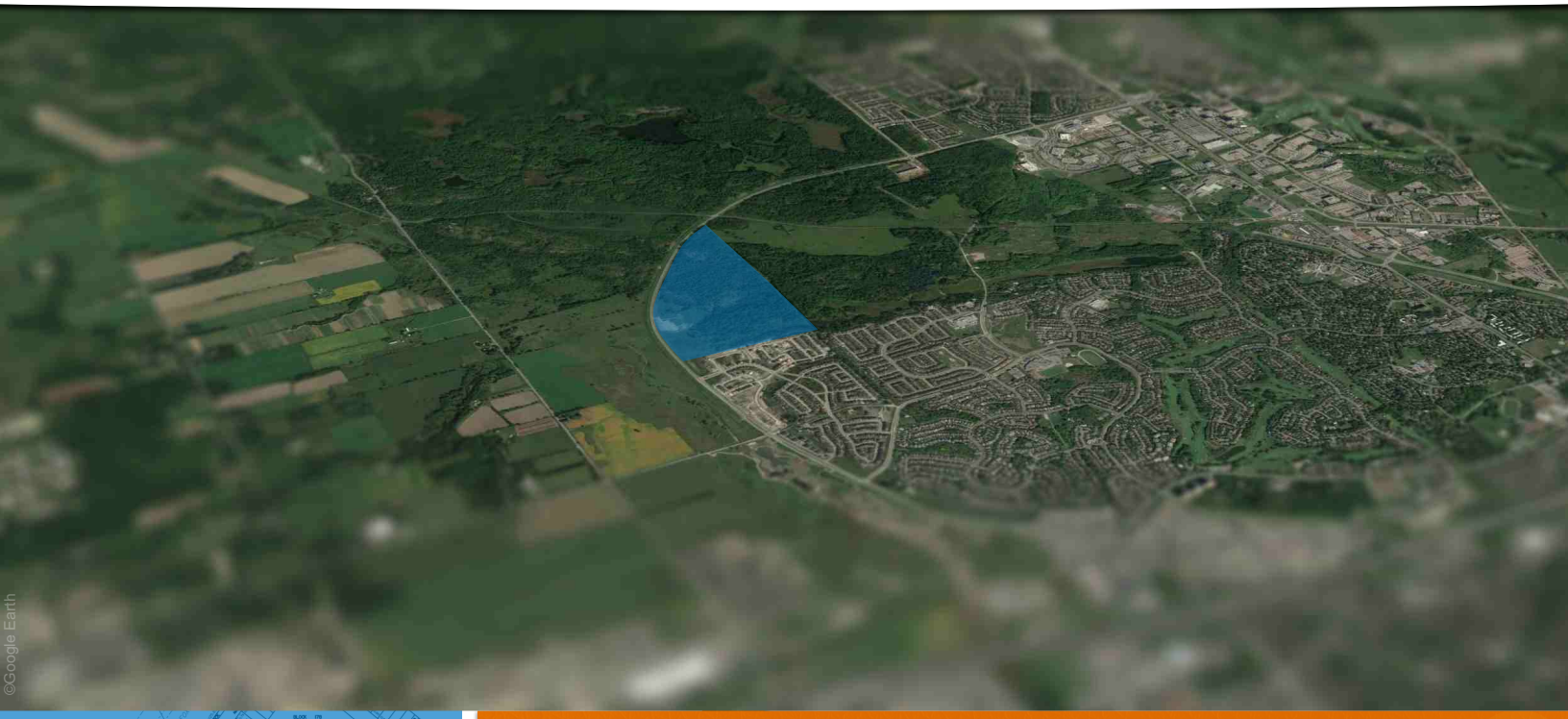
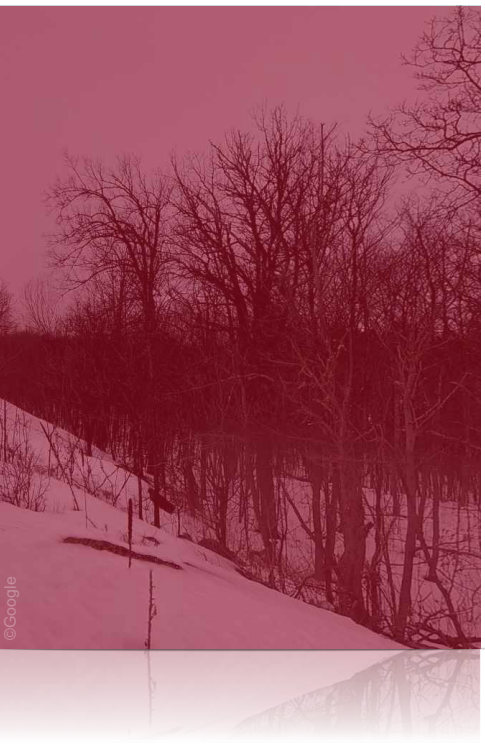
RICHCRAFT™ Group of Companies

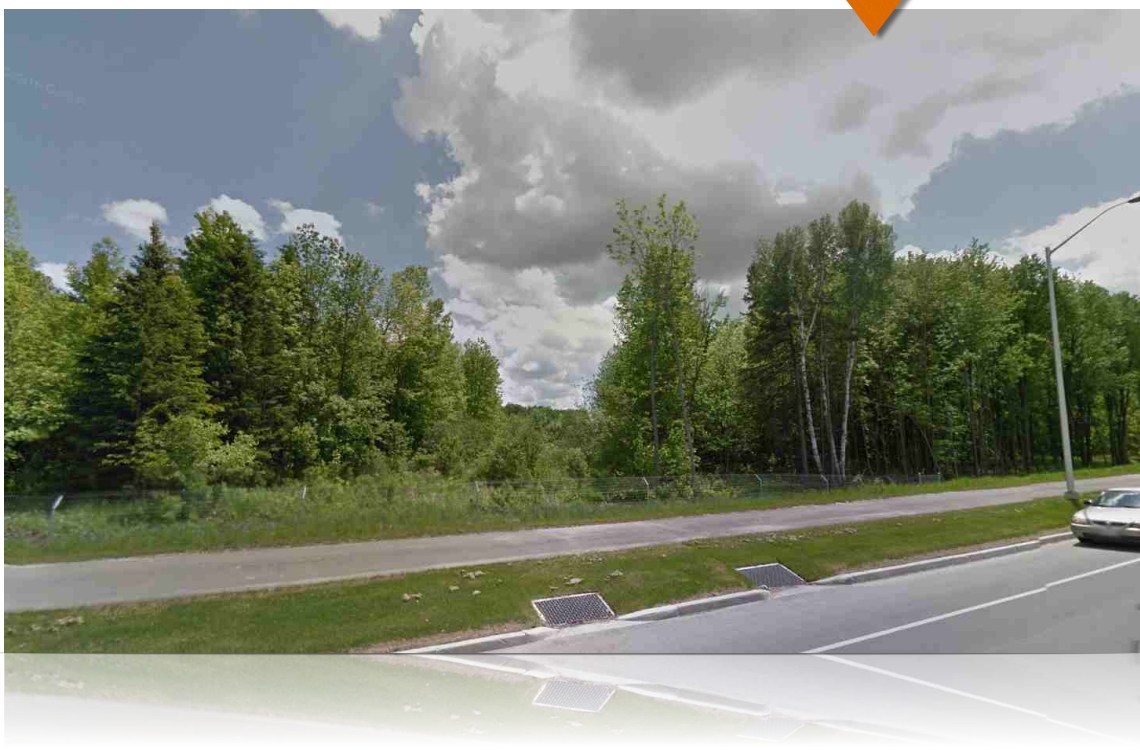
January 2017



Kanata Highlands: Phase 1

Transportation Impact Study





PARSONS

Kanata Highlands: Phase 1

Traffic Impact Study

prepared for:

Richcraft
2280 St. Laurent Boulevard
Suite 201
Ottawa, ON K1G 4K1

prepared by:

PARSONS
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Suite 100
Ottawa, ON K1J 7T2

January 23, 2017

476190 - 10000

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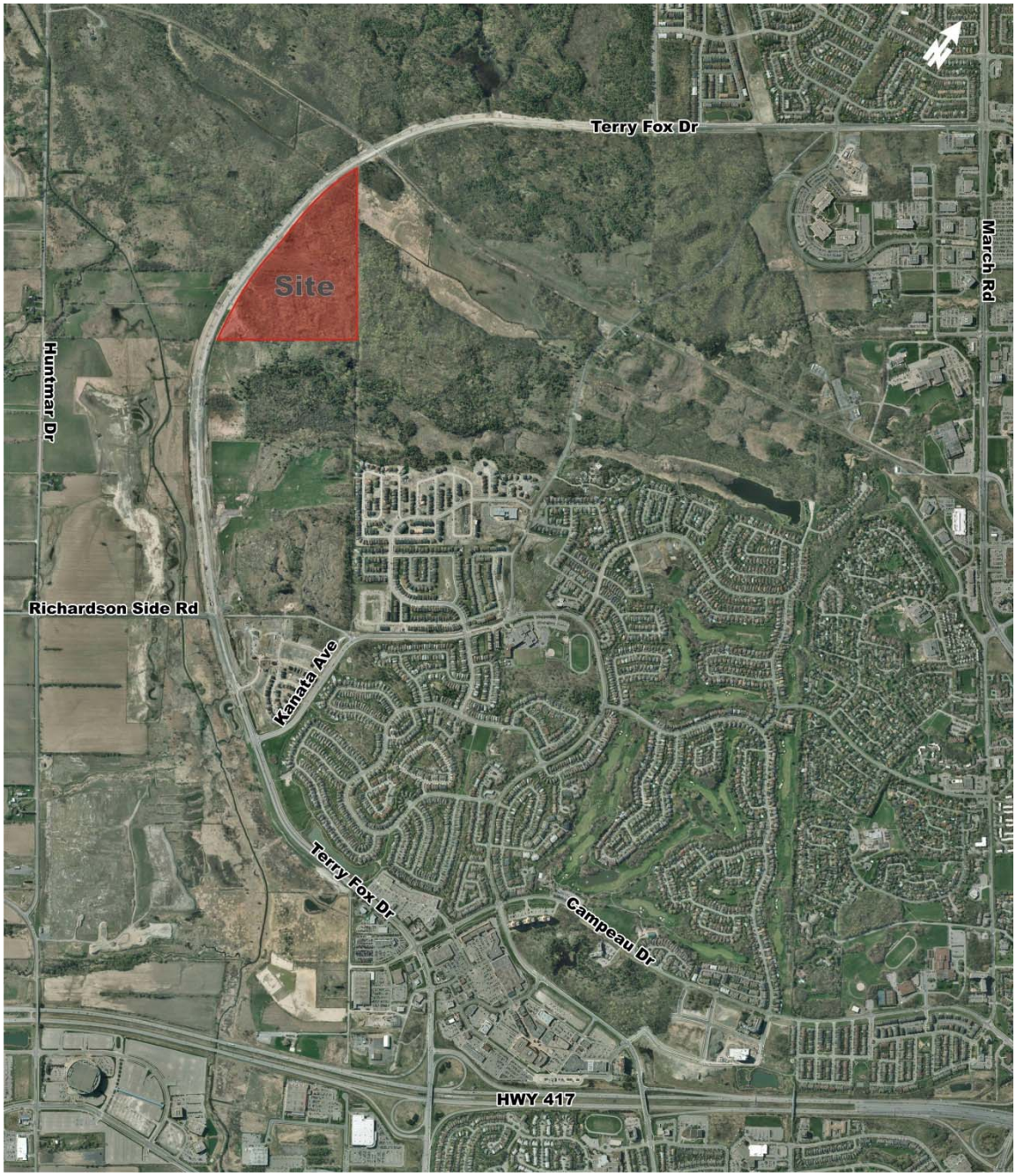
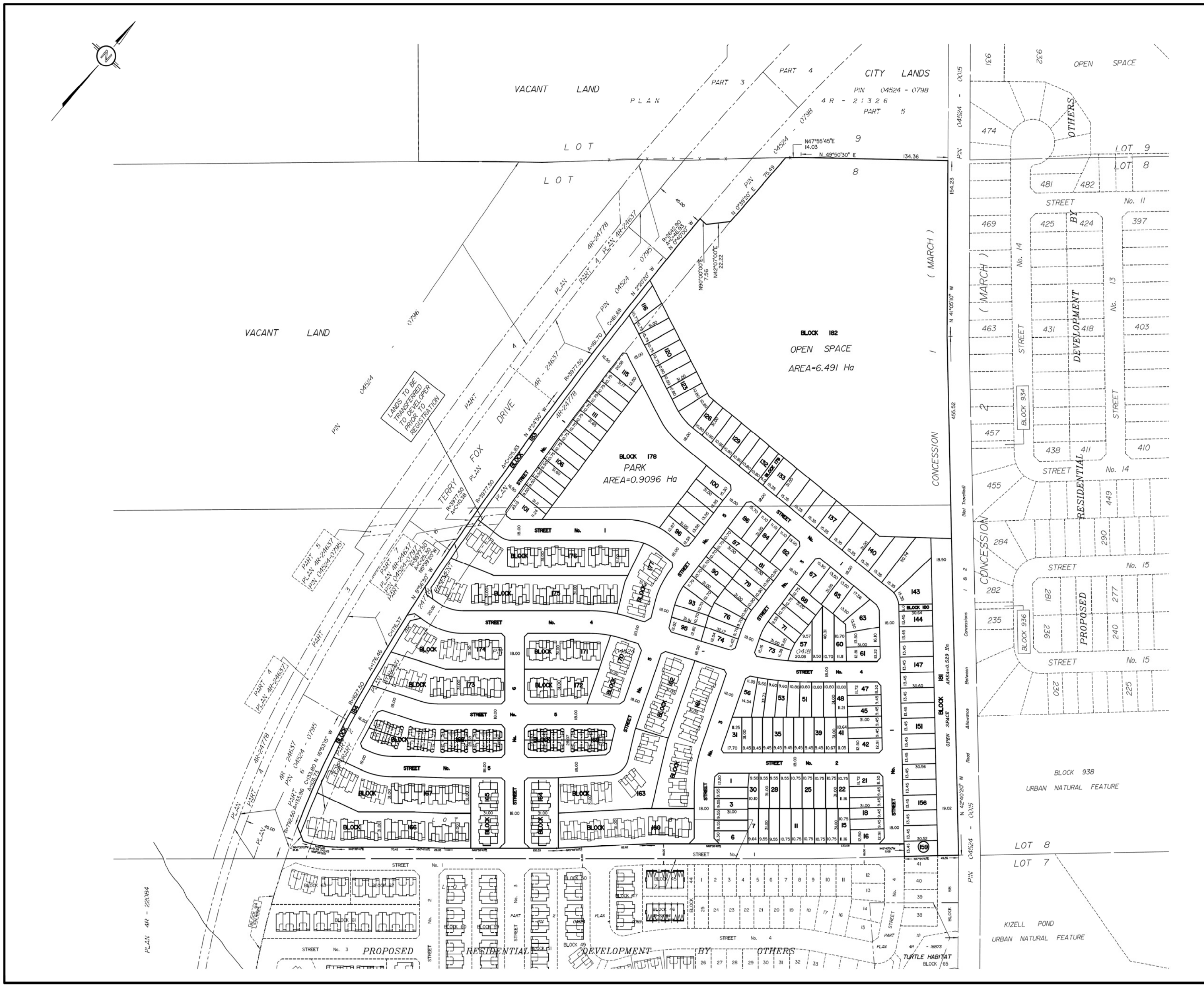
Traffic Impact Study

1. INTRODUCTION

Richcraft is proposing a 435 unit residential subdivision on the lands in Kanata located adjacent to Terry Fox Drive between Richardson Side Road and Second Line Road approximately midway. The site's context is shown in Figure 1 and the Site Plan is shown on Figure 2. As shown on the Site Plan, two roadway connections are proposed to Terry Fox Drive and one is shown connecting to the residential subdivision to the south.

