Appendix E.3 – Transportation Technical Report #2

Kennedy Road Environmental Assessment between Steeles Avenue and Major Mackenzie Drive

Transportation Technical Report #2

Class Environmental Assessment for Kennedy Road from Steeles Avenue East to Major Mackenzie Drive East

FINAL

Regional Municipality of York

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Preface

The Schedule ‘C’ Municipal Class Environmental Assessment (EA) Study for Kennedy Road from Steeles Avenue to Major Mackenzie Drive in the City of Markham commenced in May 2017. The Needs and Justification Report and the Transportation Technical Report #1 documented Phase 1 and Phase 2 (Alternative Solutions) of the EA study.

This Transportation Technical Report#2 is a continuation of the EA study documentation to inform the development and evaluation of alternative design concepts and preferred design.

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1. 2041 Transportation Conditions

The 2041 future transportation conditions analysis and findings presented in this section reflected a 6 lane (4 GPL + 2 HOV lanes) widening scenario between Steeles Avenue and Major Mackenzie Drive. The proposed improvements also include provisions of continuous dedicated active transportation facilities to accommodate pedestrian and cyclist movements.

1.1 2041 Active Transportation

The proposed active transportation improvements include in-boulevard bi-directional Multi-Use Paths (MUP) on both sides of the road. This Active Transportation (AT) facility provides each user type a shared pathway to travel along Kennedy Road with ease and comfort. Although separate cycle tracks and sidewalks provide greater separation between users, MUPs are recommended due to the number of constrained locations along the Kennedy Road corridor. In order to keep the AT facilities consistent throughout the corridor, MUPs are proposed. A Multi-Modal Level of Service (MMLOS) analysis was used to compare existing and future AT conditions for pedestrians and cyclists. The methodology used for the existing and future conditions is based on the City of Ottawa MMLOS Guidelines, September 2015. The results of the existing conditions can be found in the Transportation Technical Report #1 of this study.

1.1.1 Pedestrian Quality of Service

The methodology for the evaluation of *segment* pedestrian level of Service (PLOS) uses a look-up table approach based on cross-section and roadway characteristics (i.e. sidewalk and boulevard width, traffic volumes, presence of on-street parking, and operating speed). *Intersection* PLOS uses the Pedestrian Exposure to Traffic at Signalized Intersections (PETSI) and assigns points based on a number of crossing characteristics (e.g. crossing distance, presence of a median, presence of a crossing refuge, turning restrictions, right-turn characteristics, curb radii, etc.). Based on this approach the future PLOS does not show significant improvements from existing conditions. This is based on provision of 1.5m wide sidewalks (meets minimum width for AODA compliance), traffic volumes along Kennedy Road over 3,000 vehicles per day, operating speed along Kennedy Road at 60 km/hr, and increasing crossing distance at intersections with the proposed design. As a result the future conditions PLOS remains at level E-F.

Although the PLOS ranking does not increase substantially for future conditions, the proposed improvements for the corridor offer improvements to the pedestrian environment. The provision of a Multi-Use Path provides a wider pathway, which will provide pedestrians and cyclists more space to pass each other safely. Landscaping strips / utility zones are also provided between the face of curb and AT facilities to maximize separation of AT facilities and vehicular traffic. Pedestrian crossings at intersections are delineated in separated crosswalks whereas cyclists cross in cross-

rides. Pedestrian/cyclist railings are proposed on structures including at the CN crossing, Rouge River crossing, and GO Transit rail crossings.

At the GO Rail crossing the sidewalks are increased to 2.0m. At the 407ETR, a separate AT Bridge is proposed to accommodate a shared Multi-Use Path to provide greater separation from AT users and vehicles. These improvements will improve the pedestrian environment.

1.1.2 Cyclist Quality of Service

The bicycle level of service (BLOS) methodology is similar to the PLOS method, and is based on roadway characteristics and facility type and quality. The methodology measures each segment's and intersection's level of traffic stress (LTS) experienced by the cyclist, established in the Minnesota Transportation Institute report no. 11-19. *Segment* BLOS are calculated using a look-up table approach and considers the facility type, street width, operating speed, and parking characteristics. *Intersection* BLOS is calculated for each approach and for both left and right turning conditions. Scores are evaluated using a look-up table approach and considers crossing distance, presence of a crossing refuge, left/right turn phasing, right hand turn characteristics, curb radii, and crosswalk treatments.

Existing BLOS ranges from D to F, while future BLOS ranges from A – F. Based on this approach, the future BLOS shows significant improvements due to the introduction of separated, in-boulevard MUPs, which provides separation from vehicular traffic. At the intersections, crosswalk markings (cross-rides) will be provided specifically for cyclists to differentiate the cycle path from the pedestrian path. These improvements will improve the cyclist environment.

1.2 2041 Auto Traffic

1.2.1 2041 Peak Hour Traffic Volume Forecasting

The future volume growth was derived from the York Region's EMME model. The methodology and the results in developing 2041 peak hour traffic within the study area were carried out during the phase 1 of the study and documented in the **Section 5.2.3 of TTR #1**. The truck percentile was assumed to remain the same as the existing.

Based on the York Region EMME model forecast, the forecast future traffic volumes are expected to exceed capacity at almost all major-major intersections. The Synchro analysis shows turning movements at all intersections will have high v/c ratios of 1.4 or above in the year of 2041. As the purpose for the Phase 3 analysis is to inform the design of the preferred concept, the over-capacity movements were further adjusted and then re-balanced to within a 10% difference along the study corridor. Volume adjustments were undertaken using the following steps:

- Turning movements that are over capacity in the existing conditions were capped at 0% growth;

- North/south through movements that are over-capacity under existing conditions were capped at a 2% compounded annually growth rate; and,
- Turning movements that are near capacity (LOS D/E) under existing conditions were capped at a 1% compounded annually growth rate.

These adjustments were made to obtain reasonable and practical peak hour volumes for intersection analysis. In reality, when demand volume exceeds capacity, traffic will seek alternatives during the peak hour, such as:

- Unserved demand will seek alternative routes;
- Unserved demand will enter the network at a later or earlier time, causing peak period spreading; and,
- Some users will switch to transit or HOV.

The adjusted turning movement Compound annual growth rates (CAGRs) at all intersections can be found in **Table 1-1** and **Table 1-2**. Comparatively higher growth rates at intersections between 16th Avenue and Major Mackenzie Drive are anticipated due to the planned York Downs Re-development and the North Markham Future Urban Area development. In addition, any negative growth rates that were calculated from the Region's EMME model forecasts were set to 0% growth as a conservative approach.

Table 1-1: Turning movement CAGRs – AM Peak Hour

Intersection	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Major Mackenzie Dr.	0.0%	6.3%	5.0%	1.6%	2.7%	1.8%	3.5%	1.9%	3.6%	2.2%	0.0%	2.0%
Schoolhouse Rd.	0.0%	4.9%	-	-	3.6%	1.0%	-	-	0.4%	-	-	-
The Fairways	0.0%	4.0%	0.0%	9.5%	2.8%	6.1%	6.3%	1.1%	0.0%	0.0%	0.0%	6.1%
Angus Glen Blvd.	1.0%	3.7%	-	-	2.2%	0.0%	-	-	1.7%	-	-	-
Bur Oak Ave.	-	4.7%	2.3%	0.0%	3.2%	-	-	-	-	1.9%	-	1.0%
Wilfred Murison Ave.	16.4 %	3.9%	0.0%	0.0%	2.8%	-	-	-	-	0.0%	-	0.0%
Beckett Ave.	-	3.9%	0.0%	0.0%	2.7%	-	-	-	-	0.1%	-	2.5%
Nipigon Ave.	-	3.7%	0.9%	-	2.5%	-	-	-	-	-	-	2.9%
16th Ave.	0.0%	4.2%	1.7%	2.7%	2.4%	2.0%	1.5%	1.0%	1.0%	1.0%	0.5%	3.9%
Birchview Ln.	0.6%	3.3%	-	-	2.0%	0.0%	1.0%	-	0.0%	-	-	-
The Bridle Trail	0.4%	3.6%	1.5%	1.9%	2.4%	1.0%	0.9%	0.0%	0.0%	0.2%	0.0%	1.9%
Carlton Rd.	0.6%	3.5%	0.6%	0.5%	2.5%	0.5%	1.5%	0.0%	0.6%	0.5%	0.1%	3.0%
Austin Dr.	-	3.4%	4.0%	1.0%	2.3%	-	-	-	-	2.6%	-	0.5%
Denby Crt./Second St. N	-	3.3%	1.7%	-	2.4%	2.9%	-	-	0.0%	-	-	-
Highway 7	1.0%	3.4%	0.9%	1.2%	2.2%	2.1%	2.5%	1.7%	2.9%	0.0%	0.5%	2.5%
Eton St.	-	2.9%	0.0%	1.1%	1.9%	2.2%	-	-	0.0%	0.0%	-	1.0%
Avoca Dr.	0.0%	2.6%	0.0%	2.0%	1.8%	13.4 %	2.8%	0.0%	0.0%	0.0%	0.0%	2.2%
Castan Ave.	-	2.5%	3.4%	0.0%	1.5%	-	-	-	-	-	-	0.0%
Unionville Gate	2.0%	2.7%	0.7%	0.0%	1.6%	2.3%	2.5%	0.8%	3.9%	0.8%	0.4%	0.0%
YMCA Blvd./Helen Ave.	0.2%	2.5%	0.4%	0.0%	1.9%	2.9%	2.4%	0.2%	4.1%	0.0%	0.8%	0.0%
407ETR WB Off-Ramp	-	1.5%	4.3%	-	1.2%	-	-	-	-	0.9%	-	3.7%
407ETR EB Off-Ramp	-	1.1%	4.4%	-	1.6%	0.3%	3.9%	-	1.1%	-	-	-
Duffield Dr.	4.8%	1.4%	-	-	1.5%	2.0%	0.0%	-	1.5%	-	-	-
14th Ave.	0.4%	2.0%	2.1%	0.4%	2.2%	0.7%	0.3%	0.5%	1.8%	2.8%	0.0%	1.3%
Lee Ave.	1.0%	1.7%	1.5%	0.6%	1.8%	0.0%	0.0%	0.0%	0.3%	0.8%	0.0%	0.0%
Highglen Ave.	1.2%	2.2%	2.0%	1.3%	1.6%	0.4%	0.1%	0.0%	0.2%	0.4%	0.0%	0.3%

Intersection	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Milliken Mills HS	-	2.1%	-	-	1.3%	0.0%	-	-	0.9%	-	-	-
Denison St.	0.0%	2.0%	0.0%	1.0%	1.7%	1.0%	1.5%	0.0%	0.0%	0.0%	0.0%	3.0%
Gorvette Rd.	0.0%	2.1%	-	-	1.6%	0.0%	0.0%	-	0.0%	-	-	-
Clayton Dr.	0.0%	1.5%	0.0%	3.2%	1.7%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	5.1%
Steeles Ave.	0.0%	0.5%	0.0%	1.1%	1.1%	0.0%	0.4%	0.0%	0.0%	2.3%	1.3%	4.2%

Table 1-2: Turning movement CAGRs – PM Peak Hour

Intersection	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Major Mackenzie Dr.	0.0%	4.3%	2.1%	1.9%	6.3%	3.4%	1.7%	0.4%	1.9%	1.9%	1.8%	1.5%
Schoolhouse Rd.	0.0%	2.9%	-	-	4.7%	2.3%	-	-	0.7%	-	-	-
The Fairways	0.0%	2.3%	0.0%	5.9%	4.4%	6.0%	5.8%	0.0%	0.0%	0.0%	1.2%	9.1%
Angus Glen Blvd.	1.6%	2.6%	-	-	4.1%	0.0%	-	-	0.9%	-	-	-
Bur Oak Ave.	-	3.1%	1.8%	1.0%	4.5%	-	-	-	-	2.2%	-	0.0%
Wilfred Murison Ave.	-	2.9%	0.0%	0.0%	3.9%	-	-	-	-	0.0%	-	0.0%
Beckett Ave.	-	2.5%	0.1%	2.4%	3.7%	-	-	-	-	0.0%	-	0.0%
Nipigon Ave.	-	2.2%	0.5%	-	3.8%	-	-	-	-	-	-	1.6%
16th Ave.	0.5%	2.2%	1.4%	2.0%	4.0%	3.3%	0.4%	1.3%	1.5%	0.5%	1.0%	2.6%
Birchview Ln.	0.0%	2.0%	-	-	3.2%	0.8%	0.0%	-	0.6%	-	-	-
The Bridle Trail	0.0%	2.3%	0.2%	1.8%	3.5%	0.8%	0.9%	0.0%	0.5%	1.5%	0.0%	1.8%
Carlton Rd.	0.6%	2.2%	2.1%	2.9%	3.4%	1.5%	0.4%	0.1%	0.5%	0.6%	0.0%	0.5%
Austin Dr.	-	2.0%	2.5%	0.5%	3.3%	-	-	-	-	3.8%	-	0.9%
Denby Crt./Second St. N	-	1.9%	-	-	3.2%	1.9%	-	-	0.0%	-	-	-
Highway 7	1.9%	2.3%	1.2%	2.4%	3.2%	4.0%	0.4%	0.5%	1.6%	0.0%	1.0%	1.2%
Eton St.	-	2.0%	0.0%	0.9%	2.8%	0.0%	-	-	0.0%	0.0%	-	1.0%
Avoca Dr.	0.0%	1.7%	0.0%	2.1%	1.8%	2.7%	1.9%	0.0%	0.0%	0.0%	0.0%	1.9%
Castan Ave.	-	1.4%	4.3%	0.0%	1.3%	-	-	-	-	-	-	0.0%
Unionville Gate	1.9%	1.1%	0.0%	0.0%	0.1%	2.4%	1.0%	0.4%	3.3%	1.5%	0.7%	0.0%
YMCA Blvd./Helen Ave.	2.9%	1.4%	0.0%	0.0%	1.0%	1.6%	0.9%	0.0%	0.0%	0.4%	1.1%	0.0%
407ETR WB Off-Ramp	-	0.8%	6.0%	-	0.3%	-	-	-	-	1.8%	-	6.5%
407ETR EB Off-Ramp	-	0.9%	3.7%	-	0.0%	4.7%	0.8%	-	1.6%	-	-	-
Duffield Dr.	0.0%	1.1%	-	-	0.6%	0.0%	1.8%	-	3.9%	-	-	-
14th Ave.	0.8%	1.6%	2.5%	0.9%	1.0%	0.0%	0.4%	0.0%	0.5%	1.6%	0.0%	0.0%
Lee Ave.	0.3%	1.7%	0.7%	0.0%	1.5%	0.0%	0.0%	0.0%	0.9%	1.5%	0.0%	0.6%
Highglen Ave.	0.2%	1.5%	0.4%	0.3%	2.0%	0.0%	0.4%	0.0%	1.1%	1.9%	0.0%	1.3%
Milliken Mills HS	-	1.2%	-	-	2.1%	0.0%	-	-	0.0%	-	-	-
Denison St.	0.0%	1.5%	0.0%	2.0%	1.7%	2.4%	1.0%	0.0%	0.0%	0.0%	0.0%	2.1%
Gorvette Rd.	0.0%	0.8%	-	-	2.0%	0.0%	0.0%	-	0.0%	-	-	-
Clayton Dr.	0.0%	1.5%	0.0%	1.9%	1.5%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	3.0%
Steeles Ave.	0.0%	0.6%	2.2%	1.9%	0.5%	1.2%	0.0%	1.0%	0.0%	0.0%	0.0%	1.1%

1.2.2 2041 Signal Warrant Analysis

Signal warrant analyses were conducted for unsignalized intersections along Kennedy Road between Steeles Avenue and Major Mackenzie Drive based on peak hour volumes for the 2041 horizon year. The signal warrants analysis in this section follows the methodology and warrants criteria outlined in the *Ontario Traffic Manual – Book 12 Traffic Signals, March 2012* (OTM Book 12).

Turning movement counts for the Weekday AM, Mid-day, and PM peak periods and historical collision data along Kennedy Road between Steeles Avenue and Major Mackenzie Drive, as detailed in Section 4.6 and Section 4.7 of the TTR #1, were provided by York Region and used as inputs for the signal warrant analysis of stop controlled intersections along the study corridor. Based on the criteria listed in OTM Book 12 and existing conditions, it was found that only the Kennedy Road and

Wilfred Murison Avenue intersection satisfies the signal warrant criteria. The signal warrant justification for this intersection is provided in **Exhibit 1-1**.

Justification		Compliance	Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A Total Volume	100 %	☐	☑
	B Crossing Volume	84 %		
2. Delay to Cross Traffic	A Main Road	100 %	☑	☐
	B Crossing Road	100 %		
3. Combination	A Justificaton 1	84 %	☑	☐
	B Justification 2	100 %		
4. 4-Hr Volume		85 %	☐	☑
5. Collision Experience		13 %	☐	☑
6. Pedestrians	A Volume	Justification not met	☐	☑
	B Delay	Justification not met		

Exhibit 1-1: Signal Warrant Criteria Compliance at Kennedy Rd & Wilfred Murison Ave

Based on these criteria, the existing peak 4-hour volumes at the Kennedy Road and Wilfred Murison Avenue intersection are sufficient to support consideration for the installation of a new traffic signal at this location.

Weekday AM and PM existing and future operations at this intersection were further modelled in Synchro (as per the HCM 2000 methodology for unsignalized intersections) to confirm the potential need for a traffic signal at this location. Delays to cross traffic at Wilfred Murison Avenue during both AM and PM peak hours would be significant (more than 10 minutes, corresponding to LOS F) due to insufficient gap time for east-west movements at this stop controlled intersection resulting from heavy northbound and southbound through traffic along Kennedy Road. The results from Synchro indicate v/c ratio greater than 1.00 and LOS 'F' for all east-west movements during future AM and PM peak hour conditions.

1.2.3 Recommended 2041 Traffic Controls

1.2.3.1 TRAFFIC SIGNALS

Signalization at residential local crossing streets that currently operate under two-way stop control were considered to be signalized because the proposed road widening would require traffic to cross 3 lanes when performing left turn movements and 6 lanes for through movements. However, future traffic volumes at these

intersections will remain relatively low and will not require a signal. Within the study corridor, only the Kennedy Road / Wilfred Murison Avenue intersection is recommended for signalization. This intersection also satisfied the signal warrant criteria outlined in *OTM Book 12* for implementing new traffic signals. The cycle lengths of the proposed new signal are assumed to be similar to adjacent intersections to facilitate signal coordination along Kennedy Road.

1.2.3.2 RIGHT-IN, RIGHT-OUT

Besides the Kennedy Road / Wilfred Murison Avenue intersection, all other commercial/residential entrances/exits that currently operate under stop control along Kennedy Road within the study area are proposed to be converted to Right-in/Right-out (RIRO) driveways due to the widening of Kennedy Road to 6 lanes to minimize left-turn conflicts. The impacts of conversion were reviewed to identify if there could be any potential issues resulting from converting full-movement entrances to RIRO driveways. Criteria considered include the size of the plaza, the accessibility of alternative routes, and the operation of the adjacent signalized intersections. In general, these conversions are not expected to result in adverse impacts; however, at certain locations restricting an inbound left-turn movement might raise traffic concerns, as identified in **Table 1-3**.

Table 1-3: Issued Inbound Left-Turn Movements at RIRO Driveways

Intersection & Proposed Permissive Movement	2041 Peak Hour Volumes (veh)	Remark
Schoolhouse Rd Northbound-Left	95~130	Moderate inbound volume during peak hours. Restricting this movement would create excessive out-of-way travel for northbound traffic accessing the commercial plaza. Synchro shows that the v/c ratio would be below 0.40 (LOS 'C') during peak hours at this left turn movement if permitted at the RIRO driveway.
Angus Glen Blvd Northbound-Left	86~197	Moderate inbound volume during peak hours. Restricting this movement would create excessive out-of-way travel for northbound traffic accessing the residential neighborhood. Synchro shows that the v/c ratio would be below 0.50 (LOS 'D') during peak hours at this left turn movement if permitted at the RIRO driveway. **The left-out restriction is not an issue as there will be a north-south connection/access from the Yorkdowns Development to Bur Oak Avenue.**
Peachtree Mall Entrance / Eton St Southbound-Left	9~29	Moderately-low inbound volume during peak hours. Restricting this movement would create excessive out-of-way travel for southbound traffic accessing the Dundee Crescent residential neighborhood via Eton Street. Synchro shows that the v/c ratio is below 0.15 (LOS 'D') during peak hours at this left turn movement if permitted at the RIRO driveway. In addition, restricting this movement might cause traffic

Intersection & Proposed Permissive Movement	2041 Peak Hour Volumes (veh)	Remark
		to reroute to the southbound left-turn at the upstream intersection (Kennedy Rd / Highway 7), which is expected to operate over capacity during the PM peak.
Castan Ave Southbound-Left	48~114	Moderate inbound volume during peak hours. Restricting this movement would create excessive out-of-way travel for southbound traffic accessing the commercial plaza. Synchro shows that the v/c ratio would be below 0.55 (LOS 'D') during peak hours at this left turn movement if permitted at the RIRO driveway.

In addition, the westbound-left movement at the Castan Avenue intersection would be restricted after converting the intersection to RIRO. The westbound-left traffic would most likely make a left-turn at South Unionville Avenue located 250m south along Kennedy Road as an alternative route. Assuming all westbound-left traffic would be routed to South Unionville Avenue, the v/c ratio and Level of Service would increase from 0.40 (LOS 'D') to 0.53 (LOS 'D') during the AM peak hour and from 0.65 (LOS 'D') to 0.96 (LOS 'F) during PM peak hour. Note that this rerouted traffic is excluded from the growth rate calculation (**Section 1.2.1**) as this traffic is not generated from background growth.

After a discussion with York Region Staff, the above left-turn movements will be restricted in the final intersection design due to the following considerations:

- Safety concerns to minimize the left-turn conflicts under a 6-lane cross section;
- Alternative routes/access are available at adjacent signalized intersection(s); and
- When the subject intersection is located near major-major signalized intersection, the traffic queue from the major-major signalized intersection can potentially block/impact the proposed left-turn movement.

In addition, at Kennedy Road and Bur Oak intersection, a new road connection will be constructed across from Bur Oak Avenue to provide northbound left-turns from Kennedy into the subdivision in the 2041 horizon year. This new connection will potentially reduce the northbound left-turns at Angus Glen Boulevard and Schoolhouse Road.

1.2.4 2041 Traffic Operations

The 2041 Synchro model was developed during the Phase 1 of the study, assuming the widening of Kennedy Road to 6 lanes to accommodate transit/HOV lanes in both directions. In order to model the HOV lane capacities in Synchro, a lane utilization

factor of 0.85 was calculated based on the lane capacity assumed in the York Region EMME model, and applied to the relevant lane groups in the 2041 Synchro model.

Signal optimizations were conducted at all signalized intersections. Optimizations involve the following strategies.

- Optimizing cycle length
- Optimizing splits
- Adding new left turn phases
- Offset adjustment

Offset adjustments were made to improve the progression along Kennedy Road, prioritizing the coordination for the peak direction. Signal timings can be found in **Appendix A**. The effective green to cycle ratio (g/c) at the 407ETR ramp intersections were maintained as existing.

1.2.5 2041 Intersection Capacity

The future traffic operations for weekday AM and PM peak hours were assessed for all signalized intersections along the study corridor. The signalized intersection analysis considers two separate measures of performance:

- The capacity of all intersection movements, which is based on a volume to capacity ratio (v/c); and,
- The level of service (LOS) for all intersection movements, which is based on the average control delay per vehicle for each of various movements through the intersection, and for the overall intersection.

Delay is an indicator of how long a vehicle must wait to complete a movement and is represented by a letter between ‘A’ and ‘F’, with ‘F’ being the longest delay. Level of service is based on the scale shown in **Table 1-4**.The volume to capacity (v/c) ratio is a measure of the degree of capacity utilized at an intersection.

Table 1-4: Level of Service Criteria

Level of Service (LOS)	Control Delay per Vehicle (s)
A	≤ 10
B	> 10 and ≤ 20
C	> 20 and ≤ 35
D	> 35 and ≤ 55
E	> 55 and ≤ 80
F	> 80

Note: Generally LOS A, B, C, and D are considered acceptable. LOS E and F indicate notable delays but may be acceptable in urban contexts.

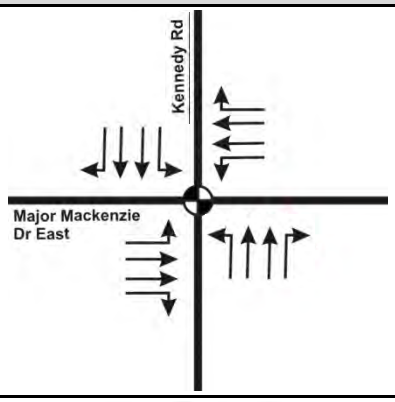
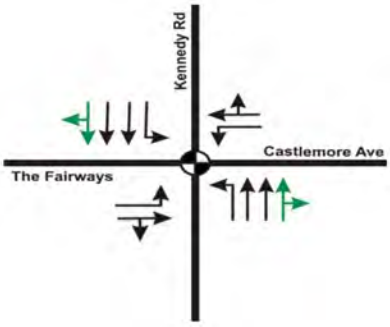
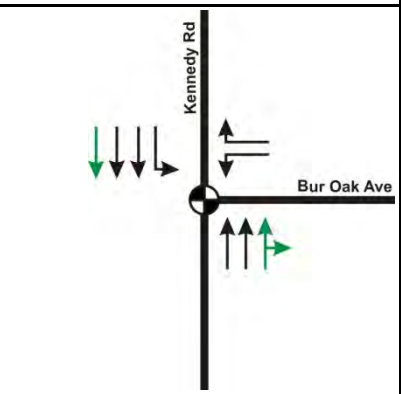
A legend for the lane configuration schematics are illustrated in **Table 1-5**.

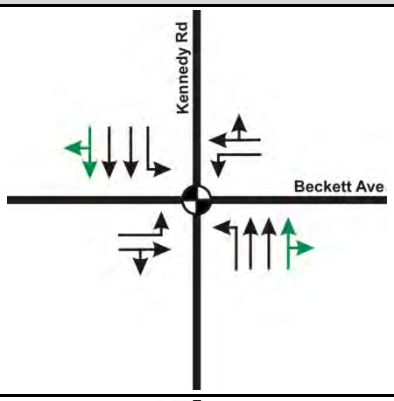
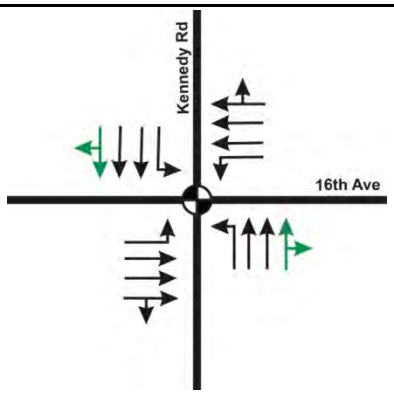
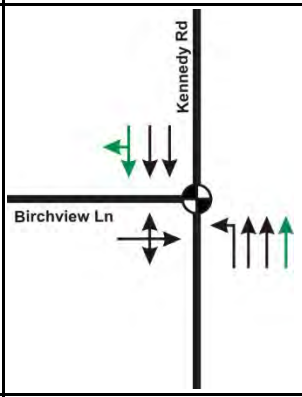
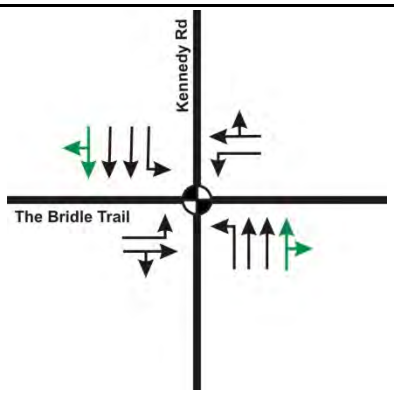
Table 1-5: Lane Configuration Schematic

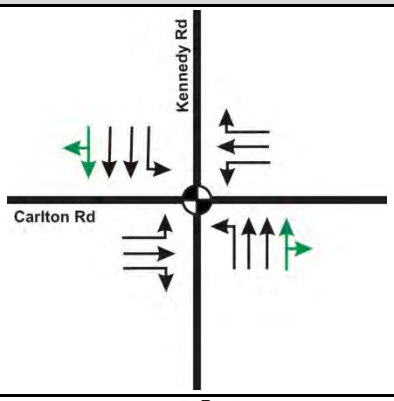
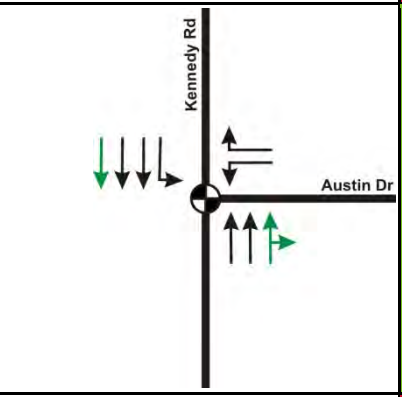
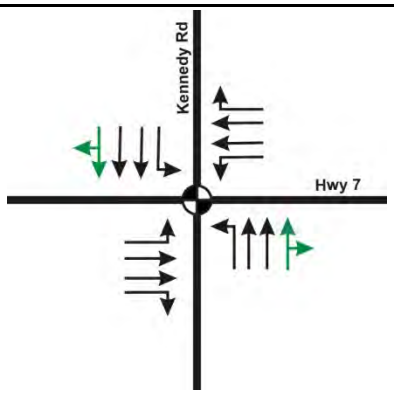
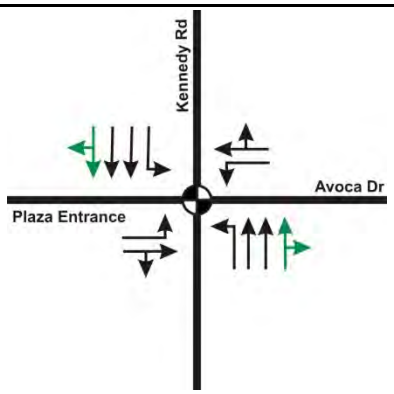
Movement	Symbol
Traffic Signal	
Left-Turn Lane	
Share Through-Left Lane	
Through Lane	
Shared Through-Right Lane	
Shared Left-Through-Right Lane	
Right-Turn Lane	
All schematics oriented with north aligned with the top of page	

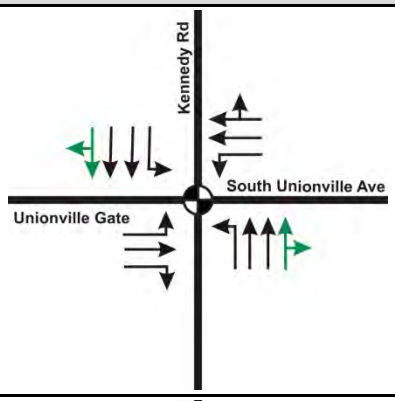
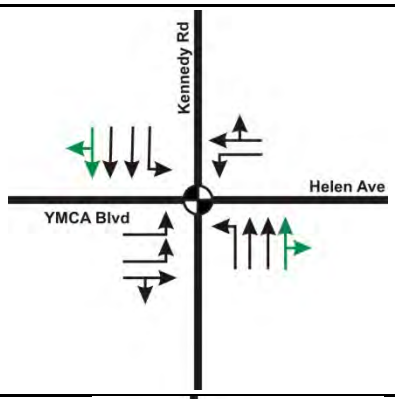
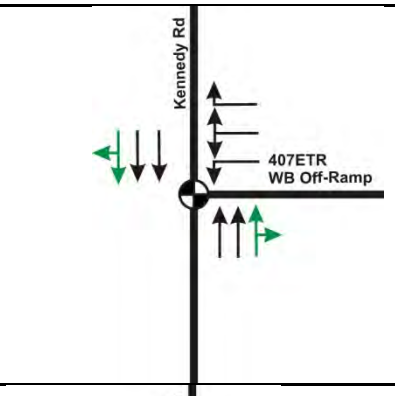
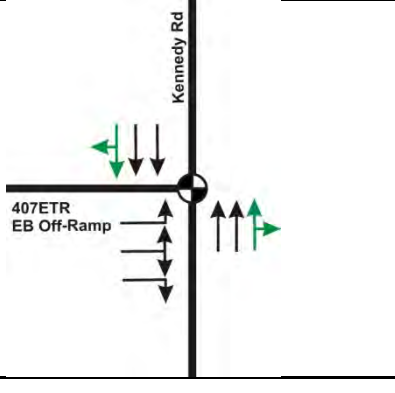
The lane configuration and intersection traffic performance are provided in **Table 1-6**. Critical movements are identified movements with a v/c ratio of 0.85 or with LOS ‘E’ or worse. The corresponding delays are also provided.

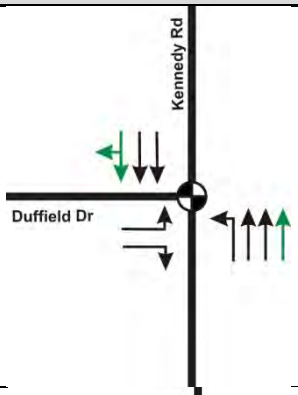
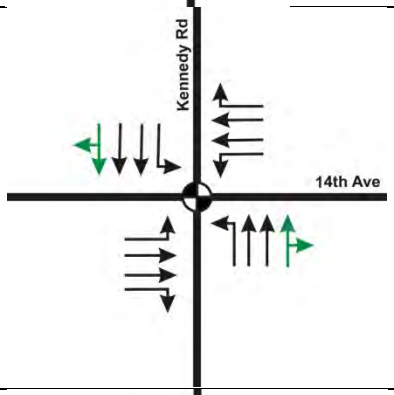
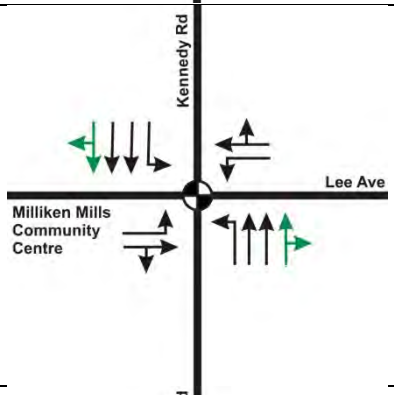
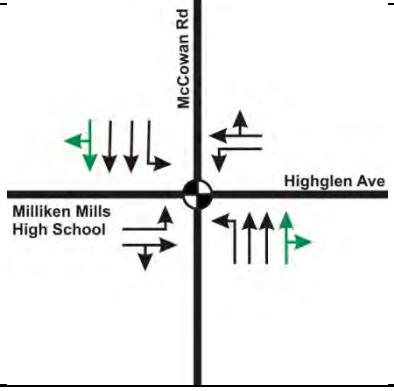
Table 1-6: 2041 Signalized Intersection Lane Configuration and Traffic Performance

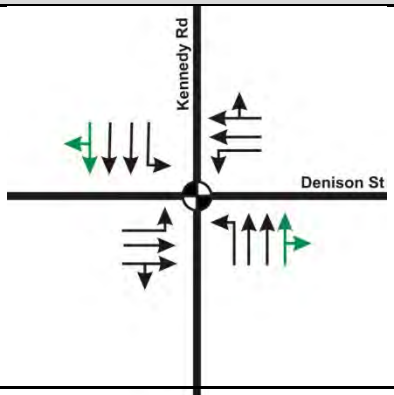
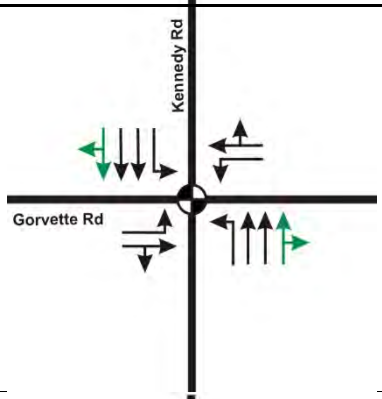
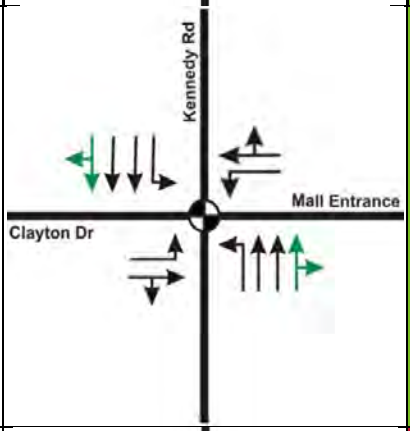
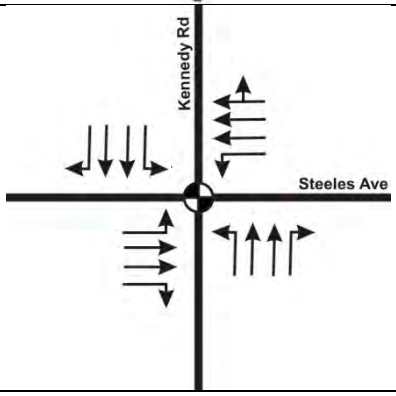
Intersection	Lane Configuration Schematic HOV Lanes shown in Green	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical Movements v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Major Mackenzie Drive		F	EBL v/c = 1.31; F (271.3s) WBL v/c = 1.07; F (99.4s) WBT v/c = 1.05; E (70.7s) NBL v/c = 1.29; F (177.1s) NBT v/c = 1.24; F (159.7s) SBL v/c = 0.81; E (70.7s) SBT v/c = 1.17; F (135.9s)	F	EBT v/c = 1.15; F (114s) WBL v/c = 0.93; F (91.2s) NBL v/c = 1.48; F (281.2s) NBT v/c = 0.98; E (91.3s) SBL v/c = 0.90; F (85.9s) SBT v/c = 1.13; F (118.6s)
The Fairways		D	WBT v/c = 0.97; E (56.6s) NBL v/c = 0.28; E (64.9s) NBT v/c = 0.82; E (63.4s) SBL v/c = 0.93; E (67.1s)	C	No Critical Movement
Bur Oak Avenue		F	WBL v/c = 1.17; F (129.7s) NBT v/c = 1.11; F (94.8s) SBL v/c = 1.15; F (155.6s) SBT v/c = 1.06; E (67.2s)	C	WBL v/c = 0.89; F (86.3s) NBT v/c = 0.88; C (34.7s) SBL v/c = 0.80; E (69.7s)
Wilfred Murison Ave		C	EBL v/c = 0.46; E (62.0s) EBTR v/c = 0.79; E (79.2s) WBL v/c =0.42; E (67.1s) NBL v/c = 0.84; F (119.0s) SBT v/c = 0.95; B (14.8s)	B	EBL v/c = 0.40; E (79.5s) WBL v/c = 0.03; E (64.5s) WBT v/c = 0.30; E (58.9s)

Intersection	Lane Configuration Schematic HOV Lanes shown in Green	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical Movements v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Beckett Avenue		B	EBL v/c = 0.57; E (61.7s) WBL v/c = 0.90; F (93.1s) SBT v/c = 0.89; B (11.0s)	A	EBL v/c = 0.73; F (84.3s) WBL v/c = 0.23; E (58.9s) NBL v/c = 0.89; C (31.5s) SBL v/c = 0.78; F (91.1s)
16th Avenue		F	EBL v/c = 1.20; F (162.9s) WBL v/c = 1.32; F (192.8s) WBT v/c = 1.12; F (109.6s) NBL v/c = 1.16; F (157.2s) SBT v/c = 1.25; F (144.2s)	F	EBL v/c = 1.06; F (105.5s) EBT v/c = 1.21; F (140.7s) WBL v/c = 1.24; F (180.4s) WBT v/c = 0.84; E (58.4s) NBL v/c = 1.28; F (194.5s) NBT v/c = 1.30; F (177.5s) SBL v/c = 1.25; F (188.2s) SBT v/c = 1.15; F (117.5s)
Birchview Lane		A	No Critical Movement	A	No Critical Movement
The Bridle Trail		B	EBL v/c = 0.60; E (67.9s) WBT v/c = 0.74; E (61.5s)	B	EBL v/c = 0.56; E (56s) NBT v/c = 0.88; B (14.6s)

Intersection	Lane Configuration Schematic HOV Lanes shown in Green	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical Movements v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Carlton Road		F	WBL v/c = 0.96; E (69.4s) WBT v/c = 1.11; F (117.6s) NBL v/c = 0.84; E (72.6s) SBT v/c = 1.19; F (120.4s)	E	EBT v/c = 0.96; F (89.7s) WBL v/c = 1.10; F (140.5s) NBL v/c = 0.73; E (56.1s) NBT v/c = 1.16; F (97.9s)
Austin Drive		A	WBL v/c = 0.61; E (69.3s)	B	WBL v/c = 0.50; E (58.8s) WBR v/c = 0.89; E (58.3s) NBT v/c = 0.96; B (16.8s) SBL v/c = 0.84; E (62.7s)
Highway 7		F	EBL v/c = 0.86; E (73.5s) WBL v/c = 1.12; F (112.9s) WBT v/c = 1.26; F (162s) NBL v/c = 1.03; F (120.4s) SBT v/c = 1.37; F (204.8s)	F	EBL v/c = 1.21; F (160.2s) EBT v/c = 1.16; F (124.7s) WBL v/c = 1.33; F (209.5s) WBT v/c = 0.90; E (58.9s) NBL v/c = 1.11; F (128.5s) NBT v/c = 1.38; F (207.2s) SBL v/c = 1.29; F (194.2s) SBT v/c = 0.99; E (67.8s)
Avoca Drive		B	EBL v/c = 0.50; E (68.6s) WBL v/c = 0.23; E (56s)	B	EBL v/c = 0.95; F (91.6s) NBL v/c = 0.85; E (59.6s) SBL v/c = 0.89; F (88.8s)

Intersection	Lane Configuration Schematic HOV Lanes shown in Green	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical Movements v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Unionville Gate		F	EBL v/c = 0.81; F (86.1s) EBR v/c = 0.88; D (48.5s) NBL v/c = 1.02; F (103.6s) SBT v/c = 1.25; F (140s)	E	EBL v/c = 0.98; E (77.5s) EBT v/c = 0.76; E (56.1s) EBR v/c = 0.98; D (54.2s) WBL v/c = 0.96; F (85.9s) NBL v/c = 1.09; F (111.4s) NBT v/c = 0.87; C (21s) SBL v/c = 0.96; F (157s) SBT v/c = 1.05; F (89.3s)
YMCA Boulevard / Helen Ave		F	EBT v/c = 0.92; E (62.2s) WBL v/c = 1.32; F (204.6s) NBL v/c = 0.85; E (60.6s) SBT v/c = 1.27; F (144s)	D	EBT v/c = 0.92; E (71.2s) WBL v/c = 0.65; E (56s) NBL v/c = 0.94; E (70.8s) SBL v/c = 0.80; E (65.7s) SBT v/c = 0.91; D (53.3s)
407ETR Westbound Off-ramp		E	WBL v/c = 0.85; E (66.1s) WBT v/c = 0.85; E (62s) WBR v/c = 0.81; E (57.1s) SBT v/c = 1.15; F (84.6s)	A	WBL v/c = 0.33; E (60.5s)
407ETR Eastbound Off-ramp		B	EBL v/c = 0.76; E (69.1s) EBT v/c = 0.72; E (56.9s) SBT v/c = 0.92; A (9.1s)	C	EBL v/c = 0.81; E (66.4s) NBT v/c = 0.86; B (13.9s)

Intersection	Lane Configuration Schematic HOV Lanes shown in Green	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical Movements v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Duffield Drive		F	EBL v/c = 0.50; E (66.1s) SBT v/c = 1.25; F (134.6s)	C	EBL v/c = 0.90; E (58s)
14th Avenue		E	WBT v/c = 1.14; F (115.1s) NBL v/c = 1.25; F (181s) NBT v/c = 0.90; D (49.9s) SBL v/c = 0.97; E (74.2s) SBT v/c = 1.08; E (66.6s)	E	EBT v/c = 1.13; F (115.8s) WBL v/c = 0.88; F (80.4s) NBL v/c = 0.81; E (59.9s) NBT v/c = 1.09; F (90.6s) SBL v/c = 1.20; F (156.6s)
Lee Avenue		B	WBR v/c = 0.80; E (58.9s) NBL v/c = 0.91; F (94.9s)	B	EBL v/c = 0.51; E (63.8s)
Highglen Avenue		D	EBL v/c = 0.53; E (66.9s) WBL v/c = 0.87; E (67s) WBT v/c = 0.87; E (59.3s) SBT v/c = 0.94; C (32.7s)	B	WBL v/c = 0.52; E (66s)

Intersection	Lane Configuration Schematic HOV Lanes shown in Green	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical Movements v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Denison Street		F	EBL v/c = 1.33; F (210.7s) WBT v/c = 1.26; F (163.3s) NBL v/c = 0.92; F (100.7s) NBT v/c = 0.96; D (40.3s) SBL v/c = 1.09; F (101.7s) SBT v/c = 1.21; F (118.6s)	E	EBL v/c = 1.24; F (171.6s) EBT v/c = 0.91; E (59.4s) WBL v/c = 0.77; E (59.6s) WBT v/c = 0.87; D (48s) NBT v/c = 1.11; F (81.9s) SBL v/c = 1.19; F (147.5s)
Gorvette Road		D	WBL v/c = 0.86; E (74.7s) SBT v/c = 1.00; D (38.7s)	C	EBL v/c = 0.62; E (62.5s) WBL v/c = 0.35; E (57.4s)
Clayton Drive		C	EBL v/c = 0.54; E (55.4s) WBL v/c = 0.47; E (58.9s)	D	EBL v/c = 0.76; E (64.9s) WBL v/c = 1.02; F (117.7s) SBL v/c = 0.93; D (51.5s)
Steeles Avenue		F	EBL v/c = 1.15; F (153.1s) WBT v/c = 1.21; F (137.1s) NBL v/c = 1.54; F (298.2s) SBL v/c = 1.12; F (128.6s) SBT v/c = 1.14; F (121.7s)	F	EBT v/c = 1.13; F (107.9s) WBL v/c = 1.11; F (140s) NBL v/c = 1.05; F (118.8s) NBT v/c = 1.09; F (104.4s) SBL v/c = 1.22; F (164.7s) SBT v/c = 0.99; E (75.4s)

Under the 2041 conditions, all major intersection along the study corridor generally operate at or near capacity during the AM and PM peak hours, with LOS 'E' or 'F' and multiple critical movements, especially on the exclusive turning movements.

At 407ETR westbound/eastbound off-ramps, assumptions were made in Synchro analysis such that the off-ramp configuration is one left turn, one shared left-right turn, and one right turn in 2041 horizon to balance the left and right turn delays.

After a discussion with York Region Staff, the 407ETR westbound/eastbound off-ramps will remain as existing configuration (dual left turns and one right turn) in final design in order to minimize the pedestrian crossing conflict at the signals.

Based on existing off-ramp configuration, Synchro indicates following critical movements at off-ramp intersections:

AM Peak

- WB off-ramp: WBR v/c 1.20; LOS 'F'; Delay 147.4s
- WB off-ramp: SBTR v/c 1.21; LOS 'F'; Delay 113.1s
- EB off-ramp: EBR v/c 0.82; LOS 'E'; Delay 65.7s
- EB off-ramp: SBTR v/c 0.93; LOS 'B'; Delay 10.0s

PM Peak

- WB off-ramp: WBR v/c 0.80; LOS 'E'; Delay 66.4s
- EB off-ramp: EBR v/c 0.0.96; LOS 'E'; Delay 72.1s
- EB off-ramp: NBTR v/c 0.94; LOS 'C'; Delay 22.2s

1.2.6 2041 Storage Lengths and Queuing

Table 1-7 through **Table 1-10** summarizes the 2041 95th percentile queues from Synchro and storage lengths at all signalized intersections between Major Mackenzie Drive East and Steeles Avenue East. Locations where 95th percentile queues exceed available storage are highlighted in red.

Table 1-7: 2041 AM Peak Hour 95th Percentile Queues – Through movements

Intersection	2041 AM Peak Hour			
	NBT		SBT	
	Storage	*95th %tile Queue*	*Storage*	*95th %tile Queue*
Kennedy Rd & Major Mackenzie Dr	400	296.2	2000	221.3
Kennedy Rd & The Fairways/Castlemore Ave	640	171.9	400	163.2
Kennedy Rd & Bur Oak Ave	370	121.2	640	112.2
Kennedy Rd & Wilfred Murison Ave	320	104.5	370	330.7
Kennedy Rd & Beckett Ave	300	36.3	320	35.4
Kennedy Rd & 16th Ave	300	149.2	300	207.5
Kennedy Rd & Birchview Ln	260	17.2	300	147.6
Kennedy Rd & The Bridle Trail	795	108.1	260	255.2
Kennedy Rd & Carlton Rd	385	132.6	795	363.2
Kennedy Rd & Austin Dr	450	53.2	385	50.2
Kennedy Rd & Highway 7	305	98.8	450	378.5
Kennedy Rd & Avoca Dr	450	67.4	305	140.2
Kennedy Rd & Unionville Gate	350	72.4	450	388.0
Kennedy Rd & Helen Ave/YMCA Blvd	145	139.8	350	270.5
Kennedy Rd & 407ETR WB Off-Ramp	330	62.7	145	303.6
Kennedy Rd & 407ETR EB Off-Ramp	330	86.9	330	45.8
Kennedy Rd & Duffield Dr	275	68.0	330	434.1
Kennedy Rd & 14th Ave	265	179.7	275	108.4
Kennedy Rd & Lee Ave	235	15.6	265	124.8
Kennedy Rd & Highglen Ave	450	150.0	235	211.2
Kennedy Rd & Denison St	210	62.4	450	262.9
Kennedy Rd & Gorvette Rd	530	149.7	210	209.3
Kennedy Rd & Clayton Dr	420	118.4	530	20.3
Kennedy Rd & Steeles Ave E	600	145.8	420	280.8

*storage was measured between signalized intersections

XX = 95th percentile queues exceed available storage

Table 1-8: 2041 PM Peak Hour 95th Percentile Queues – Through movements

Intersection	2041 PM Peak Hour			
	NBT		SBT	
	Storage	*95th %tile Queue*	*Storage*	*95th %tile Queue*
Kennedy Rd & Major Mackenzie Dr	400	218.1	2000	249.2
Kennedy Rd & The Fairways/Castlemore Ave	640	208.8	400	141.0
Kennedy Rd & Bur Oak Ave	370	316.3	640	19.7
Kennedy Rd & Wilfred Murison Ave	320	142.9	370	59.9
Kennedy Rd & Beckett Ave	300	31.4	320	69.7
Kennedy Rd & 16th Ave	300	343.0	300	279.6
Kennedy Rd & Birchview Ln	260	23.4	300	92.9
Kennedy Rd & The Bridle Trail	795	220.3	260	52.1
Kennedy Rd & Carlton Rd	385	389.4	795	208.0
Kennedy Rd & Austin Dr	450	49.6	385	99.9
Kennedy Rd & Highway 7	305	377.6	450	132.5
Kennedy Rd & Avoca Dr	450	88.5	305	64.1
Kennedy Rd & Unionville Gate	350	179.5	450	216.9
Kennedy Rd & Helen Ave/YMCA Blvd	145	123.0	350	164.0
Kennedy Rd & 407ETR WB Off-Ramp	330	58.0	145	66.6
Kennedy Rd & 407ETR EB Off-Ramp	330	311.2	330	138.7
Kennedy Rd & Duffield Dr	275	39.7	330	186.5
Kennedy Rd & 14th Ave	265	266.3	275	136.6
Kennedy Rd & Lee Ave	235	256.2	265	107.3
Kennedy Rd & Highglen Ave	450	65.5	235	111.0
Kennedy Rd & Denison St	210	222.6	450	159.7
Kennedy Rd & Gorvette Rd	530	223.4	210	217.3
Kennedy Rd & Clayton Dr	420	173	530	149.2
Kennedy Rd & Steeles Ave E	600	211.6	2000	249.2

*storage was measured between signalized intersections

XX = 95th percentile queues exceed available storage

For the through movements, queue spillover is anticipated at 16th Ave, Carlton Rd, Highway 7, 407WB Off-Ramp, Duffield Dr, 14th Ave, Lee Ave, Denison St, and Gorvette Rd, which will potentially increase the delays at the upper stream intersections. In addition, the queue on the through movements is noted to be approaching storage at The Bridle Trail, Unionville gate, Highglen Ave and Gorvette Rd during the peak hours.

