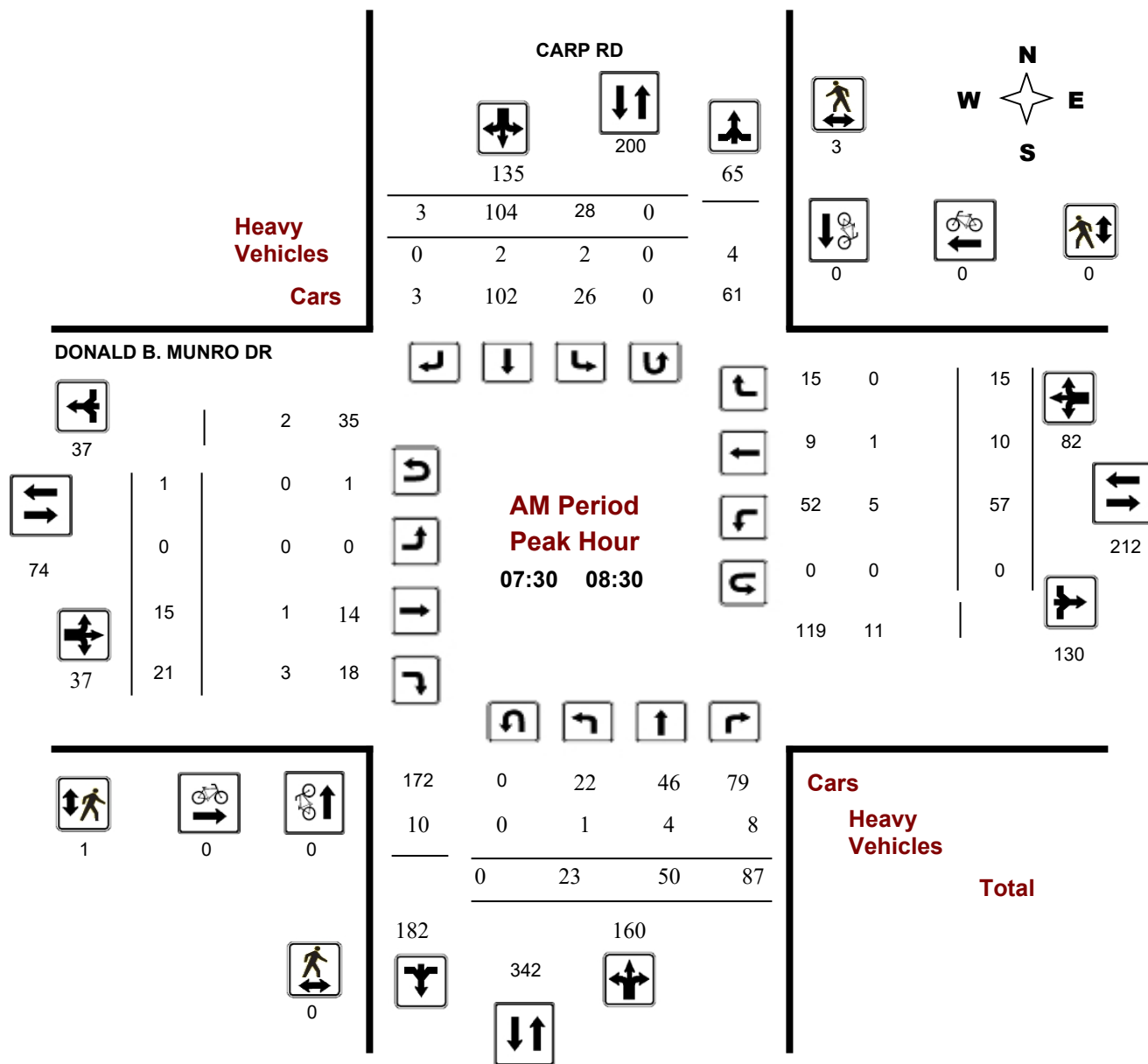
CARP RD @ DONALD B. MUNRO DR

Survey Date: Tuesday, April 02, 2019

Start Time: 07:00

WO No: 38471

Device: Miovision



Turning Movement Count - Peak Hour Diagram

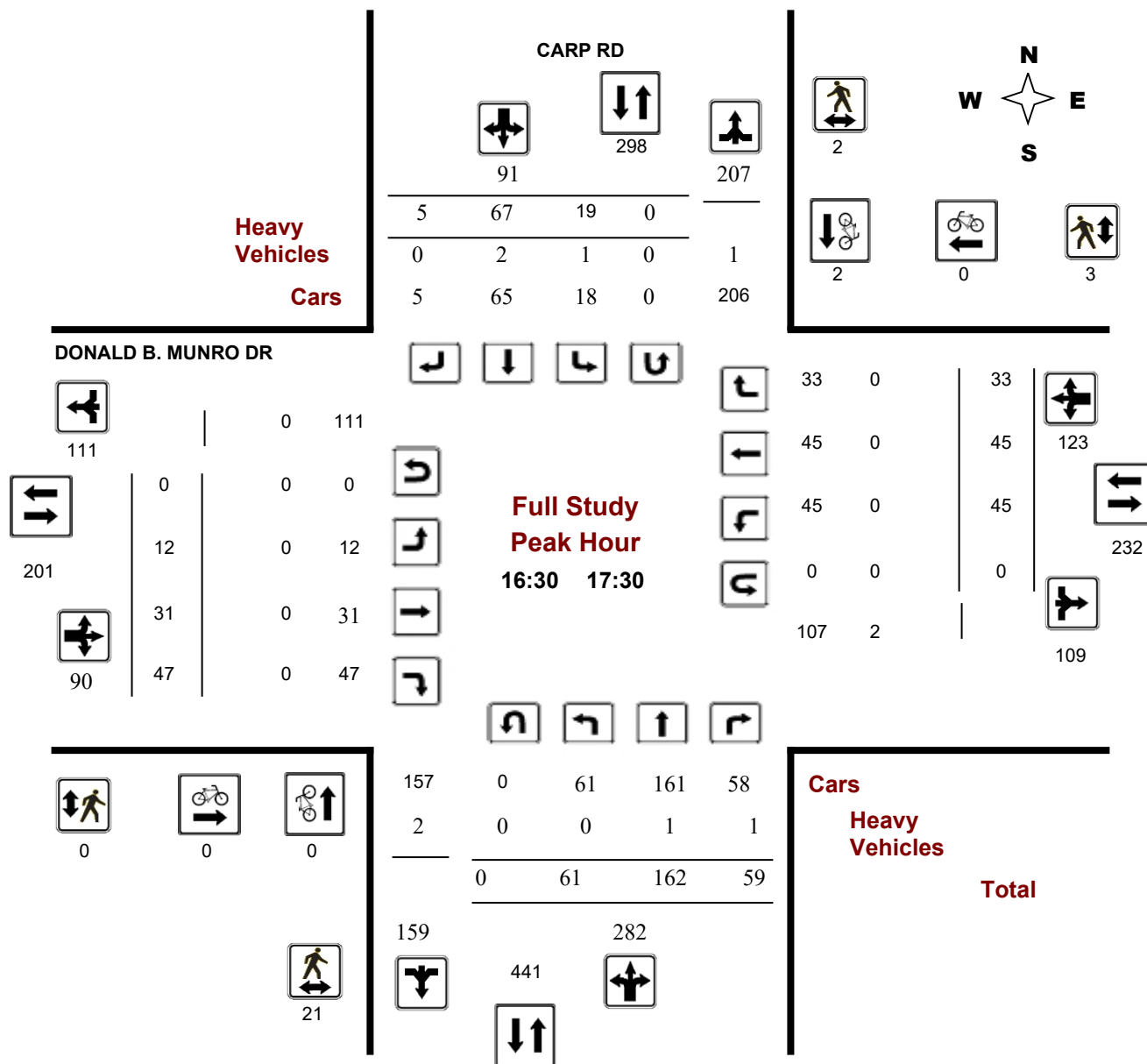
CARP RD @ DONALD B. MUNRO DR

Survey Date: Tuesday, April 02, 2019

Start Time: 07:00

WO No: 38471

Device: Miovision



Comments

Turning Movement Count - Peak Hour Diagram

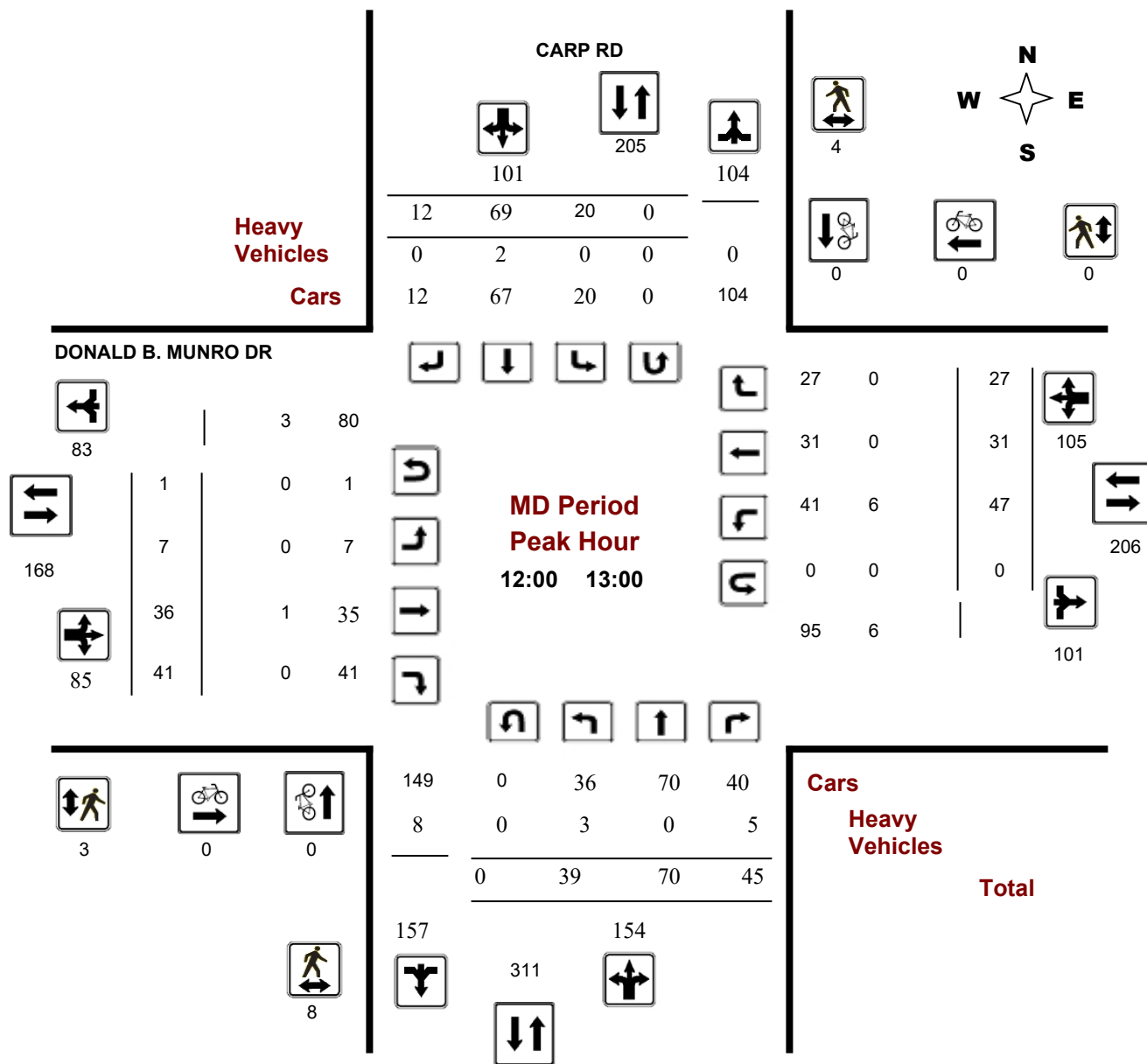
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Survey Date: Tuesday, April 02, 2019

Start Time: 07:00

WO No: 38471

Device: Miovision



Turning Movement Count - Peak Hour Diagram

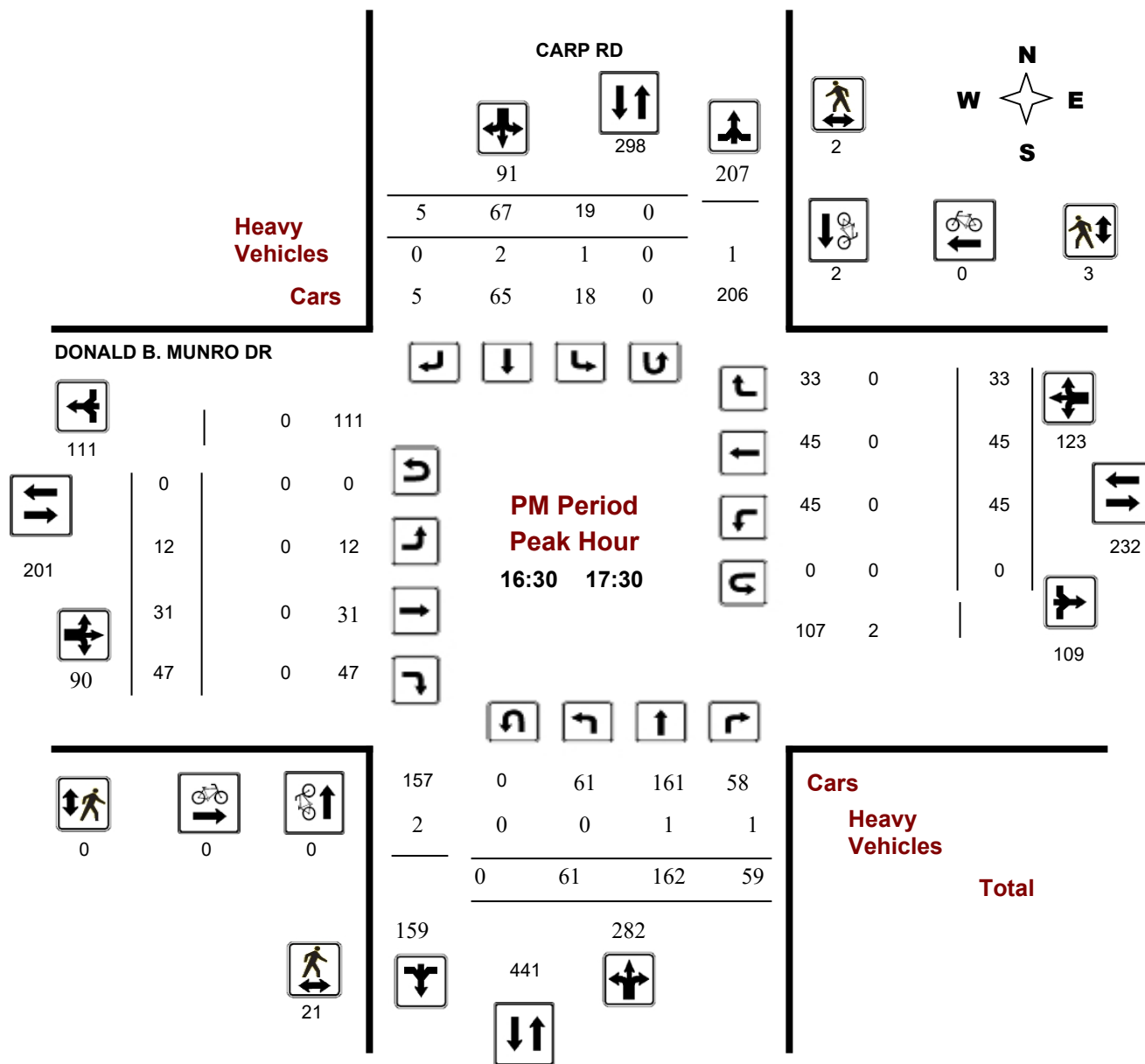
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Survey Date: Tuesday, April 02, 2019

