



Ministry of Transportation, Ontario

**HIGHWAY 407 TRANSITWAY:  
TRANSPORTATION STUDY FOR PROPOSED LESLIE  
STATION**

---

FINAL REPORT

DECEMBER, 2010





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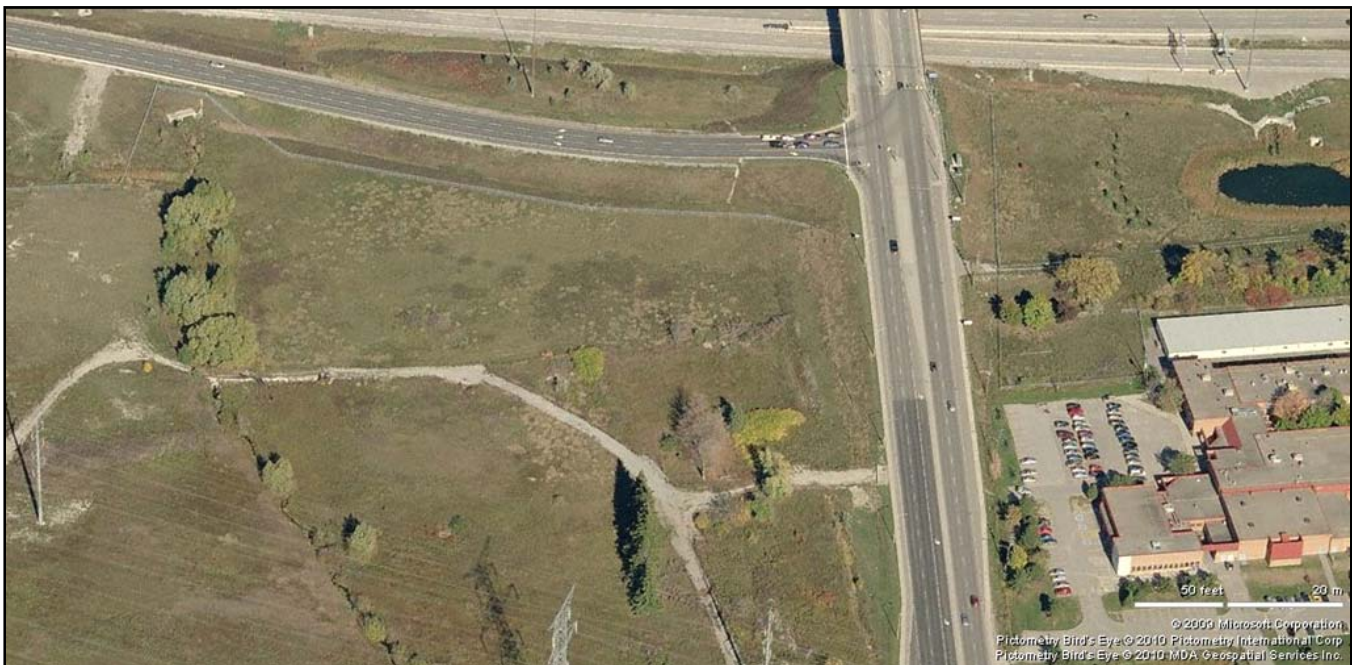
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## 1. INTRODUCTION

This transportation study report presents the preliminary findings of traffic analysis of the proposed 407 Transitway Leslie Station. The station will be located at the southwest corner of Highway 407 eastbound off-ramp terminal and Leslie Street (**Exhibit 1-1**). The analysis assesses the ability of the preferred alternative geometric layouts to accommodate projected traffic volumes, while incorporating the planned Light Rail Transit initiatives by York Region on Don Mills Road/Leslie Street.

**Exhibit 1-1 Aerial View of Proposed Leslie Station Site**



### 1.1 Report Outline

The subsequent sections of this transportation study report are as follows:

- Section 2 – Summary of the Proposed Development;
- Section 3 – Scope for the Transportation Study;
- Section 4 – Existing Condition (2010) Analysis and Results;
- Section 5 – Future Background Condition (2031) Analysis and Results;
- Section 6 – Proposed Leslie Station Related Traffic;
- Section 7 – Future Total Condition (2031) Analysis and Results; and
- Section 8 – Summary and Conclusions.

## 1.2 Key Issues

Key issues addressed in this transportation study report include the following:

- The existing and background traffic conditions at Study Area intersections;
- The estimate of traffic generated by the proposed Leslie Station park-and-ride;
- The assignment and distribution of site generated traffic;
- The implications of site generated traffic on Study Area intersections, access driveways/roadways and the surrounding road network; and
- Potential site access geometric configurations and other measures to mitigate projected traffic impacts.



## 2. THE PROPOSED DEVELOPMENT

### 2.1 Station Location

The proposed 407 Transitway Leslie Station ("Proposed Station") will be located on a parcel of vacant land ("Subject Site") on the southwest corner of Leslie Street at the Highway 407 eastbound off-ramp. The Subject Site is located in the Town of Markham on the west side of Leslie Street and opposite to St. Robert Catholic High School's existing signalized driveway. The German Mills Creek divides the Subject Site area into two distinct areas. Currently, an existing trail is located to the west of Leslie Street neighbourhoods below the hydro corridor.

A map showing the location of Subject Site and Proposed Development is in **Exhibit 2-1**.

**Exhibit 2-1: Proposed Leslie Station Site and Vacinity**

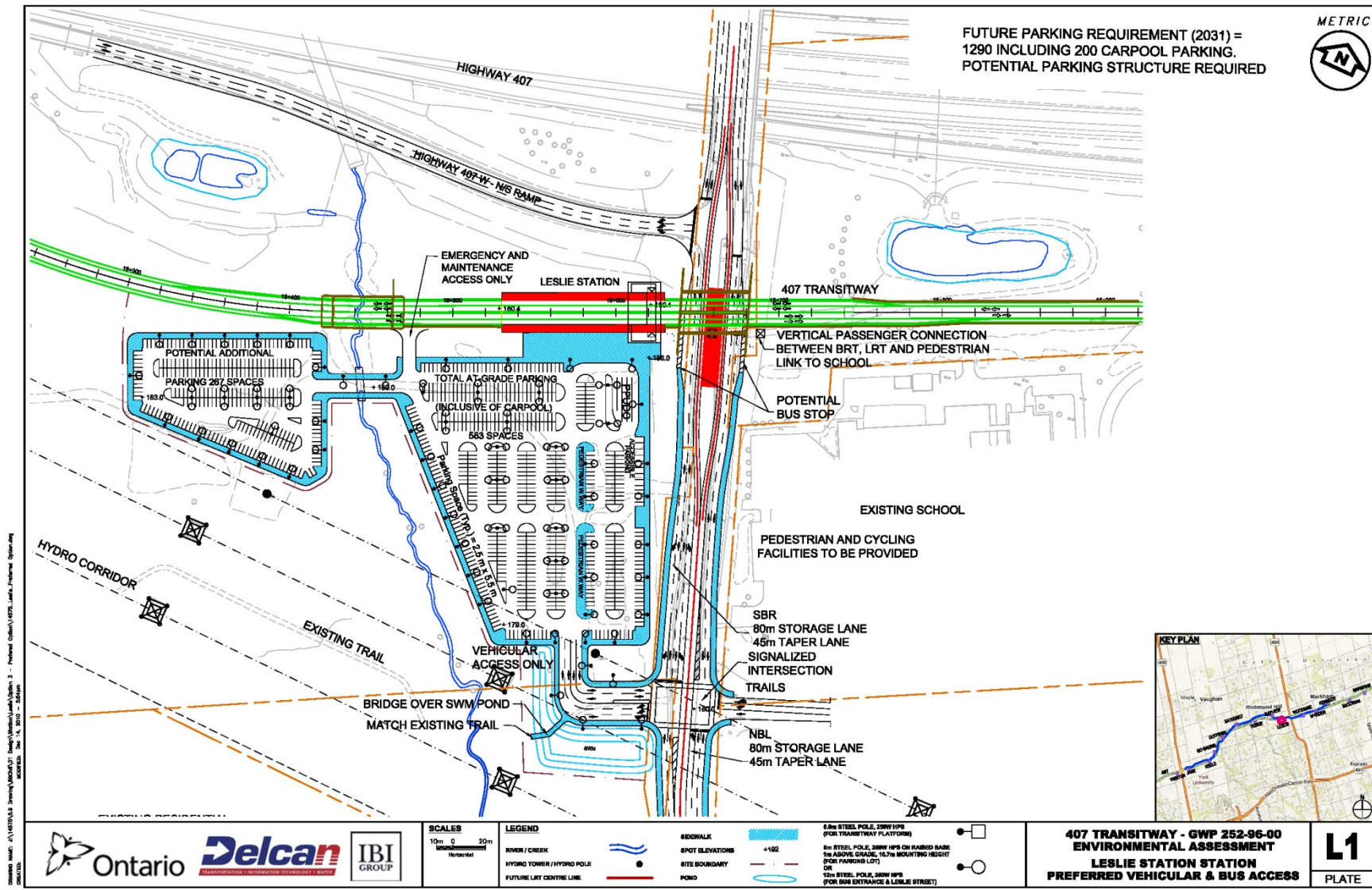


## 2.2 Site Plan

A site plan for the preferred station concept is shown in **Exhibit 2-2**. The proposed Leslie Station will serve as a regional intermodal station for passengers transferring between the proposed 407 Transitway and YRT bus services and proposed Don Mills/Leslie LRT operations on Leslie Street. The eastern portion of the Subject Site includes a passenger pick-up and drop-off (PPUDO) area and two parking areas – one for 407 Transitway users (400 parking spaces) and one for carpool users (200 parking spaces). If needed, an additional parking lot could be added to west side of the Subject Site (west of the creek) that could accommodate an additional 250 parking spaces.

From the Proposed Station, pedestrian walkways / pathways and bike accesses are planned as to connect with existing trails while also providing both at-grade and grade-separated pedestrian accesses to St. Robert Catholic High School (east side of Leslie Street). The site plan also recommends a pedestrian underpass to establish a direct pedestrian connection between the parking areas on the west side, the LRT platform, northbound bus stop, and high school campus on the east side.

Exhibit 2-2: Preferred Leslie Station Concept (December 2010)



### 3. STUDY SCOPE

#### 3.1 Study Area

The Study Area for the transportation study is generally bounded by Highway 407 to the north, Green Lane / Summerdale Drive to the south, Leslie Street to the east and the German Mills Creek to the west. A list of all Study Area intersections analyzed in this study is shown in **Exhibit 3-1** and a map of the Leslie Station Study Area is shown in **Exhibit 3-2**.

**Exhibit 3-1: List of Study Area Intersections**

No.	East-West Street	North-South Street	Intersection Type
1	Highway 407 Eastbound Off-Ramp	Leslie Street	Signalized
2	Green Lane / Summerdale Drive	Leslie Street	Signalized
3	St. Robert School Access Road / Station Access Road	Leslie Street	Signalized

#### 3.2 Guidelines and Standards

Guidelines consulted for this study include the *York Region Transportation Impact Study (TIS) Guideline For Development Applications (August 2007)* and the *Ministry of Transportation, Ontario General Guidelines for the Preparation of Traffic Impact Studies (January 2008)*.

This study was carried out according to the accepted documents for geometric design standards outlined in the *York Region Road Design Guidelines*. It also maintains consistency with recommendations described in the preliminary transit planning study *Light Rail Transit (LRT) Line in the Don Mills Road/Leslie Street Corridor*, which is currently under a Public Consultation process.

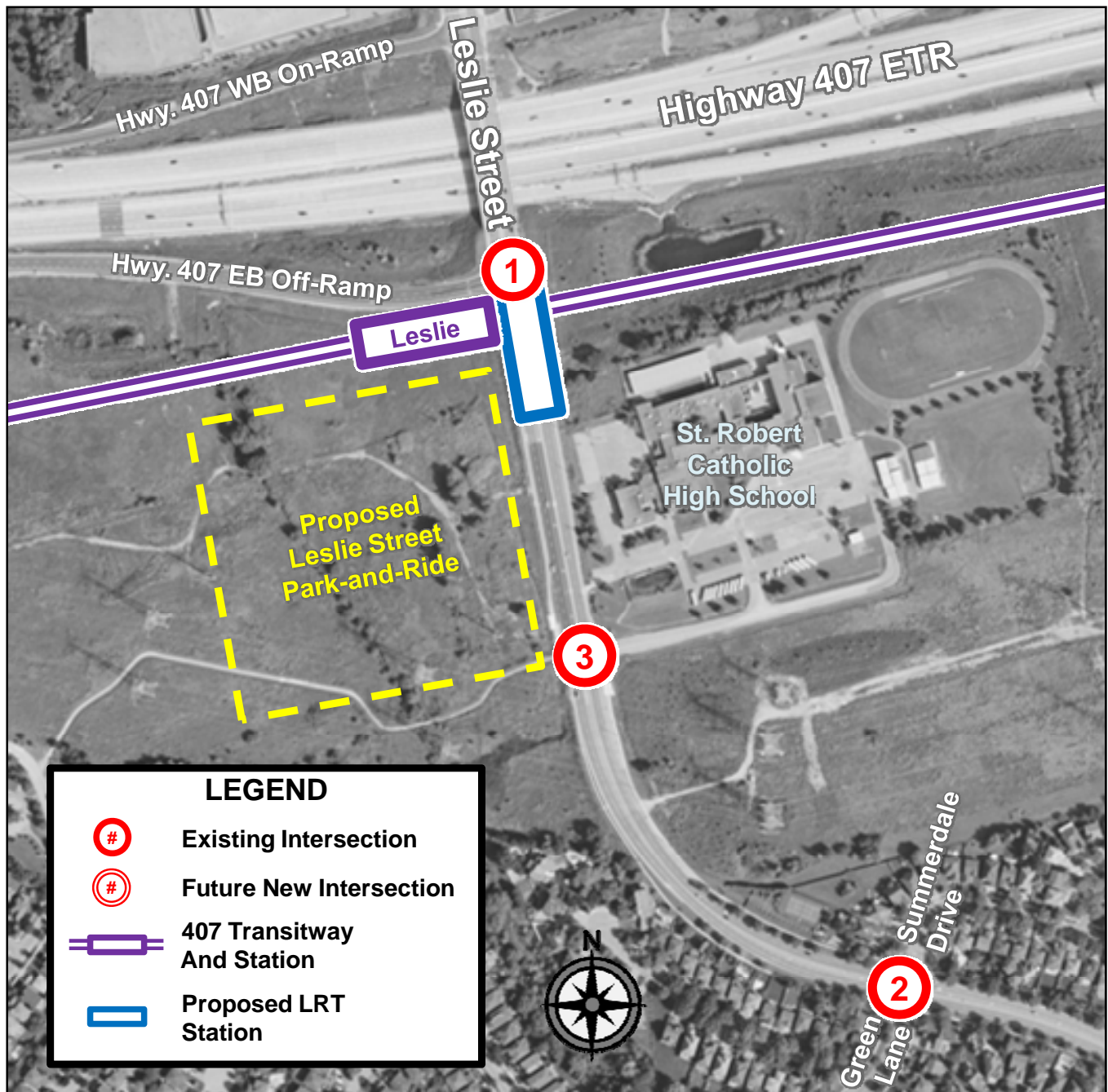
#### 3.3 Horizon Years and Analysis Periods

Based on these guidelines and proposed construction and operational dates for the 407 Transitway, the following existing and future horizon periods (conditions) were established as part of this study:

- 2010 (Existing Condition);
- 2031 (Background Condition);
- 2031 (Future Total Condition).

Performance of the road network was assessed during the weekday am peak hour and pm peak hour, which correspond to the peak hours for the proposed Leslie Station.

Exhibit 3-2: Study Area of Transportation Study





## 3.4 Data Collection

### 3.4.1 TURNING MOVEMENT COUNTS

Turning movement counts for all Study Area intersections were obtained from York Region's Transportation Service's Department.

### 3.4.2 SIGNAL TIMING AND INTERSECTION CONFIGURATIONS

Current signal phasing and splits for the signalized study intersections were obtained from York Region's Transportation Service's Department. Intersection configurations were obtained through field studies undertaken by IBI Group staff.

## 3.5 Traffic Analysis Parameters

A Synchro signalized intersection analysis was conducted at all Study Area intersections under the existing, future background and future total traffic conditions. The operational analyses were primarily based on procedures set out in the Highway Capacity Manual (2000) with the assistance of Synchro 6.0 and Highway Capacity Software 2000. Signal cycle lengths, timing, and phasing currently in effect were obtained from York Region. The critical movements are identified for each time period.

### 3.5.1 CAPACITY AND LEVEL OF SERVICE

An intersection's overall operating conditions are typically characterized by two standard measures: the volume to capacity ratio (V/C) and the level of service (LOS). Taken together, they provide an indication of delay and the number of vehicles that can be accommodated through an intersection.

The V/C ratio is an indication of the volume of traffic attempting to make a specific movement through an intersection (i.e., northbound left, westbound straight through), versus the theoretical capacity of that movement given the lane configurations, operating conditions and signal timings provided at the intersection. A V/C ratio of 1.0 represents a condition where the theoretical capacity for a particular movement is being fully used.

The level of service (LOS) of the overall intersection of a particular movement is a measure of the average vehicle delay experienced by the motorists attempting to travel through the intersection. LOS is measured from "A" to "F" with peak hour LOS in the "A" to "D" range being considered acceptable by most and a "LOS F" representing unacceptable delays.

York Region's *Transportation Impact Study (TIS) Guidelines Development Applications (August 2007)* and the Ministry of Transportation's *General Guidelines for the Preparation of Traffic Impact Studies (January 2008)* were consulted for the base parameters of this study.

Existing intersection capacity analyses were undertaken using the Highway Capacity Manual (HCM) methodology, and specifically the Synchro 6.0 Traffic Signal Coordination Software package by Trafficware. The analysis reflects the most recently available traffic volumes, current signal timings, and existing lane configurations. Peak hour factors (PHF) at each intersection were calculated using 15-minute and hourly count data.

Critical movements were identified as those operating with a volume-to-capacity (V/C) ratio of 0.85 or higher and/or the poorest level of service (LOS) among all movements.

### 3.5.2 QUEUE LENGTHS

A queue length for a turning movement that exceeds the length of the available storage bay or creates back-ups is a concern, particularly at a signalized intersection. These turning vehicles can potentially block through vehicles during a green light, which reduces the intersection efficiency.

The Synchro 6.0 Traffic Signal Coordination Software measures both the 50th percentile and 95th percentile maximum queue lengths. The 50th percentile queue (the median) is the maximum back of queue length during a typical traffic cycle. The 95th percentile queue is the maximum back of queue length during a typical traffic cycle with 95th percentile traffic volumes. The 95th percentile queue measures the queue length that 95 percent of the sample lies below.

95th percentile critical queue lengths were identified for movements where the queue surpassed the estimated length of the storage bay.

