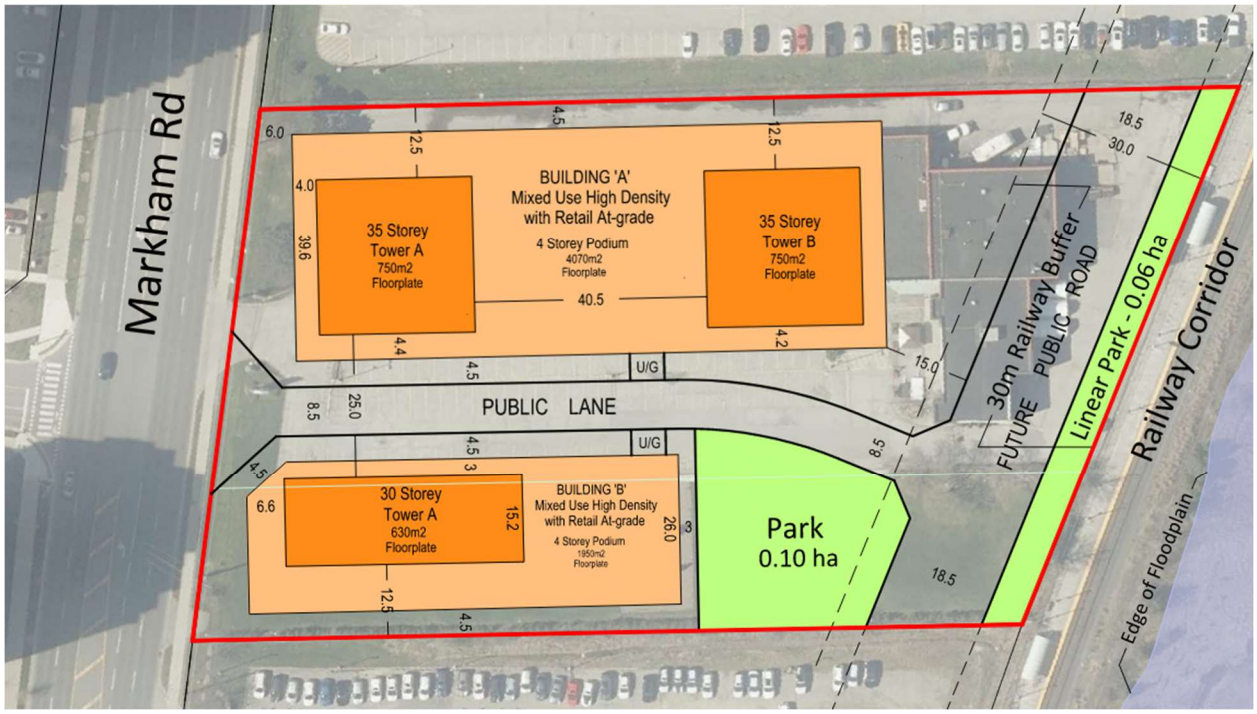
Sunny Communities

Proposed Mixed-Use Development at 9441 Markham Road, City of Markham

Transportation Impact Study

December 16, 2025



December 16, 2025

Aries Lobrin
VP of Development
Sunny Communities
Unit 1 – 2nd Floor, 25 Brodie Drive
Richmond Hill, ON L4B 3K7

Subject: Proposed Mixed-Use Development at 9441 Markham Road, City of Markham – Transportation Impact Study

Dear Mr. Lobrin:

WSP Canada Inc. (WSP) is pleased to submit this Transportation Impact Study (TIS) for the proposed mixed-use development at 9441 Markham Road in the City of Markham.

Based on the enclosed study findings, it is expected that the proposed development can be readily accommodated by the existing boundary road network. Recognizing the site is directly adjacent to the Mt. Joy GO Station, modest levels of vehicular parking is proposed to encourage transit use. The proposed bicycle parking supply, loading arrangement, TDM measures and site layout are all adequate relative to respective requirements.

We thank you for the opportunity to undertake this study. Please do not hesitate to contact us if you have any questions or comments.

Yours sincerely,

Peter Yu, P.Eng., PMP
Senior Project Manager
Transportation Planning & Science

WSP ref.:CA0055334.9688

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1 Introduction

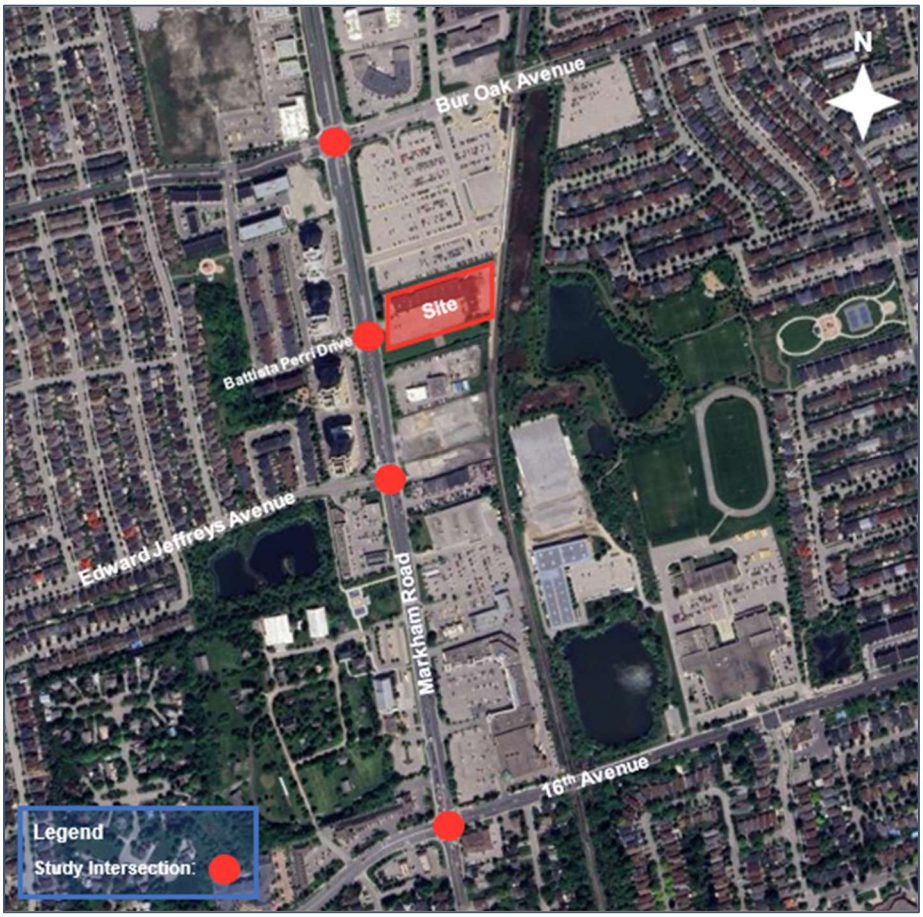
WSP Canada Inc. (WSP) was retained by Sunny Communities to prepare a Transportation Impact Study (TIS) in support of the Official Plan Amendment (OPA) and Zoning By-law Amendment (ZBA) applications for the proposed mixed-use high-density development located at 9441 Markham Road in the City of Markham.

A Terms of Reference (ToR) was circulated to the City of Markham transportation review staff prior to commencing the TIS, and feedback from staff was received. The ToR correspondences are documented in **Appendix A**. The study has been prepared in accordance with the City's TIS guidelines and incorporates the received feedback on the ToR. The current development proposal and our study approach with findings are documented herein.

1.1 Existing Uses and Context

The subject site at 9441 Markham Road is immediately south of the Mount Joy GO Station and the site location and surrounding area are shown in **Figure 1-1**. The site is currently occupied by a one-storey commercial building with temple use and its associated surface parking area. The existing site is accessed via a full-moves driveway onto Markham Road. The existing land use will be demolished as part of the proposed development.

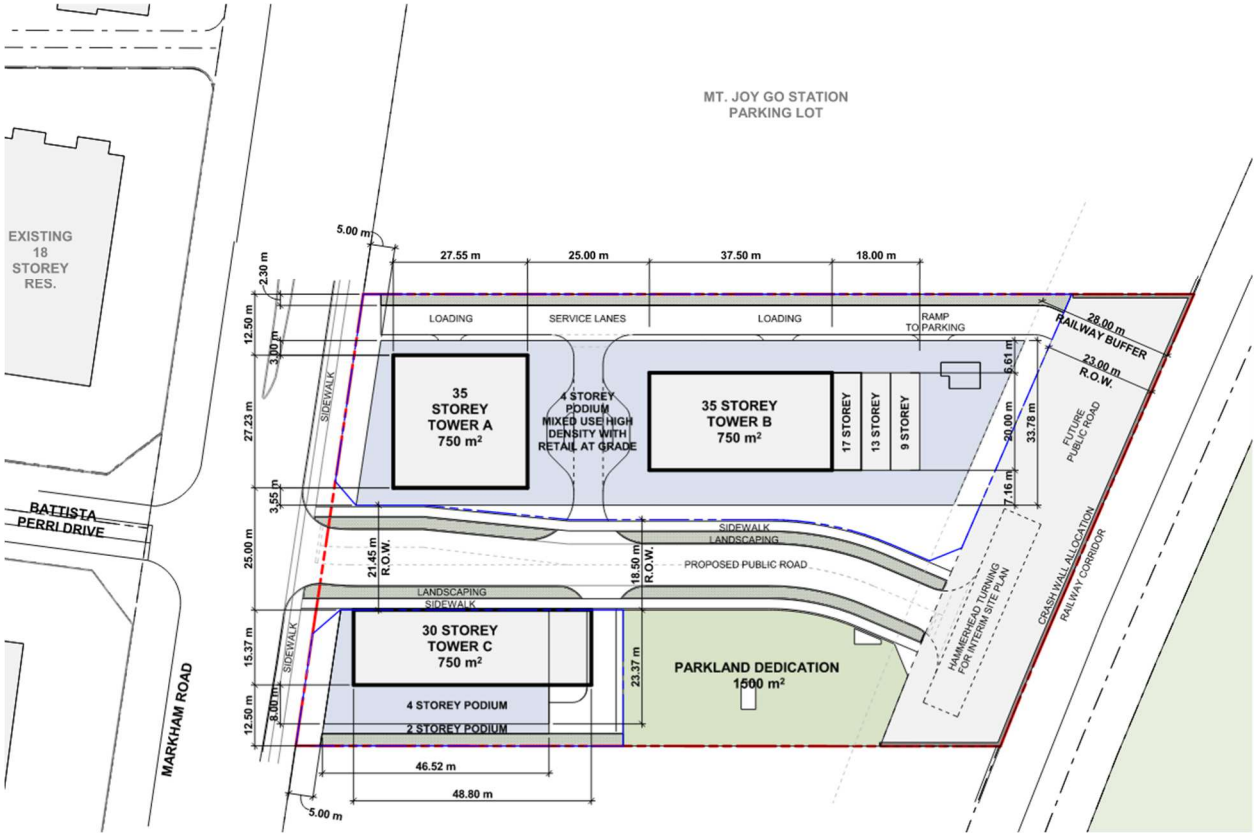
Figure 1-1 Site Location and Study Area



1.2 Proposed Development

The development proposal features two mixed-use high-density buildings with retail and temple uses. The development includes 1,218 residential units, 1,978 m^2 of ground floor retail and 1,852 m^2 of temple replacement. A total of 453 vehicular parking spaces will be provided. The proposed site plan is shown in **Figure 1-2**.

Figure 1-2 Site Plan



2 Transportation Network and Traffic Volumes

This section describes the existing and future road network and transportation context along with explanations of how the existing, future background and future total volumes are developed.

2.1 Existing Conditions

2.1.1 Boundary Roadways

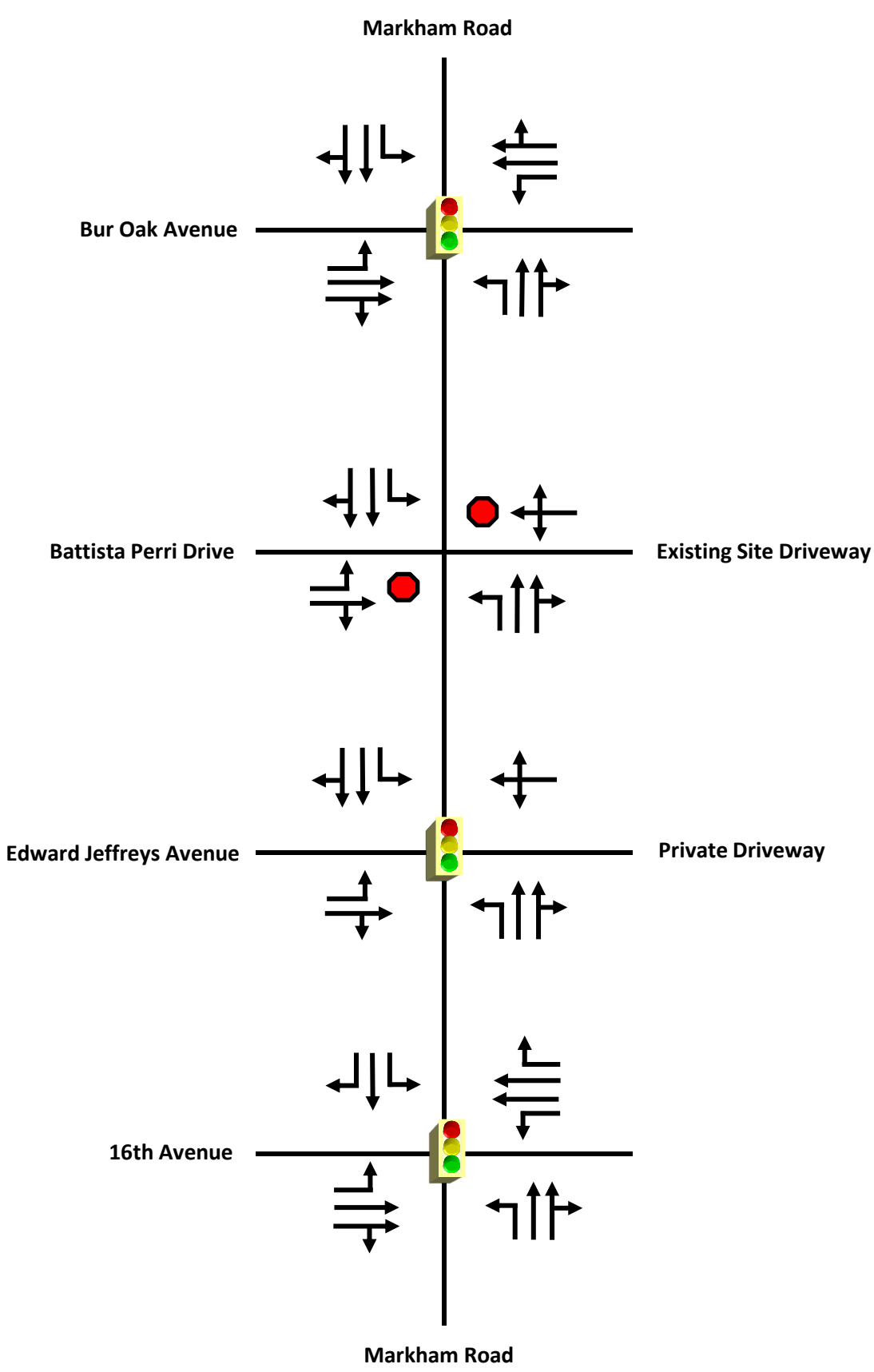
The following roadways make up the boundary road network near the subject site:

- **Markham Road**, which abuts the site to the west, is a north-south major collector road under the City's jurisdiction. Within the study area, Markham Road has a four-lane cross-section with two through lanes in each direction and auxiliary turning lanes at its intersections with several other roadways/driveways. This roadway has a posted speed limit of 60 km/h and 50 km/h north and south of Bur Oak Avenue, respectively. Sidewalks are provided on both sides of the road.
- **16th Avenue** is an east-west York Regional arterial road, located south of the site. Within the study area, 16th Avenue has a four-lane cross-section with two through lanes in each direction and auxiliary turning lanes at its intersection with Markham Road. This roadway has a posted speed limit of 60 km/h with sidewalks on both sides.
- **Bur Oak Avenue** is an east-west major collector road under the City's jurisdiction, located north of the site. Within the study area, Bur Oak Avenue has a four-lane cross-section with two through lanes in each direction and auxiliary left turn lanes at its intersection with Markham Road. This roadway has a posted speed limit of 50 km/h with sidewalks on both sides.
- **Battista Perri Drive** is an L-shaped local road, opposite the existing site access across Markham Road. Battista Perri Drive has a two-lane cross-section with one through lane in each direction and an auxiliary left-turn lane at its intersection with Markham Road. This roadway has a posted speed limit of 40 km/h with sidewalks on one or both sides.
- **Edward Jeffreys Avenue** is an east-west local road, located south of the site. Edward Jeffreys Avenue has a two-lane cross-section with one through lane in each direction and an auxiliary left-turn lane at its intersection with Markham Road. This roadway has a posted speed limit of 40 km/h with sidewalks on both sides.

The following intersections are included in this study, as confirmed through the ToR:

- Markham Road and 16th Avenue (signalized);
- Markham Road and Bur Oak Avenue (signalized);
- Markham Road and Edward Jeffreys Avenue (signalized); and
- Markham Road and Battista Perri Drive/existing site driveway (unsignalized).

The lane configurations of the existing study intersections are illustrated in **Figure 2-1**.



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Signalized Intersections

Unsignalized Intersections

Figure 2-1
Existing Lane Configurations

2.1.2 Transit Service

The subject site is directly adjacent to the Mount Joy GO Station and is located within the Mount Joy Major Transit Station Area. The site is serviced by York Region Transit (YRT), Toronto Transit Commission (TTC) and GO Transit. The existing transit services within the study area are described below and illustrated in **Figure 2-2**.

York Region Transit

- **Route 16 (16th Avenue)** operates all day, every day between the Cornell Bus Terminal and area of Rutherford Road and Ilan Ramon Boulevard in Vaughan, generally in an east-west direction. Stops closest to the site at the Markham Road and 16th Avenue intersection, which are approximately 700 metres south of the site. Weekday peak period headways of this route range from 22 to 29 minutes in the morning and 17 to 29 minutes in the afternoon.
- **Route 18 (Bur Oak)** operates during weekdays between the Angus Glen Community Centre and Cornell Bus Terminal, generally along Bur Oak Avenue and Angus Glen Boulevard. Stops for this route closest to the site are at the Markham Road and Bur Oak Avenue intersection, which are approximately 300 metres north of the site. Peak period headways of this route range from 22 to 35 minutes.
- **Route 301 (Markham Express)** operates during weekday peak periods from the Mount Joy GO Station to Finch GO Bus Terminal in the morning and in the opposite direction in the afternoon. Stops for this route closest to the site are located just east of the Bur Oak Avenue and Anderson Avenue intersection, which are approximately 400 metres northeast of the site. Headways of this route range from 9 to 40 minutes in the morning and 30 to 40 minutes in the afternoon.
- **Route 303 (Bur Oak Express)** operates during weekday peak periods from the Mount Joy GO Station to Finch GO Bus Terminal in the morning and in the opposite direction in the afternoon. Stops for this route closest to the site are located just east of the Bur Oak Avenue and Anderson Avenue intersection, which are approximately 400 metres northeast of the site. Headways of this route range from 7 to 18 minutes in the morning and 10 to 29 minutes in the afternoon.
- **Route 304 (Mount Joy Express)** operates during weekday peak periods from the Mount Joy GO Station to Finch GO Bus Terminal in the morning and in the opposite direction in the afternoon. Stops for this route closest to the site are located just east of the Bur Oak Avenue and Anderson Avenue intersection, which are approximately 400 metres northeast of the site. Headways of this route range from 17 to 25 minutes in the morning and from 20 to 31 minutes in the afternoon.

Toronto Transit Commission

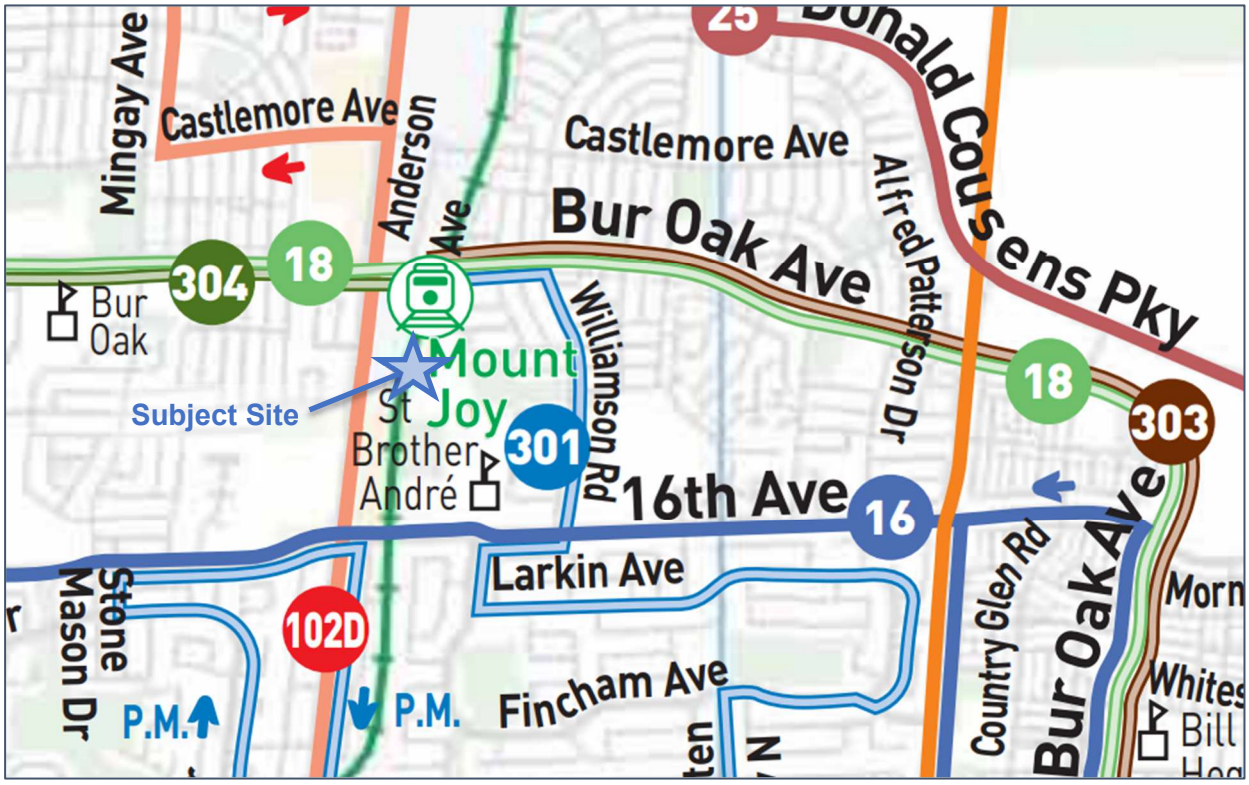
- **Route 102D (Markham Road)** operates all day, every day between the area of Major Mackenzie Drive and Markham Road and Warden Station in Toronto, generally along Markham Road in a north-south direction. Stops for this route closet to the site are at the Markham Road and Edward Jeffreys Avenue intersection, which are approximately 200 metres south of the site. Weekday peak period headways of this route range from 16 to 27 minutes in the morning and are 30 minutes in the afternoon.

GO Transit

- **GO Train Stouffville Line** operates all day, every day between Old Elm GO Station in Stouffville (or Mount Joy GO Station for non-rush-hour trips) and Union Station in Toronto. The site is located adjacent to Mount Joy GO Station and can conveniently access Stouffville Line. Weekday peak period headways of this line are 30 minutes.
- **GO Bus Route 54** operates during weekdays between Mount Joy GO Station and the Highway 407 Bus Terminal in Vaughan. Peak period headways of this route are approximately 60 minutes.
- **GO Bus Route 70D** operates every day during off periods between Mount Joy GO Station and the area of Railway Street and Albert Street in Uxbridge. This route provides connections between Mount Joy GO Station and areas to the north during the off periods. Headways of this route range from one to two hours.
- **GO Bus Route 71** operates every day outside of the service hours of Stouffville Line between the area of Railway Street and Albert Street in Uxbridge and Union Station in Toronto. This route functions as a filler service for the Stouffville Line and can be conveniently accessed at Mount Joy GO Station.

In summary, the subject site enjoys excellent levels of transit access to various parts of the City and beyond.

Figure 2-2 Study Area Existing Transit Context



Source: YRT System Map, retrieved November 2025

2.1.3 Active Transportation Network

The area surrounding the site has good pedestrian infrastructure. Sidewalks are provided on both sides of all study roadways. All signalized and all-way-stop-controlled study intersections have pedestrian crossings for all legs.

As for cycling facilities near the site, there is a “Shared Pathway in Boulevard” along Markham Road and a “Shared Roadway” along Edward Jefferys Avenue within the study road network. No multi-use trail or protected bike lanes are provided within the study road network. The “Bike Lane” along Castlemore Avenue, west of Markham Road, is the closest bike lane to the subject site, located approximately 700 meters northwest of the site. **Figure 2-3** illustrates the existing cycling network in the area.

Figure 2-3 Study Area Existing Cycling Network

Source: 2021-2022 York Region Cycling Map, retrieved November 2025

2.1.4 Traffic Data

WSP commissioned a third-party traffic collection firm (Horizon Data Services Ltd.) to collect existing turning movement counts (TMCs) at the study intersections during the weekday a.m. (7:00 to 9:00 a.m.) and p.m. (4:00 to 6:00 p.m.) peak periods on June 17, 2025 (Tuesday). **Table 2-1** summarizes the TMCs collected for this study. Additionally, signal timing plans (STPs) for the signalized intersections in the study area were acquired from the City of Markham. The TMCs and STPs are provided in **Appendix B**.

Table 2-1 Existing Traffic Data Information

Intersection	Date of Count	Surveyor
Markham Road & Bur Oak Avenue	Tuesday, June 17, 2025	Horizon Data Services Ltd.
Markham Rd & Battista Perri Dr. / Existing Driveway		
Markham Road & Edward Jefferys Avenue		
Markham Road & 16th Avenue		

The existing traffic volumes of the study network were established based on the surveyed TMCs. The existing weekday a.m. and p.m. peak hour volumes at the study intersections are illustrated in **Figure 2-4.**

2.2 Future Background Conditions

2.2.1 Study Horizon

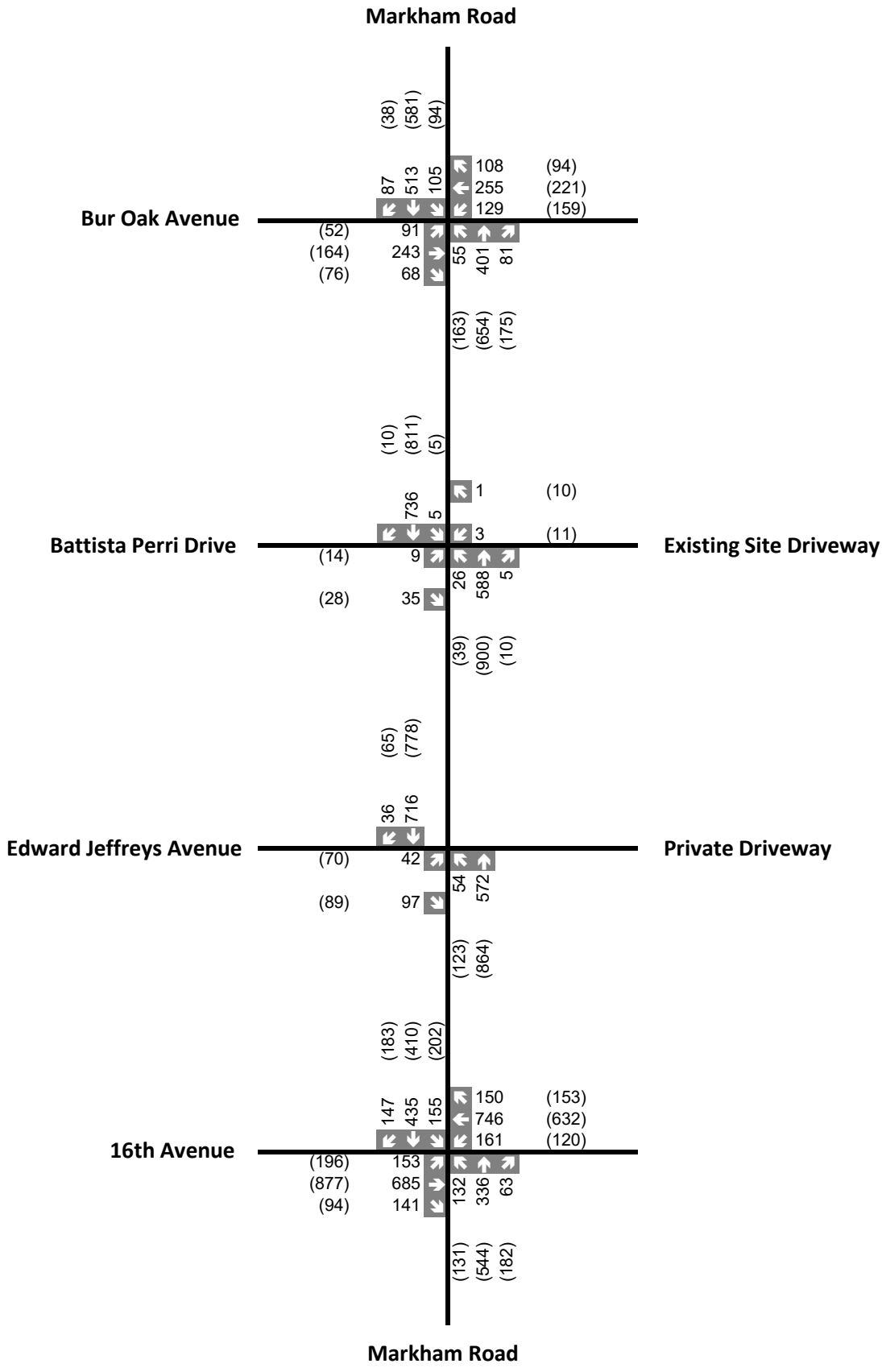
The proposed development is anticipated to be built in one phase within five years (2030). Therefore, the horizon year of 2030 has been evaluated for the near-term future traffic assessments as confirmed with the City staff through the ToR. Given the surrounding context related to the Mount Joy Secondary Plan, a longer term horizon of 2041 has been evaluated along with the high non-auto mode share scenario from the Secondary Plan.

2.2.2 Planned Transportation Network Improvements

Currently, there are no known planned roadway or active transportation improvements in the study area within the near-term study horizon (2030) from the City or York Region. However, the Mount Joy Secondary Plan does recommend lane configuration changes along Markham Road, including the reduction of a through-lane. The Secondary Plan also recommends that dedicated a right-turn lane replace the existing shared through-right lanes in the northbound direction at the intersection of Markham Road and 16th Avenue to service high turning volumes.

The recommendations directly from the Secondary Plan are shown in **Figure 2-5**, and the recommended lane configurations are shown in **Figure 2-6A and 2-6B**. These changes are considered in the 2041 future background and 2041 future total analysis. It should be noted that the City confirmed that as noted in Appendix 3 – Transportation System Improvements in the Markham Road – Mount Joy (MRMJ) SP OPA: a traffic signal is planned at Battista Perri Drive / Future East-West Road and Markham Road. Therefore, this intersection has been modelled as a signalized intersection in the future scenarios.

WSP also understands the Secondary Plan contemplates a potential north-south road along the rail corridor frontage that would connect north-south with a similar intent as the Anderson Avenue extension. However, this north-south road is a long term consideration since Metrolinx is not currently supportive of this road since it would have notable impact through the Mount Joy GO Station parking lot and station layout. As a result, this north-south road has not been evaluated in this TIS.



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xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure 2-4
Existing Traffic Volumes

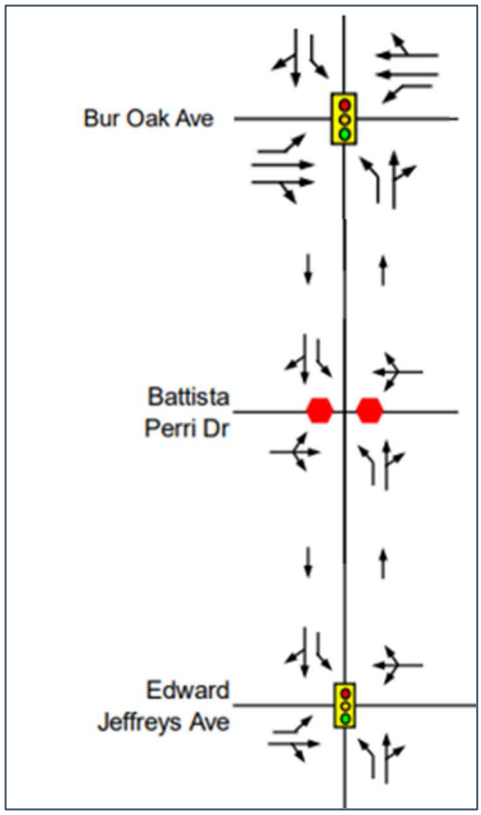
Figure 2-5 Lane Configuration Changes from the Mount Joy Secondary Plan

Based on the analysis, our preliminary recommendations include:

- One through lane northbound and southbound on Markham Road between Major Mackenzie Drive and 16th Avenue, with shared through-right movements and dedicated left-turns, except for 16th Avenue as follows
- At the 16th Avenue and Markham Road intersection:
  - The existing dedicated northbound and southbound right-turn lanes may be maintained at 16th Avenue due to high turning volumes – saving over 50 seconds of overall delay in the AM and over 30 seconds in the PM.
  - While the dedicated right-turn lanes increase crossing distance for pedestrians (and reduce Pedestrian LOS from B to C), there would be no impact relative to existing conditions.
  - Recognizing recent construction on Markham Road, to minimize throwaway construction costs, we recommend re-allocating the curb lane on Markham Road to other uses such as transit, on-street parking, additional space for active transportation. The completion of this Secondary Plan should determine the final vision for the Markham Road corridor, and **a subsequent functional design study should be undertaken** to determine appropriate transitions from dedicated turning lanes at 16th Avenue, reallocated space in the curb lanes, and interface with driveways and other intersecting streets.

Source: *Appendix C*: *Final Transportation Report – Markham Road Mount Joy Secondary Plan (p. 46), HDR, June 15, 2023*

Figure 2-6A Recommended Lane Configuration for Markham Road & Bur Oak Drive to Markham Road & Edward Jefferys Avenue



Source: *Appendix C*: *Final Transportation Report – Markham Road Mount Joy Secondary Plan (p. 36), HDR, June 15, 2023*

Figure 2-6B Recommended Lane Configuration for Markham Road & 16th Avenue

Source: *Appendix C*: *Final Transportation Report – Markham Road Mount Joy Secondary Plan (p. 42), HDR, June 15, 2023*

2.2.3 General Corridor Traffic Growth

For the 2030 horizon, historical TMCs at Markham Road & Bur Oak Avenue and Markham Road and 16th Avenue were analyzed using multiple data sets (non-COVID data ranging from 2017, 2018 and 2025). The linear growth rate regression analysis results are shown in **Table 2-2**. Growth along Markham Road and 16th Avenue was found to be negative. On Bur Oak Avenue, the growth rate in the a.m. peak hour was found to be positive. However, since the rate is less than 1% and only occurs the a.m. peak hour, it was decided that the inclusion of extensive background developments would be sufficient to predict growth along this corridor. The extensive list of background developments accounted for are discussed later in Section 2.2.4. The growth review are provided in **Appendix C**.

For the 2041 scenario, the future background volume is based on the combination of the 2041 future forecast from the Mount Joy Secondary Plan Traffic Study by HDR along and the Upper Markham Village Secondary Plan site-generated traffic. The 2041 future forecast from the HDR study already account for long-term growth and development occurring.

Therefore, no general growth is applied for the 2030 or 2041 horizons.

Table 2-2 Background Development Information

Corridor	A.M. Peak Growth	P.M. Peak Growth
Markham Road	-1.17%	-1.18%
Bur Oak Avenue	0.68%	-0.09%
16th Avenue	-2.19%	-1.11%

2.2.4 Background Development Traffic

Based on the information from the City's Development Application website and as confirmed via the ToR, the background developments listed in **Table 2-3** have been included in the future analysis. The table also includes the proposed development statistics and source for traffic information. The inclusion of the background developments in the 2030 and 2041 horizon years are also indicated for the reasons noted in Section 2.2.3.

Table 2-3 Background Development Information

Horizon Year Included	Development	Statistics	Source
2030	9331-9399 Markham Road	933 residential units and 1,049 m^2 of commercial floor area	TIS by Nextrans Consulting Engineers (February 2022)
2030	9781 Markham Road (Phase 1 and 2)	Phase 1: 545 residential units and 293 m^2 of retail space Phase 2: 752 residential units and 518 m^2 of retail space	TIS Comment Response by WSP (December 2022)
2030	9900 Markham Road	736 residential units and 513 m^2 of retail space	TIS Addendum by WSP (April 2023)
2030	77 Anderson Avenue	490 residential units and 398 m^2 of retail space	City of Markham Mappit Tool (Currently under review, stats dated November 2021)
2041	Markham Road Mount Joy Secondary Plan (base line traffic for 2041)	23,557 residents and 6,017 jobs in the study area	Transportation Report by HDR (June 2023)
2030 & 2041	Upper Markham Village Secondary Plan	15,850 residential units, 23,000 m^2 of commercial GFA, and elementary schools totaling 4,000 students	Transportation Study by LEA (December 2024)
N/A	Robinson Glen East Community Development	2,500 residential units and an elementary school with 615 students	Transportation Study by WSP (March 2025)
2030	9999 Markham Road (Phase 1A)	117 townhouse units	TIS Addendum and Response to Comments (November 2021)

As mentioned previously, the Mount Joy Secondary Plan traffic study modelled the forecast 2041 horizon year traffic volumes, which account for general growth, changes in traffic patterns due to the narrowing of Markham Road from a vehicular perspective, and applicable planned density and background developments. Notwithstanding, through the TOR stage, the City asked for the Upper Markham Village Secondary Plan and the Robinson Glen East development to be accounted for in the 2030 & 2041 forecast volumes from the Mount Joy Secondary Plan traffic study.

For context, the Upper Markham Village Secondary Plan evaluated two horizon years representing the partial and full buildout scenarios. The partial buildout is analyzed for the year 2028, whereas the full buildout is predicted to be in 2031. For the purpose of this analysis, the 2028 partial buildout volumes are applied to the 2030 analysis, and the 2031 full buildout volumes are applied to the 2041 analysis.

Upon reviewing the traffic study prepared for the Robinson Glen East Community Development, it was found that this development does not generate meaningful trips that will affect the study area of this TIS. Most of the site-traffic is assigned to McCowan Road and Kennedy Road, with approximately only 10 trips during the peak hours being directed towards the study area on Major Mackenzie. This is shown in **Appendix C**. For the purpose of this study, the Robinson Glen East Community Development is considered to have negligible influence on the study network and not included in this TIS – similar to the approach of the Mount Joy Secondary Plan traffic study.

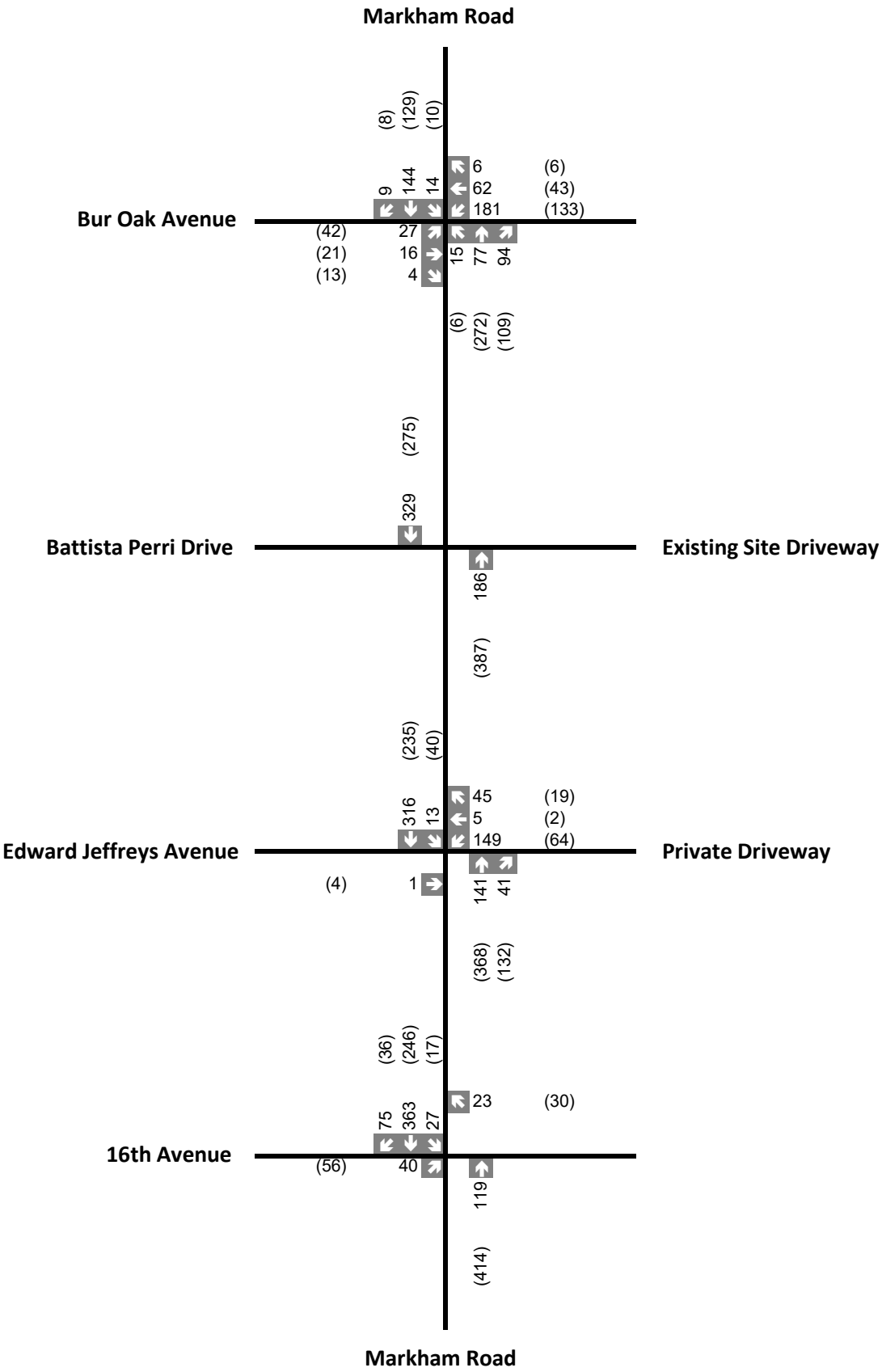
For the 9999 Markham Road site, the site-generated volume presented in the WSP response letter was for the overall 9999 Markham site with a longer-term buildout and with phases beyond 1A not yet approved. Therefore, only the proportion of the trips related to the approved Phase 1A (117 townhouses) has been included.

Traffic assignment figures for the background developments in Table 2-3 are available from their associated transportation studies. The overall background development traffic volumes are illustrated in **Figure 2-7** for the 2030 scenario. The 2041 future forecast volumes from the Mount Joy Secondary Plan are shown in **Figure 2-8A**. The Upper Markham Village Secondary Plan volumes can be seen in **Figure 2-8B**. Traffic assignment figures for individual background developments in **Table 2-3** are provided in **Appendix C**.

2.2.5 Future Background Traffic Volumes

The 2030 future background traffic forecast corresponding to the weekday a.m. and p.m. peak hours was derived by superimposing the traffic generated by the background developments (Figure 2-7) onto the existing traffic volumes. The resulting 2030 future background traffic volumes are illustrated in **Figure 2-9**.

The 2041 future background traffic forecast was derived by superimposing the Upper Markham Village Secondary Plan onto the traffic volumes from the Mount Joy Secondary Plan. Excerpts of the traffic volumes in their respective reports can be seen in **Appendix C**. The 2041 future background traffic volumes are shown in **Figure 2-10**.



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xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure 2-7
2030 Background Development Traffic Volumes

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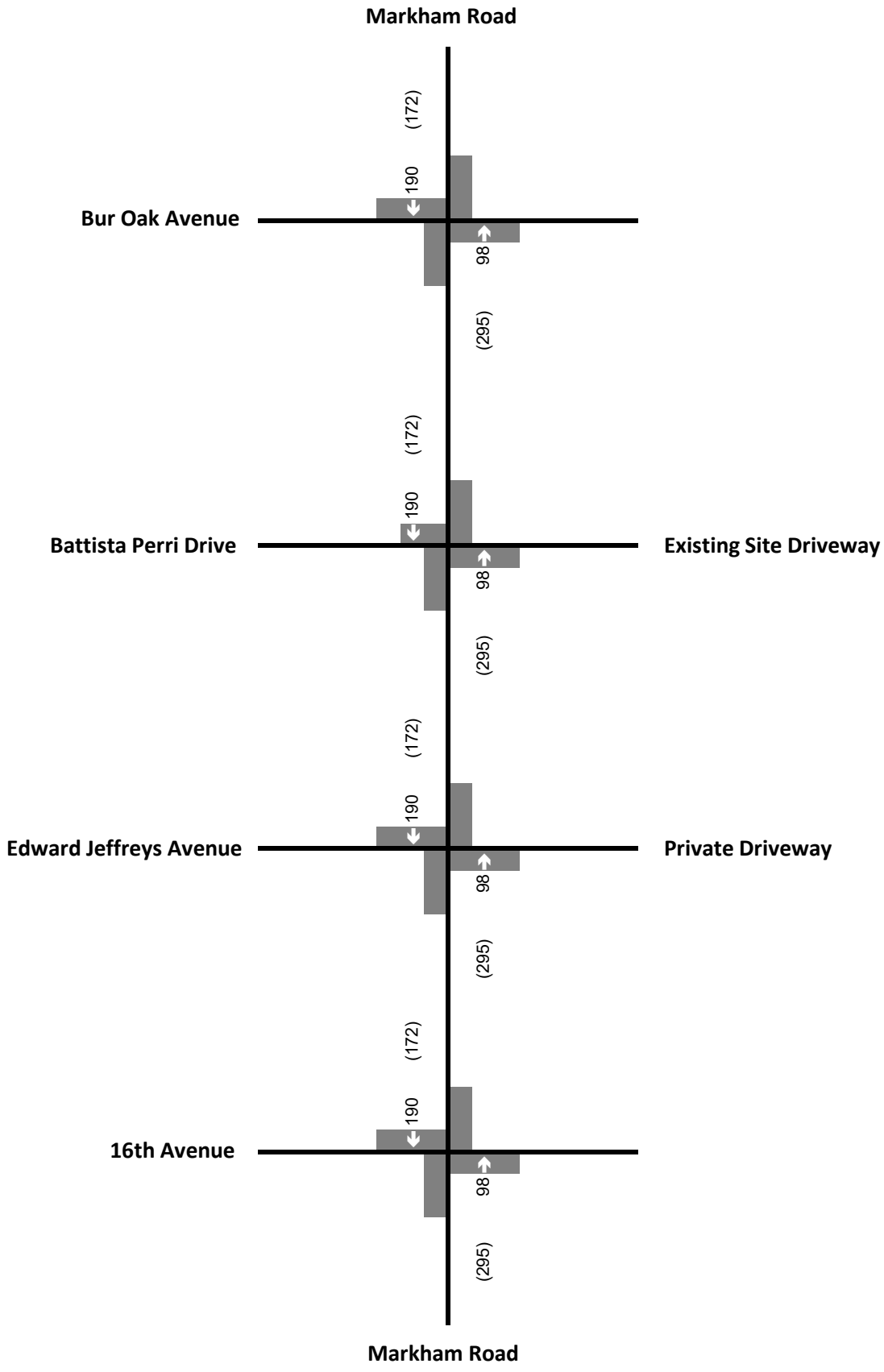
xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure 2-8A
Mount Joy Secondary Plan
Traffic Volumes



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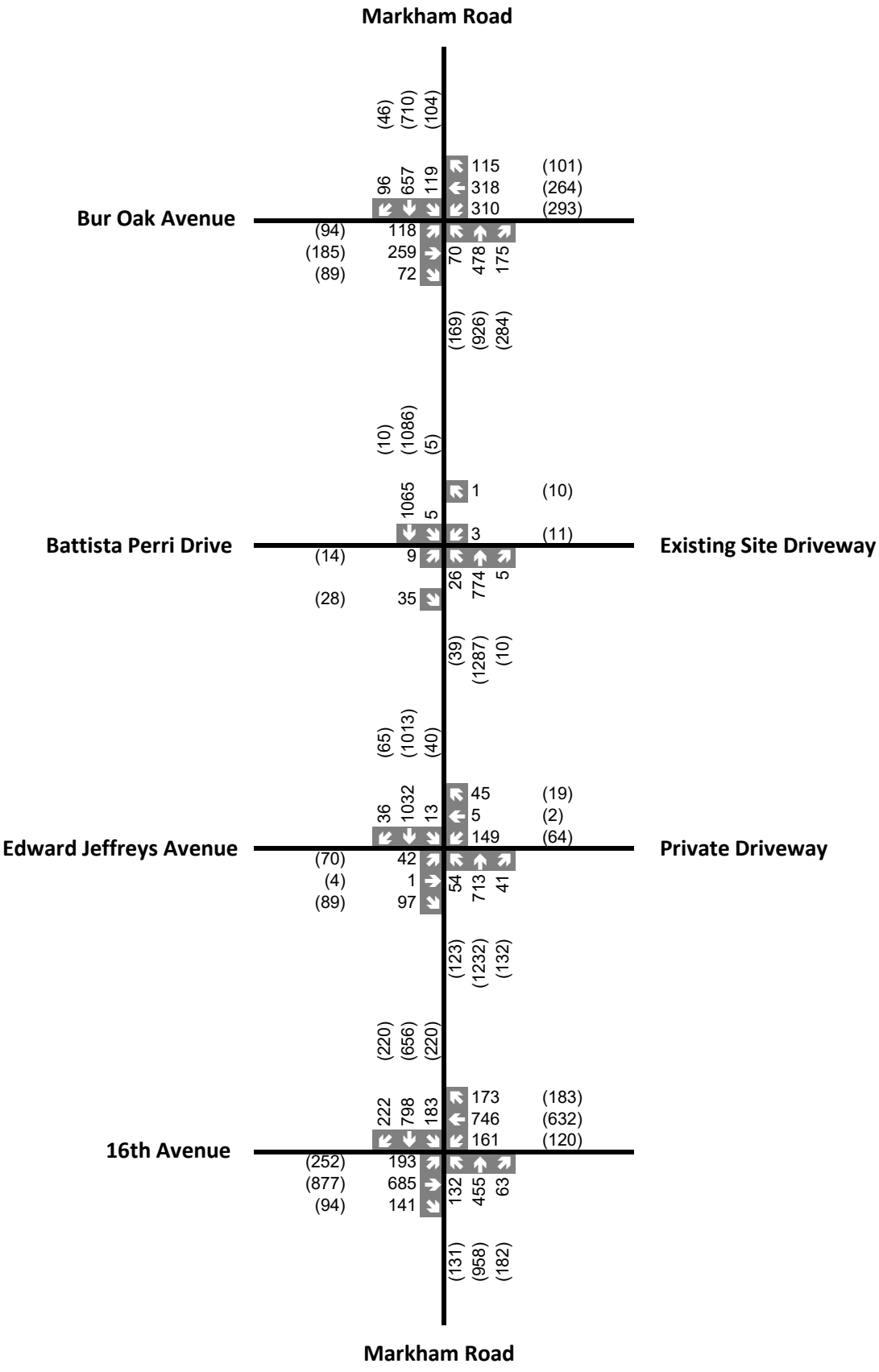
xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure 2-8B
Upper Markham Village
Secondary Plan Traffic Volumes



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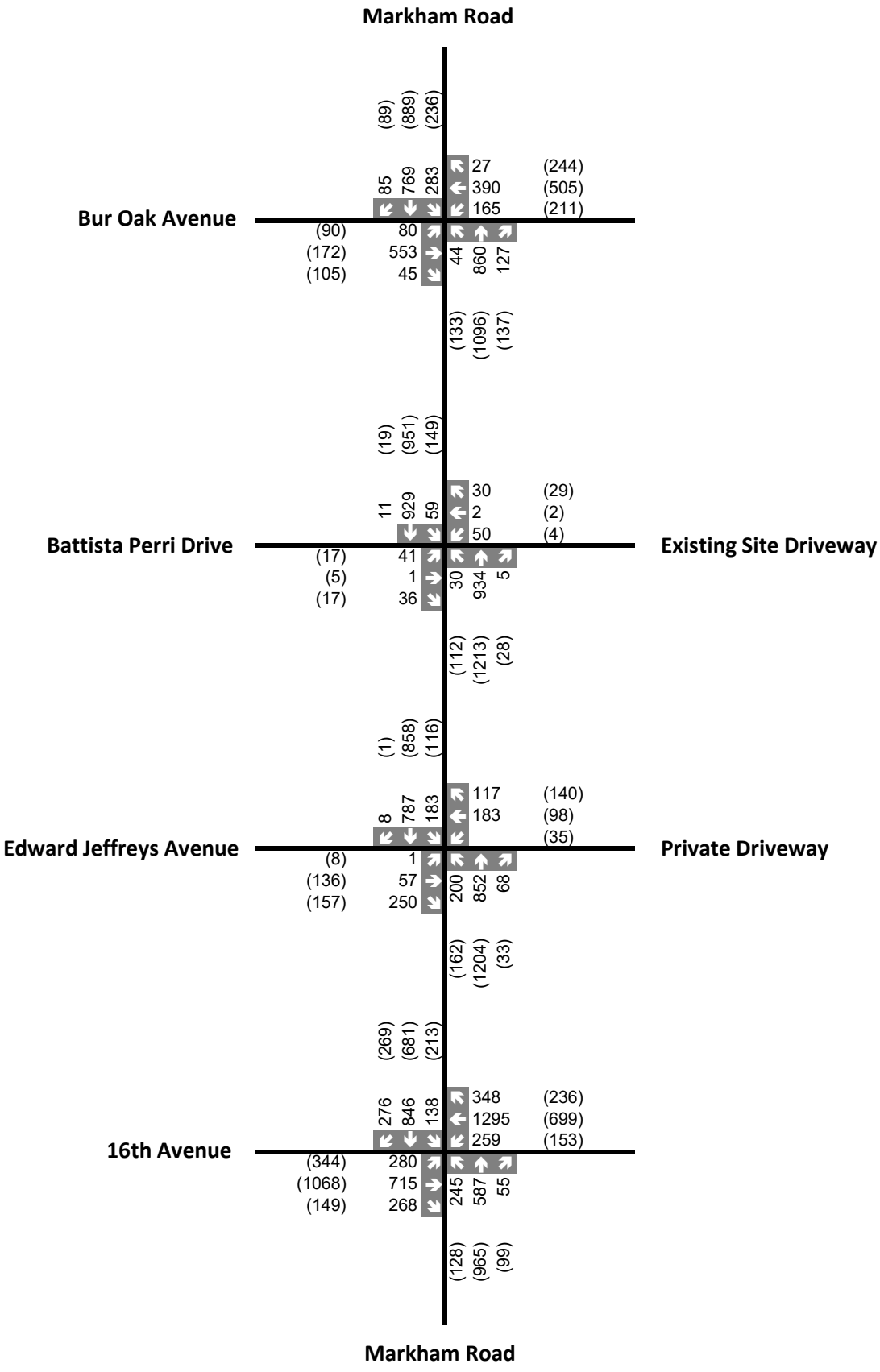
xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure 2-9
2030 Future Background Traffic Volumes



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xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

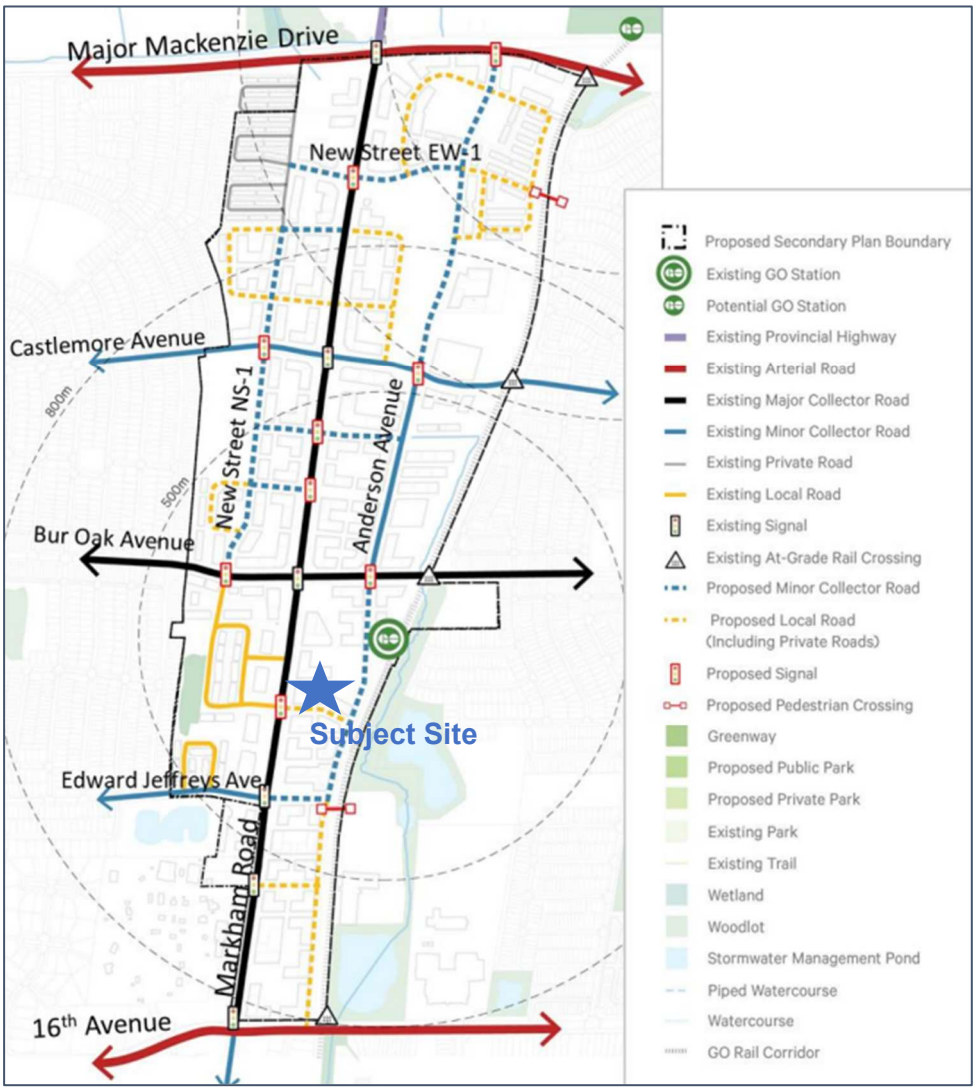
Figure 2-10
2041 Future Background Traffic Volumes

2.3 Future Total Conditions

2.3.1 Lane Configurations and Site Access Arrangement

As mentioned in **Section 2.2.2**, a new lane configuration is recommended in the Mount Joy Secondary Plan for Markham Road for 2041, resulting in a 2-lane cross section in the northbound and southbound directions, and a dedicated right-turn lane in the northbound direction at the intersection of Markham Road and 16th Avenue. Additionally, the implementation of a new traffic signal at Markham Road and Battista Perri Drive is recommended by the Secondary Plan. The Secondary Plan also shows that the existing site access will be upgraded to a future public road aligned with Battista Perri Drive. The planned traffic signal and local road can be seen in **Figure 2-11**.

Figure 2-11 Planned Traffic Signal and Local Road at the Existing Site Access



Source: *Final Transportation Report – Markham Road Mount Joy Secondary Plan (p. 29), HDR, June 15, 2023*

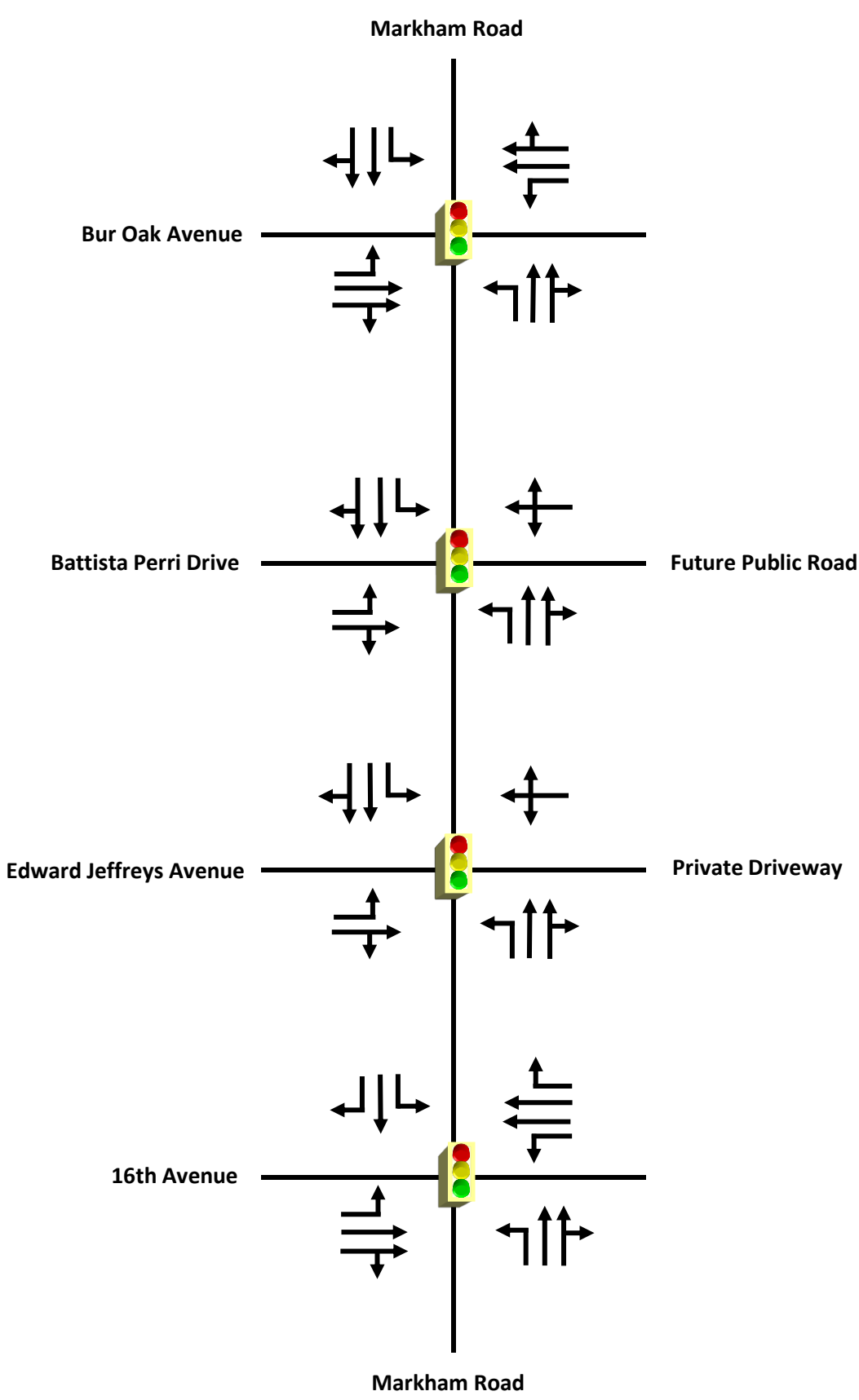
It should be noted that the planned lane configuration for the future public road at the intersection of Markham Road and Battista Perri Drive is likely to be a through-right lane and a designated left turn lane in order to mirror eastbound approach of Battista Perri Drive. This configuration has been designed as noted later in the functional design section of this TIS. To be conservative, the Synchro analysis conducted in this study assumes only a shared left-through-right westbound lane at Markham Road.

These lane configuration changes along Markham Road are only applied to the 2041 horizon year. The future east-west public road and planned signal at Battista Perri Drive/Markham Road is included in both the 2030 and 2041 horizon years as it can be delivered as part of the proposed development.

The future lane configurations for the 2030 horizon year are shown in **Figure 2-12A**, highlighting the addition of the signalized intersection at Markham Road and Battista Perri Drive and the future public road.

The future lane configurations for the 2041 horizon year are illustrated in **Figure 2-12B,** highlighting the changes recommended in the Mount Joy Secondary Plan along with the addition of the signalized intersection at Markham Road and Battista Perri Drive. The future background lane configurations at Markham Road and Battista Perri Drive are also shown in **Figure 2-12B** to highlight the comparison of the existing minor-street stop control and the future signalized intersection.

It should be noted that as per Figure 2-11, there is a north-south collector road contemplated by the City as part of the Mount Joy Secondary Plan that would connect Bur Oak Avenue to 16th Avenue, and connecting to the Anderson Avenue roadway. This future roadway has been protected for in the subject site's plans – as shown in the ground floor plan. By the 2041 horizon, if this north-south connection is delivered, it would relieve traffic pressure from Markham Road and allow the subject site-generated traffic to by-pass some of the busier intersections. To be conservative, and given the uncertainty around the timing of the north-south road, it has not been considered in this TIS under either 2030 or 2041 horizons.



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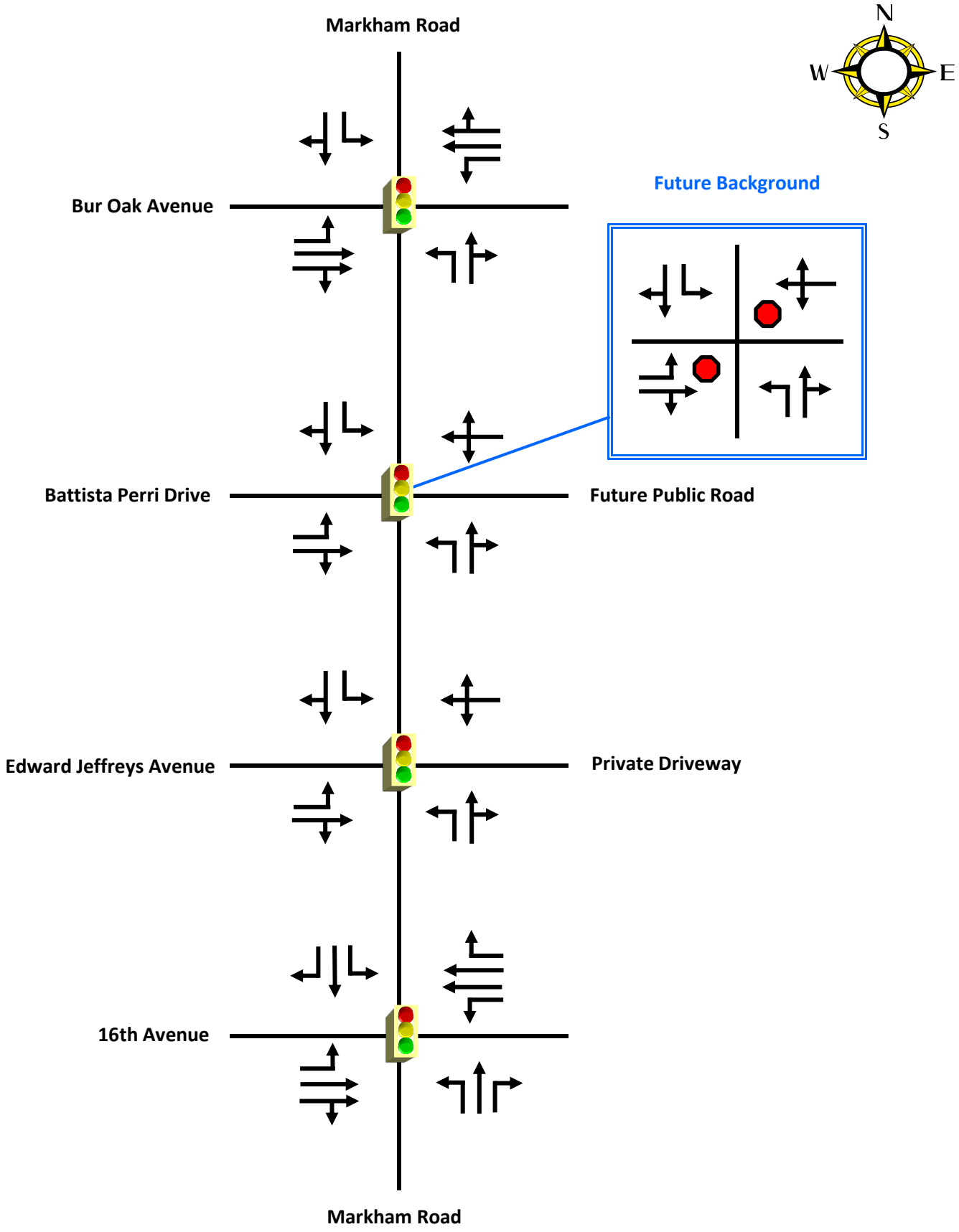
Signalized Intersections

Unsignalized Intersections

Figure 2-12A
2030 Future Lane Configurations



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Signalized Intersections

Unsignalized Intersections

Figure 2-12B
2041 Future Lane Configurations

2.3.2 Modal Split and Site Trip Generation

New vehicular trips generated by the proposed development have been established in accordance with the *Institute of Transportation Engineers* (ITE) *Trip Generation Manual, 12th Edition*. Land Use Code (LUC) 222 – Multifamily Housing (High-Rise) was used. This latest edition of ITE does not provide equation rates for this land use code, so the average rates were used. The 11th Edition does provide an equation rate, however the R^2 value is low, which indicates high variability in the data. The average rate given in the 12th Edition was based off 23 proxy studies and is the most up-to-date rate and is therefore used in this study.

It is worth noting that the site plan includes the redevelopment of the existing temple currently located on the site. Trip generation was not conducted for the temple use since the traffic generated by the temple is already accounted for in the existing TMCs. Additionally, the site includes a ground-floor retail component. However, the retail use is intended to serve the surrounding neighbourhood via non-auto modes of transportation like walking, cycling and transit. There is also no vehicular parking proposed for the retail use. Therefore, auto trip generation for the retail use is not required.

Non-auto trip reductions were applied to the calculation of trip generation. To determine the proportion of trips made by non-automobiles modes, travel data from the 2022 *Transportation Tomorrow Survey* (TTS) has been examined. Home-based data was extracted from the TTS database for Traffic Analysis Zones (TAZs) 2434, 2435, 2440 and 2441 (per 2006 zone numbering) near the subject site. Traffic analysis zones were determined based on land use similarity and proximity. The resulting modal splits in the study area are summarized in **Table 2-4**. To ensure a sufficient sample size, residential data was extracted for the peak time periods in both the inbound and outbound directions. The TTS queries are provided in **Appendix D**.

Table 2-4 Area Modal Split Percentages

Mode	Residential			
	AM Peak Hour		PM Peak Hour	
	In	Out	In	Out
Auto Driver	70%	46%	61%	65%
Auto Passenger (incl. rideshare, taxi, etc.)	6%	25%	26%	30%
Transit	-	2%	3%	-
Go Rail Only	-	2%	2%	-
Joint GO & Local Transit	-	1%	1%	-
Walk	23%	18%	6%	5%
Cycling	-	1%	-	-
Other (school bus, etc.)	2%	6%	2%	-
Non-Single Occupant Vehicle Modes[1,2]	**30%**	**54%**	**39%**	**35%**

1. Includes auto passenger trips.
2. Minor discrepancies due to rounding.

The above non-SOV proportions ranging from 30% to 54% reflect the convenience of bus services and access to the GO station. This is aligned with the MTSA designation and the intent to achieve a high transit mode split, and the reduced auto parking supply (0.30 resident space/unit) proposed as detailed later in the parking section. Based on the above findings, the new vehicular trips generated by the proposed development during the weekday a.m. and p.m. peak hours are summarized in **Table 2-5**. Detailed trip generation calculations are provided in **Appendix E**. It should be noted that at the time of completing the traffic analyses, the unit count was proposed at 1,204 units. The final submission plan reflects 1,218 units. Given the minor 1% difference, the findings based on 1,204 units is still applicable.

Table 2-5 Site New Trip Generation

Land Use	Basis/Parameter	A.M. Peak Hour			P.M. Peak Hour		
		In	Out	Total	In	Out	Total
High-Rise Residential (1,204 units)	Trip Generation Basis (per unit)[1]	0.06	0.14	0.20	0.16	0.10	0.26
	Directional Split	29%	71%	100%	61%	39%	100%
	Total Trips	70	171	241	191	121	312
	Non-SOV Modal Split Reduction Percentage	30%	54%	--	39%	35%	--
	Modal Split Reduction	21	92	113	74	42	116
Total New Vehicular Trips		**49**	**79**	**128**	**117**	**79**	**196**

1. Based on average rates from ITE LUC 222.

As indicated above, the proposed development is forecast to generate 128 and 196 two-way auto trips during the weekday a.m. and p.m. peak hours, respectively.

2.3.3 Trip Distribution and Assignment

The projected distribution for the new site trips was developed based on the existing trip distribution patterns according to the 2022 TTS database for home trips in TAZs 2434, 2435, 2440, and 2441 to capture a more comprehensive sample size. This analysis includes the inbound and outbound directions for both the a.m. and p.m. peak periods to accurately determine the impacts on the current transportation network.

Tabel 2-6 summarizes the projected site trip distribution by the relative origin and destination direction. Details of the TTS trip distribution data are provided in **Appendix D**.

