Ontario Line

Integrated Transit Oriented Communities – King-Bathurst

Draft Transportation Impact Assessment Study

Issued for Rezoning

North Site: 662-668 KING STREET WEST
TORONTO, ONTARIO, M5V 1MV

South Site: 647-655 KING STREET WEST;
69-76 BATHURST STREET;
58-60 STEWART STREET;
TORONTO, ONTARIO, M5V 1MV

Contract RFS-2019-NAFC-110

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1 Introduction

HDR Corporation was retained by Metrolinx to undertake a Transportation Impact Study (TIS) and Parking Assessment for a proposed mixed-use Transit Oriented Community (TOC) development to be located on the future Ontario Line King-Bathurst Station site.

The subject properties are located on the north-east and south-east corners of the intersections of King Street West at Bathurst Street. The existing buildings are occupied with general retail-commercial employment uses and restaurants/bars on the ground floors of both buildings

The proposed redevelopment consists of two sites:

- **North Site:** 662-668 King Street West
  - 187 residential units
  - 1,315 square metres gross floor area (SM GFA) of office space
  - 824 SM of GFA will be dedicated to the transit lobby at the ground level

- **South Site:** 647-655 King Street West, 69-76 Bathurst Street; 58-60 Stewart Street
  - 235 residential units
  - 1,366 SM of GFA will be dedicated to the transit lobby at the ground level

The sites will be highly transit-oriented given the direct access to Ontario Line and the inherent mixed-use nature of the area, which includes employment use and other commercial-retail and services that will support the residential component. Considering the nature of the development, vehicular parking is not proposed, and the site will leverage the transit availability in the area, as well as the expanded future transit availability with the construction of Ontario Line. In addition to being in close vicinity of a new higher order transit service, the sites (both buildings) will have direct internal access to the transit station.

This traffic impact study report is an interim progress report that includes draft documentation of the following components.

- Existing traffic conditions
- Background traffic conditions
- Proposed TOC trip generation
- Future total traffic conditions with the TOC & Future King-Bathurst Station
- Parking assessment
- Loading assessment
- Preliminary findings and next steps

The North Site is located at the northeast corner of King Street West and Bathurst Street and the South Site is located at the southeast corner of King Street West and Bathurst Street, as shown in **Figure 1**.

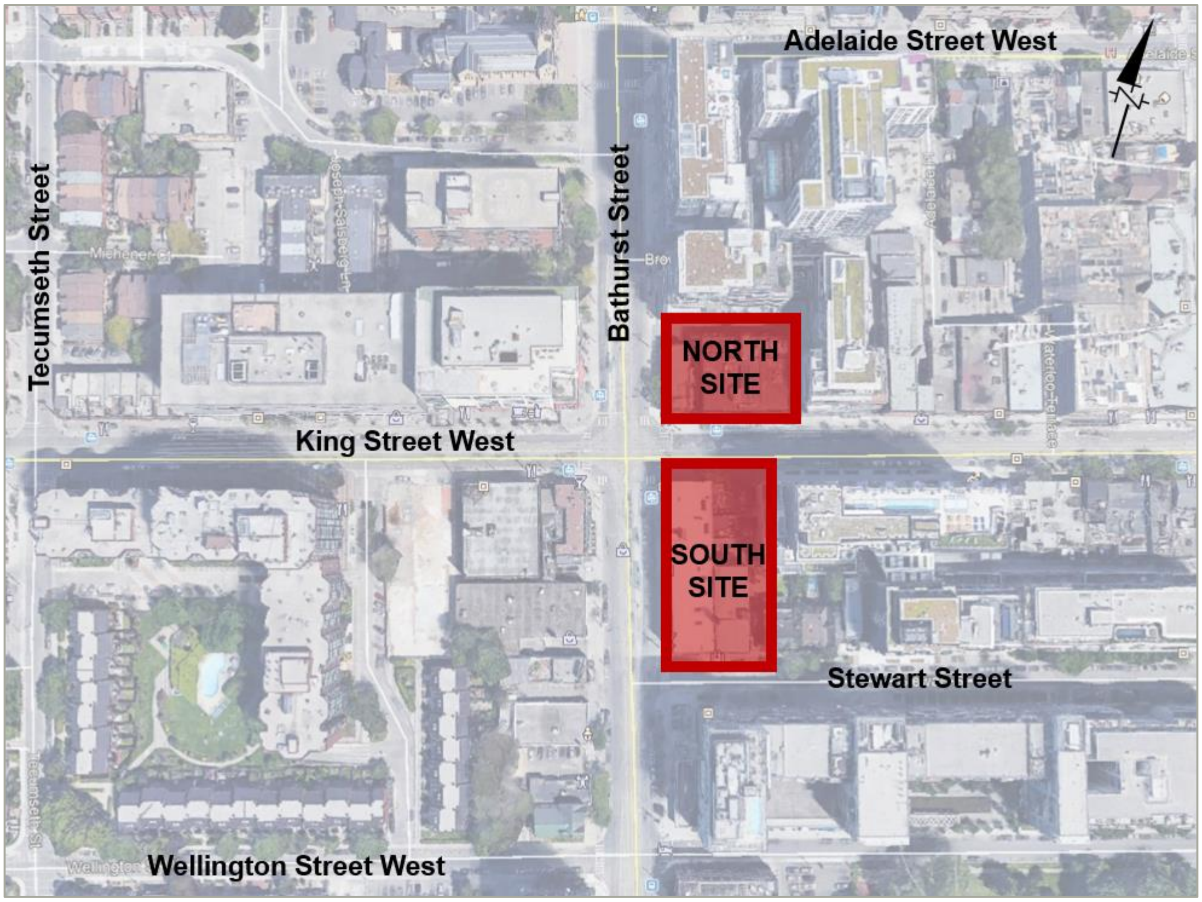


Figure 1: Study Area and Site Context

1.1 Scope of Work

The scope of work has been prepared in accordance with the **City of Toronto Guidelines for the Preparation of Transportation Impact Studies** (2013), and is as follows:

Study Area	• Area surrounding King Street West and Bathurst Street
Analysis Scenarios	• Existing 2020 Traffic Conditions • Future 2030 Background Traffic Conditions (10-year Horizon) *Includes 0.5% annual background traffic growth plus other new development traffic in the vicinity of the site* • Future 2030 Total Traffic Conditions (10-year Horizon) *Includes future background traffic volumes plus traffic resulting from the proposed development*
Analysis Time Periods	The following time periods were analyzed as they represent peak trip generation times for residential developments: • Weekday AM peak hour between 7:00am and 9:00am • Weekday PM peak hour between 3:00pm and 6:00pm
Study Area Intersections for Analysis	The following intersections were analyzed for capacity, level of service, and delays: • King Street West and Bathurst Street

Parking and Loading Review	A parking and loading assessment was undertaken for the proposed development using the City of Toronto Zoning By-law 569-2013 as the basis of the assessment, and in the context of the site as a transit-oriented community. A Transportation Demand Management (TDM) Plan has been developed to further support the proposed parking supply and to ensure a wholesome approach to transportation management that addresses the needs of all modes and achieves planning goals of encouraging multi-modal decision making through the provision of alternative and sustainable modes of travel, and reducing single-occupant vehicle use.
Multi-Modal Level of Service (MMLOS)	Multi-Modal Level of Service (MMLOS) for the King-Bathurst TOC development has been reviewed under separate cover, in the report **Ontario Line King-Bathurst Station Transportation Impact Study (Ontario Line Technical Advisor, April 13, 2021)**, which was submitted as part of a Site Plan Review package for the proposed station – referred herein as the "Station SPR". The Station SPR study assessed the 2041 horizon year, which is 11 years beyond the horizon year assessed in this report. While the station related pedestrian traffic may continue to grow, the TOC related pedestrian traffic will remain relatively constant based on the ultimate development of the site, and the presence of the proposed station. An MMLOS analysis for the 2041 horizon year is included in that assessment and incorporates site traffic generated by the proposed TOC development and for all modes of travel. The MMLOS assessment in the Station SPR is based on the City of Ottawa MMLOS Method for analysis of the surrounding pedestrian and cycling infrastructure, as well as a pedestrian analysis based on Fruin Level of Service methodology for sidewalks and transit waiting areas within the study area. This TOC report does not duplicate the SPR analysis findings but includes a high level overview of the surrounding bicycle and pedestrian infrastructure. Please refer to the Station SPR report for detailed 2041 horizon year MMLOS assessment and Fruin level of service analysis of the study area, which includes the King-Bathurst TOC development.

1.2 Intersection Operations and Analysis Methodology

Intersection operations were assessed for the study area intersection using the software program Synchro Traffic Signal Coordination Software Version 10, which employs methodology from the **Highway Capacity Manual** (HCM 2000) published by the Transportation Research Board National Research Council. Synchro can analyze both signalized and unsignalized intersections in a road corridor or network, taking into account the spacing, interaction, queues and operations between intersections.

The signalized and unsignalized intersection analysis considers three separate measures of performance:

- The capacity of all intersection movements, represented by the volume to capacity (v/c) ratio;
- The level of service (LOS) for all intersection turning movements as well as for the overall intersection. The overall intersection LOS is based on the average control delay per vehicle (weighted) for the various movements through the intersection; and,
- The forecasted queue lengths (95^{th} percentile queue length) and storage requirements.

LOS 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. The volume to capacity (v/c) ratio is a measure of the degree of capacity utilized at an intersection. HCM definitions are summarized in **Table 1**.

Table 1: Highway Capacity Manual Level of Service Definitions

Level of Service (LOS)	Signalized Control Delay per Vehicle (s)	Unsignalized Control Delay per Vehicle (s)	Description
A	≤ 10	≤ 10	Ideal
B	> 10 and ≤ 20	> 10 and ≤ 15	Acceptable
C	> 20 and ≤ 35	> 15 and ≤ 25	Acceptable
D	> 35 and ≤ 55	> 25 and ≤ 35	Somewhat undesirable
E	> 55 and ≤ 80	> 35 and ≤ 50	Undesirable
F	> 80	> 50	Poor

The analysis undertaken in this study also follows the **City of Toronto Guidelines for Using Synchro 9 (Including SimTraffic 9[1])** (March 18, 2016), City of Toronto **'Guidelines for the Preparation of Transportation Impact Studies**', and City of Toronto **'Traffic Signal Operations Policies and Strategies**' (May 2015)[2].

[1] https://www.toronto.ca/wp-content/uploads/2017/11/99bc-0_2016-04-28_Guidelines-for-Using-Synchro-9-Including-SimTraffic-9_Final-a.pdf
[2] https://www.toronto.ca/wp-content/uploads/2017/11/91d6-0_2015-11-13_Traffic-Signal-Operations-Policies-and-Strategies_Final-a.pdf

2 Existing Conditions

2.1 Site Context

As shown in **Figure 1,** the study sites are bound by Adelaide Street West to the north and Stewart Street West to the south, with King Street West running east-west between the two sites. Both sites are located on the east side of Bathurst Street.

The site is situated in an area with good surface transit service along both King Street West and Bathurst Street in the form of surface transit streetcars. Streetcars along Bathurst operate in a dedicated right-of-way. The nearest existing subway station is St. Andrew Station, approximately 1.5 kilometres to the east, and the future King-Bathurst station will be located under both sites, with direct access. Bathurst Subway station is located 2.5 kilometres to the north and directly served by streetcars along Bathurst Avenue. The sites are currently occupied by mixed uses which include ground floor eating establishments. The area is generally mixed-use and there are many amenities in the area that will support both residential and employment uses within this mixed-use downtown city-centre core, urbanized environment.

2.2 Existing Road Network

The existing study intersection is shown in **Figure 2**, including existing traffic controls and lane configurations. Both study roadways are under the jurisdiction of the City of Toronto.

The site is well-served by the surrounding road network with direct access to all bounding streets. The existing road network is described below:

King Street W

King Street is a two-way east-west major arterial street with a speed limit of 40 km/h. It has a four-lane cross section, with sidewalks on both sides of the street. There is on-street parking available adjacent to eastbound traffic along the east leg of the study area intersection. There is a westbound streetcar stop located on the sidewalk directly in front of the North Site on the east leg of the intersection, while the eastbound streetcar stop is located on the southern sidewalk on the east leg of the intersection.

Bathurst Street

Bathurst Street is a two-way north-south major arterial street with a speed limit of 40 km/h. It has a four-lane cross section with additional turn lanes at the study area intersection. Streetcars operate in a dedicated right-of-way and passenger waiting areas are also located within the median and in the form of far-side stops. On-street paid parallel parking is provided along Bathurst Street south of King Street.

Adelaide Street W

Adelaide Street is a one-way eastbound major arterial street that runs directly to the north of the North Site and provides access to the rear of the buildings facing King Street. Bulwer Street also provides primary access to some buildings on the north side of the street, such as the Factory Theatre.

Stewart Street

Stewart Street is a one-way eastbound local road to the south of South Site and provides access to the rear of the buildings facing King Street.

There are several turn prohibitions at the intersection of King Street and Bathurst Street, particularly in the east-west directions where through-traffic is not permitted and all vehicles with the exception of permitted transit vehicles or taxis (between 10PM and 5AM) must turn right or left onto Bathurst Street. Only TTC vehicles are permitted to perform the westbound left-turn. Northbound and southbound left-turns are also prohibited during peak periods.

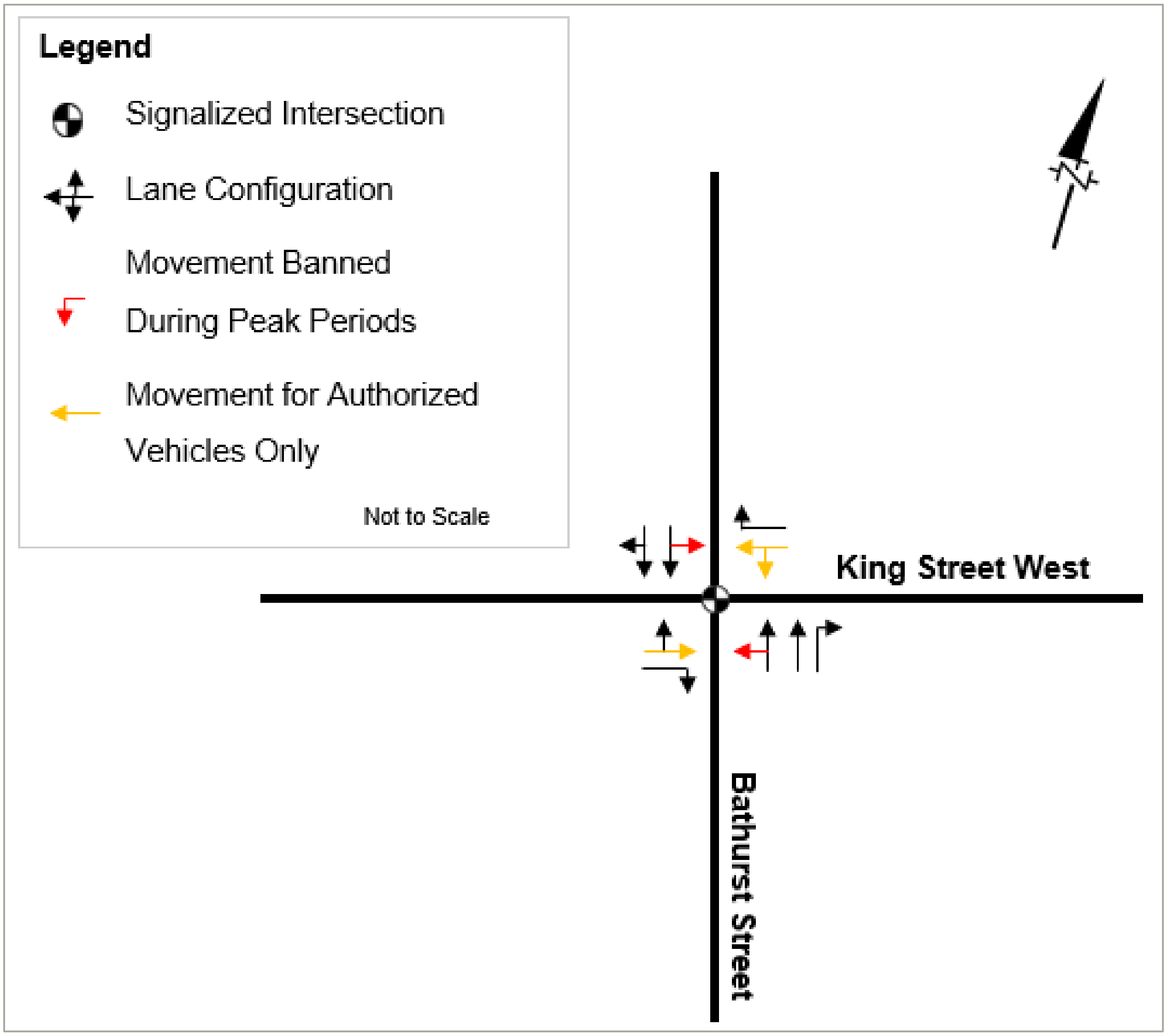


Figure 2: Existing Lane Configuration and Traffic Control

2.3 Existing Transit Services

The TTC operates streetcar services along both roadways of King Street and Bathurst Street. The surface transit routes provide direct access to the Toronto Subway System, Line 1 (Yonge-University-Spadina) at St. Andrew Station, as well as Line 2 (Bloor) at Bathurst Station. Existing transit services are summarized in **Table 2**, and an excerpt from the TTC system map is also shown in **Figure 3**.

Regional Rail service is proved by GO Transit and can be accessed from Union Station, which is approximately 2 kilometres walking distance to the south-east, or alternatively accessible via subway directly, with connections from streetcars. Union Station is also the terminal stop for the Union-Pearson (UP) Express rail, which provides a 15-minute travel time from downtown to Pearson Airport. The UP Express also has intermediate stops at Bloor Street and Weston Road. Overall, the study area has excellent transit coverage.