Table 1-9: 2041 AM Peak Hour 95th Percentile Queues – Exclusive Turning Movements

Intersection	2041 AM Peak Hour											
	EBL		EBR		WBL		WBR		NBL		SBL	
	Storage	*95th tile Queue*	*Storage*	*95th tile Queue*	*Storage*	*95th tile Queue*	*Storage*	*95th tile Queue*	*Storage*	*95th tile Queue*	*Storage*	*95th tile Queue*
Kennedy Rd & Major Mackenzie Dr	50	52.9	92	133.2	50	102.3	160	20.2	140	130.3	50	47.3
Kennedy Rd & The Fairways	-	-	-	-	-	-	64		57	4.5	50	59.8
Kennedy Rd & Bur Oak Ave	-	-	-	-	-	-	-	-	-	-	55	102.1
Kennedy Rd & Wilfred Murison Ave	-	-	-	-	-	-	-	-	50	35.1	50	0.7
Kennedy Rd & Beckett Ave	30	63.2	-	-	30	104.7	-	-	54	1.3	54	0.3
Kennedy Rd & 16th Ave	92	128.6	-	-	70	217.5	-	-	145	86.0	70	39.5
Kennedy Rd & Birchview Ln	-	-	-	-	-	-	-	-	105	0.6	-	-
Kennedy Rd & The Bridle Trail	23	34.4	-	-	27	42.3	-	-	90	9.8	120	1.9
Kennedy Rd & Carlton Rd	48	24.7	61	7.3	73	207.3	-	-	138	53.9	140	4.7
Kennedy Rd & Austin Dr	-	-	-	-	41	51.6	-	-	-	-	57	17.9
Kennedy Rd & Highway 7	78	54.0	95	15.2	43	140.5	87	4.8	111	73.2	100	20
Kennedy Rd & Avoca Dr	-	-	-	-	20	17.6	-	-	100	24.7	60	0.9
Kennedy Rd & Unionville Gate	57	60.2	-	-	83	59.6	70		193	161.1	35	2.8
Kennedy Rd & Helen Ave/YMCA Blvd	135	18.8	-	-	132	127.6	-	-	77	97.5	96	1.0
Kennedy Rd & 407ETR WB Off-Ramp	-	-	-	-	-	-	-	-	-	-	-	-
Kennedy Rd & 407 EBETR Off-Ramp	-	-	-	-	-	-	-	-	-	-	-	-
Kennedy Rd & Duffield Dr	65	39.5	-	-	-	-	-	-	63	148.8	-	-
Kennedy Rd & 14th Ave	64	37.4	58	21.0	50	69.2	45	81.6	65	113.7	50	39.0
Kennedy Rd & Lee Ave	-	-	-	-	-	-	37	68.2	90	40.0	72	5.6
Kennedy Rd & Highglen Ave	32	20.7	-	-	53	63.6	-	-	75	26.2	90	4.7
Kennedy Rd & Denison St	60	87.5	-	-	48	38	-	-	150	50.8	80	127.3
Kennedy Rd & Gorvette Rd	-	-	-	-	-	-	-	-	71	42.3	71	0.6
Kennedy Rd & Clayton Dr	57	42.9	-	-	-	-	-	-	127	49.3	90	42.7
Kennedy Rd & Steeles Ave E	92	84.6	-	-	56	45.7	-	-	43	137	166	109.9

XX = 95th percentile queues exceed available storage

Table 1-10: 2041 PM Peak Hour 95th Percentile Queues – Exclusive Turning Movements

Intersection	2041 PM Peak Hour											
	EBL		EBR		WBL		WBR		NBL		SBL	
	Storage	*95th tile Queue*	*Storage*	*95th tile Queue*	*Storage*	*95th tile Queue*	*Storage*	*95th tile Queue*	*Storage*	*95th tile Queue*	*Storage*	*95th tile Queue*
Kennedy Rd & Major Mackenzie Dr	50	22.6	92	62.4	50	62.2	160	3.3	140	124.4	50	62.0
Kennedy Rd & The Fairways	-	-	-	-	-	-	64		57	7.7	50	28.2
Kennedy Rd & Bur Oak Ave	-	-	-	-	-	-	-	-	-	-	55	57.2
Kennedy Rd & Wilfred Murison Ave	-	-	-	-	-	-	-	-	50	54.8	50	0.8
Kennedy Rd & Beckett Ave	30	58.4	-	-	30	22.2	-	-	54	5.9	54	30.9
Kennedy Rd & 16th Ave	92	174.2	-	-	70	115.7	-	-	145	128.7	70	118.4
Kennedy Rd & Birchview Ln	-	-	-	-	-	-	-	-	105	0.8	-	-
Kennedy Rd & The Bridle Trail	23	66.1	-	-	27	27.5	-	-	90	0.6	120	19.4
Kennedy Rd & Carlton Rd	48	59.3	61	31.6	73	80.1	-	-	138	34.3	140	37.3
Kennedy Rd & Austin Dr	-	-	-	-	41	56.4	-	-	-	-	57	87.6
Kennedy Rd & Highway 7	78	131.5	95	47.2	43	121.8	87	25.2	111	97.3	100	115.8
Kennedy Rd & Avoca Dr	-	-	-	-	20	17.1	-	-	100	36.3	60	18.1
Kennedy Rd & Unionville Gate	57	159.8	-	-	83	90.2	70		193	162.5	35	30.3
Kennedy Rd & Helen Ave/YMCA Blvd	135	45.4	-	-	132	36.6	-	-	77	129.9	96	10.4
Kennedy Rd & 407ETR WB Off-Ramp	-	-	-	-	-	-	-	-	-	-	-	-
Kennedy Rd & 407ETR EB Off-Ramp	-	-	-	-	-	-	-	-	-	-	-	-
Kennedy Rd & Duffield Dr	65	195.3	-	-	-	-	-	-	63	18.6	-	-
Kennedy Rd & 14th Ave	64	40.7	58	45.1	50	57.4	45		65	63.1	50	134.2
Kennedy Rd & Lee Ave	-	-	-	-	-	-	37	11.6	90	21.6	72	48.3
Kennedy Rd & Highglen Ave	32	11.9	-	-	53	27.3	-	-	75	3.3	90	46.0
Kennedy Rd & Denison St	60	120.8	-	-	48	43.9	-	-	150	33.3	80	172.8
Kennedy Rd & Gorvette Rd	-	-	-	-	-	-	-	-	71	19.7	71	10.8
Kennedy Rd & Clayton Dr	57	68.1	-	-	-	-	-	-	127	22.7	90	135.3
Kennedy Rd & Steeles Ave E	92	53.9	-	-	56	81.5	-	-	43	90.9	166	151.2

XX = 95th percentile queues exceed available storage

Queuing is particularly concentrated near the major-major intersections for exclusive turning movements, where queue spillover is anticipated which will potentially increase delays on the through movements. In order to improve corridor operations and prevent spill-over, adequate lengths for exclusive left-turn and right-turn storage bays are recommended in the critical locations identified in **Table 1-9** and **Table 1-10.** The final intersection design should consider Synchro 95th percentile queues; however, the storage design lengths are often constrained by available intersection spacing.

1.2.7 2041 Person Delays

The control delays at each signalized intersection were assessed using the Synchro models. For each turning movement, the control delays were multiplied by its peak hour traffic volume to determine the vehicle delays on an intersection level. The vehicle delays were then converted to person delays based on vehicle occupancy. The vehicle occupancy data was obtained from the 2016 Cordon Count Database. The nearest count location is Station 460 at Kennedy Road, north of Steeles Avenue.

The vehicle-delay and person-delay at each intersection are summarized in **Table 1-11**. Transit person-delays were not accounted in the person delay calculation in the table below due to the limited ridership data for the future scenario. The signal control delays per vehicle for each turning movement can be found in **Appendix A**. The control delays for the critical movements (delay greater than 55s) are illustrated in **Table 1-6**.

Table 1-11: Summary of Vehicle Delays and Person Delays

Intersection Name	Vehicle Delay (Vehicle - Hours)		Person Delay (Person - Hours)	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Major Mackenzie Dr	156	155	174	179
The Fairways	39	21	43	24
Bur Oak Ave	99	33	111	38
Wilfred Murison Ave	24	15	26	17
Beckett Ave	18	12	20	14
16th Ave	182	258	204	297
Birchview Ln	5	3	5	3
The Bridle Trail	16	20	18	23
Carlton Rd	111	99	124	114
Austin Rd	10	28	11	32
Highway 7	236	252	264	290
Avoca Ave	11	23	13	27
South Unionville Blvd	114	82	127	94
YMCA Blvd/Helen Ave	120	40	134	46
407ETR WB Off-Ramp	75	12	83	14
407ETR EB Off-Ramp	25	35	28	40
Duffield Dr	82	31	92	35
14th Ave	117	124	131	143
Lee Ave	12	16	14	19
Highglen Ave	38	15	42	17
Denison St	124	95	138	109

Intersection Name	Vehicle Delay (Vehicle - Hours)		Person Delay (Person - Hours)	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Gorvette Rd	33	20	37	23
Clayton Dr	18	43	20	49
Steeles Ave E	162	133	181	153
Total	**1825**	**1564**	**2039**	**1801**

1.3 Sensitivity Analysis

The following sub-section documents the sensitivity analysis carried out to determine the impacts of the recommendations proposed in Phase 1 of the study including 407ETR Interchange VISSIM Analysis.

1.3.1 407ETR Interchange VISSIM Analysis

VISSIM micro-simulation analysis was undertaken at the Kennedy Road/407ETR interchange to assess impacts to 407ETR users with and without dedicated Speed Change Lanes (SCL), in addition to the proposed improvements to the Kennedy Road EA study corridor (widening from four lanes to six lanes for Transit/HOV).

The analysis determined that there is negligible improvement to travel time, delay and level of service at each of the four on-ramps with dedicated speed change lanes in comparison to the scenario without dedicated speed change lanes. As such, dedicated speed change lanes at the Kennedy Road/407ETR interchange are not recommended based on traffic operations.

The detailed analysis is documented in *the Kennedy / 407 ETR Interchange VISSIM Analysis Memo.*

2. Public Feedback

Public comments related to traffic operations, signal timing, and safety concerns collected to-date were reviewed by York Region. The key comments and York Region's responses are summarized in **Table 2-1**.

Table 2-1: Summary of Comments and Responses

Issues	Comments	YR Response
AT Facilities	What is the ideal width for pedestrian and cyclist facilities?	This corridor is being designed in compliance with York Region's Design Guidelines which specify sidewalks to be a minimum width of 1.5 m. One-way cycle tracks should be a minimum width of 1.5 m with 0.3m buffer and ideal width of 2.0m. Multi-use paths should be a minimum width of 2.4 m and ideal width of 3.0 m.
AT Facilities	Is there a regional preference on AT facilities in terms of type of facility?	There is no current regional preference for type of AT facilities. Public preference as heard from the first Open House has been for cycle track and sidewalk. Multi-use paths are recommended throughout the corridor based on the available property and providing a continuous and dedicated pedestrian and cyclist facility throughout the corridor.

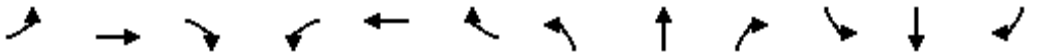
Issues	Comments	YR Response
AT Facilities	Preference for cycle tracks to be on roadway.	York Region Design Guidelines note that all AT facilities will be in-boulevard to maximize separation between vehicular traffic and pedestrians/cyclists.
AT Facilities	Are there any existing examples of the multi-use path and sidewalk combination currently in Markham?	Currently in Markham there are several locations where there are multi-use paths on one side and sidewalks on the other. Examples include Woodbine Avenue north of Major Mackenzie Drive, and Markham Road north of 16th Avenue.
AT Facilities	Inquiry on whether it is safer for the cyclists on the cycle track to travel in opposite direction from traffic?	Cycle tracks are uni-directional in the same direction of flow as traffic, and MUPs are bi-directional. It is currently not feasible to change the direction of movement for cyclists on cycle tracks since motorists are accustomed to looking left when exiting the driveways.
AT Facilities	What is the narrowest multi-use path that York Region would accept in this constrained section, and why not less?	The narrowest multi-use path would be 2.4 m for short stretches. Any dimension that is less cannot be classified as a cycling facility.
AT Facilities	If AT facilities were reduced to 1.8 m for this segment, AT could be considered for both sides with reduced general purpose and HOV lanes (3.2 m and 3.3 m, respectively).	As part of the recommended improvements from the Kennedy Road EA, vehicle lanes are recommended to be reduced to 3.0m for the GPL and 3.2m for the HOV lanes at this location to accommodate reduced 2.4m AT facilities.
AT Facilities	Cycling facility should be installed on the east side of Kennedy Road to serve the school.	Comment Noted. A Multi-Use Path is recommended to be installed on both sides.
Storage	Concern about storage lane lengths in the northbound direction at Duffield Drive. Property should be acquired from 7800 Kennedy Road to lengthen this lane if needed.	Further transportation analysis will be completed for the study corridor as a part of Phase 3 activities and will inform the storage lengths at intersections.
Connections	Miller Avenue should be extended to Kennedy Road north of the CN bridge crossing, as the connection to Duffield Drive will cause an increased amount of traffic onto Duffield Drive.	Comment noted. The Miller Avenue extension (Alignment K-1A) has been EA approved.
Connections	A horse-shoe connection should be considered at this location (Metrolinx GO Crossing north of Clayton) if there is difficulty tying back to the Pacific Mall accesses. An example of this is on 16th Avenue east of Yonge Street.	Since the second Open House, Metrolinx has initiated the GO Stouffville Expansion Study (formerly the RER) in 2018. Please refer to the Metrolinx study for the final recommendation at this location.
Safety	There should be a physical barrier separation from buses at this location (Hagerman Cemeteries) due to the lack of separation between vehicular traffic and pedestrians/cyclists.	Comment Noted. Barrier separation will be explored and presented on the recommended plan if feasible.
Safety	Vehicle lanes should not be narrowed in this segment (Hagerman Cemeteries) as there are a high volume of trucks that frequent this segment of Kennedy Road.	Comment Noted. As part of the recommended improvements from the Kennedy Road EA, vehicle lanes are recommended to be reduced at this location in order to accommodate AT facilities with reduced width (2.4m), which is within Canadian and Provincial standards for lane widths.
Safety	Preference to maintain the centre-left turn lane for residents and businesses on the east side of Kennedy Road.	A centre median island is proposed to minimize conflict points with left-turning vehicles at unsignalized intersections. U-turns are permitted at signalized intersections.

3. Summary of Recommendations

The following recommendations are carried forward for consideration in the preferred design for Kennedy Road between Steeles Avenue and Major Mackenzie Drive, to accommodate the widening to six lanes for Transit/HOV and continuous active transportation improvements. Implementation of these improvements are subject to review of design constraints and geometric feasibility:

- Provide continuous space, high level of comfort, and minimize risk of collisions between pedestrians and cyclists through wide Multi-Use Path;
- Maximize separation of AT facilities and vehicular traffic;
- Delineate AT crossings at intersections with crosswalks for pedestrians and cross-rides for cyclists;
- Pedestrian/cyclist railings proposed on structures;
- New traffic signals at Wilfred Murison Avenue;
- Convert all commercial entrances/exits that currently operate under stop control along Kennedy Road within the study area to Right-in, Right-out (RIRO);
- Exclusive left-turn storage bays at signalized intersections to accommodate adequate storage where geometrically feasible;
- No dedicated speed change lanes at the Kennedy Road/407ETR interchange and accommodate Transit/HOV lane and two general purpose lane in each direction through the interchange;
- Review and adjust signal timings and optimization throughout the corridor regularly and when Kennedy Road improvements are implemented.

Appendix A – Synchro Reports

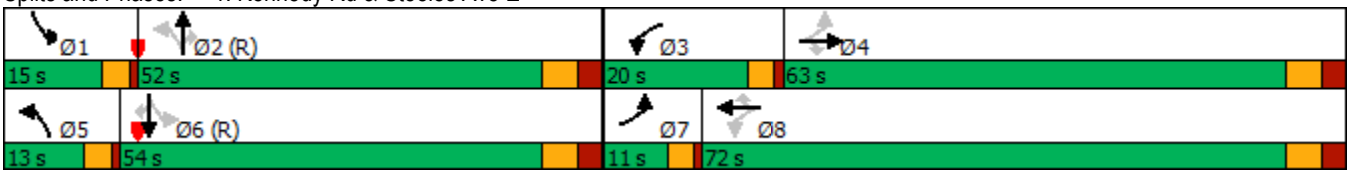


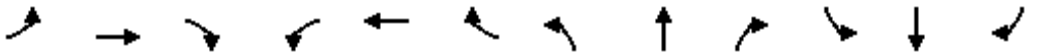
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	763	196	189	1762	259	226	805	72	226	1099	147
Future Volume (vph)	150	763	196	189	1762	259	226	805	72	226	1099	147
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	92.0		0.0	56.0		0.0	43.0		25.0	166.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1789	3476	1555	1722	3510	1541	1706	3544	1458	1789	3202	1585
Flt Permitted	0.071			0.202			0.089			0.128		
Satd. Flow (perm)	134	3476	1430	360	3510	1381	160	3544	1369	239	3202	1522
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			204			130			116			116
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		438.0			403.1			543.5			456.9	
Travel Time (s)		26.3			24.2			32.6			27.4	
Confl. Peds. (#/hr)	102		76	76		102	27		48	48		27
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	2%	5%	5%	6%	4%	6%	7%	3%	12%	2%	2%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	156	795	204	197	1835	270	235	839	75	235	1145	153
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Minimum Split (s)	11.0	56.0	56.0	11.0	56.0	56.0	11.0	50.0	50.0	11.0	50.0	50.0
Total Split (s)	11.0	63.0	63.0	20.0	72.0	72.0	13.0	52.0	52.0	15.0	54.0	54.0
Total Split (%)	7.3%	42.0%	42.0%	13.3%	48.0%	48.0%	8.7%	34.7%	34.7%	10.0%	36.0%	36.0%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	1.0	3.0	3.0	1.0	3.0	3.0	1.0	3.0	3.0	1.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	7.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Act Effct Green (s)	66.0	56.0	56.0	79.0	65.0	65.0	57.0	45.0	45.0	61.0	47.0	47.0
Actuated g/C Ratio	0.44	0.37	0.37	0.53	0.43	0.43	0.38	0.30	0.30	0.41	0.31	0.31
v/c Ratio	1.15	0.61	0.31	0.59	1.21	0.40	1.54	0.79	0.15	1.12	1.14	0.28
Control Delay	153.1	40.7	5.1	26.7	137.1	16.3	298.2	54.5	1.9	128.6	121.7	12.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	153.1	40.7	5.1	26.7	137.1	16.3	298.2	54.5	1.9	128.6	121.7	12.4
LOS	F	D	A	C	F	B	F	D	A	F	F	B
Approach Delay		49.6			113.5			100.9			111.9	
Approach LOS		D			F			F			F	
Queue Length 50th (m)	~37.7	100.7	0.0	30.5	~348.7	27.0	~82.1	120.9	0.0	~54.6	~233.3	7.8
Queue Length 95th (m)	#84.6	122.4	16.4	45.7	#389.9	50.2	#137.0	145.8	3.2	#109.9	#280.8	25.3
Internal Link Dist (m)		414.0			379.1			519.5			432.9	
Turn Bay Length (m)	92.0			56.0			43.0		25.0	166.0		
Base Capacity (vph)	136	1297	661	334	1521	672	153	1063	491	210	1003	556
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Reduced v/c Ratio	1.15	0.61	0.31	0.59	1.21	0.40	1.54	0.79	0.15	1.12	1.14	0.28

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 150			
Control Type: Pretimed			
Maximum v/c Ratio: 1.54			
Intersection Signal Delay: 98.7		Intersection LOS: F	
Intersection Capacity Utilization 123.7%		ICU Level of Service H	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: Kennedy Rd & Steeles Ave E





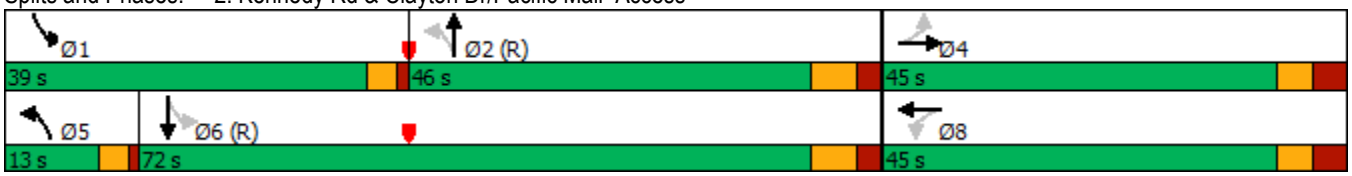
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	115	55	181	48	22	43	162	1015	46	361	1383	127
Future Volume (vph)	115	55	181	48	22	43	162	1015	46	361	1383	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	57.0		0.0	0.0		0.0	127.0		0.0	90.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1772	1582	0	1825	1606	0	1772	4630	0	1789	4631	0
Flt Permitted	0.713			0.335			0.126			0.165		
Satd. Flow (perm)	1302	1582	0	625	1606	0	234	4630	0	310	4631	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		130			45			5			15	
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		148.7			168.9			456.9			558.1	
Travel Time (s)		13.4			15.2			27.4			33.5	
Confl. Peds. (#/hr)	21		40	40		21	25		15	15		25
Confl. Bikes (#/hr)			2	2			2		3	3		2
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	3%	2%	3%	0%	0%	8%	3%	5%	3%	2%	4%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	120	246	0	50	68	0	169	1105	0	376	1573	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	30.0		7.0	30.0	
Minimum Split (s)	42.0	42.0		42.0	42.0		11.0	37.0		11.0	37.0	
Total Split (s)	45.0	45.0		45.0	45.0		13.0	46.0		39.0	72.0	
Total Split (%)	34.6%	34.6%		34.6%	34.6%		10.0%	35.4%		30.0%	55.4%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.0	4.5		3.0	4.5	
All-Red Time (s)	3.5	3.5		3.5	3.5		1.0	2.5		1.0	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.0	7.0		7.0	7.0		4.0	7.0		4.0	7.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effct Green (s)	22.4	22.4		22.4	22.4		76.4	63.2		96.6	79.4	
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.59	0.49		0.74	0.61	
v/c Ratio	0.54	0.65		0.47	0.22		0.66	0.49		0.71	0.56	
Control Delay	55.3	29.4		58.5	18.3		32.3	26.9		33.1	6.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	55.3	29.4		58.5	18.3		32.3	26.9		33.1	6.0	
LOS	E	C		E	B		C	C		C	A	
Approach Delay		37.9			35.3			27.6			11.2	
Approach LOS		D			D			C			B	
Queue Length 50th (m)	29.8	29.0		12.2	5.3		8.8	66.4		54.0	20.2	
Queue Length 95th (m)	42.9	49.4		22.4	15.8		#49.4	118.4		m42.7	m20.3	
Internal Link Dist (m)		124.7			144.9			432.9			534.1	

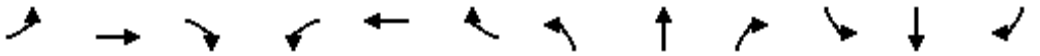
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)	57.0						127.0			90.0		
Base Capacity (vph)	380	554		182	501		261	2251		632	2833	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.32	0.44		0.27	0.14		0.65	0.49		0.59	0.56	

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 33 (25%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.71
Intersection Signal Delay: 20.3 Intersection LOS: C
Intersection Capacity Utilization 99.9% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Kennedy Rd & Clayton Dr/Pacific Mall Access





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	3	50	237	25	33	94	1145	44	6	1591	61
Future Volume (vph)	29	3	50	237	25	33	94	1145	44	6	1591	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	71.0		0.0	71.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1825	1614	0	1789	1721	0	1738	4647	0	1789	4703	0
Flt Permitted	0.950			0.715			0.068			0.127		
Satd. Flow (perm)	1816	1614	0	1347	1721	0	124	4647	0	239	4703	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		62			36			4			4	
Link Speed (k/h)		50			48			60			60	
Link Distance (m)		180.2			153.9			558.1			243.2	
Travel Time (s)		13.0			11.5			33.5			14.6	
Confl. Peds. (#/hr)	4		6				54					54
Confl. Bikes (#/hr)							3					3
Peak Hour Factor	0.81	0.92	0.81	0.92	0.92	0.92	0.81	0.81	0.92	0.92	0.81	0.81
Heavy Vehicles (%)	0%	2%	0%	2%	2%	2%	5%	5%	2%	2%	3%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	36	65	0	258	63	0	116	1462	0	7	2039	0
Turn Type	Split	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases	4	4			8		1	6			2	
Permitted Phases				8			6			2		
Detector Phase	4	4		8	8		1	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	30.0		30.0	30.0	
Minimum Split (s)	37.0	37.0		37.0	37.0		11.0	37.0		37.0	37.0	
Total Split (s)	37.0	37.0		37.0	37.0		11.0	56.0		45.0	45.0	
Total Split (%)	28.5%	28.5%		28.5%	28.5%		8.5%	43.1%		34.6%	34.6%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.0	4.5		4.5	4.5	
All-Red Time (s)	3.5	3.5		3.5	3.5		1.0	2.5		2.5	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.0	7.0		7.0	7.0		4.0	7.0		7.0	7.0	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		C-Max	C-Max	
Act Effct Green (s)	14.0	14.0		28.9	28.9		72.5	69.5		56.4	56.4	
Actuated g/C Ratio	0.11	0.11		0.22	0.22		0.56	0.53		0.43	0.43	
v/c Ratio	0.18	0.28		0.86	0.15		0.64	0.59		0.07	1.00	
Control Delay	51.9	14.9		74.7	20.7		37.2	28.8		30.3	38.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	51.9	14.9		74.7	20.7		37.2	28.8		30.3	38.7	
LOS	D	B		E	C		D	C		C	D	
Approach Delay		28.1			64.1			29.4			38.7	
Approach LOS		C			E			C			D	
Queue Length 50th (m)	8.9	0.7		62.5	5.4		20.6	131.9		0.8	~217.9	
Queue Length 95th (m)	14.7	12.4		#107.3	17.3		#42.3	149.7		m0.6	m#209.3	
Internal Link Dist (m)		156.2			129.9			534.1			219.2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)							71.0			71.0		
Base Capacity (vph)	421	420		323	440		182	2484		103	2041	
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	0.09	0.15		0.80	0.14		0.64	0.59		0.07	1.00	

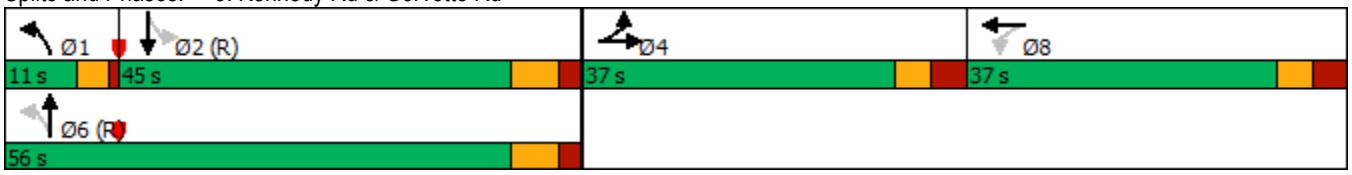
Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 110 (85%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green			
Natural Cycle: 145			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.00			
Intersection Signal Delay: 36.8		Intersection LOS: D	
Intersection Capacity Utilization 87.3%		ICU Level of Service E	
Analysis Period (min) 15			

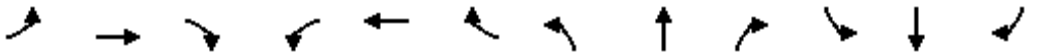
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

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

Splits and Phases: 3: Kennedy Rd & Gorvette Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	175	325	58	129	742	231	118	1005	60	360	1522	430
Future Volume (vph)	175	325	58	129	742	231	118	1005	60	360	1522	430
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	60.0		0.0	48.0		0.0	150.0		0.0	80.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1825	3368	0	1807	3317	0	1772	4608	0	1789	4499	0
Flt Permitted	0.116			0.352			0.104			0.094		
Satd. Flow (perm)	223	3368	0	654	3317	0	194	4608	0	177	4499	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			32			7			63	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		322.0			182.9			243.2			339.7	
Travel Time (s)		23.2			13.2			14.6			20.4	
Confl. Peds. (#/hr)	86		44	44		86	83		67	67		83
Confl. Bikes (#/hr)							1					1
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles (%)	0%	5%	4%	1%	2%	7%	3%	5%	0%	2%	3%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	216	473	0	159	1201	0	146	1315	0	444	2410	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6			2		
Detector Phase	7	4		3	8		1	6		5	2	
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0	30.0		7.0	30.0	
Minimum Split (s)	11.0	39.5		11.0	39.5		11.0	37.5		11.0	37.5	
Total Split (s)	11.0	42.0		13.0	44.0		11.0	46.0		29.0	64.0	
Total Split (%)	8.5%	32.3%		10.0%	33.8%		8.5%	35.4%		22.3%	49.2%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.5		3.0	4.5	
All-Red Time (s)	1.0	3.5		1.0	3.5		1.0	3.0		1.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	7.5		4.0	7.5		4.0	7.5		4.0	7.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effct Green (s)	45.0	34.5		49.0	36.5		49.0	38.5		71.0	56.5	
Actuated g/C Ratio	0.35	0.27		0.38	0.28		0.38	0.30		0.55	0.43	
v/c Ratio	1.33	0.52		0.49	1.26		0.92	0.96		1.09	1.21	
Control Delay	210.7	41.8		32.3	163.3		100.7	40.3		101.7	118.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	210.7	41.8		32.3	163.3		100.7	40.3		101.7	118.6	
LOS	F	D		C	F		F	D		F	F	
Approach Delay		94.7			148.0			46.3			115.9	
Approach LOS		F			F			D			F	
Queue Length 50th (m)	~53.3	52.8		26.9	~200.5		27.4	138.9		~108.4	~287.2	
Queue Length 95th (m)	#87.5	61.3		38.0	#204.7		#50.8	62.4		m#127.3	#262.9	
Internal Link Dist (m)		298.0			158.9			219.2			315.7	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)	60.0			48.0			150.0			80.0		
Base Capacity (vph)	163	905		326	954		158	1369		406	1990	
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	1.33	0.52		0.49	1.26		0.92	0.96		1.09	1.21	

Intersection Summary

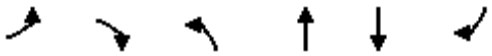
Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 114 (88%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.33
Intersection Signal Delay: 104.5 Intersection LOS: F
Intersection Capacity Utilization 104.8% ICU Level of Service G
Analysis Period (min) 15

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

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

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

Splits and Phases: 4: Kennedy Rd & Denison St/Dennison St



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	25	0	1414	2083	20
Future Volume (vph)	0	25	0	1414	2083	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	1662	0	4899	4894	0
Flt Permitted						
Satd. Flow (perm)	0	1662	0	4899	4894	0
Link Speed (k/h)	50			60	60	
Link Distance (m)	82.2			339.7	142.9	
Travel Time (s)	5.9			20.4	8.6	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	31	0	1746	2597	0
Sign Control	Yield			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	50.7%	ICU Level of Service	A
Analysis Period (min)	15		

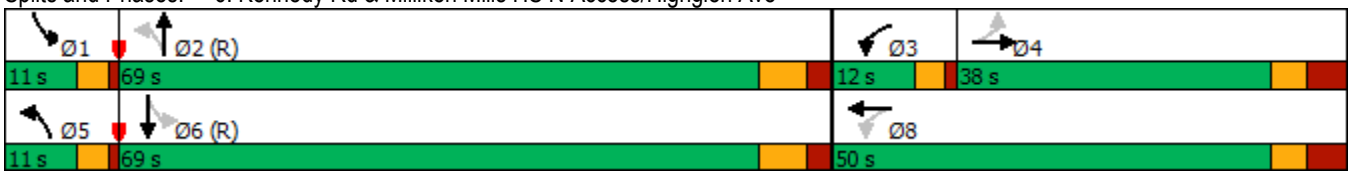
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	39	106	52	206	185	171	112	1294	21	34	1823	24
Future Volume (vph)	39	106	52	206	185	171	112	1294	21	34	1823	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	32.0		0.0	53.0		0.0	75.0		0.0	90.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1825	1795	0	1807	1748	0	1825	4651	0	1825	4697	0
Flt Permitted	0.267			0.415			0.057			0.084		
Satd. Flow (perm)	512	1795	0	768	1748	0	110	4651	0	161	4697	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		18			38			2			2	
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		183.2			282.0			142.9			266.6	
Travel Time (s)		16.5			25.4			8.6			16.0	
Confl. Peds. (#/hr)	4		32	32		4	35		9	9		35
Confl. Bikes (#/hr)	5		1	1		5	1		2	2		1
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	0%	5%	8%	0%	4%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	48	195	0	254	439	0	138	1624	0	42	2281	0
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		7.0	10.0		7.0	30.0		7.0	30.0	
Minimum Split (s)	37.5	37.5		11.0	37.5		11.0	37.0		11.0	37.0	
Total Split (s)	38.0	38.0		12.0	50.0		11.0	69.0		11.0	69.0	
Total Split (%)	29.2%	29.2%		9.2%	38.5%		8.5%	53.1%		8.5%	53.1%	
Yellow Time (s)	3.5	3.5		3.0	3.5		3.0	4.5		3.0	4.5	
All-Red Time (s)	4.0	4.0		1.0	4.0		1.0	2.5		1.0	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.5	7.5		4.0	7.5		4.0	7.0		4.0	7.0	
Lead/Lag	Lag	Lag		Lead			Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes			Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effct Green (s)	23.3	23.3		38.8	35.3		81.7	71.3		77.1	67.0	
Actuated g/C Ratio	0.18	0.18		0.30	0.27		0.63	0.55		0.59	0.52	
v/c Ratio	0.53	0.58		0.87	0.87		0.73	0.64		0.23	0.94	
Control Delay	66.9	50.1		67.0	59.3		21.4	32.0		10.8	32.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	66.9	50.1		67.0	59.3		21.4	32.0		10.8	32.7	
LOS	E	D		E	E		C	C		B	C	
Approach Delay		53.4			62.1			31.2			32.3	
Approach LOS		D			E			C			C	
Queue Length 50th (m)	11.1	41.4		52.4	98.2		23.5	158.4		2.7	225.1	
Queue Length 95th (m)	20.7	54.5		63.6	111.3		m26.2	m150.0		m4.7	211.2	
Internal Link Dist (m)		159.2			258.0			118.9			242.6	

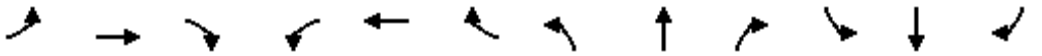
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)	32.0			53.0			75.0			90.0		
Base Capacity (vph)	120	434		293	597		189	2553		185	2423	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.40	0.45		0.87	0.74		0.73	0.64		0.23	0.94	

Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 62 (48%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 120			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.94			
Intersection Signal Delay: 37.0		Intersection LOS: D	
Intersection Capacity Utilization 93.0%		ICU Level of Service F	
Analysis Period (min) 15			

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

Splits and Phases: 6: Kennedy Rd & Milliken Mills HS N Access/Highglen Ave





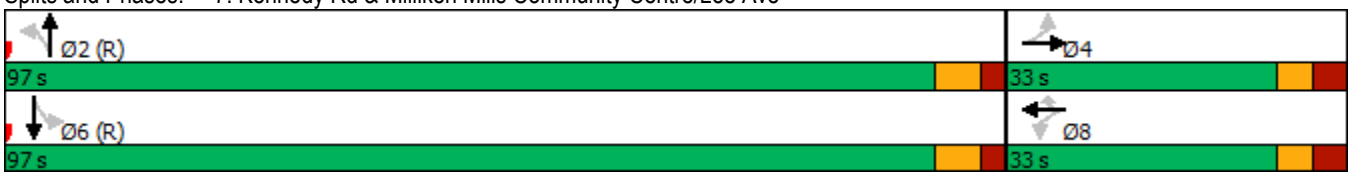
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	59	7	81	30	42	213	64	1362	13	22	1849	117
Future Volume (vph)	59	7	81	30	42	213	64	1362	13	22	1849	117
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		37.0	90.0		0.0	72.0		0.0
Storage Lanes	1		0	0		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1755	1633	0	0	1883	1633	1825	4706	0	1722	4666	0
Flt Permitted	0.706				0.824		0.054			0.132		
Satd. Flow (perm)	1299	1633	0	0	1581	1606	104	4706	0	239	4666	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		20				62		2			16	
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		87.8			315.9			266.6			285.1	
Travel Time (s)		7.9			28.4			16.0			17.1	
Confl. Peds. (#/hr)	3		2	2		3	6		2	2		6
Confl. Bikes (#/hr)									3	3		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%	0%	4%	0%	6%	4%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	64	96	0	0	79	232	70	1494	0	24	2137	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	30.0	30.0		30.0	30.0	
Minimum Split (s)	33.0	33.0		33.0	33.0	33.0	37.0	37.0		37.0	37.0	
Total Split (s)	33.0	33.0		33.0	33.0	33.0	97.0	97.0		97.0	97.0	
Total Split (%)	25.4%	25.4%		25.4%	25.4%	25.4%	74.6%	74.6%		74.6%	74.6%	
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	4.5	4.5		4.5	4.5	
All-Red Time (s)	3.5	3.5		3.5	3.5	3.5	2.5	2.5		2.5	2.5	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.0	7.0			7.0	7.0	7.0	7.0		7.0	7.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None	None	C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	19.1	19.1			19.1	19.1	96.9	96.9		96.9	96.9	
Actuated g/C Ratio	0.15	0.15			0.15	0.15	0.75	0.75		0.75	0.75	
v/c Ratio	0.34	0.37			0.34	0.80	0.91	0.43		0.13	0.61	
Control Delay	52.6	41.9			52.0	58.9	94.9	1.6		8.1	9.3	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	52.6	41.9			52.0	58.9	94.9	1.6		8.1	9.3	
LOS	D	D			D	E	F	A		A	A	
Approach Delay		46.2			57.2			5.7			9.3	
Approach LOS		D			E			A			A	
Queue Length 50th (m)	14.9	17.6			18.4	42.9	7.2	14.4		1.6	88.9	
Queue Length 95th (m)	27.4	32.6			31.8	68.2	m#40.0	15.6		5.6	124.8	
Internal Link Dist (m)		63.8			291.9			242.6			261.1	

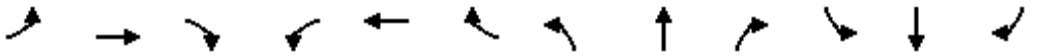
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)						37.0	90.0			72.0		
Base Capacity (vph)	259	342			316	370	77	3507		178	3481	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.25	0.28			0.25	0.63	0.91	0.43		0.13	0.61	

Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 46 (35%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.91			
Intersection Signal Delay: 12.9		Intersection LOS: B	
Intersection Capacity Utilization 76.4%		ICU Level of Service D	
Analysis Period (min) 15			

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Kennedy Rd & Milliken Mills Community Centre/Lee Ave





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	94	566	162	223	1199	315	207	1295	128	211	1695	141
Future Volume (vph)	94	566	162	223	1199	315	207	1295	128	211	1695	141
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	64.0		58.0	50.0		45.0	65.0		0.0	50.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1755	3510	1585	1789	3614	1585	1738	4645	0	1789	4638	0
Flt Permitted	0.108			0.223			0.078			0.072		
Satd. Flow (perm)	199	3510	1548	419	3614	1548	143	4645	0	136	4638	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			163			130		12			10	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		504.0			494.8			285.1			290.2	
Travel Time (s)		36.3			35.6			17.1			17.4	
Confl. Peds. (#/hr)	8		9	9		8	28		14	14		28
Confl. Bikes (#/hr)	2					2						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	4%	3%	2%	1%	3%	5%	4%	2%	2%	4%	4%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	102	615	176	242	1303	342	225	1547	0	229	1995	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8		8	6			2		
Detector Phase	7	4	4	3	8	8	1	6		5	2	
Switch Phase												
Minimum Initial (s)	7.0	20.0	20.0	7.0	20.0	20.0	7.0	20.0		7.0	20.0	
Minimum Split (s)	11.0	39.5	39.5	11.0	39.5	39.5	11.0	41.5		11.0	41.5	
Total Split (s)	11.0	44.0	44.0	19.0	52.0	52.0	14.0	59.0		18.0	63.0	
Total Split (%)	7.9%	31.4%	31.4%	13.6%	37.1%	37.1%	10.0%	42.1%		12.9%	45.0%	
Yellow Time (s)	3.0	4.5	4.5	3.0	4.5	4.5	3.0	4.5		3.0	4.5	
All-Red Time (s)	1.0	3.0	3.0	1.0	3.0	3.0	1.0	3.0		1.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5		4.0	7.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Act Effct Green (s)	47.4	36.9	36.9	59.0	44.5	44.5	65.0	51.5		73.0	55.5	
Actuated g/C Ratio	0.34	0.26	0.26	0.42	0.32	0.32	0.46	0.37		0.52	0.40	
v/c Ratio	0.70	0.66	0.33	0.76	1.14	0.59	1.25	0.90		0.97	1.08	
Control Delay	53.3	50.2	9.1	44.0	115.1	28.8	181.0	49.9		74.2	66.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	53.3	50.2	9.1	44.0	115.1	28.8	181.0	49.9		74.2	66.6	
LOS	D	D	A	D	F	C	F	D		E	E	
Approach Delay		42.5			90.4			66.5			67.4	
Approach LOS		D			F			E			E	
Queue Length 50th (m)	17.1	80.7	2.7	44.3	~220.3	49.3	~61.2	157.0		50.4	~236.2	
Queue Length 95th (m)	#37.4	101.5	21.0	#69.2	#262.8	81.6	#113.7	179.7		m39.0	m108.4	
Internal Link Dist (m)		480.0			470.8			261.1			266.2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)	64.0		58.0	50.0		45.0	65.0			50.0		
Base Capacity (vph)	145	926	528	323	1148	580	180	1716		236	1844	
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	0.70	0.66	0.33	0.75	1.14	0.59	1.25	0.90		0.97	1.08	

Intersection Summary

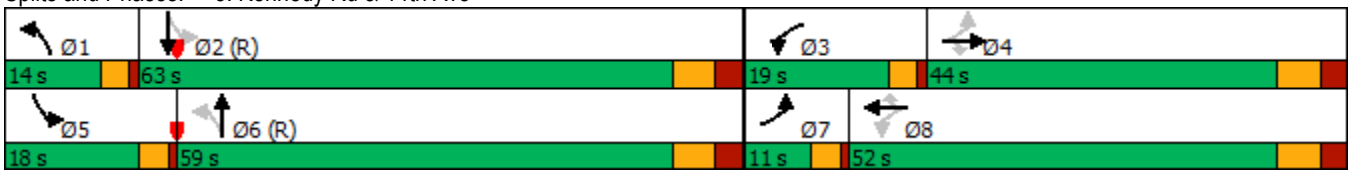
Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 31 (22%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.25
Intersection Signal Delay: 70.3 Intersection LOS: E
Intersection Capacity Utilization 105.7% ICU Level of Service G
Analysis Period (min) 15

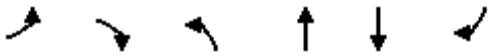
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

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

Splits and Phases: 8: Kennedy Rd & 14th Ave



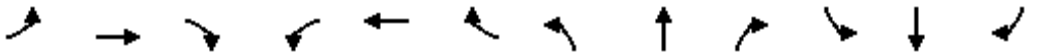


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø8
Lane Configurations							
Traffic Volume (vph)	88	94	338	1366	1953	893	
Future Volume (vph)	88	94	338	1366	1953	893	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	65.0	0.0	63.0			0.0	
Storage Lanes	1	1	1			0	
Taper Length (m)	2.5		2.5				
Satd. Flow (prot)	1738	1471	1738	4710	4518	0	
Flt Permitted	0.950		0.050				
Satd. Flow (perm)	1730	1443	91	4710	4518	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)		102			127		
Link Speed (k/h)	50			60	60		
Link Distance (m)	324.2			290.2	340.2		
Travel Time (s)	23.3			17.4	20.4		
Confl. Peds. (#/hr)	3	5	4			4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	5%	11%	5%	4%	3%	1%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	96	102	367	1485	3094	0	
Turn Type	Prot	Perm	pm+pt	NA	NA		
Protected Phases	4		1	6	2		8
Permitted Phases		4	6				
Detector Phase	4	4	1	6	2		
Switch Phase							
Minimum Initial (s)	10.0	10.0	5.0	40.0	40.0		10.0
Minimum Split (s)	35.0	35.0	9.5	47.0	47.0		35.0
Total Split (s)	35.0	35.0	23.0	105.0	82.0		35.0
Total Split (%)	25.0%	25.0%	16.4%	75.0%	58.6%		25%
Yellow Time (s)	3.5	3.5	3.5	4.5	4.5		3.5
All-Red Time (s)	3.5	3.5	1.0	2.5	2.5		3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	7.0	7.0	4.5	7.0	7.0		
Lead/Lag			Lead		Lag		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None	None	None	C-Max	C-Max		None
Act Effct Green (s)	15.4	15.4	113.1	110.6	75.0		
Actuated g/C Ratio	0.11	0.11	0.81	0.79	0.54		
v/c Ratio	0.50	0.41	0.84	0.40	1.25		
Control Delay	66.1	14.0	51.0	6.1	134.6		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	66.1	14.0	51.0	6.1	134.6		
LOS	E	B	D	A	F		
Approach Delay	39.3			15.0	134.6		
Approach LOS	D			B	F		
Queue Length 50th (m)	26.0	0.0	90.8	36.1	~412.1		
Queue Length 95th (m)	39.5	15.2	m#148.8	68.0	#434.1		
Internal Link Dist (m)	300.2			266.2	316.2		
Turn Bay Length (m)	65.0		63.0				

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø8
Base Capacity (vph)	347	370	438	3719	2479		
Starvation Cap Reductn	0	0	0	0	0		
Spillback Cap Reductn	0	0	0	0	0		
Storage Cap Reductn	0	0	0	0	0		
Reduced v/c Ratio	0.28	0.28	0.84	0.40	1.25		

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 10 (7%), Referenced to phase 2:SBT and 6:NBTL, Start of Green			
Natural Cycle: 145			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.25			
Intersection Signal Delay: 87.9		Intersection LOS: F	
Intersection Capacity Utilization 102.6%		ICU Level of Service G	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 9: Kennedy Rd & Duffield Dr



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	350	0	246	0	0	0	0	1377	48	0	2600	215
Future Volume (vph)	350	0	246	0	0	0	0	1377	48	0	2600	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	1548	1461	1477	0	0	0	0	4684	0	0	4747	0
Flt Permitted	0.950	0.966										
Satd. Flow (perm)	1548	1461	1452	0	0	0	0	4684	0	0	4747	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		35	35					6			17	
Link Speed (k/h)		60			48			60			60	
Link Distance (m)		436.7			245.1			340.2			345.9	
Travel Time (s)		26.2			18.4			20.4			20.8	
Confl. Peds. (#/hr)			3	3			3					3
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	12%	0%	5%	0%	0%	0%	0%	4%	6%	0%	2%	0%
Shared Lane Traffic (%)	41%		24%									
Lane Group Flow (vph)	227	223	205	0	0	0	0	1566	0	0	3093	0
Turn Type	Split	NA	Perm					NA			NA	
Protected Phases	4	4						6			2	
Permitted Phases			4									
Detector Phase	4	4	4					6			2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					15.0			15.0	
Minimum Split (s)	31.5	31.5	31.5					34.5			34.5	
Total Split (s)	45.0	45.0	45.0					95.0			95.0	
Total Split (%)	32.1%	32.1%	32.1%					67.9%			67.9%	
Yellow Time (s)	4.5	4.5	4.5					4.5			4.5	
All-Red Time (s)	2.0	2.0	2.0					3.0			3.0	
Lost Time Adjust (s)	0.0	0.0	0.0					0.0			0.0	
Total Lost Time (s)	6.5	6.5	6.5					7.5			7.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None					C-Max			C-Max	
Act Effct Green (s)	27.0	27.0	27.0					99.0			99.0	
Actuated g/C Ratio	0.19	0.19	0.19					0.71			0.71	
v/c Ratio	0.76	0.72	0.67					0.47			0.92	
Control Delay	69.1	56.9	52.8					20.5			9.1	
Queue Delay	0.0	0.0	0.0					0.0			0.0	
Total Delay	69.1	56.9	52.8					20.5			9.1	
LOS	E	E	D					C			A	
Approach Delay		59.8						20.5			9.1	
Approach LOS		E						C			A	
Queue Length 50th (m)	63.3	54.6	46.6					90.8			51.0	
Queue Length 95th (m)	86.5	79.3	68.9					86.9			m45.8	
Internal Link Dist (m)		412.7			221.1			316.2			321.9	
Turn Bay Length (m)												
Base Capacity (vph)	425	427	424					3314			3362	
Starvation Cap Reductn	0	0	0					0			0	
Spillback Cap Reductn	0	0	0					0			0	