Start Time: 07:00

WO No: 38471

Device: Miovision



Comments

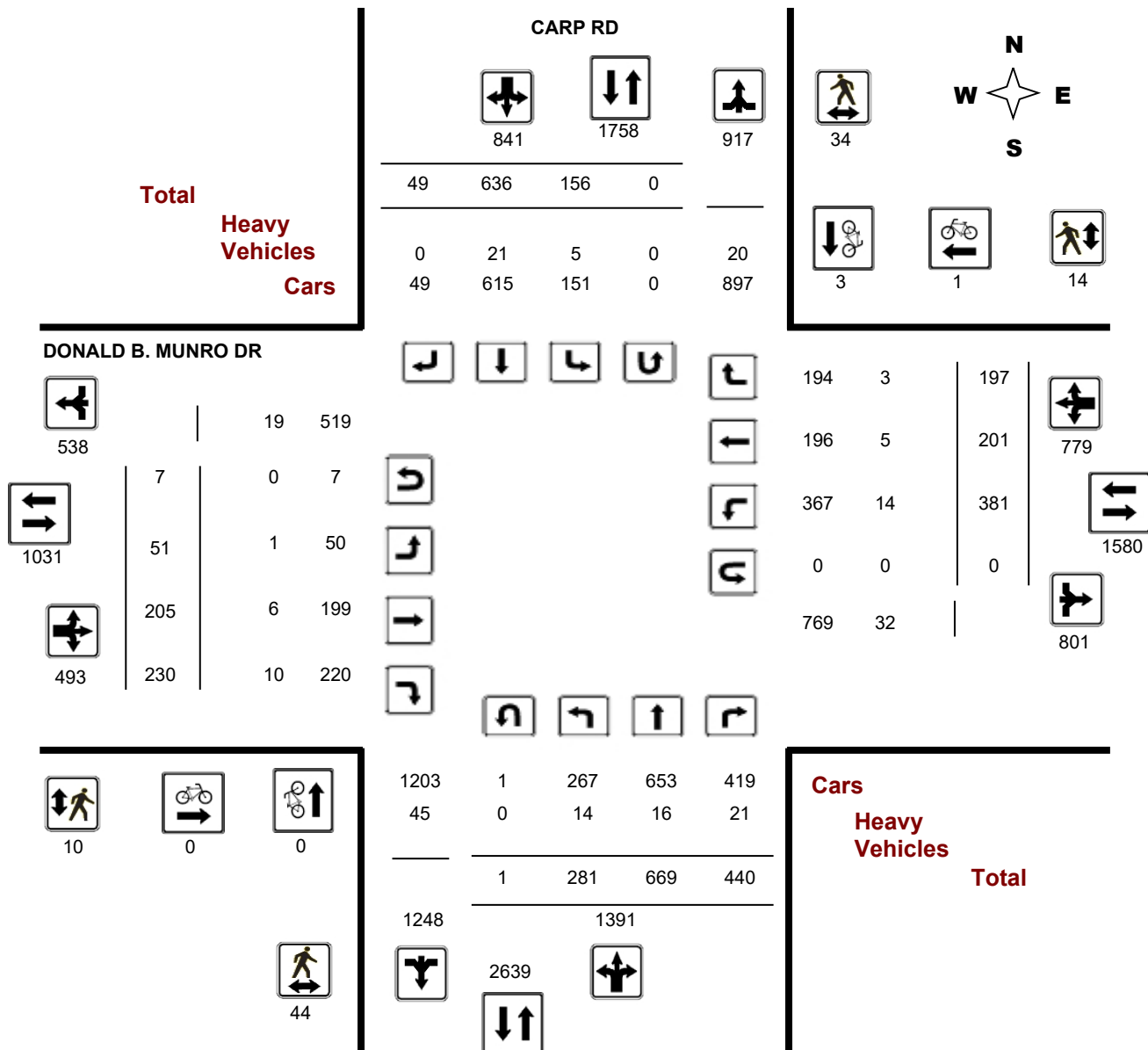
Transportation Services - Traffic Services

Turning Movement Count - Full Study Diagram

CARP RD @ DONALD B. MUNRO DR

Survey Date: Tuesday, April 02, 2019

WO#: 38471
Device: Miovision



Comments

Turning Movement Count - AM Period Diagram

CARP RD @ JUANITA AVE

Survey Date: Tuesday, April 02, 2019

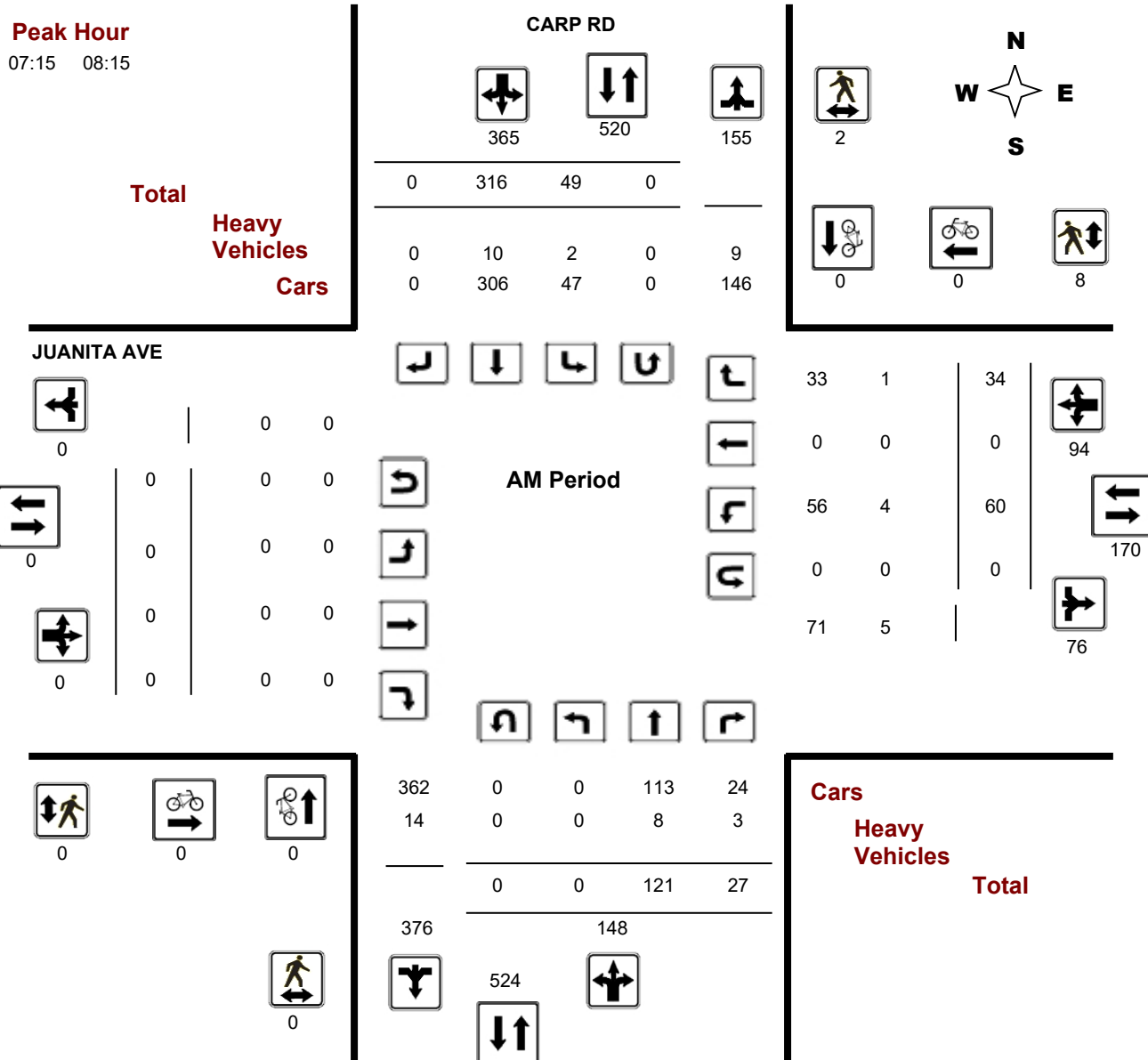
Start Time: 07:00

WO#: 38472

Device: Miovision

Peak Hour

07:15 08:15



Turning Movement Count - Full Study Diagram

CARP RD @ JUANITA AVE

Survey Date: Tuesday, April 02, 2019

Start Time: 07:00

WO#: 38472

Device: Miovision

Peak Hour

16:30 17:30

Total

Heavy Vehicles

Cars

CARP RD



776



1623

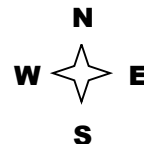


847

| | | | | |
|---|-----|----|---|-----|
| 0 | 677 | 99 | 0 | |
| 0 | 19 | 3 | 0 | 14 |
| 0 | 658 | 96 | 0 | 833 |



2



1



5



23

JUANITA AVE



0



0



0

0 0

0 0

0 0

0 0

0 0



126 1

0 0

132 6

0 0

224 7

127

0

138

0



265



496



231

Full Study



| | | | | |
|-----|---|-----|-----|-----|
| 791 | 1 | 0 | 707 | 128 |
| 25 | 0 | 0 | 13 | 4 |
| 1 | 0 | 720 | 132 | |

816

853



1669



0



0



2



1

Cars

Heavy Vehicles

Total

Comments :

Turning Movement Count - MD Period Diagram

CARP RD @ JUANITA AVE

Survey Date: Tuesday, April 02, 2019

Start Time: 07:00

WO#: 38472

Device: Miovision

Peak Hour

12:30 13:30

Total

Heavy Vehicles

Cars

CARP RD



157



321

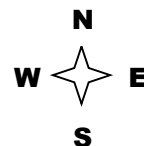


164

| | | | | |
|---|-----|----|---|-----|
| 0 | 141 | 16 | 0 | |
| 0 | 4 | 1 | 0 | 1 |
| 0 | 137 | 15 | 0 | 163 |



0



0



3



4

JUANITA AVE



0



0



0

0 0

0 0

0 0

0 0

0 0

0 0



25 0

0 0

36 1

0 0

43 1

25

0

37

0



62



106



44

MD Period



| | | | | |
|-----|---|-----|-----|----|
| 174 | 1 | 0 | 138 | 28 |
| 5 | 0 | 0 | 1 | 0 |
| 1 | 0 | 139 | 28 | |

179

168



347



Cars

Heavy Vehicles

Total

Comments :

Turning Movement Count - PM Period Diagram

CARP RD @ JUANITA AVE

Survey Date: Tuesday, April 02, 2019

Start Time: 07:00

WO#: 38472

Device: Miovision

Peak Hour

16:30 17:30

Total

Heavy Vehicles

Cars

CARP RD



254



782

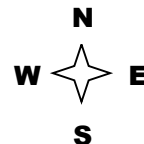


528

| | | | | |
|---|-----|----|---|-----|
| 0 | 220 | 34 | 0 | |
| 0 | 5 | 0 | 0 | 4 |
| 0 | 215 | 34 | 0 | 524 |



0



1



2



11

JUANITA AVE



0



0



0

0 0

0 0

0 0

0 0

0 0



68 0

0 0

40 1

0 0

110 1

68

0

41

0



109



220



111

PM Period



| | | | | |
|-----|---|-----|-----|----|
| 255 | 0 | 0 | 456 | 76 |
| 6 | 0 | 0 | 4 | 1 |
| 0 | 0 | 460 | 77 | |

261

537



798



Comments :

Cars

Heavy Vehicles

Total

Transportation Services - Traffic Services

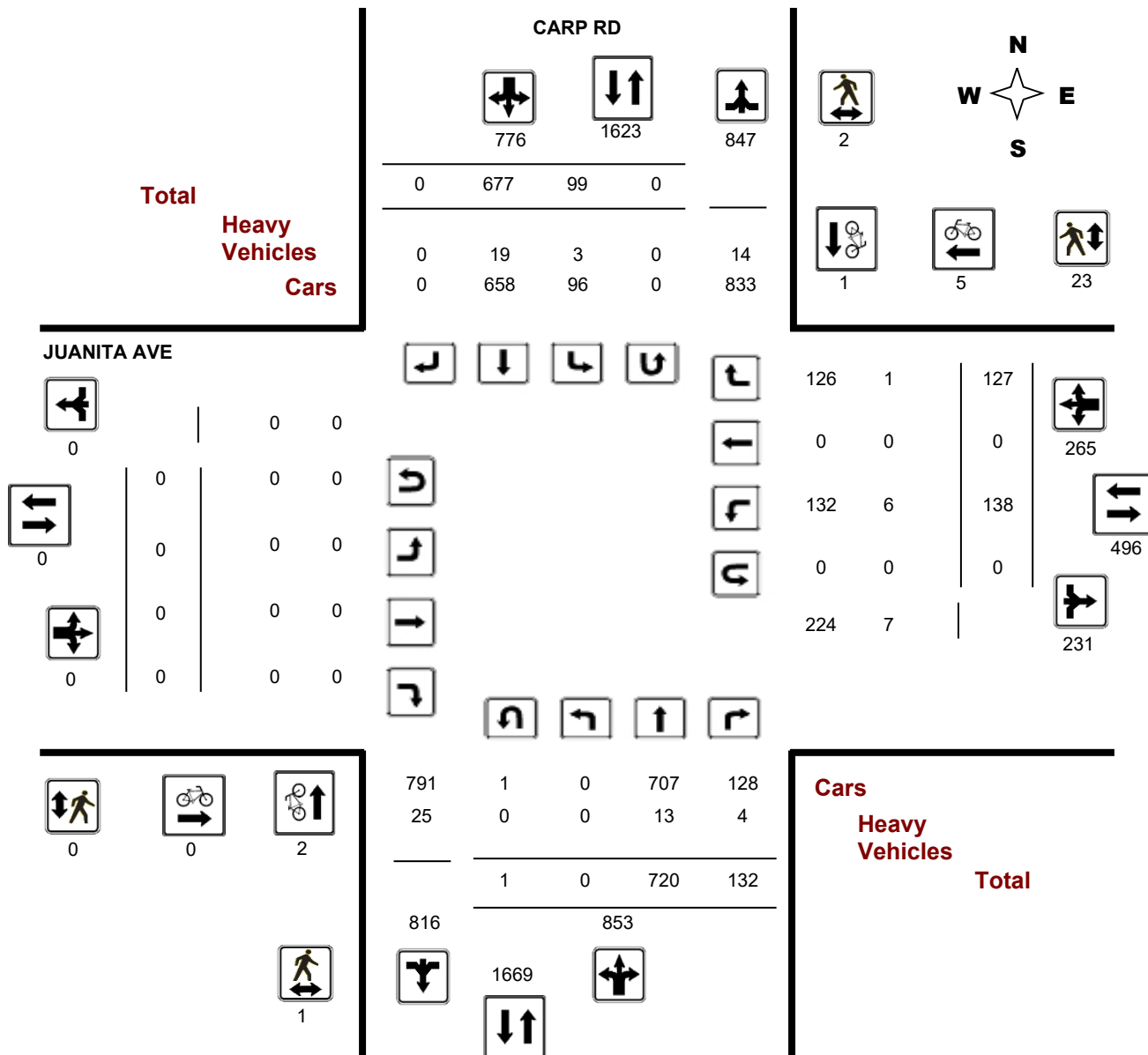
Turning Movement Count - Full Study Diagram