Table 2: Transit Service Summary

Route #	Route Name	Route Description	Peak Hour Headways	Nearest Stops & Walking Distance
145	Downtown / Humber Bay Express	Express route to downtown not available due to COVID	N/A	Bathurst & King
304	King	Night route that operates between Dundas West Station and Queen Street West	30 minutes	King & Bathurst (0m)
504	King	Operates between Dundas West Station and Queen Street West	<10 minutes	King & Bathurst (0m)
511	Bathurst	Operates between Bathurst Station on Subway Line 2 and Exhibition Loop	<10 minutes	King & Bathurst (0m)
GO	Barrie Line	Operates between Union Station and Allandale Waterfront	30 minutes	Union Station (2 km)
	Stouffville Line	Operates between Union Station and Lincolnville	30 minutes	
	Lakeshore East Line	Operates between Union Station and Bowmanville		
	Lakeshore West Line	Operates between Union Station and Niagra Falls		
	Richmond Hill Line	Operates between Union Station and Bloomington		
	Kitchener Line	Operates between Union Station and Kitchener		
	Milton Line	Operates between Union Station and Milton Yard		
UPE	Union Pearson Express	Operates between Union Station and Pearson Station	15 minutes	Union Station (2 km)

Note: Some express routes may have variable headways greater than 10 minutes. Express routes skip minor stops.

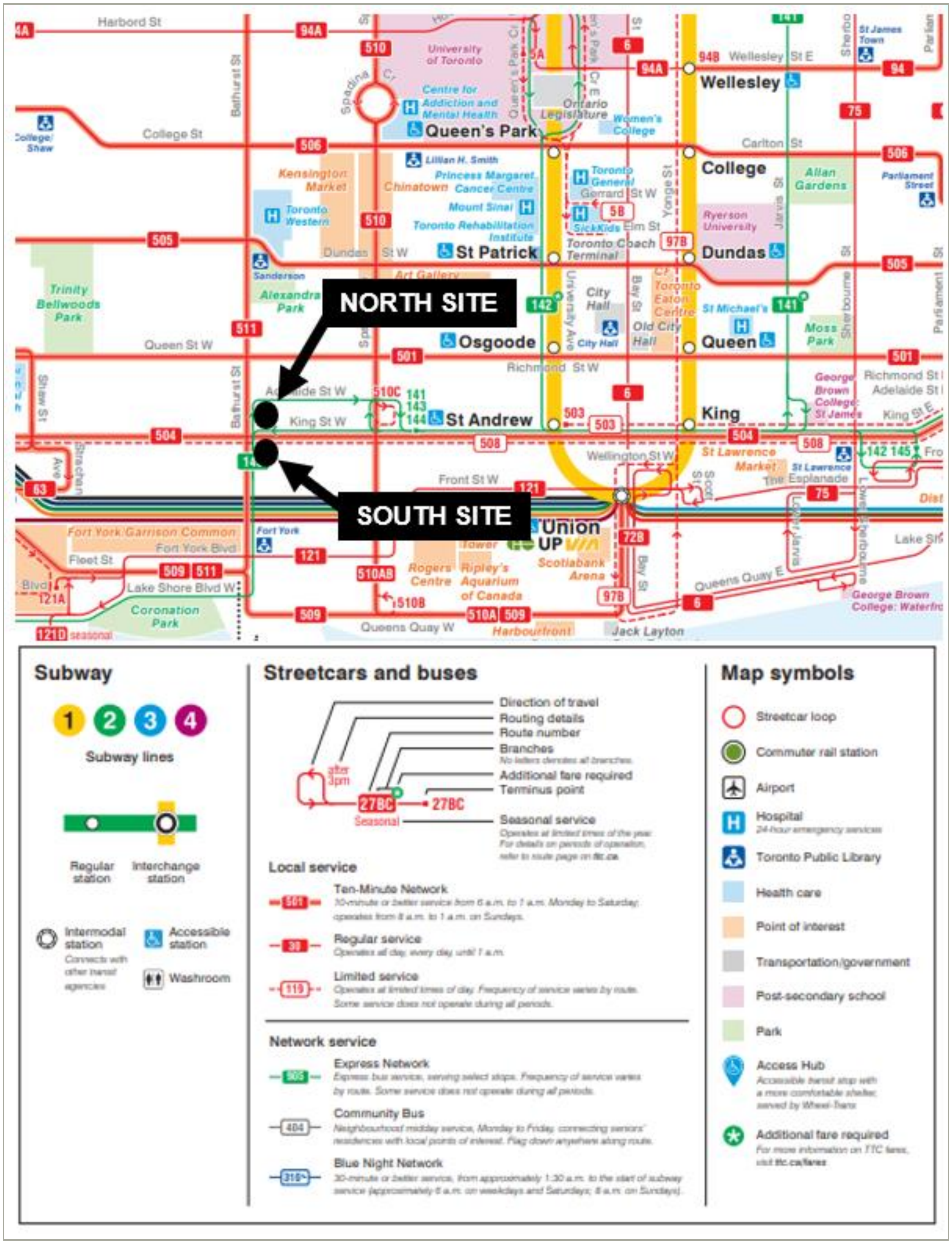


Figure 3: Existing Transit Services

2.4 Existing Cycling and Pedestrian Facilities

The site has good pedestrian connectivity in terms of sidewalks, paths, and pedestrian crossings. Both King Street West and Bathurst Street have sidewalks on both sides. Ladder crosswalks are also provided on all legs of the signalized study area intersection.

Dedicated bicycle infrastructure is not provided directly on King Street or Bathurst Street, but there are separated bicycle lanes on Wellington Street West in the westbound direction (Wellington Street is one-way only) and there are separated bicycle lanes in the eastbound direction on Adelaide Street (Adelaide Street is one-way only). Overall, this does provide the site with good bicycle infrastructure access. Bicycle lanes on Wellington Street and Adelaide Street are shown in **Figure 4**.

Figure 4: Bicycle lanes on Wellington Street (left) and Adelaide Street (right)

The existing active transportation network is depicted in **Figure 6**. Generally, the sidewalks in the study area are 1.8m wide or wider, but due to objects such as power poles, traffic signals, waste bins and street trees, the clear pedestrian zone is narrower in various locations, as illustrated in **Figure 5**. Bicycle parking in the form of parking racks or "rings" are provided by the City along King Street and Bathurst Street, along the sidewalk.

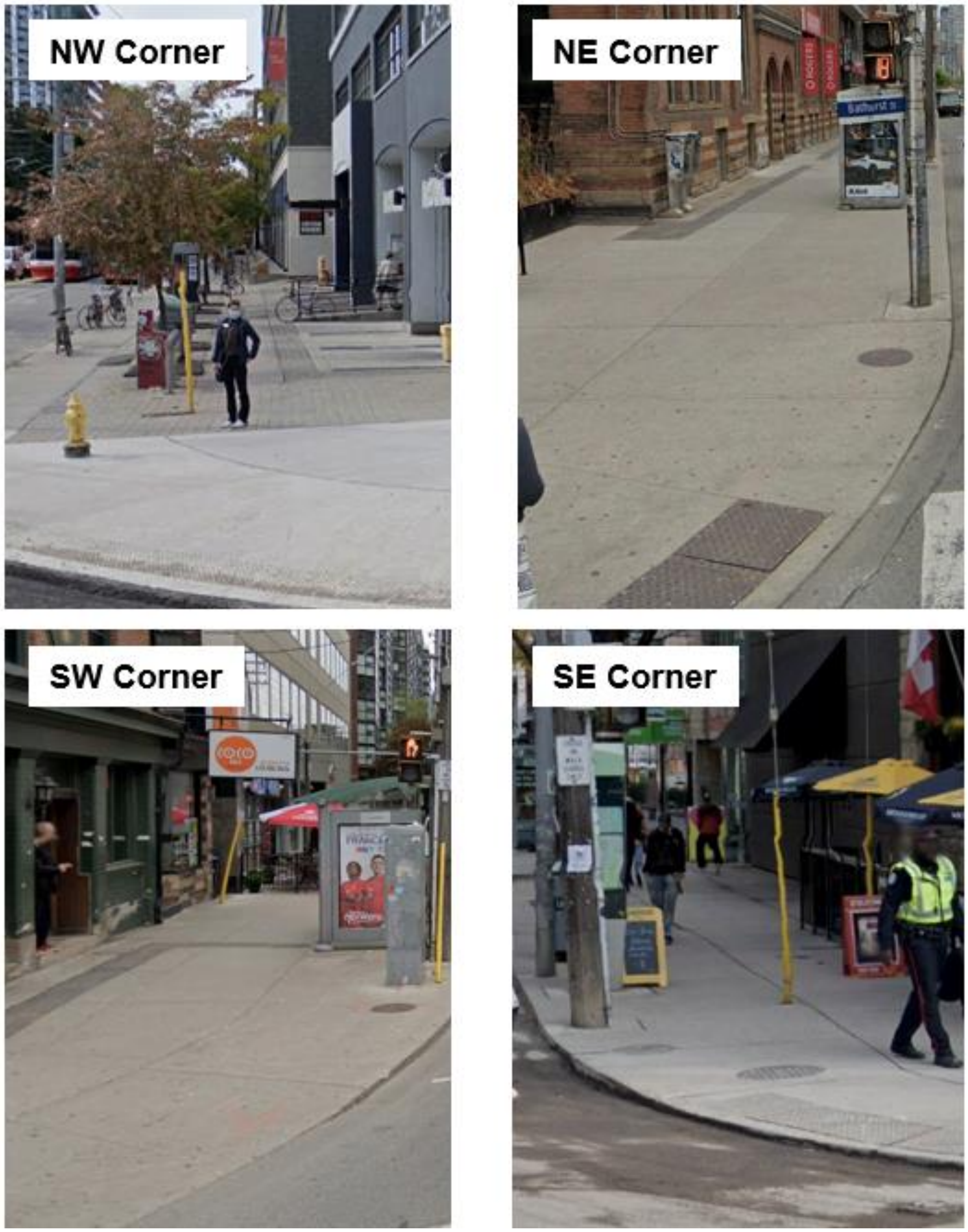


Figure 5: Pedestrian Realm at Bathurst Street and King Street (all 4 quadrants)

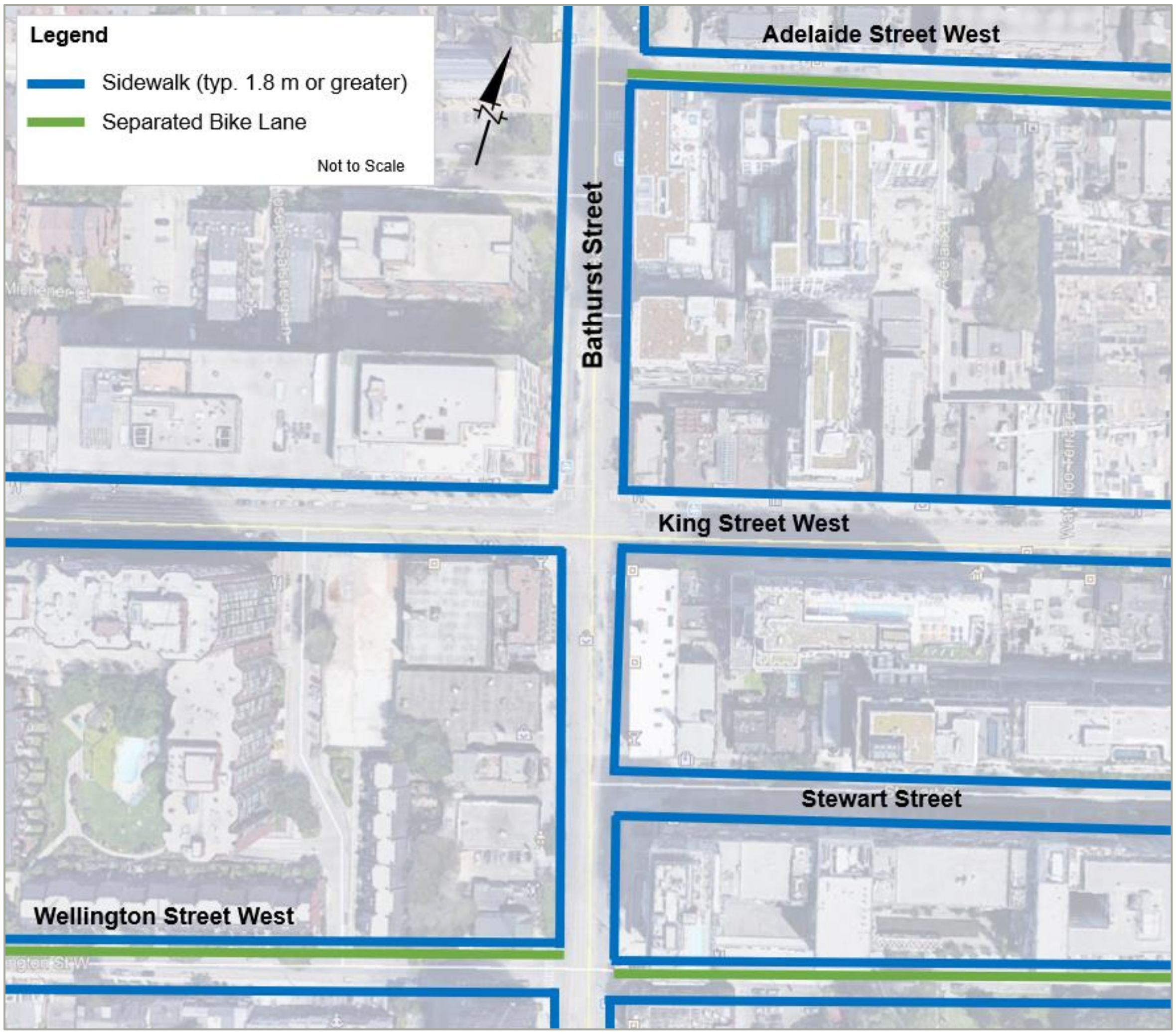


Figure 6: Active Transportation Network

2.5 Active Transportation MMLOS

A multi-modal infrastructure analysis was completed for the area within 400m of the proposed TOC. The assessment was completed using the City of Ottawa's Multi-Modal Level of Service (MMLOS) Methodology[3]. **Figure 7** and **Figure 8** show the MMLOS for walking and cycling. Due to the scope of this study and data availability, the following items are noted:

- Existing facility widths were estimated based on aerial photography (Google) for segments;
- Intersection delays for pedestrians were estimated based on estimated cycle lengths and walk times; and,
- Transit LOS for intersections was not calculated as intersection operation and delays were not assessed for the intersections.

[3] Multi-Modal Level of Service (MMLOS) Guidelines, City of Ottawa, https://app05.ottawa.ca/sirepub/cache/2/csqkiwq23jjanozog31sg3r1/31504601272021034735933.PDF

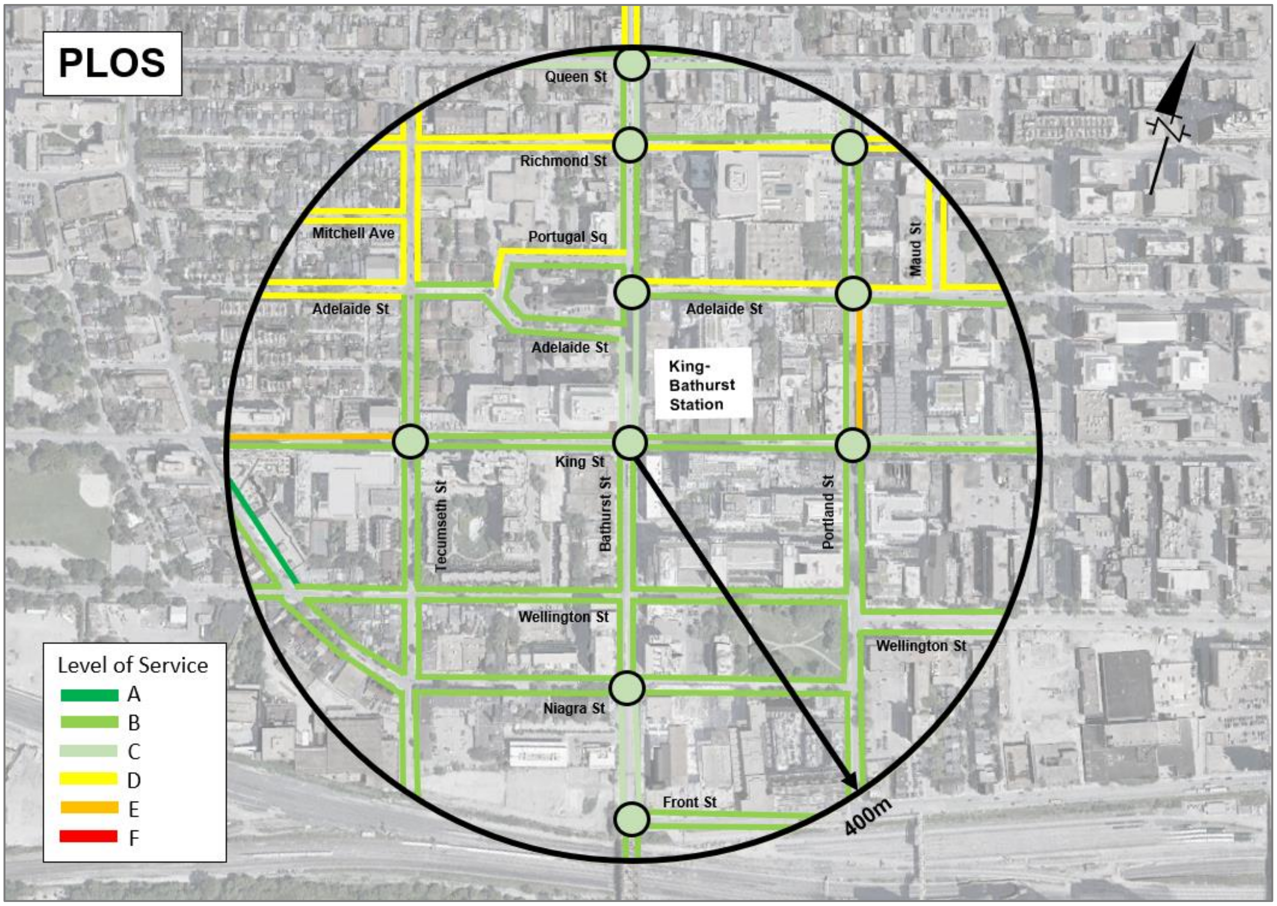


Figure 7: Pedestrian Level of Service Analysis (PLOS)

The pedestrian network within 400m of the proposed TOC is generally complete, with no significant gaps. Level of Service is generally 'D' or better, except for a portion of King Street and Portland Street, primarily due to narrow sidewalks, no boulevards or on-street parking, and high traffic volumes in the curbside lane.