Lane Group	Ø8
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (k/h)	
Link Distance (m)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	8
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	10.0
Minimum Split (s)	31.5
Total Split (s)	45.0
Total Split (%)	32%
Yellow Time (s)	4.5
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0					0			0	
Reduced v/c Ratio	0.53	0.52	0.48					0.47			0.92	

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 130 (93%), Referenced to phase 2:SBT and 6:NBT, Start of Green			
Natural Cycle: 110			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.92			
Intersection Signal Delay: 18.7		Intersection LOS: B	
Intersection Capacity Utilization 79.8%		ICU Level of Service D	
Analysis Period (min) 15			

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

Splits and Phases: 10: Kennedy Rd & 407 EB Off-Ramp

Lane Group	Ø8
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

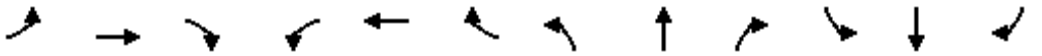
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	412	0	500	0	1380	347	0	2403	407
Future Volume (vph)	0	0	0	412	0	500	0	1380	347	0	2403	407
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	0	0	1700	1514	1521	0	4540	0	0	4671	0
Flt Permitted				0.950	0.985							
Satd. Flow (perm)	0	0	0	1700	1514	1521	0	4540	0	0	4671	0
Right Turn on Red			Yes			Yes			Yes			No
Satd. Flow (RTOR)					39	39		68				
Link Speed (k/h)		48			60			60			60	
Link Distance (m)		370.0			404.8			345.9			162.6	
Travel Time (s)		27.8			24.3			20.8			9.8	
Confl. Peds. (#/hr)									5	5		
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	0%	0%	0%	2%	0%	2%	0%	5%	0%	0%	3%	0%
Shared Lane Traffic (%)				23%		42%						
Lane Group Flow (vph)	0	0	0	382	367	349	0	2081	0	0	3385	0
Turn Type				Split	NA	Perm		NA			NA	
Protected Phases				8	8			6			2	
Permitted Phases						8						
Detector Phase				8	8	8		6			2	
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0		30.0			30.0	
Minimum Split (s)				32.5	32.5	32.5		38.0			38.0	
Total Split (s)				48.0	48.0	48.0		92.0			92.0	
Total Split (%)				34.3%	34.3%	34.3%		65.7%			65.7%	
Yellow Time (s)				4.5	4.5	4.5		4.5			4.5	
All-Red Time (s)				2.0	2.0	2.0		3.5			3.5	
Lost Time Adjust (s)				0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)				6.5	6.5	6.5		8.0			8.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode				None	None	None		C-Max			C-Max	
Act Effct Green (s)				37.2	37.2	37.2		88.3			88.3	
Actuated g/C Ratio				0.27	0.27	0.27		0.63			0.63	
v/c Ratio				0.85	0.85	0.81		0.72			1.15	
Control Delay				66.1	62.0	57.1		7.2			84.3	
Queue Delay				0.0	0.0	0.0		0.0			0.3	
Total Delay				66.1	62.0	57.1		7.2			84.6	
LOS				E	E	E		A			F	
Approach Delay					61.9			7.2			84.6	
Approach LOS					E			A			F	
Queue Length 50th (m)				103.3	94.1	83.6		60.3			~443.6	
Queue Length 95th (m)				126.6	119.4	107.0		62.7			m303.6	
Internal Link Dist (m)		346.0			380.8			321.9			138.6	
Turn Bay Length (m)												
Base Capacity (vph)				503	476	478		2889			2946	
Starvation Cap Reductn				0	0	0		0			398	
Spillback Cap Reductn				0	0	0		14			0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn				0	0	0		0			0	
Reduced v/c Ratio				0.76	0.77	0.73		0.72			1.33	

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 108 (77%), Referenced to phase 2:SBT and 6:NBT, Start of Green			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.15			
Intersection Signal Delay: 56.3		Intersection LOS: E	
Intersection Capacity Utilization 84.1%		ICU Level of Service E	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: 407 WB Off-Ramp & Kennedy Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	115	26	326	253	99	15	200	1572	108	16	2241	308
Future Volume (vph)	115	26	326	253	99	15	200	1572	108	16	2241	308
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	135.0		0.0	132.0		0.0	77.0		0.0	96.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	2902	1484	0	1807	1814	0	1706	4663	0	1825	4649	0
Flt Permitted	0.680			0.136			0.060			0.093		
Satd. Flow (perm)	2075	1484	0	258	1814	0	108	4663	0	178	4649	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		152			5			11			21	
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		303.2			335.1			162.6			360.1	
Travel Time (s)		27.3			30.2			9.8			21.6	
Confl. Peds. (#/hr)	1		5	5		1			9	9		
Confl. Bikes (#/hr)	2					2						
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	22%	4%	10%	1%	2%	14%	7%	4%	0%	0%	3%	7%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	121	370	0	266	120	0	211	1769	0	17	2683	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		Perm	NA	
Protected Phases	7	4		3	8		1	6			2	
Permitted Phases	4			8			6			2		
Detector Phase	7	4		3	8		1	6		2	2	
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0	30.0		30.0	30.0	
Minimum Split (s)	11.5	38.5		11.5	38.5		11.5	40.0		40.0	40.0	
Total Split (s)	12.0	39.0		15.0	42.0		15.0	86.0		71.0	71.0	
Total Split (%)	8.6%	27.9%		10.7%	30.0%		10.7%	61.4%		50.7%	50.7%	
Yellow Time (s)	3.0	3.5		3.0	3.5		3.0	4.5		4.5	4.5	
All-Red Time (s)	1.0	4.0		1.0	4.0		1.0	3.5		3.5	3.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	7.5		4.0	7.5		4.0	8.0		8.0	8.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		C-Max	C-Max	
Act Effct Green (s)	37.7	26.4		44.0	29.5		87.1	83.1		63.2	63.2	
Actuated g/C Ratio	0.27	0.19		0.31	0.21		0.62	0.59		0.45	0.45	
v/c Ratio	0.20	0.92		1.32	0.31		0.85	0.64		0.21	1.27	
Control Delay	33.4	60.5		204.6	45.5		60.6	21.0		12.2	143.0	
Queue Delay	0.0	1.6		0.0	0.0		0.0	0.4		0.0	1.0	
Total Delay	33.4	62.2		204.6	45.5		60.6	21.4		12.2	144.0	
LOS	C	E		F	D		E	C		B	F	
Approach Delay		55.1			155.1			25.6			143.2	
Approach LOS		E			F			C			F	
Queue Length 50th (m)	11.9	61.8		~74.4	26.5		45.6	110.8		1.0	~361.6	
Queue Length 95th (m)	18.8	#109.7		#127.6	43.4		m#97.5	139.8		m1.0	m#270.6	
Internal Link Dist (m)		279.2			311.1			138.6			336.1	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)	135.0			132.0			77.0			96.0		
Base Capacity (vph)	608	451		202	450		248	2772		80	2110	
Starvation Cap Reductn	0	0		0	0		0	479		0	0	
Spillback Cap Reductn	0	19		0	0		0	0		0	590	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.20	0.86		1.32	0.27		0.85	0.77		0.21	1.77	

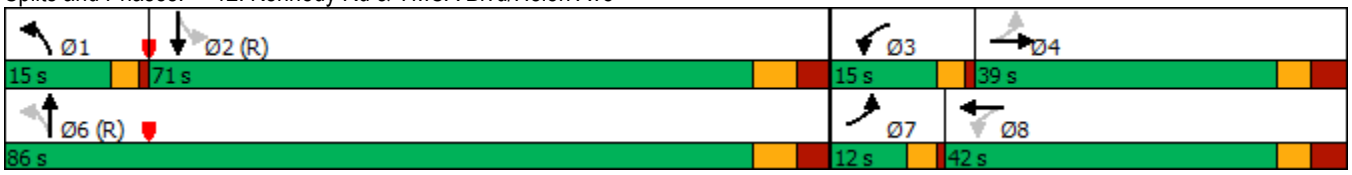
Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 102 (73%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green			
Natural Cycle: 145			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.32			
Intersection Signal Delay: 94.3		Intersection LOS: F	
Intersection Capacity Utilization 117.4%		ICU Level of Service H	
Analysis Period (min) 15			

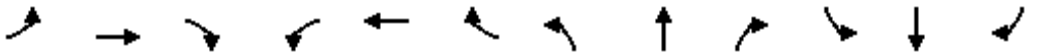
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

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

Splits and Phases: 12: Kennedy Rd & YMCA Blvd/Helen Ave



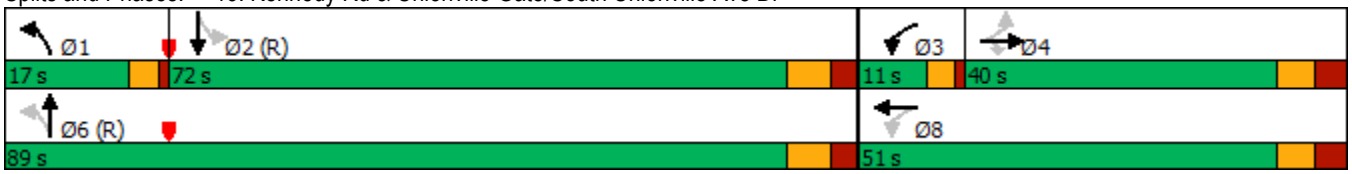


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	136	90	384	183	391	33	295	1223	59	18	2131	469
Future Volume (vph)	136	90	384	183	391	33	295	1223	59	18	2131	469
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	57.0		0.0	83.0		70.0	193.0		0.0	35.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1825	1883	1570	1807	3541	0	1755	4639	0	1825	4644	0
Flt Permitted	0.496			0.603			0.058			0.175		
Satd. Flow (perm)	953	1883	1570	1147	3541	0	107	4639	0	336	4644	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			200		6			8			41	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		264.4			158.5			360.1			256.8	
Travel Time (s)		19.0			11.4			21.6			15.4	
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	2%	4%	1%	2%	0%	4%	5%	0%	0%	3%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	142	94	400	191	441	0	307	1335	0	19	2709	0
Turn Type	Perm	NA	Perm	pm+pt	NA		pm+pt	NA		Perm	NA	
Protected Phases		4		3	8		1	6			2	
Permitted Phases	4		4	8			6			2		
Detector Phase	4	4	4	3	8		1	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	7.0	10.0		7.0	32.0		32.0	32.0	
Minimum Split (s)	39.5	39.5	39.5	11.0	39.5		11.0	39.5		39.5	39.5	
Total Split (s)	40.0	40.0	40.0	11.0	51.0		17.0	89.0		72.0	72.0	
Total Split (%)	28.6%	28.6%	28.6%	7.9%	36.4%		12.1%	63.6%		51.4%	51.4%	
Yellow Time (s)	4.0	4.0	4.0	3.0	4.0		3.0	4.5		4.5	4.5	
All-Red Time (s)	3.5	3.5	3.5	1.0	3.5		1.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.5	7.5	7.5	4.0	7.5		4.0	7.5		7.5	7.5	
Lead/Lag	Lag	Lag	Lag	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	
Act Effct Green (s)	25.8	25.8	25.8	40.3	36.8		91.7	88.2		64.5	64.5	
Actuated g/C Ratio	0.18	0.18	0.18	0.29	0.26		0.66	0.63		0.46	0.46	
v/c Ratio	0.81	0.27	0.88	0.53	0.47		1.02	0.46		0.12	1.25	
Control Delay	85.6	49.0	48.3	44.7	43.7		104.4	15.8		18.9	140.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	85.6	49.0	48.3	44.7	43.7		104.4	15.8		18.9	140.0	
LOS	F	D	D	D	D		F	B		B	F	
Approach Delay		56.7			44.0			32.4			139.1	
Approach LOS		E			D			C			F	
Queue Length 50th (m)	37.8	22.4	57.3	41.8	53.0		~80.1	66.2		1.5	~360.4	
Queue Length 95th (m)	60.2	37.0	94.6	59.6	65.3		#161.1	72.4		m2.8	#388.0	
Internal Link Dist (m)		240.4			134.5			336.1			232.8	
Turn Bay Length (m)	57.0			83.0			193.0			35.0		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	221	437	518	363	1104		301	2924		154	2161	
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	0.64	0.22	0.77	0.53	0.40		1.02	0.46		0.12	1.25	

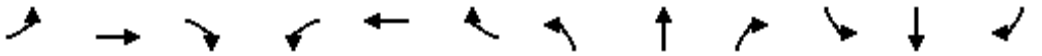
Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 81 (58%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green			
Natural Cycle: 145			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.25			
Intersection Signal Delay: 88.1		Intersection LOS: F	
Intersection Capacity Utilization 110.3%		ICU Level of Service H	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 13: Kennedy Rd & Unionville Gate/South Unionville Ave Dr



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	32	1260	76	48	2354
Future Volume (vph)	0	32	1260	76	48	2354
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	40.0	0.0		0.0	25.0	
Storage Lanes	0	1		0	1	
Taper Length (m)	2.5				2.5	
Satd. Flow (prot)	0	1662	4621	0	1825	4756
Flt Permitted					0.950	
Satd. Flow (perm)	0	1662	4621	0	1825	4756
Link Speed (k/h)	40		60			60
Link Distance (m)	247.2		256.8			188.8
Travel Time (s)	22.2		15.4			11.3
Confl. Peds. (#/hr)				4	4	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	5%	6%	0%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	33	1392	0	50	2452
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 48.8%		ICU Level of Service A	
Analysis Period (min) 15			



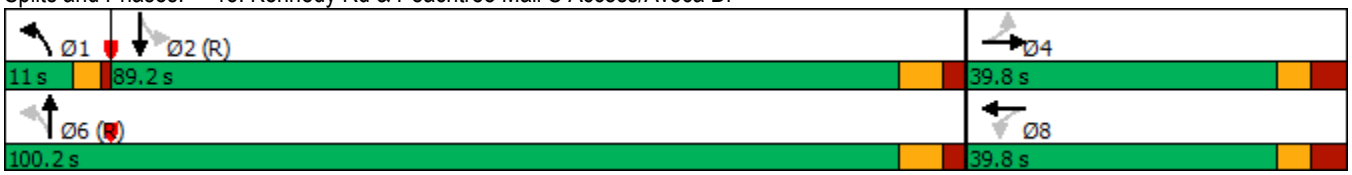
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	66	4	32	35	15	97	70	1187	6	37	2494	124
Future Volume (vph)	66	4	32	35	15	97	70	1187	6	37	2494	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	20.0		0.0	100.0		0.0	60.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1722	1640	0	1772	1626	0	1789	4617	0	1825	4723	0
Flt Permitted	0.647			0.733			0.039			0.200		
Satd. Flow (perm)	1153	1640	0	1362	1626	0	73	4617	0	383	4723	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		33			95			1			9	
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		109.6			410.4			188.8			150.5	
Travel Time (s)		9.9			36.9			11.3			9.0	
Confl. Peds. (#/hr)	15		3	3		15	3		8	8		3
Confl. Bikes (#/hr)							1					1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	6%	0%	0%	3%	0%	0%	2%	6%	0%	0%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	67	37	0	36	114	0	71	1217	0	38	2672	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		1	6			2	
Permitted Phases	4			8			6			2	2	
Detector Phase	4	4		8	8		1	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	30.0		30.0	30.0	
Minimum Split (s)	39.5	39.5		39.5	39.5		11.0	37.0		37.0	37.0	
Total Split (s)	39.8	39.8		39.8	39.8		11.0	100.2		89.2	89.2	
Total Split (%)	28.4%	28.4%		28.4%	28.4%		7.9%	71.6%		63.7%	63.7%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.0	4.5		4.5	4.5	
All-Red Time (s)	4.0	4.0		4.0	4.0		1.0	2.5		2.5	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.5	7.5		7.5	7.5		4.0	7.0		7.0	7.0	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		C-Max	C-Max	
Act Effct Green (s)	16.2	16.2		16.2	16.2		112.3	109.3		100.2	100.2	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.80	0.78		0.72	0.72	
v/c Ratio	0.50	0.17		0.23	0.42		0.48	0.34		0.14	0.79	
Control Delay	68.6	18.9		56.0	18.2		34.3	7.9		2.3	9.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	68.6	18.9		56.0	18.2		34.3	7.9		2.3	9.0	
LOS	E	B		E	B		C	A		A	A	
Approach Delay		50.9			27.2			9.3			8.9	
Approach LOS		D			C			A			A	
Queue Length 50th (m)	18.2	1.0		9.4	4.9		7.9	39.0		0.7	47.0	
Queue Length 95th (m)	29.4	10.2		17.6	20.0		m0.0	67.4		m0.9	m140.2	
Internal Link Dist (m)		85.6			386.4			164.8			126.5	

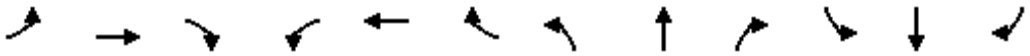
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)				20.0			100.0			60.0		
Base Capacity (vph)	266	403		314	448		147	3604		274	3384	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.25	0.09		0.11	0.25		0.48	0.34		0.14	0.79	

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 62 (44%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green			
Natural Cycle: 130			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.79			
Intersection Signal Delay: 10.7		Intersection LOS: B	
Intersection Capacity Utilization 86.0%		ICU Level of Service E	
Analysis Period (min) 15			

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

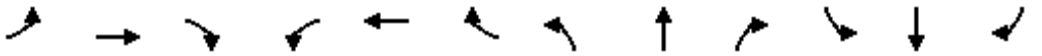
Splits and Phases: 15: Kennedy Rd & Peachtree Mall S Access/Avoca Dr





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	10	13	0	23	0	1354	10	9	2638	139
Future Volume (vph)	0	0	10	13	0	23	0	1354	10	9	2638	139
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	50.0		0.0	15.0		0.0
Storage Lanes	0		1	1		1	0		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	0	0	1662	1825	0	1633	0	4894	0	1825	4860	0
Flt Permitted				0.950						0.950		
Satd. Flow (perm)	0	0	1662	1825	0	1633	0	4894	0	1825	4860	0
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		140.1			268.7			150.5			203.0	
Travel Time (s)		12.6			24.2			9.0			12.2	
Confl. Peds. (#/hr)							7		4	4		7
Confl. Bikes (#/hr)							1		1	1		1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	10	13	0	23	0	1392	0	9	2834	0
Sign Control		Yield			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 70.8%		ICU Level of Service C	
Analysis Period (min) 15			

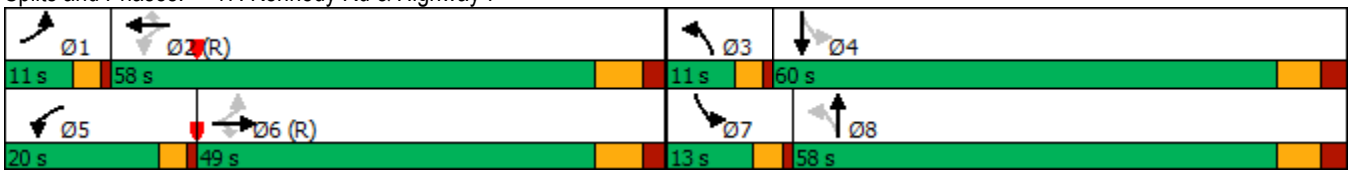


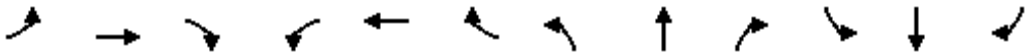
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	673	127	362	1580	68	145	1046	187	96	2184	228
Future Volume (vph)	120	673	127	362	1580	68	145	1046	187	96	2184	228
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	78.0		95.0	43.0		87.0	111.0		0.0	100.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1722	3380	1570	1738	3544	1541	1755	4463	0	1789	4767	0
Flt Permitted	0.096			0.208			0.078			0.090		
Satd. Flow (perm)	174	3380	1519	378	3544	1509	144	4463	0	169	4767	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			129			97		25			13	
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		303.4			351.7			203.0			185.7	
Travel Time (s)		15.6			18.1			12.2			11.1	
Confl. Peds. (#/hr)	8		19	19		8	11		8	8		11
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	6%	8%	4%	5%	3%	6%	4%	6%	12%	2%	1%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	122	687	130	369	1612	69	148	1258	0	98	2462	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6		6	2		2	8			4		
Detector Phase	1	6	6	5	2	2	3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	38.0	38.0	7.0	38.0	38.0	7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	45.5	45.5	11.0	45.5	45.5	11.0	44.5		11.0	44.5	
Total Split (s)	11.0	49.0	49.0	20.0	58.0	58.0	11.0	58.0		13.0	60.0	
Total Split (%)	7.9%	35.0%	35.0%	14.3%	41.4%	41.4%	7.9%	41.4%		9.3%	42.9%	
Yellow Time (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	4.5		3.0	4.5	
All-Red Time (s)	1.0	2.5	2.5	1.0	2.5	2.5	1.0	3.0		1.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5		4.0	7.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None		None	None	
Act Effct Green (s)	52.0	41.5	41.5	65.0	50.5	50.5	61.5	51.0		64.5	52.5	
Actuated g/C Ratio	0.37	0.30	0.30	0.46	0.36	0.36	0.44	0.36		0.46	0.38	
v/c Ratio	0.86	0.69	0.24	1.12	1.26	0.11	1.03	0.77		0.56	1.37	
Control Delay	73.5	47.7	7.0	112.9	162.0	2.6	120.4	42.0		37.5	204.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	73.5	47.7	7.0	112.9	162.0	2.6	120.4	42.0		37.5	204.8	
LOS	E	D	A	F	F	A	F	D		D	F	
Approach Delay		45.4			147.8			50.2			198.4	
Approach LOS		D			F			D			F	
Queue Length 50th (m)	19.1	88.6	0.2	~77.7	~294.1	0.0	~29.6	129.7		12.1	~348.7	
Queue Length 95th (m)	#54.0	110.3	15.2	#140.5	#336.4	4.8	#73.2	98.8		m20.0	#378.5	
Internal Link Dist (m)		279.4			327.7			179.0			161.7	
Turn Bay Length (m)	78.0		95.0	43.0		87.0	111.0			100.0		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	142	1001	541	330	1278	606	143	1641		182	1795	
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	0.86	0.69	0.24	1.12	1.26	0.11	1.03	0.77		0.54	1.37	

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 118 (84%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green			
Natural Cycle: 145			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.37			
Intersection Signal Delay: 132.9		Intersection LOS: F	
Intersection Capacity Utilization 126.3%		ICU Level of Service H	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 17: Kennedy Rd & Highway 7





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	23	0	0	0	0	1260	6	0	2623	10
Future Volume (vph)	0	0	23	0	0	0	0	1260	6	0	2623	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	60.0		0.0	55.0		0.0
Storage Lanes	0		1	0		1	0		0	0		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	0	0	1583	0	0	1921	0	4657	0	0	4842	0
Flt Permitted												
Satd. Flow (perm)	0	0	1583	0	0	1921	0	4657	0	0	4842	0
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		173.6			149.5			185.7			258.9	
Travel Time (s)		15.6			13.5			11.1			15.5	
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)							1		1	1		1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	5%	0%	0%	0%	0%	5%	25%	0%	1%	20%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	23	0	0	0	0	1292	0	0	2687	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 60.9%		ICU Level of Service B	
Analysis Period (min) 15			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø4
Lane Configurations							
Traffic Volume (vph)	118	159	1201	59	208	2529	
Future Volume (vph)	118	159	1201	59	208	2529	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	41.0	0.0		0.0	57.0		
Storage Lanes	1	1		0	1		
Taper Length (m)	2.5				2.5		
Satd. Flow (prot)	1825	1601	4586	0	1807	4850	
Flt Permitted	0.950				0.134		
Satd. Flow (perm)	1825	1601	4586	0	255	4850	
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		177	8				
Link Speed (k/h)	40		60			60	
Link Distance (m)	254.1		258.9			392.7	
Travel Time (s)	22.9		15.5			23.6	
Confl. Peds. (#/hr)				1	1		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	
Heavy Vehicles (%)	0%	2%	6%	5%	1%	1%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	131	177	1400	0	231	2810	
Turn Type	Prot	Perm	NA		pm+pt	NA	
Protected Phases	8		6		5	2	4
Permitted Phases		8			2		
Detector Phase	8	8	6		5	2	
Switch Phase							
Minimum Initial (s)	10.0	10.0	30.0		7.0	30.0	10.0
Minimum Split (s)	33.5	33.5	37.0		11.0	37.0	33.5
Total Split (s)	33.5	33.5	83.5		23.0	106.5	33.5
Total Split (%)	23.9%	23.9%	59.6%		16.4%	76.1%	24%
Yellow Time (s)	3.5	3.5	4.5		3.0	4.5	3.5
All-Red Time (s)	3.0	3.0	2.5		1.0	2.5	3.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.5	6.5	7.0		4.0	7.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None	None	C-Max		None	C-Max	None
Act Effct Green (s)	16.6	16.6	94.1		112.9	109.9	
Actuated g/C Ratio	0.12	0.12	0.67		0.81	0.78	
v/c Ratio	0.61	0.51	0.45		0.69	0.74	
Control Delay	69.3	12.2	6.7		25.8	4.3	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	69.3	12.2	6.7		25.8	4.3	
LOS	E	B	A		C	A	
Approach Delay	36.5		6.7			5.9	
Approach LOS	D		A			A	
Queue Length 50th (m)	35.3	0.0	22.7		20.9	41.5	
Queue Length 95th (m)	51.6	19.6	53.2		m17.9	m50.2	
Internal Link Dist (m)	230.1		234.9			368.7	
Turn Bay Length (m)	41.0				57.0		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø4
Base Capacity (vph)	351	451	3084		416	3806	
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.37	0.39	0.45		0.56	0.74	

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 32 (23%), Referenced to phase 2:SBTL and 6:NBT, Start of Green			
Natural Cycle: 95			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.74			
Intersection Signal Delay: 8.1		Intersection LOS: A	
Intersection Capacity Utilization 68.4%		ICU Level of Service C	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 19: Kennedy Rd & Austin Dr

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	92	85	470	551	123	109	1087	172	26	2039	206
Future Volume (vph)	70	92	85	470	551	123	109	1087	172	26	2039	206
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	48.0		61.0	73.0		0.0	138.0		0.0	140.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1706	1746	1601	1825	1902	1601	1690	4608	0	1825	4726	0
Flt Permitted	0.127			0.613			0.061			0.135		
Satd. Flow (perm)	228	1746	1580	1176	1902	1569	109	4608	0	259	4726	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			125			94		29			14	
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		268.3			267.4			392.7			810.8	
Travel Time (s)		24.1			24.1			23.6			48.6	
Confl. Peds. (#/hr)	6		1	1		6	1		1	1		1
Confl. Bikes (#/hr)							1					1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	7%	10%	2%	0%	1%	2%	8%	4%	3%	0%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	78	102	94	522	612	137	121	1399	0	29	2495	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		Perm	NA	
Protected Phases	7	4		3	8		1	6			2	
Permitted Phases	4		4	8		8	6			2		
Detector Phase	7	4	4	3	8	8	1	6		2	2	
Switch Phase												
Minimum Initial (s)	7.0	10.0	10.0	7.0	10.0	10.0	7.0	31.0		31.0	31.0	
Minimum Split (s)	11.5	38.5	38.5	11.5	38.5	38.5	11.5	38.0		38.0	38.0	
Total Split (s)	11.5	39.1	39.1	20.4	48.0	48.0	11.5	80.5		69.0	69.0	
Total Split (%)	8.2%	27.9%	27.9%	14.6%	34.3%	34.3%	8.2%	57.5%		49.3%	49.3%	
Yellow Time (s)	3.0	3.5	3.5	3.0	3.5	3.5	3.0	4.5		4.5	4.5	
All-Red Time (s)	1.0	4.0	4.0	1.0	4.0	4.0	1.0	2.5		2.5	2.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.0		7.0	7.0	
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	None	None	C-Max		C-Max	C-Max	
Act Effct Green (s)	42.5	31.6	31.6	55.5	40.6	40.6	76.5	73.5		62.0	62.0	
Actuated g/C Ratio	0.30	0.23	0.23	0.40	0.29	0.29	0.55	0.52		0.44	0.44	
v/c Ratio	0.53	0.26	0.21	0.96	1.11	0.26	0.84	0.58		0.25	1.19	
Control Delay	41.2	46.7	4.0	69.4	117.6	14.8	72.6	34.9		20.2	120.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	41.2	46.7	4.0	69.4	117.6	14.8	72.6	34.9		20.2	120.4	
LOS	D	D	A	E	F	B	E	C		C	F	
Approach Delay		30.5			86.7			37.9			119.3	
Approach LOS		C			F			D			F	
Queue Length 50th (m)	13.6	23.4	0.0	121.2	~193.5	8.7	26.6	123.7		5.6	~333.5	
Queue Length 95th (m)	24.7	39.9	7.3	#207.3	#264.8	25.6	#53.9	132.6		m4.7	#363.2	
Internal Link Dist (m)		244.3			243.4			368.7			786.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)	48.0		61.0	73.0			138.0			140.0		
Base Capacity (vph)	148	394	453	542	551	521	144	2432		114	2100	
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	0.53	0.26	0.21	0.96	1.11	0.26	0.84	0.58		0.25	1.19	

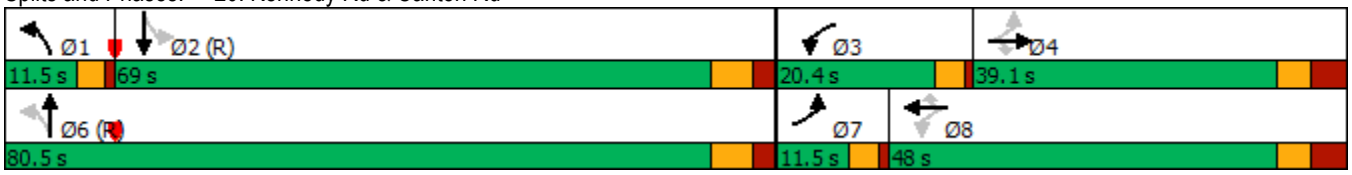
Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 9 (6%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.19			
Intersection Signal Delay: 85.4		Intersection LOS: F	
Intersection Capacity Utilization 107.9%		ICU Level of Service G	
Analysis Period (min) 15			

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

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

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

Splits and Phases: 20: Kennedy Rd & Carlton Rd



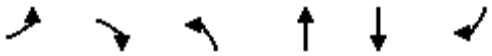
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	41	12	113	151	80	20	1218	33	27	2165	269
Future Volume (vph)	80	41	12	113	151	80	20	1218	33	27	2165	269
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	23.0		0.0	27.0		0.0	90.0		0.0	120.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1825	1360	0	1825	1658	0	1722	4879	0	1825	4748	0
Flt Permitted	0.387			0.720			0.040			0.164		
Satd. Flow (perm)	742	1360	0	1383	1658	0	72	4879	0	315	4748	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			20			4			24	
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		238.2			161.4			810.8			257.8	
Travel Time (s)		21.4			14.5			48.6			15.5	
Confl. Peds. (#/hr)	4					4	17					17
Confl. Bikes (#/hr)	1					1						1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	37%	34%	0%	13%	2%	6%	0%	0%	0%	1%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	83	56	0	118	240	0	21	1303	0	28	2535	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Detector Phase	4	4		8	8		6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		35.0	35.0		35.0	35.0	
Minimum Split (s)	50.0	50.0		50.0	50.0		49.0	49.0		49.0	49.0	
Total Split (s)	52.0	52.0		52.0	52.0		88.0	88.0		88.0	88.0	
Total Split (%)	37.1%	37.1%		37.1%	37.1%		62.9%	62.9%		62.9%	62.9%	
Yellow Time (s)	3.5	3.5		3.5	3.5		4.5	4.5		4.5	4.5	
All-Red Time (s)	4.5	4.5		4.5	4.5		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	8.0	8.0		8.0	8.0		7.0	7.0		7.0	7.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	26.1	26.1		26.1	26.1		98.9	98.9		98.9	98.9	
Actuated g/C Ratio	0.19	0.19		0.19	0.19		0.71	0.71		0.71	0.71	
v/c Ratio	0.60	0.22		0.46	0.74		0.42	0.38		0.13	0.75	
Control Delay	67.9	43.2		54.2	61.5		43.5	8.0		6.4	11.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	67.9	43.2		54.2	61.5		43.5	8.0		6.4	11.5	
LOS	E	D		D	E		D	A		A	B	
Approach Delay		58.0			59.1			8.6			11.4	
Approach LOS		E			E			A			B	
Queue Length 50th (m)	21.6	12.5		29.9	59.3		4.2	76.6		1.1	152.9	
Queue Length 95th (m)	34.4	21.4		42.3	75.5		m9.8	108.1		m1.9	255.2	
Internal Link Dist (m)		214.2			137.4			786.8			233.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)	23.0			27.0			90.0			120.0		
Base Capacity (vph)	233	430		434	534		50	3447		222	3360	
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	0.36	0.13		0.27	0.45		0.42	0.38		0.13	0.75	

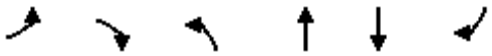
Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 76 (54%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green			
Natural Cycle: 110			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.75			
Intersection Signal Delay: 15.9		Intersection LOS: B	
Intersection Capacity Utilization 91.2%		ICU Level of Service F	
Analysis Period (min) 15			

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

Splits and Phases: 21: Kennedy Rd & The Bridle Trail



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø8
Lane Configurations							
Traffic Volume (vph)	19	42	8	1363	2351	3	
Future Volume (vph)	19	42	8	1363	2351	3	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	0.0	0.0	105.0			0.0	
Storage Lanes	1	0	1			0	
Taper Length (m)	2.5		2.5				
Satd. Flow (prot)	1644	0	1587	4710	4803	0	
Flt Permitted	0.985		0.039				
Satd. Flow (perm)	1644	0	65	4710	4803	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	10						
Link Speed (k/h)	40			60	60		
Link Distance (m)	142.4			257.8	309.6		
Travel Time (s)	12.8			15.5	18.6		
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	
Heavy Vehicles (%)	14%	0%	15%	4%	2%	0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	64	0	8	1420	2452	0	
Turn Type	Prot		Perm	NA	NA		
Protected Phases	4			6	2		8
Permitted Phases			6				
Detector Phase	4		6	6	2		
Switch Phase							
Minimum Initial (s)	5.0		30.0	30.0	30.0		10.0
Minimum Split (s)	22.5		37.0	37.0	37.0		31.0
Total Split (s)	32.0		108.0	108.0	108.0		32.0
Total Split (%)	22.9%		77.1%	77.1%	77.1%		23%
Yellow Time (s)	3.5		4.5	4.5	4.5		3.5
All-Red Time (s)	1.0		2.5	2.5	2.5		3.5
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		7.0	7.0	7.0		
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	None		C-Max	C-Max	C-Max		None
Act Effct Green (s)	13.9		118.0	118.0	118.0		
Actuated g/C Ratio	0.10		0.84	0.84	0.84		
v/c Ratio	0.37		0.15	0.36	0.61		
Control Delay	53.3		7.5	0.9	6.0		
Queue Delay	0.0		0.0	0.0	0.0		
Total Delay	53.3		7.5	0.9	6.0		
LOS	D		A	A	A		
Approach Delay	53.3			1.0	6.0		
Approach LOS	D			A	A		
Queue Length 50th (m)	14.3		0.0	3.1	74.8		
Queue Length 95th (m)	26.3		m0.6	17.2	147.6		
Internal Link Dist (m)	118.4			233.8	285.6		
Turn Bay Length (m)			105.0				
Base Capacity (vph)	330		54	3969	4048		

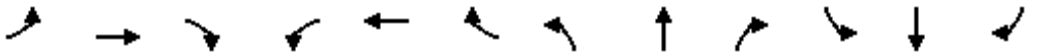


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø8
Starvation Cap Reductn	0		0	0	0		
Spillback Cap Reductn	0		0	0	136		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.19		0.15	0.36	0.63		

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 57 (41%), Referenced to phase 2:SBT and 6:NBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.61			
Intersection Signal Delay: 4.9		Intersection LOS: A	
Intersection Capacity Utilization 59.2%		ICU Level of Service B	
Analysis Period (min) 15			

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

Splits and Phases: 22: Kennedy Rd & Birchview Ln



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	240	661	197	440	1650	68	149	1080	118	169	1632	630
Future Volume (vph)	240	661	197	440	1650	68	149	1080	118	169	1632	630
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	92.0		0.0	70.0		0.0	145.0		0.0	70.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1772	4901	0	1807	5150	0	1755	4632	0	1825	4574	0
Flt Permitted	0.107			0.147			0.074			0.085		
Satd. Flow (perm)	200	4901	0	279	5150	0	137	4632	0	163	4574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		48			4			12			78	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		347.4			311.5			309.6			151.8	
Travel Time (s)		20.8			18.7			18.6			9.1	
Confl. Peds. (#/hr)	12		10	10		12	7		4	4		7
Confl. Bikes (#/hr)	1		1	1		1						
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	3%	3%	2%	1%	1%	4%	4%	4%	4%	0%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	250	894	0	458	1790	0	155	1248	0	176	2356	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2			8			4		
Detector Phase	1	6		5	2		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	35.0		7.0	35.0		7.0	15.0		7.0	15.0	
Minimum Split (s)	11.0	42.5		11.0	42.5		11.0	41.5		11.0	41.5	
Total Split (s)	17.0	45.0		26.0	54.0		11.0	59.0		20.0	68.0	
Total Split (%)	11.3%	30.0%		17.3%	36.0%		7.3%	39.3%		13.3%	45.3%	
Yellow Time (s)	3.0	4.5		3.0	4.5		3.0	4.5		3.0	4.5	
All-Red Time (s)	1.0	3.0		1.0	3.0		1.0	3.0		1.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	7.5		4.0	7.5		4.0	7.5		4.0	7.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	C-Max		None	C-Max		None	Max		None	None	
Act Effct Green (s)	54.0	37.5		67.0	46.5		64.4	53.9		74.7	60.5	
Actuated g/C Ratio	0.36	0.25		0.45	0.31		0.43	0.36		0.50	0.40	
v/c Ratio	1.20	0.71		1.32	1.12		1.16	0.75		0.76	1.25	
Control Delay	162.9	52.0		192.8	109.6		157.2	45.4		52.1	144.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	162.9	52.0		192.8	109.6		157.2	45.4		52.1	144.2	
LOS	F	D		F	F		F	D		D	F	
Approach Delay		76.2			126.5			57.8			137.8	
Approach LOS		E			F			E			F	
Queue Length 50th (m)	~73.0	84.9		~149.3	~223.9		~38.4	127.7		31.7	~333.8	
Queue Length 95th (m)	#128.6	101.0		#217.5	#253.2		#86.0	149.2		m39.5	#207.5	
Internal Link Dist (m)		323.4			287.5			285.6			127.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)	92.0			70.0			145.0			70.0		
Base Capacity (vph)	208	1261		348	1599		134	1671		258	1891	
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	1.20	0.71		1.32	1.12		1.16	0.75		0.68	1.25	

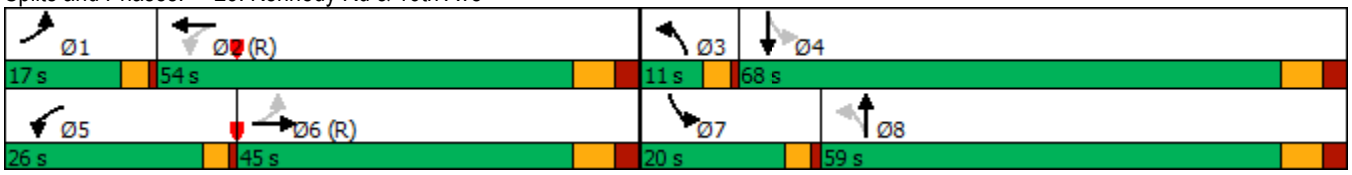
Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 4 (3%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.32			
Intersection Signal Delay: 109.4		Intersection LOS: F	
Intersection Capacity Utilization 126.8%		ICU Level of Service H	
Analysis Period (min) 15			

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

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

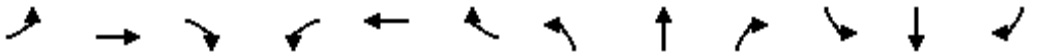
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 23: Kennedy Rd & 16th Ave



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	16	1376	15	0	2593
Future Volume (vph)	0	16	1376	15	0	2593
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	0.0		0.0	42.0	
Storage Lanes	0	1		0	0	
Taper Length (m)	2.5				2.5	
Satd. Flow (prot)	0	1629	5132	0	0	5142
Flt Permitted						
Satd. Flow (perm)	0	1629	5132	0	0	5142
Link Speed (k/h)	48		60			60
Link Distance (m)	184.7		151.8			175.9
Travel Time (s)	13.9		9.1			10.6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	17	1512	0	0	2818
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 53.4%		ICU Level of Service A	
Analysis Period (min) 15			

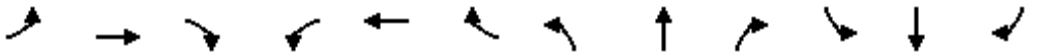


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	34	79	206	45	45	16	1309	26	9	2517	136
Future Volume (vph)	140	34	79	206	45	45	16	1309	26	9	2517	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	30.0		0.0	30.0		0.0	54.0		0.0	54.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1789	1686	0	1825	1738	0	1789	4652	0	1825	4769	0
Flt Permitted	0.692			0.651			0.038			0.124		
Satd. Flow (perm)	1303	1686	0	1251	1738	0	72	4652	0	238	4769	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			32			4			11	
Link Speed (k/h)		48			48			60			60	
Link Distance (m)		172.3			265.8			175.9			318.0	
Travel Time (s)		12.9			19.9			10.6			19.1	
Confl. Peds. (#/hr)						5						
Peak Hour Factor	0.92	0.92	0.92	0.89	0.92	0.89	0.92	0.89	0.89	0.89	0.89	0.92
Heavy Vehicles (%)	2%	2%	2%	0%	2%	0%	2%	5%	4%	0%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	152	123	0	231	100	0	17	1500	0	10	2976	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Detector Phase	4	4		8	8		6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		30.0	30.0		30.0	30.0	
Minimum Split (s)	35.5	35.5		35.5	35.5		37.0	37.0		37.0	37.0	
Total Split (s)	42.1	42.1		42.1	42.1		107.9	107.9		107.9	107.9	
Total Split (%)	28.1%	28.1%		28.1%	28.1%		71.9%	71.9%		71.9%	71.9%	
Yellow Time (s)	3.5	3.5		3.5	3.5		4.5	4.5		4.5	4.5	
All-Red Time (s)	4.0	4.0		4.0	4.0		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.5	7.5		7.5	7.5		7.0	7.0		7.0	7.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	30.8	30.8		30.8	30.8		104.7	104.7		104.7	104.7	
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.70	0.70		0.70	0.70	
v/c Ratio	0.57	0.35		0.90	0.26		0.34	0.46		0.06	0.89	
Control Delay	61.7	51.8		93.1	34.3		25.7	5.7		3.9	10.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.5	
Total Delay	61.7	51.8		93.1	34.3		25.7	5.7		3.9	11.0	
LOS	E	D		F	C		C	A		A	B	
Approach Delay		57.3			75.3			5.9			11.0	
Approach LOS		E			E			A			B	
Queue Length 50th (m)	40.2	30.2		66.2	16.5		1.0	34.7		0.4	28.3	
Queue Length 95th (m)	63.2	48.9		#104.7	32.9		m1.3	m36.3		m0.3	35.4	
Internal Link Dist (m)		148.3			241.8			151.9			294.0	
Turn Bay Length (m)	30.0			30.0			54.0			54.0		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	300	391		288	425		50	3248		166	3332	
Starvation Cap Reductn	0	0		0	0		0	0		0	101	
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	0.51	0.31		0.80	0.24		0.34	0.46		0.06	0.92	

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 39 (26%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green			
Natural Cycle: 110			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.90			
Intersection Signal Delay: 16.2		Intersection LOS: B	
Intersection Capacity Utilization 82.6%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 25: Kennedy Rd & Beckett Ave



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	93	24	173	32	32	25	38	1351	12	10	2636	31
Future Volume (vph)	93	24	173	32	32	25	38	1351	12	10	2636	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	50.0		0.0	50.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1789	1635	0	1825	1749	0	1789	4618	0	1659	4752	0
Flt Permitted	0.701			0.314			0.034			0.088		
Satd. Flow (perm)	1320	1635	0	603	1749	0	64	4618	0	154	4752	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			29			2			2	
Link Speed (k/h)		48			40			60			60	
Link Distance (m)		211.4			236.7			318.0			378.3	
Travel Time (s)		15.9			21.3			19.1			22.7	
Confl. Peds. (#/hr)				1		3			1	1		
Confl. Bikes (#/hr)									3	3		
Peak Hour Factor	0.92	0.92	0.92	0.76	0.92	0.76	0.92	0.76	0.76	0.76	0.76	0.92
Heavy Vehicles (%)	2%	2%	2%	0%	2%	0%	2%	6%	0%	10%	3%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	101	214	0	42	68	0	41	1794	0	13	3502	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	36.5	36.5		36.5	36.5		36.5	36.5		36.5	36.5	
Total Split (s)	38.0	38.0		38.0	38.0		112.0	112.0		112.0	112.0	
Total Split (%)	25.3%	25.3%		25.3%	25.3%		74.7%	74.7%		74.7%	74.7%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Min	C-Min		C-Min	C-Min	
Act Effct Green (s)	24.9	24.9		24.9	24.9		116.1	116.1		116.1	116.1	
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.77	0.77		0.77	0.77	
v/c Ratio	0.46	0.79		0.42	0.22		0.84	0.50		0.11	0.95	
Control Delay	62.0	79.2		67.1	32.5		119.0	12.7		3.9	14.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	4.9	
Total Delay	62.0	79.2		67.1	32.5		119.0	12.7		3.9	19.8	
LOS	E	E		E	C		F	B		A	B	
Approach Delay		73.7			45.7			15.0			19.7	
Approach LOS		E			D			B			B	
Queue Length 50th (m)	27.5	61.7		11.4	10.0		10.0	97.9		0.6	392.3	
Queue Length 95th (m)	43.7	85.1		18.8	22.7		m#35.1	104.5		m0.7	m330.7	
Internal Link Dist (m)		187.4			212.7			294.0			354.3	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)							50.0			50.0		
Base Capacity (vph)	294	365		134	413		49	3576		119	3679	
Starvation Cap Reductn	0	0		0	0		0	0		0	164	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.34	0.59		0.31	0.16		0.84	0.50		0.11	1.00	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 17 (11%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 21.7 Intersection LOS: C
Intersection Capacity Utilization 79.8% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 26: Kennedy Rd & Wilfred Murison Ave

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø4
Lane Configurations							
Traffic Volume (vph)	669	283	1136	237	205	1880	
Future Volume (vph)	669	283	1136	237	205	1880	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	0.0	0.0		0.0	55.0		
Storage Lanes	1	1		0	1		
Taper Length (m)	2.5				2.5		
Satd. Flow (prot)	1825	1555	4531	0	1772	4756	
Flt Permitted	0.950				0.069		
Satd. Flow (perm)	1822	1446	4531	0	129	4756	
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		190	29				
Link Speed (k/h)	40		60			60	
Link Distance (m)	253.8		378.3			302.0	
Travel Time (s)	22.8		22.7			18.1	
Confl. Peds. (#/hr)	1	37		12	12		
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	
Heavy Vehicles (%)	0%	5%	4%	6%	3%	3%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	880	372	1807	0	270	2474	
Turn Type	Prot	Perm	NA		pm+pt	NA	
Protected Phases	8		6		5	2	4
Permitted Phases		8			2		
Detector Phase	8	8	6		5	2	
Switch Phase							
Minimum Initial (s)	10.0	10.0	30.0		5.0	30.0	10.0
Minimum Split (s)	35.0	35.0	37.5		9.5	37.5	35.0
Total Split (s)	69.0	69.0	61.0		20.0	81.0	69.0
Total Split (%)	46.0%	46.0%	40.7%		13.3%	54.0%	46%
Yellow Time (s)	3.5	3.5	5.0		3.5	5.0	3.5
All-Red Time (s)	3.5	3.5	2.5		1.0	2.5	3.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.0	7.0	7.5		4.5	7.5	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None	None	C-Max		None	C-Max	None
Act Effct Green (s)	62.0	62.0	53.5		76.5	73.5	
Actuated g/C Ratio	0.41	0.41	0.36		0.51	0.49	
v/c Ratio	1.17	0.52	1.11		1.15	1.06	
Control Delay	128.8	18.1	94.8		155.6	61.8	
Queue Delay	0.9	0.0	0.0		0.0	5.4	
Total Delay	129.7	18.1	94.8		155.6	67.2	
LOS	F	B	F		F	E	
Approach Delay	96.5		94.8			75.9	
Approach LOS	F		F			E	
Queue Length 50th (m)	~310.1	39.3	~144.4		~78.7	~318.5	
Queue Length 95th (m)	#291.6	47.2	121.2		#102.1	112.2	
Internal Link Dist (m)	229.8		354.3			278.0	
Turn Bay Length (m)					55.0		

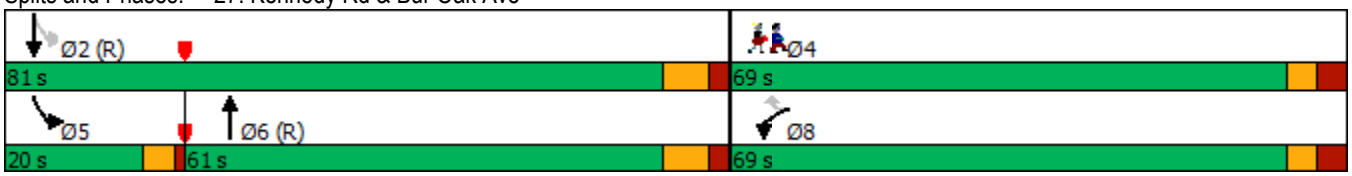
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø4
Base Capacity (vph)	754	709	1634		235	2330	
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	102	0	0		0	28	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	1.35	0.52	1.11		1.15	1.07	