Table 2-6 Site Trip Distribution Pattern

Direction	AM Peak Hour		PM Peak Hour	
	Inbound	Outbound	Inbound	Outbound
Northwest	2%	2%	2%	1%
North	0%	2%	3%	4%
Northeast	25%	14%	8%	9%
East	1%	1%	2%	3%
Southeast	11%	8%	8%	8%
South	1%	7%	9%	14%
Southwest	36%	46%	44%	43%
West	23%	20%	24%	20%

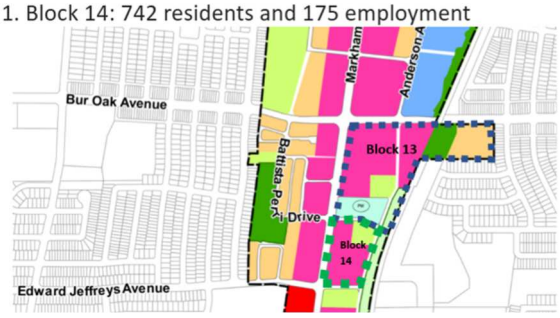
Using the distribution trend in **Table 2-6**, the new site-generated trips were assigned to individual movements within the study area based on factors such as site access locations ease of turning, shortest distances, the convenience of route choices and intersection configurations. The site traffic assignment within the study network is illustrated in **Figure 2-13**. The traffic-related to the temple use is already shown at the east-west public road/Barrista Perri Drive/Markham Road intersection.

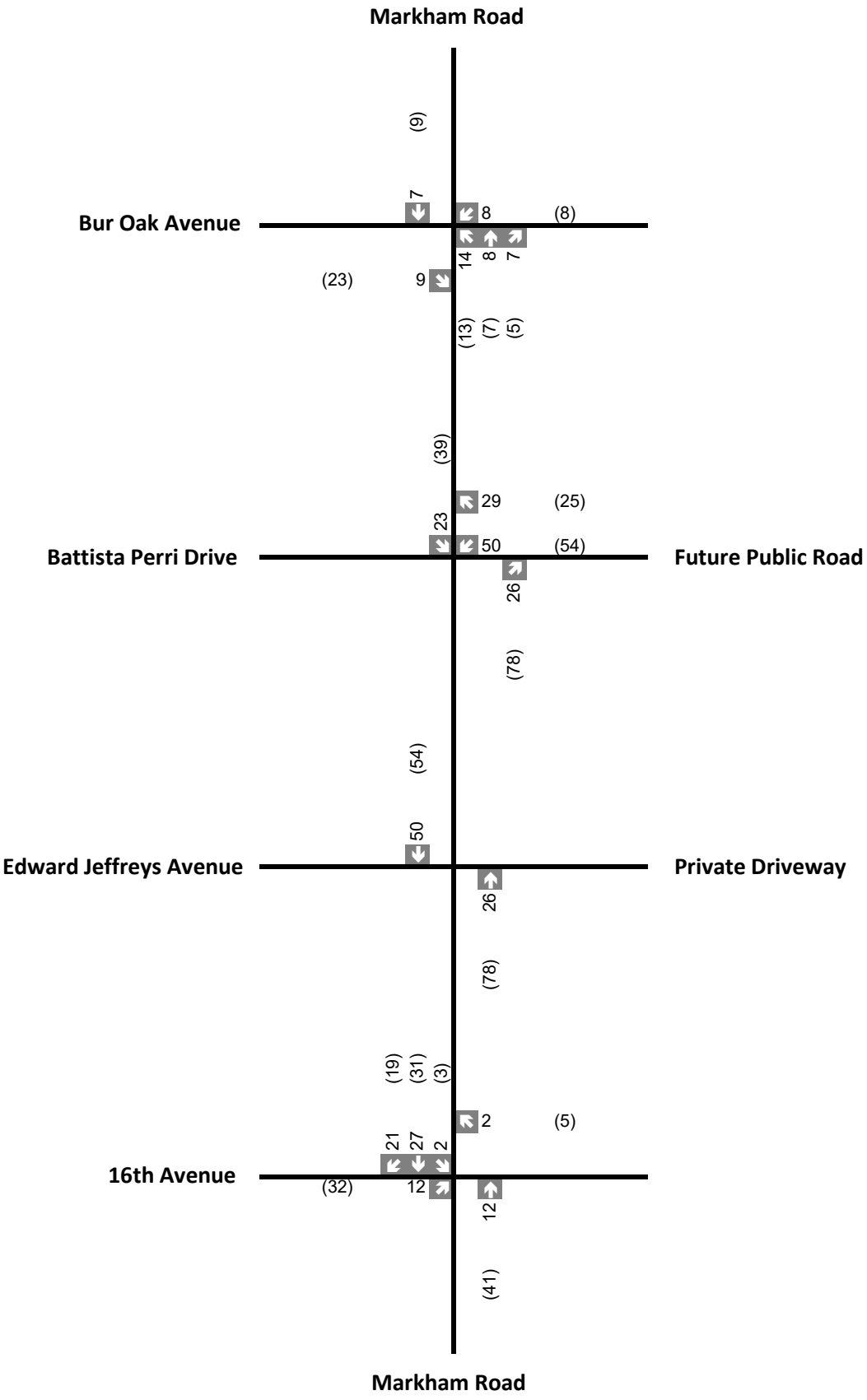
2.3.4 Future Total Traffic Volumes

The 2030 and 2041 future total traffic volumes corresponding to the weekday a.m. and p.m. peak hours were derived by combining the trips generated by the proposed development and the future background traffic volumes determined for each horizon year. The resulting future total traffic volumes for 2030 and 2041 are illustrated in **Figure 2-14** and **Figure 2-15**, respectively.

It is important to note that the direct addition of the site-generated trips from the proposed development onto the 2041 future background volumes represents a very conservative approach. This is because the Mount Joy Secondary Plan already envisioned a certain level of high-density development occurring on the subject site (as shown in the excerpt below). Therefore, there is an overlap in traffic generated by the subject site, which means the results presented are the worst-case scenario.

8. The density planned for the MRMJ Secondary Plan are by blocks:
    1. Block 13: 3,732 residents and 1,575 employment
        i. However, the existing place of worship was assumed to remain. Suggestion is to remove the existing site driveway traffic and add the proposed development traffic.
    1. Block 14: 742 residents and 175 employment



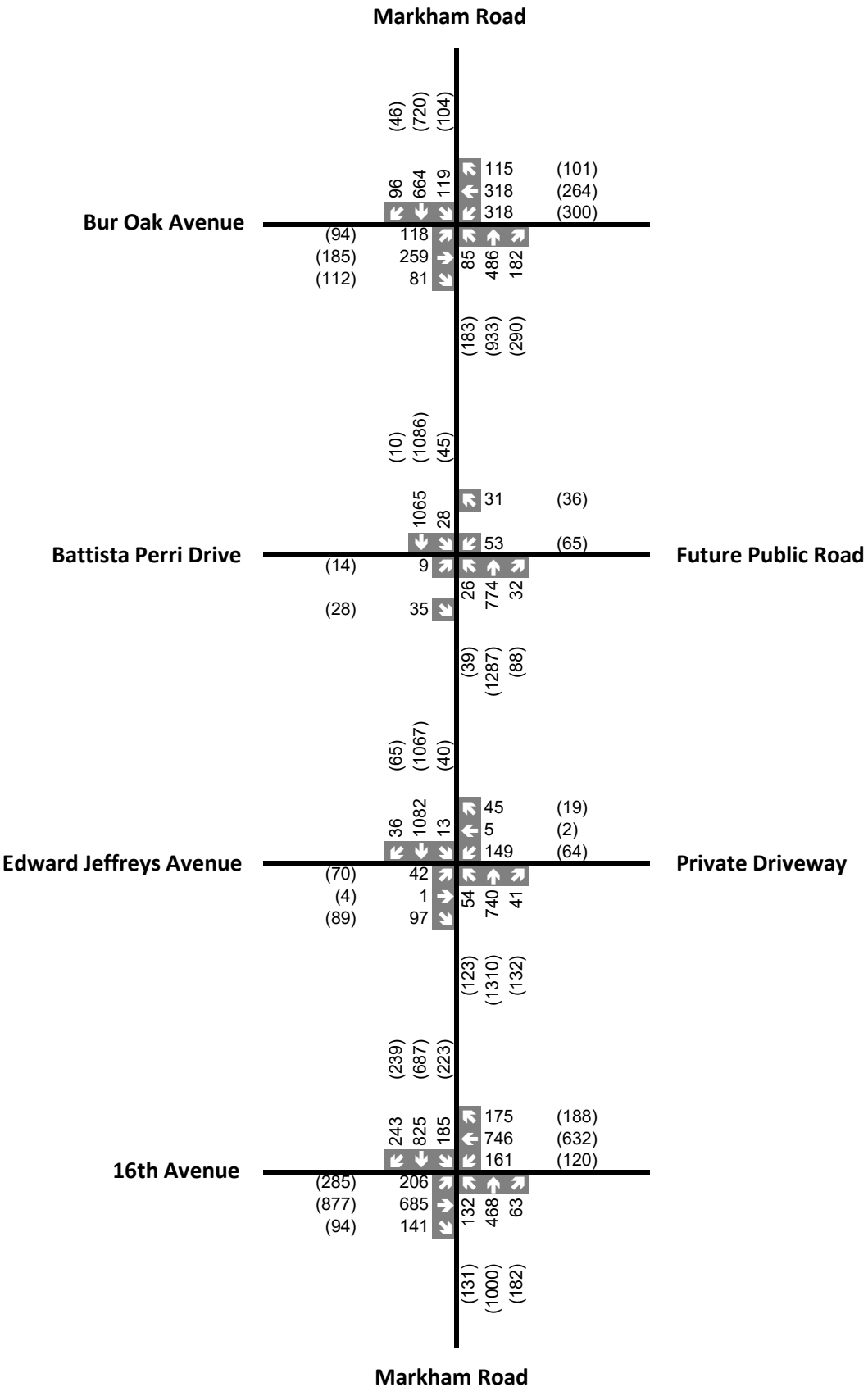


Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure 2-13
Site Generated Trip Assignment

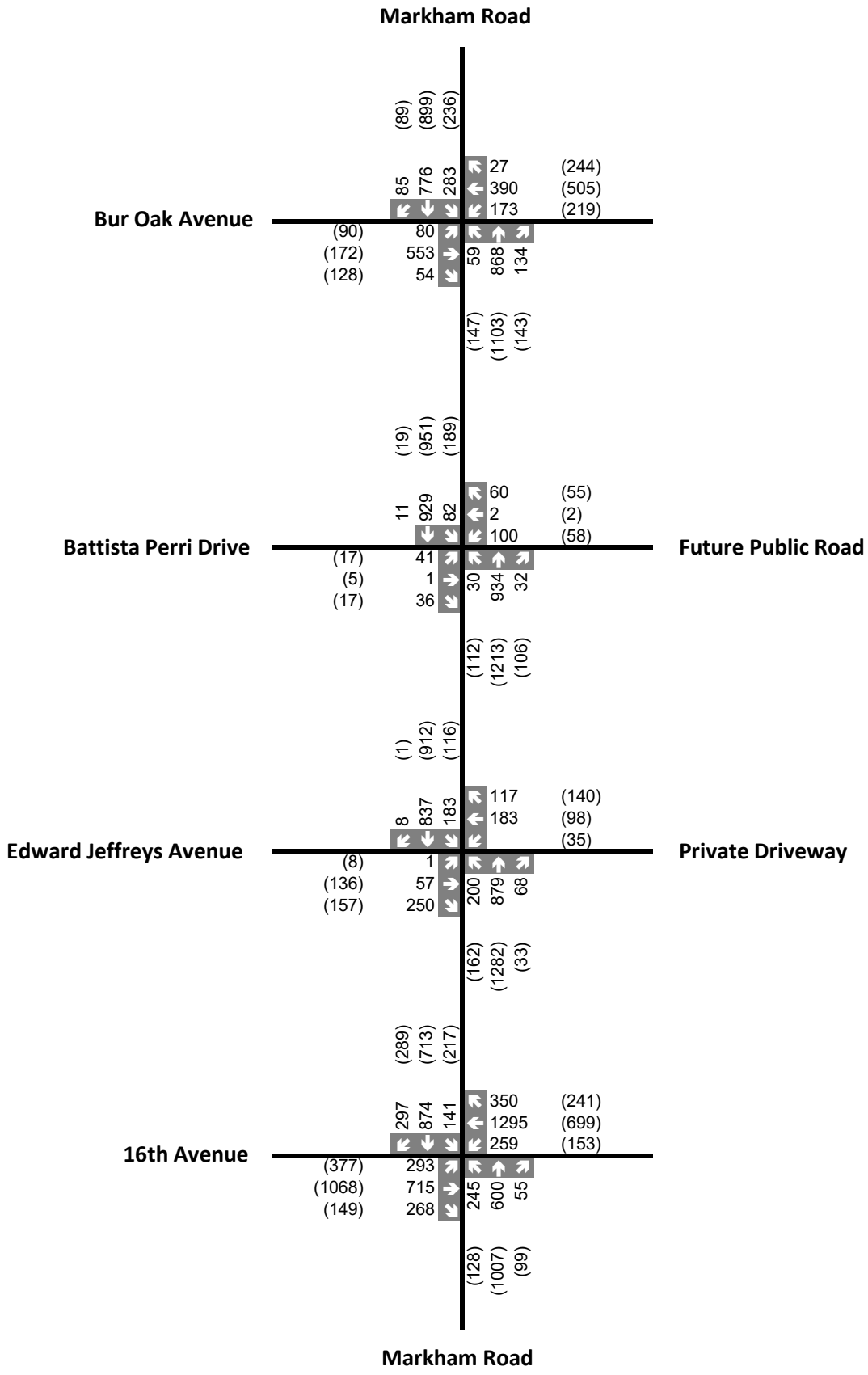


Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure 2-14
2030 Future Total Traffic Volumes



Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure 2-15
2041 Future Total Traffic Volumes

3 Traffic Operations Assessment

This section documents the methodology and findings for the traffic operations assessment under existing, future background, and future total conditions using Synchro.

3.1 Study Assumptions and Methodology

3.1.1 Methodology and Synchro Parameters

Methodology

The Synchro model has been established based on York Region's *Transportation Mobility Plan Guidelines (2025)* and the City of Markham's *Transportation Impact Assessment Study – Terms of Reference (February 2023)* (referred to as the Synchro Guidelines hereafter). The Synchro 12 traffic analysis software incorporates the methodology outlined in the *Highway Capacity Manual* (HCM), Transportation Research Board, 2000 and 2010. Synchro 12 is the latest version of the software series. The City's Synchro Guidelines remain applicable as the settings are consistent across the two versions. Intersection capacity analysis provides an indication of traffic operations based on calculations of volume-to-capacity ratio (v/c) and delays for individual movements at an intersection. Level of Service (LOS) denoted by the letters 'A' through 'D', represents satisfactory traffic operations. LOS denoted by the letters 'E' and 'F' represents congested traffic conditions. The Level of Service definitions for signalized and unsignalized intersections are included in **Appendix F**. For this study, the reported results for signalized and unsignalized intersections are based on the HCM 2000 methodology, unless otherwise indicated, in accordance with the City's Synchro Guidelines.

Synchro Input Parameters

The Synchro input parameters used in the analysis were established in accordance with the City's Synchro Guidelines. The key Synchro input parameters are listed below.

- Heavy vehicle percentages and pedestrian and cyclist volumes were coded based on the respective counts from the TMCs;
- Bus blockages were incorporated based on available scheduling information from the York Region and TTC websites;
- Peak hour factors (PHF) were calculated based on the overall intersection volumes;
- The latest signal timing plans provided by the City of Markham;
- A default ideal saturation flow rate of 1,900 vehicles per hour per lane (vphpl) was applied to all movements;
- Detector settings were coded per the signal timing plans and the Synchro Guidelines;
- A lost time adjustment (LTA) of 0 second was applied at the signalized intersections per the Synchro Default Guidelines; and
- Through and dedicated turning lanes were coded based on their measured widths using Google Earth.

3.2 Intersection Capacity Analysis

Table 3-1 summarizes the LOS, v/c ratios, and delays at the study intersections under the existing, future background, and future total conditions during the weekday a.m. and p.m. peak hours based on the corresponding volumes documented in previous sections. Critical movements include those with a v/c ratio of 0.85 or greater. Over-capacity movements have a v/c ratio of 1.00 or greater. Signal timings were optimized under the future conditions at only one study intersection, which is discussed in the following sections. Detailed Synchro analysis worksheets are provided in **Appendix G**.

3.2.1 Existing Conditions

As shown in **Table 3-1**, the signalized study intersections operate at an acceptable overall LOS 'D' or better during the weekday a.m. and p.m. peak hours under existing conditions, with only three critical movements with a v/c ratio of 0.85 or greater; one during the a.m. peak hour and two during the p.m. peak hour. All of the critical movements occur at the intersection of Markham Road and 16th Avenue.

The unsignalized study intersection that serves as the site access operates at LOS 'A' during the weekday a.m. and p.m. peak hours. The stop-controlled movements at the existing Battista Perri Drive intersection with Markham Road operates adequately at LOS 'A' to 'C' with ample residual capacity.

3.2.2 Future Background Conditions

Under future background conditions, the signal timings at the signalized intersection of 16th Avenue and Markham Road were optimized for both the 2030 and 2041 horizons to improve overall intersection operations, as various movements were initially found to be operating over capacity. For both the a.m. and p.m. peak hours, the split time allocation were optimized while maintaining the existing cycle length. In general the northbound and southbound splits were increased to reflect the increased north-south travel demand and the future narrowing of Markham Road under the 2041 scenario. **Figures 3-1A-C** and **Figures 3-2A-C** show a comparison between the optimized signal timing splits and the existing splits for each scenario at the intersection of 16th Avenue and Markham Road.

2030 Horizon Year

For the 2030 scenario, the results in **Table 3-1** show that the signalized intersection of Markham Road and Bur Oak Avenue is expected to operate at LOS 'D' or better, with one critical movement in both the a.m. and p.m. peak hours. As seen in **Table 3-1** , these movements are critical but do not exceed capacity. As mentioned previously, the a.m. and p.m. timing splits were optimized at the signalized intersection of Markham Road and 16th Avenue under future background conditions, as there were movements over capacity in both periods. The optimized splits for the a.m. and p.m. peak hours are shown in **Figure 3-1B** and **Figure 3-2B**, respectively. Optimization reduces the overall intersection delays and **Table 3-1** shows that there are no longer movements that are significantly over capacity. The unsignalized intersection of Markham Road and Battista Perri Drive operates at an overall very good LOS 'A' with no critical movements in both the a.m. and p.m. peak hours.

2041 Horizon Year

For the 2041 future background scenario, traffic volumes increase as the Mount Joy Secondary Plan is implemented and the inclusion of the Upper Markham Village Secondary Plan. As a result, all of the study intersections operate at LOS 'F' with the exception of Markham Road and Edward Jefferys Avenue in the a.m. peak hour, which operates at LOS 'C'. Additionally, there are several critical movements at each study intersection as shown in **Table 3-1**.

Similar to the 2030 future background scenario, the intersection that sees significant improvement from split optimization is Markham Road and 16th Avenue. The optimized splits for the a.m. and p.m. peak hours are shown in **Figure 3-1C** and **Figure 3-2C**, respectively. The optimized splits help improve overall intersection delay as well as the v/c ratios for the northbound and southbound movements.

The unsignalized intersection of Markham Road and Battista Perri Drive is planned to be upgraded to a signalized intersection, as noted in the Mount Joy Secondary Plan. This implementation will be included in the future total analysis since that is when the east-west public road will be built aligning with Battista Perri Drive. **Table 3-1** shows this change to be necessary, given the poor LOS and over-capacity movements arises when this intersection is left as unsignalized under 2041 future background conditions.

Figure 3-1A Existing A.M. Peak Hour Timing Splits

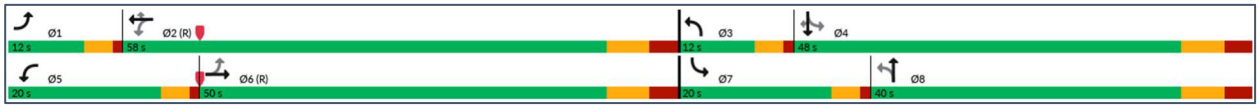


Figure 3-1B Optimized 2030 A.M. Peak Hour Timing Splits

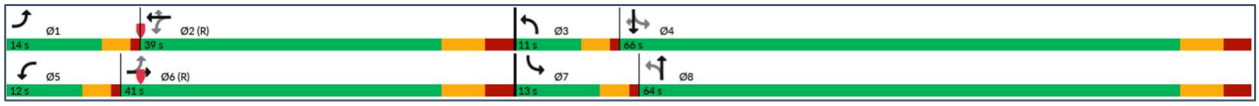


Figure 3-1C Optimized 2041 A.M. Peak Hour Timing Splits

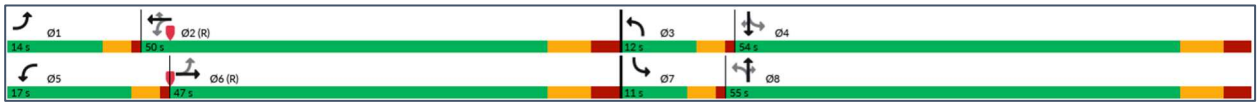


Figure 3-2A Existing P.M. Peak Hour Timing Splits

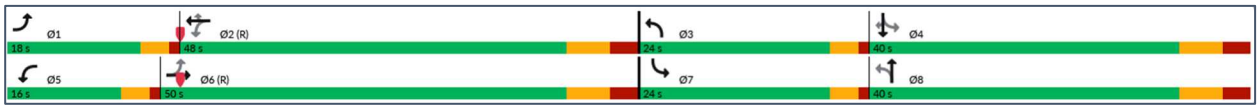


Figure 3-2B 2030 P.M. Peak Hour Timing Splits

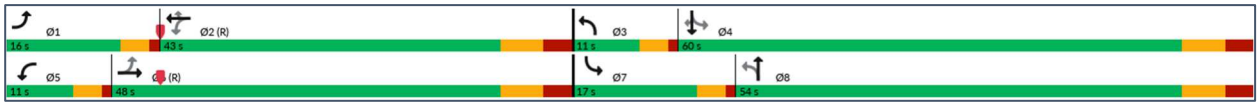
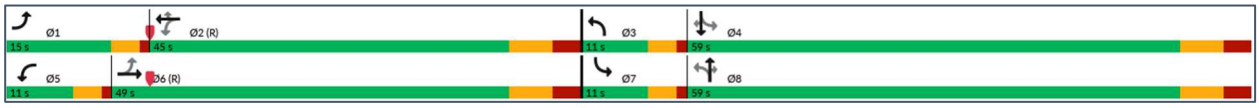


Figure 3-2C Optimized 2041 P.M. Peak Hour Timing Splits



3.2.3 Future Total Conditions

The signal timing optimizations recommended under future background conditions are carried forward to the respective 2030 and 2041 future total traffic analysis without any further modifications to allow “Apples to Apples” comparison to understand the level of influence the site-generated traffic has on the study network.

2030 Horizon Year

As shown in **Table 3-1**, the 2030 future total scenario operates very similar to the 2030 future background scenario. The site-generated trips are relatively low in comparison to the background development volumes (Figure 2-7) and 2030 future background volumes (Figure 2-9).

The addition of the signalized intersection at Markham Road and Battista Perri Drive / public road improves intersection function from LOS ‘D’ to ‘A’ in both the a.m. and p.m. peak hours. Motorist delay also improves significantly, as it decreases by approximately 25 seconds in the a.m. peak hour, and 19 seconds in the p.m. peak hour.

Minimal change occurs at the intersections of Markham Road and Bur Oak Avenue and Markham Road and Edward Jefferys Avenue, as the LOS remains unchanged for both the a.m. and p.m. peak hours. At Markham Road and 16th Avenue, the LOS goes from LOS ‘D’ to ‘E’ in the p.m. peak hour but the actual average motorist increase in delay is relatively minor at 3.9 seconds per vehicle. **Overall, the average increase in average intersection delay at all of the signalized study intersections is approximately 1 second per vehicle during both the a.m. and p.m. peak hours for the 2030 horizon year.** This indicates that the site traffic has minimal influence on the road network operations.

2041 Horizon Year

Similar to the 2030 horizon year, the site-generated trips are very low in comparison to the future total volumes applied to the 2041 scenario, as shown in **Figure 2-13** and **Figure 2-15**, respectively. As seen in **Table 3-1**, the future total conditions for 2041 show that many of the movements in the study area are over capacity.

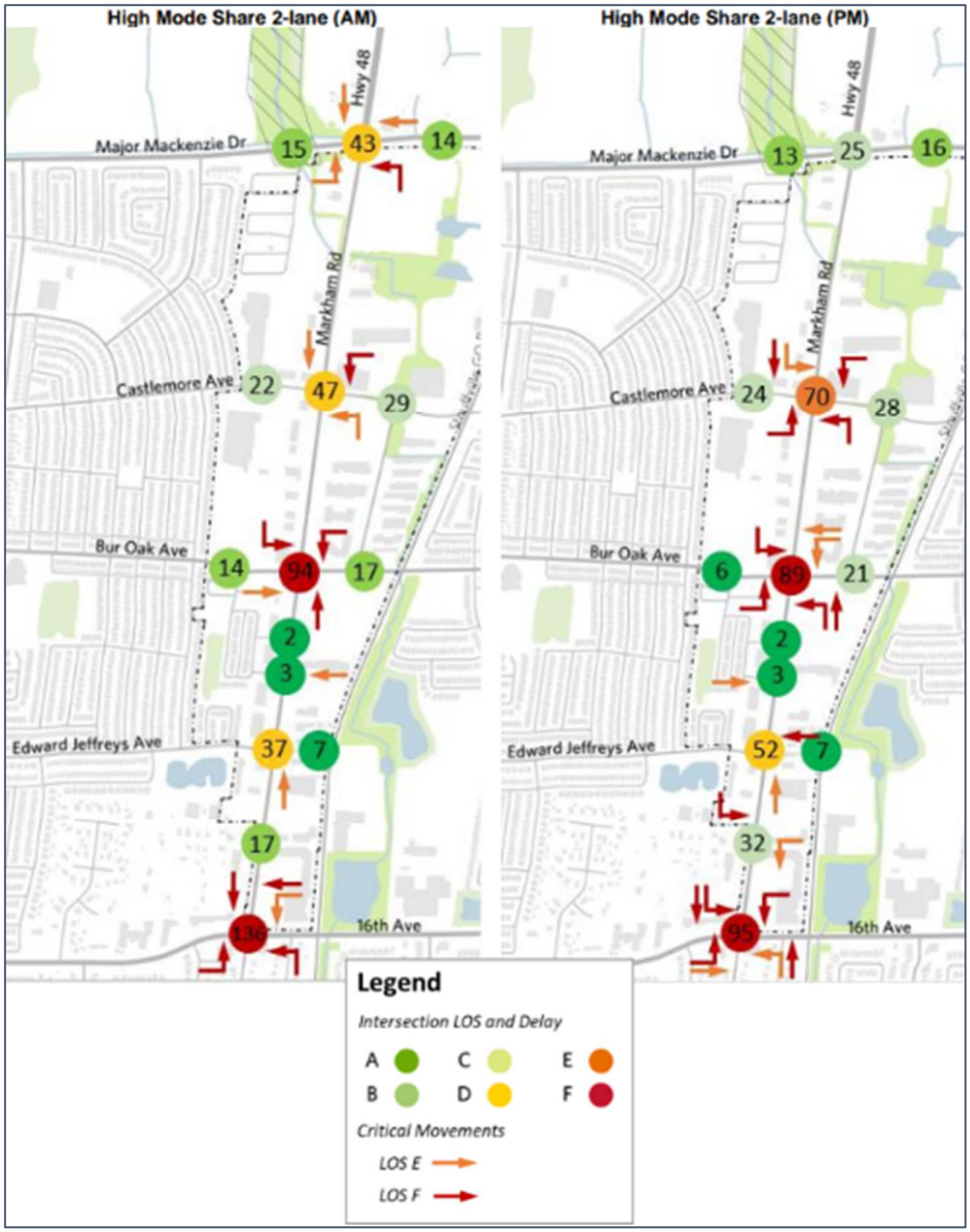
The addition of the traffic signal at Markham Road and Battista Perri Drive improves the intersection operation significantly, with the LOS in the a.m. peak hour improving from LOS ‘F’ to ‘E’. The signal timing splits for this intersection were assumed to be the same as the Markham Road and Edward Jefferys Avenue intersection since the intersections are close in proximity and both service local roads.

The intersections of Markham Road and Bur Oak Avenue, Markham Road and Edward Jefferys Avenue, and Markham Road and 16th Avenue see no significant changes from the 2041 future background scenario. The increased average delay at these intersections is approximately 3 seconds per vehicle for both the a.m. and p.m. peak hours for the 2041 horizon year. Like the 2030 horizon year, this indicates that the site traffic has minimal impact on individual intersection and network delay. As noted earlier, the 2041 future total evaluation may be considered the worst-case scenario since it adds the site-generated traffic directly to the 2041 future forecast from the Mount Joy Secondary Plan traffic study, which results in an overlap of the traffic generated by the site. Moreover, the use of 2022 TTS for the 2041 horizon is conservative since higher non-auto modal split is intended.

Comparison to Mount Joy Secondary Plan

In the 2041 future background and future total scenario, traffic is congested along Markham Road within the study area. The Mount Joy Secondary Plan traffic study also found capacity issues, specifically at the intersections of Markham Road and Bur Oak Avenue and Markham Road and 16th Avenue, where the intersections operate at LOS 'F' for both peak hours as shown below.

Figure 3-3 Secondary Plan Synchro Analysis for Over Capacity Intersections



Source: Appendix C: Final Transportation Report – Markham Road Mount Joy Secondary Plan (p. 39), HDR, June 15, 2023

The 2041 future evaluation presented in this TIS is more conservative than the HDR traffic study since it considers the traffic generated by the Upper Markham Village Secondary Plan.

The Mount Joy Secondary Plan also highlights strong multimodal considerations, summarizing that mode share assumptions must be met to mitigate the expected traffic issues. This can be seen in **Figure 3-4**. This further shows that congestion within the study area is acknowledged. Focusing on active transportation and transit availability will help reduce vehicular dependency but will not eliminate the expected traffic issues. It is also worth noting for sites such as the subject site where there is no minimum vehicular parking requirements anymore, lower auto parking supplies proposed will also directly limit the amount of vehicular traffic generated by developments. The high mode split scenario by the Mount Joy Secondary Plan assumed that only 38% of trips would be via non-auto modes. In comparison, the proposed development proposes a resident parking supply of 0.30 spaces/unit, which implies that approximately 70% of trips will be made via non-auto modes.

Figure 3-4 Multimodal Considerations in Mount Joy Secondary Plan

7.3.3 Multimodal Considerations

The proposed intensification of the study area necessitates the prioritization of more efficient and sustainable travel. Firstly, the proposed mix of land uses creates origins and destinations near to one another such that most new trips generated in the study area can be made by walking or cycling. Secondly, capitalizing on the significant transit investments in all-day two-way GO service, Viva and YRT services requires prioritization not only of the movement of the transit vehicles themselves but also access to the transit services via walking and cycling.

While traffic congestion, delays, and queues are a concern, it must be recognized that prioritizing vehicular movements and building traffic capacity infrastructure results in reduced comfort, safety, and quality of service for non-auto modes, further car dependence, and ultimately inducing further demand for car travel.

Ultimately, mitigating the traffic issues identified in the analysis will require strong prioritization of non-auto modes to achieve and exceed the non-auto mode share assumptions presented in **Figure 7-1**.

Source: Final Transportation Report – Markham Road Mount Joy Secondary Plan (p. 39), HDR, June 15, 2023

Figure 3-5 Mode Share Assumptions in Mount Joy Secondary Plan

	Existing Mode Share	2041 Low Non-Auto Mode Share Scenario	2041 High Non-Auto Mode Share Scenario
Auto Driver and Passenger	88%	79%	63%
Local/Regional Transit	9%	10%	18%
Active Transportation	4%	11%	20%

Source: Final Transportation Report – Markham Road Mount Joy Secondary Plan (p. 30), HDR, June 15, 2023

In conclusion, from an intersection capacity perspective, the forecasted site-generated traffic has minimal impact the overall network function, and can be implemented in the near-term (2030) prior to the broader network changes related to the Mount Joy Secondary Plan. Although the study area experiences more congestion with the lane reduction contemplated by the Mount Joy Secondary Plan by 2041, it also increases the modal share of people walking, cycling or taking transit.

3.3 Queuing Assessment

Table 3-1 Error! Reference source not found. summarizes the Synchro queuing analysis results for movements with exclusive turning storage lanes at intersections within the study area. Detailed Synchro queuing reports are included in the worksheets in **Appendix G**.

3.3.1 Existing Conditions

As shown in **Table 3-1**, the 50th and 95th percentile queues for most turning movements or through movements at the study intersections can be contained within the available storage or link distance during the weekday a.m. and p.m. peak hours under existing conditions. The only exception is:

- Southbound left-turn movement at Markham Road and 16th Avenue during the p.m. peak hour.

The 95th percentile queues for the southbound left-turn movement at Markham Road and 16th Avenue exceed the existing storage length, but the 50th percentile queues do not. It should be noted that 95th percentile volumes rarely occur in the field, while the 50th percentile queues represent more day to day conditions during the peak hours. Queuing for this movement is deemed acceptable since it can be sufficiently accommodated by existing storage during an average cycle.

3.3.2 Future Background Conditions

Based on the rationale discussed in the previous section, signal timings at the intersection of Markham Road and 16th Avenue were optimized to improve overall network capacity. The splits for the north-south movements were increased and left-turn splits were adjusted while the existing cycle length was maintained.

2030 Horizon Year

As seen in **Table 3-1**, the majority of the projected 95th percentile queues for the 2030 horizon year can be accommodated within the available storage lengths during the weekday a.m. and p.m. peak hours under the future background conditions.

The 95th percentile queues at Markham Road at Battista Perri Drive and Markham Road at Edward Jefferys Drive can be accommodated in the existing storage lengths for all movements. In both the a.m. and p.m. peak hours, the 95th percentile queue for the westbound-left movement at Markham Road and Bur Oak Avenue exceeds the provided storage, but the 50th percentile volumes do not. As mentioned previously, the 50th percentile volumes represent average traffic conditions, so these movements can be

deemed acceptable since it can be accommodated by the provided storage length. At Markham Road and 16th Avenue, the 95th percentile queues for the northbound, southbound, and eastbound-left movements exceed the provided storage length in the p.m. peak hour, but the 50th percentile queues do not.

2041 Horizon Year

As seen in **Table 3-1**, majority of the 95th and 50th percentile queues exceed the existing storage lengths under the 2041 future background conditions, particularly the left-turn queues at the intersections of Markham Road and 16th Avenue. The southbound-left movement at Markham Road and Bur Oak Drive also experiences queues that exceed both 95th and 50th percentile queues in the a.m. peak hour. At Markham Road and Edward Jefferys Avenue, all 50th percentile queues can be accommodated.

The optimized splits applied at Markham Road and 16th Avenue do not reduce queues for left or right-turn movements but do reduce queues for the through movements in the northbound and southbound directions. This can be seen in **Appendix G-2**.

3.3.3 Future Total Conditions

2030 Horizon Year

Under future total conditions, the 2030 horizon scenario performs similarly to the 2030 future background conditions, as seen in **Table 3-1**. The 95th percentile queues at Markham Road and Battista Perri Drive can be accommodated in the existing storage lengths for all movements. In the a.m. peak period, the 95th percentile queue for the northbound left-turn at Markham Road and 16th Avenue exceeds the existing storage length, as well as the westbound left-turn at Markham Road and Bur Oak Avenue. In the p.m. peak period, the 95th percentile queues for the eastbound and southbound left-turns at Markham Road and 16th Avenue, and the westbound left-turn at Markham Road and Bur Oak Avenue exceed the existing storage lengths. However, for all movements, the 50th percentile queues can be accommodated and are therefore deemed acceptable.

2041 Horizon Year

As seen in **Table 3-1**, the 2041 future total conditions show minimal change from the future background conditions. With the addition of the signalized intersection at Markham Road & Battista Perri Drive, the 50th percentile queues can all be accommodated by the existing storage lengths at this intersection. At the other study intersections, the majority of the left and right-turn movements experience queues that cannot be accommodated by the existing storage lengths.

Like the future background condition, all study intersections are near or over capacity. The optimized splits applied at Markham Road and 16th Avenue help reduce the queues experienced at the through movements in the northbound and southbound directions, but not the left or right-turn movements. This can be seen in **Appendix G-3**.

In conclusion, the forecasted site-generated trips have little impact to the expected queues at the study intersections and can be implemented with minimal operational issues at the site access intersection. As stated previously, the increased queue lengths can be attributed to increased traffic related to the Upper Markham Secondary Plan

considered in this TIS. Although the study area is over-capacity by 2041, the proposed development does not contribute to queuing issues.

3.4 Synchro Capacity and Queuing Analysis Results

Table 3-1 presents all synchro results from all the analysis scenarios for this study. Any text that is red and bold represents a movement or queue that is over capacity. It should be noted that the delay, LOS and v/c ratio appears as an error at Battista Perri Drive & Markham Road under the 2041 future background condition. This is due to high delay and is later remedied by the introduction of the signalized intersection.

4 Multi-Modal Analysis

The section documents the multi-modal analyses of performance measures for alternative modes of travel (transit, cycling and walking) based on the *York Region Transportation Mobility Plan Guidelines for Development Applications* (2025). The use of this methodology was confirmed via the ToR.

4.1 Methodology

The multi-modal LOS criteria for transit, cycling, and pedestrian modes per the York Region guidelines are summarized in **Table 4-1**, **Table 4-2**, and **Table 4-3**, respectively.

Table 4-1 Transit Level of Service Criteria

LOS	Access to Transit Stops	Transit Frequency (Headways)	Intersection Approach (Transit or Curb Lanes)	
			Delay (sec/veh)	V/C
A	90% within ≤200 m	≤5 minutes	≤10	0 to 0.60
B	90% within ≤500m and 70% within ≤200	>5-10 minutes	>10-20	0.61 to 0.70
C	90% within ≤500m and 50% within ≤200m	>10-15 minutes	>20-35	0.71 to 0.80
D	100% within ≤600m	>15-20 minutes	>35-55	0.81 to 0.90
E	100% within ≤800m	>20-30 minutes	>55-80	0.91 to 1.00
F	100% >800m	>30 minutes	>80	>1.0

Table 4-2 Cycling Level of Service Criteria

LOS	Segment	Intersection
A	Separated cycling facilities (e.g. cycle tracks, multi-use path)	• Separated cycling facilities • Bicycle box or clearly delineated bicycle treatment • or bicycle signal head
B	≥1.8 m dedicated cycling facilities (e.g. bicycle lanes with and without buffer)	• >1.8 m dedicated cycling facilities (e.g. bicycle lanes with and without buffer), Bicycle box, clearly delineated bicycle treatment or bicycle signal head
C	<1.8 m dedicated cycling facilities with no buffer	• <1.8 m dedicated cycling facilities with no buffer, Bicycle box, clearly delineated bicycle treatment or bicycle signal head
D	≤1.5 m bicycle lane with no buffer	• ≤1.5 m bicycle lane and no buffer • Bicycle treatment

LOS	Segment	Intersection
E	Shared facilities (e.g. signed routes, Sharrows or paved shoulder with minimum 1.2 m in the constrained area)	• Shared facilities (e.g. signed routes, sharrows or paved shoulder with a minimum of 1.2 m in the constrained area) • No clearly delineated bicycle treatment
F	No bicycle provision	• No bicycle provision

Table 4-3 Pedestrian Level of Service Criteria

LOS	Segment	Intersection
A	≥2.0 m sidewalk with minimum 3.5 m buffer including planting and edge zone; or ≥3.0 m multi-use path	• ≥2.0 m sidewalk with minimum 3.5 m buffer including planting and edge zone; or ≥3.0 m multi-use path • Pedestrian signal head with sufficient pedestrian clearance time • Clearly delineated crosswalk
B	≥1.5 m sidewalk with minimum 1.0 m buffer including edge zone; or <3.0 m multi-use path	• ≥1.5 m sidewalk with minimum 1.0 m buffer including edge zone; or ≥3.0 m multi-use path • Pedestrian signal head with sufficient pedestrian clearance time • Clearly delineated crosswalk
C	≥1.5 m curb-faced sidewalk (no buffer)	• ≥1.5 m curb-faced sidewalk (no buffer) • Pedestrian signal head with sufficient pedestrian clearance time • Clearly delineated crosswalk
D	<1.5m sidewalk	• <1.5m sidewalk • Pedestrian signal head with sufficient pedestrian clearance time • No clearly delineated crosswalk
E	Paved shoulder or no sidewalk provision	• Paved shoulder or no sidewalk provision • No pedestrian signal head • No clearly delineated crosswalk
F	No sidewalk provision	• No sidewalk provisions • No pedestrian signal head • Not clearly delineated crosswalk

4.2 Existing Conditions

4.2.1 Transit Mode

A description of the existing transit routes in the vicinity of the proposed development is provided in **Section 2.1.2**. The performance measures for current transit services are presented in **Table 4-4** at the study intersections that have bus stops based on the corresponding York Region Transit LOS criteria.

Table 4-4 Existing Transit Level of Service

Intersection	Transit Route	Direction	A.M. Peak Headway	P.M. Peak Headway	Access to Stops	A.M. Peak Delay (s) (v/c) LOS[1]	P.M. Peak Delay (s) (v/c) LOS[1]
Markham Road & Bur Oak Avenue	TTC Route 102D	NB	16 minutes LOS 'D'	30 minutes LOS 'E'	225 m LOS 'B'	23 (0.40) C	27 (0.67) C
		SB			300 m LOS 'B'	24 (0.50) C	26 (0.53) C
	YRT Route 18	EB	22 minutes LOS 'E'	22 minutes LOS 'E'	300 m LOS 'B'	29 (0.34) C	28 (0.23) C
		WB			300 m LOS 'B'	28 (0.36) C	27 (0.29) C
	YRT Route 304	EB	22 minutes LOS 'E'	-	300 m LOS 'B'	29 (0.34) C	-
		WB	-	22 minutes LOS 'E'	300 m LOS 'B'	-	27 (0.29) C
Markham Road & Edward Jefferys Avenue	TTC Route 102D	NB	16 minutes LOS 'D'	30 minutes LOS 'E'	200 m LOS 'A'	5 (0.23) A	7 (0.40) A
		SB			200 m LOS 'A'	9 (0.36) A	14 (0.48) B
Markham Road & 16th Avenue	TTC Route 102D	NB	16 minutes LOS 'D'	30 minutes LOS 'E'	700 m LOS 'E'	43 (0.48) D	58 (0.90) E
		SB			700 m LOS 'E'	50 (0.88) D	51 (0.85) D
	YRT Route 16	EB	22 minutes LOS 'E'	17 minutes LOS 'D'	700 m LOS 'E'	32 (0.60) D	36 (0.71) D
		WB			700 m LOS 'E'	29 (0.51) C	31 (0.47) C
	YRT Route 301	WB	-	30 minutes LOS 'E'	700 m LOS 'E'	-	31 (0.47) C

1. Intersection approach LOS associated with the worst performance between delay and v/c.

As indicated above, TTC Route 102D can be most conveniently accessed from the study site within 200 metres at LOS 'A'. However, the 102D route has a headway LOS of 'D' and 'E' during the a.m. and p.m. peak hours. The bus route does not have delay or capacity issues at the study intersection.

All bus routes are accessible by walking from the site, with the farthest distance at 700 metres from the site, with LOS of 'E', at the Markham Road and 16th Avenue intersection.

The intersection approach LOS at this intersection is LOS 'D' or better during the study peak hours, indicating no traffic operational issues for the transit routes.

4.2.2 Pedestrian and Cycling Modes

Based on the York Region LOS criteria for active modes, **Table 4-5** shows the corresponding pedestrian and cycling modes within the study area. The dimensions of the active transportation infrastructure were measured through Google Earth.

Table 4-5 Existing Pedestrian and Cycling Level of Service

Intersection	Approach	Pedestrians		Cyclists	
		Segment	Intersection	Segment	Intersection
Markham Road & Bur Oak Avenue	EB	B	B	F	F
	WB	B	B	F	F
	NB	B	B	F	F
	SB	A	A	A	A
Markham Road & Battista Perri Drive / Existing Site Driveway	EB	B	N/A	F	F
	WB	N/A	N/A	N/A	N/A
	NB	B	B	F	F
	SB	A	A	A	A
Markham Road & Edward Jefferys Avenue	EB	B	B	E	E
	WB	N/A	B	N/A	N/A
	NB	B	B	F	F
	SB	A	A	A	A
Markham Road & 16th Avenue	EB	C	C	F	F
	WB	C	C	F	F
	NB	C	C	F	F
	SB	C	C	F	F

The results in **Table 4-5** show most approaches at the study intersections have pedestrian LOS score of 'C' or better, with the exception of the existing site access and the driveway at Markham Road and Edward Jefferys Avenue. Overall, the study area has adequate pedestrian infrastructure under existing conditions.

In the study network, there is a three-metre multi-use path with a buffer along the west side of Markham Road acting as a shared facility for pedestrians and cyclists. The appropriate markings are provided in the southbound direction at all intersections, with the exception of Markham Road and 16th Avenue. There is no other existing cycling infrastructure in the study network, resulting in a LOS of 'F' along all other segments and intersections.

4.3 Future Conditions

4.3.1 Transit Mode

As per York Region Transit's 2026 Annual Transit Plan, improved service of TTC Route 102D – Markham Road is proposed to provide additional capacity to address growing ridership. The proposed changes include increased weekday afternoon rush hour frequency and increased Saturday early evening frequency. The proposed implementation date is January 2026. The increased frequency is shown in **Figure 4-1**. The proposed change considered in this study includes increased weekday afternoon rush hour headway from 30 minutes to 20 minutes. This improves the p.m. peak frequency LOS score from 'E' to 'D'. All other transit routes within the study area do not have any planned improvements from York Region.

Figure 4-1 Proposed Increased Frequency of TTC Route 102D – Markham Road

Time of day	Current frequency (mins)	Proposed frequency (mins)
Afternoon rush hour	30	20
Saturday (7 p.m. to 10 p.m.)	51	38

Source: York Region Transit's 2026 Annual Transit Plan

The Mount Joy Secondary Plan indicates that the existing transit services in the study area are not sufficient to meet the transit needs of the 2041 horizon scenario. Recommendations have been made to increase the frequency of existing transit routes, which are summarized in **Figure 4-2**. These recommendations are included in the analysis for the 2041 horizon year as to accommodate the Mount Joy Secondary Plan.

Figure 4-2 Transit Service Improvements Recommendations

Route	Recommendation* (Peak Hour Buses / Service Frequency)
16 – 16th Ave	Increase service (4 / 15 minutes)
18 - Bur Oak	Increase service (4 / 15 minutes)
25 - Major Mackenzie	Increase service (6 / 10 minutes)
41 - Markham Local	On-demand
102 - Markham Road	Increase service (3 / 20 minutes)
301 - Markham Express	On-demand
303 - Bur Oak Express	Consolidate with Route 18
304 - Mount Joy Express	Increase service (4 / 15 minutes)

*Based on high-level analysis. Additional coordination will be required with YRT to discuss the future transit plans to support the growth in the study area.

Source: Final Transportation Report – Markham Road Mount Joy Secondary Plan (p. 43), HDR, June 15, 2023

The performance measures for future transit services are presented in **Table 4-6** at the study intersections that have bus stops based on the corresponding York Region Transit

LOS criteria. For the intersection of Markham Road and 16th Avenue, the results incorporating optimized signal timing splits presented for both the 2030 and 2041 future background and future total scenarios are presented. The results from this analysis will be used to determine the intersection approach delay and LOS, and the results are displayed in **Table 4-6**.

Table 4-6 Intersection Approach Delay and LOS Scores

Intersection	Direction	A.M. Headway	P.M. Headway	Access to Stops	Future Background		Future Total	
					A.M. Peak Delay (s) (v/c) LOS[1]	P.M. Peak Delay (s) (v/c) LOS[1]	A.M. Peak Delay (s) (v/c) LOS[1]	P.M. Peak Delay (s) (v/c) LOS[1]
2030 Horizon Year								
Markham Road & Bur Oak Avenue	NB	D	D	B	27 (0.56) C	51 (0.98) D	27 (0.57) C	55 (1.00) D
	SB	D	D	B	27 (0.60) C	29 (0.64) C	27 (0.61) C	29 (0.65) C
	EB	E	E	B	30 (0.37) C	29 (0.27) C	30 (0.38) C	29 (0.27) C
	WB	E	E	B	31 (0.48) C	29 (0.27) C	31 (0.48) C	29 (0.37) C
Markham Road & Edward Jefferys Avenue	NB	D	D	A	8 (0.34) A	10 (0.64) A	8 (0.35) A	7 (0.59) A
	SB	D	D	A	16 (0.57) B	16 (0.63) B	16 (0.59) B	13 (0.57) B
Markham Road & 16th Avenue	NB	D	D	E	25 (0.35) C	59 (0.96) E	25 (0.36) C	62 (0.98) E
	SB	D	D	E	63 (0.98) E	54 (0.92) D	72 (1.02) E	58 (0.94) E
	EB	E	D	E	70 (0.96) E	57 (0.92) E	70 (0.96) E	57 (0.92) E
	WB	E	D	E	62 (0.90) E	46 (0.67) D	62 (0.90) E	46 (0.67) D
2041 Horizon Year								
Markham Road & Bur Oak Avenue	NB	D	D	B	343 (1.67) F	528 (2.09) F	366 (1.72) F	539 (2.11) F
	SB	D	D	B	180 (1.31) F	348 (1.68) F	219 (1.40) F	360 (1.71) F
	EB	C	C	B	33 (0.64) C	27 (0.24) C	33 (0.65) C	28 (0.25) C
	WB	C	C	B	29 (0.42) C	34 (0.74) C	29 (0.42) C	34 (0.74) C
Markham Road & Edward Jefferys Avenue	NB	D	D	A	29 (0.77) C	120 (1.20) F	21 (0.84) C	97 (1.15) F
	SB	D	D	A	30 (0.85) C	73 (1.06) E	35 (0.91) C	55 (1.01) D
Markham Road & 16th Avenue	NB	D	D	E	27 (0.04) C	25 (0.07) C	27 (0.04) C	25 (0.07) C
	SB	D	D	E	32 (0.40) C	28 (0.33) C	33 (0.43) C	28 (0.36) C
	EB	C	C	E	67 (0.97) E	120 (1.14) F	67 (0.97) E	115 (1.13) F

	WB	C	C	E	124 (1.15) F	46 (0.71) D	124 (1.15) F	46 (0.70) D

1. Intersection approach LOS associated with the worst performance between delay and v/c.

Similar to the existing conditions analysis, TTC Route 102D can be most conveniently accessed from the study site within 200 metres at LOS 'A'. However, route 102D has a headway LOS 'D' during the a.m. and p.m. peak hours. The future background and future total conditions for the 2030 horizon year result in an intersection approach LOS of 'D', meeting the target LOS score. As mentioned in the capacity analysis, the Mount Joy Secondary Plan recommends a lane reduction along Markham Road. This recommendation in conjunction with the projected traffic volumes along Markham Road in terms of capacity constraints shown for the intersection approach for the 2041 horizon. This results in a LOS of 'F'.

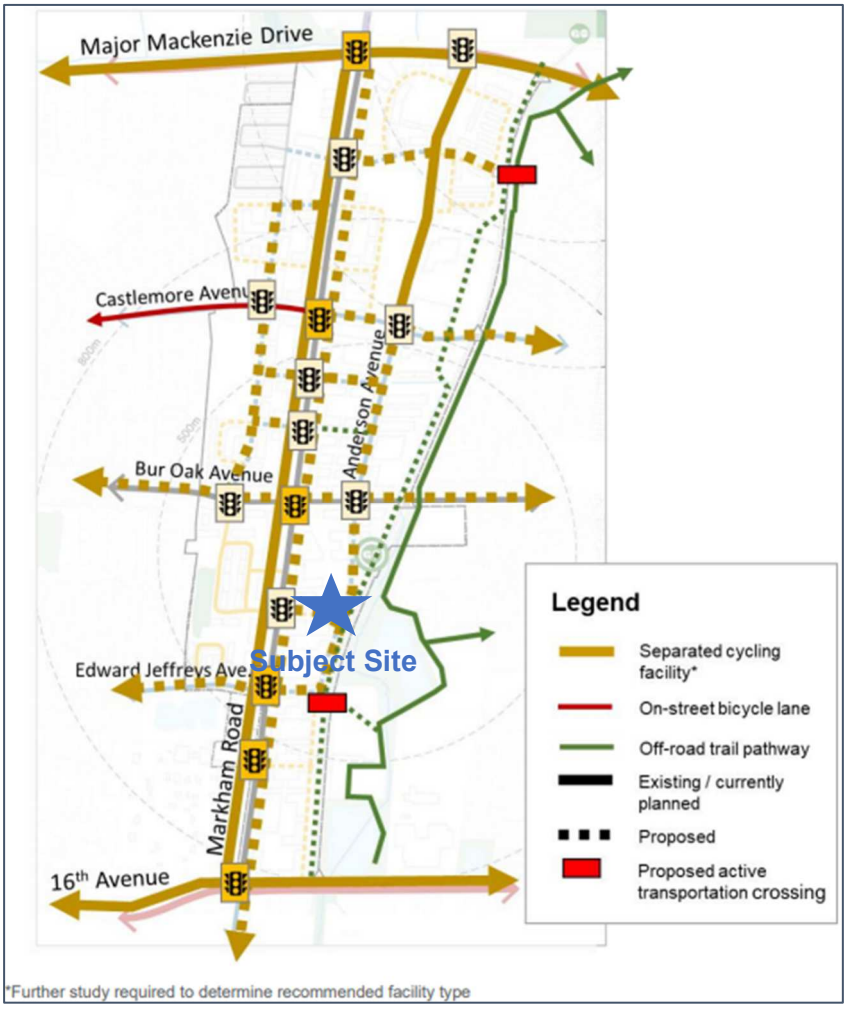
All bus routes are accessible by walking from the site, with the farthest distance at 700 metres from the site, with LOS 'E', at the Markham Road and 16th Avenue intersection. Additionally, the recommended transit service improvements shown in **Figure 4-1** improve the headway LOS to 'C' in the eastbound and westbound directions, while the northbound and southbound scores remain the same. The intersection approach LOS at this intersection is LOS 'D' or better during the study peak hours for the 2030 horizon year, indicating no traffic operational issues for the transit routes. These scores deteriorates to LOS 'F' for the 2041 horizon year as a result of capacity issues along Markham Road due to the planned lane reduction.

4.3.2 Pedestrian and Cycling Modes

For the 2030 horizon year, the proposed development will be complete, and it can be assumed that the future public east-west read where the existing site access will be implemented. As shown in **Figure 4-3**, separated cycling facilities are recommended along this corridor, and will be included in the 2030 pedestrian and cyclist level of service considerations. Given that no other improvements are expected in this time, all other results from the existing conditions level of service analysis still hold.

For the 2041 horizon year, the Mount Joy Secondary Plan recommends that additional active transportation facilities, primarily separated cycling facilities, be provided. These recommendations can be seen in **Figure 4-3**. For example, the north-south collector road being protected for east of the subject site is planned to feature in boulevard cycling facilities that will connect to the GO station even easier. Without implementation, it can be assumed that the LOS scores will remain unchanged from the 2030 analysis. The 2041 analysis in **Table 4-7** will include the recommendations shown in **Figure 4-3**.

Figure 4-3 Active Transportation Network Recommendations



Source: Final Transportation Report – Markham Road Mount Joy Secondary Plan (p. 45), HDR, June 15, 2023

Table 4-7 Future Pedestrian and Cycling Level of Service

Intersection	Approach	Pedestrians		Cyclists	
		Segment	Intersection	Segment	Intersection
2030 Horizon Year					
Markham Road & Bur Oak Avenue	EB	B	B	F	F
	WB	B	B	F	F
	NB	B	B	F	F
	SB	A	A	E	E
Markham Road & Battista Perri Drive / Existing Site Driveway	EB	B	B	F	F
	WB	C	C	C	C
	NB	B	B	F	F
	SB	A	A	E	E
Markham Road & Edward Jefferys Avenue	EB	B	B	E	E
	WB	N/A	B	N/A	N/A
	NB	B	B	F	F
	SB	A	A	E	E
Markham Road & 16th Avenue	EB	C	C	F	F
	WB	C	C	F	F
	NB	C	C	F	F
	SB	C	C	E	F
2041 Horizon Year					
Markham Road & Bur Oak Avenue	EB	B	B	C	C
	WB	B	B	C	C
	NB	A	A	A	A
	SB	A	A	A	A
Markham Road & Battista Perri Drive / Existing Site Driveway	EB	B	B	F	F
	WB	C	C	C	C
	NB	A	A	A	A
	SB	A	A	A	A
Markham Road & Edward Jefferys Avenue	EB	B	B	C	C
	WB	B	B	C	C
	NB	A	A	A	A
	SB	A	A	A	A
Markham Road & 16th Avenue	EB	C	C	C	C
	WB	C	C	C	C
	NB	A	A	A	A
	SB	A	A	A	A

As mentioned by York Region' Transportation Mobility Plan (2025), the target LOS score for the categories outlined in **Table 4-7** is 'C'. For pedestrian improvements, it can be assumed that a minimum target of 'C' will be achieved. For cycling improvements, a score of 'A' may not be attainable after further study to determine the recommended facilities, as this was not included in the scope of the study. However, it can be assumed that facilities with the target LOS score of 'C' will be provided in case separated facilities are not feasible. Therefore, it can be assumed that a minimum LOS of 'C' can be given to future cycling improvements. This methodology is applied to improvements in both the 2030 and 2041 horizon years. All results are shown in **Table 4-7**.

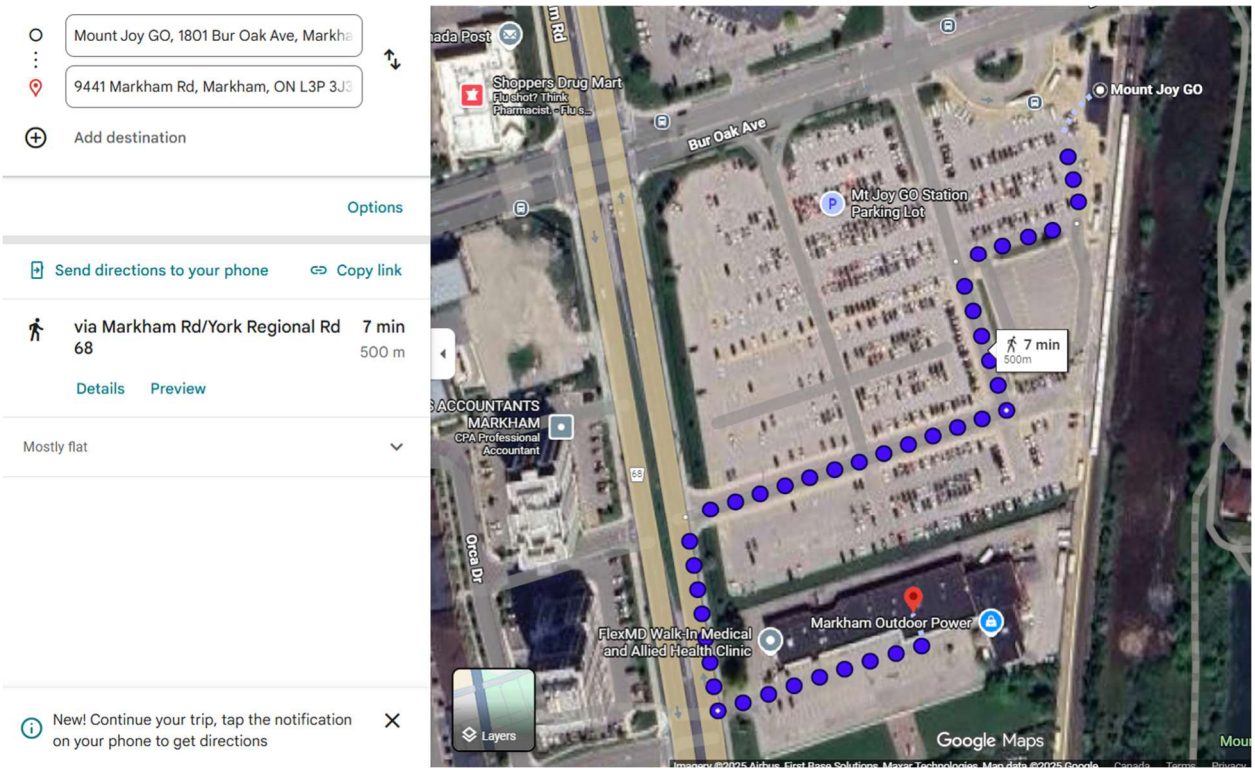
The results for the 2030 horizon year remain similar to the existing conditions results, except for Markham Road and Battista Perri Drive. This intersection is to be upgraded to a signalized intersection and will also service a future east-west public road. It can be assumed that this intersection will implement crosswalks in all four directions, upgrading the intersection LOS scores to a minimum of 'C'. Additionally, the westbound segment score also improves to a minimum LOS of 'C', as the future east-west road will incorporate a sidewalk. It can also be assumed that a minimum LOS score of 'C' can be given to the westbound cycling facilities, as a shared facility should be recommended if a separated facility is not feasible. Cycling facilities are not recommended in the eastbound direction, as shown in **Figure 4-3.**

For the 2041 future level of service, it is assumed that all improvements shown in **Figure 4-3** are incorporated**.** As mentioned in the existing conditions analysis, there is an existing multi-use path along the west side of Markham Road. There is also a proposed separated cycling facility on the east side of Markham Road. Given the existing multi-use path, it is conservative to assume that the existing sidewalk on the east side of Markham Road will be upgraded to a multi-use path. This raises the pedestrian LOS on these segments to an 'A', and the cycling LOS to an 'A'. It can also be assumed that the proper markings will be provided at both segments and intersections. Given that the recommended active transportation network in **Figure 4-3** also suggests separated cycling facilities along Bur Oak Avenue and Edward Jefferys Avenue. It can be assumed that a minimum LOS of 'C' can be given, assuming that shared facilities will be provided if separate facilities are not feasible after further investigation.

The pedestrian and cycling infrastructure improvements shown in **Table 4-7** help to encourage the use of active transportation facilities and reduce the overall dependence on vehicular travel. Given that the site is in a Protected Major Transit Station Area (PMTSA), connectivity to Mount Joy GO Station is essential to creating a safe environment for cyclists and pedestrians. The recommended active transportation network outlined in **Figure 4-3** will allow cyclists and pedestrians to navigate the transportation network with ease and efficiency.

Notwithstanding the longer-term planned improvements, the subject site will deliver the east-west public road with sidewalks that will connect to Markham Road and eventually to the Mount Joy GO Station as shown in **Figure 4-4** in a convenient and direct fashion that is within a 7 minute walk.

Figure 4-4 Subject Site Walk Route to Mount Joy GO Station

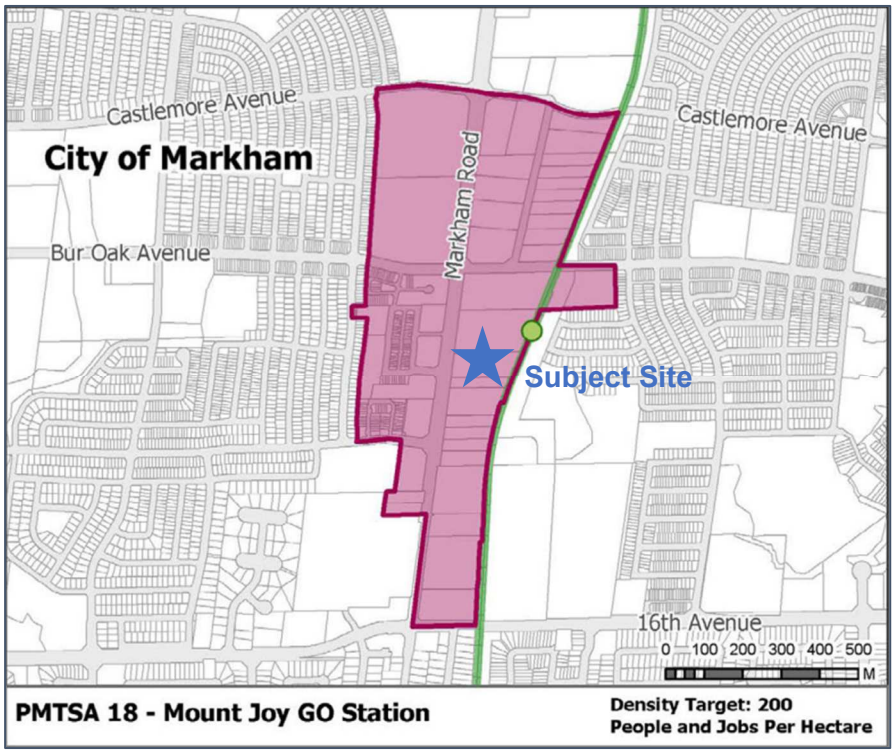


5 Parking Assessment

5.1 Vehicular Parking Requirements and Supply

This development is located within a Protected Major Transit Station Area (PMTSA), as per the 2022 York Region Official Plan, as seen in **Figure 5-1**. Therefore, there is no minimum parking requirement as per the Ontario Planning Act Bill 185.

Figure 5-1 Site Parking Zone



A total of 453 vehicular parking spaces are proposed for the development. The breakdown of spaces is as follows:

- 367 resident spaces; and
- 86 spaces to serve as residential visitor, retail, and temple parking (inclusive of 4 spaces-at grade).

5.2 Accessible Parking Assessment

According to Comprehensive Zoning By-law 2024-19, the required amount of accessible parking spaces should be calculated based on the percentages listed in Table 5.6.1 in conjunction with the number of parking spaces provided. As mentioned, the site is within a PMTSA, and there are no minimum parking requirements. However, the proposed parking provision still satisfies the accessible parking requirements, as shown in **Table 5-1**.

Table 5-1 Zoning Bylaw 2024-19 Accessible Parking Requirements

Provided Parking Spaces	Accessible Parking Standard	Required Accessible Parking			Accessible Parking Supply
		Total	Type A	Type B	
453	2% + 2	12 ((453 x 0.02) + 2)	6 (50%)	6 (50%)	17

Per the By-law, the proposed development is required to provide 12 accessible parking spaces. The accessible parking provision more than satisfies the requirement.

5.3 Bicycle Parking Assessment

Bicycle parking requirements for PMTSAs are listed under the Comprehensive Zoning Bylaw 2024-19 amended by the City of Markham Bylaw 177-96 for the development at 9900 Markham Road completed by Sunny Communities. This is shown in **Table 5-2** along with the proposed number of bicycle parking spaces**.**

Table 5-2 City of Markham Bylaw 177-96 Bicycle Parking Requirements

Proposed Use	Proposed Units / GFA	By-Law 2024-19 Requirements			
		Long-Term Rate	Short-Term Rate	Long-Term Parking Required (Proposed)	Short-Term Parking Required (Proposed)
High-Rise Residential	1218 units	0.8 spaces/ unit	0.15 spaces/ unit	974 (974)	183 (183)

As shown above, the proposed supply satisfies the By-law requirements. The site will also include 10 bicycle parking spaces to accommodate the retail component of the site.

6 Site Plan and Functional Design Review

6.1 Loading Assessment

One Type G (13m long 4m wide) loading bay is proposed in the north portion of the site that will serve both Towers A and B, and another Type G loading bay is proposed for the south portion of the site serving Tower C. An additional Type C (3.5m wide and 6m long) loading bay is proposed for Tower A to serve any smaller deliveries located at the base of the building.

6.2 Site Circulation

The AutoTURN 11.0 turning template software was used to simulate and review the circulation of design vehicles as detailed below.

6.2.1 Waste Collection

WSP completed a review of the maneuvers of a standard City of Markham front-end garbage truck. **Figures 6-1** and **6-2** show the trucks can enter the 2 proposed Type 'G' loading space and exit the site in a forward motion with no projected conflicts.

6.2.2 Fire Truck Circulation

Fire trucks will service the proposed buildings via the east-west public road directly since the lobbies of the residential uses front onto this road. A fire truck can either reverse back onto Markham Road, or conduct a 3-point turn at either the north-south driveway intersecting with the east-west public road, or turn-around at the proposed hammerhead located at the easterly terminus of the east-west public road.

6.2.3 Loading Operation

WSP reviewed the maneuvers of a loading truck using a medium single-unit (MSU) truck (10.0 metres long, per TAC 2017 standards), as illustrated in **Figures 6-3** and **6-4**. The review shows that the loading trucks can safely access and egress the proposed Type 'G' loading spaces with no issues. A smaller LSU truck has been tested at the proposed Type 'C' loading bay in **Figure 6-5** and the movements work adequately as well.

6.2.4 Passenger Vehicle

The circulation of a passenger vehicle were tested using a P-TAC vehicle . As shown in **Figures 6-6** to **6-10**, the P-TAC vehicle can enter, circulate and exit the site with no conflicts. Convex mirrors are recommended on the ground floor and in the parking garages at 90 degree corners and at the top/bottom of the ramp to assist with motorist awareness. The parking movements at critical parking spaces near a dead-end has been tested and as shown in **Figures 6-11** and **6-12**, 2 small car visitor spaces are proposed.

6.3 Sightline Analysis

Horizontal sightline analyses were completed at the proposed driveway on to the east-west public road. As per City of Markham Engineering Design Criteria, Section B-Roads, Table 2, along local roads the design and posted speed of 40 km/h has been applied. This in turn requires a minimum stopping sight distance of 45 m. As per TAC table 9.9.4 left turn sight distance of 85 m is required. **Figures 6-13** and **6-14** illustrate that due to the short length of the east-west public road, the sight distances cannot be fully satisfied. However, a motorist at the driveways can adequately see upstream and downstream traffic turning from Markham Road onto the public road.

6.4 Internal Functional Design Review

The east-west public road has been designed based on the general alignment presented in the Mount Joy Secondary Plan. City standard MR4 local road cross-section (18.5m ROW) has been complied with in terms of the 2m wide sidewalk, planting zone and typical driving portion. Approaching the intersection with Markham Road, the ROW expands to 21m to accommodate the dedicated westbound left-turn lane to mirror the existing eastbound approach of Battista Perri Drive. The two approaches intersection adequately without off-set and the intersection angle achieved is 89 degrees. The functional design is presented in **Figure 6-15.** WSP prepared pavement marking and signage plans for the east-west public road as shown in **Figure 6-16.**

From a vertical curve perspective, the roadway is not expected to entail significant grade changes and this will be designed further beyond the functional design. Please see the civil servicing report for vertical-related information along the east-west public road.

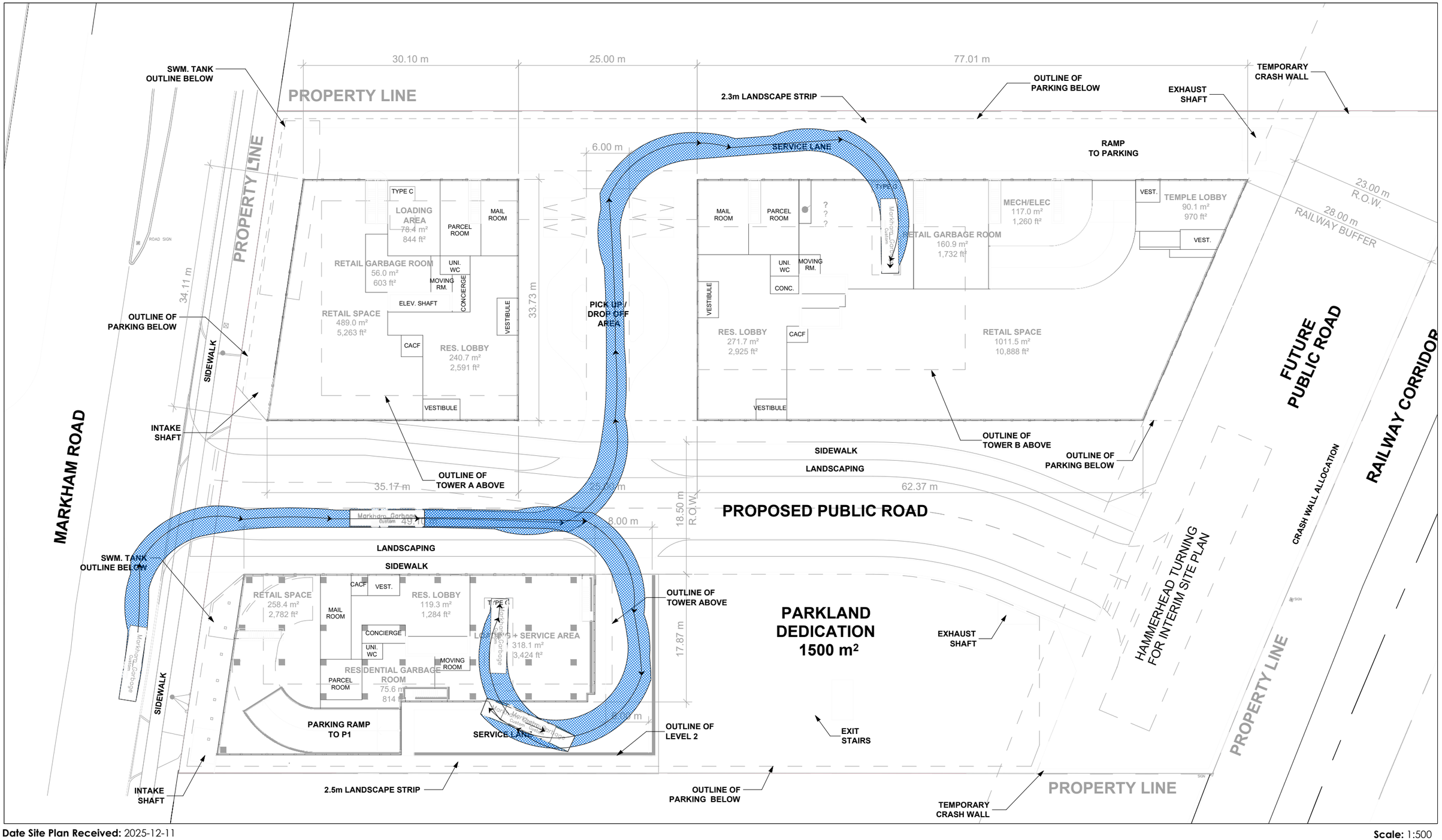
From a horizontal curve perspective, the City of Markham Engineering Design Criteria, Section B-Roads, Table 2 requires 120m minimum. A reduced radius of 55m was used due to the length and context of the east-west public road, and the need to have an appropriate tangent at the intersection at intersections.