CARP RD @ JUANITA AVE

Survey Date: Tuesday, April 02, 2019

WO#: 38472

Device: Miovision

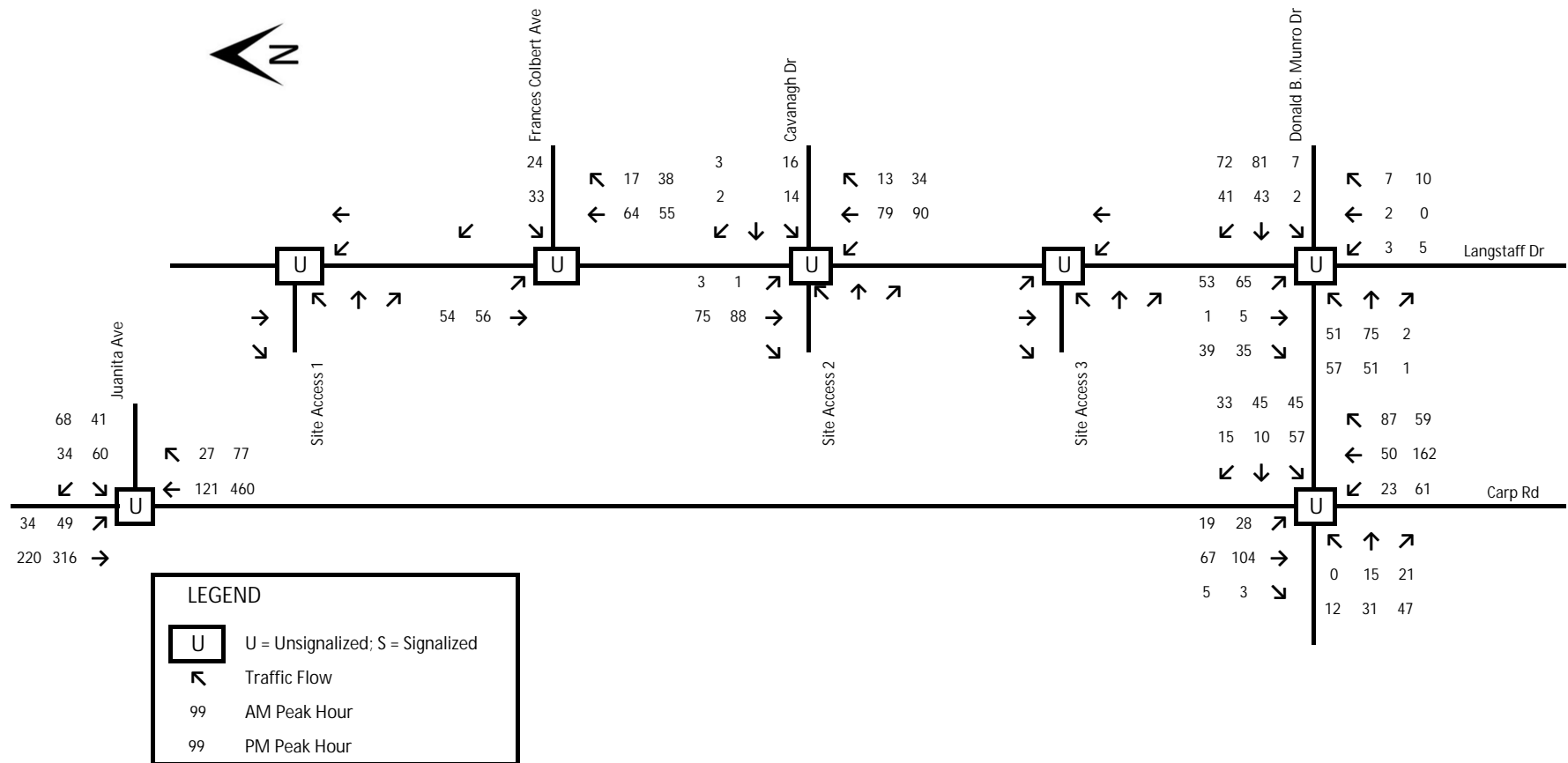


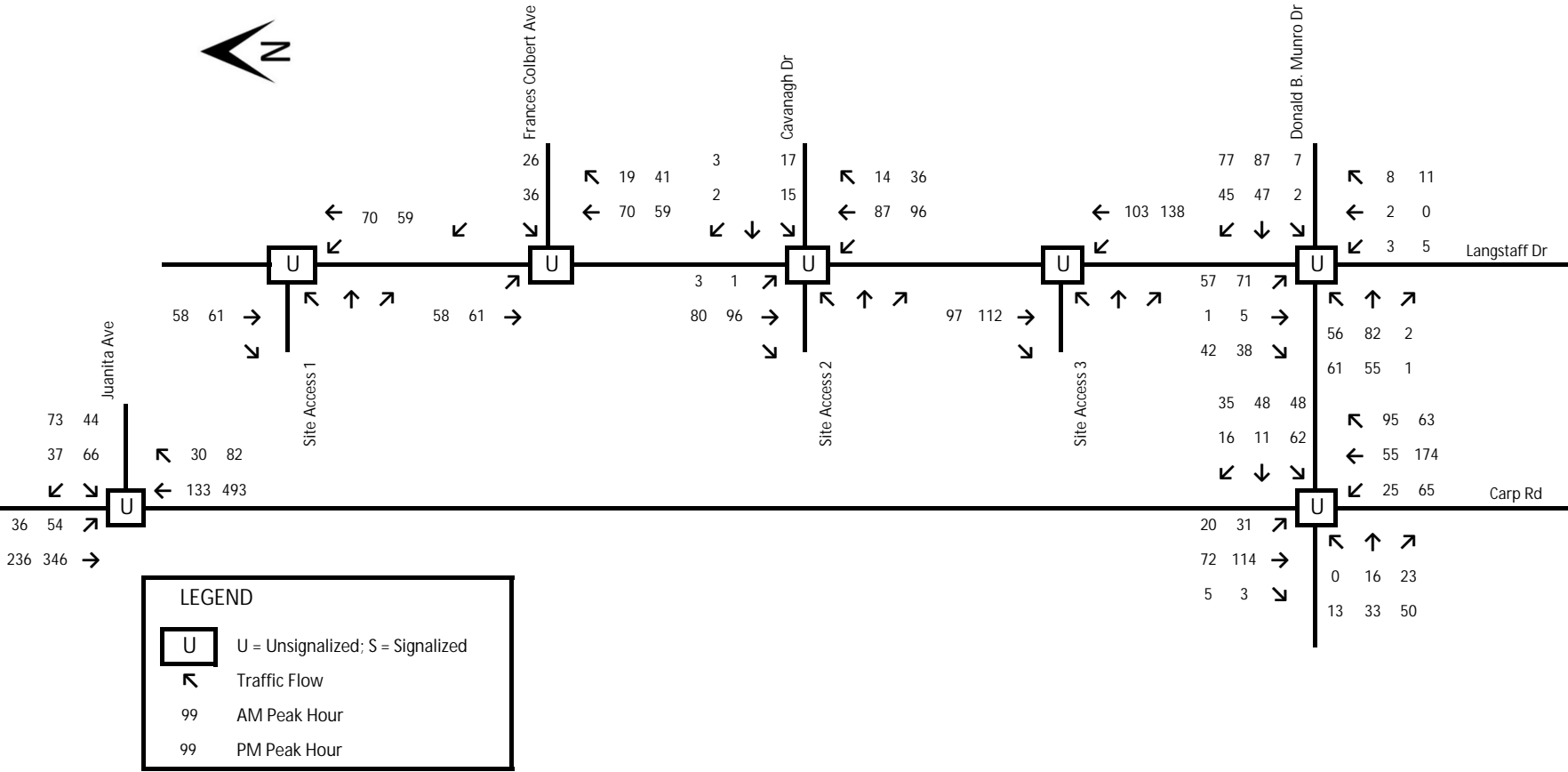
Comments

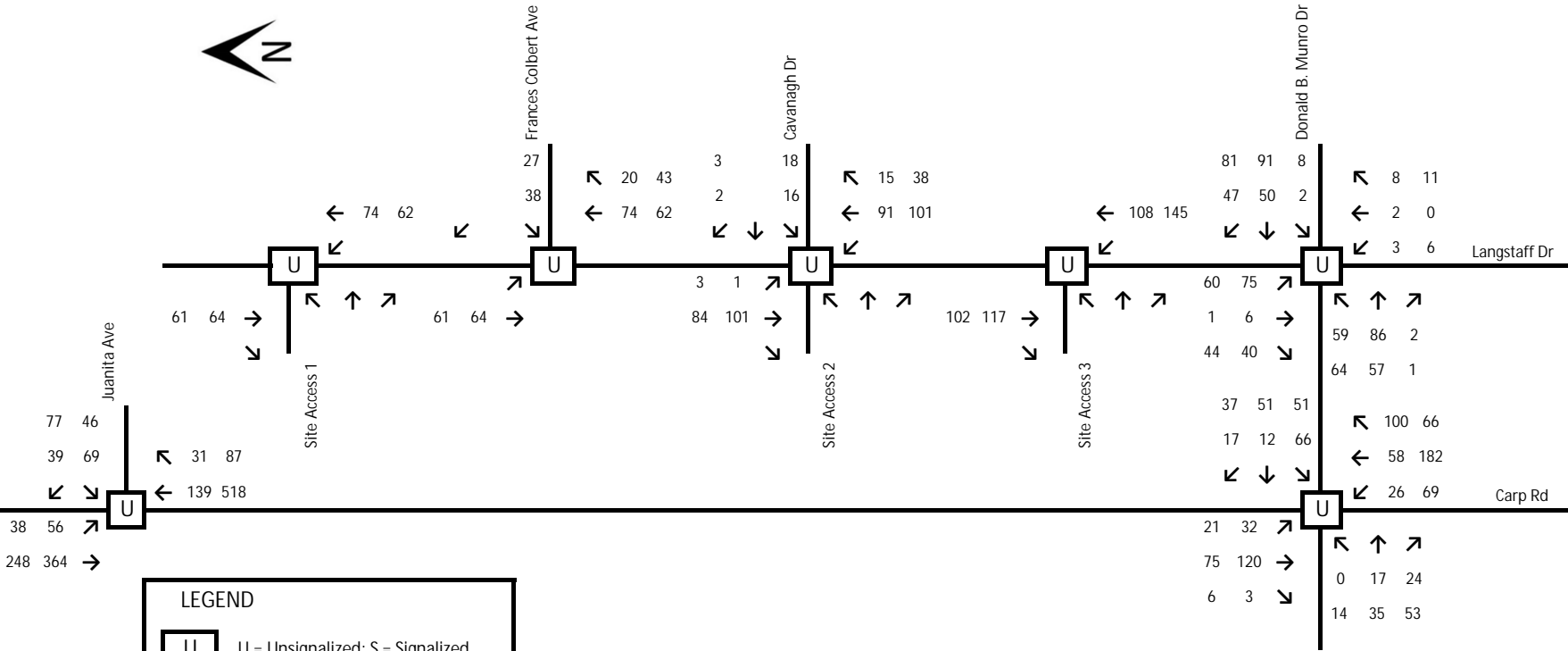
TIA ANALYSIS REPORT: RESIDENTIAL DEVELOPMENT AT 147 LANGSTAFF ROAD

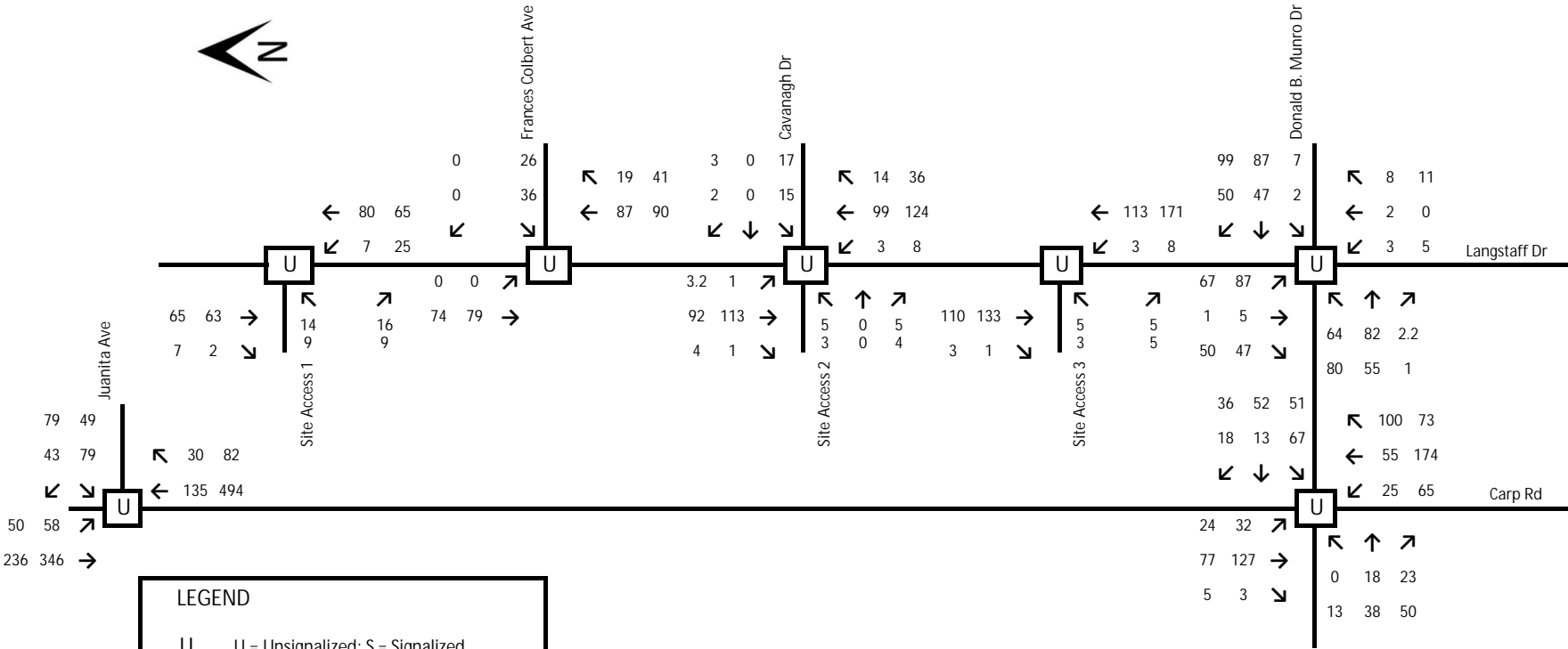


APPENDIX D – TRAFFIC VOLUME FIGURES









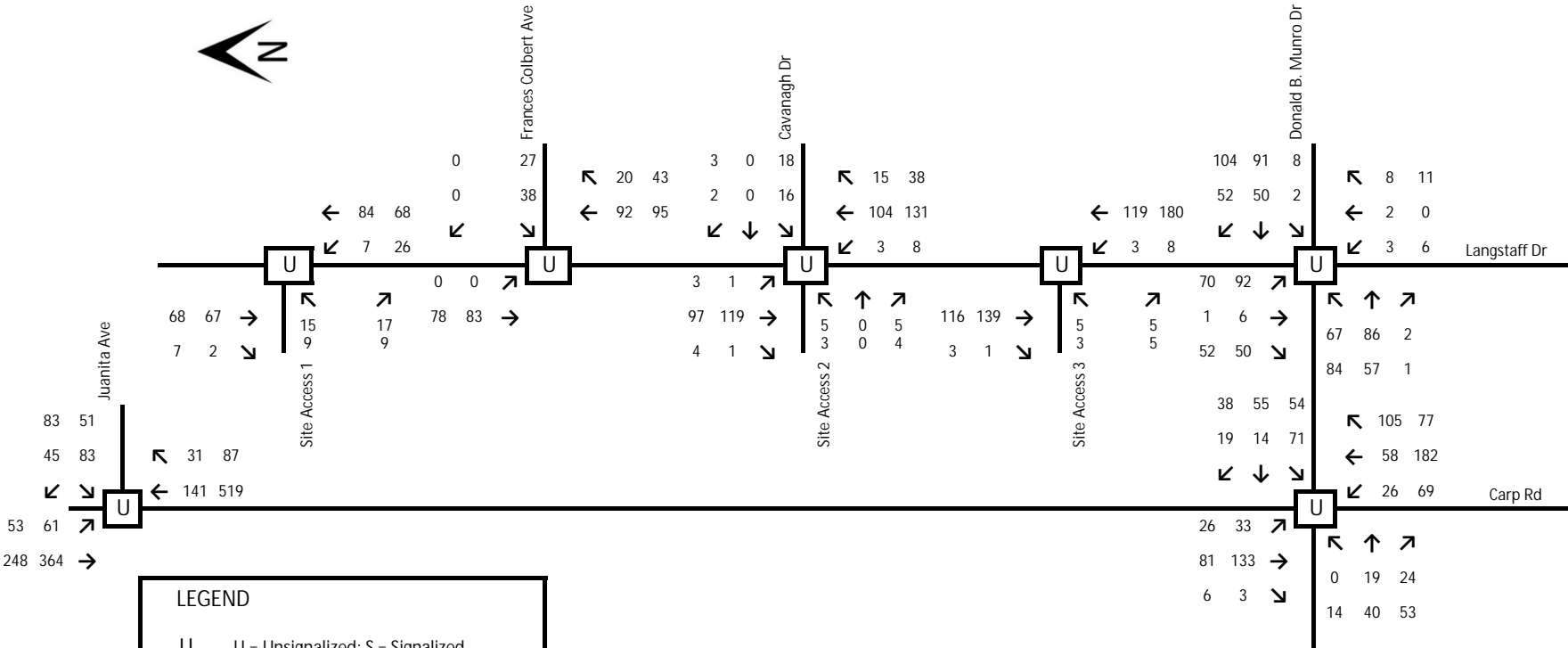
LEGEND

U U = Unsignalized; S = Signalized

↖ Traffic Flow

99 AM Peak Hour

99 PM Peak Hour



TIA ANALYSIS REPORT: RESIDENTIAL DEVELOPMENT AT 147 LANGSTAFF ROAD



















APPENDIX E – SYNCHRO REPORTS

HCM Unsignalized Intersection Capacity Analysis

2: Deugo St & Donald B. Munro Dr & Langstaff Dr

Background Traffic 2023

AM Peak










| | | | | | | | | | | | | |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | SBL2 | SBL | SBR | NWL | NWR | NWR2 |
| Lane Configurations | |  | | |  | | |  | | | |  |
| Sign Control | | Stop | | | Stop | | | Stop | | Stop | | |
| Traffic Volume (vph) | 56 | 82 | 2 | 2 | 47 | 45 | 71 | 5 | 38 | 3 | 2 | 8 |
| Future Volume (vph) | 56 | 82 | 2 | 2 | 47 | 45 | 71 | 5 | 38 | 3 | 2 | 8 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 61 | 89 | 2 | 2 | 51 | 49 | 77 | 5 | 41 | 3 | 2 | 9 |
| Direction, Lane # | EB 1 | WB 1 | SB 1 | NW 1 | | | | | | | | |
| Volume Total (vph) | 152 | 102 | 123 | 14 | | | | | | | | |
| Volume Left (vph) | 61 | 2 | 77 | 3 | | | | | | | | |
| Volume Right (vph) | 2 | 49 | 41 | 9 | | | | | | | | |
| Hadj (s) | 0.11 | -0.25 | -0.04 | -0.31 | | | | | | | | |
| Departure Headway (s) | 4.4 | 4.1 | 4.4 | 4.3 | | | | | | | | |
| Degree Utilization, x | 0.19 | 0.12 | 0.15 | 0.02 | | | | | | | | |
| Capacity (veh/h) | 783 | 824 | 758 | 772 | | | | | | | | |
| Control Delay (s) | 8.5 | 7.7 | 8.2 | 7.4 | | | | | | | | |
| Approach Delay (s) | 8.5 | 7.7 | 8.2 | 7.4 | | | | | | | | |
| Approach LOS | A | A | A | A | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Delay | | | 8.2 | | | | | | | | | |
| Level of Service | | | A | | | | | | | | | |
| Intersection Capacity Utilization | | | Err% | ICU Level of Service | | | | | H | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

3: Langstaff Dr & Frances Colbert Ave

Background Traffic 2023

AM Peak










| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | WBL | WBR | SEL | SET | NWT | NWR |
| Lane Configurations |  | | |  |  | |
| Traffic Volume (veh/h) | 36 | 0 | 0 | 61 | 70 | 19 |
| Future Volume (Veh/h) | 36 | 0 | 0 | 61 | 70 | 19 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 39 | 0 | 0 | 66 | 76 | 21 |
| 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 | 152 | 86 | 97 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 152 | 86 | 97 | | | |
| tC, single (s) | 6.4 | 6.2 | 4.1 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 95 | 100 | 100 | | | |
| cM capacity (veh/h) | 839 | 972 | 1496 | | | |
| Direction, Lane # | WB 1 | SE 1 | NW 1 | | | |
| Volume Total | 39 | 66 | 97 | | | |
| Volume Left | 39 | 0 | 0 | | | |
| Volume Right | 0 | 0 | 21 | | | |
| cSH | 839 | 1496 | 1700 | | | |
| Volume to Capacity | 0.05 | 0.00 | 0.06 | | | |
| Queue Length 95th (m) | 1.2 | 0.0 | 0.0 | | | |
| Control Delay (s) | 9.5 | 0.0 | 0.0 | | | |
| Lane LOS | A | | | | | |
| Approach Delay (s) | 9.5 | 0.0 | 0.0 | | | |
| Approach LOS | A | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | 1.8 | | | | |
| Intersection Capacity Utilization | | 14.8% | | ICU Level of Service | | A |
| Analysis Period (min) | | 15 | | | | |