## 4. EXISTING CONDITION

### 4.1 Area Road Network

Major roadways in the Study Area include the following:

- Leslie Street – Regional (Arterial) Road;
- Highway 407 Eastbound Off-Ramp – 400 Series Provincial Highway;
- Green Lane / Summerdale Drive – Urban (Local) Road; and
- St. Robert's School Access Road – Urban (Local) Road.

These are described in further detail below.

**Leslie Street** is a four-lane arterial road under the jurisdiction of York Region, and classified as a "Regional Primary Arterial" road. According to 2003 York Region ATR counts, Leslie Street south of Highway 407 ramp terminal accommodates approximately 25,000 to 32,000 vehicles per day within the Study Area road network. There are three traffic signals along the 930 metres stretch of roadway between the Highway 407 eastbound off-ramp terminal and Green Lane/Summerdale Drive. Within the Study Area, the maximum posted speed is 60km/h on Leslie Street.



*Street View of Leslie Street Looking North*



**Highway 407 Eastbound Off-Ramp** allows eastbound Highway 407 vehicles to exit to Leslie Street. It consists of two eastbound left-turn lanes and one eastbound right-turn lane.



*Street View of Highway 407 Eastbound Off-Ramp Looking East*

**Green Lane / Summerdale Drive** are east-west urban local roadways that connect through Leslie Street. Green Lane extends from Bayview Avenue in the west with Leslie Street in the east. Summerdale Drive is a loop roadway that provides access to local residential streets on the east side of Leslie Street and reconnects with Leslie Street further south as an unsignalized intersection.



*Street View of Green Lane Looking Northeast*

**St. Robert School Access Road** is an urban local east-west access roadway that connects St. Robert's Catholic School with the east side of Leslie Street. It is located approximately 300 metres south of the Highway 407 Eastbound Off-Ramp. It consists of one westbound left-turn lane, one westbound right-turn lane and one eastbound inbound lane.



*Street View of St. Robert's School Access At Leslie Street Looking East*

## 4.2 Lane Configurations

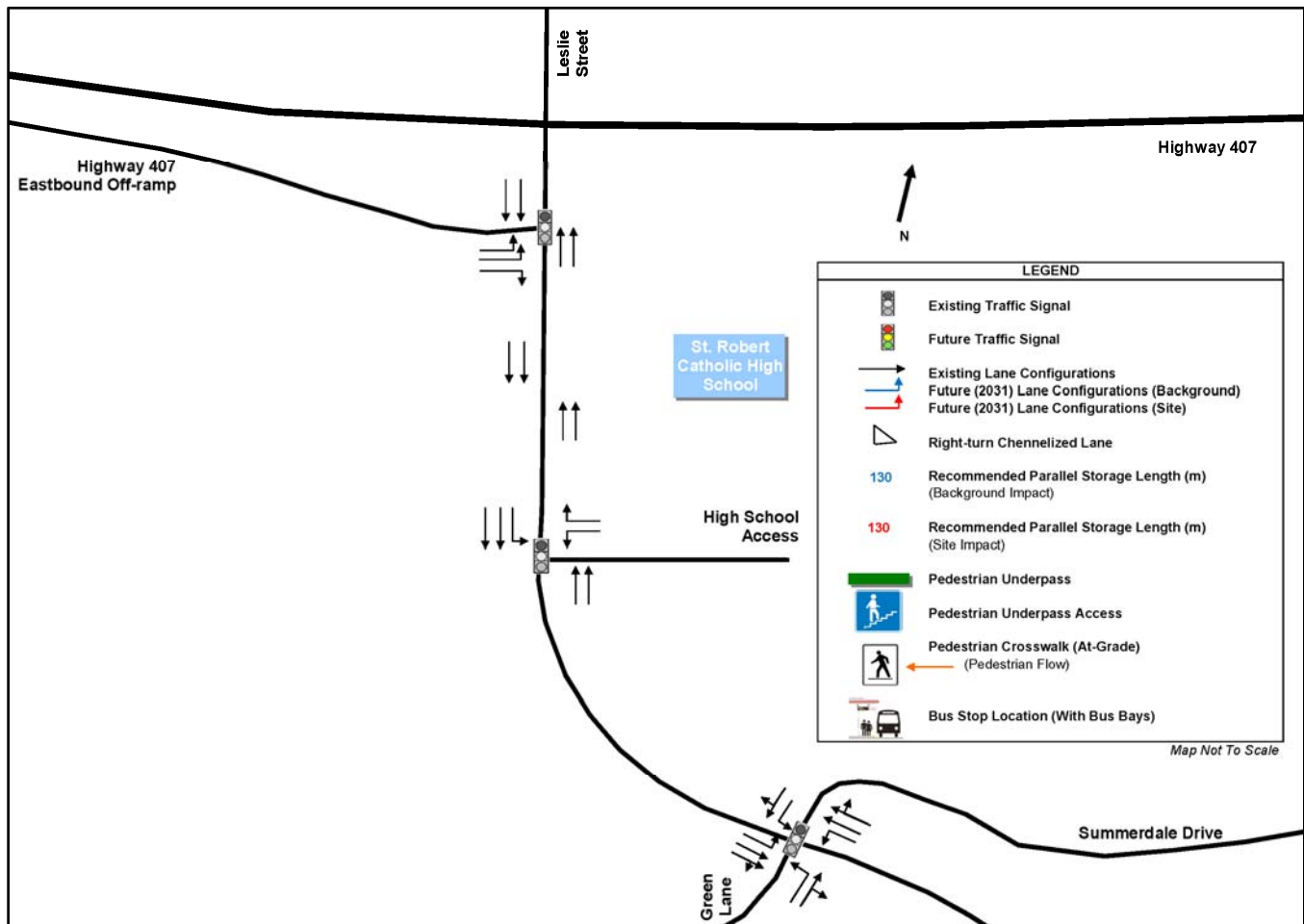
A map shown existing Study Area roadway lane configurations is shown in **Exhibit 4-1**. Through the Study Area, Leslie Street consists of two northbound and two southbound travel lanes with dedicated left-turn lanes at key signalized intersections. The Highway 407 Eastbound Off-Ramp has three eastbound lanes: two left-turn and one right-turn. Green Lane / Summerdale Drive each have one shared through / right-turn lane and one exclusive left-turn lane in the eastbound and westbound directions, respectively. The St. Robert High School Access roadway has two westbound lanes: one left-turn and one right-turn.

## 4.3 Transit Services and Operations

Transit users and a significant portion of St. Robert Catholic High School students use several YRT routes. **Exhibit 4-2** shows the existing transit routes in the Study Area. In the vicinity of the Subject Site, the transit operation comprises several YRT bus routes (#3, #82 and #90) and TTC's Don Mills bus route (#25D) on Leslie Street.

The peak hour headways of these transit routes are from 20 to 30 minutes for the YRT local bus routes and 15 minutes for TTC's bus services. A total of approximately 8 buses (per direction) are expected to pass through the Leslie Street site frontage area during the weekday am and pm peak hours (one hour between 7:00 to 9:00 am and 4:00 to 6:00 pm).

**Exhibit 4-1: Existing Study Area Lane Configurations**

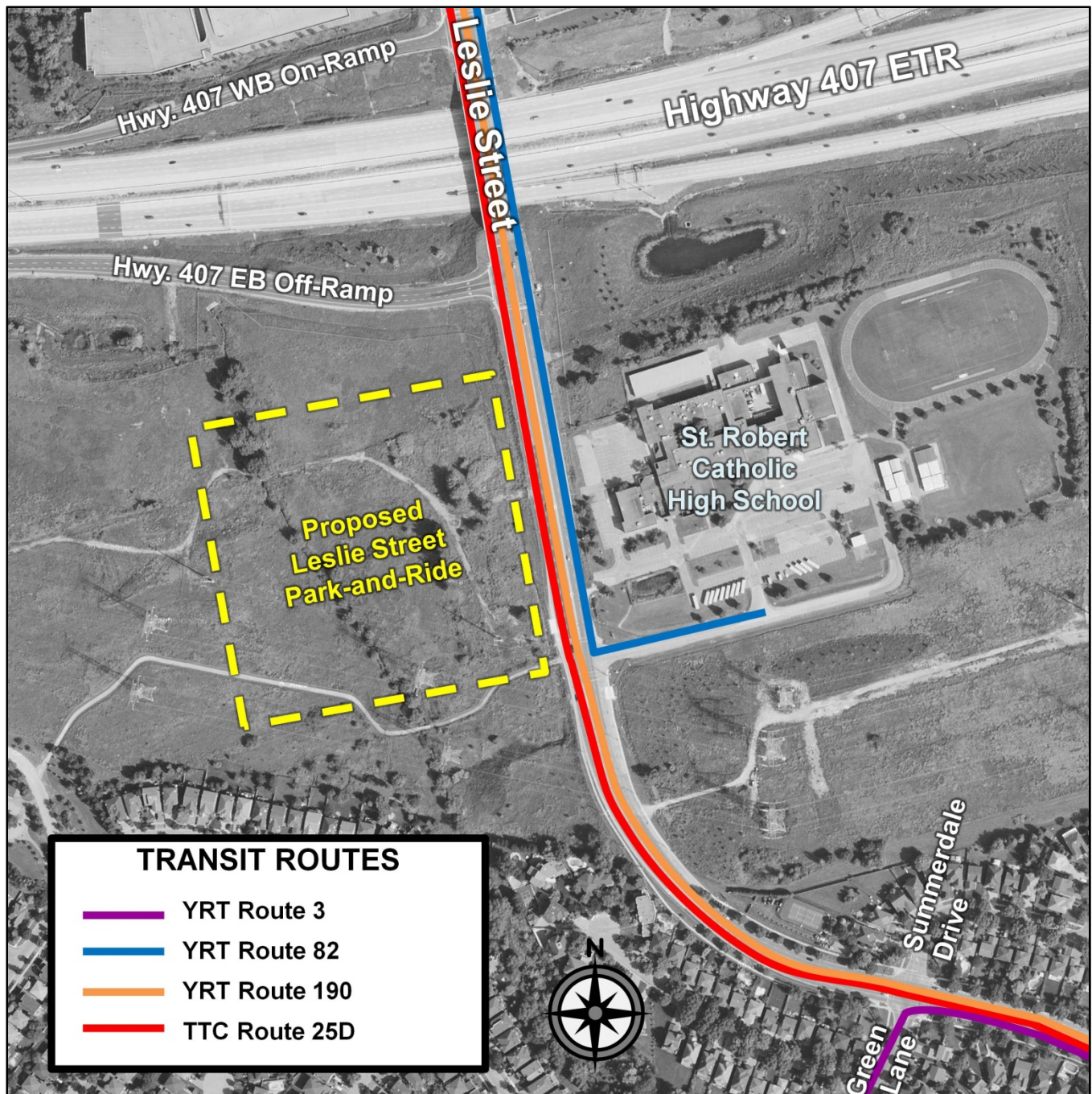


## 4.4 Existing Condition (2010) Traffic Volumes and Operations

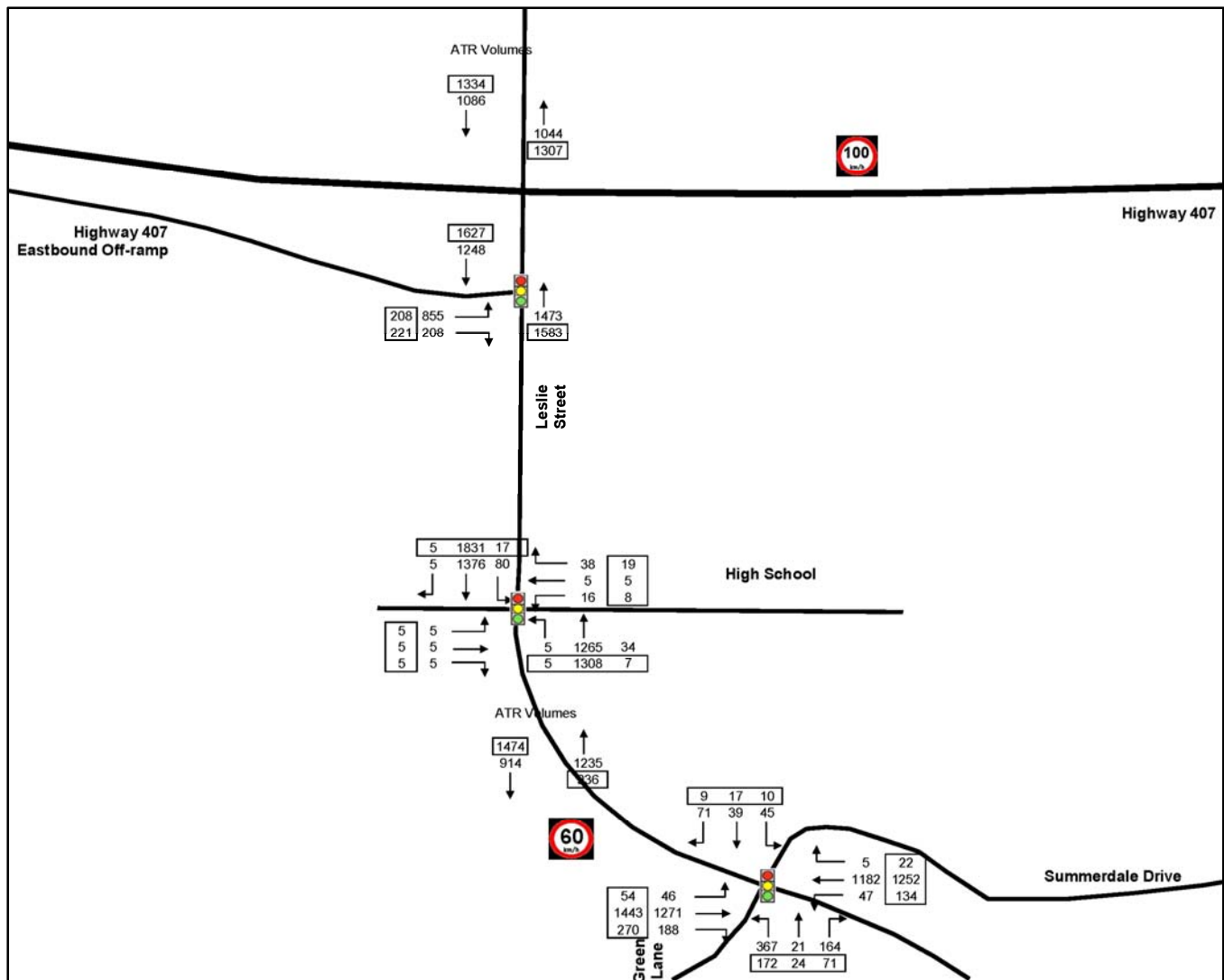
The 2010 Existing Condition traffic volumes, including the weekday am and pm peak hours, are shown in **Exhibit 4-3**. The 2010 Existing Condition intersection capacity analyses were undertaken using the methodology outlined in **Section 3.2**.



Exhibit 4-2: Transit Services in the Study Area



**Exhibit 4-3: 2010 Existing Condition Traffic Volumes**



#### 4.4.1 CAPACITY AND LEVEL OF SERVICE

The weekday am and pm peak hour existing condition traffic analysis results are included in **Exhibit 4-4**. Existing Condition Synchro traffic analysis reports are included in **Appendix A**.

**Exhibit 4-4: Existing Condition (2010) Intersection Operations**

Intersection		Peak Hour	Movement	Existing Condition (2010)		
				V/C	Delay	LOS
Signalized Intersections						
1	Highway 407 Eastbound Off-Ramp @ Leslie Street	am	Overall	0.79	25	C
			EBL	0.92	54	D
		pm	Overall	0.68	14	B
2	Leslie Street (East-West) @ Green Lane / Summerdale Drive (North-South)	am	Overall	0.85	31	C
			EBT	0.79	30	C
			NBL	0.96	74	E
		pm	Overall	0.82	26	C
			EBT	0.90	34	C
3	St. Robert School Access Road / Station Access Road @ Leslie Street	am	Overall	0.47	3	A
			SBT	0.51	2	A
		pm	Overall	0.61	6	A
			SBT	0.66	8	A

Notes:

Critical movement(s) defined as V/C > 0.85 and/or poorest LOS.

Overall, the three signalized intersections in the Study Area operate at acceptable levels of service (LOS 'C' or better) under the existing weekday am and pm peak hour traffic demands, with the volume to capacity (V/C) ratio below 1.0. Overall V/C ratios range from 0.47 to 0.85 during the weekday am peak hour, and from 0.61 to 0.82 during the weekday pm peak hour.

However, the northbound left-turn movement at the Leslie Street @ Green Lane / Summerdale Drive intersection experiences higher delays during the am peak hour. These results indicate that this signalized intersection is experiencing specific turning movement capacity deficiencies with the current geometric configurations.

#### 4.4.2 QUEUE LENGTHS

The weekday am and pm peak hour existing condition queue length analysis results are included in **Exhibit 4-5**. Existing Condition Synchro traffic analysis reports are included in **Appendix A**.

**Exhibit 4-5: Existing Condition (2010) Turning Movement Queue Lengths**

Intersection		Peak Hour	Movement	Parallel Lane Storage Length (m)	Existing Condition (2010) Synchro Queues (m)	
					50th Percentile	95th Percentile
Signalized Intersections						
1	Highway 407 Eastbound Off-Ramp @ Leslie Street	am	EBR	EBR = 280;	29	50
		pm	EBR		43	65
2	Leslie Street (East-West) @ Green Lane / Summerdale Drive (North-South)	am	EBL	EBL= 75; NBL= 25;	8	18
			NBL		98	171
		pm	EBL		9	17
			NBL		38	61
3	St. Robert School Access Road / Station Access Road @ Leslie Street	am	EBL	SBL = 150;	-	-
			NBL		-	-
			SBL		3	6
		pm	EBL		-	-
			NBL		-	-
			SBL		1	2

At the Leslie Street @ Green Lane / Summerdale Drive intersection, during both the am and pm peak hours, the northbound left-turn movement currently experiences queuing spillbacks, where the queued vehicles exceed the available storage space. There are no queuing issues at other Study Area intersection turning movements.

## 5. FUTURE BACKGROUND CONDITION

### 5.1 Proposed Transit Services

Under Metrolinx's Regional Transportation Plan (RTP), a light rail transit (LRT) service is proposed along the Don Mills Road / Leslie Street corridor ("Don Mills LRT") from the Bloor-Danforth Subway north to Highway 7 as an opportunity to attract significant number of commuters. The Don Mills LRT will create an important north-south transit corridor and connect with many existing and proposed transit services including the Bloor-Danforth Subway, Eglinton Crosstown LRT, Sheppard Subway, Sheppard East LRT and VIVA buses.