Figure 1: Local Context





KEY MAP
NOT TO SCALE

Sketch to Illustrate

CONCEPT PLAN being
PART OF LOT 8
CONCESSION 1
Geographic Township of March
CITY OF OTTAWA

Prepared by Annis , O'Sullivan , Vollebekk Ltd.

Scale 1 : 1500

Metric
DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

UNIT COUNT

SINGLE LOTS 31' (9.45m.) PRODUCT = 48 (30%)
SINGLE LOTS 35' (10.67m.) PRODUCT = 73 (46%)
SINGLE LOTS 44' (13.45m.) PRODUCT = 27 (17%)
SINGLE LOTS 50' (15.25m.) PRODUCT = 11 (7%)

TOTAL SINGLE LOTS = 159

TOTAL TOWNHOUSE UNITS = 224
TOTAL BACK TO BACK UNITS = 52

TOTAL NUMBER OF UNITS = 435

REVISION SCHEDULE

DATE	REVISION	
DEC. 9, 2016	GENERAL REVISIONS	S
NOV. 17, 2016	GENERAL REVISIONS	S
NOV. 2, 2016	GENERAL REVISIONS	N
OCT. 20, 2016	PLAN PREPARED	N

Ontario Land Surveyors
ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079

PARSONS

Figure 2: Proposed Plan of Subdivision

2. SCOPE OF WORK

The scope of work for the required transportation study was discussed with the City's Ed Blaszynski, Program Manager, Infrastructure Approvals, prior to his retirement. As the proposed subdivision is at the current edge of urban development, and as Terry Fox Drive has significant spare capacity at its existing two lanes (planned for four lanes ultimately), the following was agreed to:

- A Transportation Impact Study is required but a screenline analysis and study area collision analysis is not required; and
- The primary focus should be on local issues including; current Terry Fox Drive peak hour volumes, site intersection spacing and requirements, internal street layout and pedestrian and bicycle network connectivity.

The following TIS addresses these topics.

3. EXISTING TRANSPORTATION CONDITIONS

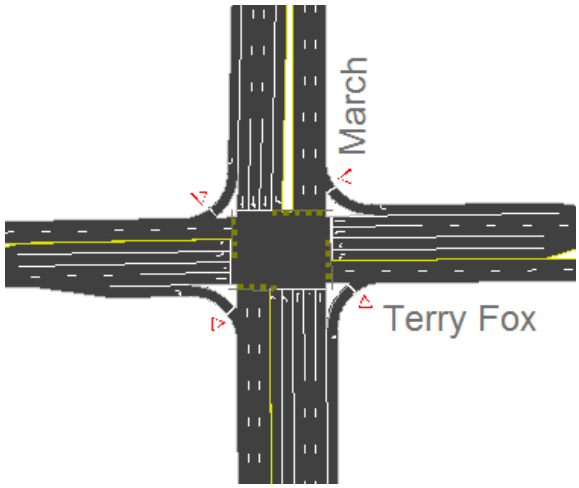
This section focuses on Terry Fox Drive, which extends from March Road in the east to Highway 417 and beyond in the west/southwest. Over much of its length, and adjacent to the site, it exists as a two lane roadway which is planned to ultimately be a four-lane divided arterial. Currently, the south two lanes are built, with its south edge being urban and its north edge being rural. Proceeding from south to north the existing road cross-section is comprised of an asphalt multi-use pathway, street lighting, a boulevard, curbing, a bike lane, two paved lanes (one each direction), a wide paved shoulder and a ditch.

3.1. STUDY AREA INTERSECTIONS

The key intersections on either side of the subject site are Terry Fox/Kanata Avenue to the southwest and Terry Fox/March Road to the east.

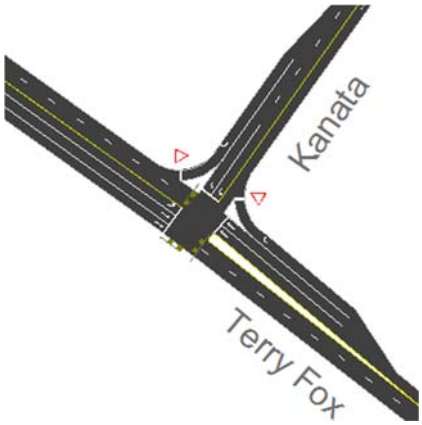
Terry Fox/March

The Terry Fox/March intersection is a signalized four-legged intersection. The east and westbound approaches consist of double left-turn lanes, two through lanes and single channelized right-turn lanes. The northbound approach consists of two left-turn lanes, three through lane and a single channelized right-turn lane. The southbound approach consists of a single left-turn lane, three through lanes and a single channelized right-turn lane. All movements are permitted at this location. Terry Fox Drive at this location has a sidewalk on the south side and bicycle lanes in both directions.



Terry Fox/Kanata

The Terry Fox/Kanata intersection is a signalized three-legged intersection. The northbound approach consists of two through lanes and a channelized right-turn lane. The southbound approach consists of a single left-turn lane and two through lanes. The westbound approach consists of two left-turn lanes and a channelized right-turn lane. All movements are permitted at this location. Terry Fox Drive at this location also has a sidewalk on the east side and bicycle lanes in both directions.

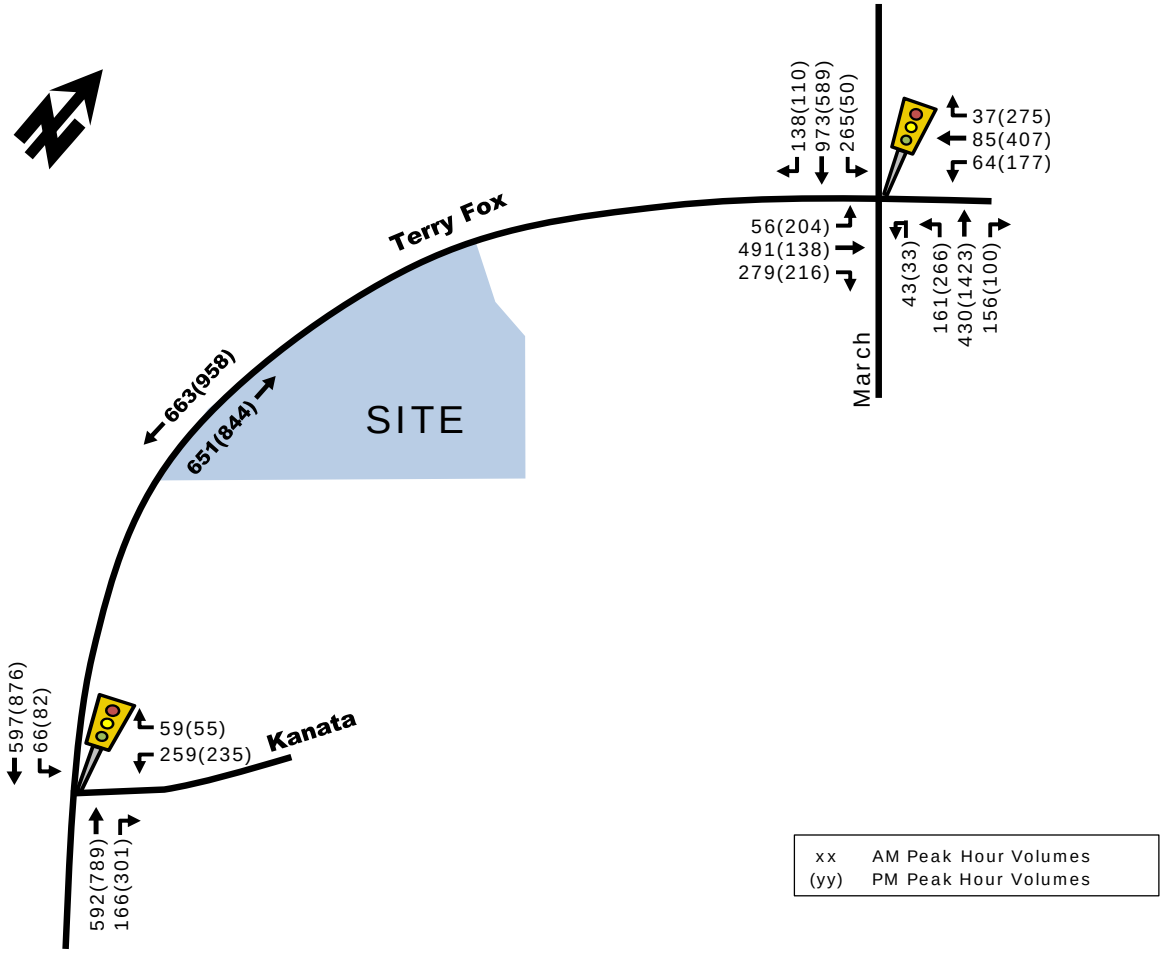


In the vicinity of Huntsville Drive located to the north of Kanata Avenue, the road's cross-section transitions down to a two-lane road, which extends to the subject site and beyond with the above-noted two-lane cross-section.

3.2. EXISTING TRAFFIC VOLUMES

With regard to traffic volumes, the City's most current peak hour intersection counts at the Terry Fox/Kanata and Terry Fox/March intersections are included in Appendix A and summarized in the following Figure 3. As noted, two-way peak hour volumes adjacent to the site are approximately 1,300 veh/h during the morning peak hour and 1,800 veh/h during the afternoon peak hour, with peak directional volumes ranging from approximately 650 vph to 950 veh/h.

Figure 3: Current Study Area Traffic Volumes



3.3. EXISTING INTERSECTION OPERATIONS

Table 1 provides a summary of existing traffic operations at study area intersections based on the SYNCHRO (V9) traffic analysis software. The subject intersections were assessed in terms of the volume-to-capacity (v/c) ratio and the corresponding Level of Service (LoS) for the critical movement(s). The subject intersections "as a whole" were assessed based on a weighted v/c ratio and the Synchro model output of existing conditions is provided within Appendix B.

Table 1: Existing Intersection Operation

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a Whole'		
	LoS	Max. v/c or avg. delay(s)	Movement	Delay(s)	LoS	v/c
March/Terry Fox	B(C)	0.67(0.72)	SBL(NBT)	31.5(36.1)	A(B)	0.51(0.69)
Kanata/Terry Fox	A(A)	0.45(0.48)	WBL(WBL)	9.1(8.9)	A(A)	0.32(0.41)
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

As shown in Table 1, the two key study area signalized intersections "as a whole" operate at an excellent Level of Service 'B' or better during both peak hours. With regard to the "critical movements", they are operating at an acceptable LoS 'C' or better during the weekday peak hours.

With regard to existing transit service, currently Route #165 travels past the site. Once the subject subdivision is developed, transit routing adjustments will be required. There is a Park and Ride station located in close proximity to the site at the Innovation/Terry Fox intersection, approximately 2 to 3 km away.

4. DEMAND FORECASTING

4.1. PLANNED TRANSPORTATION NETWORK MODIFICATIONS

Within the general study area, the major road projects are:

- Bus rapid transit (BRT) with at-grade crossing along March Road from HWY 417 to Solandt Road and transit priority along March Road from Solandt Road to Maxell Bridge Road – identified in the '2031 Affordable Network Plan'
- Realignment of Goulbourn Forced Road to intersect Terry Fox Drive;
- Widening of Terry Fox Drive between March Road and Richardson Side Road. This is not identified as a City project within the TMP, however, based on the development growth in the area, it will likely be required before 2031.

4.2. LOCAL AREA DEVELOPMENTS

Within the vicinity of the site, the following local area developments are planned:

Richardson Ridge Subdivision – Phase 4

Phase 4 of the Richardson Ridge subdivision is planned to be constructed directly south of the proposed development at 467 Terry Fox Drive. The Transportation Impact Study (prepared by IBI) projects an increase in vehicle traffic volumes of approximately 90 and 107 veh/h during the morning and afternoon peak hours, respectively. This subdivision will share a driveway connection to Terry Fox Drive with the subject Kanata Highlands subdivision as shown on Figure 2.

Kanata North Catholic School

Ottawa Catholic School Board is proposing to construct a new elementary school in Kanata North located adjacent to the west of the realigned Goulbourn Forced Road at Terry Fox Drive. The Transportation Brief (prepared by Parsons) projects an increase in vehicle traffic of approximately 200 veh/h during both the morning and afternoon school peak periods.

5045 Innovation Drive

Colonade Bridgeport is proposing the construction of a gas station and retail development located at the above-noted address. The Transportation Impact Study (prepared by Parsons) projects an increase in vehicle traffic of approximately 90 and 95 veh/h during the weekday morning and afternoon peak hours, respectively.

5050 Innovation Drive

An approximate 238,000 ft^2 office building is being proposed at the above noted address. The Transportation Impact Study (prepared by Dillon) projects an increase in traffic volumes of approximately 350 veh/h during both peak hours. Building A of this development is currently constructed however not occupied.

Innovation Park and Ride

An OC Transpo Park and Ride facility is being constructed adjacent to the Terry Fox/Innovation intersection. The plans for the future Park and Ride include the construction of two new roadways and two signalized intersections. The Transportation Impact Study (prepared by Stantec) projects a total increase in traffic volumes of approximately 150 veh/h during the 2017 Interim Phase and approximately 250 to 300 veh/h during the 2024 Ultimate Phase.

4.3. BACKGROUND TRAFFIC GROWTH

Total projected traffic conditions typically are for a "horizon year" which is 5 years beyond full build-out. As an approximate 435 unit subdivision typically takes 3 to 4 years to be built and occupied, and as the project will not start construction for a year or two, it is realistic to assume a build-out of 4 to 5 years from now. This would be approximately 2021, with a resultant horizon year of 2026.

As noted above, the area within the vicinity of the subject development is expected to continue to develop and use of Terry Fox Drive as an arterial route will also continue. As such, a 2% annual background traffic growth rate for Terry Fox Drive volumes and a 1% annual growth rate for March Road volumes was applied to the existing traffic volumes for the Horizon years 2021 and 2026. Given there is significant development along March Road and the high existing volumes, the volumes were not grown as aggressively along March Road.

As the subject development will share the access road to Terry Fox Drive with the Richardson Ridge Phase 4 subdivision, traffic volume projections from the Richardson Ridge Subdivision are included in the background traffic growth analysis. The resultant traffic volumes for the years 2021, representing full built-out and occupancy and 2026 representing 5-years beyond full build out are illustrated in Figure 4 and 5, respectively.