HCM Unsignalized Intersection Capacity Analysis

5: Langstaff Dr & Cavanagh Dr

Background Traffic 2023

AM Peak

















| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | WBL | WBR | SEL | SET | NWT | NWR |
| Lane Configurations |  | | |  |  | |
| Traffic Volume (veh/h) | 15 | 2 | 1 | 96 | 87 | 14 |
| Future Volume (Veh/h) | 15 | 2 | 1 | 96 | 87 | 14 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 16 | 2 | 1 | 104 | 95 | 15 |
| 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 | 208 | 102 | 110 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 208 | 102 | 110 | | | |
| tC, single (s) | 6.4 | 6.2 | 4.1 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 98 | 100 | 100 | | | |
| cM capacity (veh/h) | 779 | 953 | 1480 | | | |
| Direction, Lane # | WB 1 | SE 1 | NW 1 | | | |
| Volume Total | 18 | 105 | 110 | | | |
| Volume Left | 16 | 1 | 0 | | | |
| Volume Right | 2 | 0 | 15 | | | |
| cSH | 795 | 1480 | 1700 | | | |
| Volume to Capacity | 0.02 | 0.00 | 0.06 | | | |
| Queue Length 95th (m) | 0.6 | 0.0 | 0.0 | | | |
| Control Delay (s) | 9.6 | 0.1 | 0.0 | | | |
| Lane LOS | A | A | | | | |
| Approach Delay (s) | 9.6 | 0.1 | 0.0 | | | |
| Approach LOS | A | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | 0.8 | | | | |
| Intersection Capacity Utilization | | 15.8% | | ICU Level of Service | | A |
| Analysis Period (min) | | 15 | | | | |

HCM Unsignalized Intersection Capacity Analysis

10: Carp Rd & Donald B. Munro Dr

Background Traffic 2023

AM Peak










| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | SEL | SET | SER | NWL | NWT | NWR |
| Lane Configurations | |  | | |  | | |  | | |  | |
| Sign Control | | Stop | | | Stop | | | Stop | | | Stop | |
| Traffic Volume (vph) | 0 | 16 | 23 | 62 | 11 | 16 | 31 | 114 | 3 | 25 | 55 | 95 |
| Future Volume (vph) | 0 | 16 | 23 | 62 | 11 | 16 | 31 | 114 | 3 | 25 | 55 | 95 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 0 | 17 | 25 | 67 | 12 | 17 | 34 | 124 | 3 | 27 | 60 | 103 |
| Direction, Lane # | EB 1 | WB 1 | SE 1 | NW 1 | | | | | | | | |
| Volume Total (vph) | 42 | 96 | 161 | 190 | | | | | | | | |
| Volume Left (vph) | 0 | 67 | 34 | 27 | | | | | | | | |
| Volume Right (vph) | 25 | 17 | 3 | 103 | | | | | | | | |
| Hadj (s) | -0.32 | 0.07 | 0.07 | -0.26 | | | | | | | | |
| Departure Headway (s) | 4.5 | 4.8 | 4.5 | 4.2 | | | | | | | | |
| Degree Utilization, x | 0.05 | 0.13 | 0.20 | 0.22 | | | | | | | | |
| Capacity (veh/h) | 726 | 691 | 760 | 828 | | | | | | | | |
| Control Delay (s) | 7.7 | 8.5 | 8.6 | 8.3 | | | | | | | | |
| Approach Delay (s) | 7.7 | 8.5 | 8.6 | 8.3 | | | | | | | | |
| Approach LOS | A | A | A | A | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Delay | | | | 8.4 | | | | | | | | |
| Level of Service | | | | A | | | | | | | | |
| Intersection Capacity Utilization | | | | 30.5% | ICU Level of Service | A | | | | | | |
| Analysis Period (min) | | | | 15 | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

Background Traffic 2023

15:

AM Peak

















| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | SEL | SET | NWT | NWR | SWL | SWR |
| Lane Configurations | |  |  | |  | |
| Traffic Volume (veh/h) | 54 | 346 | 133 | 30 | 66 | 37 |
| Future Volume (Veh/h) | 54 | 346 | 133 | 30 | 66 | 37 |
| Sign Control | | Free | Free | | Stop | |
| Grade | | 0% | 0% | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 59 | 376 | 145 | 33 | 72 | 40 |
| 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 | 178 | | | | 656 | 162 |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 178 | | | | 656 | 162 |
| tC, single (s) | 4.1 | | | | 6.4 | 6.2 |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 2.2 | | | | 3.5 | 3.3 |
| p0 queue free % | 96 | | | | 83 | 95 |
| cM capacity (veh/h) | 1398 | | | | 412 | 883 |
| Direction, Lane # | SE 1 | NW 1 | SW 1 | | | |
| Volume Total | 435 | 178 | 112 | | | |
| Volume Left | 59 | 0 | 72 | | | |
| Volume Right | 0 | 33 | 40 | | | |
| cSH | 1398 | 1700 | 509 | | | |
| Volume to Capacity | 0.04 | 0.10 | 0.22 | | | |
| Queue Length 95th (m) | 1.1 | 0.0 | 6.7 | | | |
| Control Delay (s) | 1.4 | 0.0 | 14.0 | | | |
| Lane LOS | A | | B | | | |
| Approach Delay (s) | 1.4 | 0.0 | 14.0 | | | |
| Approach LOS | | | B | | | |
| Intersection Summary | | | | | | |
| Average Delay | | 3.0 | | | | |
| Intersection Capacity Utilization | | 45.9% | ICU Level of Service | A | | |
| Analysis Period (min) | | 15 | | | | |

HCM Unsignalized Intersection Capacity Analysis

2: Deugo St & Donald B. Munro Dr & Langstaff Dr

Background Traffic 2023

PM Peak










| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | SBL2 | SBL | SBR | NWL | NWR | NWR2 |
| Lane Configurations | |  | | |  | | |  | | | |  |
| Sign Control | | Stop | | | Stop | | | Stop | | Stop | | |
| Traffic Volume (vph) | 61 | 55 | 1 | 7 | 87 | 77 | 57 | 1 | 42 | 5 | 0 | 11 |
| Future Volume (vph) | 61 | 55 | 1 | 7 | 87 | 77 | 57 | 1 | 42 | 5 | 0 | 11 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 66 | 60 | 1 | 8 | 95 | 84 | 62 | 1 | 46 | 5 | 0 | 12 |
| Direction, Lane # | EB 1 | WB 1 | SB 1 | NW 1 | | | | | | | | |
| Volume Total (vph) | 127 | 187 | 109 | 17 | | | | | | | | |
| Volume Left (vph) | 66 | 8 | 62 | 5 | | | | | | | | |
| Volume Right (vph) | 1 | 84 | 46 | 12 | | | | | | | | |
| Hadj (s) | 0.13 | -0.23 | -0.11 | -0.33 | | | | | | | | |
| Departure Headway (s) | 4.5 | 4.1 | 4.5 | 4.4 | | | | | | | | |
| Degree Utilization, x | 0.16 | 0.21 | 0.14 | 0.02 | | | | | | | | |
| Capacity (veh/h) | 766 | 835 | 739 | 748 | | | | | | | | |
| Control Delay (s) | 8.4 | 8.2 | 8.2 | 7.5 | | | | | | | | |
| Approach Delay (s) | 8.4 | 8.2 | 8.2 | 7.5 | | | | | | | | |
| Approach LOS | A | A | A | A | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Delay | | | 8.2 | | | | | | | | | |
| Level of Service | | | A | | | | | | | | | |
| Intersection Capacity Utilization | | | Err% | ICU Level of Service | H | | | | | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

3: Langstaff Dr & Frances Colbert Ave

Background Traffic 2023

PM Peak










| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | WBL | WBR | SEL | SET | NWT | NWR |
| Lane Configurations |  | | |  |  | |
| Traffic Volume (veh/h) | 26 | 0 | 0 | 58 | 59 | 41 |
| Future Volume (Veh/h) | 26 | 0 | 0 | 58 | 59 | 41 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 28 | 0 | 0 | 63 | 64 | 45 |
| 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 | 150 | 86 | 109 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 150 | 86 | 109 | | | |
| tC, single (s) | 6.4 | 6.2 | 4.1 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 97 | 100 | 100 | | | |
| cM capacity (veh/h) | 842 | 972 | 1481 | | | |
| Direction, Lane # | WB 1 | SE 1 | NW 1 | | | |
| Volume Total | 28 | 63 | 109 | | | |
| Volume Left | 28 | 0 | 0 | | | |
| Volume Right | 0 | 0 | 45 | | | |
| cSH | 842 | 1481 | 1700 | | | |
| Volume to Capacity | 0.03 | 0.00 | 0.06 | | | |
| Queue Length 95th (m) | 0.8 | 0.0 | 0.0 | | | |
| Control Delay (s) | 9.4 | 0.0 | 0.0 | | | |
| Lane LOS | A | | | | | |
| Approach Delay (s) | 9.4 | 0.0 | 0.0 | | | |
| Approach LOS | A | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | 1.3 | | | | |
| Intersection Capacity Utilization | | 15.6% | | ICU Level of Service | | A |
| Analysis Period (min) | | 15 | | | | |

HCM Unsignalized Intersection Capacity Analysis

5: Langstaff Dr & Cavanagh Dr

Background Traffic 2023

PM Peak

















| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | WBL | WBR | SEL | SET | NWT | NWR |
| Lane Configurations |  | | |  |  | |
| Traffic Volume (veh/h) | 17 | 3 | 3 | 80 | 96 | 36 |
| Future Volume (Veh/h) | 17 | 3 | 3 | 80 | 96 | 36 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 18 | 3 | 3 | 87 | 104 | 39 |
| Pedestrians | | | | | | |
| Lane Width (m) | | | | | | |
| Walking Speed (m/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | | None | None | |
| Median storage (veh) | | | | | | |
| Upstream signal (m) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 216 | 124 | 143 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 216 | 124 | 143 | | | |
| tC, single (s) | 6.4 | 6.2 | 4.1 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 98 | 100 | 100 | | | |
| cM capacity (veh/h) | 770 | 927 | 1440 | | | |
| Direction, Lane # | WB 1 | SE 1 | NW 1 | | | |
| Volume Total | 21 | 90 | 143 | | | |
| Volume Left | 18 | 3 | 0 | | | |
| Volume Right | 3 | 0 | 39 | | | |
| cSH | 789 | 1440 | 1700 | | | |
| Volume to Capacity | 0.03 | 0.00 | 0.08 | | | |
| Queue Length 95th (m) | 0.7 | 0.1 | 0.0 | | | |
| Control Delay (s) | 9.7 | 0.3 | 0.0 | | | |
| Lane LOS | A | A | | | | |
| Approach Delay (s) | 9.7 | 0.3 | 0.0 | | | |
| Approach LOS | A | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | 0.9 | | | | |
| Intersection Capacity Utilization | | 17.2% | | ICU Level of Service | | A |
| Analysis Period (min) | | 15 | | | | |

HCM Unsignalized Intersection Capacity Analysis

10: Carp Rd & Donald B. Munro Dr

Background Traffic 2023

PM Peak










| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | SEL | SET | SER | NWL | NWT | NWR |
| Lane Configurations | |  | | |  | | |  | | |  | |
| Sign Control | | Stop | | | Stop | | | Stop | | | Stop | |
| Traffic Volume (vph) | 13 | 33 | 50 | 48 | 48 | 35 | 20 | 72 | 5 | 65 | 174 | 63 |
| Future Volume (vph) | 13 | 33 | 50 | 48 | 48 | 35 | 20 | 72 | 5 | 65 | 174 | 63 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 14 | 36 | 54 | 52 | 52 | 38 | 22 | 78 | 5 | 71 | 189 | 68 |
| Direction, Lane # | EB 1 | WB 1 | SE 1 | NW 1 | | | | | | | | |
| Volume Total (vph) | 104 | 142 | 105 | 328 | | | | | | | | |
| Volume Left (vph) | 14 | 52 | 22 | 71 | | | | | | | | |
| Volume Right (vph) | 54 | 38 | 5 | 68 | | | | | | | | |
| Hadj (s) | -0.25 | -0.05 | 0.05 | -0.05 | | | | | | | | |
| Departure Headway (s) | 4.9 | 5.1 | 5.0 | 4.6 | | | | | | | | |
| Degree Utilization, x | 0.14 | 0.20 | 0.15 | 0.42 | | | | | | | | |
| Capacity (veh/h) | 657 | 648 | 663 | 744 | | | | | | | | |
| Control Delay (s) | 8.7 | 9.3 | 8.9 | 11.0 | | | | | | | | |
| Approach Delay (s) | 8.7 | 9.3 | 8.9 | 11.0 | | | | | | | | |
| Approach LOS | A | A | A | B | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Delay | | | | 10.0 | | | | | | | | |
| Level of Service | | | | A | | | | | | | | |
| Intersection Capacity Utilization | | | | 43.2% | ICU Level of Service | A | | | | | | |
| Analysis Period (min) | | | | 15 | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

Background Traffic 2023

15:

















PM Peak

| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | SEL | SET | NWT | NWR | SWL | SWR |
| Lane Configurations | |  |  | |  | |
| Traffic Volume (veh/h) | 36 | 236 | 493 | 82 | 44 | 73 |
| Future Volume (Veh/h) | 36 | 236 | 493 | 82 | 44 | 73 |
| Sign Control | | Free | Free | | Stop | |
| Grade | | 0% | 0% | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 39 | 257 | 536 | 89 | 48 | 79 |
| 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 | 625 | | | | 916 | 580 |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 625 | | | | 916 | 580 |
| tC, single (s) | 4.1 | | | | 6.4 | 6.2 |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 2.2 | | | | 3.5 | 3.3 |
| p0 queue free % | 96 | | | | 83 | 85 |
| cM capacity (veh/h) | 956 | | | | 290 | 514 |
| Direction, Lane # | SE 1 | NW 1 | SW 1 | | | |
| Volume Total | 296 | 625 | 127 | | | |
| Volume Left | 39 | 0 | 48 | | | |
| Volume Right | 0 | 89 | 79 | | | |
| cSH | 956 | 1700 | 398 | | | |
| Volume to Capacity | 0.04 | 0.37 | 0.32 | | | |
| Queue Length 95th (m) | 1.0 | 0.0 | 10.8 | | | |
| Control Delay (s) | 1.5 | 0.0 | 18.2 | | | |
| Lane LOS | A | | C | | | |
| Approach Delay (s) | 1.5 | 0.0 | 18.2 | | | |
| Approach LOS | | | C | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 2.6 | | | |
| Intersection Capacity Utilization | | 56.4% | | ICU Level of Service | | B |
| Analysis Period (min) | | 15 | | | | |

HCM Unsignalized Intersection Capacity Analysis

2: Deugo St/Langstaff Dr & Donald B. Munro Dr










Total Traffic 2023
AM Peak

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | SEL | SET | SER | NWL | NWT | NWR |
| Lane Configurations | |  | | |  | | |  | | |  | |
| Sign Control | | Stop | | | Stop | | | Stop | | | Stop | |
| Traffic Volume (vph) | 64 | 82 | 2 | 2 | 47 | 50 | 87 | 5 | 47 | 3 | 2 | 8 |
| Future Volume (vph) | 64 | 82 | 2 | 2 | 47 | 50 | 87 | 5 | 47 | 3 | 2 | 8 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 70 | 89 | 2 | 2 | 51 | 54 | 95 | 5 | 51 | 3 | 2 | 9 |
| Direction, Lane # | EB 1 | WB 1 | SE 1 | NW 1 | | | | | | | | |
| Volume Total (vph) | 161 | 107 | 151 | 14 | | | | | | | | |
| Volume Left (vph) | 70 | 2 | 95 | 3 | | | | | | | | |
| Volume Right (vph) | 2 | 54 | 51 | 9 | | | | | | | | |
| Hadj (s) | 0.11 | -0.27 | -0.04 | -0.31 | | | | | | | | |
| Departure Headway (s) | 4.5 | 4.2 | 4.5 | 4.4 | | | | | | | | |
| Degree Utilization, x | 0.20 | 0.13 | 0.19 | 0.02 | | | | | | | | |
| Capacity (veh/h) | 765 | 805 | 752 | 755 | | | | | | | | |
| Control Delay (s) | 8.7 | 7.8 | 8.5 | 7.5 | | | | | | | | |
| Approach Delay (s) | 8.7 | 7.8 | 8.5 | 7.5 | | | | | | | | |
| Approach LOS | A | A | A | A | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Delay | | | 8.4 | | | | | | | | | |
| Level of Service | | | A | | | | | | | | | |
| Intersection Capacity Utilization | | | 35.9% | | ICU Level of Service | | A | | | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