Currently, the City of Toronto and Toronto Transit Commission (TTC) are undertaking a transit planning study to define the LRT project along the Don Mills Road corridor from the Bloor-Danforth Subway to Steeles Avenue. York Region is also conducting a transit environmental assessment (EA) to identify the need and justification of Don Mills LRT Extension north of Steeles Avenue along Don Mills Road and Leslie Street to Highway 7. Consequently, this transportation study analyzes future traffic operations on Leslie Street with a dedicated Don Mills LRT line on Leslie Street.

### 5.2 Future Background Traffic Growth

Future background traffic volumes account for general corridor growth on the Study Area road network. This growth was estimated based on the forecasts obtained from the York Region Travel Demand Forecasting Model. For the purposes of this study, existing traffic volumes were factored up by 1.245, representing a compound growth rate of 1% per annum over 21 years, to develop the 2031 base background traffic volumes. These factors were applied to all movements along the Leslie Street corridor.

### 5.3 Future Background Developments

A review of York Region and Town of Markham planning documents indicate that no future background developments are proposed in the Study Area. Therefore, no additional background traffic has been added to the road network.

### 5.4 Future Background Volumes

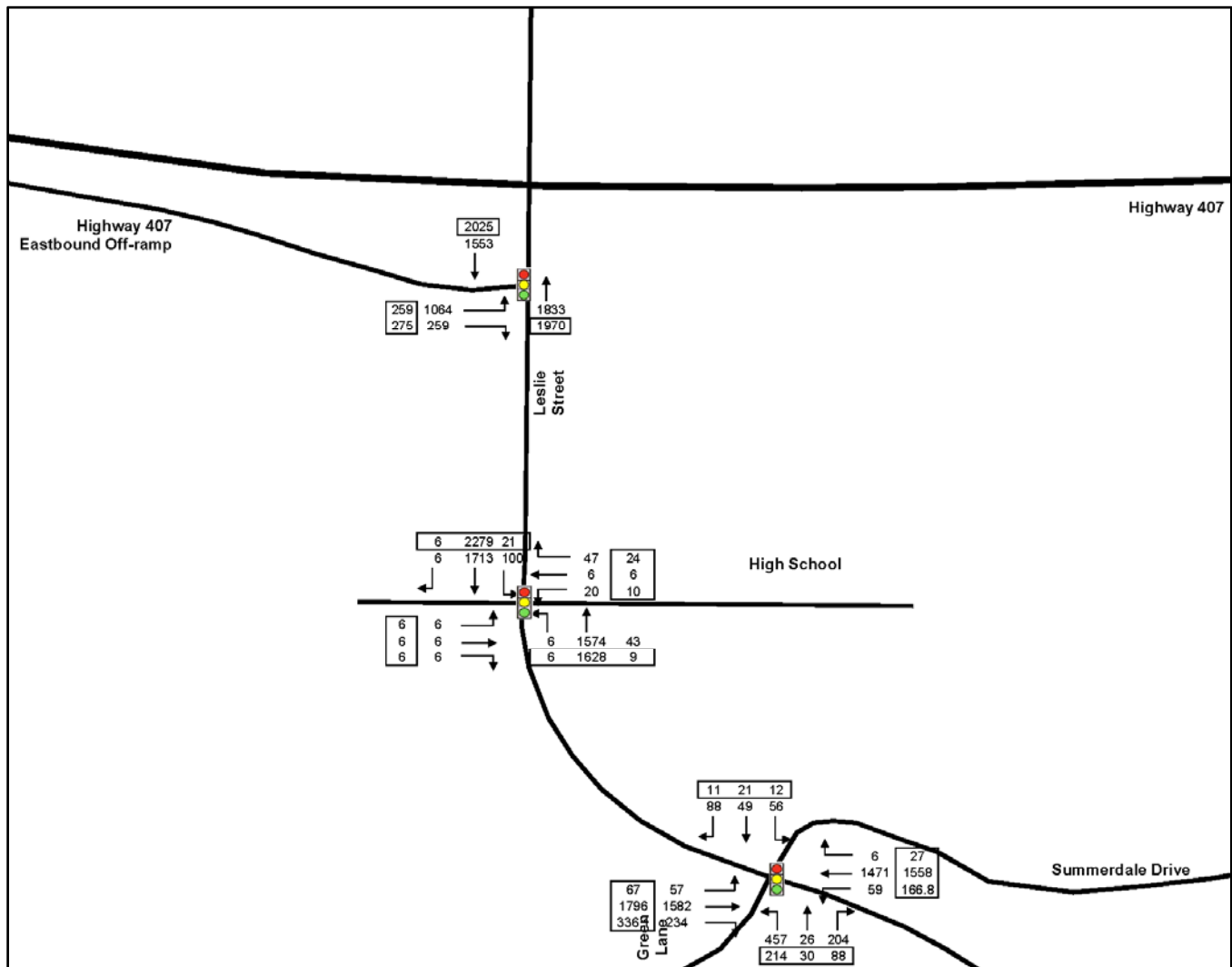
The future (2031) background traffic volumes comprise existing (2010) base traffic volumes shown in **Exhibit 4-3** plus corridor growth traffic to the area surrounding the Subject Site. The resultant future background traffic volumes are illustrated in **Exhibit 5-1** for the weekday am and pm peak hours, respectively.

### 5.5 Future Background Condition (2031) Traffic Operations

The 2031 Background Condition intersection capacity analyses were undertaken using the methodology outlined in **Section 3.2**.



**Exhibit 5-1: 2031 Background Condition Traffic Volumes**



### 5.5.1 CAPACITY AND LEVEL OF SERVICE

The weekday am and pm peak hour background condition traffic analysis results are included in **Exhibit 5-2**. Full analysis summaries are included in **Appendix B**.

**Exhibit 5-2: Background Condition (2031) Compared with Existing Condition (2010)  
Intersection Operations**

Intersection		Peak Hour	Movement	Existing Condition (2010)			Background Condition (2031)		
				V/C	Delay	LOS	V/C	Delay	LOS
Signalized Intersections									
1	Highway 407 Eastbound Off-Ramp @ Leslie Street	am	Overall	0.79	25	C	0.90	30	C
			EBL	0.92	54	D	0.97	62	E
		pm	Overall	0.68	14	B	0.86	22	C
2	Leslie Street (East-West) @ Green Lane / Summerdale Drive (North-South)	am	Overall	0.85	31	C	0.79	30	C
			EBT	0.79	30	C	0.87	32	C
			NBL	0.96	74	E	0.67	37	D
		pm	Overall	0.82	26	C	0.74	24	C
			EBT	0.90	34	C	0.84	28	C
3	St. Robert School Access Road / Station Access Road @ Leslie Street	am	Overall	0.47	3	A	0.59	4	A
			SBT	0.51	2	A	0.63	3	A
		pm	Overall	0.61	6	A	0.77	8	A
			SBT	0.66	8	A	0.82	10	B

Notes:

Critical movement(s) defined as V/C > 0.85 and/or poorest LOS.

The future total background traffic analysis results indicate that all the approaches at the signalized intersections will continue to operate satisfactorily at Level of Service (LOS) 'C' (or better) during both the weekday am, and pm peak hours.

However, the northbound left-turn movement at the Leslie Street @ Green Lane / Summerdale Drive intersection is projected to continue to experience higher delays during the am peak hour. Therefore, consideration should be given to introduce dual left-turn lanes for the long-term horizon period. With dual northbound left-turn lanes, the northbound left-turn V/C ratio is projected to be reduced from 0.96 to 0.67, and the LOS will improve from LOS E to D.

The eastbound left-turn operation at the Highway 407 Eastbound Off-Ramp @ Leslie Street also approaches 'capacity' conditions during am peak hour. However, no additional geometric improvements are considered under future background conditions.

### 5.5.2 QUEUE LENGTHS

The weekday am and pm peak hour existing condition queue length analysis results are included in **Exhibit 5-3**. Full analysis summaries are included in **Appendix B**.

**Exhibit 5-3: Background Condition (2031) Compared with Existing Condition (2010) Turning Movement Queue Lengths**

Intersection		Peak Hour	Movement	Parallel Lane Storage Length (m)	Existing Condition (2010) Synchro Queues (m)		Background Condition (2031) Synchro Queues (m)	
					50th Percen.	95th Percen.	50th Percen.	95th Percen.
Signalized Intersections								
1	Highway 407 Eastbound Off-Ramp @ Leslie Street	am	EBR	EBR = 280;	29	50	46	72
		pm	EBR		43	65	58	95
2	Leslie Street (East-West) @ Green Lane / Summerdale Dr. (North-South)	am	EBL	EBL= 75; NBL= 25;	8	18	11	18
			NBL		98	171	41	55
		pm	EBL		9	17	14	17
			NBL		38	61	23	35
3	St. Robert School Access Road / Station Access Road @ Leslie Street	am	EBL	SBL = 150;	-	-	-	-
			NBL		-	-	-	-
			SBL		3	6	18	47
		pm	EBL		-	-	-	-
			NBL		-	-	-	-
			SBL		1	2	2	2

At the Leslie Street @ Green Lane / Summerdale Drive intersection, the northbound left-turn movement is projected to continue to experience queuing issues during both the am and pm peak hours, respectively. With the addition of a second northbound left-turn lane, queue lengths are projected to drop by approximately 50% from the Existing Condition. There are no queuing issues at other Study Area intersection turning movements.

## 6. LESLIE STATION RELATED TRAFFIC

### 6.1 Passenger Flow Projections

The preferred station concept shown in **Exhibit 2-2** indicates that the park-and-ride facility will initially include 400 parking spaces for 407 Transitway users and 200 spaces for carpoolers by the year 2031. There is the potential for an additional 250 parking spaces on the west end of the Leslie Station Site for a total of 850 parking spaces. Vehicle access to and from the parking lot will be through a single access point from Leslie Street.

### 6.2 Trip Generation

#### 6.2.1 ASSUMPTIONS

The following assumptions were used to establish the increase in site related traffic. The trip generation rates for the subject park-and-ride development were extracted from the *Institute of Transportation Engineers (ITE) Trip Generation Manual, 8th Edition*. The selected trip rates were taken from Land Use Code 090: Park-and-Ride Lot with Bus Service and are summarized in **Exhibit 6-1**.

**Exhibit 6-1: Trips Rates and Splits for Park-and-Ride with PPUDO Facility**

Site Users	No. of Parking Spaces	Am Split		Pm Split		Trip Rates					
						Am Peak Hour			Pm Peak Hour		
		In	Out	In	Out	In	Out	Total	In	Out	Total
407 Transitway	650	81%	19%	23%	77%	0.58	0.14	0.72	0.14	0.48	0.62
Carpool	200	81%	19%	23%	77%	0.58	0.14	0.72	0.14	0.48	0.62

#### 6.2.1 GENERATED TRIPS

The estimated trip generation for the proposed Leslie Station is summarized in **Exhibit 6-2**. The park-and-ride facility will generate approximately 615 and 530 two-way trips during the am and pm peak hours, respectively.

**Exhibit 6-2: Estimated Trip Generation for Leslie Station**

Site Users	No. of Parking Spaces	Am Split		Pm Split		Trip Rates					
						Am Peak Hour			Pm Peak Hour		
		In	Out	In	Out	In	Out	Total	In	Out	Total
407 Transitway	650	81%	19%	23%	77%	379	89	468	93	310	403
Carpool	200	81%	19%	23%	77%	117	27	144	29	95	124
<b>Total Trips</b>						<b>496</b>	<b>116</b>	<b>612</b>	<b>121</b>	<b>406</b>	<b>527</b>

### 6.3 Future Bus Transit Volumes

In terms of bus traffic stopping on Leslie Street, it was assumed the frequency of future local feeder buses including TTC and YRT would approximately increase by 50 percent before the introduction of Leslie LRT line. Therefore, a total of 30 buses (15 in each direction) will stop on Leslie Street in both directions during the weekday am and pm peak hours.

### 6.4 Trip Distribution

Site generated traffic was assigned to the road network based on the indicated trip generation, trip distribution, and proposed site access parameters. **Exhibit 6-3** summarizes the trip distribution parameters used for this study.

**Exhibit 6-3: Distribution of Park-and-Ride Traffic**

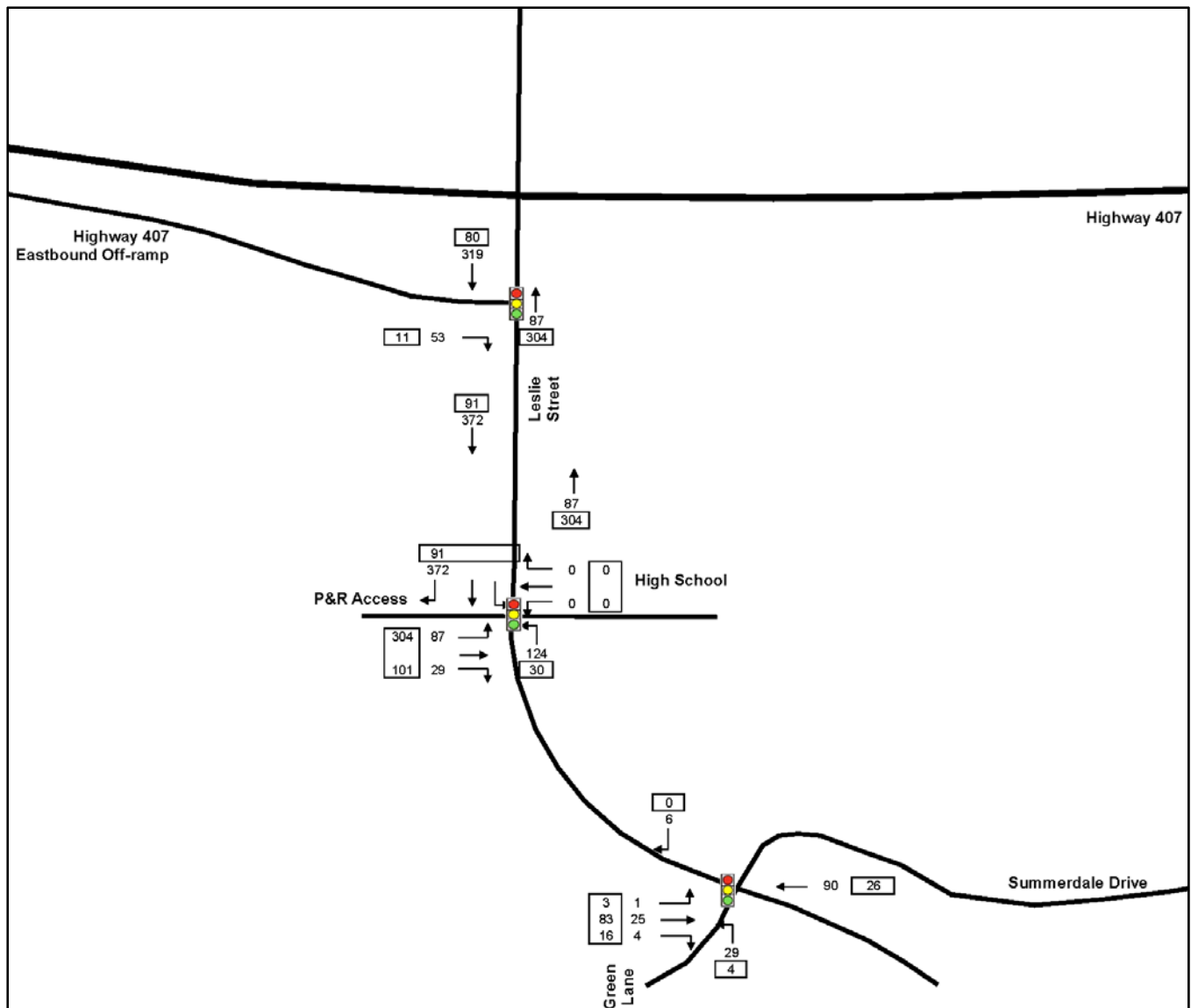
To / From	Am Peak Hour		Pm Peak Hour	
	IN	OUT	IN	OUT
Leslie Street (North)	64%	75%	66%	75%
Leslie Street (South)	18%	21%	22%	20%
Highway 407 (West)	11%	-	9%	-
Other	7%	4%	3%	5%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

The source of the trip distribution is associated with Transportation Tomorrow Survey (TTS) data. As indicated in the TTS data, it is expected that the Leslie Street north approach will provide the most inbound traffic to the Subject Site during the am and pm peak hours – approximately 64% to 66%. Minor differences for inbound and outbound trips patterns reflect the relative convenience of alternative trip routings afforded by the Study Area and larger regional road network.

### 6.5 Trip Assignment

The site generated trips were assigned to the street network based on the trip distribution percentages discussed above, taking into account the directionality of the trips (inbound vs. outbound). The site generated traffic volumes for the weekday am and pm peak hour are illustrated in **Exhibit 6-4**.

**Exhibit 6-4: 2031 Site Generated Traffic Volumes**



## 7. FUTURE TOTAL CONDITION

### 7.1 Effects of Light Rail Transit Operation on Leslie Street

For this study, it is assumed that LRT will operate on dedicated lanes in the middle of Leslie Street and thus potentially affecting the traffic operation at the park-and-ride location. Left-turn operations on Leslie Street require protected phases to allow transit vehicles in both the northbound and southbound directions to progress with the through vehicles in an efficient manner. The operational effectiveness of a dedicated transit lane, such as the LRT proposed on Leslie Street, was reviewed at signalized site accesses from both corridor operations and queuing perspectives.

Generally, it was found that delays would increase by 25% during the morning peak hour at the park-and-ride access location. The impact of LRT operation in terms of overall V/C ratios will be marginal (0% to 2% increases during both design peak hours) for the long-term horizon periods. However, the northbound and southbound left-turn delays would be more than 60 seconds during the peak hours.

Overall, to improve LRT operations on Leslie Street requires delay increases of less than 10-seconds per vehicles, and a relatively acceptable increase in storage length for auxiliary turning lanes for other non-transit traffic operations.

### 7.2 Future Transit Services and Operations

Based on the existing transit route configuration and Transit City's LRT operations, the physical configuration of the future transit operations were evaluated to achieve optimum geometric configurations for the road network surrounding Leslie Station. The following can be concluded for future transit operations at Leslie Station:

- LRT operations are assumed with a dedicated right-of-way in the middle of Leslie Street. Protected left-turning operation were also introduced at site access location to reflect the actual traffic operation performances under future conditions;
- On-street YRT operation (i.e. no transit access to 407 Leslie Station) will require two bus stops with bus bays on both sides of Leslie Street. Future road configurations on Leslie Street should include queue jump options for safe and efficient transit operation during bus transit activities at future transit stops; and

### 7.3 Future Pedestrian / Bicycle Facilities and Operations

In order to ensure the Subject Site is a complete and sustainable community, it is proposed that walking and cycling infrastructure be built into the site from the outset (See **Exhibit 7-1**). Key features include:

- An east-west multi-use underpass below Leslie Street to provide vertical access for pedestrian and bike users. This pedestrian underpass will connect both sides of Leslie Street as well as the future LRT station in the middle of Leslie Street. A pedestrian pathway will be provided to link this underpass and the High School on the east side of Leslie Street;
- At-grade crosswalk at park-and-ride access is recommended to facilitate pedestrian crossing between both sides of Leslie Street;

- A pedestrian and bicycle connection to the west of Leslie Station is also planned to access the residential neighbourhood west of Leslie Street;
- A walking path is also recommended to access the 407 Transitway platforms from Leslie Street transit bus bays; and
- In addition, as the site plan and station facilities details are refined, other opportunities to promote walking and cycling will be pursued, including options for bicycle parking, and pedestrian amenities (e.g. benches).