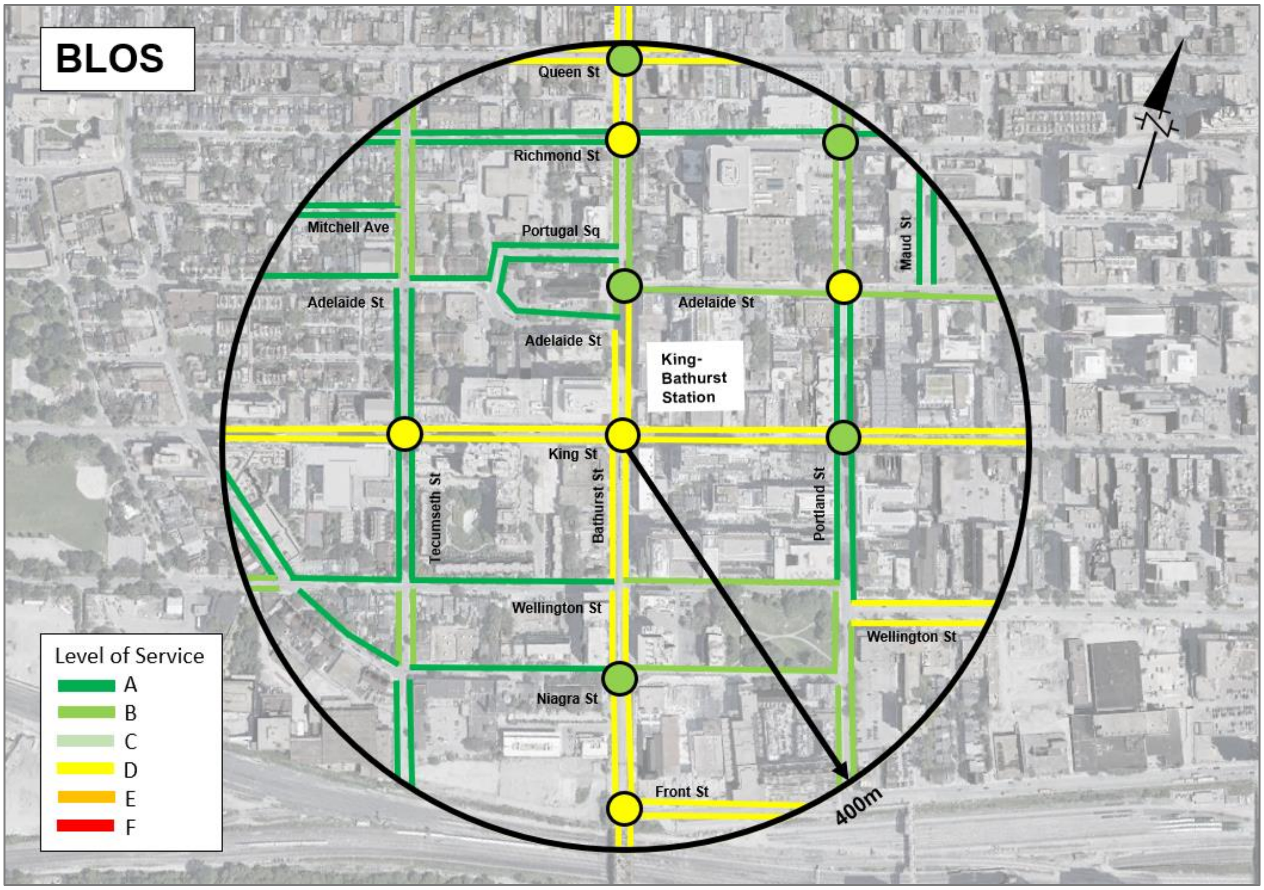


Figure 8: Bicycle Level of Service Analysis (BLOS)

The cycling network within 400m of the proposed TOC is somewhat limited with dedicated facilities provided on portions of Richmond Street, Bathurst Street, Adelaide Street, and Wellington Street.

2.6 Existing Traffic Volumes

Available traffic data for the intersection of King Street West and Bathurst Street was captured on July 3rd, 2014. The 2014 count pre-dates the conversion of King Street to a transit priority corridor. The count does separate traffic volumes by regular vehicles, trucks, and transit vehicles. The count data was therefore adjusted to reflect the conversion of King Street to a transit priority network by removing regular traffic volumes for movements that are no longer permitted. For example, the only east-west through volumes that were retained were transit volumes, and all regular vehicle and truck volumes were removed from these movements. The same adjustments were applied to the northbound left-turn, southbound left-turn, and westbound left-turn traffic volumes. Heavy vehicle percentages were recalculated according to the removal of regular vehicle traffic resulting from the conversion of King Street to a transit priority corridor, including adjusting the heavy vehicle percentage of transit-only vehicle movements to 100%.

Ideally, a new traffic count would be acquired which would capture these diversions without the overlapping impacts of Covid-19, thus eliminating the need for these adjustments to the available traffic data. Since the diversions are outside of the study area and a new count would capture the local impacts at the study intersection of King Street and Bathurst Street, the diversions were not tested outside of the study area intersection.

To be conservative, counts were grown by an annual growth factor of 0.5% to reach existing 2020 volumes. Peak hour volumes were used for analysis. **Appendix A** shows the existing traffic volumes at the study area intersection.

The impact of streetcars were incorporated into the analysis by reducing the King Street and Bathurst Street ideal saturated flow rates from the default 1,900 vehicles per hour (vphpl) to 1,250, based on the impact that streetcars were found to have on existing capacity/operations near the proposed Queen Street Ontario Line Station. This effectively reduces the capacity of the lanes by 33% and is considered a conservative estimate of the actual traffic capacity loss associated with the streetcar. Additionally, the lost time was adjusted from the default value of -1 second to -2 seconds to account for higher volume of streetcars and slower acceleration. These adjustments should result in a reasonable representation of the capacity at the study intersection.

2.7 Existing Traffic Operations

Based on the existing traffic volumes shown in **Appendix A** and the existing road network illustrated in **Figure 2**, intersection operations were assessed using the Synchro 9 traffic analysis software. Existing signal timings are provided in **Appendix B**.

Table 3 summarizes the level-of-service (LOS), volume/capacity ratio (v/c ratio), and 95th percentile queue for each movement under existing conditions using HCM 2000. Detailed Synchro results and reports for all study area intersections are provided in **Appendix C**.

Table 3: Existing Conditions – Summary of Traffic Analysis Results

Intersection and Movement		Lanes	Storage (m)	AM Peak Hour			PM Peak Hour		
				LOS	v/c	95th Q (m)	LOS	v/c	95th Q (m)
King St & Bathurst St		-	-	**D**	**0.84**	-	**F**	**1.13**	-
Eastbound	Through-Left	1	-	D	0.74	52	**F**	**1.00**	87
	Right	1	-	B	0.12	9	B	0.26	18
Westbound	Through-Left	1	-	C	0.22	12	C	0.23	13
	Right	1	-	C	0.06	2	C	0.37	26
Northbound	Through-Left	2	-	D	**0.95**	106	E	**1.06**	124
	Right	1	-	C	0.36	31	B	0.36	22
Southbound	Thru-Left + Thru-Right	1	-	E	**0.98**	93	**F**	**1.40**	160

Note: LOS = level of service; v/c = volume to capacity ratio; Critical movements are highlighted in **red** as defined by the City's TIS Guidelines. Movements approaching critical operations are highlighted **yellow**. 95th percentile queue values highlighted in **blue** indicated that the queue extends past the available storage length.

Under existing traffic conditions, the signalized study intersection operates at a level of service 'D' during the AM peak hour and 'F' during the PM peak hour. During the AM peak hour most movements are operating at level of service 'D' or better and with v/c ratios less than 0.74 – however, the northbound through-left movement and the southbound approach are operating near capacity. During the PM peak hour, the same movements are operating at level of service 'E' or 'F' and at capacity, and the eastbound through-left is also operating at capacity with level of service 'F'.

Critical movements are defined as shared through/turning movements with v/c ratios greater than 0.85, or exclusive turning movements with v/c ratios greater than 1.00 based on the City's TIS guidelines. Level of service 'E' requires monitoring, and level of service 'F' is unacceptable. The critical movements under existing conditions at King Street and Bathurst Street are:

- AM Peak Hour
  - Northbound Through-left: v/c ratio of 0.95; LOS D
  - Southbound Approach: v/c ratio of 0.98; LOS E
- PM Peak Hour
  - Eastbound Through-left: v/c ratio of 1.00; LOS F
  - Northbound Through-left: v/c ratio of 1.06; LOS E
  - Southbound approach: v/c ratio of 1.40, LOS F

3 Background Traffic Conditions

3.1 Planned Roadway Improvements

Based on the City of Toronto's Ongoing Infrastructure & Construction Projects[4] , there are no planned network changes proposed within the study area. The assumed 2030 future road network lane configurations are shown in **Figure 2**.

3.2 Background Traffic Volumes

Background traffic volumes are comprised of existing traffic volumes plus general background traffic growth, plus traffic associated with nearby developments and the Ontario Line King-Bathurst Station.

3.2.1 Background Developments

As part of the analysis, nearby background developments of the study were reviewed and accounted for in the traffic forecasting process. As shown in **Figure 9**, a total of 35 development applications were found within a 250 metre radius of the study sites.

[4] https://www.toronto.ca/community-people/get-involved/public-consultations/infrastructure-projects/

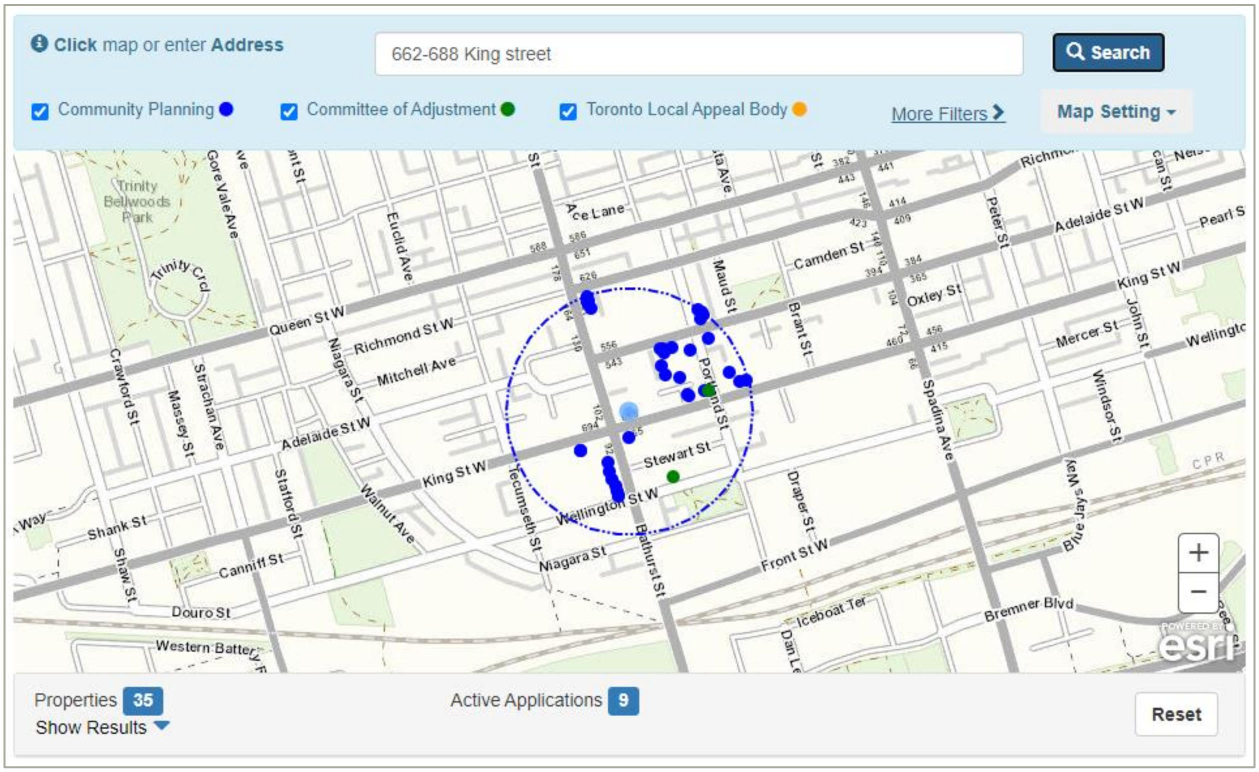


Figure 9: Adjacent Background Developments for Consideration

Of these applications, only a small portion had TIS reports available in the supporting documentation. The TIS for most of these adjacent developments reported insignificant trip generation and did not provide any trip assignment figures. However, there were two development locations that provided volume diagrams of site generated trip distributions. These locations were a hotel development at 689 King Street West and a mixed-use development at 663-665 King Street West and 69-73 Bathurst Street. The volume diagrams for these adjacent background developments are reported in **Appendix A**.

3.2.2 General Background Growth

A review of the historical traffic counts from various sources, including previous transportation studies, revealed that the magnitude of traffic volumes within the study area has been relatively stable, despite variations in traffic patterns. There may also be some movements that have experienced negative growth. A growth rate of 0.5% was applied to all movements to assess the worst-case growth conditions of all movements in the study area. However, this growth rate is not sustainable and, in our opinion, will overestimate future background traffic volumes for some traffic movements. General background traffic volumes are reported in **Appendix A.**

3.2.3 Ontario Line King-Bathurst Station Pedestrian Traffic

The King-Bathurst Station has been included as a layer of background growth, and walking and transit trips to/from the station were generated. A transfer trip matrix, shown in **Appendix D**, was used to assign pedestrian trips throughout the intersection. The generated pedestrian volumes used from this matrix were adjusted to the 2030 horizon year using a 1% per annum reverse growth rate from 2080 to 2030.

The pedestrian trips were assigned based on the anticipated origins and destinations from the broader area, partly influenced by rooftops and densities. Due to the streetcar stop locations, as well as the Ontario Line lobby locations, not all trips coming to and from the King-Bathurst station need to cross any legs of the intersection to complete their trip, so there was a portion of generated trips not distributed within the intersection. The pedestrian trips along each leg of the intersection are summarized in **Table 4**.

Table 4: King-Bathurst Station Pedestrian Trip Distribution

Peak Hour	Total Trips Produced To/From Station	Pedestrian Trip Assigned To				Total Pedestrians Crossing at King and Bathurst	% Trips not Crossing at King and Bathurst
		North Leg	East Leg	South Leg	West Leg		
AM/PM	5,820	851	1,253	537	448	3,089	47

The total 2030 background growth volumes, including the general background growth plus the adjacent development volumes and the Ontario Line Station trips, are reported in **Appendix A.**

3.3 Background Traffic Operations

Table 5 summarizes the LOS, v/c ratio, and 95th percentile queue for movements under future background conditions based on the forecast traffic volumes shown in **Appendix A**. Detailed Synchro results and reports for the study area intersection are provided in **Appendix C**.

Table 5: 2030 Background Conditions – Summary of Traffic Analysis Results

Intersection and Movement		Lanes	Storage (m)	AM Peak Hour			PM Peak Hour		
				LOS	v/c	95th Q (m)	LOS	v/c	95th Q (m)
King St & Bathurst St		-	-	F	1.58	-	F	1.62	-
Eastbound	Through-Left	1	-	E	0.89	66	F	1.12	94
	Right	1	-	B	0.21	13	B	0.33	21
Westbound	Through-Left	1	-	C	0.23	13	C	0.22	12
	Right	1	-	C	0.09	3	D	0.53	38
Northbound	Through-Left	2	-	E	1.00	115	F	1.18	137
	Right	1	-	F	2.30	64	F	2.34	58
Southbound	Thru-Left + Thru-Right	1	-	F	1.12	105	F	1.64	178

Note: LOS = level of service; v/c = volume to capacity ratio; Critical movements are highlighted in **red** as defined by the City's TIS Guidelines. Movements approaching critical operations are highlighted **yellow**. 95th percentile queue values highlighted in **blue** indicated that the queue extends past the available storage length.

Under 2030 background traffic conditions, the study intersection will operate at capacity and at a level of service 'F' during both peak hours. During both peak periods, the following movements are considered critical and/or at capacity.

The critical movements under background conditions at King Street and Bathurst Street are:

- AM Peak Hour
  - Eastbound Through-left: v/c ratio of 0.89; LOS E
  - Northbound Through-left: v/c ratio of 1.00; LOS E
  - Northbound Right-turn: v/c ratio of 2.30; LOS F
  - Southbound Approach: v/c ratio of 1.12; LOS F
- PM Peak Hour
  - Eastbound Through-left: v/c ratio of 1.12; LOS F
  - Northbound Through-left: v/c ratio of 1.18; LOS F
  - Northbound Right-turn: v/c ratio of 2.34; LOS F
  - Southbound Approach: v/c ratio of 1.64; LOS F

Operational impacts compared to existing conditions are primarily caused by the additional pedestrian crossing volume on the crosswalks which cause delays to vehicular traffic.