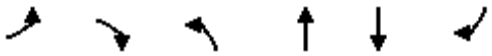
Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 14 (9%), Referenced to phase 2:SBTL and 6:NBT, Start of Green			
Natural Cycle: 105			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.17			
Intersection Signal Delay: 86.2		Intersection LOS: F	
Intersection Capacity Utilization 91.7%		ICU Level of Service F	
Analysis Period (min) 15			

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

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

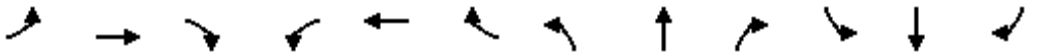
Splits and Phases: 27: Kennedy Rd & Bur Oak Ave





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	218	86	1436	1762	6
Future Volume (vph)	0	218	86	1436	1762	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0	0.0	20.0			0.0
Storage Lanes	0	1	1			0
Taper Length (m)	2.5		2.5			
Satd. Flow (prot)	0	1598	1644	4756	4749	0
Flt Permitted			0.950			
Satd. Flow (perm)	0	1598	1644	4756	4749	0
Link Speed (k/h)	40			60	60	
Link Distance (m)	234.8			302.0	341.0	
Travel Time (s)	21.1			18.1	20.5	
Confl. Peds. (#/hr)			6			6
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	0%	4%	11%	3%	3%	17%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	287	113	1889	2326	0
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 54.3%		ICU Level of Service A	
Analysis Period (min) 15			

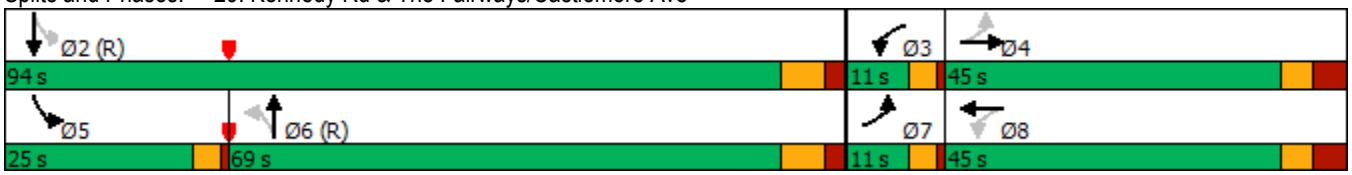


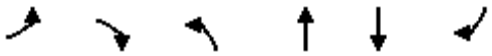
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	18	30	162	11	493	13	1404	103	240	1634	25
Future Volume (vph)	48	18	30	162	11	493	13	1404	103	240	1634	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		64.0	57.0		0.0	50.0		0.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1825	1594	0	1825	1585	0	1573	4702	0	1825	4747	0
Flt Permitted	0.134			0.636			0.074			0.058		
Satd. Flow (perm)	257	1594	0	1216	1585	0	123	4702	0	111	4747	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		34			296			9			2	
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		207.4			193.2			341.0			227.3	
Travel Time (s)		18.7			17.4			20.5			13.6	
Confl. Peds. (#/hr)	8		4	4		8	1		5	5		1
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	0%	15%	4%	0%	10%	1%	16%	3%	2%	0%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	55	55	0	186	580	0	15	1732	0	276	1907	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		pm+pt	NA	
Protected Phases	7	4		3	8			6		5	2	
Permitted Phases	4			8			6			2		
Detector Phase	7	4		3	8		6	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	12.0		6.0	12.0		33.0	33.0		6.0	33.0	
Minimum Split (s)	10.0	44.5		10.0	44.5		40.5	40.5		10.0	40.5	
Total Split (s)	11.0	45.0		11.0	45.0		69.0	69.0		25.0	94.0	
Total Split (%)	7.3%	30.0%		7.3%	30.0%		46.0%	46.0%		16.7%	62.7%	
Yellow Time (s)	3.0	3.5		3.0	3.5		5.0	5.0		3.0	5.0	
All-Red Time (s)	1.0	4.0		1.0	4.0		2.5	2.5		1.0	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	7.5		4.0	7.5		7.5	7.5		4.0	7.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag		Lead		
Lead-Lag Optimize?		Yes			Yes		Yes	Yes		Yes		
Recall Mode	None	None		None	None		C-Max	C-Max		None	C-Max	
Act Effct Green (s)	39.6	32.3		44.5	35.4		66.9	66.9		94.3	90.8	
Actuated g/C Ratio	0.26	0.22		0.30	0.24		0.45	0.45		0.63	0.61	
v/c Ratio	0.40	0.15		0.46	0.97		0.28	0.82		0.93	0.66	
Control Delay	42.8	21.6		43.5	56.6		64.9	63.4		67.1	13.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	42.8	21.6		43.5	56.6		64.9	63.4		67.1	13.9	
LOS	D	C		D	E		E	E		E	B	
Approach Delay		32.2			53.4			63.4			20.6	
Approach LOS		C			D			E			C	
Queue Length 50th (m)	11.0	4.8		40.3	94.8		3.8	183.2		56.0	166.8	
Queue Length 95th (m)	20.6	15.5		58.4	#154.6		m4.5	m171.9		m59.8	m163.2	
Internal Link Dist (m)		183.4			169.2			317.0			203.3	
Turn Bay Length (m)							57.0			50.0		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	141	424		408	618		54	2102		310	2875	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.39	0.13		0.46	0.94		0.28	0.82		0.89	0.66	

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green			
Natural Cycle: 125			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.97			
Intersection Signal Delay: 41.7		Intersection LOS: D	
Intersection Capacity Utilization 118.3%		ICU Level of Service H	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

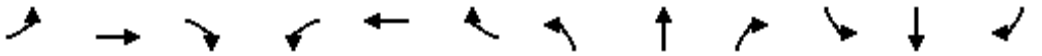
Splits and Phases: 29: Kennedy Rd & The Fairways/Castlemore Ave





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	32	130	1711	1767	14
Future Volume (vph)	0	32	130	1711	1767	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	0.0	15.0			0.0
Storage Lanes	0	1	1			0
Taper Length (m)	2.5		2.5			
Satd. Flow (prot)	0	1497	1825	5092	4795	0
Flt Permitted			0.950			
Satd. Flow (perm)	0	1497	1825	5092	4795	0
Link Speed (k/h)	40			60	60	
Link Distance (m)	115.5			227.3	167.2	
Travel Time (s)	10.4			13.6	10.0	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	0%	11%	0%	3%	2%	10%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	37	149	1967	2047	0
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 48.3%		ICU Level of Service A	
Analysis Period (min) 15			

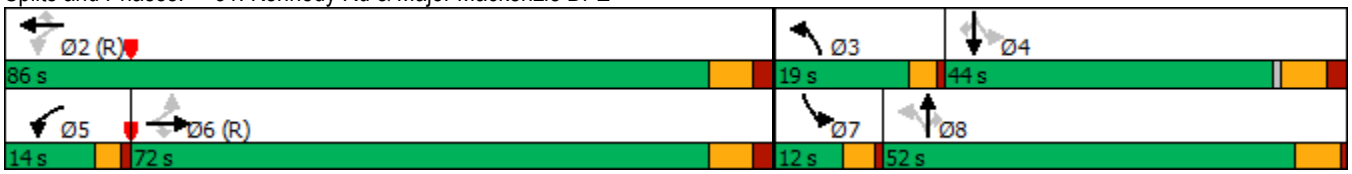


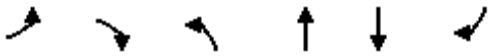
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	804	515	262	1713	201	257	1050	299	101	900	182
Future Volume (vph)	55	804	515	262	1713	201	257	1050	299	101	900	182
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0		92.0	50.0		160.0	140.0		0.0	50.0		92.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1738	3510	1633	1772	3579	1570	1772	3171	1601	1789	3544	1601
Flt Permitted	0.062			0.182			0.093			0.107		
Satd. Flow (perm)	113	3510	1609	339	3579	1547	173	3171	1601	202	3544	1579
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			215			174			184			124
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		424.7			384.5			167.2			409.3	
Travel Time (s)		21.8			19.8			10.0			24.6	
Confl. Peds. (#/hr)	2		2	2		2	1					1
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	5%	4%	0%	3%	2%	4%	3%	3%	2%	2%	3%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	63	924	592	301	1969	231	295	1207	344	116	1034	209
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		6		5	2		3	8		7	4	
Permitted Phases	6		6	2		2	8		8	4		4
Detector Phase	6	6	6	5	2	2	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	15.0	15.0	15.0	7.0	15.0	15.0	7.0	10.0	10.0	6.0	10.0	10.0
Minimum Split (s)	37.5	37.5	37.5	11.0	37.5	37.5	11.0	37.0	37.0	10.5	38.5	38.5
Total Split (s)	72.0	72.0	72.0	14.0	86.0	86.0	19.0	52.0	52.0	12.0	44.0	44.0
Total Split (%)	48.0%	48.0%	48.0%	9.3%	57.3%	57.3%	12.7%	34.7%	34.7%	8.0%	29.3%	29.3%
Yellow Time (s)	5.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	3.5	5.0	5.0
All-Red Time (s)	2.5	2.5	2.5	1.0	2.5	2.5	1.0	1.0	1.0	1.0	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.5	7.5	7.5	4.0	7.5	7.5	4.0	6.0	6.0	4.5	7.5	7.5
Lead/Lag	Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	C-Max	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	64.5	64.5	64.5	82.0	78.5	78.5	60.0	46.0	46.0	48.0	37.5	37.5
Actuated g/C Ratio	0.43	0.43	0.43	0.55	0.52	0.52	0.40	0.31	0.31	0.32	0.25	0.25
v/c Ratio	1.31	0.61	0.73	1.07	1.05	0.26	1.29	1.24	0.56	0.81	1.17	0.43
Control Delay	271.3	35.2	27.7	99.4	70.7	5.9	177.1	159.7	30.8	70.7	135.9	21.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	271.3	35.2	27.7	99.4	70.7	5.9	177.1	159.7	30.8	70.7	135.9	21.8
LOS	F	D	C	F	E	A	F	F	C	E	F	C
Approach Delay		41.9			68.2			138.5			112.8	
Approach LOS		D			E			F			F	
Queue Length 50th (m)	~23.9	110.8	95.9	~54.5	~335.1	8.2	~96.1	~266.2	64.6	22.1	~191.8	20.2
Queue Length 95th (m)	#52.9	126.5	133.2	#102.3	#352.9	20.2	m#130.3	m#296.2	m78.8	#47.3	#221.3	41.9
Internal Link Dist (m)		400.7			360.5			143.2			385.3	
Turn Bay Length (m)	50.0		92.0	50.0		160.0	140.0			50.0		92.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	48	1509	814	280	1873	892	229	972	618	143	886	487
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.31	0.61	0.73	1.07	1.05	0.26	1.29	1.24	0.56	0.81	1.17	0.43

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 8 (5%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green			
Natural Cycle: 130			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.31			
Intersection Signal Delay: 88.6		Intersection LOS: F	
Intersection Capacity Utilization 121.1%		ICU Level of Service H	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 31: Kennedy Rd & Major Mackenzie Dr E





Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	25	0	1414	2083	20
Future Volume (Veh/h)	0	25	0	1414	2083	20
Sign Control	Yield			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	0	31	0	1746	2572	25
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				340	143	
pX, platoon unblocked	0.67	0.54	0.54			
vC, conflicting volume	3166	870	2572			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0	935			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	95	100			
cM capacity (veh/h)	685	590	401			

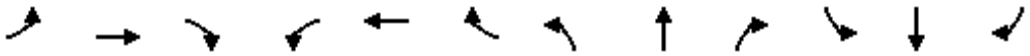
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	31	582	582	582	1029	1029	539
Volume Left	0	0	0	0	0	0	0
Volume Right	31	0	0	0	0	0	25
cSH	590	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.05	0.34	0.34	0.34	0.61	0.61	0.32
Queue Length 95th (m)	1.3	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	11.4	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B						
Approach Delay (s)	11.4	0.0			0.0		
Approach LOS	B						

Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	50.7%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	32	1260	76	48	2354
Future Volume (Veh/h)	0	32	1260	76	48	2354
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	0	33	1312	79	50	2452
Pedestrians	4					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			257			189
pX, platoon unblocked	0.69	0.87			0.87	
vC, conflicting volume	2273	481			1395	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	31	0			943	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	97			92	
cM capacity (veh/h)	624	949			640	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3	SB 4
Volume Total	33	525	525	341	50	817	817	817
Volume Left	0	0	0	0	50	0	0	0
Volume Right	33	0	0	79	0	0	0	0
cSH	949	1700	1700	1700	640	1700	1700	1700
Volume to Capacity	0.03	0.31	0.31	0.20	0.08	0.48	0.48	0.48
Queue Length 95th (m)	0.8	0.0	0.0	0.0	1.9	0.0	0.0	0.0
Control Delay (s)	8.9	0.0	0.0	0.0	11.1	0.0	0.0	0.0
Lane LOS	A				B			
Approach Delay (s)	8.9	0.0			0.2			
Approach LOS	A							

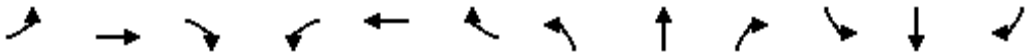
Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	48.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	10	13	0	23	0	1354	10	9	2638	139
Future Volume (Veh/h)	0	0	10	13	0	23	0	1354	10	9	2638	139
Sign Control		Yield			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	0	10	13	0	23	0	1382	10	9	2692	142
Pedestrians		7			4							
Lane Width (m)		3.7			3.7							
Walking Speed (m/s)		1.1			1.1							
Percent Blockage		1			0							
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								151			203	
pX, platoon unblocked	0.67	0.67	0.64	0.67	0.67	0.93	0.64			0.93		
vC, conflicting volume	3272	4184	975	2306	4108	470	2699			1396		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1980	3334	0	546	3221	169	1680			1164		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	99	95	100	97	100			98		
cM capacity (veh/h)	24	5	692	275	6	790	245			563		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3	SB 4
Volume Total	10	13	23	553	553	286	9	1077	1077	680
Volume Left	0	13	0	0	0	0	9	0	0	0
Volume Right	10	0	23	0	0	10	0	0	0	142
cSH	692	275	790	1700	1700	1700	563	1700	1700	1700
Volume to Capacity	0.01	0.05	0.03	0.33	0.33	0.17	0.02	0.63	0.63	0.40
Queue Length 95th (m)	0.3	1.1	0.7	0.0	0.0	0.0	0.4	0.0	0.0	0.0
Control Delay (s)	10.3	18.7	9.7	0.0	0.0	0.0	11.5	0.0	0.0	0.0
Lane LOS	B	C	A				B			
Approach Delay (s)	10.3	13.0		0.0			0.0			
Approach LOS	B	B								

Intersection Summary					
Average Delay	0.2				
Intersection Capacity Utilization	70.8%	ICU Level of Service		C	
Analysis Period (min)	15				



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	23	0	0	0	0	1260	6	0	2623	10
Future Volume (Veh/h)	0	0	23	0	0	0	0	1260	6	0	2623	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	0	23	0	0	0	0	1286	6	0	2677	10
Pedestrians					1							
Lane Width (m)					3.7							
Walking Speed (m/s)					1.1							
Percent Blockage					0							
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								186			259	
pX, platoon unblocked	0.80	0.80	0.69	0.80	0.80	0.78	0.69			0.78		
vC, conflicting volume	3111	3975	897	2205	3977	433	2687			1293		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	921	1997	0	0	2000	0	1885			388		
tC, single (s)	7.5	6.5	7.0	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	97	100	100	100	100			100		
cM capacity (veh/h)	183	49	745	799	49	850	223			920		

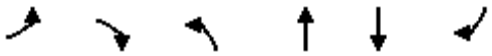
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	23	0	514	514	263	1071	1071	545
Volume Left	0	0	0	0	0	0	0	0
Volume Right	23	0	0	0	6	0	0	10
cSH	745	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.03	0.00	0.30	0.30	0.15	0.63	0.63	0.32
Queue Length 95th (m)	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	A						
Approach Delay (s)	10.0	0.0	0.0			0.0		
Approach LOS	A	A						

Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	60.9%	ICU Level of Service	B	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	16	1376	15	0	2593
Future Volume (Veh/h)	0	16	1376	15	0	2593
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	17	1496	16	0	2818
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			152			176
pX, platoon unblocked	0.61	0.78			0.78	
vC, conflicting volume	2443	507			1512	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0			662	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	98			100	
cM capacity (veh/h)	627	844			718	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	17	598	598	315	939	939	939
Volume Left	0	0	0	0	0	0	0
Volume Right	17	0	0	16	0	0	0
cSH	844	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.02	0.35	0.35	0.19	0.55	0.55	0.55
Queue Length 95th (m)	0.5	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	9.4	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A						
Approach Delay (s)	9.4	0.0			0.0		
Approach LOS	A						

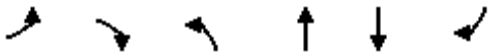
Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	53.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	218	86	1436	1762	6
Future Volume (Veh/h)	0	218	86	1436	1762	6
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Hourly flow rate (vph)	0	287	113	1889	2318	8
Pedestrians	6					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	1					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				302	341	
pX, platoon unblocked	0.82	0.73	0.73			
vC, conflicting volume	3184	783	2332			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	681	0	1543			
tC, single (s)	6.8	7.0	4.3			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.3			
p0 queue free %	100	63	60			
cM capacity (veh/h)	189	786	281			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3
Volume Total	287	113	630	630	630	927	927	472
Volume Left	0	113	0	0	0	0	0	0
Volume Right	287	0	0	0	0	0	0	8
cSH	786	281	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.37	0.40	0.37	0.37	0.37	0.55	0.55	0.28
Queue Length 95th (m)	12.8	14.1	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	12.2	26.2	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	D						
Approach Delay (s)	12.2	1.5				0.0		
Approach LOS	B							

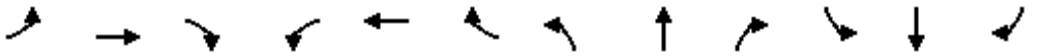
Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	54.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	32	130	1711	1767	14
Future Volume (Veh/h)	0	32	130	1711	1767	14
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	0	37	149	1967	2031	16
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				227	167	
pX, platoon unblocked	0.81	0.78	0.78			
vC, conflicting volume	2993	685	2047			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	836	0	1375			
tC, single (s)	6.8	7.1	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.4	2.2			
p0 queue free %	100	96	62			
cM capacity (veh/h)	156	829	397			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3
Volume Total	37	149	656	656	656	812	812	422
Volume Left	0	149	0	0	0	0	0	0
Volume Right	37	0	0	0	0	0	0	16
cSH	829	397	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.04	0.38	0.39	0.39	0.39	0.48	0.48	0.25
Queue Length 95th (m)	1.1	13.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	9.5	19.4	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	C						
Approach Delay (s)	9.5	1.4				0.0		
Approach LOS	A							

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	48.3%	ICU Level of Service	A
Analysis Period (min)	15		

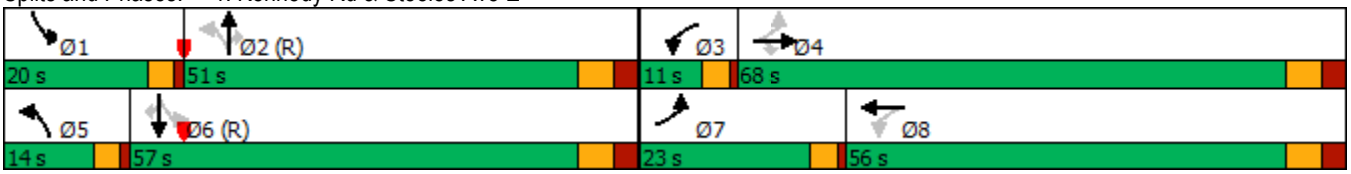


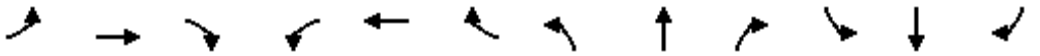
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	194	1480	294	141	754	190	166	1052	212	275	975	208
Future Volume (vph)	194	1480	294	141	754	190	166	1052	212	275	975	208
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	92.0		0.0	56.0		0.0	43.0		25.0	166.0		0.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1807	3510	1601	1807	4773	0	1772	3579	1498	1807	3202	1555
Flt Permitted	0.148			0.082			0.091			0.083		
Satd. Flow (perm)	277	3510	1308	156	4773	0	169	3579	1265	158	3202	1463
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			168		44				145			143
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		438.0			403.1			543.5			456.9	
Travel Time (s)		26.3			24.2			32.6			27.4	
Confl. Peds. (#/hr)	98		186	186		98	47		143	143		47
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	4%	2%	1%	5%	2%	3%	2%	9%	1%	2%	5%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	211	1609	320	153	1027	0	180	1143	230	299	1060	226
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8			2		2	6		6
Minimum Split (s)	11.0	55.0	55.0	11.0	55.0		11.0	51.0	51.0	11.0	51.0	51.0
Total Split (s)	23.0	68.0	68.0	11.0	56.0		14.0	51.0	51.0	20.0	57.0	57.0
Total Split (%)	15.3%	45.3%	45.3%	7.3%	37.3%		9.3%	34.0%	34.0%	13.3%	38.0%	38.0%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	1.0	3.0	3.0	1.0	3.0		1.0	3.0	3.0	1.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	7.0	7.0	4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Act Effct Green (s)	75.0	61.0	61.0	59.0	49.0		57.0	44.0	44.0	67.0	50.0	50.0
Actuated g/C Ratio	0.50	0.41	0.41	0.39	0.33		0.38	0.29	0.29	0.45	0.33	0.33
v/c Ratio	0.64	1.13	0.51	1.11	0.65		1.05	1.09	0.49	1.22	0.99	0.39
Control Delay	31.5	107.9	18.0	140.0	43.4		118.8	104.4	19.6	164.7	75.4	15.9
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.5	107.9	18.0	140.0	43.4		118.8	104.4	19.6	164.7	75.4	15.9
LOS	C	F	B	F	D		F	F	B	F	E	B
Approach Delay		86.9			55.9			93.5			83.7	
Approach LOS		F			E			F			F	
Queue Length 50th (m)	34.8	~290.5	32.4	~34.2	91.8		~41.6	~200.5	19.7	~91.8	185.0	17.5
Queue Length 95th (m)	53.9	#332.7	61.3	#81.5	107.6		#90.9	#243.1	46.0	#151.2	#238.0	40.3
Internal Link Dist (m)		414.0			379.1			519.5			432.9	
Turn Bay Length (m)	92.0			56.0			43.0		25.0	166.0		
Base Capacity (vph)	332	1427	631	138	1588		171	1049	473	246	1067	583
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Reduced v/c Ratio	0.64	1.13	0.51	1.11	0.65		1.05	1.09	0.49	1.22	0.99	0.39

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 150			
Control Type: Pretimed			
Maximum v/c Ratio: 1.22			
Intersection Signal Delay: 82.1		Intersection LOS: F	
Intersection Capacity Utilization 121.0%		ICU Level of Service H	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: Kennedy Rd & Steeles Ave E



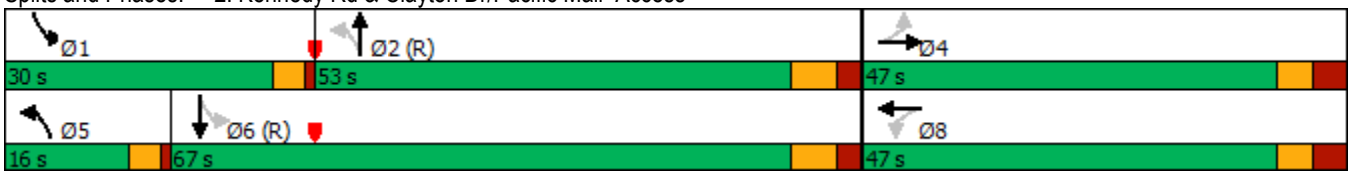


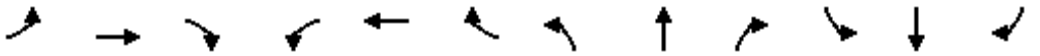
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	104	210	164	75	203	123	1349	79	341	1115	71
Future Volume (vph)	145	104	210	164	75	203	123	1349	79	341	1115	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	57.0		0.0	0.0		0.0	127.0		0.0	90.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			0.0			2.5			2.5		
Satd. Flow (prot)	1772	1615	0	1789	1656	0	1825	4762	0	1789	4618	0
Flt Permitted	0.394			0.337			0.172			0.074		
Satd. Flow (perm)	729	1615	0	613	1656	0	328	4762	0	139	4618	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		81			108			7			9	
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		148.7			168.9			456.9			558.1	
Travel Time (s)		13.4			15.2			27.4			33.5	
Confl. Peds. (#/hr)	12		62	62		12	23		12	12		23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	2%	1%	2%	0%	2%	0%	2%	0%	2%	5%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	158	341	0	178	303	0	134	1552	0	371	1289	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	30.0		7.0	30.0	
Minimum Split (s)	42.0	42.0		42.0	42.0		11.0	37.0		11.0	37.0	
Total Split (s)	47.0	47.0		47.0	47.0		16.0	53.0		30.0	67.0	
Total Split (%)	36.2%	36.2%		36.2%	36.2%		12.3%	40.8%		23.1%	51.5%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.0	4.5		3.0	4.5	
All-Red Time (s)	3.5	3.5		3.5	3.5		1.0	2.5		1.0	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.0	7.0		7.0	7.0		4.0	7.0		4.0	7.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effct Green (s)	37.3	37.3		37.3	37.3		62.6	50.1		81.7	65.2	
Actuated g/C Ratio	0.29	0.29		0.29	0.29		0.48	0.39		0.63	0.50	
v/c Ratio	0.76	0.65		1.02	0.55		0.50	0.84		0.93	0.56	
Control Delay	64.9	36.6		117.7	28.1		19.9	42.4		51.5	37.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	64.9	36.6		117.7	28.1		19.9	42.4		51.5	37.1	
LOS	E	D		F	C		B	D		D	D	
Approach Delay		45.6			61.2			40.6			40.3	
Approach LOS		D			E			D			D	
Queue Length 50th (m)	35.8	57.1		44.5	40.7		13.7	148.0		94.3	132.2	
Queue Length 95th (m)	#68.1	89.7		#90.3	69.1		22.7	#173.0		#135.3	149.2	
Internal Link Dist (m)		124.7			144.9			432.9			534.1	
Turn Bay Length (m)	57.0						127.0			90.0		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	224	553		188	584		302	1840		417	2320	
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	0.71	0.62		0.95	0.52		0.44	0.84		0.89	0.56	

Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 17 (13%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.02			
Intersection Signal Delay: 43.4		Intersection LOS: D	
Intersection Capacity Utilization 104.9%		ICU Level of Service G	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 2: Kennedy Rd & Clayton Dr/Pacific Mall Access



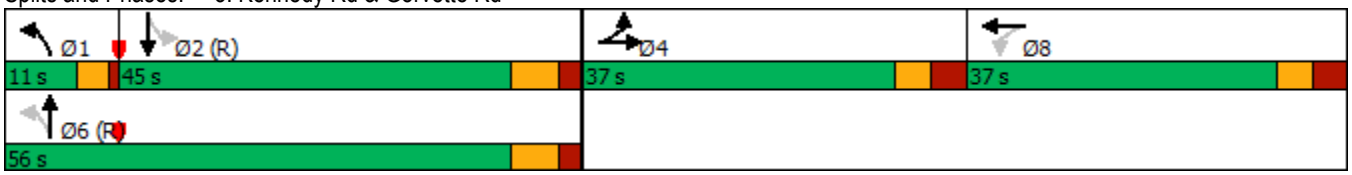


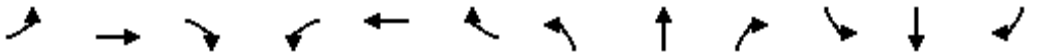
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	143	25	115	44	3	6	103	1477	237	33	1495	46
Future Volume (vph)	143	25	115	44	3	6	103	1477	237	33	1495	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	71.0		0.0	71.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	0.0			2.5			2.5			0.0		
Satd. Flow (prot)	1772	1627	0	1789	1686	0	1789	4697	0	1789	4729	0
Flt Permitted	0.950			0.663			0.072			0.081		
Satd. Flow (perm)	1767	1627	0	1249	1686	0	136	4697	0	153	4729	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		120			7			26			3	
Link Speed (k/h)		50			48			60			60	
Link Distance (m)		180.2			169.9			558.1			243.2	
Travel Time (s)		13.0			12.7			33.5			14.6	
Confl. Peds. (#/hr)	2		6				15					15
Peak Hour Factor	0.96	0.92	0.96	0.92	0.92	0.92	0.96	0.96	0.92	0.92	0.96	0.96
Heavy Vehicles (%)	3%	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	149	147	0	48	10	0	107	1797	0	36	1605	0
Turn Type	Split	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases	4	4			8		1	6			2	
Permitted Phases				8			6			2		
Detector Phase	4	4		8	8		1	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	30.0		30.0	30.0	
Minimum Split (s)	37.0	37.0		37.0	37.0		11.0	37.0		37.0	37.0	
Total Split (s)	37.0	37.0		37.0	37.0		11.0	56.0		45.0	45.0	
Total Split (%)	28.5%	28.5%		28.5%	28.5%		8.5%	43.1%		34.6%	34.6%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.0	4.5		4.5	4.5	
All-Red Time (s)	3.5	3.5		3.5	3.5		1.0	2.5		2.5	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.0	7.0		7.0	7.0		4.0	7.0		7.0	7.0	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		C-Max	C-Max	
Act Effct Green (s)	17.8	17.8		14.5	14.5		83.1	80.1		68.0	68.0	
Actuated g/C Ratio	0.14	0.14		0.11	0.11		0.64	0.62		0.52	0.52	
v/c Ratio	0.62	0.45		0.35	0.05		0.57	0.62		0.45	0.65	
Control Delay	62.5	16.5		57.4	29.1		43.1	10.5		44.3	24.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	62.5	16.5		57.4	29.1		43.1	10.5		44.3	24.9	
LOS	E	B		E	C		D	B		D	C	
Approach Delay		39.7			52.5			12.3			25.3	
Approach LOS		D			D			B			C	
Queue Length 50th (m)	37.0	6.3		12.0	0.7		13.5	35.2		4.1	70.3	
Queue Length 95th (m)	52.5	22.9		20.9	5.3		m19.7	#223.4		m#10.8	#217.3	
Internal Link Dist (m)		156.2			145.9			534.1			219.2	
Turn Bay Length (m)							71.0			71.0		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	408	467		288	394		189	2903		80	2474	
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	0.37	0.31		0.17	0.03		0.57	0.62		0.45	0.65	

Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 62 (48%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green			
Natural Cycle: 135			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.65			
Intersection Signal Delay: 20.5		Intersection LOS: C	
Intersection Capacity Utilization 102.3%		ICU Level of Service G	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 3: Kennedy Rd & Gorvette Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	255	827	29	117	395	369	102	1388	291	380	1352	230
Future Volume (vph)	255	827	29	117	395	369	102	1388	291	380	1352	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	60.0		0.0	48.0		0.0	150.0		0.0	80.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1789	3556	0	1772	3202	0	1789	4653	0	1722	4622	0
Flt Permitted	0.112			0.126			0.092			0.084		
Satd. Flow (perm)	210	3556	0	233	3202	0	173	4653	0	152	4622	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			173			33			29	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		322.0			182.9			243.2			339.7	
Travel Time (s)		23.2			13.2			14.6			20.4	
Confl. Peds. (#/hr)	11		35	35		11	32		11	11		32
Confl. Bikes (#/hr)			1	1								
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	2%	2%	0%	3%	5%	4%	2%	2%	2%	6%	3%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	266	891	0	122	795	0	106	1749	0	396	1648	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4			8			6			2		
Detector Phase	7	4		3	8		1	6		5	2	
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0	30.0		7.0	30.0	
Minimum Split (s)	11.0	39.5		11.0	39.5		11.0	37.5		11.0	37.5	
Total Split (s)	15.0	44.0		11.0	40.0		11.0	51.0		24.0	64.0	
Total Split (%)	11.5%	33.8%		8.5%	30.8%		8.5%	39.2%		18.5%	49.2%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.5		3.0	4.5	
All-Red Time (s)	1.0	3.5		1.0	3.5		1.0	3.0		1.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	7.5		4.0	7.5		4.0	7.5		4.0	7.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effct Green (s)	50.2	35.7		42.2	31.7		54.0	43.5		71.8	57.3	
Actuated g/C Ratio	0.39	0.27		0.32	0.24		0.42	0.33		0.55	0.44	
v/c Ratio	1.24	0.91		0.77	0.87		0.67	1.11		1.19	0.80	
Control Delay	171.6	59.4		59.6	48.0		47.5	81.9		147.5	35.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	171.6	59.4		59.6	48.0		47.5	81.9		147.5	35.2	
LOS	F	E		E	D		D	F		F	D	
Approach Delay		85.2			49.5			79.9			57.0	
Approach LOS		F			D			E			E	
Queue Length 50th (m)	~66.8	115.1		20.2	82.6		11.0	~200.0		~111.9	104.3	
Queue Length 95th (m)	#120.8	#149.3		#43.9	#108.8		m#33.3	#222.6		#172.8	159.7	
Internal Link Dist (m)		298.0			158.9			219.2			315.7	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)	60.0			48.0			150.0			80.0		
Base Capacity (vph)	214	1000		158	930		158	1578		334	2052	
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	1.24	0.89		0.77	0.85		0.67	1.11		1.19	0.80	

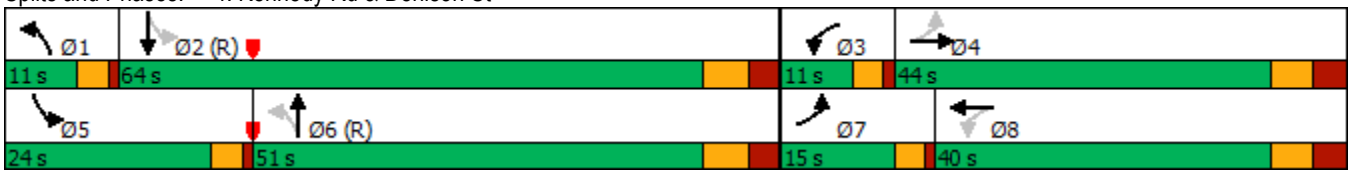
Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 67 (52%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green			
Natural Cycle: 140			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.24			
Intersection Signal Delay: 68.4		Intersection LOS: E	
Intersection Capacity Utilization 112.2%		ICU Level of Service H	
Analysis Period (min) 15			

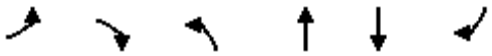
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

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

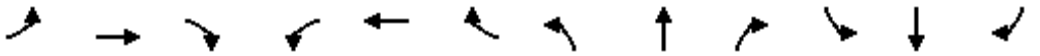
Splits and Phases: 4: Kennedy Rd & Denison St





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	20	0	1901	1996	20
Future Volume (vph)	0	20	0	1901	1996	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	1662	0	4899	4889	0
Flt Permitted						
Satd. Flow (perm)	0	1662	0	4899	4889	0
Link Speed (k/h)	50			60	60	
Link Distance (m)	82.2			339.7	142.9	
Travel Time (s)	5.9			20.4	8.6	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	21	0	1980	2100	0
Sign Control	Yield			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	49.0%	ICU Level of Service	A
Analysis Period (min)	15		



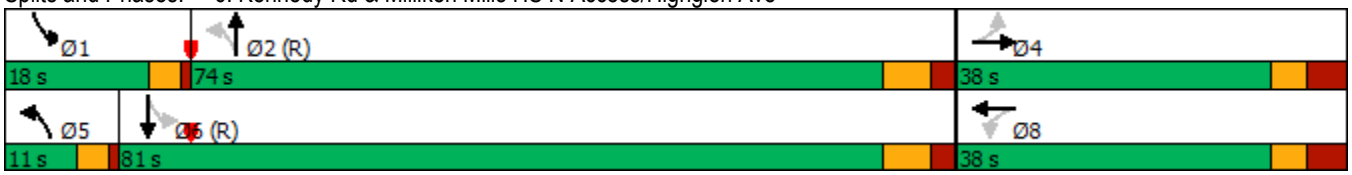
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	58	82	63	45	86	51	1896	77	133	1749	13
Future Volume (vph)	21	58	82	63	45	86	51	1896	77	133	1749	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	32.0		0.0	53.0		0.0	75.0		0.0	90.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1825	1729	0	1825	1716	0	1825	4772	0	1825	4705	0
Flt Permitted	0.587			0.557			0.082			0.048		
Satd. Flow (perm)	1126	1729	0	1061	1716	0	157	4772	0	92	4705	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		51			69			6			1	
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		183.2			282.0			142.9			266.6	
Travel Time (s)		16.5			25.4			8.6			16.0	
Confl. Peds. (#/hr)	1		8	8		1	16		2	2		16
Confl. Bikes (#/hr)							3		4	4		3
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	4%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	22	145	0	66	137	0	53	2055	0	139	1836	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	30.0		7.0	30.0	
Minimum Split (s)	37.5	37.5		37.5	37.5		11.0	37.0		11.0	37.0	
Total Split (s)	38.0	38.0		38.0	38.0		11.0	74.0		18.0	81.0	
Total Split (%)	29.2%	29.2%		29.2%	29.2%		8.5%	56.9%		13.8%	62.3%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.0	4.5		3.0	4.5	
All-Red Time (s)	4.0	4.0		4.0	4.0		1.0	2.5		1.0	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.5	7.5		7.5	7.5		4.0	7.0		4.0	7.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effct Green (s)	15.6	15.6		15.6	15.6		95.4	85.3		102.3	91.0	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.73	0.66		0.79	0.70	
v/c Ratio	0.16	0.58		0.52	0.52		0.26	0.66		0.65	0.56	
Control Delay	50.1	42.3		66.0	32.4		7.0	9.7		37.1	11.2	
Queue Delay	0.0	0.0		0.0	0.2		0.0	0.0		0.0	0.0	
Total Delay	50.1	42.3		66.0	32.6		7.0	9.7		37.1	11.2	
LOS	D	D		E	C		A	A		D	B	
Approach Delay		43.4			43.4			9.7			13.0	
Approach LOS		D			D			A			B	
Queue Length 50th (m)	5.3	23.4		16.6	16.7		1.8	65.9		17.8	74.3	
Queue Length 95th (m)	11.9	38.7		27.3	31.9		m3.3	m65.5		46.0	111.0	
Internal Link Dist (m)		159.2			258.0			118.9			242.6	

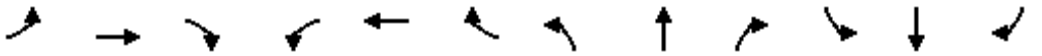
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)	32.0			53.0			75.0			90.0		
Base Capacity (vph)	264	444		248	455		206	3131		260	3294	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	54		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.08	0.33		0.27	0.34		0.26	0.66		0.53	0.56	

Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 78 (60%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.66			
Intersection Signal Delay: 13.9		Intersection LOS: B	
Intersection Capacity Utilization 88.1%		ICU Level of Service E	
Analysis Period (min) 15			

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

Splits and Phases: 6: Kennedy Rd & Milliken Mills HS N Access/Highglen Ave





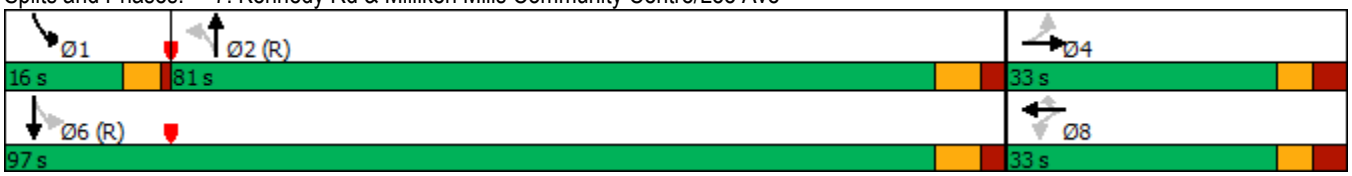
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	72	4	79	26	20	61	45	2041	50	132	1637	130
Future Volume (vph)	72	4	79	26	20	61	45	2041	50	132	1637	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		37.0	90.0		0.0	72.0		0.0
Storage Lanes	1		0	0		1	1		0	1		0
Taper Length (m)	0.0			0.0			2.5			2.5		
Satd. Flow (prot)	1825	1605	0	0	1867	1633	1825	4783	0	1825	4660	0
Flt Permitted	0.724				0.772		0.082			0.044		
Satd. Flow (perm)	1375	1605	0	0	1473	1594	157	4783	0	85	4660	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		29				71		4			21	
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		87.8			315.9			266.6			285.1	
Travel Time (s)		7.9			28.4			16.0			17.1	
Confl. Peds. (#/hr)	8		9	9		8	5					5
Confl. Bikes (#/hr)							1		3	3		1
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	4%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	81	93	0	0	51	69	51	2349	0	148	1985	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	30.0	30.0		5.0	30.0	
Minimum Split (s)	33.0	33.0		33.0	33.0	33.0	37.0	37.0		9.5	37.0	
Total Split (s)	33.0	33.0		33.0	33.0	33.0	81.0	81.0		16.0	97.0	
Total Split (%)	25.4%	25.4%		25.4%	25.4%	25.4%	62.3%	62.3%		12.3%	74.6%	
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	4.5	4.5		3.5	4.5	
All-Red Time (s)	3.5	3.5		3.5	3.5	3.5	2.5	2.5		1.0	2.5	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.0	7.0			7.0	7.0	7.0	7.0		4.5	7.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)	15.0	15.0			15.0	15.0	86.4	86.4		103.5	101.0	
Actuated g/C Ratio	0.12	0.12			0.12	0.12	0.66	0.66		0.80	0.78	
v/c Ratio	0.51	0.44			0.30	0.28	0.49	0.74		0.73	0.55	
Control Delay	63.8	41.7			54.9	12.7	30.3	15.9		48.6	6.9	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.5		0.0	0.0	
Total Delay	63.8	41.7			54.9	12.7	30.3	16.4		48.6	6.9	
LOS	E	D			D	B	C	B		D	A	
Approach Delay		52.0			30.6			16.7			9.8	
Approach LOS		D			C			B			A	
Queue Length 50th (m)	20.2	15.6			12.4	0.0	4.5	170.6		20.0	59.4	
Queue Length 95th (m)	32.8	29.0			22.4	11.6	m21.6	256.2		#48.3	107.3	
Internal Link Dist (m)		63.8			291.9			242.6			261.1	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)						37.0	90.0			72.0		
Base Capacity (vph)	275	344			294	375	104	3178		226	3625	
Starvation Cap Reductn	0	0			0	0	0	376		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	0.29	0.27			0.17	0.18	0.49	0.84		0.65	0.55	

Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 113 (87%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.74			
Intersection Signal Delay: 15.2		Intersection LOS: B	
Intersection Capacity Utilization 90.6%		ICU Level of Service E	
Analysis Period (min) 15			

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Kennedy Rd & Milliken Mills Community Centre/Lee Ave



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	141	1200	207	128	607	313	162	1695	223	315	1414	97
Future Volume (vph)	141	1200	207	128	607	313	162	1695	223	315	1414	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	64.0		58.0	50.0		45.0	65.0		0.0	50.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1807	3614	1601	1772	3579	1601	1789	4720	0	1825	4698	0
Flt Permitted	0.255			0.101			0.076			0.071		
Satd. Flow (perm)	484	3614	1573	188	3579	1567	143	4720	0	136	4698	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			103			216		17			8	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		504.0			494.8			285.1			290.2	
Travel Time (s)		36.3			35.6			17.1			17.4	
Confl. Peds. (#/hr)	7		3	3		7	17		7	7		17
Confl. Bikes (#/hr)			2	2			2		1	1		2
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	1%	1%	2%	3%	2%	2%	2%	2%	0%	0%	3%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	142	1212	209	129	613	316	164	1937	0	318	1526	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8		8	6			2		
Detector Phase	7	4	4	3	8	8	1	6		5	2	
Switch Phase												
Minimum Initial (s)	7.0	20.0	20.0	7.0	20.0	20.0	7.0	20.0		7.0	20.0	
Minimum Split (s)	11.0	39.5	39.5	11.0	39.5	39.5	11.0	41.5		11.0	41.5	
Total Split (s)	13.0	49.0	49.0	11.0	47.0	47.0	16.0	60.0		20.0	64.0	
Total Split (%)	9.3%	35.0%	35.0%	7.9%	33.6%	33.6%	11.4%	42.9%		14.3%	45.7%	
Yellow Time (s)	3.0	4.5	4.5	3.0	4.5	4.5	3.0	4.5		3.0	4.5	
All-Red Time (s)	1.0	3.0	3.0	1.0	3.0	3.0	1.0	3.0		1.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5		4.0	7.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Act Effct Green (s)	53.9	41.5	41.5	50.1	39.6	39.6	67.4	52.5		76.0	57.1	
Actuated g/C Ratio	0.38	0.30	0.30	0.36	0.28	0.28	0.48	0.38		0.54	0.41	
v/c Ratio	0.53	1.13	0.39	0.88	0.61	0.53	0.81	1.09		1.20	0.79	
Control Delay	35.3	115.8	21.6	80.4	46.5	16.7	59.9	90.6		156.6	46.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	35.3	115.8	21.6	80.4	46.5	16.7	59.9	90.6		156.6	46.1	
LOS	D	F	C	F	D	B	E	F		F	D	
Approach Delay		95.9			41.7			88.2			65.1	
Approach LOS		F			D			F			E	
Queue Length 50th (m)	25.4	~204.4	22.4	22.9	77.6	21.6	27.9	~235.0		~91.6	106.9	
Queue Length 95th (m)	40.7	#246.8	45.1	#57.4	97.7	51.2	#63.1	#266.3		m#134.2	136.6	
Internal Link Dist (m)		480.0			470.8			261.1			266.2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)	64.0		58.0	50.0		45.0	65.0			50.0		
Base Capacity (vph)	271	1071	538	146	1011	598	210	1780		266	1921	
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	0.52	1.13	0.39	0.88	0.61	0.53	0.78	1.09		1.20	0.79	

Intersection Summary

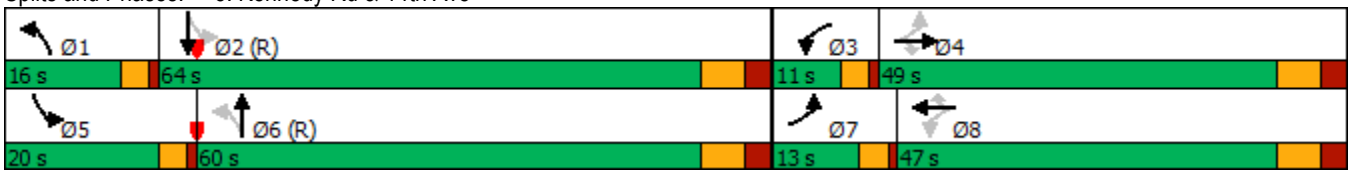
Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 5 (4%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.20
Intersection Signal Delay: 76.1 Intersection LOS: E
Intersection Capacity Utilization 114.7% ICU Level of Service H
Analysis Period (min) 15

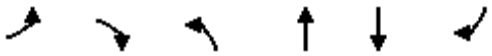
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

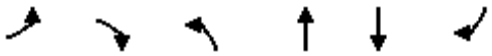
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Kennedy Rd & 14th Ave





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø8
Lane Configurations							
Traffic Volume (vph)	600	338	99	1953	1485	165	
Future Volume (vph)	600	338	99	1953	1485	165	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	65.0	0.0	63.0			0.0	
Storage Lanes	1	1	1			0	
Taper Length (m)	2.5		2.5				
Satd. Flow (prot)	1789	1601	1738	4803	4658	0	
Flt Permitted	0.950		0.062				
Satd. Flow (perm)	1773	1570	113	4803	4658	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)		169			14		
Link Speed (k/h)	50			60	60		
Link Distance (m)	324.2			290.2	340.2		
Travel Time (s)	23.3			17.4	20.4		
Confl. Peds. (#/hr)	6	5	15			15	
Confl. Bikes (#/hr)			1			1	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	
Heavy Vehicles (%)	2%	2%	5%	2%	3%	3%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	606	341	100	1973	1667	0	
Turn Type	Prot	Perm	pm+pt	NA	NA		
Protected Phases	4		1	6	2		8
Permitted Phases		4	6				
Detector Phase	4	4	1	6	2		
Switch Phase							
Minimum Initial (s)	10.0	10.0	5.0	40.0	40.0		10.0
Minimum Split (s)	35.0	35.0	9.5	47.0	47.0		35.0
Total Split (s)	66.0	66.0	14.0	74.0	60.0		66.0
Total Split (%)	47.1%	47.1%	10.0%	52.9%	42.9%		47%
Yellow Time (s)	3.5	3.5	3.5	4.5	4.5		3.5
All-Red Time (s)	3.5	3.5	1.0	2.5	2.5		3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	7.0	7.0	4.5	7.0	7.0		
Lead/Lag			Lead		Lag		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None	None	None	C-Max	C-Max		None
Act Effct Green (s)	52.8	52.8	75.7	73.2	60.0		
Actuated g/C Ratio	0.38	0.38	0.54	0.52	0.43		
v/c Ratio	0.90	0.49	0.62	0.79	0.83		
Control Delay	58.0	17.5	54.2	8.4	31.3		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	58.0	17.5	54.2	8.4	31.3		
LOS	E	B	D	A	C		
Approach Delay	43.4			10.6	31.3		
Approach LOS	D			B	C		
Queue Length 50th (m)	154.1	34.2	16.0	38.1	94.5		
Queue Length 95th (m)	195.3	58.2	m18.6	m39.7	#186.5		
Internal Link Dist (m)	300.2			266.2	316.2		

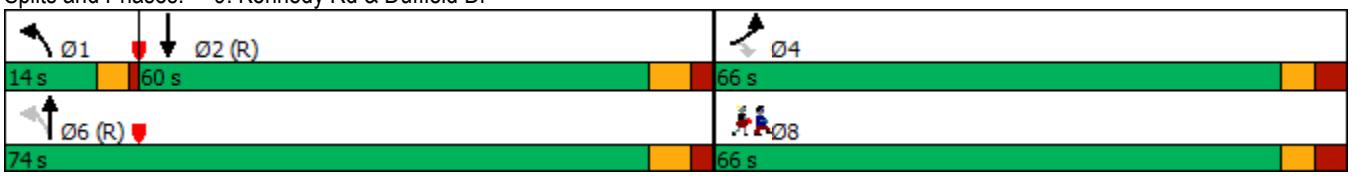


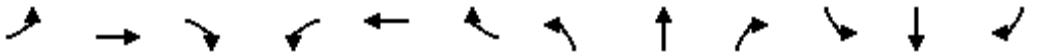
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø8
Turn Bay Length (m)	65.0		63.0				
Base Capacity (vph)	753	759	172	2511	2005		
Starvation Cap Reductn	0	0	0	0	0		
Spillback Cap Reductn	0	0	0	0	0		
Storage Cap Reductn	0	0	0	0	0		
Reduced v/c Ratio	0.80	0.45	0.58	0.79	0.83		