The westbound left-turn lane's taper length is 30m, as per TAC Geometric Guideline Table 9.17.1.

As noted earlier, a hammerhead is proposed instead of a cul-de-sac given the site's constraints and proximity to the Metrolinx rail corridor resulting in the need for a crash wall. A hammerhead has been designed to adequately accommodate a snowplow as shown in **Figure 6-17**.

The City of Markham Engineering Design Criteria, Section B-Roads, Table 4 specifies a day light triangle of R5m. This daylight triangles provided meet the requirement.

The curb radii proposed at 7.5m for intersections of local road with all other levels of roadway meet the City standards.



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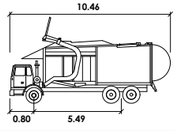
Date Site Plan Received: 2025-12-11

Scale: 1:500



Markham Garbage

	meters
Width	: 2.40
Track	: 2.40
Lock to Lock Time	: 6.0
Steering Angle	: 25.9

Figure 6-1
Garbage Truck Access - Entering 9441 Markham Road

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30.10 m | 25.00 m | 77.01 m

SWM. TANK OUTLINE BELOW

PROPERTY LINE

2.3m LANDSCAPE STRIP

OUTLINE OF PARKING BELOW

EXHAUST SHAFT

TEMPORARY CRASH WALL

6.00 m

SERVICE LANE

RAMP TO PARKING

23.00 m R.O.W.

28.00 m RAILWAY BUFFER

TYPE C

LOADING AREA 78.4 m² 844 ft²

PARCEL ROOM

MAIL ROOM

RETAIL GARBAGE ROOM 56.0 m² 603 ft²

UNI. WC

MOVING RM.

CONCIERGE

ELEV. SHAFT

RETAIL SPACE 489.0 m² 5,263 ft²

VESTIBULE

CACF

RES. LOBBY 240.7 m² 2,591 ft²

VESTIBULE

33.73 m

PICK UP / DROP OFF AREA

MAIL ROOM

PARCEL ROOM

UNI. WC

MOVING RM.

CONC.

VESTIBULE

RES. LOBBY 271.7 m² 2,925 ft²

CACF

VESTIBULE

MECH/ELEC 117.0 m² 1,260 ft²

RETAIL GARBAGE ROOM 160.9 m² 1,732 ft²

VEST.

TEMPLE LOBBY 90.1 m² 970 ft²

VEST.

RETAIL SPACE 1011.5 m² 10,888 ft²

OUTLINE OF PARKING BELOW

SIDEWALK

INTAKE SHAFT

OUTLINE OF TOWER B ABOVE

OUTLINE OF PARKING BELOW

SIDEWALK

LANDSCAPING

OUTLINE OF TOWER ABOVE

25.00 m

62.37 m

18.50 m R.O.W.

PROPOSED PUBLIC ROAD

49.10 m

LANDSCAPING

SIDEWALK

SWM. TANK OUTLINE BELOW

RETAIL SPACE 258.4 m² 2,782 ft²

CACF

VEST.

MAIL ROOM

RES. LOBBY 119.3 m² 1,284 ft²

CONCIERGE

UNI. WC

MOVING ROOM

PARCEL ROOM

RESIDENTIAL GARBAGE ROOM 75.6 m² 814 ft²

LOADING / SERVICE AREA 38.1 m² 424 ft²

OUTLINE OF TOWER ABOVE

PARKLAND DEDICATION 1500 m²

17.87 m

EXHAUST SHAFT

HAMMERHEAD TURNING FOR INTERIM SITE PLAN

CRASH WALL ALLOCATION

RAILWAY CORRIDOR

SIDEWALK

PARKING RAMP TO P1

SERVICE LANE

OUTLINE OF LEVEL 2

EXIT STAIRS

INTAKE SHAFT

2.5m LANDSCAPE STRIP

OUTLINE OF PARKING BELOW

TEMPORARY CRASH WALL

PROPERTY LINE

PROPERTY LINE

MARKHAM ROAD

FUTURE PUBLIC ROAD

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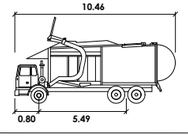

Markham Garbage

	meters
Width	: 2.40
Track	: 2.40
Lock to Lock Time	: 6.0
Steering Angle	: 25.9

Figure 6-2
Garbage Truck Access - Exiting
9441 Markham Road

wsp - 9441 Markham Road (GF Level).dwg_f2

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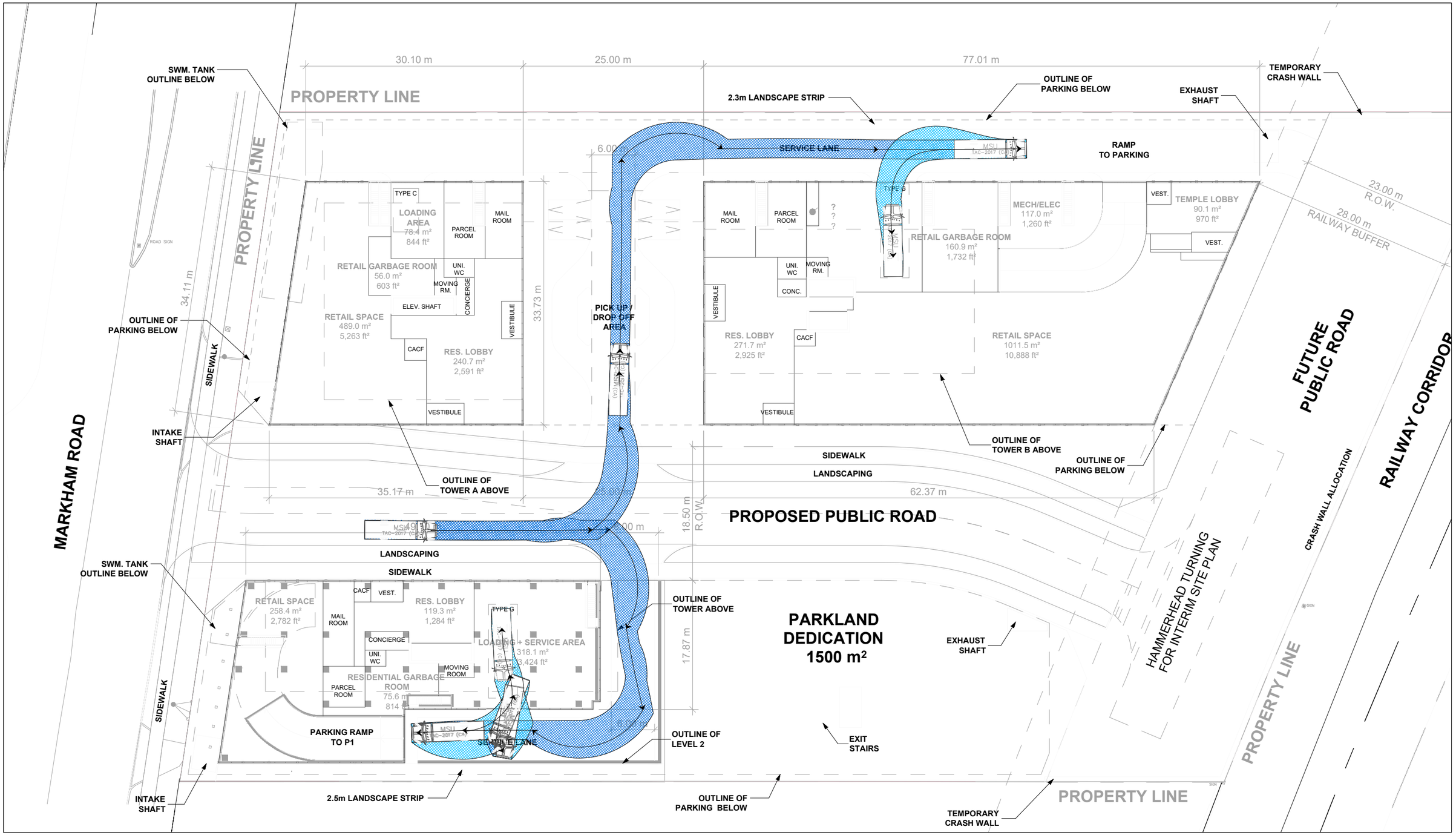

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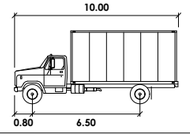
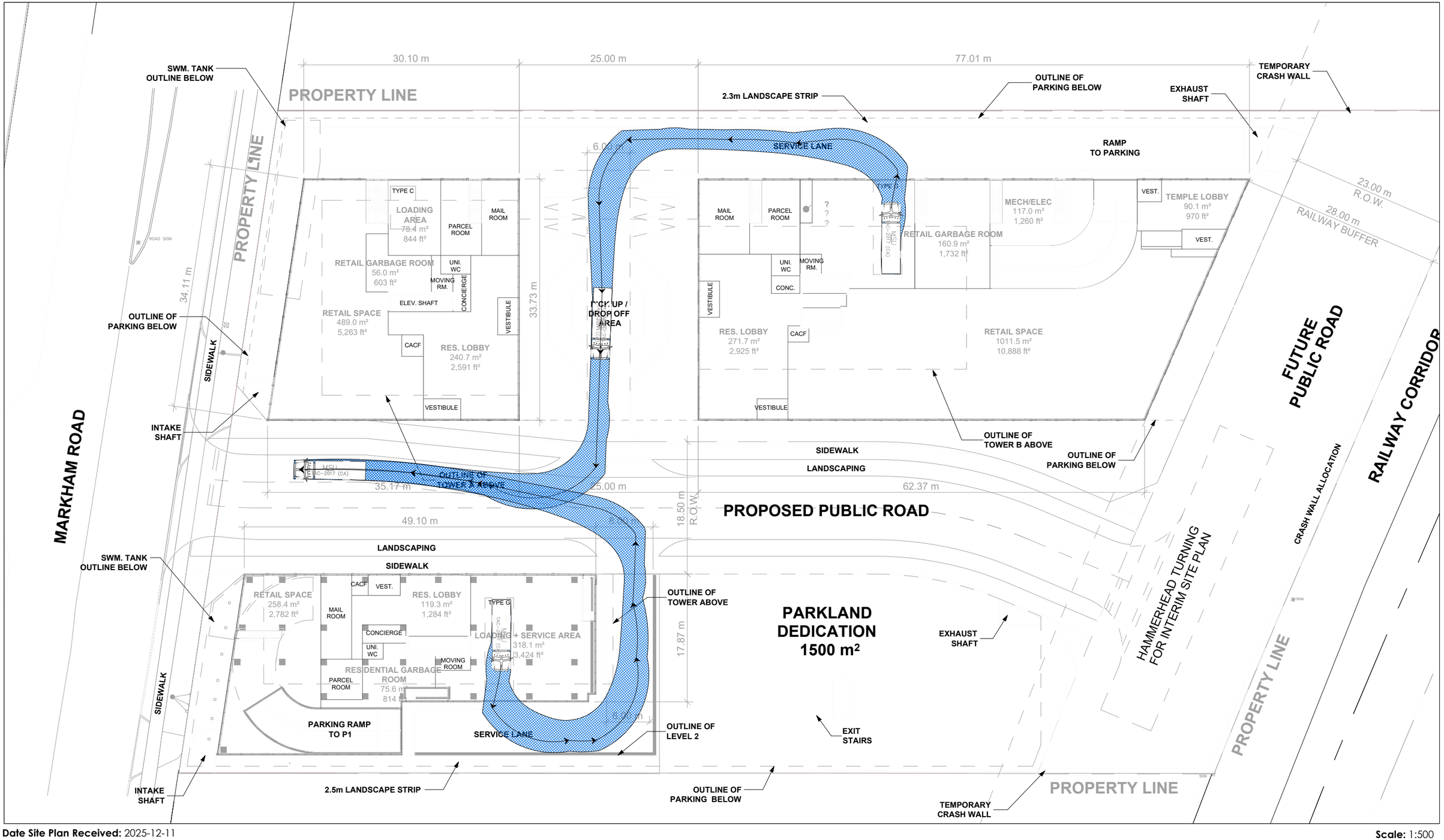


MSU

	meters
Width	: 2.60
Track	: 2.60
Lock to Lock Time	: 6.0
Steering Angle	: 40.2

Figure 6-3
Loading Truck Access - Entering 9441 Markham Road



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Date Site Plan Received: 2025-12-11

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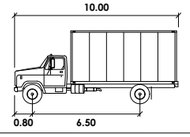

MSU

	meters
Width	: 2.60
Track	: 2.60
Lock to Lock Time	: 6.0
Steering Angle	: 40.2

Figure 6-4

Loading Truck Access - Exiting
9441 Markham Road

wsp - 9441 Markham Road (GF Level).dwg_f4

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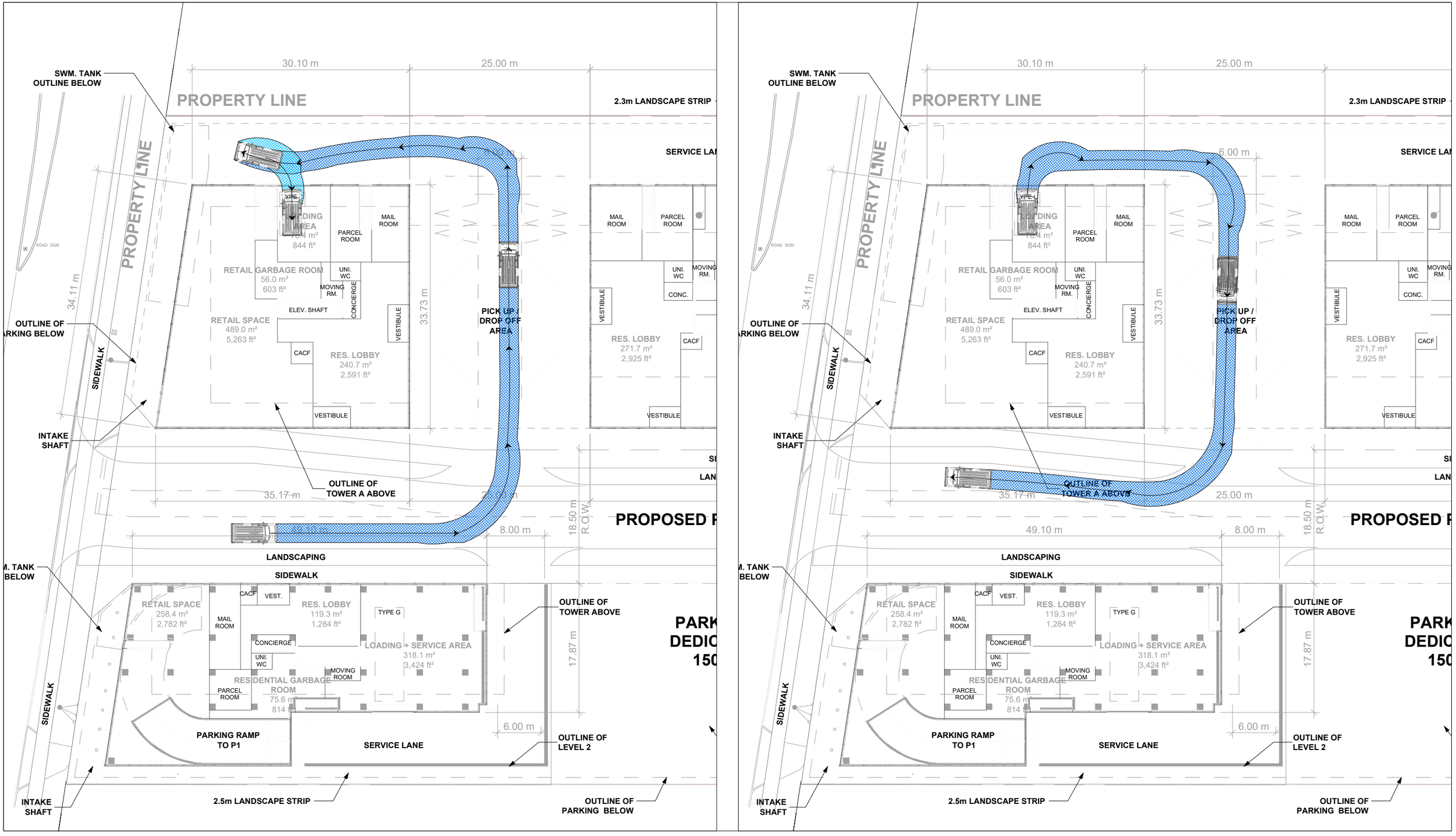

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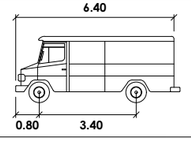

LSU

	meters
Width	: 2.60
Track	: 2.60
Lock to Lock Time	: 6.0
Steering Angle	: 40.3

Figure 6-5
Delivery Truck Access
9441 Markham Road

TY LINE

2.3m LANDSCAPE STRIP

SHAFT

SERVICE LANE

RAMP TO PARKING

6.00 m

TYPE C

LOADING AREA
78.4 m²
844 ft²

MAIL ROOM

PARCEL ROOM

L GARBAGE ROOM
56.0 m²
603 ft²

UNI. WC

MOVING RM.

CONCIERGE

ELEV. SHAFT

PACE
m²
ft²

VESTIBULE

CACF

RES. LOBBY
240.7 m²
2,591 ft²

VESTIBULE

33.73 m

PICK UP / DROP OFF AREA

TYPE G

MAIL ROOM

PARCEL ROOM

? ? ?

MECH/ELEC
117.0 m²
1,260 ft²

VEST.

TEMPLE LOBE
90.1 m²
970 ft²

VEST.

RETAIL GARBAGE ROOM
160.9 m²
1,732 ft²

UNI. WC

MOVING RM.

CONC.

VESTIBULE

RES. LOBBY
271.7 m²
2,925 ft²

CACF

RETAIL SPACE
1011.5 m²
10,888 ft²

VESTIBULE

OUTLINE OF TOWER B ABOVE

OUTLINE OF PARKING BELOW

SIDEWALK

LANDSCAPING

OUTLINE OF TOWER A ABOVE

35.17 m

25.00 m

62.37 m

18.50 m R.O.W.

49.10 m

8.00 m

PROPOSED PUBLIC ROAD

LANDSCAPING

SIDEWALK

D TURNING
SITE PLAN

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wsp

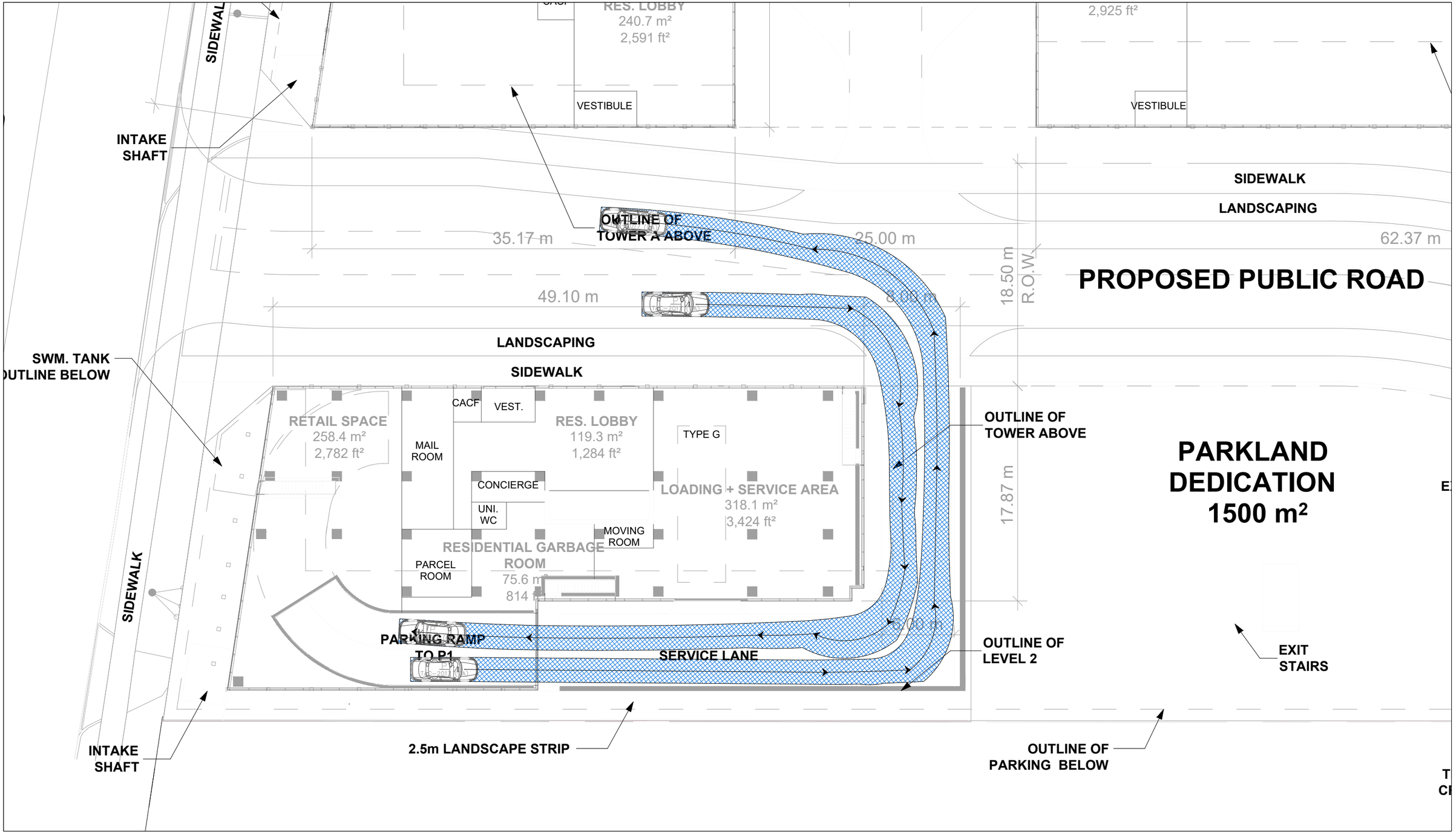
5.60
1.10 3.20

P

	meters
Width	: 2.00
Track	: 2.00
Lock to Lock Time	: 6.0
Steering Angle	: 35.9

Figure 6-6

Passenger Vehicle Circulation Manoeuvre Review - Ground Level (Northern Segment)
9441 Markham Road



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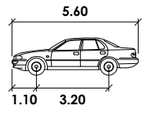

P

	meters
Width	: 2.00
Track	: 2.00
Lock to Lock Time	: 6.0
Steering Angle	: 35.9

Figure 6-7

Passenger Vehicle Circulation Manoeuvre Review - Ground Level (Southern Segment)
9441 Markham Road

wsp - 9441 Markham Road (GF Level).dwg_f7

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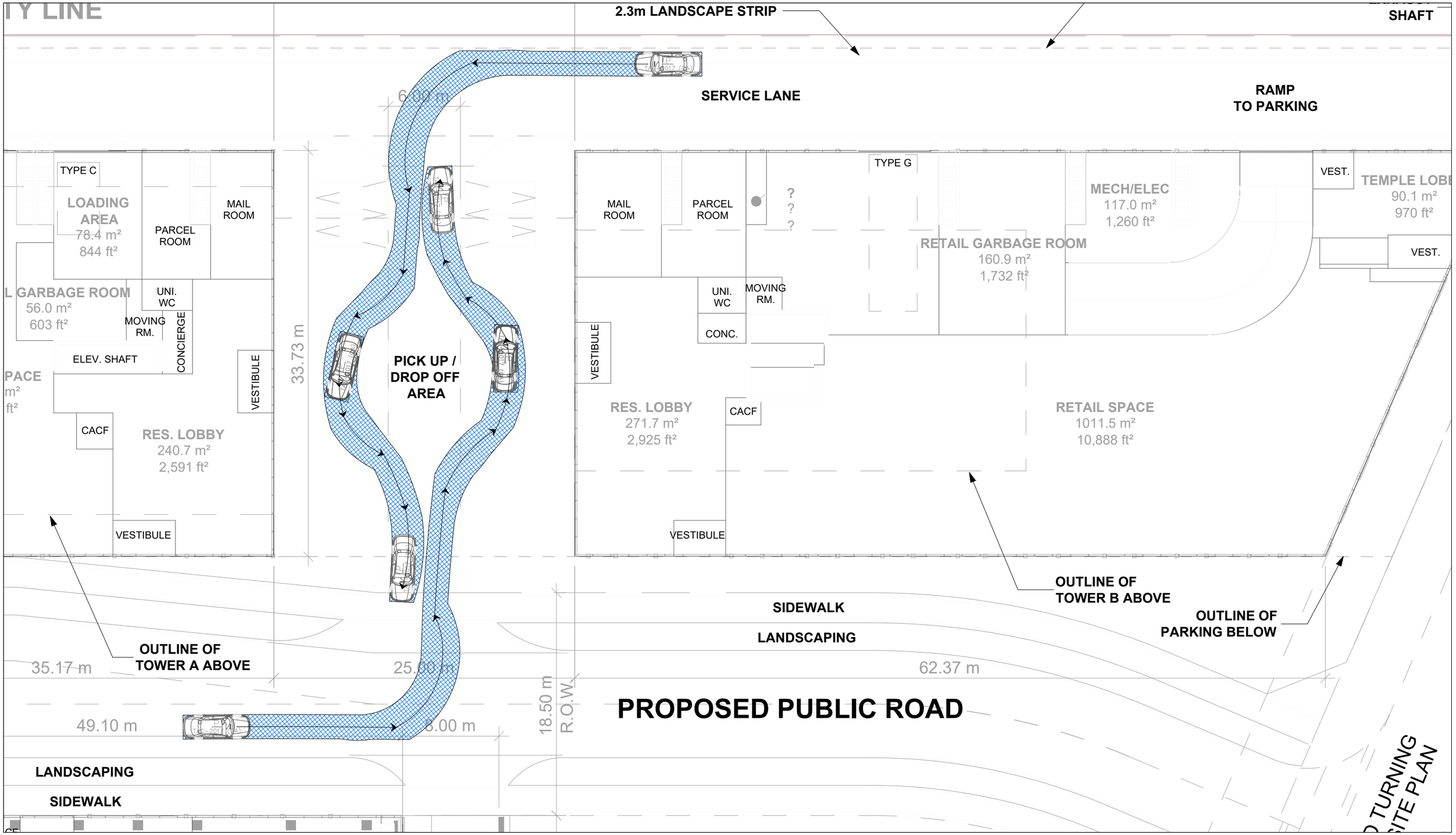

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Date Site Plan Received: 2025-12-11

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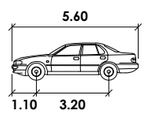
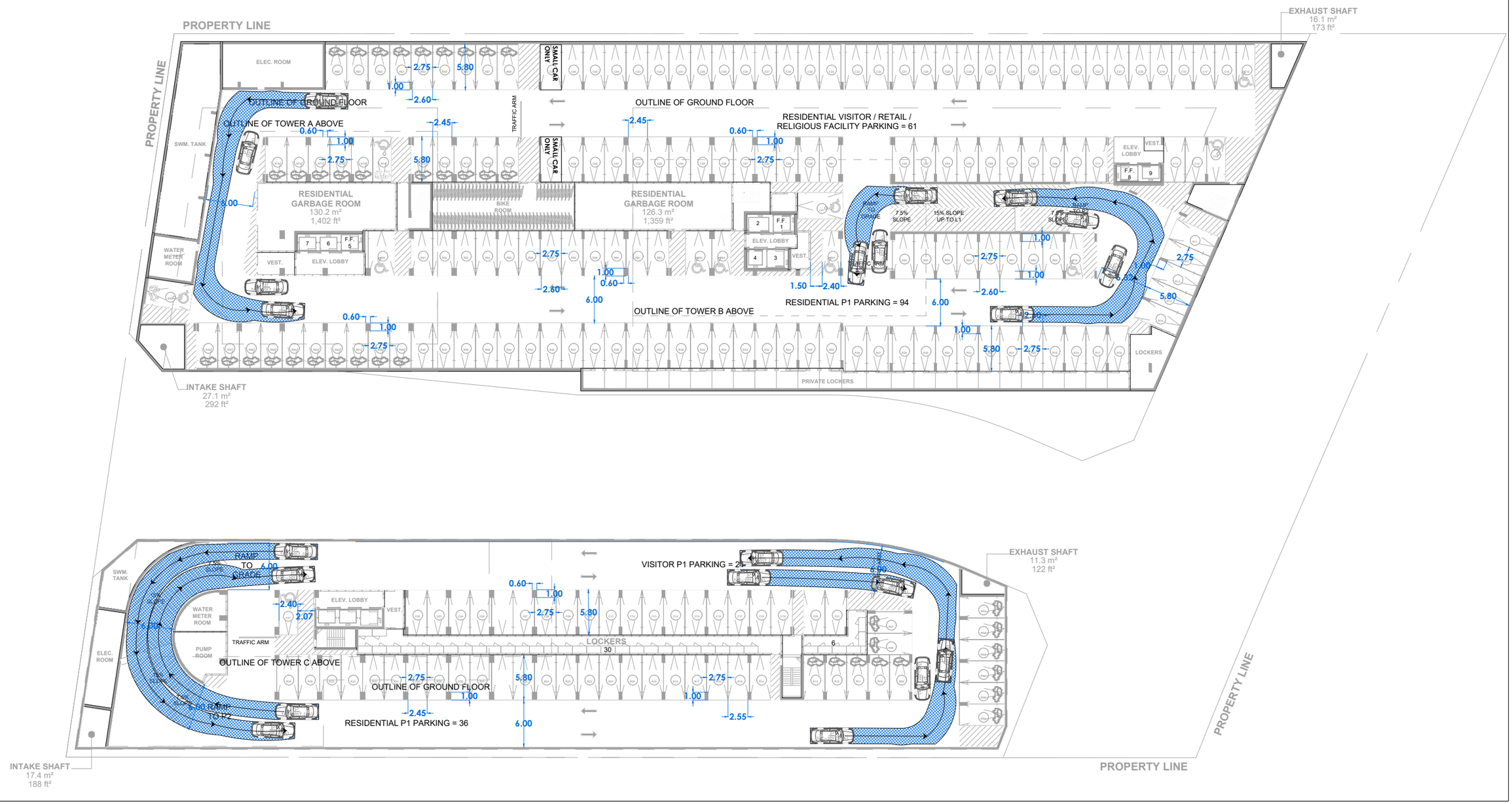


P

	meters
Width	: 2.00
Track	: 2.00
Lock to Lock Time	: 6.0
Steering Angle	: 35.9

Figure 6-8

Passenger Vehicle PUDO Area Access Manoeuvre Review - Ground Level (Northern Segment)
9441 Markham Road



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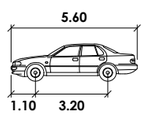
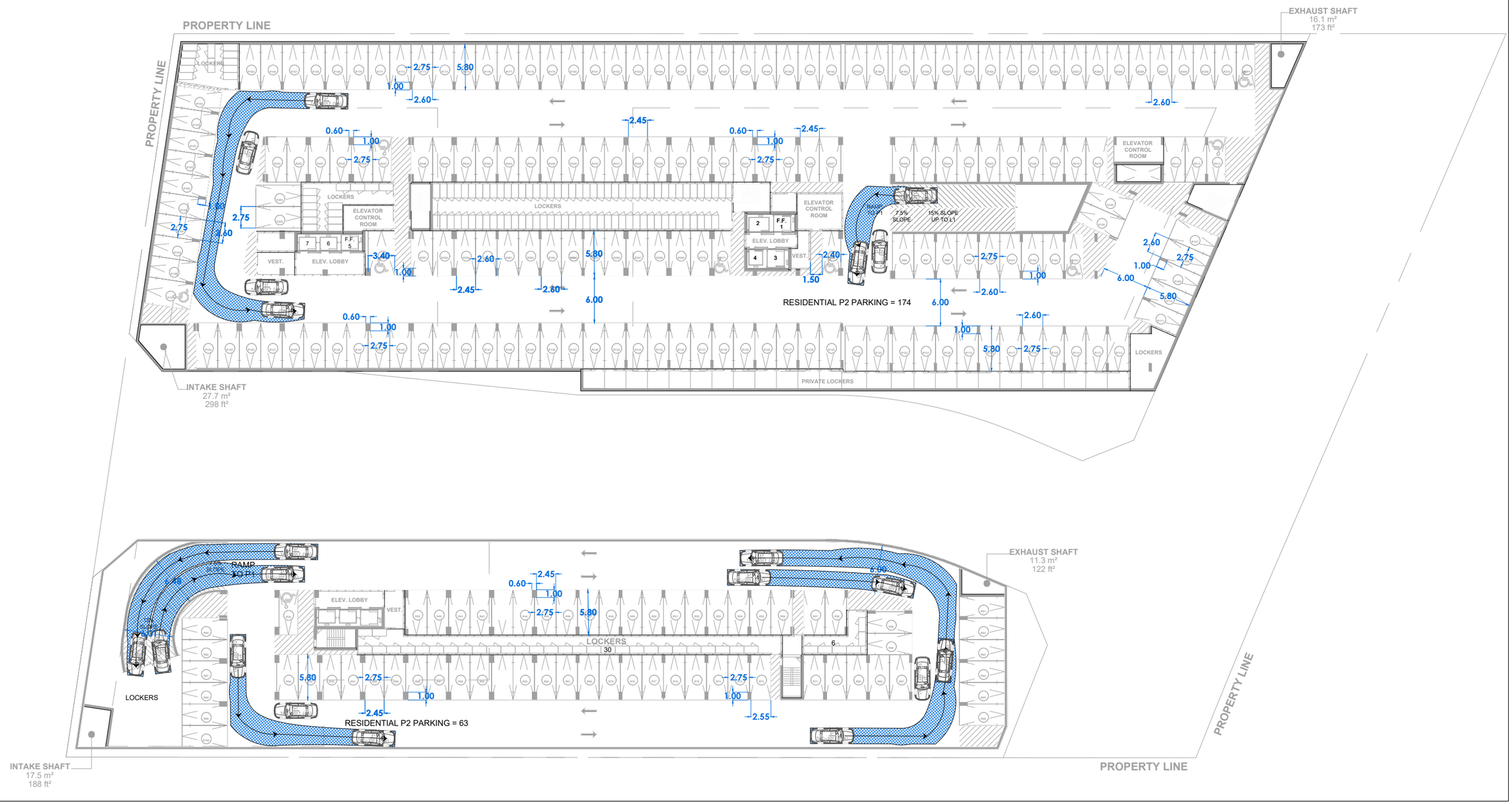


P

	meters
Width	: 2.00
Track	: 2.00
Lock to Lock Time	: 6.0
Steering Angle	: 35.9

Figure 6-9
Passenger car circulation - P1 Level
9441 Markham Road



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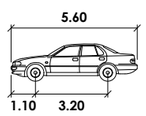

P

	meters
Width	: 2.00
Track	: 2.00
Lock to Lock Time	: 6.0
Steering Angle	: 35.9

Figure 6-10
Parking Level Review - P2 Level
9441 Markham Road

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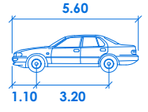
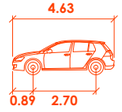


P (TAC)

	meters
Width	: 2.00
Track	: 2.00
Lock to Lock Time	: 6.0
Steering Angle	: 35.9

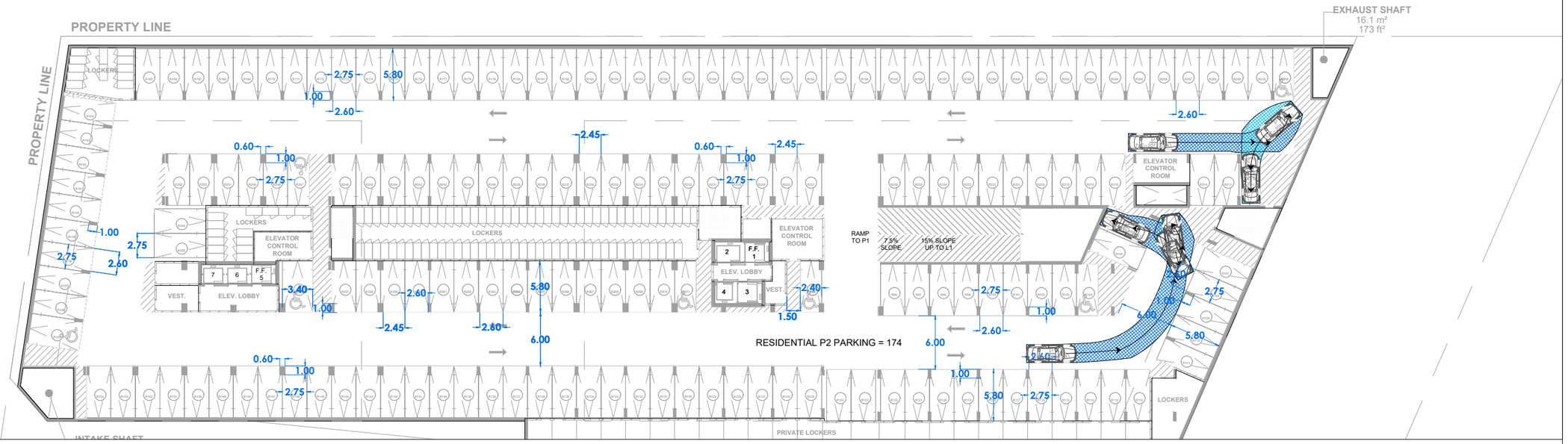


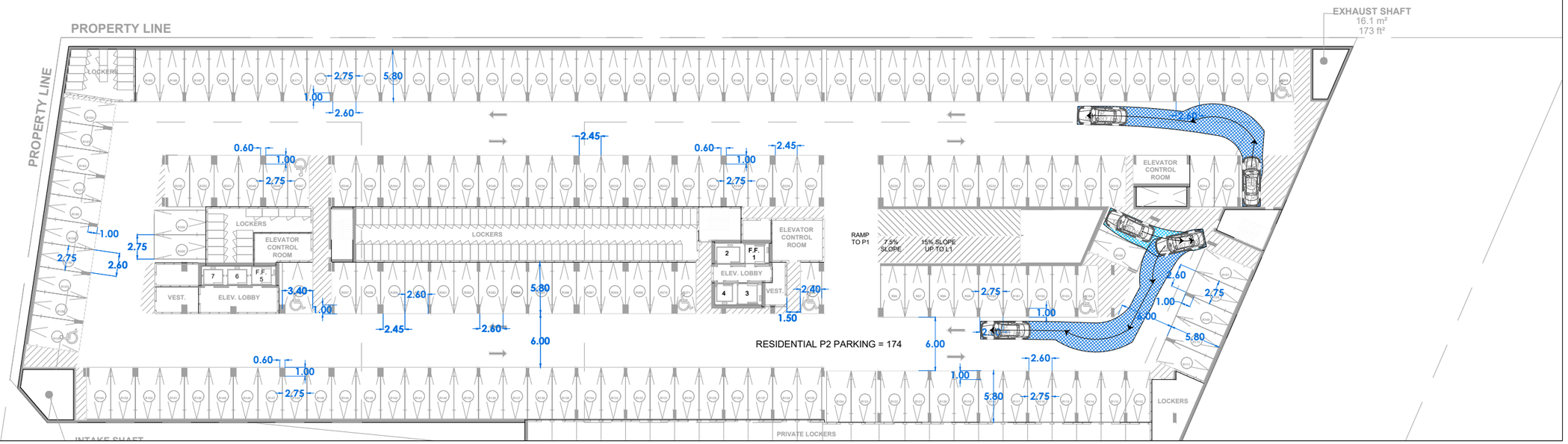
P-Compact

	meters
Width	: 1.80
Track	: 1.78
Lock to Lock Time	: 6.0
Steering Angle	: 35.1

Figure 6-11

Dead-end parking space access manoeuvre review - P1 Level
9441 Markham Road





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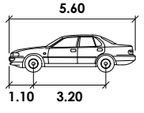

P

	meters
Width	: 2.00
Track	: 2.00
Lock to Lock Time	: 6.0
Steering Angle	: 35.9

Figure 6-12
Dead-end parking space access manoeuvre review - P2 Level
9441 Markham Road

The proposed road is to be classified as "Local".

As per City of Markham Engineering Design Criteria, Section B 'Roads', Table 2, a minimum stopping sight distance of 45 m is required. This requirement is expected to be met.

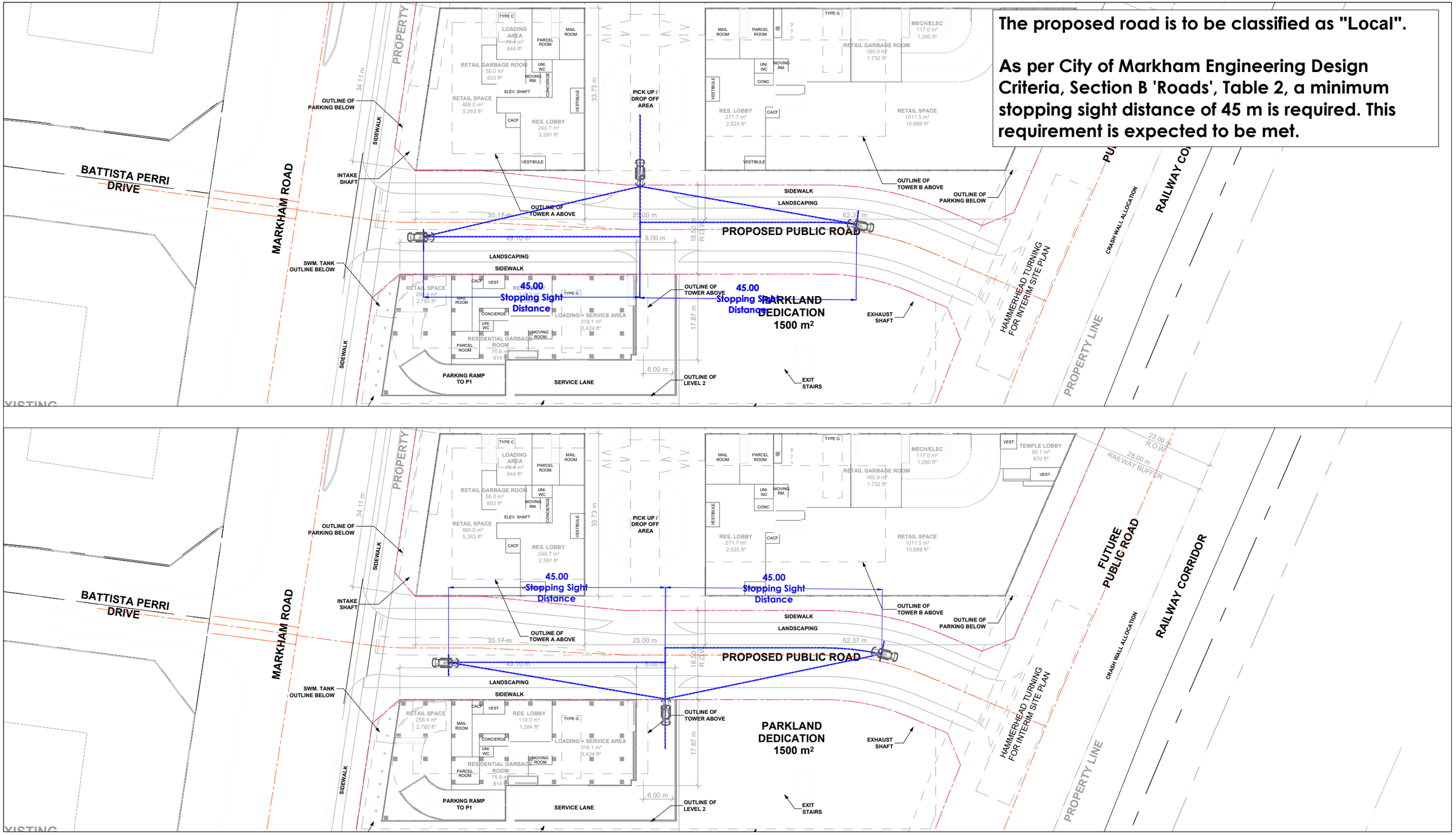

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Figure 6-13

Stopping Sight Line Review
9441 Markham Road

The proposed road is to be classified as "Local".

As per City of Markham Engineering Design Criteria, Section B 'Roads', Table 2, a design speed of 40 km/h will be assumed along the roadway.

As per TAC Geometric Design Guideline Table 9.9.4, a left turn decision sight distance of 85 m is required. On the East of the driveway, the hammerhead (future t-intersection) is located at a distance of less than 85 m.

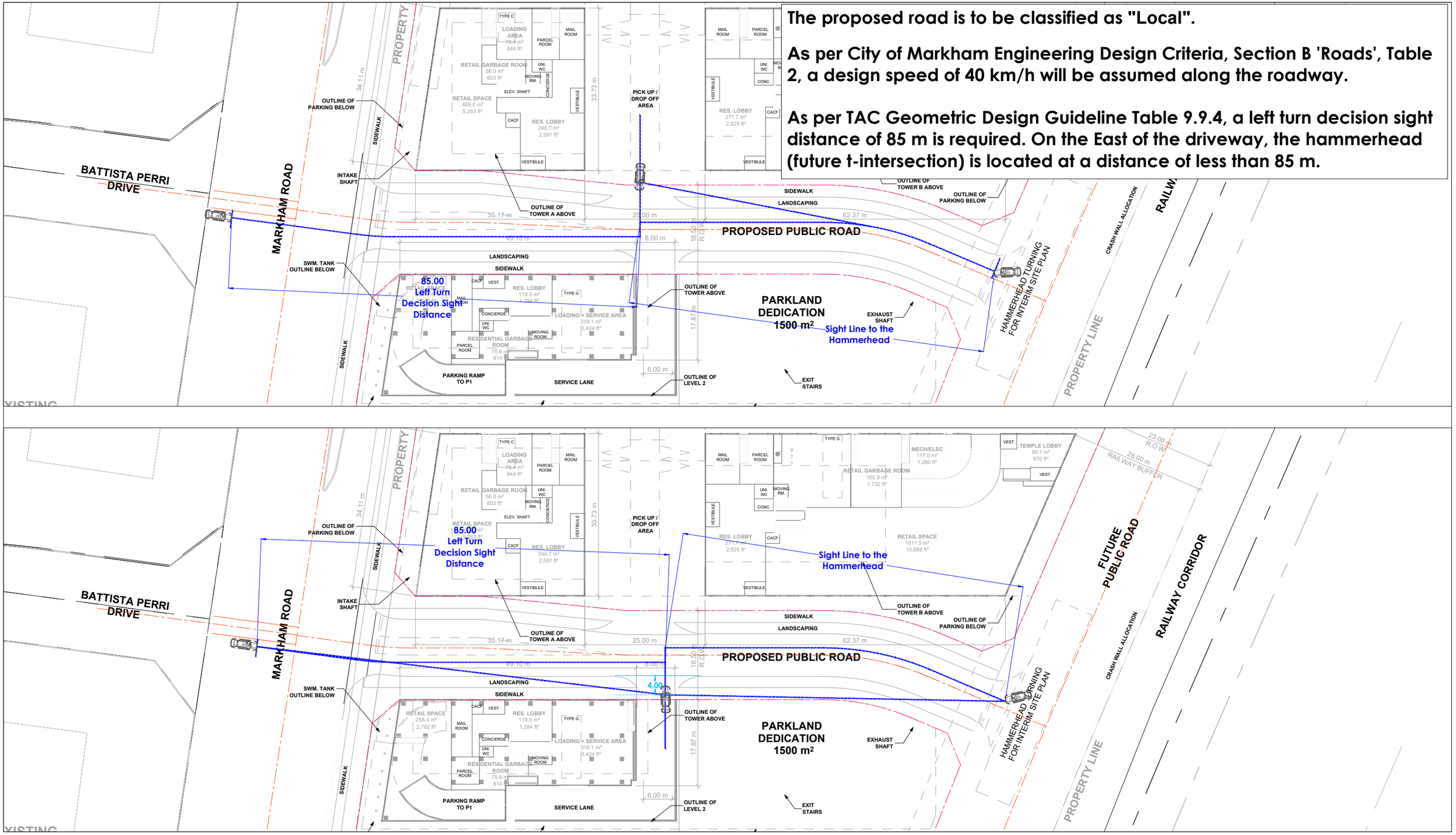

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Figure 6-14

Left Turn Decision Sight Line Review
9441 Markham Road

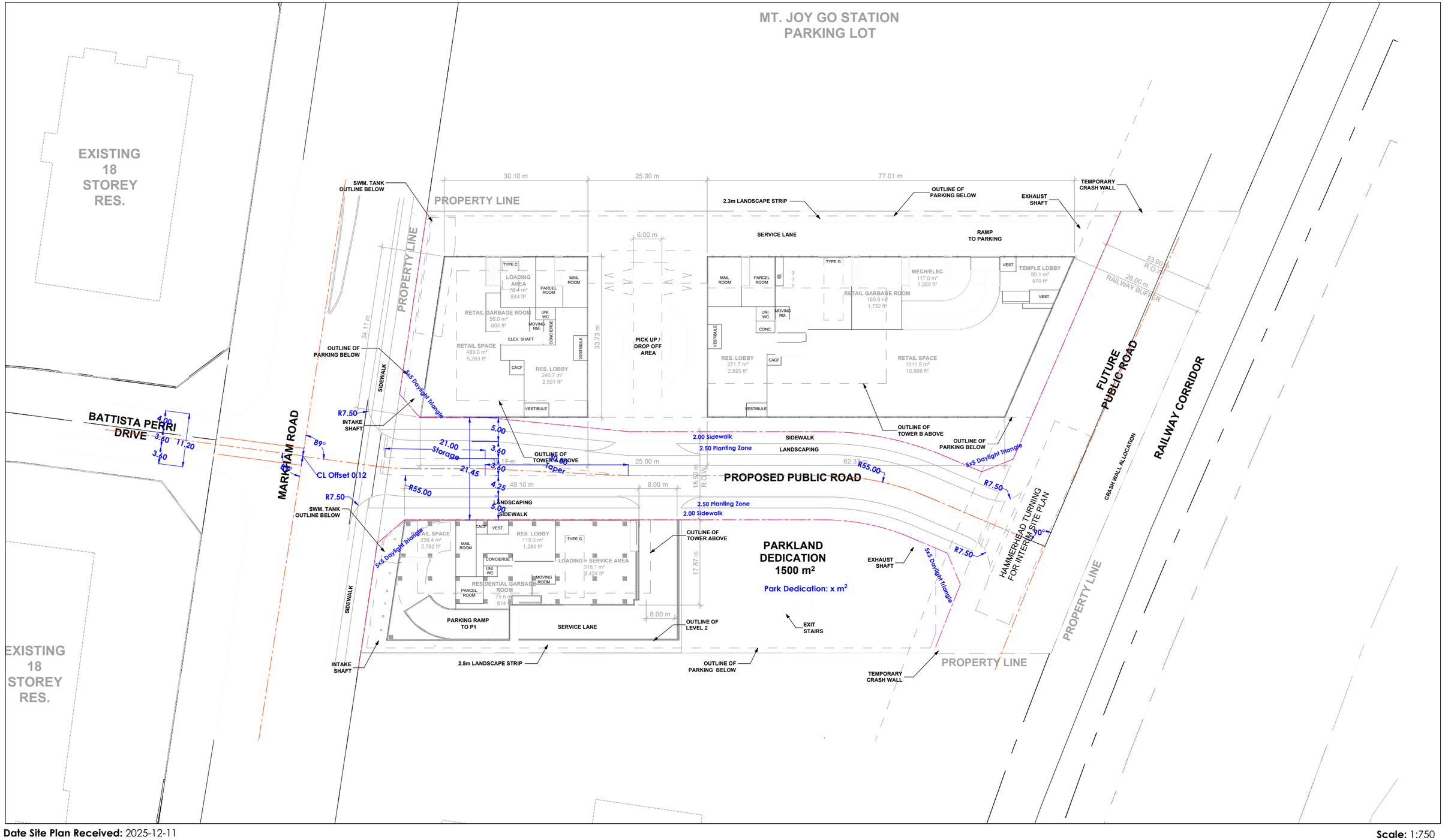

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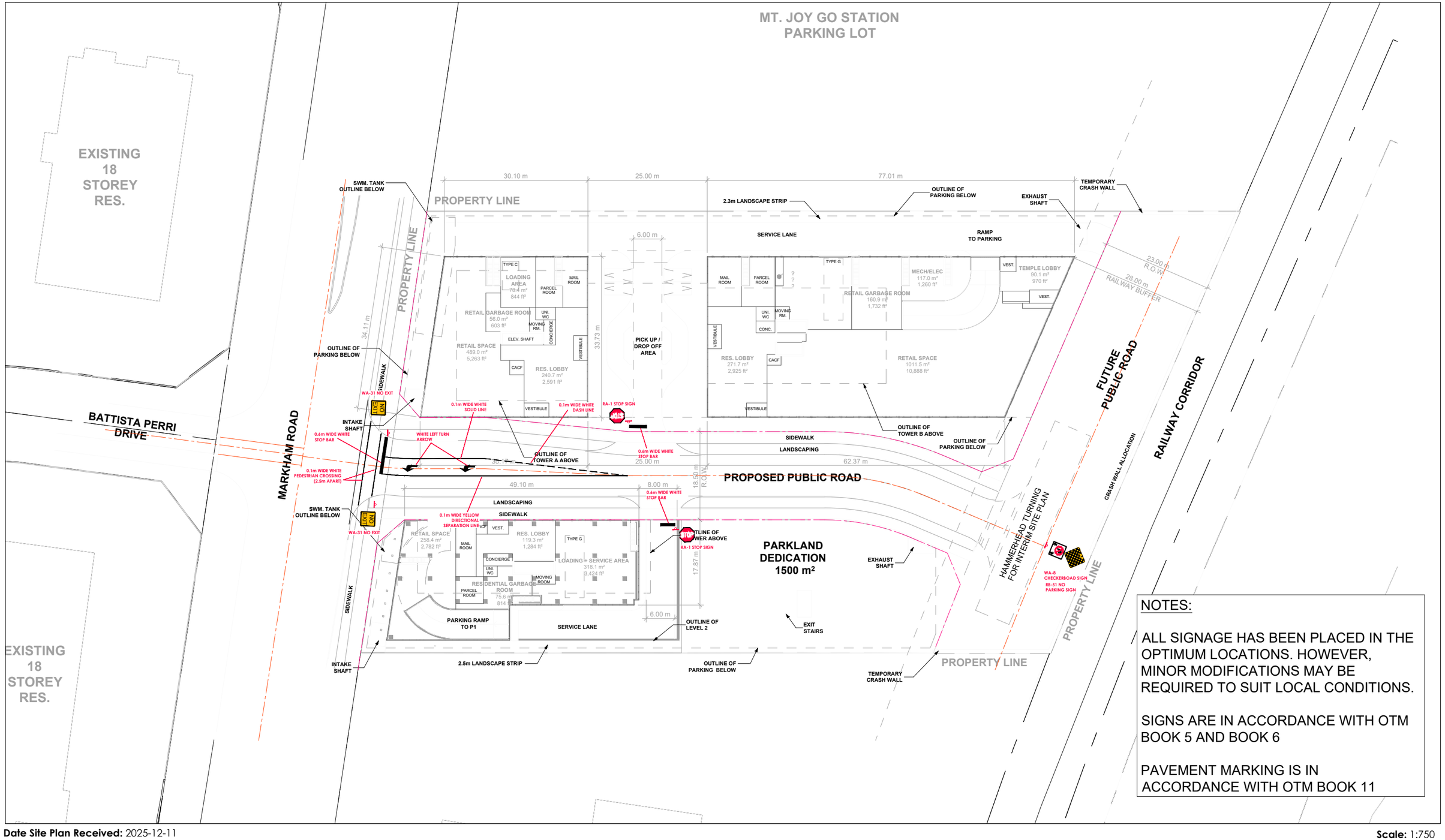
Figure 6-15
Road Alignment and Design Specifications
9441 Markham Road



NOTES:

ALL SIGNAGE HAS BEEN PLACED IN THE OPTIMUM LOCATIONS. HOWEVER, MINOR MODIFICATIONS MAY BE REQUIRED TO SUIT LOCAL CONDITIONS.

SIGNS ARE IN ACCORDANCE WITH OTM BOOK 5 AND BOOK 6

PAVEMENT MARKING IS IN ACCORDANCE WITH OTM BOOK 11

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Figure 6-16

Pavement Marking and Signage Plan
9441 Markham Road

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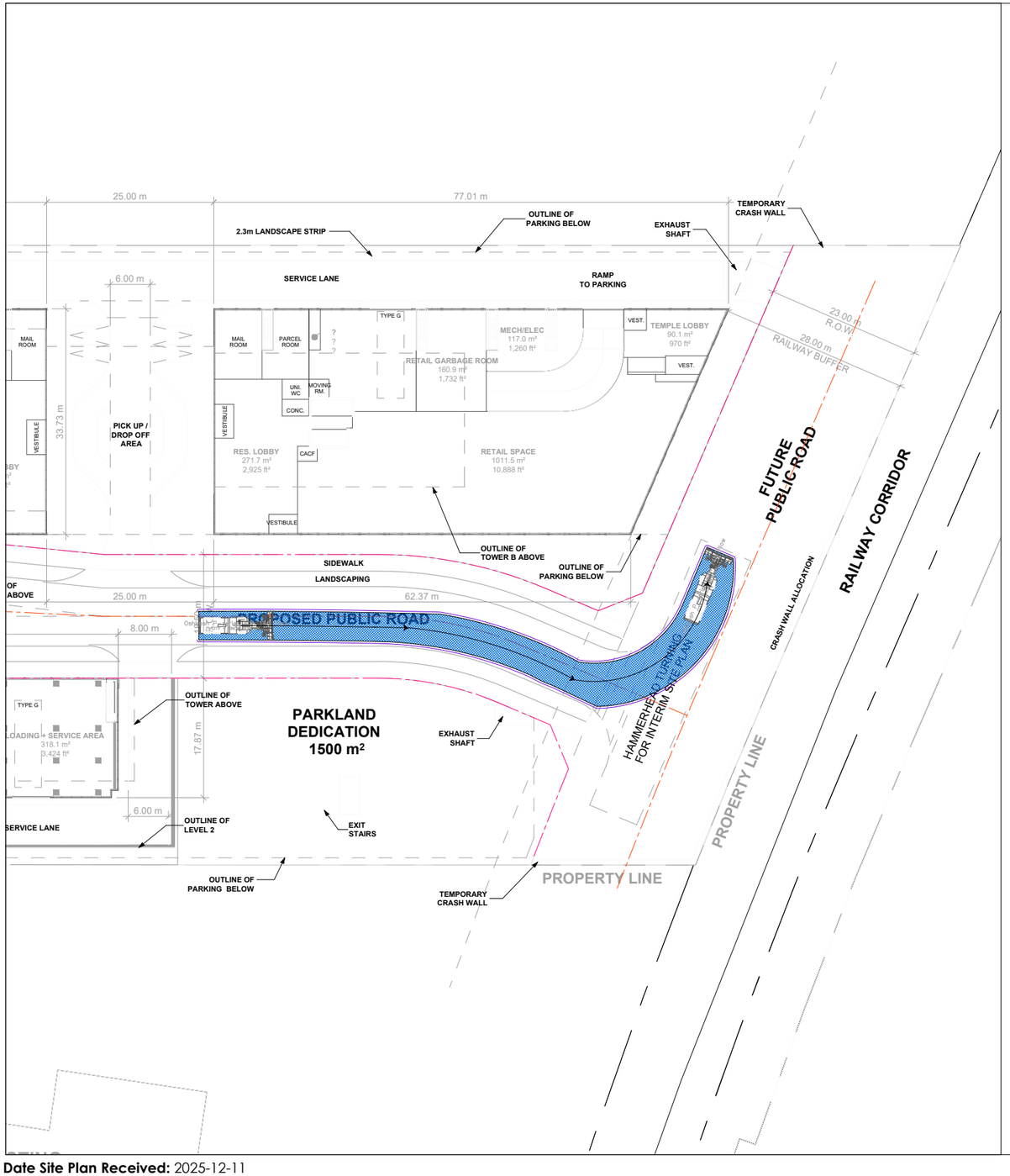

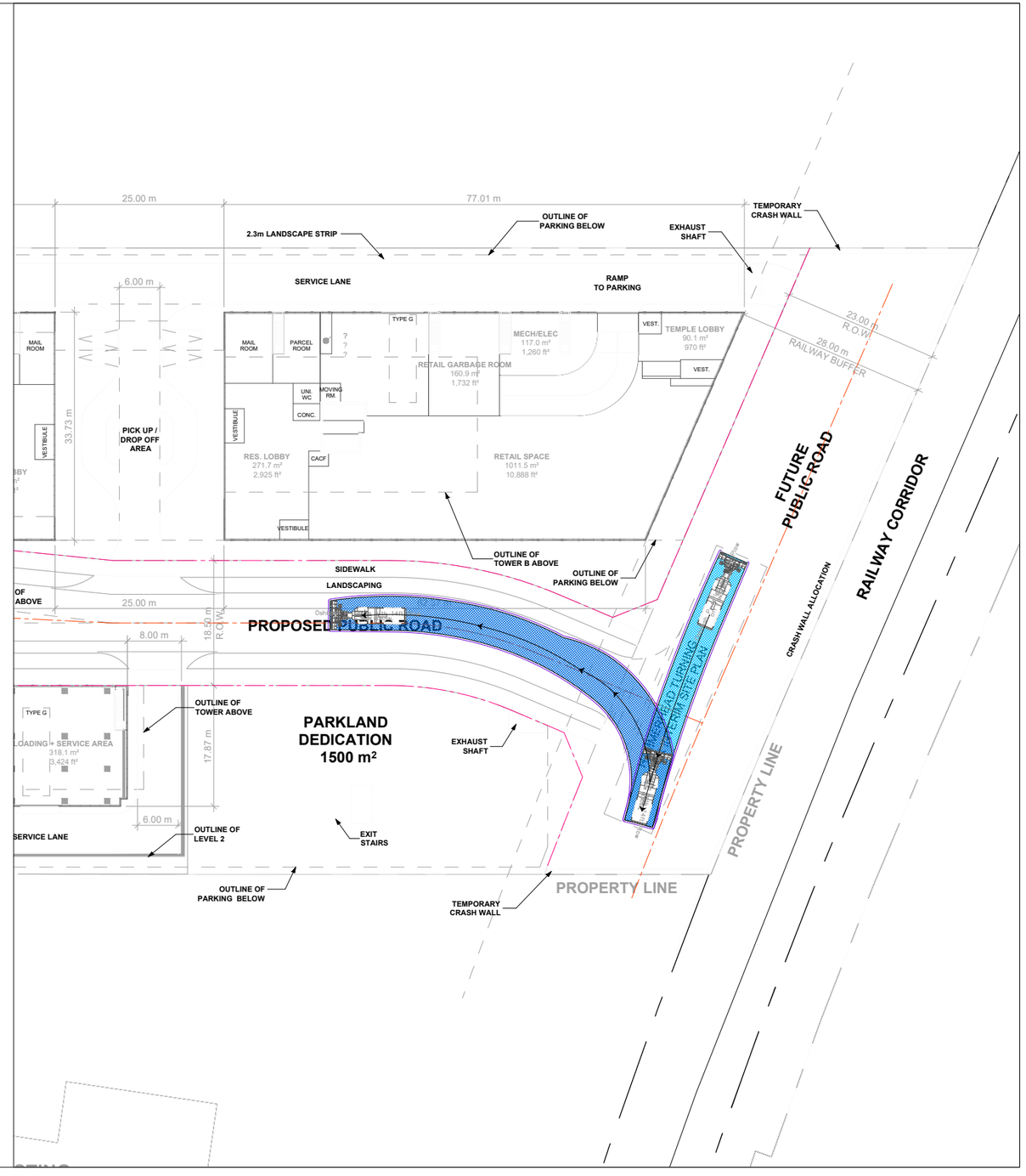

Date Site Plan Received: 2025-12-11

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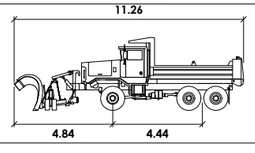

Oshkosh P-series with 14ft Plow

	meters
Width	: 4.27
Track	: 2.44
Lock to Lock Time	: 6.0
Steering Angle	: 15.1

Figure 6-17

Snowplow Review at the proposed Hammerhead 9441 Markham Road

wsp - 9441 Markham Rd (Road alignment).dwg_A16

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7 Transportation Demand Management

A Transportation Demand Management (TDM) Plan is a general term for various strategies that increase transportation system efficiency by managing the demand for travel. TDM initiatives discourage single-occupant vehicle travel and encourage more efficient modes such as walking, cycling, ridesharing and public transit, and vehicle parking demand is consequently reduced. This section outlines the TDM measures WSP recommends for the proposed development at 9441 Markham Road.

7.1 Encourage the Use of Transit Services

The subject site is located near the Mount Joy GO station and has access to a number of inter-regional and local transit services. To encourage the use of transit for future commuters of the site, WSP recommends the following measures:

- Provide transit information to future occupants of the development, such as transit route schedules, maps and brochures. Such information can be provided to residents in the form of an information package;
- Provide Presto cards to future residents with pre-loaded funds of $120 via the information sessions to incentivize new residents to become familiar with the benefits and convenience of the local transit network and adopt a transit-dependent lifestyle; and
- Establish communication strategy and organize two outreach events (information sessions) to distribute information packages and transit incentives.

The transit information packages and Presto cards would be made available by York Region staff vie two outreach events at locations provided by the applicant.

7.2 Encourage Cycling

The provision of bicycle parking will encourage residents to utilize cycling as a mode of transportation. A total of 963 long-term and 191 short-term bicycle parking spaces are proposed for the site. Additionally, providing residents with information regarding the existing cycling facilities and destinations (trails, bicycle lanes, parks, etc.) in the form of an information package will further promote the use of cycling facilities. It is also recommended that one bicycle repair station be provided on -site for the development, which can be used by residents and occasional visitors.

7.3 Encourage Walking

The area surrounding the subject site that well-developed pedestrian infrastructure and connections to the existing sidewalks in the network will be provided on-site. It is recommended that information on the amenities within walking distance of this site, including shopping, services (banking, dry cleaners, etc.) restaurants, institutions and facilities (libraries, theatres, parking, etc.) be provided in the form of an information package via information sessions.

7.4 Unbundled Parking

To complement the proposed parking supply for residents, WSP recommends that the developer implement unbundled parking for the proposed development. The practice of unbundled parking is an important and standard TDM strategy for medium and high-density residential developments in the GTA.

This TDM measure offers potential residents the option to purchase their unit separately from the parking space at a reduced cost. The cost reduction must reflect the realistic and actual cost of the parking space in order to encourage purchasers to consider an unbundled sparking option. This, in turn, promotes residents to explore alternative transportation options aside from single occupancy driving.

7.5 Information Packages for New Residents

To help facilitate non-auto trips, it is important to provide transportation information to new residents so that they can view and understand their travel options before establishing new travel habits. This will increase the likelihood that new residents incorporate alternative options in their travel patterns after moving into the development.

Strategies to promote cycling, walking, transit, and car-share usage are outlined in the previous sections. The developer will provide information about transportation options to new residents in an information package that will include items such as:

- Existing transit services, including a YRT ride guide, a GO transit system map, route navigators for each transit route in the area and seven-day schedules for nearby stops (provided by York Region staff);
- Presto cards for the first set of move-in residents with pre-loaded funds of $120. This is above and beyond what the Region provides through its development charge funds;
- A map of the surrounding area with sidewalks and bicycle facilities, cycling and pedestrian safety tips, and information on active transportation events (prepared by the City); and
- Information about car-share within the development.

The developer will be responsible for coordinating with the Region and the City to organize two outreach events to distribute the information packages.

7.6 TDM Strategy Cost Summary

The estimated cost of the recommended TDM measures for the subject site are shown in **Table 7-1**, which results in a total cost of approximately $119,300.

Table 7-1 TDM Measures and Cost

TDM Measure/Description		Quantity	Unit Cost	Total Cost	Comment/Assumption
Pedestrian Connections	Applicant to provide connections to pedestrian infrastructure in the area	N.A.	N.A.	N.A.	Included in construction costs
Bicycle Parking	Provide long-term bicycle parking spaces	843	N.A.	N.A.	Included in construction costs
	Provide short-term bicycle parking spaces	324	N.A.	N.A.	Included in construction costs
Bicycle Repair Station	Provide one bicycle repair station on-site – one for each building	3	$1,500	$4,500	Based on the cost for the Fixit Air Kit 2 Station, approximated assuming installation costs The location will be specified during SPA but would generally be near the long-term bicycle parking rooms.
Outreach Events (Information Sessions)	Information sessions to take place within the development common areas as to provide a space for York Region staff to distribute transit incentives and information packages	1	$500	$500	-
Information Packages	The Presto pass incentive is above and beyond what the Region offers through the DC program.	1,218	$10	$12,180	Potential opportunity for cost sharing with York Region. Regional amount to be determined by York Region through their MyTrip program (if applicable)
Pre-loaded Presto Cards		For units not purchasing parking 1,218 units – 367 resident spaces = 851 units	$120	$102,120	
Unbundled Parking & and no Subsidy	Residential units to be sold / rented separately from parking spaces. The full cost of the parking space would also be passed onto the purchaser/renter so that it does not incentivize auto ownership.	N.A.	N.A.	N.A.	-
Total TDM Investment				**$119,300**	

8 Summary and Recommendations

The subject site located at 9441 Markham Road is currently occupied by a one-storey commercial building and its associated surface parking area with a stop-controlled site access on Markham Road. The proposed development will consist of redeveloping the existing land uses on the subject site into 1,218 residential units, 978 m^2 of ground floor retail and 1,852 m^2 of temple replacement. A total of 453 vehicular parking spaces will be provided. The existing site driveway will be converted into a future east-west public road that is aligned with Battista Perri Drive forming a signalized intersection. Elements of the Mount Joy Secondary Plan including the planned lane reduction and resulting 2041 forecast volumes have been accounted for.

- Under existing conditions, traffic operations show that all study intersections operate at an acceptable LOS 'D' or better during the a.m. and p.m. peak periods. All movements operate within capacity.
- Two horizon years are evaluated in this TIS: 2030 and 2041. This accounts for the buildout of the site and the longer term horizon evaluated in the Mount Joy Secondary Plan traffic study.
- Under 2030 future background conditions, the study intersections are expected to operate at an acceptable LOS 'D' or better except for Markham Road & 16th Avenue, which operates at LOS 'E' and 'F' for the a.m. and p.m. peak hours, respectively. Optimized signal timing splits improve the LOS for the p.m. period to 'D' and reduces motorist delay for both peak periods.
- Under 2041 future background scenario, the study intersections generally operate at LOS 'F' due to the Secondary Plan lane configurations and the additional inclusion of the Upper Markham Village Secondary Plan traffic, which was not accounted for in the Mount Joy Secondary Plan traffic study. Optimized signal timing splits are recommended for the intersection of Markham Road and 16th Avenue to improve network function.
- Under 2030 future total conditions, the study intersections are expected to operate similarly to the future background conditions. The addition of the signalized intersection at the new future east-west public road at Markham Road and Battista Perri Drive allows the site-generated traffic to readily access and egress the Site. The site-generated traffic has minimal influence on the study intersections – with the average increase in average delay ranging from 1 to 3 seconds per vehicle, which is minor.
- Under the 2041 future total conditions, the study intersections operate similarly to the 2041 future background conditions with most study intersections operating at LOS 'F' while facing capacity constraints. The poor traffic operation conditions throughout the study network of the 2041 scenario is consistent with the findings from the Mount Joy Secondary Plan traffic study. In addition, this study is more conservative since it includes the Upper Markham Village Secondary Plan and double counts the level of traffic generated by the site. Therefore, the 2041 results presented are the worst-case scenario.

- The queueing analysis indicated that the addition of site-generated traffic has minimal influence on the 95th and 50th percentile queue lengths. The findings are aligned with the intersection operations, where 2030 results are generally adequate, while 2041 results show constrained queuing conditions.
- Overall, the findings indicated that the site-generated traffic from the proposed development at 9441 Markham Road can be readily accommodated by the near-term 2030 road network and the planned traffic signal and east-west public road. As the vision of the 2041 Mount Joy Secondary Plan scenario is gradually delivered, it is recommended that the City monitor traffic flow and implement improvements as required to respond to the narrowing of Markham Road.
- The proposed vehicular and bicycle parking supplies meet relevant requirements.
- The proposed loading arrangement allows each building to be readily served by delivery and waste collection vehicles.
- The proposed east-west public road design is adequate given the context in terms of short length, proximity to the Metrolinx rail corridor and lower design speed.

APPENDIX

A Terms of Reference

To City of Markham – Langston Lai
Site: 9441 Markham Road
Date: August 26, 2025

Terms of Reference Request

Further to our PAC meeting on June 23, 2025 with City staff, the following terms of reference (TOR) request has been compiled for the City's confirmation or commentary. For context, the draft concept plan is presented in **Figure 1**, as shared with City staff during the June meeting. The site is located in a MTSA zone being located immediately south of the Mt. Joy GO Station. The contemplated 3 tower development will replace the existing church and non-residential uses on site today. Further unit count and parking counts are not yet available.

Task 1 – Traffic Data Collection

Based on the location and magnitude of the development, we proposed to analyze the following study intersections:

- Markham Road and Bur Oak Avenue (signalized)
- Markham Road and existing site driveway / (unsignalized)
- Markham Road and Edward Jeffreys Avenue (signalized)
- Markham Road and 16th Avenue (signalized)

We will collect the necessary traffic data including turning movement counts and signal timing plans for the study area identified above. The TMCs will capture the vehicular and pedestrian volumes during the typical weekday a.m. and p.m. peak hours at the study intersections.