4 Proposed TOC Development

4.1 Conceptual Site Plan

The site statistics for both sites are reported in **Table 6** below and the conceptual ground floor plans for both sites is shown in **Figure 10**. The site traffic projections and the traffic analysis are based on slightly different development statistics, which generally represents higher unit numbers. The net impact is slightly higher trip generation. Transit GFA was not used for trip generation – rather, the transfer matrix discussed in **Section 3.2.3** was used directly.

Table 6: Site Plan Statistics

Proposal	Residential Units	Office Size	Transit
Development Concept Plan Statistics			
North Site	187 units	1,315 m^2 GFA	824 m^2 GFA
South Site	235 units	–	1366 m^2 GFA
Traffic Analysis Statistics			
North Site	185 units	1,445 m^2 (GFA	823 m^2 GFA
South Site	258 units	–	2661 m^2 GFA

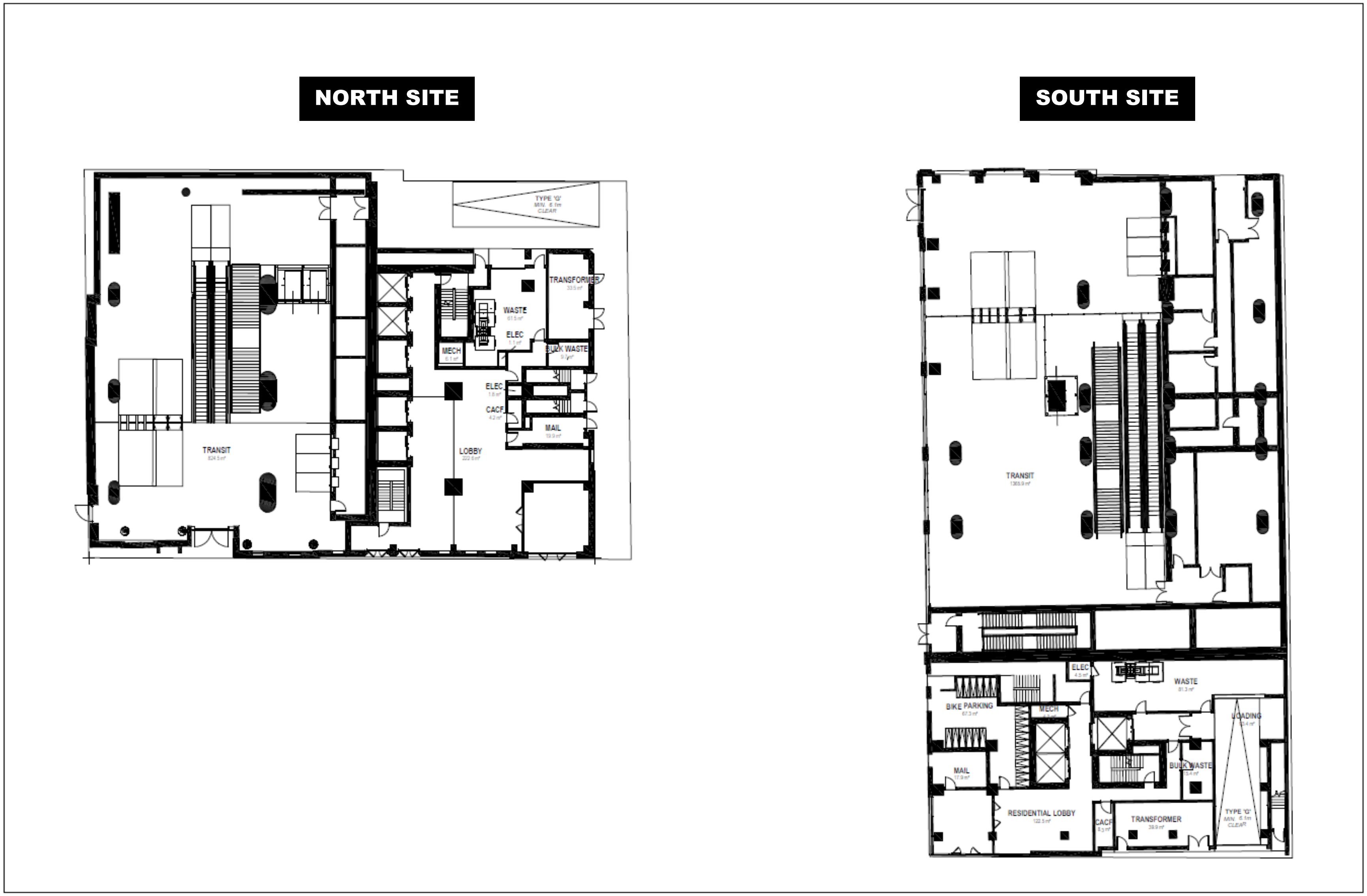


Figure 10: Conceptual Site Plan – Level 01 of North and South Sites (May 21, 2021)

4.2 Site Trip Generation

4.2.1 Mode Splits

The 2016 Transportation Tomorrow Survey (TTS) was used to inform the mode split assumptions for the development using existing information for nearby uses. The TTS is a survey of households within the Greater Golden Horseshoe including the Greater Toronto Area that summarizes travel patterns and other related transportation information that can be used to aid in planning, such as mode splits. The 2016 TTS divides geographical areas into 'zones' for the purposes of determining trip patterns from one zone to another.

The mode split for the area was obtained through a review of TTS (2006) Zones 65-67, 76-78, 90-91, which are the zones surrounding the subject site. The existing mode splits are reported in **Table 7**.

As the AM Outbound and PM Inbound were very similar and make up the largest share of total trips that will be generated by the TOC, the average of AM outbound and PM inbound mode splits were used for all trips.

Additionally, it is assumed that there will be no auto driver trips (0% auto drive mode share) since the proposed sites will have no available parking. The Auto Driver trips were shifted to other mode shares using the proportional share of other modes from existing conditions. The proposed mode splits are summarized in **Table 8**.

Table 7: Existing Mode Splits (2016 Transportation Tomorrow Survey)

Mode	Existing (TTS)			
	AM (In)	AM (Out)	PM (In)	PM (Out)
Transit	54%	22%	26%	50%
Walking	15%	44%	38%	17%
Cycling	7%	7%	6%	7%
Auto Passenger / Taxi / Rideshare	4%	7%	8%	5%
Auto Driver	20%	22%	22%	20%
Total	100%	100%	100%	100%

Should future residents decide to own a vehicle, they will have to park their vehicle at a nearby public or private parking lot.

Table 8: Modified and Proposed Mode Splits (2016 Transportation Tomorrow Survey)

Mode	Modified (TTS)				Proposed
	AM (In)	AM (Out)	PM (In)	PM (Out)	AM (Out) / PM (In)
Transit	68%	28%	33%	63%	30%
Walking	19%	56%	49%	22%	52%
Cycling	9%	9%	8%	9%	8%
Auto Passenger / Taxi / Rideshare	4%	8%	10%	6%	9%
Auto Driver	0%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%

Should future residents decide to own a vehicle, they will have to park their vehicle at a nearby public or private parking lot.

4.2.2 Person-Trip Generation

Trips were generated for the proposed development using the information provided in the Institute of Transportation Engineers (ITE) Trip Generation Informational Report (10th edition). Trip generation rates for Land Use 222 (Multifamily Housing – High-Rise) and Land Use 710 (General Office Building) were used.

The land use assumes dense multi-use conditions for Land Use 222, and general urban/suburban conditions were used for the other land uses as a dense multi-use category was not available.

Table 9 shows the ITE trip generation rates used for each site's land use, and it includes estimated person trips per vehicle trip. The purpose of generating person trips rather than vehicle trips was to be able to assign pedestrian, cycling and transit trips to the study network. It is assumed that there will be an increase in the rideshare mode, which includes services like Uber, Lyft as well as taxi service. **Table 10** and **Table 11** show the resulting trip generation by mode for the North and South, respectively.

Table 9: ITE Trip Generation Rates

Land Use	ITE LUC	Peak Hour	ITE Average Vehicle Trip Rate	Equation*	Entering	Exiting	Person Trips per Vehicle Trip
Residential	222 Multi-family High Rise	AM	0.21	Ln(T) = 0.84 Ln(X) - 0.65	12%	88%	2.81
		PM	0.19	Ln(T) = 0.81 Ln(X) - 0.60	70%	30%	2.17
Office	710 General Office Building	AM	0.83	T = 0.72(X) + 21.64	86%	14%	1.47
		PM	0.87	T = 0.83(X) + 7.99	17%	83%	1.46

Note: The trip generation equation was only used for Residential Land Use, for all other land uses, the total person trips were calculated by multiplying the ITE vehicle trip rate by the person trips per vehicle value to get total person trips

Table 10: North Site Person Trip Generation by Mode

Land Use	AM Peak Hour			PM Peak Hour		
	Total	In	Out	Total	In	Out
Residential – LUC 230 Multifamily High Rise						
Total	**118**	**14**	**104**	**82**	**57**	**25**
Transit	36	4	31	25	17	7
Walking	61	7	54	43	30	13
Cycling	10	1	9	7	5	2
Auto Passenger	11	1	10	8	5	2
Auto Driver	0	0	0	0	0	0
Office – LUC 710 General Office Building						
Total	**48**	**42**	**7**	**31**	**5**	**25**
Transit	15	13	2	9	2	8
Walking	25	22	4	16	3	13
Cycling	4	3	1	3	0	2
Auto Passenger	4	4	1	3	0	2
Auto Driver	0	0	0	0	0	0
Site Total						
Total	**166**	**56**	**110**	**112**	**62**	**50**
Transit	50	17	34	34	19	15
Walking	87	29	58	59	33	26
Cycling	14	5	9	9	5	4
Auto Passenger	15	5	10	10	6	5
Auto Driver	0	0	0	0	0	0

Table 11: South Site Person Trip Generation by Mode

Land Use	AM Peak Hour			PM Peak Hour		
	Total	In	Out	Total	In	Out
Residential – LUC 230 Multifamily High Rise						
Total	**156**	**19**	**137**	**107**	**75**	**32**
Transit	47	6	42	32	23	10
Walking	81	10	71	56	39	17
Cycling	13	2	11	9	6	3
Auto Passenger	14	2	13	10	7	3
Auto Driver	0	0	0	0	0	0
Site Total						
Total	**156**	**19**	**137**	**107**	**75**	**32**
Transit	47	6	42	32	23	10
Walking	81	10	71	56	39	17
Cycling	13	2	11	9	6	3
Auto Passenger	14	2	13	10	7	3
Auto Driver	0	0	0	0	0	0

4.3 Site Traffic Distribution and Assignment

Future trip distribution was estimated using the information from the 2016 TTS. The trip distribution for the site was based on the existing distribution to TTS zones (TTS 2006 Zones 65-67, 76-78, 90-91). Trips were distributed based on each mode of transportation for AM Inbound, AM Outbound, PM Inbound, and PM Outbound trips. These mode distributions are shown in **Table 12**.

Table 12: Assumed Person Trip Distribution – North and South Sites

Mode	Time Period / Direction	Direction				
		North	East	South	West	Total
Walk	AM (In)	10%	39%	23%	27%	100%
	AM (Out)	10%	87%	0%	4%	100%
	PM (In)	11%	82%	0%	8%	100%
	PM (Out)	9%	57%	16%	18%	100%
Cycle	AM (In)	29%	34%	0%	37%	100%
	AM (Out)	28%	36%	0%	36%	100%
	PM (In)	19%	58%	0%	23%	100%
	PM (Out)	21%	47%	3%	29%	100%
Transit (Walk)	AM (In)	37%	36%	0%	27%	100%
	AM (Out)	35%	50%	0%	15%	100%
	PM (In)	42%	35%	3%	19%	100%
	PM (Out)	39%	36%	0%	25%	100%
Auto	AM (In)	43%	24%	0%	32%	100%
	AM (Out)	34%	22%	0%	44%	100%
	PM (In)	36%	24%	3%	36%	100%
	PM (Out)	42%	28%	1%	29%	100%

The transit trips were further divided into predicted Ontario Line trips and surface-level transit trips. Since both sites have direct access to the Ontario Line station, these transit walking trips were not assigned to the surface-level pedestrian network and crosswalks at the intersection of King Street and Bathurst Street as they will not need to exit the building and cross at the intersection to access Ontario Line.

For simplicity, 75% of transit walking trips were assigned to the Ontario Line station and 25% of the transit walking trips were assigned to surface-level transit. All vehicle trips (pick-up/drop-off and rideshare) were assigned as pass-by trips such that they reflected an inbound and outbound trip that would pick-up or drop-off along King Street or Bathurst Street directly. These trips were assigned according to existing traffic patterns.

It should also be noted that some of the walk-in transit trips to and from Ontario Line will include trips from the TOC. This overlap has not been accounted for as this will result in a slightly conservative estimate of future pedestrian trips due to the double counting of TOC trips. However, the TOC trips account for only up to 100 two-way trips during any of the peak periods, and are marginal compared to the total number of pedestrian trips generated by Ontario Line.

The total new site trips and total traffic volumes, comprised of the future background traffic plus site volumes, are shown in **Appendix A**.

5 Future Total Traffic Conditions with TOC

Table 13 summarizes the future total traffic operations at the study area intersection. Although little to no residential vehicle trips will be generated by the TOC, it was still important to assess the key study area intersection as there will be increased pedestrian traffic crossing all approaches of the intersection. Signal timing split optimization was performed to the model and there were no geometric improvements assumed. Synchro results and reports for the intersection are provided in **Appendix C**.

Table 13: 2030 Total Traffic Conditions – Summary of Traffic Analysis Results

Intersection and Movement		Lanes	Storage (m)	AM Peak Hour			PM Peak Hour		
				LOS	v/c	95th Q (m)	LOS	v/c	95th Q (m)
King St & Bathurst St		**-**	**-**	**F**	**1.61**	**-**	**F**	**1.64**	**-**
Eastbound	Through-Left	1	-	E	**0.89**	67	**F**	**1.12**	94
	Right	1	-	B	0.26	16	B	0.36	23
Westbound	Through-Left	1	-	C	0.23	13	C	0.22	12
	Right	1	-	C	0.12	6	D	0.58	41
Northbound	Through-Left	2	-	E	**1.00**	115	**F**	**1.18**	137
	Right	1	-	**F**	**2.38**	66	**F**	**2.37**	59
Southbound	Thru-Left + Thru-Right	1	-	**F**	**1.13**	106	**F**	**1.64**	179

Note: LOS = level of service; v/c = volume to capacity ratio; Critical movements are highlighted in **red** as defined by the City's TIS Guidelines. Movements approaching critical operations are highlighted **yellow**. 95th percentile queue values highlighted in **blue** indicated that the queue extends past the available storage length.

Consistent with 2030 background conditions, under 2030 total traffic conditions, the study intersection will operate at capacity and at a level of service 'F' during both peak hours. During both peak periods, the following movements are considered critical and/or at capacity. The critical movements under total conditions at King Street and Bathurst Street are:

- AM Peak Hour
  - Eastbound Through-left: v/c ratio of 0.89; LOS E
  - Northbound Through-left: v/c ratio of 1.00; LOS E
  - Northbound Right-turn: v/c ratio of 2.38; LOS F
  - Southbound Approach: v/c ratio of 1.13; LOS F
- PM Peak Hour
  - Eastbound Through-left: v/c ratio of 1.12; LOS F
  - Northbound Through-left: v/c ratio of 1.18; LOS F
  - Northbound Right-turn: v/c ratio of 2.37; LOS F
  - Southbound Approach: v/c ratio of 1.64; LOS F

Compared to background conditions the impacts are very minor, which demonstrates that the TOC will have minimal impacts on the intersection operations. The majority of impacts at the study intersection will be a result of station generated traffic under background traffic conditions. The northbound-right turn movement is the primary movement experiencing delays and congestion, while some other movements are operating at capacity but with v/c ratios in the range of 1.00 to 1.18 which indicates that there will be some multi-cycle queues. It is possible that drivers will divert to other routes to avoid northbound right-turn delays at the intersection, in which case all traffic movements will benefit.

Additionally, and as discussed in **Section 2.6**, the traffic data represents patterns and magnitude of volumes from before King Street was converted to a transit priority corridor. The turning movement count data was adjusted to account for this change, but it is likely to continue to overstate the northbound right-turn demand since many vehicles that previously used King Street as a commuter route may have diverted to other routes. A sensitivity analysis was performed to determine the diversion that would result in the northbound right-turn operating at capacity during both peak periods. Northbound right-turning traffic may continue to travel northbound through the intersection, northerly to Adelaide Street West where they will then turn to the east and continue eastbound. This may reduce the overall delay but will still result in the northbound through movement operating at capacity and with multi-cycle queues. Alternatively, drivers could divert earlier and use alternatives such as Front Street.

The northbound right-turn volume under total traffic conditions is 167 vehicles during the AM peak hour and 141 vehicles during the PM peak hour. During the AM peak period a diversion of 70 vehicles (reducing the northbound right-turn volume to 97 vehicles), results in a v/c ratio of 1.01. Similarly, during the PM peak period a diversion of 60 vehicles (reducing the northbound right-turn volume to 81 vehicles), results in a v/c ratio of 0.88. These are minor diversions and may be represented in the current traffic patterns but would require a new count to confirm.

The southbound approach is also operating with a v/c ratio of 1.64 during the PM peak period which is also largely affected by the crossing volume on the east leg as a result of the station.