## 7.4 Site Access and Configurations

The total signalized intersection spacing on Leslie Street, between the eastbound off-ramp and the High School access is approximately 270 metres. It is recommended that the site access roadway to the proposed Leslie Station site and park-and-ride be aligned with the existing site access roadway to St. Robert School to form a four way signalized intersection.

A substantial curvature and grade variation exists between the north and south approach of park-and-ride / school signalized access. A minimum of 80 metres of southbound right-turn storage (excluding taper length) is recommended under future total traffic conditions at the park-and-ride access. The northbound left-turn lane at this intersection will also need considerable attention to address sight limitations given a substantial curvature exist to its south approach.

## 7.5 Future Traffic Control and Lane Configurations

A map shown future Study Area roadway lane configurations is shown in **Exhibit 7-1** with recommended future background and site lane configurations and storage lengths shown in blue and red. Other geometrical improvements including pedestrian crossings and pathways are also shown.

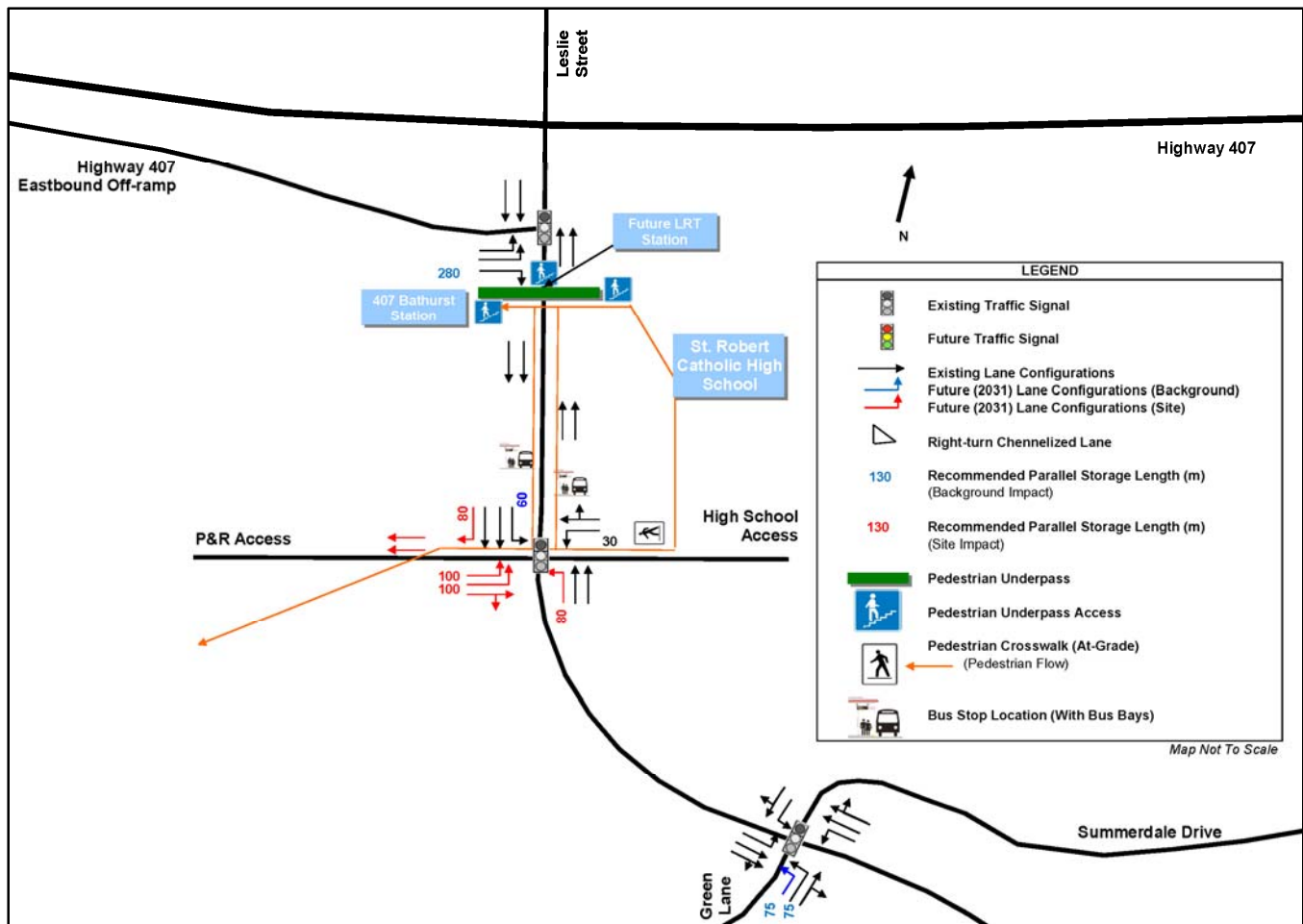
Supplemental improvements beyond those planned will be required along Leslie Street. These include:

- The introduction of northbound left-turn and southbound right-turn lanes along Leslie Street at park-and-ride site access;
- The addition of auxiliary eastbound dual left-turn lanes at the park-and-ride site access; and

The aligning of the east-west alignment at park-and-ride intersection by adjusting the east side left-turn lane and corner radius, which may require the relocation the traffic signal post at appropriate location.



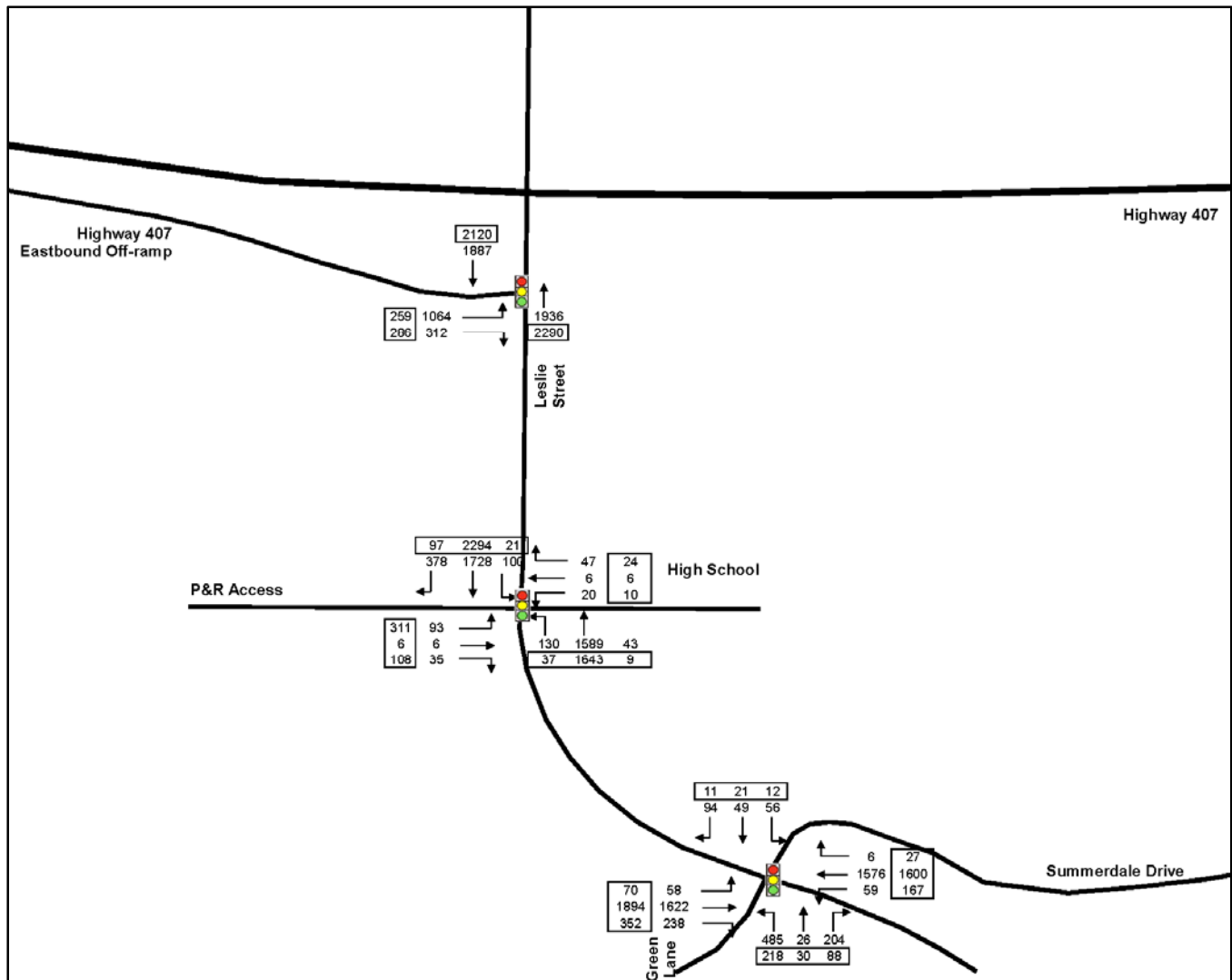
**Exhibit 7-1: Future Study Area Recommended Lane and Geometrical Configurations**



## 7.6 Future Total Traffic Volumes

Site traffic volumes were added to future background traffic volumes to obtain the corresponding future total traffic volumes at the study area intersections. The 2031 future total traffic volumes are shown in **Exhibit 7-2**.

**Exhibit 7-2: 2031 Future Total Traffic Volumes**



## 7.7 Future Total Condition (2031) Traffic Operations

### 7.7.1 CAPACITY AND LEVEL OF SERVICE

The weekday am and pm peak hour traffic analysis results are included in **Exhibit 7-3**. Full analysis summaries are included in **Appendix C**.

**Exhibit 7-3: Future Total Condition (2031) Compared with Background Condition (2031) Intersection Operations**

Intersection		Peak Hour	Movement	Background Condition (2031)			Future Total Condition (2031)		
				V/C	Delay	LOS	V/C	Delay	LOS
Signalized Intersections									
1	Highway 407 Eastbound Off-Ramp @ Leslie Street	am	Overall	0.90	30	C	0.94	28	C
			EBL	0.97	62	E	0.97	62	E
		pm	Overall	0.86	22	C	0.91	26	C
2	Leslie Street (East-West) @ Green Lane / Summerdale Drive (North-South)	am	Overall	0.79	30	C	0.82	33	C
			EBT	0.87	32	C	0.88	42	D
			NBL	0.67	37	D	0.73	40	D
		pm	Overall	0.74	24	C	0.78	27	C
			EBT	0.84	28	C	0.92	35	D
3	St. Robert School Access Road / Station Access Road @ Leslie Street	am	Overall	0.59	4	A	0.85	43	D
			SBT	0.63	3	A	1.06	59	E
		pm	Overall	0.77	8	A	0.87	43	D
			SBT	0.82	10	B	1.03	58	E

Notes:

Critical movement(s) defined as V/C > 0.85 and/or poorest LOS.

The addition of site traffic will moderately affect future operations at Study Area signalized intersections except the site access location. Changes to the overall V/C ratios are in the range of 3% to 26% during the weekday peak hours. Based on implementation of the several traffic control and physical road improvements at the site accesses, overall satisfactory level-of-service will be maintained under future traffic conditions (LOS 'D' or better).

Several signalized Study Area intersection traffic movements are projected to operate at LOS 'E' or worse including the following"

- At the Highway 407 Eastbound Off-Ramp @ Leslie Street intersection, the eastbound left-turn is projected to continue to operate at LOS 'E' during the am peak hour; and
- At the St. Robert School Access Road / Station Access Road @ Leslie Street intersection, the southbound through movement is projected to operate at LOS 'E' during the am and pm peak hours, respectively.

### 7.7.2 QUEUE LENGTHS

The weekday am and pm peak hour existing condition queue length analysis results are included in **Exhibit 7-4**. Full analysis summaries are included in **Appendix C**.

**Exhibit 7-4: Future Total Condition (2031) Compared With Background Condition (2031)  
Intersection Operations**

Intersection		Peak Hour	Movement	Parallel Lane Storage Length (m)	Background Condition (2031) Synchro Queues (m)		Future Total Condition (2031) Synchro Queues (m)	
					50th Percen.	95th Percen.	50th Percen.	95th Percen.
Signalized Intersections								
1	Highway 407 Eastbound Off-Ramp @ Leslie Street	am	EBR	EBR = 280;	46	72	63	95
		pm	EBR		58	95	62	102
2	Leslie Street (East-West) @ Green Lane / Summerdale Dr. (North-South)	am	EBL	EBL= 75; NBL= 25;	11	18	12	12
			NBL		41	55	44	61
		pm	EBL		14	17	13	15
			NBL		23	35	24	35
3	St. Robert School Access Road / Station Access Road @ Leslie Street	am	EBL	SBL = 150;	-	-	11	20
			NBL		-	-	28	68
			SBL		18	47	24	39
		pm	EBL		-	-	35	46
			NBL		-	-	9	14
			SBL		2	2	5	6

Notes:

Critical movement(s) defined as V/C >0.85 and/or poorest LOS.

At the Leslie Street @ Green Lane / Summerdale Drive signalized intersection, the northbound left-turn movement queues (on Green Lane) are projected to exceed the existing storage bay length of 25 metres by approximately 35 metres and 10 metres during the am and pm peak hours, respectively.

## 8. SUMMARY AND CONCLUSIONS

Based on the analysis presented above, the following have been concluded / recommended:

- The preferred transit scenario for the proposed Leslie Station is for no on-site transit access with bus stops located on the street. This on-street bus stop option will require transit stops on both sides of Leslie Street with exclusive bus bays for transit vehicles;
- Dual eastbound left-turn lanes are recommended for the Station Access Road @ Leslie Street intersection;
- An east-west multi-use underpass below Leslie Street is recommended to provide pedestrian and bike access between Leslie Station (west side of Leslie Street), St. Robert High School (east side of Leslie Street), and the LRT station (middle of Leslie Street). Other active transportation facilities are also recommended to connect the surrounding neighbourhood to future transit facilities and services on Leslie Street;
- Without transit access to Leslie Station, land designated for a potential bus terminal area can be used for parking spaces. As a result, the required number of parking spaces west of the German Mills Creek will be reduced and thus will ultimately lessen the impact of the proposed Leslie Station on the surrounding environment;
- The results of LRT operation capacity analysis project that the impact of LRT operations on non-transit traffic on Leslie Street is marginal during peak hours; and
- The proposed Leslie Station and park-and-ride access roadway should align with the existing School Access Road (on the east side of Leslie Street) to form a four-way signalized intersection. Aligning these roadways will allow for the construction of a full movement signalized intersection, with pedestrian crossings and left-turn lanes.



## APPENDIX A

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### 2010 EXISTING CONDITION SYNCHRO SUMMARY OUTPUTS





2010 Existing - Weekday AM Peak Hour  
 1: Hwy 407 Eastbound Off-Ramp & Leslie Street

Queues  
 Highway 407 Transitway: Leslie Station



Lane Group	EBL	EBR	NBT	SBT
Lane Configurations	↰↰	↱	↕↕	↕↕
Volume (vph)	855	208	1473	1248
Lane Group Flow (vph)	929	226	1601	1357
Turn Type	Perm			
Protected Phases	4		2	6
Permitted Phases		4		
Detector Phases	4	4	2	6
Minimum Initial (s)	10.0	10.0	30.0	30.0
Minimum Split (s)	33.0	33.0	37.0	37.0
Total Split (s)	40.0	40.0	80.0	80.0
Total Split (%)	33.3%	33.3%	66.7%	66.7%
Yellow Time (s)	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	C-Max	C-Max
v/c Ratio	0.92	0.45	0.72	0.62
Control Delay	55.7	27.7	15.0	14.8
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	55.7	27.7	15.0	14.8
Queue Length 50th (m)	100.3	28.5	146.2	86.8
Queue Length 95th (m)#	134.8	49.9	168.2	105.4
Internal Link Dist (m)	396.9		119.1	356.1
Turn Bay Length (m)	280.0			
Base Capacity (vph)	1009	504	2217	2195
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.92	0.45	0.72	0.62

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

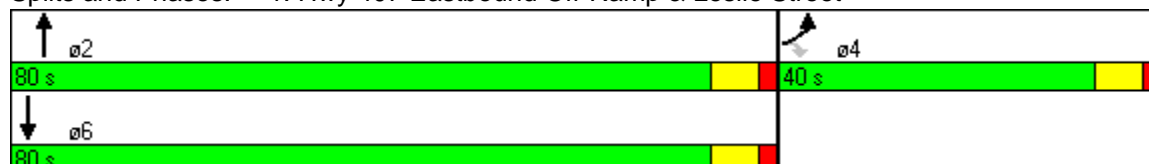
Natural Cycle: 70

Control Type: Actuated-Coordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Hwy 407 Eastbound Off-Ramp & Leslie Street



2010 Existing - Weekday AM Peak Hour  
1: Hwy 407 Eastbound Off-Ramp & Leslie Street

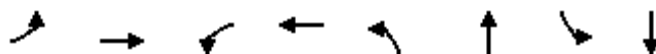
HCM Signalized Intersection Capacity Analysis  
Highway 407 Transitway: Leslie Station



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↱	↱		↰↱	↰↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	0.97	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3362	1536		3500	3466	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3362	1536		3500	3466	
Volume (vph)	855	208	0	1473	1248	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	929	226	0	1601	1357	0
RTOR Reduction (vph)	0	43	0	0	0	0
Lane Group Flow (vph)	929	183	0	1601	1357	0
Confl. Peds. (#/hr)			5			5
Heavy Vehicles (%)	3%	4%	0%	2%	3%	0%
Turn Type	Perm					
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	33.0	33.0		73.0	73.0	
Effective Green, g (s)	36.0	36.0		76.0	76.0	
Actuated g/C Ratio	0.30	0.30		0.63	0.63	
Clearance Time (s)	7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	1009	461		2217	2195	
v/s Ratio Prot	c0.28			c0.46	0.39	
v/s Ratio Perm		0.12				
v/c Ratio	0.92	0.40		0.72	0.62	
Uniform Delay, d1	40.6	33.4		14.9	13.3	
Progression Factor	1.00	1.00		0.86	1.00	
Incremental Delay, d2	13.2	0.6		1.9	1.3	
Delay (s)	53.8	33.9		14.7	14.6	
Level of Service	D	C		B	B	
Approach Delay (s)	49.9			14.7	14.6	
Approach LOS	D			B	B	
<b>Intersection Summary</b>						
HCM Average Control Delay		24.5		HCM Level of Service		C
HCM Volume to Capacity ratio		0.79				
Actuated Cycle Length (s)		120.0		Sum of lost time (s)		8.0
Intersection Capacity Utilization		71.8%		ICU Level of Service		C
Analysis Period (min)		15				
c Critical Lane Group						

2010 Existing - Weekday AM Peak Hour  
2: Leslie Street & Summerdale Drive

Queues  
Highway 407 Transitway: Leslie Station



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	←	↑↓	←	↑↓	←	↑	←	↑
Volume (vph)	46	1271	47	1182	367	21	45	39
Lane Group Flow (vph)	50	1586	51	1290	399	201	49	119
Turn Type	Perm		Perm		Perm		Perm	
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phases	4	4	8	8	2	2	6	6
Minimum Initial (s)	30.0	30.0	30.0	30.0	10.0	10.0	10.0	10.0
Minimum Split (s)	37.0	37.0	37.0	37.0	29.0	29.0	29.0	29.0
Total Split (s)	86.0	86.0	86.0	86.0	34.0	34.0	34.0	34.0
Total Split (%)	71.7%	71.7%	71.7%	71.7%	28.3%	28.3%	28.3%	28.3%
Yellow Time (s)	5.0	5.0	5.0	5.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max
v/c Ratio	0.28	0.79	0.47	0.63	1.01	0.35	0.23	0.19
Control Delay	21.1	29.8	27.9	17.2	87.6	23.0	36.6	14.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.1	29.8	27.9	17.2	87.6	23.0	36.6	14.8
Queue Length 50th (m)	7.3	146.2	5.5	84.1	~97.4	21.2	7.9	7.0
Queue Length 95th (m)	m17.2	158.8	15.0	81.5	#170.2	44.7	19.8	21.6
Internal Link Dist (m)		354.0		188.5		124.1		194.2
Turn Bay Length (m)	75.0		120.0		25.0		35.0	
Base Capacity (vph)	208	2324	125	2388	397	568	209	621
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	0.68	0.41	0.54	1.01	0.35	0.23	0.19

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 43 (36%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.