Figure 4: 2021 Background Traffic Volumes

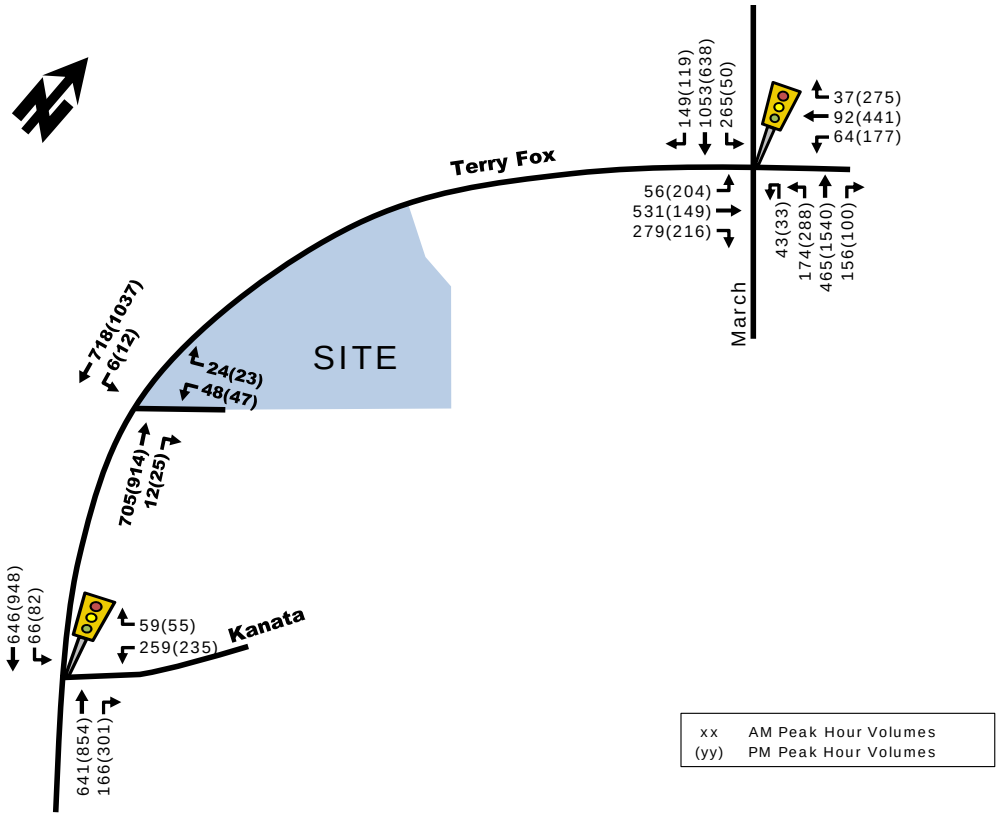
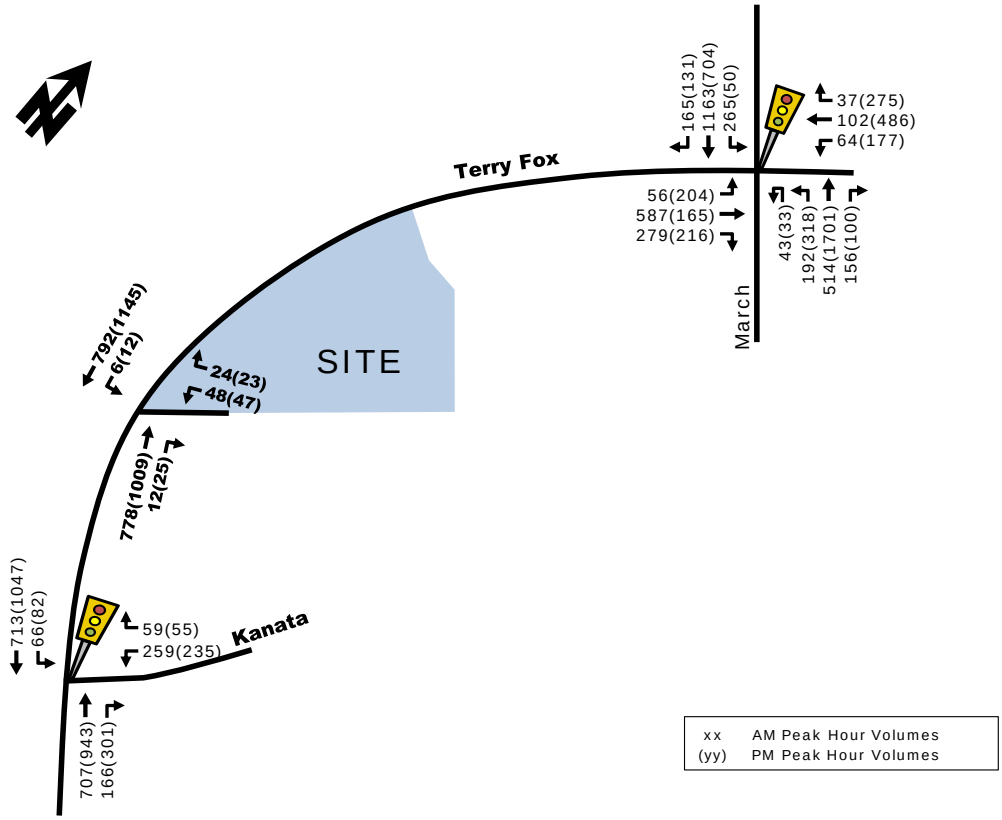


Figure 5: 2026 Background Traffic Volumes



4.4. SITE PLAN TRAFFIC GENERATION

Richcraft's proposed subdivision will consist of approximately 159 single family homes and 276 townhomes. The appropriate trip generation rate for the proposed land use was obtained from the 9th Edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual and is summarized in Table 2.

Table 2: ITE Vehicle Trip Generation Rates

Land Use	Data Source	Trip Rates	
		AM Peak	PM Peak
Single Family Detached	ITE 210	T = 0.75(du); T = 0.70(du) + 9.74	T = 1.01(du); Ln(T) = 0.90 ln(du) + 0.51
Townhome	ITE 230	T = 0.44(du); Ln(T) = 0.80 ln(du) + 0.26	T = 0.52(du); Ln(T) = 0.82 ln(du) + 0.32

Notes: T = Average Vehicle Trip Ends
du = dwell unit

As ITE trip generation surveys only record vehicle trips and typically reflect highly suburban locations (with little to no access by travel modes other than private automobiles), adjustment factors appropriate to the more urban study area context were applied to attain estimates of person trips for the proposed development.

To convert ITE vehicle trip rates to person trips, an auto occupancy factor and a non-auto trip factor were applied to the ITE vehicle trip rates. Our review of available literature suggests that a combined factor of approximately 1.3 is considered reasonable to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%. As such, the person trip generation for the proposed site is summarized in Table 3.

Table 3: Modified Person Trip Generation

Land Use	Area	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Single Family Detached	159 units	18	93	111	87	44	131
Townhome	276 units	82	246	328	262	155	417
Total Person Trips		100	339	439	349	199	548

Note: 1.3 factor to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%

The person trips shown in Table 3 for the proposed site were then reduced by modal share values based on the site's location and proximity to adjacent communities, employment, transit and shopping uses. Modal share values for the proposed residential development are summarized in Table 4. These values are derived from the TRANS 2011 OD Survey that states that 24% of commuters from this area to the City in the morning peak hour take transit and 21% take transit in the afternoon travelling from the City to the district.

Table 4: Residential Trip Generation

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	60%	39	146	185	150	82	232
Auto Passenger	15%	9	36	45	38	20	58
Transit	20%	12	49	61	50	28	78
Non-motorized	5%	4	13	17	12	7	19
Total Person Trips	100%	64	244	308	250	137	387
Total 'New' Auto Trips		**39**	**146**	**185**	**150**	**82**	**232**

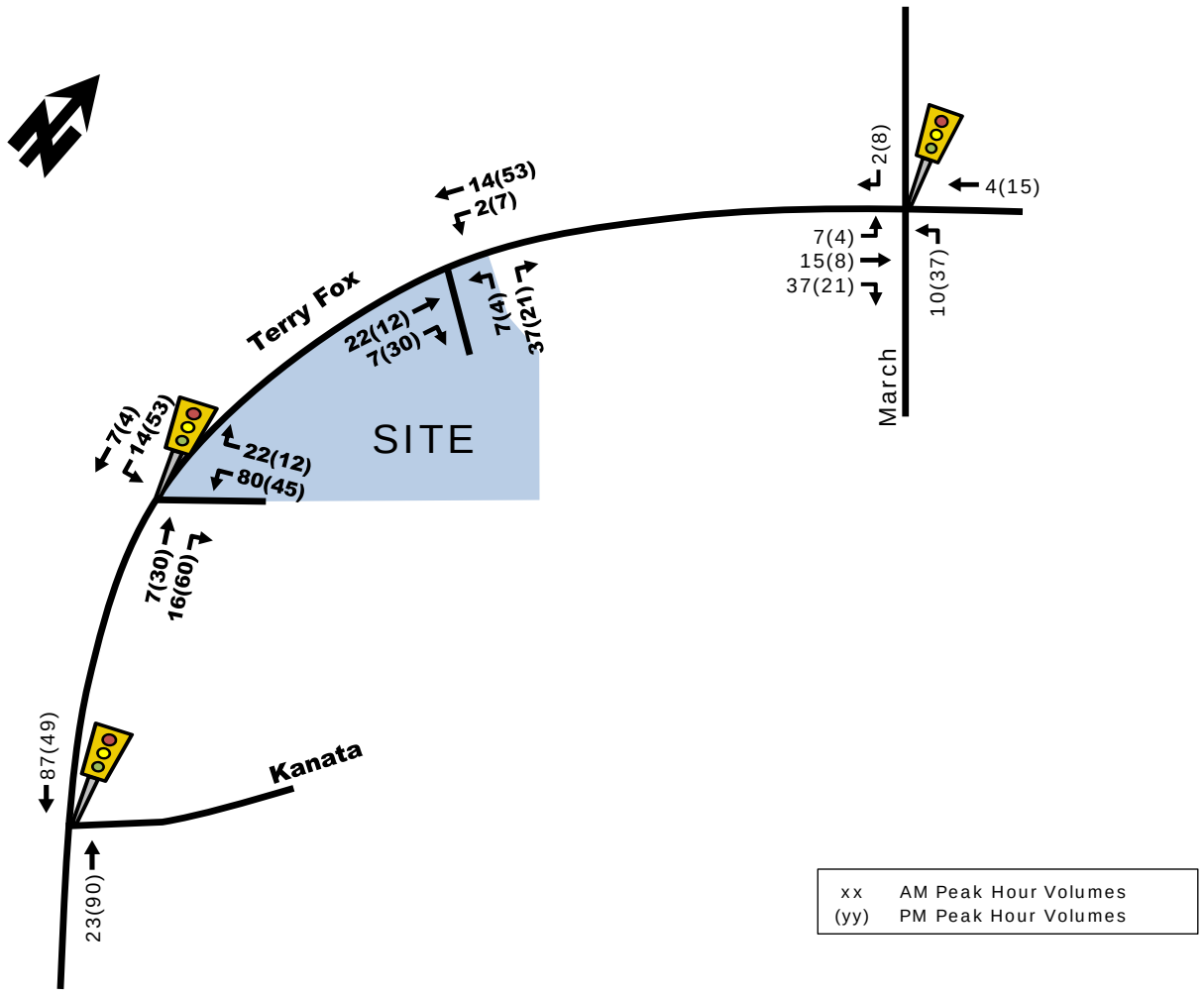
As shown in Table 4, the resulting number of potential "new" two-way vehicle trips generated by the proposed subdivision and approximately 185 veh/h and 230 veh/h during the morning and afternoon peak hours, respectively. It is these volumes that will be assigned to the proposed site intersections and the study area's signalized intersections to determine impacts and requirements.

4.5. TRAFFIC DISTRIBUTION AND ASSIGNMENT

Traffic distribution is impacted by a number of factors when considering a residential site plan. Included are locations of employment and retail, subdivision driveway connections to adjacent arterial roads and connectivity to the area's main commuter/highway routes. Given the location of the proposed subdivision, located between too major arterials (Terry Fox Drive and March Road) that both provide access to HWY 417, the distribution to/from the site is estimated to be 60% to the south via Terry Fox Drive and 40% to the east towards March Road. Applying this distribution to the Table 4 projected peak hour traffic generation and assigning it to the subdivision's two proposed roadway connections to Terry Fox Drive results in the traffic assignment depicted in Figure 6. It is noteworthy that the percentage distribution at the Terry Fox/March intersection is approximately the same as existing conditions.

With regard to subdivision access to Terry Fox Drive, given the southern driveway connection will be shared with the Richardson Ridge subdivision to the south, it is likely this access will warrant signalization. As such, a greater percentage of left-turning vehicles into and out of the site were assigned to the southern intersection under the assumption it will be signalized.

Figure 6: Site-Generated Peak Hour Traffic Assignment



5. TOTAL PROJECTED TRAFFIC CONDITIONS

5.1. TOTAL PROJECTED 2021 TRAFFIC VOLUMES

The total projected 2021 volumes associated with the proposed development were derived by superimposing 'new' site-generated traffic volumes (Figure 6) onto background 2021 traffic volumes (Figure 4). The resulting total projected volumes are illustrated as Figure 7.

The projected intersection operation and requirements for the total projected build-out year traffic conditions (background traffic growth + site-generated traffic as per Figure 7) were determined using the SYNCHRO (V9) traffic analysis software. The subject intersections were assessed in terms of the volume-to-capacity (v/c) ratio and the corresponding Level of Service (LoS) for the critical movement(s). The subject intersections "as a whole" were assessed based on a weighted v/c ratio and the Synchro model output of horizon year conditions is provided within Appendix C. Projected intersection performance is summarized in Table 5.

Figure 7: Total Projected 2021 Traffic Volumes

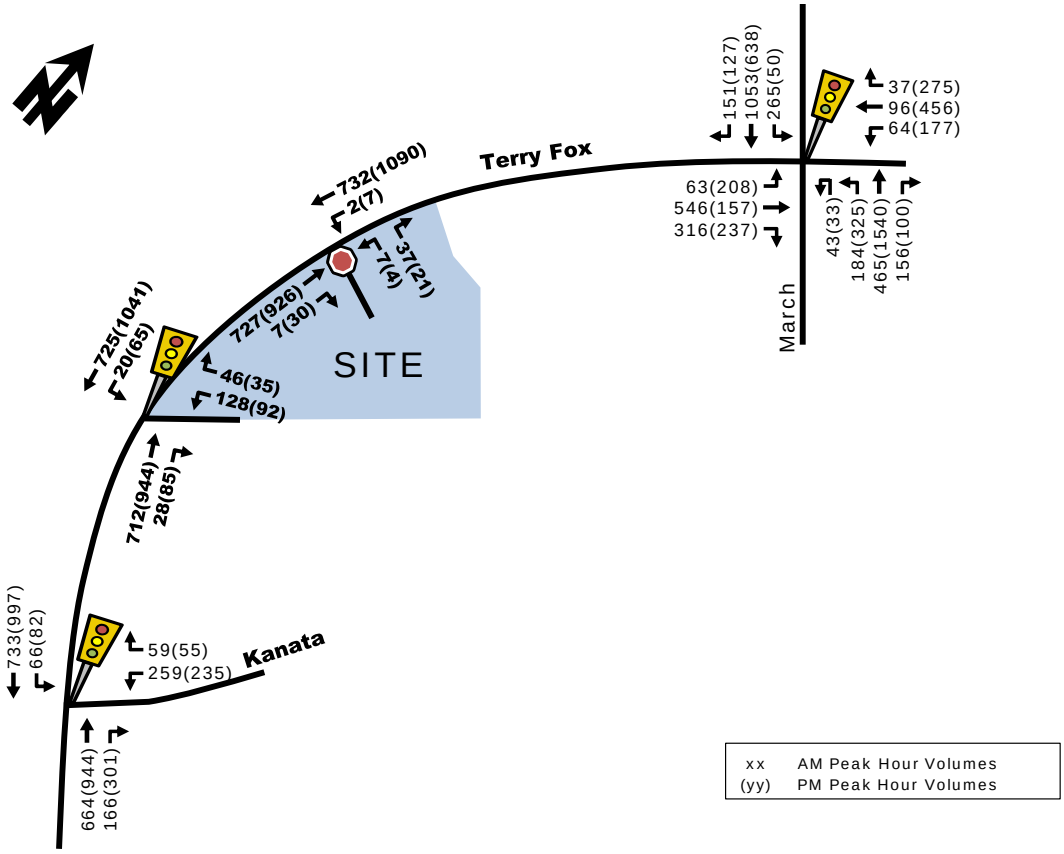


Table 5: Projected 2021 Intersection Performance

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a Whole'		
	LoS	Max. v/c or avg. delay(s)	Movement	Delay(s)	LoS	v/c
Terry Fox/March	B(C)	0.70(0.80)	SBL(NBT)	33.1(38.3)	A(C)	0.53(0.76)
Terry Fox/Kanata	A(A)	0.45(0.48)	WBL(WBL)	8.9(9.0)	A(A)	0.35(0.45)
Terry Fox/Site North	C(D)	19.1(29.4)	WBL(WBL)	0.6(0.6)	-	-
Terry Fox/Site South	B(D)	0.70(0.89)	SBT(SBT)	13.1(19.4)	B(D)	0.65(0.85)
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

As noted in Table 5, both the March/Terry Fox and Kanata/Terry Fox "intersections as a whole" are continuing to operate at very good levels of service in the Los 'A' to 'C' range. With regard to the "critical movements" at these existing signalized study area intersections, they are projected to operate at an acceptable LoS 'C' or better during peak hours.