6 Parking and Loading Assessment

This section of the report reviews the proposed parking supply and the requirements of the new City-wide Zoning By-law 569-2013, as amended (Office Consolidation) Version Date: May 1, 2020. The by-law includes specific requirements for parking (bicycle and vehicle) as well as loading.

6.1 Policy Area Designations and Parking Requirements

The current city-wide Zoning By-law 569-2013 is typically applied to new developments throughout the City. The By-law includes multiple sets of vehicle parking rates with diminishing requirements for some areas that have better transit accessibility. King and Bathurst TOC site falls under Policy Area 1, as shown in **Figure 11**, and this area has some of the lowest rates.

According to By-law No. 569-2013, within Bicycle Zone 1, if bicycle parking is provided in excess of the required minimums, then the minimum vehicle parking requirements can be reduced by 1 vehicle space for every 5 bicycle parking spaces provided beyond the minimum, to a maximum of 20% of the required minimum vehicle parking. The subject site is located in Bicycle Zone 1, which is defined as the area of the City bounded by the Humber River on the west, Lawrence Avenue on the north, Victoria Park Avenue on the east and Lake Ontario on the south.

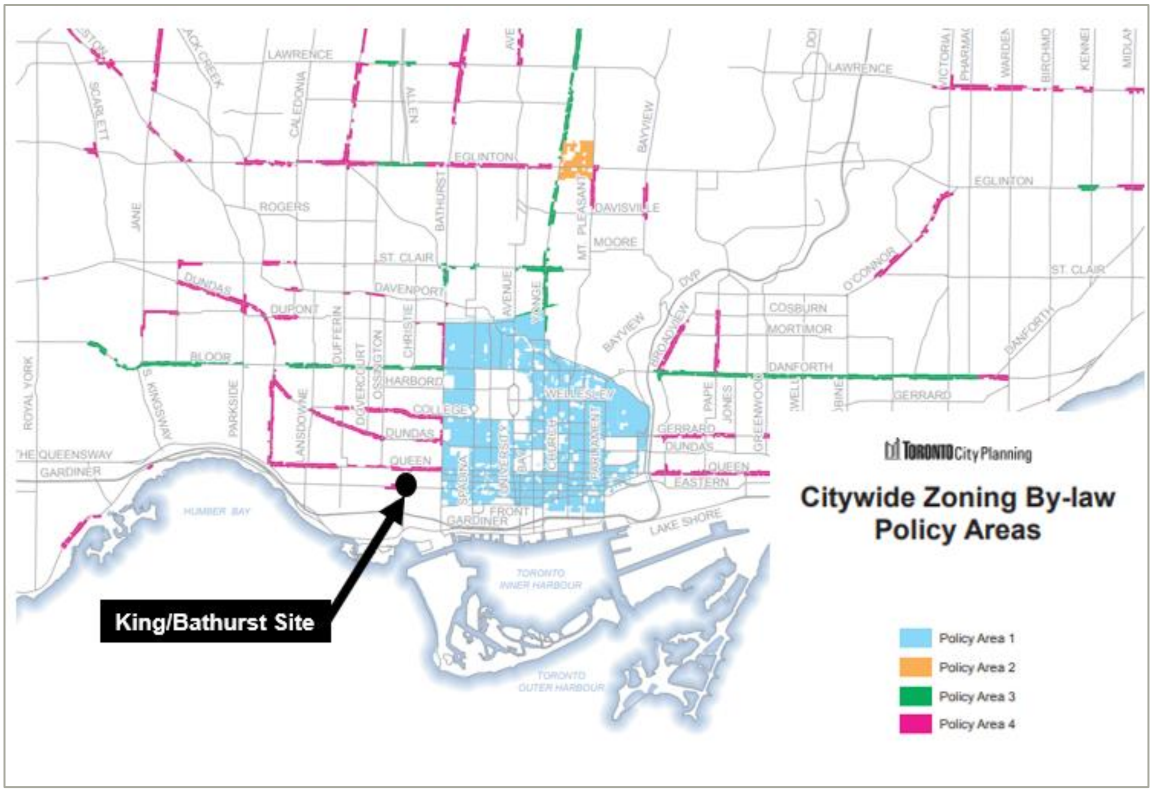


Figure 11: City of Toronto Policy Areas [5]

6.2 Vehicle Parking Requirements

Vehicle parking requirements were reviewed using By-law 569-2013, and the requirements are shown in **Table 14** and **Table 15** for the North and South Sites, respectively.

Table 14: Vehicle Parking Zoning By-law Requirements – North Site

Building	Land Use	Size (Unit or SM)	By-law No. 569-2013 (PA1)	
			Rate	# Spaces Req.
North Site	Bachelor	21 units	0.3 / unit	6
	1-bed	84 units	0.5 / unit	42
	2-bed	62 units	0.8 / unit	49
	3-bed	20 units	1.0 / unit	20
	Visitors	187 units	0.1 / unit	18
	Office	1315 SM	0.0 / 100SM [1]	0
Bicycle Parking Reduction [2]			91 extra spaces = 18 space reduction	
Total Required			-	**117**
Total Proposed			-	**0**
Total Surplus / Deficit			-	**- 117**

Note: 1) In a CR zone in PA1, no parking spaces are required for office uses, if the interior floor area of all these uses, does not exceed 1.0 times the area of the lot. 2) In PA1 the vehicle parking spaces required on a lot may be reduced at a rate of 1 vehicle parking space for each 5 bicycle parking spaces provided in excess of the minimum number of bicycle parking spaces required by Chapter 230 if the reduction of vehicle parking space is not greater than 20% of the total minimum vehicle parking spaces required.

[5] https://www.toronto.ca/wp-content/uploads/2017/10/96e8-City-Planning-Zoning-city-wide-Policy-Areas-zone-map.pdf

Table 15: Vehicle Parking Zoning By-law Requirements – South Site

Building	Land Use	Size (Unit or SM)	By-law No. 569-2013 (PA1)	
			Rate	# Spaces Req.
South Site	Bachelor	0 units	0.3 / unit	0
	1-bed	124 units	0.5 / unit	62
	2-bed	43 units	0.8 / unit	34
	3-bed	68 units	1.0 / unit	68
	Visitors	235 units	0.1 / unit	23
Bicycle Parking Reduction [1]			55 extra spaces = 11 space reduction	
Total Required			-	**176**
Total Proposed			-	**0**
Total Surplus / Deficit			-	**- 176**

Note: 1) In PA1 the vehicle parking spaces required on a lot may be reduced at a rate of 1 vehicle parking space for each 5 bicycle parking spaces provided in excess of the minimum number of bicycle parking spaces required by Chapter 230 if the reduction of vehicle parking space is not greater than 20% of the total minimum vehicle parking spaces required.

The sites will not have on-site dedicated vehicle parking. However, considering the urban trends, downtown location and access to transit, it is neither practical nor reasonable to provide the number of parking spaces required by the prevailing Zoning By-law for the proposed development. In recent years, City Council has acknowledged this and has adopted lower standards for approval for new developments in downtown. These actions have been bolstered by Ontario's New Five-Year Climate Change Action Plan and numerous other initiatives by the City of Toronto.

There has also been a steep decline in residential parking demand and vehicle ownership in the downtown Toronto area. There have been developments constructed with 'zero' parking across North America, including downtown Toronto, where transit access is very high. This area is well served by transit, both sites will have direct internal access to the King-Bathurst Ontario Line station, and will also be well served by both streetcar routes on King and Bathurst, and by a number of bus routes. Also, a very high transit-dependency is the fundamental characteristic of Transit Oriented Developments/Communities, as they promote reduced auto-dependency.

6.3 Vehicle Ownership Rates in the Surrounding Area

A review of auto-ownership rates in the immediate area was performed using the same Transportation Tomorrow Survey zones discussed in **Section 20**. The average auto-ownership rate is 0.56 vehicles per household for apartment units and 0.59 vehicles per unit for regular homes. The lowest auto-ownership rate was 0.33 vehicles per apartment unit in zone 67 which is the zone north of Queen Street and east of Spadina Avenue. Overall, this does indicate that there are some areas where less than, or approximately half of the units have a vehicle.

6.4 Zero Parking / Elimination of Parking Minimums

6.4.1 Elimination of Parking Minimums: Toronto

The City already allows for the elimination of parking minimums for some land uses within Policy Area 1 as per Zoning By-law 5690-2013, when the interior floor area of all the uses does not exceed 1.0 times the area of the lot. This acknowledges that some uses cannot provide parking, and more importantly, can be sustained without any on-site parking. Although residential land uses are not included, the By-law does acknowledge that some people will either rely on public parking to visit the use, or will be a walk-in trip without any vehicle.

Recently, the Chief Planner and Executive Director of City Planning put out a Report for Action dated January 5, 2021. The Report is entitled Proposed Review of Parking Requirements for New Development[6]. The report essentially outlines the rationale and support for the elimination of parking minimum. The report provides examples of some of City Council's recent decisions which recognize that the current automobile parking standards represent a barrier to the City achieving its housing vision. For example:

- *"In relation to the Queen Street West Planning Study - Bathurst Street to Roncesvalles Avenue, Council removed automobile parking requirements for various forms of development within the study area in order to facilitate the conservation of heritage buildings, and to support Public Realm, Built Form and Transportation objectives. (URL: http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2020.TE14.5)*
- *In 2018, City Council requested City Planning to report on exempting low rise apartment buildings from parking requirements in some cases, and other potential incentives to promote purpose-built rentals in Neighbourhoods-designated areas (URL: http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2018.PG27.5)."*

The report makes the following recommendations regarding the elimination of parking minimums:

- ***A shift in focus from minimums to maximums** will further support and encourage land- and cost-efficient forms of development which do not include extensive automobile parking.*
- ***Limiting the supply of automobile parking and increasing the supply of bicycle parking** will encourage transportation alternatives to automobiles and support the City's policies related to reducing automobile dependence.*
- ***Removing automobile parking minimums** or reducing the number of land uses for which parking rates are specified may simplify the zoning requirements, allowing for easier understanding and application.*
- *Consideration of replacing minimum automobile parking requirements with parking supply guidelines;*
- ***Identification of other mobility infrastructure required if automobile parking requirements are reduced or removed and mechanisms to pay for it;***

[6] https://www.toronto.ca/legdocs/mmis/2021/ph/bgrd/backgroundfile-159784.pdf

- *Development of **new parking policy area boundaries** to better reflect areas with good alternatives to automobile travel, **such as high-quality transit service**;*
- ***Development of an approach to adjust parking requirements without a zoning by-law amendment as new transit infrastructure enters service;***
- *Identification of land uses and areas where the existing ZBL parking standards should be adjusted to meet the intent of the Official Plan by:*
  - ***Reducing or eliminating automobile parking minimums; • Reducing or introducing automobile parking maximums; or***
  - ***Increasing bicycle parking minimums;***

The subject development is a perfect candidate for the elimination of parking minimums, since it achieves many of the goals listed above and meets many of the prerequisites for consideration. The site will be within walking distance to many employment uses within downtown including the central business and financial districts. In addition, there will be direct transit access to Ontario Line and surface transit along the King Street transitway. The sites excellent transit access will make it a perfect location to implement a no parking, truly transit-oriented community. With ample bicycle parking and access to surface cycling routes, the site will also be able to support a zero-vehicle culture by supporting other active modes of transportation.

6.4.1.1 EXAMPLES OF NEAR-ZERO VEHICLE PARKING CONDOMINIUMS IN TORONTO

An existing condominium at 426 University Avenue in the City of Toronto just south of St Patrick subway station on the Yonge-University-Spadina subway line (Dundas Street at University Avenue) – referred to as "RCMI" due to it being integrated with the heritage façade of the Royal Canadian Military Institute – was built and began occupancy in 2014[7].

The condominium building is 42 storeys tall and has 315 units, mostly comprised of one-bedroom and bachelor units. The building is equipped with 4 vehicle stacker parking spaces, plus one regular parking space. This allows for parking of up to 9 vehicles, all of which are dedicated car-share parking spaces. The building therefore relies entirely on use of car-sharing, as well as the available surrounding public parking supply for any overflow demand or visitor demand. The building also has 315 bicycle parking spaces which is one space for each unit. This demonstrates the ability for a building to rely on car-share and public parking. Comparatively, the proposed TOC building will have even better (direct) transit access, will have more bicycle parking (on a spaces per unit basis), and will also have car-share available in the surrounding area but not directly in the TOC. Overall, the transportation option availability for the subject TOC is similar but more heavily weighted towards transit and cycling reliance.

6.4.2 Elimination of Parking Minimums: Brampton

Brampton City Council has also recently passed a vote to enable Open Option Parking city-wide effective July 2, 2020[8]. This means that developers can determine how much parking is required for a development based on market expectations. This allows the market to control the parking needs and to be more flexible to infrastructure changes. This also allows for reduced

[7] https://www.toronto.ca/legdocs/mmis/2009/te/bgrd/backgroundfile-21943.pdf

[8] https://www.edmonton.ca/city_government/urban_planning_and_design/comprehensive-parking-review.aspx

construction and unit costs when parking is not provided, which is considered in the market assessment when determining if and how much parking would be provided.

6.5 Public Parking

There is available public parking located directly adjacent to both buildings, and a total of at least 4 parking lots within 200 metres walking distance. These parking lots can be used by guests or visitors. The nearby parking lots are summarized below.

- **650 King Street** – Underground Parking east of North Site, accessible from King Street
- **111 Bathurst Street** – Underground Parking north of North Site, accessible from Bathurst Street
- **621 King Street** – Underground Parking east of South Site, accessible from King Street
- **523-525 Adelaide Street West** – north side of Adelaide Street, surface parking lot

In addition to the public parking lots which will be able to accommodate long-term visitors, there will also be available on-street parking which will be better suited for short-term visitors.

6.6 Vehicular Parking Supply

The total proposed vehicular parking supply for both sites is zero spaces. The site will be heavily reliant on transit services and the proximity of amenities and jobs in the downtown core, which would lead to active transportation and transit trips.

If there will be vehicles owned by future residents of the TOC development, these vehicles will be utilizing nearby parking lots and may also enter rental or sublet agreements with nearby private parking space owners to use those nearby space. This will allow for an otherwise underutilized parking space to be used.

Parking requirements from the City Zoning By-law were reviewed, despite the proposal to not provide any on-site parking.

6.7 Bicycle Parking Supply

Bicycle parking for the site will be provided in the form of short-term and long-term bicycle parking spaces. Short-term bicycle parking will be provided at-grade (internally or weather protected if outdoors) as well as underground, and will serve residential visitors, commercial patrons, and residents who are making short stops at home. Long-term bicycle parking will be located on the underground parking levels under each building. The bicycle parking supply is summarized in **Table 16** for both sites.

There are several bike share locations within 200 metres walking distance from the sites for a total number of 35 bike share spaces available, as shown in **Figure 12.** These bikeshare spaces will be available to residents and visitors. Available bicycles will be usable by residents or visitors leaving the sites, while empty spaces will be available for residents and visitors returning back. As a result, all of the bikeshare spaces are considered available to the residents.

Table 16: Bicycle Parking Supply

Area	Bicycle Parking Space Type							
	Residence Long Term	Residential Short Term	Non-residential Long Term	Non-residential Short Term	Transit Long Term	Transit Short Term	Bike Share	Total
North Site	176	38	26	4	0	0	35	**279**
South Site	220	36	0	0	0	0	35	**291**

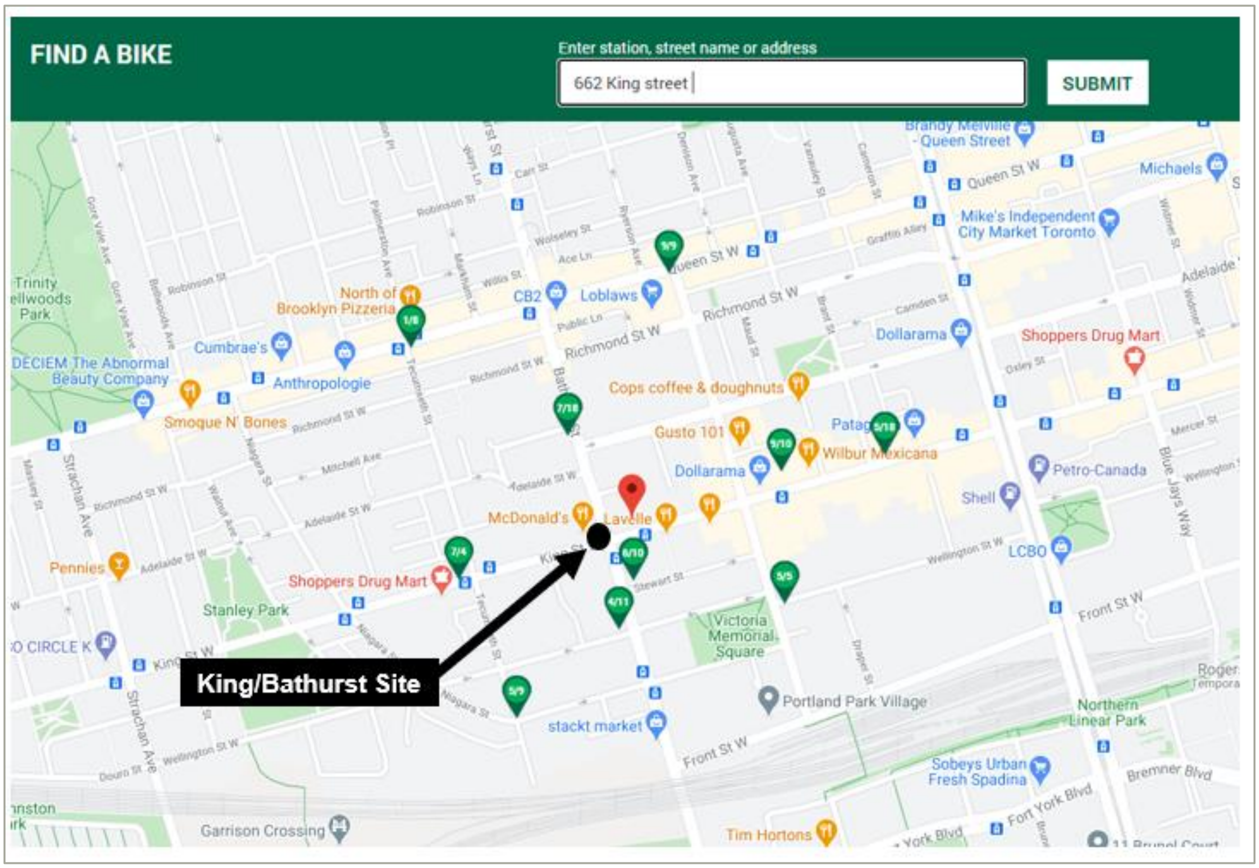


Figure 12: Bike Share Locations near King-Bathurst

Source: https://bikesharetoronto.com/system-map/

6.8 Bicycle Parking Requirements

Bicycle parking requirements were reviewed for By-law 569-2013. Bicycle parking requirements for the North and South Sites are summarized in **Table 17** and **Table 18**, respectively.