3: Langstaff Dr & Frances Colbert Ave

Total Traffic 2023
AM Peak

















| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | WBL | WBR | SEL | SET | NWT | NWR |
| Lane Configurations |  | | |  |  | |
| Traffic Volume (veh/h) | 36 | 0 | 0 | 79 | 87 | 19 |
| Future Volume (Veh/h) | 36 | 0 | 0 | 79 | 87 | 19 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 39 | 0 | 0 | 86 | 95 | 21 |
| 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 | 192 | 106 | 116 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 192 | 106 | 116 | | | |
| tC, single (s) | 6.4 | 6.2 | 4.1 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 95 | 100 | 100 | | | |
| cM capacity (veh/h) | 797 | 949 | 1473 | | | |
| Direction, Lane # | WB 1 | SE 1 | NW 1 | | | |
| Volume Total | 39 | 86 | 116 | | | |
| Volume Left | 39 | 0 | 0 | | | |
| Volume Right | 0 | 0 | 21 | | | |
| cSH | 797 | 1473 | 1700 | | | |
| Volume to Capacity | 0.05 | 0.00 | 0.07 | | | |
| Queue Length 95th (m) | 1.2 | 0.0 | 0.0 | | | |
| Control Delay (s) | 9.7 | 0.0 | 0.0 | | | |
| Lane LOS | A | | | | | |
| Approach Delay (s) | 9.7 | 0.0 | 0.0 | | | |
| Approach LOS | A | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | 1.6 | | | | |
| Intersection Capacity Utilization | | 15.7% | | ICU Level of Service | | A |
| Analysis Period (min) | | 15 | | | | |

HCM Unsignalized Intersection Capacity Analysis

5: Langstaff Dr & Cavanagh Dr

















Total Traffic 2023

AM Peak

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | WBL2 | WBL | WBR | SEL | SET | SER | NWL | NWT | NWR | NEL | NER | NER2 |
| Lane Configurations | |  | | |  | | |  | |  | | |
| Traffic Volume (veh/h) | 15 | 0 | 2 | 1 | 113 | 1 | 3 | 99 | 14 | 5 | 0 | 5 |
| Future Volume (Veh/h) | 15 | 0 | 2 | 1 | 113 | 1 | 3 | 99 | 14 | 5 | 0 | 5 |
| Sign Control | | Stop | | | Free | | | Free | | Stop | | |
| Grade | | 0% | | | 0% | | | 0% | | 0% | | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 16 | 0 | 2 | 1 | 123 | 1 | 3 | 108 | 15 | 5 | 0 | 5 |
| Pedestrians | | | | | | | | | | | | |
| Lane Width (m) | | | | | | | | | | | | |
| Walking Speed (m/s) | | | | | | | | | | | | |
| Percent Blockage | | | | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | None | | | | | | None | | | | | |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (m) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 252 | 248 | 116 | 123 | | | 124 | | | 249 | 254 | 124 |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 252 | 248 | 116 | 123 | | | 124 | | | 249 | 254 | 124 |
| tC, single (s) | 7.1 | 6.5 | 6.2 | 4.1 | | | 4.1 | | | 7.1 | 6.5 | 6.2 |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 3.5 | 4.0 | 3.3 | 2.2 | | | 2.2 | | | 3.5 | 4.0 | 3.3 |
| p0 queue free % | 98 | 100 | 100 | 100 | | | 100 | | | 99 | 100 | 99 |
| cM capacity (veh/h) | 696 | 653 | 937 | 1464 | | | 1463 | | | 702 | 647 | 927 |
| Direction, Lane # | WB 1 | SE 1 | NW 1 | NE 1 | | | | | | | | |
| Volume Total | 18 | 125 | 126 | 10 | | | | | | | | |
| Volume Left | 16 | 1 | 3 | 5 | | | | | | | | |
| Volume Right | 2 | 1 | 15 | 5 | | | | | | | | |
| cSH | 717 | 1464 | 1463 | 799 | | | | | | | | |
| Volume to Capacity | 0.03 | 0.00 | 0.00 | 0.01 | | | | | | | | |
| Queue Length 95th (m) | 0.6 | 0.0 | 0.0 | 0.3 | | | | | | | | |
| Control Delay (s) | 10.2 | 0.1 | 0.2 | 9.6 | | | | | | | | |
| Lane LOS | B | A | A | A | | | | | | | | |
| Approach Delay (s) | 10.2 | 0.1 | 0.2 | 9.6 | | | | | | | | |
| Approach LOS | B | | | A | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | | 1.1 | | | | | | | | |
| Intersection Capacity Utilization | | | | 24.7% | ICU Level of Service | | | | A | | | |
| Analysis Period (min) | | | | 15 | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis 10: Carp Rd & Donald B. Munro Dr

Total Traffic 2023
AM Peak










| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | SEL | SET | SER | NWL | NWT | NWR |
| Lane Configurations | |  | | |  | | |  | | |  | |
| Sign Control | | Stop | | | Stop | | | Stop | | | Stop | |
| Traffic Volume (vph) | 0 | 18 | 23 | 67 | 13 | 18 | 32 | 127 | 3 | 25 | 55 | 100 |
| Future Volume (vph) | 0 | 18 | 23 | 67 | 13 | 18 | 32 | 127 | 3 | 25 | 55 | 100 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 0 | 20 | 25 | 73 | 14 | 20 | 35 | 138 | 3 | 27 | 60 | 109 |
| Direction, Lane # | EB 1 | WB 1 | SE 1 | NW 1 | | | | | | | | |
| Volume Total (vph) | 45 | 107 | 176 | 196 | | | | | | | | |
| Volume Left (vph) | 0 | 73 | 35 | 27 | | | | | | | | |
| Volume Right (vph) | 25 | 20 | 3 | 109 | | | | | | | | |
| Hadj (s) | -0.30 | 0.06 | 0.06 | -0.27 | | | | | | | | |
| Departure Headway (s) | 4.6 | 4.9 | 4.6 | 4.2 | | | | | | | | |
| Degree Utilization, x | 0.06 | 0.14 | 0.22 | 0.23 | | | | | | | | |
| Capacity (veh/h) | 708 | 682 | 751 | 816 | | | | | | | | |
| Control Delay (s) | 7.9 | 8.7 | 8.9 | 8.5 | | | | | | | | |
| Approach Delay (s) | 7.9 | 8.7 | 8.9 | 8.5 | | | | | | | | |
| Approach LOS | A | A | A | A | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Delay | | | 8.6 | | | | | | | | | |
| Level of Service | | | A | | | | | | | | | |
| Intersection Capacity Utilization | | | 31.9% | | ICU Level of Service | | | | A | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

Total Traffic 2023

14: Langstaff Dr










AM Peak

| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | SET | SER | NWL | NWT | NEL | NER |
| Lane Configurations |  | | |  |  | |
| Traffic Volume (veh/h) | 63 | 2 | 7 | 80 | 14 | 16 |
| Future Volume (Veh/h) | 63 | 2 | 7 | 80 | 14 | 16 |
| Sign Control | Free | | | Free | Stop | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 68 | 2 | 8 | 87 | 15 | 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) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | | | 70 | | 172 | 69 |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | | | 70 | | 172 | 69 |
| tC, single (s) | | | 4.1 | | 6.4 | 6.2 |
| tC, 2 stage (s) | | | | | | |
| tF (s) | | | 2.2 | | 3.5 | 3.3 |
| p0 queue free % | | | 99 | | 98 | 98 |
| cM capacity (veh/h) | | | 1531 | | 814 | 994 |
| Direction, Lane # | SE 1 | NW 1 | NE 1 | | | |
| Volume Total | 70 | 95 | 32 | | | |
| Volume Left | 0 | 8 | 15 | | | |
| Volume Right | 2 | 0 | 17 | | | |
| cSH | 1700 | 1531 | 901 | | | |
| Volume to Capacity | 0.04 | 0.01 | 0.04 | | | |
| Queue Length 95th (m) | 0.0 | 0.1 | 0.9 | | | |
| Control Delay (s) | 0.0 | 0.7 | 9.1 | | | |
| Lane LOS | | A | A | | | |
| Approach Delay (s) | 0.0 | 0.7 | 9.1 | | | |
| Approach LOS | | | A | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 1.8 | | | |
| Intersection Capacity Utilization | | 20.0% | | ICU Level of Service | | A |
| Analysis Period (min) | | | 15 | | | |

HCM Unsignalized Intersection Capacity Analysis

17: Langstaff Dr

Total Traffic 2023
AM Peak










| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | SET | SER | NWL | NWT | NEL | NER |
| Lane Configurations |  | | |  |  | |
| Traffic Volume (veh/h) | 133 | 1 | 3 | 113 | 5 | 5 |
| Future Volume (Veh/h) | 133 | 1 | 3 | 113 | 5 | 5 |
| Sign Control | Free | | | Free | Stop | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 145 | 1 | 3 | 123 | 5 | 5 |
| Pedestrians | | | | | | |
| Lane Width (m) | | | | | | |
| Walking Speed (m/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | None | | | None | | |
| Median storage (veh) | | | | | | |
| Upstream signal (m) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | | | 146 | | 274 | 146 |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | | | 146 | | 274 | 146 |
| tC, single (s) | | | 4.1 | | 6.4 | 6.2 |
| tC, 2 stage (s) | | | | | | |
| tF (s) | | | 2.2 | | 3.5 | 3.3 |
| p0 queue free % | | | 100 | | 99 | 99 |
| cM capacity (veh/h) | | | 1436 | | 714 | 902 |
| Direction, Lane # | SE 1 | NW 1 | NE 1 | | | |
| Volume Total | 146 | 126 | 10 | | | |
| Volume Left | 0 | 3 | 5 | | | |
| Volume Right | 1 | 0 | 5 | | | |
| cSH | 1700 | 1436 | 797 | | | |
| Volume to Capacity | 0.09 | 0.00 | 0.01 | | | |
| Queue Length 95th (m) | 0.0 | 0.1 | 0.3 | | | |
| Control Delay (s) | 0.0 | 0.2 | 9.6 | | | |
| Lane LOS | | A | A | | | |
| Approach Delay (s) | 0.0 | 0.2 | 9.6 | | | |
| Approach LOS | | | A | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 0.4 | | | |
| Intersection Capacity Utilization | | | 18.4% | ICU Level of Service | | A |
| Analysis Period (min) | | | 15 | | | |

HCM Unsignalized Intersection Capacity Analysis

Total Traffic 2023

20:

AM Peak










| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | SEL | SET | NWT | NWR | SWL | SWR |
| Lane Configurations | |  |  | |  | |
| Traffic Volume (veh/h) | 58 | 346 | 133 | 30 | 79 | 43 |
| Future Volume (Veh/h) | 58 | 346 | 133 | 30 | 79 | 43 |
| Sign Control | | Free | Free | | Stop | |
| Grade | | 0% | 0% | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 63 | 376 | 145 | 33 | 86 | 47 |
| 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 | 178 | | | | 664 | 162 |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 178 | | | | 664 | 162 |
| tC, single (s) | 4.1 | | | | 6.4 | 6.2 |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 2.2 | | | | 3.5 | 3.3 |
| p0 queue free % | 95 | | | | 79 | 95 |
| cM capacity (veh/h) | 1398 | | | | 407 | 883 |
| Direction, Lane # | SE 1 | NW 1 | SW 1 | | | |
| Volume Total | 439 | 178 | 133 | | | |
| Volume Left | 63 | 0 | 86 | | | |
| Volume Right | 0 | 33 | 47 | | | |
| cSH | 1398 | 1700 | 503 | | | |
| Volume to Capacity | 0.05 | 0.10 | 0.26 | | | |
| Queue Length 95th (m) | 1.1 | 0.0 | 8.4 | | | |
| Control Delay (s) | 1.5 | 0.0 | 14.7 | | | |
| Lane LOS | A | | B | | | |
| Approach Delay (s) | 1.5 | 0.0 | 14.7 | | | |
| Approach LOS | | | B | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 3.5 | | | |
| Intersection Capacity Utilization | | 47.2% | | ICU Level of Service | | A |
| Analysis Period (min) | | 15 | | | | |

HCM Unsignalized Intersection Capacity Analysis

Total Traffic 2023

20:

















PM Peak

| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | SEL | SET | NWT | NWR | SWL | SWR |
| Lane Configurations | |  |  | |  | |
| Traffic Volume (veh/h) | 50 | 236 | 493 | 82 | 49 | 79 |
| Future Volume (Veh/h) | 50 | 236 | 493 | 82 | 49 | 79 |
| Sign Control | | Free | Free | | Stop | |
| Grade | | 0% | 0% | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 54 | 257 | 536 | 89 | 53 | 86 |
| 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 | 625 | | | | 946 | 580 |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 625 | | | | 946 | 580 |
| tC, single (s) | 4.1 | | | | 6.4 | 6.2 |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 2.2 | | | | 3.5 | 3.3 |
| p0 queue free % | 94 | | | | 81 | 83 |
| cM capacity (veh/h) | 956 | | | | 274 | 514 |
| Direction, Lane # | SE 1 | NW 1 | SW 1 | | | |
| Volume Total | 311 | 625 | 139 | | | |
| Volume Left | 54 | 0 | 53 | | | |
| Volume Right | 0 | 89 | 86 | | | |
| cSH | 956 | 1700 | 385 | | | |
| Volume to Capacity | 0.06 | 0.37 | 0.36 | | | |
| Queue Length 95th (m) | 1.4 | 0.0 | 12.9 | | | |
| Control Delay (s) | 2.1 | 0.0 | 19.5 | | | |
| Lane LOS | A | | C | | | |
| Approach Delay (s) | 2.1 | 0.0 | 19.5 | | | |
| Approach LOS | | | C | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 3.1 | | | |
| Intersection Capacity Utilization | | | 63.7% | ICU Level of Service | | B |
| Analysis Period (min) | | | 15 | | | |

HCM Unsignalized Intersection Capacity Analysis 2: Deugo St & Donald B. Munro Dr & Langstaff Dr

Background Traffic 2028

AM Peak










| | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|--|--|--|--|--|--|--|--|
| |  |  |  |  |  |  |  |  |  |  |  |  | | | | | | | | |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | SBL2 | SBL | SBR | NWL | NWR | NWR2 | | | | | | | | |
| Lane Configurations | |  | | |  | | |  | | | |  | | | | | | | | |
| Sign Control | | Stop | | | Stop | | | Stop | | Stop | | | | | | | | | | |
| Traffic Volume (vph) | 59 | 86 | 2 | 2 | 50 | 47 | 75 | 6 | 40 | 3 | 2 | 8 | | | | | | | | |
| Future Volume (vph) | 59 | 86 | 2 | 2 | 50 | 47 | 75 | 6 | 40 | 3 | 2 | 8 | | | | | | | | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | | | | | | | | |
| Hourly flow rate (vph) | 64 | 93 | 2 | 2 | 54 | 51 | 82 | 7 | 43 | 3 | 2 | 9 | | | | | | | | |
| Direction, Lane # | EB 1 | WB 1 | SB 1 | NW 1 | | | | | | | | | | | | | | | | |
| Volume Total (vph) | 159 | 107 | 132 | 14 | | | | | | | | | | | | | | | | |
| Volume Left (vph) | 64 | 2 | 82 | 3 | | | | | | | | | | | | | | | | |
| Volume Right (vph) | 2 | 51 | 43 | 9 | | | | | | | | | | | | | | | | |
| Hadj (s) | 0.11 | -0.25 | -0.04 | -0.31 | | | | | | | | | | | | | | | | |
| Departure Headway (s) | 4.5 | 4.2 | 4.5 | 4.4 | | | | | | | | | | | | | | | | |
| Degree Utilization, x | 0.20 | 0.12 | 0.16 | 0.02 | | | | | | | | | | | | | | | | |
| Capacity (veh/h) | 777 | 815 | 752 | 762 | | | | | | | | | | | | | | | | |
| Control Delay (s) | 8.6 | 7.8 | 8.4 | 7.4 | | | | | | | | | | | | | | | | |
| Approach Delay (s) | 8.6 | 7.8 | 8.4 | 7.4 | | | | | | | | | | | | | | | | |
| Approach LOS | A | A | A | A | | | | | | | | | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | | | | | | | | | |
| Delay | | | 8.3 | | | | | | | | | | | | | | | | | |
| Level of Service | | | A | | | | | | | | | | | | | | | | | |
| Intersection Capacity Utilization | | | Err% | ICU Level of Service | | H | | | | | | | | | | | | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

3: Langstaff Dr & Frances Colbert Ave

Background Traffic 2028

AM Peak










| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | WBL | WBR | SEL | SET | NWT | NWR |
| Lane Configurations |  | | |  |  | |
| Traffic Volume (veh/h) | 38 | 0 | 0 | 64 | 74 | 20 |
| Future Volume (Veh/h) | 38 | 0 | 0 | 64 | 74 | 20 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 41 | 0 | 0 | 70 | 80 | 22 |
| Pedestrians | | | | | | |
| Lane Width (m) | | | | | | |
| Walking Speed (m/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | | None | None | |
| Median storage (veh) | | | | | | |
| Upstream signal (m) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 161 | 91 | 102 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 161 | 91 | 102 | | | |
| tC, single (s) | 6.4 | 6.2 | 4.1 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 95 | 100 | 100 | | | |
| cM capacity (veh/h) | 830 | 967 | 1490 | | | |
| Direction, Lane # | WB 1 | SE 1 | NW 1 | | | |
| Volume Total | 41 | 70 | 102 | | | |
| Volume Left | 41 | 0 | 0 | | | |
| Volume Right | 0 | 0 | 22 | | | |
| cSH | 830 | 1490 | 1700 | | | |
| Volume to Capacity | 0.05 | 0.00 | 0.06 | | | |
| Queue Length 95th (m) | 1.2 | 0.0 | 0.0 | | | |
| Control Delay (s) | 9.6 | 0.0 | 0.0 | | | |
| Lane LOS | A | | | | | |
| Approach Delay (s) | 9.6 | 0.0 | 0.0 | | | |
| Approach LOS | A | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | 1.8 | | | | |
| Intersection Capacity Utilization | | 15.1% | | ICU Level of Service | | A |
| Analysis Period (min) | | 15 | | | | |