With regard to the proposed Terry Fox/Site South intersection, based on the projected traffic volumes from the subject site and the adjacent Richardson Ridge subdivision, signalization of this roadway's intersection with Terry Fox Drive is warranted as shown in the attached signal warrant analysis (Appendix D). Currently the speed limit along this portion of Terry Fox Drive is 80 km/h, however, if this speed limit is lowered to less than 70 km/h, the signal is only 73% warranted based on the projected volumes. As shown in Table 5, if this intersection is constructed as a signalized intersection, it is projected to operate with an acceptable LoS 'D' or better during peak hours.

With regard to the proposed unsignalized site driveway to the north, it is projected to operate with acceptable delays for vehicles exiting the development of approximately 30 seconds and minimal delays along Terry Fox Drive.

Based on high volumes along Terry Fox Drive, auxiliary left turn lanes are warranted at both site intersections. The left-turn warrant analysis is included as Appendix D. With regard to turn lane requirements at the site's North and South Accesses, they are as follows for the volumes shown in Figure 7.

North Site Access:

- WB left-turn lane storage = 15 m
- SB left-turn lane storage = 15 m

South Site Access:

- NB right-turn lane storage = 30 m
- SB left-turn lane storage = 25 m
- WB left-turn lane storage = 45 m

5.2. TOTAL PROJECTED 2026 TRAFFIC VOLUMES

The total projected 2026 volumes associated with the proposed development were derived by superimposing 'new' site-generated traffic volumes (Figure 6) onto background 2026 traffic volumes (Figure 4). The resulting total projected volumes are illustrated as Figure 8.

The projected intersection operation and requirements for the total projected 5-years beyond build-out year traffic conditions (background traffic growth + site-generated traffic as per Figure 8) were determined using the SYNCHRO (V9) traffic analysis software. The subject intersections were assessed in terms of the volume-to-capacity (v/c) ratio and the corresponding Level of Service (LoS) for the critical movement(s). The subject intersections "as a whole" were assessed based on a weighted v/c ratio and the Synchro model output of horizon year conditions is provided within Appendix E. Projected intersection performance is summarized in Table 6.

Figure 8: Total Projected 2026 Traffic Volumes

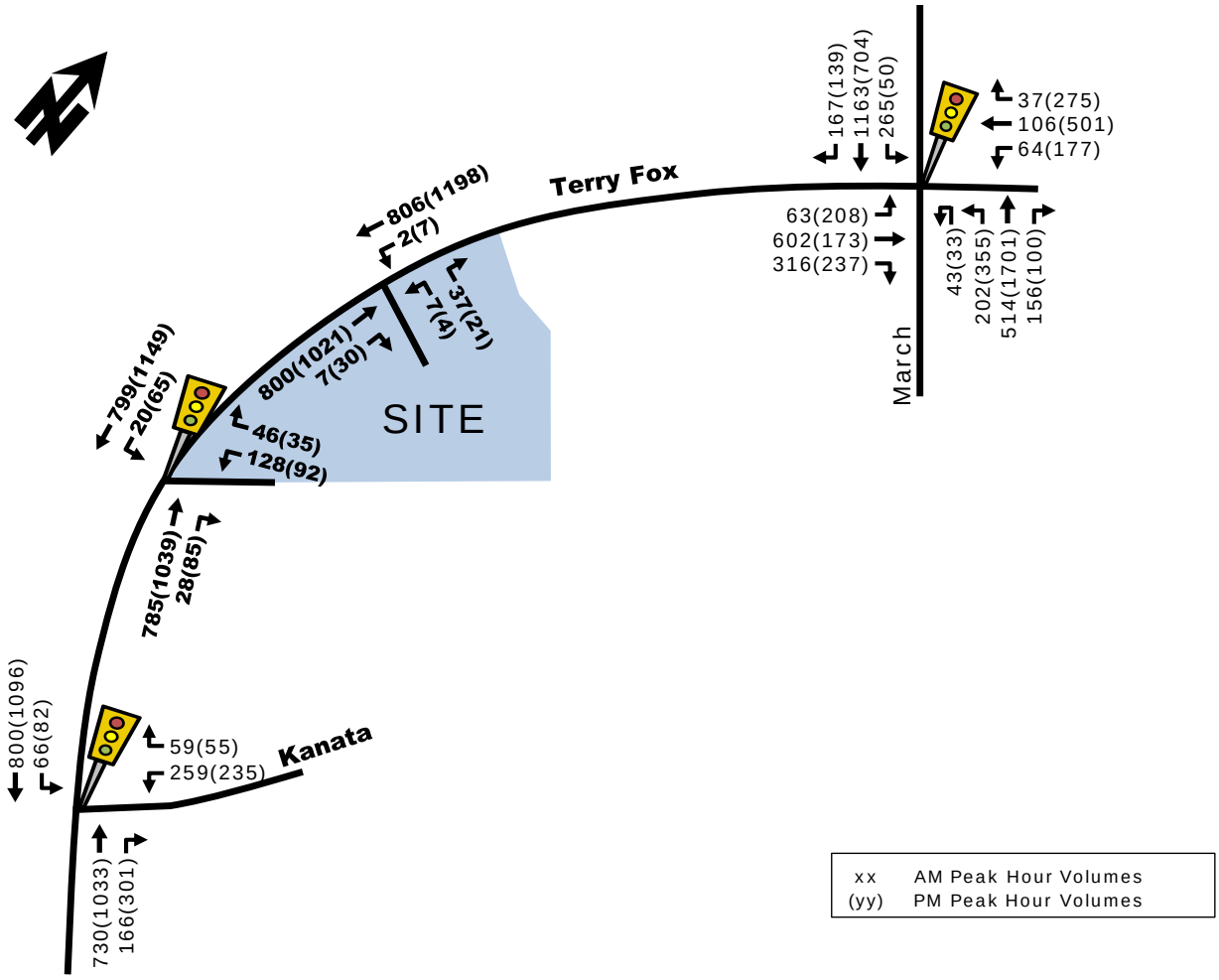


Table 6: Projected 2026 Intersection Performance

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a Whole'		
	LoS	Max. v/c or avg. delay(s)	Movement	Delay(s)	LoS	v/c
Terry Fox/March	C(E)	0.74(0.92)	SBL(NBT)	34.4(42.2)	A(D)	0.56(0.85)
Terry Fox/Kanata	A(A)	0.45(0.48)	WBL(WBL)	8.8(9.2)	A(A)	0.37(0.48)
Terry Fox/Site North	C(E)	21.8(37.2)	WBL(WBL)	0.6(0.7)	-	-
Terry Fox/Site South	C(E)	0.74(0.93)	SBT(SBT)	13.9(22.5)	B(D)	0.69(0.90)
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

As noted in Table 6, all signalized study area intersections 'as a whole' are projected to operate at an acceptable LoS 'D' or better during both weekday peak hours. During the afternoon peak hour, the critical movements at the Terry Fox/March intersection and the site driveway connections to Terry Fox Drive are projected to operate at capacity (LoS 'E'). This is based on a continuous growth rate along both March Road and Terry Fox Drive for the next 9 years. If this growth rate continues, the widening of Terry Fox Drive will likely be required before 2031. If/when Terry Fox Drive is widened to four-lanes, the northern site access will likely be converted into a right-in/right-out access or signalization may be required.

6. SITE PLAN REVIEW

During the development of the Site Plan, Parsons reviewed a number of iterations and provided comments regarding internal intersection location, uninterrupted throat lengths on the site connections to Terry Fox Drive, street rights-of-way and intersection spacing along Terry Fox Drive.

With regard to rights-of-way, the two streets that connect to Terry Fox Drive have the following characteristics:

- 18 to 20 m right-of-way;
- 80 to 100 m of throat length uninterrupted by residential driveways; and
- the potential for 11 m to 12 m of pavement width to accommodate one inbound lane and two outbound lanes at their future signalized intersections with Terry Fox Drive.

All other internal local streets have an 18 m rights-of-way with appropriate intersection spacing and design so as to have safe and efficient traffic circulation and to minimize the noise attenuation requirements along Terry Fox Drive.

With regard to sidewalks, the locations have not yet been shown, but it is assumed that they will be provided on both sides of the 20 m wide roads and on at least one side of the 18 m roads.

With regard to transit service, it will ultimately be provided along Terry Fox Drive and bus pads/shelters will be required. OC Transpo will determine the location of bus stop locations along Terry Fox Drive and these will be well connected to the Richcraft subdivision via both the sidewalk system on Terry Fox Drive and the planned sidewalk system internal to the community. As noted in Table 4, the Richcraft subdivision is projected to generate between 60 and 80 transit riders during peak hours.

7. FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

The findings, conclusions and recommendations of the foregoing analysis are:

- Richcraft's proposed 435 unit residential development is projected to generate a two-way total of 185 veh/h and 230 veh/h during the morning and afternoon peak hours respectively.

- The two proposed site connections to Terry Fox Drive are sufficient to accommodate projected site-generated traffic.

- Given the southern site intersection will be shared with the Richardson Ridge subdivision to the south, it is recommended to be signalized.

- Internal to the subdivision, the combination of road rights-of-way, throat lengths on the Terry Fox Drive connections, intersection locations and pathway connections are all considered acceptable.

- The projected transit ridership of 60 to 80 transit riders per hour can be adequately accommodated by planned transit service on Terry Fox Drive.

- For the horizon year of this analysis, traffic signal control is warranted at the site's southern intersection assuming a posted speed limit of 70 km/h or more. Depending on the future adjacent developments, northern access may eventually warrant signalization.

- Turn lane requirements at the site connections to Terry Fox Drive are initially as follows.

  North Site Access:

  - WB left-turn lane storage = 15 m
  - SB left-turn lane storage = 15 m

  South Site Access:

  - NB right-turn lane storage = 30 m
  - SB left-turn lane storage = 25 m
  - WB left-turn lane storage = 45 m

- Based on a continuous growth rate along both March Road and Terry Fox Drive for the next 9 years, some of the critical movements at study area intersections are projected to operate at capacity (LoS 'E'). If this growth rate continues, the widening of Terry Fox Drive will likely be required before 2031. If/when Terry Fox Drive is widened to four-lanes, the northern site access will likely be converted into a right-in/right-out access or may warrant signalization.

Accounting for the foregoing recommendations, the proposed Site Plan is recommended from a transportation perspective.