There will be 52 surplus long-term bicycle parking spaces, compared to the Zoning By-law requirement. Between the two buildings, there will be 82 additional short-term parking spaces. In addition to the provided parking on-site, there will be bike-share parking in the near vicinity that is not counted towards the parking supply.

Table 17: Bicycle Parking Zoning By-law Requirements – North Site

Land Use		Unit or per 100 SM	By-law No. 569-2013			
			Long Term		Short Term	
			Rate	# Required	Rate	# Required
North Site	Residential	187 units	0.9 / unit	169	0.1 / unit	19
	Office [1]	1236 SM	0.2 / 100 SM	0 [1]	0.2 / 100 SM	0 [1]
Total Required			-	169	-	19
Proposed			-	237	-	42
Surplus / Deficit			-	**+ 68**	-	**+ 23**

Note: 1) According to By-law 569-2013, if a bicycle parking space is required for uses on a lot, other than a dwelling unit, and the total interior floor area of all such uses on that lot is 2000 square metres or less, then no bicycle parking space is required.

Table 18: Bicycle Parking Zoning By-law Requirements – South Site

Land Use		Unit or per 100 SM	By-law No. 569-2013			
			Long Term		Short Term	
			Rate	# Required	Rate	# Required
South Site	Residential	235 units	0.9 / unit	212	0.1 / unit	24
Total Required			-	212	-	24
Proposed			-	255	-	36
Surplus / Deficit			-	**+ 43**	-	**+ 12**

6.9 Loading Space Requirements

Loading space requirements of Zoning By-law 569-2013 were also reviewed for the proposed site. The loading space requirements as per the By-law, and loading spaces provided, are shown in **Table 19** and **Table 20** for the North and South Sites, respectively.

Table 19: Loading Spaces Required Based on By-Law Rates – North Site

Building	Land Use Type	Unit or SM	Loading space required and provided
North Site	Residential	187 units	1 Type 'G'
	Office	1315 SM	1 Type 'B' and 1 Type 'C'
	Total Required		**1 Type 'G'; 1 Type 'B'; 1 Type 'C'**
	Total Provided		**1 Type 'G'; 0 Type 'B'; 0 Type 'C'**

Table 20: Loading Spaces Required Based on By-Law Rates – South Site

Building	Land Use Type	Unit or SM	Loading space required and provided
South Site	Residential	235 units	1 Type 'G'
	Total Required		**1 Type 'G'**
	Total Provided		**1 Type 'G'**

The dimensions of the proposed loadings spaces meet the By-law requirements, with the dimensions of each type listed below.

Type 'G'

- Minimum Length: 13.0 metres
- Minimum Width: 4.0 metres
- Minimum Clearance: 6.1 metres

The north building will be equipped with a typical Type 'G' loading space that will be accessible via King Street. The office component will not be equipped with additional Type 'B' and Type 'C' loading spaces, due to limit space. Rather, the building manager will be required to coordinate use of the loading area for refuse collection and for deliveries/loading operations. The loading area will need to be fully accessible for refuse collection during the schedules days and times.

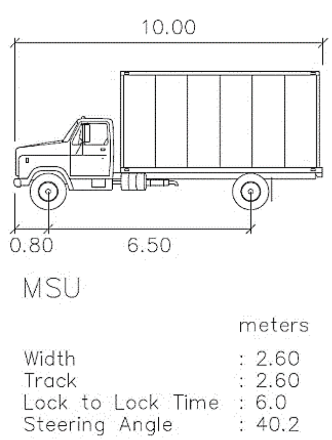
The south site will be equipped with one Type 'G' loading space which will be accessible from Stewart Street. This space fulfills the requirements, as per the By-law.

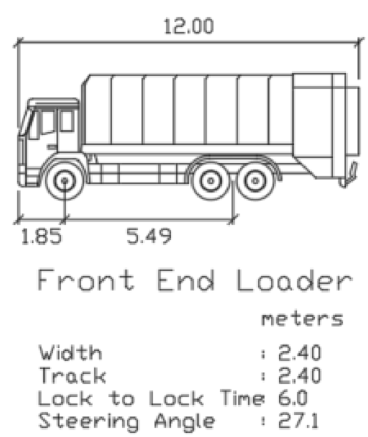
6.9.1 Loading Swept Path Analysis

The loading areas were tested using AutoTURN software (AutoCAD-assisted software) to check the loading space accessibility for anticipated design vehicles entering the site, and for each of the building loading areas. The largest vehicles anticipated to enter the site are a delivery or moving vehicle, as well as a front-end loader refuse collection truck.

The swept path analysis at the north site is shown in **Figure 13** and **Figure 14** for the delivery/moving truck and refuse collection truck, respectively. The swept path analysis at the south site is shown in **Figure 15** and **Figure 16** for the delivery truck and refuse collection truck, respectively. For the delivery truck, a Medium Single Unit ("MSU") design vehicle was tested, while for refuse collection accessibility, a City of Toronto "Front End Loader" design vehicle was used. The design vehicles and dimensions are shown below.

The anticipated design vehicles will be able to navigate to the proposed loading area, load or unload as needed, and then exit the site without conflicting with any obstructions. The developer and property manager will need to ensure that the trucks accessing the site are of comparable size to the design vehicles or smaller to access the buildings loading area.





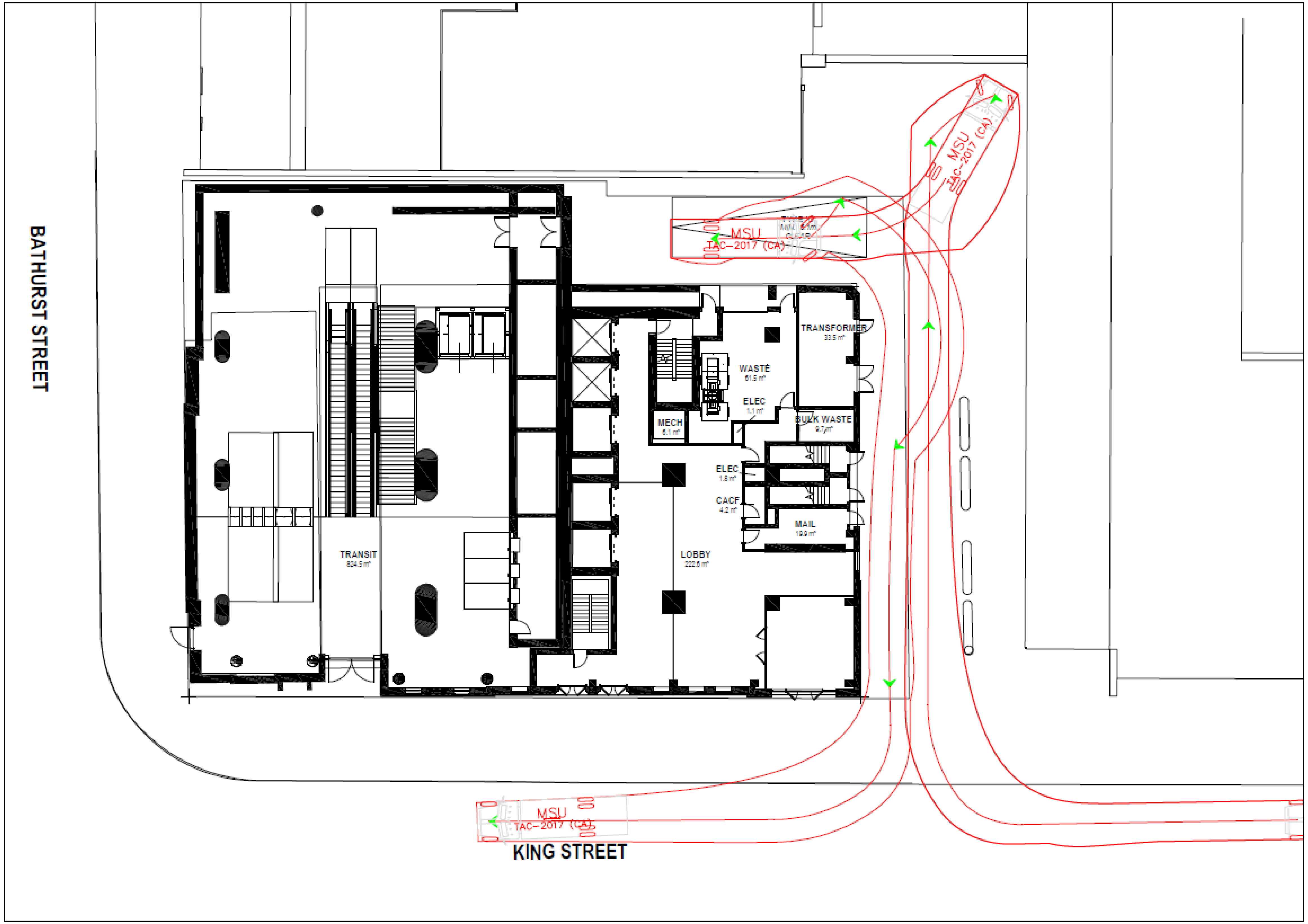


Figure 13: Loading Swept Path Analysis Medium Single Unit Truck (North Site)

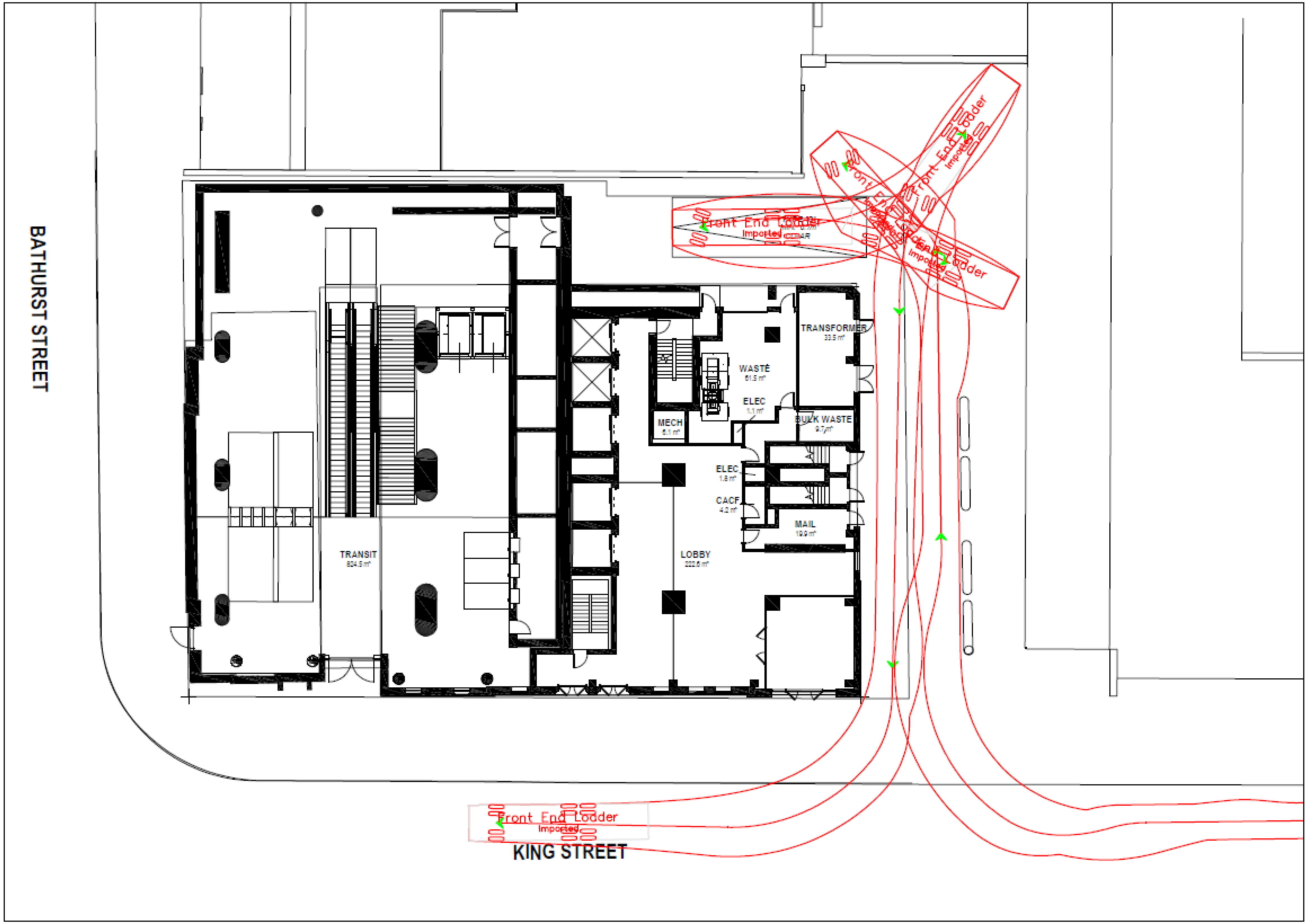


Figure 14: Refuse Swept Path Analysis Refuse Collection Truck (North Site)

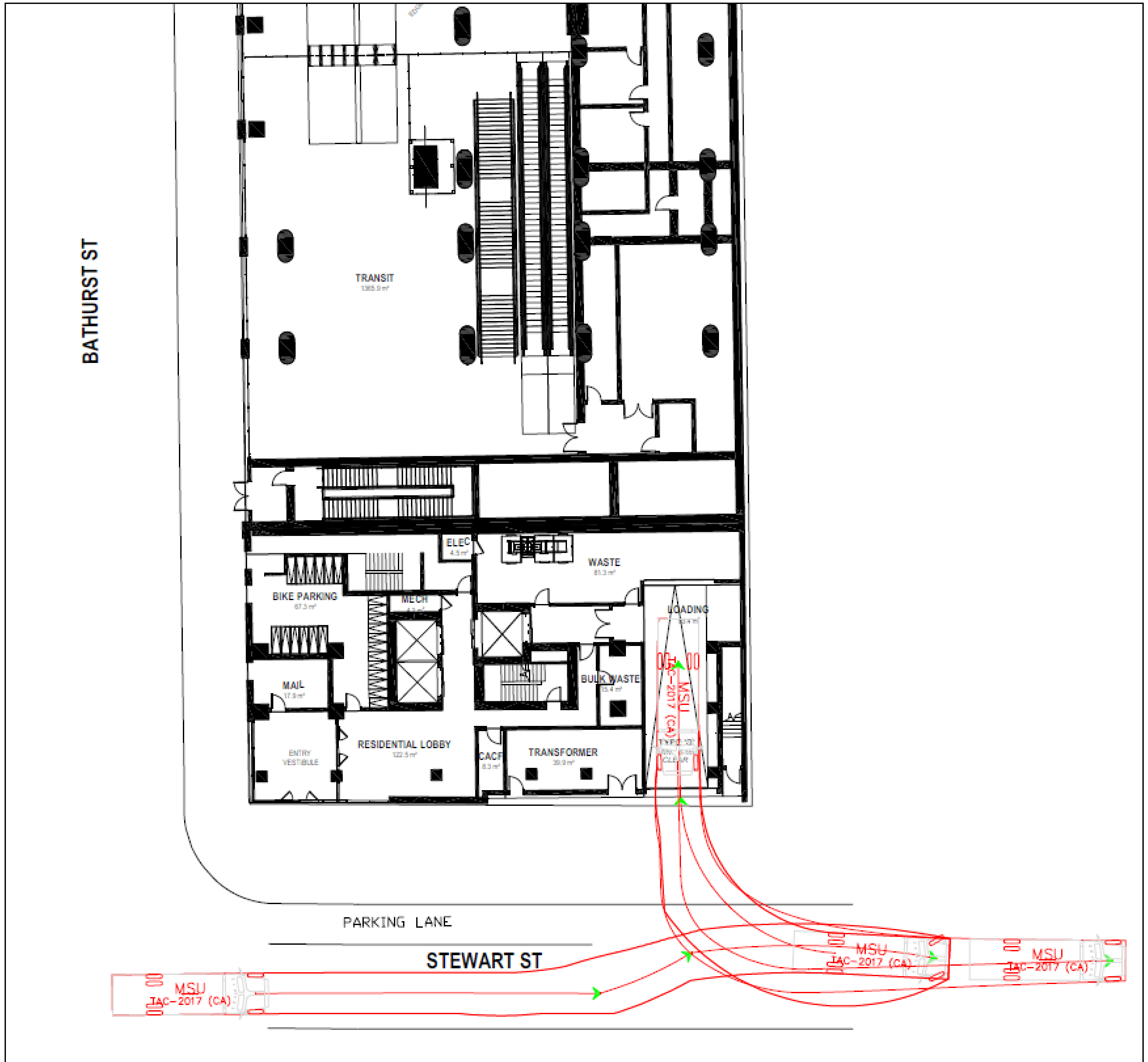


Figure 15: Loading Swept Path Analysis Medium Single Unit Truck (South Site)