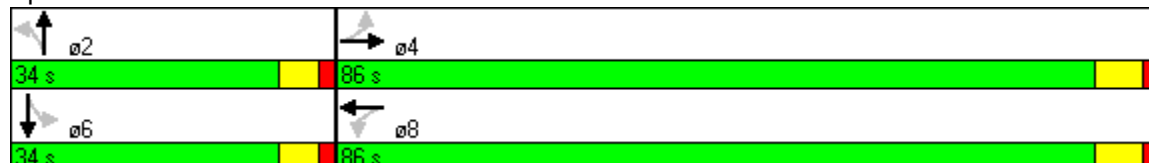
Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.





















m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Leslie Street & Summerdale Drive















2010 Existing - Weekday AM Peak Hour  
2: Leslie Street & Summerdale Drive

HCM Signalized Intersection Capacity Analysis  
Highway 407 Transitway: Leslie Station

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	0.98		1.00	1.00		1.00	0.87		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	3386		1684	3495		1743	1510		1205	1661	
Flt Permitted	0.14	1.00		0.07	1.00		0.65	1.00		0.54	1.00	
Satd. Flow (perm)	250	3386		127	3495		1202	1510		688	1661	
Volume (vph)	46	1271	188	47	1182	5	367	21	164	45	39	71
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)	50	1382	204	51	1285	5	399	23	178	49	42	77
RTOR Reduction (vph)	0	13	0	0	0	0	0	47	0	0	48	0
Lane Group Flow (vph)	50	1573	0	51	1290	0	399	154	0	49	71	0
Confl. Peds. (#/hr)	1		8	8		1	3		7	7		3
Heavy Vehicles (%)	2%	3%	2%	6%	2%	20%	2%	19%	4%	47%	3%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases	4			8			2			6		
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	67.6	67.6		67.6	67.6		39.4	39.4		39.4	39.4	
Effective Green, g (s)	70.6	70.6		70.6	70.6		41.4	41.4		41.4	41.4	
Actuated g/C Ratio	0.59	0.59		0.59	0.59		0.34	0.34		0.34	0.34	
Clearance Time (s)	7.0	7.0		7.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	147	1992		75	2056		415	521		237	573	
v/s Ratio Prot	c0.46			0.37			0.10			0.04		
v/s Ratio Perm	0.20			0.40			c0.33			0.07		
v/c Ratio	0.34	0.79		0.68	0.63		0.96	0.30		0.21	0.12	
Uniform Delay, d1	12.7	19.0		16.9	16.1		38.5	28.7		27.7	26.9	
Progression Factor	1.68	1.48		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.6	2.3		28.0	0.9		35.5	1.4		2.0	0.4	
Delay (s)	24.0	30.3		45.0	17.0		74.0	30.1		29.7	27.3	
Level of Service	C	C		D	B		E	C		C	C	
Approach Delay (s)	30.1			18.0			59.3			28.0		
Approach LOS	C			B			E			C		
Intersection Summary												
HCM Average Control Delay	30.4			HCM Level of Service			C					
HCM Volume to Capacity ratio	0.85											
Actuated Cycle Length (s)	120.0			Sum of lost time (s)			8.0					
Intersection Capacity Utilization	85.3%			ICU Level of Service			E					
Analysis Period (min)	15											
c Critical Lane Group												

2010 Existing - Weekday AM Peak Hour  
 3: High School Access & Leslie Street

Queues  
 Highway 407 Transitway: Leslie Station

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	16	38	1265	34	80	1376
Lane Group Flow (vph)	17	41	1375	37	87	1496
Turn Type	Perm		pm+ov		Perm	
Protected Phases	8		2	8		6
Permitted Phases		8		2	6	
Detector Phases	8	8	2	8	6	6
Minimum Initial (s)	10.0	10.0	30.0	10.0	30.0	30.0
Minimum Split (s)	33.0	33.0	37.0	33.0	37.0	37.0
Total Split (s)	40.0	40.0	80.0	40.0	80.0	80.0
Total Split (%)	33.3%	33.3%	66.7%	33.3%	66.7%	66.7%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	None	C-Max	C-Max
v/c Ratio	0.09	0.20	0.46	0.02	0.42	0.50
Control Delay	49.6	16.9	2.4	0.0	8.0	2.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.6	16.9	2.4	0.0	8.0	2.4
Queue Length 50th (m)	3.4	0.0	21.0	0.0	2.6	25.1
Queue Length 95th (m)	9.9	9.7	m28.8	m0.0	m5.2	27.7
Internal Link Dist (m)	110.4		354.0			117.9
Turn Bay Length (m)	30.0			20.0	160.0	
Base Capacity (vph)	525	499	3010	1566	207	3010
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.08	0.46	0.02	0.42	0.50

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green















Natural Cycle: 80

Control Type: Actuated-Coordinated

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: High School Access & Leslie Street



						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1750	1566	3500	1566	1750	3500
Flt Permitted	0.95	1.00	1.00	1.00	0.18	1.00
Satd. Flow (perm)	1750	1566	3500	1566	331	3500
Volume (vph)	16	38	1265	34	80	1376
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	41	1375	37	87	1496
RTOR Reduction (vph)	0	37	0	0	0	0
Lane Group Flow (vph)	17	4	1375	37	87	1496
Turn Type	Perm		pm+ov		Perm	
Protected Phases	8		2	8		6
Permitted Phases		8		2		6
Actuated Green, G (s)	8.0	8.0	98.0	106.0	98.0	98.0
Effective Green, g (s)	11.0	11.0	101.0	112.0	101.0	101.0
Actuated g/C Ratio	0.09	0.09	0.84	0.93	0.84	0.84
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	160	144	2946	1566	279	2946
v/s Ratio Prot	c0.01		0.39	0.00		c0.43
v/s Ratio Perm		0.00		0.02	0.26	
v/c Ratio	0.11	0.03	0.47	0.02	0.31	0.51
Uniform Delay, d1	50.0	49.6	2.5	0.3	2.0	2.6
Progression Factor	1.00	1.00	0.78	1.00	0.86	0.69
Incremental Delay, d2	0.3	0.1	0.4	0.0	2.3	0.5
Delay (s)	50.3	49.7	2.3	0.3	4.1	2.3
Level of Service	D	D	A	A	A	A
Approach Delay (s)	49.9		2.3			2.4
Approach LOS	D		A			A
<b>Intersection Summary</b>						
HCM Average Control Delay			3.2		HCM Level of Service	A
HCM Volume to Capacity ratio			0.47			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			78.3%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						

2010 Existing - Weekday PM Peak Hour  
 1: Hwy 407 Eastbound Off-Ramp & Leslie Street

Queues  
 Highway 407 Transitway: Leslie Station



Lane Group	EBL	EBR	NBT	SBT
Lane Configurations	↰↰	↱	↕↕	↕↕
Volume (vph)	208	221	1583	1627
Lane Group Flow (vph)	226	240	1721	1768
Turn Type	Perm			
Protected Phases	4		2	6
Permitted Phases		4		
Detector Phases	4	4	2	6
Minimum Initial (s)	10.0	10.0	30.0	30.0
Minimum Split (s)	33.0	33.0	37.0	37.0
Total Split (s)	33.0	33.0	87.0	87.0
Total Split (%)	27.5%	27.5%	72.5%	72.5%
Yellow Time (s)	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	C-Max	C-Max
v/c Ratio	0.36	0.73	0.66	0.68
Control Delay	42.5	51.2	10.8	10.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	42.5	51.2	10.8	10.5
Queue Length 50th (m)	21.9	42.2	76.8	94.0
Queue Length 95th (m)	30.7	64.6	111.0	135.1
Internal Link Dist (m)	396.9		119.1	356.1
Turn Bay Length (m)	280.0			
Base Capacity (vph)	790	404	2590	2616
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.29	0.59	0.66	0.68

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 47 (39%), Referenced to phase 2:NBT and 6:SBT, Start of Green











Natural Cycle: 80

Control Type: Actuated-Coordinated

Splits and Phases: 1: Hwy 407 Eastbound Off-Ramp & Leslie Street

2010 Existing - Weekday PM Peak Hour  
1: Hwy 407 Eastbound Off-Ramp & Leslie Street

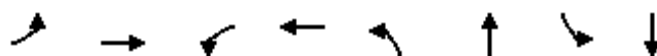
HCM Signalized Intersection Capacity Analysis  
Highway 407 Transitway: Leslie Station

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	0.97	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3267	1566		3500	3535	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3267	1566		3500	3535	
Volume (vph)	208	221	0	1583	1627	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	226	240	0	1721	1768	0
RTOR Reduction (vph)	0	27	0	0	0	0
Lane Group Flow (vph)	226	213	0	1721	1768	0
Confl. Peds. (#/hr)			3			3
Heavy Vehicles (%)	6%	2%	0%	2%	1%	0%
Turn Type	Perm					
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	20.2	20.2		85.8	85.8	
Effective Green, g (s)	23.2	23.2		88.8	88.8	
Actuated g/C Ratio	0.19	0.19		0.74	0.74	
Clearance Time (s)	7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	632	303		2590	2616	
v/s Ratio Prot	0.07			0.49	c0.50	
v/s Ratio Perm		c0.14				
v/c Ratio	0.36	0.70		0.66	0.68	
Uniform Delay, d1	41.9	45.2		8.0	8.1	
Progression Factor	1.00	1.00		1.06	1.00	
Incremental Delay, d2	0.3	7.2		1.3	1.4	
Delay (s)	42.3	52.3		9.8	9.5	
Level of Service	D	D		A	A	
Approach Delay (s)	47.5			9.8	9.5	
Approach LOS	D			A	A	
<b>Intersection Summary</b>						
HCM Average Control Delay		14.1		HCM Level of Service		B
HCM Volume to Capacity ratio		0.68				
Actuated Cycle Length (s)		120.0		Sum of lost time (s)		8.0
Intersection Capacity Utilization		65.3%		ICU Level of Service		C
Analysis Period (min)		15				
c Critical Lane Group						



2010 Existing - Weekday PM Peak Hour  
2: Leslie Street & Summerdale Drive

Queues  
Highway 407 Transitway: Leslie Station



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	54	1443	134	1252	172	24	10	17
Lane Group Flow (vph)	59	1861	146	1385	187	103	11	28
Turn Type	Perm		pm+pt		Perm		Perm	
Protected Phases		4	3	8		2		6
Permitted Phases	4		8		2		6	
Detector Phases	4	4	3	8	2	2	6	6
Minimum Initial (s)	30.0	30.0	4.0	30.0	10.0	10.0	10.0	10.0
Minimum Split (s)	37.0	37.0	8.0	37.0	29.0	29.0	29.0	29.0
Total Split (s)	73.0	73.0	17.0	90.0	30.0	30.0	30.0	30.0
Total Split (%)	60.8%	60.8%	14.2%	75.0%	25.0%	25.0%	25.0%	25.0%
Yellow Time (s)	5.0	5.0	3.0	5.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag	Lag	Lag	Lead					
Lead-Lag Optimize?	Yes	Yes	Yes					
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max
v/c Ratio	0.28	0.90	0.68	0.55	0.63	0.26	0.04	0.07
Control Delay	25.0	35.1	38.0	9.0	53.6	14.9	37.9	27.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.0	35.1	38.0	9.0	53.6	14.9	37.9	27.9
Queue Length 50th (m)	8.5	215.9	15.7	65.5	37.1	4.5	1.9	3.1
Queue Length 95th (m)	m16.9	#240.9	35.3	79.4	60.2	17.9	6.5	10.3
Internal Link Dist (m)		354.0		188.5		124.1		194.2
Turn Bay Length (m)	75.0		120.0		25.0		35.0	
Base Capacity (vph)	212	2064	253	2503	295	403	263	392
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.28	0.90	0.58	0.55	0.63	0.26	0.04	0.07

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 7 (6%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

# 95th percentile volume exceeds capacity, queue may be longer.





















Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Leslie Street & Summerdale Drive













2010 Existing - Weekday PM Peak Hour  
2: Leslie Street & Summerdale Drive

HCM Signalized Intersection Capacity Analysis  
Highway 407 Transitway: Leslie Station

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
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	0.99		1.00	0.99	
Flpb, ped/bikes	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		1.00	0.89		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	3439		1767	3492		1745	1579		1780	1769	
Flt Permitted	0.18	1.00		0.05	1.00		0.74	1.00		0.65	1.00	
Satd. Flow (perm)	341	3439		98	3492		1357	1579		1210	1769	
Volume (vph)	54	1443	270	134	1252	22	172	24	71	10	17	9
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)	59	1568	293	146	1361	24	187	26	77	11	18	10
RTOR Reduction (vph)	0	12	0	0	1	0	0	60	0	0	8	0
Lane Group Flow (vph)	59	1849	0	146	1384	0	187	43	0	11	20	0
Confl. Peds. (#/hr)			5	5			2		2	2		2
Heavy Vehicles (%)	0%	1%	0%	1%	2%	0%	2%	0%	6%	0%	0%	0%
Turn Type	Perm		pm+pt		Perm		Perm		Perm		Perm	
Protected Phases	4		3		8		2		6		6	
Permitted Phases	4		8		2		6		6		6	
Actuated Green, G (s)	68.6	68.6		82.9	82.9		24.1	24.1		24.1	24.1	
Effective Green, g (s)	71.6	71.6		85.9	85.9		26.1	26.1		26.1	26.1	
Actuated g/C Ratio	0.60	0.60		0.72	0.72		0.22	0.22		0.22	0.22	
Clearance Time (s)	7.0	7.0		4.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	5.0	5.0		3.0	5.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	203	2052		213	2500		295	343		263	385	
v/s Ratio Prot	c0.54		c0.06		0.40		0.03		0.01		0.01	
v/s Ratio Perm	0.17		0.43		c0.14		0.01		0.01		0.01	
v/c Ratio	0.29	0.90		0.69	0.55		0.63	0.12		0.04	0.05	
Uniform Delay, d1	11.8	21.1		33.2	8.0		42.6	37.8		37.1	37.2	
Progression Factor	1.64	1.38		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.3	5.0		8.8	0.5		10.0	0.7		0.3	0.3	
Delay (s)	20.7	34.1		42.0	8.5		52.6	38.5		37.4	37.4	
Level of Service	C	C		D	A		D	D		D	D	
Approach Delay (s)	33.6		11.7		47.6		37.4		37.4		37.4	
Approach LOS	C		B		D		D		D		D	
Intersection Summary												
HCM Average Control Delay			25.9		HCM Level of Service			C				
HCM Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			120.0		Sum of lost time (s)			12.0				
Intersection Capacity Utilization			89.5%		ICU Level of Service			E				
Analysis Period (min)			15									
c Critical Lane Group												

2010 Existing - Weekday PM Peak Hour  
3: High School Access & Leslie Street













Queues  
Highway 407 Transitway: Leslie Station

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	8	19	1308	7	17	1831
Lane Group Flow (vph)	9	21	1422	8	18	1990
Turn Type	Perm		pm+ov		Perm	
Protected Phases	8		2	8		6
Permitted Phases		8		2	6	
Detector Phases	8	8	2	8	6	6
Minimum Initial (s)	10.0	10.0	30.0	10.0	30.0	30.0
Minimum Split (s)	33.0	33.0	37.0	33.0	37.0	37.0
Total Split (s)	40.0	40.0	80.0	40.0	80.0	80.0
Total Split (%)	33.3%	33.3%	66.7%	33.3%	66.7%	66.7%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	None	C-Max	C-Max
v/c Ratio	0.05	0.11	0.45	0.01	0.09	0.64
Control Delay	48.8	20.0	4.1	0.0	4.4	8.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.1
Total Delay	48.8	20.0	4.1	0.0	4.4	8.2
Queue Length 50th (m)	1.8	0.0	47.4	0.0	1.0	111.8
Queue Length 95th (m)	6.4	7.0	72.0	m0.0	m1.4	187.9
Internal Link Dist (m)	110.4		354.0			117.9
Turn Bay Length (m)	30.0			20.0	160.0	
Base Capacity (vph)	525	485	3133	1566	198	3133
Starvation Cap Reductn	0	0	0	0	0	180
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.04	0.45	0.01	0.09	0.67
<b>Intersection Summary</b>						
Cycle Length: 120						
Actuated Cycle Length: 120						
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green						
Natural Cycle: 90						
Control Type: Actuated-Coordinated						
m Volume for 95th percentile queue is metered by upstream signal.						