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 22 (16%), Referenced to phase 2:SBT and 6:NBTL, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 24.6 Intersection LOS: C
Intersection Capacity Utilization 87.5% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Kennedy Rd & Duffield Dr





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	407	0	451	0	0	0	0	2141	412	0	1173	500
Future Volume (vph)	407	0	451	0	0	0	0	2141	412	0	1173	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	1683	1481	1463	0	0	0	0	4678	0	0	4560	0
Flt Permitted	0.950	0.982										
Satd. Flow (perm)	1683	1481	1463	0	0	0	0	4678	0	0	4560	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		63	67					45			136	
Link Speed (k/h)		60			48			60			60	
Link Distance (m)		436.7			245.1			340.2			345.3	
Travel Time (s)		26.2			18.4			20.4			20.7	
Confl. Peds. (#/hr)							7					7
Confl. Bikes (#/hr)							2		3	3		2
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	3%	0%	6%	0%	0%	0%	0%	2%	1%	0%	2%	0%
Shared Lane Traffic (%)	26%		40%									
Lane Group Flow (vph)	317	301	285	0	0	0	0	2688	0	0	1761	0
Turn Type	Split	NA	Perm					NA			NA	
Protected Phases	4	4						6			2	
Permitted Phases			4									
Detector Phase	4	4	4					6			2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					15.0			15.0	
Minimum Split (s)	31.5	31.5	31.5					34.5			34.5	
Total Split (s)	49.0	49.0	49.0					91.0			91.0	
Total Split (%)	35.0%	35.0%	35.0%					65.0%			65.0%	
Yellow Time (s)	4.5	4.5	4.5					4.5			4.5	
All-Red Time (s)	2.0	2.0	2.0					3.0			3.0	
Lost Time Adjust (s)	0.0	0.0	0.0					0.0			0.0	
Total Lost Time (s)	6.5	6.5	6.5					7.5			7.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None					C-Max			C-Max	
Act Effct Green (s)	32.6	32.6	32.6					93.4			93.4	
Actuated g/C Ratio	0.23	0.23	0.23					0.67			0.67	
v/c Ratio	0.81	0.77	0.73					0.86			0.57	
Control Delay	66.4	51.7	47.8					13.9			23.8	
Queue Delay	0.0	0.0	0.0					0.0			0.0	
Total Delay	66.4	51.7	47.8					13.9			23.8	
LOS	E	D	D					B			C	
Approach Delay		55.6						13.9			23.8	
Approach LOS		E						B			C	
Queue Length 50th (m)	88.0	69.2	59.8					100.9			138.1	
Queue Length 95th (m)	113.7	97.5	86.2					311.2			138.7	
Internal Link Dist (m)		412.7			221.1			316.2			321.3	
Turn Bay Length (m)												
Base Capacity (vph)	510	493	490					3136			3088	
Starvation Cap Reductn	0	0	0					0			0	

Lane Group	Ø8
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (k/h)	
Link Distance (m)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	8
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	22.5
Total Split (s)	49.0
Total Split (%)	35%
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn	0	0	0					0			0	
Storage Cap Reductn	0	0	0					0			0	
Reduced v/c Ratio	0.62	0.61	0.58					0.86			0.57	

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 28 (20%), Referenced to phase 2:SBT and 6:NBT, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.86			
Intersection Signal Delay: 24.2		Intersection LOS: C	
Intersection Capacity Utilization 78.1%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 10: Kennedy Rd & 407 EB Off-Ramp

Lane Group	Ø8
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

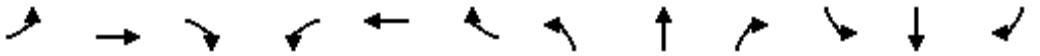
Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	63	0	215	0	2227	321	0	1530	350
Future Volume (vph)	0	0	0	63	0	215	0	2227	321	0	1530	350
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	0	0	1651	1426	1477	0	4709	0	0	4667	0
Flt Permitted				0.950	0.997							
Satd. Flow (perm)	0	0	0	1651	1426	1477	0	4709	0	0	4667	0
Right Turn on Red			Yes			Yes			Yes			No
Satd. Flow (RTOR)					39	39		37				
Link Speed (k/h)		48			60			60			60	
Link Distance (m)		370.0			404.8			345.3			162.6	
Travel Time (s)		27.8			24.3			20.7			9.8	
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)							2		4	4		2
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	0%	0%	5%	0%	5%	0%	2%	0%	0%	2%	0%
Shared Lane Traffic (%)				10%		49%						
Lane Group Flow (vph)	0	0	0	58	116	113	0	2627	0	0	1938	0
Turn Type				Split	NA	Perm		NA			NA	
Protected Phases				8	8			6			2	
Permitted Phases						8						
Detector Phase				8	8	8		6			2	
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0		30.0			30.0	
Minimum Split (s)				32.5	32.5	32.5		38.0			38.0	
Total Split (s)				38.0	38.0	38.0		102.0			102.0	
Total Split (%)				27.1%	27.1%	27.1%		72.9%			72.9%	
Yellow Time (s)				4.5	4.5	4.5		4.5			4.5	
All-Red Time (s)				2.0	2.0	2.0		3.5			3.5	
Lost Time Adjust (s)				0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)				6.5	6.5	6.5		8.0			8.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode				None	None	None		C-Max			C-Max	
Act Effct Green (s)				15.1	15.1	15.1		110.4			110.4	
Actuated g/C Ratio				0.11	0.11	0.11		0.79			0.79	
v/c Ratio				0.33	0.62	0.59		0.71			0.53	
Control Delay				60.5	52.3	49.5		4.6			6.1	
Queue Delay				0.0	0.0	0.0		0.2			0.2	
Total Delay				60.5	52.3	49.6		4.8			6.4	
LOS				E	D	D		A			A	
Approach Delay					52.9			4.8			6.4	
Approach LOS					D			A			A	
Queue Length 50th (m)				16.2	22.9	20.9		40.8			43.4	
Queue Length 95th (m)				28.3	41.4	38.5		58.0			66.6	
Internal Link Dist (m)		346.0			380.8			321.3			138.6	
Turn Bay Length (m)												
Base Capacity (vph)				371	351	362		3722			3681	
Starvation Cap Reductn				0	0	0		0			849	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn				0	2	2		357			0	
Storage Cap Reductn				0	0	0		0			0	
Reduced v/c Ratio				0.16	0.33	0.31		0.78			0.68	

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 49 (35%), Referenced to phase 2:SBT and 6:NBT, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.71			
Intersection Signal Delay: 8.3		Intersection LOS: A	
Intersection Capacity Utilization 71.2%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 11: Kennedy Rd & 407 WB Off-Ramp



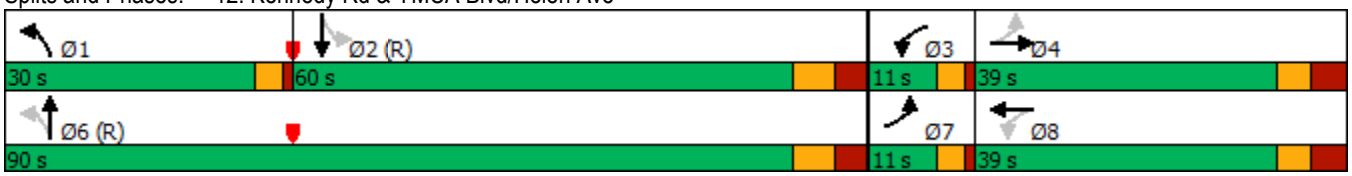
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	308	105	244	108	26	42	326	1873	387	42	1572	115
Future Volume (vph)	308	105	244	108	26	42	326	1873	387	42	1572	115
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	135.0		0.0	132.0		0.0	77.0		0.0	96.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	3372	1599	0	1738	1680	0	1690	4663	0	1772	4729	0
Flt Permitted	0.611			0.236			0.068			0.073		
Satd. Flow (perm)	2169	1599	0	429	1680	0	121	4663	0	136	4729	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		77			24			48			9	
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		303.2			335.1			162.6			360.1	
Travel Time (s)		27.3			30.2			9.8			21.6	
Confl. Peds. (#/hr)			11	11			8		3	3		8
Confl. Bikes (#/hr)									3	3		
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	5%	2%	7%	5%	10%	0%	8%	2%	1%	3%	1%	20%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	314	356	0	110	70	0	333	2306	0	43	1721	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		Perm	NA	
Protected Phases	7	4		3	8		1	6			2	
Permitted Phases	4			8			6			2		
Detector Phase	7	4		3	8		1	6		2	2	
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0	30.0		30.0	30.0	
Minimum Split (s)	11.0	38.5		11.0	38.5		11.0	40.0		40.0	40.0	
Total Split (s)	11.0	39.0		11.0	39.0		30.0	90.0		60.0	60.0	
Total Split (%)	7.9%	27.9%		7.9%	27.9%		21.4%	64.3%		42.9%	42.9%	
Yellow Time (s)	3.0	3.5		3.0	3.5		3.0	4.5		4.5	4.5	
All-Red Time (s)	1.0	4.0		1.0	4.0		1.0	3.5		3.5	3.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	7.5		4.0	7.5		4.0	8.0		8.0	8.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		C-Max	C-Max	
Act Effct Green (s)	39.9	28.6		34.2	26.4		88.9	84.9		56.1	56.1	
Actuated g/C Ratio	0.28	0.20		0.24	0.19		0.64	0.61		0.40	0.40	
v/c Ratio	0.43	0.92		0.65	0.21		0.94	0.81		0.80	0.91	
Control Delay	39.8	71.2		56.0	31.5		70.8	14.0		65.7	53.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.8		0.0	0.0	
Total Delay	39.8	71.2		56.0	31.5		70.8	14.9		65.7	53.3	
LOS	D	E		E	C		E	B		E	D	
Approach Delay		56.4			46.5			21.9			53.6	
Approach LOS		E			D			C			D	
Queue Length 50th (m)	33.1	76.4		21.8	10.3		71.9	211.1		10.5	165.7	
Queue Length 95th (m)	45.4	#127.6		36.6	23.5		#129.9	123.0		m10.4	m164.0	
Internal Link Dist (m)		279.2			311.1			138.6			336.1	

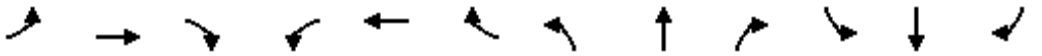
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)	135.0			132.0			77.0			96.0		
Base Capacity (vph)	727	419		170	396		368	2845		54	1899	
Starvation Cap Reductn	0	0		0	0		0	257		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.43	0.85		0.65	0.18		0.90	0.89		0.80	0.91	

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 90 (64%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green			
Natural Cycle: 125			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.94			
Intersection Signal Delay: 37.8		Intersection LOS: D	
Intersection Capacity Utilization 121.5%		ICU Level of Service H	
Analysis Period (min) 15			

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 12: Kennedy Rd & YMCA Blvd/Helen Ave





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	370	360	600	208	186	109	350	1826	115	46	1094	378
Future Volume (vph)	370	360	600	208	186	109	350	1826	115	46	1094	378
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	57.0		0.0	83.0		70.0	193.0		0.0	35.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1789	1883	1585	1772	3382	0	1807	4716	0	1772	4549	0
Flt Permitted	0.422			0.303			0.079			0.086		
Satd. Flow (perm)	795	1883	1585	565	3382	0	150	4716	0	160	4549	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			331		20			10			67	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		264.4			158.5			360.1			256.8	
Travel Time (s)		19.0			11.4			21.6			15.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	2%	2%	3%	3%	2%	2%	1%	3%	2%	3%	4%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	411	400	667	231	328	0	389	2157	0	51	1636	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		Perm	NA	
Protected Phases	7	4		3	8		1	6			2	
Permitted Phases	4		4	8			6			2		
Detector Phase	7	4	4	3	8		1	6		2	2	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	7.0	10.0		7.0	32.0		32.0	32.0	
Minimum Split (s)	9.5	39.5	39.5	11.0	39.5		11.0	39.5		39.5	39.5	
Total Split (s)	20.0	48.0	48.0	12.0	40.0		26.0	80.0		54.0	54.0	
Total Split (%)	14.3%	34.3%	34.3%	8.6%	28.6%		18.6%	57.1%		38.6%	38.6%	
Yellow Time (s)	3.5	4.0	4.0	3.0	4.0		3.0	4.5		4.5	4.5	
All-Red Time (s)	1.0	3.5	3.5	1.0	3.5		1.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	7.5	7.5	4.0	7.5		4.0	7.5		7.5	7.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead			Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes			Yes	Yes	
Recall Mode	None	None	None	None	None		None	C-Max		C-Max	C-Max	
Act Effct Green (s)	54.3	39.3	39.3	42.8	31.3		77.2	73.7		46.5	46.5	
Actuated g/C Ratio	0.39	0.28	0.28	0.31	0.22		0.55	0.53		0.33	0.33	
v/c Ratio	0.98	0.76	0.98	0.96	0.42		1.09	0.87		0.96	1.05	
Control Delay	77.5	56.1	54.2	85.9	45.3		111.4	21.0		157.0	89.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	77.5	56.1	54.2	85.9	45.3		111.4	21.0		157.0	89.3	
LOS	E	E	D	F	D		F	C		F	F	
Approach Delay		61.2			62.1			34.8			91.4	
Approach LOS		E			E			C			F	
Queue Length 50th (m)	88.5	100.3	107.4	43.7	38.3		~106.1	156.5		14.2	~185.2	
Queue Length 95th (m)	#159.8	138.1	#188.2	#90.2	52.9		m#162.5	179.5		m#30.3	#216.9	
Internal Link Dist (m)		240.4			134.5			336.1			232.8	
Turn Bay Length (m)	57.0			83.0			193.0			35.0		
Base Capacity (vph)	418	544	693	241	800		356	2487		53	1555	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
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	0.98	0.74	0.96	0.96	0.41		1.09	0.87		0.96	1.05	

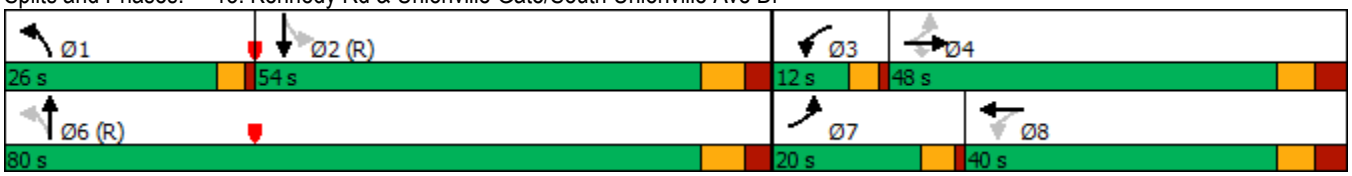
Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 108 (77%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green			
Natural Cycle: 145			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.09			
Intersection Signal Delay: 58.7		Intersection LOS: E	
Intersection Capacity Utilization 117.1%		ICU Level of Service H	
Analysis Period (min) 15			

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

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

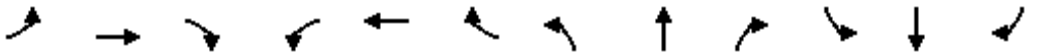
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 13: Kennedy Rd & Unionville Gate/South Unionville Ave Dr



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	98	2180	250	114	1569
Future Volume (vph)	0	98	2180	250	114	1569
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	40.0	0.0		0.0	25.0	
Storage Lanes	0	1		0	1	
Taper Length (m)	2.5				2.5	
Satd. Flow (prot)	0	1629	4731	0	1755	4710
Flt Permitted					0.950	
Satd. Flow (perm)	0	1629	4731	0	1755	4710
Link Speed (k/h)	40		60			60
Link Distance (m)	247.2		256.8			191.8
Travel Time (s)	22.2		15.4			11.5
Confl. Peds. (#/hr)		1		12	12	
Confl. Bikes (#/hr)				1	1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	3%	2%	2%	2%	4%	4%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	109	2700	0	127	1743
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 67.8%		ICU Level of Service C	
Analysis Period (min) 15			

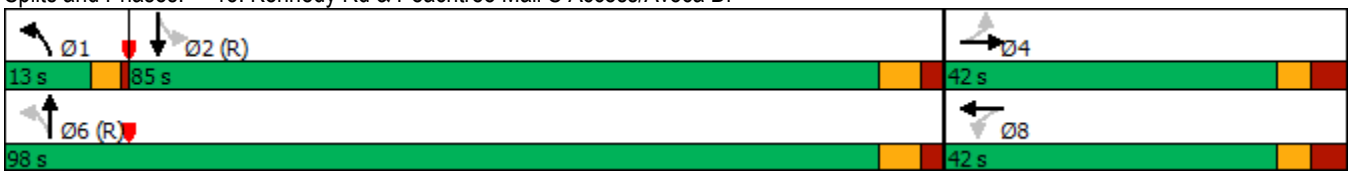


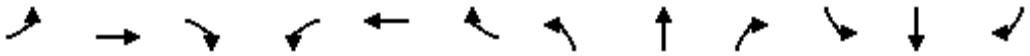
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	293	34	112	35	25	55	162	2238	23	49	1675	41
Future Volume (vph)	293	34	112	35	25	55	162	2238	23	49	1675	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	20.0		0.0	100.0		0.0	60.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	0.0			2.5			2.5			2.5		
Satd. Flow (prot)	1789	1632	0	1825	1654	0	1807	4743	0	1825	4681	0
Flt Permitted	0.704			0.624			0.066			0.051		
Satd. Flow (perm)	1307	1632	0	1188	1654	0	126	4743	0	98	4681	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		113			8			2			4	
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		109.6			410.4			191.8			150.5	
Travel Time (s)		9.9			36.9			11.5			9.0	
Confl. Peds. (#/hr)	12		9	9		12	8		15	15		8
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	2%	0%	3%	0%	0%	3%	1%	3%	5%	0%	4%	10%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	296	147	0	35	81	0	164	2284	0	49	1733	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		1	6			2	
Permitted Phases	4			8			6			2		
Detector Phase	4	4		8	8		1	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	30.0		30.0	30.0	
Minimum Split (s)	39.5	39.5		39.5	39.5		11.0	37.0		37.0	37.0	
Total Split (s)	42.0	42.0		42.0	42.0		13.0	98.0		85.0	85.0	
Total Split (%)	30.0%	30.0%		30.0%	30.0%		9.3%	70.0%		60.7%	60.7%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.0	4.5		4.5	4.5	
All-Red Time (s)	4.0	4.0		4.0	4.0		1.0	2.5		2.5	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.5	7.5		7.5	7.5		4.0	7.0		7.0	7.0	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		C-Max	C-Max	
Act Effct Green (s)	33.4	33.4		33.4	33.4		95.1	92.1		79.0	79.0	
Actuated g/C Ratio	0.24	0.24		0.24	0.24		0.68	0.66		0.56	0.56	
v/c Ratio	0.95	0.31		0.12	0.20		0.85	0.73		0.89	0.66	
Control Delay	91.6	14.0		42.5	39.3		59.6	8.6		88.8	12.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	91.6	14.0		42.5	39.3		59.6	8.6		88.8	12.4	
LOS	F	B		D	D		E	A		F	B	
Approach Delay		65.8			40.3			12.1			14.5	
Approach LOS		E			D			B			B	
Queue Length 50th (m)	80.4	7.3		7.6	16.0		27.9	63.3		4.6	61.2	
Queue Length 95th (m)	#135.0	25.1		17.1	30.2		m#36.3	m88.5		m#18.1	m64.1	
Internal Link Dist (m)		85.6			386.4			167.8			126.5	
Turn Bay Length (m)				20.0			100.0			60.0		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	322	487		292	413		193	3119		55	2644	
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	0.92	0.30		0.12	0.20		0.85	0.73		0.89	0.66	

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 93 (66%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.95			
Intersection Signal Delay: 18.6		Intersection LOS: B	
Intersection Capacity Utilization 115.8%		ICU Level of Service H	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 15: Kennedy Rd & Peachtree Mall S Access/Avoca Dr





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	72	4	0	27	0	2706	33	29	1846	183
Future Volume (vph)	0	0	72	4	0	27	0	2706	33	29	1846	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	50.0		0.0	15.0		0.0
Storage Lanes	0		1	1		1	0		0	1		0
Taper Length (m)	0.0			0.0			2.5			2.5		
Satd. Flow (prot)	0	0	1629	1825	0	1555	0	4746	0	1825	4616	0
Flt Permitted				0.950						0.950		
Satd. Flow (perm)	0	0	1629	1825	0	1555	0	4746	0	1825	4616	0
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		140.1			268.7			150.5			203.0	
Travel Time (s)		12.6			24.2			9.0			12.2	
Confl. Peds. (#/hr)			1	1			8		14	14		8
Confl. Bikes (#/hr)									1	1		
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	0%	0%	2%	0%	0%	5%	0%	3%	4%	0%	5%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	73	4	0	27	0	2766	0	29	2050	0
Sign Control		Yield			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 63.0%		ICU Level of Service B	
Analysis Period (min) 15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	270	1350	257	234	980	183	215	2011	407	222	1385	287
Future Volume (vph)	270	1350	257	234	980	183	215	2011	407	222	1385	287
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	78.0		95.0	43.0		87.0	111.0		0.0	100.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1807	3614	1585	1722	3614	1601	1772	4668	0	1807	4656	0
Flt Permitted	0.088			0.094			0.076			0.079		
Satd. Flow (perm)	167	3614	1527	170	3614	1563	142	4668	0	150	4656	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			152			150		31			31	
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		303.4			351.7			203.0			185.7	
Travel Time (s)		15.6			18.1			12.2			11.1	
Confl. Peds. (#/hr)	11		23	23		11	13		5	5		13
Confl. Bikes (#/hr)							1					1
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	1%	1%	3%	6%	1%	2%	3%	1%	7%	1%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	273	1364	260	236	990	185	217	2442	0	224	1689	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6		6	2		2	8			4		
Detector Phase	1	6	6	5	2	2	3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	38.0	38.0	7.0	38.0	38.0	7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	45.5	45.5	11.0	45.5	45.5	11.0	44.5		11.0	44.5	
Total Split (s)	17.0	53.0	53.0	14.0	50.0	50.0	15.0	60.0		13.0	58.0	
Total Split (%)	12.1%	37.9%	37.9%	10.0%	35.7%	35.7%	10.7%	42.9%		9.3%	41.4%	
Yellow Time (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	4.5		3.0	4.5	
All-Red Time (s)	1.0	2.5	2.5	1.0	2.5	2.5	1.0	3.0		1.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5		4.0	7.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None		None	None	
Act Effct Green (s)	62.0	45.5	45.5	56.0	42.5	42.5	67.0	52.5		63.0	50.5	
Actuated g/C Ratio	0.44	0.32	0.32	0.40	0.30	0.30	0.48	0.38		0.45	0.36	
v/c Ratio	1.21	1.16	0.43	1.33	0.90	0.32	1.11	1.38		1.29	0.99	
Control Delay	160.2	124.7	17.3	209.5	58.9	10.5	128.5	207.2		194.2	67.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	160.2	124.7	17.3	209.5	58.9	10.5	128.5	207.2		194.2	67.8	
LOS	F	F	B	F	E	B	F	F		F	E	
Approach Delay		115.0			77.7			200.8			82.6	
Approach LOS		F			E			F			F	
Queue Length 50th (m)	~75.0	~234.8	22.0	~68.2	138.6	6.9	~53.2	~347.6		~63.7	134.1	
Queue Length 95th (m)	#131.5	#277.4	47.2	#121.8	#174.8	25.2	m#97.3	#377.6		#115.8	#132.5	
Internal Link Dist (m)		279.4			327.7			179.0			161.7	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)	78.0		95.0	43.0		87.0	111.0			100.0		
Base Capacity (vph)	226	1174	598	178	1097	578	196	1769		174	1699	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	1.21	1.16	0.43	1.33	0.90	0.32	1.11	1.38		1.29	0.99	

Intersection Summary

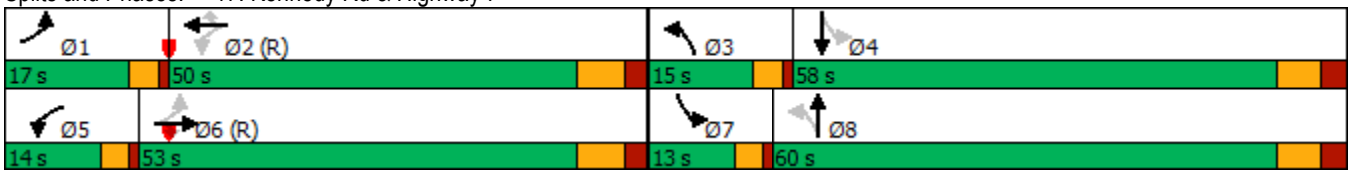
Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 38 (27%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.38
Intersection Signal Delay: 129.4 Intersection LOS: F
Intersection Capacity Utilization 129.8% ICU Level of Service H
Analysis Period (min) 15

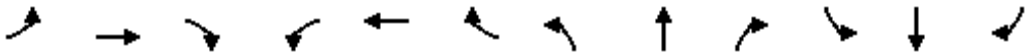
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

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

Splits and Phases: 17: Kennedy Rd & Highway 7





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	11	0	0	0	0	2569	0	0	1914	8
Future Volume (vph)	0	0	11	0	0	0	0	2569	0	0	1914	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	60.0		0.0	55.0		0.0
Storage Lanes	0		1	0		1	0		0	0		0
Taper Length (m)	0.0			0.0			2.5			2.5		
Satd. Flow (prot)	0	0	1662	0	0	1921	0	4850	0	0	4798	0
Flt Permitted												
Satd. Flow (perm)	0	0	1662	0	0	1921	0	4850	0	0	4798	0
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		173.6			149.5			185.7			258.9	
Travel Time (s)		15.6			13.5			11.1			15.5	
Confl. Peds. (#/hr)							1		2	2		1
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	11	0	0	0	0	2595	0	0	1941	0
Sign Control		Stop			Stop			Free			Free	

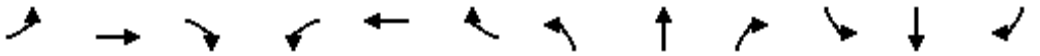
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 53.0%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø4
Lane Configurations							
Traffic Volume (vph)	141	328	2531	205	212	1833	
Future Volume (vph)	141	328	2531	205	212	1833	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	41.0	0.0		0.0	57.0		
Storage Lanes	1	1		0	1		
Taper Length (m)	2.5				2.5		
Satd. Flow (prot)	1789	1617	4788	0	1825	4803	
Flt Permitted	0.950				0.045		
Satd. Flow (perm)	1789	1617	4788	0	86	4803	
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		140	15				
Link Speed (k/h)	40		60			60	
Link Distance (m)	254.1		258.9			392.3	
Travel Time (s)	22.9		15.5			23.5	
Confl. Peds. (#/hr)				2	2		
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	
Heavy Vehicles (%)	2%	1%	1%	1%	0%	2%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	144	335	2792	0	216	1870	
Turn Type	Prot	Perm	NA		pm+pt	NA	
Protected Phases	8		6		5	2	4
Permitted Phases		8			2		
Detector Phase	8	8	6		5	2	
Switch Phase							
Minimum Initial (s)	10.0	10.0	30.0		7.0	30.0	10.0
Minimum Split (s)	33.5	33.5	37.0		11.0	37.0	33.5
Total Split (s)	34.0	34.0	90.0		16.0	106.0	34.0
Total Split (%)	24.3%	24.3%	64.3%		11.4%	75.7%	24%
Yellow Time (s)	3.5	3.5	4.5		3.0	4.5	3.5
All-Red Time (s)	3.0	3.0	2.5		1.0	2.5	3.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.5	6.5	7.0		4.0	7.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None	None	C-Max		None	C-Max	None
Act Effct Green (s)	22.4	22.4	84.7		107.1	104.1	
Actuated g/C Ratio	0.16	0.16	0.60		0.76	0.74	
v/c Ratio	0.50	0.89	0.96		0.84	0.52	
Control Delay	58.8	58.3	16.8		62.7	8.7	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	58.8	58.3	16.8		62.7	8.7	
LOS	E	E	B		E	A	
Approach Delay	58.5		16.8			14.3	
Approach LOS	E		B			B	
Queue Length 50th (m)	36.3	54.9	80.3		49.4	53.8	
Queue Length 95th (m)	56.4	#95.5	m49.6		m#87.6	m99.9	
Internal Link Dist (m)	230.1		234.9			368.3	
Turn Bay Length (m)	41.0				57.0		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø4
Base Capacity (vph)	351	430	2902		256	3571	
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.41	0.78	0.96		0.84	0.52	

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 105 (75%), Referenced to phase 2:SBTL and 6:NBT, Start of Green			
Natural Cycle: 135			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.96			
Intersection Signal Delay: 19.6		Intersection LOS: B	
Intersection Capacity Utilization 88.1%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 19: Kennedy Rd & Austin Dr



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	182	389	180	164	111	40	151	2211	618	94	1592	89
Future Volume (vph)	182	389	180	164	111	40	151	2211	618	94	1592	89
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	48.0		61.0	73.0		0.0	138.0		0.0	140.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1825	1883	1617	1825	1883	1585	1789	4671	0	1825	4755	0
Flt Permitted	0.684			0.130			0.056			0.059		
Satd. Flow (perm)	1309	1883	1584	249	1883	1560	105	4671	0	113	4755	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			138			125		68			7	
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		268.3			267.4			392.3			810.8	
Travel Time (s)		24.1			24.1			23.5			48.6	
Confl. Peds. (#/hr)	3		6	6		3	7		4	4		7
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	2%	1%	0%	2%	3%	2%	1%	0%	0%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	186	397	184	167	113	41	154	2887	0	96	1715	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8		8	6			2		
Detector Phase	7	4	4	3	8	8	1	6		5	2	
Switch Phase												
Minimum Initial (s)	7.0	10.0	10.0	7.0	10.0	10.0	7.0	31.0		6.0	31.0	
Minimum Split (s)	11.0	38.5	38.5	11.0	38.5	38.5	11.0	38.0		10.0	38.0	
Total Split (s)	11.0	38.5	38.5	11.0	38.5	38.5	20.0	80.5		10.0	70.5	
Total Split (%)	7.9%	27.5%	27.5%	7.9%	27.5%	27.5%	14.3%	57.5%		7.1%	50.4%	
Yellow Time (s)	3.0	3.5	3.5	3.0	3.5	3.5	3.0	4.5		3.0	4.5	
All-Red Time (s)	1.0	4.0	4.0	1.0	4.0	4.0	1.0	2.5		1.0	2.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.0		4.0	7.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Act Effct Green (s)	41.2	30.7	30.7	41.2	30.7	30.7	86.1	73.6		76.7	67.5	
Actuated g/C Ratio	0.29	0.22	0.22	0.29	0.22	0.22	0.62	0.53		0.55	0.48	
v/c Ratio	0.45	0.96	0.40	1.10	0.27	0.09	0.73	1.16		0.70	0.75	
Control Delay	41.4	89.7	16.1	140.5	47.4	0.4	56.1	97.9		43.4	34.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	41.4	89.7	16.1	140.5	47.4	0.4	56.1	97.9		43.4	34.1	
LOS	D	F	B	F	D	A	E	F		D	C	
Approach Delay		60.3			89.8			95.7			34.6	
Approach LOS		E			F			F			C	
Queue Length 50th (m)	38.7	109.4	10.3	~38.7	26.1	0.0	30.2	~363.2		13.6	181.2	
Queue Length 95th (m)	59.3	#171.5	31.6	#80.1	43.8	0.0	m34.3	#389.4		#37.3	208.0	
Internal Link Dist (m)		244.3			243.4			368.3			786.8	
Turn Bay Length (m)	48.0		61.0	73.0			138.0			140.0		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	410	416	458	152	416	442	257	2487		137	2296	
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	0.45	0.95	0.40	1.10	0.27	0.09	0.60	1.16		0.70	0.75	

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 128 (91%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.16			
Intersection Signal Delay: 72.2		Intersection LOS: E	
Intersection Capacity Utilization 111.1%		ICU Level of Service H	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 20: Kennedy Rd & Carlton Rd

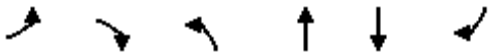
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	167	85	8	65	27	49	10	2396	134	58	1706	84
Future Volume (vph)	167	85	8	65	27	49	10	2396	134	58	1706	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	23.0		0.0	27.0		0.0	90.0		0.0	120.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1807	1893	0	1734	1637	0	1825	4808	0	1772	4764	0
Flt Permitted	0.700			0.696	0.976		0.085			0.046		
Satd. Flow (perm)	1322	1893	0	1263	1603	0	163	4808	0	86	4764	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			48			10			10	
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		238.2			161.4			810.8			257.8	
Travel Time (s)		21.4			14.5			48.6			15.5	
Confl. Peds. (#/hr)	6		5	5		6	9		2	2		9
Confl. Bikes (#/hr)	2											2
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	1%	0%	0%	0%	0%	0%	0%	1%	0%	3%	2%	0%
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	169	94	0	59	83	0	10	2555	0	59	1808	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			6		5	2	
Permitted Phases	4			8			6			2		
Detector Phase	4	4		8	8		6	6		5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		35.0	35.0		6.0	35.0	
Minimum Split (s)	40.0	40.0		40.0	40.0		42.0	42.0		11.0	42.0	
Total Split (s)	40.0	40.0		40.0	40.0		89.0	89.0		11.0	100.0	
Total Split (%)	28.6%	28.6%		28.6%	28.6%		63.6%	63.6%		7.9%	71.4%	
Yellow Time (s)	3.5	3.5		3.5	3.5		4.5	4.5		3.0	4.5	
All-Red Time (s)	4.5	4.5		4.5	4.5		2.5	2.5		1.0	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	8.0	8.0		8.0	8.0		7.0	7.0		4.0	7.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	Max	Max		Max	Max		Max	Max		None	C-Max	
Act Effct Green (s)	32.0	32.0		32.0	32.0		84.3	84.3		96.0	93.0	
Actuated g/C Ratio	0.23	0.23		0.23	0.23		0.60	0.60		0.69	0.66	
v/c Ratio	0.56	0.22		0.20	0.21		0.10	0.88		0.42	0.57	
Control Delay	56.0	44.0		46.0	22.0		4.4	14.6		33.3	10.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	56.0	44.0		46.0	22.0		4.4	14.6		33.3	10.8	
LOS	E	D		D	C		A	B		C	B	
Approach Delay		51.7			32.0			14.6			11.6	
Approach LOS		D			C			B			B	
Queue Length 50th (m)	41.7	20.6		14.0	8.1		0.0	276.0		3.6	47.5	
Queue Length 95th (m)	66.1	36.4		27.5	22.9		m0.6	m220.3		19.4	52.1	
Internal Link Dist (m)		214.2			137.4			786.8			233.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)	23.0			27.0			90.0			120.0		
Base Capacity (vph)	302	435		288	403		98	2899		143	3168	
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	0.56	0.22		0.20	0.21		0.10	0.88		0.41	0.57	

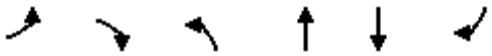
Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 31 (22%), Referenced to phase 2:SBTL, Start of Green			
Natural Cycle: 115			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.88			
Intersection Signal Delay: 15.9		Intersection LOS: B	
Intersection Capacity Utilization 88.5%		ICU Level of Service E	
Analysis Period (min) 15			

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

Splits and Phases: 21: Kennedy Rd & The Bridle Trail



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø8
Lane Configurations							
Traffic Volume (vph)	3	30	31	2423	1858	11	
Future Volume (vph)	3	30	31	2423	1858	11	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	0.0	0.0	105.0			0.0	
Storage Lanes	1	0	1			0	
Taper Length (m)	0.0		2.5				
Satd. Flow (prot)	1597	0	1755	4850	4795	0	
Flt Permitted	0.995		0.086				
Satd. Flow (perm)	1597	0	159	4850	4795	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	30				1		
Link Speed (k/h)	40			60	60		
Link Distance (m)	142.4			257.8	309.6		
Travel Time (s)	12.8			15.5	18.6		
Confl. Peds. (#/hr)		1	1			1	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	
Heavy Vehicles (%)	0%	4%	4%	1%	2%	12%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	33	0	31	2447	1888	0	
Turn Type	Prot		Perm	NA	NA		
Protected Phases	4			6	2		8
Permitted Phases			6				
Detector Phase	4		6	6	2		
Switch Phase							
Minimum Initial (s)	10.0		30.0	30.0	30.0		10.0
Minimum Split (s)	31.0		38.0	38.0	37.0		31.0
Total Split (s)	31.0		109.0	109.0	109.0		31.0
Total Split (%)	22.1%		77.9%	77.9%	77.9%		22%
Yellow Time (s)	3.5		4.5	4.5	4.5		3.5
All-Red Time (s)	3.5		2.5	2.5	2.5		3.5
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	7.0		7.0	7.0	7.0		
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	None		C-Max	C-Max	C-Max		None
Act Effct Green (s)	12.8		122.8	122.8	122.8		
Actuated g/C Ratio	0.09		0.88	0.88	0.88		
v/c Ratio	0.19		0.22	0.58	0.45		
Control Delay	21.7		2.9	1.0	3.9		
Queue Delay	0.0		0.0	0.0	0.0		
Total Delay	21.7		2.9	1.1	3.9		
LOS	C		A	A	A		
Approach Delay	21.7			1.1	3.9		
Approach LOS	C			A	A		
Queue Length 50th (m)	0.8		0.5	18.7	46.4		
Queue Length 95th (m)	10.3		m0.8	23.4	92.9		
Internal Link Dist (m)	118.4			233.8	285.6		
Turn Bay Length (m)			105.0				



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø8
Base Capacity (vph)	298		139	4254	4206		
Starvation Cap Reductn	0		0	210	0		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.11		0.22	0.61	0.45		

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 38 (27%), Referenced to phase 2:SBT and 6:NBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.58			
Intersection Signal Delay: 2.5		Intersection LOS: A	
Intersection Capacity Utilization 67.2%		ICU Level of Service C	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 22: Kennedy Rd & Birchview Ln

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	350	1977	210	195	921	116	215	1610	402	195	1365	367
Future Volume (vph)	350	1977	210	195	921	116	215	1610	402	195	1365	367
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	92.0		0.0	70.0		72.0	145.0		0.0	70.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1807	5116	0	1807	5050	0	1807	4685	0	1807	4626	0
Flt Permitted	0.092			0.101			0.078			0.079		
Satd. Flow (perm)	175	5116	0	192	5050	0	148	4685	0	150	4626	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		14			14			38			42	
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		347.4			311.5			309.6			150.2	
Travel Time (s)		20.8			18.7			18.6			9.0	
Confl. Peds. (#/hr)	12		4	4		12	8		7	7		8
Confl. Bikes (#/hr)	1					1	2					2
Peak Hour Factor	0.90	0.95	0.95	0.90	0.92	0.92	0.90	0.95	0.95	0.90	0.95	0.95
Heavy Vehicles (%)	1%	1%	0%	1%	2%	0%	1%	1%	1%	1%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	389	2302	0	217	1127	0	239	2118	0	217	1823	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6			2			8			4		
Detector Phase	1	6		5	2		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	35.0		7.0	35.0		7.0	15.0		7.0	15.0	
Minimum Split (s)	11.0	42.5		11.0	42.5		11.0	41.5		11.0	41.5	
Total Split (s)	30.0	63.0		14.0	47.0		15.0	59.0		14.0	58.0	
Total Split (%)	20.0%	42.0%		9.3%	31.3%		10.0%	39.3%		9.3%	38.7%	
Yellow Time (s)	3.0	4.5		3.0	4.5		3.0	4.5		3.0	4.5	
All-Red Time (s)	1.0	3.0		1.0	3.0		1.0	3.0		1.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	7.5		4.0	7.5		4.0	7.5		4.0	7.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	
Act Effct Green (s)	73.0	55.5		53.0	39.5		66.0	51.5		64.0	50.5	
Actuated g/C Ratio	0.49	0.37		0.35	0.26		0.44	0.34		0.43	0.34	
v/c Ratio	1.06	1.21		1.24	0.84		1.28	1.30		1.25	1.15	
Control Delay	105.5	140.7		180.4	58.4		194.5	177.5		188.2	117.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	105.5	140.7		180.4	58.4		194.5	177.5		188.2	117.5	
LOS	F	F		F	E		F	F		F	F	
Approach Delay		135.6			78.1			179.2			125.1	
Approach LOS		F			E			F			F	
Queue Length 50th (m)	~109.2	~305.3		~62.6	115.7		~73.1	~313.1		~64.7	~249.8	
Queue Length 95th (m)	#174.2	#332.4		#115.7	133.7		#128.7	#343.0		#118.4	#279.6	
Internal Link Dist (m)		323.4			287.5			285.6			126.2	

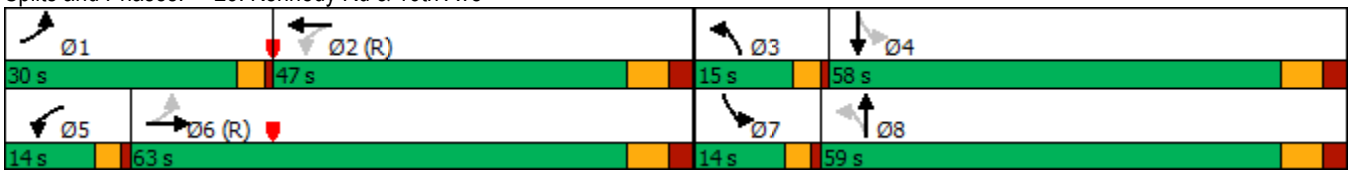
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)	92.0			70.0			145.0			70.0		
Base Capacity (vph)	368	1901		175	1340		186	1633		174	1585	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	1.06	1.21		1.24	0.84		1.28	1.30		1.25	1.15	

Intersection Summary		
Area Type:	Other	
Cycle Length: 150		
Actuated Cycle Length: 150		
Offset: 92 (61%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green		
Natural Cycle: 150		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 1.30		
Intersection Signal Delay: 136.1	Intersection LOS: F	
Intersection Capacity Utilization 123.9%	ICU Level of Service H	
Analysis Period (min) 15		

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

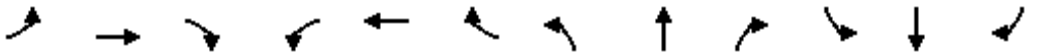
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 23: Kennedy Rd & 16th Ave



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	18	2292	9	0	2002
Future Volume (vph)	0	18	2292	9	0	2002
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	0.0		0.0	42.0	
Storage Lanes	0	1		0	0	
Taper Length (m)	2.5				2.5	
Satd. Flow (prot)	0	1629	5137	0	0	5142
Flt Permitted						
Satd. Flow (perm)	0	1629	5137	0	0	5142
Link Speed (k/h)	48		60			60
Link Distance (m)	207.8		150.2			177.5
Travel Time (s)	15.6		9.0			10.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	20	2501	0	0	2176
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 54.5%		ICU Level of Service A	
Analysis Period (min) 15			

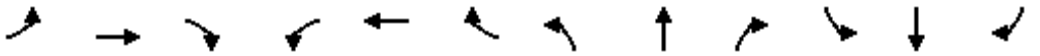


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	45	16	40	34	13	79	2344	57	38	1777	140
Future Volume (vph)	121	45	16	40	34	13	79	2344	57	38	1777	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	30.0		0.0	30.0		0.0	54.0		0.0	54.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1789	1810	0	1825	1809	0	1789	4832	0	1825	4750	0
Flt Permitted	0.724			0.714			0.067			0.035		
Satd. Flow (perm)	1364	1810	0	1362	1809	0	126	4832	0	67	4750	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10			10			5			20	
Link Speed (k/h)		48			48			60			60	
Link Distance (m)		151.1			265.8			177.5			318.0	
Travel Time (s)		11.3			19.9			10.7			19.1	
Confl. Peds. (#/hr)				5		1						
Peak Hour Factor	0.92	0.92	0.92	0.96	0.92	0.96	0.92	0.96	0.96	0.96	0.96	0.92
Heavy Vehicles (%)	2%	2%	2%	0%	2%	0%	2%	1%	0%	0%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	132	66	0	42	51	0	86	2501	0	40	2003	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Detector Phase	4	4		8	8		6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		30.0	30.0		30.0	30.0	
Minimum Split (s)	35.5	35.5		35.5	35.5		37.0	37.0		37.0	37.0	
Total Split (s)	35.8	35.8		35.8	35.8		114.2	114.2		114.2	114.2	
Total Split (%)	23.9%	23.9%		23.9%	23.9%		76.1%	76.1%		76.1%	76.1%	
Yellow Time (s)	3.5	3.5		3.5	3.5		4.5	4.5		4.5	4.5	
All-Red Time (s)	4.0	4.0		4.0	4.0		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.5	7.5		7.5	7.5		7.0	7.0		7.0	7.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	19.9	19.9		19.9	19.9		115.6	115.6		115.6	115.6	
Actuated g/C Ratio	0.13	0.13		0.13	0.13		0.77	0.77		0.77	0.77	
v/c Ratio	0.73	0.27		0.23	0.21		0.89	0.67		0.78	0.55	
Control Delay	84.3	50.1		58.9	47.0		31.5	3.6		91.1	7.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.3		0.0	0.0	
Total Delay	84.3	50.1		58.9	47.0		31.5	3.8		91.1	7.8	
LOS	F	D		E	D		C	A		F	A	
Approach Delay		72.9			52.4			4.7			9.4	
Approach LOS		E			D			A			A	
Queue Length 50th (m)	38.3	15.2		11.4	11.0		8.3	32.3		7.5	120.0	
Queue Length 95th (m)	58.4	28.2		22.2	22.7		m5.9	m31.4		m#30.9	69.7	
Internal Link Dist (m)		127.1			241.8			153.5			294.0	
Turn Bay Length (m)	30.0			30.0			54.0			54.0		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	257	349		256	349		97	3726		51	3666	
Starvation Cap Reductn	0	0		0	0		0	494		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	0.51	0.19		0.16	0.15		0.89	0.77		0.78	0.55	

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.89			
Intersection Signal Delay: 10.3		Intersection LOS: B	
Intersection Capacity Utilization 91.1%		ICU Level of Service F	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 25: Kennedy Rd & Beckett Ave



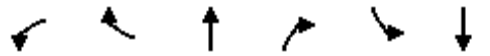
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	32	38	2	24	9	173	2333	24	5	1736	93
Future Volume (vph)	31	32	38	2	24	9	173	2333	24	5	1736	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	50.0		0.0	50.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			0.0			0.0			2.5		
Satd. Flow (prot)	1789	1731	0	1825	1712	0	1789	4569	0	1825	4678	0
Flt Permitted	0.734			0.580			0.071			0.049		
Satd. Flow (perm)	1382	1731	0	1114	1712	0	134	4569	0	94	4678	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		37			9			2			8	
Link Speed (k/h)		48			40			60			60	
Link Distance (m)		193.4			236.7			318.0			378.3	
Travel Time (s)		14.5			21.3			19.1			22.7	
Confl. Peds. (#/hr)						2						
Confl. Bikes (#/hr)									1	1		
Peak Hour Factor	0.92	0.92	0.92	0.97	0.92	0.97	0.92	0.97	0.97	0.97	0.97	0.92
Heavy Vehicles (%)	2%	2%	2%	0%	2%	23%	2%	7%	5%	0%	4%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	34	76	0	2	35	0	188	2430	0	5	1891	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	36.5	36.5		36.5	36.5		10.5	36.5		36.5	36.5	
Total Split (s)	40.0	40.0		40.0	40.0		29.0	110.0		81.0	81.0	
Total Split (%)	26.7%	26.7%		26.7%	26.7%		19.3%	73.3%		54.0%	54.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?										Yes	Yes	
Recall Mode	None	None		None	None		None	C-Min		C-Min	C-Min	
Act Effct Green (s)	9.4	9.4		9.4	9.4		131.6	131.6		112.3	112.3	
Actuated g/C Ratio	0.06	0.06		0.06	0.06		0.88	0.88		0.75	0.75	
v/c Ratio	0.40	0.53		0.03	0.30		0.67	0.61		0.07	0.54	
Control Delay	79.5	50.5		64.5	58.9		23.3	8.9		11.4	12.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	79.5	50.5		64.5	58.9		23.3	9.0		11.4	12.9	
LOS	E	D		E	E		C	A		B	B	
Approach Delay		59.5			59.2			10.0			12.9	
Approach LOS		E			E			A			B	
Queue Length 50th (m)	9.9	11.4		0.6	7.5		14.6	194.0		0.6	101.8	
Queue Length 95th (m)	21.2	27.5		3.3	18.9		54.8	142.9		m0.8	59.9	
Internal Link Dist (m)		169.4			212.7			294.0			354.3	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)							50.0			50.0		
Base Capacity (vph)	327	437		263	412		387	4008		70	3504	
Starvation Cap Reductn	0	0		0	0		0	116		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	0.10	0.17		0.01	0.08		0.49	0.62		0.07	0.54	

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 85			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.67			
Intersection Signal Delay: 12.7		Intersection LOS: B	
Intersection Capacity Utilization 70.2%		ICU Level of Service C	
Analysis Period (min) 15			