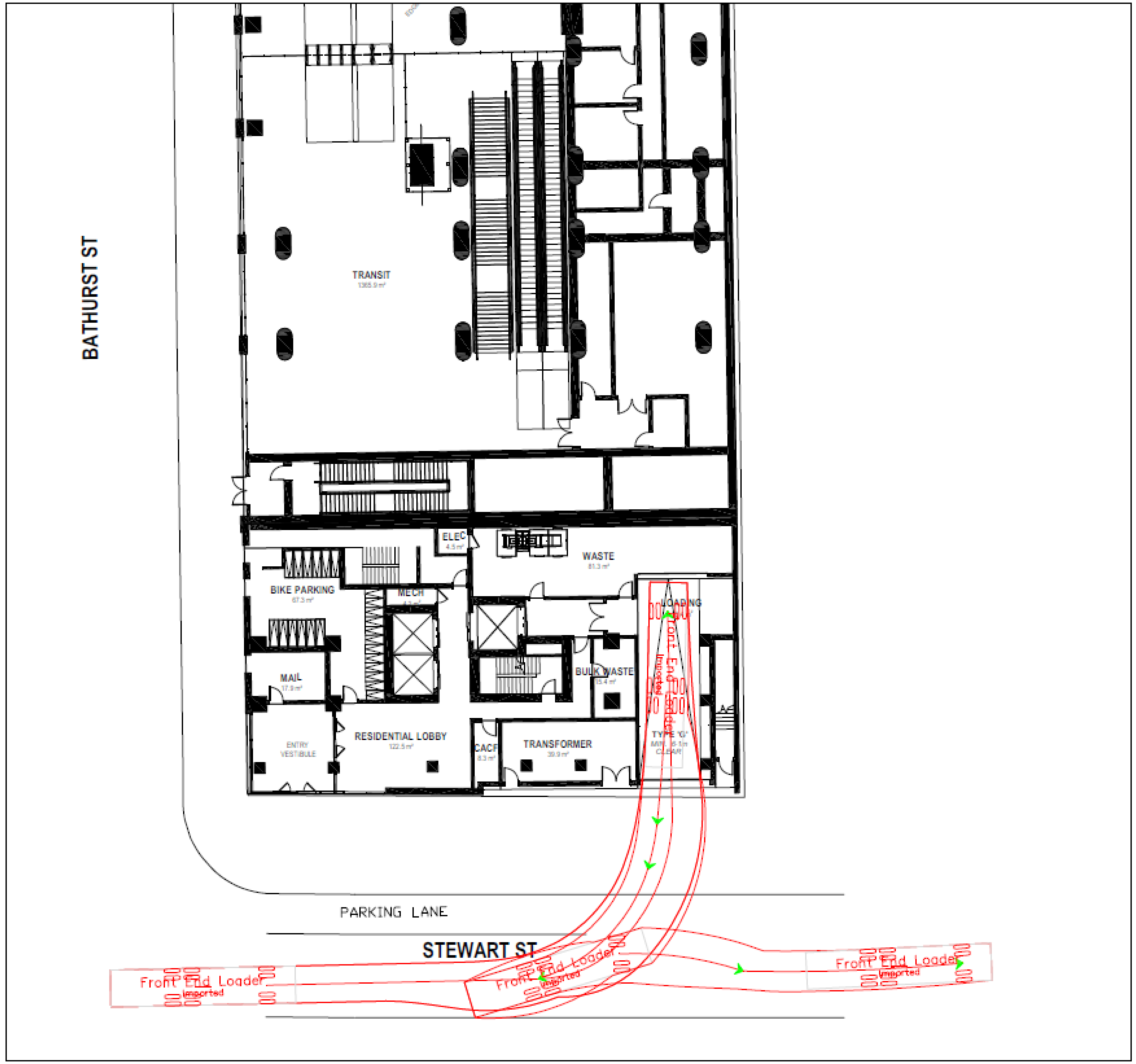


Figure 16: Refuse Swept Path Analysis Refuse Collection Truck (South Site)

6.10 Travel Demand Management ('TDM')

Transportation Demand Management (TDM) measures are methods employed to reduce the traffic impacts of a development through the reduction of Single-Occupant Vehicle (SOV) trips as well as the encouragement of more sustainable forms of travel and more efficient use of the transportation network for all modes of travel.

TDM measures can be 'hard measures', such as infrastructure like bicycle parking, or can be 'soft measures' such as policies that allow for working-from-home or flex hours. TDM measures must also be tied to the surrounding transportation network context of the development. For example, bicycle parking will be ineffective if there is no surrounding bicycle infrastructure like bicycle lanes, multi-use paths, or a lack of bicycle parking at the ultimate destination. For this reason, successful TDM implementation requires a united effort and coordination between the City and developers.

Hard measures are physically infrastructure improvements that encourage alternative modes of travel and mode shifts away from single-occupant vehicles. This can include the provision of bicycle parking or enhanced pedestrian and cyclist facilities on-site including shower and change facilities for employment uses.

Soft measures are programs or policies, such as unbundling or condo units to parking spaces, work-from-home policies, transit subsidies, carpooling assistance etcetera. In many cases, hard and soft measures work together and provide mutual benefit. For instance, transit pass subsidies are soft measures, but when paired with hard measures like improved waiting areas, they can have a greater impact on mode choice.

The Toronto Green Standard (Version 3) requires measures that will support a 15% or greater reduction in single-occupancy vehicle (SOV) trips.

For the subject site, the general context of the area as a downtown city centre-core, mixed-use environment with excellent transit access and future direct transit access to the Ontario Line, will have an impact on the potential TDM measures. In fact, the inherent nature of the area and the presence of the Ontario Line and streetcar surface transit routes along both roadways adjacent to the development will make this location an excellent candidate to benefit from TDM initiatives.

The mixed-use nature of downtown allows for synergy and mixed-use interactions between the proposed residential towers, as well as the ancillary retail at the ground floor, and the surrounding retail-commercial and services that are in the area. Additionally, due to the location near the City's central business district, there is an expectation that many of the residents will work within the general area and will not rely on transit to make their daily trips. Rather, these residents will walk or cycle. The mixed-use, and walkable nature of the area will in itself help to reduce vehicle trips by encouraging walking and linked trips.

Regardless of the ability for the development to leverage TDM initiatives, the strongest TDM measure will be the fact that both residential towers will not have any vehicular parking provided. Therefore, any vehicle trips generated by the development will be pick-up/drop-off or taxi/rideshare trips. The occupancy of the buildings will be market-driven, meaning that residents who decide to purchase units in this building will want to be car-free and many will live and work in close proximity, thus relying on transit, walking, and cycling to get around.

Since the ancillary commercial will primarily serve the surrounding area and the residential condos above, the TDM plan will be geared towards adapting the residential component.

6.10.1 Local and Regional Transit Accessibility

As already discussed, there is excellent transit coverage within the vicinity of the site even without the construction of Ontario Line. TTC surface transit is provided in the form of streetcars along King Street and Bathurst Street (in mixed traffic). Additionally, both of these streetcar routes provide direct access to the Toronto subway system along Line 1 (easterly to University Avenue) and Line 2 (northerly to Bloor Street). Transit stops are located directly at the intersection of King Street and Bathurst Street, and all stops are within 100 metres walking distance from each building.

Bathurst subway station is located 2.4 kilometres to the north, and St Andrew Station 1.5 kilometres to the east. With Ontario Line, subway access will be directly accessible by residents from within the building. Residents will not need to leave the building to access the Ontario Line. Ontario Line riders will be able to transfer at St Andrew Station (King Street and University Avenue) as well as at Bathurst Station (Bloor Street and Bathurst Street).

The study area already has a fairly high non-vehicle modal split at 79% non-auto drive and this is expected to increase in general due to the increase in transit availability. The site itself will further benefit and leverage this proximity and access.

6.10.2 Transit Pass Subsidies

Residents and tenants of the buildings will be given transit pass subsidies that will further encourage the use of transit as a primary mode, and will attract those who wish to rely on transit and will utilize the transit passes. The subsidies can be provided in the form of reduced cost passes, or can be provided in the form of subsidies to residents.

6.10.3 Real-Time Transit Information

Real-time transit service updates will be provided in the lobby area of each residential tower. The real-time displays will include arrival time for the nearest transit stops for each of the primary transit services expected to serve the development. The real-time displays will allow residents to time leaving their buildings to reduce the amount of time standing at each transit stop, thus making transit more attractive.

6.10.4 Pedestrian and Cycling Connections

Both buildings will be directly fronting both King Street as well as Bathurst Street and will have direct access to these streets. Internally, the residential component of the condo towers will have access to the transit station lobby area, and there will be no need for residents to leave the building if they are destined to Ontario Line.

Cycling infrastructure in the form of bicycle lanes on Wellington Street in the westbound direction (Wellington Street is one-way in the westbound direction). Similarly, cyclists may travel to the south to Adelaide Street which is a one-way street in the eastbound direction and also has separated dedicated cycling lanes. The City's broader cycling network can be accessed from these roadways.

Bicycles are also allowed on the TTC subway system outside of peak periods. Residents will be able to bring their bicycles on the subway and use them to complete the last leg of their trips, if it is conducive to their needs.

6.10.5 Bicycle Parking

The building will be equipped with long-term bicycle parking that will be available to all residents. Long-term bicycle parking ensures that residents are encouraged to own bicycles in the first place by providing them with easily accessible, secure and sheltered bicycle parking. Short-term bicycle parking will be provided for visitors. The short-term bicycle parking will be placed in safe, well lit, accessible areas at ground level. This will encourage visitors to feel cycling is a viable option.

As per the City of Toronto By-law 569-2013, in Policy Area 1 (PA1), the total minimum number of vehicle parking spaces required on a lot may be reduced at a rate of 1 vehicle parking space for each 5 bicycle parking spaces provided in excess of the minimum number of bicycle parking spaces, if the reduction of vehicle parking space is not greater than 20% of the total minimum vehicle parking spaces required. The By-law acknowledges that improved bicycle infrastructure and access will make cycling a more viable mode and will encourage a shift in mode share as well as a reduction in auto-ownership. The By-law also has a limit on the reduction to 20% of the total required supply which suggests that there may be diminishing returns, and this is to ensure the reduction is not overstated.

Bikeshare is also available within the general area. There are 10 bikeshare stations within 400 metres walking distance (as discussed in Section 6), which amounts to a total bike share availability of 102 spaces. These will also be available for use by residents and visitors if they use the bikeshare services. Bikeshare spaces are considered usable if they are occupied or empty, as they can be used by residents or visitors when leaving the site (bicycle is available) or when returning (there is a free "dock").

With the above taken into considerations, the site would achieve the 20% reduction allowed by the By-law. However, given the environment, it is plausible that multiple residents in a unit will cycle, and will need the additional bicycle parking, thus resulting in a greater shift from SOV.

6.10.6 Unbundled Resident Parking

Bundling parking spaces with unit sales, whether intended or not intended, results in the building being marketed to drivers and vehicle owners. For those who do not own vehicles and do not wish to own a parking space, these hidden costs are forced on them and at the very least result in unwanted effort required to rent out and seek a renter for the parking space in an effort to recuperate lost money.

Therefore, unbundling further benefits the developer as well as the community because the building will automatically be marketed to and attract those who do not drive as a primary form of transportation. This theoretically reduces parking requirements for the building, reduces the amount of congestion on the surrounding road network, and allows for more efficient site design and use of the transportation network.

Unbundled parking could lead to a potential 10% to the residential parking rates.[9] Therefore, removing vehicle parking altogether is likely to have an even greater impact on the tenantry, as owning a vehicle and parking on site will not be viable. The building will be marketed and will find most interest from those who do not and have no interest in owning vehicles.

6.10.7 Car-Share Services

Car-share services are an effective way to reduce auto dependency and parking needs for both residential and non-residential developments, by providing vehicles that can be used by residents and tenants on an as-needed basis. The result is that the development will attract those who do not own vehicles and typically rely on alternative forms of transportation, thus reducing the number of parking spaces required on site and attracting residents and tenants that will generally produce fewer vehicle trips, but will still occasionally require a vehicle.

For some development proposals, the City of Toronto has accepted proposals that suggest that for each car-share parking space provided on site, the development will be able to reduce the parking supply by 3 parking spaces. This is another example of the City accepting TDM measures to reduce the parking supply.

Since there is no vehicle parking on site, carshare will not be directly available. However, there are carshare services in the vicinity of the site and within a 400 metre walking distance in all directions. Options include Zipcar. The availability of carshare will allow occasional drivers access to vehicles.

6.10.8 Summary of Transportation Demand Management

The following summarizes the measures that will support a 15% or greater reduction in single occupancy vehicle (SOV) trips as required by the Toronto Green Standard (Version 3):

- **Direct access to Ontario Line** from within the building;
- Transit passes or subsidies provided to all residents of the building including the commercial-retail components;
- Proximity to surface transit routes along King Street and Bathurst Street;
- Real-time transit information;
- Location in a mixed-use city centre core environment to promote walking trips;
- Proximity to carshare services; and,
- Unbundled resident parking due to no vehicle parking provision.

[9] https://www.vtpi.org/park_man.pdf

7 Preliminary Findings and Next Steps

7.1 Traffic Forecasts

The Ontario Line King-Bathurst Station is estimated to add 3,089 walking and transit trips to the intersection. The proposed developments (North and South Sites) will add a combined total of 322 and 220 total all modes trips for the AM and PM peak hours, respectively, with a majority of these trips being pedestrian and surface transit trips destined to/from the station. The TOC's contribution to total traffic volumes is presented in **Table 21**.

Table 21: King-Bathurst TOC Transportation Contribution at King / Bathurst Intersection

Period	Pedestrian Volumes	Traffic Volume	Bicycle Volumes
AM Peak Hour	2.1%	1.4%	7.1%
PM Peak Hour	1.5%	0.8%	4.3%

The TOC will contribute less than 1.5% to total vehicle traffic volumes at the intersection under 2030 total traffic conditions. Comparatively, the TOC will generate many more pedestrian and bicycle trips as a proportion of the total intersection volume which includes pedestrians on the crosswalks and cyclists riding within the curb lane. Up to 2.1% of total pedestrian traffic will be TOC related, and up to 7.1% of total cyclist traffic will be TOC related.

The station contribution of total traffic volumes at the study intersection is summarized in **Table 22**. The station itself will account for approximately 60% of all the pedestrian traffic at the study intersection. The east leg will carry the largest number of pedestrians – up to approximately 1,500 per hour, of which the station accounts for 1,250 per hour. The total hourly intersection pedestrian crossing volume will be in the range of 3,000 people.

Table 22: King-Bathurst Station Transportation Contribution at King / Bathurst Intersection

Period	Pedestrian Volumes
AM Peak Hour	62.4%
PM Peak Hour	60.3%

7.2 Traffic Capacity and Operations

Despite some congestion and some movements operating near-capacity under existing conditions, there is residual capacity in the road network to accommodate the projected vehicle auto volumes during the AM peak hour. During the PM peak hour the intersection is operating at capacity overall, with some movements operating at capacity with poor level of service ('F').

Under future background and future total traffic conditions, the study intersection will be operating at capacity and there will be several movements at capacity and operating at level of service 'F'. The northbound right-turn will reportedly be operating with a v/c ratio exceeding 2.35 during both peak hours. The demand for this movement is in the range of 160 vehicles per hour, and the majority of the delays that will be experienced by this movement is a result of the high pedestrian demand on the east crosswalk. However, the traffic data used in as the basis for the analysis reflects King Street operations prior to conversion to a transit priority corridor. Therefore, it is possible that vehicles have already diverted to other alternative routes and that the demand for this movement (and other movements) is overstated. The southbound approach is also reportedly operating with a v/c of 1.64 under background and total conditions during the PM peak period, and this is also a result of the high pedestrian demand generated by Ontario Line. The analysis demonstrates that the TOC itself will have marginal impacts on traffic operations.

7.2.1 Recommended Mitigation Measures

Based on the anticipated large volume of added pedestrians to the network due to the Ontario Line King-Bathurst Station, the sidewalks and crosswalks at the intersection of King Street West and Bathurst may require improvements to increase the capacity. There are no recommendations for roadway improvements related to vehicular operations. The majority of activity generated under future conditions will be in the form of active transportation trips, primarily pedestrian walking trips, and the TOC will only contribute a very small component compared to the large number of pedestrian trips expected to be generated by the new station.

Detailed impacts and potential mitigation measures have been explored through the report **Ontario Line King-Bathurst Station Transportation Impact Study (Ontario Line Technical Advisor, April 13, 2021)**. Due to the large number of pedestrian trips generated by the station, the Station SPR study includes a multi-modal level of service analysis following the City of Ottawa MMLOS, methodology which focuses on available infrastructure, as well as the Fruin pedestrian level of service analysis methodology, through static calculations at the sidewalks and transit waiting areas, to determine potential hotspots. The analysis in the Station SPR was performed using 2041 station transfer volumes, and therefore is indicative of the potential impacts from the continuing growth of pedestrians related to the station. The pedestrian traffic generated by the TOC will be using the station however, that pedestrian traffic will remain relatively constant after 100% occupancy, and a minor component of the overall station demand.

Some options for localized improvements were discussed for consideration, such as increasing sidewalk widths or increasing sidewalk areas by removing street furniture, as well as widening crosswalk widths or providing "intersection bulbs" where feasible. However, in light of the existing urban context and constraints in the study area, there were limited opportunities for infrastructure improvements and substantial mitigation measures. Additional recommendations included the need for monitoring pedestrian demand levels after the station is open and operating.