Sincerely,

Christopher Gordon, P.Eng.
Senior Project Manager

Appendix A

Current Peak Hour Traffic Volumes

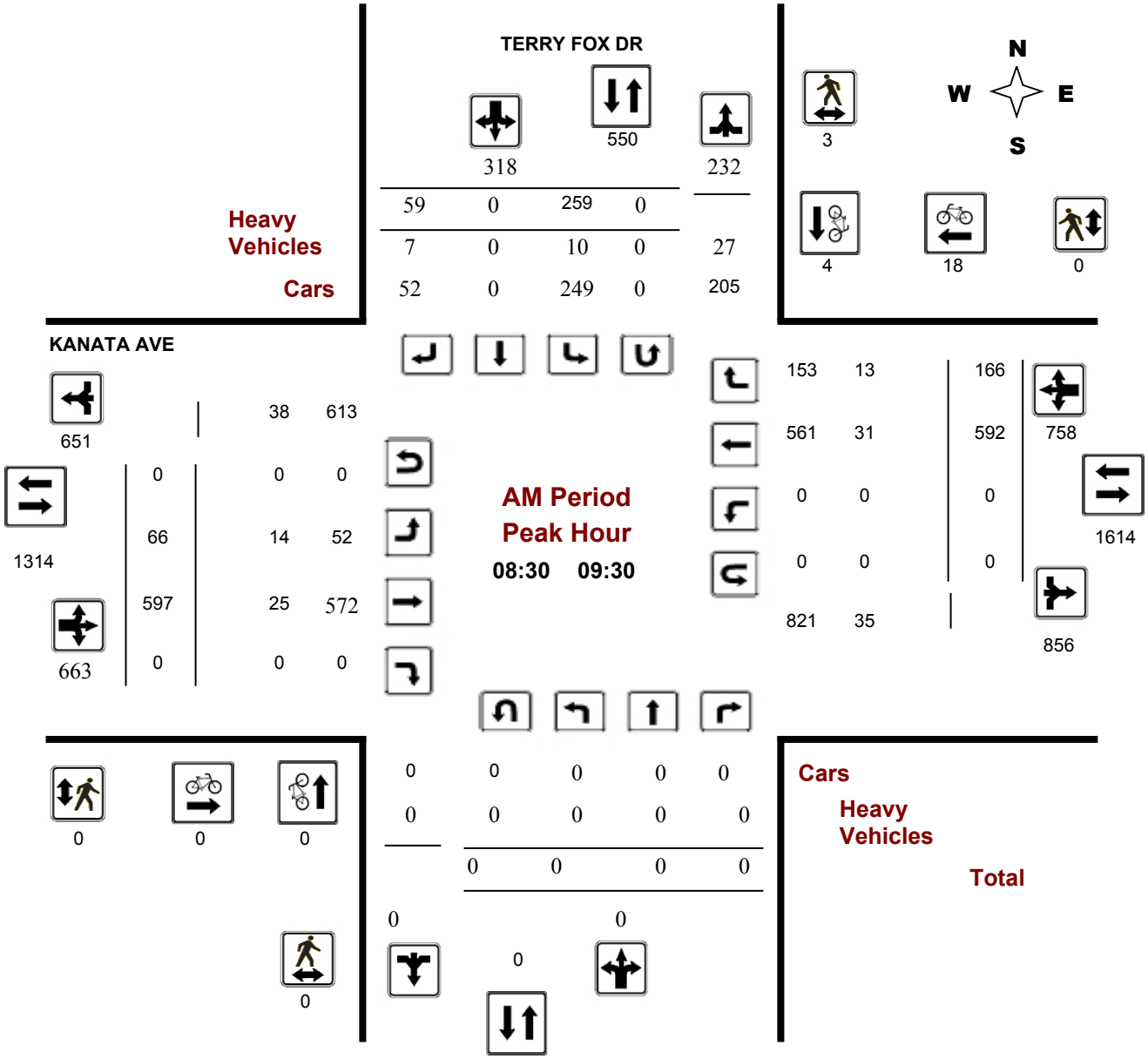
Public Works - Traffic Services

Turning Movement Count - Peak Hour Diagram

KANATA AVE @ TERRY FOX DR

Survey Date: Friday, June 27, 2014
Start Time: 07:00

WO No: 1140
Device: Jamar Technologies, Inc



Comments

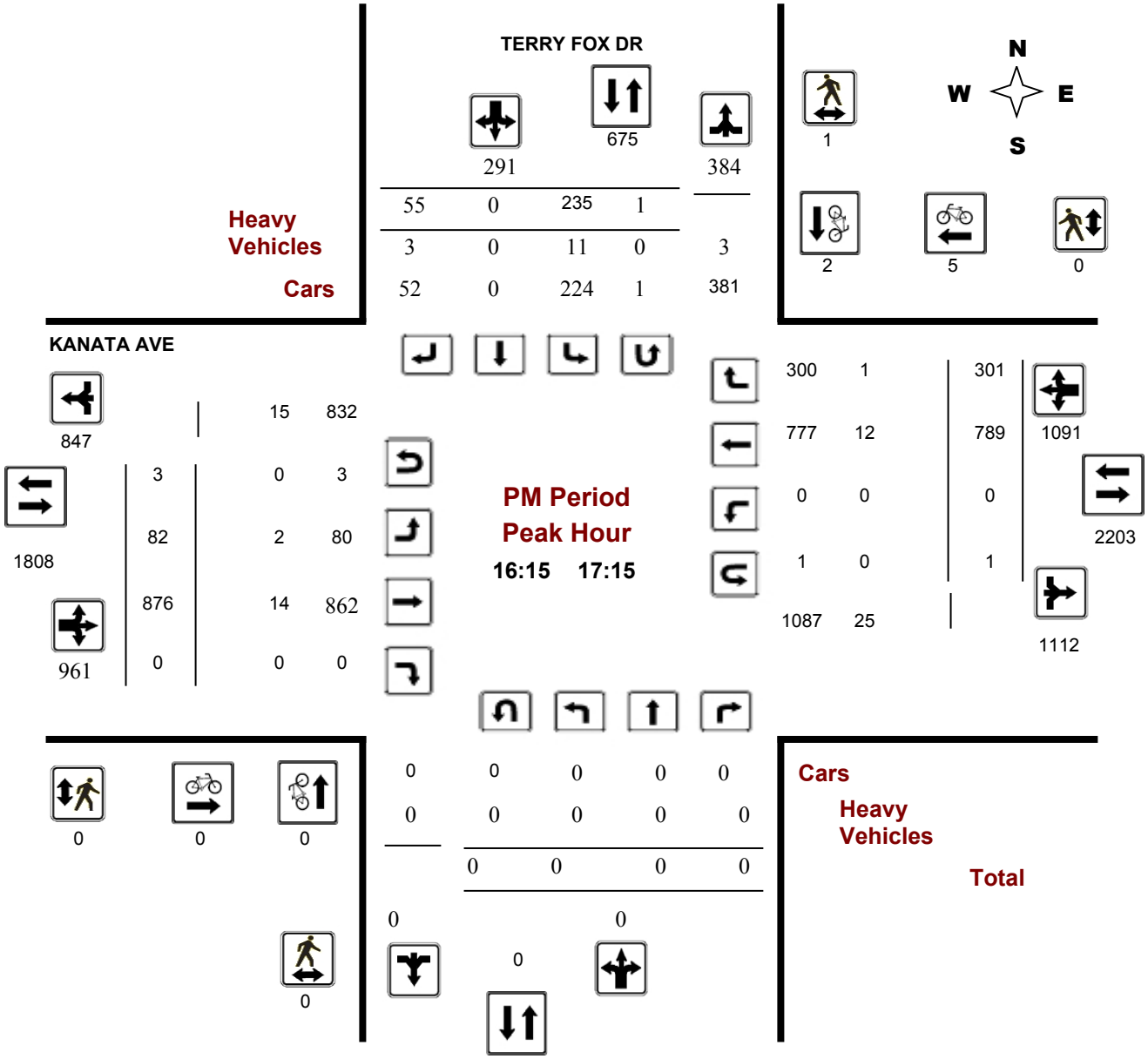
Public Works - Traffic Services

Turning Movement Count - Peak Hour Diagram

KANATA AVE @ TERRY FOX DR

Survey Date: Friday, June 27, 2014
Start Time: 07:00

WO No: 1140
Device: Jamar Technologies, Inc



Comments

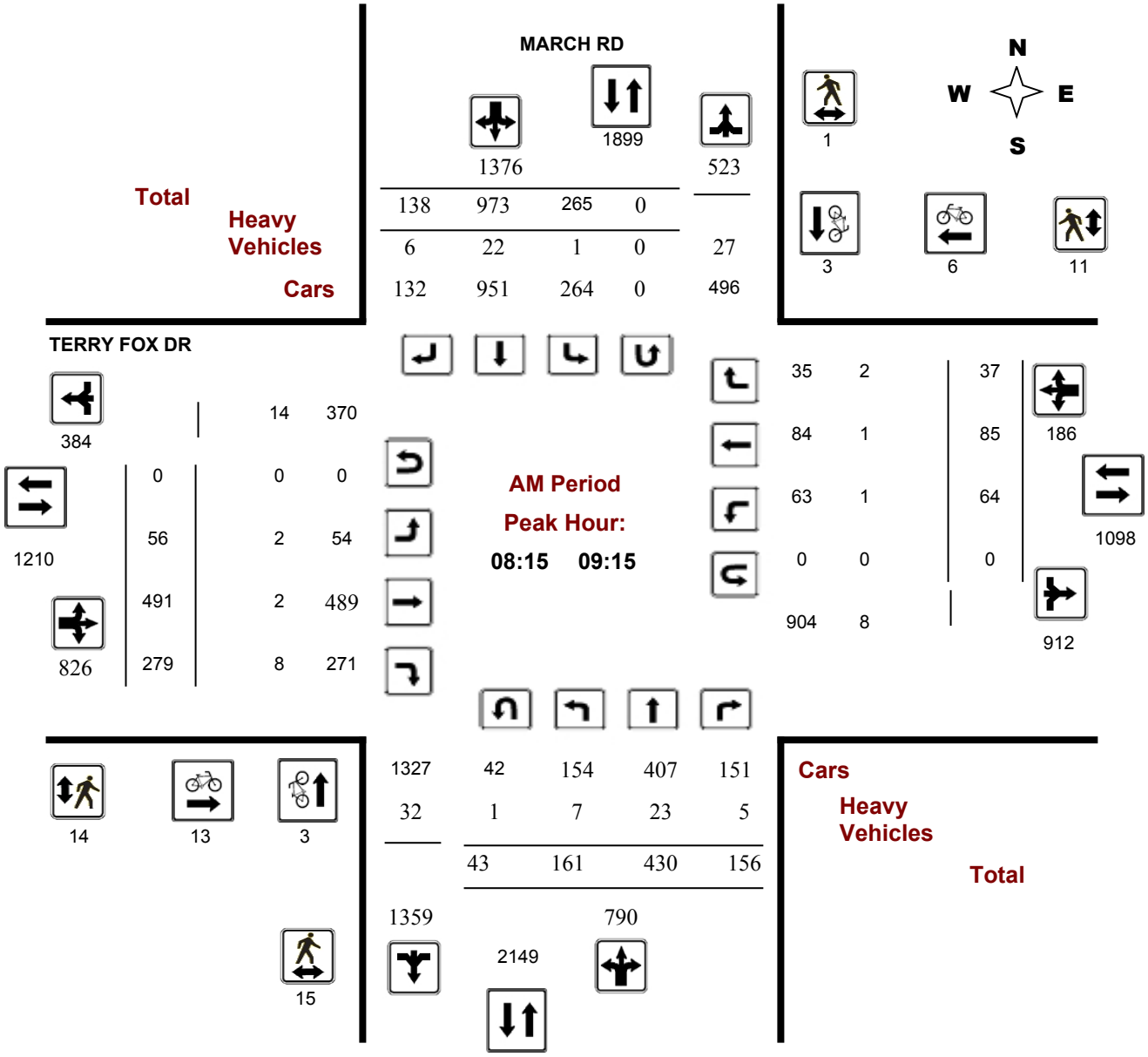
Public Works - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

MARCH RD @ TERRY FOX DR

Survey Date: Wednesday, August 10, 2016 **WO No:** 36152

Start Time: 07:00 **Device:** Miovision



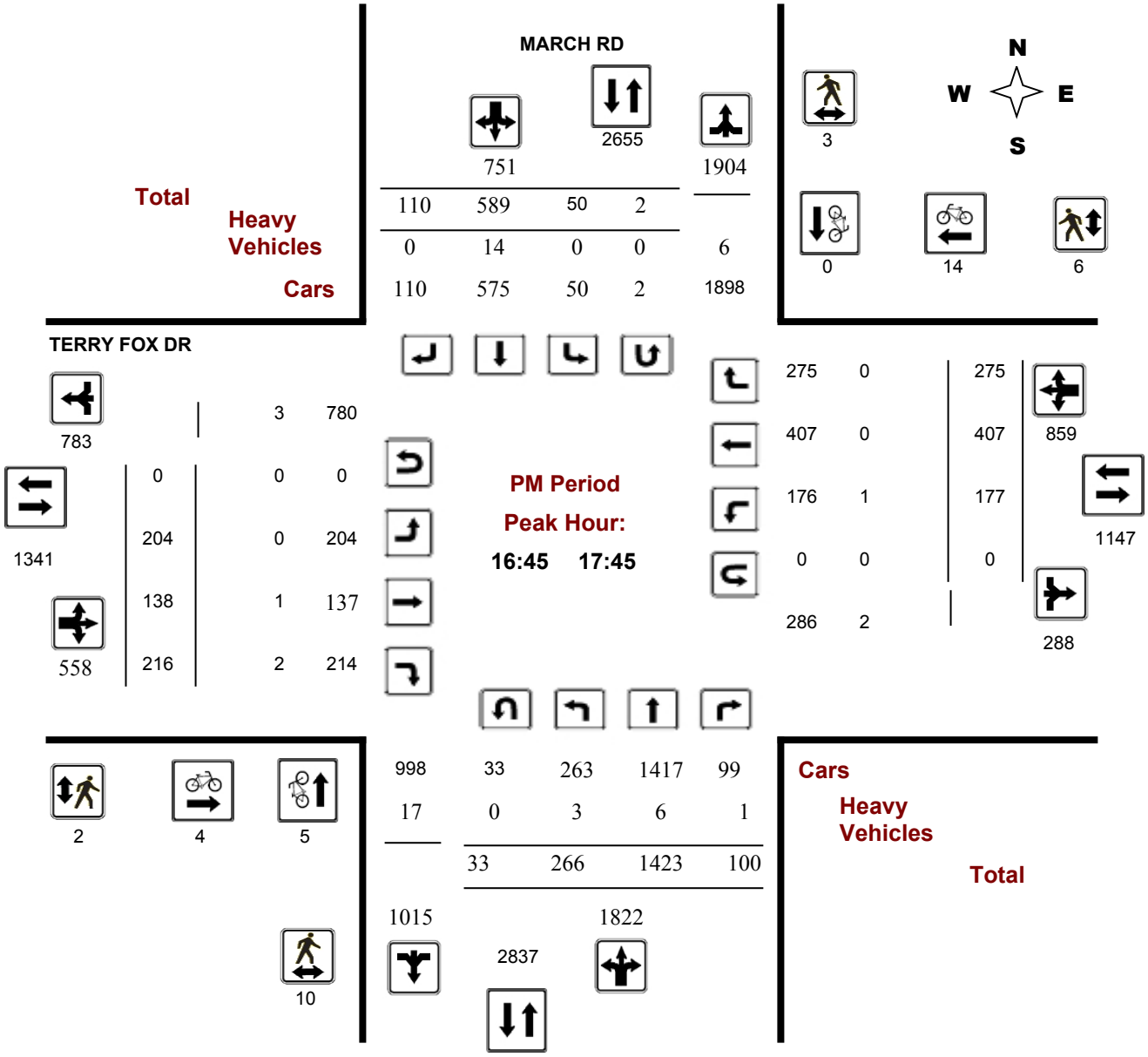
Public Works - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

MARCH RD @ TERRY FOX DR

Survey Date: Wednesday, August 10, 2016 **WO No:** 36152

Start Time: 07:00 **Device:** Miovision



Comments

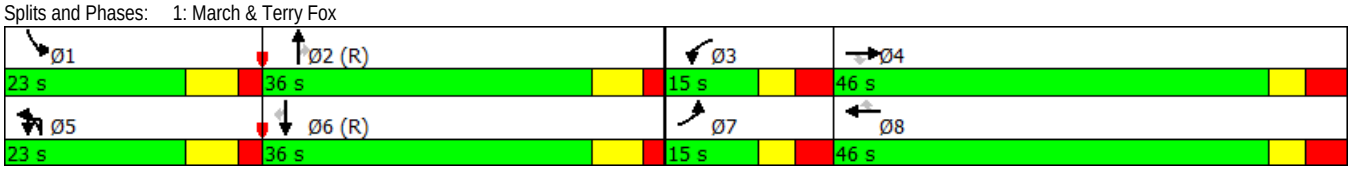
Appendix B

SYNCHRO Capacity Analysis: Existing Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	491	279	64	85	37	161	430	156	265	973	138
Future Volume (vph)	56	491	279	64	85	37	161	430	156	265	973	138
Lane Group Flow (vph)	59	517	294	67	89	39	214	453	164	279	1024	145
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.7	36.1	36.1	11.7	36.1	36.1	11.8	28.6	28.6	11.8	28.6	28.6
Total Split (s)	15.0	46.0	46.0	15.0	46.0	46.0	23.0	36.0	36.0	23.0	36.0	36.0
Total Split (%)	12.5%	38.3%	38.3%	12.5%	38.3%	38.3%	19.2%	30.0%	30.0%	19.2%	30.0%	30.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	3.4	3.8	3.8	3.4	3.8	3.8	2.2	2.0	2.0	2.2	2.0	2.0
Lost Time Adjust (s)	-2.7	-3.1	-3.1	-2.7	-3.1	-3.1	-2.8	-2.6	-2.6	-2.8	-2.6	-2.6
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	10.0	28.6	28.6	10.1	28.7	28.7	15.9	38.2	38.2	29.6	51.8	51.8
Actuated g/C Ratio	0.08	0.24	0.24	0.08	0.24	0.24	0.13	0.32	0.32	0.25	0.43	0.43
v/c Ratio	0.22	0.64	0.53	0.24	0.11	0.08	0.49	0.29	0.28	0.67	0.49	0.20
Control Delay	52.9	44.3	8.7	53.2	34.4	0.3	51.8	33.1	6.4	50.4	27.8	4.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.9	44.3	8.7	53.2	34.4	0.3	51.8	33.1	6.4	50.4	27.8	4.1
LOS	D	D	A	D	C	A	D	C	A	D	C	A
Approach Delay		32.9			34.0			32.7			29.8	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	6.8	57.9	3.5	7.7	8.6	0.0	24.4	31.0	0.0	58.2	65.0	0.0
Queue Length 95th (m)	13.3	70.1	24.4	14.7	14.3	0.0	35.3	41.8	16.0	#101.2	91.7	11.5
Internal Link Dist (m)		1862.6			280.2			873.2			461.7	
Turn Bay Length (m)	70.0		40.0	70.0		75.0	150.0		75.0	100.0		100.0
Base Capacity (vph)	301	1186	694	301	1186	624	523	1548	594	417	2104	732
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	0.20	0.44	0.42	0.22	0.08	0.06	0.41	0.29	0.28	0.67	0.49	0.20

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 8 (7%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.67	
Intersection Signal Delay: 31.5	Intersection LOS: C
Intersection Capacity Utilization 64.8%	ICU Level of Service C
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 1: March & Terry Fox



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	259	59	592	166	66	597
Future Volume (vph)	259	59	592	166	66	597
Lane Group Flow (vph)	273	62	623	175	69	628
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	31.0	31.0	25.0	25.0	16.2	16.2
Total Split (s)	32.0	32.0	68.0	68.0	68.0	68.0
Total Split (%)	32.0%	32.0%	68.0%	68.0%	68.0%	68.0%
Yellow Time (s)	4.2	4.2	4.2	4.2	3.7	3.7
All-Red Time (s)	1.8	1.8	1.8	1.8	2.5	2.5
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.2	-2.2
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
Act Effct Green (s)	16.2	16.2	64.2	64.2	64.2	64.2
Actuated g/C Ratio	0.18	0.18	0.73	0.73	0.73	0.73
v/c Ratio	0.45	0.19	0.25	0.15	0.13	0.26
Control Delay	34.3	9.2	4.9	1.2	5.5	4.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.3	9.2	4.9	1.2	5.5	4.9
LOS	C	A	A	A	A	A
Approach Delay	29.6		4.1			5.0
Approach LOS	C		A			A
Queue Length 50th (m)	21.3	0.0	13.9	0.0	2.6	14.0
Queue Length 95th (m)	32.0	9.3	32.8	6.6	10.3	33.2
Internal Link Dist (m)	660.0		365.3			1434.7
Turn Bay Length (m)	100.0	100.0		90.0	90.0	
Base Capacity (vph)	1044	524	2461	1149	527	2461
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.12	0.25	0.15	0.13	0.26