Task 3 - Existing Traffic Operations

The existing conditions will be analyzed using the Synchro 12 Traffic Software, which is a software implementation of the Highway Capacity Manual methodologies, the recognized standard for traffic operations analysis in North America. The existing conditions will be modelled based on the existing transportation network and peak hour traffic volumes as collected. This will be the baseline scenario to which all subsequent scenarios will be compared with.

Task 4 – Future Background Traffic Operations

The future background traffic analysis will model the "do nothing" conditions without the proposed development. Based on the planning context of the site and feedback received through the PAC meeting, two horizons/scenarios will be evaluated

- 2030 near-term horizon: This scenario corresponds to the assumed build-out year of the proposed development. It considers background developments submitted to date and general background growth determined via historical data with the existing roadway network; and
- 2041 ultimate horizon high non-auto mode share scenario: This scenario corresponds to the 2041 high non-auto mode share scenario with two lanes on Markham Road assessed in the Secondary Plan. The recommended road network and future traffic volumes from the Secondary Plan will be used in this scenario.

No further adjustment to the volumes will be made since the Secondary Plan already accounted for significant growth.

The future background traffic operations will be performed using Synchro 12. The 2030 evaluation will identify whether improvements to the study area road network are required as a result of the other background developments and general traffic growth in the area. By the 2041 ultimate horizon, it is assumed the Secondary Plan recommendations will be in place.

WSP has reviewed the City's MappIT – Development Application Viewer web page and identified the following active development applications of scale in the vicinity of the site to be included in the 2030 future background analysis:

- 9331-9399 Markham Road mixed-use development (TIS available from City's website);
- 9900 Markham Road development (TIS available from version submitted by WSP);
- 9781 Markham Road mixed-use development Phases 1 and 2 (TIS available from City's website and WSP's database); and
- 77 Anderson Avenue mixed-use development (TIS not available).

Traffic generated by general growth will be reviewed based on historical data and the study findings of the Secondary Plan.

WSP respectfully requests the City to confirm the list of background developments and provide the associated traffic study for the 77 Anderson Avenue development.

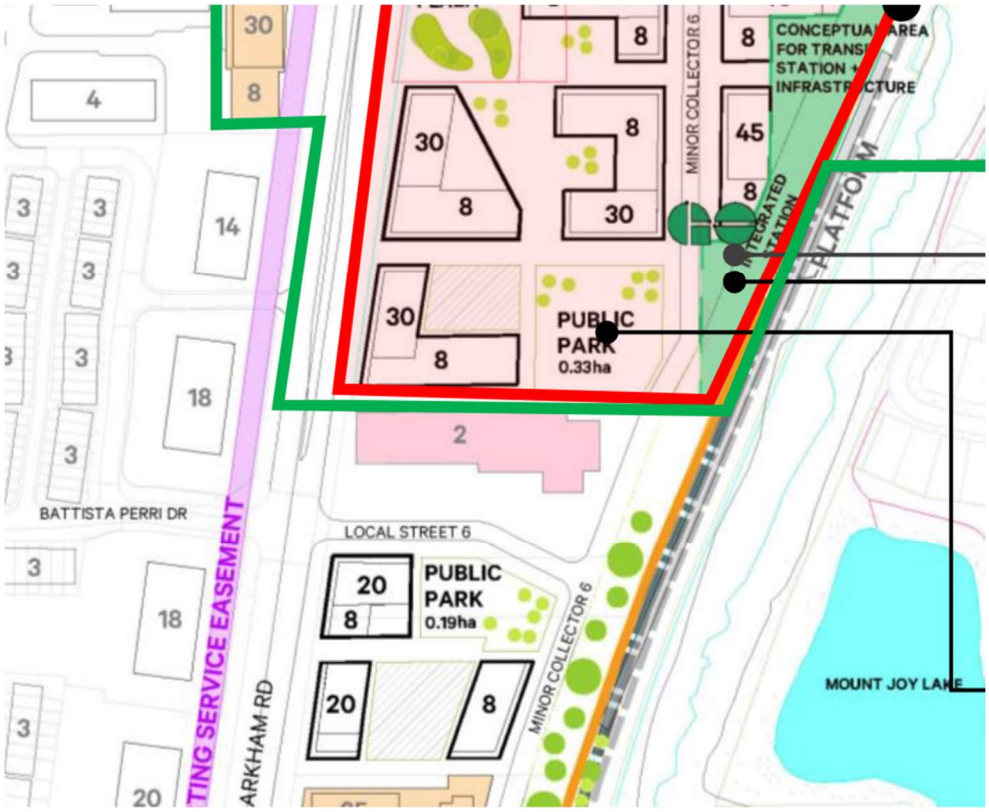
We request the City to confirm the planned intersection control at Markham Road and the future public lane / Battista Perri Drive intersection. As discussed during the PAC meeting, different pages of the Secondary Plan appear to show different intersection controls (signalized versus minor-street stop controlled)

Task 5 – Trip Generation and Assignment

We will generate weekday a.m. and p.m. peak hour site traffic for the residential development based on the rates representative of the development typology. The ITE Trip Generation Manual, the level of parking proposed, proximity to the Mt. Joy GO Station and TTS data will also be considered. The site-generated traffic will be assigned to the future road for each of the two horizon years evaluated:

- For the 2030 near-term scenario, WSP will only consider the existing study road network (without the full build-out of the broader Secondary Plan planned road network - i.e., the north-south road to the east of the subject site). Trips generated by the existing development on-site will be removed based on existing traffic counts.
- For the 2041 ultimate scenario, WSP will assume the full implementation of the Secondary Plan road network with two lanes on Markham Road along with the north-south connection adjacent to the rail corridor.

It should be noted that the Mount Joy Secondary Plan already accounted for a certain level of density for the subject site as shown in the excerpt below. To avoid overlap in density and traffic forecast, WSP will compare the planned density with the proposed density to prorate the “delta” in trip generation.



We request the City to provide the density planned for the subject site as evaluated in the Secondary Plan for the 2041 horizon year.

Task 6 – Future Total Traffic Operations

The future total traffic conditions are used to assess the potential impact of the development on the road network. It is derived by superimposing the site-generated traffic (net) onto the future background traffic forecasts to develop the future total traffic volumes. The analysis will be completed for the boundary study intersections and the site access for the weekday a.m. and p.m. peak hours. As previously mentioned, the future total analysis will assess the following horizon/scenarios:

- 2030 near-term horizon; and
- 2041 ultimate horizon Secondary Plan - high non-auto mode share scenario.

We will identify if there is a need for improvements depending on the increase in delay or capacity of movements due to the net site-generated traffic.

Task 7 – Multi-modal Evaluation

Multi-modal level of service (MMLOS) analysis will be completed using the York Region Transportation Mobility Plan Guideline methodology. WSP will evaluate the public streets and intersection that the site fronts onto to document the existing and future conditions related to the proposed sidewalk and cycling connections.

Task 8 – Transportation Demand Management (TDM) Plan

We will include a Transportation Demand Management (TDM) Plan that accounts for the site context and traffic conditions, with consideration for the intent of the Mount Joy Secondary Plan and relevant City/Region guidelines. The TDM Plan will seek to promote the use of sustainable and actives modes of transportation, while minimizing automobile use.

Task 9 – Loading Space Assessment

We will evaluate the City's Zoning By-law loading standards, and based on our review, provide commentary on how the proposed loading supply satisfies the applicable requirements.

Task 10 – Parking Assessment

We will review the proposed auto and bicycle parking supply for the proposed development relative to the City's Zoning By-law requirements. It should be noted that the site is within a MTSA directly adjacent to the Mount Joy GO Station, and there are no minimum parking requirements per provincial legislation. WSP will provide commentary on the appropriateness of the proposed parking supply, which may be based on the site transportation and planning context as well as TDM measures.

Task 11 – Access. Public Street and Site Plan Review

We will complete a comprehensive review of the site plan from a transportation perspective based on the applicable municipal and TAC standards, and test the movements of passenger vehicles as well as garbage, delivery and moving trucks to ensure the manoeuvres can be adequately accommodated. We will also review the future east-west public road/lane alignment and functional layout to ensure it meets the intent of the Mount Joy Secondary Plan along with the City's relevant road design standards. During the interim 2030 scenario, a temporary turn-around area may be required at the easterly terminus of the public lane.

Task 12 – Reporting

The TIS will document the study methodologies and findings and be submitted to the review agencies.

Thank you for your review and assistance.

Peter Yu, P.Eng., Senior Project Manager

Outlook

RE: 9441 Markham Road - Term of Reference Confirmation Request

From Lai, Langston <LLai@markham.ca>
Date Tue 9/16/2025 4:11 PM
To Yu, Peter <Peter.Yu@wsp.com>
Cc Dong, Xinwei <Xinwei.Dong@wsp.com>

Hi Peter,

My response is as follows:

1. The WSP ToR already included 77 Anderson Avenue in your list of development applications to be included in the 2030 future background analysis.
2. We are not sharing the TIS prepared by consultants for both the Upper Markham Village SP and the Robinson Glen SP with WSP because there are multiple outstanding City comments related to the trip generation/assignment assumptions in the two TIS reports and the City have not accepted the validity of the TIS. You are welcome to make use of the TIS for the two Secondary Plans as a starting point; however, it is the responsibility of the consultant to ensure that the trip generation/assignment assumptions in those TIS are appropriate based on your engineering judgment. If WSP chooses to copy the trip generation/assignment assumptions directly from the two studies and applies them to your traffic analysis, naturally City staff would make the same comments regarding the trip generation/assignment assumptions provided to the two Secondary Plan consultants on their TIS studies.

Hope that helps.

Regards,
Langston Lai, P.Eng. | Transportation Engineer
Engineering Department
Anthony Roman Centre | City of Markham
101 Town Centre Boulevard
Markham ON L3R 9W3

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Connect with us:

From: Yu, Peter <Peter.Yu@wsp.com>
Sent: Tuesday, September 16, 2025 10:12 AM

To: Lai, Langston <llai@markham.ca>
Cc: Dong, Xinwei <Xinwei.Dong@wsp.com>
Subject: Re: 9441 Markham Road - Term of Reference Confirmation Request

Hi Langston

Thanks for the feedback, please see my comments/questions below in red.

thanks
Peter

From: Lai, Langston <LLai@markham.ca>
Sent: Monday, September 15, 2025 12:37 PM
To: Yu, Peter <Peter.Yu@wsp.com>
Subject: RE: 9441 Markham Road - Term of Reference Confirmation Request

Hi Peter,

City staff comments on the TIS terms of reference are as follows:

1. Any modification to the default Synchro parameters must be documented in the report and justified to the satisfaction of the City.
2. Please include the Upper Markham Village Secondary Plan, Robinson Glen East Secondary Plan, and 9999 Markham Road Phase 1A in the list of background developments to be considered in the analysis:

Upper Markham Village

Table 1-1: Potential Unit Count by Land Use Designation

Land Use	Net Land Area	Unit Type	Potential Unit Count
Residential Low Rise	97	Singles	2,520
		Towns & Back-to-Back	630
Residential Mid Rise	60	Singles	135
		Towns & Back-to-Back	3,065
		Stacked	800
		Apartments	225
Residential High Rise	16	Towns & Back-to-Back	390
		Stacked	390
		Apartments	3,990
Mixed-Use Mid Rise	6	Towns & Back-to-Back	255
		Stacked	60
Mixed-Use High Rise	7	Towns & Back-to-Back	110
		Stacked	110
		Apartments	3,170
		Total Unit Count	15,850

Robinson Glen East

Table 4-2 Unit, Gross Floor Area and Student Breakdown per Land Use, 2031 Horizon

Land Use	Robinson Glen East Lands			
	McCowan Elgin	Beechgrove	Non-Participant Landowners	Total
Residential				
Single Family Detached Housing (Units)	418	87	75	580
Residential Mid-Rise Condominium /Townhomes (Units)	360	-	345	705
High Rise Apartment (Units)	-	360	155	515
Mixed-Use Mid-rise Condominium	-		80	80
Townhouses (Units)	242	303	75	620
Total Units (excluding school students)				**2,500**
Elementary School (# of Students)	615[1]		-	615

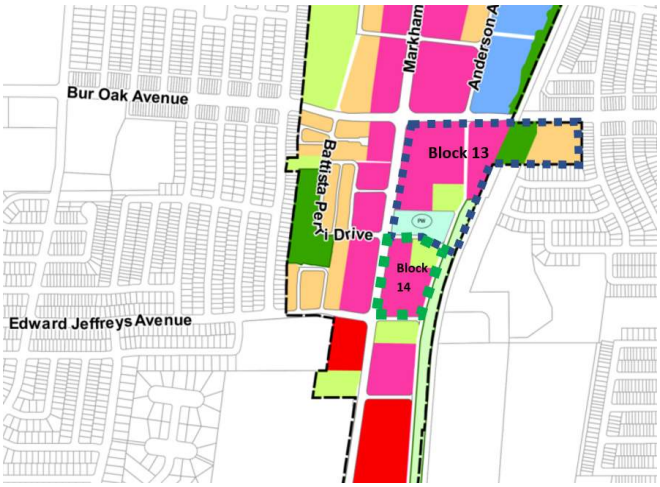
[1]The Elementary School is situated within McCowan Elgin and Beechgrove lands.

9999 Markham Road – Phase 1A: 105 townhouse units (TIS attached)

3. Please note that the TIS reports related to the above two Secondary Plans, as well as 77 Anderson Avenue have not been accepted. Please generate trip forecasts and trip assignment for the 2 Secondary Plans and 77 Anderson Avenue based on industry standard methodology and assumptions. You mention 77 Anderson here but not in the list above, please confirm it's also required. I discussed with Sharon Sterling and we both agree that it does not make sense for me to do a standalone trip generation and assignment for the 2 secondary plans while there have already been substantial work completed by consultant teams dedicated to these 2 secondary plans. This leads to inconsistencies in findings and prolongs the review period as well. Sharon mentioned she has the site traffic for the Robinson Glen East ready and is expecting to receive that of the Upper Markham College in the near future. We need to be careful that we're not adding Secondary Plan type work for a TIS, given the HDR traffic study completed for the Mt. Joy Secondary Plan did not consider either secondary plans. So we're now moving away from an "Apples to Apples" comparison, which is the intent we discussed during our kick off meeting. Can you please confirm that I can reach out to Sharon to coordinate on the site traffic for the 2 secondary plans and cite their sources in my TIS.
4. The updated site statistics and parking supply for 77 Anderson Avenue is 490 dwelling units and ground floor retail space of 398 m^2 , with 204 residential parking spaces plus 74 spaces shared between visitors and retail use. Please reflect that in the traffic study.
5. As noted in Appendix 3 – Transportation System Improvements in the Markham Road – Mount Joy (MRMJ) SP OPA: traffic control signal is required for Markham Road/Battista Perri Drive (Sub-Area 10).
6. Please note that the Functional Traffic Design Study (FTDS) is required for the draft plan of subdivision application to create the public roads. Please ensure that the City of Markham Engineering submission outlines for FTDS is followed (see attached PDF: page 25 of 26)
7. Please check with York Region for comments on the Terms of Reference.
8. The density planned for the MRMJ Secondary Plan are by blocks:
    1. Block 13: 3,732 residents and 1,575 employment

        i. However, the existing place of worship was assumed to remain. Suggestion is to remove the existing site driveway traffic and add the proposed development traffic.

    1. Block 14: 742 residents and 175 employment



9. The consultant is advised that if place of worship or substantial amount of non-residential uses are proposed for the subject development, Saturday or weekend peak period analysis may need to be included in the study.
10. Bicycle parking supply must conform to the minimum bicycle parking supply standard in the Comprehensive Zoning By-law 2024-19.
11. The following pre-consultation checklist requirements have been repeated below for your reference:
    1. A new north-south minor collector road (Anderson Avenue extension with 23 m ROW, not 18.5 m shown in the applicant's drawing) and a new east-west local road must be created as identified in Map SP6 of the Markham Road-Mount Joy Secondary Plan.
    2. There may be additional design requirements at intersections, such as the need for turning lanes.
    3. Transportation study must include sightline analysis at the proposed site driveways to ensure that sufficient sightlines are available for drivers at the driveways,
    4. Transportation study must include documentation on the proposed parking supply by block and the proposed parking sharing arrangement between different land use within the site, if any.
    5. The applicant is advised to contact Metrolinx to confirm if and what kind of crash barriers may be required along the rail corridor.
    6. Pavement Marking and Signage Plan for the site must be prepared and submitted by a qualified transportation consultant as part of the site plan control application.

Regards,

Langston Lai, P.Eng. | Transportation Engineer

Engineering Department

Anthony Roman Centre | City of Markham

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Connect with us:

From: Yu, Peter <Peter.Yu@wsp.com>
Sent: Tuesday, September 9, 2025 9:43 AM
To: Lai, Langston <llai@markham.ca>
Subject: Re: 9441 Markham Road - Term of Reference Confirmation Request

Hi Langston

Following up on my ToR request below, can you get back to me by this week?

When we met a few months ago - you were also going to check on the planned intersection control at Markham Road and Battista Perri Dr / Future E-W road. You'll recall some document showed it as a future signal while others as unsignalized.

Thanks

Peter

Peter Yu, P.Eng., PMP

Senior Project Manager

Transportation Planning and Science

25 York St, Toronto, ON M5J 2V5

Floor 7

T+ 1 289-982-4764

Mobile : 416-508-3248

From: Yu, Peter <Peter.Yu@wsp.com>
Sent: Monday, August 25, 2025 11:40 PM
To: Lai, Langston <llai@markham.ca>
Subject: 9441 Markham Road - Term of Reference Confirmation Request

Hi Langston

Further to the PAC meeting a few months ago for the 9441 Markham Road project, please find attached our proposed terms of reference and preliminary concept plan.

As discussed, we are proposing 2 scenarios - one base line near-term before the secondary plan improvements kick in more broadly, and the other longer-term scenario where the broader improvements are in place.

Please let me know if you have any questions.

Thanks

Peter

Peter Yu, P.Eng., PMP

Senior Project Manager

Transportation Planning and Science

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Mobile : 416-508-3248

APPENDIX

B Traffic Data

Horizon Data Services Ltd

(416) 840-6619

Your Traffic Count Specialist

File Name : Bur Oak Avenue at Markham Road
Site Code : Loc-1
Start Date : 2025-06-17
Page No : 1

Groups Printed- Light - Heavy

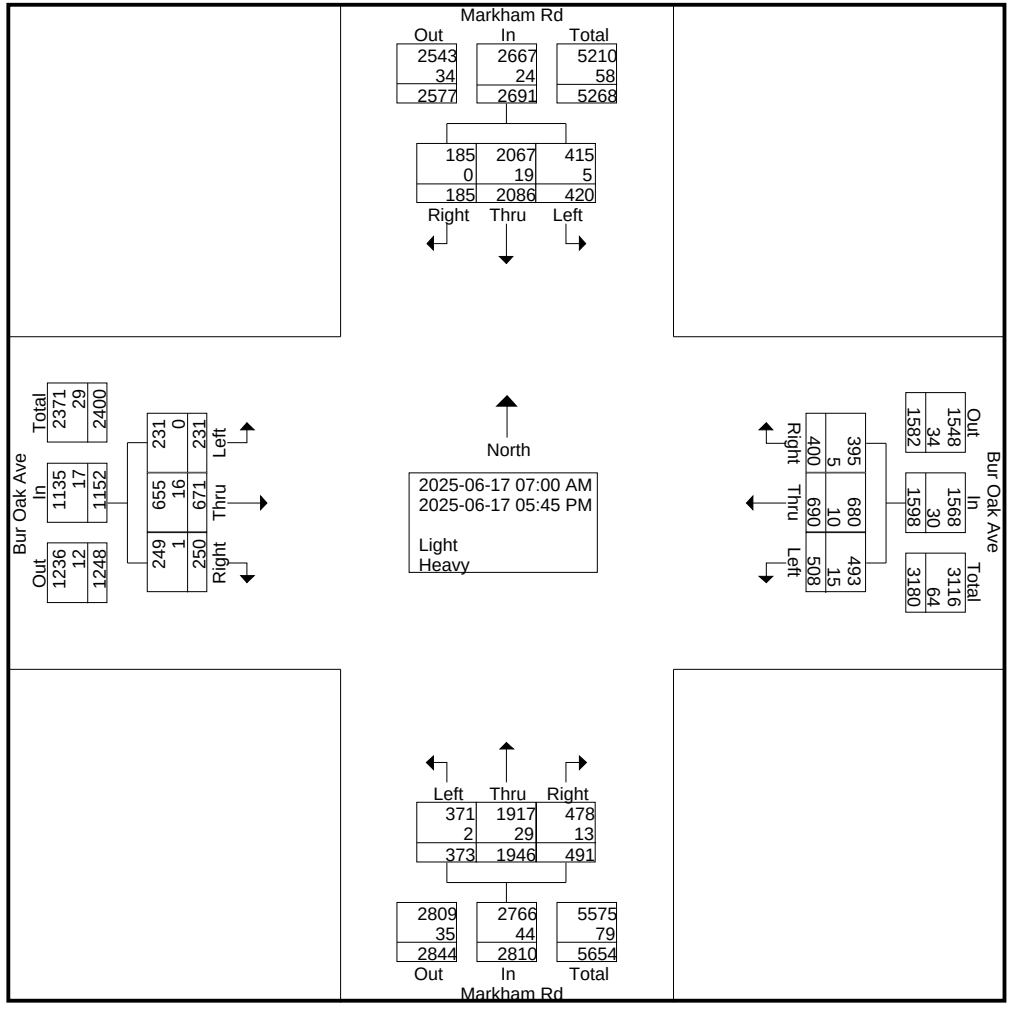
	Markham Rd From North				Bur Oak Ave From East				Markham Rd From South				Bur Oak Ave From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
07:00 AM	2	56	37	95	12	5	12	29	7	50	5	62	1	24	7	32	218
07:15 AM	2	88	51	141	33	37	28	98	12	65	12	89	5	52	4	61	389
07:30 AM	9	95	31	135	31	26	38	95	11	68	6	85	8	31	7	46	361
07:45 AM	27	128	43	198	27	69	41	137	18	87	14	119	12	70	17	99	553
Total	40	367	162	569	103	137	119	359	48	270	37	355	26	177	35	238	1521
08:00 AM	33	122	25	180	27	83	38	148	21	80	12	113	13	77	37	127	568
08:15 AM	19	138	27	184	19	65	22	106	23	119	13	155	19	68	19	106	551
08:30 AM	8	125	10	143	35	38	28	101	19	115	16	150	24	28	18	70	464
08:45 AM	14	134	14	162	35	40	28	103	34	103	11	148	23	26	16	65	478
Total	74	519	76	669	116	226	116	458	97	417	52	566	79	199	90	368	2061
04:00 PM	7	159	21	187	30	27	35	92	50	189	40	279	18	33	12	63	621
04:15 PM	9	132	22	163	11	24	22	57	46	126	27	199	21	37	14	72	491
04:30 PM	7	155	23	185	18	31	33	82	31	135	30	196	23	29	13	65	528
04:45 PM	10	173	22	205	28	24	24	76	44	155	24	223	7	32	15	54	558
Total	33	619	88	740	87	106	114	307	171	605	121	897	69	131	54	254	2198
05:00 PM	8	124	28	160	22	59	46	127	41	184	45	270	18	40	13	71	628
05:15 PM	8	147	23	178	27	47	45	119	44	133	38	215	17	37	15	69	581
05:30 PM	14	162	16	192	22	53	36	111	50	204	35	289	24	28	14	66	658
05:45 PM	8	148	27	183	23	62	32	117	40	133	45	218	17	59	10	86	604
Total	38	581	94	713	94	221	159	474	175	654	163	992	76	164	52	292	2471
Grand Total	185	2086	420	2691	400	690	508	1598	491	1946	373	2810	250	671	231	1152	8251
Apprch %	6.9	77.5	15.6		25	43.2	31.8		17.5	69.3	13.3		21.7	58.2	20.1		
Total %	2.2	25.3	5.1	32.6	4.8	8.4	6.2	19.4	6	23.6	4.5	34.1	3	8.1	2.8	14	
Light	185	2067	415	2667	395	680	493	1568	478	1917	371	2766	249	655	231	1135	8136
% Light	100	99.1	98.8	99.1	98.8	98.6	97	98.1	97.4	98.5	99.5	98.4	99.6	97.6	100	98.5	98.6
Heavy	0	19	5	24	5	10	15	30	13	29	2	44	1	16	0	17	115
% Heavy	0	0.9	1.2	0.9	1.2	1.4	3	1.9	2.6	1.5	0.5	1.6	0.4	2.4	0	1.5	1.4

Horizon Data Services Ltd

(416) 840-6619

Your Traffic Count Specialist

File Name : Bur Oak Avenue at Markham Road
Site Code : Loc-1
Start Date : 2025-06-17
Page No : 2



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Your Traffic Count Specialist

File Name : Bur Oak Avenue at Markham Road
Site Code : Loc-1
Start Date : 2025-06-17
Page No : 3

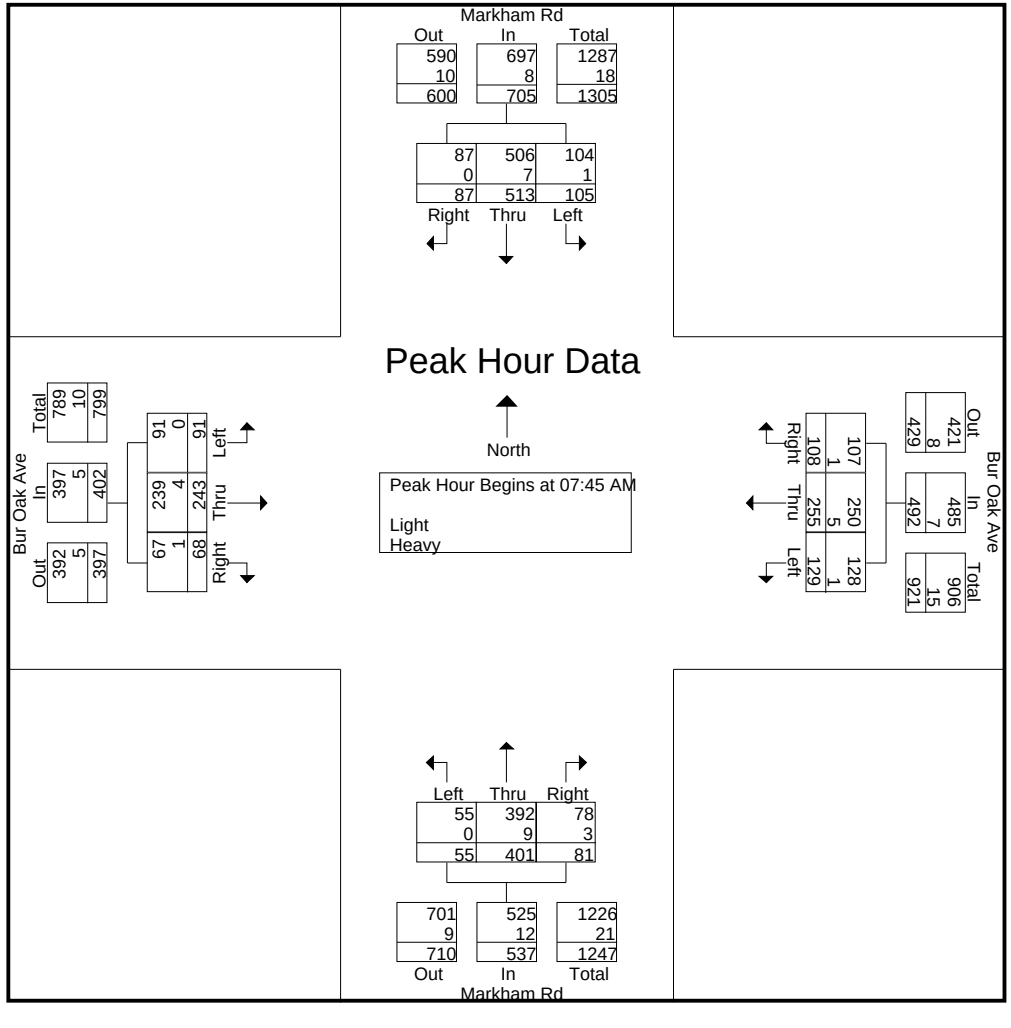
	Markham Rd From North				Bur Oak Ave From East				Markham Rd From South				Bur Oak Ave From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	27	128	**43**	**198**	27	69	**41**	137	18	87	14	119	12	70	17	99	553
08:00 AM	**33**	122	25	180	27	**83**	38	**148**	21	80	12	113	13	**77**	**37**	**127**	**568**
08:15 AM	19	**138**	27	184	19	65	22	106	**23**	**119**	13	**155**	19	68	19	106	551
08:30 AM	8	125	10	143	**35**	38	28	101	19	115	**16**	150	**24**	28	18	70	464
Total Volume	87	513	105	705	108	255	129	492	81	401	55	537	68	243	91	402	2136
% App. Total	12.3	72.8	14.9		22	51.8	26.2		15.1	74.7	10.2		16.9	60.4	22.6		
PHF	.659	.929	.610	.890	.771	.768	.787	.831	.880	.842	.859	.866	.708	.789	.615	.791	.940
Light	87	506	104	697	107	250	128	485	78	392	55	525	67	239	91	397	2104
% Light	100	98.6	99.0	98.9	99.1	98.0	99.2	98.6	96.3	97.8	100	97.8	98.5	98.4	100	98.8	98.5
Heavy	0	7	1	8	1	5	1	7	3	9	0	12	1	4	0	5	32
% Heavy	0	1.4	1.0	1.1	0.9	2.0	0.8	1.4	3.7	2.2	0	2.2	1.5	1.6	0	1.2	1.5

Horizon Data Services Ltd

(416) 840-6619

Your Traffic Count Specialist

File Name : Bur Oak Avenue at Markham Road
Site Code : Loc-1
Start Date : 2025-06-17
Page No : 4



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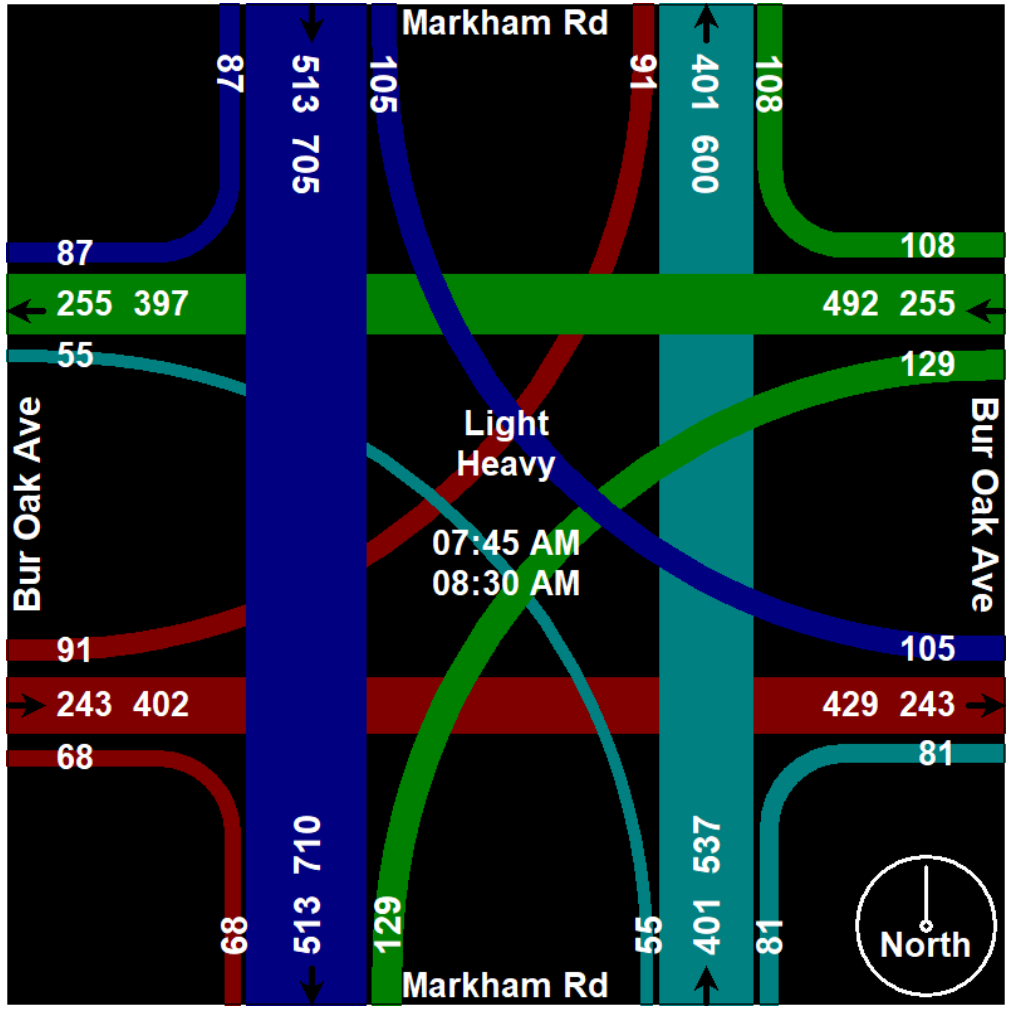
Your Traffic Count Specialist

File Name : Bur Oak Avenue at Markham Road
Site Code : Loc-1
Start Date : 2025-06-17
Page No : 5



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Your Traffic Count Specialist

File Name : Bur Oak Avenue at Markham Road
Site Code : Loc-1
Start Date : 2025-06-17
Page No : 6

	Markham Rd From North				Bur Oak Ave From East				Markham Rd From South				Bur Oak Ave From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	8	124	**28**	160	22	59	**46**	**127**	41	184	**45**	270	18	40	13	71	628
05:15 PM	8	147	23	178	**27**	47	45	119	44	133	38	215	17	37	**15**	69	581
05:30 PM	**14**	**162**	16	**192**	22	53	36	111	**50**	**204**	35	**289**	**24**	28	14	66	**658**
05:45 PM	8	148	27	183	23	**62**	32	117	40	133	45	218	17	**59**	10	**86**	604
Total Volume	38	581	94	713	94	221	159	474	175	654	163	992	76	164	52	292	2471
% App. Total	5.3	81.5	13.2		19.8	46.6	33.5		17.6	65.9	16.4		26	56.2	17.8		
PHF	.679	.897	.839	.928	.870	.891	.864	.933	.875	.801	.906	.858	.792	.695	.867	.849	.939
Light	38	577	93	708	93	219	152	464	174	653	163	990	76	159	52	287	2449
% Light	100	99.3	98.9	99.3	98.9	99.1	95.6	97.9	99.4	99.8	100	99.8	100	97.0	100	98.3	99.1
Heavy	0	4	1	5	1	2	7	10	1	1	0	2	0	5	0	5	22
% Heavy	0	0.7	1.1	0.7	1.1	0.9	4.4	2.1	0.6	0.2	0	0.2	0	3.0	0	1.7	0.9

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Your Traffic Count Specialist

File Name : Bur Oak Avenue at Markham Road
Site Code : Loc-1
Start Date : 2025-06-17
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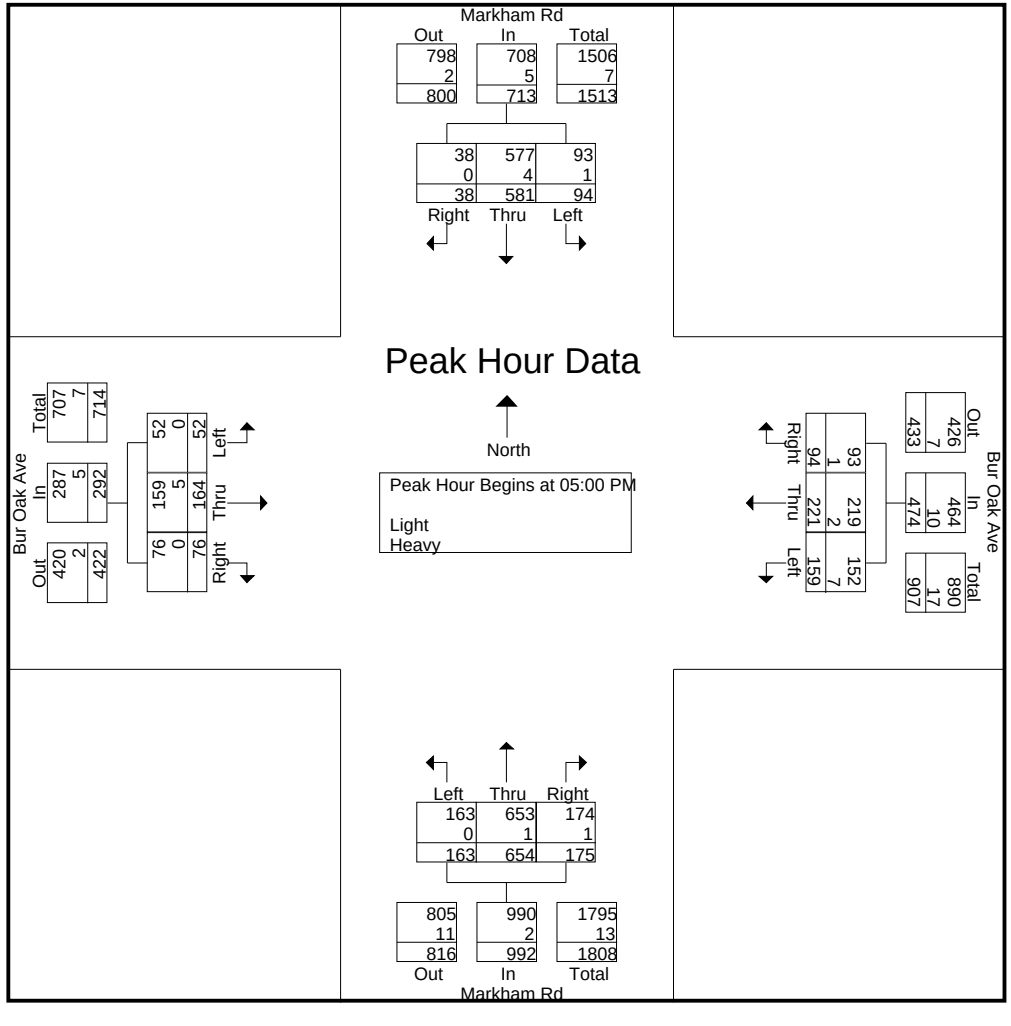

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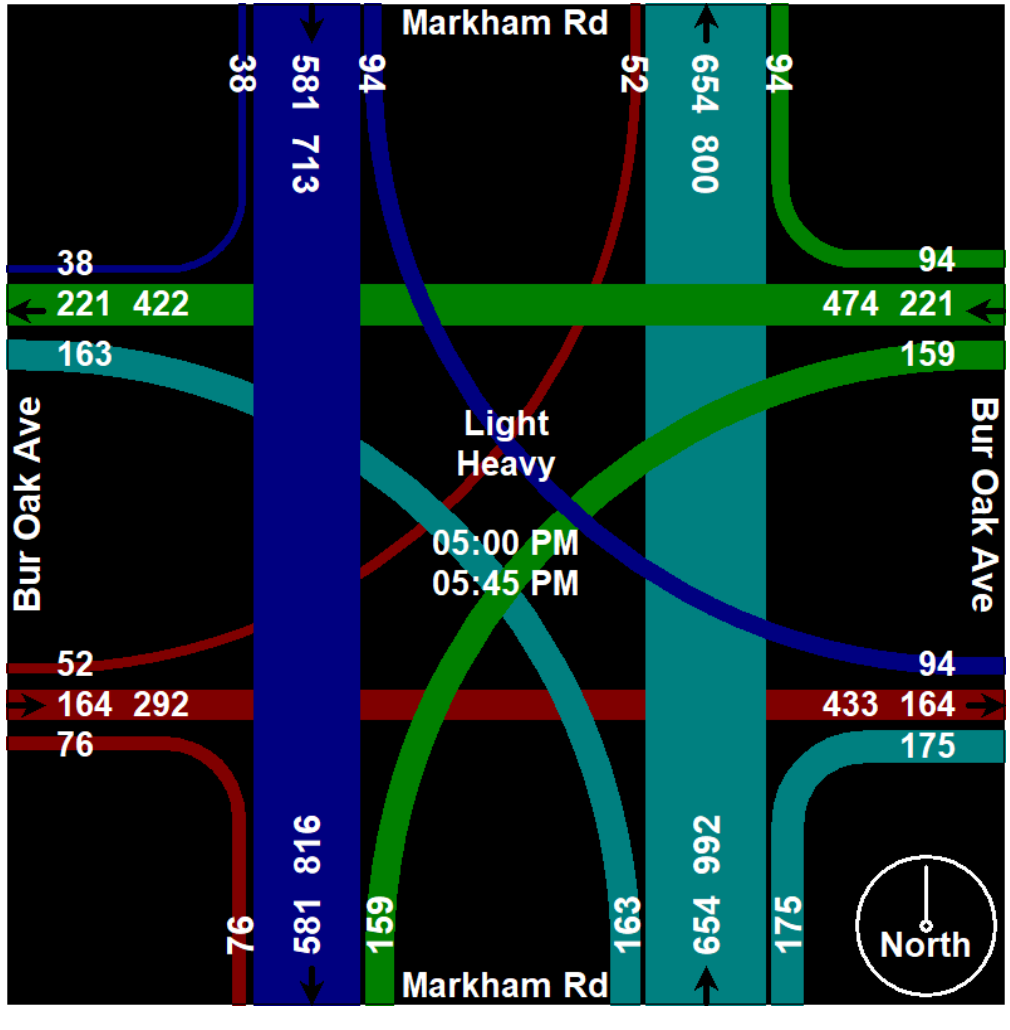
Your Traffic Count Specialist

File Name : Bur Oak Avenue at Markham Road
Site Code : Loc-1
Start Date : 2025-06-17
Page No : 8



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Your Traffic Count Specialist

File Name : Battista Perri Drive at Markham Road
Site Code : Loc-2
Start Date : 2025-06-17
Page No : 1

Groups Printed- Light - Heavy

	Markham Rd From North				Driveway From East				Markham Rd From South				Battista Perri Dr From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
07:00 AM	0	72	0	72	0	0	0	0	0	76	2	78	5	0	3	8	158
07:15 AM	1	116	0	117	0	0	0	0	0	104	2	106	8	0	3	11	234
07:30 AM	0	129	0	129	0	0	0	0	0	95	6	101	11	0	3	14	244
07:45 AM	0	178	4	182	0	0	0	0	1	139	2	142	6	0	3	9	333
Total	1	495	4	500	0	0	0	0	1	414	12	427	30	0	12	42	969
08:00 AM	0	183	1	184	1	0	0	1	1	129	4	134	11	0	2	13	332
08:15 AM	0	184	3	187	0	0	1	1	1	149	5	155	6	0	3	9	352
08:30 AM	0	184	0	184	0	0	1	1	2	175	9	186	9	0	3	12	383
08:45 AM	0	185	1	186	0	0	1	1	1	135	8	144	9	0	1	10	341
Total	0	736	5	741	1	0	3	4	5	588	26	619	35	0	9	44	1408
04:00 PM	0	205	2	207	7	0	5	12	2	205	10	217	5	0	3	8	444
04:15 PM	2	175	0	177	1	0	2	3	2	186	12	200	3	0	1	4	384
04:30 PM	2	209	4	215	0	0	1	1	3	212	11	226	4	0	2	6	448
04:45 PM	0	203	1	204	4	0	6	10	2	211	12	225	4	0	1	5	444
Total	4	792	7	803	12	0	14	26	9	814	45	868	16	0	7	23	1720
05:00 PM	5	184	2	191	2	0	2	4	4	260	9	273	8	0	2	10	478
05:15 PM	4	200	1	205	1	0	2	3	2	187	13	202	8	0	6	14	424
05:30 PM	1	224	1	226	3	0	1	4	2	242	5	249	8	0	5	13	492
05:45 PM	4	191	0	195	4	0	2	6	1	185	7	193	7	0	3	10	404
Total	14	799	4	817	10	0	7	17	9	874	34	917	31	0	16	47	1798
Grand Total	19	2822	20	2861	23	0	24	47	24	2690	117	2831	112	0	44	156	5895
Apprch %	0.7	98.6	0.7		48.9	0	51.1		0.8	95	4.1		71.8	0	28.2		
Total %	0.3	47.9	0.3	48.5	0.4	0	0.4	0.8	0.4	45.6	2	48	1.9	0	0.7	2.6	
Light	19	2774	20	2813	23	0	24	47	24	2645	116	2785	112	0	44	156	5801
% Light	100	98.3	100	98.3	100	0	100	100	100	98.3	99.1	98.4	100	0	100	100	98.4
Heavy	0	48	0	48	0	0	0	0	0	45	1	46	0	0	0	0	94
% Heavy	0	1.7	0	1.7	0	0	0	0	0	1.7	0.9	1.6	0	0	0	0	1.6

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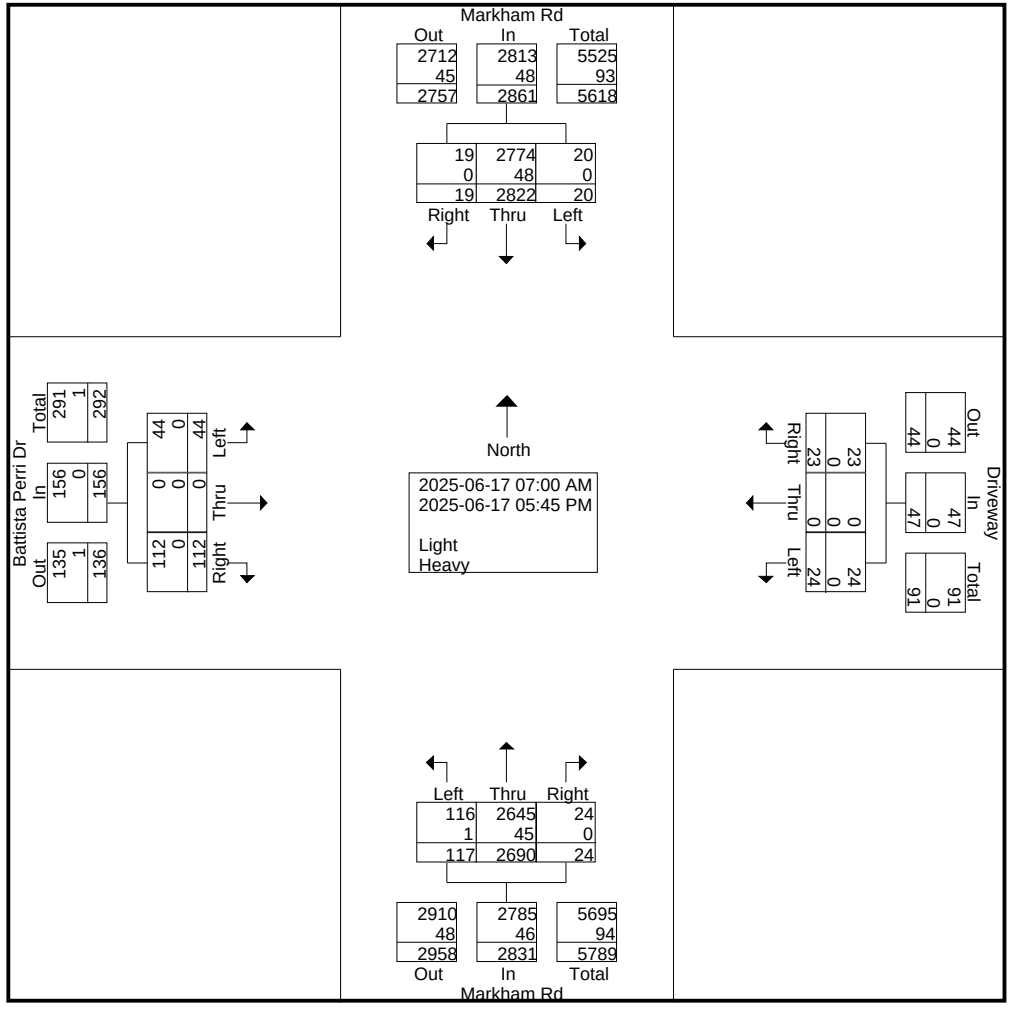
Your Traffic Count Specialist

File Name : Battista Perri Drive at Markham Road
Site Code : Loc-2
Start Date : 2025-06-17
Page No : 2



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Your Traffic Count Specialist

File Name : Battista Perri Drive at Markham Road
Site Code : Loc-2
Start Date : 2025-06-17

	Markham Rd From North				Driveway From East				Markham Rd From South				Battista Perri Dr From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	0	183	1	184	**1**	0	0	**1**	1	129	4	134	**11**	0	2	**13**	332
08:15 AM	0	184	**3**	**187**	0	0	**1**	1	1	149	5	155	6	0	**3**	9	352
08:30 AM	0	184	0	184	0	0	1	1	**2**	**175**	**9**	**186**	9	0	3	12	**383**
08:45 AM	0	**185**	1	186	0	0	1	1	1	135	8	144	9	0	1	10	341
Total Volume	0	736	5	741	1	0	3	4	5	588	26	619	35	0	9	44	1408
% App. Total	0	99.3	0.7		25	0	75		0.8	95	4.2		79.5	0	20.5		
PHF	.000	.995	.417	.991	.250	.000	.750	1.00	.625	.840	.722	.832	.795	.000	.750	.846	.919
Light	0	724	5	729	1	0	3	4	5	579	26	610	35	0	9	44	1387
% Light	0	98.4	100	98.4	100	0	100	100	100	98.5	100	98.5	100	0	100	100	98.5
Heavy	0	12	0	12	0	0	0	0	0	9	0	9	0	0	0	0	21
% Heavy	0	1.6	0	1.6	0	0	0	0	0	1.5	0	1.5	0	0	0	0	1.5

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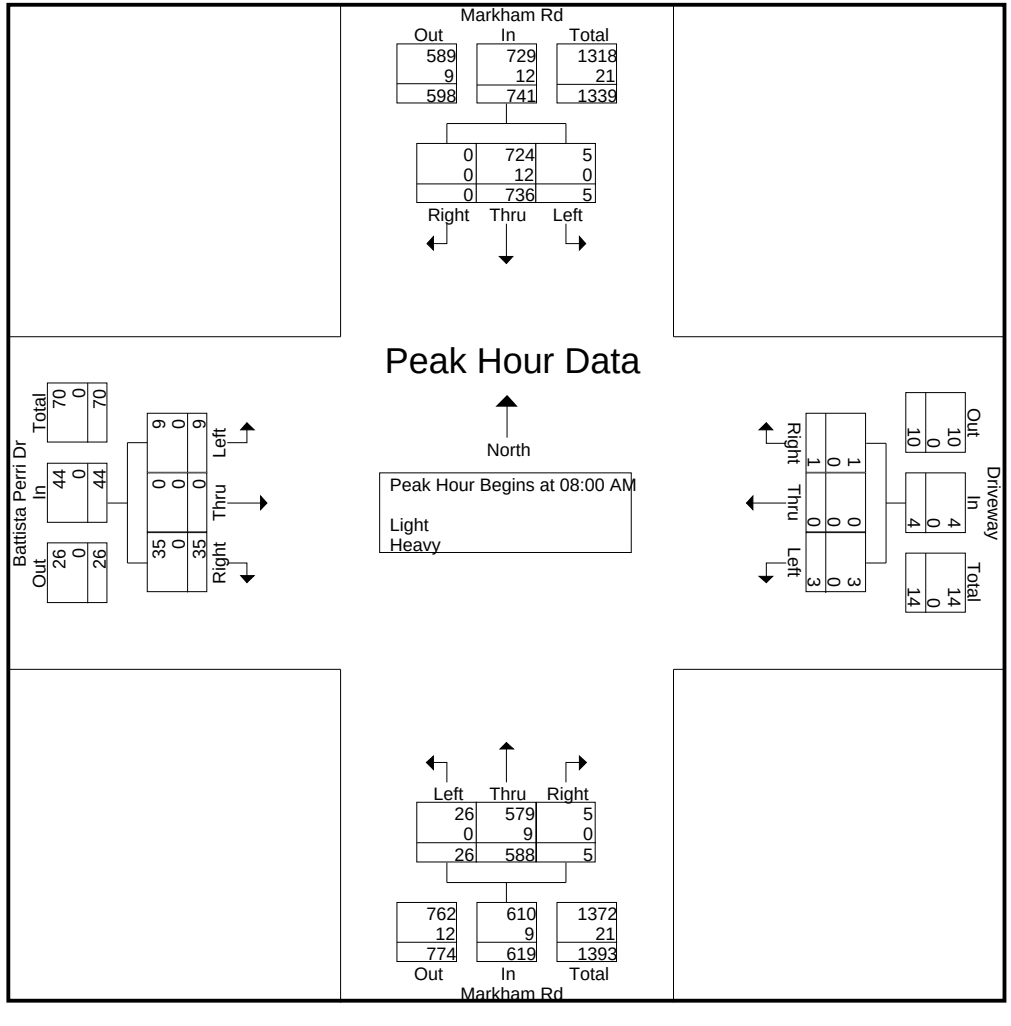
Your Traffic Count Specialist

File Name : Battista Perri Drive at Markham Road
Site Code : Loc-2
Start Date : 2025-06-17
Page No : 4



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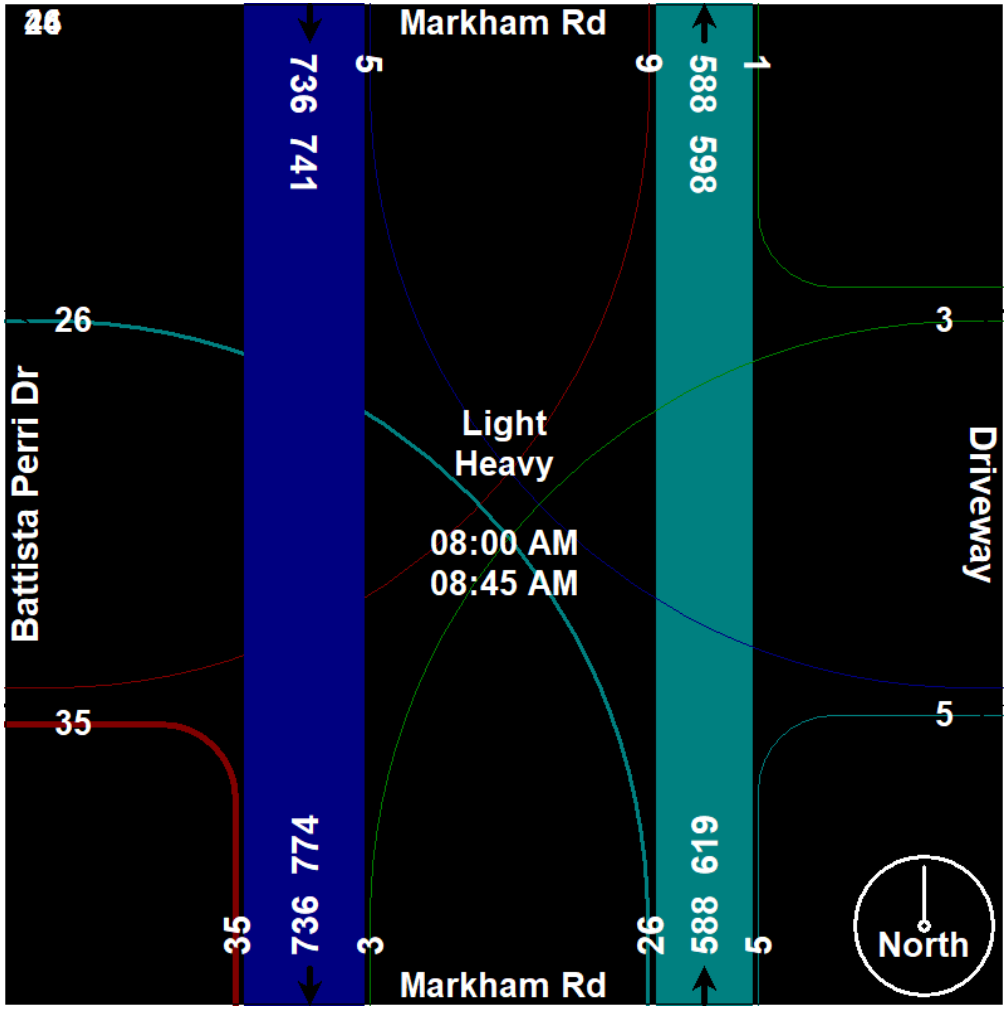
Your Traffic Count Specialist

File Name : Battista Perri Drive at Markham Road
Site Code : Loc-2
Start Date : 2025-06-17
Page No : 5



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Your Traffic Count Specialist

File Name : Battista Perri Drive at Markham Road
Site Code : Loc-2
Start Date : 2025-06-17

	Markham Rd From North				Driveway From East				Markham Rd From South				Battista Perri Dr From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	0	203	1	204	**4**	0	**6**	**10**	2	211	12	225	4	0	1	5	444
05:00 PM	**5**	184	**2**	191	2	0	2	4	**4**	**260**	9	**273**	**8**	0	2	10	478
05:15 PM	4	200	1	205	1	0	2	3	2	187	**13**	202	8	0	**6**	**14**	424
05:30 PM	1	**224**	1	**226**	3	0	1	4	2	242	5	249	8	0	5	13	**492**
Total Volume	10	811	5	826	10	0	11	21	10	900	39	949	28	0	14	42	1838
% App. Total	1.2	98.2	0.6		47.6	0	52.4		1.1	94.8	4.1		66.7	0	33.3		
PHF	.500	.905	.625	.914	.625	.000	.458	.525	.625	.865	.750	.869	.875	.000	.583	.750	.934
Light	10	797	5	812	10	0	11	21	10	894	39	943	28	0	14	42	1818
% Light	100	98.3	100	98.3	100	0	100	100	100	99.3	100	99.4	100	0	100	100	98.9
Heavy	0	14	0	14	0	0	0	0	0	6	0	6	0	0	0	0	20
% Heavy	0	1.7	0	1.7	0	0	0	0	0	0.7	0	0.6	0	0	0	0	1.1

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Your Traffic Count Specialist

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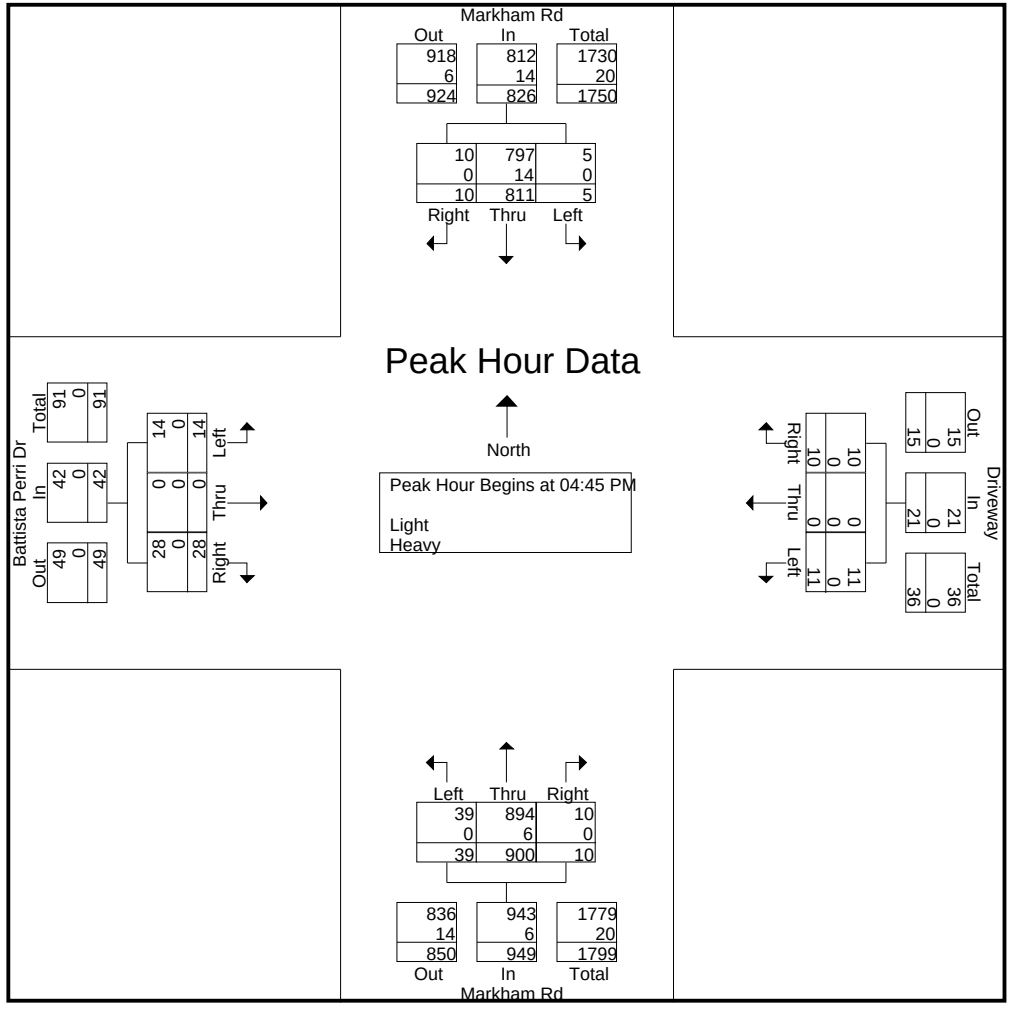
Site Code : Loc-2
Start Date : 2025-06-17
Page No : 7



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Your Traffic Count Specialist

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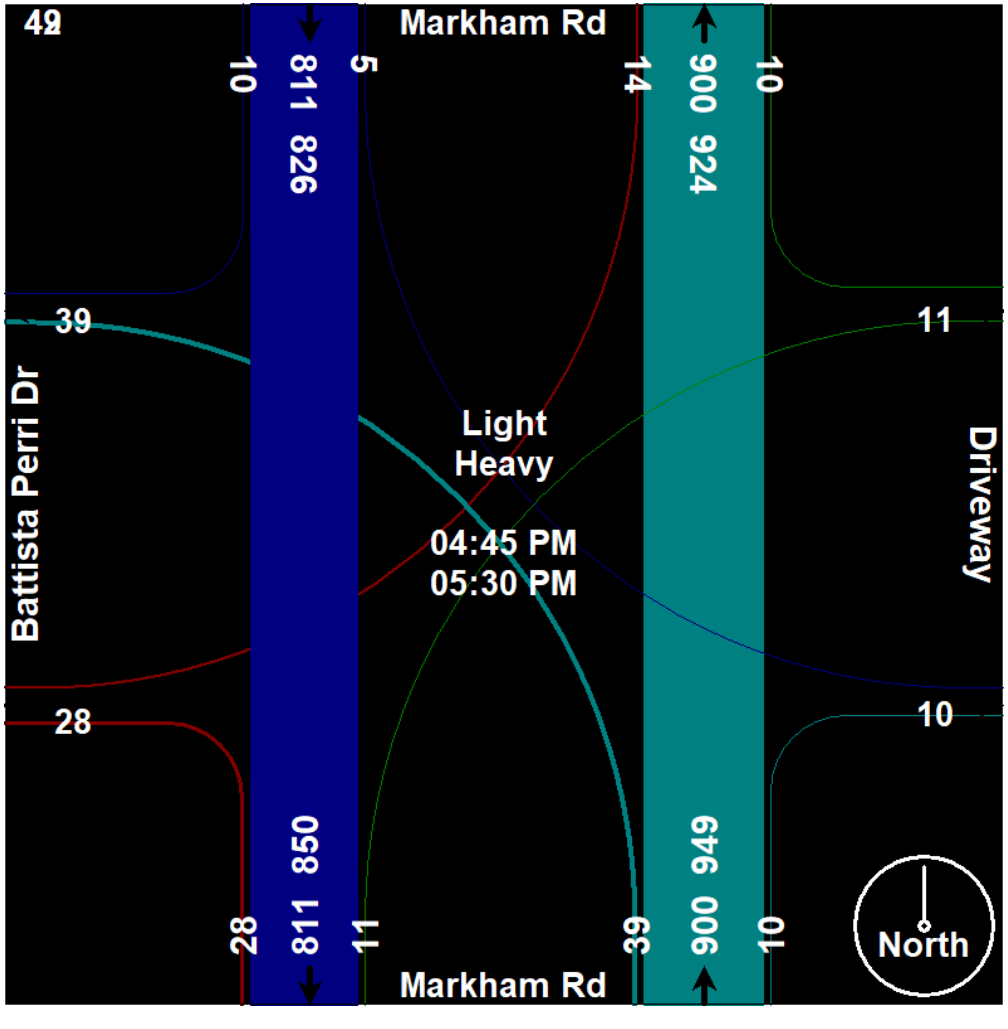
Start Date : 2025-06-17
Page No : 8



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Your Traffic Count Specialist

File Name : Edward Jeffreys Avenue at Markham Road
Site Code : Loc-2
Start Date : 2025-06-17
Page No : 1

Groups Printed- Light - Heavy

	Markham Rd From North				Accesss From East				Markham Rd From South				Edward Jeffreys Dr From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
07:00 AM	1	74	0	75	0	0	0	0	0	70	5	75	9	0	6	15	165
07:15 AM	10	123	0	133	0	0	0	0	0	93	3	96	15	0	17	32	261
07:30 AM	4	133	0	137	0	0	0	0	0	96	5	101	14	0	7	21	259
07:45 AM	14	164	0	178	0	0	0	0	0	112	11	123	21	0	32	53	354
Total	29	494	0	523	0	0	0	0	0	371	24	395	59	0	62	121	1039
08:00 AM	14	177	0	191	0	0	0	0	0	122	13	135	29	0	17	46	372
08:15 AM	7	178	0	185	0	0	0	0	0	145	16	161	27	0	6	33	379
08:30 AM	5	178	0	183	0	0	0	0	0	164	12	176	23	0	9	32	391
08:45 AM	10	183	0	193	0	0	0	0	0	141	13	154	18	0	10	28	375
Total	36	716	0	752	0	0	0	0	0	572	54	626	97	0	42	139	1517
04:00 PM	12	196	0	208	0	0	0	0	0	251	26	277	25	0	14	39	524
04:15 PM	9	164	0	173	0	0	0	0	0	189	36	225	23	0	10	33	431
04:30 PM	13	205	0	218	0	0	0	0	0	207	24	231	22	0	12	34	483
04:45 PM	19	189	0	208	0	0	0	0	0	203	19	222	18	0	18	36	466
Total	53	754	0	807	0	0	0	0	0	850	105	955	88	0	54	142	1904
05:00 PM	16	182	0	198	0	0	0	0	0	243	32	275	21	0	17	38	511
05:15 PM	14	188	0	202	0	0	0	0	0	179	30	209	29	0	22	51	462
05:30 PM	16	219	0	235	0	0	0	0	0	239	42	281	21	0	13	34	550
05:45 PM	13	181	0	194	0	0	0	0	0	176	35	211	21	0	10	31	436
Total	59	770	0	829	0	0	0	0	0	837	139	976	92	0	62	154	1959
Grand Total	177	2734	0	2911	0	0	0	0	0	2630	322	2952	336	0	220	556	6419
Apprch %	6.1	93.9	0		0	0	0		0	89.1	10.9		60.4	0	39.6		
Total %	2.8	42.6	0	45.3	0	0	0	0	0	41	5	46	5.2	0	3.4	8.7	
Light	174	2691	0	2865	0	0	0	0	0	2585	322	2907	336	0	219	555	6327
% Light	98.3	98.4	0	98.4	0	0	0	0	0	98.3	100	98.5	100	0	99.5	99.8	98.6
Heavy	3	43	0	46	0	0	0	0	0	45	0	45	0	0	1	1	92
% Heavy	1.7	1.6	0	1.6	0	0	0	0	0	1.7	0	1.5	0	0	0.5	0.2	1.4

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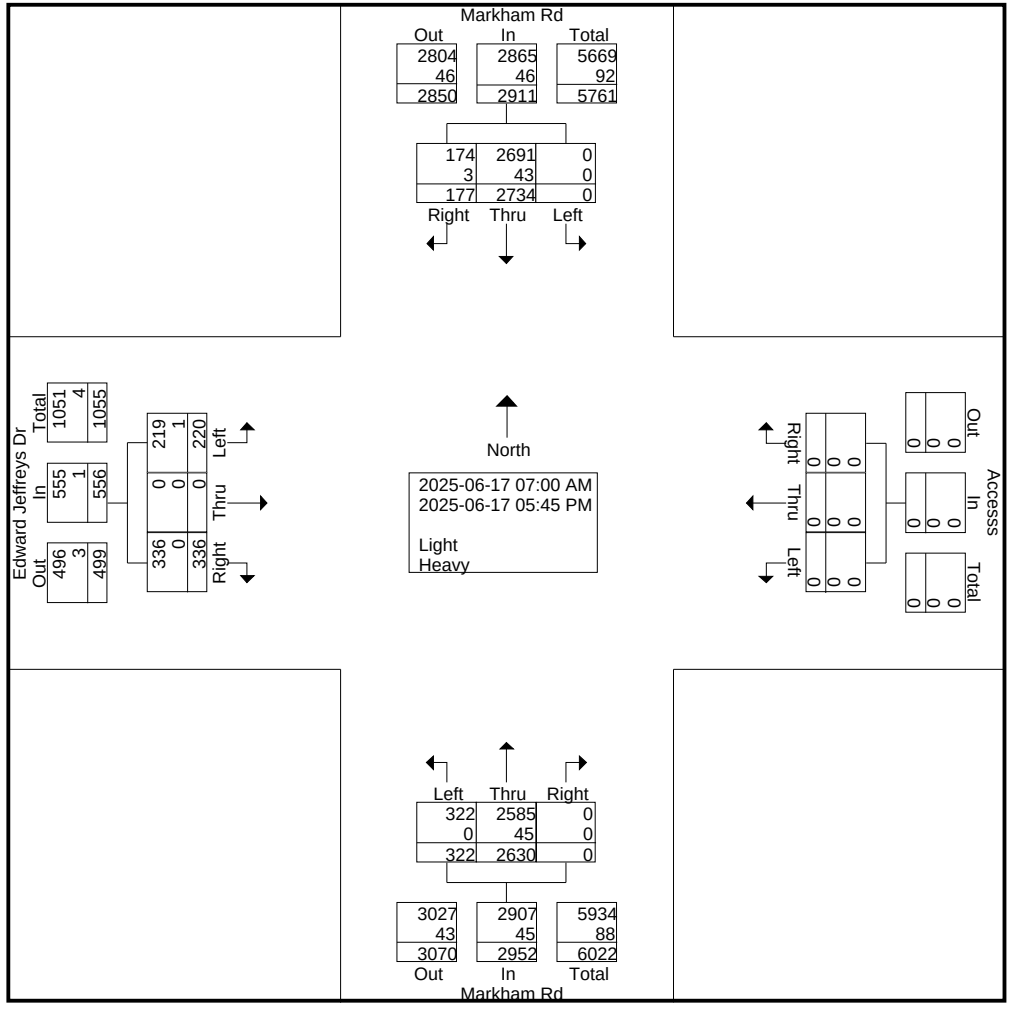
Your Traffic Count Specialist

File Name : Edward Jeffreys Avenue at Markham Road
Site Code : Loc-2
Start Date : 2025-06-17
Page No : 2



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Your Traffic Count Specialist

File Name : Edward Jeffreys Avenue at Markham Road
Site Code : Loc-2
Start Date : 2025-06-17
Page No : 3

	Markham Rd From North				Accesss From East				Markham Rd From South				Edward Jeffreys Dr From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	**14**	177	0	191	0	0	0	0	0	122	13	135	**29**	0	**17**	**46**	372
08:15 AM	7	178	0	185	0	0	0	0	0	145	**16**	161	27	0	6	33	379
08:30 AM	5	178	0	183	0	0	0	0	0	**164**	12	**176**	23	0	9	32	**391**
08:45 AM	10	**183**	0	**193**	0	0	0	0	0	141	13	154	18	0	10	28	375
Total Volume	36	716	0	752	0	0	0	0	0	572	54	626	97	0	42	139	1517
% App. Total	4.8	95.2	0		0	0	0		0	91.4	8.6		69.8	0	30.2		
PHF	.643	.978	.000	.974	.000	.000	.000	.000	.000	.872	.844	.889	.836	.000	.618	.755	.970
Light	35	705	0	740	0	0	0	0	0	564	54	618	97	0	41	138	1496
% Light	97.2	98.5	0	98.4	0	0	0	0	0	98.6	100	98.7	100	0	97.6	99.3	98.6
Heavy	1	11	0	12	0	0	0	0	0	8	0	8	0	0	1	1	21
% Heavy	2.8	1.5	0	1.6	0	0	0	0	0	1.4	0	1.3	0	0	2.4	0.7	1.4