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

Splits and Phases: 26: Kennedy Rd & Wilfred Murison Ave

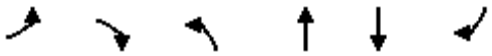


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø4
Lane Configurations							
Traffic Volume (vph)	295	85	1957	456	149	1626	
Future Volume (vph)	295	85	1957	456	149	1626	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	0.0	0.0		0.0	55.0		
Storage Lanes	1	1		0	1		
Taper Length (m)	0.0				2.5		
Satd. Flow (prot)	1789	1585	4661	0	1772	4803	
Flt Permitted	0.950				0.042		
Satd. Flow (perm)	1786	1539	4661	0	78	4803	
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		88	52				
Link Speed (k/h)	40		60			60	
Link Distance (m)	253.8		378.3			302.0	
Travel Time (s)	22.8		22.7			18.1	
Confl. Peds. (#/hr)	1	11		11	11		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	
Heavy Vehicles (%)	2%	3%	1%	2%	3%	2%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	304	88	2488	0	154	1676	
Turn Type	Prot	Perm	NA		pm+pt	NA	
Protected Phases	8		6		5	2	4
Permitted Phases		8			2		
Detector Phase	8	8	6		5	2	
Switch Phase							
Minimum Initial (s)	10.0	10.0	30.0		5.0	30.0	10.0
Minimum Split (s)	35.0	35.0	37.5		9.5	37.5	35.0
Total Split (s)	38.0	38.0	93.6		18.4	112.0	38.0
Total Split (%)	25.3%	25.3%	62.4%		12.3%	74.7%	25%
Yellow Time (s)	3.5	3.5	5.0		3.5	5.0	3.5
All-Red Time (s)	3.5	3.5	2.5		1.0	2.5	3.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.0	7.0	7.5		4.5	7.5	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None	None	C-Max		None	C-Max	None
Act Effct Green (s)	28.7	28.7	90.3		109.8	106.8	
Actuated g/C Ratio	0.19	0.19	0.60		0.73	0.71	
v/c Ratio	0.89	0.24	0.88		0.80	0.49	
Control Delay	86.3	10.8	34.7		69.7	9.4	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	86.3	10.8	34.7		69.7	9.4	
LOS	F	B	C		E	A	
Approach Delay	69.3		34.7			14.5	
Approach LOS	E		C			B	
Queue Length 50th (m)	87.4	0.0	231.1		24.1	153.5	
Queue Length 95th (m)	#133.3	14.9	316.3		#57.2	19.7	
Internal Link Dist (m)	229.8		354.3			278.0	
Turn Bay Length (m)					55.0		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø4
Base Capacity (vph)	369	387	2826		213	3421	
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.82	0.23	0.88		0.72	0.49	

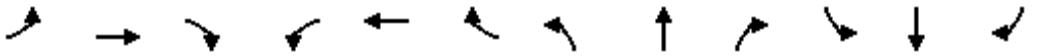
Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 22 (15%), Referenced to phase 2:SBTL and 6:NBT, Start of Green			
Natural Cycle: 105			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.89			
Intersection Signal Delay: 29.8		Intersection LOS: C	
Intersection Capacity Utilization 90.8%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 27: Kennedy Rd & Bur Oak Ave



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	100	197	1674	1605	7
Future Volume (vph)	0	100	197	1674	1605	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0	0.0	20.0			0.0
Storage Lanes	0	1	1			0
Taper Length (m)	2.5		2.5			
Satd. Flow (prot)	0	1598	1772	4850	4798	0
Flt Permitted			0.950			
Satd. Flow (perm)	0	1598	1772	4850	4798	0
Link Speed (k/h)	40			60	60	
Link Distance (m)	234.8			302.0	341.0	
Travel Time (s)	21.1			18.1	20.5	
Confl. Peds. (#/hr)			2			2
Confl. Bikes (#/hr)			1			1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	4%	3%	1%	2%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	103	203	1726	1662	0
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 48.7%		ICU Level of Service A	
Analysis Period (min) 15			



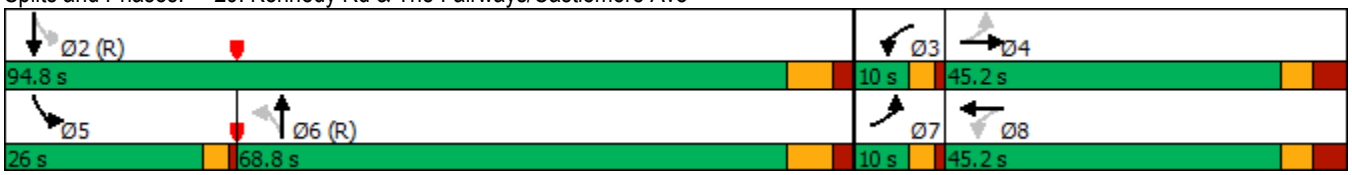
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	33	5	22	74	12	293	20	1399	132	188	1442	52
Future Volume (vph)	33	5	22	74	12	293	20	1399	132	188	1442	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		64.0	57.0		0.0	50.0		0.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	0.0			0.0			2.5			2.5		
Satd. Flow (prot)	1825	1485	0	1772	1610	0	1825	4738	0	1772	4776	0
Flt Permitted	0.339			0.552			0.138			0.093		
Satd. Flow (perm)	648	1485	0	1019	1610	0	265	4738	0	173	4776	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		23			302			11			6	
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		207.4			193.2			341.0			227.3	
Travel Time (s)		18.7			17.4			20.5			13.6	
Confl. Peds. (#/hr)	8		9	9		8	7		2	2		7
Confl. Bikes (#/hr)			1	1					2	2		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	40%	5%	3%	0%	0%	0%	2%	0%	3%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	34	28	0	76	314	0	21	1578	0	194	1541	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		pm+pt	NA	
Protected Phases	7	4		3	8			6		5	2	
Permitted Phases	4			8			6			2		
Detector Phase	7	4		3	8		6	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	10.0		6.0	10.0		33.0	33.0		6.0	33.0	
Minimum Split (s)	10.0	44.5		10.0	44.5		40.5	40.5		10.0	40.5	
Total Split (s)	10.0	45.2		10.0	45.2		68.8	68.8		26.0	94.8	
Total Split (%)	6.7%	30.1%		6.7%	30.1%		45.9%	45.9%		17.3%	63.2%	
Yellow Time (s)	3.0	3.5		3.0	3.5		5.0	5.0		3.0	5.0	
All-Red Time (s)	1.0	4.0		1.0	4.0		2.5	2.5		1.0	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	7.5		4.0	7.5		7.5	7.5		4.0	7.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag		Lead		
Lead-Lag Optimize?		Yes			Yes		Yes	Yes		Yes		
Recall Mode	None	None		None	None		C-Max	C-Max		None	C-Max	
Act Effct Green (s)	19.9	15.8		24.9	15.8		92.5	92.5		114.7	111.2	
Actuated g/C Ratio	0.13	0.11		0.17	0.11		0.62	0.62		0.76	0.74	
v/c Ratio	0.26	0.16		0.34	0.72		0.13	0.54		0.67	0.44	
Control Delay	52.2	24.0		53.4	16.2		39.9	38.9		27.8	5.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	52.2	24.0		53.4	16.2		39.9	38.9		27.8	5.9	
LOS	D	C		D	B		D	D		C	A	
Approach Delay		39.5			23.4			38.9			8.4	
Approach LOS		D			C			D			A	
Queue Length 50th (m)	8.8	1.4		20.2	3.4		4.6	189.5		20.8	11.8	
Queue Length 95th (m)	15.0	9.5		27.9	28.0		m7.7	208.8		m28.2	m141.0	
Internal Link Dist (m)		183.4			169.2			317.0			203.3	

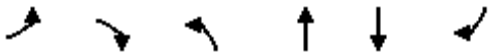
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (m)							57.0			50.0		
Base Capacity (vph)	133	390		224	630		163	2924		368	3542	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.26	0.07		0.34	0.50		0.13	0.54		0.53	0.44	

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green			
Natural Cycle: 105			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.72			
Intersection Signal Delay: 23.3		Intersection LOS: C	
Intersection Capacity Utilization 103.6%		ICU Level of Service G	
Analysis Period (min) 15			

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

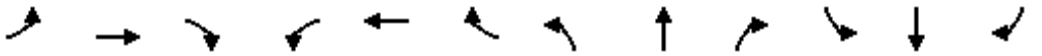
Splits and Phases: 29: Kennedy Rd & The Fairways/Castlemore Ave





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	105	86	1506	1621	7
Future Volume (vph)	0	105	86	1506	1621	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	0.0	15.0			0.0
Storage Lanes	0	1	1			0
Taper Length (m)	0.0		2.5			
Satd. Flow (prot)	0	1662	1825	4756	4798	0
Flt Permitted			0.950			
Satd. Flow (perm)	0	1662	1825	4756	4798	0
Link Speed (k/h)	40			60	60	
Link Distance (m)	115.5			227.3	167.2	
Travel Time (s)	10.4			13.6	10.0	
Confl. Peds. (#/hr)	3	1				
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	0%	0%	3%	2%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	108	89	1553	1678	0
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 49.9%		ICU Level of Service A	
Analysis Period (min) 15			

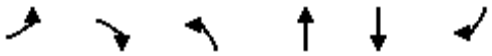


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	52	1875	346	120	1126	44	214	912	262	127	1110	57
Future Volume (vph)	52	1875	346	120	1126	44	214	912	262	127	1110	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	50.0		92.0	50.0		160.0	140.0		0.0	50.0		92.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	1825	3614	1617	1755	3579	1633	1807	3266	1633	1825	3579	1633
Flt Permitted	0.184			0.054			0.091			0.094		
Satd. Flow (perm)	353	3614	1595	100	3579	1611	173	3266	1611	181	3579	1611
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			162			65			105			95
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		424.7			384.5			167.2			409.3	
Travel Time (s)		21.8			19.8			10.0			24.6	
Confl. Peds. (#/hr)	1		1	1		1	1		1	1		1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	1%	1%	4%	2%	0%	1%	0%	0%	0%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	54	1933	357	124	1161	45	221	940	270	131	1144	59
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		6		5	2		3	8		7	4	
Permitted Phases	6		6	2		2	8		8	4		4
Detector Phase	6	6	6	5	2	2	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	15.0	15.0	15.0	7.0	15.0	15.0	7.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	37.5	37.5	37.5	11.0	37.5	37.5	11.0	37.0	37.0	9.5	38.5	38.5
Total Split (s)	77.0	77.0	77.0	11.0	88.0	88.0	12.0	50.0	50.0	12.0	50.0	50.0
Total Split (%)	51.3%	51.3%	51.3%	7.3%	58.7%	58.7%	8.0%	33.3%	33.3%	8.0%	33.3%	33.3%
Yellow Time (s)	5.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	3.5	5.0	5.0
All-Red Time (s)	2.5	2.5	2.5	1.0	2.5	2.5	1.0	1.0	1.0	1.0	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.5	7.5	7.5	4.0	7.5	7.5	4.0	6.0	6.0	4.5	7.5	7.5
Lead/Lag	Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	C-Max	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	69.5	69.5	69.5	84.0	80.5	80.5	54.0	44.0	44.0	53.0	42.5	42.5
Actuated g/C Ratio	0.46	0.46	0.46	0.56	0.54	0.54	0.36	0.29	0.29	0.35	0.28	0.28
v/c Ratio	0.33	1.15	0.43	0.93	0.60	0.05	1.48	0.98	0.49	0.90	1.13	0.11
Control Delay	32.8	114.0	15.7	91.2	25.5	1.7	281.9	91.3	45.3	85.9	118.6	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.8	114.0	15.7	91.2	25.5	1.7	281.9	91.3	45.3	85.9	118.6	2.0
LOS	C	F	B	F	C	A	F	F	D	F	F	A
Approach Delay		97.2			30.8			112.1			110.2	
Approach LOS		F			C			F			F	
Queue Length 50th (m)	10.0	~355.6	36.9	21.1	121.3	0.0	~75.2	173.7	62.5	25.8	~206.7	0.0
Queue Length 95th (m)	22.6	#396.2	62.4	#62.2	142.7	3.3	#124.4	#218.1	89.4	#62.0	#249.2	3.0
Internal Link Dist (m)		400.7			360.5			143.2			385.3	
Turn Bay Length (m)	50.0		92.0	50.0		160.0	140.0			50.0		92.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	163	1674	825	133	1920	894	149	958	546	146	1014	524
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.33	1.15	0.43	0.93	0.60	0.05	1.48	0.98	0.49	0.90	1.13	0.11

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 139 (93%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.48			
Intersection Signal Delay: 89.5		Intersection LOS: F	
Intersection Capacity Utilization 120.2%		ICU Level of Service H	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 31: Kennedy Rd & Major Mackenzie Dr E



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	20	0	1901	1996	20
Future Volume (Veh/h)	0	20	0	1901	1996	20
Sign Control	Yield			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	0	21	0	1980	2079	21
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				340	143	
pX, platoon unblocked	0.81	0.81	0.81			
vC, conflicting volume	2750	704	2079			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	718	0	1500			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	100			
cM capacity (veh/h)	297	880	365			

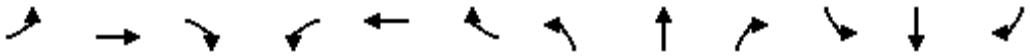
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	21	660	660	660	832	832	437
Volume Left	0	0	0	0	0	0	0
Volume Right	21	0	0	0	0	0	21
cSH	880	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.02	0.39	0.39	0.39	0.49	0.49	0.26
Queue Length 95th (m)	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	9.2	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A						
Approach Delay (s)	9.2	0.0			0.0		
Approach LOS	A						

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	49.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	98	2180	250	114	1569
Future Volume (Veh/h)	0	98	2180	250	114	1569
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	109	2422	278	127	1743
Pedestrians	12					1
Lane Width (m)	3.7					3.7
Walking Speed (m/s)	1.1					1.1
Percent Blockage	1					0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			257			192
pX, platoon unblocked	0.73	0.61			0.61	
vC, conflicting volume	3408	959			2712	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	765	0			1558	
tC, single (s)	6.9	6.9			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	83			49	
cM capacity (veh/h)	118	651			247	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3	SB 4
Volume Total	109	969	969	762	127	581	581	581
Volume Left	0	0	0	0	127	0	0	0
Volume Right	109	0	0	278	0	0	0	0
cSH	651	1700	1700	1700	247	1700	1700	1700
Volume to Capacity	0.17	0.57	0.57	0.45	0.51	0.34	0.34	0.34
Queue Length 95th (m)	4.5	0.0	0.0	0.0	20.5	0.0	0.0	0.0
Control Delay (s)	11.6	0.0	0.0	0.0	34.0	0.0	0.0	0.0
Lane LOS	B				D			
Approach Delay (s)	11.6	0.0			2.3			
Approach LOS	B							

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	67.8%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	72	4	0	27	0	2706	33	29	1846	183
Future Volume (Veh/h)	0	0	72	4	0	27	0	2706	33	29	1846	183
Sign Control		Yield			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	0	0	73	4	0	27	0	2733	33	29	1865	185
Pedestrians		8			14			1				
Lane Width (m)		3.7			3.7			3.7				
Walking Speed (m/s)		1.1			1.1			1.1				
Percent Blockage		1			1			0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								151			203	
pX, platoon unblocked	0.83	0.83	0.67	0.83	0.83	0.68	0.67			0.68		
vC, conflicting volume	2962	4804	723	3444	4694	942	1873			2780		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	53	2262	0	632	2132	0	596			1966		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	7.0	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	90	98	100	96	100			86		
cM capacity (veh/h)	659	29	723	239	35	720	661			201		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3	SB 4
Volume Total	73	4	27	1093	1093	580	29	746	746	558
Volume Left	0	4	0	0	0	0	29	0	0	0
Volume Right	73	0	27	0	0	33	0	0	0	185
cSH	723	239	720	1700	1700	1700	201	1700	1700	1700
Volume to Capacity	0.10	0.02	0.04	0.64	0.64	0.34	0.14	0.44	0.44	0.33
Queue Length 95th (m)	2.5	0.4	0.9	0.0	0.0	0.0	3.8	0.0	0.0	0.0
Control Delay (s)	10.5	20.3	10.2	0.0	0.0	0.0	25.9	0.0	0.0	0.0
Lane LOS	B	C	B				D			
Approach Delay (s)	10.5	11.5		0.0			0.4			
Approach LOS	B	B								

Intersection Summary				
Average Delay	0.4			
Intersection Capacity Utilization	63.0%	ICU Level of Service	B	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	11	0	0	0	0	2569	0	0	1914	8
Future Volume (Veh/h)	0	0	11	0	0	0	0	2569	0	0	1914	8
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	0	0	11	0	0	0	0	2595	0	0	1933	8
Pedestrians		1			2							
Lane Width (m)		3.7			3.7							
Walking Speed (m/s)		1.1			1.1							
Percent Blockage		0			0							
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								186			259	
pX, platoon unblocked	0.72	0.72	0.84	0.72	0.72	0.64	0.84			0.64		
vC, conflicting volume	2803	4535	649	3252	4539	867	1942			2597		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	657	3070	0	1283	3076	0	1465			1522		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	99	100	100	100	100			100		
cM capacity (veh/h)	253	9	919	88	9	696	393			283		

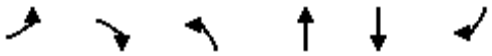
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	11	0	1038	1038	519	773	773	395
Volume Left	0	0	0	0	0	0	0	0
Volume Right	11	0	0	0	0	0	0	8
cSH	919	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.01	0.00	0.61	0.61	0.31	0.45	0.45	0.23
Queue Length 95th (m)	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	A						
Approach Delay (s)	9.0	0.0	0.0			0.0		
Approach LOS	A	A						

Intersection Summary				
Average Delay	0.0			
Intersection Capacity Utilization	53.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	18	2292	9	0	2002
Future Volume (Veh/h)	0	18	2292	9	0	2002
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	20	2491	10	0	2176
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			150			177
pX, platoon unblocked	0.75	0.67			0.67	
vC, conflicting volume	3221	835			2501	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1348	0			1505	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	97			100	
cM capacity (veh/h)	106	724			294	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	20	996	996	508	725	725	725
Volume Left	0	0	0	0	0	0	0
Volume Right	20	0	0	10	0	0	0
cSH	724	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.03	0.59	0.59	0.30	0.43	0.43	0.43
Queue Length 95th (m)	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	10.1	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B						
Approach Delay (s)	10.1	0.0			0.0		
Approach LOS	B						

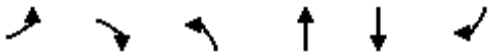
Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	100	197	1674	1605	7
Future Volume (Veh/h)	0	100	197	1674	1605	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	0	103	203	1726	1655	7
Pedestrians	2					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				302	341	
pX, platoon unblocked	0.72	0.88	0.88			
vC, conflicting volume	2642	557	1664			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	812	29	1284			
tC, single (s)	6.8	7.0	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	89	57			
cM capacity (veh/h)	130	909	467			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3
Volume Total	103	203	575	575	575	662	662	338
Volume Left	0	203	0	0	0	0	0	0
Volume Right	103	0	0	0	0	0	0	7
cSH	909	467	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.11	0.43	0.34	0.34	0.34	0.39	0.39	0.20
Queue Length 95th (m)	2.9	16.4	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	9.5	18.5	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	C						
Approach Delay (s)	9.5	1.9				0.0		
Approach LOS	A							

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	48.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	105	86	1506	1621	7
Future Volume (Veh/h)	0	105	86	1506	1621	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	0	108	89	1553	1671	7
Pedestrians				1	3	
Lane Width (m)				3.7	3.7	
Walking Speed (m/s)				1.1	1.1	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				227	167	
pX, platoon unblocked	0.83	0.75	0.75			
vC, conflicting volume	2373	562	1678			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	585	0	739			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	87	86			
cM capacity (veh/h)	322	818	658			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3
Volume Total	108	89	518	518	518	668	668	341
Volume Left	0	89	0	0	0	0	0	0
Volume Right	108	0	0	0	0	0	0	7
cSH	818	658	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.13	0.14	0.30	0.30	0.30	0.39	0.39	0.20
Queue Length 95th (m)	3.5	3.5	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	10.1	11.3	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	B						
Approach Delay (s)	10.1	0.6				0.0		
Approach LOS	B							

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	49.9%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix B – Kennedy / 407 ETR Interchange VISSIM Analysis Memo

Memo

Date:	Friday January 11, 2019
Project:	Kennedy Environmental Assessment Study
To:	Tyrone Gan
From:	Benjamin Loucks
Subject:	Kennedy / 407ETR Interchange VISSIM Analysis

Executive Summary

Recommendations

VISSIM micro-simulation analysis was undertaken at the Kennedy Road/407ETR interchange to assess impacts to 407ETR users with and without dedicated Speed Change Lanes (SCL) in addition to the proposed improvements to the Kennedy Road EA study corridor (widening from four lanes to six lanes for Transit/High Occupancy Vehicle (HOV).

The analysis determined that the scenario with SCLs does not consistently provide improved travel times for 407ETR ramp traffic compared to the scenario without SCLs. The difference in travel times between the two scenarios for all on-ramp sub-paths is always within one second.

Based on this analysis, there is no notable benefit to 407ETR traffic from providing SCLs and as a result dedicated speed change lanes are not warranted.

Background and Methodology

The Region is undertaking the Kennedy Road Environmental Assessment (EA) Study between Steeles Avenue and Major Mackenzie Drive. The recommended improvements to the EA study corridor are to widen from four to six lanes for Transit/HOV and provide continuous Active Transportation (AT) improvements. At the 407ETR interchange with Kennedy Road, the existing configuration is four general purpose lanes with two dedicated speed change lanes. To apply the EA recommendations at the interchange, determination of whether dedicated speed change lanes in addition to Transit/HOV lanes are needed to minimize adverse impacts to 407ETR users accessing the four on-ramps. The following memorandum documents the development, calibration, and preliminary findings of the VISSIM micro-simulation models prepared to undertake this assessment.

The study area for the VISSIM analysis spans from south of 14th Avenue to north of YMCA Boulevard/Helen Road and includes five signalized intersections at 14th Avenue, Duffield Drive, Westbound 407ETR off-ramp terminal, Eastbound 407ETR off-ramp terminal and YMCA Boulevard/Helen Avenue as illustrated in **Exhibit A**.

Exhibit A: Study Area

At the Kennedy Road/407ETR interchange there are four on-ramps which are:

1. Kennedy Northbound (NB) to Hwy 407 Eastbound (EB) ramp
2. Kennedy Southbound (SB) to Hwy 407 EB ramp
3. Kennedy NB to Hwy 407 Westbound (WB) ramp
4. Kennedy SB to Hwy 407 WB ramp

VISSIM models were developed, calibrated, and analyzed for the following scenarios:

1. **2018 Existing Condition**: Four general purpose lanes with existing speed change lanes, used to support model validation and calibration.
2. **Alternative 1: 2041 Without SCL**: Widen to six lanes (4 general purpose + Transit/HOV lanes) without adding a SCL.

3. **Alternative 2: 2041 With SCL**: Widen to eight lanes between the ramp terminals (4 general purpose lanes, 2 Transit/HOV lanes, 2 SCL).

Travel time surveys and field observations along Kennedy Road between YMCA Boulevard / Helen Avenue and Duffield Drive were undertaken in July and August 2018 to calibrate the models. For each scenario, Weekday AM and PM peak hours were simulated at each of the four on-ramps and link queues, corridor sub-path travel times, on-ramp sub-path travel times and on-ramp delays and level of service were determined.

Findings

The VISSIM model analysis included the link queue comparison, corridor sub-path travel times, on-ramp sub-path travel time and on-ramp delays and level of service. The following **Tables (A and B)** and **Exhibit B** summarize the key results.

In general, future 2041 VISSIM models for Kennedy Road were not able to serve the full future demand volumes derived from York Region's EMME based forecast because the corridor in general is expected to be oversaturated. As a result, this analysis is based on the volumes served in the VISSIM model during the peak hour. In addition, some turning movements from the base forecast heavily exceeded capacity. These movements were capped at capacity and the traffic was reassigned to alternate routes.

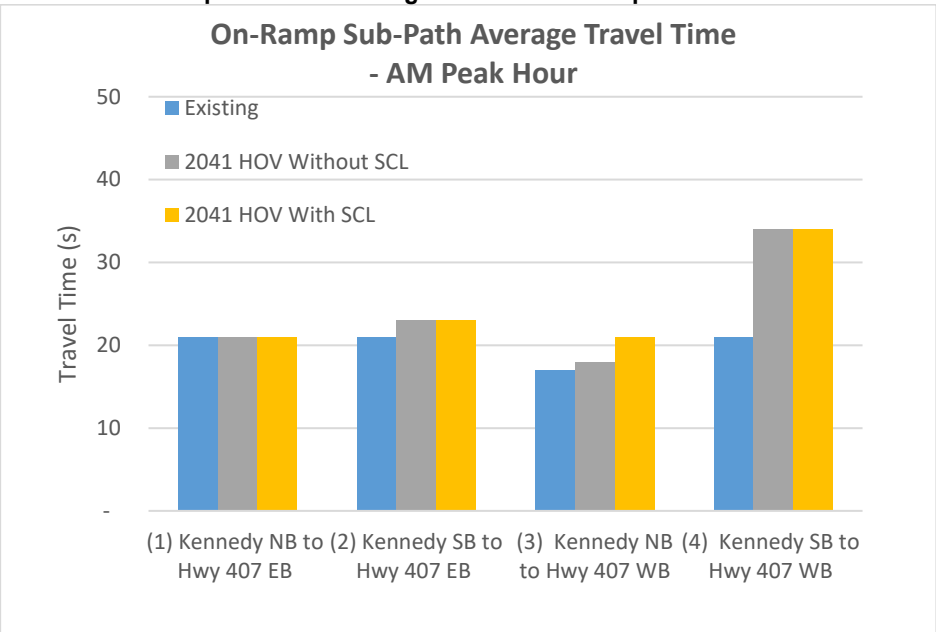
Table A: Link Queue Comparison

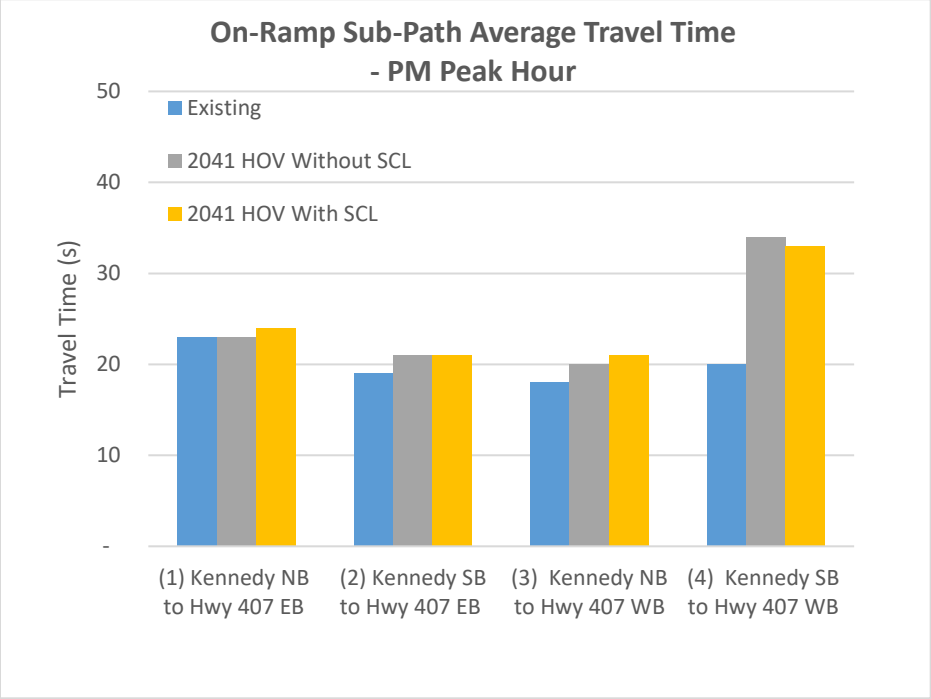
Intersection	Turning Movement	Distance to Ramp Entrance (m)	Link Queue Length (m)					
			2018 Existing		2041 Without SCL		2041 With SCL	
			Avg.	Max.	Avg.	Max.	Avg.	Max.
AM Peak Hour								
Kennedy & Hwy 407 WB Off-Ramp	NBT	240 (110)	2	46	(28)	**(175)**	27	184
	SBT	-	21	178	51	177	51	178
Kennedy & Hwy 407 EB Off-Ramp	NBT	80	8	**117**	7	**75**	7	76
	SBT	235 (80)	9	144	**(173)**	**(356)**	171	**355**
PM Peak Hour								
Kennedy & Hwy 407 WB Off-Ramp	NBT	240 (110)	26	**263**	**(138)**	**(342)**	153	**355**
	SBT	-	9	167	24	174	23	174
Kennedy & Hwy 407 EB Off-Ramp	NBT	80	26	**191**	32	**165**	38	**200**
	SBT	235 (80)	5	111	(4)	(61)	3	42

**(xx) represents the distance between the stop bar and the entrance to the on-ramp when no speed change lane is provided, only applicable to the 2041 Without SCL scenario*
**__red text__ denotes where queues exceed storage*

The link queue lengths shown above are calculated from the maximum queue length in any of the lanes within a link segment during the peak hour. The maximum is the longest observed queue in any lane during the peak hour, and the average is the average of the longest queues in any of the lanes over the course of the peak hour.

Exhibit B: On-Ramp Sub-Path Average Travel Time Comparison





Reviewing the simulation visually, the maximum queue was on the general purpose lane beside the HOV lane at all times during both directions, and does not impact access to any of the four on-ramp entrances. The sub-path travel time comparisons in the following **Exhibit B** support this observation.

On-ramp travel times and levels of service at each of the four ramps were determined. The findings resulted in LOS C or better at all four on-ramps during both the AM and PM peak hours for both 2041 With SCL and Without SCL scenarios. The difference in the resulting travel time between the 2041 With SCL and Without SCL are negligible in both peak periods.

Table B: On-Ramp Travel Time and Level of Service

On-Ramp Movement	Sub-Path Distance (m)	Free Flow Travel Time (s)	AM Peak Hour Travel Time per Vehicle (s) (LOS)			PM Peak Hour Travel Time per Vehicle (s) (LOS)		
			2018 Existing	2041 Without SCL	2041 With SCL	2018 Existing	2041 Without SCL	2041 With SCL
1. Kennedy NB to Hwy 407 EB	344	21	21 (LOS A)	21 (LOS A)	21 (LOS A)	23 (LOS A)	23 (LOS A)	24 (LOS A)
2. Kennedy SB to Hwy 407 EB	299	18	21 (LOS A)	23 (LOS A)	23 (LOS A)	19 (LOS A)	21 (LOS A)	21 (LOS A)
3. Kennedy NB to Hwy 407 WB	266	16	17 (LOS A)	18 (LOS A)	18 (LOS A)	18 (LOS A)	20 (LOS A)	19 (LOS A)
4. Kennedy SB to Hwy 407 WB	263	16	21 (LOS A)	34 (LOS C)	34 (LOS C)	20 (LOS A)	34 (LOS C)	33 (LOS C)

* Ramp movement LOS is based on HCM 2010 definition for unsignalized intersections from VISSIM

In visually reviewing the modelled 2041 operations of Alternative 1 and Alternative 2, traffic is observed accessing the on-ramps at all times with minor obstructions under both scenarios during both peak periods. The simulation outputs, including corridor sub-path travel time, link queue, and on-ramp sub-path travel time, consistently support the visual observations.

Based on the simulation results, adding speed change lanes to Kennedy Road between the two ramp terminal intersections (Alternative 2) will not improve the sub-path travel times for 407ETR on-ramps because queues in the Transit/HOV lanes before the ramp entrances are not long enough to significantly impede ramp traffic.

Table C shows the criteria for LOS in terms of delay compared to the free flow travel time.

Table C: Level of Service Criteria

Level of Service (LOS)	Delay in Comparison to Free Flow Travel Time (Sec)
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 20
D	> 20 and ≤ 35
E	> 35 and ≤ 50
F	> 50

1. Introduction and Study Area

The recommendations for Kennedy Road Environmental Assessment Study from Steeles Avenue to Major Mackenzie Drive is to widen from four lanes to six lanes for Transit/High Occupancy Vehicle (HOV) and provide continuous Active Transportation (AT) facilities. At the 407ETR interchange with Kennedy Road the existing configuration is four general purpose lanes with two dedicated speed change lanes. To apply the EA recommendations at the interchange, it is required to determine whether dedicated speed change lanes are needed in addition to Transit/HOV lanes to minimize adverse impacts to 407ETR users.

This technical memorandum documents the development, calibration, and preliminary findings of the VISSIM micro simulation models developed to assess alternatives at the Kennedy Road/407ETR interchange. Specifically the impact to 407ETR users through the interchange with and without dedicated Speed Change Lanes (SCL) was reviewed.

The study area for the VISSIM analysis spans from south of 14th Avenue to north of YMCA Boulevard/Helen Road and includes five signalized intersections at 14th Avenue, Duffield Drive, Westbound 407ETR off-ramp terminal, Eastbound 407ETR off-ramp terminal, and YMCA Boulevard/Helen Avenue as illustrated in **Exhibit 1**

Exhibit 1: Study Area Limits

The four on-ramps at this interchange are illustrated in **Exhibit 2**:

1. Kennedy Northbound (NB) to Hwy 407 Eastbound (EB) ramp
2. Kennedy Southbound (SB) to Hwy 407 EB ramp
3. Kennedy NB to Hwy 407 Westbound (WB) ramp
4. Kennedy SB to Hwy 407 WB ramp

Exhibit 2: Highway 407 Ramp Sub-Paths

2. Data Collection

HDR conducted the travel time surveys and observations along Kennedy Road between YMCA Boulevard/Helen Avenue and Duffield Drive in July and August 2018 in order to calibrate the model. Field observations were made during Weekday AM and PM peak periods using GPS Loggers for a minimum of 5 runs per direction. Site observation notes are documented in **Appendix A**.

HDR obtained the existing cordon count volumes and occupancy splits from the 'York Region Cordon Count Program (2016)'. The existing Single Occupancy Vehicle (SOV) and HOV splits were based on the Kennedy Road / Steeles Avenue station as this is the nearest station to the Kennedy Road/407ETR interchange that is available on TTS.

3. VISSIM Model Development

A VISSIM micro-simulation model of the study area was developed leveraging the existing Synchro model (developed during phase one of the EA study) of the study area. After developing the base geographic layout of the network, the key network attributes were checked including links (number of lanes, lane width, storage length, etc.) and nodes (signal timing plans, signs, yield signs, detectors, etc.). The model comprises five signalized intersections; two of the signalized intersections represent ramp terminals of 407ETR, and the other three are at YMCA Boulevard/Helen Avenue, Duffield Drive, and 14th Avenue.

For both AM and PM periods, the VISSIM model simulates half an hour warm up period (50% of the peak demand) plus one hour peak demand. The half an hour warm up periods were excluded from the performance evaluation as they are purely used to seed the network before the start of the peak hour simulation.

For Alternative 2 scenario in VISSIM, the dedicated speed change lane (SCL) was coded immediately after the WB On-Ramp in the southbound direction, and immediately after the EB Off-Ramp terminal intersection in the northbound direction.

3.1 Travel Demand

The travel demand for both the existing (2018) and 2041 horizon was based on the previous work originally developed for Synchro analysis during Phase 1 of the EA study. It is noted that the Synchro analysis was completed for an existing horizon year of 2016, however the travel demand for 2016 and 2018 were considered comparable as there was no major development that occurred within this time period. Since the scope of this study involves micro-simulation analysis, the traffic volumes were further adjusted to reduce imbalances between intersections. York Region's 2041 Emme forecast was used to determine the base link volumes. Turning volumes were then generated from existing turning movement counts using the Furness Method. Some interchange ramps resulted in lower 2041 volumes than existing. In those cases, a minimum compound growth rate of 1% was used. As York Region's 2041 model only has AM volumes, PM volumes were generated by reversing the intersection and interchange volumes. Some intersection turning volumes generated by the Furness method resulted in turning volumes that exceeded capacity.

Those movements were also capped at capacity (estimated from the Synchro model) by assuming the rerouting of the remainder traffic to other routes. The detailed adjustments and balanced volumes are illustrated in **Appendix B**.

3.2 Vehicle Composition

As previously noted, the occupancy split between SOV and HOV were estimated from the 2016 Cordon Count Database at Kennedy Rd / Steeles Ave station. The splits for both directions and periods are summarized in **Table 1**. The average between NB and SB was used for each peak period model.

Table 1: Existing High Occupancy Vehicle Summary from Cordon Counts

Peak Period	Direction	Peak Hour	SOV Split	HOV Split	Avg. HOV Split
AM	NB	7AM	0.77	0.14	16%
	SB	6AM	0.71	0.18	
PM	NB	5PM	0.71	0.23	25%
	SB	6PM	0.64	0.27	

Truck percentages were estimated based on the existing (2016) intersection turning movement counts provided by York Region using the average of all movements at all intersections within the study area. As a result, truck percentages of 6.0% and 4.0% were obtained for AM and PM, respectively. These percentages were applied to all future scenarios. The vehicle composition for all scenarios are listed in **Table 2**.

Table 2: Summary of HOV Splits on Kennedy Road within the Study Area

Scenario	AM Peak Hour			PM Peak Hour		
	SOV %	Truck %	HOV %	SOV %	Truck %	HOV %
Existing	94.0%	6.0%	-	96.0%	4.0%	-
2041 With/Without SCLs	78.0%	6.0%	16%	71.0%	4.0%	25%

3.3 Calibration and Validation Criteria

The criteria used for the calibration and validation of the VISSIM model are based on Federal Highway Administration U.S. Department of Transportation (FHWA) microscopic simulation guidelines[1] shown in **Exhibit 3**.

[1] Traffic Analysis Toolbox, Volume III: Guidelines for Applying Traffic Micro-simulation Modeling Software, June 2004, FHWA-HRT-04-040.

Criteria and Measures	Calibration Acceptance Targets
Hourly Flows, Model Versus Observed	
Individual Link Flows	
Within 15%, for 700 veh/h < Flow < 2700 veh/h	> 85% of cases
Within 100 veh/h, for Flow < 700 veh/h	> 85% of cases
Within 400 veh/h, for Flow > 2700 veh/h	> 85% of cases
Sum of All Link Flows	Within 5% of sum of all link counts
GEH Statistic < 5 for Individual Link Flows*	> 85% of cases
GEH Statistic for Sum of All Link Flows	GEH < 4 for sum of all link counts
Travel Times, Model Versus Observed	
Journey Times, Network	
Within 15% (or 1 min, if higher)	> 85% of cases
Visual Audits	
Individual Link Speeds	
Visually Acceptable Speed-Flow Relationship	To analyst's satisfaction
Bottlenecks	
Visually Acceptable Queuing	To analyst's satisfaction

*The GEH statistic is computed as follows:

$$GEH = \sqrt{\frac{(E-V)^2}{(E+V)/2}} \quad (4)$$

where:

E = model estimated volume
V = field count

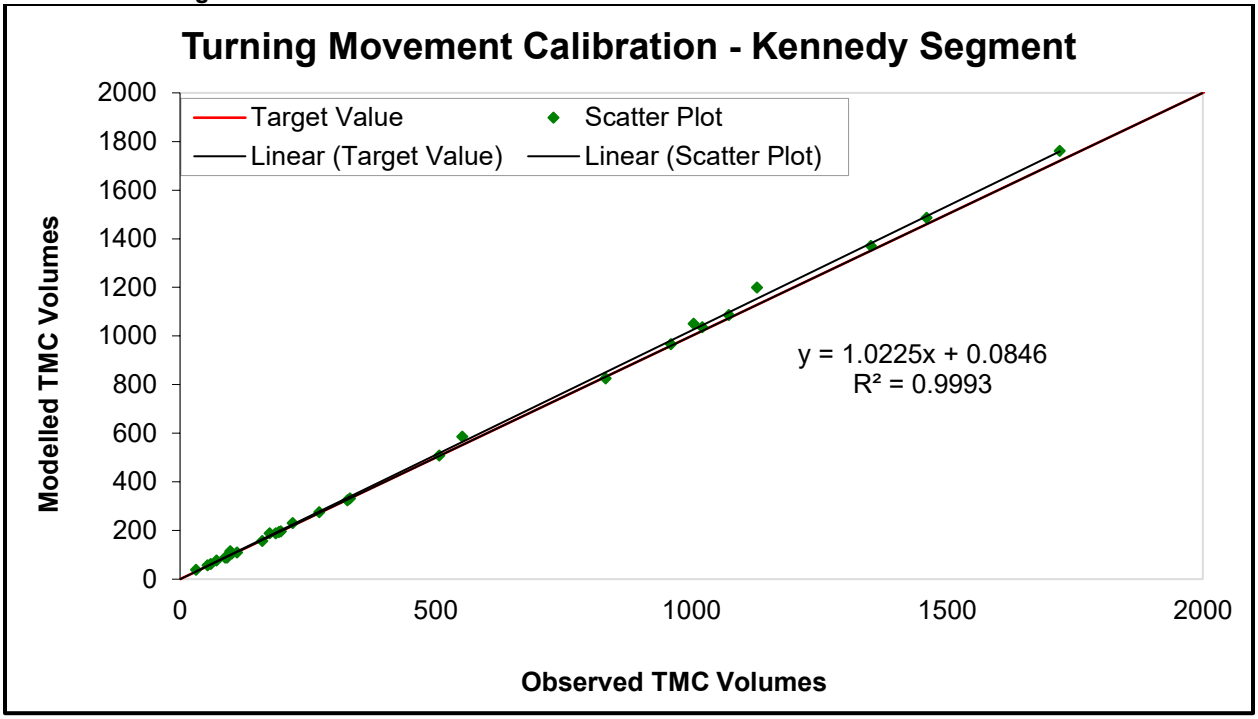
Exhibit 3: FHWA Calibration Guideline

3.4 Volume Calibration/Validation

Based on the observed and simulated traffic demand, the scatter plots for both peak periods were developed and are shown in the following pages. As shown in **Exhibit 4** and **Exhibit 5**, the model fits the observed peak periods well. In addition to the scatter plot, a summary of the GEH calculation and reference to FHWA target guidelines are shown in **Exhibit 6** and **Exhibit 7** for both AM and PM peak hours. Overall, the results showed that the simulated model is loading the observed traffic demand with a high degree of accuracy when compared against the balanced traffic count inputs.

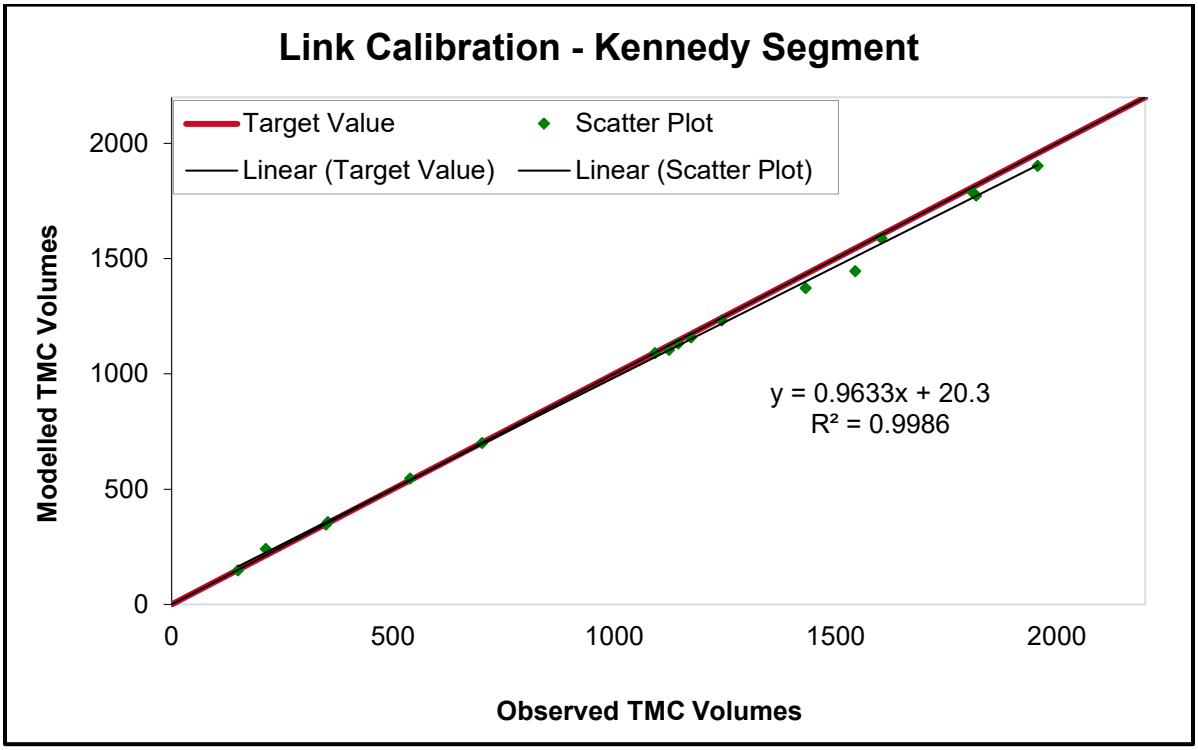
Although public transport buses were already captured in the traffic counts, this analysis includes the bus operations and stops close to the study area to capture the impacts of bus operations because of the nearby Unionville GO Station and many bus routes in the study area. The included Bus Routes are: (1) VIVA Green, (2) VIVA Purple, (3) YRT 8, (4) YRT 42, (5) YRT 522, (6) GO 70 & 70 E, (7) GO 71 & 71 C, (8) GO 52, (9) GO 54, (10) YRT 304, and (11) GO 204. As a result, the actual total input volumes in VISSIM is slightly higher than the traffic counts.

Exhibit 4: Turning Movement Calibration – AM Peak Hour



Turning Movement Calibration Criteria	Modelled	Target	Check
Percentage of Turns with GEH <= 5	100%	>85%	OK
Percentage of Turns with GEH <= 10	100%	>95%	OK
Percentage of Turns with GEH > 10	0%	<5%	OK

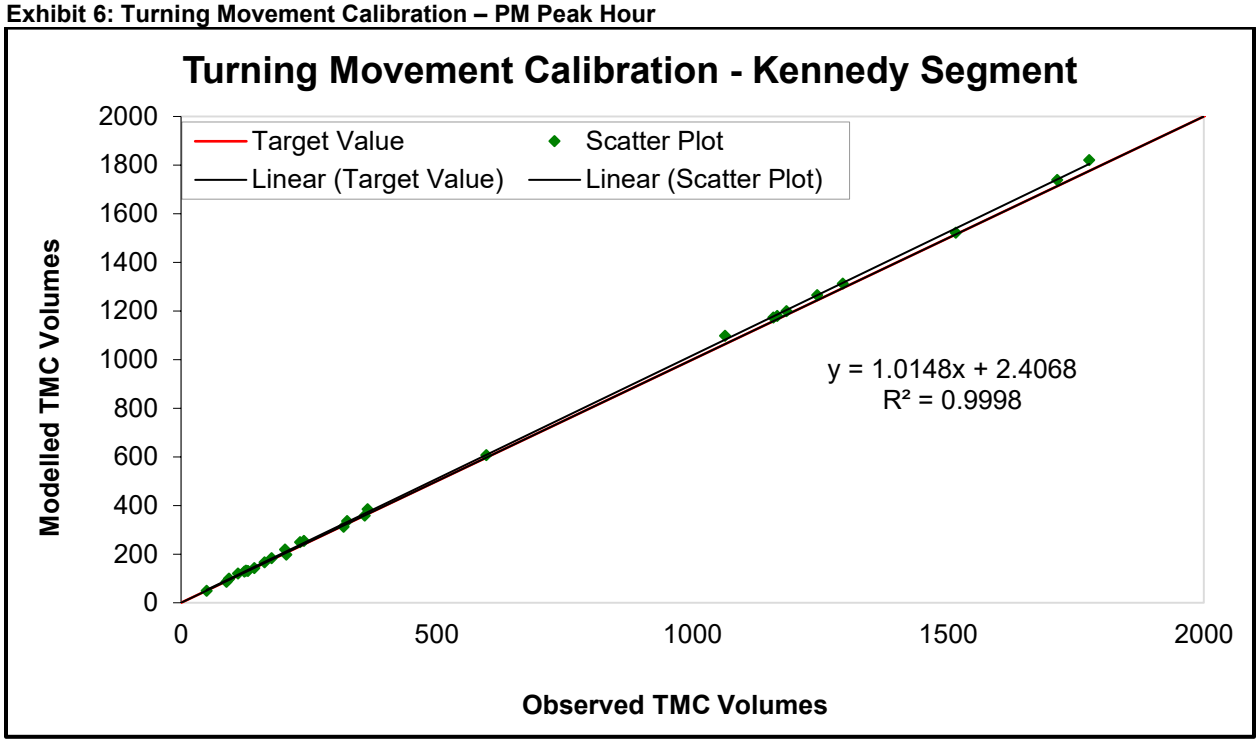
Exhibit 5: Link Calibration – AM Peak Hour



Link Calibration Criteria	Modelled	Target	Check
Percentage of Links with GEH <= 5	100%	> 85%	OK
Percentage of Links with GEH <= 10	100%	>95%	OK
Percentage of Links with GEH > 10	0%	<5%	OK
RMSE	3.3%	<30%	OK
Link flows with 700 < Flow < 2700 veh/h within 15%	100%	>85%	OK
Link flows < 700 veh/h within 100vph	100%	>85%	OK
Link Flow > 2700 veh/h within 400 vph*	0%	>85%	-
Sum of All Link Flows with 5% of sum of All Link counts	2.4	<4	OK
GEH of Sum of All Links	1.8%	<5%	OK

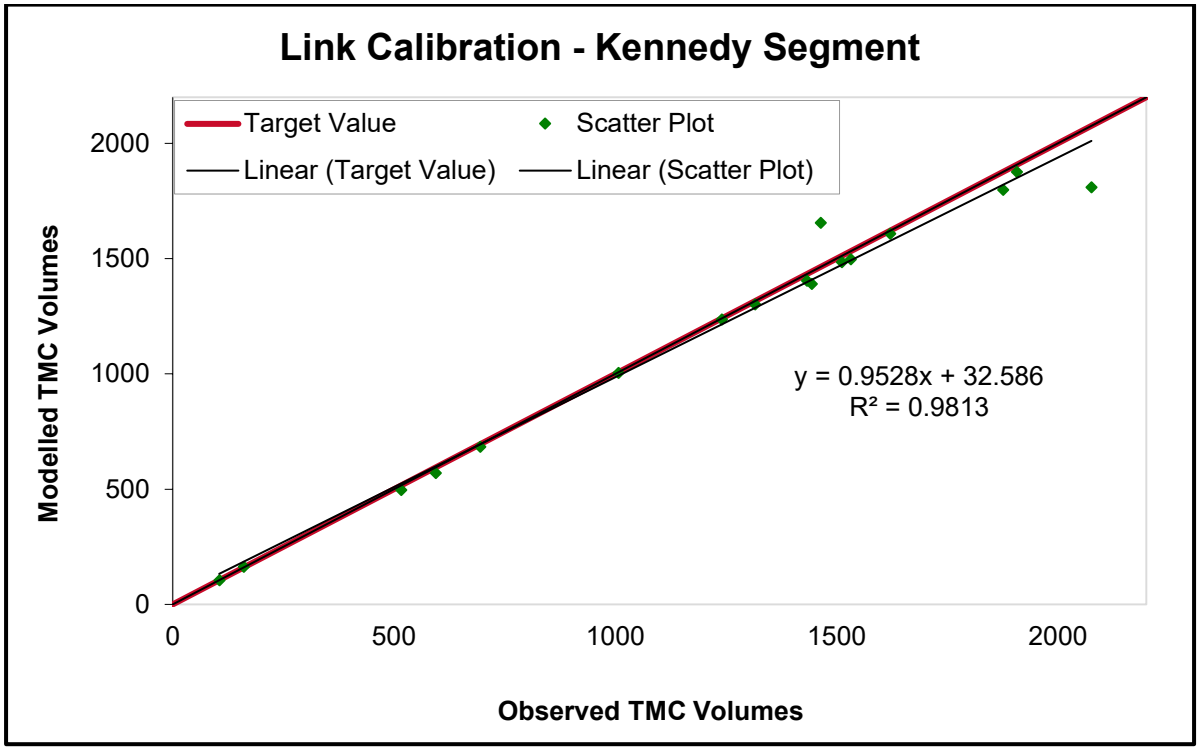
** No link flow exceed 2700 veh/h*

Exhibit 6: Turning Movement Calibration – PM Peak Hour



Turning Movement Calibration Criteria	Modelled	Target	Check
Percentage of Turns with GEH <= 5	100%	>85%	OK
Percentage of Turns with GEH <= 10	100%	>95%	OK
Percentage of Turns with GEH > 10	0%	<5%	OK

Exhibit 7: Link Calibration – PM Peak Hour



Link Calibration Criteria	Modelled	Target	Check
Percentage of Links with GEH <= 5	94%	>85%	OK
Percentage of Links with GEH <= 10	100%	>95%	OK
Percentage of Links with GEH > 10	0%	<5%	OK
RMSE	7.2%	<30%	OK
Link flows with 700 < Flow < 2700 veh/h within 15%	100%	>85%	OK
Link flows < 700 veh/h within 100vph	100%	>85%	OK
Link Flow > 2700 veh/h within 400 vph*	0%	>85%	-
Sum of All Link Flows with 5% of sum of All Link counts	2.9	<4	OK
GEH of Sum of All Links	2.0%	<5%	OK

** No link flow exceed 2700 veh/h*

3.5 Travel Time Calibration/Validation

In addition to calibration, the model was validated to travel time utilizing the travel time (TT) data collected. A comparison between modelled travel times and observed travel times was completed.