Intersection Summary		
Cycle Length: 100		
Actuated Cycle Length: 88.4		
Natural Cycle: 60		
Control Type: Actuated-Uncoordinated		
Maximum v/c Ratio: 0.45		
Intersection Signal Delay: 9.1	Intersection LOS: A	
Intersection Capacity Utilization 43.9%	ICU Level of Service A	
Analysis Period (min) 15		

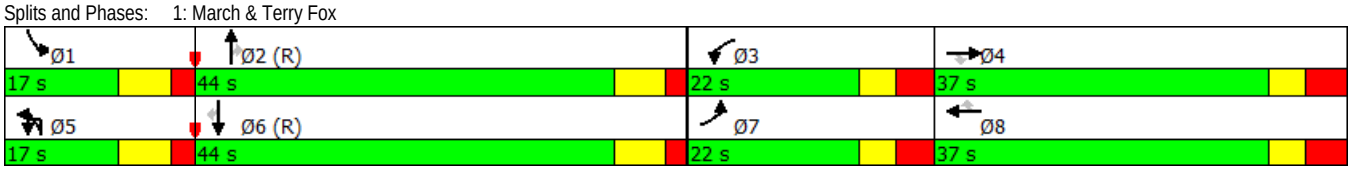
Splits and Phases: 4: Terry Fox & Kanata

Existing PM
1: March & Terry Fox

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	204	138	216	177	407	275	266	1423	100	50	589	110
Future Volume (vph)	204	138	216	177	407	275	266	1423	100	50	589	110
Lane Group Flow (vph)	215	145	227	186	428	289	315	1498	105	53	620	116
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.7	36.1	36.1	11.7	36.1	36.1	11.8	28.6	28.6	11.8	28.6	28.6
Total Split (s)	22.0	37.0	37.0	22.0	37.0	37.0	17.0	44.0	44.0	17.0	44.0	44.0
Total Split (%)	18.3%	30.8%	30.8%	18.3%	30.8%	30.8%	14.2%	36.7%	36.7%	14.2%	36.7%	36.7%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	3.4	3.8	3.8	3.4	3.8	3.8	2.2	2.0	2.0	2.2	2.0	2.0
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)	6.7	7.1	7.1	6.7	7.1	7.1	6.8	6.6	6.6	6.8	6.6	6.6
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
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	12.8	22.9	22.9	12.1	22.1	22.1	17.7	51.5	51.5	8.8	40.2	40.2
Actuated g/C Ratio	0.11	0.19	0.19	0.10	0.18	0.18	0.15	0.43	0.43	0.07	0.34	0.34
v/c Ratio	0.61	0.22	0.54	0.56	0.68	0.65	0.65	0.72	0.14	0.43	0.38	0.19
Control Delay	58.8	40.7	16.4	57.9	51.0	20.3	56.1	33.2	1.3	63.1	31.8	2.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.8	40.7	16.4	57.9	51.0	20.3	56.1	33.2	1.3	63.1	31.8	2.3
LOS	E	D	B	E	D	C	E	C	A	E	C	A
Approach Delay		37.9			42.6			35.2			29.6	
Approach LOS		D			D			D			C	
Queue Length 50th (m)	25.2	15.3	11.0	21.8	50.0	17.1	35.8	109.6	0.0	12.1	41.7	0.0
Queue Length 95th (m)	37.0	23.1	33.0	32.6	62.4	43.4	#69.6	#162.0	2.8	24.8	53.3	5.3
Internal Link Dist (m)		1862.6			280.2			873.2			461.7	
Turn Bay Length (m)	70.0		40.0	70.0		75.0	150.0		75.0	100.0		100.0
Base Capacity (vph)	419	844	496	419	844	527	485	2092	742	147	1631	604
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	0.51	0.17	0.46	0.44	0.51	0.55	0.65	0.72	0.14	0.36	0.38	0.19

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 54 (45%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 36.1	Intersection LOS: D
Intersection Capacity Utilization 75.4%	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.	

Splits and Phases: 1: March & Terry Fox



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	235	55	789	301	82	876
Future Volume (vph)	235	55	789	301	82	876
Lane Group Flow (vph)	247	58	831	317	86	922
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	31.2	31.2	35.1	35.1	16.1	16.1
Total Split (s)	32.0	32.0	68.0	68.0	68.0	68.0
Total Split (%)	32.0%	32.0%	68.0%	68.0%	68.0%	68.0%
Yellow Time (s)	3.7	3.7	4.2	4.2	4.2	4.2
All-Red Time (s)	2.5	2.5	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.1	0.1	0.1	0.1
Total Lost Time (s)	6.2	6.2	6.1	6.1	6.1	6.1
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
Act Effct Green (s)	13.7	13.7	62.1	62.1	62.1	62.1
Actuated g/C Ratio	0.16	0.16	0.70	0.70	0.70	0.70
v/c Ratio	0.48	0.20	0.35	0.27	0.21	0.39
Control Delay	36.8	10.3	6.2	1.4	7.3	6.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.8	10.3	6.2	1.4	7.3	6.5
LOS	D	B	A	A	A	A
Approach Delay	31.8		4.9			6.6
Approach LOS	C		A			A
Queue Length 50th (m)	19.8	0.0	22.0	0.0	3.9	25.3
Queue Length 95th (m)	30.3	9.3	49.7	9.2	14.6	56.8
Internal Link Dist (m)	660.0		365.3			2013.6
Turn Bay Length (m)	95.0	95.0		100.0	90.0	
Base Capacity (vph)	965	486	2387	1162	410	2387
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.12	0.35	0.27	0.21	0.39

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 88.2	
Natural Cycle: 70	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.48	
Intersection Signal Delay: 8.9	Intersection LOS: A
Intersection Capacity Utilization 55.0%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 4: Terry Fox & Kanata

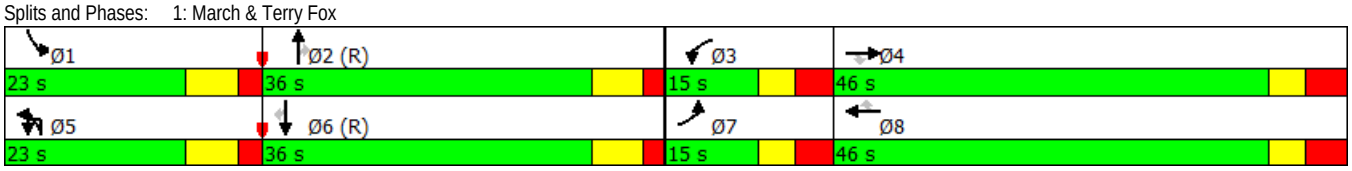
Appendix C

SYNCHRO Capacity Analysis: Projected 2021 Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	63	546	316	64	96	37	184	465	156	265	1053	151
Future Volume (vph)	63	546	316	64	96	37	184	465	156	265	1053	151
Lane Group Flow (vph)	66	575	333	67	101	39	239	489	164	279	1108	159
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.7	36.1	36.1	11.7	36.1	36.1	11.8	28.6	28.6	11.8	28.6	28.6
Total Split (s)	15.0	46.0	46.0	15.0	46.0	46.0	23.0	36.0	36.0	23.0	36.0	36.0
Total Split (%)	12.5%	38.3%	38.3%	12.5%	38.3%	38.3%	19.2%	30.0%	30.0%	19.2%	30.0%	30.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	3.4	3.8	3.8	3.4	3.8	3.8	2.2	2.0	2.0	2.2	2.0	2.0
Lost Time Adjust (s)	-2.7	-3.1	-3.1	-2.7	-3.1	-3.1	-2.8	-2.6	-2.6	-2.8	-2.6	-2.6
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	10.1	31.3	31.3	10.1	31.3	31.3	16.8	36.9	36.9	28.2	48.3	48.3
Actuated g/C Ratio	0.08	0.26	0.26	0.08	0.26	0.26	0.14	0.31	0.31	0.24	0.40	0.40
v/c Ratio	0.24	0.65	0.57	0.24	0.11	0.08	0.52	0.33	0.28	0.70	0.56	0.23
Control Delay	53.2	42.7	11.3	53.2	32.5	0.3	51.7	34.2	6.5	53.6	31.6	5.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.2	42.7	11.3	53.2	32.5	0.3	51.7	34.2	6.5	53.6	31.6	5.6
LOS	D	D	B	D	C	A	D	C	A	D	C	A
Approach Delay		32.6			33.2			33.8			32.9	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	7.5	63.5	10.7	7.7	9.5	0.0	27.2	34.4	0.0	59.2	76.2	0.0
Queue Length 95th (m)	14.5	75.6	34.7	14.7	15.3	0.0	38.5	44.9	16.0	#110.9	105.9	15.4
Internal Link Dist (m)		1097.0			280.2			873.2			461.7	
Turn Bay Length (m)	70.0		40.0	70.0		75.0	150.0		75.0	100.0		100.0
Base Capacity (vph)	301	1186	693	301	1186	624	529	1499	580	397	1962	694
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	0.22	0.48	0.48	0.22	0.09	0.06	0.45	0.33	0.28	0.70	0.56	0.23

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 8 (7%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.70	
Intersection Signal Delay: 33.1	Intersection LOS: C
Intersection Capacity Utilization 68.7%	ICU Level of Service C
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 1: March & Terry Fox



Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Configurations					
Traffic Volume (vph)	128	712	28	20	725
Future Volume (vph)	128	712	28	20	725
Lane Group Flow (vph)	183	749	29	21	763
Turn Type	Prot	NA	Perm	Perm	NA
Protected Phases	8	2			6
Permitted Phases			2	6	
Detector Phase	8	2	2	6	6
Switch Phase					
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	24.8	24.8	24.8	24.8	24.8
Total Split (s)	25.0	75.0	75.0	75.0	75.0
Total Split (%)	25.0%	75.0%	75.0%	75.0%	75.0%
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2
Lost Time Adjust (s)	-2.8	-2.8	-2.8	-2.8	-2.8
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	Min	Min	Min	Min
Act Effct Green (s)	15.3	36.7	36.7	36.7	36.7
Actuated g/C Ratio	0.25	0.61	0.61	0.61	0.61
v/c Ratio	0.42	0.69	0.03	0.08	0.70
Control Delay	22.0	12.1	3.4	6.0	12.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	22.0	12.1	3.4	6.0	12.4
LOS	C	B	A	A	B
Approach Delay	22.0	11.8			12.3
Approach LOS	C	B			B
Queue Length 50th (m)	13.5	42.9	0.4	0.7	44.4
Queue Length 95th (m)	38.8	97.7	3.1	3.6	101.0
Internal Link Dist (m)	384.5	344.5			186.4
Turn Bay Length (m)			20.0	25.0	
Base Capacity (vph)	607	1741	1481	437	1741
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	0.30	0.43	0.02	0.05	0.44

Intersection Summary			
Cycle Length: 100			
Actuated Cycle Length: 60.3			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 13.1		Intersection LOS: B	
Intersection Capacity Utilization 57.4%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 3: Terry Fox & Site S

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	259	59	664	166	66	733
Future Volume (vph)	259	59	664	166	66	733
Lane Group Flow (vph)	273	62	699	175	69	772
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	31.0	31.0	25.0	25.0	16.2	16.2
Total Split (s)	32.0	32.0	68.0	68.0	68.0	68.0
Total Split (%)	32.0%	32.0%	68.0%	68.0%	68.0%	68.0%
Yellow Time (s)	4.2	4.2	4.2	4.2	3.7	3.7
All-Red Time (s)	1.8	1.8	1.8	1.8	2.5	2.5
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.2	-2.2
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
Act Effct Green (s)	16.2	16.2	64.2	64.2	64.2	64.2
Actuated g/C Ratio	0.18	0.18	0.73	0.73	0.73	0.73
v/c Ratio	0.45	0.19	0.28	0.15	0.14	0.31
Control Delay	34.3	9.2	5.1	1.2	5.7	5.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.3	9.2	5.1	1.2	5.7	5.3
LOS	C	A	A	A	A	A
Approach Delay	29.6		4.3			5.3
Approach LOS	C		A			A
Queue Length 50th (m)	21.3	0.0	16.1	0.0	2.7	18.2
Queue Length 95th (m)	32.0	9.3	37.4	6.6	10.5	42.0
Internal Link Dist (m)	660.0		365.3			1434.7
Turn Bay Length (m)	100.0	100.0		90.0	90.0	
Base Capacity (vph)	1044	524	2461	1149	483	2461
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.12	0.28	0.15	0.14	0.31

Intersection Summary		
Cycle Length: 100		
Actuated Cycle Length: 88.4		
Natural Cycle: 60		
Control Type: Actuated-Uncoordinated		
Maximum v/c Ratio: 0.45		
Intersection Signal Delay: 8.9	Intersection LOS: A	
Intersection Capacity Utilization 46.0%	ICU Level of Service A	
Analysis Period (min) 15		

Splits and Phases: 4: Terry Fox & Kanata

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	727	7	2	732	7	37
Future Volume (Veh/h)	727	7	2	732	7	37
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	765	7	2	771	7	39
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			772		1544	768
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			772		1544	768
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		94	90
cM capacity (veh/h)			843		126	401

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	772	773	46
Volume Left	0	2	7
Volume Right	7	0	39
cSH	1700	843	301
Volume to Capacity	0.45	0.00	0.15
Queue Length 95th (m)	0.0	0.1	4.0
Control Delay (s)	0.0	0.1	19.1
Lane LOS		A	C
Approach Delay (s)	0.0	0.1	19.1
Approach LOS			C

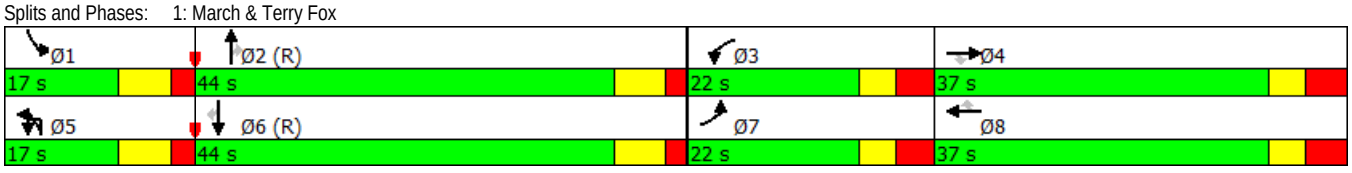
Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	52.3%	ICU Level of Service	A
Analysis Period (min)	15		