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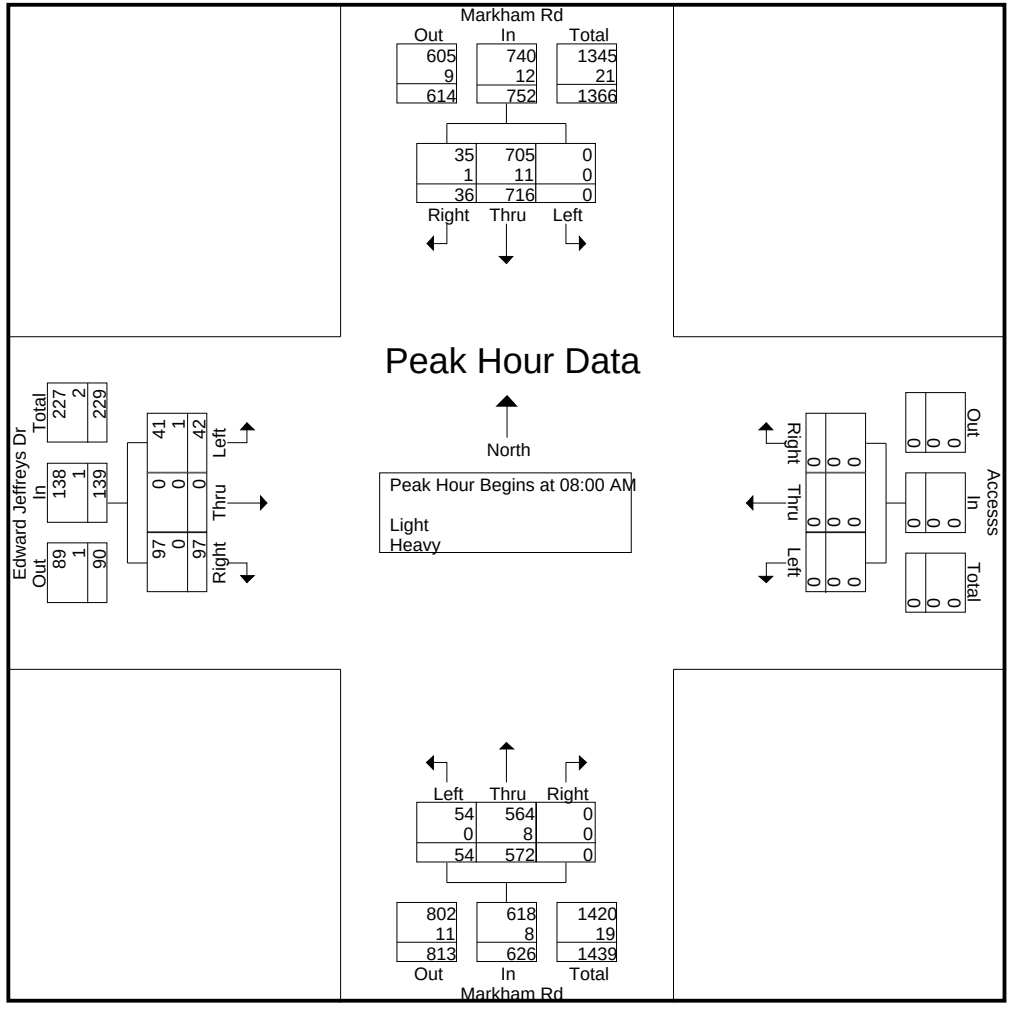
Your Traffic Count Specialist

File Name : Edward Jeffreys Avenue at Markham Road
Site Code : Loc-2
Start Date : 2025-06-17
Page No : 4



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Your Traffic Count Specialist

File Name : Edward Jeffreys Avenue at Markham Road
Site Code : Loc-2
Start Date : 2025-06-17
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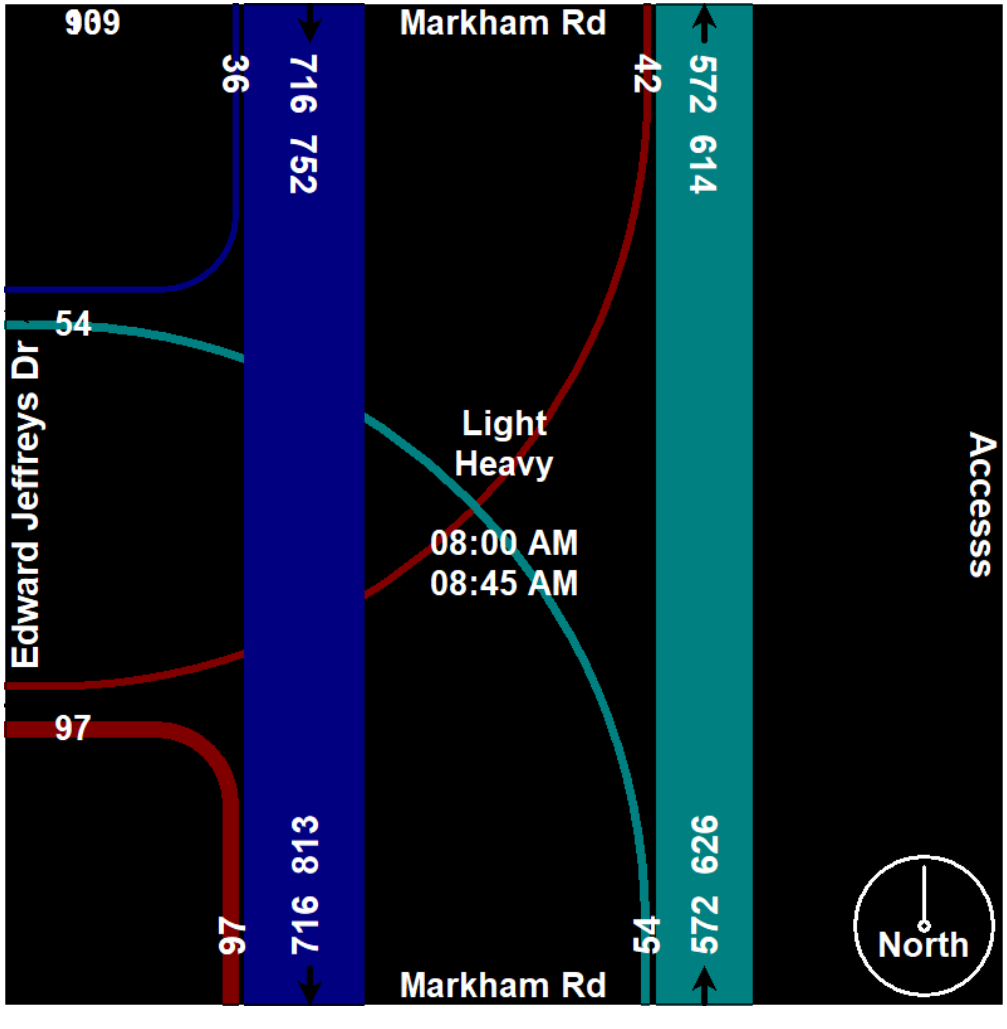

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Your Traffic Count Specialist

File Name : Edward Jeffreys Avenue at Markham Road
Site Code : Loc-2
Start Date : 2025-06-17
Page No : 6

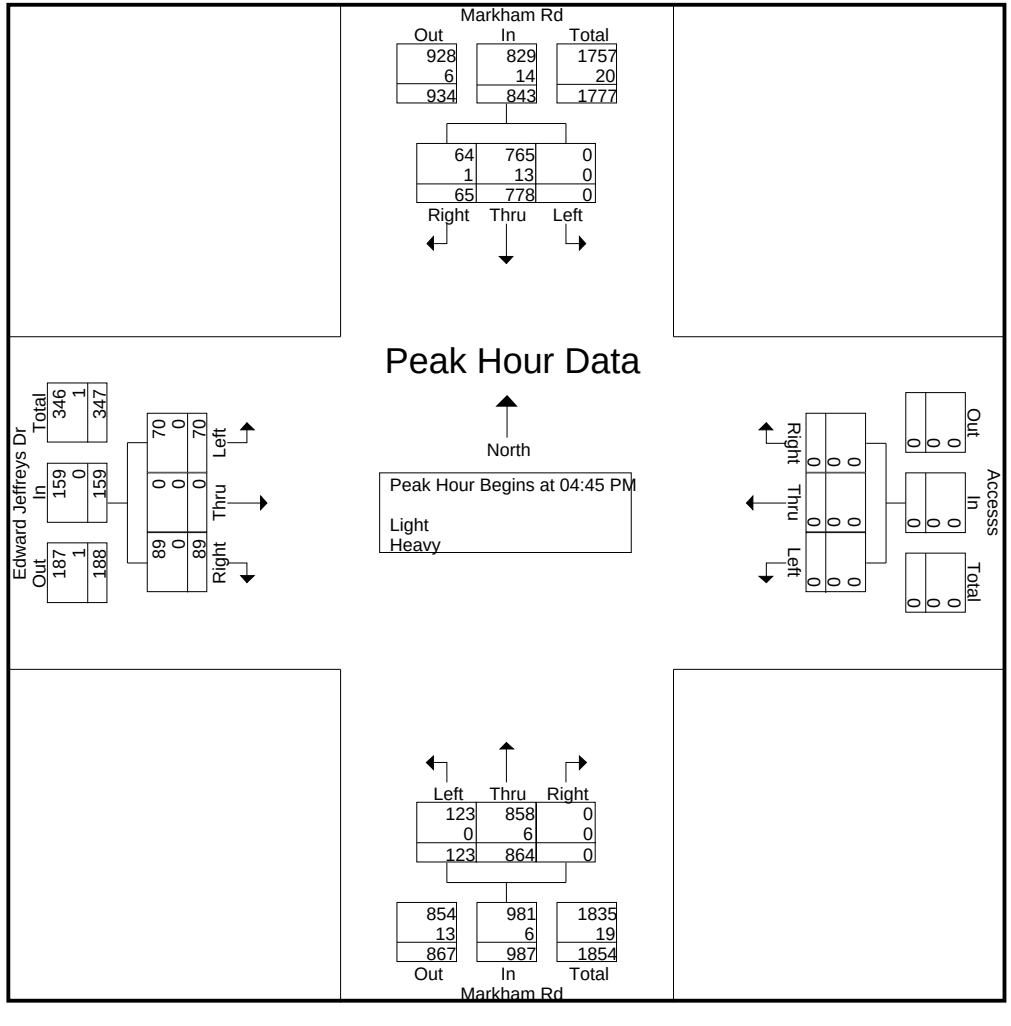
	Markham Rd From North				Accesss From East				Markham Rd From South				Edward Jeffreys Dr From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	**19**	189	0	208	0	0	0	0	0	203	19	222	18	0	18	36	466
05:00 PM	16	182	0	198	0	0	0	0	0	**243**	32	275	21	0	17	38	511
05:15 PM	14	188	0	202	0	0	0	0	0	179	30	209	**29**	0	**22**	**51**	462
05:30 PM	16	**219**	0	**235**	0	0	0	0	0	239	**42**	**281**	21	0	13	34	**550**
Total Volume	65	778	0	843	0	0	0	0	0	864	123	987	89	0	70	159	1989
% App. Total	7.7	92.3	0		0	0	0		0	87.5	12.5		56	0	44		
PHF	.855	.888	.000	.897	.000	.000	.000	.000	.000	.889	.732	.878	.767	.000	.795	.779	.904
Light	64	765	0	829	0	0	0	0	0	858	123	981	89	0	70	159	1969
% Light	98.5	98.3	0	98.3	0	0	0	0	0	99.3	100	99.4	100	0	100	100	99.0
Heavy	1	13	0	14	0	0	0	0	0	6	0	6	0	0	0	0	20
% Heavy	1.5	1.7	0	1.7	0	0	0	0	0	0.7	0	0.6	0	0	0	0	1.0

Horizon Data Services Ltd

(416) 840-6619

Your Traffic Count Specialist

File Name : Edward Jeffreys Avenue at Markham Road
Site Code : Loc-2
Start Date : 2025-06-17
Page No : 7



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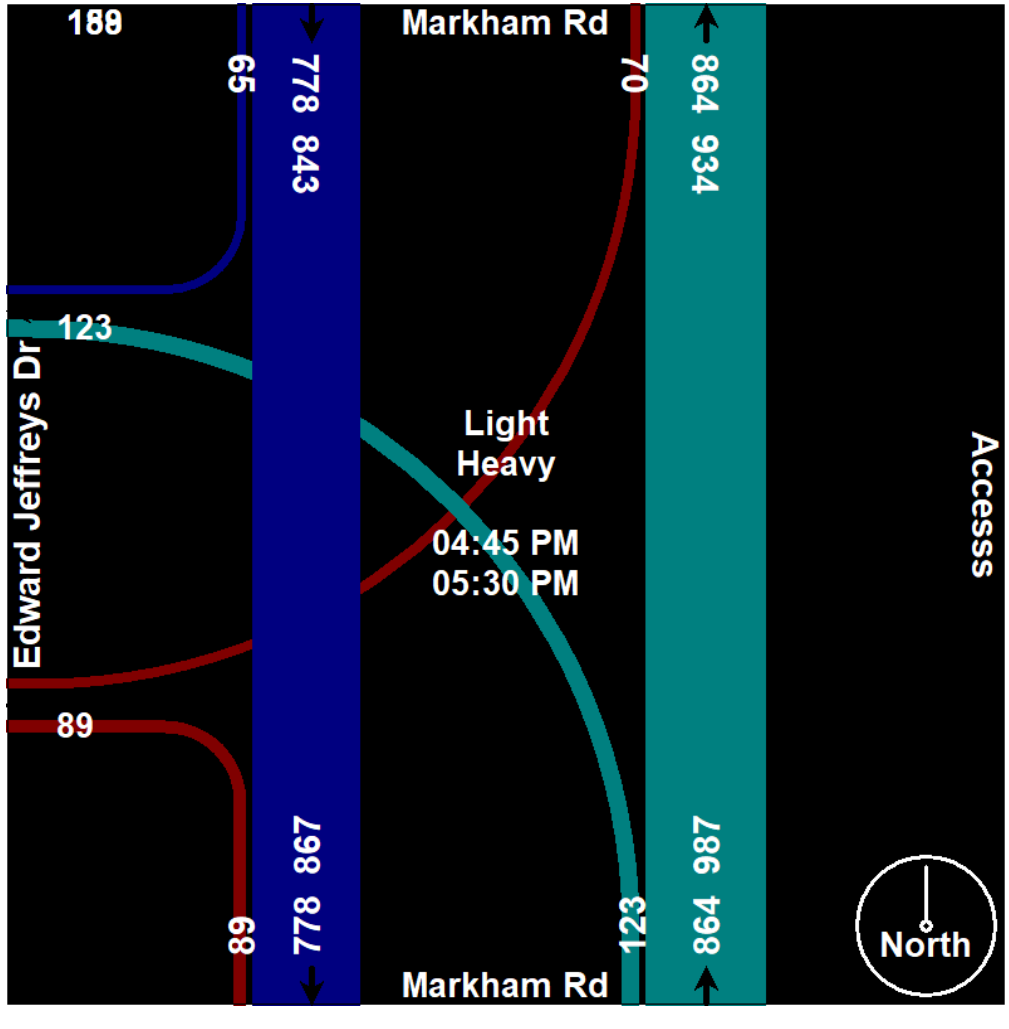
(416) 840-6619

Your Traffic Count Specialist

File Name : Edward Jeffreys Avenue at Markham Road
Site Code : Loc-2
Start Date : 2025-06-17
Page No : 8



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(416) 840-6619

Your Traffic Count Specialist

File Name : 16th Avenue at Markham Road
Site Code : Loc-4
Start Date : 2025-06-17
Page No : 1

Groups Printed- Light - Heavy

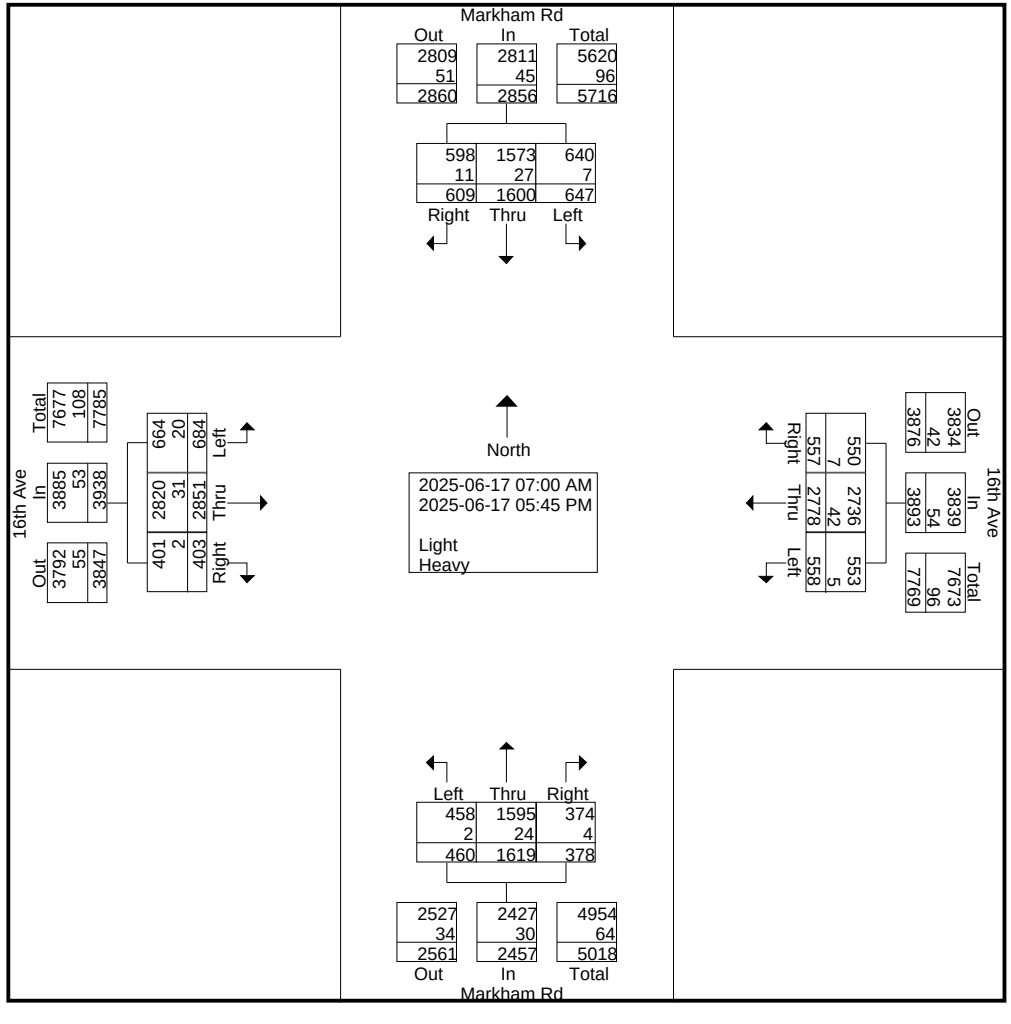
	Markham Rd From North				16th Ave From East				Markham Rd From South				16th Ave From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
07:00 AM	17	59	13	89	21	133	28	182	6	42	13	61	7	49	20	76	408
07:15 AM	28	84	21	133	28	182	44	254	11	41	19	71	15	70	22	107	565
07:30 AM	26	90	26	142	36	213	28	277	11	51	28	90	16	111	17	144	653
07:45 AM	27	92	29	148	34	238	60	332	7	67	26	100	30	134	27	191	771
Total	98	325	89	512	119	766	160	1045	35	201	86	322	68	364	86	518	2397
08:00 AM	29	112	35	176	37	186	46	269	19	76	35	130	30	155	32	217	792
08:15 AM	35	113	38	186	40	196	40	276	18	76	31	125	37	187	33	257	844
08:30 AM	38	103	40	181	33	177	28	238	16	111	34	161	40	179	42	261	841
08:45 AM	45	107	42	194	40	187	47	274	10	73	32	115	34	164	46	244	827
Total	147	435	155	737	150	746	161	1057	63	336	132	531	141	685	153	979	3304
04:00 PM	59	110	59	228	36	171	35	242	22	150	35	207	23	207	58	288	965
04:15 PM	31	108	50	189	36	154	23	213	23	136	25	184	26	250	63	339	925
04:30 PM	50	113	43	206	32	170	26	228	31	135	26	192	20	226	54	300	926
04:45 PM	41	99	49	189	31	139	33	203	22	117	25	164	31	242	74	347	903
Total	181	430	201	812	135	634	117	886	98	538	111	747	100	925	249	1274	3719
05:00 PM	47	85	52	184	41	162	30	233	44	160	49	253	17	224	48	289	959
05:15 PM	44	124	51	219	27	161	28	216	46	102	24	172	28	205	45	278	885
05:30 PM	50	97	49	196	43	162	28	233	46	164	41	251	27	206	45	278	958
05:45 PM	42	104	50	196	42	147	34	223	46	118	17	181	22	242	58	322	922
Total	183	410	202	795	153	632	120	905	182	544	131	857	94	877	196	1167	3724
Grand Total	609	1600	647	2856	557	2778	558	3893	378	1619	460	2457	403	2851	684	3938	13144
Apprch %	21.3	56	22.7		14.3	71.4	14.3		15.4	65.9	18.7		10.2	72.4	17.4		
Total %	4.6	12.2	4.9	21.7	4.2	21.1	4.2	29.6	2.9	12.3	3.5	18.7	3.1	21.7	5.2	30	
Light	598	1573	640	2811	550	2736	553	3839	374	1595	458	2427	401	2820	664	3885	12962
% Light	98.2	98.3	98.9	98.4	98.7	98.5	99.1	98.6	98.9	98.5	99.6	98.8	99.5	98.9	97.1	98.7	98.6
Heavy	11	27	7	45	7	42	5	54	4	24	2	30	2	31	20	53	182
% Heavy	1.8	1.7	1.1	1.6	1.3	1.5	0.9	1.4	1.1	1.5	0.4	1.2	0.5	1.1	2.9	1.3	1.4

Horizon Data Services Ltd

(416) 840-6619

Your Traffic Count Specialist

File Name : 16th Avenue at Markham Road
Site Code : Loc-4
Start Date : 2025-06-17
Page No : 2



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(416) 840-6619

Your Traffic Count Specialist

File Name : 16th Avenue at Markham Road
Site Code : Loc-4
Start Date : 2025-06-17
Page No : 3

	Markham Rd From North				16th Ave From East				Markham Rd From South				16th Ave From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	29	112	35	176	37	186	46	269	**19**	76	**35**	130	30	155	32	217	792
08:15 AM	35	**113**	38	186	**40**	**196**	40	**276**	18	76	31	125	37	**187**	33	257	**844**
08:30 AM	38	103	40	181	33	177	28	238	16	**111**	34	**161**	**40**	179	42	**261**	841
08:45 AM	**45**	107	**42**	**194**	40	187	**47**	274	10	73	32	115	34	164	**46**	244	827
Total Volume	147	435	155	737	150	746	161	1057	63	336	132	531	141	685	153	979	3304
% App. Total	19.9	59	21		14.2	70.6	15.2		11.9	63.3	24.9		14.4	70	15.6		
PHF	.817	.962	.923	.950	.938	.952	.856	.957	.829	.757	.943	.825	.881	.916	.832	.938	.979
Light	146	429	151	726	150	733	159	1042	61	330	131	522	141	674	152	967	3257
% Light	99.3	98.6	97.4	98.5	100	98.3	98.8	98.6	96.8	98.2	99.2	98.3	100	98.4	99.3	98.8	98.6
Heavy	1	6	4	11	0	13	2	15	2	6	1	9	0	11	1	12	47
% Heavy	0.7	1.4	2.6	1.5	0	1.7	1.2	1.4	3.2	1.8	0.8	1.7	0	1.6	0.7	1.2	1.4

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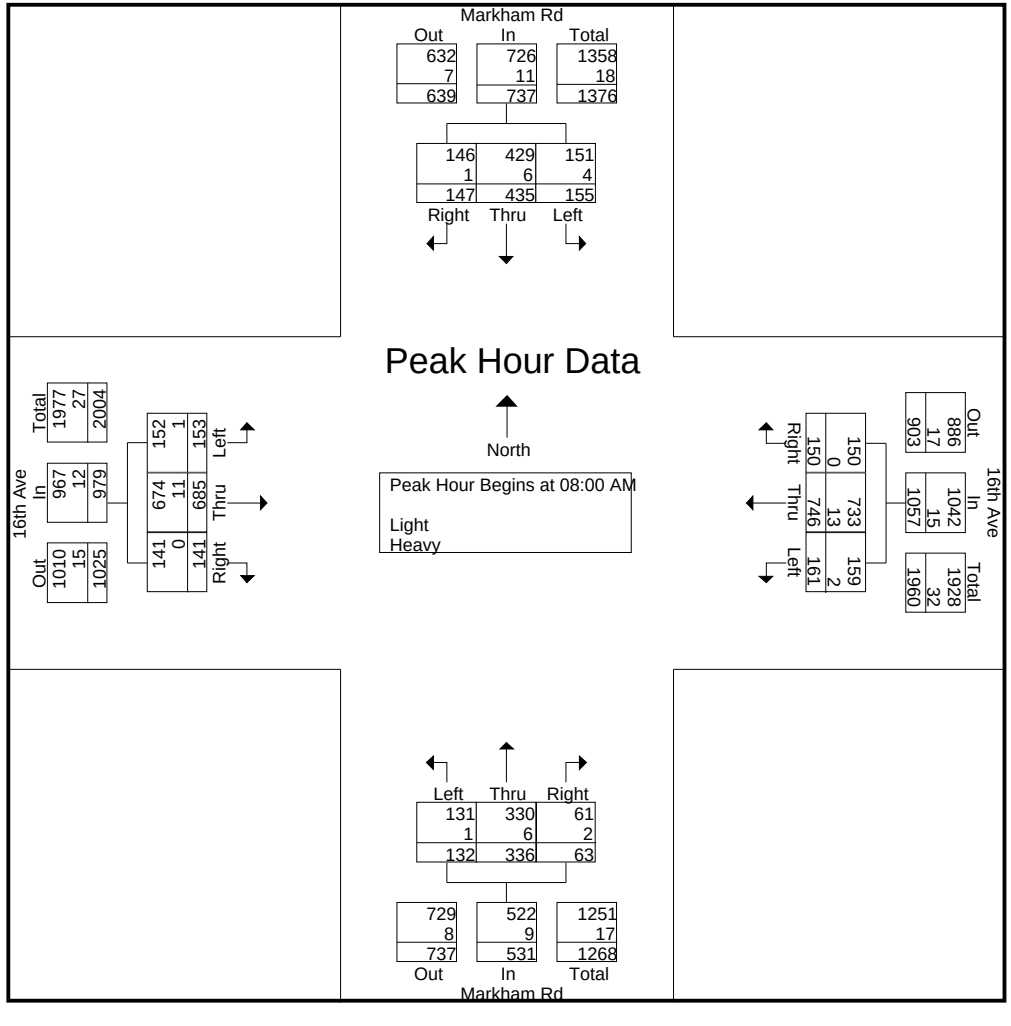
(416) 840-6619

Your Traffic Count Specialist

File Name : 16th Avenue at Markham Road
Site Code : Loc-4
Start Date : 2025-06-17
Page No : 4



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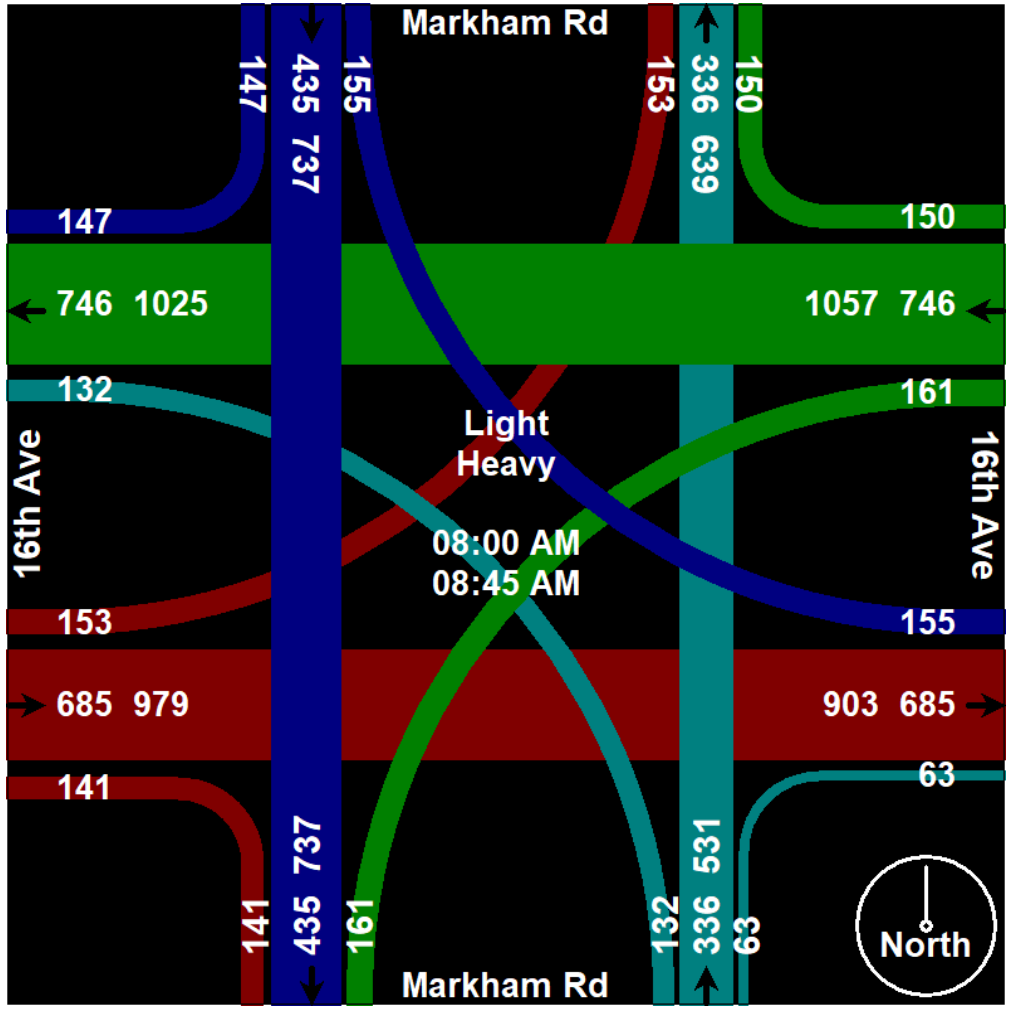
(416) 840-6619

Your Traffic Count Specialist

File Name : 16th Avenue at Markham Road
Site Code : Loc-4
Start Date : 2025-06-17
Page No : 5



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(416) 840-6619

Your Traffic Count Specialist

File Name : 16th Avenue at Markham Road
Site Code : Loc-4
Start Date : 2025-06-17
Page No : 6

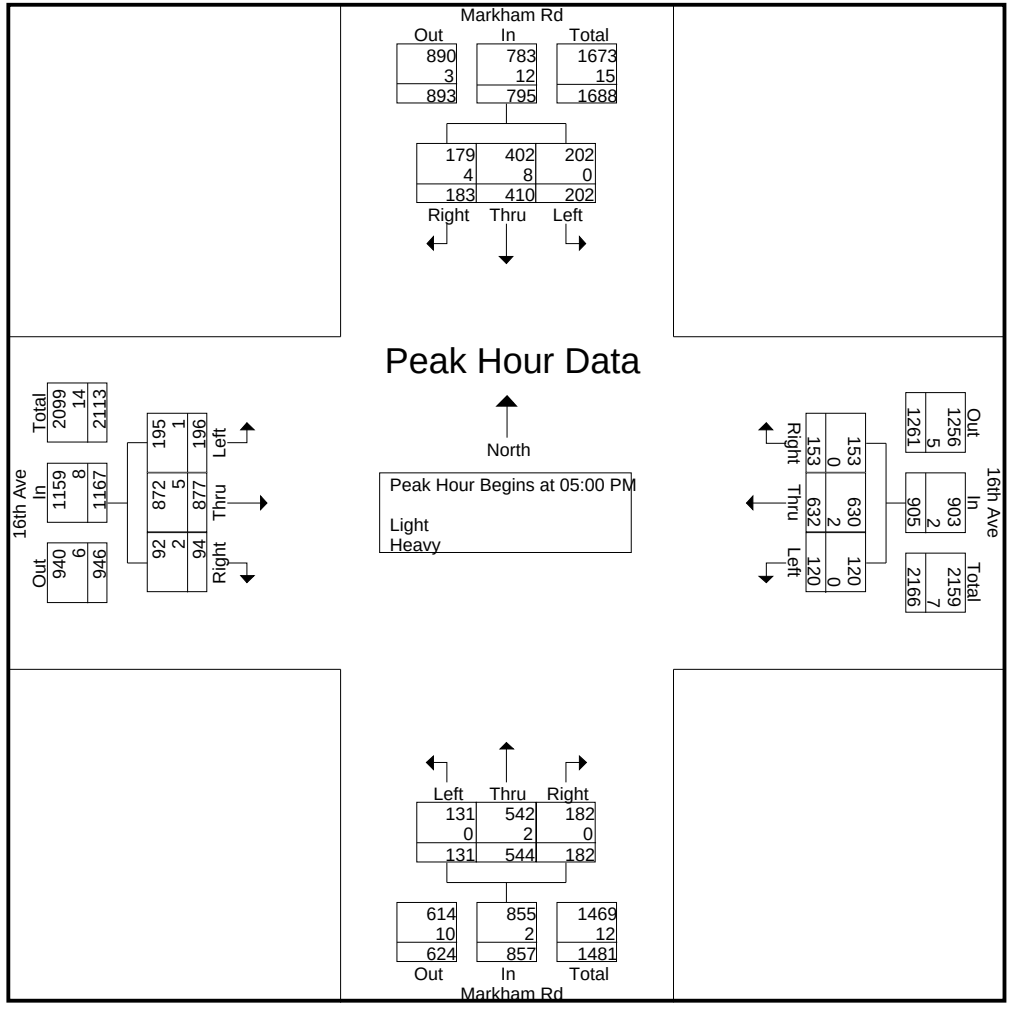
	Markham Rd From North				16th Ave From East				Markham Rd From South				16th Ave From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	47	85	**52**	184	41	**162**	30	**233**	44	160	**49**	**253**	17	224	48	289	**959**
05:15 PM	44	**124**	51	**219**	27	161	28	216	**46**	102	24	172	**28**	205	45	278	885
05:30 PM	**50**	97	49	196	**43**	162	28	233	46	**164**	41	251	27	206	45	278	958
05:45 PM	42	104	50	196	42	147	**34**	223	46	118	17	181	22	**242**	**58**	**322**	922
Total Volume	183	410	202	795	153	632	120	905	182	544	131	857	94	877	196	1167	3724
% App. Total	23	51.6	25.4		16.9	69.8	13.3		21.2	63.5	15.3		8.1	75.1	16.8		
PHF	.915	.827	.971	.908	.890	.975	.882	.971	.989	.829	.668	.847	.839	.906	.845	.906	.971
Light	179	402	202	783	153	630	120	903	182	542	131	855	92	872	195	1159	3700
% Light	97.8	98.0	100	98.5	100	99.7	100	99.8	100	99.6	100	99.8	97.9	99.4	99.5	99.3	99.4
Heavy	4	8	0	12	0	2	0	2	0	2	0	2	2	5	1	8	24
% Heavy	2.2	2.0	0	1.5	0	0.3	0	0.2	0	0.4	0	0.2	2.1	0.6	0.5	0.7	0.6

Horizon Data Services Ltd

(416) 840-6619

Your Traffic Count Specialist

File Name : 16th Avenue at Markham Road
Site Code : Loc-4
Start Date : 2025-06-17
Page No : 7

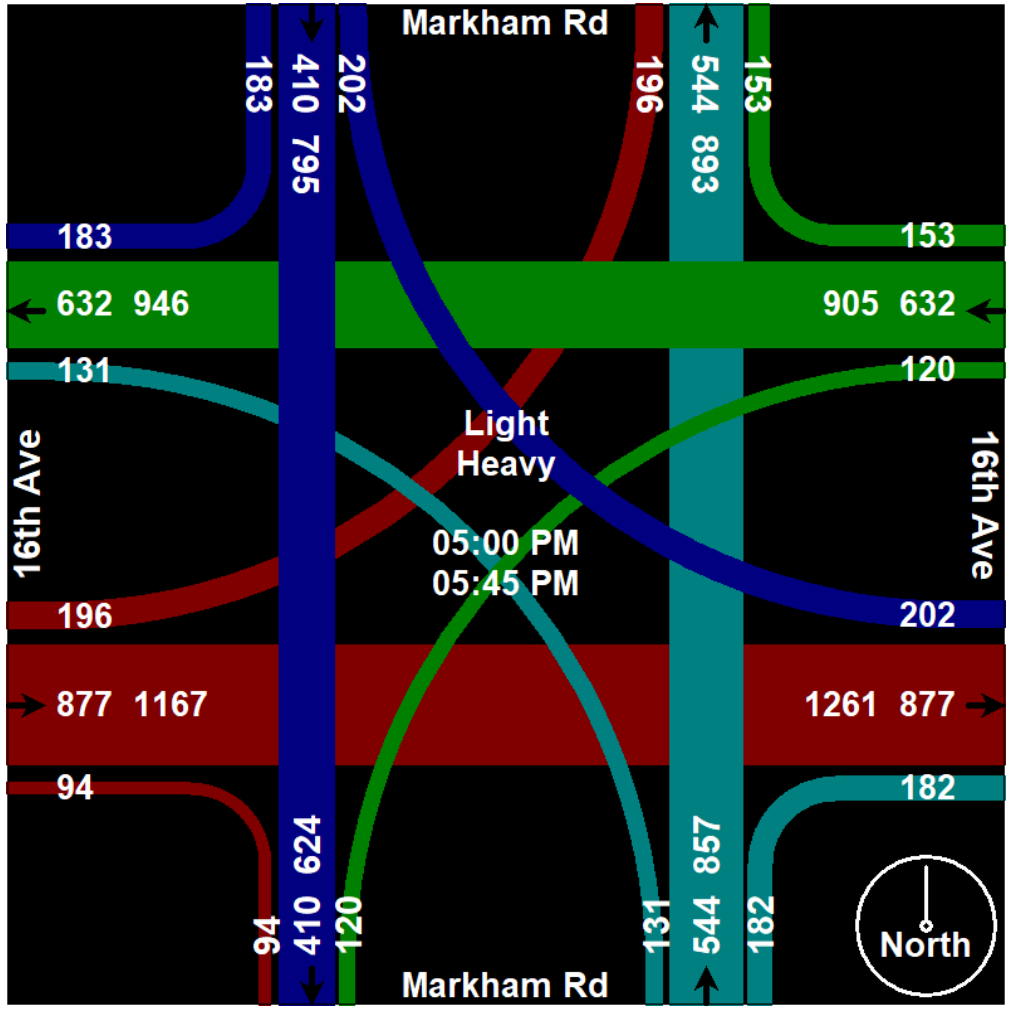


Horizon Data Services Ltd

(416) 840-6619

Your Traffic Count Specialist

File Name : 16th Avenue at Markham Road
Site Code : Loc-4
Start Date : 2025-06-17
Page No : 8



61. Markham Road & Bur Oak Avenue
Developed by: IBI Group (2019-07-29)
Approved by:
Revised by:

Proposed Timings	Cycle Length AM (PM) OFF	106 (106) 96							
	Offset AM (PM) OFF	53 (50) 0							
	Phase	1	2	3	4	5	6	7	8
	Direction	NBL	SBT	WBL	EBT	SBL	NBT	EBL	WBT
	Minimum Green	7	15	7	10	7	15	7	10
	Maximum Split AM (Mon to Fri, 7:00 AM to 10:00 AM)	11	41	11	43	11	41	11	43
	Maximum Split PM (Mon to Fri, 3:00 PM to 7:00 PM)	12	40	11	43	11	41	11	43
	Maximum Split OFF (all other times except 7-10am & 3-7pm on weekdays)	11	42	0	43	11	42	0	43
	Amber	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0
	Red Clearance	1.0	3.0	1.0	3.0	1.0	3.0	1.0	3.0
	Walk	-	7	-	7	-	7	-	7
	Pedestrian Clearance (FDW)	-	24	-	29	-	24	-	29
Notes	Mode of Control: Semi-Actuated Vehicle and pedestrian clearances will need to match the values presented on this timing card summary Weekend Operations: Use OFF peak split timings (cycle length, offset) and hours of operations								

93. Markham Road & Edward Jeffreys Avenue
Developed by: IBI Group (2019-07-29)
Approved by:

Proposed Timings	Cycle Length AM (PM) OFF	106 (106) 96							
	Offset AM (PM) OFF	32 (73) 0							
	Phase	1	2	3	4	5	6	7	8
	Direction		NBT		EBT	NBL	SBT		WBT
	Minimum Green		15		10	7	15		10
	Maximum Split AM (Mon to Fri, 7:00 AM to 10:00 AM)		69		37	11	58		37
	Maximum Split PM (Mon to Fri, 3:00 PM to 7:00 PM)		70		36	14	56		36
	Maximum Split OFF (all other times except 7-10am & 3-7pm on weekdays)		61		35	11	50		35
	Amber		4.0		3.5	3.0	4.0		3.5
	Red Clearance		3.0		3.0	1.0	3.0		3.0
	Walk		7		7		7		7
	Pedestrian Clearance (FDW)	-	23	-	21	-	23	-	21
Notes	Mode of Control: Semi-Actuated. Vehicle and pedestrian clearances will need to match the values presented on this timing card summary. Weekend operations: Use OFF peak split timings (cycle length, offset) and hours of operations.								

LOCATION:	**16th Ave (YR 73) & Highway 48 / Main St**	*MUNICIPALITY:*	**Markham**
CTCS:	**240**	*COMPUTER SYSTEM:*	**Centracs**
MODE/COMMENT:	**SA with APS**	*CONTROLLER/CABINET TYPE:*	**Econolite Cobalt / TS2T1**
PREPARED/CHECKED BY:	**MA**	*CONFLICT FLASH:*	**Red & Red**
PREPARATION DATE:	**February 1, 2024**	*DESIGN WALK SPEED:*	**1.0 m/s (FDW based on full crossing at 1.2 m/s)**
IMPLEMENTATION DATE:	**February 1, 2024**	*CHANNEL/DROP:*	

N

NEMA Phase (York)		AM 7:00-9:00 M-F	PM 15:00-19:00 M-F	OFF 9:00-15:00 19:00-22:00 M-F 9:00-22:00 Sat & Sun	FREE 22:00-7:00 M-F 22:00-9:00 Sat & Sun	Phase Mode (Fixed/Demanded/Callable)	Remarks
	Local Plan	Pattern 1	Pattern 2	Pattern 3	Pattern 99		
	System Plan	Plan 1	Plan 2	Plan 3	Plan 99		
1. E/B Left Turn Arrow	WLK FDW MIN 7 EXT 5 MAX1 7 MAX2 0 AMB 3 ALR 1 SPLIT	**12**	**18**	**15**	**0**	Callable/Extendable by Setback Loop	Pedestrian Minimums: EWWK = 7 sec., EWFD = 24 sec. NSWK = 7 sec., NSFD = 24 sec.
2. Westbound 16th Ave	WLK 7 FDW 24 MIN 31 EXT 0 MAX1 31 MAX2 0 AMB 4.5 ALR 3.0 SPLIT	**58**	**48**	**46**	**0**	Fixed	**Emergency vehicle pre-emption 3:** Serve EWG/EWDW min 20 secs and up to 100 secs if there are continuous emergency calls in EW direction. **Emergency vehicle pre-emption 4:** Serve NSG/NSDW min 20 secs and up to 100 secs if there are continuous emergency calls in NS direction. NS phase is callable by vehicle and/or pedestrian actuation. If a vehicle call is received, the minimum NSG is served. If ongoing vehicle demand exists on the stopbar loop, the NSG is capable of providing vehicle extensions up to the maximum green split during coordinated operation or MAX1 during Free operation. If a pedestrian call is received, the pedestrian minimum will be served. The NSWK & NSFD are only displayed on the pedestrian signal heads if a pedestrian call is received. Extension time is based on vehicle demand.
3. N/B Left Turn Arrow	WLK FDW MIN 7 EXT 3 MAX1 7 MAX2 0 AMB 3 ALR 1 SPLIT	**12**	**24**	**17**	**0**	Callable/Extendable by Setback Loop **Unused time allocated to phase 4 (Pref 1)**	During coordinated operation, unused extension time for phases 3 & 7 (NSLA) will be given to phases 4 & 8 (NSG) and any other unused extension time is given to phases 2 & 6 (EWG). During coordinated operation, the signal constantly cycles through main street FDW to improve response time to side street vehicle and pedestrian demand.
4. Southbound Highway 48	WLK 7 FDW 24 MIN 10 EXT 6 MAX1 30 MAX2 0 AMB 4.5 ALR 3.0 SPLIT	**48**	**40**	**52**	**0**	Callable by stopbar loop and/or pushbutton; Extendable by stopbar loop.	During free plan, signal rests in EWWK and does not cycle through EWFD unless there is side street vehicle or pedestrian demand. EWFD reverts to EWWK if there is no side street demand at the end of the EWFD. APS Extended Push Activation = 3 sec When activated, APS is on for 7 seconds.
5. W/B Left Turn Arrow	WLK FDW MIN 7 EXT 5 MAX1 7 MAX2 0 AMB 3 ALR 1 SPLIT	**20**	**16**	**15**	**0**	Callable/Extendable by Setback Loop	**Signal Timing Changes:** • Increased Phases 1 & 5 (EBLA-WBLA) splits, and adjusted Offsets, during Coord Plan# 3 (Off-Peak). • Increased Phases 1 & 5 (EBLA-WBLA) vehicle extensions, to 5(s).
6. Eastbound 16th Ave	WLK 7 FDW 24 MIN 31 EXT 0 MAX1 31 MAX2 0 AMB 4.5 ALR 3.0 SPLIT	**50**	**50**	**46**	**0**	Fixed	
7. S/B Left Turn Arrow	WLK FDW MIN 7 EXT 3 MAX1 7 MAX2 0 AMB 3 ALR 1 SPLIT	**20**	**24**	**17**	**0**	Callable/Extendable by Setback Loop **Unused time allocated to phase 8 (Pref 1)**	**LEGEND:** SA - Semi-Actuated signal WLK - Walk time FDW - Flashing Don't Walk time MIN - Minimum green time EXT - Extension time MAX1 - Maximum green time 1 MAX2 - Maximum green time 2 AMB - Amber ALR -All Red CL - Cycle Length OF - Offset VP - Vehicle Permissive NSWK - North/South Walk EWWK - East/West Walk NSG - North/South Green EWG - East/West Green NSFD - North/South Flashing Don't Walk EWFD - East/West Flashing Don't Walk TSP - Transit Priority APS - Audible Pedestrian Signal RLC - Red Light Camera
8. Northbound Main St	WLK 7 FDW 24 MIN 10 EXT 6 MAX1 30 MAX2 0 AMB 4.5 ALR 3.0 SPLIT	**40**	**40**	**52**	**0**	Callable by stopbar loop and/or pushbutton; Extendable by stopbar loop.	
	CL OF VP	**130** **115** 24	**130** **81** 24	**130** **78** 24	**0 (FREE)** **0 (FREE)** 0 (FREE)		

NOTES:

APPENDIX

C Background Development & General Growth Information

nextrans
CONSULTING ENGINEERS

nextrans.ca

FOURO TOWERS BUILDERS LTD.

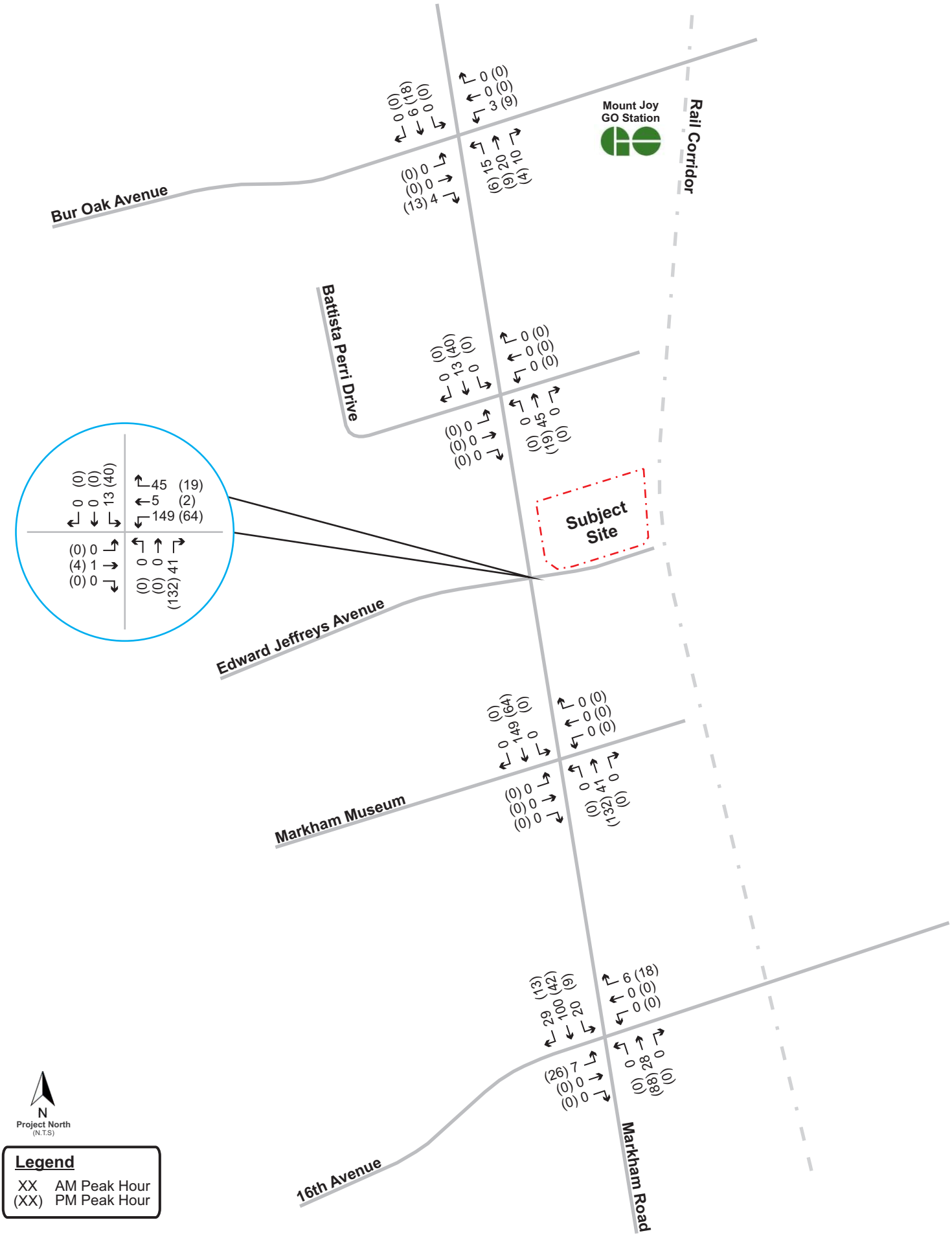
Transportation Impact and Functional Traffic Design Study

PROPOSED MIXED-USE DEVELOPMENT

9331-9399 Markham Road
CITY OF MARKHAM, ONTARIO

February 2022

Figure 4-1 Site Generated Traffic Volumes



December 06, 2022

Thanh Nguyen, MES
9781 Markham Road Limited Partnership
c/o
Liberty Development Corporation
1 Steelcase Road West, Unit 8
Markham, ON L3R 0T3

Subject: **9781 Markham Road, Phase 2, City of Markham - Response to Transportation Comments**

Dear Mr. Nguyen:

WSP Canada Inc. (WSP) previously prepared a Transportation Impact Study (TIS), dated October 1, 2021, for Phase 2 of the proposed mixed-use development located at 9781 Markham Road in the City of Markham. Subsequent to its submission, the City of Markham and Region of York staff provided transportation-related comments on this TIS. The City's comments were provided in a letter, dated January 10, 2022, and the Region's comments were provided in a memorandum with no specified date.

This Response to Comments Letter has been prepared to address the City and Region's transportation comments on the October 2021 TIS. Compared to the site plan included in the October 2021 TIS, the following changes have been made to the proposed site plan:

- Phase 1: unit count increases from 536 to 545 units and retail/commercial GFA decreases from 629 to 293 m^2;
- Phase 2: unit count increases from 722 to 752 units, the strata park in the northeast corner of the site has been converted to six townhouse units, and retail/commercial GFA remains the same at 518 m^2; and
- The total parking supply for Phases 1 and 2 increases from 1,138 to 1,178 spaces.

Since the submission of the original TIS, additional studies/information that are relevant to the context of this study have become available and were referenced in this response letter, such as the Municipal Class Environmental Assessment Schedule 'C' Environmental Study Report for Anderson Avenue Extension, prepared by Masongsong Associates Engineering Ltd., dated March 10, 2022, and the Markham Road – Mount Joy Secondary Plan Study Update that was presented to the Markham Development Services Committee on July 11, 2022.

The original comments received from the City and Region are provided in **Attachment A**. The transportation comments and our responses are provided herein.

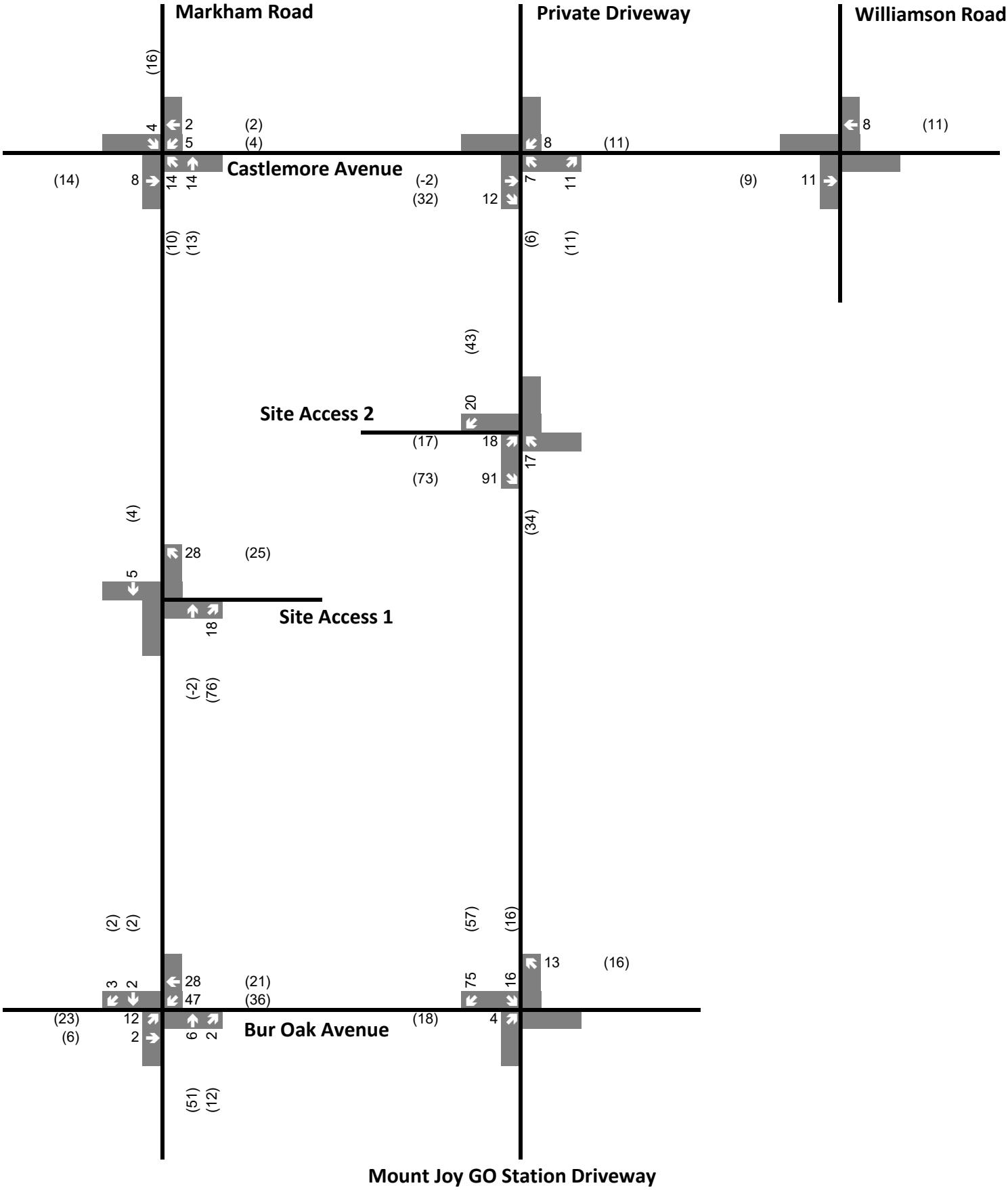
CITY'S COMMENTS AND WSP'S RESPONSES

B - GENERAL COMMENTS

Comment 1: A Response Letter will be required as part of any follow-up or revised transportation submission(s), to keep track and facilitate the review of outstanding comments relating to the subject application.

100 Commerce Valley Drive West
Thornhill, ON
Canada L3T 0A1

T: +1 905 882-1100
F: +1 905 882-0055
wsp.com



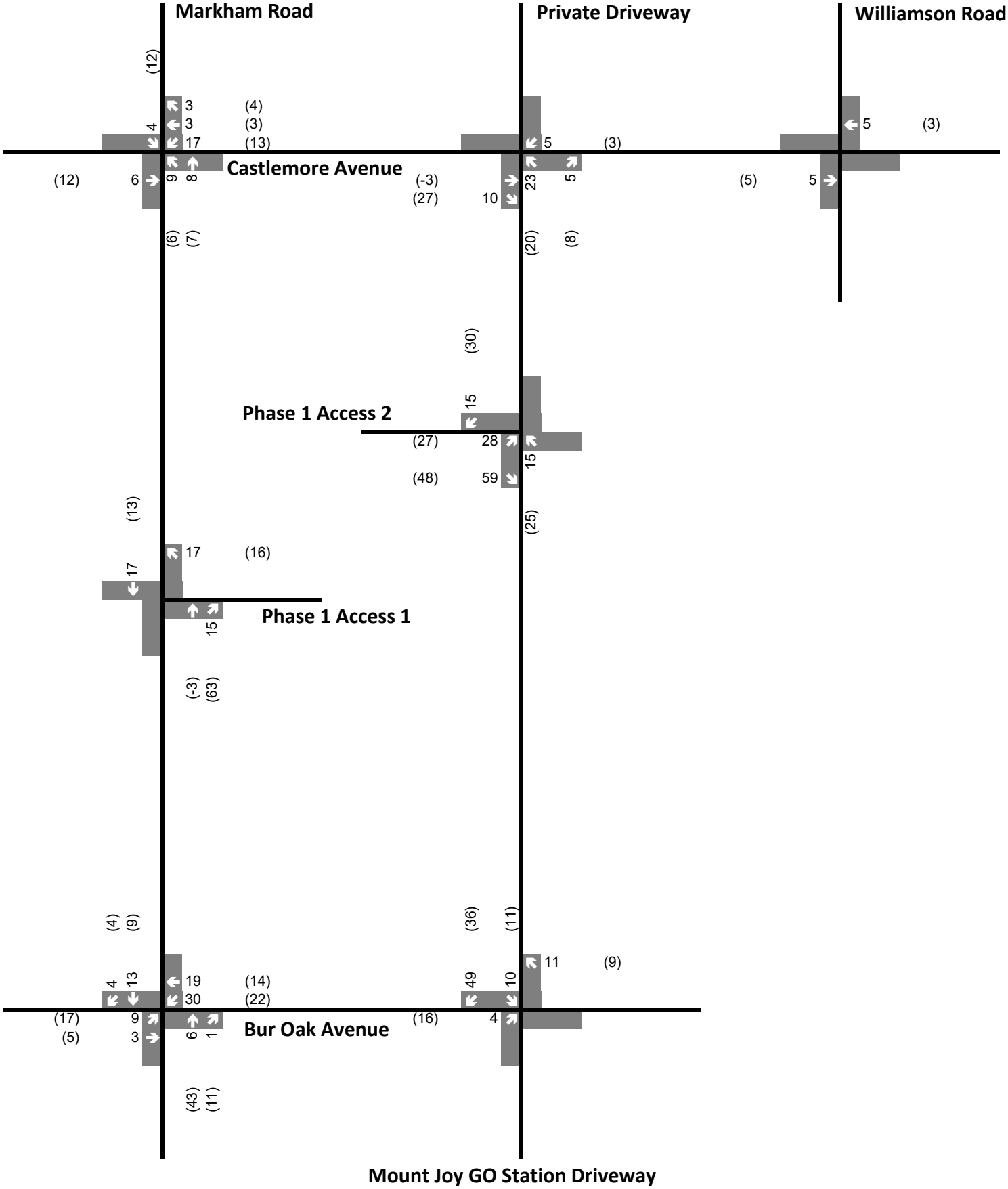
Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure 3

Site (Phase 2) Traffic Assignment - Scenario 1



Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Appendix C

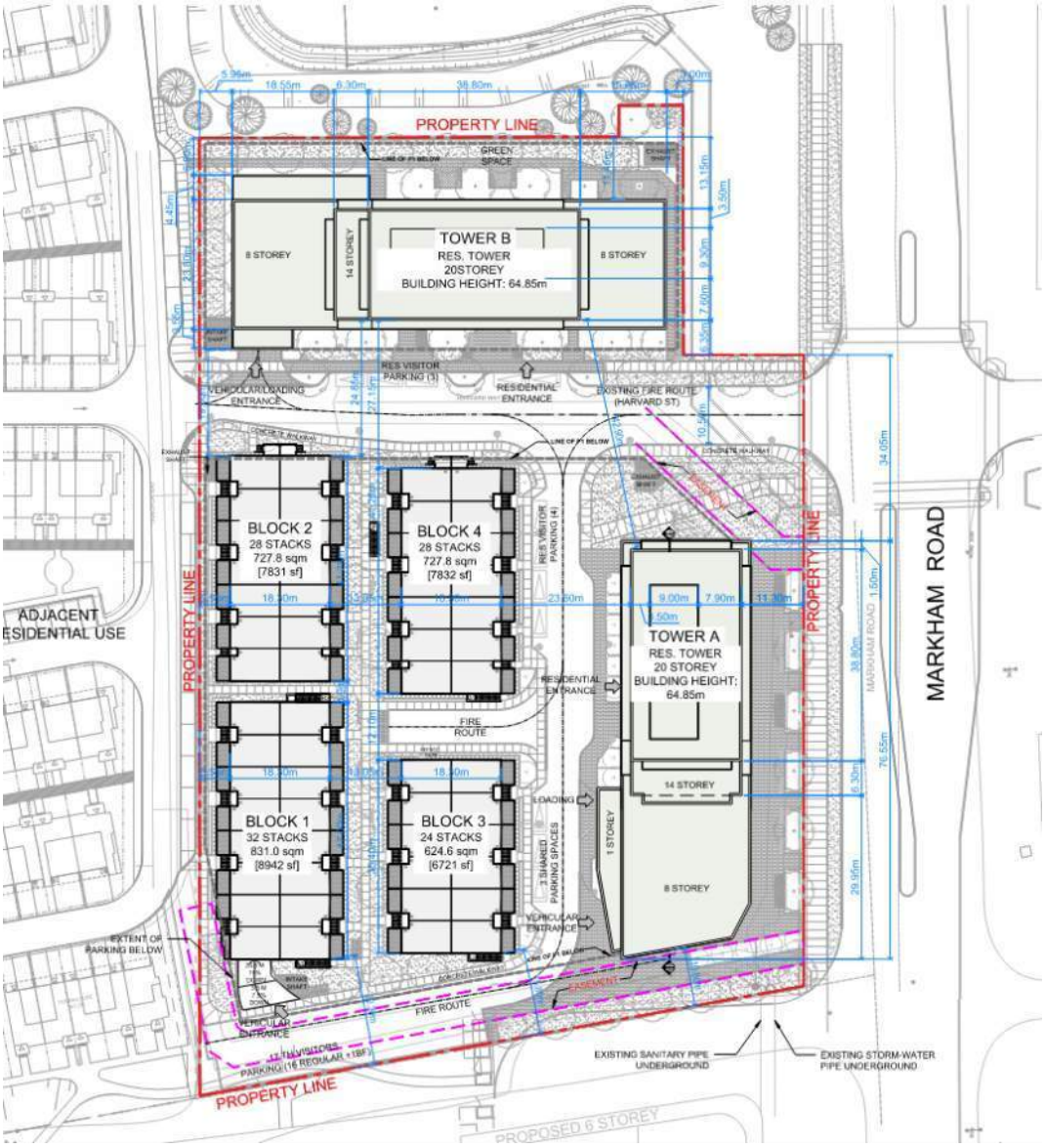
Phase 1 Traffic Assignment - Scenario 1

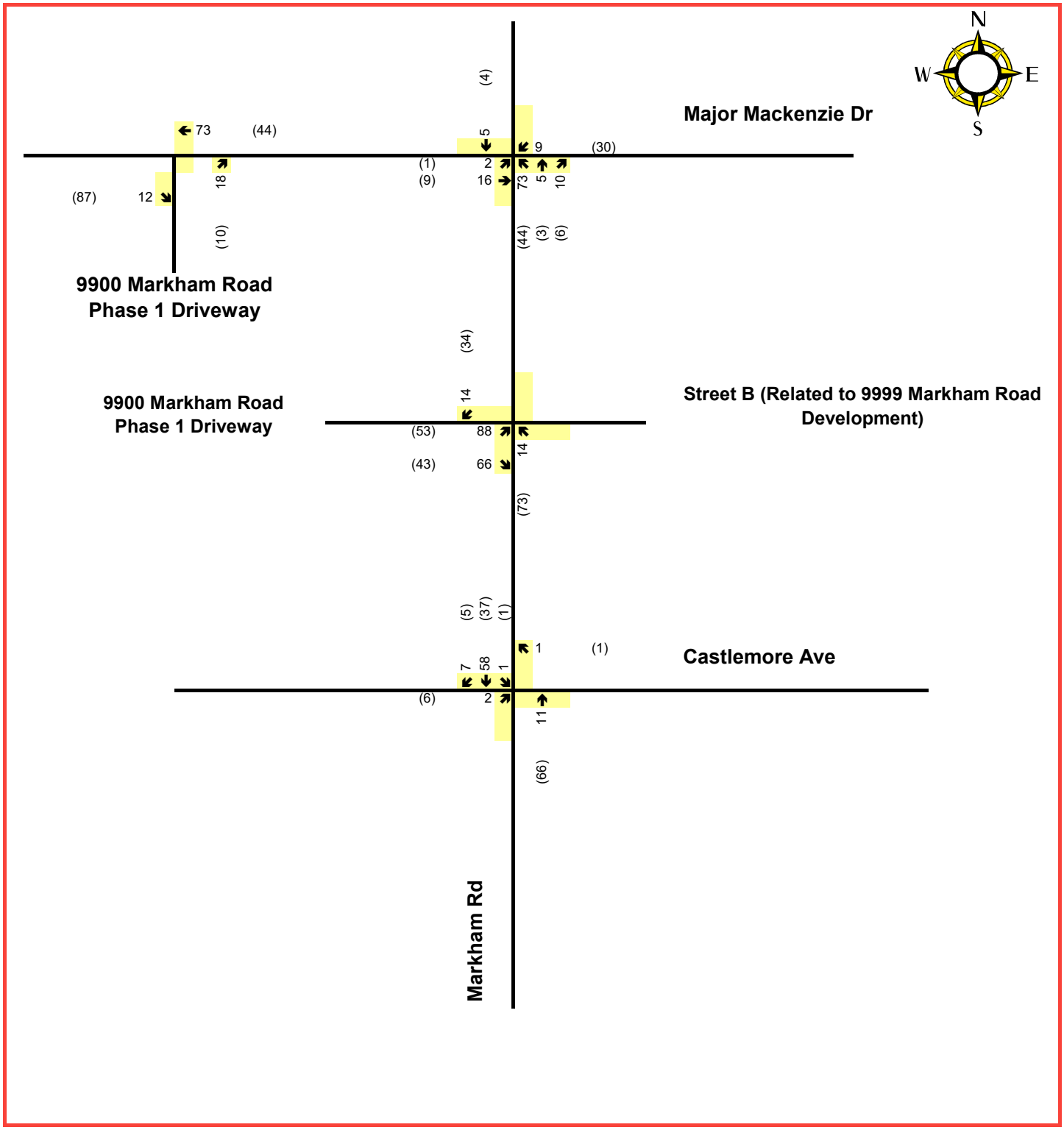
SUNNY COMMUNITIES

TIS ADDENDUM

9900 MARKHAM ROAD DEVELOPMENT

April 2023





Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure 4.1

Site-generated Traffic Volumes

2585231 ONTARIO INC.

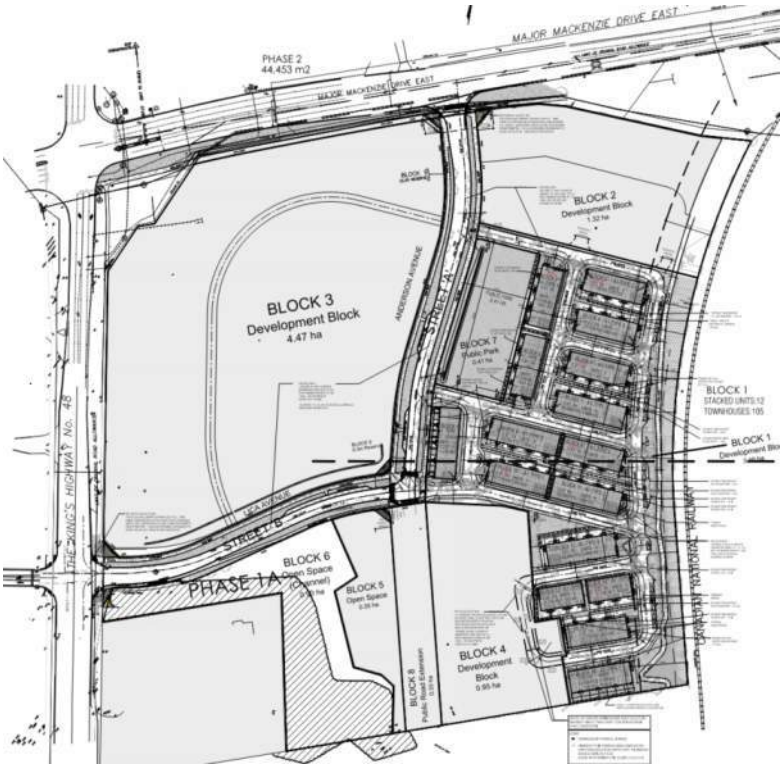
9999 MARKHAM ROAD DEVELOPMENT PHASE 1A

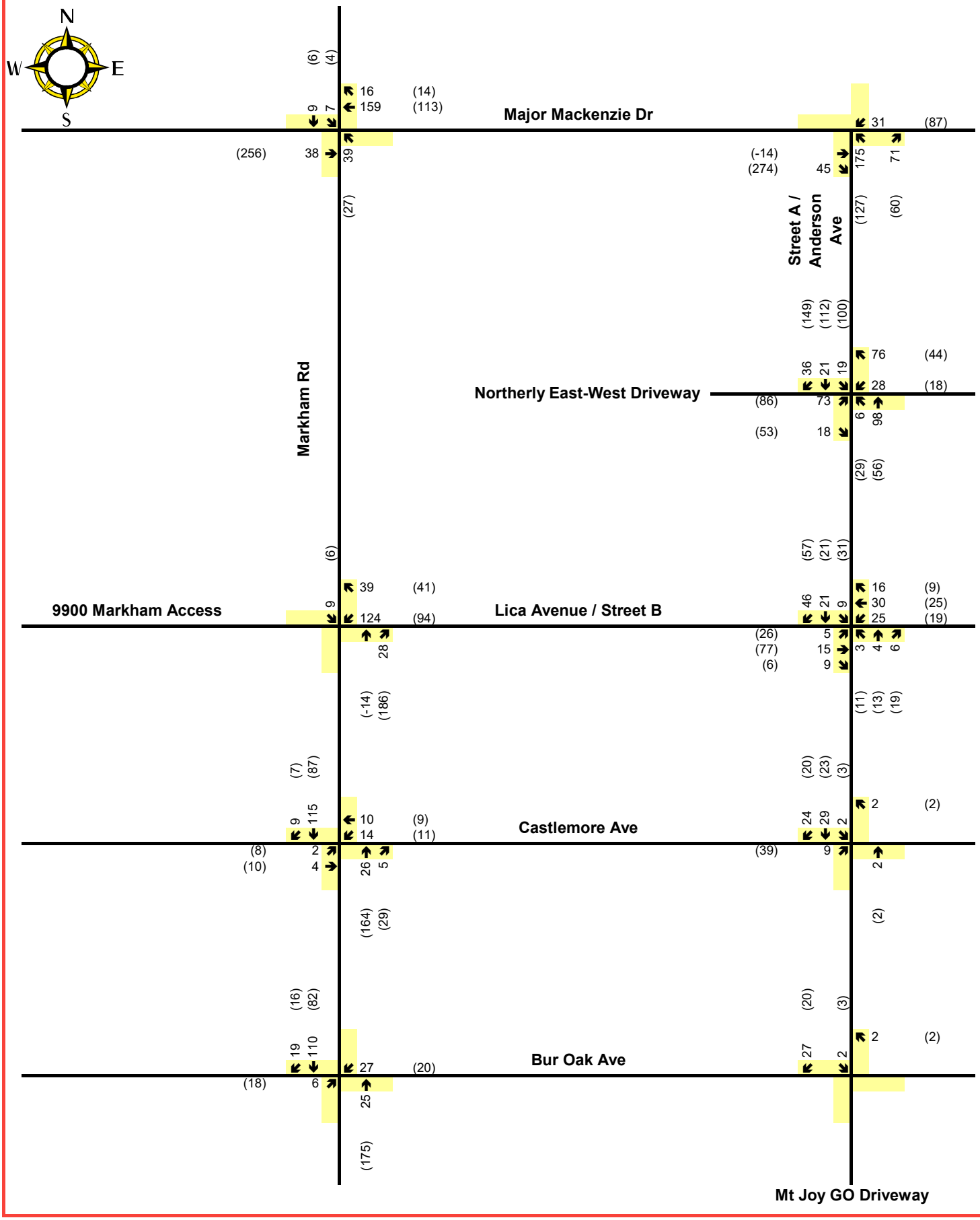
TIS ADDENDUM AND RESPONSE TO COMMENTS

NOVEMBER 23, 2021

CITY OF MARKHAM FILE: SPC 19 127869

REGION OF YORK: SP.19.M.0193





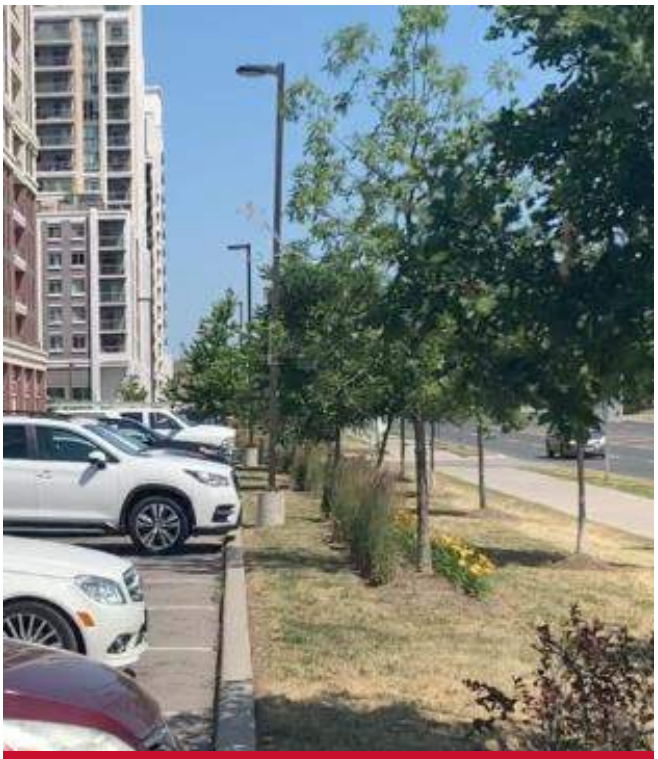
Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Site Traffic