Splits and Phases: 3: High School Access & Leslie Street

2010 Existing - Weekday PM Peak Hour  
3: High School Access & Leslie Street

HCM Signalized Intersection Capacity Analysis  
Highway 407 Transitway: Leslie Station

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1750	1566	3500	1566	1750	3500
Flt Permitted	0.95	1.00	1.00	1.00	0.17	1.00
Satd. Flow (perm)	1750	1566	3500	1566	318	3500
Volume (vph)	8	19	1308	7	17	1831
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	21	1422	8	18	1990
RTOR Reduction (vph)	0	19	0	0	0	0
Lane Group Flow (vph)	9	2	1422	8	18	1990
Turn Type	Perm		pm+ov		Perm	
Protected Phases	8		2	8		6
Permitted Phases		8		2		6
Actuated Green, G (s)	6.0	6.0	100.0	106.0	100.0	100.0
Effective Green, g (s)	9.0	9.0	103.0	112.0	103.0	103.0
Actuated g/C Ratio	0.08	0.08	0.86	0.93	0.86	0.86
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	131	117	3004	1566	273	3004
v/s Ratio Prot	c0.01		0.41	0.00		c0.57
v/s Ratio Perm		0.00		0.00	0.06	
v/c Ratio	0.07	0.01	0.47	0.01	0.07	0.66
Uniform Delay, d1	51.6	51.4	2.0	0.3	1.3	2.8
Progression Factor	1.00	1.00	1.72	1.00	1.79	2.40
Incremental Delay, d2	0.2	0.0	0.4	0.0	0.3	0.8
Delay (s)	51.8	51.4	3.9	0.3	2.6	7.6
Level of Service	D	D	A	A	A	A
Approach Delay (s)	51.6		3.9			7.5
Approach LOS	D		A			A
<b>Intersection Summary</b>						
HCM Average Control Delay			6.4		HCM Level of Service	A
HCM Volume to Capacity ratio			0.61			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			65.6%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

## APPENDIX B

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### 2031 BACKGROUND CONDITION SYNCHRO SUMMARY OUTPUTS



2031 Background - Weekday AM Peak Hour  
1: Hwy 407 Eastbound Off-Ramp & Leslie Street

Queues  
Highway 407 Transitway: Leslie Station



Lane Group	EBL	EBR	NBT	SBT
Lane Configurations	↰↰	↱	↕↕	↕↕
Volume (vph)	1064	259	1833	1553
Lane Group Flow (vph)	1064	282	1929	1635
Turn Type	Perm			
Protected Phases	4		2	6
Permitted Phases		4		
Detector Phases	4	4	2	6
Minimum Initial (s)	10.0	10.0	30.0	30.0
Minimum Split (s)	33.0	33.0	37.0	37.0
Total Split (s)	40.0	40.0	80.0	80.0
Total Split (%)	33.3%	33.3%	66.7%	66.7%
Yellow Time (s)	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	C-Max	C-Max
v/c Ratio	0.97	0.58	0.87	0.74
Control Delay	63.2	36.9	21.9	18.0
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	63.2	36.9	21.9	18.0
Queue Length 50th (m)	113.9	45.8	192.2	120.3
Queue Length 95th (m)#	152.2	72.1	228.6	145.5
Internal Link Dist (m)	396.9		119.1	356.1
Turn Bay Length (m)	280.0			
Base Capacity (vph)	1094	484	2217	2195
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.97	0.58	0.87	0.74

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

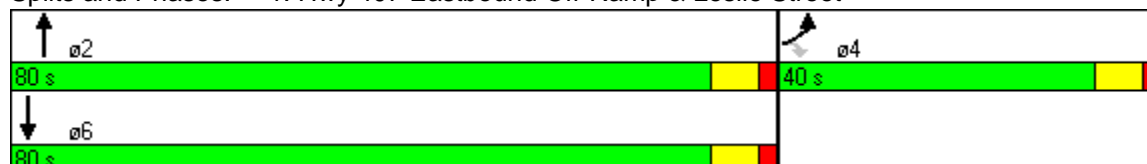
Natural Cycle: 90

Control Type: Actuated-Coordinated











# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Hwy 407 Eastbound Off-Ramp & Leslie Street





















2031 Background - Weekday AM Peak Hour      HCM Signalized Intersection Capacity Analysis  
 1: Hwy 407 Eastbound Off-Ramp & Leslie Street      Highway 407 Transitway: Leslie Station

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	*1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	1.00	1.00		1.00	1.00	
Satd. Flow (prot)	3648	1536		3500	3466	
Flt Permitted	1.00	1.00		1.00	1.00	
Satd. Flow (perm)	3648	1536		3500	3466	
Volume (vph)	1064	259	0	1833	1553	0
Peak-hour factor, PHF	1.00	0.92	0.92	0.95	0.95	0.92
Adj. Flow (vph)	1064	282	0	1929	1635	0
RTOR Reduction (vph)	0	23	0	0	0	0
Lane Group Flow (vph)	1064	259	0	1929	1635	0
Confl. Peds. (#/hr)			5			5
Heavy Vehicles (%)	3%	4%	0%	2%	3%	0%
Turn Type	Perm					
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	33.0	33.0		73.0	73.0	
Effective Green, g (s)	36.0	36.0		76.0	76.0	
Actuated g/C Ratio	0.30	0.30		0.63	0.63	
Clearance Time (s)	7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	1094	461		2217	2195	
v/s Ratio Prot	c0.29			c0.55	0.47	
v/s Ratio Perm		0.17				
v/c Ratio	0.97	0.56		0.87	0.74	
Uniform Delay, d1	41.5	35.4		18.0	15.3	
Progression Factor	1.00	1.00		0.94	1.00	
Incremental Delay, d2	20.7	1.6		4.4	2.3	
Delay (s)	62.2	36.9		21.4	17.6	
Level of Service	E	D		C	B	
Approach Delay (s)	56.9			21.4	17.6	
Approach LOS	E			C	B	
<b>Intersection Summary</b>						
HCM Average Control Delay			29.9		HCM Level of Service	C
HCM Volume to Capacity ratio			0.90			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			87.7%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						



2031 Background - Weekday AM Peak Hour  
2: Leslie Street & Summerdale Drive

Queues  
Highway 407 Transitway: Leslie Station

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	57	1582	234	59	1471	457	26	56	49
Lane Group Flow (vph)	62	1665	254	64	1559	457	250	61	149
Turn Type	Perm		pm+ov	pm+pt		pm+pt		Perm	
Protected Phases		4	5	3	8	5	2		6
Permitted Phases	4		4	8		2		6	
Detector Phases	4	4	5	3	8	5	2	6	6
Minimum Initial (s)	30.0	30.0	7.0	7.0	30.0	7.0	10.0	10.0	10.0
Minimum Split (s)	37.0	37.0	11.0	11.0	37.0	11.0	29.0	29.0	29.0
Total Split (s)	69.0	69.0	11.0	11.0	80.0	11.0	40.0	29.0	29.0
Total Split (%)	57.5%	57.5%	9.2%	9.2%	66.7%	9.2%	33.3%	24.2%	24.2%
Yellow Time (s)	5.0	5.0	3.0	3.0	5.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	1.0	1.0	2.0	1.0	2.0	2.0	2.0
Lead/Lag	Lag	Lag	Lead	Lead		Lead		Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		Yes		Yes	Yes
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	C-Max
v/c Ratio	0.50	0.86	0.25	0.42	0.71	0.68	0.43	0.34	0.36
Control Delay	36.4	33.1	6.9	19.3	18.4	39.4	18.9	47.2	32.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.4	33.1	6.9	19.3	18.4	39.4	18.9	47.2	32.5
Queue Length 50th (m)	10.6	145.5	14.1	4.9	100.1	40.9	21.0	11.5	20.4
Queue Length 95th (m)	17.6	189.9	26.8	12.5	120.0	54.6	43.3	24.1	38.5
Internal Link Dist (m)		354.0			188.5		124.1		194.2
Turn Bay Length (m)	75.0			120.0		25.0		35.0	
Base Capacity (vph)	126	1976	1000	154	2328	677	585	179	417
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.84	0.25	0.42	0.67	0.68	0.43	0.34	0.36

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

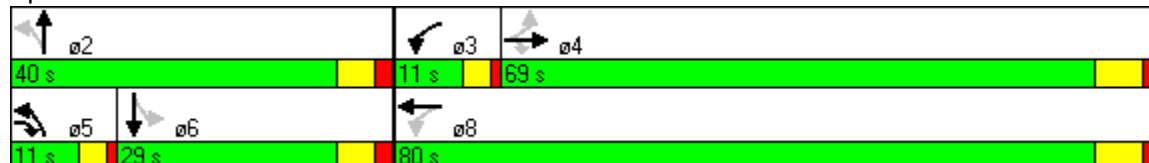
Offset: 43 (36%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated






















m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Leslie Street & Summerdale Drive















2031 Background - Weekday AM Peak Hour  
2: Leslie Street & Summerdale Drive

HCM Signalized Intersection Capacity Analysis  
Highway 407 Transitway: Leslie Station

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	*1.00	1.00	1.00	*1.00		0.97	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00		1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.87		1.00	0.90	
Flt Protected	0.95	1.00	1.00	0.95	1.00		1.00	1.00		0.95	1.00	
Satd. Flow (prot)	1750	3648	1512	1684	3675		3565	1510		1205	1661	
Flt Permitted	0.11	1.00	1.00	0.06	1.00		0.48	1.00		0.60	1.00	
Satd. Flow (perm)	210	3648	1512	105	3675		1727	1510		766	1661	
Volume (vph)	57	1582	234	59	1471	10	457	26	204	56	49	88
Peak-hour factor, PHF	0.92	0.95	0.92	0.92	0.95	0.92	1.00	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	62	1665	254	64	1548	11	457	28	222	61	53	96
RTOR Reduction (vph)	0	0	102	0	0	0	0	84	0	0	30	0
Lane Group Flow (vph)	62	1665	152	64	1559	0	457	166	0	61	119	0
Confl. Peds. (#/hr)	1		8	8		1	3		7	7		3
Heavy Vehicles (%)	2%	3%	2%	6%	2%	20%	2%	19%	4%	47%	3%	0%
Turn Type	Perm	pm+ov		pm+pt			pm+pt			Perm		
Protected Phases		4	5	3	8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	60.3	60.3	68.2	69.9	69.9		37.1	37.1		25.2	25.2	
Effective Green, g (s)	63.3	63.3	71.2	72.9	72.9		39.1	39.1		27.2	27.2	
Actuated g/C Ratio	0.53	0.53	0.59	0.61	0.61		0.33	0.33		0.23	0.23	
Clearance Time (s)	7.0	7.0	4.0	4.0	7.0		4.0	6.0		6.0	6.0	
Vehicle Extension (s)	5.0	5.0	3.0	3.0	5.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	111	1924	948	137	2233		684	492		174	376	
v/s Ratio Prot		c0.46	0.01	0.02	c0.42		c0.04	0.11			0.07	
v/s Ratio Perm	0.29		0.09	0.26			c0.17			0.08		
v/c Ratio	0.56	0.87	0.16	0.47	0.70		0.67	0.34		0.35	0.32	
Uniform Delay, d1	19.0	24.6	11.0	21.5	16.0		34.3	30.6		39.0	38.7	
Progression Factor	1.19	1.15	5.65	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	8.2	3.9	0.1	2.5	1.2		2.5	1.8		5.5	2.2	
Delay (s)	30.9	32.3	62.0	24.0	17.3		36.8	32.5		44.5	40.8	
Level of Service	C	C	E	C	B		D	C		D	D	
Approach Delay (s)		36.1			17.5			35.2			41.9	
Approach LOS		D			B			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			29.6			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.79									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			91.2%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

2031 Background - Weekday AM Peak Hour  
3: High School Access & Leslie Street

Queues  
Highway 407 Transitway: Leslie Station

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	20	47	1574	43	100	1713
Lane Group Flow (vph)	22	51	1711	47	109	1862
Turn Type	Perm		pm+ov		Perm	
Protected Phases	8		2	8		6
Permitted Phases		8		2	6	
Detector Phases	8	8	2	8	6	6
Minimum Initial (s)	10.0	10.0	30.0	10.0	30.0	30.0
Minimum Split (s)	33.0	33.0	37.0	33.0	37.0	37.0
Total Split (s)	40.0	40.0	80.0	40.0	80.0	80.0
Total Split (%)	33.3%	33.3%	66.7%	33.3%	66.7%	66.7%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	None	C-Max	C-Max
v/c Ratio	0.12	0.26	0.57	0.03	1.04	0.62
Control Delay	50.0	30.8	2.5	0.0	106.7	2.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.0	30.8	2.6	0.0	106.7	2.7
Queue Length 50th (m)	4.4	4.6	6.8	0.0	~17.8	34.2
Queue Length 95th (m)	11.8	15.7	43.7	m0.0m	#46.5	35.8
Internal Link Dist (m)	110.4		354.0			117.9
Turn Bay Length (m)	30.0			20.0	160.0	
Base Capacity (vph)	525	489	3010	1566	105	3010
Starvation Cap Reductn	0	0	0	0	0	29
Spillback Cap Reductn	0	0	26	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.10	0.57	0.03	1.04	0.62

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 120

Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.

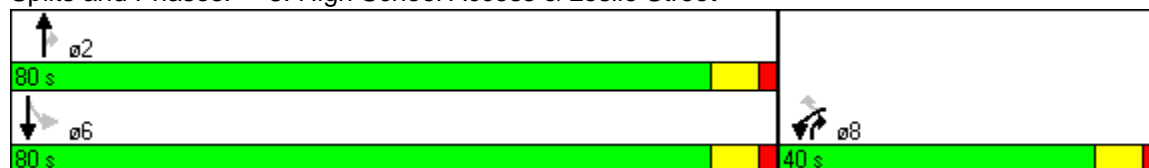
Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.













m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: High School Access & Leslie Street











2031 Background - Weekday AM Peak Hour  
3: High School Access & Leslie Street

HCM Signalized Intersection Capacity Analysis  
Highway 407 Transitway: Leslie Station

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1750	1566	3500	1566	1750	3500
Flt Permitted	0.95	1.00	1.00	1.00	0.12	1.00
Satd. Flow (perm)	1750	1566	3500	1566	219	3500
Volume (vph)	20	47	1574	43	100	1713
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	51	1711	47	109	1862
RTOR Reduction (vph)	0	25	0	0	0	0
Lane Group Flow (vph)	22	26	1711	47	109	1862
Turn Type	Perm		pm+ov		Perm	
Protected Phases	8		2	8		6
Permitted Phases		8		2		6
Actuated Green, G (s)	8.0	8.0	98.0	106.0	98.0	98.0
Effective Green, g (s)	11.0	11.0	101.0	112.0	101.0	101.0
Actuated g/C Ratio	0.09	0.09	0.84	0.93	0.84	0.84
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	160	144	2946	1566	184	2946
v/s Ratio Prot	0.01		0.49	0.00		c0.53
v/s Ratio Perm		c0.02		0.03	0.50	
v/c Ratio	0.14	0.18	0.58	0.03	0.59	0.63
Uniform Delay, d1	50.1	50.3	2.9	0.3	3.0	3.2
Progression Factor	1.00	1.00	0.63	1.00	1.53	0.58
Incremental Delay, d2	0.4	0.6	0.6	0.0	9.5	0.7
Delay (s)	50.5	50.9	2.4	0.3	14.0	2.6
Level of Service	D	D	A	A	B	A
Approach Delay (s)	50.8		2.4			3.2
Approach LOS	D		A			A
<b>Intersection Summary</b>						
HCM Average Control Delay			3.8		HCM Level of Service	A
HCM Volume to Capacity ratio			0.59			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			86.8%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						

2031 Background - Weekday PM Peak Hour  
1: Hwy 407 Eastbound Off-Ramp & Leslie Street

Queues  
Highway 407 Transitway: Leslie Station

				
Lane Group	EBL	EBR	NBT	SBT
Lane Configurations				
Volume (vph)	259	275	1970	2025
Lane Group Flow (vph)	282	299	2141	2201
Turn Type	Perm			
Protected Phases	4		2	6
Permitted Phases		4		
Detector Phases	4	4	2	6
Minimum Initial (s)	10.0	10.0	30.0	30.0
Minimum Split (s)	33.0	33.0	37.0	37.0
Total Split (s)	33.0	33.0	87.0	87.0
Total Split (%)	27.5%	27.5%	72.5%	72.5%
Yellow Time (s)	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	C-Max	C-Max
v/c Ratio	0.39	0.83	0.86	0.88
Control Delay	40.7	61.4	20.7	19.4
Queue Delay	0.0	10.9	0.0	0.0
Total Delay	40.7	72.3	20.7	19.4
Queue Length 50th (m)	26.2	58.0	199.3	185.2
Queue Length 95th (m)	37.7	#94.9	221.1	226.3
Internal Link Dist (m)	396.9		119.1	356.1
Turn Bay Length (m)	280.0			
Base Capacity (vph)	790	389	2483	2508
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	68	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.36	0.93	0.86	0.88

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 47 (39%), Referenced to phase 2:NBT and 6:SBT, Start of Green

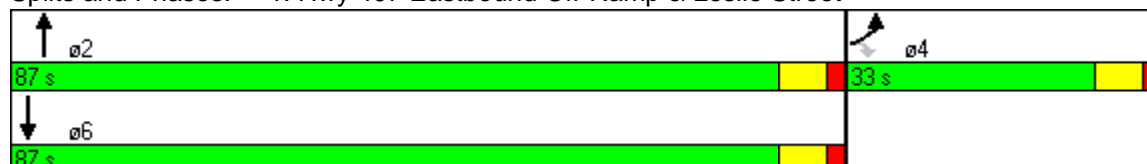
Natural Cycle: 90

Control Type: Actuated-Coordinated











# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Hwy 407 Eastbound Off-Ramp & Leslie Street





















2031 Background - Weekday PM Peak Hour      HCM Signalized Intersection Capacity Analysis  
 1: Hwy 407 Eastbound Off-Ramp & Leslie Street      Highway 407 Transitway: Leslie Station

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	0.97	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3267	1566		3500	3535	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3267	1566		3500	3535	
Volume (vph)	259	275	0	1970	2025	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	282	299	0	2141	2201	0
RTOR Reduction (vph)	0	11	0	0	0	0
Lane Group Flow (vph)	282	288	0	2141	2201	0
Confl. Peds. (#/hr)			3			3
Heavy Vehicles (%)	6%	2%	0%	2%	1%	0%
Turn Type	Perm					
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	23.9	23.9		82.1	82.1	
Effective Green, g (s)	26.9	26.9		85.1	85.1	
Actuated g/C Ratio	0.22	0.22		0.71	0.71	
Clearance Time (s)	7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	732	351		2482	2507	
v/s Ratio Prot	0.09			0.61	0.62	
v/s Ratio Perm		0.18				
v/c Ratio	0.39	0.82		0.86	0.88	
Uniform Delay, d1	39.5	44.3		13.1	13.4	
Progression Factor	1.00	1.00		1.19	1.00	
Incremental Delay, d2	0.3	14.2		3.8	4.8	
Delay (s)	39.9	58.5		19.4	18.2	
Level of Service	D	E		B	B	
Approach Delay (s)	49.4			19.4	18.2	
Approach LOS	D			B	B	
<b>Intersection Summary</b>						
HCM Average Control Delay		22.4		HCM Level of Service		C
HCM Volume to Capacity ratio		0.86				
Actuated Cycle Length (s)		120.0		Sum of lost time (s)		8.0
Intersection Capacity Utilization		79.7%		ICU Level of Service		D
Analysis Period (min)		15				
c Critical Lane Group						