Projected 2021 PM
1: March & Terry Fox

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	208	157	237	177	456	275	325	1540	100	50	638	127
Future Volume (vph)	208	157	237	177	456	275	325	1540	100	50	638	127
Lane Group Flow (vph)	219	165	249	186	480	289	377	1621	105	53	672	134
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.7	36.1	36.1	11.7	36.1	36.1	11.8	28.6	28.6	11.8	28.6	28.6
Total Split (s)	22.0	37.0	37.0	22.0	37.0	37.0	17.0	44.0	44.0	17.0	44.0	44.0
Total Split (%)	18.3%	30.8%	30.8%	18.3%	30.8%	30.8%	14.2%	36.7%	36.7%	14.2%	36.7%	36.7%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	3.4	3.8	3.8	3.4	3.8	3.8	2.2	2.0	2.0	2.2	2.0	2.0
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)	6.7	7.1	7.1	6.7	7.1	7.1	6.8	6.6	6.6	6.8	6.6	6.6
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
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	12.9	24.9	24.9	12.1	24.0	24.0	18.4	49.7	49.7	8.6	37.4	37.4
Actuated g/C Ratio	0.11	0.21	0.21	0.10	0.20	0.20	0.15	0.41	0.41	0.07	0.31	0.31
v/c Ratio	0.62	0.23	0.57	0.56	0.71	0.62	0.75	0.80	0.15	0.43	0.44	0.23
Control Delay	58.8	39.5	19.9	57.9	50.3	19.0	59.8	37.0	1.4	64.0	34.1	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.8	39.5	19.9	57.9	50.3	19.0	59.8	37.0	1.4	64.0	34.1	3.7
LOS	E	D	B	E	D	B	E	D	A	E	C	A
Approach Delay		38.5			42.3			39.3			31.2	
Approach LOS		D			D			D			C	
Queue Length 50th (m)	25.7	17.1	17.2	21.8	56.0	16.9	44.3	126.8	0.0	12.1	46.1	0.0
Queue Length 95th (m)	37.6	25.5	41.3	32.6	69.4	43.2	#90.2	#184.3	2.8	25.0	57.9	9.1
Internal Link Dist (m)		1862.6			280.2			873.2			461.7	
Turn Bay Length (m)	70.0		40.0	70.0		75.0	150.0		75.0	100.0		100.0
Base Capacity (vph)	419	844	489	419	844	526	505	2016	721	145	1518	573
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	0.52	0.20	0.51	0.44	0.57	0.55	0.75	0.80	0.15	0.37	0.44	0.23

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 54 (45%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.80	
Intersection Signal Delay: 38.3	Intersection LOS: D
Intersection Capacity Utilization 78.2%	ICU Level of Service D
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 1: March & Terry Fox



Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Configurations					
Traffic Volume (vph)	92	944	85	65	1041
Future Volume (vph)	92	944	85	65	1041
Lane Group Flow (vph)	134	994	89	68	1096
Turn Type	Prot	NA	Perm	Perm	NA
Protected Phases	8	2			6
Permitted Phases			2	6	
Detector Phase	8	2	2	6	6
Switch Phase					
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	24.8	24.8	24.8	24.8	24.8
Total Split (s)	24.8	75.2	75.2	75.2	75.2
Total Split (%)	24.8%	75.2%	75.2%	75.2%	75.2%
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	Min	Min	Min	Min
Act Effct Green (s)	12.7	59.5	59.5	59.5	59.5
Actuated g/C Ratio	0.15	0.69	0.69	0.69	0.69
v/c Ratio	0.52	0.81	0.08	0.32	0.89
Control Delay	38.7	16.1	3.2	10.5	21.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	38.7	16.1	3.2	10.5	21.9
LOS	D	B	A	B	C
Approach Delay	38.7	15.0			21.3
Approach LOS	D	B			C
Queue Length 50th (m)	17.7	93.1	2.2	3.6	117.9
Queue Length 95th (m)	38.0	186.4	7.5	12.9	#272.1
Internal Link Dist (m)	166.6	655.4			338.4
Turn Bay Length (m)			20.0	25.0	
Base Capacity (vph)	366	1441	1233	248	1441
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	0.69	0.07	0.27	0.76

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 86	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.89	
Intersection Signal Delay: 19.4	Intersection LOS: B
Intersection Capacity Utilization 77.5%	ICU Level of Service D
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 3: Terry Fox & Site S

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	235	55	944	301	82	997
Future Volume (vph)	235	55	944	301	82	997
Lane Group Flow (vph)	247	58	994	317	86	1049
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	31.2	31.2	35.1	35.1	16.1	16.1
Total Split (s)	32.0	32.0	68.0	68.0	68.0	68.0
Total Split (%)	32.0%	32.0%	68.0%	68.0%	68.0%	68.0%
Yellow Time (s)	3.7	3.7	4.2	4.2	4.2	4.2
All-Red Time (s)	2.5	2.5	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.1	0.1	0.1	0.1
Total Lost Time (s)	6.2	6.2	6.1	6.1	6.1	6.1
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
Act Effct Green (s)	13.7	13.7	62.1	62.1	62.1	62.1
Actuated g/C Ratio	0.16	0.16	0.70	0.70	0.70	0.70
v/c Ratio	0.48	0.20	0.42	0.27	0.26	0.44
Control Delay	36.8	10.3	6.8	1.4	8.4	7.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.8	10.3	6.8	1.4	8.4	7.0
LOS	D	B	A	A	A	A
Approach Delay	31.8		5.5			7.1
Approach LOS	C		A			A
Queue Length 50th (m)	19.8	0.0	28.2	0.0	4.0	30.4
Queue Length 95th (m)	30.3	9.3	62.5	9.2	15.9	67.4
Internal Link Dist (m)	660.0		365.3			971.8
Turn Bay Length (m)	95.0	95.0		100.0	90.0	
Base Capacity (vph)	965	486	2387	1162	335	2387
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.12	0.42	0.27	0.26	0.44

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 88.2	
Natural Cycle: 70	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.48	
Intersection Signal Delay: 9.0	Intersection LOS: A
Intersection Capacity Utilization 59.5%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 4: Terry Fox & Kanata

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	926	30	7	1090	4	21
Future Volume (Veh/h)	926	30	7	1090	4	21
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	975	32	7	1147	4	22
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			1007		2152	991
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1007		2152	991
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		92	93
cM capacity (veh/h)			688		52	299

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	1007	1154	26
Volume Left	0	7	4
Volume Right	32	0	22
cSH	1700	688	173
Volume to Capacity	0.59	0.01	0.15
Queue Length 95th (m)	0.0	0.2	3.9
Control Delay (s)	0.0	0.4	29.4
Lane LOS		A	D
Approach Delay (s)	0.0	0.4	29.4
Approach LOS			D

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	76.4%	ICU Level of Service	D
Analysis Period (min)	15		

Appendix D

Signal Warrant and Left-Turn Lane Warrant Analysis

Terry Fox/Site S - (peak hour signal warrant)

Signal Warrant			Description	Minimum Requirement for Two Lane Roadways	Compliance		
				Free Flow - Operating Speed Greater Than or Equal to 70 km/h	Sectional %	Entire %	Warrant
Intersection	1. Minimum Vehicular Volume	(1) A	Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of on Average Day, and	480	222%	42%	**100% Yes**
		(4) B	Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	180	42%		
	2. Delay to Cross Traffic	(1) A	Vehicle Volume, Along Major Street for Each of the Heaviest 8 Hours of an Average Day, and	480	207%	110%	
		(2) B	Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours	50	110%		

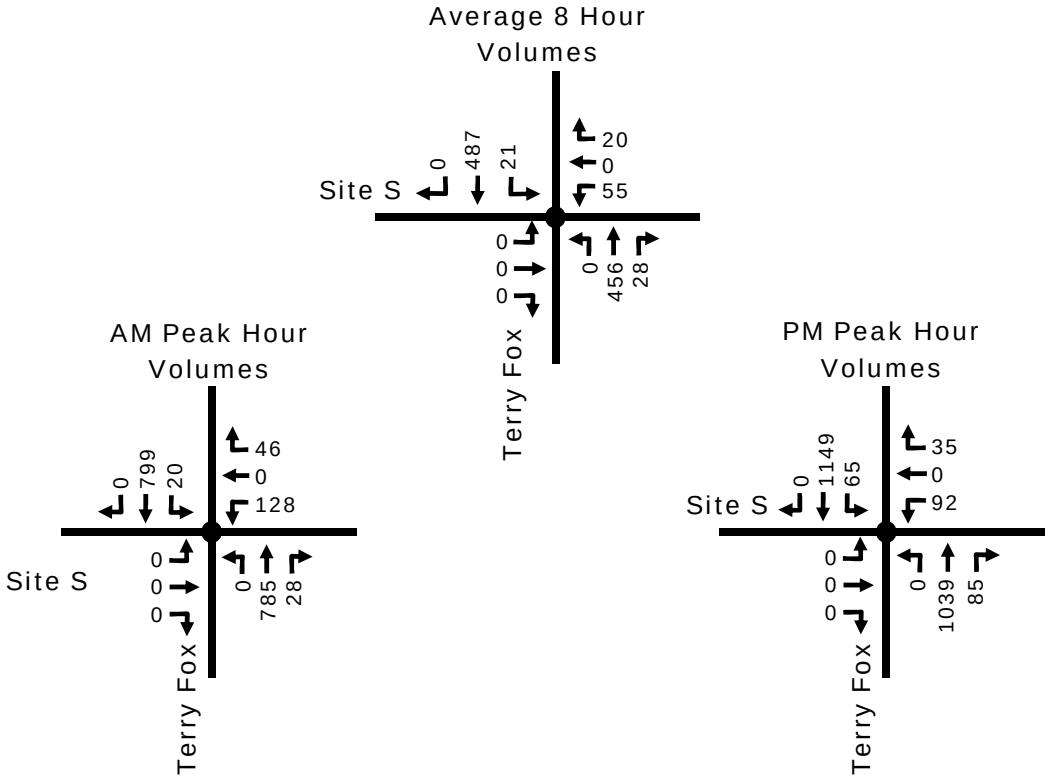
Notes

1 *Vehicle Volume Warrants (1A), (2A) and (5B) for Roadways Having Two or More Moving Lanes in one Direction Should Be 25% Higher Than Values Given Above* **No**

2 *For Definition of Crossing Volume Refer to Note 4 on the Signal Warrant Analysis Form B2.03.08*

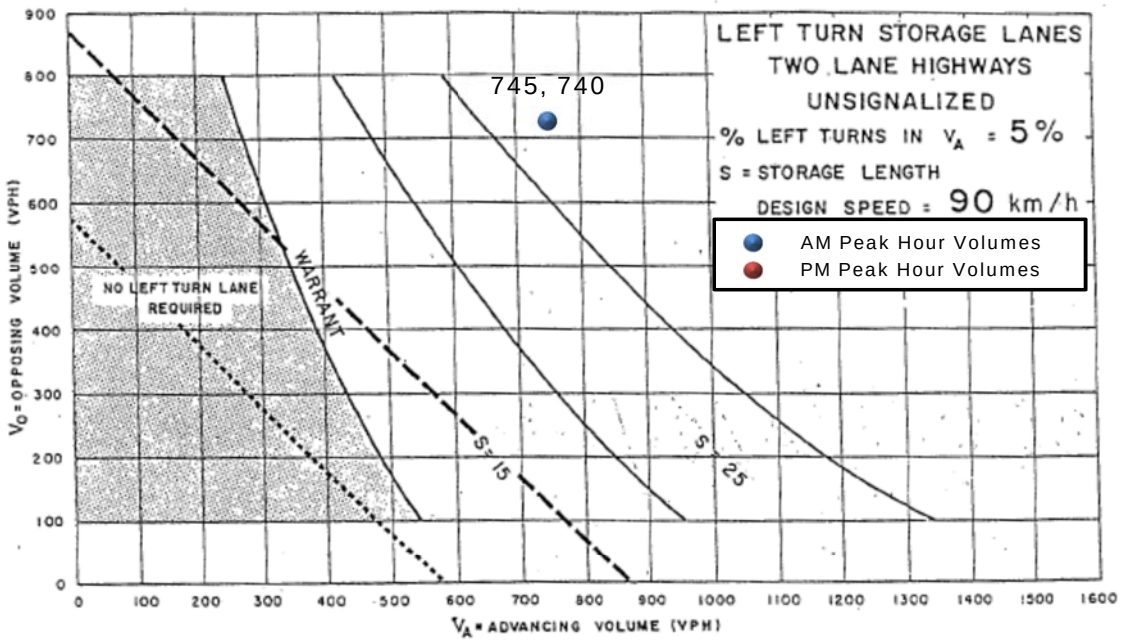
3 *The Lowest Sectional Percentage Governs the Entire Warrant*

4 *For "T" Intersections the Warrant Values for Minor Street Should be Increased by 50% (Warrant 1B only)* **Yes**



	Design Speed	Advancing Traffic Volume (V_A)		Opposing Traffic Volume (V_O)		Left Turn Traffic Volume (V_L)		% of Left Turning Traffic		Warrant Left Turn Lane
		AM	PM	AM	PM	AM	PM	AM	PM	
Existing										
Terry Fox/Site S	90	745	1106	740	1029	20	65	3%	6%	Yes

Peak	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
				Warrant?								
AM	0	712	28	20	725	0	0	0	0	128	0	46
PM	0	944	85	65	1041	0	0	0	0	92	0	35

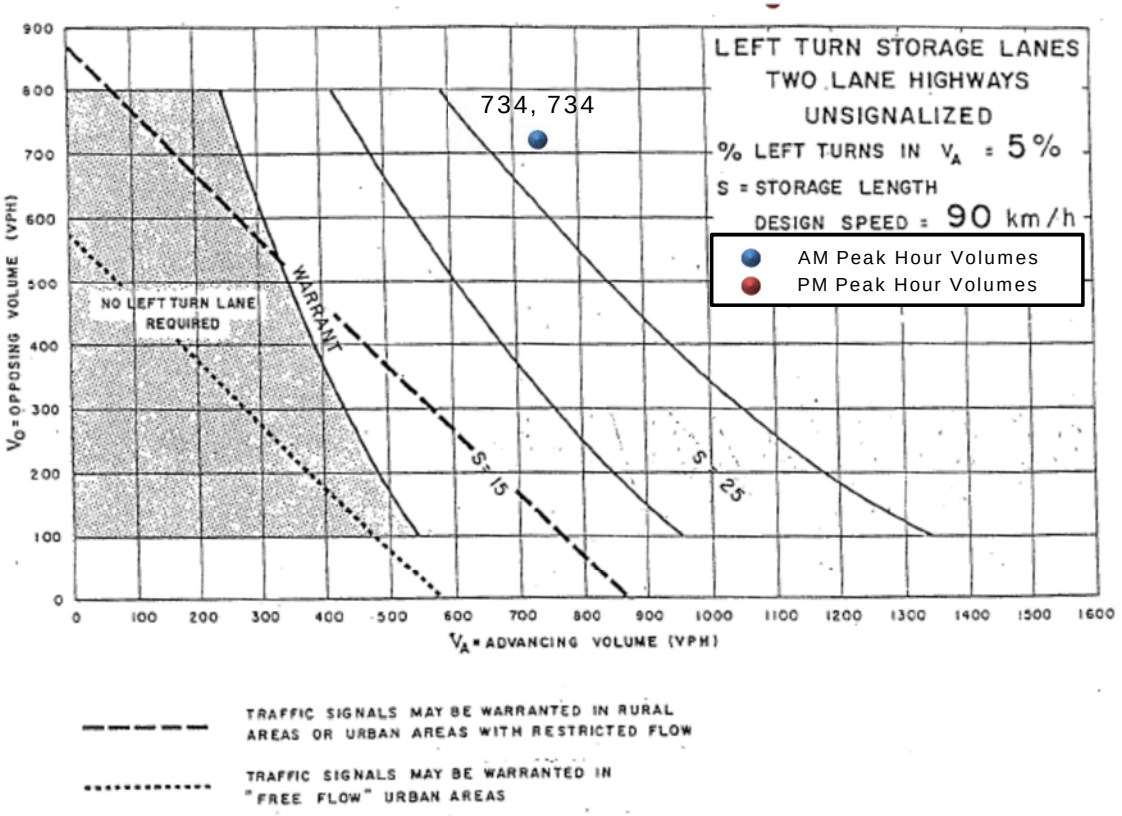


TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW

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

	Design Speed	Advancing Traffic Volume (V_A)		Opposing Traffic Volume (V_O)		Left Turn Traffic Volume (V_L)		% of Left Turning Traffic		Warrant Left Turn Lane
		AM	PM	AM	PM	AM	PM	AM	PM	
Existing										
Terry Fox/Site N	90	734	1097	734	956	2	7	0%	1%	Yes

Peak	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
										Warrant?		
AM	7	0	37	0	0	0	0	727	7	2	732	0
PM	4	0	21	0	0	0	0	926	30	7	1090	0