Anderson Reassignment



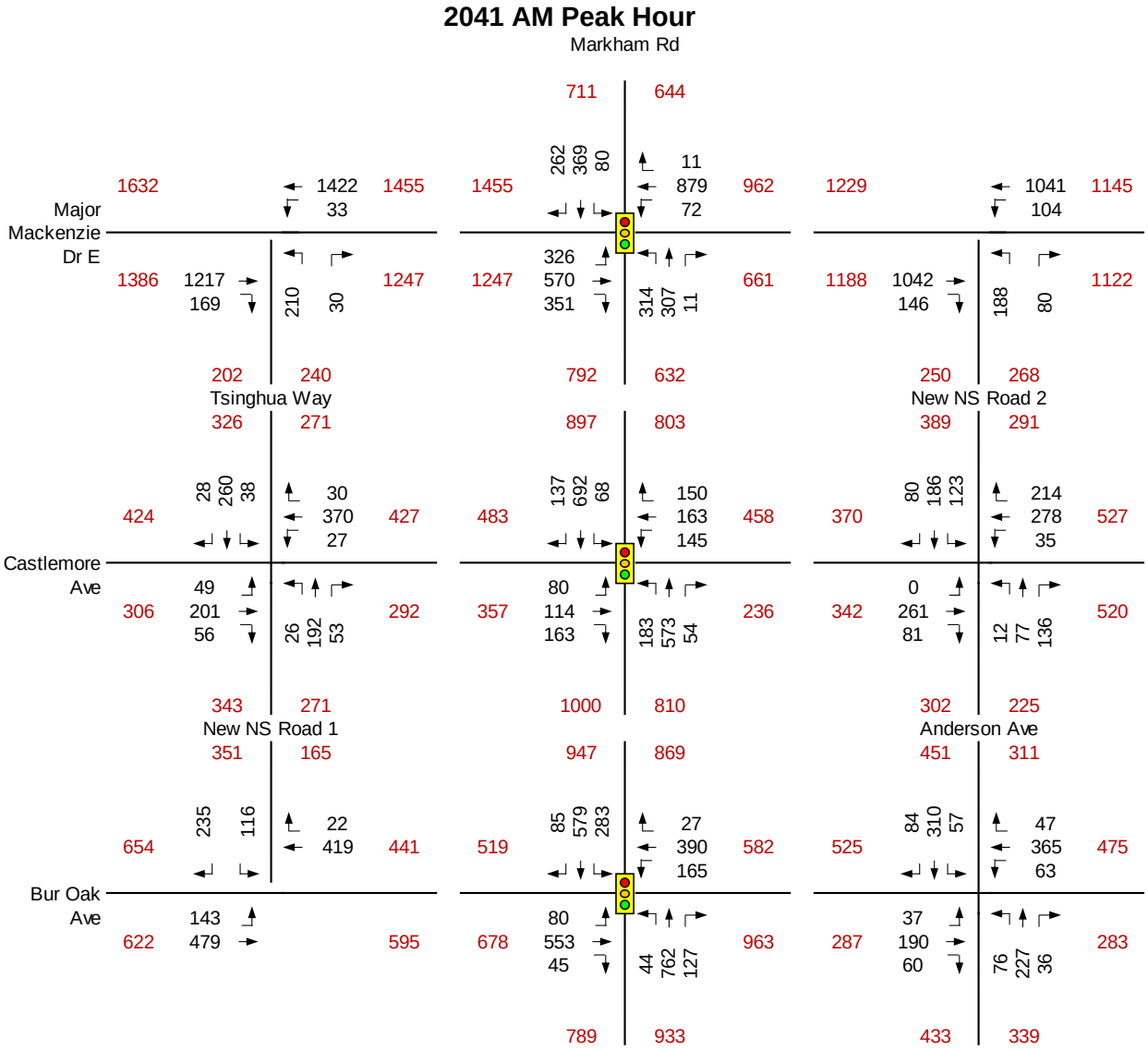
Final Transportation Report

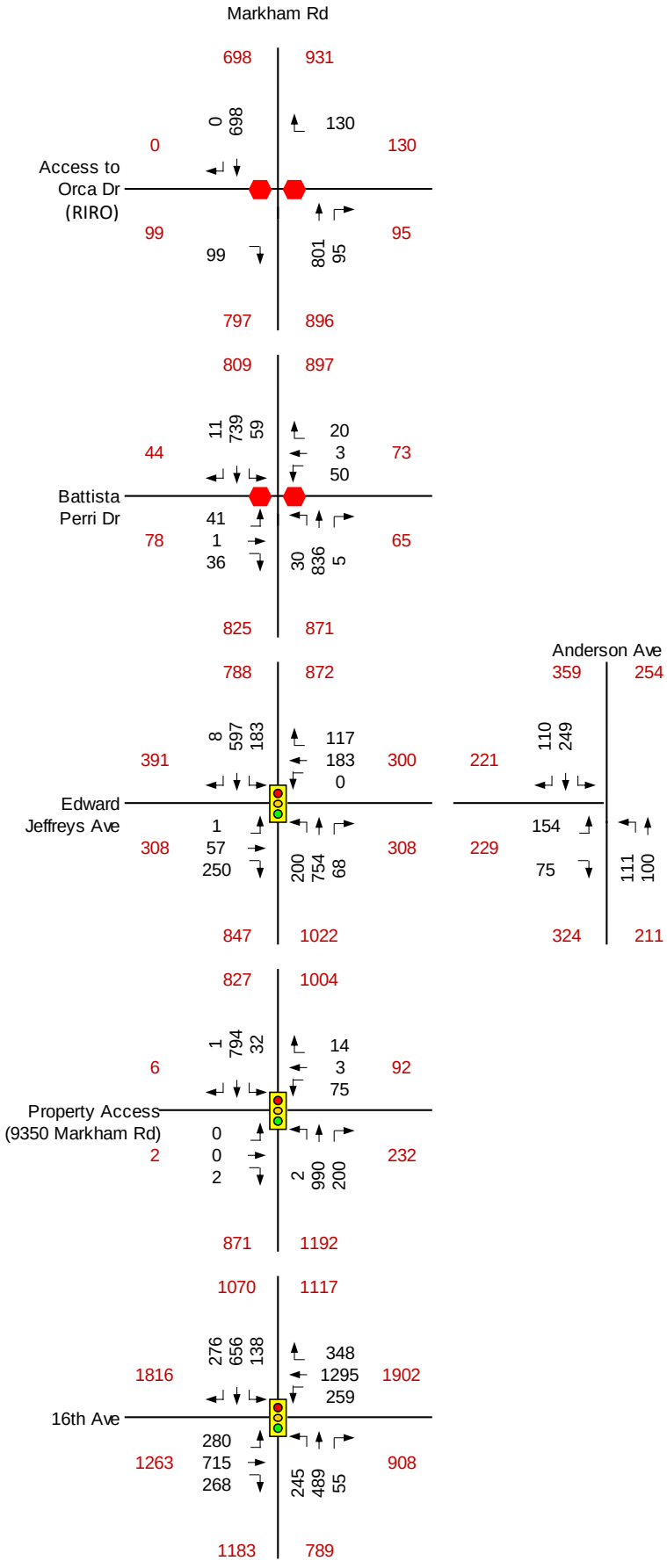
Markham Road Mount Joy Secondary Plan

City of Markham

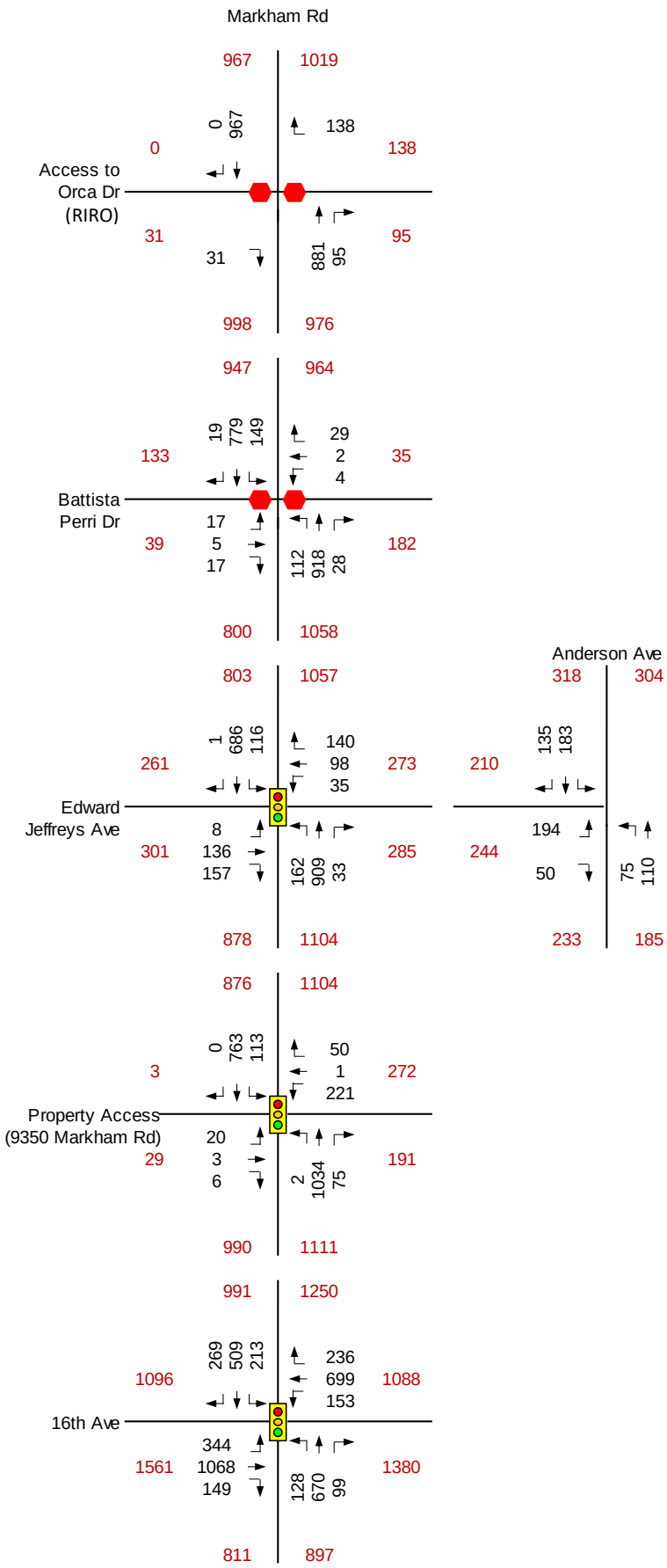
June 15, 2023

Figure 5-1: Estimated Future (2041) Traffic Volumes




Markham Rd
698
931
0
698
130
0
130
Access to
Orca Dr
(RIRO)
99
95
99
801
95
797
896
809
897
11
739
59
20
3
50
44
73
Battista
Perri Dr
41
1
36
78
65
30
836
5
825
871
Anderson Ave
788
872
359
254
8
597
183
117
183
0
391
300
221
110
249
Edward
Jeffreys Ave
1
57
250
154
75
308
308
229
200
754
68
111
100
847
1022
324
211
827
1004
1
794
32
14
3
75
6
92
Property Access
(9350 Markham Rd)
0
0
2
2
990
200
2
232
871
1192
1070
1117
276
656
138
348
1295
259
1816
1902
16th Ave
280
715
268
1263
908
245
489
55
1183
789

2041 PM Peak Hour

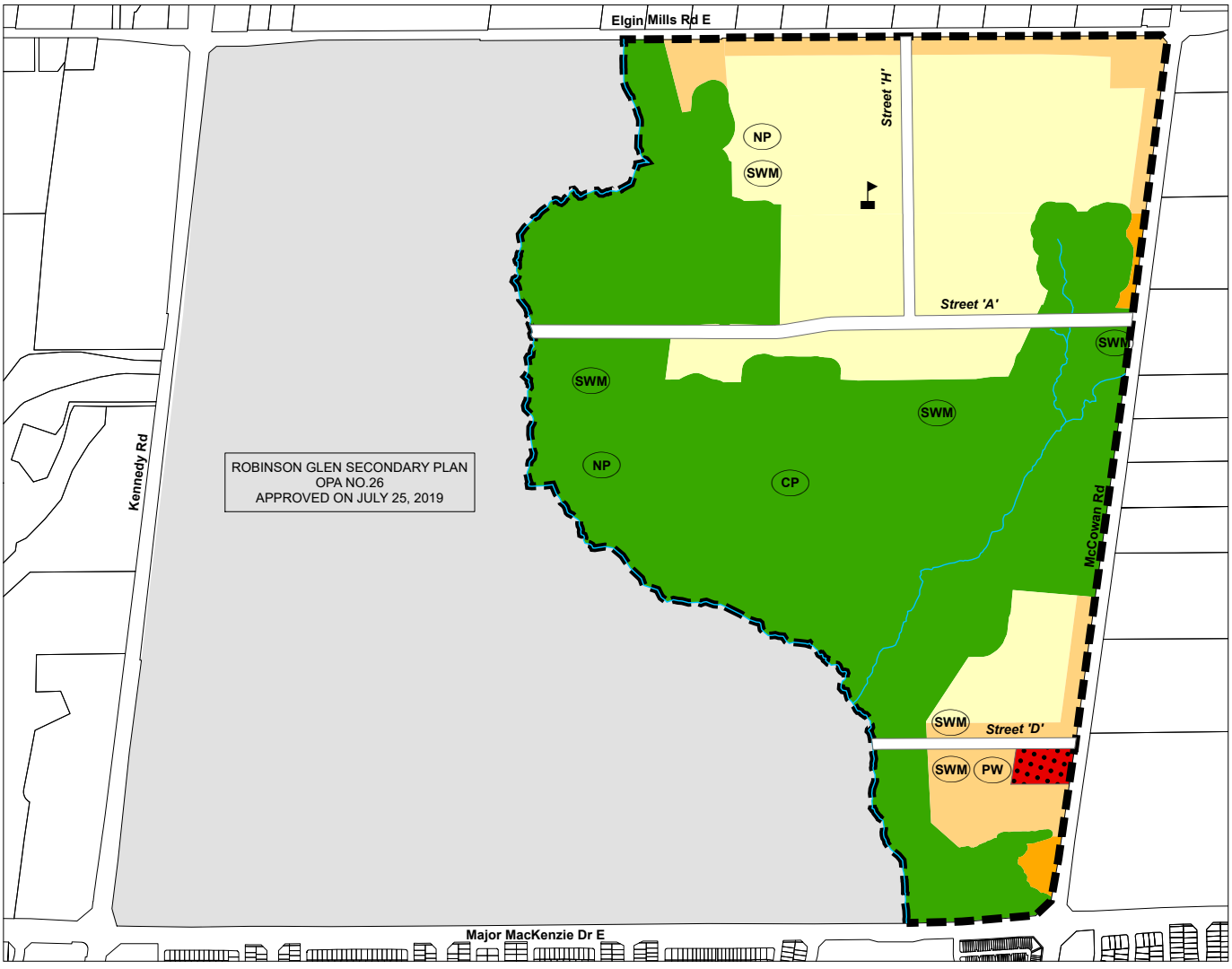

Markham Rd
967
1019
0
967
138
0
138
Access to
Orca Dr
(RIRO)
31
95
31
881
95
998
976
947
964
19
779
149
29
133
2
35
4
Battista
Perri Dr
17
39
5
182
17
112
918
28
800
1058
Anderson Ave
803
1057
318
304
1
686
116
140
261
98
273
210
135
183
35
Edward
Jeffreys Ave
8
194
301
136
285
244
157
162
909
33
50
75
110
878
1104
233
185
876
1104
0
763
113
50
3
1
272
221
Property Access
(9350 Markham Rd)
20
29
3
191
6
2
1034
75
990
1111
991
1250
269
509
213
236
1096
699
1088
153
16th Ave
344
1561
1068
1380
149
128
670
99
811
897

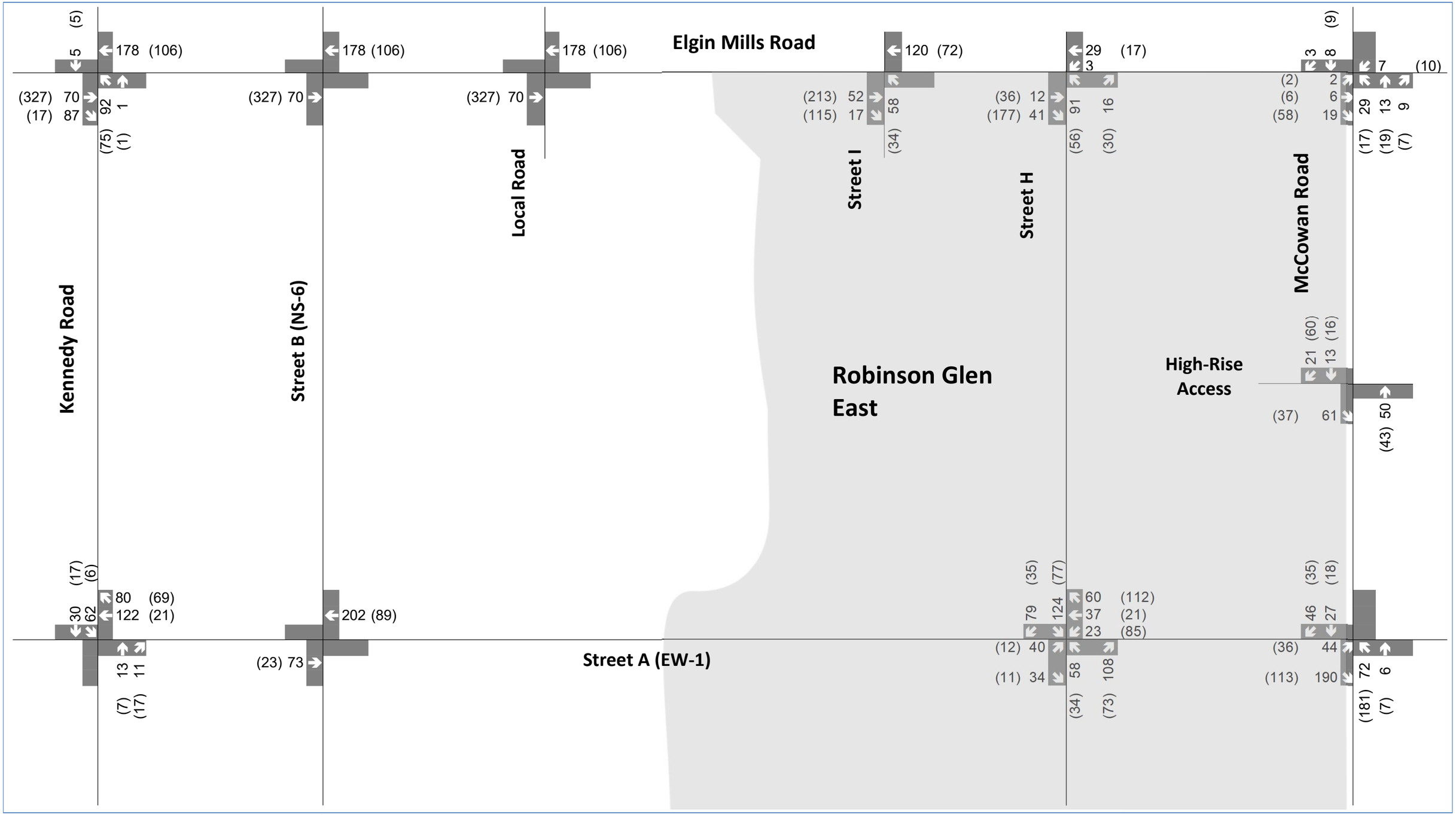
Robinson Glen East Landowners Group

Robinson Glen East Community Development, City of Markham

Transportation Study - Part of MESPA

March 04, 2025





N
W E
S

Legend

xx A.M. Peak Hour Traffic Volumes (xx) P.M. Peak Hour Traffic Volumes

Figure 4-1
Robinson Glen East Site Traffic Volumes, Page 1

Robinson Glen East

Kennedy Road

McCowan Road

Street C (L-3)

Street B (NS-6)

Street D (EW-3)

Street E

Street F

Street G

William Berczy Boulevard

The Bridle Walk

Ridgecrest Road

Stonebridge Drive

Major Mackenzie Drive

Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure 4-3
Robinson Glen East Site Traffic Volumes, Page 2

Upper Markham Village Landowners Group

SECONDARY PLAN TRANSPORTATION STUDY

Upper Markham Village

December 2024

8833

Figure 5-2: Site Traffic Peak Hour Volumes (2028 Interim – Partial Buildout)

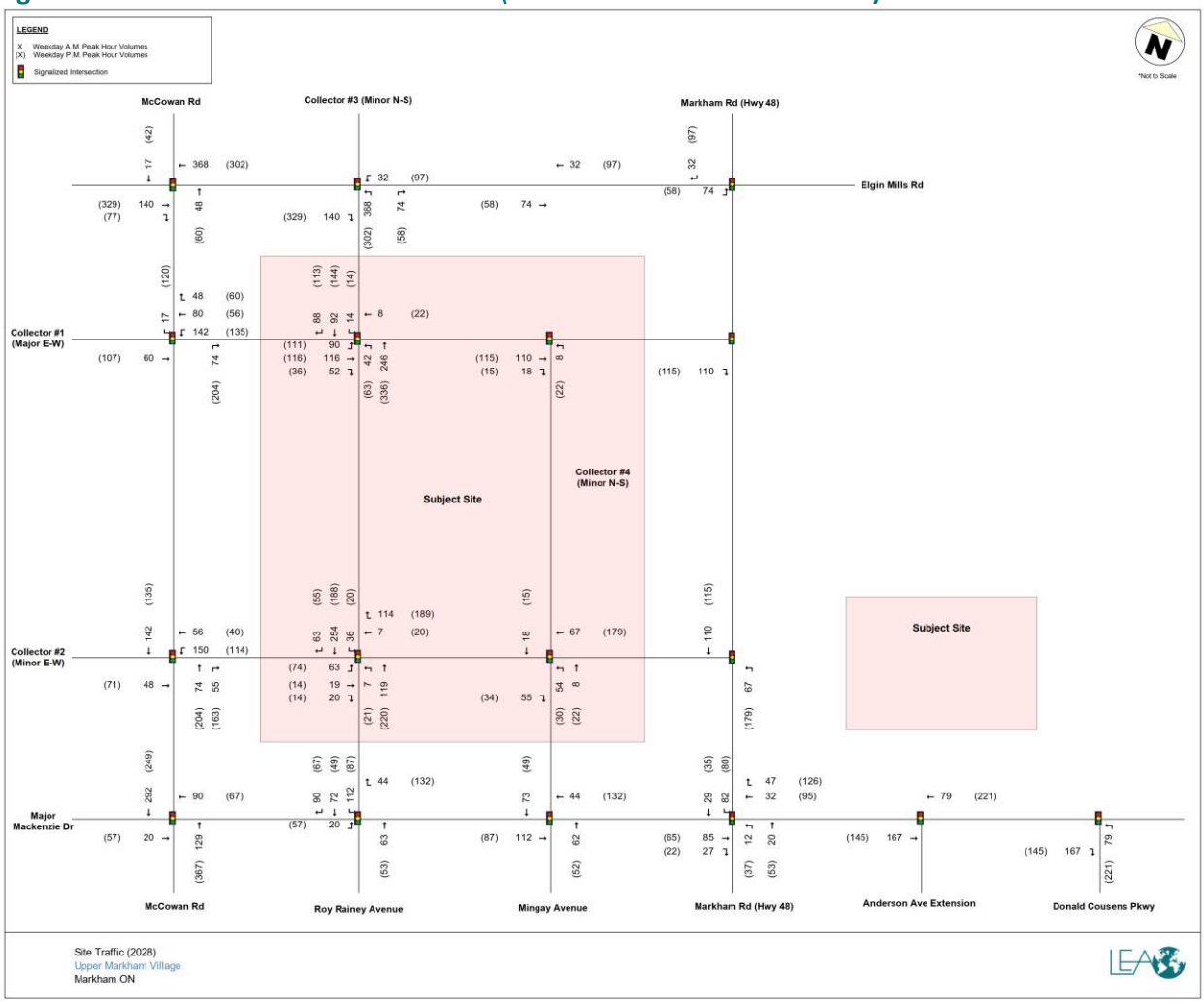
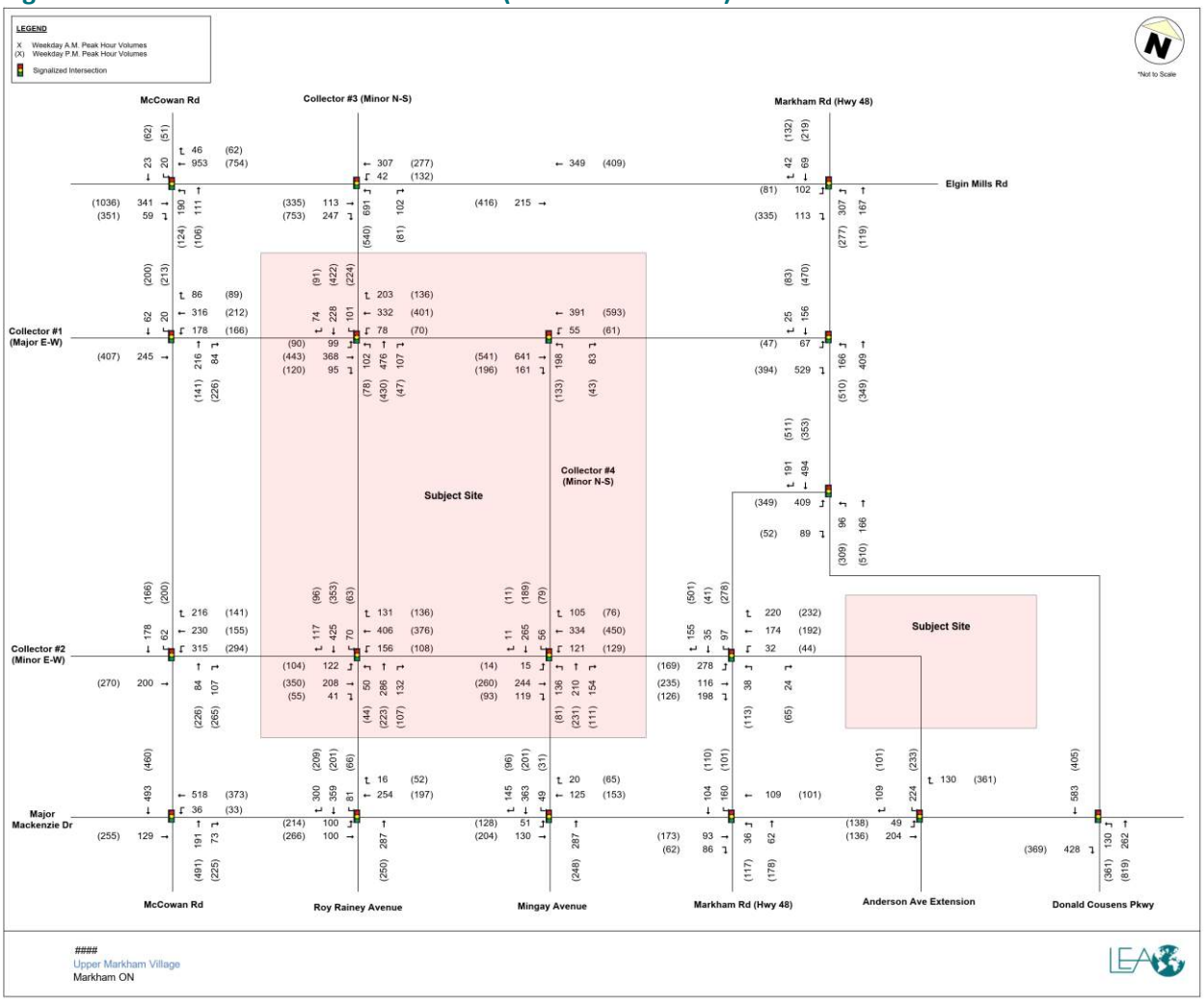


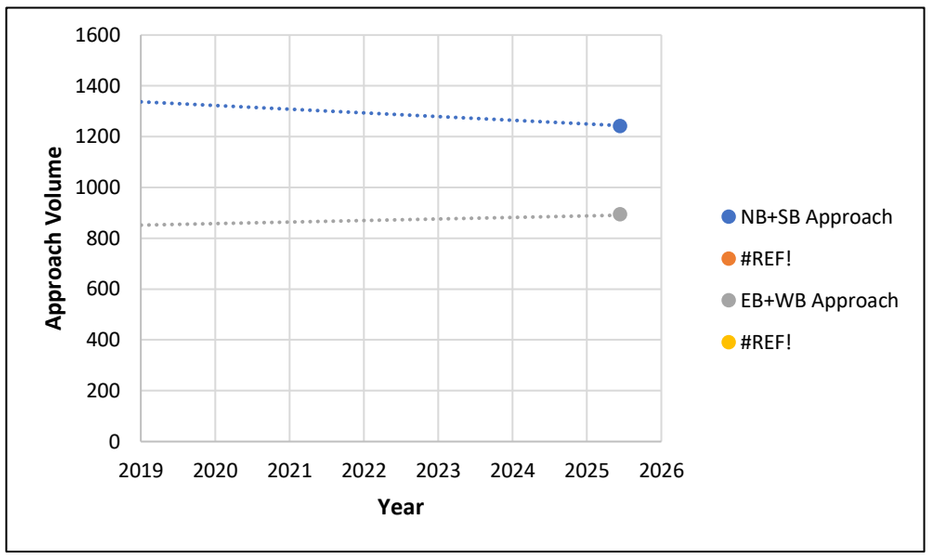
Figure 5-3: Site Traffic Peak Hour Volumes (2031 Full Buildout)



Corridor Growth

Intersection Markham Rd & Bur Oak Ave
Period AM Peak Hour

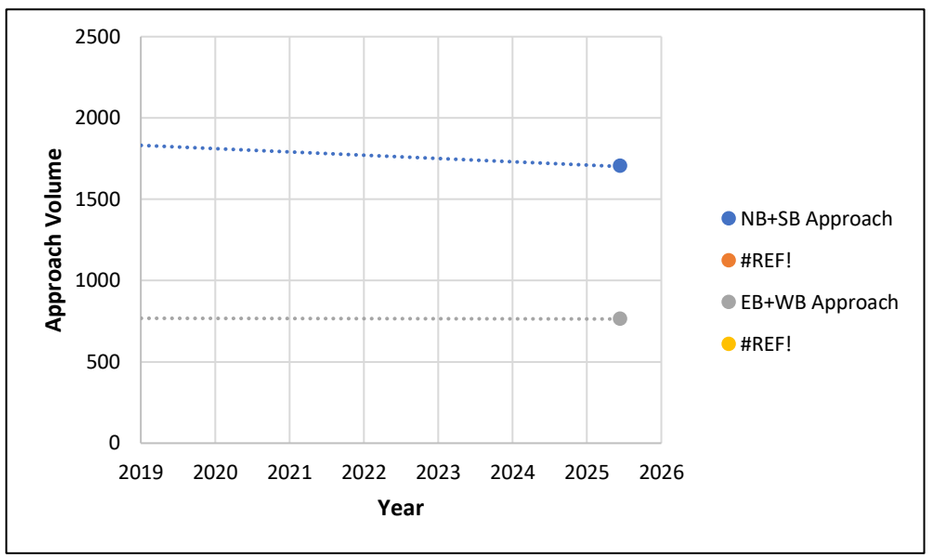
Date	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NB+SB Approach	EB+WB Approach
2017-11-14	66	424	121	112	559	48	50	252	81	159	271	84	1330	897
2018-04-25	66	468	123	107	554	54	37	225	70	149	241	70	1372	792
2025-06-17	55	401	81	105	513	87	91	243	68	129	255	108	1242	894
											Slope		-0.040	0.017
											Rate		**-1.17%**	**0.68%**



Corridor Growth

Intersection Markham Rd & Bur Oak Ave
Period PM Peak Hour

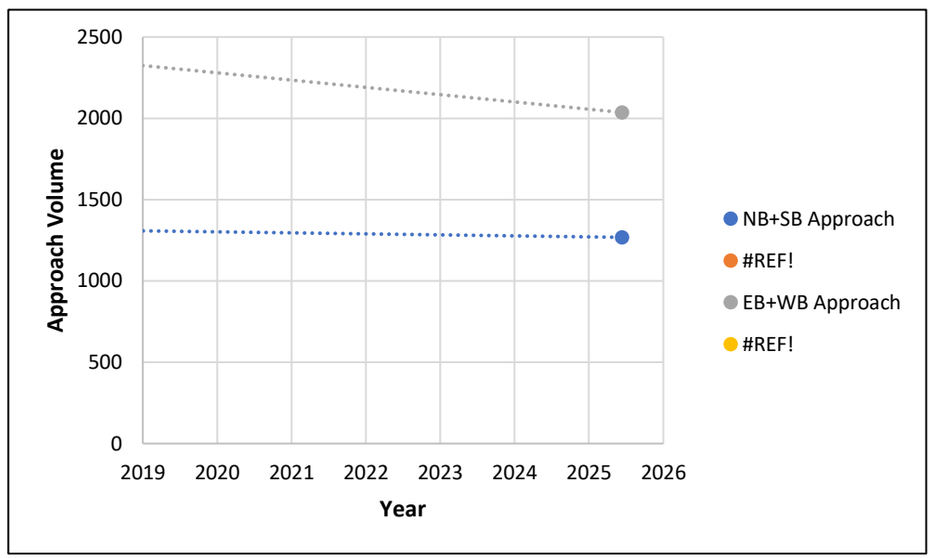
Date	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NB+SB Approach	EB+WB Approach
2017-11-14	182	758	214	90	619	50	58	156	120	156	214	103	1913	807
2018-04-25	179	664	184	87	614	55	39	134	102	147	228	78	1783	728
2025-06-17	163	654	175	94	581	38	52	164	76	159	221	94	1705	766
											Slope		-0.055	-0.002
											Rate		**-1.18%**	**-0.09%**



Corridor Growth

Intersection Markham Rd & 16th Avenue
Period AM Peak Hour

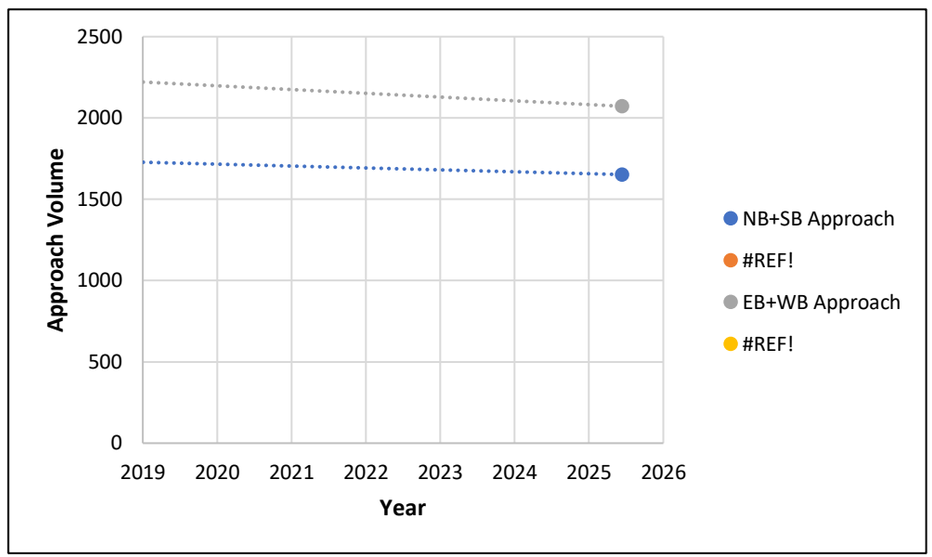
Date	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NB+SB Approach	EB+WB Approach
2017-11-14	113	264	89	176	460	213	128	680	168	223	924	252	1315	2375
													0	0
2025-06-17	132	336	63	155	435	147	153	685	141	161	746	150	1268	2036
											Slope		-0.017	-0.122
											Rate		**-0.49%**	**-2.19%**



Corridor Growth

Intersection Markham Rd & 16th Avenue
Period PM Peak Hour

Date	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NB+SB Approach	EB+WB Approach
2017-11-14	136	572	155	250	405	223	236	892	94	130	648	247	1741	2247
													0	0
2025-06-17	131	544	182	202	410	183	196	877	94	120	632	153	1652	2072
											Slope		-0.032	-0.063
											Rate		**-0.71%**	**-1.11%**



APPENDIX

D TTS Information

TTS Trip Distribution Summary

In order to inform the trip assignment stage of the analysis, informaton about the general trip distribution is required to inform the analysis. The distribution represents the proportion of trips to and away from the site in any given direction. The following pages summarizes the general trip distribution results, which were calculated using Transportation Tomorrow Survey (TTS) 2016 trip origin and destination data. Trips were grouped under cardinal directions based on the relative angle between trip origin and destination, and appropriate adjustments were made to the calculation to conform to local geography and street grid.

The "TTS Directional Distribution Summary" on the next page presents a summary of the calculations described above, along with notes on any details specific to the analysis in this report. The table shows the total number of trips to and from the subject site categorized into general directions (North, Northeast, East etc.) and the percentage share of trips in each general direction in all directions.

The pages after show graphical illustrations of the categorizations for all Traffic Analysis Zones (TAZ) in the TTS survey area. Note that the latest survey zones were last updated in 2006.

These results are used as reference information for the trip assignment. They do not directly determine the trip assignment on the study network. The final trip assignments are completed based on a combination of local context, engineering experience, and engineering judgement, with the trip distribution information presented here to illustrate general travel behaviour.

Directional Distribution Output (Eight Directions)																	
Time Periods	Internal								External								Total
	NW	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	
AM (IN)	0%	0%	25%	1%	11%	0%	29%	21%	2%	0%	0%	0%	0%	1%	7%	2%	100%
AM (OUT)	0%	2%	14%	1%	8%	1%	27%	15%	2%	0%	0%	0%	0%	6%	19%	5%	100%
PM (IN)	0%	3%	7%	1%	8%	4%	20%	17%	2%	0%	1%	2%	0%	5%	24%	7%	100%
PM (OUT)	0%	4%	9%	0%	7%	11%	29%	17%	1%	0%	0%	3%	0%	3%	14%	2%	100%

Directional Distribution Output (Four Directions)									
Time Periods	Internal				External				Total
	N	E	S	W	N	E	S	W	
AM (IN)	0%	1%	0%	21%	0%	0%	1%	2%	25%
AM (OUT)	2%	1%	1%	15%	0%	0%	6%	5%	31%
PM (IN)	3%	1%	4%	17%	0%	2%	5%	7%	38%
PM (OUT)	4%	0%	11%	17%	0%	3%	3%	2%	40%

TTS Directional Distribution Summary: Test Project

Notes:

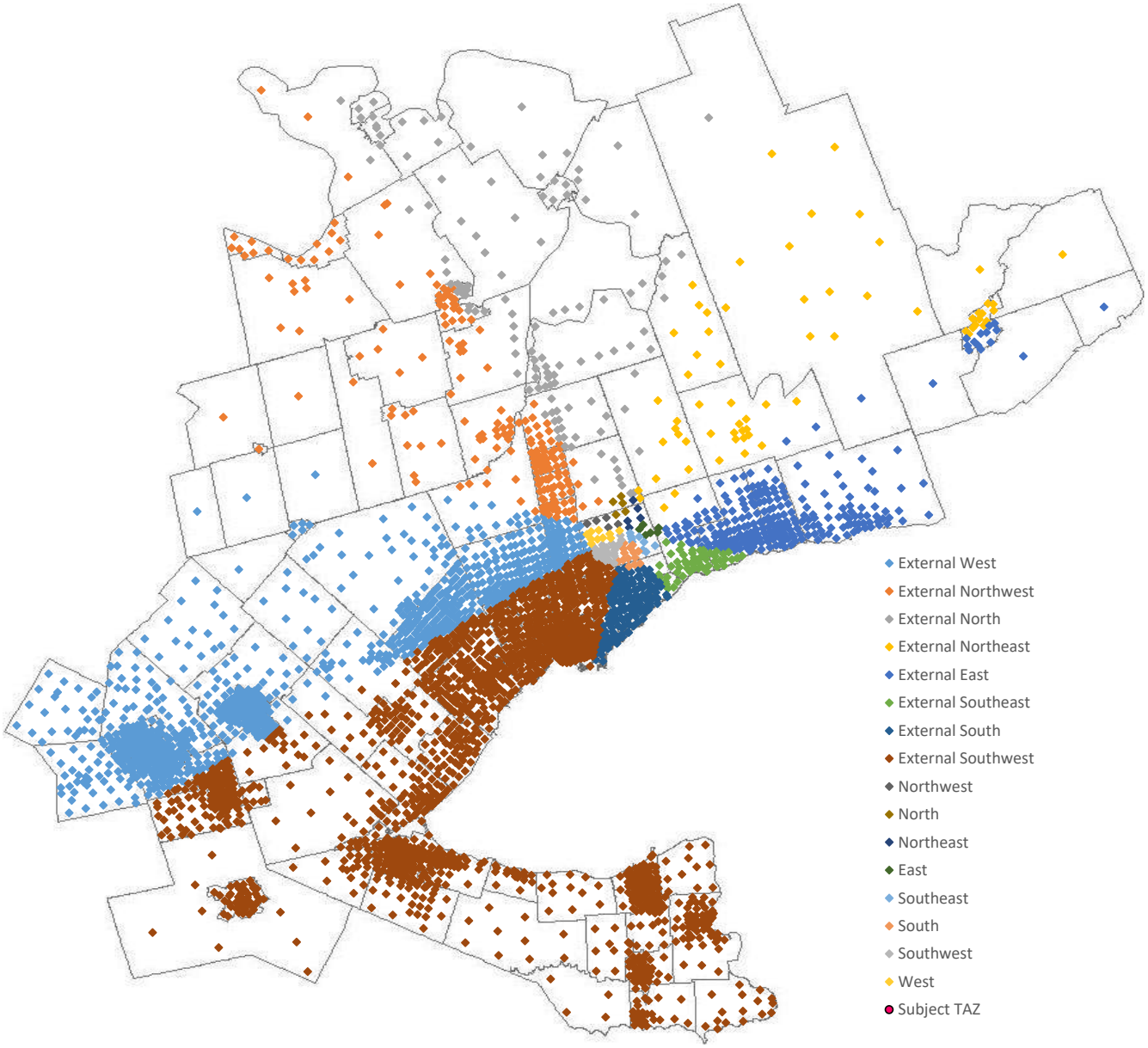
1. Directions determined based on centroid coordinates of destination/origin traffic analysis zones.

2. 'Internal' refers to local trips made within the defined radius, while 'External' refers to trips made to areas outside of the defined radius.

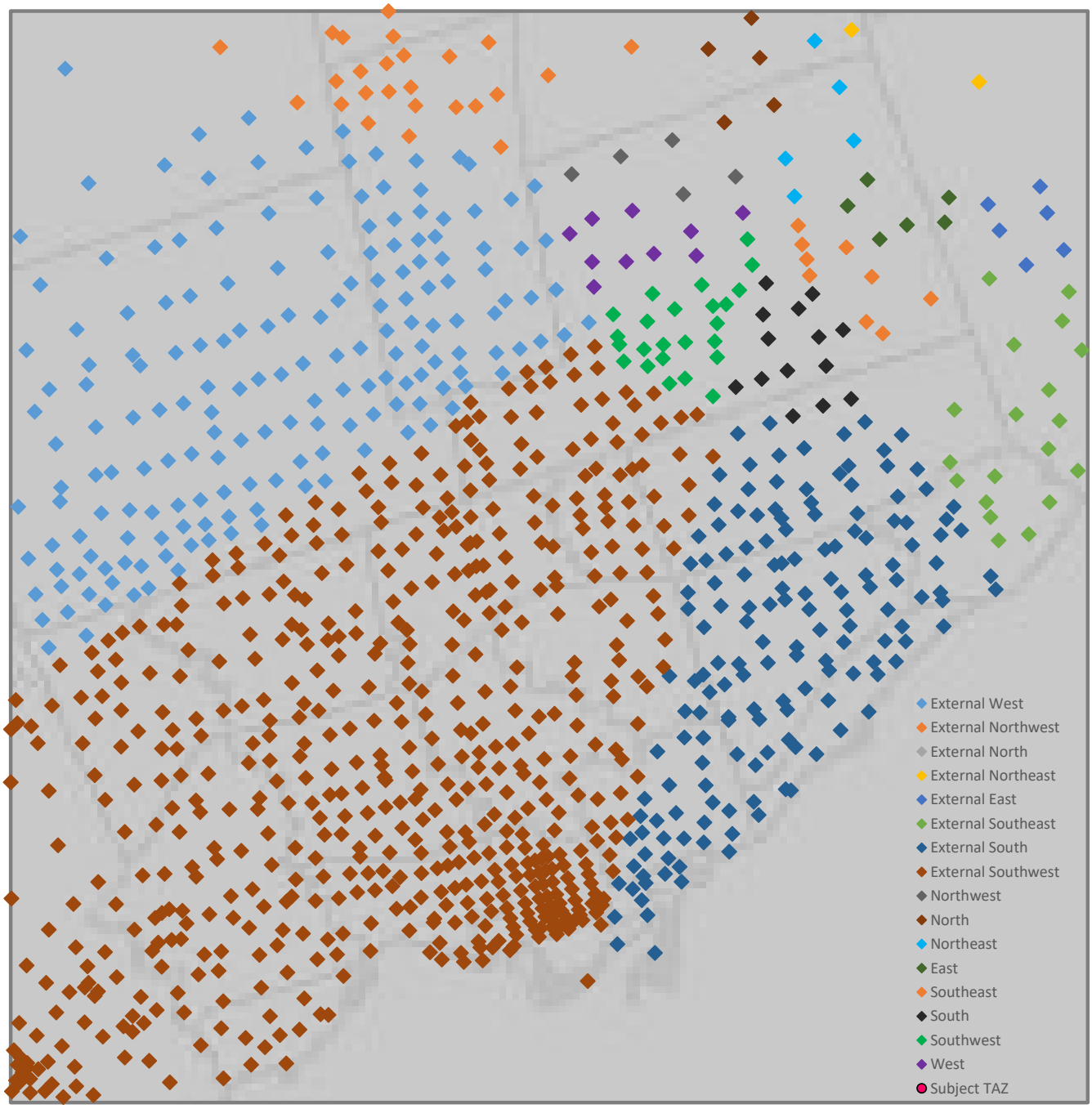
3. 'I' refers to local trips made within the subject TAZ that do not have a cardinal direction assigned to them. These trips are excluded from the analysis.

			Internal										External								
	Time Period	Direction	I	NW	N	NE	E	SE	S	SW	W	Total	NW	N	NE	E	SE	S	SW	W	Total
Trips	A.M.	Inbound	0	0	0	843	30	377	0	960	695	2905	74	0	0	0	0	37	246	62	419
		Outbound	0	0	318	2273	83	1272	244	4470	2455	11115	261	49	28	23	23	968	3042	880	5274
	P.M.	Inbound	0	0	360	859	83	1046	577	2599	2255	7779	267	16	170	240	28	629	3216	863	5429
		Outbound	0	0	168	393	0	327	505	1312	805	3510	51	0	0	124	19	148	652	99	1093
Percentage	A.M.	Inbound	0%	0%	0%	25%	1%	11%	0%	29%	21%	87%	2%	0%	0%	0%	0%	1%	7%	2%	13%
		Outbound	0%	0%	2%	14%	1%	8%	1%	27%	15%	68%	2%	0%	0%	0%	0%	6%	19%	5%	32%
	P.M.	Inbound	0%	0%	3%	7%	1%	8%	4%	20%	17%	59%	2%	0%	1%	2%	0%	5%	24%	7%	41%
		Outbound	0%	0%	4%	9%	0%	7%	11%	29%	17%	76%	1%	0%	0%	3%	0%	3%	14%	2%	24%

TAZ Directional Categorisation Visualisation (Complete TTS Survey Area)



TAZ Directional Categorisation Visualisation (City of Toronto)



AM IN

Wed Sep 24 2025 11:15:46 GMT-0700 (Pacific Daylight Time) - Run Time: 3604ms

Cross Tabulation Query Form - Trip - 2022

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of destination - gta06_dest

Filters:
2006 GTA zone of destination - gta06_dest In 2441,2440,2434,2435
and
Start time of trip - start_time In 0630-0930
and
Trip Purpose of Destination - purp_dest In H,

Trip 2022
Table:

,2434,2435,2440,2441
Auto driver,703,474,769,473
E-scooter,54,0,0,0
Auto passenger,135,27,13,45
Walk,213,116,304,52

	Auto driver	E-Scooter	Auto passenger	Walk	
2434	703	54	135	213	
2435	474	0	27	116	
2440	769	0	13	404	
2441	473	0	45	52	
	2419	54	220	785	3478
	69.55%	1.55%	6.33%	22.57%	100.00%

AM OUT

Wed Sep 24 2025 11:18:19 GMT-0700 (Pacific Daylight Time) - Run Time: 4094ms

Cross Tabulation Query Form - Trip - 2022

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of origin - gta06_orig

Filters:
2006 GTA zone of origin - gta06_orig In 2441,2440,2434,2435
and
Start time of trip - start_time In 0630-0930
and
Trip Purpose of Origin - purp_orig In H,

Trip 2022
Table:

,2434,2435,2440,2441
Transit excluding GO rail,159,60,34,61
Cycle,30,54,49,0
Auto driver,2272,1600,2155,1630
E-scooter,107,0,0,0
GO rail only,117,65,88,45
Joint GO rail and local transit,52,43,11,0
Auto passenger,1447,813,1196,694
School bus,199,295,140,112
Paid rideshare,0,13,0,0
Walk,795,928,796,490

	Transit excluding GO rail	Cycle	Auto driver	E-scooter	Go rail only	Joint GO rail and local transit	Auto passenger	School bus	Paid rideshare	Walk	
2434	159	30	2272	107	117	52	1447	199	0	795	
2435	60	54	1600	0	65	43	813	295	13	928	
2440	34	49	2155	0	88	11	1196	140	0	796	
2441	61	0	1630	0	45	0	694	112	0	490	
	314	133	7657	107	315	106	4150	746	13	3009	16550
	1.90%	0.80%	46.27%	0.65%	1.90%	0.64%	25.08%	4.51%	0.08%	18.18%	100.00%

PM IN

Wed Sep 24 2025 11:16:19 GMT-0700 (Pacific Daylight Time) - Run Time: 3842ms

Cross Tabulation Query Form - Trip - 2022

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of destination - gta06_dest

Filters:
2006 GTA zone of destination - gta06_dest In 2441,2440,2434,2435
and
Start time of trip - start_time In 1530-1830
and
Trip Purpose of Destination - purp_dest In H,

Trip 2022
Table:

,2434,2435,2440,2441
Transit excluding GO rail,69,60,83,68
Cycle,11,0,42,0
Auto driver,2373,2198,2154,1335
GO rail only,57,23,88,45
Joint GO rail and local transit,24,44,15,19
Other,12,0,0,0
Auto passenger,1386,851,700,472
School bus,66,187,14,65
Taxi passenger,60,0,0,0
Paid rideshare,17,0,0,0
Walk,388,322,15,42

	Transit excluding GO rail	Cycle	Auto driver	GO rail only	Joint GO rail and local transit	Other	Auto passenger	School bus	Taxi passenger	Paid rideshare	Walk	
2434	69	11	2373	57	24	12	1386	55	60	17	388	
2435	60	0	2198	23	44	0	851	187	0	0	322	
2440	83	42	2154	88	15	0	700	14	0	0	15	
2441	68	0	1335	45	19	0	472	65	0	0	42	
	280	53	8060	213	102	12	3409	321	60	17	767	13294
	2.11%	0.40%	60.63%	1.60%	0.77%	0.09%	25.64%	2.41%	0.45%	0.13%	5.77%	100.00%

PM OUT

Wed Sep 24 2025 11:17:56 GMT-0700 (Pacific Daylight Time) - Run Time: 3768ms

Cross Tabulation Query Form - Trip - 2022

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of origin - gta06_orig

Filters:
2006 GTA zone of origin - gta06_orig In 2441,2440,2434,2435
and
Start time of trip - start_time In 1530-1830
and
Trip Purpose of Origin - purp_orig In H,

Trip 2022
Table:

,2434,2435,2440,2441
Cycle,0,4,0,0
Auto driver,846,938,816,398
Auto passenger,418,326,358,267
Paid rideshare,17,0,0,0
Walk,195,14,0,0

	Cycle	Auto driver	Auto passenger	Paid rideshare	Walk	
2434	0	846	418	17	195	
2435	4	938	326	0	14	
2440	0	816	358	0	0	
2441	0	398	267	0	0	
	4	2998	1369	17	209	4597
	0.09%	65.22%	29.78%	0.37%	4.55%	100.00%

APPENDIX

E Trip Generation Calculations

Land Use: 222
Multifamily Housing (High-Rise)

Description

High-rise multifamily housing is a residential building with more than 10 floors (levels) of residence. Access to individual dwelling units is through an outside building entrance, a lobby, elevators, and a set of hallways.

Land Use Subcategory

Data are presented for two subcategories for this land use: (1) not close to rail transit and (2) close to rail transit. A site is considered close to rail transit if the walking distance between the residential site entrance and the closest rail transit station entrance is ½ mile or less.

Additional Data

For the 12 sites for which both the number of residents and the number of occupied dwelling units were available, there was an average of 1.6 residents per occupied dwelling unit.

For the 26 sites for which the numbers of both total dwelling units and occupied dwelling units were available, an average of 98 percent of the total dwelling units were occupied.

It is expected that the number of bedrooms and number of residents are likely correlated to the trips generated by a residential site. To assist in future analysis, trip generation studies of all multifamily housing should attempt to obtain information on occupancy rate and on the mix of residential unit sizes (i.e., number of units by number of bedrooms at the site complex).

The sites were surveyed in the 2000s and the 2010s in California, District of Columbia, New York, Ontario (CAN), Oregon, and Virginia.

Source Numbers

818, 862, 901, 910, 949, 963, 964, 966, 967, 1056, 1057, 1076, 1077

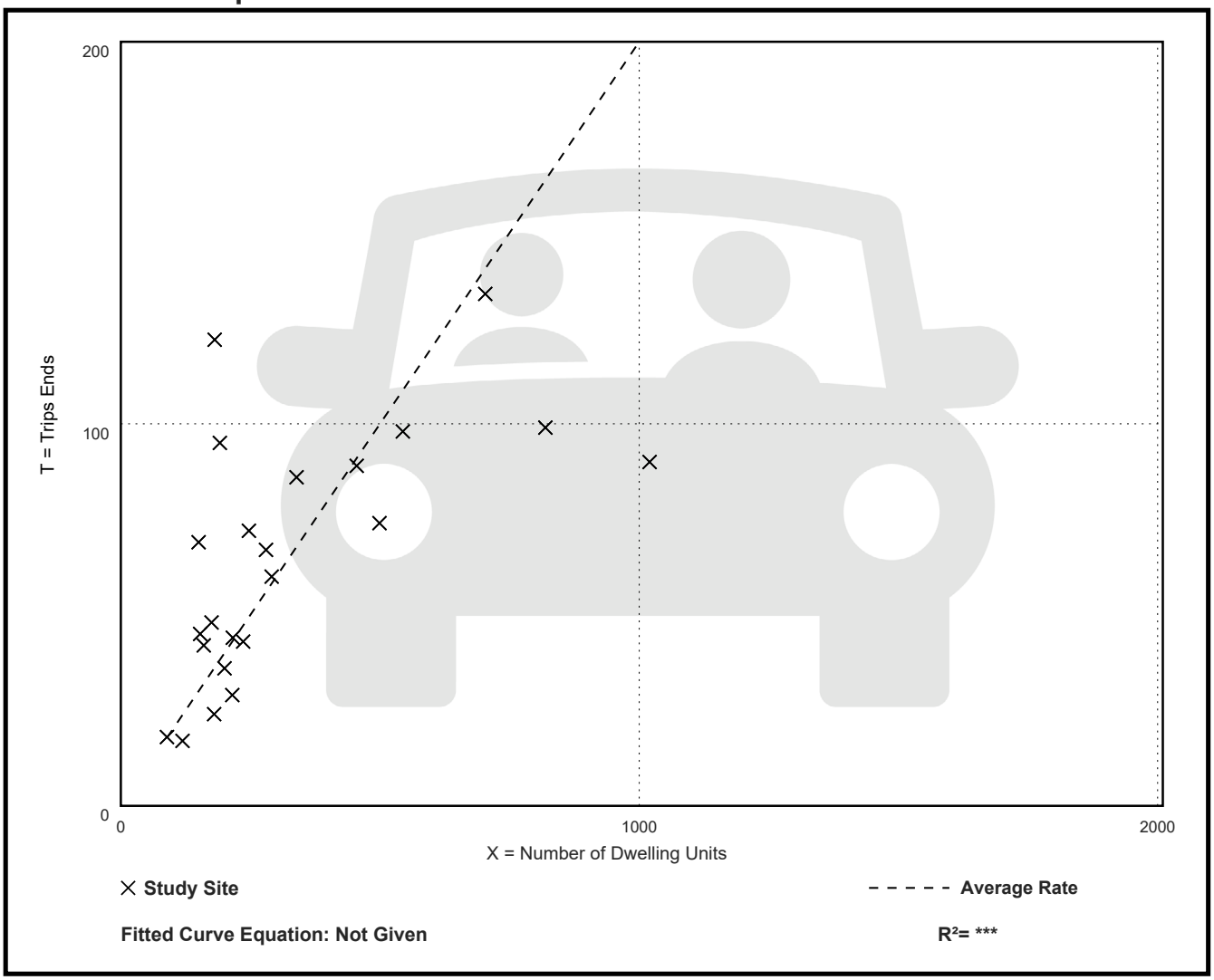
Multifamily Housing (High-Rise)
Not Close to Rail Transit (222)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	23
Avg. Num. of Dwelling Units:	324
Directional Distribution:	29% entering, 71% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.20	0.09 - 0.67	0.12

Data Plot and Equation



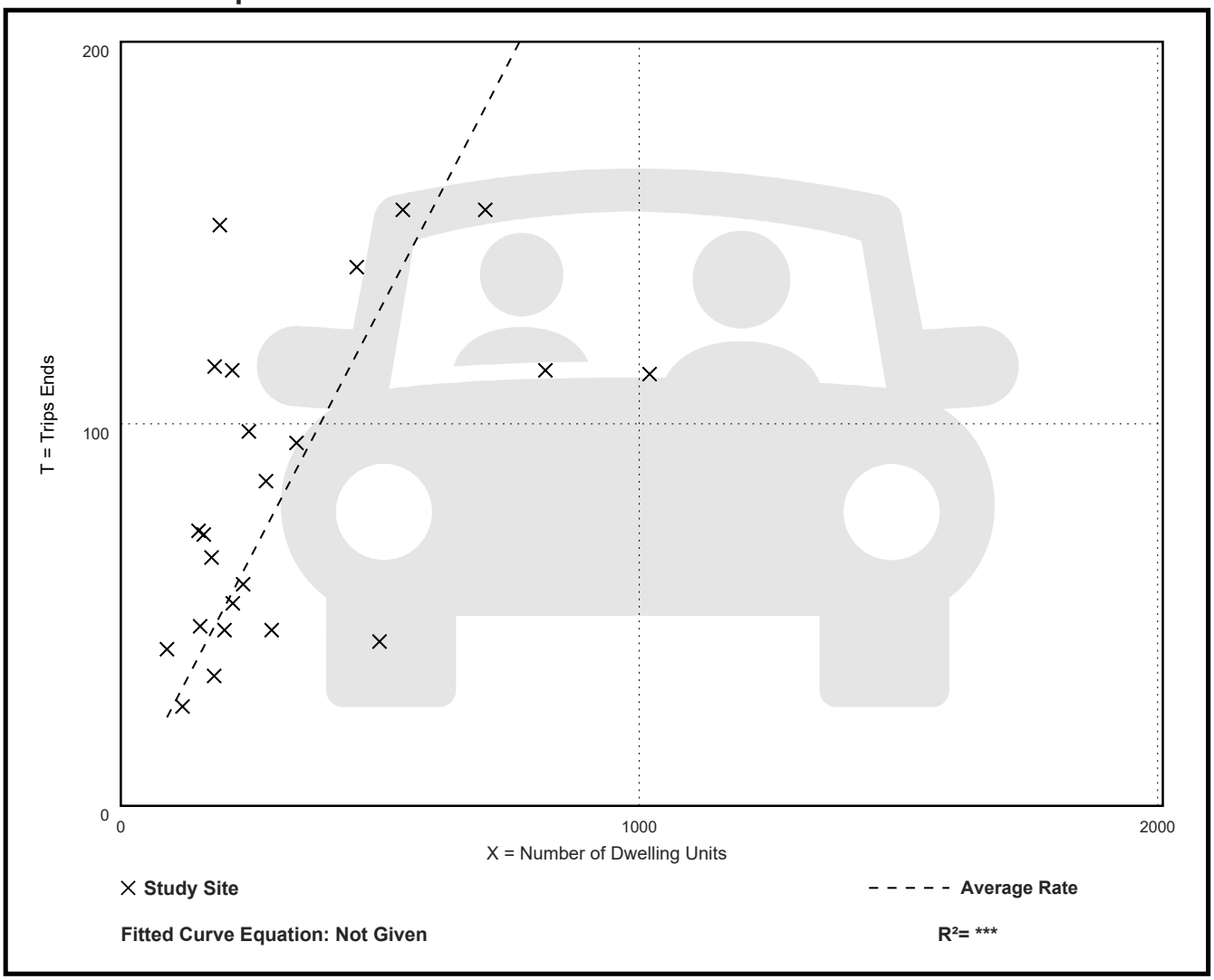
Multifamily Housing (High-Rise)
Not Close to Rail Transit (222)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 23
Avg. Num. of Dwelling Units: 324
Directional Distribution: 61% entering, 39% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.26	0.09 - 0.80	0.16

Data Plot and Equation



APPENDIX

F LOS Definitions

LEVEL OF SERVICE DEFINITIONS AT SIGNALIZED INTERSECTIONS[1]

Level of service for signalized intersections is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and lost travel time. Specifically, level-of-service (LOS) criteria are stated in terms of the average control delay per vehicle, typically for a 15-min analysis period. The criteria are given in the table below. Delay may be measured in the field or estimated using software such as Highway Capacity Software. Delay is a complex measure and is dependent upon a number of variables, including quality of progression, the cycle length, the green ratio, and the *v/c* ratio for the lane group in question.

Level of Service	Features	Control Delay per vehicle (sec)
A	LOS A describes operations with very low delay, up to 10 sec per vehicle. This level of service occurs when progression is extremely favourable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.	≤ 10
B	LOS B describes operations with delay greater than 10 and up to 20 sec per vehicle. This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of average delay.	> 10 and ≤ 20
C	LOS C describes operations with delay greater than 20 and up to 35 sec per vehicle. These higher delays may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.	> 20 and ≤ 35
D	LOS D describes operations with delay greater than 35 and up to 55 sec per vehicle. At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavourable progression, long cycle lengths, of high *v/c* ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.	> 35 and ≤ 55
E	LOS E describes operations with delay greater than 55 and up to 80 sec per vehicle. This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high *v/c* ratios. Individual cycle failures are frequent occurrences.	> 55 and ≤ 80
F	LOS F describes operations with delay in excess of 80 sec per vehicle. This level, considered to be unacceptable to most drivers, often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of the intersection. It may also occur at high *v/c* ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.	> 80

(1) Highway Capacity Manual 2000

LEVEL OF SERVICE DEFINITIONS AT UNSIGNALIZED INTERSECTIONS[1]

The level of service criteria for unsignalized intersections are given in the table below. As used here, total delay is defined as the total elapsed time from when a vehicle stops at the end of the queue until the vehicle departs from the stop line; this time includes the time required for the vehicle to travel from the last-in-queue position to the first-in-queue position. The average total delay for any particular minor movement is a function of the service rate or capacity of the approach and the degree of saturation.

Level of Service	Features	Average Total Delay (sec/veh)
A	Little or no traffic delay occurs. Approaches appear open, turning movements are easily made, and drivers have freedom of operation.	≤ 10
B	Short traffic delays occur. Many drivers begin to feel somewhat restricted in terms of freedom of operation.	> 10 and ≤ 15
C	Average traffic delays occur. Operations are generally stable, but drivers emerging from the minor street may experience difficulty in completing their movement. This may occasionally impact on the stability of flow on the major street.	> 15 and ≤ 25
D	Long traffic delays occur. Motorists emerging from the minor street experience significant restriction and frustration. Drivers on the major street will experience congestion and delay as drivers emerging from the minor street interfere with the major through movements.	> 25 and ≤ 35
E	Very long traffic delays occur. Operations approach the capacity of the intersection.	> 35 and ≤ 50
F	Saturation occurs, with vehicle demand exceeding the available capacity. Very long traffic delays occur.	> 50

(1) Highway Capacity Manual 2000.