2031 Background - Weekday PM Peak Hour  
2: Leslie Street & Summerdale Drive

Queues  
Highway 407 Transitway: Leslie Station

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	67	1796	336	167	1558	214	30	12	21
Lane Group Flow (vph)	73	1891	365	182	1669	233	129	13	35
Turn Type	Perm		Perm	pm+pt		Perm		Perm	
Protected Phases		4		3	8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phases	4	4	4	3	8	2	2	6	6
Minimum Initial (s)	30.0	30.0	30.0	4.0	30.0	10.0	10.0	10.0	10.0
Minimum Split (s)	37.0	37.0	37.0	8.0	37.0	29.0	29.0	29.0	29.0
Total Split (s)	76.0	76.0	76.0	15.0	91.0	29.0	29.0	29.0	29.0
Total Split (%)	63.3%	63.3%	63.3%	12.5%	75.8%	24.2%	24.2%	24.2%	24.2%
Yellow Time (s)	5.0	5.0	5.0	3.0	5.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag	Lag	Lag	Lag	Lead					
Lead-Lag Optimize?	Yes	Yes	Yes	Yes					
Recall Mode	None	None	None	None	None	C-Max	C-Max	C-Max	C-Max
v/c Ratio	0.47	0.84	0.34	0.84	0.63	0.43	0.32	0.06	0.09
Control Delay	29.6	29.2	5.6	58.9	9.6	44.0	15.1	39.0	28.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.6	29.2	5.6	58.9	9.6	44.0	15.1	39.0	28.9
Queue Length 50th (m)	13.8	213.5	18.7	24.5	81.9	22.6	5.8	2.3	4.0
Queue Length 95th (m)	m16.9	231.5	m26.8	#58.7	95.8	34.1	21.0	7.4	12.0
Internal Link Dist (m)		354.0			188.5		124.1		194.2
Turn Bay Length (m)	75.0			120.0		25.0		35.0	
Base Capacity (vph)	156	2250	1060	225	2665	547	406	229	381
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.84	0.34	0.81	0.63	0.43	0.32	0.06	0.09

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 7 (6%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 90






Control Type: Actuated-Coordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.






















m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Leslie Street & Summerdale Drive

		
ø2	ø3	ø4
29 s	15 s	76 s
		
ø6	ø8	
29 s	91 s	

2031 Background - Weekday PM Peak Hour  
2: Leslie Street & Summerdale Drive













HCM Signalized Intersection Capacity Analysis  
Highway 407 Transitway: Leslie Station

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	*1.00	1.00	1.00	*1.00		0.97	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.89		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	3721	1546	1767	3676		3378	1580		1781	1773	
Flt Permitted	0.14	1.00	1.00	0.05	1.00		0.73	1.00		0.58	1.00	
Satd. Flow (perm)	257	3721	1546	97	3676		2611	1580		1096	1773	
Volume (vph)	67	1796	336	167	1558	27	214	30	88	12	21	11
Peak-hour factor, PHF	0.92	0.95	0.92	0.92	0.95	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	73	1891	365	182	1640	29	233	33	96	13	23	12
RTOR Reduction (vph)	0	0	126	0	1	0	0	76	0	0	9	0
Lane Group Flow (vph)	73	1891	239	182	1668	0	233	53	0	13	26	0
Confl. Peds. (#/hr)			5	5			2		2	2		2
Heavy Vehicles (%)	0%	1%	0%	1%	2%	0%	2%	0%	6%	0%	0%	0%
Turn Type	Perm		Perm	pm+pt			Perm			Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	69.4	69.4	69.4	83.9	83.9		23.1	23.1		23.1	23.1	
Effective Green, g (s)	72.4	72.4	72.4	86.9	86.9		25.1	25.1		25.1	25.1	
Actuated g/C Ratio	0.60	0.60	0.60	0.72	0.72		0.21	0.21		0.21	0.21	
Clearance Time (s)	7.0	7.0	7.0	4.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	5.0	5.0	5.0	3.0	5.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	155	2245	933	216	2662		546	330		229	371	
v/s Ratio Prot		0.51		c0.07	0.45			0.03			0.01	
v/s Ratio Perm	0.28		0.15	c0.53			c0.09			0.01		
v/c Ratio	0.47	0.84	0.26	0.84	0.63		0.43	0.16		0.06	0.07	
Uniform Delay, d1	13.2	19.2	11.2	36.9	8.4		41.2	38.8		38.0	38.1	
Progression Factor	1.49	1.35	2.58	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.8	2.0	0.2	24.6	0.7		2.4	1.0		0.5	0.4	
Delay (s)	22.4	28.0	28.9	61.5	9.0		43.6	39.9		38.4	38.4	
Level of Service	C	C	C	E	A		D	D		D	D	
Approach Delay (s)		27.9			14.2			42.3			38.4	
Approach LOS		C			B			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			23.6			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)				8.0		
Intersection Capacity Utilization			98.1%			ICU Level of Service				F		
Analysis Period (min)			15									
c Critical Lane Group												



2031 Background - Weekday PM Peak Hour  
3: High School Access & Leslie Street

Queues  
Highway 407 Transitway: Leslie Station

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	10	24	1628	10	21	2279
Lane Group Flow (vph)	11	26	1770	11	23	2477
Turn Type	Perm		pm+ov		Perm	
Protected Phases	8		2	8		6
Permitted Phases		8		2	6	
Detector Phases	8	8	2	8	6	6
Minimum Initial (s)	10.0	10.0	30.0	10.0	30.0	30.0
Minimum Split (s)	33.0	33.0	37.0	33.0	37.0	37.0
Total Split (s)	40.0	40.0	80.0	40.0	80.0	80.0
Total Split (%)	33.3%	33.3%	66.7%	33.3%	66.7%	66.7%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	None	C-Max	C-Max
v/c Ratio	0.06	0.14	0.56	0.01	0.24	0.79
Control Delay	49.0	20.2	5.4	0.0	8.4	11.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.4
Total Delay	49.0	20.2	5.4	0.0	8.4	12.2
Queue Length 50th (m)	2.2	0.2	78.4	0.0	1.4	235.6
Queue Length 95th (m)	7.4	8.1	108.6	m0.0	m1.4	261.5
Internal Link Dist (m)	110.4		354.0			117.9
Turn Bay Length (m)	30.0			20.0	160.0	
Base Capacity (vph)	525	487	3133	1566	94	3133
Starvation Cap Reductn	0	0	0	0	0	236
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.05	0.56	0.01	0.24	0.86

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 120

Control Type: Actuated-Coordinated















m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: High School Access & Leslie Street



2031 Background - Weekday PM Peak Hour  
3: High School Access & Leslie Street

HCM Signalized Intersection Capacity Analysis  
Highway 407 Transitway: Leslie Station

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1750	1566	3500	1566	1750	3500
Flt Permitted	0.95	1.00	1.00	1.00	0.11	1.00
Satd. Flow (perm)	1750	1566	3500	1566	209	3500
Volume (vph)	10	24	1628	10	21	2279
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	26	1770	11	23	2477
RTOR Reduction (vph)	0	23	0	0	0	0
Lane Group Flow (vph)	11	3	1770	11	23	2477
Turn Type	Perm		pm+ov		Perm	
Protected Phases	8		2	8		6
Permitted Phases		8		2		6
Actuated Green, G (s)	6.0	6.0	100.0	106.0	100.0	100.0
Effective Green, g (s)	9.0	9.0	103.0	112.0	103.0	103.0
Actuated g/C Ratio	0.08	0.08	0.86	0.93	0.86	0.86
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	131	117	3004	1566	179	3004
v/s Ratio Prot	c0.01		0.51	0.00		c0.71
v/s Ratio Perm		0.00		0.01	0.11	
v/c Ratio	0.08	0.02	0.59	0.01	0.13	0.82
Uniform Delay, d1	51.7	51.4	2.4	0.3	1.4	4.1
Progression Factor	1.00	1.00	1.83	1.00	1.79	2.17
Incremental Delay, d2	0.3	0.1	0.7	0.0	0.7	1.3
Delay (s)	51.9	51.5	5.2	0.3	3.1	10.2
Level of Service	D	D	A	A	A	B
Approach Delay (s)	51.6		5.1			10.2
Approach LOS	D		A			B
<b>Intersection Summary</b>						
HCM Average Control Delay			8.4		HCM Level of Service	A
HCM Volume to Capacity ratio			0.77			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			78.0%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						

## APPENDIX C









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### 2031 FUTURE CONDITION SYNCHRO SUMMARY OUTPUTS



2031 Future - Weekday AM Peak Hour  
1: Hwy 407 Eastbound Off-Ramp & Leslie Street

Queues  
Highway 407 Transitway: Leslie Station

				
Lane Group	EBL	EBR	NBT	SBT
Lane Configurations				
Volume (vph)	1064	312	1936	1887
Lane Group Flow (vph)	1064	339	2038	1986
Turn Type	Perm			
Protected Phases	4		2	6
Permitted Phases		4		
Detector Phases	4	4	2	6
Minimum Initial (s)	10.0	10.0	30.0	30.0
Minimum Split (s)	33.0	33.0	37.0	37.0
Total Split (s)	40.0	40.0	80.0	80.0
Total Split (%)	33.3%	33.3%	66.7%	66.7%
Yellow Time (s)	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	C-Max	C-Max
v/c Ratio	0.97	0.72	0.92	0.90
Control Delay	63.2	45.8	11.3	26.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	63.2	45.8	11.3	26.3
Queue Length 50th (m)	113.9	62.8	22.3	181.0
Queue Length 95th (m)#	152.2	94.6	26.2	220.0
Internal Link Dist (m)	396.9		261.0	356.1
Turn Bay Length (m)	280.0			
Base Capacity (vph)	1094	471	2217	2195
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.97	0.72	0.92	0.90

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

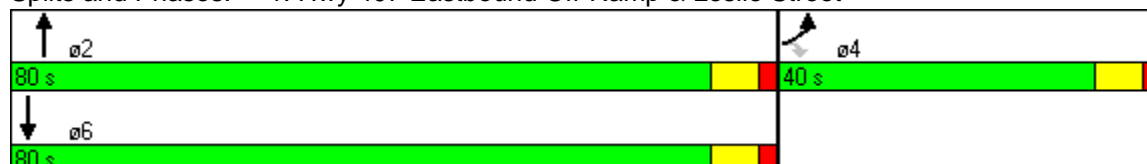
Natural Cycle: 90

Control Type: Actuated-Coordinated

# 95th percentile volume exceeds capacity, queue may be longer.











Queue shown is maximum after two cycles.

Splits and Phases: 1: Hwy 407 Eastbound Off-Ramp & Leslie Street





















2031 Future - Weekday AM Peak Hour  
1: Hwy 407 Eastbound Off-Ramp & Leslie Street

HCM Signalized Intersection Capacity Analysis  
Highway 407 Transitway: Leslie Station

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	*1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	1.00	1.00		1.00	1.00	
Satd. Flow (prot)	3648	1536		3500	3466	
Flt Permitted	1.00	1.00		1.00	1.00	
Satd. Flow (perm)	3648	1536		3500	3466	
Volume (vph)	1064	312	0	1936	1887	0
Peak-hour factor, PHF	1.00	0.92	0.92	0.95	0.95	0.92
Adj. Flow (vph)	1064	339	0	2038	1986	0
RTOR Reduction (vph)	0	11	0	0	0	0
Lane Group Flow (vph)	1064	329	0	2038	1986	0
Confl. Peds. (#/hr)			5			5
Heavy Vehicles (%)	3%	4%	0%	2%	3%	0%
Turn Type	Perm					
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	33.0	33.0		73.0	73.0	
Effective Green, g (s)	36.0	36.0		76.0	76.0	
Actuated g/C Ratio	0.30	0.30		0.63	0.63	
Clearance Time (s)	7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	1094	461		2217	2195	
v/s Ratio Prot	c0.29			c0.58	0.57	
v/s Ratio Perm		0.21				
v/c Ratio	0.97	0.71		0.92	0.90	
Uniform Delay, d1	41.5	37.4		19.3	18.9	
Progression Factor	1.00	1.00		0.30	1.00	
Incremental Delay, d2	20.7	5.2		4.8	6.7	
Delay (s)	62.2	42.6		10.5	25.6	
Level of Service	E	D		B	C	
Approach Delay (s)	57.5			10.5	25.6	
Approach LOS	E			B	C	
Intersection Summary						
HCM Average Control Delay			28.2	HCM Level of Service		C
HCM Volume to Capacity ratio			0.94			
Actuated Cycle Length (s)			120.0	Sum of lost time (s)		8.0
Intersection Capacity Utilization			90.5%	ICU Level of Service		E
Analysis Period (min)			15			
c Critical Lane Group						

2031 Future - Weekday AM Peak Hour  
2: Leslie Street & Summerdale Drive

Queues  
Highway 407 Transitway: Leslie Station

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	58	1622	238	59	1576	485	26	56	49
Lane Group Flow (vph)	63	1707	259	64	1666	485	250	61	155
Turn Type	Perm		pm+ov	pm+pt		pm+pt		Perm	
Protected Phases		4	5	3	8	5	2		6
Permitted Phases	4		4	8		2		6	
Detector Phases	4	4	5	3	8	5	2	6	6
Minimum Initial (s)	30.0	30.0	7.0	7.0	30.0	7.0	10.0	10.0	10.0
Minimum Split (s)	37.0	37.0	11.0	11.0	37.0	11.0	29.0	29.0	29.0
Total Split (s)	69.0	69.0	11.0	11.0	80.0	11.0	40.0	29.0	29.0
Total Split (%)	57.5%	57.5%	9.2%	9.2%	66.7%	9.2%	33.3%	24.2%	24.2%
Yellow Time (s)	5.0	5.0	3.0	3.0	5.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	1.0	1.0	2.0	1.0	2.0	2.0	2.0
Lead/Lag	Lag	Lag	Lead	Lead		Lead		Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		Yes		Yes	Yes
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	C-Max
v/c Ratio	0.62	0.88	0.26	0.42	0.75	0.73	0.43	0.35	0.39
Control Delay	45.7	42.3	7.3	19.2	19.2	42.1	19.3	47.8	35.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.7	42.3	7.3	19.2	19.2	42.1	19.3	47.8	35.8
Queue Length 50th (m)	11.3	153.8	15.3	4.9	112.6	43.8	21.4	11.5	23.3
Queue Length 95th (m)	m11.4	m149.4	m14.9	12.5	134.8	#60.1	43.7	24.1	41.9
Internal Link Dist (m)		356.5			188.5		124.1		194.2
Turn Bay Length (m)	75.0			120.0		25.0		35.0	
Base Capacity (vph)	103	1976	1011	154	2329	665	576	172	395
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.86	0.26	0.42	0.72	0.73	0.43	0.35	0.39

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 43 (36%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 100

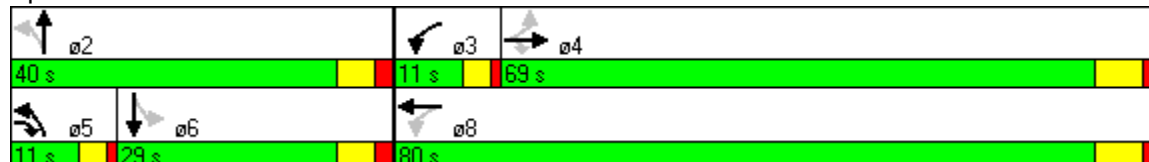
Control Type: Actuated-Coordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.






















m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Leslie Street & Summerdale Drive



2031 Future - Weekday AM Peak Hour  
2: Leslie Street & Summerdale Drive












HCM Signalized Intersection Capacity Analysis  
Highway 407 Transitway: Leslie Station

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	*1.00	1.00	1.00	*1.00		0.97	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00		1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.87		1.00	0.90	
Flt Protected	0.95	1.00	1.00	0.95	1.00		1.00	1.00		0.95	1.00	
Satd. Flow (prot)	1750	3648	1512	1684	3679		3566	1510		1205	1658	
Flt Permitted	0.09	1.00	1.00	0.06	1.00		0.47	1.00		0.60	1.00	
Satd. Flow (perm)	173	3648	1512	104	3679		1658	1510		766	1658	
Volume (vph)	58	1622	238	59	1576	6	485	26	204	56	49	94
Peak-hour factor, PHF	0.92	0.95	0.92	0.92	0.95	0.92	1.00	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	63	1707	259	64	1659	7	485	28	222	61	53	102
RTOR Reduction (vph)	0	0	99	0	0	0	0	84	0	0	24	0
Lane Group Flow (vph)	63	1707	160	64	1666	0	485	166	0	61	131	0
Confl. Peds. (#/hr)	1		8	8		1	3		7	7		3
Heavy Vehicles (%)	2%	3%	2%	6%	2%	20%	2%	19%	4%	47%	3%	0%
Turn Type	Perm	pm+ov		pm+pt			pm+pt			Perm		
Protected Phases		4	5	3	8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	61.0	61.0	69.3	70.6	70.6		36.4	36.4		24.1	24.1	
Effective Green, g (s)	64.0	64.0	72.3	73.6	73.6		38.4	38.4		26.1	26.1	
Actuated g/C Ratio	0.53	0.53	0.60	0.61	0.61		0.32	0.32		0.22	0.22	
Clearance Time (s)	7.0	7.0	4.0	4.0	7.0		4.0	6.0		6.0	6.0	
Vehicle Extension (s)	5.0	5.0	3.0	3.0	5.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	92	1946	961	138	2256		663	483		167	361	
v/s Ratio Prot		c0.47	0.01	0.02	c0.45		c0.05	0.11			0.08	
v/s Ratio Perm	0.36		0.09	0.26			c0.18			0.08		
v/c Ratio	0.68	0.88	0.17	0.46	0.74		0.73	0.34		0.37	0.36	
Uniform Delay, d1	20.6	24.6	10.5	21.9	16.4		35.6	31.2		39.9	39.9	
Progression Factor	1.62	1.63	5.59	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.6	1.6	0.0	2.5	1.6		4.2	1.9		6.1	2.8	
Delay (s)	41.0	41.6	58.9	24.4	18.0		39.7	33.1		46.0	42.7	
Level of Service	D	D	E	C	B		D	C		D	D	
Approach Delay (s)		43.8			18.2			37.5			43.6	
Approach LOS		D			B			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			33.4			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			92.0%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												



2031 Future - Weekday AM Peak Hour  
3: P&R Access & Leslie Street

Queues  
Highway 407 Transitway: Leslie Station

										
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	93	6	20	6	130	1589	43	100	1728	378
Lane Group Flow (vph)	101	45	22	58	141	1727	47	109	1878	411
Turn Type	Prot		Perm		Prot		Perm	Prot		Perm
Protected Phases	7	4		8	5	2		1	6	
Permitted Phases			8				2			6
Detector Phases	7	4	8	8	5	2	2	1	6	6
Minimum Initial (s)	6.0	4.0	10.0	10.0	6.0	30.0	30.0	6.0	30.0	30.0
Minimum Split (s)	10.0	32.0	33.0	33.0	10.0	37.0	37.0	10.0	37.0	37.0
Total Split (s)	12.0	40.0	28.0	28.0	10.0	70.0	70.0	10.0	70.0	70.0
Total Split (%)	10.0%	33.3%	23.3%	23.3%	8.3%	58.3%	58.3%	8.3%	58.3%	58.3%
Yellow Time (s)	3.0	4.0	4.0	4.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	2.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lead/Lag	Lead		Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
v/c Ratio	0.49	0.13	0.13	0.24	0.55	0.90	0.05	0.50	1.04	0.42
Control Delay	62.4	13.7	46.9	16.7	61.0	29.2	8.6	51.4	52.2	9.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.4	13.7	46.9	16.7	61.0	29.2	8.6	51.4	52.2	9.2
Queue Length 50th (m)	11.0	1.2	4.4	1.4	27.8	194.0	2.0	23.7	~230.0	19.3
Queue Length 95th (m)	19.4	9.0	10.6	11.5m	#67.6	#239.1	m3.3m	#38.1	#270.0	m29.1
Internal Link Dist (m)		94.1		110.4		356.5			261.0	
Turn Bay Length (m)	50.0		30.0		50.0		20.0	160.0		50.0
Base Capacity (vph)	210	519	274	367	258	1925	940	218	1802	984
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	0.09	0.08	0.16	0.55	0.90	0.05	0.50	1.04	0.42

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 110 (92%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.