The FHWA guideline suggests that a VISSIM micro-simulation model meets the travel time validation if more than 85% of the individual segments are within 15% or one minute of the observed travel times. However, in this study, the short study corridor results in a comparatively greater range between 15% (typically 3-5s for one sub-path segment) and one minute targets. A sub-path is a defined path used to collect travel time within a segment. An additional validation criteria was therefore added on top of FHWA target – Root Mean Square Error (RMSE) within 30%. The 30% threshold is occasionally used in microsimulation studies, including the City of

Toronto Methodology for Microsimulation Modelling. The travel time validation for AM peak hour are summarized in **Table 3** through

Table 6.

Table 3: Travel Time Validation Criteria – AM Northbound

Travel Time Validation Criteria	Modelled	Target	Check
% of Links with TT within 15% or 1 min of observed	100%	>85%	OK
RMSE	27%	<30%	OK

Table 4: Travel Time Validation – AM Northbound Individual Segment Breakdown

From	To	Length (km)	Observed Travel Time (s)	VISSIM Travel Time (s)	RMS	% Diff.	Abs. Diff.	Check
14th Avenue	Duffield Dr	0.30	26.0	30.5	0.0305	17%	4.5	OK
Duffield Dr	Hwy 407 EB Off-Ramp	0.34	21.6	29.9	0.1464	38%	8.3	OK
Hwy 407 EB Off-Ramp	Hwy 407 WB Off-Ramp	0.34	49.0	24.1	0.0728	27%	8.9	OK
Hwy 407 WB Off-Ramp	YMCA - Helen	0.16	45.0	31.6	0.1311	36%	8.4	OK

Table 5: Travel Time Validation Criteria – AM Southbound

Travel Time Validation Criteria	Modelled	Target	Check
% of Links with TT within 15% or 1 min of observed	100%	>85%	OK
RMSE	30.9%	<30%	OK *

**acceptable as the modelled value is almost at the target limit and also based on the filed observations*

Table 6: Travel Time Validation – AM Southbound Individual Segment Breakdown

From	To	Length (km)	Observed Travel Time (s)	VISSIM Travel Time (s)	RMS	% Diff.	Abs. Diff.	Check
YMCA - Helen	Hwy 407 WB Off-Ramp	0.16	15.6	20.9	0.1151	34%	5.3	OK
Hwy 407 WB Off-Ramp	Hwy 407 EB Off-Ramp	0.34	25.4	24.5	0.0011	3%	0.9	OK
Hwy 407 EB Off-Ramp	Duffield Dr	0.34	43.0	63.1	0.2195	47%	20.1	OK
Duffield Dr	14th Avenue	0.30	89.7	81.7	0.0079	9%	8.0	OK

Based on the travel time validation tables, both northbound and southbound meet the travel time validation criteria during the AM peak hour.

The travel time validation for PM peak hour are summarized in **Table 7** through **Table 10.**

Table 7: Travel Time Validation Criteria – PM Northbound

Travel Time Validation Criteria	Modelled	Target	Check
% of Links with TT within 15% or 1 min of observed	100%	>85%	OK
RMSE	27%	<30%	OK

Table 8: Travel Time Validation – PM Northbound Individual Segment Breakdown

From	To	Length (km)	Observed Travel Time (s)	VISSIM Travel Time (s)	RMS	% Diff.	Abs. Diff.	Check
14th Avenue	Duffield Dr	0.30	37.6	36.0	0.0019	4%	1.6	OK
Duffield Dr	Hwy 407 EB Off-Ramp	0.34	39.2	37.1	0.0028	5%	2.1	OK
Hwy 407 EB Off-Ramp	Hwy 407 WB Off-Ramp	0.34	23.8	36.0	0.2612	51%	12.2	OK
Hwy 407 WB Off-Ramp	YMCA - Helen	0.16	41.8	36.3	0.0175	13%	5.5	OK

Table 9: Travel Time Validation Criteria – PM Southbound

Travel Time Validation Criteria	Modelled	Target	Check
% of Links with TT within 15% or 1 min of observed	100%	>85%	OK
RMSE	18%	<30%	OK

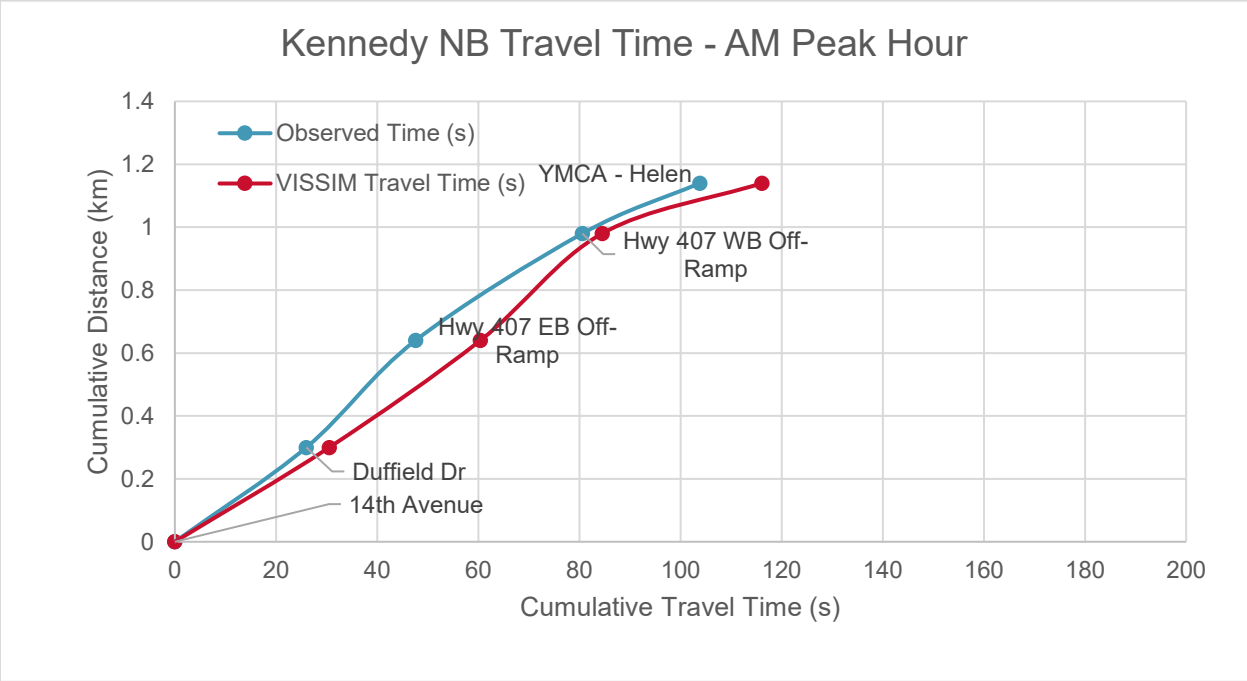
Table 10: Travel Time Validation – PM Southbound Individual Segment Breakdown

From	To	Length (km)	Observed Travel Time (s)	VISSIM Travel Time (s)	RMS	% Diff.	Abs. Diff.	Check
YMCA - Helen	Hwy 407 WB Off-Ramp	0.16	20.0	16.8	0.0252	16%	3.2	OK
Hwy 407 WB Off-Ramp	Hwy 407 EB Off-Ramp	0.34	24.6	25.5	0.0013	4%	0.9	OK
Hwy 407 EB Off-Ramp	Duffield Dr	0.34	59.0	46.0	0.0482	22%	13.0	OK
Duffield Dr	14th Avenue	0.30	85.2	65.2	0.0550	23%	20.0	OK

The results for the PM peak hour shown in **Table 7** through **Table 10** demonstrate that the PM model was able to attain validation of the travel time for the various paths.

In addition to the FHWA check, the travel time comparison plots for each of the paths are shown in **Exhibit 8** and **Exhibit 9**, which further highlight the model's performance. For most of the sub-paths, the modelled travel times are quite close to observed travel times. There were a few instances where the model either overestimated or underestimated travel times but the errors are within acceptable reporting errors as per the FHWA guidelines.

Exhibit 8: Travel Time Plots – AM Peak Hour



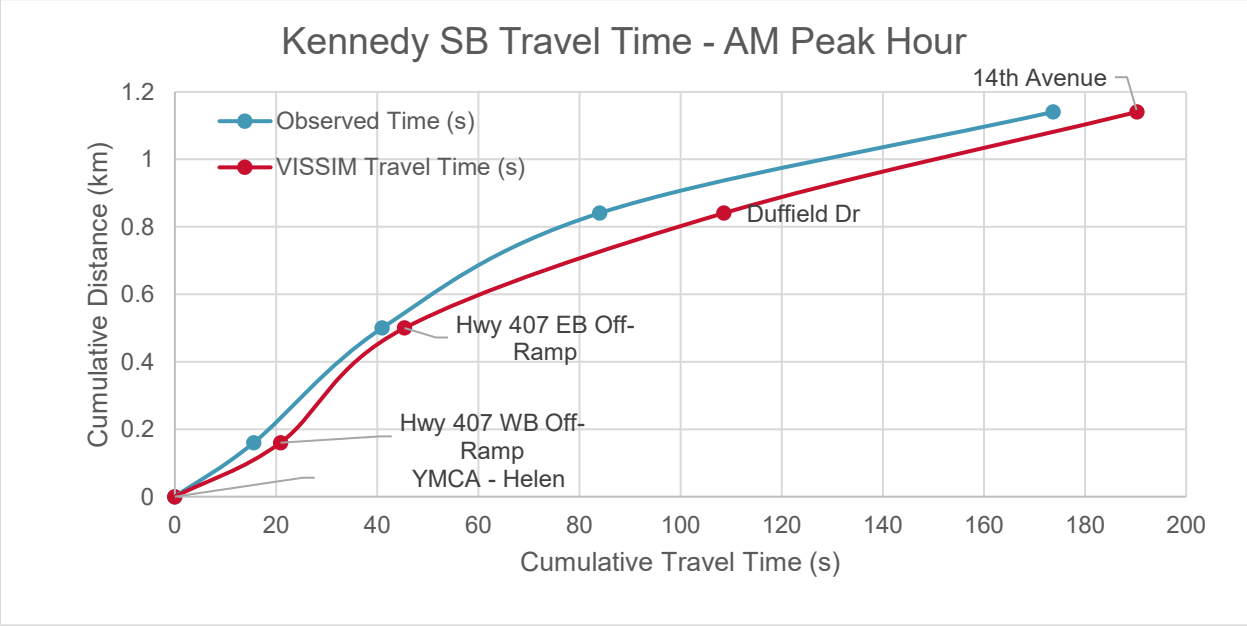
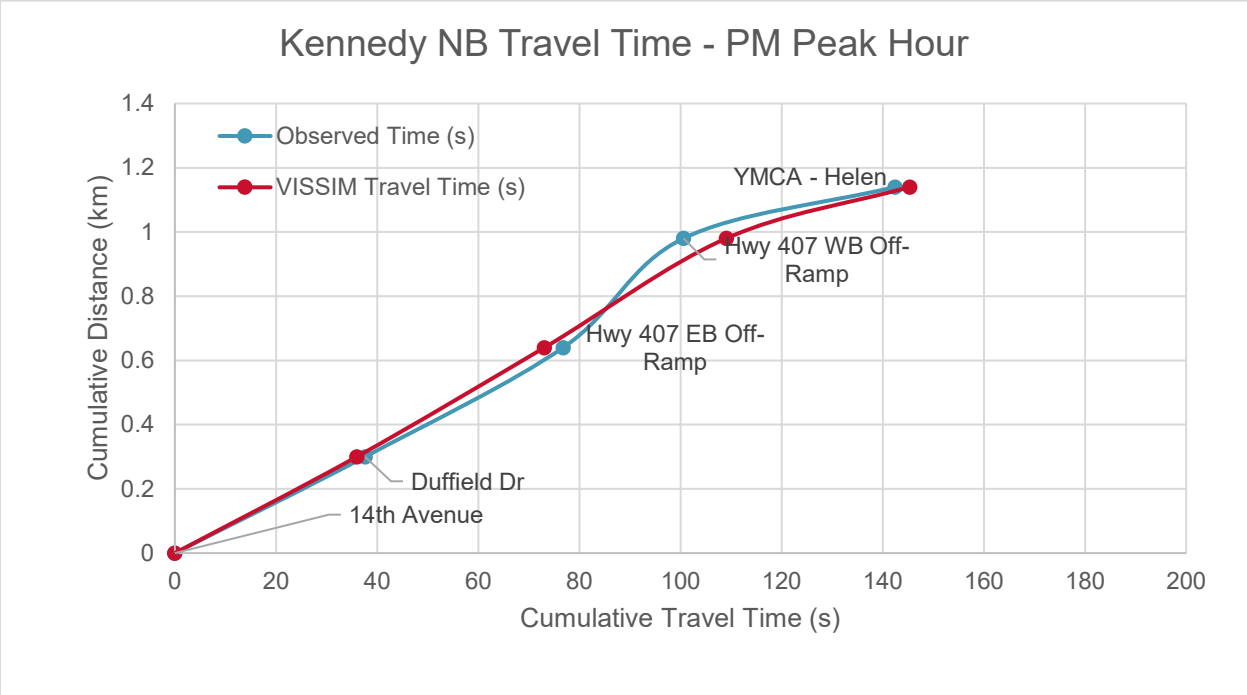
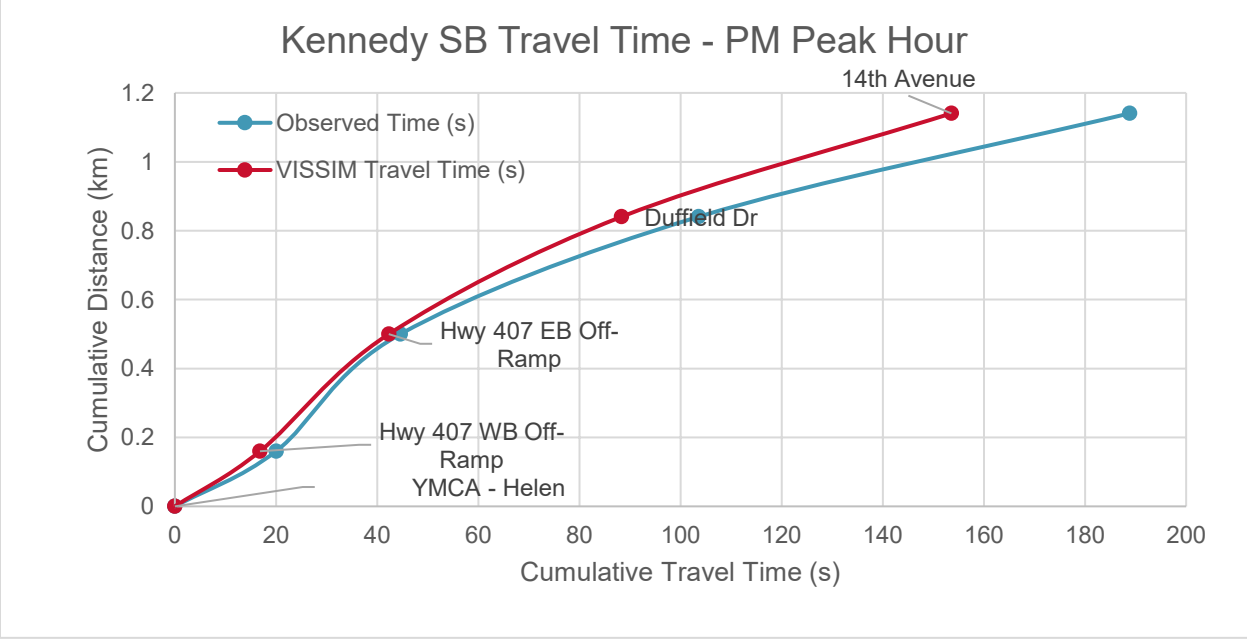


Exhibit 9: Travel Time Plots – PM Peak Hour





Moreover, the modelled queue within the study limits are comparable with the visually observed queue. Given that the modelled travel times meet both FWHA and RESM targets, the results are reasonable.

4. Scenario Analysis

With the analysis tools developed and calibrated for the purpose of this study, the calibrated models were further modified to the 2041 conditions under two different scenarios:

- **Alternative 1:** 2041 Without SCL Scenario: Widen to six lanes (4 GPL + 2 Transit/ HOV lanes) without adding a SCL
- **Alternative 2:** 2041 With SCL Scenario: Widen to eight lanes between the ramp terminals (4 general purpose lanes, 2 Transit/HOV lanes, 2 SCL).

The scenario models were developed based on the calibrated models with further geometric modifications and refinements in order to code HOV, and accommodate future turning volumes. Understanding that the High-Occupancy Vehicle lane performance has a close relationship with the ramp delay at the interchange, it is very important to ensure that vehicles are following the HOV restriction in the simulation. In order to enforce the HOV restriction while allowing ramp vehicles to access 407ETR, the on-ramp traffic were assigned as a different vehicle class than the general traffic travelling along Kennedy Road. This enables ramp traffic to pass through the HOV lanes but keeps other Single-Occupancy Vehicle traffic out of the HOV lanes between the two ramp terminals.

Also, for simplicity, all 407ETR ramp traffic enters the model from the north and south ends of Kennedy Road. This is not expected to affect the simulation of traffic operations at the interchange ramps.

The lane configurations are illustrated in **Appendix C**. Not all future scenario models satisfied the FWHA calibration targets for modelled volumes against input demands. Detailed GEH plots and criteria tables can be illustrated in **Appendix D**.

4.1 Corridor Traffic Diversion

The 2041 forecast northbound left volumes on Kennedy Road and YMCA Boulevard/Helen Avenue intersection during both AM and PM peak hours exceed the capacity of the movement because of limitations on the demand forecast from EMME (the EMME forecast does not account for intersection delay). Therefore the volumes were manually adjusted to keep the volume at existing capacity and the remaining traffic was diverted to alternative routes via the northbound through movement.

4.2 Served Demand in Model

The Phase 1 Synchro analysis indicated queue spillbacks for the study area turning movements which had a volume to capacity (V/C) ratio exceeding 1.00. The 2041 Synchro analysis shows the movements which will incur a volume to capacity (V/C) ratio exceeding 1.00 under an optimized and coordinated signalization scheme during both peaks.

VISSIM micro-simulation is susceptible to the queue spillback and/or weaving on a short link segment. As a result, the VISSIM model scenarios were not able to serve the full future forecasted 2041 demand volumes because of expected spillbacks and weaving effects on the short segments within the study area. **Table 11** shows the served link volumes in VISSIM.

Table 11: Served Volumes in VISSIM

Intersection	Approach	Input Volumes (from EMME)	Served in Model	Absolute Difference
AM 2041 HOV Without SCL				
Kennedy & 14th Avenue	WB	1,708	1,347	361
	EB	822	806	16
	NB	1,630	1,617	13
	SB	2,047	1,639	408
Kennedy & Duffield Dr	EB	153	154	1
	NB	1,704	1,650	54
	SB	2,846	2,210	636
Kennedy & Hwy 407 EB Off Ramp	EB	596	501	95
	NB	1,425	1,488	63
	SB	2,815	2,250	565
Kennedy & Hwy 407 WB Off Ramp	WB	912	917	5
	NB	1,727	1,727	0
	SB	2,810	2,607	203
Kennedy & YMCA - Helen	WB	354	351	3
	EB	467	459	8
	NB	1,880	1,794	86
	SB	2,561	1,881	680
AM 2041 HOV With SCL				
Kennedy & 14th Avenue	WB	1,708	1,355	353
	EB	822	809	13
	NB	1,630	1,614	16
	SB	2,047	1,620	427
Kennedy & Duffield Dr	EB	153	154	1
	NB	1,704	1,653	51
	SB	2,846	2,193	653
Kennedy & Hwy 407 EB Off Ramp	EB	596	495	101
	NB	1,425	1,488	63
	SB	2,815	2,237	578
Kennedy & Hwy 407 WB Off Ramp	WB	912	917	5
	NB	1,727	1,728	1
	SB	2,810	2,584	226
Kennedy & YMCA - Helen	WB	354	343	11
	EB	467	457	10
	NB	1,880	1,791	89
	SB	2,561	1,867	694
PM 2041 HOV Without SCL				
Kennedy & 14th Avenue	WB	905	903	2
	EB	1,518	1,159	359
	NB	2,080	1,963	117
	SB	1,823	1,515	308
Kennedy & Duffield Dr	EB	938	382	556
	NB	2,047	2,034	13
	SB	1,544	1,521	23
Kennedy & Hwy 407 EB Off Ramp	EB	858	861	3
	NB	2,553	2,198	355
	SB	1,593	1,566	27
Kennedy & Hwy 407 WB Off Ramp	WB	278	286	8
	NB	2,548	2,184	364
	SB	1,880	2,213	333

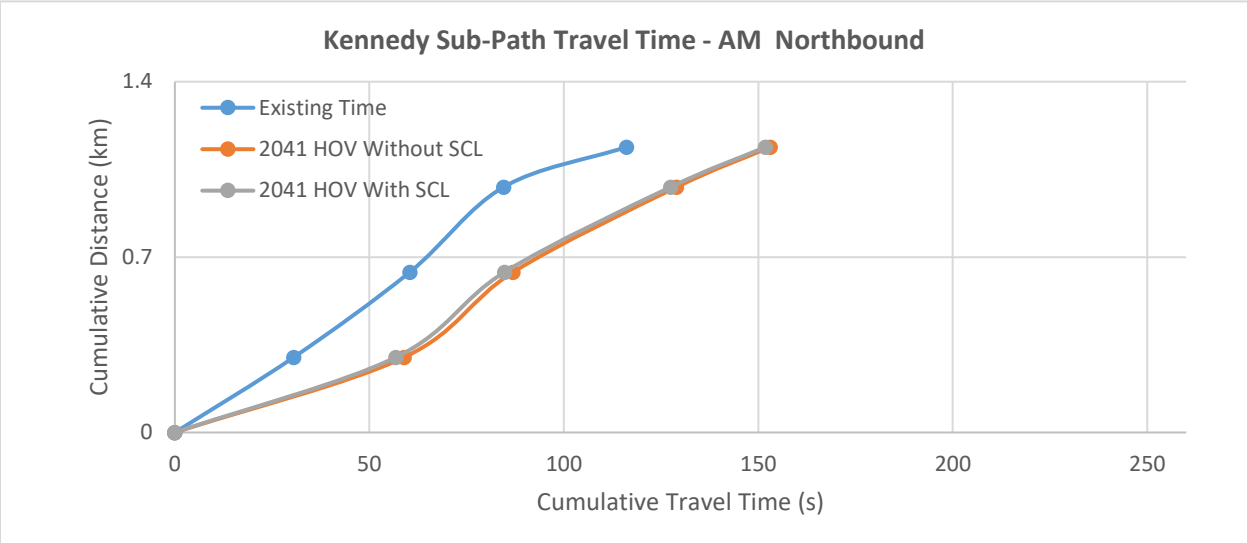
Intersection	Approach	Input Volumes (from EMME)	Served in Model	Absolute Difference
Kennedy & YMCA - Helen	WB	146	144	2
	EB	607	419	188
	NB	2,442	2,066	376
	SB	1,699	1,711	12
PM 2041 HOV With SCL				
Kennedy & 14th Avenue	WB	905	903	2
	EB	1,518	1,158	360
	NB	2,080	1,954	126
	SB	1,823	1,527	296
Kennedy & Duffield Dr	EB	938	386	552
	NB	2,047	2,023	24
	SB	1,544	1,517	27
Kennedy & Hwy 407 EB Off Ramp	EB	858	860	2
	NB	2,553	2,179	374
	SB	1,593	1,556	37
Kennedy & Hwy 407 WB Off Ramp	WB	278	287	9
	NB	2,548	2,165	383
	SB	1,880	2,206	326
Kennedy & YMCA - Helen	WB	146	144	2
	EB	607	400	207
	NB	2,442	2,057	385
	SB	1,699	1,710	11

4.3 Corridor Sub-Path Travel Time Comparison

The cumulative corridor travel time for all vehicles (both SOVs and HOVs) on all lanes (both GPL and HOV Lane) of the Kennedy Road for all the scenarios are shown in **Exhibit 10** and **Exhibit 11**. During the existing AM peak, the southbound travel time is higher than the northbound travel time because of the existing frequent spillback condition of the SBT at 14th Avenue as observed in the field observation. During the future 2041 AM peak hour, the southbound travel time is higher than the northbound travel time. In general, future corridor travel times are higher than the existing conditions except in the scenario with SCLs in the southbound direction during the PM peak hour.

Corridor travel times between the two scenarios also varied by up to 15 seconds (9%) relative to the scenario without an SCL. The scenario with SCLs showed slightly better through travel times in the southbound direction during the PM peak hour. This can be attributed to optimized signal timing plans as well as the addition of the SCL.

Exhibit 10: Corridor Sub-Path Travel Time Comparison Summary - AM



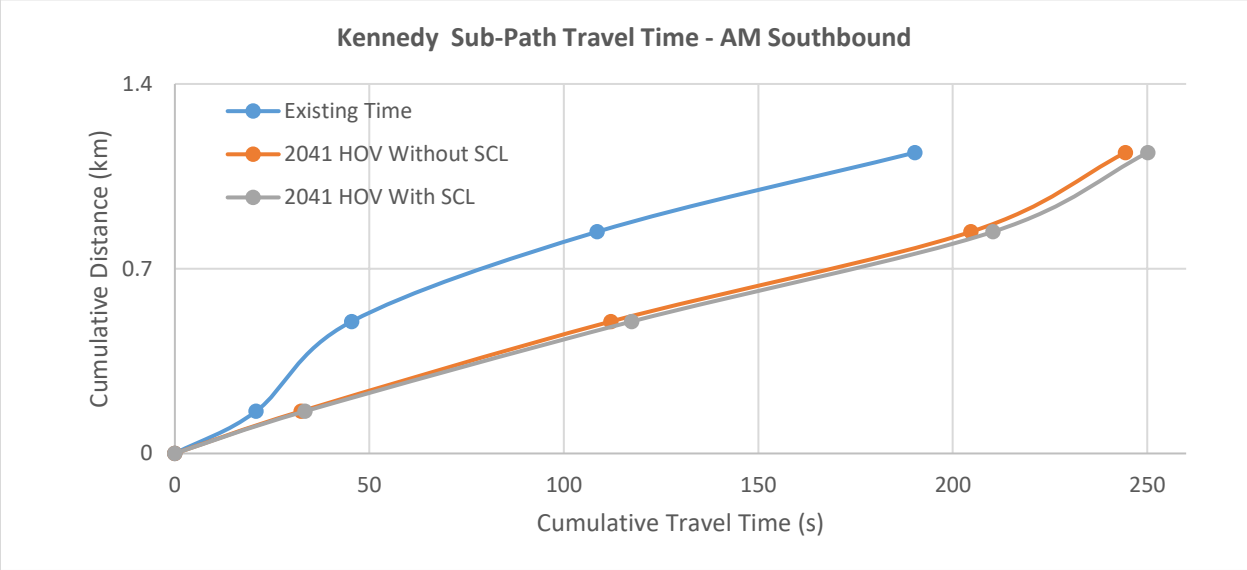
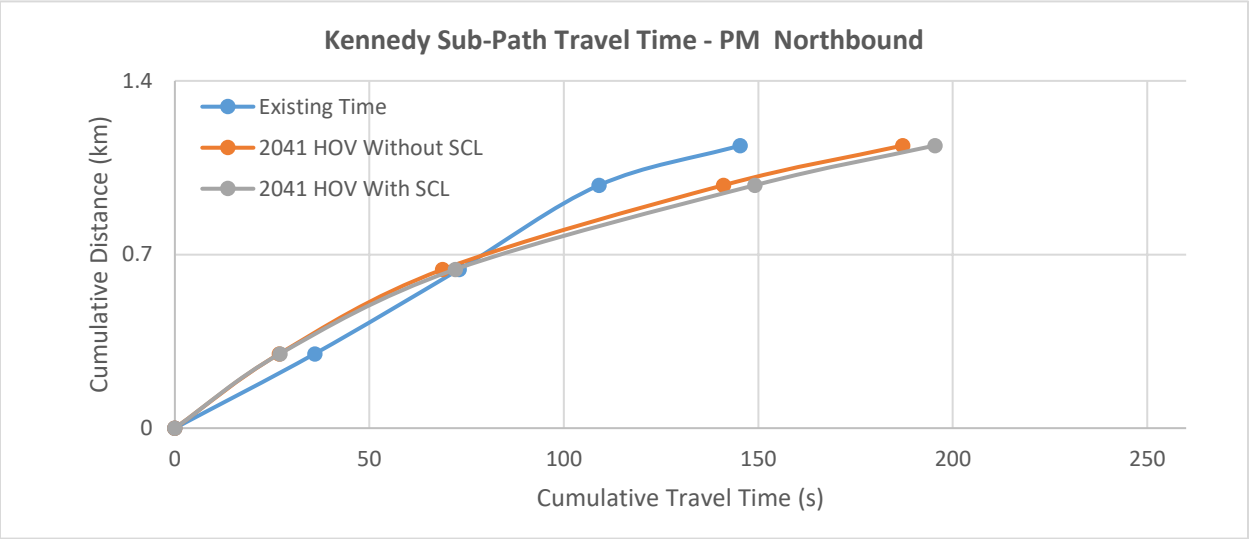
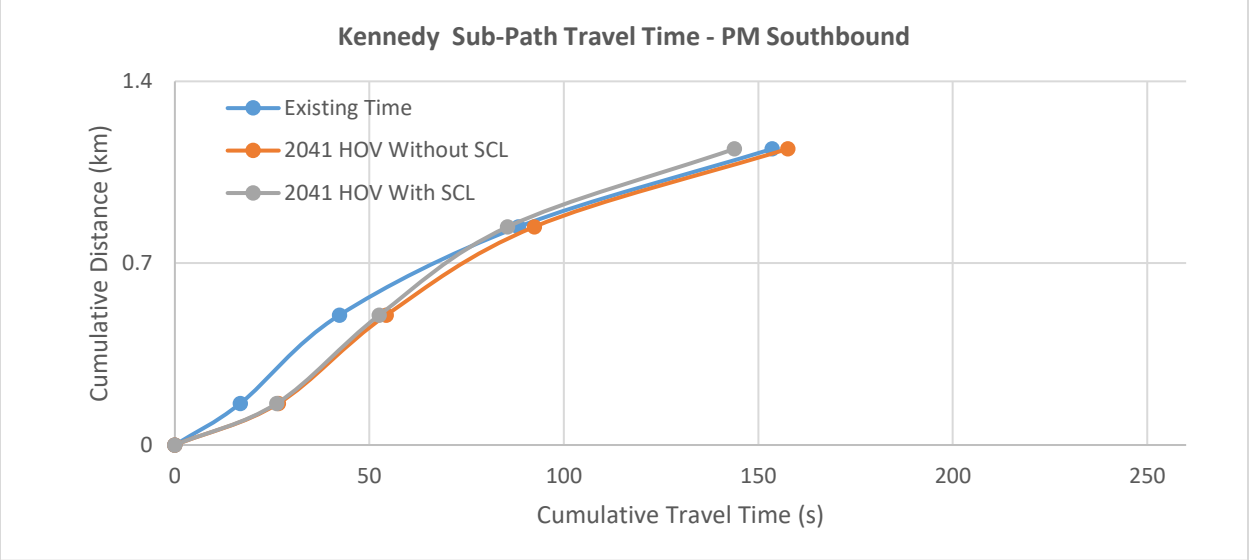


Exhibit 11: Corridor Sub-Path Travel Time Comparison Summary - PM

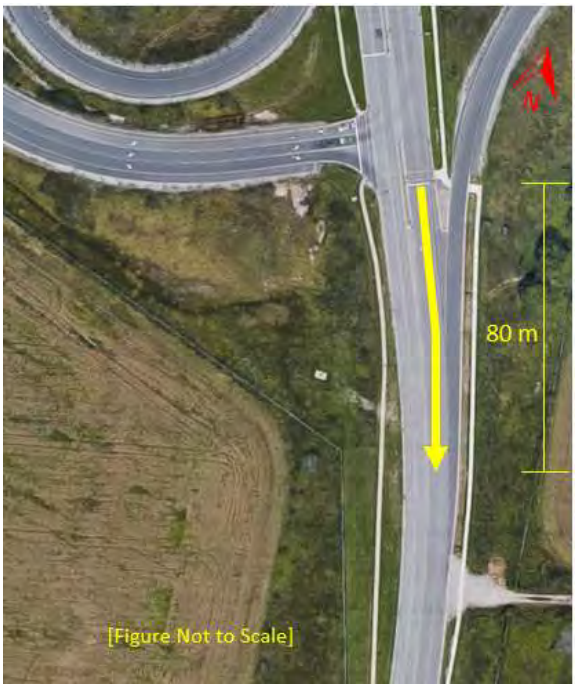




4.4 Link Queue Comparison

Link queue length from the stop sign of the downstream signal to the entry of each on-ramp was evaluated in VISSIM. This link queue refers all vehicles (both SOVs and HOVs) on all lanes (both GPL and HOV Lane) of the Kennedy Road. **Exhibit 12** shows the schematic diagram of link queue length immediately before each of the on-ramp entries with and without SCL scenarios.

Exhibit 12: Schematic Diagram of Distances to On Ramps from Link Queue Beginning

NBT Queue Storage Length (Before Highway 407 EB On Ramp)	SBT Queue Storage Length (Before Highway 407 EB On Ramp)
	
NBT Queue Storage Length (Before Highway 407 WB On Ramp)	**SBT Queue Storage Length (Before Signal of Highway 407 WB Off Ramp Terminal)**
	

The maximum queues at a link level are summarized **Table 12** and **Table 13.**

Based on the VISSIM results, link queues are expected to exceed available storage capacity at the northbound-through (NBT) movement of the south ramp terminal in the scenario without SCLs during both peak hours, and in the scenario with SCLs during the PM peak hour. The southbound through (SBT) movement queue of the south ramp terminal is expected to exceed available storage capacity for both scenarios during the AM peak hour. During the PM peak hour, the northbound maximum observed link queues at the north ramp terminal are also expected to extend 232 m and 115 m beyond the gore of the N-W loop ramp for the scenario without and with SCLs, respectively. There is sufficient storage capacity for all other peak hour ramp movements to accommodate queues.

Table 12: Link Queue Comparison – AM Peak Hour

Intersection	TMC	Distance to Ramp Entrance (m)	Existing (m)	2041 Without SCL (m)	2041 With SCL (m)
Kennedy & Hwy 407 EB Off Ramp	NBT	80	**117**	**86**	76
	SBT	235 (80)	144	**(356)**	**355**
Kennedy & Hwy 407 WB Off-Ramp	NBT	240 (110)	46	**(168)**	184
	SBT	-	178	179	178

**(xx) represents the storage between the stop bar and the entrance to the on-ramp when no speed change lane is provided, only applicable to the 2041 Without SCL scenario*
**__red text__ denotes where queues exceed storage*

Table 13: Link Queue Comparison – PM Peak Hour

Intersection	TMC	Distance to Ramp Entrance (m)	Existing (m)	2041 Without SCL (m)	2041 With SCL (m)
Kennedy & Hwy 407 EB Off-Ramp	NBT	80	**191**	**165**	**200**
	SBT	235 (80)	111	(61)	42
Kennedy & Hwy 407 WB Off-Ramp	NBT	240 (110)	**263**	**(342)**	**355**
	SBT	-	167	174	174

**(xx) represents the storage between the stop bar and the entrance to the on-ramp when no speed change lane is provided, only applicable to the 2041 Without SCL scenario*
**__red text__ denotes where queues exceed storage*

4.5 On-Ramp Sub-Path Travel Time Comparison

Sub-paths were set up in the model for each of the on-ramps from the middle of the upstream intersection (not counting the signal delay), as shown in the **Exhibit 2.**

The sub-path travel time comparisons for accessing each of the on-ramps are shown in **Exhibit 13** and **Exhibit 14**. In general, the SCL scenario does not significantly improve ramp entry travel times compared to the scenario without SCLs. For the scenario with SCLs during the both peak hours, all ramp sub-path travel times remain the same (within one second) as of the scenario without SCLs.

Exhibit 13: On-Ramp Sub-Path Travel Time Comparison – AM Peak Hour

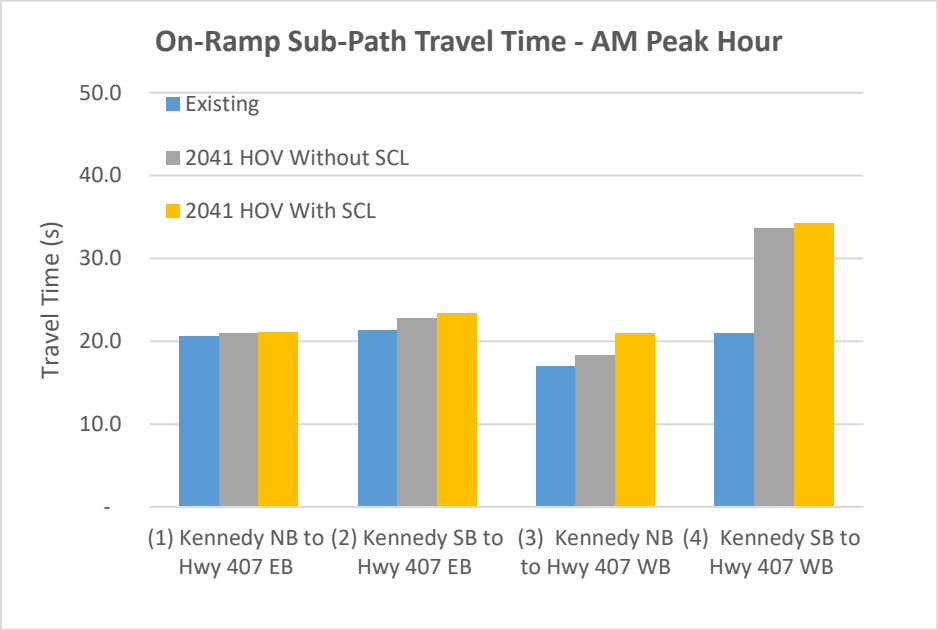
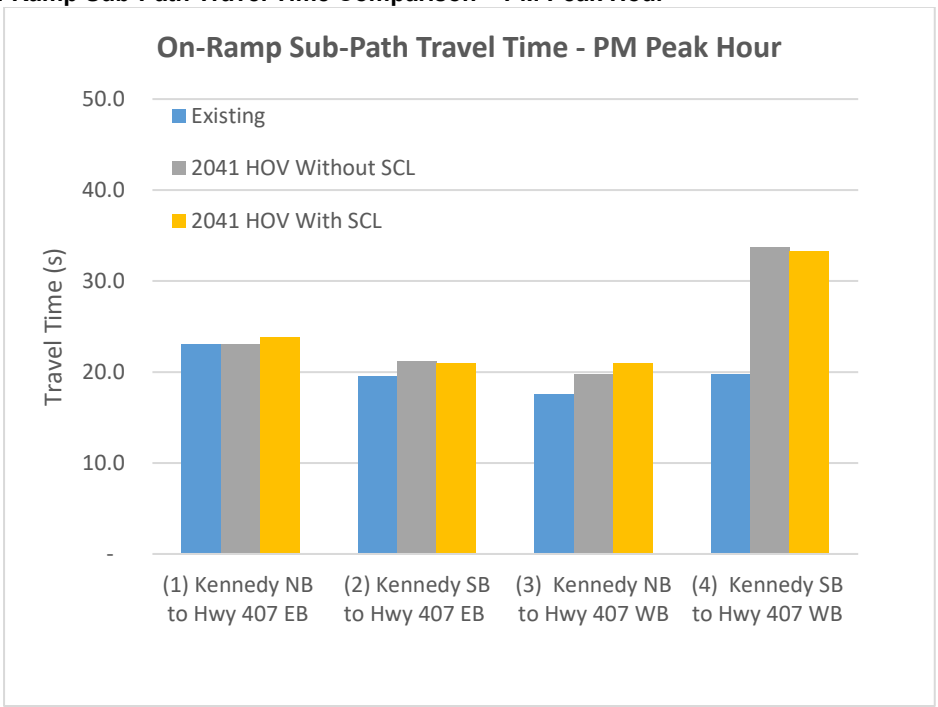


Exhibit 14: On-Ramp Sub-Path Travel Time Comparison – PM Peak Hour



4.6 Level of Service and Delay

Based on the sub-path travel times, the delays of accessing each of the on-ramps were also calculated.

Level of service is based on the average delay per vehicle for a given movement at non-signalized intersections. Delay is an indicator of how long a vehicle must wait to complete a movement and is represented by a letter between ‘A’ and ‘F’, with ‘F’ being the longest delay. Level of service is

based on the scale shown in **Table 14**. The LOS criteria was adopted from the Highway Capacity Manual 2010 for unsignalized intersection evaluation. Due to the absence of the guidelines/criteria for evaluating free flow movements with LOS, this is the most applicable criteria that can be borrowed. Generally LOS A, B, C, and D are considered acceptable. LOS E and F indicate notable delays but may be acceptable in urban contexts.

Table 14: Level of Service Criteria

Level of Service (LOS)	Delay in Comparison to Free Flow Travel Time (Sec)
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 20
D	> 20 and ≤ 35
E	> 35 and ≤ 50
F	> 50

The results of the modelled ramp movement volumes against input demand volumes, and delays, and LOS of ramp movements are summarized in **Table 15** through **Table 17**. As shown in **Table 15**: , except for the southbound on-ramp traffic during the AM, the 2041 SCL scenarios generally served similar on-ramp traffic compared to the scenario without SCLs during both peak hours for other directions. The findings indicated LOS C or better at all four on-ramps during both the AM and PM peak hours for both 2041 With SCL and Without SCL scenarios. The difference in the resulting travel time between the 2041 With SCL and Without SCL are negligible in both peak periods.

Table 15: On-Ramp Volumes – AM and PM Peak Hours

On-Ramp Movement	Input/ Simulated Demand	2018 Existing		2041 Without SCL		2041 With SCL		On Ramp Volume Increase by SCL	
		AM	PM	AM	PM	AM	PM	AM	PM
Kennedy NB to Hwy 407 EB	Input	38	167	48	412	48	412	-	-
	Simulated	31	163	44	376	45	367	+1	-9
Kennedy SB to Hwy 407 EB	Input	57	143	215	500	215	500	-	-
	Simulated	54	143	199	485	199	485	0	0
Kennedy NB to Hwy 407 WB	Input	276	255	347	321	347	321	-	-
	Simulated	272	240	341	299	342	295	+1	-4
Kennedy SB to Hwy 407 WB	Input	324	198	407	350	407	350	-	-
	Simulated	327	206	362	347	363	348	+1	+1

Table 16: On-Ramp Delays and LOS – AM Peak Hour

Location	Sub-Path Distance (m)	Free Flow Travel Time (sec)	Travel Time (LOS)			Increase of Travel Time by SCL (sec)
			2018 Existing Condition	2041 Without SCL	2041 With SCL	
1. Kennedy NB to Hwy 407 EB	344	21	21 (LOS A)	21 (LOS A)	21 (LOS A)	0
2. Kennedy SB to Hwy 407 EB	299	18	21 (LOS A)	23 (LOS A)	23 (LOS A)	0
3. Kennedy NB to Hwy 407 WB	266	16	17 (LOS A)	18 (LOS A)	18 (LOS A)	0
4. Kennedy SB to Hwy 407 WB	263	16	21 (LOS A)	34 (LOS C)	34 (LOS C)	0

* Ramp movement LOS is based on HCM 2010 definition for unsignalized intersections from VISSIM

Table 17: On-Ramp Delays and LOS – PM Peak Hour

Location	Sub-Path Distance (m)	Free Flow Travel Time (sec)	Travel Time (LOS)			Increase of Travel Time by SCL (sec)
			2018 Existing Condition	2041 Without SCL	2041 With SCL	
1. Kennedy NB to Hwy 407 EB	344	21	23 (LOS A)	23 (LOS A)	24 (LOS A)	+1
2. Kennedy SB to Hwy 407 EB	299	18	19 (LOS A)	21 (LOS A)	21 (LOS A)	0
3. Kennedy NB to Hwy 407 WB	266	16	18 (LOS A)	20 (LOS A)	19 (LOS A)	-1
4. Kennedy SB to Hwy 407 WB	263	16	20 (LOS A)	34 (LOS C)	33 (LOS C)	-1

* Ramp movement LOS is based on HCM 2010 definition for unsignalized intersections from VISSIM

5. Conclusion

Based on the simulation results, speed changing lanes are not expected to improve the travel times of 407ETR ramp traffic significantly during the both peak hours. Both scenarios with and without SCLs indicate similar sub-path travel times and corridor through-traffic travel times.

Appendix A
Site Observation Notes

Kennedy Road – Site Observations

AM Peak Period:

Tuesday, July 31, 2018

- Three runs conducted between YMCA- Helen and Duffield Drive for both northbound and southbound directions.
- In general, no operational issues were noted; traffic volumes were low, and no queuing or delays were experienced between YMCA- Helen and Duffield Drive.

Monday, August 20, 2018

- Two runs conducted between YMCA- Helen and Duffield Drive for both northbound and southbound directions.
- In general, no operational issues were noted.

Monday, August 28, 2018

- Four runs conducted between 14th Avenue and Duffield Drive for both northbound and southbound directions.
- In general, no operational issues were noted.

PM Peak Period:

Tuesday, July 31, 2018

- Five runs conducted from Duffield Drive to YMCA- Helen and for both northbound direction.
- Some queue is also observed before Highway 407 eastbound entrance and also between the ramp terminals in the northbound direction
- Queue is also observed before YMCA- Helen because of spillback from South Unionville in the northbound direction.
- Four runs conducted from YMCA- Helen and to Duffield Drive for the southbound direction.
- Queues from 14th Avenue spilled back towards Duffield Drive, past the CN Bridge for two of the runs.

Monday, August 20, 2018

- One run conducted from YMCA- Helen and to Duffield Drive for the southbound direction.
- In general, no operational issues were noted for the southbound direction.

Monday, August 27, 2018

- Five runs conducted between 14th Avenue and Duffield Drive for both northbound and southbound directions.
- In general, no operational issues were noted unless wide delay ranges because of the signal timing in the southbound direction.