HCM Unsignalized Intersection Capacity Analysis

5: Langstaff Dr & Cavanagh Dr

Background Traffic 2028

AM Peak

















| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | WBL | WBR | SEL | SET | NWT | NWR |
| Lane Configurations |  | | |  |  | |
| Traffic Volume (veh/h) | 16 | 2 | 1 | 101 | 91 | 15 |
| Future Volume (Veh/h) | 16 | 2 | 1 | 101 | 91 | 15 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 17 | 2 | 1 | 110 | 99 | 16 |
| Pedestrians | | | | | | |
| Lane Width (m) | | | | | | |
| Walking Speed (m/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | | None | None | |
| Median storage (veh) | | | | | | |
| Upstream signal (m) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 219 | 107 | 115 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 219 | 107 | 115 | | | |
| tC, single (s) | 6.4 | 6.2 | 4.1 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 98 | 100 | 100 | | | |
| cM capacity (veh/h) | 769 | 947 | 1474 | | | |
| Direction, Lane # | WB 1 | SE 1 | NW 1 | | | |
| Volume Total | 19 | 111 | 115 | | | |
| Volume Left | 17 | 1 | 0 | | | |
| Volume Right | 2 | 0 | 16 | | | |
| cSH | 784 | 1474 | 1700 | | | |
| Volume to Capacity | 0.02 | 0.00 | 0.07 | | | |
| Queue Length 95th (m) | 0.6 | 0.0 | 0.0 | | | |
| Control Delay (s) | 9.7 | 0.1 | 0.0 | | | |
| Lane LOS | A | A | | | | |
| Approach Delay (s) | 9.7 | 0.1 | 0.0 | | | |
| Approach LOS | A | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 0.8 | | | |
| Intersection Capacity Utilization | | 16.1% | | ICU Level of Service | | A |
| Analysis Period (min) | | 15 | | | | |

HCM Unsignalized Intersection Capacity Analysis

10: Carp Rd & Donald B. Munro Dr

Background Traffic 2028

AM Peak










| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | SEL | SET | SER | NWL | NWT | NWR |
| Lane Configurations | |  | | |  | | |  | | |  | |
| Sign Control | | Stop | | | Stop | | | Stop | | | Stop | |
| Traffic Volume (vph) | 0 | 17 | 24 | 66 | 12 | 17 | 32 | 120 | 3 | 26 | 58 | 100 |
| Future Volume (vph) | 0 | 17 | 24 | 66 | 12 | 17 | 32 | 120 | 3 | 26 | 58 | 100 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 0 | 18 | 26 | 72 | 13 | 18 | 35 | 130 | 3 | 28 | 63 | 109 |
| Direction, Lane # | EB 1 | WB 1 | SE 1 | NW 1 | | | | | | | | |
| Volume Total (vph) | 44 | 103 | 168 | 200 | | | | | | | | |
| Volume Left (vph) | 0 | 72 | 35 | 28 | | | | | | | | |
| Volume Right (vph) | 26 | 18 | 3 | 109 | | | | | | | | |
| Hadj (s) | -0.32 | 0.07 | 0.06 | -0.27 | | | | | | | | |
| Departure Headway (s) | 4.6 | 4.9 | 4.5 | 4.2 | | | | | | | | |
| Degree Utilization, x | 0.06 | 0.14 | 0.21 | 0.23 | | | | | | | | |
| Capacity (veh/h) | 715 | 683 | 753 | 820 | | | | | | | | |
| Control Delay (s) | 7.8 | 8.6 | 8.8 | 8.5 | | | | | | | | |
| Approach Delay (s) | 7.8 | 8.6 | 8.8 | 8.5 | | | | | | | | |
| Approach LOS | A | A | A | A | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Delay | 8.5 | | | | | | | | | | | |
| Level of Service | A | | | | | | | | | | | |
| Intersection Capacity Utilization | 31.5% | | | ICU Level of Service | | | | | A | | | |
| Analysis Period (min) | 15 | | | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

Background Traffic 2028

15:

AM Peak

















| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | SEL | SET | NWT | NWR | SWL | SWR |
| Lane Configurations | |  |  | |  | |
| Traffic Volume (veh/h) | 56 | 364 | 139 | 31 | 69 | 39 |
| Future Volume (Veh/h) | 56 | 364 | 139 | 31 | 69 | 39 |
| Sign Control | | Free | Free | | Stop | |
| Grade | | 0% | 0% | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 61 | 396 | 151 | 34 | 75 | 42 |
| 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 | 185 | | | | 686 | 168 |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 185 | | | | 686 | 168 |
| tC, single (s) | 4.1 | | | | 6.4 | 6.2 |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 2.2 | | | | 3.5 | 3.3 |
| p0 queue free % | 96 | | | | 81 | 95 |
| cM capacity (veh/h) | 1390 | | | | 395 | 876 |
| Direction, Lane # | SE 1 | NW 1 | SW 1 | | | |
| Volume Total | 457 | 185 | 117 | | | |
| Volume Left | 61 | 0 | 75 | | | |
| Volume Right | 0 | 34 | 42 | | | |
| cSH | 1390 | 1700 | 492 | | | |
| Volume to Capacity | 0.04 | 0.11 | 0.24 | | | |
| Queue Length 95th (m) | 1.1 | 0.0 | 7.3 | | | |
| Control Delay (s) | 1.4 | 0.0 | 14.6 | | | |
| Lane LOS | A | | B | | | |
| Approach Delay (s) | 1.4 | 0.0 | 14.6 | | | |
| Approach LOS | | | B | | | |
| Intersection Summary | | | | | | |
| Average Delay | | 3.1 | | | | |
| Intersection Capacity Utilization | | 47.7% | ICU Level of Service | A | | |
| Analysis Period (min) | | 15 | | | | |

HCM Unsignalized Intersection Capacity Analysis

2: Deugo St & Donald B. Munro Dr & Langstaff Dr

Background Traffic 2028

PM Peak










| | | | | | | | | | | | | |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | SBL2 | SBL | SBR | NWL | NWR | NWR2 |
| Lane Configurations | |  | | |  | | |  | | | |  |
| Sign Control | | Stop | | | Stop | | | Stop | | Stop | | |
| Traffic Volume (vph) | 64 | 57 | 1 | 8 | 91 | 81 | 60 | 1 | 44 | 6 | 0 | 11 |
| Future Volume (vph) | 64 | 57 | 1 | 8 | 91 | 81 | 60 | 1 | 44 | 6 | 0 | 11 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 70 | 62 | 1 | 9 | 99 | 88 | 65 | 1 | 48 | 7 | 0 | 12 |
| Direction, Lane # | EB 1 | WB 1 | SB 1 | NW 1 | | | | | | | | |
| Volume Total (vph) | 133 | 196 | 114 | 19 | | | | | | | | |
| Volume Left (vph) | 70 | 9 | 65 | 7 | | | | | | | | |
| Volume Right (vph) | 1 | 88 | 48 | 12 | | | | | | | | |
| Hadj (s) | 0.13 | -0.23 | -0.10 | -0.27 | | | | | | | | |
| Departure Headway (s) | 4.6 | 4.1 | 4.6 | 4.5 | | | | | | | | |
| Degree Utilization, x | 0.17 | 0.23 | 0.14 | 0.02 | | | | | | | | |
| Capacity (veh/h) | 759 | 829 | 732 | 729 | | | | | | | | |
| Control Delay (s) | 8.5 | 8.4 | 8.3 | 7.6 | | | | | | | | |
| Approach Delay (s) | 8.5 | 8.4 | 8.3 | 7.6 | | | | | | | | |
| Approach LOS | A | A | A | A | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Delay | | | 8.4 | | | | | | | | | |
| Level of Service | | | A | | | | | | | | | |
| Intersection Capacity Utilization | | | Err% | ICU Level of Service | | H | | | | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

3: Langstaff Dr & Frances Colbert Ave

Background Traffic 2028

PM Peak










| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | WBL | WBR | SEL | SET | NWT | NWR |
| Lane Configurations |  | | |  |  | |
| Traffic Volume (veh/h) | 27 | 0 | 0 | 61 | 62 | 43 |
| Future Volume (Veh/h) | 27 | 0 | 0 | 61 | 62 | 43 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 29 | 0 | 0 | 66 | 67 | 47 |
| 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 | 156 | 90 | 114 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 156 | 90 | 114 | | | |
| tC, single (s) | 6.4 | 6.2 | 4.1 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 97 | 100 | 100 | | | |
| cM capacity (veh/h) | 835 | 967 | 1475 | | | |
| Direction, Lane # | WB 1 | SE 1 | NW 1 | | | |
| Volume Total | 29 | 66 | 114 | | | |
| Volume Left | 29 | 0 | 0 | | | |
| Volume Right | 0 | 0 | 47 | | | |
| cSH | 835 | 1475 | 1700 | | | |
| Volume to Capacity | 0.03 | 0.00 | 0.07 | | | |
| Queue Length 95th (m) | 0.9 | 0.0 | 0.0 | | | |
| Control Delay (s) | 9.5 | 0.0 | 0.0 | | | |
| Lane LOS | A | | | | | |
| Approach Delay (s) | 9.5 | 0.0 | 0.0 | | | |
| Approach LOS | A | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | 1.3 | | | | |
| Intersection Capacity Utilization | | 15.9% | | ICU Level of Service | | A |
| Analysis Period (min) | | 15 | | | | |

HCM Unsignalized Intersection Capacity Analysis

5: Langstaff Dr & Cavanagh Dr

Background Traffic 2028

PM Peak

















| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | WBL | WBR | SEL | SET | NWT | NWR |
| Lane Configurations |  | | |  |  | |
| Traffic Volume (veh/h) | 18 | 3 | 3 | 84 | 101 | 38 |
| Future Volume (Veh/h) | 18 | 3 | 3 | 84 | 101 | 38 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 20 | 3 | 3 | 91 | 110 | 41 |
| Pedestrians | | | | | | |
| Lane Width (m) | | | | | | |
| Walking Speed (m/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | | None | None | |
| Median storage (veh) | | | | | | |
| Upstream signal (m) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 228 | 130 | 151 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 228 | 130 | 151 | | | |
| tC, single (s) | 6.4 | 6.2 | 4.1 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 97 | 100 | 100 | | | |
| cM capacity (veh/h) | 759 | 919 | 1430 | | | |
| Direction, Lane # | WB 1 | SE 1 | NW 1 | | | |
| Volume Total | 23 | 94 | 151 | | | |
| Volume Left | 20 | 3 | 0 | | | |
| Volume Right | 3 | 0 | 41 | | | |
| cSH | 777 | 1430 | 1700 | | | |
| Volume to Capacity | 0.03 | 0.00 | 0.09 | | | |
| Queue Length 95th (m) | 0.7 | 0.1 | 0.0 | | | |
| Control Delay (s) | 9.8 | 0.3 | 0.0 | | | |
| Lane LOS | A | A | | | | |
| Approach Delay (s) | 9.8 | 0.3 | 0.0 | | | |
| Approach LOS | A | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | 0.9 | | | | |
| Intersection Capacity Utilization | | 17.6% | | ICU Level of Service | | A |
| Analysis Period (min) | | 15 | | | | |

HCM Unsignalized Intersection Capacity Analysis

10: Carp Rd & Donald B. Munro Dr

Background Traffic 2028

PM Peak










| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | SEL | SET | SER | NWL | NWT | NWR |
| Lane Configurations | |  | | |  | | |  | | |  | |
| Sign Control | | Stop | | | Stop | | | Stop | | | Stop | |
| Traffic Volume (vph) | 14 | 35 | 53 | 51 | 51 | 37 | 21 | 75 | 6 | 69 | 182 | 66 |
| Future Volume (vph) | 14 | 35 | 53 | 51 | 51 | 37 | 21 | 75 | 6 | 69 | 182 | 66 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 15 | 38 | 58 | 55 | 55 | 40 | 23 | 82 | 7 | 75 | 198 | 72 |
| Direction, Lane # | EB 1 | WB 1 | SE 1 | NW 1 | | | | | | | | |
| Volume Total (vph) | 111 | 150 | 112 | 345 | | | | | | | | |
| Volume Left (vph) | 15 | 55 | 23 | 75 | | | | | | | | |
| Volume Right (vph) | 58 | 40 | 7 | 72 | | | | | | | | |
| Hadj (s) | -0.25 | -0.05 | 0.04 | -0.05 | | | | | | | | |
| Departure Headway (s) | 5.0 | 5.1 | 5.1 | 4.7 | | | | | | | | |
| Degree Utilization, x | 0.15 | 0.21 | 0.16 | 0.45 | | | | | | | | |
| Capacity (veh/h) | 643 | 636 | 652 | 735 | | | | | | | | |
| Control Delay (s) | 8.9 | 9.5 | 9.0 | 11.5 | | | | | | | | |
| Approach Delay (s) | 8.9 | 9.5 | 9.0 | 11.5 | | | | | | | | |
| Approach LOS | A | A | A | B | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Delay | | | | 10.3 | | | | | | | | |
| Level of Service | | | | B | | | | | | | | |
| Intersection Capacity Utilization | | | | 44.9% | ICU Level of Service | A | | | | | | |
| Analysis Period (min) | | | | 15 | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

Background Traffic 2028

15:

















PM Peak

| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | SEL | SET | NWT | NWR | SWL | SWR |
| Lane Configurations | |  |  | |  | |
| Traffic Volume (veh/h) | 38 | 248 | 518 | 87 | 46 | 77 |
| Future Volume (Veh/h) | 38 | 248 | 518 | 87 | 46 | 77 |
| Sign Control | | Free | Free | | Stop | |
| Grade | | 0% | 0% | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 41 | 270 | 563 | 95 | 50 | 84 |
| 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 | 658 | | | | 962 | 610 |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 658 | | | | 962 | 610 |
| tC, single (s) | 4.1 | | | | 6.4 | 6.2 |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 2.2 | | | | 3.5 | 3.3 |
| p0 queue free % | 96 | | | | 82 | 83 |
| cM capacity (veh/h) | 930 | | | | 271 | 494 |
| Direction, Lane # | SE 1 | NW 1 | SW 1 | | | |
| Volume Total | 311 | 658 | 134 | | | |
| Volume Left | 41 | 0 | 50 | | | |
| Volume Right | 0 | 95 | 84 | | | |
| cSH | 930 | 1700 | 378 | | | |
| Volume to Capacity | 0.04 | 0.39 | 0.35 | | | |
| Queue Length 95th (m) | 1.1 | 0.0 | 12.5 | | | |
| Control Delay (s) | 1.6 | 0.0 | 19.7 | | | |
| Lane LOS | A | | C | | | |
| Approach Delay (s) | 1.6 | 0.0 | 19.7 | | | |
| Approach LOS | | | C | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 2.8 | | | |
| Intersection Capacity Utilization | | | 59.1% | ICU Level of Service | | B |
| Analysis Period (min) | | | 15 | | | |

HCM Unsignalized Intersection Capacity Analysis

2: Deugo St/Langstaff Dr & Donald B. Munro Dr










Total Traffic 2028
Am Peak

| |  |  |  |  |  |  |  |  |  |  |  |  | | | | | | | | |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|--|--|--|--|--|--|--|--|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | SEL | SET | SER | NWL | NWT | NWR | | | | | | | | |
| Lane Configurations | |  | | |  | | |  | | |  | | | | | | | | | |
| Sign Control | | Stop | | | Stop | | | Stop | | | Stop | | | | | | | | | |
| Traffic Volume (vph) | 67 | 86 | 2 | 2 | 50 | 52 | 92 | 6 | 50 | 3 | 2 | 8 | | | | | | | | |
| Future Volume (vph) | 67 | 86 | 2 | 2 | 50 | 52 | 92 | 6 | 50 | 3 | 2 | 8 | | | | | | | | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | | | | | | | | |
| Hourly flow rate (vph) | 73 | 93 | 2 | 2 | 54 | 57 | 100 | 7 | 54 | 3 | 2 | 9 | | | | | | | | |
| Direction, Lane # | EB 1 | WB 1 | SE 1 | NW 1 | | | | | | | | | | | | | | | | |
| Volume Total (vph) | 168 | 113 | 161 | 14 | | | | | | | | | | | | | | | | |
| Volume Left (vph) | 73 | 2 | 100 | 3 | | | | | | | | | | | | | | | | |
| Volume Right (vph) | 2 | 57 | 54 | 9 | | | | | | | | | | | | | | | | |
| Hadj (s) | 0.11 | -0.27 | -0.04 | -0.31 | | | | | | | | | | | | | | | | |
| Departure Headway (s) | 4.6 | 4.3 | 4.5 | 4.4 | | | | | | | | | | | | | | | | |
| Degree Utilization, x | 0.21 | 0.13 | 0.20 | 0.02 | | | | | | | | | | | | | | | | |
| Capacity (veh/h) | 758 | 797 | 746 | 744 | | | | | | | | | | | | | | | | |
| Control Delay (s) | 8.8 | 7.9 | 8.7 | 7.5 | | | | | | | | | | | | | | | | |
| Approach Delay (s) | 8.8 | 7.9 | 8.7 | 7.5 | | | | | | | | | | | | | | | | |
| Approach LOS | A | A | A | A | | | | | | | | | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | | | | | | | | | |
| Delay | | | 8.5 | | | | | | | | | | | | | | | | | |
| Level of Service | | | A | | | | | | | | | | | | | | | | | |
| Intersection Capacity Utilization | | | 36.8% | ICU Level of Service | A | | | | | | | | | | | | | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