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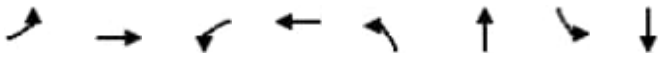
APPENDIX

G Traffic Analysis Reports

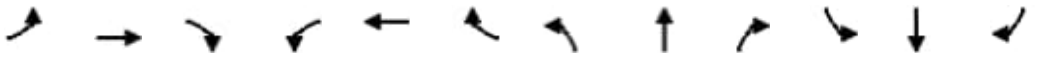
APPENDIX

G-1 *Existing Synchro Worksheets*



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	97	331	137	386	59	513	112	639
v/c Ratio	0.23	0.37	0.33	0.38	0.16	0.41	0.26	0.50
Control Delay (s/veh)	17.9	25.2	19.3	22.9	16.7	24.8	17.3	26.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	17.9	25.2	19.3	22.9	16.7	24.8	17.3	26.5
Queue Length 50th (m)	10.9	23.0	15.7	25.1	6.7	42.2	13.1	55.8
Queue Length 95th (m)	20.1	34.3	27.1	37.4	14.1	57.6	23.7	73.9
Internal Link Dist (m)		129.9		116.8		249.3		213.8
Turn Bay Length (m)	70.0		55.0		55.0		70.0	
Base Capacity (vph)	424	1336	418	1342	375	1263	432	1281
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.25	0.33	0.29	0.16	0.41	0.26	0.50

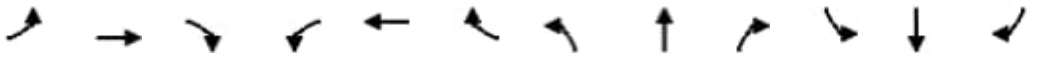
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	91	243	68	129	255	108	55	401	81	105	513	87
Future Volume (vph)	91	243	68	129	255	108	55	401	81	105	513	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.96		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1777	3324		1753	3290		1781	3339		1763	3396	
Flt Permitted	0.52	1.00		0.50	1.00		0.33	1.00		0.42	1.00	
Satd. Flow (perm)	979	3324		931	3290		618	3339		771	3396	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	97	259	72	137	271	115	59	427	86	112	546	93
RTOR Reduction (vph)	0	26	0	0	48	0	0	15	0	0	12	0
Lane Group Flow (vph)	97	305	0	137	338	0	59	498	0	112	627	0
Confl. Peds. (#/hr)	20		34	34		20	20		14	14		20
Confl. Bikes (#/hr)						3						7
Heavy Vehicles (%)	0%	2%	2%	1%	2%	1%	0%	3%	4%	1%	2%	0%
Bus Blockages (#/hr)	0	5	0	0	5	0	0	3	0	0	3	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	30.9	25.6		34.7	27.5		40.4	35.1		40.4	35.1	
Effective Green, g (s)	30.9	25.6		34.7	27.5		40.4	35.1		40.4	35.1	
Actuated g/C Ratio	0.32	0.27		0.36	0.29		0.42	0.37		0.42	0.37	
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	362	893		401	950		327	1231		382	1252	
v/s Ratio Prot	0.01	0.09		c0.03	c0.10		0.01	0.15		c0.02	c0.18	
v/s Ratio Perm	0.07			0.10			0.07			0.11		
v/c Ratio	0.27	0.34		0.34	0.36		0.18	0.40		0.29	0.50	
Uniform Delay, d1	23.0	28.0		20.9	26.8		16.6	22.3		16.9	23.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.2		0.5	0.2		0.3	1.0		0.4	1.4	
Delay (s)	23.4	28.2		21.4	27.1		16.8	23.3		17.4	24.7	
Level of Service	C	C		C	C		B	C		B	C	
Approach Delay (s/veh)		27.1			25.6			22.6			23.6	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	24.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	95.2	Sum of lost time (s)	22.0
Intersection Capacity Utilization	80.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



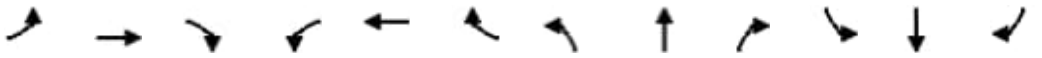
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	0	35	3	0	1	26	588	5	5	736	0
Future Volume (Veh/h)	9	0	35	3	0	1	26	588	5	5	736	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	0	38	3	0	1	28	639	5	5	800	0
Pedestrians		25			11						1	
Lane Width (m)		3.5			3.5						3.5	
Walking Speed (m/s)		1.0			1.0						1.0	
Percent Blockage		2			1						0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								190			273	
pX, platoon unblocked	0.91	0.91	0.90	0.91	0.91	0.98	0.90			0.98		
vC, conflicting volume	1213	1546	425	1157	1544	334	825			655		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	923	1288	144	862	1285	267	588			596		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	100	95	99	100	100	97			99		
cM capacity (veh/h)	192	138	777	205	139	711	877			956		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	10	38	4	28	426	218	5	533	267
Volume Left	10	0	3	28	0	0	5	0	0
Volume Right	0	38	1	0	0	5	0	0	0
cSH	192	777	250	877	1700	1700	956	1700	1700
Volume to Capacity	0.05	0.05	0.02	0.03	0.25	0.13	0.01	0.31	0.16
Queue Length 95th (m)	1.2	1.2	0.4	0.8	0.0	0.0	0.1	0.0	0.0
Control Delay (s/veh)	24.8	9.9	19.7	9.2	0.0	0.0	8.8	0.0	0.0
Lane LOS	C	A	C	A			A		
Approach Delay (s/veh)	13.0		19.7	0.4			0.1		
Approach LOS	B		C						

Intersection Summary				
Average Delay	0.7			
Intersection Capacity Utilization	31.9%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBL	EBT	NBL	NBT	SBT
Lane Group Flow (vph)	43	100	56	590	775
v/c Ratio	0.21	0.22	0.10	0.22	0.34
Control Delay (s/veh)	34.9	1.2	5.0	5.4	10.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	34.9	1.2	5.0	5.4	10.5
Queue Length 50th (m)	6.5	0.0	1.8	13.7	31.3
Queue Length 95th (m)	15.2	0.0	8.5	37.2	66.3
Internal Link Dist (m)		103.2		447.4	165.7
Turn Bay Length (m)	50.0		65.0		
Base Capacity (vph)	471	704	552	2626	2264
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.09	0.14	0.10	0.22	0.34

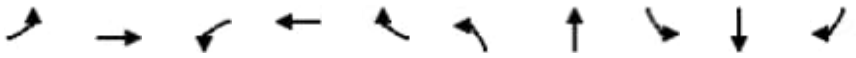
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	0	97	0	0	0	54	572	0	0	716	36
Future Volume (vph)	42	0	97	0	0	0	54	572	0	0	716	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5					4.0	7.0			7.0	
Lane Util. Factor	1.00	1.00					1.00	0.95			0.95	
Frpb, ped/bikes	1.00	0.98					1.00	1.00			1.00	
Flpb, ped/bikes	0.99	1.00					1.00	1.00			1.00	
Frt	1.00	0.85					1.00	1.00			0.99	
Flt Protected	0.95	1.00					0.95	1.00			1.00	
Satd. Flow (prot)	1714	1563					1782	3479			3446	
Flt Permitted	0.76	1.00					0.32	1.00			1.00	
Satd. Flow (perm)	1366	1563					595	3479			3446	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	43	0	100	0	0	0	56	590	0	0	738	37
RTOR Reduction (vph)	0	88	0	0	0	0	0	0	0	0	3	0
Lane Group Flow (vph)	43	12	0	0	0	0	56	590	0	0	772	0
Confl. Peds. (#/hr)	11		8	8		11	11					11
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	3%	2%	0%	2%	2%	2%	0%	2%	2%	2%	2%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	3	0	0	3	0
Turn Type	Perm	NA					pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	11.0	11.0					66.4	66.4			56.8	
Effective Green, g (s)	11.0	11.0					66.4	66.4			56.8	
Actuated g/C Ratio	0.12	0.12					0.73	0.73			0.62	
Clearance Time (s)	6.5	6.5					4.0	7.0			7.0	
Vehicle Extension (s)	3.0	3.0					3.0	3.0			3.0	
Lane Grp Cap (vph)	165	189					507	2541			2153	
v/s Ratio Prot		0.01					0.01	c0.17			c0.22	
v/s Ratio Perm	c0.03						0.07					
v/c Ratio	0.26	0.06					0.11	0.23			0.36	
Uniform Delay, d1	36.3	35.4					3.7	4.0			8.2	
Progression Factor	1.00	1.00					1.00	1.00			1.00	
Incremental Delay, d2	0.8	0.1					0.1	0.2			0.5	
Delay (s)	37.1	35.5					3.8	4.2			8.7	
Level of Service	D	D					A	A			A	
Approach Delay (s/veh)		36.0			0.0			4.2			8.7	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	9.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	90.9	Sum of lost time (s)	17.5
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		

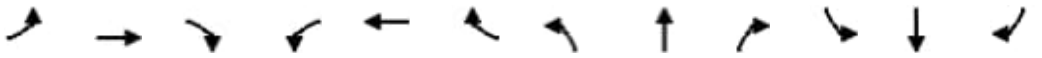
c Critical Lane Group



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	156	843	164	761	153	135	407	158	444	150
v/c Ratio	0.46	0.60	0.52	0.51	0.21	0.67	0.48	0.45	0.88	0.29
Control Delay (s/veh)	21.5	33.0	22.0	29.4	4.5	43.2	42.0	29.7	64.5	6.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	21.5	33.0	22.0	29.4	4.5	43.2	42.0	29.7	64.5	6.6
Queue Length 50th (m)	19.6	87.3	20.8	75.3	0.0	22.1	44.6	26.3	107.7	0.2
Queue Length 95th (m)	33.7	120.8	35.4	98.9	13.3	#35.6	60.7	40.0	142.9	15.1
Internal Link Dist (m)		115.5		150.8			147.9		447.4	
Turn Bay Length (m)	65.0		115.0		90.0	40.0		50.0		
Base Capacity (vph)	340	1396	382	1504	744	205	877	396	573	572
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.46	0.60	0.43	0.51	0.21	0.66	0.46	0.40	0.77	0.26

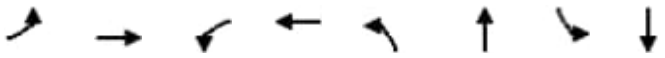
Intersection Summary

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



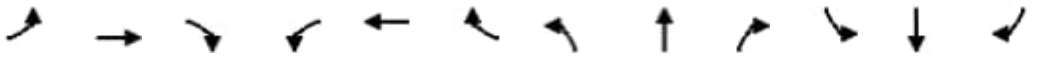
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	153	685	141	161	746	150	132	336	63	155	435	147
Future Volume (vph)	153	685	141	161	746	150	132	336	63	155	435	147
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.95		1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1766	3370		1748	3500	1529	1765	3371		1728	1842	1509
Flt Permitted	0.29	1.00		0.22	1.00	1.00	0.19	1.00		0.38	1.00	1.00
Satd. Flow (perm)	532	3370		396	3500	1529	358	3371		688	1842	1509
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	156	699	144	164	761	153	135	343	64	158	444	150
RTOR Reduction (vph)	0	12	0	0	0	87	0	12	0	0	0	108
Lane Group Flow (vph)	156	831	0	164	761	66	135	395	0	158	444	42
Confl. Peds. (#/hr)	9		16	16		9	18		13	13		18
Heavy Vehicles (%)	1%	2%	0%	2%	2%	0%	1%	2%	4%	3%	2%	1%
Bus Blockages (#/hr)	0	3	0	0	0	5	0	3	0	0	0	3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2		2	8			4		4
Actuated Green, G (s)	61.2	53.4		66.0	55.8	55.8	39.8	32.0		47.0	35.6	35.6
Effective Green, g (s)	61.2	53.4		66.0	55.8	55.8	39.8	32.0		47.0	35.6	35.6
Actuated g/C Ratio	0.47	0.41		0.51	0.43	0.43	0.31	0.25		0.36	0.27	0.27
Clearance Time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0		2.0	3.0	3.0
Lane Grp Cap (vph)	324	1384		307	1502	656	194	829		339	504	413
v/s Ratio Prot	0.03	c0.25		c0.04	0.22		c0.04	0.12		c0.04	c0.24	
v/s Ratio Perm	0.20			0.23		0.04	0.17			0.13		0.03
v/c Ratio	0.48	0.60		0.53	0.51	0.10	0.70	0.48		0.47	0.88	0.10
Uniform Delay, d1	20.6	30.0		19.5	27.1	22.1	35.6	41.8		29.6	45.2	35.3
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.4	1.9		0.9	1.2	0.3	8.4	0.4		0.4	16.4	0.1
Delay (s)	21.0	31.9		20.4	28.3	22.4	44.1	42.3		29.9	61.5	35.4
Level of Service	C	C		C	C	C	D	D		C	E	D
Approach Delay (s/veh)		30.2			26.2			42.7			49.7	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	35.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	85.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	55	255	169	335	173	882	100	658
v/c Ratio	0.13	0.29	0.41	0.31	0.48	0.66	0.35	0.53
Control Delay (s/veh)	16.7	18.8	21.4	20.7	20.7	29.3	19.2	28.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	16.7	18.8	21.4	20.7	20.7	29.3	19.2	28.4
Queue Length 50th (m)	6.0	13.2	19.8	20.6	21.1	83.9	11.7	59.7
Queue Length 95th (m)	12.7	22.5	33.2	31.7	34.8	107.7	21.5	78.5
Internal Link Dist (m)		129.9		116.8		249.3		213.8
Turn Bay Length (m)	70.0		55.0		55.0		70.0	
Base Capacity (vph)	425	1293	410	1311	369	1335	282	1239
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.20	0.41	0.26	0.47	0.66	0.35	0.53

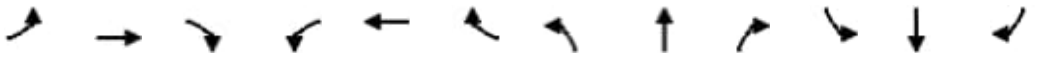
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	52	164	76	159	221	94	163	654	175	94	581	38
Future Volume (vph)	52	164	76	159	221	94	163	654	175	94	581	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.96		1.00	0.97		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1773	3237		1685	3302		1781	3386		1749	3482	
Flt Permitted	0.55	1.00		0.53	1.00		0.29	1.00		0.21	1.00	
Satd. Flow (perm)	1026	3237		936	3302		544	3386		392	3482	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	55	174	81	169	235	100	173	696	186	100	618	40
RTOR Reduction (vph)	0	58	0	0	47	0	0	20	0	0	4	0
Lane Group Flow (vph)	55	197	0	169	288	0	173	862	0	100	654	0
Confl. Peds. (#/hr)	24		31	31		24	28		21	21		28
Confl. Bikes (#/hr)			1						2			4
Heavy Vehicles (%)	0%	4%	0%	5%	1%	2%	0%	1%	1%	2%	1%	0%
Bus Blockages (#/hr)	0	5	0	0	5	0	0	2	0	0	2	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	30.0	26.2		36.6	29.5		44.8	37.1		40.2	34.8	
Effective Green, g (s)	30.0	26.2		36.6	29.5		44.8	37.1		40.2	34.8	
Actuated g/C Ratio	0.31	0.27		0.37	0.30		0.46	0.38		0.41	0.36	
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	343	867		404	996		346	1284		236	1238	
v/s Ratio Prot	0.01	0.06		c0.03	0.09		c0.04	c0.25		0.02	0.19	
v/s Ratio Perm	0.04			c0.13			0.19			0.15		
v/c Ratio	0.16	0.23		0.42	0.29		0.50	0.67		0.42	0.53	
Uniform Delay, d1	24.3	27.9		21.3	26.1		16.6	25.3		18.8	25.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.1		0.7	0.2		1.1	2.8		1.2	1.6	
Delay (s)	24.5	28.0		22.1	26.3		17.8	28.1		20.1	26.6	
Level of Service	C	C		C	C		B	C		C	C	
Approach Delay (s/veh)		27.4			24.9			26.4			25.7	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	26.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	97.8	Sum of lost time (s)	22.0
Intersection Capacity Utilization	84.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group



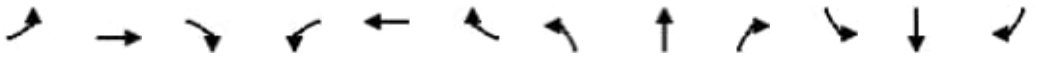
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	0	28	11	0	10	39	900	10	5	811	10
Future Volume (Veh/h)	14	0	28	11	0	10	39	900	10	5	811	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	15	0	30	12	0	11	42	968	11	5	872	11
Pedestrians		29			19						3	
Lane Width (m)		3.5			3.5						3.5	
Walking Speed (m/s)		1.0			1.0						1.0	
Percent Blockage		3			2						0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								190			273	
pX, platoon unblocked	0.93	0.93	0.87	0.93	0.93	0.89	0.87			0.89		
vC, conflicting volume	1499	1999	471	1553	1999	512	912			998		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	852	1391	103	910	1391	207	608			753		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	100	96	94	100	98	95			99		
cM capacity (veh/h)	210	118	797	188	118	703	831			757		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	15	30	23	42	645	334	5	581	302
Volume Left	15	0	12	42	0	0	5	0	0
Volume Right	0	30	11	0	0	11	0	0	11
cSH	210	797	290	831	1700	1700	757	1700	1700
Volume to Capacity	0.07	0.04	0.08	0.05	0.38	0.20	0.01	0.34	0.18
Queue Length 95th (m)	1.7	0.9	2.0	1.2	0.0	0.0	0.2	0.0	0.0
Control Delay (s/veh)	23.5	9.7	18.5	9.6	0.0	0.0	9.8	0.0	0.0
Lane LOS	C	A	C	A			A		
Approach Delay (s/veh)	14.3		18.5	0.4			0.1		
Approach LOS	B		C						

Intersection Summary				
Average Delay	0.8			
Intersection Capacity Utilization	47.1%	ICU Level of Service		A
Analysis Period (min)	15			

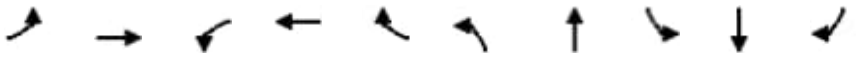
Lane Group	EBL	EBT	NBL	NBT	SBT
Lane Group Flow (vph)	78	99	137	960	936
v/c Ratio	0.32	0.21	0.32	0.40	0.49
Control Delay (s/veh)	36.0	1.0	7.7	8.4	15.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	36.0	1.0	7.7	8.4	15.4
Queue Length 50th (m)	12.3	0.0	4.6	26.0	40.5
Queue Length 95th (m)	24.5	0.0	17.7	65.8	89.0
Internal Link Dist (m)		103.2		447.4	165.7
Turn Bay Length (m)	50.0		65.0		
Base Capacity (vph)	431	658	458	2406	1923
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.18	0.15	0.30	0.40	0.49

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	0	89	0	0	0	123	864	0	0	778	65
Future Volume (vph)	70	0	89	0	0	0	123	864	0	0	778	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5					4.0	7.0			7.0	
Lane Util. Factor	1.00	1.00					1.00	0.95			0.95	
Frpb, ped/bikes	1.00	0.98					1.00	1.00			1.00	
Flpb, ped/bikes	0.98	1.00					1.00	1.00			1.00	
Frt	1.00	0.85					1.00	1.00			0.99	
Flt Protected	0.95	1.00					0.95	1.00			1.00	
Satd. Flow (prot)	1750	1563					1783	3520			3433	
Flt Permitted	0.76	1.00					0.24	1.00			1.00	
Satd. Flow (perm)	1395	1563					445	3520			3433	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	78	0	99	0	0	0	137	960	0	0	864	72
RTOR Reduction (vph)	0	82	0	0	0	0	0	0	0	0	5	0
Lane Group Flow (vph)	78	17	0	0	0	0	137	960	0	0	931	0
Confl. Peds. (#/hr)	19		9	9		19	17					17
Heavy Vehicles (%)	0%	2%	0%	2%	2%	2%	0%	1%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	0	0	2	0
Turn Type	Perm	NA					pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	16.7	16.7					65.5	65.5			53.6	
Effective Green, g (s)	16.7	16.7					65.5	65.5			53.6	
Actuated g/C Ratio	0.17	0.17					0.68	0.68			0.56	
Clearance Time (s)	6.5	6.5					4.0	7.0			7.0	
Vehicle Extension (s)	3.0	3.0					3.0	3.0			3.0	
Lane Grp Cap (vph)	243	272					415	2409			1922	
v/s Ratio Prot		0.01					0.03	c0.27			c0.27	
v/s Ratio Perm	c0.06						0.20					
v/c Ratio	0.32	0.06					0.33	0.40			0.48	
Uniform Delay, d1	34.5	33.0					6.3	6.6			12.7	
Progression Factor	1.00	1.00					1.00	1.00			1.00	
Incremental Delay, d2	0.8	0.1					0.5	0.5			0.9	
Delay (s)	35.3	33.1					6.8	7.0			13.6	
Level of Service	D	C					A	A			B	
Approach Delay (s/veh)		34.1			0.0			7.0			13.6	
Approach LOS		C			A			A			B	

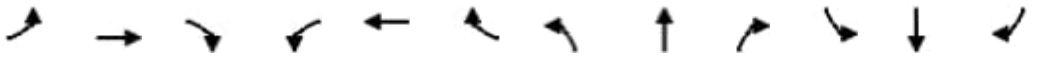
Intersection Summary			
HCM 2000 Control Delay (s/veh)	12.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	95.7	Sum of lost time (s)	17.5
Intersection Capacity Utilization	68.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	202	1001	124	652	158	135	749	208	423	189
v/c Ratio	0.51	0.71	0.50	0.47	0.23	0.54	0.91	0.80	0.85	0.35
Control Delay (s/veh)	22.2	36.8	24.3	32.9	5.6	32.6	61.2	51.6	60.8	7.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	22.2	36.8	24.3	32.9	5.6	32.6	61.2	51.6	60.8	7.4
Queue Length 50th (m)	27.0	111.7	15.8	66.8	0.0	21.6	93.1	34.8	101.2	1.5
Queue Length 95th (m)	46.0	#158.6	29.2	93.7	15.3	32.5	#123.2	57.4	136.7	18.3
Internal Link Dist (m)		115.5		150.8			147.9		447.4	
Turn Bay Length (m)	65.0		115.0		90.0	40.0		50.0		
Base Capacity (vph)	424	1405	290	1374	689	379	868	328	510	541
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.71	0.43	0.47	0.23	0.36	0.86	0.63	0.83	0.35

Intersection Summary

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	196	877	94	120	632	153	131	544	182	202	410	183
Future Volume (vph)	196	877	94	120	632	153	131	544	182	202	410	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.95		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	0.99		1.00	1.00	0.96
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1765	3441		1784	3535	1525	1781	3373		1785	1842	1479
Flt Permitted	0.30	1.00		0.16	1.00	1.00	0.23	1.00		0.11	1.00	1.00
Satd. Flow (perm)	558	3441		304	3535	1525	429	3373		215	1842	1479
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	202	904	97	124	652	158	135	561	188	208	423	189
RTOR Reduction (vph)	0	5	0	0	0	97	0	26	0	0	0	132
Lane Group Flow (vph)	202	996	0	124	652	61	135	723	0	208	423	57
Confl. Peds. (#/hr)	11		12	12		11	21		12	12		21
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	1%	1%	3%	0%	1%	0%	0%	1%	0%	0%	2%	3%
Bus Blockages (#/hr)	0	3	0	0	0	5	0	2	0	0	0	2
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2		2	8			4		4
Actuated Green, G (s)	64.2	53.0		59.4	50.6	50.6	40.8	30.9		49.2	35.3	35.3
Effective Green, g (s)	64.2	53.0		59.4	50.6	50.6	40.8	30.9		49.2	35.3	35.3
Actuated g/C Ratio	0.49	0.41		0.46	0.39	0.39	0.31	0.24		0.38	0.27	0.27
Clearance Time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0		2.0	3.0	3.0
Lane Grp Cap (vph)	379	1402		239	1375	593	237	801		254	500	401
v/s Ratio Prot	c0.05	c0.29		0.04	0.18		0.04	0.21		c0.09	c0.23	
v/s Ratio Perm	0.22			0.20		0.04	0.14			0.22		0.04
v/c Ratio	0.53	0.71		0.52	0.47	0.10	0.57	0.90		0.82	0.85	0.14
Uniform Delay, d1	19.8	32.1		23.0	29.7	25.3	34.4	48.1		31.6	44.8	35.9
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.7	3.1		0.8	1.2	0.4	1.9	13.4		17.4	12.5	0.2
Delay (s)	20.5	35.2		23.8	30.9	25.6	36.3	61.5		49.0	57.2	36.0
Level of Service	C	D		C	C	C	D	E		D	E	D
Approach Delay (s/veh)		32.7			29.1			57.7			50.3	
Approach LOS		C			C			E			D	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	41.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	89.8%	ICU Level of Service	E
Analysis Period (min)	15		

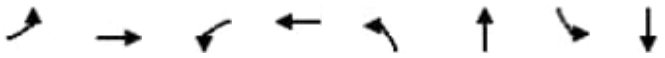
c Critical Lane Group

APPENDIX

G-2 *Future Background Synchro Worksheets*

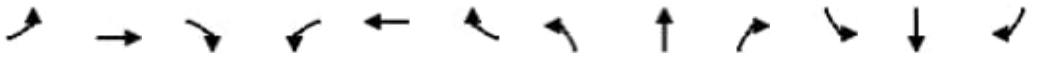
APPENDIX

2030 Horizon Year



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	126	353	330	460	74	695	127	801
v/c Ratio	0.35	0.39	0.81	0.50	0.24	0.58	0.38	0.61
Control Delay (s/veh)	19.9	26.0	39.3	27.3	17.6	27.3	19.3	28.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	19.9	26.0	39.3	27.3	17.6	27.3	19.3	28.9
Queue Length 50th (m)	14.3	24.9	42.9	33.3	8.5	59.4	15.0	75.2
Queue Length 95th (m)	25.3	36.6	64.5	47.1	16.7	79.0	26.5	97.1
Internal Link Dist (m)		129.9		116.8		249.3		213.8
Turn Bay Length (m)	70.0		55.0		55.0		70.0	
Base Capacity (vph)	357	1276	408	1281	314	1202	334	1316
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.28	0.81	0.36	0.24	0.58	0.38	0.61

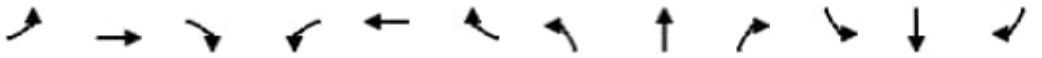
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	118	259	72	310	318	115	70	478	175	119	657	96
Future Volume (vph)	118	259	72	310	318	115	70	478	175	119	657	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.96		1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1780	3323		1753	3309		1783	3276		1766	3406	
Flt Permitted	0.41	1.00		0.51	1.00		0.25	1.00		0.28	1.00	
Satd. Flow (perm)	766	3323		949	3309		475	3276		516	3406	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	126	276	77	330	338	122	74	509	186	127	699	102
RTOR Reduction (vph)	0	26	0	0	38	0	0	33	0	0	10	0
Lane Group Flow (vph)	126	327	0	330	422	0	74	662	0	127	791	0
Confl. Peds. (#/hr)	20		34	34		20	20		14	14		20
Confl. Bikes (#/hr)						3						7
Heavy Vehicles (%)	0%	2%	2%	1%	2%	1%	0%	3%	4%	1%	2%	0%
Bus Blockages (#/hr)	0	5	0	0	5	0	0	3	0	0	3	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	32.8	25.7		32.8	25.7		40.8	35.4		44.2	37.1	
Effective Green, g (s)	32.8	25.7		32.8	25.7		40.8	35.4		44.2	37.1	
Actuated g/C Ratio	0.34	0.26		0.34	0.26		0.42	0.36		0.45	0.38	
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	332	877		378	874		271	1191		325	1298	
v/s Ratio Prot	0.03	0.10		c0.06	0.13		0.02	0.20		c0.03	c0.23	
v/s Ratio Perm	0.10			c0.23			0.10			0.15		
v/c Ratio	0.38	0.37		0.87	0.48		0.27	0.56		0.39	0.61	
Uniform Delay, d1	23.1	29.2		28.5	30.2		17.7	24.7		16.3	24.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	0.3		19.4	0.4		0.5	1.9		0.8	2.1	
Delay (s)	23.8	29.5		47.9	30.6		18.2	26.6		17.1	26.4	
Level of Service	C	C		D	C		B	C		B	C	
Approach Delay (s/veh)		28.0			37.8			25.8			25.1	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	29.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	97.3	Sum of lost time (s)	22.0
Intersection Capacity Utilization	91.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



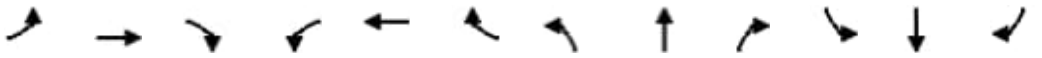
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	0	35	3	0	1	26	774	5	5	1065	0
Future Volume (Veh/h)	9	0	35	3	0	1	26	774	5	5	1065	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	0	38	3	0	1	28	841	5	5	1158	0
Pedestrians		25			11						1	
Lane Width (m)		3.5			3.5						3.5	
Walking Speed (m/s)		1.0			1.0						1.0	
Percent Blockage		2			1						0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								190			273	
pX, platoon unblocked	0.89	0.89	0.85	0.89	0.89	0.92	0.85			0.92		
vC, conflicting volume	1672	2106	604	1538	2104	435	1183			857		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1096	1587	167	945	1584	214	851			672		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	100	95	98	100	100	96			99		
cM capacity (veh/h)	138	87	705	171	87	726	657			845		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	10	38	4	28	561	285	5	772	386
Volume Left	10	0	3	28	0	0	5	0	0
Volume Right	0	38	1	0	0	5	0	0	0
cSH	138	705	211	657	1700	1700	845	1700	1700
Volume to Capacity	0.07	0.05	0.02	0.04	0.33	0.17	0.01	0.45	0.23
Queue Length 95th (m)	1.8	1.3	0.4	1.0	0.0	0.0	0.1	0.0	0.0
Control Delay (s/veh)	33.2	10.4	22.4	10.7	0.0	0.0	9.3	0.0	0.0
Lane LOS	D	B	C	B			A		
Approach Delay (s/veh)	15.1		22.4	0.3			0.0		
Approach LOS	C		C						

Intersection Summary				
Average Delay	0.6			
Intersection Capacity Utilization	39.8%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	43	101	205	56	777	13	1101
v/c Ratio	0.17	0.25	0.76	0.17	0.34	0.04	0.56
Control Delay (s/veh)	31.6	7.8	51.1	7.6	8.7	13.5	16.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	31.6	7.8	51.1	7.6	8.7	13.5	16.7
Queue Length 50th (m)	6.5	0.2	33.3	2.9	29.8	1.1	68.1
Queue Length 95th (m)	15.1	12.0	57.1	8.9	53.3	4.7	108.8
Internal Link Dist (m)		103.2	75.9		447.4		165.7
Turn Bay Length (m)	50.0			65.0		55.0	
Base Capacity (vph)	387	562	408	338	2262	371	1952
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.18	0.50	0.17	0.34	0.04	0.56

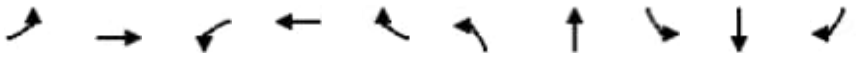
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	1	97	149	5	45	54	713	41	13	1032	36
Future Volume (vph)	42	1	97	149	5	45	54	713	41	13	1032	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.98			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00			0.99		1.00	1.00		1.00	1.00	
Frt	1.00	0.85			0.97		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00			0.96		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1720	1566			1703		1784	3451		1750	3456	
Flt Permitted	0.68	1.00			0.71		0.18	1.00		0.36	1.00	
Satd. Flow (perm)	1229	1566			1263		342	3451		658	3456	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	43	1	100	154	5	46	56	735	42	13	1064	37
RTOR Reduction (vph)	0	80	0	0	11	0	0	3	0	0	2	0
Lane Group Flow (vph)	43	21	0	0	194	0	56	774	0	13	1099	0
Confl. Peds. (#/hr)	11		8	8		11	11					11
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	3%	2%	0%	2%	2%	2%	0%	2%	2%	2%	2%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	3	0	0	3	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	19.9	19.9			19.9		64.3	64.3		54.7	54.7	
Effective Green, g (s)	19.9	19.9			19.9		64.3	64.3		54.7	54.7	
Actuated g/C Ratio	0.20	0.20			0.20		0.66	0.66		0.56	0.56	
Clearance Time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	250	318			257		307	2271		368	1934	
v/s Ratio Prot		0.01					0.01	c0.22			c0.32	
v/s Ratio Perm	0.03				c0.15		0.11			0.02		
v/c Ratio	0.17	0.07			0.75		0.18	0.34		0.04	0.57	
Uniform Delay, d1	32.1	31.4			36.6		7.6	7.4		9.7	13.9	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.1			11.8		0.3	0.4		0.2	1.2	
Delay (s)	32.4	31.5			48.4		7.9	7.8		9.8	15.1	
Level of Service	C	C			D		A	A		A	B	
Approach Delay (s/veh)		31.8			48.4			7.8			15.0	
Approach LOS		C			D			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	16.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	97.7	Sum of lost time (s)	17.5
Intersection Capacity Utilization	70.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

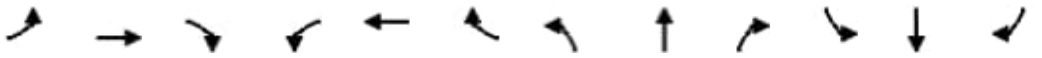


Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	197	843	164	761	177	135	528	187	814	227
v/c Ratio	0.65	0.67	0.58	0.56	0.25	0.80	0.56	0.55	1.42	0.40
Control Delay (s/veh)	31.1	37.0	25.8	32.8	4.5	59.7	42.5	30.2	234.0	16.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	31.1	37.0	25.8	32.8	4.5	59.7	42.5	30.2	234.0	16.0
Queue Length 50th (m)	27.2	92.2	22.2	79.3	0.0	21.0	59.7	30.1	~280.5	16.7
Queue Length 95th (m)	42.0	120.8	35.4	98.9	14.2	#53.5	80.8	47.0	#355.6	38.7
Internal Link Dist (m)		115.5		150.8			147.9		447.4	
Turn Bay Length (m)	65.0		115.0		90.0	40.0		50.0		
Base Capacity (vph)	306	1263	351	1367	705	171	948	379	573	565
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.64	0.67	0.47	0.56	0.25	0.79	0.56	0.49	1.42	0.40

Intersection Summary

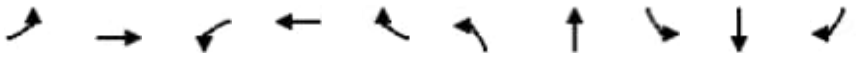
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	193	685	141	161	746	173	132	455	63	183	798	222
Future Volume (vph)	193	685	141	161	746	173	132	455	63	183	798	222
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.95		1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1766	3370		1748	3500	1529	1767	3396		1730	1842	1509
Flt Permitted	0.27	1.00		0.19	1.00	1.00	0.11	1.00		0.30	1.00	1.00
Satd. Flow (perm)	498	3370		353	3500	1529	207	3396		547	1842	1509
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	197	699	144	164	761	177	135	464	64	187	814	227
RTOR Reduction (vph)	0	13	0	0	0	108	0	8	0	0	0	95
Lane Group Flow (vph)	197	830	0	164	761	69	135	520	0	187	814	132
Confl. Peds. (#/hr)	9		16	16		9	18		13	13		18
Heavy Vehicles (%)	1%	2%	0%	2%	2%	0%	1%	2%	4%	3%	2%	1%
Bus Blockages (#/hr)	0	3	0	0	0	5	0	3	0	0	0	3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2		2	8			4		4
Actuated Green, G (s)	56.2	48.3		61.2	50.8	50.8	43.8	36.0		52.3	40.5	40.5
Effective Green, g (s)	56.2	48.3		61.2	50.8	50.8	43.8	36.0		52.3	40.5	40.5
Actuated g/C Ratio	0.43	0.37		0.47	0.39	0.39	0.34	0.28		0.40	0.31	0.31
Clearance Time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0		2.0	3.0	3.0
Lane Grp Cap (vph)	292	1252		277	1367	597	163	940		331	573	470
v/s Ratio Prot	0.04	0.25		c0.05	0.22		c0.05	0.15		0.05	c0.44	
v/s Ratio Perm	c0.25			0.23		0.05	0.23			0.17		0.09
v/c Ratio	0.67	0.66		0.59	0.56	0.12	0.83	0.55		0.56	1.42	0.28
Uniform Delay, d1	26.1	34.1		22.6	30.8	25.3	35.2	40.1		27.0	44.8	33.8
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.8	2.8		2.3	1.6	0.4	26.7	0.7		1.3	199.3	0.3
Delay (s)	30.9	36.8		24.8	32.5	25.7	61.9	40.8		28.3	244.1	34.1
Level of Service	C	D		C	C	C	E	D		C	F	C
Approach Delay (s/veh)		35.7			30.2			45.1			172.4	
Approach LOS		D			C			D			F	

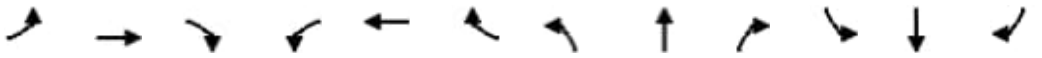
Intersection Summary			
HCM 2000 Control Delay (s/veh)	77.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	105.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	197	843	164	761	177	135	528	187	814	227
v/c Ratio	0.99	0.96	0.96	0.90	0.35	0.87	0.35	0.41	0.98	0.30
Control Delay (s/veh)	95.3	68.1	93.4	62.1	7.6	69.7	24.5	17.1	63.0	8.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	95.3	68.1	93.4	62.1	7.6	69.7	24.5	17.1	63.0	8.5
Queue Length 50th (m)	35.1	110.5	28.7	99.8	0.0	18.3	45.4	22.6	201.8	10.6
Queue Length 95th (m)	#83.3	#150.9	#70.2	#133.3	17.8	#55.6	59.2	35.2	#287.7	26.9
Internal Link Dist (m)		115.5		150.8			147.9		447.4	
Turn Bay Length (m)	65.0		115.0		90.0	40.0		50.0		
Base Capacity (vph)	198	881	170	848	504	155	1495	463	828	763
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.99	0.96	0.96	0.90	0.35	0.87	0.35	0.40	0.98	0.30

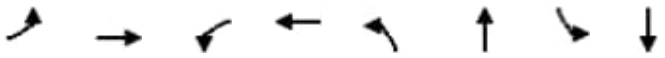
Intersection Summary

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	193	685	141	161	746	173	132	455	63	183	798	222
Future Volume (vph)	193	685	141	161	746	173	132	455	63	183	798	222
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.95		1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1767	3370		1749	3500	1529	1767	3396		1729	1842	1509
Flt Permitted	0.12	1.00		0.13	1.00	1.00	0.07	1.00		0.40	1.00	1.00
Satd. Flow (perm)	222	3370		234	3500	1529	131	3396		724	1842	1509
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	197	699	144	164	761	177	135	464	64	187	814	227
RTOR Reduction (vph)	0	13	0	0	0	134	0	8	0	0	0	85
Lane Group Flow (vph)	197	830	0	164	761	43	135	520	0	187	814	142
Confl. Peds. (#/hr)	9		16	16		9	18		13	13		18
Heavy Vehicles (%)	1%	2%	0%	2%	2%	0%	1%	2%	4%	3%	2%	1%
Bus Blockages (#/hr)	0	3	0	0	0	5	0	3	0	0	0	3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2		2	8			4		4
Actuated Green, G (s)	43.5	33.5		39.5	31.5	31.5	63.9	56.9		67.1	58.5	58.5
Effective Green, g (s)	43.5	33.5		39.5	31.5	31.5	63.9	56.9		67.1	58.5	58.5
Actuated g/C Ratio	0.33	0.26		0.30	0.24	0.24	0.49	0.44		0.52	0.45	0.45
Clearance Time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0		2.0	3.0	3.0
Lane Grp Cap (vph)	193	868		164	848	370	152	1486		440	828	679
v/s Ratio Prot	c0.08	0.25		0.06	0.22		c0.05	0.15		c0.03	c0.44	
v/s Ratio Perm	c0.26			0.24		0.03	0.39			0.19		0.09
v/c Ratio	1.02	0.96		1.00	0.90	0.12	0.89	0.35		0.43	0.98	0.21
Uniform Delay, d1	36.3	47.5		40.1	47.7	38.4	30.1	24.3		17.3	35.3	21.7
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	70.3	21.5		70.3	14.2	0.6	40.7	0.1		0.2	26.9	0.2
Delay (s)	106.6	69.1		110.4	61.9	39.0	70.9	24.4		17.6	62.2	21.9
Level of Service	F	E		F	E	D	E	C		B	E	C
Approach Delay (s/veh)		76.2			65.4			33.9			48.0	
Approach LOS		E			E			C			D	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	57.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	105.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

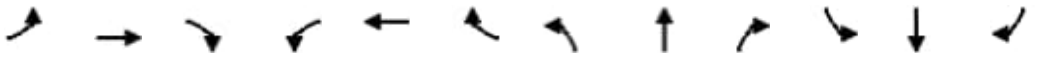


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	100	292	312	388	180	1287	111	804
v/c Ratio	0.24	0.33	0.76	0.39	0.60	0.97	0.52	0.66
Control Delay (s/veh)	18.1	19.8	35.7	24.1	25.6	50.4	25.3	31.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	18.1	19.8	35.7	24.1	25.6	50.4	25.3	31.2
Queue Length 50th (m)	11.2	15.8	40.3	26.2	22.0	~163.7	13.0	77.2
Queue Length 95th (m)	20.6	26.0	61.4	38.5	#37.9	#205.6	#24.5	99.1
Internal Link Dist (m)		129.9		116.8		249.3		213.8
Turn Bay Length (m)	70.0		55.0		55.0		70.0	
Base Capacity (vph)	411	1287	410	1303	306	1327	212	1226
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.23	0.76	0.30	0.59	0.97	0.52	0.66

Intersection Summary

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

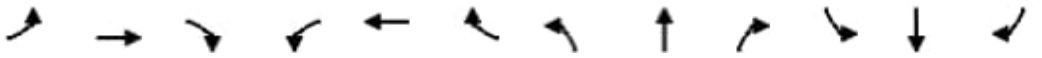
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	94	185	89	293	264	101	169	926	284	104	710	46
Future Volume (vph)	94	185	89	293	264	101	169	926	284	104	710	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.96		1.00	0.96		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1775	3234		1686	3317		1783	3371		1750	3482	
Flt Permitted	0.52	1.00		0.54	1.00		0.21	1.00		0.12	1.00	
Satd. Flow (perm)	967	3234		954	3317		393	3371		213	3482	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	100	197	95	312	281	107	180	985	302	111	755	49
RTOR Reduction (vph)	0	61	0	0	41	0	0	25	0	0	4	0
Lane Group Flow (vph)	100	231	0	312	347	0	180	1262	0	111	800	0
Confl. Peds. (#/hr)	24		31	31		24	28		21	21		28
Confl. Bikes (#/hr)			1						2			4
Heavy Vehicles (%)	0%	4%	0%	5%	1%	2%	0%	1%	1%	2%	1%	0%
Bus Blockages (#/hr)	0	5	0	0	5	0	0	2	0	0	2	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	31.1	25.7		34.5	27.4		45.0	37.1		40.0	34.6	
Effective Green, g (s)	31.1	25.7		34.5	27.4		45.0	37.1		40.0	34.6	
Actuated g/C Ratio	0.32	0.26		0.35	0.28		0.46	0.38		0.41	0.36	
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	353	854		391	934		294	1285		172	1238	
v/s Ratio Prot	0.02	0.07		c0.06	0.10		c0.05	c0.37		0.04	0.23	
v/s Ratio Perm	0.07			c0.22			0.23			0.23		
v/c Ratio	0.28	0.27		0.80	0.37		0.61	0.98		0.65	0.65	
Uniform Delay, d1	23.9	28.4		26.8	28.0		17.2	29.8		22.2	26.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.2		10.8	0.3		3.7	21.2		8.0	2.6	
Delay (s)	24.3	28.5		37.6	28.3		20.9	51.0		30.3	28.8	
Level of Service	C	C		D	C		C	D		C	C	
Approach Delay (s/veh)		27.5			32.4			47.3			29.0	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	37.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	97.3	Sum of lost time (s)	22.0
Intersection Capacity Utilization	98.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	0	28	11	0	10	39	1287	10	5	1086	10
Future Volume (Veh/h)	14	0	28	11	0	10	39	1287	10	5	1086	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	15	0	30	12	0	11	42	1384	11	5	1168	11
Pedestrians		29			19						3	
Lane Width (m)		3.5			3.5						3.5	
Walking Speed (m/s)		1.0			1.0						1.0	
Percent Blockage		3			2						0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								190			273	
pX, platoon unblocked	0.85	0.85	0.82	0.85	0.85	0.76	0.82			0.76		
vC, conflicting volume	2003	2711	619	2117	2711	720	1208			1414		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	892	1726	109	1026	1726	3	825			916		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	100	96	91	100	99	94			99		
cM capacity (veh/h)	178	66	744	140	66	809	652			562		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	15	30	23	42	923	472	5	779	400
Volume Left	15	0	12	42	0	0	5	0	0
Volume Right	0	30	11	0	0	11	0	0	11
cSH	178	744	231	652	1700	1700	562	1700	1700
Volume to Capacity	0.08	0.04	0.10	0.06	0.54	0.28	0.01	0.46	0.24
Queue Length 95th (m)	2.1	1.0	2.5	1.6	0.0	0.0	0.2	0.0	0.0
Control Delay (s/veh)	27.1	10.0	22.3	10.9	0.0	0.0	11.5	0.0	0.0
Lane LOS	D	B	C	B			B		
Approach Delay (s/veh)	15.7		22.3	0.3			0.0		
Approach LOS	C		C						

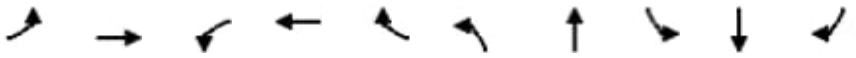
Intersection Summary				
Average Delay	0.6			
Intersection Capacity Utilization	51.1%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	78	103	94	137	1516	44	1198
v/c Ratio	0.32	0.29	0.40	0.42	0.64	0.28	0.63
Control Delay (s/veh)	35.9	8.9	32.8	9.7	11.7	21.3	18.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	35.9	8.9	32.8	9.7	11.7	21.3	18.1
Queue Length 50th (m)	12.3	0.6	12.7	4.8	54.6	3.2	59.8
Queue Length 95th (m)	24.5	12.9	26.5	17.7	130.3	15.4	125.8
Internal Link Dist (m)		103.2	75.9		447.4		165.7
Turn Bay Length (m)	50.0			65.0		55.0	
Base Capacity (vph)	428	562	404	363	2355	156	1904
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.18	0.23	0.38	0.64	0.28	0.63

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	4	89	64	2	19	123	1232	132	40	1013	65
Future Volume (vph)	70	4	89	64	2	19	123	1232	132	40	1013	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.98			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.98	1.00			0.99		1.00	1.00		1.00	1.00	
Frt	1.00	0.86			0.97		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00			0.96		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1756	1574			1699		1784	3466		1750	3445	
Flt Permitted	0.74	1.00			0.71		0.15	1.00		0.15	1.00	
Satd. Flow (perm)	1363	1574			1256		286	3466		283	3445	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	78	4	99	71	2	21	137	1369	147	44	1126	72
RTOR Reduction (vph)	0	81	0	0	12	0	0	6	0	0	4	0
Lane Group Flow (vph)	78	22	0	0	82	0	137	1510	0	44	1194	0
Confl. Peds. (#/hr)	19		9	9		19	17					17
Heavy Vehicles (%)	0%	2%	0%	2%	2%	2%	0%	1%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	0	0	2	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	16.8	16.8			16.8		64.1	64.1		52.2	52.2	
Effective Green, g (s)	16.8	16.8			16.8		64.1	64.1		52.2	52.2	
Actuated g/C Ratio	0.18	0.18			0.18		0.68	0.68		0.55	0.55	
Clearance Time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	242	280			223		319	2353		156	1904	
v/s Ratio Prot		0.01					0.04	c0.44			0.35	
v/s Ratio Perm	0.06				c0.07		0.25			0.16		
v/c Ratio	0.32	0.08			0.37		0.43	0.64		0.28	0.63	
Uniform Delay, d1	33.8	32.3			34.1		8.3	8.6		11.2	14.4	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	0.1			1.0		0.9	1.4		4.5	1.6	
Delay (s)	34.6	32.5			35.2		9.2	10.0		15.6	16.0	
Level of Service	C	C			D		A	A		B	B	
Approach Delay (s/veh)		33.4			35.2			9.9			16.0	
Approach LOS		C			D			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	14.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	94.4	Sum of lost time (s)	17.5
Intersection Capacity Utilization	85.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

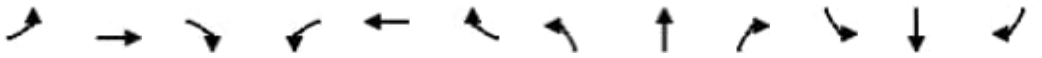


Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	260	1001	124	652	189	135	1176	227	676	227
v/c Ratio	0.68	0.75	0.53	0.52	0.28	0.67	1.35	0.83	1.27	0.43
Control Delay (s/veh)	29.4	39.4	26.8	35.8	5.6	41.5	204.9	54.4	172.5	17.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	29.4	39.4	26.8	35.8	5.6	41.5	204.9	54.4	172.5	17.4
Queue Length 50th (m)	37.0	113.9	16.2	70.1	0.0	21.2	~207.3	39.6	~215.7	17.6
Queue Length 95th (m)	59.3	#158.6	29.2	93.7	16.5	35.5	#250.0	64.6	#288.0	40.7
Internal Link Dist (m)		115.5		150.8			147.9		447.4	
Turn Bay Length (m)	65.0		115.0		90.0	40.0		50.0		
Base Capacity (vph)	395	1335	274	1262	666	335	868	330	534	525
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.66	0.75	0.45	0.52	0.28	0.40	1.35	0.69	1.27	0.43

Intersection Summary

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

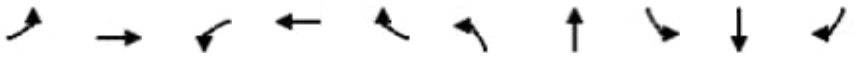
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	252	877	94	120	632	183	131	958	182	220	656	220
Future Volume (vph)	252	877	94	120	632	183	131	958	182	220	656	220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.95		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	1.00		1.00	1.00	0.96
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1766	3441		1784	3535	1525	1785	3427		1785	1842	1479
Flt Permitted	0.28	1.00		0.15	1.00	1.00	0.12	1.00		0.11	1.00	1.00
Satd. Flow (perm)	513	3441		287	3535	1525	231	3427		206	1842	1479
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	260	904	97	124	652	189	135	988	188	227	676	227
RTOR Reduction (vph)	0	6	0	0	0	121	0	12	0	0	0	97
Lane Group Flow (vph)	260	995	0	124	652	68	135	1164	0	227	676	130
Confl. Peds. (#/hr)	11		12	12		11	21		12	12		21
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	1%	1%	3%	0%	1%	0%	0%	1%	0%	0%	2%	3%
Bus Blockages (#/hr)	0	3	0	0	0	5	0	2	0	0	0	2
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2		2	8			4		4
Actuated Green, G (s)	63.0	50.3		55.4	46.5	46.5	42.6	32.5		51.8	37.7	37.7
Effective Green, g (s)	63.0	50.3		55.4	46.5	46.5	42.6	32.5		51.8	37.7	37.7
Actuated g/C Ratio	0.48	0.39		0.43	0.36	0.36	0.33	0.25		0.40	0.29	0.29
Clearance Time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0		2.0	3.0	3.0
Lane Grp Cap (vph)	371	1331		224	1264	545	196	856		267	534	428
v/s Ratio Prot	c0.07	c0.29		0.04	0.18		0.05	0.34		c0.10	c0.37	
v/s Ratio Perm	0.27			0.20		0.04	0.17			0.24		0.09
v/c Ratio	0.70	0.75		0.55	0.52	0.12	0.69	1.36		0.85	1.27	0.30
Uniform Delay, d1	21.7	34.4		25.4	32.9	28.1	35.1	48.8		33.9	46.2	35.9
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.8	3.9		1.7	1.5	0.5	7.8	169.5		21.2	134.0	0.4
Delay (s)	26.6	38.3		27.0	34.4	28.5	42.9	218.3		55.1	180.1	36.3
Level of Service	C	D		C	C	C	D	F		E	F	D
Approach Delay (s/veh)		35.9			32.3			200.2			126.1	
Approach LOS		D			C			F			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	103.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	103.6%	ICU Level of Service	G
Analysis Period (min)	15		

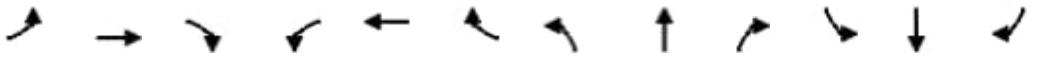
c Critical Lane Group



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	260	1001	124	652	189	135	1176	227	676	227
v/c Ratio	0.88	0.92	0.78	0.67	0.34	0.77	0.96	0.95	0.92	0.33
Control Delay (s/veh)	56.9	56.3	57.7	45.7	6.7	47.9	58.4	78.9	55.9	8.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	56.9	56.3	57.7	45.7	6.7	47.9	58.4	78.9	55.9	8.5
Queue Length 50th (m)	44.4	129.8	19.4	78.6	0.0	17.6	151.5	41.4	161.3	8.6
Queue Length 95th (m)	#86.4	#170.0	#45.7	99.4	17.5	#43.9	#196.6	#90.3	#233.7	26.0
Internal Link Dist (m)		115.5		150.8			147.9		447.4	
Turn Bay Length (m)	65.0		115.0		90.0	40.0		50.0		
Base Capacity (vph)	297	1091	159	979	558	175	1238	239	743	699
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.88	0.92	0.78	0.67	0.34	0.77	0.95	0.95	0.91	0.32

Intersection Summary

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



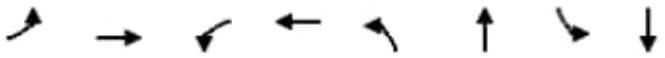
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	252	877	94	120	632	183	131	958	182	220	656	220
Future Volume (vph)	252	877	94	120	632	183	131	958	182	220	656	220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.95		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	1.00		1.00	1.00	0.96
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1766	3441		1785	3535	1525	1785	3427		1785	1842	1479
Flt Permitted	0.22	1.00		0.11	1.00	1.00	0.11	1.00		0.08	1.00	1.00
Satd. Flow (perm)	401	3441		209	3535	1525	210	3427		150	1842	1479
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	260	904	97	124	652	189	135	988	188	227	676	227
RTOR Reduction (vph)	0	6	0	0	0	137	0	12	0	0	0	103
Lane Group Flow (vph)	260	995	0	124	652	52	135	1164	0	227	676	124
Confl. Peds. (#/hr)	11		12	12		11	21		12	12		21
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	1%	1%	3%	0%	1%	0%	0%	1%	0%	0%	2%	3%
Bus Blockages (#/hr)	0	3	0	0	0	5	0	2	0	0	0	2
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2		2	8			4		4
Actuated Green, G (s)	52.0	41.0		43.0	36.0	36.0	53.0	46.0		63.0	52.0	52.0
Effective Green, g (s)	52.0	41.0		43.0	36.0	36.0	53.0	46.0		63.0	52.0	52.0
Actuated g/C Ratio	0.40	0.32		0.33	0.28	0.28	0.41	0.35		0.48	0.40	0.40
Clearance Time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0		2.0	3.0	3.0
Lane Grp Cap (vph)	286	1085		153	978	422	170	1212		236	736	591
v/s Ratio Prot	c0.08	c0.29		0.04	0.18		0.04	0.34		c0.10	0.37	
v/s Ratio Perm	0.28			0.22		0.03	0.28			c0.37		0.08
v/c Ratio	0.91	0.92		0.81	0.67	0.12	0.79	0.96		0.96	0.92	0.21
Uniform Delay, d1	31.4	42.9		34.1	41.7	35.2	29.9	41.1		38.3	37.0	25.5
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	29.8	13.5		25.5	3.6	0.6	20.7	17.1		47.4	16.3	0.2
Delay (s)	61.3	56.3		59.6	45.3	35.8	50.6	58.2		85.8	53.3	25.7
Level of Service	E	E		E	D	D	D	E		F	D	C
Approach Delay (s/veh)		57.3			45.3			57.4			54.3	
Approach LOS		E			D			E			D	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	54.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	103.6%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX

2041 Horizon Year



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	85	636	176	444	47	1050	301	908
v/c Ratio	0.21	0.65	0.63	0.42	0.23	1.71	1.50	1.27
Control Delay (s/veh)	17.5	33.3	28.9	27.9	18.6	350.3	269.2	161.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	17.5	33.3	28.9	27.9	18.6	350.3	269.2	161.8
Queue Length 50th (m)	9.4	54.7	20.6	35.6	5.3	~332.7	~76.4	~268.5
Queue Length 95th (m)	18.0	72.2	34.1	49.1	11.9	#409.6	#128.7	#342.7
Internal Link Dist (m)		129.9		116.8		249.3		213.8
Turn Bay Length (m)	70.0		55.0		55.0		70.0	
Base Capacity (vph)	397	1258	281	1262	206	615	201	714
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.51	0.63	0.35	0.23	1.71	1.50	1.27

Intersection Summary

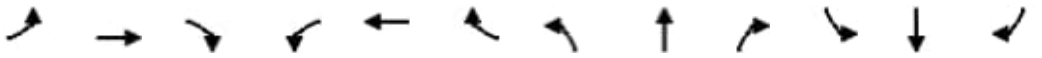
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	553	45	165	390	27	44	860	127	283	769	85
Future Volume (vph)	80	553	45	165	390	27	44	860	127	283	769	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1774	3408		1761	3422		1785	1760		1767	1790	
Flt Permitted	0.46	1.00		0.26	1.00		0.11	1.00		0.10	1.00	
Satd. Flow (perm)	862	3408		486	3422		209	1760		190	1790	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	85	588	48	176	415	29	47	915	135	301	818	90
RTOR Reduction (vph)	0	6	0	0	5	0	0	5	0	0	4	0
Lane Group Flow (vph)	85	630	0	176	439	0	47	1045	0	301	904	0
Confl. Peds. (#/hr)	20		34	34		20	20		14	14		20
Confl. Bikes (#/hr)						3						7
Heavy Vehicles (%)	0%	2%	2%	1%	2%	1%	0%	3%	4%	1%	2%	0%
Bus Blockages (#/hr)	0	5	0	0	5	0	0	3	0	0	3	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	34.6	29.1		37.8	30.7		39.9	36.0		46.3	39.2	
Effective Green, g (s)	34.6	29.1		37.8	30.7		39.9	36.0		46.3	39.2	
Actuated g/C Ratio	0.34	0.29		0.37	0.30		0.39	0.36		0.46	0.39	
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	343	979		270	1037		142	625		197	692	
v/s Ratio Prot	0.01	0.18		c0.05	0.13		0.01	c0.59		c0.11	0.51	
v/s Ratio Perm	0.07			c0.20			0.12			0.59		
v/c Ratio	0.25	0.64		0.65	0.42		0.33	1.67		1.53	1.31	
Uniform Delay, d1	23.1	31.6		22.9	28.2		24.3	32.7		24.5	31.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	1.5		5.5	0.3		1.4	309.8		261.6	148.4	
Delay (s)	23.5	33.0		28.4	28.5		25.7	342.4		286.1	179.4	
Level of Service	C	C		C	C		C	F		F	F	
Approach Delay (s/veh)		31.9			28.5			328.8			206.0	
Approach LOS		C			C			F			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	178.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	101.3	Sum of lost time (s)	22.0
Intersection Capacity Utilization	122.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	41	1	36	50	2	30	30	934	5	59	929	11
Future Volume (Veh/h)	41	1	36	50	2	30	30	934	5	59	929	11
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	45	1	39	54	2	33	33	1015	5	64	1010	12
Pedestrians		25			11						1	
Lane Width (m)		3.5			3.5						3.5	
Walking Speed (m/s)		1.0			1.0						1.0	
Percent Blockage		2			1						0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								190			273	
pX, platoon unblocked	0.78	0.78	0.59	0.78	0.78	0.57	0.59			0.57		
vC, conflicting volume	2285	2266	1041	2272	2270	1030	1047			1031		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1331	1306	726	1314	1311	678	736			680		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	38	99	84	27	98	87	94			88		
cM capacity (veh/h)	72	98	248	74	98	258	508			522		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	45	40	89	33	1020	64	1022
Volume Left	45	0	54	33	0	64	0
Volume Right	0	39	33	0	5	0	12
cSH	72	238	101	508	1700	522	1700
Volume to Capacity	0.62	0.17	0.88	0.06	0.60	0.12	0.60
Queue Length 95th (m)	20.8	4.5	38.7	1.6	0.0	3.2	0.0
Control Delay (s/veh)	114.9	23.1	136.4	12.6	0.0	12.9	0.0
Lane LOS	F	C	F	B		B	
Approach Delay (s/veh)	71.7		136.4	0.4		0.8	
Approach LOS	F		F				

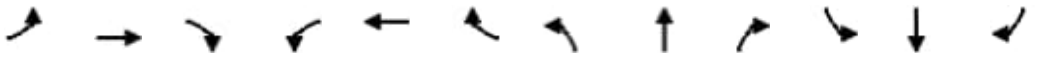
Intersection Summary				
Average Delay	8.4			
Intersection Capacity Utilization	67.7%	ICU Level of Service	C	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	1	317	310	206	948	189	819
v/c Ratio	0.01	0.62	0.78	0.75	0.82	1.03	0.85
Control Delay (s/veh)	28.0	17.2	45.9	27.2	22.0	101.4	31.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	28.0	17.2	45.9	27.2	22.0	101.4	31.5
Queue Length 50th (m)	0.2	17.0	49.5	12.5	119.7	~35.9	124.1
Queue Length 95th (m)	1.5	42.9	77.8	#41.4	#254.6	#88.3	#236.3
Internal Link Dist (m)		103.2	75.9		447.4		165.7
Turn Bay Length (m)	50.0			65.0		55.0	
Base Capacity (vph)	183	647	564	276	1159	184	960
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.49	0.55	0.75	0.82	1.03	0.85

Intersection Summary

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

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	57	250	0	183	117	200	852	68	183	787	8
Future Volume (vph)	1	57	250	0	183	117	200	852	68	183	787	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.97			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.88			0.95		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1715	1596			1719		1785	1800		1750	1816	
Flt Permitted	0.32	1.00			1.00		0.13	1.00		0.19	1.00	
Satd. Flow (perm)	580	1596			1719		245	1800		349	1816	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	1	59	258	0	189	121	206	878	70	189	811	8
RTOR Reduction (vph)	0	163	0	0	24	0	0	3	0	0	0	0
Lane Group Flow (vph)	1	154	0	0	286	0	206	945	0	189	819	0
Confl. Peds. (#/hr)	11		8	8		11	11					11
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	3%	2%	0%	2%	2%	2%	0%	2%	2%	2%	2%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	3	0	0	3	0
Turn Type	Perm	NA			NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	21.1	21.1			21.1		62.2	62.2		51.2	51.2	
Effective Green, g (s)	21.1	21.1			21.1		62.2	62.2		51.2	51.2	
Actuated g/C Ratio	0.22	0.22			0.22		0.64	0.64		0.53	0.53	
Clearance Time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	126	347			374		268	1156		184	960	
v/s Ratio Prot		0.10			c0.17		0.06	c0.53			0.45	
v/s Ratio Perm	0.00						0.44			c0.54		
v/c Ratio	0.01	0.44			0.76		0.77	0.82		1.03	0.85	
Uniform Delay, d1	29.7	32.8			35.5		16.2	13.0		22.8	19.6	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.9			9.0		12.4	6.5		73.6	9.5	
Delay (s)	29.7	33.7			44.5		28.6	19.5		96.4	29.1	
Level of Service	C	C			D		C	B		F	C	
Approach Delay (s/veh)		33.6			44.5			21.1			41.7	
Approach LOS		C			D			C			D	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	32.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	96.8	Sum of lost time (s)	17.5
Intersection Capacity Utilization	98.6%	ICU Level of Service	F
Analysis Period (min)	15		

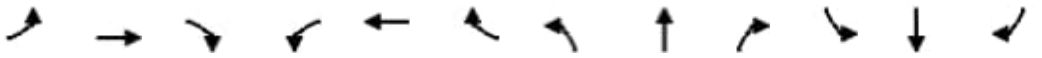
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	286	1003	264	1321	355	250	599	56	141	863	282
v/c Ratio	1.68	0.90	0.97	0.97	0.47	1.46	1.13	0.10	0.71	1.51	0.50
Control Delay (s/veh)	353.8	51.6	80.9	57.8	9.1	264.0	120.5	0.4	44.3	269.8	21.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	353.8	51.6	80.9	57.8	9.1	264.0	120.5	0.4	44.3	269.8	21.4
Queue Length 50th (m)	~90.8	124.2	51.2	173.2	13.1	~70.8	~175.8	0.0	22.1	~306.6	29.1
Queue Length 95th (m)	#146.5	#162.2	#104.8	#221.8	37.9	#127.7	#263.4	0.0	40.1	#382.2	55.8
Internal Link Dist (m)		115.5		150.8			147.9			447.4	
Turn Bay Length (m)	65.0		115.0		90.0	40.0			50.0		50.0
Base Capacity (vph)	170	1116	276	1359	752	171	532	558	268	573	565
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.68	0.90	0.96	0.97	0.47	1.46	1.13	0.10	0.53	1.51	0.50

Intersection Summary

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

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	280	715	268	259	1295	348	245	587	55	138	846	276
Future Volume (vph)	280	715	268	259	1295	348	245	587	55	138	846	276
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1767	3306		1750	3500	1505	1767	1820	1493	1733	1842	1509
Flt Permitted	0.09	1.00		0.09	1.00	1.00	0.11	1.00	1.00	0.10	1.00	1.00
Satd. Flow (perm)	174	3306		158	3500	1505	196	1820	1493	180	1842	1509
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	286	730	273	264	1321	355	250	599	56	141	863	282
RTOR Reduction (vph)	0	30	0	0	0	168	0	0	40	0	0	95
Lane Group Flow (vph)	286	973	0	264	1321	187	250	599	16	141	863	187
Confl. Peds. (#/hr)	9		16	16		9	18		13	13		18
Heavy Vehicles (%)	1%	2%	0%	2%	2%	0%	1%	2%	4%	3%	2%	1%
Bus Blockages (#/hr)	0	3	0	0	0	5	0	3	0	0	0	3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2		2	8		8	4		4
Actuated Green, G (s)	50.7	42.7		62.5	50.5	50.5	46.0	38.0	38.0	51.0	40.5	40.5
Effective Green, g (s)	50.7	42.7		62.5	50.5	50.5	46.0	38.0	38.0	51.0	40.5	40.5
Actuated g/C Ratio	0.39	0.33		0.48	0.39	0.39	0.35	0.29	0.29	0.39	0.31	0.31
Clearance Time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0
Lane Grp Cap (vph)	165	1085		269	1359	584	166	532	436	196	573	470
v/s Ratio Prot	c0.11	0.29		c0.12	0.38		c0.09	0.33		c0.06	c0.47	
v/s Ratio Perm	c0.57			0.35		0.12	0.44		0.01	0.22		0.12
v/c Ratio	1.73	0.90		0.98	0.97	0.32	1.51	1.13	0.04	0.72	1.51	0.40
Uniform Delay, d1	32.8	41.6		39.3	39.1	27.8	36.8	46.0	32.9	31.7	44.8	35.2
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	354.0	11.6		49.4	18.6	1.4	256.4	78.5	0.0	10.0	236.7	0.6
Delay (s)	386.9	53.1		88.6	57.6	29.2	293.2	124.5	33.0	41.7	281.5	35.7
Level of Service	F	D		F	E	C	F	F	C	D	F	D
Approach Delay (s/veh)		127.2			56.7			165.4			201.3	
Approach LOS		F			E			F			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	125.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.56		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	128.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	286	1003	264	1321	355	250	599	56	141	863	282
v/c Ratio	1.44	0.97	1.12	1.15	0.56	1.48	0.90	0.09	0.76	1.31	0.46
Control Delay (s/veh)	253.1	64.5	126.2	119.6	17.9	269.6	57.3	0.4	48.0	186.0	22.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	253.1	64.5	126.2	119.6	17.9	269.6	57.3	0.4	48.0	186.0	22.1
Queue Length 50th (m)	~83.2	129.0	~61.1	~209.7	29.5	~71.7	144.2	0.0	20.1	~284.0	33.6
Queue Length 95th (m)	#138.9	#173.1	#115.7	#252.0	60.2	#124.7	#211.6	0.7	#42.3	#359.6	59.0
Internal Link Dist (m)		115.5		150.8			147.9			447.4	
Turn Bay Length (m)	65.0		115.0		90.0	40.0			50.0		50.0
Base Capacity (vph)	198	1034	236	1144	632	169	665	612	185	658	608
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.44	0.97	1.12	1.15	0.56	1.48	0.90	0.09	0.76	1.31	0.46

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
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95th percentile volume exceeds capacity, queue may be longer.
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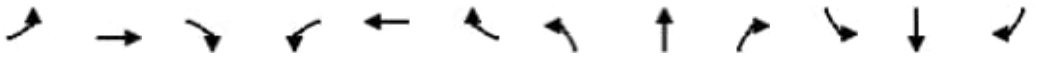
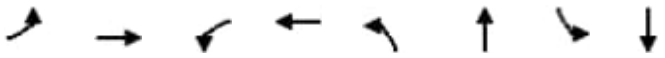


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	280	715	268	259	1295	348	245	587	55	138	846	276
Future Volume (vph)	280	715	268	259	1295	348	245	587	55	138	846	276
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1767	3306		1750	3500	1505	1767	1820	1493	1733	1842	1509
Flt Permitted	0.10	1.00		0.09	1.00	1.00	0.08	1.00	1.00	0.13	1.00	1.00
Satd. Flow (perm)	188	3306		173	3500	1505	157	1820	1493	238	1842	1509
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	286	730	273	264	1321	355	250	599	56	141	863	282
RTOR Reduction (vph)	0	30	0	0	0	141	0	0	36	0	0	69
Lane Group Flow (vph)	286	973	0	264	1321	214	250	599	20	141	863	213
Confl. Peds. (#/hr)	9		16	16		9	18		13	13		18
Heavy Vehicles (%)	1%	2%	0%	2%	2%	0%	1%	2%	4%	3%	2%	1%
Bus Blockages (#/hr)	0	3	0	0	0	5	0	3	0	0	0	3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2		2	8		8	4		4
Actuated Green, G (s)	49.5	39.5		55.5	42.5	42.5	55.5	47.5	47.5	53.5	46.5	46.5
Effective Green, g (s)	49.5	39.5		55.5	42.5	42.5	55.5	47.5	47.5	53.5	46.5	46.5
Actuated g/C Ratio	0.38	0.30		0.43	0.33	0.33	0.43	0.37	0.37	0.41	0.36	0.36
Clearance Time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0
Lane Grp Cap (vph)	193	1004		231	1144	492	166	665	545	178	658	539
v/s Ratio Prot	c0.11	0.29		c0.11	0.38		c0.09	0.33		0.04	0.47	
v/s Ratio Perm	c0.45			0.37		0.14	c0.55		0.01	0.28		0.14
v/c Ratio	1.48	0.97		1.14	1.15	0.44	1.51	0.90	0.04	0.79	1.31	0.40
Uniform Delay, d1	34.0	44.6		37.4	43.8	34.3	33.2	39.0	26.5	29.5	41.7	31.2
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	242.5	21.9		103.1	79.9	2.8	256.4	15.4	0.0	19.7	150.9	0.5
Delay (s)	276.5	66.5		140.6	123.6	37.1	289.6	54.4	26.6	49.2	192.6	31.7
Level of Service	F	E		F	F	D	F	D	C	D	F	C
Approach Delay (s/veh)		113.1			110.1			117.6			141.6	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	119.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.48		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	128.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

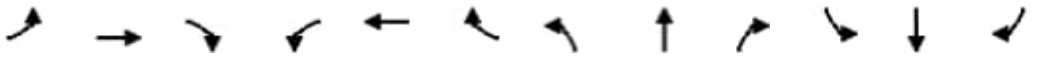


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	96	295	224	797	141	1312	251	1041
v/c Ratio	0.39	0.30	0.53	0.75	0.63	2.07	1.21	1.67
Control Delay (s/veh)	21.1	16.6	24.3	32.3	30.8	507.8	155.9	333.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	21.1	16.6	24.3	32.3	30.8	507.8	155.9	333.5
Queue Length 50th (m)	10.7	13.8	27.3	66.4	16.8	~444.7	~51.1	~329.3
Queue Length 95th (m)	20.0	23.8	43.2	87.6	#36.8	#524.2	#100.3	#405.8
Internal Link Dist (m)		129.9		116.8		249.3		213.8
Turn Bay Length (m)	70.0		55.0		55.0		70.0	
Base Capacity (vph)	244	1243	422	1258	229	635	207	624
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.39	0.24	0.53	0.63	0.62	2.07	1.21	1.67

Intersection Summary

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

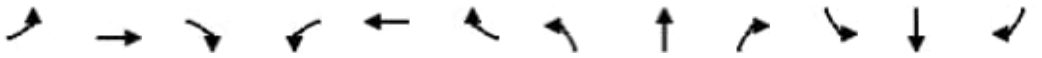
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	172	105	211	505	244	133	1096	137	236	889	89
Future Volume (vph)	90	172	105	211	505	244	133	1096	137	236	889	89
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.98		1.00	0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	0.95		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1782	3174		1676	3261		1785	1808		1750	1815	
Flt Permitted	0.20	1.00		0.54	1.00		0.12	1.00		0.12	1.00	
Satd. Flow (perm)	376	3174		952	3261		218	1808		219	1815	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	96	183	112	224	537	260	141	1166	146	251	946	95
RTOR Reduction (vph)	0	80	0	0	58	0	0	4	0	0	3	0
Lane Group Flow (vph)	96	215	0	224	739	0	141	1308	0	251	1038	0
Confl. Peds. (#/hr)	24		31	31		24	28		21	21		28
Confl. Bikes (#/hr)			1						2			4
Heavy Vehicles (%)	0%	4%	0%	5%	1%	2%	0%	1%	1%	2%	1%	0%
Bus Blockages (#/hr)	0	5	0	0	5	0	0	2	0	0	2	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	34.0	28.6		37.4	30.3		42.2	34.4		40.8	33.7	
Effective Green, g (s)	34.0	28.6		37.4	30.3		42.2	34.4		40.8	33.7	
Actuated g/C Ratio	0.34	0.29		0.38	0.31		0.43	0.35		0.41	0.34	
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	205	915		410	996		215	626		199	616	
v/s Ratio Prot	0.03	0.07		c0.04	c0.23		0.05	c0.72		c0.09	0.57	
v/s Ratio Perm	0.13			0.17			0.23			0.43		
v/c Ratio	0.47	0.24		0.55	0.74		0.66	2.09		1.26	1.68	
Uniform Delay, d1	23.5	27.0		22.8	30.9		22.8	32.4		25.4	32.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.7	0.1		1.5	3.0		7.0	495.8		151.5	315.1	
Delay (s)	25.2	27.1		24.2	33.9		29.8	528.2		176.9	347.8	
Level of Service	C	C		C	C		C	F		F	F	
Approach Delay (s/veh)		26.6			31.8			479.8			314.6	
Approach LOS		C			C			F			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	275.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.39		
Actuated Cycle Length (s)	99.2	Sum of lost time (s)	22.0
Intersection Capacity Utilization	131.9%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	5	17	4	2	29	112	1213	28	149	951	19
Future Volume (Veh/h)	17	5	17	4	2	29	112	1213	28	149	951	19
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	18	5	18	4	2	31	120	1304	30	160	1023	20
Pedestrians		29			19						3	
Lane Width (m)		3.5			3.5						3.5	
Walking Speed (m/s)		1.0			1.0						1.0	
Percent Blockage		3			2						0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								190			273	
pX, platoon unblocked	0.57	0.57	0.64	0.57	0.57	0.39	0.64			0.39		
vC, conflicting volume	2961	2975	1062	2942	2970	1341	1072			1353		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2638	2663	813	2604	2654	1088	829			1119		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	92	0	36	69	76			33		
cM capacity (veh/h)	1	3	236	0	3	100	503			239		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	18	23	37	120	1334	160	1043
Volume Left	18	0	4	120	0	160	0
Volume Right	0	18	31	0	30	0	20
cSH	1	14	0	503	1700	239	1700
Volume to Capacity	14.74	1.70	Err	0.24	0.78	0.67	0.61
Queue Length 95th (m)	Err	27.3	Err	7.0	0.0	32.2	0.0
Control Delay (s/veh)	Err	904.7	Err	14.4	0.0	45.9	0.0
Lane LOS	F	F	F	B		E	
Approach Delay (s/veh)	4897.3		Err	1.2		6.1	
Approach LOS	F		F				

Intersection Summary				
Average Delay	Err			
Intersection Capacity Utilization	90.5%	ICU Level of Service	E	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	9	325	304	180	1375	129	954
v/c Ratio	0.05	0.72	0.98	0.77	1.20	1.79	1.06
Control Delay (s/veh)	29.1	38.4	80.1	41.0	122.6	432.0	74.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	29.1	38.4	80.1	41.0	122.6	432.0	74.5
Queue Length 50th (m)	1.4	49.2	51.3	19.2	~352.2	~40.3	~224.4
Queue Length 95th (m)	5.3	79.0	#101.3	#51.6	#439.0	#64.8	#302.8
Internal Link Dist (m)		103.2	75.9		447.4		165.7
Turn Bay Length (m)	50.0			65.0		55.0	
Base Capacity (vph)	215	526	356	252	1142	72	901
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.62	0.85	0.71	1.20	1.79	1.06

Intersection Summary

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

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	136	157	35	98	140	162	1204	33	116	858	1
Future Volume (vph)	8	136	157	35	98	140	162	1204	33	116	858	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.98			0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.98	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92			0.93		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1753	1679			1655		1785	1837		1750	1827	
Flt Permitted	0.40	1.00			0.66		0.07	1.00		0.08	1.00	
Satd. Flow (perm)	741	1679			1103		139	1837		147	1827	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	9	151	174	39	109	156	180	1338	37	129	953	1
RTOR Reduction (vph)	0	41	0	0	38	0	0	1	0	0	0	0
Lane Group Flow (vph)	9	284	0	0	266	0	180	1374	0	129	954	0
Confl. Peds. (#/hr)	19		9	9		19	17					17
Heavy Vehicles (%)	0%	2%	0%	2%	2%	2%	0%	1%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	0	0	2	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	25.0	25.0			25.0		63.2	63.2		50.2	50.2	
Effective Green, g (s)	25.0	25.0			25.0		63.2	63.2		50.2	50.2	
Actuated g/C Ratio	0.25	0.25			0.25		0.62	0.62		0.49	0.49	
Clearance Time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	182	412			271		232	1141		72	901	
v/s Ratio Prot		0.17					0.07	c0.75			0.52	
v/s Ratio Perm	0.01				c0.24		0.41			c0.88		
v/c Ratio	0.05	0.69			0.98		0.78	1.20		1.79	1.06	
Uniform Delay, d1	29.3	34.8			38.1		27.1	19.3		25.8	25.8	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	4.8			49.6		14.9	100.5		405.9	46.8	
Delay (s)	29.4	39.6			87.7		42.0	119.7		431.7	72.6	
Level of Service	C	D			F		D	F		F	E	
Approach Delay (s/veh)		39.3			87.7			110.7			115.3	
Approach LOS		D			F			F			F	

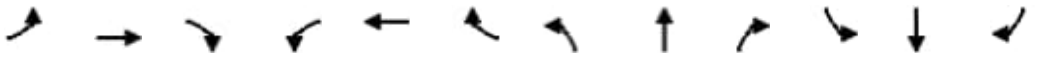
Intersection Summary			
HCM 2000 Control Delay (s/veh)	102.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.50		
Actuated Cycle Length (s)	101.7	Sum of lost time (s)	17.5
Intersection Capacity Utilization	139.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	355	1255	158	721	243	132	995	102	220	702	277
v/c Ratio	0.98	0.96	0.80	0.58	0.36	0.66	2.16	0.22	0.82	1.32	0.55
Control Delay (s/veh)	67.3	55.7	54.4	37.5	5.4	41.1	553.8	7.8	53.1	195.4	27.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	67.3	55.7	54.4	37.5	5.4	41.1	553.8	7.8	53.1	195.4	27.3
Queue Length 50th (m)	53.4	162.6	22.7	78.9	0.0	20.8	~406.8	0.0	37.9	~231.1	35.7
Queue Length 95th (m)	#116.4	#236.0	#53.9	105.1	18.3	34.5	#484.5	13.1	62.1	#301.6	63.6
Internal Link Dist (m)		115.5		150.8			147.9			447.4	
Turn Bay Length (m)	65.0		115.0		90.0	40.0			50.0		50.0
Base Capacity (vph)	362	1312	226	1237	682	334	461	467	330	531	504
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.96	0.70	0.58	0.36	0.40	2.16	0.22	0.67	1.32	0.55