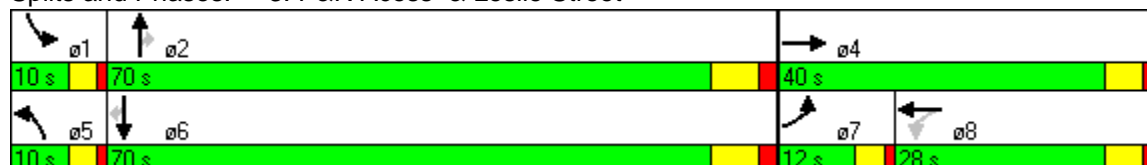
Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.























m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: P&R Access & Leslie Street











2031 Future - Weekday AM Peak Hour  
3: P&R Access & Leslie Street

HCM Signalized Intersection Capacity Analysis  
Highway 407 Transitway: Leslie Station

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.87		1.00	0.87		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3148	1641		1785	1631		1668	3290	1597	1785	3258	1597
Flt Permitted	0.95	1.00		0.73	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3148	1641		1367	1631		1668	3290	1597	1785	3258	1597
Volume (vph)	93	6	35	20	6	47	130	1589	43	100	1728	378
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)	101	7	38	22	7	51	141	1727	47	109	1878	411
RTOR Reduction (vph)	0	30	0	0	46	0	0	0	6	0	0	103
Lane Group Flow (vph)	101	15	0	22	12	0	141	1727	41	109	1878	308
Heavy Vehicles (%)	10%	0%	0%	0%	0%	0%	7%	2%	0%	0%	3%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	30	0	0	30	0
Turn Type	Prot		Perm		Prot		Perm		Prot		Perm	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases				8					2			6
Actuated Green, G (s)	7.9	22.3		10.4	10.4		18.5	66.0	66.0	14.7	62.2	62.2
Effective Green, g (s)	7.9	24.3		12.4	12.4		18.5	69.0	69.0	14.7	65.2	65.2
Actuated g/C Ratio	0.07	0.20		0.10	0.10		0.15	0.58	0.58	0.12	0.54	0.54
Clearance Time (s)	4.0	6.0		6.0	6.0		4.0	7.0	7.0	4.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	207	332		141	169		257	1892	918	219	1770	868
v/s Ratio Prot	c0.03	0.01			0.01		c0.08	c0.52		0.06	c0.58	
v/s Ratio Perm				c0.02					0.03			0.19
v/c Ratio	0.49	0.04		0.16	0.07		0.55	0.91	0.05	0.50	1.06	0.35
Uniform Delay, d1	54.1	38.5		49.0	48.6		46.9	22.8	11.1	49.2	27.4	15.5
Progression Factor	1.00	1.00		1.00	1.00		1.15	1.04	0.89	0.91	0.89	1.29
Incremental Delay, d2	1.8	0.1		0.5	0.2		1.6	5.8	0.1	0.9	34.4	0.6
Delay (s)	55.9	38.6		49.5	48.8		55.4	29.6	10.0	45.6	58.8	20.5
Level of Service	E	D		D	D		E	C	A	D	E	C
Approach Delay (s)		50.6			49.0			31.0			51.6	
Approach LOS		D			D			C			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			42.8			HCM Level of Service			D			
HCM Volume to Capacity ratio			0.85									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			74.3%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

2031 Future - Weekday PM Peak Hour  
1: Hwy 407 Eastbound Off-Ramp & Leslie Street

Queues  
Highway 407 Transitway: Leslie Station

				
Lane Group	EBL	EBR	NBT	SBT
Lane Configurations				
Volume (vph)	259	286	2290	2120
Lane Group Flow (vph)	282	311	2411	2232
Turn Type	Perm			
Protected Phases	4		2	6
Permitted Phases		4		
Detector Phases	4	4	2	6
Minimum Initial (s)	10.0	10.0	30.0	30.0
Minimum Split (s)	33.0	33.0	37.0	37.0
Total Split (s)	33.0	33.0	87.0	87.0
Total Split (%)	27.5%	27.5%	72.5%	72.5%
Yellow Time (s)	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	C-Max	C-Max
v/c Ratio	0.38	0.85	0.93	0.85
Control Delay	40.3	63.5	28.7	17.7
Queue Delay	0.0	0.0	4.0	0.0
Total Delay	40.3	63.5	32.7	17.7
Queue Length 50th (m)	26.2	61.3	247.6	168.3
Queue Length 95th (m)	37.7	#101.2	#301.0	202.2
Internal Link Dist (m)	396.9		261.0	356.1
Turn Bay Length (m)	280.0			
Base Capacity (vph)	790	388	2598	2624
Starvation Cap Reductn	0	0	141	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.36	0.80	0.98	0.85

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 47 (39%), Referenced to phase 2:NBT and 6:SBT, Start of Green

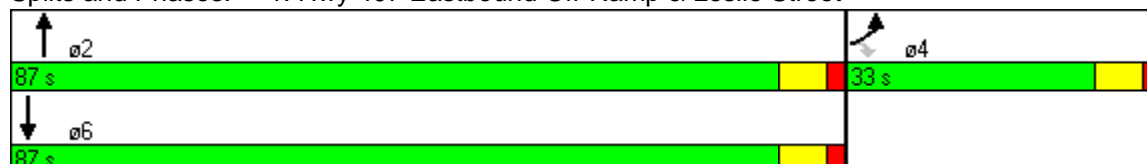
Natural Cycle: 100

Control Type: Actuated-Coordinated

# 95th percentile volume exceeds capacity, queue may be longer.











Queue shown is maximum after two cycles.

Splits and Phases: 1: Hwy 407 Eastbound Off-Ramp & Leslie Street



2031 Future - Weekday PM Peak Hour  
1: Hwy 407 Eastbound Off-Ramp & Leslie Street

HCM Signalized Intersection Capacity Analysis  
Highway 407 Transitway: Leslie Station

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	0.97	1.00		*1.00	*1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3267	1566		3684	3721	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3267	1566		3684	3721	
Volume (vph)	259	286	0	2290	2120	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.92
Adj. Flow (vph)	282	311	0	2411	2232	0
RTOR Reduction (vph)	0	10	0	0	0	0
Lane Group Flow (vph)	282	301	0	2411	2232	0
Confl. Peds. (#/hr)			3			3
Heavy Vehicles (%)	6%	2%	0%	2%	1%	0%
Turn Type	Perm					
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	24.4	24.4		81.6	81.6	
Effective Green, g (s)	27.4	27.4		84.6	84.6	
Actuated g/C Ratio	0.23	0.23		0.70	0.70	
Clearance Time (s)	7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	746	358		2597	2623	
v/s Ratio Prot	0.09			c0.65	0.60	
v/s Ratio Perm		c0.19				
v/c Ratio	0.38	0.84		0.93	0.85	
Uniform Delay, d1	39.1	44.2		15.1	13.1	
Progression Factor	1.00	1.00		1.42	1.00	
Incremental Delay, d2	0.3	16.1		6.0	3.7	
Delay (s)	39.4	60.3		27.6	16.8	
Level of Service	D	E		C	B	
Approach Delay (s)	50.4			27.6	16.8	
Approach LOS	D			C	B	
<b>Intersection Summary</b>						
HCM Average Control Delay		25.5		HCM Level of Service		C
HCM Volume to Capacity ratio		0.91				
Actuated Cycle Length (s)		120.0		Sum of lost time (s)		8.0
Intersection Capacity Utilization		83.0%		ICU Level of Service		E
Analysis Period (min)		15				
c Critical Lane Group						

2031 Future - Weekday PM Peak Hour  
2: Leslie Street & Summerdale Drive

Queues  
Highway 407 Transitway: Leslie Station

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	70	1894	352	167	1600	218	30	12	21
Lane Group Flow (vph)	76	1994	383	182	1713	237	129	13	35
Turn Type	Perm		Perm	pm+pt		Perm		Perm	
Protected Phases		4		3	8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phases	4	4	4	3	8	2	2	6	6
Minimum Initial (s)	30.0	30.0	30.0	4.0	30.0	10.0	10.0	10.0	10.0
Minimum Split (s)	37.0	37.0	37.0	8.0	37.0	29.0	29.0	29.0	29.0
Total Split (s)	76.0	76.0	76.0	15.0	91.0	29.0	29.0	29.0	29.0
Total Split (%)	63.3%	63.3%	63.3%	12.5%	75.8%	24.2%	24.2%	24.2%	24.2%
Yellow Time (s)	5.0	5.0	5.0	3.0	5.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag	Lag	Lag	Lag	Lead					
Lead-Lag Optimize?	Yes	Yes	Yes	Yes					
Recall Mode	None	None	None	None	None	C-Max	C-Max	C-Max	C-Max
v/c Ratio	0.54	0.92	0.37	0.84	0.66	0.39	0.29	0.05	0.08
Control Delay	26.8	35.5	6.1	59.7	11.3	42.3	14.8	38.9	28.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.8	35.5	6.1	59.7	11.3	42.3	14.8	38.9	28.8
Queue Length 50th (m)	12.9	230.0	19.3	24.3	84.0	23.2	5.8	2.3	4.0
Queue Length 95th (m)	m14.5m	233.9	m19.9	#58.7	100.5	34.6	21.0	7.4	12.0
Internal Link Dist (m)		354.0			188.5		124.1		194.2
Turn Bay Length (m)	75.0			120.0		25.0		35.0	
Base Capacity (vph)	145	2233	1054	222	2665	606	440	254	420
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.89	0.36	0.82	0.64	0.39	0.29	0.05	0.08

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 7 (6%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.























m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Leslie Street & Summerdale Drive

	ø2		ø3		ø4
29 s		15 s		76 s	
	ø6		ø8		
29 s		91 s			












2031 Future - Weekday PM Peak Hour  
2: Leslie Street & Summerdale Drive

HCM Signalized Intersection Capacity Analysis  
Highway 407 Transitway: Leslie Station

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	*1.00	1.00	1.00	*1.00		0.97	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.89		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	3721	1546	1767	3676		3385	1580		1781	1773	
Flt Permitted	0.12	1.00	1.00	0.05	1.00		0.73	1.00		0.60	1.00	
Satd. Flow (perm)	229	3721	1546	101	3676		2616	1580		1122	1773	
Volume (vph)	70	1894	352	167	1600	27	218	30	88	12	21	11
Peak-hour factor, PHF	0.92	0.95	0.92	0.92	0.95	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	1994	383	182	1684	29	237	33	96	13	23	12
RTOR Reduction (vph)	0	0	133	0	1	0	0	74	0	0	9	0
Lane Group Flow (vph)	76	1994	250	182	1712	0	237	55	0	13	26	0
Confl. Peds. (#/hr)			5	5			2		2	2		2
Heavy Vehicles (%)	0%	1%	0%	1%	2%	0%	2%	0%	6%	0%	0%	0%
Turn Type	Perm		Perm	pm+pt			Perm			Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	66.6	66.6	66.6	81.2	81.2		25.8	25.8		25.8	25.8	
Effective Green, g (s)	69.6	69.6	69.6	84.2	84.2		27.8	27.8		27.8	27.8	
Actuated g/C Ratio	0.58	0.58	0.58	0.70	0.70		0.23	0.23		0.23	0.23	
Clearance Time (s)	7.0	7.0	7.0	4.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	5.0	5.0	5.0	3.0	5.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	133	2158	897	218	2579		606	366		260	411	
v/s Ratio Prot		c0.54		c0.07	0.47			0.03			0.01	
v/s Ratio Perm	0.33		0.16	0.51			c0.09			0.01		
v/c Ratio	0.57	0.92	0.28	0.83	0.66		0.39	0.15		0.05	0.06	
Uniform Delay, d1	15.8	22.8	12.6	38.0	10.0		38.9	36.7		35.8	35.9	
Progression Factor	1.24	1.42	2.50	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.2	2.9	0.1	23.2	0.9		1.9	0.9		0.4	0.3	
Delay (s)	22.8	35.2	31.6	61.2	10.9		40.8	37.6		36.2	36.2	
Level of Service	C	D	C	E	B		D	D		D	D	
Approach Delay (s)		34.3			15.7			39.7			36.2	
Approach LOS		C			B			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			27.3			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.78									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			99.3%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

2031 Future - Weekday PM Peak Hour  
3: P-and-R Access & Leslie Street

Queues  
Highway 407 Transitway: Leslie Station

										
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	311	6	10	6	37	1643	10	21	2294	97
Lane Group Flow (vph)	327	120	11	31	39	1729	11	22	2294	102
Turn Type	Prot		Perm		Prot		Perm	Prot		Perm
Protected Phases	7	4		8	5	2		1	6	
Permitted Phases			8				2			6
Detector Phases	7	4	8	8	5	2	2	1	6	6
Minimum Initial (s)	10.0	10.0	6.0	6.0	6.0	30.0	30.0	6.0	30.0	30.0
Minimum Split (s)	28.0	30.0	10.0	10.0	10.0	37.0	37.0	10.0	37.0	37.0
Total Split (s)	28.0	38.0	10.0	10.0	10.0	72.0	72.0	10.0	72.0	72.0
Total Split (%)	23.3%	31.7%	8.3%	8.3%	8.3%	60.0%	60.0%	8.3%	60.0%	60.0%
Yellow Time (s)	4.0	4.0	3.0	3.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	2.0	2.0	1.0	1.0	1.0	2.0	2.0	1.0	2.0	2.0
Lead/Lag	Lead		Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
v/c Ratio	0.61	0.29	0.16	0.28	0.37	0.72	0.01	0.23	0.99	0.09
Control Delay	52.0	11.9	59.8	30.7	56.5	24.5	14.1	52.7	43.1	8.5
Queue Delay	2.1	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	54.0	11.9	59.8	31.3	56.5	24.5	14.1	52.7	43.1	8.5
Queue Length 50th (m)	34.6	4.0	2.3	1.3	8.3	137.9	0.8	4.4	~282.8	7.2
Queue Length 95th (m)	45.6	16.8	8.0	10.4	m13.9	192.7	m1.8	m5.4	#331.6	m8.0
Internal Link Dist (m)		203.1		110.4		354.0			261.0	
Turn Bay Length (m)			30.0				20.0	160.0		
Base Capacity (vph)	693	526	68	111	105	2387	1102	97	2313	1089
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	231	0	0	12	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.23	0.16	0.31	0.37	0.72	0.01	0.23	0.99	0.09

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 145

Control Type: Actuated-Coordinated

~ 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.

m Volume for 95th percentile queue is metered by upstream signal.























Splits and Phases: 3: P-and-R Access & Leslie Street





2031 Future - Weekday PM Peak Hour  
3: P-and-R Access & Leslie Street

HCM Signalized Intersection Capacity Analysis  
Highway 407 Transitway: Leslie Station

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00		1.00	1.00		1.00	*1.00	1.00	1.00	*1.00	1.00
Frt	1.00	0.86		1.00	0.88		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3463	1611		1785	1652		1785	3463	1597	1785	3463	1597
Flt Permitted	0.95	1.00		1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3463	1611		1879	1652		1785	3463	1597	1785	3463	1597
Volume (vph)	311	6	108	10	6	24	37	1643	10	21	2294	97
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	1.00	0.95
Adj. Flow (vph)	327	6	114	11	6	25	39	1729	11	22	2294	102
RTOR Reduction (vph)	0	75	0	0	24	0	0	0	1	0	0	24
Lane Group Flow (vph)	327	45	0	11	7	0	39	1729	10	22	2294	78
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	2%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	30	0	0	30	0
Turn Type	Prot			Perm			Prot			Perm		
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases				8					2			6
Actuated Green, G (s)	16.6	24.6		4.0	4.0		4.5	75.6	75.6	2.8	73.9	73.9
Effective Green, g (s)	18.6	26.6		4.0	4.0		4.5	78.6	78.6	2.8	76.9	76.9
Actuated g/C Ratio	0.16	0.22		0.03	0.03		0.04	0.65	0.65	0.02	0.64	0.64
Clearance Time (s)	6.0	6.0		4.0	4.0		4.0	7.0	7.0	4.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	5.0	5.0	3.0	5.0	5.0
Lane Grp Cap (vph)	537	357		63	55		67	2268	1046	42	2219	1023
v/s Ratio Prot	c0.09	c0.03			0.00		c0.02	0.50		0.01	c0.66	
v/s Ratio Perm				0.01					0.01			0.05
v/c Ratio	0.61	0.13		0.17	0.12		0.58	0.76	0.01	0.52	1.03	0.08
Uniform Delay, d1	47.3	37.4		56.4	56.3		56.8	14.3	7.2	57.9	21.5	8.1
Progression Factor	1.00	1.00		1.00	1.00		0.89	1.54	1.57	0.91	1.60	1.81
Incremental Delay, d2	2.0	0.2		1.3	1.0		9.6	1.9	0.0	5.8	23.3	0.1
Delay (s)	49.3	37.6		57.7	57.3		60.1	23.9	11.3	58.7	57.8	14.8
Level of Service	D	D		E	E		E	C	B	E	E	B
Approach Delay (s)		46.1			57.4			24.6			56.0	
Approach LOS		D			E			C			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			43.2				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.87									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			85.6%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												