3: Langstaff Dr & Frances Colbert Ave

Total Traffic 2028
Am Peak

















| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | WBL | WBR | SEL | SET | NWT | NWR |
| Lane Configurations |  | | |  |  | |
| Traffic Volume (veh/h) | 38 | 0 | 0 | 83 | 92 | 20 |
| Future Volume (Veh/h) | 38 | 0 | 0 | 83 | 92 | 20 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 41 | 0 | 0 | 90 | 100 | 22 |
| Pedestrians | | | | | | |
| Lane Width (m) | | | | | | |
| Walking Speed (m/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | | None | None | |
| Median storage (veh) | | | | | | |
| Upstream signal (m) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 201 | 111 | 122 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 201 | 111 | 122 | | | |
| tC, single (s) | 6.4 | 6.2 | 4.1 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 95 | 100 | 100 | | | |
| cM capacity (veh/h) | 788 | 942 | 1465 | | | |
| Direction, Lane # | WB 1 | SE 1 | NW 1 | | | |
| Volume Total | 41 | 90 | 122 | | | |
| Volume Left | 41 | 0 | 0 | | | |
| Volume Right | 0 | 0 | 22 | | | |
| cSH | 788 | 1465 | 1700 | | | |
| Volume to Capacity | 0.05 | 0.00 | 0.07 | | | |
| Queue Length 95th (m) | 1.3 | 0.0 | 0.0 | | | |
| Control Delay (s) | 9.8 | 0.0 | 0.0 | | | |
| Lane LOS | A | | | | | |
| Approach Delay (s) | 9.8 | 0.0 | 0.0 | | | |
| Approach LOS | A | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | 1.6 | | | | |
| Intersection Capacity Utilization | | 16.1% | | ICU Level of Service | | A |
| Analysis Period (min) | | 15 | | | | |

HCM Unsignalized Intersection Capacity Analysis

5: Langstaff Dr & Cavanagh Dr

















Total Traffic 2028

Am Peak

| | | | | | | | | | | | | |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement | WBL2 | WBL | WBR | SEL | SET | SER | NWL | NWT | NWR | NEL | NER | NER2 |
| Lane Configurations | |  | | |  | | |  | |  | | |
| Traffic Volume (veh/h) | 16 | 0 | 2 | 1 | 119 | 1 | 3 | 104 | 15 | 5 | 0 | 5 |
| Future Volume (Veh/h) | 16 | 0 | 2 | 1 | 119 | 1 | 3 | 104 | 15 | 5 | 0 | 5 |
| Sign Control | | Stop | | | Free | | | Free | | Stop | | |
| Grade | | 0% | | | 0% | | | 0% | | 0% | | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 17 | 0 | 2 | 1 | 129 | 1 | 3 | 113 | 16 | 5 | 0 | 5 |
| Pedestrians | | | | | | | | | | | | |
| Lane Width (m) | | | | | | | | | | | | |
| Walking Speed (m/s) | | | | | | | | | | | | |
| Percent Blockage | | | | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | None | | | | | | None | | | | | |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (m) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 264 | 259 | 121 | 129 | | | 130 | | | 260 | 266 | 130 |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 264 | 259 | 121 | 129 | | | 130 | | | 260 | 266 | 130 |
| tC, single (s) | 7.1 | 6.5 | 6.2 | 4.1 | | | 4.1 | | | 7.1 | 6.5 | 6.2 |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 3.5 | 4.0 | 3.3 | 2.2 | | | 2.2 | | | 3.5 | 4.0 | 3.3 |
| p0 queue free % | 98 | 100 | 100 | 100 | | | 100 | | | 99 | 100 | 99 |
| cM capacity (veh/h) | 684 | 644 | 930 | 1457 | | | 1455 | | | 689 | 637 | 920 |
| Direction, Lane # | WB 1 | SE 1 | NW 1 | NE 1 | | | | | | | | |
| Volume Total | 19 | 131 | 132 | 10 | | | | | | | | |
| Volume Left | 17 | 1 | 3 | 5 | | | | | | | | |
| Volume Right | 2 | 1 | 16 | 5 | | | | | | | | |
| cSH | 704 | 1457 | 1455 | 788 | | | | | | | | |
| Volume to Capacity | 0.03 | 0.00 | 0.00 | 0.01 | | | | | | | | |
| Queue Length 95th (m) | 0.7 | 0.0 | 0.0 | 0.3 | | | | | | | | |
| Control Delay (s) | 10.3 | 0.1 | 0.2 | 9.6 | | | | | | | | |
| Lane LOS | B | A | A | A | | | | | | | | |
| Approach Delay (s) | 10.3 | 0.1 | 0.2 | 9.6 | | | | | | | | |
| Approach LOS | B | | | A | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | | 1.1 | | | | | | | | |
| Intersection Capacity Utilization | | | | 25.0% | ICU Level of Service | | | | A | | | |
| Analysis Period (min) | | | | 15 | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis 10: Carp Rd & Donald B. Munro Dr

Total Traffic 2028
Am Peak











| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | SEL | SET | SER | NWL | NWT | NWR |
| Lane Configurations | |  | | |  | | |  | | |  | |
| Sign Control | | Stop | | | Stop | | | Stop | | | Stop | |
| Traffic Volume (vph) | 0 | 19 | 24 | 71 | 14 | 19 | 33 | 133 | 3 | 26 | 58 | 105 |
| Future Volume (vph) | 0 | 19 | 24 | 71 | 14 | 19 | 33 | 133 | 3 | 26 | 58 | 105 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 0 | 21 | 26 | 77 | 15 | 21 | 36 | 145 | 3 | 28 | 63 | 114 |
| Direction, Lane # | EB 1 | WB 1 | SE 1 | NW 1 | | | | | | | | |
| Volume Total (vph) | 47 | 113 | 184 | 205 | | | | | | | | |
| Volume Left (vph) | 0 | 77 | 36 | 28 | | | | | | | | |
| Volume Right (vph) | 26 | 21 | 3 | 114 | | | | | | | | |
| Hadj (s) | -0.30 | 0.06 | 0.06 | -0.27 | | | | | | | | |
| Departure Headway (s) | 4.6 | 4.9 | 4.6 | 4.2 | | | | | | | | |
| Degree Utilization, x | 0.06 | 0.15 | 0.23 | 0.24 | | | | | | | | |
| Capacity (veh/h) | 695 | 674 | 744 | 808 | | | | | | | | |
| Control Delay (s) | 7.9 | 8.8 | 9.0 | 8.6 | | | | | | | | |
| Approach Delay (s) | 7.9 | 8.8 | 9.0 | 8.6 | | | | | | | | |
| Approach LOS | A | A | A | A | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Delay | | | 8.7 | | | | | | | | | |
| Level of Service | | | A | | | | | | | | | |
| Intersection Capacity Utilization | | | 32.8% | ICU Level of Service | | | | | | | A | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

14: Langstaff Dr

Total Traffic 2028

Am Peak










| | | | | | | |
|-----------------------------------|---|---|---|---|---|---|
| |  |  |  |  |  |  |
| Movement | SET | SER | NWL | NWT | NEL | NER |
| Lane Configurations |  | | |  |  |  |
| Traffic Volume (veh/h) | 67 | 2 | 7 | 84 | 15 | 17 |
| Future Volume (Veh/h) | 67 | 2 | 7 | 84 | 15 | 17 |
| Sign Control | Free | | | Free | Stop | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 73 | 2 | 8 | 91 | 16 | 18 |
| 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 | | | 75 | 181 | | 74 |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | | | 75 | 181 | | 74 |
| tC, single (s) | | | 4.1 | 6.4 | | 6.2 |
| tC, 2 stage (s) | | | | | | |
| tF (s) | | | 2.2 | 3.5 | | 3.3 |
| p0 queue free % | | | 99 | 98 | | 98 |
| cM capacity (veh/h) | | | 1524 | 804 | | 988 |
| Direction, Lane # | SE 1 | NW 1 | NE 1 | | | |
| Volume Total | 75 | 99 | 34 | | | |
| Volume Left | 0 | 8 | 16 | | | |
| Volume Right | 2 | 0 | 18 | | | |
| cSH | 1700 | 1524 | 892 | | | |
| Volume to Capacity | 0.04 | 0.01 | 0.04 | | | |
| Queue Length 95th (m) | 0.0 | 0.1 | 1.0 | | | |
| Control Delay (s) | 0.0 | 0.6 | 9.2 | | | |
| Lane LOS | | | A | | | |
| Approach Delay (s) | 0.0 | 0.6 | 9.2 | | | |
| Approach LOS | | | A | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 1.8 | | | |
| Intersection Capacity Utilization | | | 20.2% | ICU Level of Service | | A |
| Analysis Period (min) | | | 15 | | | |

HCM Unsignalized Intersection Capacity Analysis

17: Langstaff Dr

Total Traffic 2028

Am Peak










| | | | | | | |
|-----------------------------------|---|---|---|---|---|---|
| |  |  |  |  |  |  |
| Movement | SET | SER | NWL | NWT | NEL | NER |
| Lane Configurations |  | | |  |  | |
| Traffic Volume (veh/h) | 139 | 1 | 3 | 119 | 5 | 5 |
| Future Volume (Veh/h) | 139 | 1 | 3 | 119 | 5 | 5 |
| Sign Control | Free | | | Free | Stop | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 151 | 1 | 3 | 129 | 5 | 5 |
| Pedestrians | | | | | | |
| Lane Width (m) | | | | | | |
| Walking Speed (m/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | None | | | None | | |
| Median storage veh) | | | | | | |
| Upstream signal (m) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | | | 152 | 286 | | 152 |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | | | 152 | 286 | | 152 |
| tC, single (s) | | | 4.1 | 6.4 | | 6.2 |
| tC, 2 stage (s) | | | | | | |
| tF (s) | | | 2.2 | 3.5 | | 3.3 |
| p0 queue free % | | | 100 | 99 | | 99 |
| cM capacity (veh/h) | | | 1429 | 702 | | 895 |
| Direction, Lane # | SE 1 | NW 1 | NE 1 | | | |
| Volume Total | 152 | 132 | 10 | | | |
| Volume Left | 0 | 3 | 5 | | | |
| Volume Right | 1 | 0 | 5 | | | |
| cSH | 1700 | 1429 | 787 | | | |
| Volume to Capacity | 0.09 | 0.00 | 0.01 | | | |
| Queue Length 95th (m) | 0.0 | 0.1 | 0.3 | | | |
| Control Delay (s) | 0.0 | 0.2 | 9.6 | | | |
| Lane LOS | | | A | | | |
| Approach Delay (s) | 0.0 | 0.2 | 9.6 | | | |
| Approach LOS | | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | | | | |
| | | | 0.4 | | | |
| Intersection Capacity Utilization | | | 18.7% | ICU Level of Service | | A |
| Analysis Period (min) | | | | | | |
| | | | 15 | | | |

HCM Unsignalized Intersection Capacity Analysis

Total Traffic 2028

















20:

Am Peak

| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | SEL | SET | NWT | NWR | SWL | SWR |
| Lane Configurations | |  |  | |  | |
| Traffic Volume (veh/h) | 61 | 364 | 139 | 31 | 83 | 45 |
| Future Volume (Veh/h) | 61 | 364 | 139 | 31 | 83 | 45 |
| Sign Control | | Free | Free | | Stop | |
| Grade | | 0% | 0% | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 66 | 396 | 151 | 34 | 90 | 49 |
| Pedestrians | | | | | | |
| Lane Width (m) | | | | | | |
| Walking Speed (m/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | None | None | | | |
| Median storage (veh) | | | | | | |
| Upstream signal (m) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 185 | | | | 696 | 168 |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 185 | | | | 696 | 168 |
| tC, single (s) | 4.1 | | | | 6.4 | 6.2 |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 2.2 | | | | 3.5 | 3.3 |
| p0 queue free % | 95 | | | | 77 | 94 |
| cM capacity (veh/h) | 1390 | | | | 388 | 876 |
| Direction, Lane # | SE 1 | NW 1 | SW 1 | | | |
| Volume Total | 462 | 185 | 139 | | | |
| Volume Left | 66 | 0 | 90 | | | |
| Volume Right | 0 | 34 | 49 | | | |
| cSH | 1390 | 1700 | 483 | | | |
| Volume to Capacity | 0.05 | 0.11 | 0.29 | | | |
| Queue Length 95th (m) | 1.2 | 0.0 | 9.4 | | | |
| Control Delay (s) | 1.5 | 0.0 | 15.4 | | | |
| Lane LOS | A | | C | | | |
| Approach Delay (s) | 1.5 | 0.0 | 15.4 | | | |
| Approach LOS | | | C | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 3.6 | | | |
| Intersection Capacity Utilization | | 49.1% | | ICU Level of Service | | A |
| Analysis Period (min) | | 15 | | | | |

HCM Unsignalized Intersection Capacity Analysis 2: Deugo St/Langstaff Dr & Donald B. Munro Dr

Total Traffic 2028
PM Peak










| |  |  |  |  |  |  |  |  |  |  |  |  | | | | | | | | |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|--|--|--|--|--|--|--|--|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | SEL | SET | SER | NWL | NWT | NWR | | | | | | | | |
| Lane Configurations | |  | | |  | | |  | | |  | | | | | | | | | |
| Sign Control | | Stop | | | Stop | | | Stop | | | Stop | | | | | | | | | |
| Traffic Volume (vph) | 84 | 57 | 1 | 8 | 91 | 104 | 70 | 1 | 52 | 6 | 0 | 11 | | | | | | | | |
| Future Volume (vph) | 84 | 57 | 1 | 8 | 91 | 104 | 70 | 1 | 52 | 6 | 0 | 11 | | | | | | | | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | | | | | | | | |
| Hourly flow rate (vph) | 91 | 62 | 1 | 9 | 99 | 113 | 76 | 1 | 57 | 7 | 0 | 12 | | | | | | | | |
| Direction, Lane # | EB 1 | WB 1 | SE 1 | NW 1 | | | | | | | | | | | | | | | | |
| Volume Total (vph) | 154 | 221 | 134 | 19 | | | | | | | | | | | | | | | | |
| Volume Left (vph) | 91 | 9 | 76 | 7 | | | | | | | | | | | | | | | | |
| Volume Right (vph) | 1 | 113 | 57 | 12 | | | | | | | | | | | | | | | | |
| Hadj (s) | 0.15 | -0.26 | -0.11 | -0.27 | | | | | | | | | | | | | | | | |
| Departure Headway (s) | 4.7 | 4.2 | 4.7 | 4.7 | | | | | | | | | | | | | | | | |
| Degree Utilization, x | 0.20 | 0.26 | 0.17 | 0.02 | | | | | | | | | | | | | | | | |
| Capacity (veh/h) | 740 | 817 | 712 | 696 | | | | | | | | | | | | | | | | |
| Control Delay (s) | 8.8 | 8.6 | 8.6 | 7.8 | | | | | | | | | | | | | | | | |
| Approach Delay (s) | 8.8 | 8.6 | 8.6 | 7.8 | | | | | | | | | | | | | | | | |
| Approach LOS | A | A | A | A | | | | | | | | | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | | | | | | | | | |
| Delay | | | 8.7 | | | | | | | | | | | | | | | | | |
| Level of Service | | | A | | | | | | | | | | | | | | | | | |
| Intersection Capacity Utilization | | | 40.9% | ICU Level of Service | A | | | | | | | | | | | | | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

3: Langstaff Dr & Frances Colbert Ave

Total Traffic 2028

PM Peak

















| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | WBL | WBR | SEL | SET | NWT | NWR |
| Lane Configurations |  | | |  |  | |
| Traffic Volume (veh/h) | 27 | 0 | 0 | 78 | 95 | 43 |
| Future Volume (Veh/h) | 27 | 0 | 0 | 78 | 95 | 43 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 29 | 0 | 0 | 85 | 103 | 47 |
| 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 | 212 | 126 | 150 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 212 | 126 | 150 | | | |
| tC, single (s) | 6.4 | 6.2 | 4.1 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 96 | 100 | 100 | | | |
| cM capacity (veh/h) | 777 | 924 | 1431 | | | |
| Direction, Lane # | WB 1 | SE 1 | NW 1 | | | |
| Volume Total | 29 | 85 | 150 | | | |
| Volume Left | 29 | 0 | 0 | | | |
| Volume Right | 0 | 0 | 47 | | | |
| cSH | 777 | 1431 | 1700 | | | |
| Volume to Capacity | 0.04 | 0.00 | 0.09 | | | |
| Queue Length 95th (m) | 0.9 | 0.0 | 0.0 | | | |
| Control Delay (s) | 9.8 | 0.0 | 0.0 | | | |
| Lane LOS | A | | | | | |
| Approach Delay (s) | 9.8 | 0.0 | 0.0 | | | |
| Approach LOS | A | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | 1.1 | | | | |
| Intersection Capacity Utilization | | 17.6% | | ICU Level of Service | | A |
| Analysis Period (min) | | 15 | | | | |