Table 1A: Travel Times from the Survey

Travel Time Survey Between YMCA and Duffield Dr

Kennedy	Segment		AM								PM							
	From	To	Run1	Run2	Run3	Run4	Run5	Max Travel Time [s]	Average Time [s]	Min Travel Time [s]	Run1	Run2	Run3	Run4	Run5	Max Travel Time [s]	Average Time [s]	Min Travel Time [s]
Southbound	YMCA Blvd	407 WB Off-ramp	10.0	10.0	16.0	16.0	26.0	26.0	15.6	10.0	9.0	26.0	10.0	39.0	16.0	39.0	20.0	9.0
	407 WB Off-ramp	407 EB Off-ramp	23.0	23.0	23.0	32.0	26.0	32.0	25.4	23.0	23.0	26.0	22.0	26.0	26.0	26.0	24.6	22.0
	407 EB Off-ramp	Duffield Drive	42.0	22.0	58.0	45.0	48.0	58.0	43.0	22.0	74.0	61.0	42.0	54.0	64.0	74.0	59.0	42.0
		Corridor Total	[1.2 min]	[0.9 min]	[1.6 min]	[1.6 min]	[1.7 min]	[1.9 min]	[1.4 min]	[0.9 min]	[1.8 min]	[1.9 min]	[1.2 min]	[2 min]	[1.8 min]	[2.3 min]	[1.7 min]	[1.2 min]
Northbound	Duffield Drive	407 EB Off-ramp	22.0	19.0	23.0	22.0	22.0	23.0	21.6	19.0	45.00	22.0	35.0	68.0	26.0	68.0	39.2	22.0
	407 EB Off-ramp	407 WB Off-ramp	26.0	23.0	25.0	42.0	49.0	49.0	33.0	23.0	23.00	33.0	20.0	23.0	20.0	33.0	23.8	20.0
	407 WB Off-ramp	YMCA Blvd	13.0	13.0	13.0	32.0	45.0	45.0	23.2	13.0	61.00	16.0	45.0	13.0	74.0	74.0	41.8	13.0
		Corridor Total	[1 min]	[0.9 min]	[1 min]	[1.6 min]	[1.9 min]	[2 min]	[1.3 min]	[0.9 min]	[2.2 min]	[1.2 min]	[1.7 min]	[1.7 min]	[2 min]	[2.9 min]	[1.7 min]	[0.9 min]

		Run 1	Run 2	Run 3	Run 4	Run 5			Run 1	Run 2	Run 3	Run 4	Run 5
Date of Survey	SB	31-Jul	31-Jul	31-Jul	20-Aug	20-Aug	Date of Survey	SB	31-Jul	31-Jul	31-Jul	31-Jul	20-Aug
	NB	31-Jul	31-Jul	31-Jul	20-Aug	20-Aug		NB	31-Jul	31-Jul	31-Jul	31-Jul	31-Jul

Travel Time Survey Between Duffield Dr and 14th Avenue

Kennedy	Segment		AM								PM							
	From	To	Run1	Run2	Run3	Run4	Run5	Max Travel Time [s]	Average Time [s]	Min Travel Time [s]	Run1	Run2	Run3	Run4	Run5	Max Travel Time [s]	Average Time [s]	Min Travel Time [s]
Southbound	Duffield Drive	14th Ave	23.0	104.0	67.0	165.0	-	165.0	89.7	23.0	48.0	116.0	84.0	113.0	65.0	116.0	85.2	48.0
		Corridor Total	[0.4 min]	[1.7 min]	[1.1 min]	[2.7 min]	[0 min]	[2.7 min]	[1.5 min]	[0.4 min]	[0.8 min]	[1.9 min]	[1.4 min]	[1.9 min]	[1.1 min]	[1.9 min]	[1.4 min]	[0.8 min]
Northbound	14th Ave	Duffield Drive	23.0	16.0	45.0	20.0	-	45.0	26.0	16.0	19.00	23.0	62.0	19.0	65.0	65.0	37.6	19.0
		Corridor Total	[0.4 min]	[0.3 min]	[0.7 min]	[0.3 min]	[0 min]	[0.7 min]	[0.4 min]	[0.3 min]	[0.3 min]	[0.4 min]	[1 min]	[0.3 min]	[1.1 min]	[1.1 min]	[0.6 min]	[0.3 min]

		Run 1	Run 2	Run 3	Run 4	Run 5			Run 1	Run 2	Run 3	Run 4	Run 5
Date of Survey	SB	28-Aug	28-Aug	28-Aug	28-Aug	-	Date of Survey	SB	28-Aug	28-Aug	28-Aug	28-Aug	28-Aug
	NB	28-Aug	28-Aug	28-Aug	28-Aug	-		NB	28-Aug	28-Aug	28-Aug	28-Aug	28-Aug

Appendix B
Volume Balancing

Methods of Volume Balancing for future 2041:

Step 1: Furnessing (i.e. Extended Fratar Method) of all Future Node Volumes was applied based on the existing (2017-2018) balanced node volumes during the AM Peak first

Step 2: After Furnessing, if ramp volume is found lower than the existing ramp volume, only then 1% Growth is applied for ramps, otherwise, the fraterred ramp volume is taken for future. Here:

Final On-ramp AM Turn Volume = Max. of (Furnessed Turn Volume, 1% Growth Volume)

Final Off-ramp AM Turn Volume = Max. of (Furnessed Turn Volume, 1% Growth Volume)

Step 3: Adjusted unreasonable left-turn volumes (Fix AM left turn volume around capacity level i.e. 250 per hour per lane), and similar procedures for AM right turn volumes also as these will be reversed to act as PM left turns

Step 4: Adjusted NS flow for AM peak hour

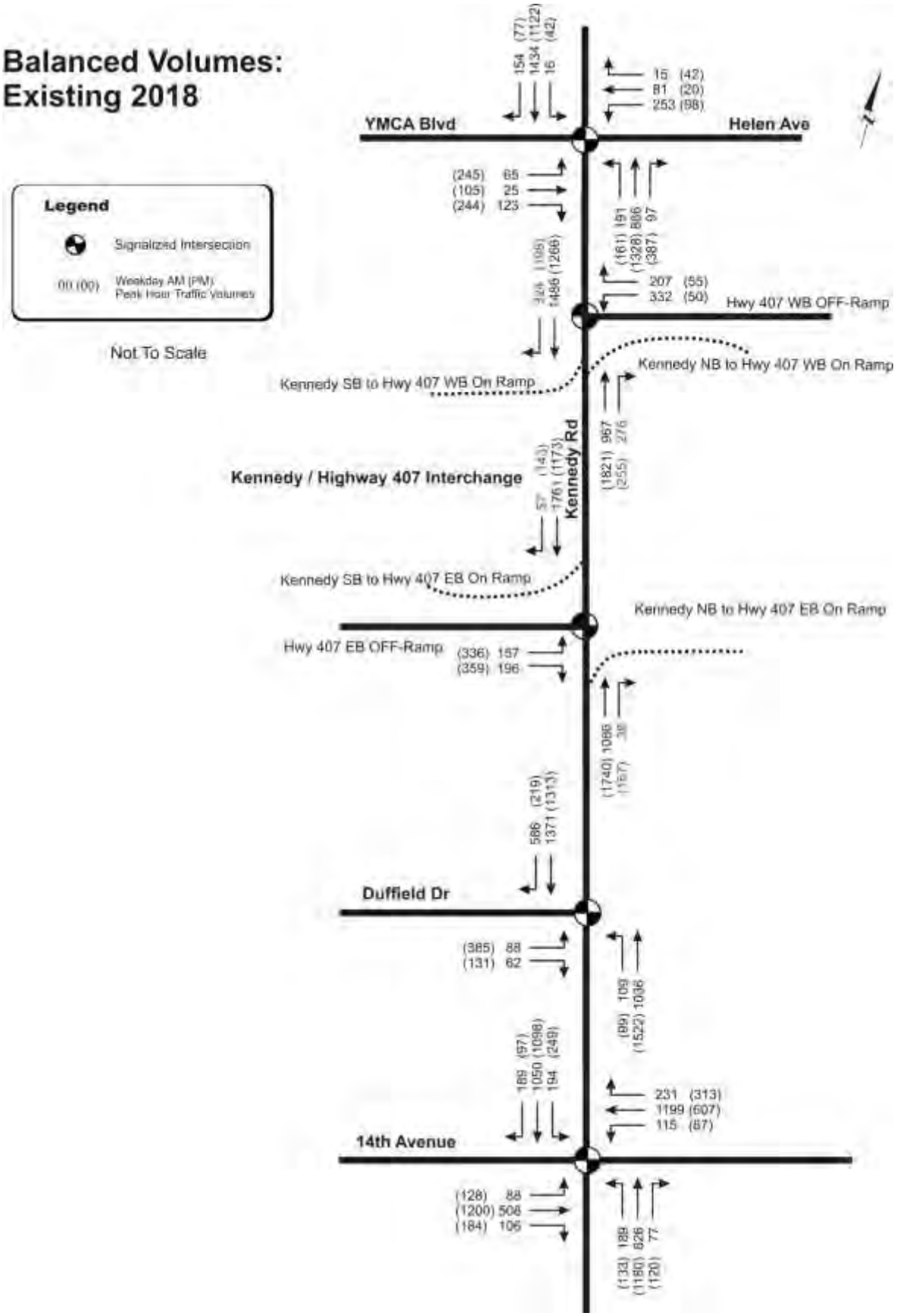
Step 5: Reversed the AM traffic turn volumes during the PM peak hour. In case of lower than existing ramp traffic volume is found, then fix the ramp traffic with 1% Growth again for on-ramps, and for off-ramps just keep the existing volumes. Here:

Final On-ramp PM Volume = Maximum of (Reversed AM Turn Volume, 1% Growth Volume)

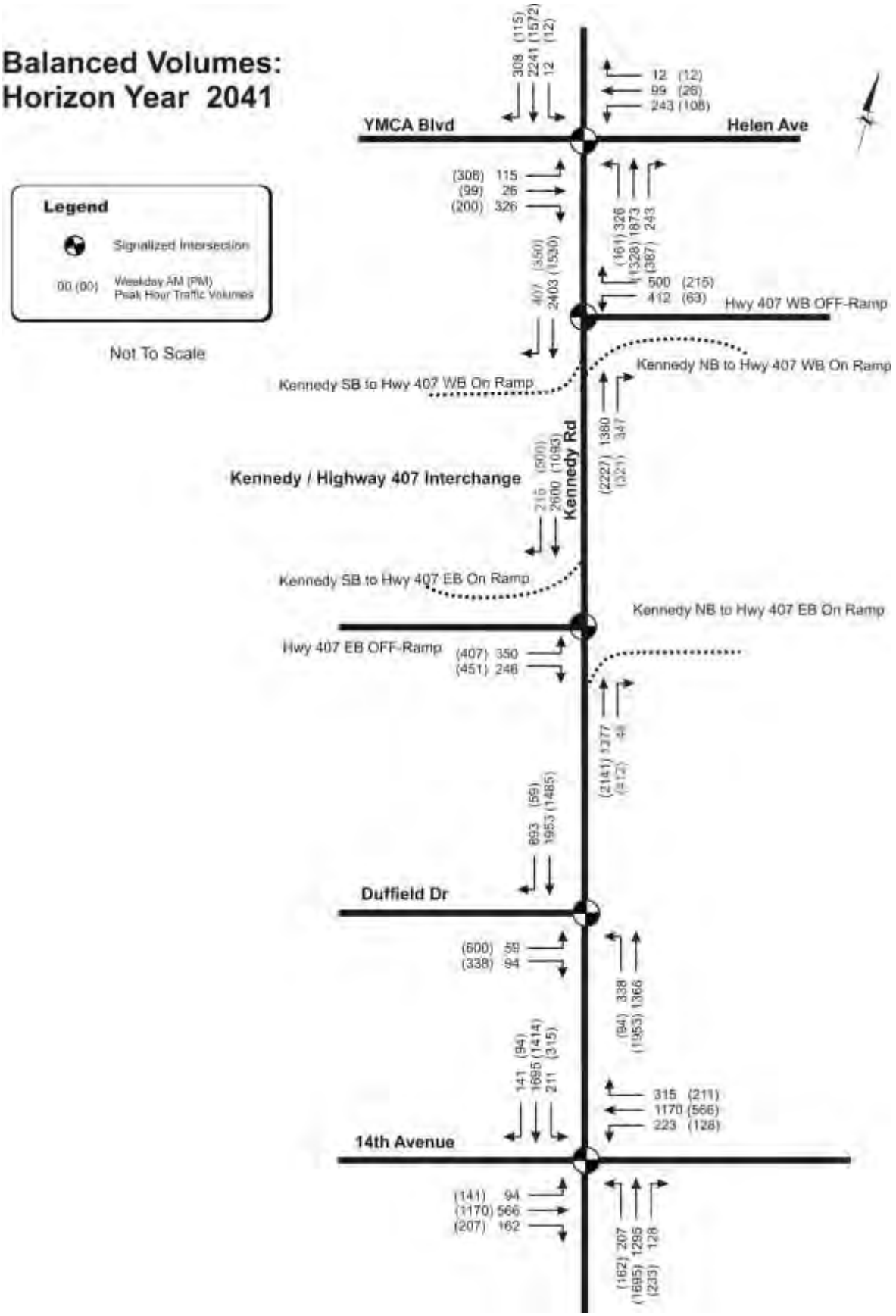
Final Off-ramp PM Volume = Maximum of (Reversed AM Turn Volume, 1% Growth Volume)

Step 6: Adjusted NS flow for PM peak hour.

For existing 2018 volume balancing, the ramp volumes of the recent 2018 traffic counts were fixed first, then the north-south flow was adjusted.

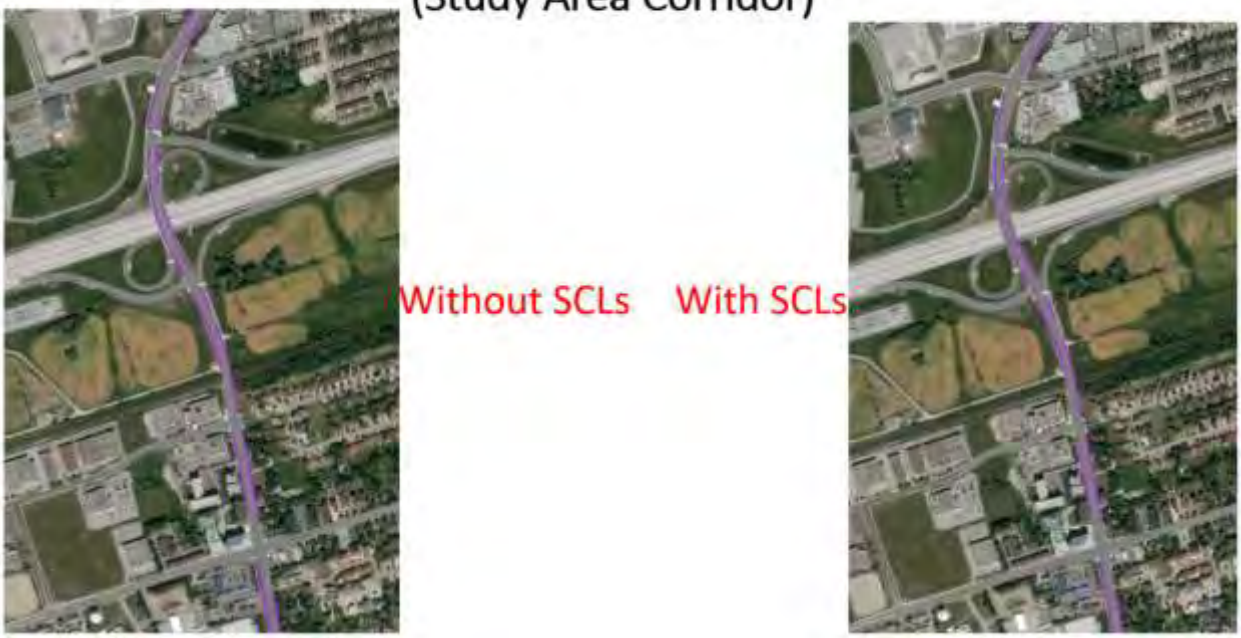

Balanced Volumes:
Existing 2018
Legend
Signalized Intersection
00 (00) Weekday AM (PM) Peak Hour Traffic Volumes
Not To Scale
YMCA Blvd
Helen Ave
Hwy 407 WB OFF-Ramp
Kennedy SB to Hwy 407 WB On Ramp
Kennedy NB to Hwy 407 WB On Ramp
Kennedy / Highway 407 Interchange
Kennedy Rd
Kennedy SB to Hwy 407 EB On Ramp
Kennedy NB to Hwy 407 EB On Ramp
Hwy 407 EB OFF-Ramp
Duffield Dr
14th Avenue

Balanced Volumes: Horizon Year 2041

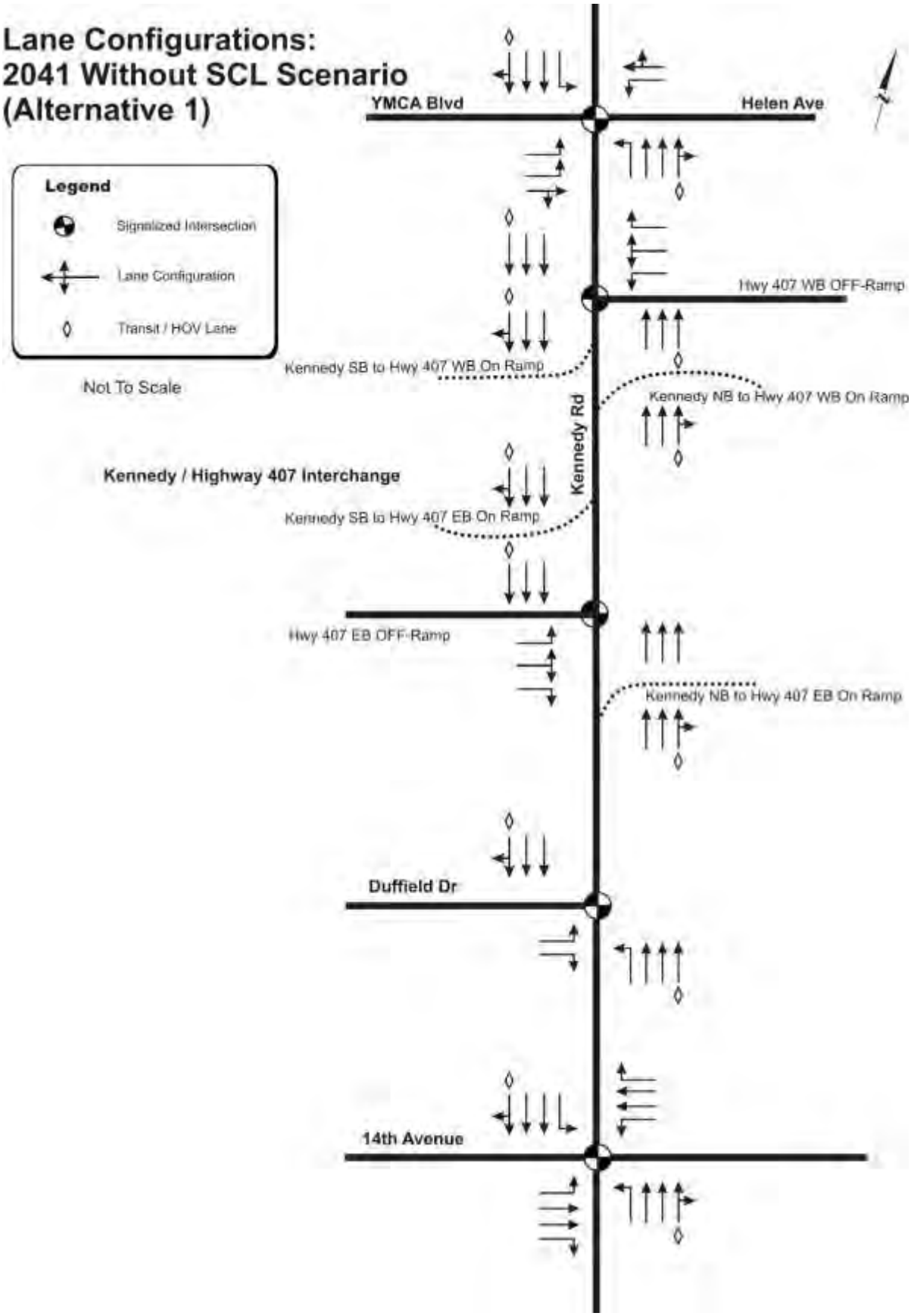


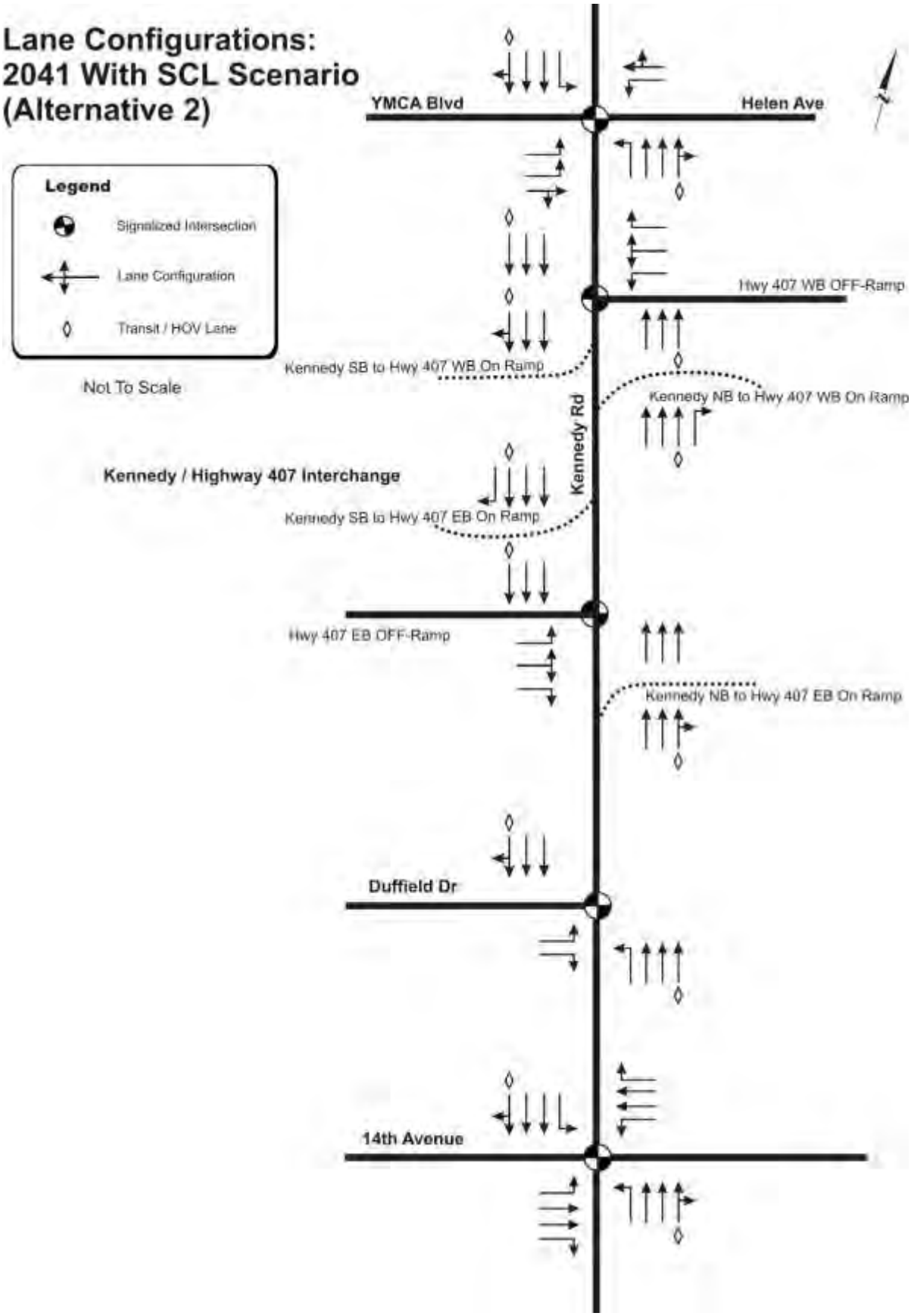
Appendix C
Lane Configurations

HOV Configurations (Study Area Corridor)



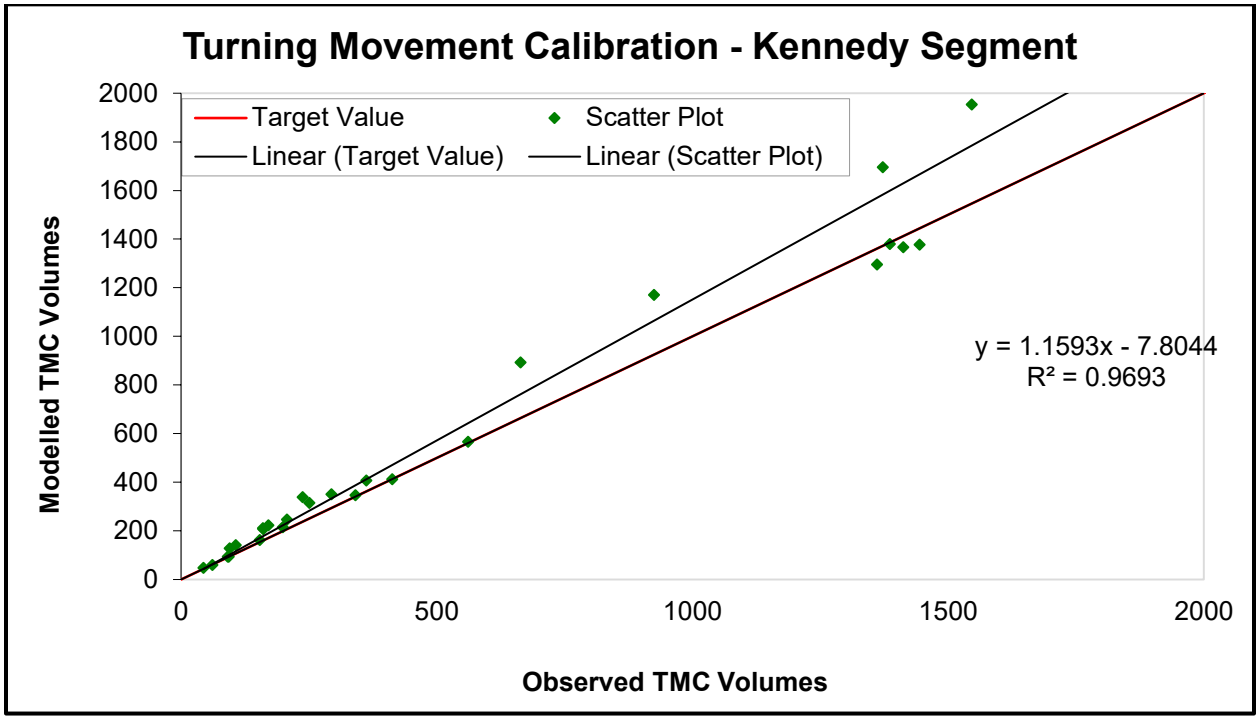
HOV Configurations (Highway 407 ETR Ramp Areas)


Lane Configurations:
2041 Without SCL Scenario
(Alternative 1)
Legend
Signalized Intersection
Lane Configuration
Transit / HOV Lane
Not To Scale
YMCA Blvd
Helen Ave
Hwy 407 WB OFF-Ramp
Kennedy SB to Hwy 407 WB On Ramp
Kennedy NB to Hwy 407 WB On Ramp
Kennedy Rd
Kennedy / Highway 407 Interchange
Kennedy SB to Hwy 407 EB On Ramp
Hwy 407 EB OFF-Ramp
Kennedy NB to Hwy 407 EB On Ramp
Duffield Dr
14th Avenue

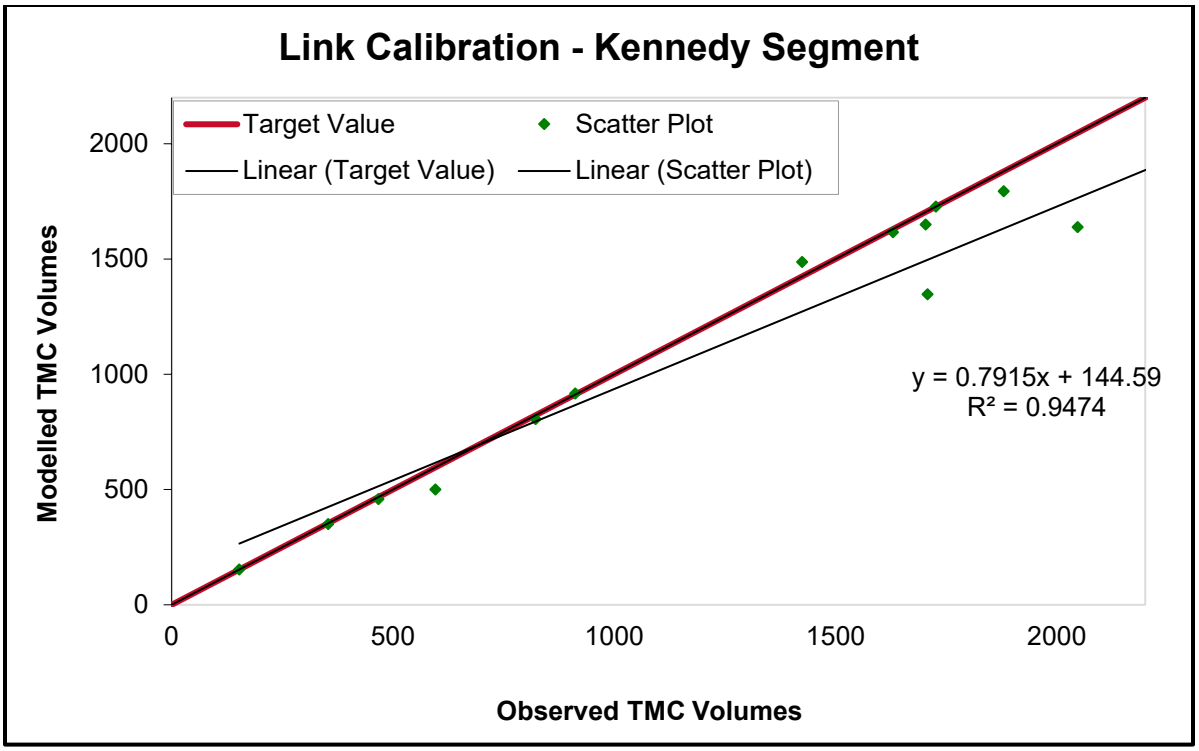

Lane Configurations:
2041 With SCL Scenario
(Alternative 2)
Legend
Signalized Intersection
Lane Configuration
Transit / HOV Lane
Not To Scale
YMCA Blvd
Helen Ave
Hwy 407 WB OFF-Ramp
Kennedy SB to Hwy 407 WB On Ramp
Kennedy NB to Hwy 407 WB On Ramp
Kennedy Rd
Kennedy / Highway 407 Interchange
Kennedy SB to Hwy 407 EB On Ramp
Hwy 407 EB OFF-Ramp
Kennedy NB to Hwy 407 EB On Ramp
Duffield Dr
14th Avenue

Appendix D
2041 GEH Statistics

2041 Without SCL Scenario (Alternative 1) – AM Peak Hour

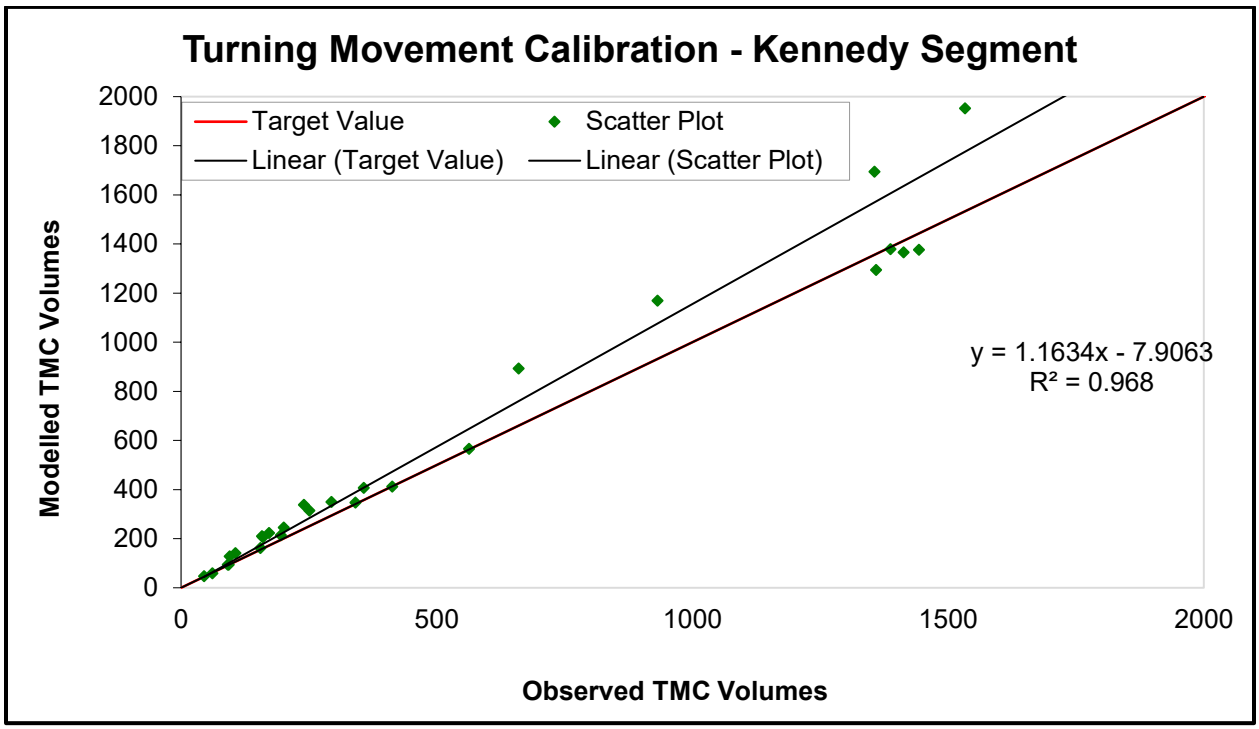


TMC Calibration Check			
Peak Direction	**Modelled**	**Target**	**Check**
Percentage of Turns with GEH <= 5	79%	85%	FAIL
Percentage of Turns with GEH <= 10	93%	95%	FAIL
Percentage of Turns with GEH > 10	7%	5%	FAIL

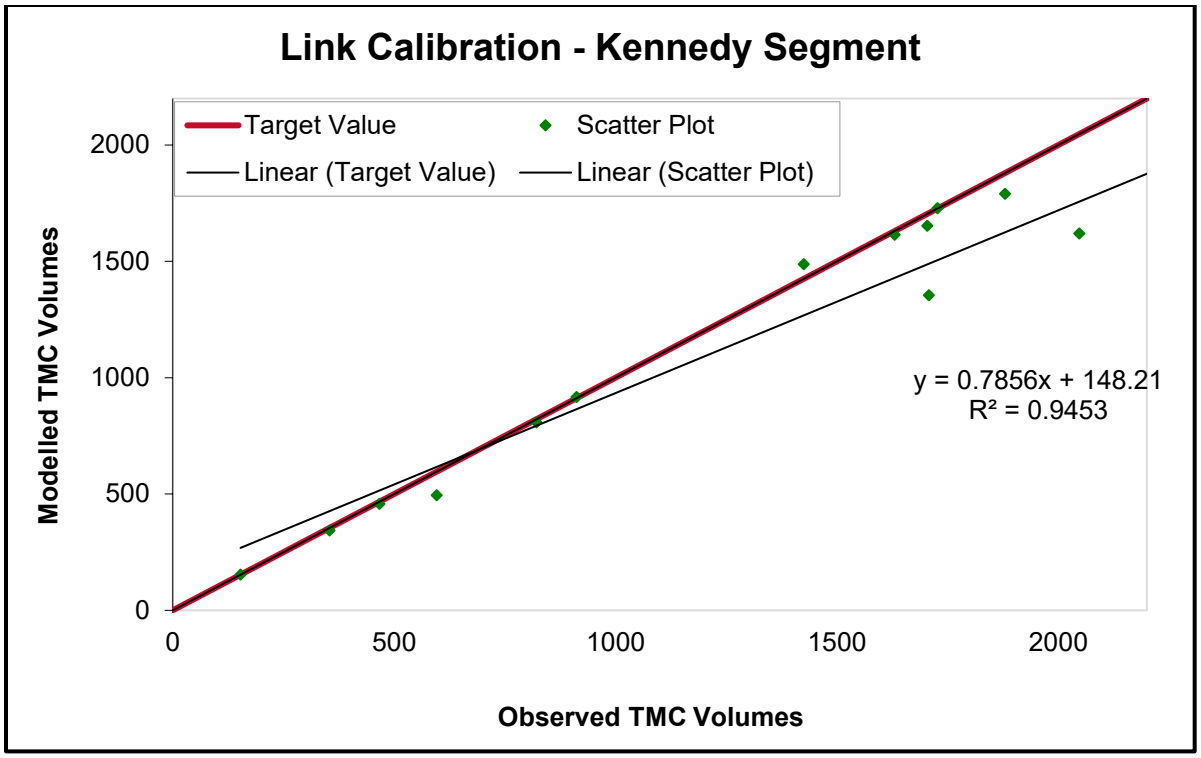


Link Calibration Check			
Peak Direction	**Modelled**	**Target**	**Check**
Percentage of Links with GEH <= 5	71%	85%	FAIL
Percentage of Links with GEH <= 10	82%	95%	FAIL
Percentage of Links with GEH > 10	18%	5%	FAIL
RMSE	21.9%	30%	OK
Link flows with 700 < Flow < 2700 veh/h within 15%	100%	85%	OK
Link flows < 700 veh/h within 100vph	100%	85%	OK
Link Flow > 2700 veh/h within 400 vph	33%	85%	FAIL
Sum of All Link Flows with 5% of sum of All Link counts	19.4	4	FAIL
GEH of Sum of All Links	11.6%	5%	FAIL

2041 With SCL Scenario (Alternative 2) – AM Peak Hour

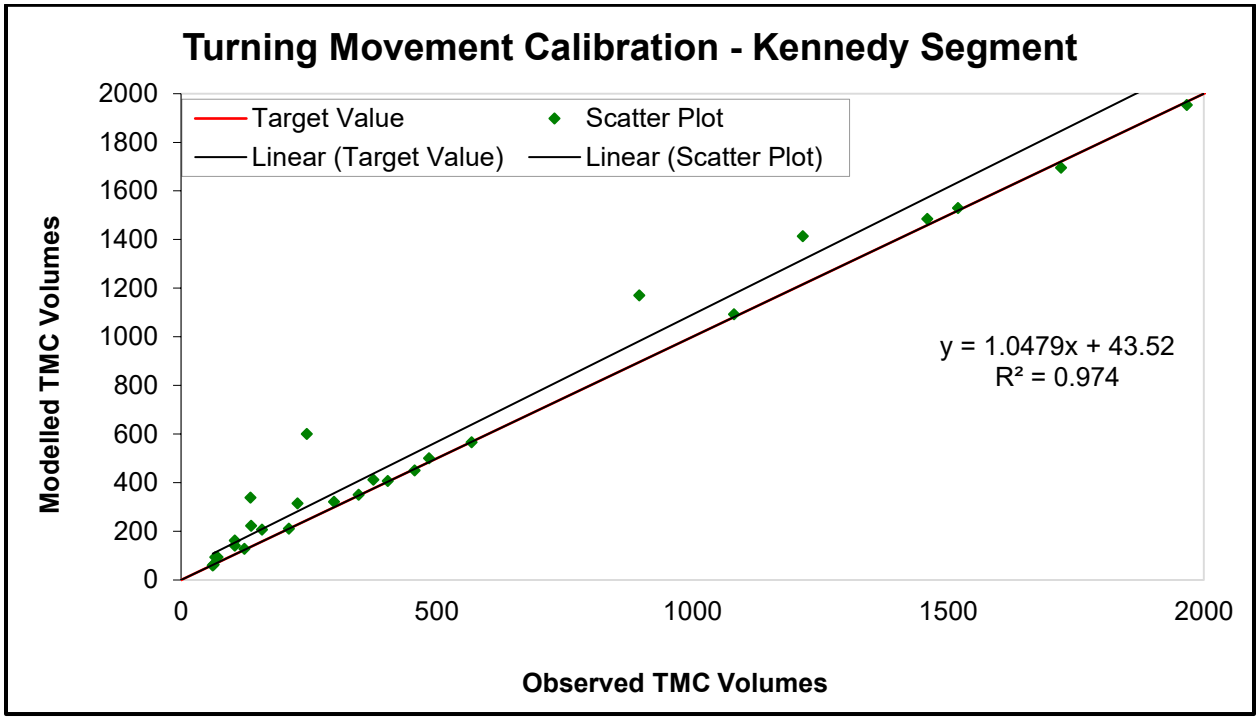


TMC Calibration Check			
Peak Direction	**Modelled**	**Target**	**Check**
Percentage of Turns with GEH <= 5	79%	85%	FAIL
Percentage of Turns with GEH <= 10	90%	95%	FAIL
Percentage of Turns with GEH > 10	10%	5%	FAIL

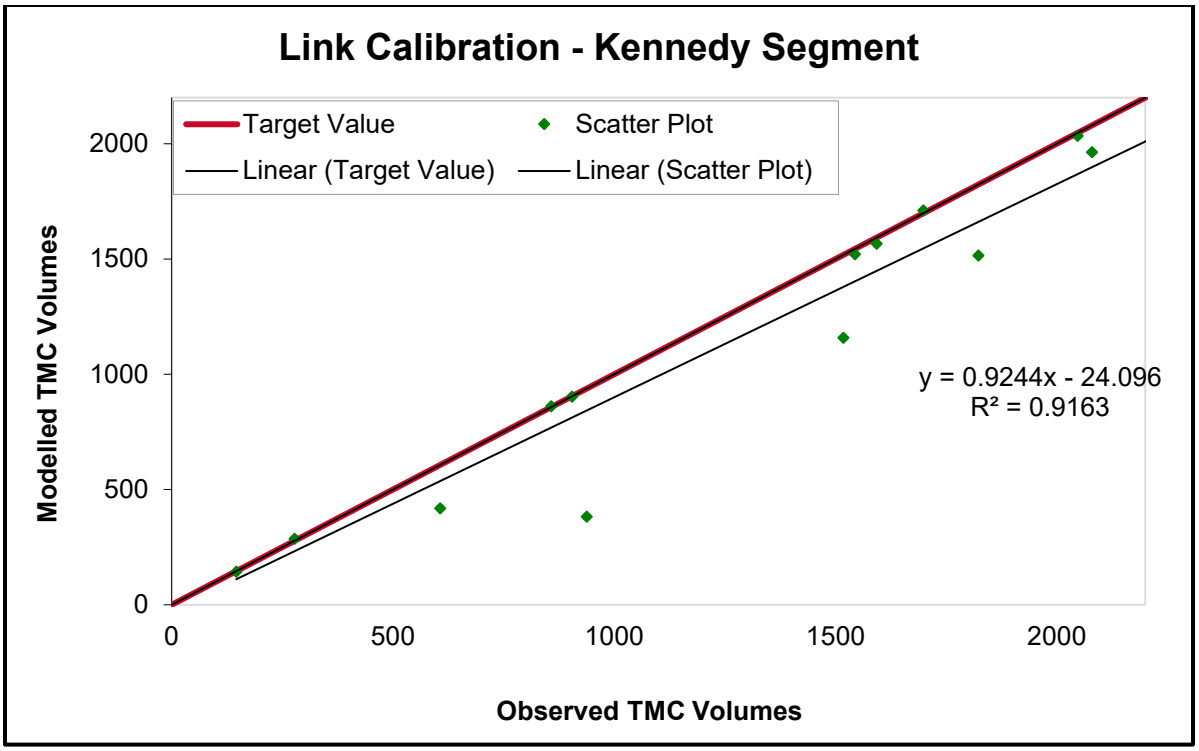


Link Calibration Check			
Peak Direction	**Modelled**	**Target**	**Check**
Percentage of Links with GEH <= 5	71%	85%	FAIL
Percentage of Links with GEH <= 10	82%	95%	FAIL
Percentage of Links with GEH > 10	18%	5%	FAIL
RMSE	22.6%	30%	OK
Link flows with 700 < Flow < 2700 veh/h within 15%	100%	85%	OK
Link flows < 700 veh/h within 100vph	75%	85%	OK
Link Flow > 2700 veh/h within 400 vph	33%	85%	FAIL
Sum of All Link Flows with 5% of sum of All Link counts	20.9	4	FAIL
GEH of Sum of All Links	11.8%	5%	FAIL

2041 Without SCL Scenario (Alternative 1) – PM Peak Hour



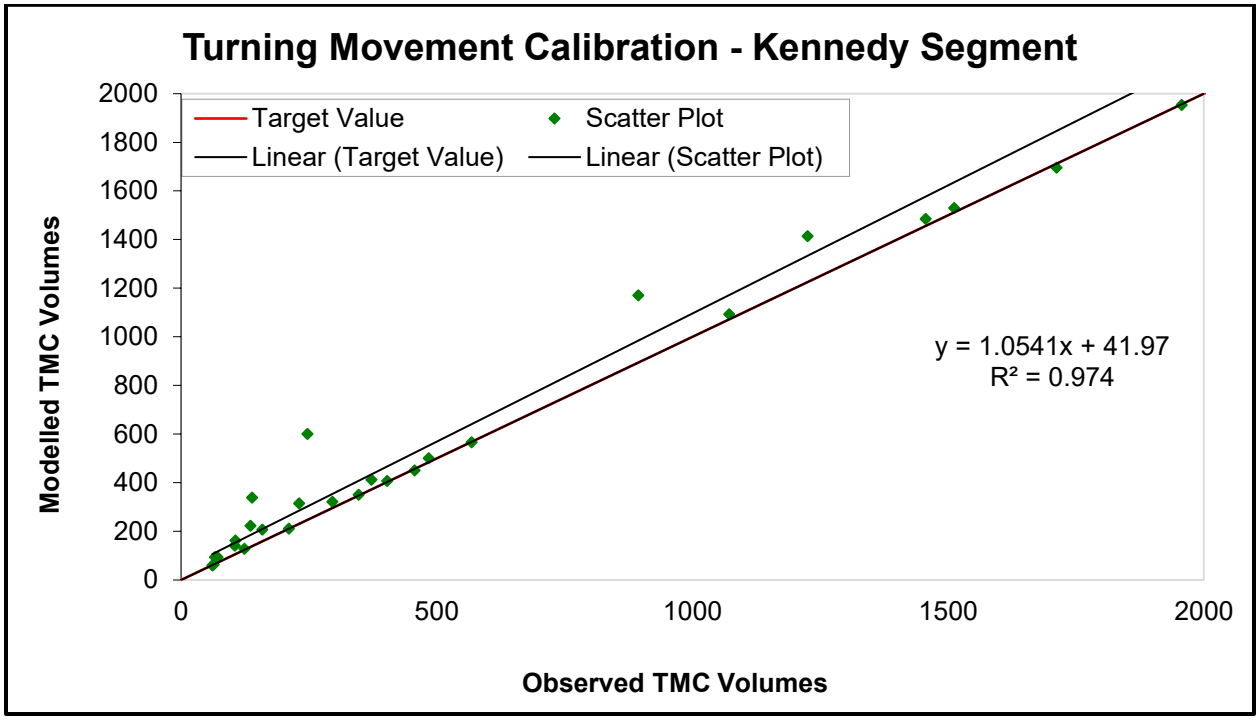
TMC Calibration Check			
Peak Direction	**Modelled**	**Target**	**Check**
Percentage of Turns with GEH <= 5	76%	85%	FAIL
Percentage of Turns with GEH <= 10	95%	95%	OK
Percentage of Turns with GEH > 10	5%	5%	OK



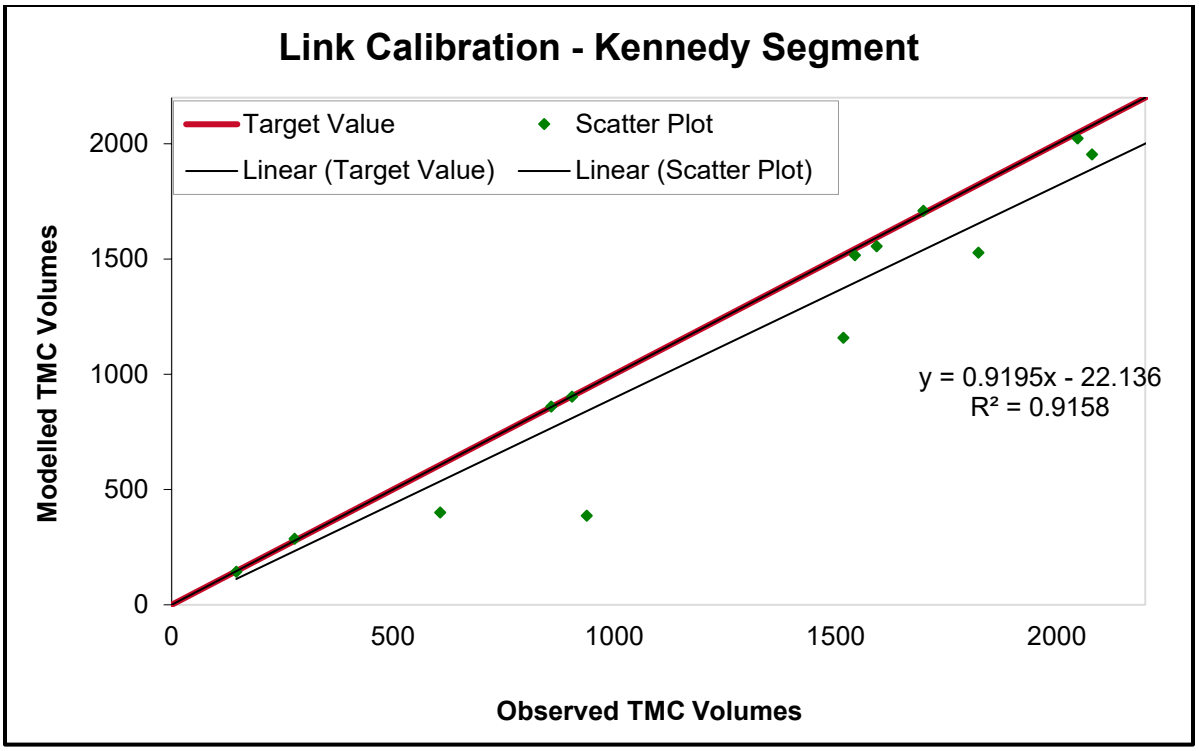
Link Calibration Check			
Peak Direction	**Modelled**	**Target**	**Check**
Percentage of Links with GEH <= 5	53%	85%	FAIL
Percentage of Links with GEH <= 10	94%	95%	FAIL
Percentage of Links with GEH > 10	6%	5%	FAIL
RMSE	17.9%	30%	OK
Link flows with 700 < Flow < 2700 veh/h within 15%	93%	85%	OK
Link flows < 700 veh/h within 100vph	67%	85%	FAIL
Link Flow > 2700 veh/h within 400 vph*	-	85%	-
Sum of All Link Flows with 5% of sum of All Link counts	15.0	4	FAIL
GEH of Sum of All Links	9.2%	5%	FAIL

* no link flow exceed 2700 veh/h

2041 With SCL Scenario (Alternative 2) – PM Peak Hour



TMC Calibration Check			
Peak Direction	**Modelled**	**Target**	**Check**
Percentage of Turns with GEH <= 5	76%	85%	FAIL
Percentage of Turns with GEH <= 10	95%	95%	OK
Percentage of Turns with GEH > 10	5%	5%	OK



Link Calibration Check			
Peak Direction	**Modelled**	**Target**	**Check**
Percentage of Links with GEH <= 5	53%	85%	FAIL
Percentage of Links with GEH <= 10	94%	95%	FAIL
Percentage of Links with GEH > 10	6%	5%	FAIL
RMSE	19.0%	30%	OK
Link flows with 700 < Flow < 2700 veh/h within 15%	93%	85%	OK
Link flows < 700 veh/h within 100vph	67%	85%	FAIL
Link Flow > 2700 veh/h within 400 vph*	-	85%	-
Sum of All Link Flows with 5% of sum of All Link counts	15.6	4	FAIL
GEH of Sum of All Links	9.5%	5%	FAIL

* no link flow exceed 2700 veh/h