Intersection Summary

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

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	344	1068	149	153	699	236	128	965	99	213	681	269
Future Volume (vph)	344	1068	149	153	699	236	128	965	99	213	681	269
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00	0.96
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1765	3421		1785	3535	1498	1785	1845	1554	1785	1842	1479
Flt Permitted	0.23	1.00		0.09	1.00	1.00	0.12	1.00	1.00	0.11	1.00	1.00
Satd. Flow (perm)	431	3421		165	3535	1498	231	1845	1554	206	1842	1479
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	355	1101	154	158	721	243	132	995	102	220	702	277
RTOR Reduction (vph)	0	7	0	0	0	158	0	0	77	0	0	78
Lane Group Flow (vph)	355	1248	0	158	721	85	132	995	26	220	702	199
Confl. Peds. (#/hr)	11		12	12		11	21		12	12		21
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	1%	1%	3%	0%	1%	0%	0%	1%	0%	0%	2%	3%
Bus Blockages (#/hr)	0	3	0	0	0	5	0	2	0	0	0	2
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2		2	8		8	4		4
Actuated Green, G (s)	63.5	49.6		55.4	45.5	45.5	42.5	32.5	32.5	51.5	37.5	37.5
Effective Green, g (s)	63.5	49.6		55.4	45.5	45.5	42.5	32.5	32.5	51.5	37.5	37.5
Actuated g/C Ratio	0.49	0.38		0.43	0.35	0.35	0.33	0.25	0.25	0.40	0.29	0.29
Clearance Time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0
Lane Grp Cap (vph)	354	1305		193	1237	524	195	461	388	263	531	426
v/s Ratio Prot	c0.11	0.36		0.06	0.20		0.05	c0.54		c0.10	c0.38	
v/s Ratio Perm	c0.38			0.29		0.06	0.17		0.02	0.23		0.13
v/c Ratio	1.00	0.96		0.82	0.58	0.16	0.68	2.16	0.07	0.84	1.32	0.47
Uniform Delay, d1	27.6	39.1		29.5	34.5	29.1	35.2	48.8	37.2	33.2	46.3	38.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	48.5	16.4		21.9	2.0	0.7	7.1	528.4	0.1	19.3	157.7	0.8
Delay (s)	76.1	55.5		51.4	36.5	29.8	42.3	577.2	37.2	52.5	204.0	38.8
Level of Service	E	E		D	D	C	D	F	D	D	F	D
Approach Delay (s/veh)		60.1			37.1			474.9			138.0	
Approach LOS		E			D			F			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	172.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.36		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	126.6%	ICU Level of Service	H
Analysis Period (min)	15		

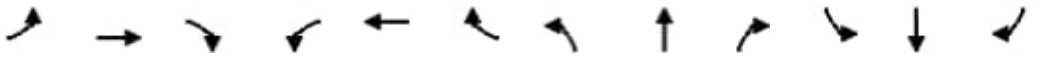
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	355	1255	158	721	243	132	995	102	220	702	277
v/c Ratio	1.33	1.14	0.99	0.71	0.45	0.84	1.36	0.15	1.39	0.96	0.41
Control Delay (s/veh)	198.4	114.7	99.5	45.9	17.5	62.4	205.0	4.8	235.4	64.1	15.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	198.4	114.7	99.5	45.9	17.5	62.4	205.0	4.8	235.4	64.1	15.8
Queue Length 50th (m)	~85.9	~196.8	24.9	87.1	18.6	17.5	~335.1	0.0	~58.4	173.6	24.2
Queue Length 95th (m)	#145.9	#239.7	#68.6	108.9	43.0	#51.9	#412.8	10.4	#108.7	#251.8	47.4
Internal Link Dist (m)		115.5		150.8			147.9			447.4	
Turn Bay Length (m)	65.0		115.0		90.0	40.0			50.0		50.0
Base Capacity (vph)	267	1100	159	1019	537	158	730	679	158	729	668
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.33	1.14	0.99	0.71	0.45	0.84	1.36	0.15	1.39	0.96	0.41

Intersection Summary

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

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	344	1068	149	153	699	236	128	965	99	213	681	269
Future Volume (vph)	344	1068	149	153	699	236	128	965	99	213	681	269
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00	0.96
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1766	3421		1785	3535	1498	1785	1845	1554	1785	1842	1479
Flt Permitted	0.18	1.00		0.11	1.00	1.00	0.08	1.00	1.00	0.08	1.00	1.00
Satd. Flow (perm)	343	3421		200	3535	1498	146	1845	1554	146	1842	1479
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	355	1101	154	158	721	243	132	995	102	220	702	277
RTOR Reduction (vph)	0	8	0	0	0	105	0	0	62	0	0	83
Lane Group Flow (vph)	355	1247	0	158	721	138	132	995	40	220	702	194
Confl. Peds. (#/hr)	11		12	12		11	21		12	12		21
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	1%	1%	3%	0%	1%	0%	0%	1%	0%	0%	2%	3%
Bus Blockages (#/hr)	0	3	0	0	0	5	0	2	0	0	0	2
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2		2	8		8	4		4
Actuated Green, G (s)	52.5	41.5		44.5	37.5	37.5	58.5	51.5	51.5	58.5	51.5	51.5
Effective Green, g (s)	52.5	41.5		44.5	37.5	37.5	58.5	51.5	51.5	58.5	51.5	51.5
Actuated g/C Ratio	0.40	0.32		0.34	0.29	0.29	0.45	0.40	0.40	0.45	0.40	0.40
Clearance Time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0
Lane Grp Cap (vph)	258	1092		153	1019	432	153	730	615	153	729	585
v/s Ratio Prot	c0.12	0.36		0.06	0.20		0.05	0.54		c0.08	0.38	
v/s Ratio Perm	c0.44			0.30		0.09	0.34		0.03	c0.57		0.13
v/c Ratio	1.38	1.14		1.03	0.71	0.32	0.86	1.36	0.07	1.44	0.96	0.33
Uniform Delay, d1	33.5	44.3		38.5	41.3	36.2	29.5	39.3	24.3	32.4	38.3	27.3
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	191.7	75.1		81.7	4.1	1.9	35.2	172.1	0.0	230.1	24.4	0.3
Delay (s)	225.2	119.3		120.1	45.5	38.2	64.7	211.4	24.4	262.5	62.7	27.6
Level of Service	F	F		F	D	D	E	F	C	F	E	C
Approach Delay (s/veh)		142.7			54.4			180.1			91.3	
Approach LOS		F			D			F			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	120.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.44		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	126.6%	ICU Level of Service	H
Analysis Period (min)	15		

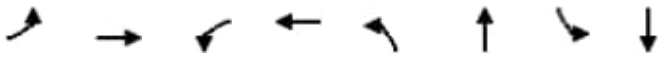
c Critical Lane Group

APPENDIX

G-3 *Future Total Synchro Worksheets*

APPENDIX

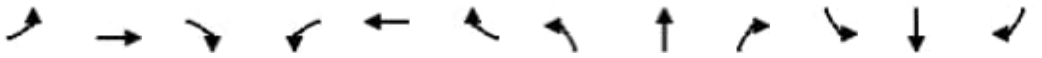
2030 Horizon Year



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	126	362	338	460	90	711	127	808
v/c Ratio	0.35	0.40	0.84	0.50	0.29	0.59	0.39	0.61
Control Delay (s/veh)	19.9	25.7	42.5	27.3	18.1	27.5	19.4	29.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	19.9	25.7	42.5	27.3	18.1	27.5	19.4	29.0
Queue Length 50th (m)	14.3	25.2	44.1	33.3	10.4	61.1	15.0	76.0
Queue Length 95th (m)	25.3	37.1	#68.1	47.1	19.7	81.0	26.5	98.1
Internal Link Dist (m)		129.9		116.8		249.3		213.8
Turn Bay Length (m)	70.0		55.0		55.0		70.0	
Base Capacity (vph)	357	1275	403	1281	311	1202	328	1316
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.28	0.84	0.36	0.29	0.59	0.39	0.61

Intersection Summary

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



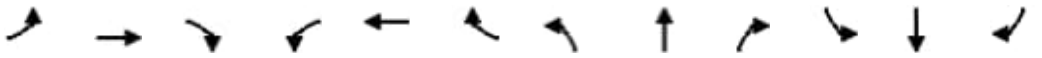
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	118	259	81	318	318	115	85	486	182	119	664	96
Future Volume (vph)	118	259	81	318	318	115	85	486	182	119	664	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.96		1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1780	3310		1753	3309		1783	3273		1766	3407	
Flt Permitted	0.41	1.00		0.50	1.00		0.25	1.00		0.27	1.00	
Satd. Flow (perm)	766	3310		932	3309		468	3273		500	3407	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	126	276	86	338	338	122	90	517	194	127	706	102
RTOR Reduction (vph)	0	31	0	0	38	0	0	34	0	0	10	0
Lane Group Flow (vph)	126	331	0	338	422	0	90	677	0	127	798	0
Confl. Peds. (#/hr)	20		34	34		20	20		14	14		20
Confl. Bikes (#/hr)						3						7
Heavy Vehicles (%)	0%	2%	2%	1%	2%	1%	0%	3%	4%	1%	2%	0%
Bus Blockages (#/hr)	0	5	0	0	5	0	0	3	0	0	3	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	32.8	25.7		32.8	25.7		40.8	35.4		44.2	37.1	
Effective Green, g (s)	32.8	25.7		32.8	25.7		40.8	35.4		44.2	37.1	
Actuated g/C Ratio	0.34	0.26		0.34	0.26		0.42	0.36		0.45	0.38	
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	332	874		374	874		269	1190		319	1299	
v/s Ratio Prot	0.03	0.10		c0.07	0.13		0.02	0.21		c0.03	c0.23	
v/s Ratio Perm	0.10			c0.24			0.12			0.15		
v/c Ratio	0.38	0.38		0.90	0.48		0.33	0.57		0.40	0.61	
Uniform Delay, d1	23.1	29.3		29.0	30.2		17.9	24.8		16.4	24.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	0.3		24.3	0.4		0.7	2.0		0.8	2.2	
Delay (s)	23.8	29.5		53.4	30.6		18.6	26.8		17.2	26.5	
Level of Service	C	C		D	C		B	C		B	C	
Approach Delay (s/veh)		28.1			40.2			25.9			25.2	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	29.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	97.3	Sum of lost time (s)	22.0
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	10	38	92	28	876	30	1158
v/c Ratio	0.06	0.12	0.39	0.07	0.32	0.07	0.45
Control Delay (s/veh)	34.7	0.7	15.8	2.9	4.0	7.0	7.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	34.7	0.7	15.8	2.9	4.0	7.0	7.7
Queue Length 50th (m)	1.5	0.0	1.5	0.9	22.5	1.2	33.7
Queue Length 95th (m)	6.0	0.0	14.6	2.5	30.9	5.6	72.7
Internal Link Dist (m)		112.8	36.0		165.7		249.3
Turn Bay Length (m)	35.0			20.0		45.0	
Base Capacity (vph)	500	660	537	417	2738	445	2576
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.06	0.17	0.07	0.32	0.07	0.45

Intersection Summary



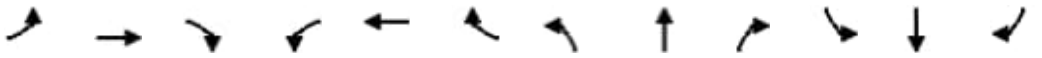
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	0	35	53	0	31	26	774	32	28	1065	0
Future Volume (vph)	9	0	35	53	0	31	26	774	32	28	1065	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.85			0.95		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1783	1597			1722		1783	3477		1776	3500	
Flt Permitted	0.77	1.00			0.79		0.20	1.00		0.32	1.00	
Satd. Flow (perm)	1443	1597			1396		381	3477		606	3500	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	0	38	58	0	34	28	841	35	30	1158	0
RTOR Reduction (vph)	0	35	0	0	75	0	0	2	0	0	0	0
Lane Group Flow (vph)	10	3	0	0	17	0	28	874	0	30	1158	0
Confl. Peds. (#/hr)	1					1	25		11	11		25
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	2%	0%	0%	2%	2%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	8.1	8.1			8.1		70.4	70.4		63.5	63.5	
Effective Green, g (s)	8.1	8.1			8.1		70.4	70.4		63.5	63.5	
Actuated g/C Ratio	0.09	0.09			0.09		0.77	0.77		0.69	0.69	
Clearance Time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	127	140			122		335	2660		418	2415	
v/s Ratio Prot		0.00					0.00	c0.25			c0.33	
v/s Ratio Perm	0.01				c0.01		0.06			0.05		
v/c Ratio	0.08	0.02			0.14		0.08	0.33		0.07	0.48	
Uniform Delay, d1	38.5	38.3			38.7		3.4	3.4		4.6	6.6	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.1			0.5		0.1	0.3		0.3	0.7	
Delay (s)	38.8	38.4			39.3		3.5	3.7		5.0	7.3	
Level of Service	D	D			D		A	A		A	A	
Approach Delay (s/veh)		38.5			39.3			3.7			7.2	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	7.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	92.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	43	101	205	56	805	13	1152
v/c Ratio	0.17	0.25	0.76	0.17	0.36	0.04	0.59
Control Delay (s/veh)	31.6	7.8	51.1	7.7	8.8	13.5	17.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Total Delay (s/veh)	31.6	7.8	51.1	7.7	8.8	13.5	17.3
Queue Length 50th (m)	6.5	0.2	33.3	2.9	31.2	1.1	72.9
Queue Length 95th (m)	15.1	12.0	57.1	8.9	55.6	4.7	116.1
Internal Link Dist (m)		103.2	75.9		447.4		165.7
Turn Bay Length (m)	50.0			65.0		55.0	
Base Capacity (vph)	387	562	408	321	2262	361	1952
Starvation Cap Reductn	0	0	0	0	0	0	162
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.18	0.50	0.17	0.36	0.04	0.64

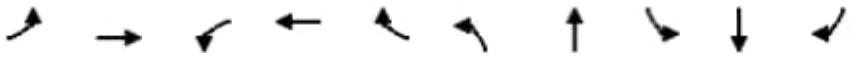
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	1	97	149	5	45	54	740	41	13	1082	36
Future Volume (vph)	42	1	97	149	5	45	54	740	41	13	1082	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.98			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00			0.99		1.00	1.00		1.00	1.00	
Frt	1.00	0.85			0.97		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00			0.96		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1720	1566			1703		1784	3452		1750	3457	
Flt Permitted	0.68	1.00			0.71		0.17	1.00		0.35	1.00	
Satd. Flow (perm)	1229	1566			1263		314	3452		640	3457	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	43	1	100	154	5	46	56	763	42	13	1115	37
RTOR Reduction (vph)	0	80	0	0	11	0	0	3	0	0	2	0
Lane Group Flow (vph)	43	21	0	0	194	0	56	802	0	13	1150	0
Confl. Peds. (#/hr)	11		8	8		11	11					11
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	3%	2%	0%	2%	2%	2%	0%	2%	2%	2%	2%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	3	0	0	3	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	19.9	19.9			19.9		64.3	64.3		54.7	54.7	
Effective Green, g (s)	19.9	19.9			19.9		64.3	64.3		54.7	54.7	
Actuated g/C Ratio	0.20	0.20			0.20		0.66	0.66		0.56	0.56	
Clearance Time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	250	318			257		290	2271		358	1935	
v/s Ratio Prot		0.01					0.01	c0.23			c0.33	
v/s Ratio Perm	0.03				c0.15		0.12			0.02		
v/c Ratio	0.17	0.07			0.75		0.19	0.35		0.04	0.59	
Uniform Delay, d1	32.1	31.4			36.6		8.0	7.4		9.7	14.2	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.1			11.8		0.3	0.4		0.2	1.4	
Delay (s)	32.4	31.5			48.4		8.3	7.9		9.8	15.5	
Level of Service	C	C			D		A	A		A	B	
Approach Delay (s/veh)		31.8			48.4			7.9			15.5	
Approach LOS		C			D			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	16.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	97.7	Sum of lost time (s)	17.5
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

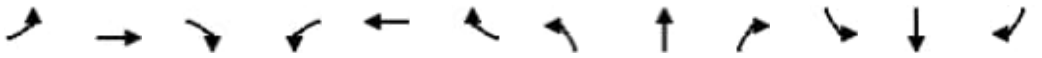


Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	210	843	164	761	179	135	542	189	842	248
v/c Ratio	0.69	0.67	0.58	0.56	0.25	0.80	0.57	0.56	1.47	0.44
Control Delay (s/veh)	33.8	37.0	25.8	32.9	4.5	59.9	42.9	30.7	254.4	17.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	33.8	37.0	25.8	32.9	4.5	59.9	42.9	30.7	254.4	17.9
Queue Length 50th (m)	29.2	92.2	22.2	79.3	0.0	21.0	61.7	30.5	~295.4	21.1
Queue Length 95th (m)	#48.2	120.8	35.4	98.9	14.3	#53.5	83.3	47.3	#371.0	45.3
Internal Link Dist (m)		115.5		150.8			147.9		447.4	
Turn Bay Length (m)	65.0		115.0		90.0	40.0		50.0		
Base Capacity (vph)	305	1263	351	1364	705	171	947	374	573	565
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.67	0.47	0.56	0.25	0.79	0.57	0.51	1.47	0.44

Intersection Summary

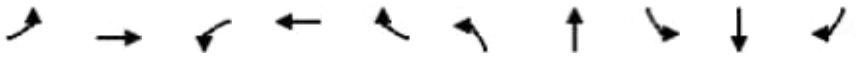
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	206	685	141	161	746	175	132	468	63	185	825	243
Future Volume (vph)	206	685	141	161	746	175	132	468	63	185	825	243
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.95		1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1766	3370		1748	3500	1529	1767	3398		1730	1842	1509
Flt Permitted	0.27	1.00		0.19	1.00	1.00	0.11	1.00		0.29	1.00	1.00
Satd. Flow (perm)	496	3370		353	3500	1529	207	3398		527	1842	1509
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	210	699	144	164	761	179	135	478	64	189	842	248
RTOR Reduction (vph)	0	13	0	0	0	109	0	8	0	0	0	95
Lane Group Flow (vph)	210	830	0	164	761	70	135	534	0	189	842	153
Confl. Peds. (#/hr)	9		16	16		9	18		13	13		18
Heavy Vehicles (%)	1%	2%	0%	2%	2%	0%	1%	2%	4%	3%	2%	1%
Bus Blockages (#/hr)	0	3	0	0	0	5	0	3	0	0	0	3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2		2	8			4		4
Actuated Green, G (s)	56.3	48.3		61.1	50.7	50.7	43.7	35.9		52.3	40.5	40.5
Effective Green, g (s)	56.3	48.3		61.1	50.7	50.7	43.7	35.9		52.3	40.5	40.5
Actuated g/C Ratio	0.43	0.37		0.47	0.39	0.39	0.34	0.28		0.40	0.31	0.31
Clearance Time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0		2.0	3.0	3.0
Lane Grp Cap (vph)	292	1252		277	1365	596	163	938		326	573	470
v/s Ratio Prot	c0.04	0.25		c0.05	0.22		c0.05	0.16		0.06	c0.46	
v/s Ratio Perm	c0.27			0.23		0.05	0.23			0.18		0.10
v/c Ratio	0.72	0.66		0.59	0.56	0.12	0.83	0.57		0.58	1.47	0.33
Uniform Delay, d1	26.9	34.1		22.6	30.9	25.3	35.2	40.4		27.1	44.8	34.3
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	6.9	2.8		2.3	1.6	0.4	26.7	0.8		1.6	220.7	0.4
Delay (s)	33.8	36.8		24.9	32.6	25.7	62.0	41.2		28.6	265.4	34.7
Level of Service	C	D		C	C	C	E	D		C	F	C
Approach Delay (s/veh)		36.2			30.3			45.3			185.7	
Approach LOS		D			C			D			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	82.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	107.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

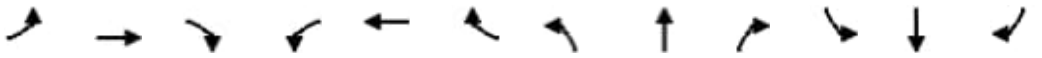


Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	210	843	164	761	179	135	542	189	842	248
v/c Ratio	1.06	0.96	0.96	0.90	0.35	0.87	0.36	0.42	1.02	0.32
Control Delay (s/veh)	112.7	68.1	93.4	62.1	7.5	69.7	24.7	17.3	71.3	9.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	112.7	68.1	93.4	62.1	7.5	69.7	24.7	17.3	71.3	9.0
Queue Length 50th (m)	~41.6	110.5	28.7	99.8	0.0	18.3	47.0	22.9	~227.6	12.5
Queue Length 95th (m)	#91.4	#150.9	#70.2	#133.3	18.0	#55.6	61.1	35.5	#303.1	30.1
Internal Link Dist (m)		115.5		150.8			147.9		447.4	
Turn Bay Length (m)	65.0		115.0		90.0	40.0		50.0		
Base Capacity (vph)	198	881	170	848	506	155	1494	456	828	768
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.06	0.96	0.96	0.90	0.35	0.87	0.36	0.41	1.02	0.32

Intersection Summary

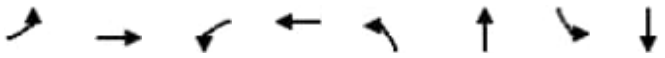
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	206	685	141	161	746	175	132	468	63	185	825	243
Future Volume (vph)	206	685	141	161	746	175	132	468	63	185	825	243
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.95		1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1767	3370		1749	3500	1529	1767	3398		1729	1842	1509
Flt Permitted	0.12	1.00		0.13	1.00	1.00	0.07	1.00		0.39	1.00	1.00
Satd. Flow (perm)	222	3370		234	3500	1529	131	3398		709	1842	1509
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	210	699	144	164	761	179	135	478	64	189	842	248
RTOR Reduction (vph)	0	13	0	0	0	136	0	8	0	0	0	90
Lane Group Flow (vph)	210	830	0	164	761	43	135	534	0	189	842	158
Confl. Peds. (#/hr)	9		16	16		9	18		13	13		18
Heavy Vehicles (%)	1%	2%	0%	2%	2%	0%	1%	2%	4%	3%	2%	1%
Bus Blockages (#/hr)	0	3	0	0	0	5	0	3	0	0	0	3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2		2	8			4		4
Actuated Green, G (s)	43.5	33.5		39.5	31.5	31.5	63.9	56.9		67.1	58.5	58.5
Effective Green, g (s)	43.5	33.5		39.5	31.5	31.5	63.9	56.9		67.1	58.5	58.5
Actuated g/C Ratio	0.33	0.26		0.30	0.24	0.24	0.49	0.44		0.52	0.45	0.45
Clearance Time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0		2.0	3.0	3.0
Lane Grp Cap (vph)	193	868		164	848	370	152	1487		433	828	679
v/s Ratio Prot	c0.08	0.25		0.06	0.22		c0.05	0.16		c0.03	c0.46	
v/s Ratio Perm	c0.28			0.24		0.03	0.39			0.20		0.10
v/c Ratio	1.09	0.96		1.00	0.90	0.12	0.89	0.36		0.44	1.02	0.23
Uniform Delay, d1	36.3	47.5		40.1	47.7	38.4	30.8	24.4		17.4	35.8	22.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	90.2	21.5		70.3	14.2	0.6	40.7	0.1		0.3	35.6	0.2
Delay (s)	126.5	69.1		110.4	61.9	39.1	71.5	24.5		17.7	71.3	22.1
Level of Service	F	E		F	E	D	E	C		B	E	C
Approach Delay (s/veh)		80.5			65.4			33.9			53.9	
Approach LOS		F			E			C			D	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	60.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	107.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

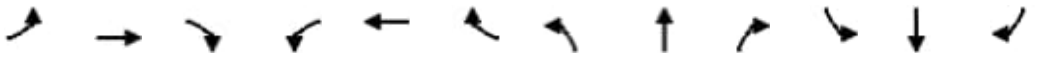


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	100	316	319	388	195	1302	111	815
v/c Ratio	0.24	0.34	0.80	0.39	0.65	0.98	0.52	0.67
Control Delay (s/veh)	18.1	17.3	38.9	24.1	28.7	53.3	25.3	31.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	18.1	17.3	38.9	24.1	28.7	53.3	25.3	31.5
Queue Length 50th (m)	11.2	14.9	41.5	26.2	24.1	~167.5	13.0	78.7
Queue Length 95th (m)	20.6	25.3	62.9	38.5	#40.3	#209.3	#24.5	100.9
Internal Link Dist (m)		129.9		116.8		249.3		213.8
Turn Bay Length (m)	70.0		55.0		55.0		70.0	
Base Capacity (vph)	411	1300	400	1303	303	1324	212	1222
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.24	0.80	0.30	0.64	0.98	0.52	0.67

Intersection Summary

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

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



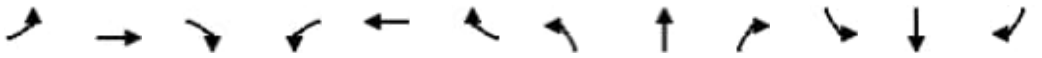
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	94	185	112	300	264	101	183	933	290	104	720	46
Future Volume (vph)	94	185	112	300	264	101	183	933	290	104	720	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	0.96		1.00	0.96		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1775	3208		1687	3317		1783	3362		1750	3475	
Flt Permitted	0.52	1.00		0.52	1.00		0.20	1.00		0.12	1.00	
Satd. Flow (perm)	967	3208		922	3317		383	3362		213	3475	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	100	197	119	319	281	107	195	993	309	111	766	49
RTOR Reduction (vph)	0	88	0	0	41	0	0	25	0	0	4	0
Lane Group Flow (vph)	100	228	0	319	347	0	195	1277	0	111	811	0
Confl. Peds. (#/hr)	24		31	31		24	28		21	21		28
Confl. Bikes (#/hr)			1						2			4
Heavy Vehicles (%)	0%	4%	0%	5%	1%	2%	0%	1%	1%	2%	1%	0%
Bus Blockages (#/hr)	0	5	0	0	5	0	0	3	0	0	3	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	31.1	25.7		34.5	27.4		45.0	37.1		40.0	34.6	
Effective Green, g (s)	31.1	25.7		34.5	27.4		45.0	37.1		40.0	34.6	
Actuated g/C Ratio	0.32	0.26		0.35	0.28		0.46	0.38		0.41	0.36	
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	353	847		382	934		290	1281		172	1235	
v/s Ratio Prot	0.02	0.07		c0.06	0.10		c0.05	c0.38		0.04	0.23	
v/s Ratio Perm	0.07			c0.23			0.26			0.23		
v/c Ratio	0.28	0.27		0.84	0.37		0.67	1.00		0.65	0.66	
Uniform Delay, d1	23.9	28.4		27.3	28.0		17.5	30.0		22.4	26.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.2		14.5	0.3		6.0	24.3		8.0	2.7	
Delay (s)	24.3	28.5		41.8	28.3		23.5	54.4		30.4	29.1	
Level of Service	C	C		D	C		C	D		C	C	
Approach Delay (s/veh)		27.5			34.4			50.4			29.3	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	39.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	97.3	Sum of lost time (s)	22.0
Intersection Capacity Utilization	99.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	15	30	110	42	1495	49	1191
v/c Ratio	0.09	0.08	0.46	0.11	0.55	0.22	0.48
Control Delay (s/veh)	35.5	0.4	19.7	3.3	5.9	11.5	9.2
Queue Delay	0.0	0.0	0.0	0.0	0.2	0.0	0.0
Total Delay (s/veh)	35.5	0.4	19.7	3.3	6.1	11.5	9.2
Queue Length 50th (m)	2.3	0.0	4.3	1.3	50.2	3.5	57.2
Queue Length 95th (m)	7.7	0.0	18.9	3.8	73.6	11.0	80.0
Internal Link Dist (m)		112.8	36.0		165.7		249.3
Turn Bay Length (m)	35.0			20.0		45.0	
Base Capacity (vph)	455	673	522	444	2737	223	2474
Starvation Cap Reductn	0	0	0	0	427	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.04	0.21	0.09	0.65	0.22	0.48

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	0	28	65	0	36	39	1287	88	45	1086	10
Future Volume (vph)	14	0	28	65	0	36	39	1287	88	45	1086	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.85			0.95		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1781	1597			1724		1783	3492		1779	3494	
Flt Permitted	0.73	1.00			0.79		0.19	1.00		0.17	1.00	
Satd. Flow (perm)	1363	1597			1400		355	3492		317	3494	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	15	0	30	71	0	39	42	1399	96	49	1180	11
RTOR Reduction (vph)	0	27	0	0	74	0	0	3	0	0	0	0
Lane Group Flow (vph)	15	3	0	0	36	0	42	1492	0	49	1191	0
Confl. Peds. (#/hr)	3					3	29		19	19		29
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	1%	0%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	8.4	8.4			8.4		69.4	69.4		61.1	61.1	
Effective Green, g (s)	8.4	8.4			8.4		69.4	69.4		61.1	61.1	
Actuated g/C Ratio	0.09	0.09			0.09		0.76	0.76		0.67	0.67	
Clearance Time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	125	146			128		337	2654		212	2338	
v/s Ratio Prot		0.00					0.01	c0.43			0.34	
v/s Ratio Perm	0.01				c0.03		0.09			0.15		
v/c Ratio	0.12	0.02			0.28		0.12	0.56		0.23	0.51	
Uniform Delay, d1	38.1	37.7			38.6		3.7	4.6		5.9	7.6	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.1			1.2		0.2	0.9		2.5	0.8	
Delay (s)	38.5	37.8			39.8		3.9	5.5		8.4	8.4	
Level of Service	D	D			D		A	A		A	A	
Approach Delay (s/veh)		38.0			39.8			5.4			8.4	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	91.3	Sum of lost time (s)	17.5
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		

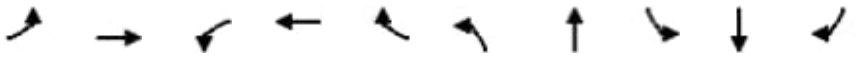
c Critical Lane Group

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	72	96	88	127	1487	41	1167
v/c Ratio	0.33	0.30	0.43	0.34	0.57	0.21	0.56
Control Delay (s/veh)	37.8	10.3	35.4	6.9	8.5	16.1	14.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Total Delay (s/veh)	37.8	10.3	35.4	6.9	8.5	16.1	14.2
Queue Length 50th (m)	11.3	0.6	11.7	4.3	51.1	2.9	56.4
Queue Length 95th (m)	23.0	12.6	24.9	16.5	126.4	13.7	120.3
Internal Link Dist (m)		103.2	75.9		447.4		165.7
Turn Bay Length (m)	50.0			65.0		55.0	
Base Capacity (vph)	466	583	428	418	2610	193	2088
Starvation Cap Reductn	0	0	0	0	0	0	173
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.16	0.21	0.30	0.57	0.21	0.61

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	4	89	64	2	19	123	1310	132	40	1067	65
Future Volume (vph)	70	4	89	64	2	19	123	1310	132	40	1067	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.98			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.98	1.00			0.99		1.00	1.00		1.00	1.00	
Frt	1.00	0.86			0.97		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00			0.96		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1756	1576			1699		1784	3462		1750	3440	
Flt Permitted	0.76	1.00			0.72		0.18	1.00		0.17	1.00	
Satd. Flow (perm)	1409	1576			1266		332	3462		319	3440	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	72	4	92	66	2	20	127	1351	136	41	1100	67
RTOR Reduction (vph)	0	80	0	0	12	0	0	5	0	0	3	0
Lane Group Flow (vph)	72	16	0	0	76	0	127	1482	0	41	1164	0
Confl. Peds. (#/hr)	19		9	9		19	17					17
Heavy Vehicles (%)	0%	2%	0%	2%	2%	2%	0%	1%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	3	0	0	3	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	11.5	11.5			11.5		65.9	65.9		54.4	54.4	
Effective Green, g (s)	11.5	11.5			11.5		65.9	65.9		54.4	54.4	
Actuated g/C Ratio	0.13	0.13			0.13		0.72	0.72		0.60	0.60	
Clearance Time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	178	199			160		360	2509		190	2058	
v/s Ratio Prot		0.01					0.03	c0.43			0.34	
v/s Ratio Perm	0.05				c0.06		0.23			0.13		
v/c Ratio	0.40	0.08			0.47		0.35	0.59		0.22	0.57	
Uniform Delay, d1	36.5	35.0			36.9		5.6	6.0		8.4	11.1	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.5	0.2			2.2		0.6	1.0		2.6	1.1	
Delay (s)	38.1	35.2			39.1		6.2	7.0		11.0	12.2	
Level of Service	D	D			D		A	A		B	B	
Approach Delay (s/veh)		36.4			39.1			7.0			12.2	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	90.9	Sum of lost time (s)	17.5
Intersection Capacity Utilization	87.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

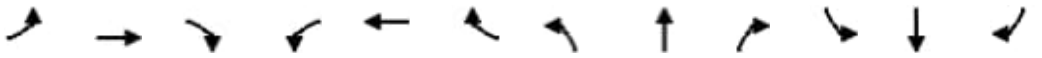


Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	291	991	122	645	192	134	1206	228	701	244
v/c Ratio	0.75	0.74	0.52	0.52	0.29	0.67	1.39	0.83	1.31	0.46
Control Delay (s/veh)	33.7	39.2	26.3	36.2	5.5	41.4	219.9	54.4	189.1	18.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	33.7	39.2	26.3	36.2	5.5	41.4	219.9	54.4	189.1	18.3
Queue Length 50th (m)	42.3	112.3	15.9	69.2	0.0	21.0	~216.2	39.8	~228.7	20.2
Queue Length 95th (m)	#74.6	#154.4	28.8	92.6	16.7	35.3	#258.8	65.3	#301.4	44.8
Internal Link Dist (m)		115.5		150.8			147.9		447.4	
Turn Bay Length (m)	65.0		115.0		90.0	40.0		50.0		
Base Capacity (vph)	394	1334	278	1242	660	335	867	331	536	529
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.74	0.44	0.52	0.29	0.40	1.39	0.69	1.31	0.46

Intersection Summary

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

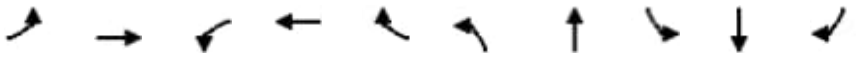
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	877	94	120	632	188	131	1000	182	223	687	239
Future Volume (vph)	285	877	94	120	632	188	131	1000	182	223	687	239
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.95		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	1.00		1.00	1.00	0.96
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1766	3441		1784	3535	1525	1785	3423		1785	1842	1473
Flt Permitted	0.28	1.00		0.16	1.00	1.00	0.12	1.00		0.11	1.00	1.00
Satd. Flow (perm)	511	3441		300	3535	1525	231	3423		206	1842	1473
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	291	895	96	122	645	192	134	1020	186	228	701	244
RTOR Reduction (vph)	0	6	0	0	0	125	0	11	0	0	0	100
Lane Group Flow (vph)	291	985	0	122	645	67	134	1195	0	228	701	144
Confl. Peds. (#/hr)	11		12	12		11	21		12	12		21
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	1%	1%	3%	0%	1%	0%	0%	1%	0%	0%	2%	3%
Bus Blockages (#/hr)	0	3	0	0	0	5	0	3	0	0	0	3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2		2	8			4		4
Actuated Green, G (s)	63.1	50.3		54.5	45.7	45.7	42.5	32.5		51.9	37.9	37.9
Effective Green, g (s)	63.1	50.3		54.5	45.7	45.7	42.5	32.5		51.9	37.9	37.9
Actuated g/C Ratio	0.49	0.39		0.42	0.35	0.35	0.33	0.25		0.40	0.29	0.29
Clearance Time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0		2.0	3.0	3.0
Lane Grp Cap (vph)	377	1331		226	1242	536	195	855		269	537	429
v/s Ratio Prot	c0.08	0.29		0.04	0.18		0.05	0.35		c0.10	c0.38	
v/s Ratio Perm	c0.29			0.19		0.04	0.17			0.24		0.10
v/c Ratio	0.77	0.74		0.54	0.52	0.13	0.69	1.40		0.85	1.31	0.34
Uniform Delay, d1	22.2	34.2		25.6	33.4	28.6	35.2	48.8		34.0	46.1	36.2
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	8.6	3.7		1.2	1.6	0.5	7.8	185.9		20.4	150.5	0.5
Delay (s)	30.9	38.0		26.8	35.0	29.1	43.0	234.7		54.4	196.6	36.6
Level of Service	C	D		C	C	C	D	F		D	F	D
Approach Delay (s/veh)		36.4			32.8			215.5			135.7	
Approach LOS		D			C			F			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	110.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	106.8%	ICU Level of Service	G
Analysis Period (min)	15		

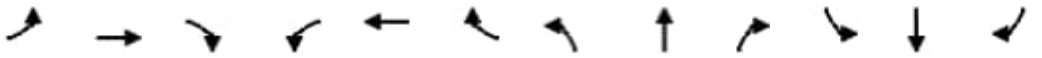
c Critical Lane Group



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	291	991	122	645	192	134	1206	228	701	244
v/c Ratio	0.98	0.92	0.77	0.67	0.35	0.83	0.98	0.95	0.94	0.35
Control Delay (s/veh)	78.7	57.0	56.0	46.0	7.8	61.4	61.1	80.3	59.6	9.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	78.7	57.0	56.0	46.0	7.8	61.4	61.1	80.3	59.6	9.1
Queue Length 50th (m)	50.8	128.0	19.1	77.5	1.7	17.4	157.8	41.9	171.0	10.4
Queue Length 95th (m)	#106.3	#167.2	#44.2	98.3	19.7	#51.6	#205.5	#91.9	#247.5	29.1
Internal Link Dist (m)		115.5		150.8			147.9		447.4	
Turn Bay Length (m)	65.0		115.0		90.0	40.0		50.0		
Base Capacity (vph)	296	1077	159	965	549	161	1236	239	743	700
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.92	0.77	0.67	0.35	0.83	0.98	0.95	0.94	0.35

Intersection Summary

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



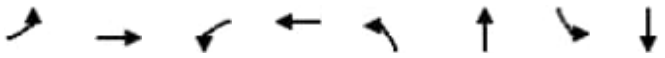
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	877	94	120	632	188	131	1000	182	223	687	239
Future Volume (vph)	285	877	94	120	632	188	131	1000	182	223	687	239
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.95		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	1.00		1.00	1.00	0.96
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1766	3441		1784	3535	1525	1785	3423		1785	1842	1473
Flt Permitted	0.22	1.00		0.11	1.00	1.00	0.09	1.00		0.08	1.00	1.00
Satd. Flow (perm)	403	3441		212	3535	1525	170	3423		149	1842	1473
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	291	895	96	122	645	192	134	1020	186	228	701	244
RTOR Reduction (vph)	0	6	0	0	0	133	0	12	0	0	0	106
Lane Group Flow (vph)	291	985	0	122	645	59	134	1194	0	228	701	138
Confl. Peds. (#/hr)	11		12	12		11	21		12	12		21
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	1%	1%	3%	0%	1%	0%	0%	1%	0%	0%	2%	3%
Bus Blockages (#/hr)	0	3	0	0	0	5	0	3	0	0	0	3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2		2	8			4		4
Actuated Green, G (s)	51.5	40.5		42.5	35.5	35.5	53.5	46.5		63.5	52.5	52.5
Effective Green, g (s)	51.5	40.5		42.5	35.5	35.5	53.5	46.5		63.5	52.5	52.5
Actuated g/C Ratio	0.40	0.31		0.33	0.27	0.27	0.41	0.36		0.49	0.40	0.40
Clearance Time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5		4.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0		2.0	3.0	3.0
Lane Grp Cap (vph)	285	1072		153	965	416	156	1224		236	743	594
v/s Ratio Prot	c0.09	0.29		0.04	0.18		0.05	0.35		c0.10	0.38	
v/s Ratio Perm	c0.31			0.22		0.04	0.31			c0.38		0.09
v/c Ratio	1.02	0.92		0.80	0.67	0.14	0.86	0.98		0.97	0.94	0.23
Uniform Delay, d1	34.5	43.2		34.3	42.0	35.7	30.4	41.2		38.7	37.3	25.5
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	58.8	13.8		22.9	3.7	0.7	33.6	19.9		48.4	20.3	0.2
Delay (s)	93.3	56.9		57.3	45.7	36.4	63.9	61.1		87.1	57.6	25.7
Level of Service	F	E		E	D	D	E	E		F	E	C
Approach Delay (s/veh)		65.2			45.3			61.4			56.7	
Approach LOS		E			D			E			E	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	58.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	106.8%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX

2041 Horizon Year

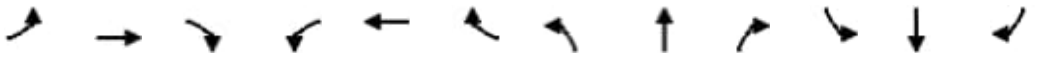


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	85	645	184	444	63	1066	301	916
v/c Ratio	0.21	0.66	0.66	0.41	0.30	1.74	1.48	1.37
Control Delay (s/veh)	17.5	33.4	30.8	27.9	19.8	362.6	260.2	204.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	17.5	33.4	30.8	27.9	19.8	362.6	260.2	204.5
Queue Length 50th (m)	9.4	55.6	21.7	35.6	7.2	~339.6	~74.4	~272.3
Queue Length 95th (m)	18.0	73.3	35.6	49.1	14.8	#416.5	#126.7	#346.6
Internal Link Dist (m)		129.9		116.8		249.3		213.8
Turn Bay Length (m)	70.0		55.0		55.0		70.0	
Base Capacity (vph)	399	1254	280	1260	208	614	204	669
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.51	0.66	0.35	0.30	1.74	1.48	1.37

Intersection Summary

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

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	553	54	173	390	27	59	868	134	283	776	85
Future Volume (vph)	80	553	54	173	390	27	59	868	134	283	776	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1774	3399		1761	3422		1785	1758		1767	1790	
Flt Permitted	0.46	1.00		0.26	1.00		0.11	1.00		0.11	1.00	
Satd. Flow (perm)	866	3399		480	3422		214	1758		202	1790	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	85	588	57	184	415	29	63	923	143	301	826	90
RTOR Reduction (vph)	0	7	0	0	5	0	0	5	0	0	3	0
Lane Group Flow (vph)	85	638	0	184	439	0	63	1061	0	301	913	0
Confl. Peds. (#/hr)	20		34	34		20	20		14	14		20
Confl. Bikes (#/hr)						3						7
Heavy Vehicles (%)	0%	2%	2%	1%	2%	1%	0%	3%	4%	1%	2%	0%
Bus Blockages (#/hr)	0	5	0	0	5	0	0	3	0	0	3	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	34.7	29.2		37.9	30.8		40.7	35.2		43.9	36.8	
Effective Green, g (s)	34.7	29.2		37.9	30.8		40.7	35.2		43.9	36.8	
Actuated g/C Ratio	0.34	0.29		0.38	0.31		0.40	0.35		0.44	0.37	
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	348	986		271	1047		172	615		198	654	
v/s Ratio Prot	0.01	0.19		c0.05	0.13		0.02	c0.60		c0.11	0.51	
v/s Ratio Perm	0.07			c0.21			0.13			0.55		
v/c Ratio	0.24	0.65		0.68	0.42		0.37	1.72		1.52	1.40	
Uniform Delay, d1	22.7	31.2		22.9	27.8		23.5	32.7		24.1	31.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	1.5		6.6	0.3		1.3	333.0		258.2	187.3	
Delay (s)	23.1	32.7		29.5	28.1		24.8	365.7		282.3	219.2	
Level of Service	C	C		C	C		C	F		F	F	
Approach Delay (s/veh)		31.5			28.5			346.7			234.8	
Approach LOS		C			C			F			F	

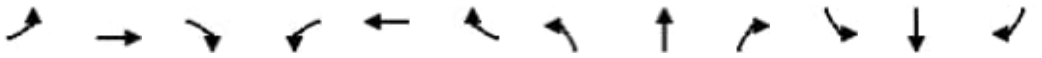
Intersection Summary			
HCM 2000 Control Delay (s/veh)	193.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.24		
Actuated Cycle Length (s)	100.6	Sum of lost time (s)	22.0
Intersection Capacity Utilization	123.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	45	40	176	33	1050	89	1022
v/c Ratio	0.22	0.13	0.69	0.15	0.83	0.48	0.90
Control Delay (s/veh)	34.6	11.5	44.2	6.2	19.5	24.9	31.0
Queue Delay	0.0	0.0	0.0	0.0	4.8	0.0	0.0
Total Delay (s/veh)	34.6	11.5	44.2	6.2	24.3	24.9	31.0
Queue Length 50th (m)	6.9	0.2	24.4	1.4	117.0	8.9	163.6
Queue Length 95th (m)	16.2	8.2	45.2	4.9	#262.6	#34.5	#293.0
Internal Link Dist (m)		112.8	19.9		165.7		249.3
Turn Bay Length (m)	35.0			20.0		45.0	
Base Capacity (vph)	392	546	471	226	1264	187	1138
Starvation Cap Reductn	0	0	0	0	156	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.07	0.37	0.15	0.95	0.48	0.90

Intersection Summary

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	41	1	36	100	2	60	30	934	32	82	929	11
Future Volume (vph)	41	1	36	100	2	60	30	934	32	82	929	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.85			0.95		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1783	1603			1717		1785	1832		1781	1838	
Flt Permitted	0.65	1.00			0.79		0.08	1.00		0.16	1.00	
Satd. Flow (perm)	1211	1603			1395		145	1832		302	1838	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	45	1	39	109	2	65	33	1015	35	89	1010	12
RTOR Reduction (vph)	0	33	0	0	23	0	0	1	0	0	0	0
Lane Group Flow (vph)	45	7	0	0	153	0	33	1049	0	89	1022	0
Confl. Peds. (#/hr)	1					1	25		11	11		25
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	2%	0%	0%	2%	2%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	15.7	15.7			15.7		66.6	66.6		58.4	58.4	
Effective Green, g (s)	15.7	15.7			15.7		66.6	66.6		58.4	58.4	
Actuated g/C Ratio	0.16	0.16			0.16		0.70	0.70		0.61	0.61	
Clearance Time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	198	262			228		172	1273		184	1120	
v/s Ratio Prot		0.00					0.01	c0.57			c0.56	
v/s Ratio Perm	0.04				c0.11		0.12			0.29		
v/c Ratio	0.23	0.03			0.67		0.19	0.82		0.48	0.91	
Uniform Delay, d1	34.8	33.6			37.6		16.3	10.4		10.4	16.4	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.6	0.0			7.3		0.5	6.1		8.8	12.6	
Delay (s)	35.4	33.7			44.9		16.9	16.6		19.2	29.1	
Level of Service	D	C			D		B	B		B	C	
Approach Delay (s/veh)		34.6			44.9			16.6			28.3	
Approach LOS		C			D			B			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	24.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	95.8	Sum of lost time (s)	17.5
Intersection Capacity Utilization	95.7%	ICU Level of Service	F
Analysis Period (min)	15		

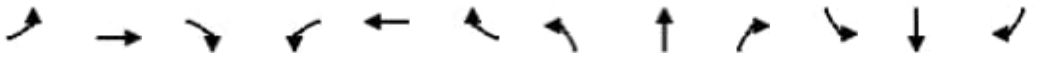
c Critical Lane Group

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	1	317	310	206	976	189	871
v/c Ratio	0.01	0.62	0.78	0.87	0.84	1.15	0.91
Control Delay (s/veh)	28.0	17.2	45.9	50.6	23.6	142.1	37.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	9.9
Total Delay (s/veh)	28.0	17.2	45.9	50.6	23.6	142.1	46.9
Queue Length 50th (m)	0.2	17.0	49.5	16.4	127.6	~41.6	139.6
Queue Length 95th (m)	1.5	42.9	77.8	#66.2	#267.5	#92.1	#260.5
Internal Link Dist (m)		103.2	75.9		447.4		165.7
Turn Bay Length (m)	50.0			65.0		55.0	
Base Capacity (vph)	183	647	564	236	1158	165	960
Starvation Cap Reductn	0	0	0	0	0	0	82
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.49	0.55	0.87	0.84	1.15	0.99

Intersection Summary

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

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	57	250	0	183	117	200	879	68	183	837	8
Future Volume (vph)	1	57	250	0	183	117	200	879	68	183	837	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.97			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.88			0.95		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1715	1596			1719		1785	1800		1750	1817	
Flt Permitted	0.32	1.00			1.00		0.10	1.00		0.17	1.00	
Satd. Flow (perm)	580	1596			1719		179	1800		313	1817	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	1	59	258	0	189	121	206	906	70	189	863	8
RTOR Reduction (vph)	0	163	0	0	24	0	0	2	0	0	0	0
Lane Group Flow (vph)	1	154	0	0	286	0	206	974	0	189	871	0
Confl. Peds. (#/hr)	11		8	8		11	11					11
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	3%	2%	0%	2%	2%	2%	0%	2%	2%	2%	2%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	3	0	0	3	0
Turn Type	Perm	NA			NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	21.1	21.1			21.1		62.2	62.2		51.2	51.2	
Effective Green, g (s)	21.1	21.1			21.1		62.2	62.2		51.2	51.2	
Actuated g/C Ratio	0.22	0.22			0.22		0.64	0.64		0.53	0.53	
Clearance Time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	126	347			374		231	1156		165	961	
v/s Ratio Prot		0.10			c0.17		0.06	c0.54			0.48	
v/s Ratio Perm	0.00						0.51			c0.60		
v/c Ratio	0.01	0.44			0.76		0.89	0.84		1.15	0.91	
Uniform Delay, d1	29.7	32.8			35.5		21.9	13.5		22.8	20.6	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.9			9.0		31.9	7.5		114.5	13.6	
Delay (s)	29.7	33.7			44.5		53.8	21.0		137.3	34.3	
Level of Service	C	C			D		D	C		F	C	
Approach Delay (s/veh)		33.6			44.5			26.7			52.6	
Approach LOS		C			D			C			D	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	39.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	96.8	Sum of lost time (s)	17.5
Intersection Capacity Utilization	100.1%	ICU Level of Service	G
Analysis Period (min)	15		

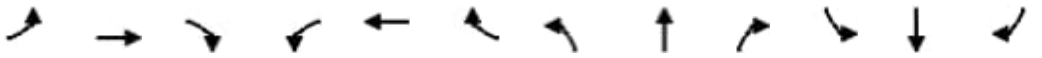
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	299	1003	264	1321	357	250	612	56	144	892	303
v/c Ratio	1.76	0.90	0.97	0.97	0.48	1.46	1.15	0.10	0.71	1.56	0.54
Control Delay (s/veh)	386.3	51.6	80.9	57.8	9.4	263.2	131.1	0.4	44.8	291.3	23.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	386.3	51.6	80.9	57.8	9.4	263.2	131.1	0.4	44.8	291.3	23.4
Queue Length 50th (m)	~97.8	124.2	51.2	173.2	13.8	~70.6	~183.4	0.0	22.6	~322.0	34.2
Queue Length 95th (m)	#154.6	#162.2	#104.8	#221.8	39.2	#127.7	#271.8	0.0	40.9	#398.7	63.2
Internal Link Dist (m)		115.5		150.8			147.9			447.4	
Turn Bay Length (m)	65.0		115.0		90.0	40.0			50.0		50.0
Base Capacity (vph)	170	1116	276	1359	751	171	530	556	268	573	565
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.76	0.90	0.96	0.97	0.48	1.46	1.15	0.10	0.54	1.56	0.54

Intersection Summary

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

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	293	715	268	259	1295	350	245	600	55	141	874	297
Future Volume (vph)	293	715	268	259	1295	350	245	600	55	141	874	297
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1767	3306		1750	3500	1505	1767	1820	1493	1733	1842	1509
Flt Permitted	0.09	1.00		0.09	1.00	1.00	0.11	1.00	1.00	0.10	1.00	1.00
Satd. Flow (perm)	174	3306		158	3500	1505	196	1820	1493	180	1842	1509
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	299	730	273	264	1321	357	250	612	56	144	892	303
RTOR Reduction (vph)	0	30	0	0	0	167	0	0	40	0	0	95
Lane Group Flow (vph)	299	973	0	264	1321	190	250	612	16	144	892	208
Confl. Peds. (#/hr)	9		16	16		9	18		13	13		18
Heavy Vehicles (%)	1%	2%	0%	2%	2%	0%	1%	2%	4%	3%	2%	1%
Bus Blockages (#/hr)	0	3	0	0	0	5	0	3	0	0	0	3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2		2	8		8	4		4
Actuated Green, G (s)	50.7	42.7		62.5	50.5	50.5	45.9	37.9	37.9	51.1	40.5	40.5
Effective Green, g (s)	50.7	42.7		62.5	50.5	50.5	45.9	37.9	37.9	51.1	40.5	40.5
Actuated g/C Ratio	0.39	0.33		0.48	0.39	0.39	0.35	0.29	0.29	0.39	0.31	0.31
Clearance Time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0
Lane Grp Cap (vph)	165	1085		269	1359	584	165	530	435	197	573	470
v/s Ratio Prot	c0.11	0.29		c0.12	0.38		c0.09	0.34		c0.06	c0.48	
v/s Ratio Perm	c0.59			0.35		0.13	0.44		0.01	0.23		0.14
v/c Ratio	1.81	0.90		0.98	0.97	0.33	1.52	1.15	0.04	0.73	1.56	0.44
Uniform Delay, d1	32.8	41.6		39.3	39.1	27.8	36.7	46.1	33.0	31.7	44.8	35.7
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	388.4	11.6		49.4	18.6	1.5	260.4	89.4	0.0	11.3	259.0	0.7
Delay (s)	421.2	53.1		88.6	57.6	29.3	297.1	135.4	33.0	43.0	303.8	36.4
Level of Service	F	D		F	E	C	F	F	C	D	F	D
Approach Delay (s/veh)		137.7			56.6			173.2			215.2	
Approach LOS		F			E			F			F	

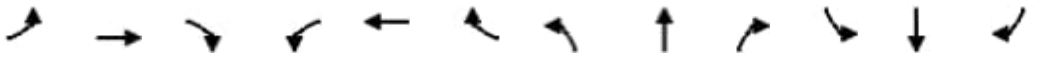
Intersection Summary			
HCM 2000 Control Delay (s/veh)	133.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.62		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	130.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	299	1003	264	1321	357	250	612	56	144	892	303
v/c Ratio	1.51	0.97	1.12	1.15	0.57	1.48	0.92	0.09	0.83	1.36	0.50
Control Delay (s/veh)	280.3	64.5	126.2	119.6	18.7	269.6	60.1	0.4	58.0	204.2	23.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	280.3	64.5	126.2	119.6	18.7	269.6	60.1	0.4	58.0	204.2	23.2
Queue Length 50th (m)	~90.2	129.0	~61.1	~209.7	31.1	~71.7	148.9	0.0	20.6	~299.4	37.5
Queue Length 95th (m)	#147.0	#173.1	#115.7	#252.0	62.5	#124.7	#218.5	0.7	#50.2	#376.0	65.0
Internal Link Dist (m)		115.5		150.8			147.9			447.4	
Turn Bay Length (m)	65.0		115.0		90.0	40.0			50.0		50.0
Base Capacity (vph)	198	1034	236	1144	629	169	665	612	174	658	611
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.51	0.97	1.12	1.15	0.57	1.48	0.92	0.09	0.83	1.36	0.50

Intersection Summary

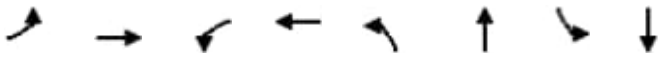
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	293	715	268	259	1295	350	245	600	55	141	874	297
Future Volume (vph)	293	715	268	259	1295	350	245	600	55	141	874	297
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1767	3306		1750	3500	1505	1767	1820	1493	1733	1842	1509
Flt Permitted	0.10	1.00		0.09	1.00	1.00	0.08	1.00	1.00	0.12	1.00	1.00
Satd. Flow (perm)	188	3306		173	3500	1505	157	1820	1493	212	1842	1509
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	299	730	273	264	1321	357	250	612	56	144	892	303
RTOR Reduction (vph)	0	30	0	0	0	137	0	0	36	0	0	71
Lane Group Flow (vph)	299	973	0	264	1321	220	250	612	20	144	892	232
Confl. Peds. (#/hr)	9		16	16		9	18		13	13		18
Heavy Vehicles (%)	1%	2%	0%	2%	2%	0%	1%	2%	4%	3%	2%	1%
Bus Blockages (#/hr)	0	3	0	0	0	5	0	3	0	0	0	3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2		2	8		8	4		4
Actuated Green, G (s)	49.5	39.5		55.5	42.5	42.5	55.5	47.5	47.5	53.5	46.5	46.5
Effective Green, g (s)	49.5	39.5		55.5	42.5	42.5	55.5	47.5	47.5	53.5	46.5	46.5
Actuated g/C Ratio	0.38	0.30		0.43	0.33	0.33	0.43	0.37	0.37	0.41	0.36	0.36
Clearance Time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0
Lane Grp Cap (vph)	193	1004		231	1144	492	166	665	545	169	658	539
v/s Ratio Prot	c0.12	0.29		c0.11	0.38		c0.09	0.34		0.05	0.48	
v/s Ratio Perm	c0.47			0.37		0.15	c0.55		0.01	0.30		0.15
v/c Ratio	1.55	0.97		1.14	1.15	0.45	1.51	0.92	0.04	0.85	1.36	0.43
Uniform Delay, d1	34.0	44.6		37.4	43.8	34.5	33.2	39.4	26.5	30.0	41.7	31.7
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	271.1	21.9		103.1	79.9	2.9	256.4	18.1	0.0	30.7	169.9	0.6
Delay (s)	305.2	66.5		140.6	123.6	37.4	289.6	57.6	26.6	60.6	211.6	32.2
Level of Service	F	E		F	F	D	F	E	C	E	F	C
Approach Delay (s/veh)		121.3			110.1			118.9			154.8	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	125.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.51		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	130.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

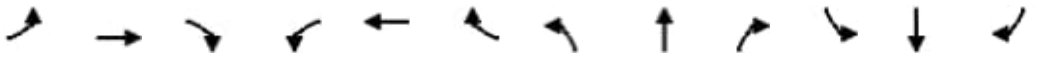


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	96	319	233	797	156	1325	251	1051
v/c Ratio	0.39	0.33	0.56	0.75	0.69	2.09	1.21	1.70
Control Delay (s/veh)	21.1	15.5	25.4	32.3	35.3	520.0	155.9	344.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	21.1	15.5	25.4	32.3	35.3	520.0	155.9	344.7
Queue Length 50th (m)	10.7	13.8	28.5	66.4	18.8	~450.9	~51.1	~334.2
Queue Length 95th (m)	20.0	24.2	45.0	87.6	#44.7	#530.9	#100.3	#411.1
Internal Link Dist (m)		129.9		116.8		249.3		213.8
Turn Bay Length (m)	70.0		55.0		55.0		70.0	
Base Capacity (vph)	244	1248	413	1258	229	633	207	620
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.39	0.26	0.56	0.63	0.68	2.09	1.21	1.70

Intersection Summary

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

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	172	128	219	505	244	147	1103	143	236	899	89
Future Volume (vph)	90	172	128	219	505	244	147	1103	143	236	899	89
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.97		1.00	0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	0.95		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1782	3147		1677	3261		1785	1799		1750	1808	
Flt Permitted	0.20	1.00		0.52	1.00		0.12	1.00		0.12	1.00	
Satd. Flow (perm)	375	3147		922	3261		218	1799		219	1808	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	96	183	136	233	537	260	156	1173	152	251	956	95
RTOR Reduction (vph)	0	97	0	0	58	0	0	4	0	0	3	0
Lane Group Flow (vph)	96	222	0	233	739	0	156	1321	0	251	1048	0
Confl. Peds. (#/hr)	24		31	31		24	28		21	21		28
Confl. Bikes (#/hr)			1						2			4
Heavy Vehicles (%)	0%	4%	0%	5%	1%	2%	0%	1%	1%	2%	1%	0%
Bus Blockages (#/hr)	0	5	0	0	5	0	0	3	0	0	3	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	34.0	28.6		37.4	30.3		42.4	34.5		40.8	33.7	
Effective Green, g (s)	34.0	28.6		37.4	30.3		42.4	34.5		40.8	33.7	
Actuated g/C Ratio	0.34	0.29		0.38	0.31		0.43	0.35		0.41	0.34	
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	204	906		401	995		217	625		199	613	
v/s Ratio Prot	0.03	0.07		c0.04	c0.23		0.06	c0.73		c0.09	0.58	
v/s Ratio Perm	0.13			0.18			0.25			0.43		
v/c Ratio	0.47	0.25		0.58	0.74		0.72	2.11		1.26	1.71	
Uniform Delay, d1	23.6	27.1		23.1	31.0		23.0	32.4		25.5	32.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.7	0.1		2.1	3.0		10.8	506.6		151.5	326.0	
Delay (s)	25.3	27.2		25.3	34.0		33.8	539.0		177.0	358.8	
Level of Service	C	C		C	C		C	F		F	F	
Approach Delay (s/veh)		26.8			32.0			485.8			323.8	
Approach LOS		C			C			F			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	280.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.40		
Actuated Cycle Length (s)	99.3	Sum of lost time (s)	22.0
Intersection Capacity Utilization	133.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	18	23	125	122	1433	205	1055
v/c Ratio	0.11	0.10	0.56	0.51	1.09	2.50	0.97
Control Delay (s/veh)	34.6	18.2	33.3	17.6	67.4	729.9	41.7
Queue Delay	0.0	0.0	0.0	0.0	6.2	0.0	0.0
Total Delay (s/veh)	34.6	18.2	33.3	17.6	73.6	729.9	41.7
Queue Length 50th (m)	2.7	0.8	12.9	4.2	~270.1	~44.2	151.7
Queue Length 95th (m)	8.6	7.2	29.7	21.5	#383.3	#93.8	#288.4
Internal Link Dist (m)		112.8	19.9		165.7		249.3
Turn Bay Length (m)	35.0			20.0		45.0	
Base Capacity (vph)	415	550	497	280	1320	82	1085
Starvation Cap Reductn	0	0	0	0	73	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.04	0.25	0.44	1.15	2.50	0.97

Intersection Summary

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

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	5	17	58	2	55	112	1213	106	189	951	19
Future Volume (vph)	17	5	17	58	2	55	112	1213	106	189	951	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.88			0.94		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1778	1651			1693		1785	1832		1785	1835	
Flt Permitted	0.68	1.00			0.83		0.07	1.00		0.07	1.00	
Satd. Flow (perm)	1276	1651			1439		130	1832		140	1835	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	5	18	63	2	60	122	1318	115	205	1034	21
RTOR Reduction (vph)	0	16	0	0	37	0	0	2	0	0	0	0
Lane Group Flow (vph)	18	7	0	0	88	0	122	1431	0	205	1055	0
Confl. Peds. (#/hr)	3					3	29		19	19		29
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	1%	0%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	11.9	11.9			11.9		65.4	65.4		53.7	53.7	
Effective Green, g (s)	11.9	11.9			11.9		65.4	65.4		53.7	53.7	
Actuated g/C Ratio	0.13	0.13			0.13		0.72	0.72		0.59	0.59	
Clearance Time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	167	216			188		233	1319		82	1085	
v/s Ratio Prot		0.00					0.04	c0.78			0.57	
v/s Ratio Perm	0.01				c0.06		0.33			c1.46		
v/c Ratio	0.11	0.03			0.47		0.52	1.08		2.50	0.97	
Uniform Delay, d1	34.8	34.4			36.5		19.4	12.7		18.5	17.8	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.1			1.8		2.1	51.2		709.8	21.4	
Delay (s)	35.1	34.5			38.3		21.5	63.9		728.3	39.2	
Level of Service	D	C			D		C	E		F	D	
Approach Delay (s/veh)		34.7			38.3			60.6			151.3	
Approach LOS		C			D			E			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	97.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	2.03		
Actuated Cycle Length (s)	90.8	Sum of lost time (s)	17.5
Intersection Capacity Utilization	114.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	8	302	281	167	1356	120	941
v/c Ratio	0.05	0.73	1.01	0.71	1.15	1.60	1.01
Control Delay (s/veh)	29.5	39.8	88.8	34.5	100.2	352.4	57.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	25.7
Total Delay (s/veh)	29.5	39.8	88.8	34.5	100.2	352.4	83.6
Queue Length 50th (m)	1.2	44.2	45.7	14.5	~312.4	~33.5	~194.7
Queue Length 95th (m)	5.0	72.2	#91.2	#45.0	#431.8	#60.2	#297.9
Internal Link Dist (m)		103.2	75.9		447.4		165.7
Turn Bay Length (m)	50.0			65.0		55.0	
Base Capacity (vph)	222	542	361	259	1175	75	934
Starvation Cap Reductn	0	0	0	0	0	0	64
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.56	0.78	0.64	1.15	1.60	1.08

Intersection Summary

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

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	136	157	35	98	140	162	1282	33	116	912	1
Future Volume (vph)	8	136	157	35	98	140	162	1282	33	116	912	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.98			0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.98	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92			0.93		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1753	1679			1656		1785	1831		1750	1820	
Flt Permitted	0.40	1.00			0.65		0.07	1.00		0.08	1.00	
Satd. Flow (perm)	741	1679			1091		138	1831		146	1820	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	8	140	162	36	101	144	167	1322	34	120	940	1
RTOR Reduction (vph)	0	42	0	0	38	0	0	1	0	0	0	0
Lane Group Flow (vph)	8	260	0	0	243	0	167	1355	0	120	941	0
Confl. Peds. (#/hr)	19		9	9		19	17					17
Heavy Vehicles (%)	0%	2%	0%	2%	2%	2%	0%	1%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	3	0	0	3	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	21.7	21.7			21.7		63.2	63.2		50.6	50.6	
Effective Green, g (s)	21.7	21.7			21.7		63.2	63.2		50.6	50.6	
Actuated g/C Ratio	0.22	0.22			0.22		0.64	0.64		0.51	0.51	
Clearance Time (s)	6.5	6.5			6.5		4.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	163	370			240		232	1176		75	935	
v/s Ratio Prot		0.15					0.06	c0.74			0.52	
v/s Ratio Perm	0.01				c0.22		0.40			c0.82		
v/c Ratio	0.05	0.70			1.01		0.72	1.15		1.60	1.01	
Uniform Delay, d1	30.2	35.4			38.4		24.7	17.6		23.9	23.9	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	5.9			61.1		10.2	78.7		323.4	31.0	
Delay (s)	30.3	41.3			99.5		34.9	96.3		347.3	54.9	
Level of Service	C	D			F		C	F		F	D	
Approach Delay (s/veh)		41.0			99.5			89.6			88.0	
Approach LOS		D			F			F			F	

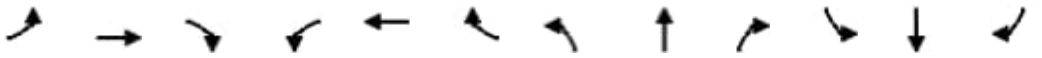
Intersection Summary			
HCM 2000 Control Delay (s/veh)	85.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.41		
Actuated Cycle Length (s)	98.4	Sum of lost time (s)	17.5
Intersection Capacity Utilization	143.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	385	1242	156	713	246	131	1028	101	221	728	295
v/c Ratio	1.05	0.95	0.79	0.58	0.36	0.66	2.24	0.22	0.82	1.37	0.58
Control Delay (s/veh)	87.3	54.1	53.6	37.4	5.4	40.9	589.4	7.7	53.3	213.1	28.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	87.3	54.1	53.6	37.4	5.4	40.9	589.4	7.7	53.3	213.1	28.7
Queue Length 50th (m)	~64.6	159.6	22.3	77.8	0.0	20.6	~424.9	0.0	38.1	~244.6	39.6
Queue Length 95th (m)	#133.4	#232.0	#52.8	103.8	18.5	34.3	#503.1	12.9	62.8	#315.7	69.2
Internal Link Dist (m)		115.5		150.8			147.9			447.4	
Turn Bay Length (m)	65.0		115.0		90.0	40.0			50.0		50.0
Base Capacity (vph)	365	1313	226	1236	684	334	459	467	330	533	506
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.05	0.95	0.69	0.58	0.36	0.39	2.24	0.22	0.67	1.37	0.58

Intersection Summary

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

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	377	1068	149	153	699	241	128	1007	99	217	713	289
Future Volume (vph)	377	1068	149	153	699	241	128	1007	99	217	713	289
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00	0.96
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1765	3422		1785	3535	1498	1785	1838	1554	1785	1842	1473
Flt Permitted	0.24	1.00		0.09	1.00	1.00	0.12	1.00	1.00	0.11	1.00	1.00
Satd. Flow (perm)	439	3422		165	3535	1498	231	1838	1554	206	1842	1473
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	385	1090	152	156	713	246	131	1028	101	221	728	295
RTOR Reduction (vph)	0	7	0	0	0	160	0	0	76	0	0	80
Lane Group Flow (vph)	385	1235	0	156	713	86	131	1028	25	221	728	215
Confl. Peds. (#/hr)	11		12	12		11	21		12	12		21
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	1%	1%	3%	0%	1%	0%	0%	1%	0%	0%	2%	3%
Bus Blockages (#/hr)	0	3	0	0	0	5	0	3	0	0	0	3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2		2	8		8	4		4
Actuated Green, G (s)	63.5	49.6		55.4	45.5	45.5	42.4	32.5	32.5	51.5	37.6	37.6
Effective Green, g (s)	63.5	49.6		55.4	45.5	45.5	42.4	32.5	32.5	51.5	37.6	37.6
Actuated g/C Ratio	0.49	0.38		0.43	0.35	0.35	0.33	0.25	0.25	0.40	0.29	0.29
Clearance Time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0
Lane Grp Cap (vph)	357	1305		193	1237	524	193	459	388	263	532	426
v/s Ratio Prot	c0.12	0.36		0.06	0.20		0.05	c0.56		c0.10	c0.40	
v/s Ratio Perm	c0.41			0.28		0.06	0.17		0.02	0.24		0.15
v/c Ratio	1.08	0.95		0.81	0.58	0.16	0.68	2.24	0.07	0.84	1.37	0.50
Uniform Delay, d1	27.7	38.9		29.3	34.4	29.1	35.2	48.8	37.2	33.4	46.2	38.4
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	70.2	15.0		20.4	2.0	0.7	7.2	564.8	0.1	20.0	177.5	0.9
Delay (s)	97.9	53.9		49.7	36.4	29.8	42.5	613.6	37.2	53.4	223.7	39.4
Level of Service	F	D		D	D	C	D	F	D	D	F	D
Approach Delay (s/veh)		64.3			36.8			508.0			149.8	
Approach LOS		E			D			F			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	185.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.43		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	130.9%	ICU Level of Service	H
Analysis Period (min)	15		

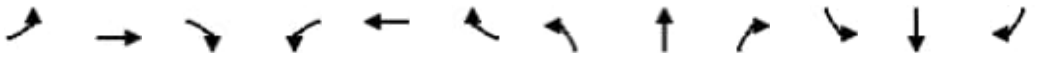
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	385	1242	156	713	246	131	1028	101	221	728	295
v/c Ratio	1.43	1.13	0.98	0.70	0.46	0.83	1.41	0.15	1.40	1.00	0.44
Control Delay (s/veh)	237.7	110.3	96.0	45.6	18.4	61.3	225.6	4.7	237.9	72.4	16.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	237.7	110.3	96.0	45.6	18.4	61.3	225.6	4.7	237.9	72.4	16.6
Queue Length 50th (m)	~107.6	~193.1	24.6	85.8	20.1	17.3	~353.4	0.0	~59.0	184.4	27.3
Queue Length 95th (m)	#180.9	#235.8	#67.5	107.5	45.1	#51.4	#431.6	10.2	#109.8	#266.7	52.0
Internal Link Dist (m)		115.5		150.8			147.9			447.4	
Turn Bay Length (m)	65.0		115.0		90.0	40.0			50.0		50.0
Base Capacity (vph)	270	1100	159	1019	534	158	728	679	158	729	668
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.43	1.13	0.98	0.70	0.46	0.83	1.41	0.15	1.40	1.00	0.44

Intersection Summary

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

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	377	1068	149	153	699	241	128	1007	99	217	713	289
Future Volume (vph)	377	1068	149	153	699	241	128	1007	99	217	713	289
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00	0.96
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1766	3422		1785	3535	1498	1785	1838	1554	1785	1842	1473
Flt Permitted	0.19	1.00		0.11	1.00	1.00	0.08	1.00	1.00	0.08	1.00	1.00
Satd. Flow (perm)	352	3422		200	3535	1498	146	1838	1554	146	1842	1473
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	385	1090	152	156	713	246	131	1028	101	221	728	295
RTOR Reduction (vph)	0	8	0	0	0	102	0	0	61	0	0	85
Lane Group Flow (vph)	385	1234	0	156	713	144	131	1028	40	221	728	210
Confl. Peds. (#/hr)	11		12	12		11	21		12	12		21
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	1%	1%	3%	0%	1%	0%	0%	1%	0%	0%	2%	3%
Bus Blockages (#/hr)	0	3	0	0	0	5	0	3	0	0	0	3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2		2	8		8	4		4
Actuated Green, G (s)	52.5	41.5		44.5	37.5	37.5	58.5	51.5	51.5	58.5	51.5	51.5
Effective Green, g (s)	52.5	41.5		44.5	37.5	37.5	58.5	51.5	51.5	58.5	51.5	51.5
Actuated g/C Ratio	0.40	0.32		0.34	0.29	0.29	0.45	0.40	0.40	0.45	0.40	0.40
Clearance Time (s)	4.0	7.5		4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0
Lane Grp Cap (vph)	261	1092		153	1019	432	153	728	615	153	729	583
v/s Ratio Prot	c0.12	0.36		0.05	0.20		0.05	0.56		c0.08	0.40	
v/s Ratio Perm	c0.47			0.29		0.10	0.34		0.03	c0.57		0.14
v/c Ratio	1.48	1.13		1.02	0.70	0.33	0.86	1.41	0.07	1.44	1.00	0.36
Uniform Delay, d1	33.7	44.3		38.5	41.2	36.4	30.2	39.3	24.3	32.4	39.2	27.6
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	233.4	70.4		78.0	4.0	2.1	33.6	193.6	0.0	232.8	32.7	0.4
Delay (s)	267.1	114.6		116.5	45.2	38.5	63.8	232.8	24.4	265.2	72.0	28.0
Level of Service	F	F		F	D	D	E	F	C	F	E	C
Approach Delay (s/veh)		150.7			53.7			198.5			95.9	
Approach LOS		F			D			F			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	128.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.49		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	130.9%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group