HCM Unsignalized Intersection Capacity Analysis

5: Langstaff Dr & Cavanagh Dr

















Total Traffic 2028

PM Peak

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | WBL2 | WBL | WBR | SEL | SET | SER | NWL | NWT | NWR | NEL | NER | NER2 |
| Lane Configurations | |  | | |  | | |  | |  | | |
| Traffic Volume (veh/h) | 18 | 0 | 3 | 3 | 97 | 4 | 8 | 131 | 38 | 3 | 0 | 4 |
| Future Volume (Veh/h) | 18 | 0 | 3 | 3 | 97 | 4 | 8 | 131 | 38 | 3 | 0 | 4 |
| Sign Control | | Stop | | | Free | | | Free | | Stop | | |
| Grade | | 0% | | | 0% | | | 0% | | 0% | | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 20 | 0 | 3 | 3 | 105 | 4 | 9 | 142 | 41 | 3 | 0 | 4 |
| 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 | 298 | 296 | 162 | 183 | | | 109 | | | 296 | 314 | 107 |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 298 | 296 | 162 | 183 | | | 109 | | | 296 | 314 | 107 |
| tC, single (s) | 7.1 | 6.5 | 6.2 | 4.1 | | | 4.1 | | | 7.1 | 6.5 | 6.2 |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 3.5 | 4.0 | 3.3 | 2.2 | | | 2.2 | | | 3.5 | 4.0 | 3.3 |
| p0 queue free % | 97 | 100 | 100 | 100 | | | 99 | | | 100 | 100 | 100 |
| cM capacity (veh/h) | 648 | 611 | 882 | 1392 | | | 1481 | | | 649 | 597 | 947 |
| Direction, Lane # | WB 1 | SE 1 | NW 1 | NE 1 | | | | | | | | |
| Volume Total | 23 | 112 | 192 | 7 | | | | | | | | |
| Volume Left | 20 | 3 | 9 | 3 | | | | | | | | |
| Volume Right | 3 | 4 | 41 | 4 | | | | | | | | |
| cSH | 671 | 1392 | 1481 | 792 | | | | | | | | |
| Volume to Capacity | 0.03 | 0.00 | 0.01 | 0.01 | | | | | | | | |
| Queue Length 95th (m) | 0.9 | 0.1 | 0.1 | 0.2 | | | | | | | | |
| Control Delay (s) | 10.6 | 0.2 | 0.4 | 9.6 | | | | | | | | |
| Lane LOS | B | A | A | A | | | | | | | | |
| Approach Delay (s) | 10.6 | 0.2 | 0.4 | 9.6 | | | | | | | | |
| Approach LOS | B | | | A | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | | 1.2 | | | | | | | | |
| Intersection Capacity Utilization | | | | 29.5% | ICU Level of Service | | | | A | | | |
| Analysis Period (min) | | | | 15 | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis 10: Carp Rd & Donald B. Munro Dr

Total Traffic 2028
PM Peak










| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | SEL | SET | SER | NWL | NWT | NWR |
| Lane Configurations | |  | | |  | | |  | | |  | |
| Sign Control | | Stop | | | Stop | | | Stop | | | Stop | |
| Traffic Volume (vph) | 14 | 40 | 53 | 54 | 55 | 38 | 26 | 81 | 6 | 69 | 182 | 77 |
| Future Volume (vph) | 14 | 40 | 53 | 54 | 55 | 38 | 26 | 81 | 6 | 69 | 182 | 77 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 15 | 43 | 58 | 59 | 60 | 41 | 28 | 88 | 7 | 75 | 198 | 84 |
| Direction, Lane # | EB 1 | WB 1 | SE 1 | NW 1 | | | | | | | | |
| Volume Total (vph) | 116 | 160 | 123 | 357 | | | | | | | | |
| Volume Left (vph) | 15 | 59 | 28 | 75 | | | | | | | | |
| Volume Right (vph) | 58 | 41 | 7 | 84 | | | | | | | | |
| Hadj (s) | -0.24 | -0.05 | 0.05 | -0.07 | | | | | | | | |
| Departure Headway (s) | 5.1 | 5.2 | 5.2 | 4.7 | | | | | | | | |
| Degree Utilization, x | 0.16 | 0.23 | 0.18 | 0.47 | | | | | | | | |
| Capacity (veh/h) | 628 | 624 | 639 | 726 | | | | | | | | |
| Control Delay (s) | 9.1 | 9.8 | 9.3 | 11.9 | | | | | | | | |
| Approach Delay (s) | 9.1 | 9.8 | 9.3 | 11.9 | | | | | | | | |
| Approach LOS | A | A | A | B | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Delay | 10.6 | | | | | | | | | | | |
| Level of Service | B | | | | | | | | | | | |
| Intersection Capacity Utilization | 45.0% | | | ICU Level of Service | | | | | A | | | |
| Analysis Period (min) | 15 | | | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

Total Traffic 2028

14: Langstaff Dr

PM Peak










| | | | | | | |
|-----------------------------------|---|---|---|---|---|---|
| |  |  |  |  |  |  |
| Movement | SET | SER | NWL | NWT | NEL | NER |
| Lane Configurations |  | | |  |  | |
| Traffic Volume (veh/h) | 68 | 7 | 26 | 68 | 9 | 9 |
| Future Volume (Veh/h) | 68 | 7 | 26 | 68 | 9 | 9 |
| Sign Control | Free | | | Free | Stop | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 74 | 8 | 28 | 74 | 10 | 10 |
| Pedestrians | | | | | | |
| Lane Width (m) | | | | | | |
| Walking Speed (m/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | None | | | None | | |
| Median storage veh) | | | | | | |
| Upstream signal (m) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | | | 82 | | 208 | 78 |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | | | 82 | | 208 | 78 |
| 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 | | 99 | 99 |
| cM capacity (veh/h) | | | 1515 | | 766 | 983 |
| Direction, Lane # | SE 1 | NW 1 | NE 1 | | | |
| Volume Total | 82 | 102 | 20 | | | |
| Volume Left | 0 | 28 | 10 | | | |
| Volume Right | 8 | 0 | 10 | | | |
| cSH | 1700 | 1515 | 861 | | | |
| Volume to Capacity | 0.05 | 0.02 | 0.02 | | | |
| Queue Length 95th (m) | 0.0 | 0.5 | 0.6 | | | |
| Control Delay (s) | 0.0 | 2.1 | 9.3 | | | |
| Lane LOS | | A | A | | | |
| Approach Delay (s) | 0.0 | 2.1 | 9.3 | | | |
| Approach LOS | | | A | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 2.0 | | | |
| Intersection Capacity Utilization | | | 21.7% | ICU Level of Service | | A |
| Analysis Period (min) | | | 15 | | | |

HCM Unsignalized Intersection Capacity Analysis

17: Langstaff Dr

Total Traffic 2028

PM Peak










| | | | | | | |
|-----------------------------------|---|---|---|---|---|---|
| |  |  |  |  |  |  |
| Movement | SET | SER | NWL | NWT | NEL | NER |
| Lane Configurations |  | | |  |  | |
| Traffic Volume (veh/h) | 116 | 3 | 8 | 180 | 3 | 5 |
| Future Volume (Veh/h) | 116 | 3 | 8 | 180 | 3 | 5 |
| Sign Control | Free | | | Free | Stop | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 126 | 3 | 9 | 196 | 3 | 5 |
| Pedestrians | | | | | | |
| Lane Width (m) | | | | | | |
| Walking Speed (m/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | None | | | None | | |
| Median storage veh) | | | | | | |
| Upstream signal (m) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | | | 129 | | | 342 |
| vC1, stage 1 conf vol | | | | | | 128 |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | | | 129 | | | 342 |
| tC, single (s) | | | 4.1 | | | 6.4 |
| tC, 2 stage (s) | | | | | | 6.2 |
| tF (s) | | | 2.2 | | | 3.5 |
| p0 queue free % | | | 99 | | | 100 |
| cM capacity (veh/h) | | | 1457 | | | 651 |
| | | | | | | 923 |
| Direction, Lane # | SE 1 | NW 1 | NE 1 | | | |
| Volume Total | 129 | 205 | 8 | | | |
| Volume Left | 0 | 9 | 3 | | | |
| Volume Right | 3 | 0 | 5 | | | |
| cSH | 1700 | 1457 | 798 | | | |
| Volume to Capacity | 0.08 | 0.01 | 0.01 | | | |
| Queue Length 95th (m) | 0.0 | 0.1 | 0.2 | | | |
| Control Delay (s) | 0.0 | 0.4 | 9.6 | | | |
| Lane LOS | | | A | | | |
| Approach Delay (s) | 0.0 | 0.4 | 9.6 | | | |
| Approach LOS | | | A | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 0.5 | | | |
| Intersection Capacity Utilization | | | 26.0% | ICU Level of Service | | A |
| Analysis Period (min) | | | 15 | | | |

HCM Unsignalized Intersection Capacity Analysis

Total Traffic 2028

20:

PM Peak

| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | SEL | SET | NWT | NWR | SWL | SWR |
| Lane Configurations | |  |  | |  | |
| Traffic Volume (veh/h) | 53 | 248 | 518 | 87 | 51 | 83 |
| Future Volume (Veh/h) | 53 | 248 | 518 | 87 | 51 | 83 |
| Sign Control | | Free | Free | | Stop | |
| Grade | | 0% | 0% | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 58 | 270 | 563 | 95 | 55 | 90 |
| 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 | 658 | | | | 996 | 610 |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 658 | | | | 996 | 610 |
| tC, single (s) | 4.1 | | | | 6.4 | 6.2 |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 2.2 | | | | 3.5 | 3.3 |
| p0 queue free % | 94 | | | | 78 | 82 |
| cM capacity (veh/h) | 930 | | | | 254 | 494 |
| Direction, Lane # | SE 1 | NW 1 | SW 1 | | | |
| Volume Total | 328 | 658 | 145 | | | |
| Volume Left | 58 | 0 | 55 | | | |
| Volume Right | 0 | 95 | 90 | | | |
| cSH | 930 | 1700 | 364 | | | |
| Volume to Capacity | 0.06 | 0.39 | 0.40 | | | |
| Queue Length 95th (m) | 1.6 | 0.0 | 14.9 | | | |
| Control Delay (s) | 2.2 | 0.0 | 21.3 | | | |
| Lane LOS | A | | C | | | |
| Approach Delay (s) | 2.2 | 0.0 | 21.3 | | | |
| Approach LOS | | | C | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 3.4 | | | |
| Intersection Capacity Utilization | | | 66.5% | ICU Level of Service | | C |
| Analysis Period (min) | | | 15 | | | |

TIA ANALYSIS REPORT: RESIDENTIAL DEVELOPMENT AT 147 LANGSTAFF ROAD



APPENDIX F – BUS ROUTE

303

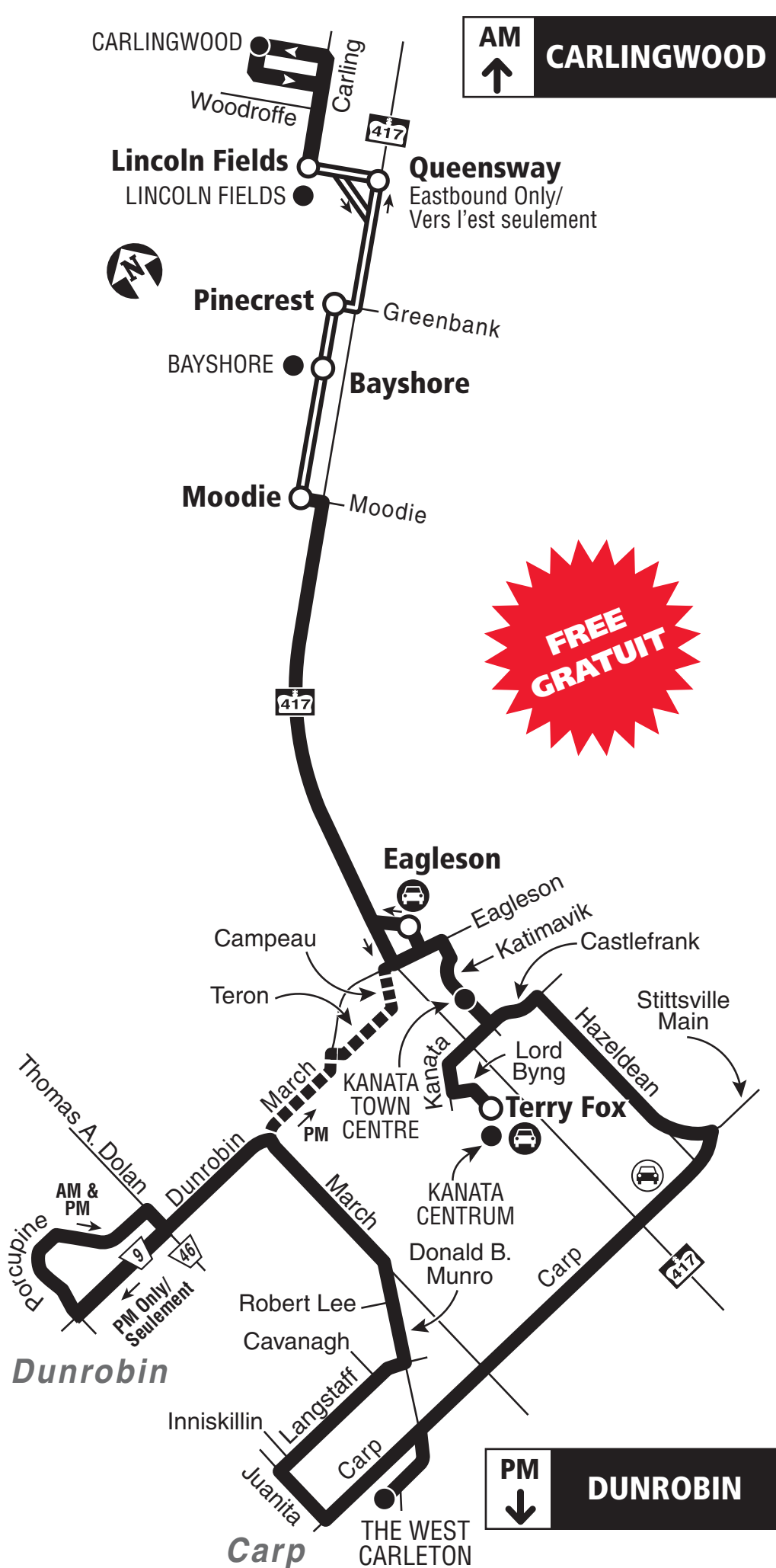
CARLINGWOOD DUNROBIN, CARP

Local

Wednesday only / Mercredi seulement

Selected time periods

Périodes sélectionnées



2018.09



Schedule / Horaire.....613-560-1000

Text / Texto560560

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

Customer Relations

Service à la clientèle **613-741-4390**

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

Security / Sécurité **613-741-2478**

Effective Septembre 2, 2018

En vigueur 2 septembre 2018

Transpo

INFO 613-741-4390
octranspo.com

TIA ANALYSIS REPORT: RESIDENTIAL DEVELOPMENT AT 147 LANGSTAFF ROAD



APPENDIX G – TDM CHECKLIST

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

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

| TDM-supportive design & infrastructure measures: <i>Residential developments</i> | | Check if completed & add descriptions, explanations or plan/drawing references |
|---|---|---|
| 1. WALKING & CYCLING: ROUTES | | |
| 1.1 Building location & access points | | |
| BASIC | 1.1.1 Locate building close to the street, and do not locate parking areas between the street and building entrances | <input checked="" type="checkbox"/> |
| BASIC | 1.1.2 Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations | <input checked="" type="checkbox"/> Building entrance located within 370m of bus stop |
| BASIC | 1.1.3 Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort | <input checked="" type="checkbox"/> Building doors and windows provide visibility of pedestrians |
| 1.2 Facilities for walking & cycling | | |
| REQUIRED | 1.2.1 Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations (<i>see Official Plan policy 4.3.3</i>) | <input checked="" type="checkbox"/> Concrete sidewalks and pedestrian crossings are provided on-site. Connection to existing pedestrian facilities along Langstaff Drive and to bus stops provided |
| 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 checked="" type="checkbox"/> Concrete sidewalks and pedestrian crossings are provided on-site. Connection to existing pedestrian facilities along Langstaff Drive and to bus stops provided |

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

| TDM-supportive design & infrastructure measures: <i>Residential developments</i> | | Check if completed & add descriptions, explanations or plan/drawing references |
|---|--|--|
| 2. WALKING & CYCLING: END-OF-TRIP FACILITIES | | |
| 2.1 Bicycle parking | | |
| REQUIRED | 2.1.1 Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible (see <i>Official Plan policy 4.3.6</i>) | <input type="checkbox"/> |
| 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"/> |
| 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"/> |
| BASIC | 2.1.4 Provide bicycle parking spaces equivalent to the expected number of resident-owned bicycles, plus the expected peak number of visitor cyclists | <input checked="" type="checkbox"/> 4 bicycle trips expected during the peak hours. 58 bicycle stalls provided |
| 2.2 Secure bicycle parking | | |
| REQUIRED | 2.2.1 Where more than 50 bicycle parking spaces are provided for a single residential building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers (see <i>Zoning By-law Section 111</i>) | <input checked="" type="checkbox"/> |
| BETTER | 2.2.2 Provide secure bicycle parking spaces equivalent to at least the number of units at condominiums or multi-family residential developments | <input checked="" type="checkbox"/> 58 bicycle stalls provided |
| 2.3 Bicycle repair station | | |
| BETTER | 2.3.1 Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided) | <input checked="" type="checkbox"/> |
| 3. TRANSIT | | |
| 3.1 Customer amenities | | |
| BASIC | 3.1.1 Provide shelters, lighting and benches at any on-site transit stops | <input checked="" type="checkbox"/> There are no on-site transit stops. |
| BASIC | 3.1.2 Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter | <input checked="" type="checkbox"/> |
| BETTER | 3.1.3 Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building | <input checked="" type="checkbox"/> |

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