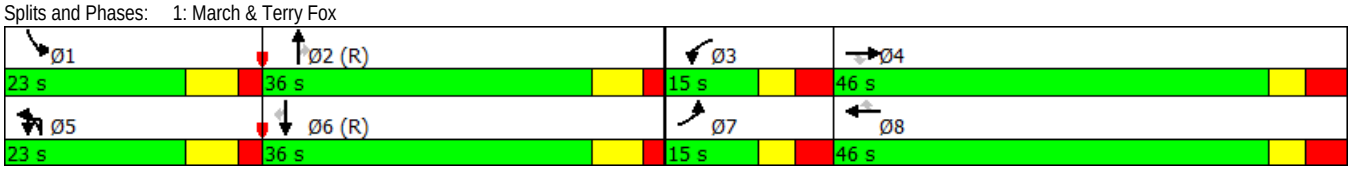
Appendix E

SYNCHRO Capacity Analysis: Projected 2026 Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	63	602	316	64	106	37	202	514	156	265	1163	167
Future Volume (vph)	63	602	316	64	106	37	202	514	156	265	1163	167
Lane Group Flow (vph)	66	634	333	67	112	39	258	541	164	279	1224	176
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.7	36.1	36.1	11.7	36.1	36.1	11.8	28.6	28.6	11.8	28.6	28.6
Total Split (s)	15.0	46.0	46.0	15.0	46.0	46.0	23.0	36.0	36.0	23.0	36.0	36.0
Total Split (%)	12.5%	38.3%	38.3%	12.5%	38.3%	38.3%	19.2%	30.0%	30.0%	19.2%	30.0%	30.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	3.4	3.8	3.8	3.4	3.8	3.8	2.2	2.0	2.0	2.2	2.0	2.0
Lost Time Adjust (s)	-2.7	-3.1	-3.1	-2.7	-3.1	-3.1	-2.8	-2.6	-2.6	-2.8	-2.6	-2.6
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	10.1	33.4	33.4	10.1	33.4	33.4	17.1	36.2	36.2	26.8	45.9	45.9
Actuated g/C Ratio	0.08	0.28	0.28	0.08	0.28	0.28	0.14	0.30	0.30	0.22	0.38	0.38
v/c Ratio	0.24	0.67	0.55	0.24	0.12	0.07	0.55	0.37	0.29	0.74	0.66	0.26
Control Delay	53.2	41.7	10.4	53.2	31.1	0.3	52.2	35.1	6.6	57.3	35.2	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.2	41.7	10.4	53.2	31.1	0.3	52.2	35.1	6.6	57.3	35.2	5.9
LOS	D	D	B	D	C	A	D	D	A	E	D	A
Approach Delay		32.4			32.4			34.8			35.8	
Approach LOS		C			C			C			D	
Queue Length 50th (m)	7.5	69.8	10.5	7.7	10.3	0.0	29.4	38.6	0.0	60.6	90.1	0.0
Queue Length 95th (m)	14.5	81.2	33.2	14.7	15.9	0.0	41.8	49.7	16.0	#120.6	#132.0	16.6
Internal Link Dist (m)		1097.0			280.2			873.2			461.7	
Turn Bay Length (m)	70.0		40.0	70.0		75.0	150.0		75.0	100.0		100.0
Base Capacity (vph)	301	1186	693	301	1186	624	525	1469	571	378	1863	677
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	0.22	0.53	0.48	0.22	0.09	0.06	0.49	0.37	0.29	0.74	0.66	0.26

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 8 (7%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.74	
Intersection Signal Delay: 34.4	Intersection LOS: C
Intersection Capacity Utilization 71.4%	ICU Level of Service C
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 1: March & Terry Fox



Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Configurations					
Traffic Volume (vph)	128	785	28	20	799
Future Volume (vph)	128	785	28	20	799
Lane Group Flow (vph)	183	826	29	21	841
Turn Type	Prot	NA	Perm	Perm	NA
Protected Phases	8	2			6
Permitted Phases			2	6	
Detector Phase	8	2	2	6	6
Switch Phase					
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	24.8	24.8	24.8	24.8	24.8
Total Split (s)	25.0	75.0	75.0	75.0	75.0
Total Split (%)	25.0%	75.0%	75.0%	75.0%	75.0%
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2
Lost Time Adjust (s)	-2.8	-2.8	-2.8	-2.8	-2.8
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	Min	Min	Min	Min
Act Effct Green (s)	15.6	41.9	41.9	41.9	41.9
Actuated g/C Ratio	0.24	0.64	0.64	0.64	0.64
v/c Ratio	0.45	0.73	0.03	0.08	0.74
Control Delay	25.6	12.7	3.1	5.8	13.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	25.6	12.7	3.1	5.8	13.1
LOS	C	B	A	A	B
Approach Delay	25.6	12.4			13.0
Approach LOS	C	B			B
Queue Length 50th (m)	15.3	52.9	0.5	0.8	54.8
Queue Length 95th (m)	44.3	114.1	3.1	3.6	118.3
Internal Link Dist (m)	384.5	344.5			186.4
Turn Bay Length (m)			20.0	25.0	
Base Capacity (vph)	560	1707	1452	376	1707
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	0.33	0.48	0.02	0.06	0.49

Intersection Summary			
Cycle Length: 100			
Actuated Cycle Length: 65.9			
Natural Cycle: 65			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.74			
Intersection Signal Delay: 13.9		Intersection LOS: B	
Intersection Capacity Utilization 61.5%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 3: Terry Fox & Site S

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	259	59	730	166	66	800
Future Volume (vph)	259	59	730	166	66	800
Lane Group Flow (vph)	273	62	768	175	69	842
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	31.0	31.0	25.0	25.0	16.2	16.2
Total Split (s)	32.0	32.0	68.0	68.0	68.0	68.0
Total Split (%)	32.0%	32.0%	68.0%	68.0%	68.0%	68.0%
Yellow Time (s)	4.2	4.2	4.2	4.2	3.7	3.7
All-Red Time (s)	1.8	1.8	1.8	1.8	2.5	2.5
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.2	-2.2
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
Act Effct Green (s)	16.2	16.2	64.2	64.2	64.2	64.2
Actuated g/C Ratio	0.18	0.18	0.73	0.73	0.73	0.73
v/c Ratio	0.45	0.19	0.31	0.15	0.16	0.34
Control Delay	34.3	9.2	5.3	1.2	5.9	5.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.3	9.2	5.3	1.2	5.9	5.5
LOS	C	A	A	A	A	A
Approach Delay	29.6		4.5			5.5
Approach LOS	C		A			A
Queue Length 50th (m)	21.3	0.0	18.1	0.0	2.7	20.4
Queue Length 95th (m)	32.0	9.3	41.8	6.6	10.7	46.9
Internal Link Dist (m)	660.0		365.3			1434.7
Turn Bay Length (m)	100.0	100.0		90.0	90.0	
Base Capacity (vph)	1044	524	2461	1149	445	2461
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.12	0.31	0.15	0.16	0.34

Intersection Summary		
Cycle Length: 100		
Actuated Cycle Length: 88.4		
Natural Cycle: 60		
Control Type: Actuated-Uncoordinated		
Maximum v/c Ratio: 0.45		
Intersection Signal Delay: 8.8	Intersection LOS: A	
Intersection Capacity Utilization 48.0%	ICU Level of Service A	
Analysis Period (min) 15		

Splits and Phases: 4: Terry Fox & Kanata

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	800	7	2	806	7	37
Future Volume (Veh/h)	800	7	2	806	7	37
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	842	7	2	848	7	39
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			849		1698	846
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			849		1698	846
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		93	89
cM capacity (veh/h)			789		101	362

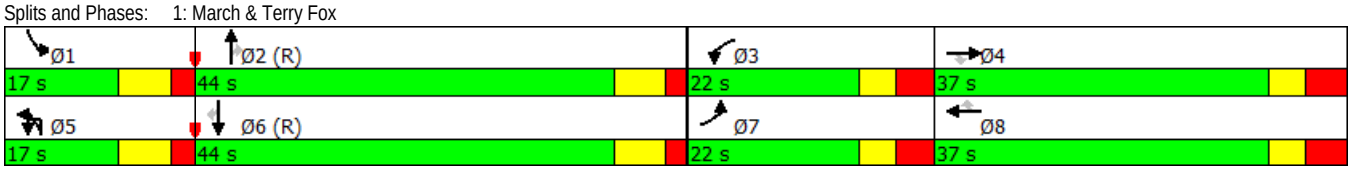
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	849	850	46
Volume Left	0	2	7
Volume Right	7	0	39
cSH	1700	789	260
Volume to Capacity	0.50	0.00	0.18
Queue Length 95th (m)	0.0	0.1	4.8
Control Delay (s)	0.0	0.1	21.8
Lane LOS		A	C
Approach Delay (s)	0.0	0.1	21.8
Approach LOS			C

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	56.5%	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)	208	173	237	177	501	275	355	1701	100	50	704	139
Future Volume (vph)	208	173	237	177	501	275	355	1701	100	50	704	139
Lane Group Flow (vph)	219	182	249	186	527	289	409	1791	105	53	741	146
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.7	36.1	36.1	11.7	36.1	36.1	11.8	28.6	28.6	11.8	28.6	28.6
Total Split (s)	22.0	37.0	37.0	22.0	37.0	37.0	17.0	44.0	44.0	17.0	44.0	44.0
Total Split (%)	18.3%	30.8%	30.8%	18.3%	30.8%	30.8%	14.2%	36.7%	36.7%	14.2%	36.7%	36.7%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	3.4	3.8	3.8	3.4	3.8	3.8	2.2	2.0	2.0	2.2	2.0	2.0
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)	6.7	7.1	7.1	6.7	7.1	7.1	6.8	6.6	6.6	6.8	6.6	6.6
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
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	12.9	26.5	26.5	12.1	25.6	25.6	16.9	48.1	48.1	8.6	37.4	37.4
Actuated g/C Ratio	0.11	0.22	0.22	0.10	0.21	0.21	0.14	0.40	0.40	0.07	0.31	0.31
v/c Ratio	0.62	0.24	0.56	0.56	0.73	0.60	0.89	0.92	0.15	0.43	0.49	0.25
Control Delay	58.8	38.5	20.2	57.9	50.0	18.0	73.1	44.4	1.4	64.0	34.9	4.8
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	58.8	38.5	20.2	57.9	50.0	18.0	73.1	44.4	1.4	64.0	34.9	4.8
LOS	E	D	C	E	D	B	E	D	A	E	C	A
Approach Delay		38.3			42.2			47.6			31.8	
Approach LOS		D			D			D			C	
Queue Length 50th (m)	25.7	18.5	18.3	21.8	60.7	16.7	49.8	~153.3	0.0	12.1	51.7	0.0
Queue Length 95th (m)	37.6	27.8	43.4	32.6	76.7	43.5	#99.0	#214.6	2.8	25.0	64.2	11.9
Internal Link Dist (m)		1862.6			280.2			873.2			461.7	
Turn Bay Length (m)	70.0		40.0	70.0		75.0	150.0		75.0	100.0		100.0
Base Capacity (vph)	419	848	485	419	844	526	462	1953	703	145	1518	573
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	0.52	0.21	0.51	0.44	0.62	0.55	0.89	0.92	0.15	0.37	0.49	0.25

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 54 (45%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 110	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.92	
Intersection Signal Delay: 42.2	Intersection LOS: D
Intersection Capacity Utilization 82.7%	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.	

Splits and Phases: 1: March & Terry Fox



Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Configurations					
Traffic Volume (vph)	92	1039	85	65	1149
Future Volume (vph)	92	1039	85	65	1149
Lane Group Flow (vph)	134	1094	89	68	1209
Turn Type	Prot	NA	Perm	Perm	NA
Protected Phases	8	2			6
Permitted Phases			2	6	
Detector Phase	8	2	2	6	6
Switch Phase					
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	24.8	24.8	24.8	24.8	24.8
Total Split (s)	24.8	75.2	75.2	75.2	75.2
Total Split (%)	24.8%	75.2%	75.2%	75.2%	75.2%
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	Min	Min	Min	Min
Act Effct Green (s)	12.9	72.1	72.1	72.1	72.1
Actuated g/C Ratio	0.13	0.73	0.73	0.73	0.73
v/c Ratio	0.58	0.84	0.08	0.36	0.93
Control Delay	44.6	17.9	3.1	12.3	26.2
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	44.6	17.9	3.1	12.3	26.2
LOS	D	B	A	B	C
Approach Delay	44.6	16.8			25.5
Approach LOS	D	B			C
Queue Length 50th (m)	20.6	117.9	2.4	3.9	156.6
Queue Length 95th (m)	38.0	#270.9	7.7	15.0	#319.1
Internal Link Dist (m)	166.6	655.4			338.4
Turn Bay Length (m)			20.0	25.0	
Base Capacity (vph)	316	1304	1118	189	1304
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	0.42	0.84	0.08	0.36	0.93

Intersection Summary		
Cycle Length: 100		
Actuated Cycle Length: 98.6		
Natural Cycle: 100		
Control Type: Actuated-Uncoordinated		
Maximum v/c Ratio: 0.93		
Intersection Signal Delay: 22.5	Intersection LOS: C	
Intersection Capacity Utilization 83.5%	ICU Level of Service E	
Analysis Period (min) 15		

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

Splits and Phases: 3: Terry Fox & Site S

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	235	55	1033	301	82	1096
Future Volume (vph)	235	55	1033	301	82	1096
Lane Group Flow (vph)	247	58	1087	317	86	1154
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	31.2	31.2	35.1	35.1	16.1	16.1
Total Split (s)	32.0	32.0	68.0	68.0	68.0	68.0
Total Split (%)	32.0%	32.0%	68.0%	68.0%	68.0%	68.0%
Yellow Time (s)	3.7	3.7	4.2	4.2	4.2	4.2
All-Red Time (s)	2.5	2.5	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.1	0.1	0.1	0.1
Total Lost Time (s)	6.2	6.2	6.1	6.1	6.1	6.1
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
Act Effct Green (s)	13.7	13.7	62.1	62.1	62.1	62.1
Actuated g/C Ratio	0.16	0.16	0.70	0.70	0.70	0.70
v/c Ratio	0.48	0.20	0.46	0.27	0.29	0.48
Control Delay	36.8	10.3	7.1	1.4	9.4	7.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.8	10.3	7.1	1.4	9.4	7.4
LOS	D	B	A	A	A	A
Approach Delay	31.8		5.8			7.5
Approach LOS	C		A			A
Queue Length 50th (m)	19.8	0.0	32.0	0.0	4.1	34.9
Queue Length 95th (m)	30.3	9.3	70.9	9.2	17.0	77.3
Internal Link Dist (m)	660.0		365.3			971.8
Turn Bay Length (m)	95.0	95.0		100.0	90.0	
Base Capacity (vph)	965	486	2387	1162	297	2387
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.12	0.46	0.27	0.29	0.48

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 88.2	
Natural Cycle: 70	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.48	
Intersection Signal Delay: 9.2	Intersection LOS: A
Intersection Capacity Utilization 62.1%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 4: Terry Fox & Kanata

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1021	30	7	1198	4	21
Future Volume (Veh/h)	1021	30	7	1198	4	21
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	1075	32	7	1261	4	22
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			1107		2366	1091
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1107		2366	1091
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		90	92
cM capacity (veh/h)			631		38	261

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	1107	1268	26
Volume Left	0	7	4
Volume Right	32	0	22
cSH	1700	631	138
Volume to Capacity	0.65	0.01	0.19
Queue Length 95th (m)	0.0	0.3	5.1
Control Delay (s)	0.0	0.5	37.2
Lane LOS		A	E
Approach Delay (s)	0.0	0.5	37.2
Approach LOS			E

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	82.4%	ICU Level of Service	E
Analysis Period (min)	15		