7.3 Transit

In addition to vehicular trips, transit demand was generated using the person trips method. Transit demand generated by the subject development was distributed onto the surrounding transit network, and to the future Ontario Line King-Bathurst Station and has accounted for future passenger transfers between Ontario Line and existing surface transit, as well as walk-in trips to Ontario Line, under future background traffic conditions.

7.4 Parking

The vehicular parking requirements based on By-law 569-2013 are 117 and 176 for the North and South Sites, respectively, but both sites propose zero parking spaces for residents and visitors. However, in a location with extensive transit and active-transportation options, this should be adequate for the location. The buildings will be marketed to those who do not own vehicles and wish to rely on other alternative modes of travel. Furthermore, this offers a great opportunity for the City to explore the elimination of parking minimums in an urban, transit-oriented environment.

There are two public parking lots located directly adjacent to the TOC building – one to the north along Bathurst Street, and another to the east along King Street – and there are at least 4 public parking areas within 200 metres walking distance. These public parking lots may be used by long-term visitors, and short-term visitors will also be able to use on-street parking. Residents who do wish to own vehicles can also use the nearby public parking, and can rent their own private parking spaces from nearby lots or from other condominium owners who have spaces but do not use them. There are several websites that provide listings of available rental and sublet agreements of privately owned parking spaces. This will always remain an option for residents and allows for efficient use of the existing supply that may otherwise be underutilized.

The bicycle parking requirements based on By-law 569-2013 are 188 and 236 for the North and South Sites, respectively. The bicycle parking provided at both sites is in surplus compared to the requirement and will serve all anticipated needs.

7.5 Loading

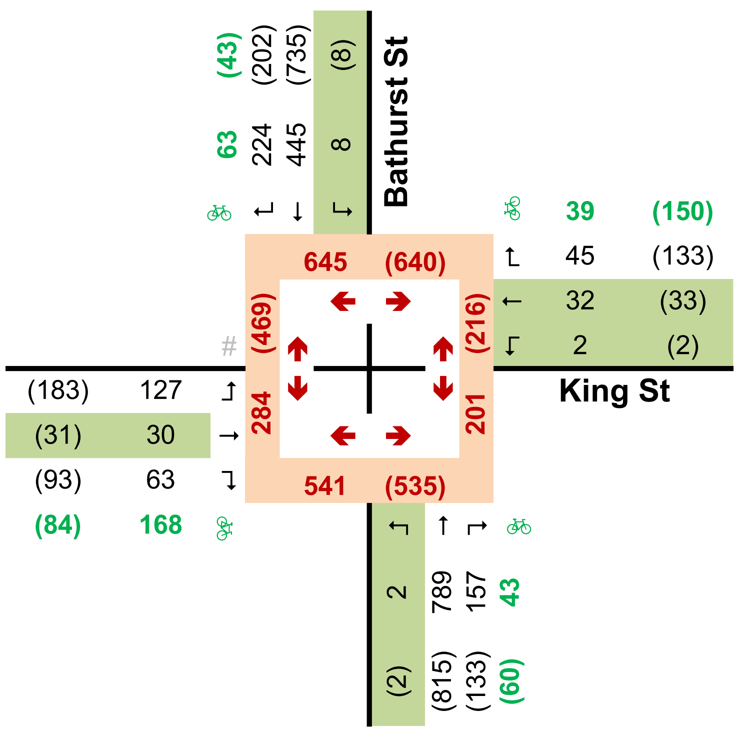
Application of Zoning By-laws 569-2013 and 438-86 requires a Type 'G', Type 'B', and type 'C' loading spaces at the North Site and a 'Type G' loading space at the South Site. Both sites will be equipped with a single Type 'G' loading space, which will satisfy the requirements for the south site. For the north site, the building manager will need to coordinate so that the loading area is fully accessible to refuse collection during the scheduled dates and times for refuse pickup.

Appendix A: Volume Diagrams

EXISTING VOLUMES

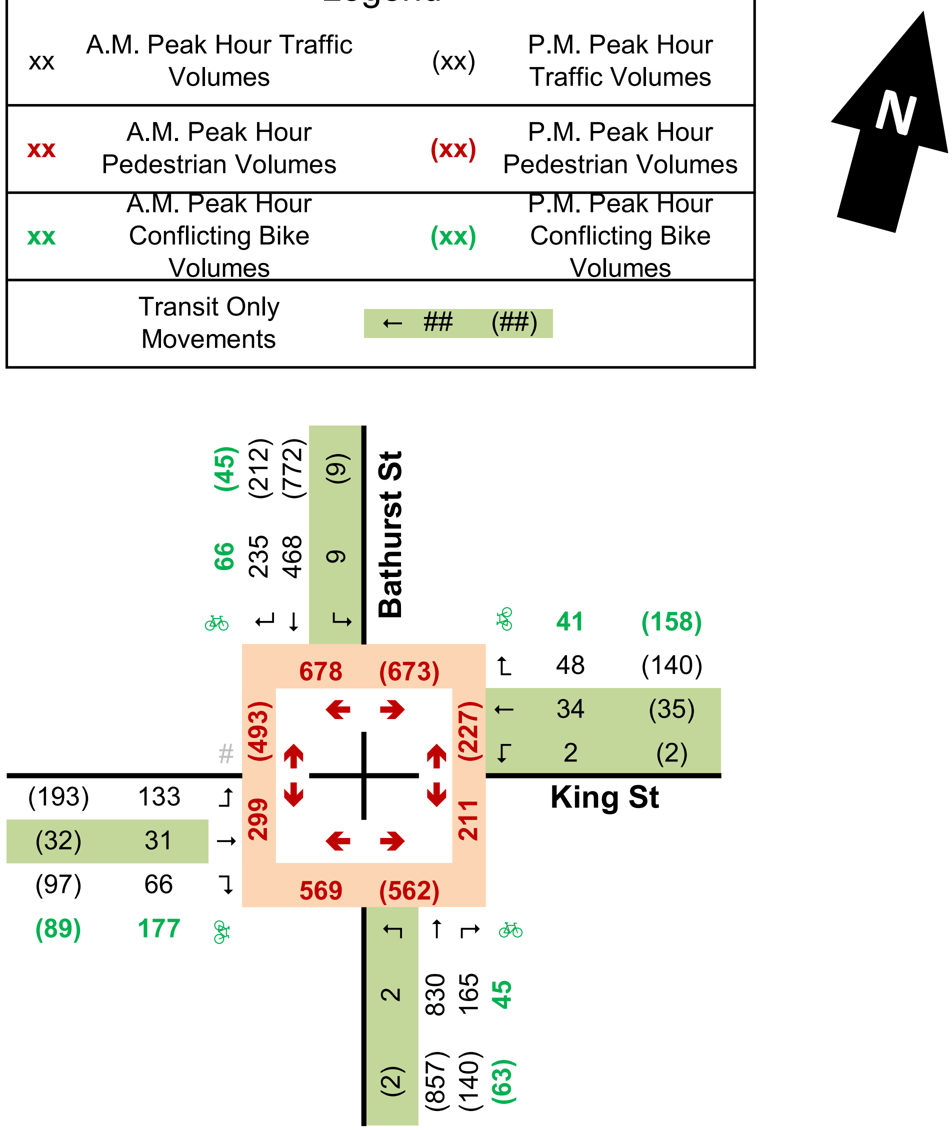
Legend

xx	A.M. Peak Hour Traffic Volumes	(xx)	P.M. Peak Hour Traffic Volumes
xx	A.M. Peak Hour Pedestrian Volumes	(xx)	P.M. Peak Hour Pedestrian Volumes
xx	A.M. Peak Hour Conflicting Bike Volumes	(xx)	P.M. Peak Hour Conflicting Bike Volumes
	Transit Only Movements	← ## (##)	



2030 GENERAL BACKGROUND VOLUMES

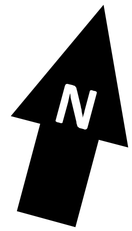
Legend			
xx	A.M. Peak Hour Traffic Volumes	(xx)	P.M. Peak Hour Traffic Volumes
xx	A.M. Peak Hour Pedestrian Volumes	(xx)	P.M. Peak Hour Pedestrian Volumes
xx	A.M. Peak Hour Conflicting Bike Volumes	(xx)	P.M. Peak Hour Conflicting Bike Volumes
	Transit Only Movements	← ## (##)	

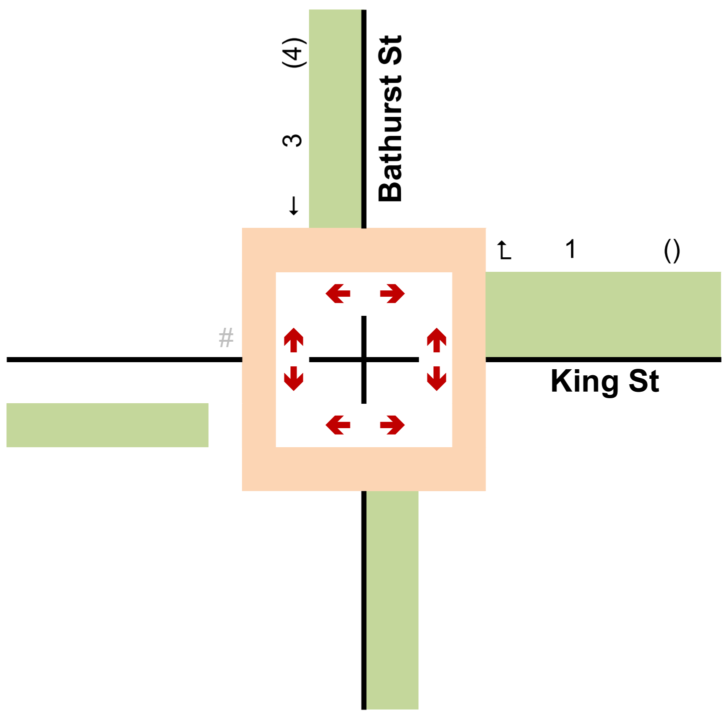


Adjacent Background Development 1

663- 665 King St W & 69-73 Bathurst St / 647 King Street W & 58-60 Stewart St

Legend			
xx	A.M. Peak Hour Traffic Volumes	(xx)	P.M. Peak Hour Traffic Volumes
xx	A.M. Peak Hour Pedestrian Volumes	(xx)	P.M. Peak Hour Pedestrian Volumes
xx	A.M. Peak Hour Conflicting Bike Volumes	(xx)	P.M. Peak Hour Conflicting Bike Volumes
	Transit Only Movements	← ## (##)	

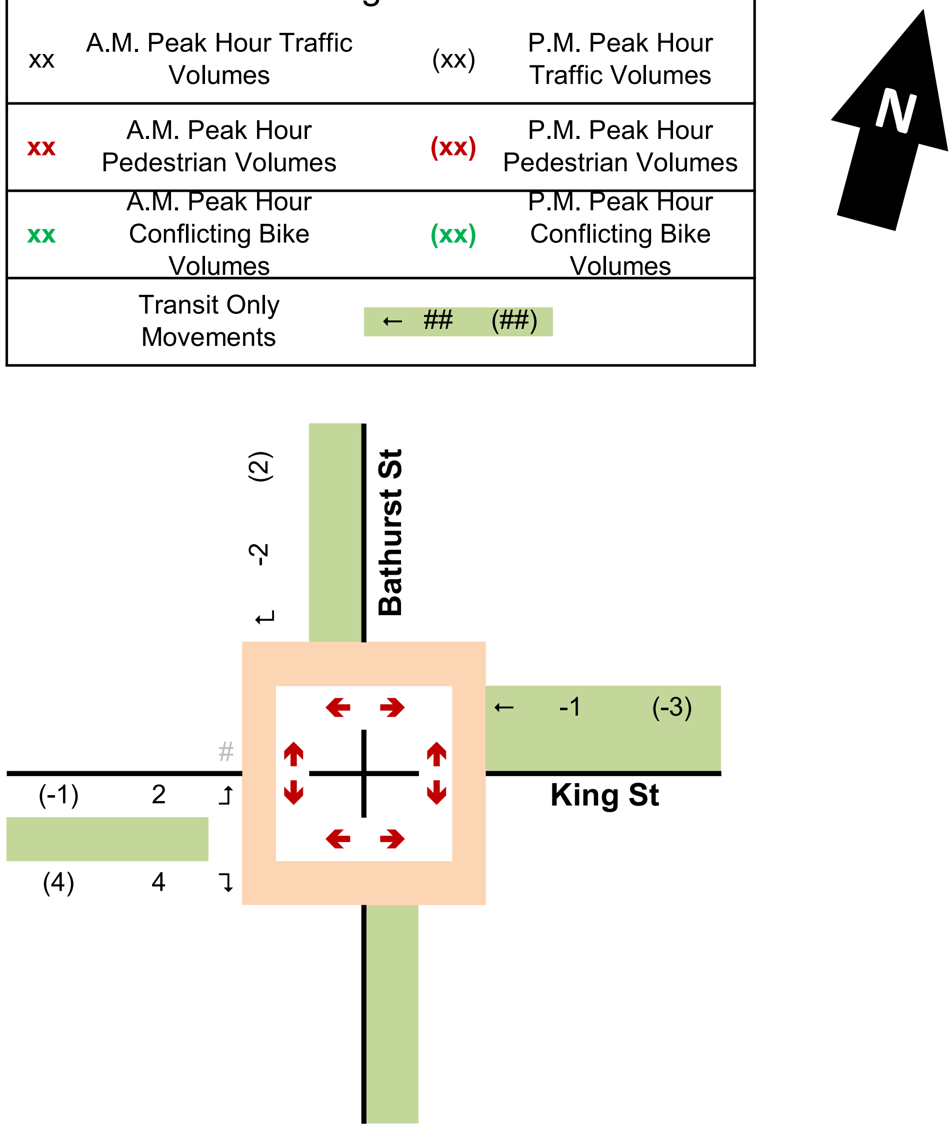




Adjacent Background Development 2

689 King Street W

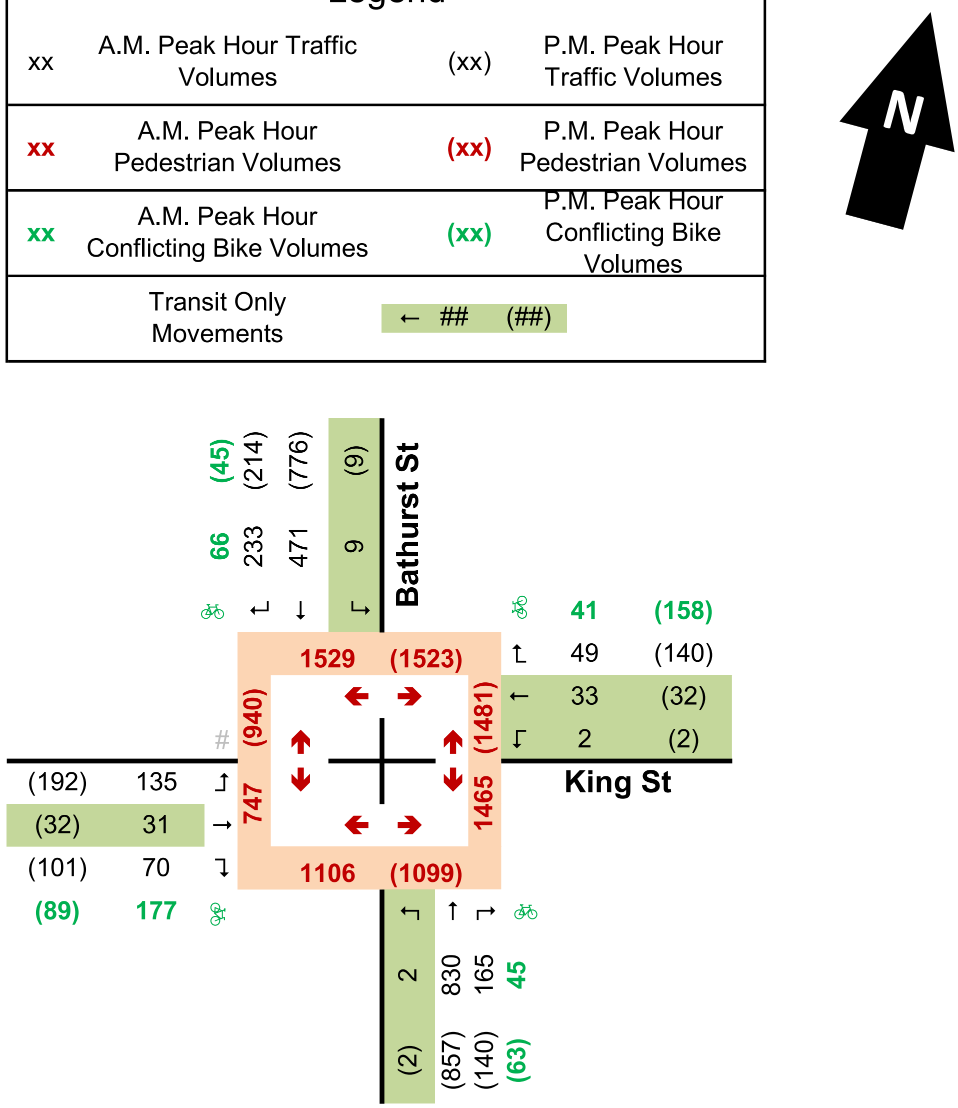
Legend			
xx	A.M. Peak Hour Traffic Volumes	(xx)	P.M. Peak Hour Traffic Volumes
xx	A.M. Peak Hour Pedestrian Volumes	(xx)	P.M. Peak Hour Pedestrian Volumes
xx	A.M. Peak Hour Conflicting Bike Volumes	(xx)	P.M. Peak Hour Conflicting Bike Volumes
	Transit Only Movements	← ## (##)	



2030 TOTAL BACKGROUND VOLUMES

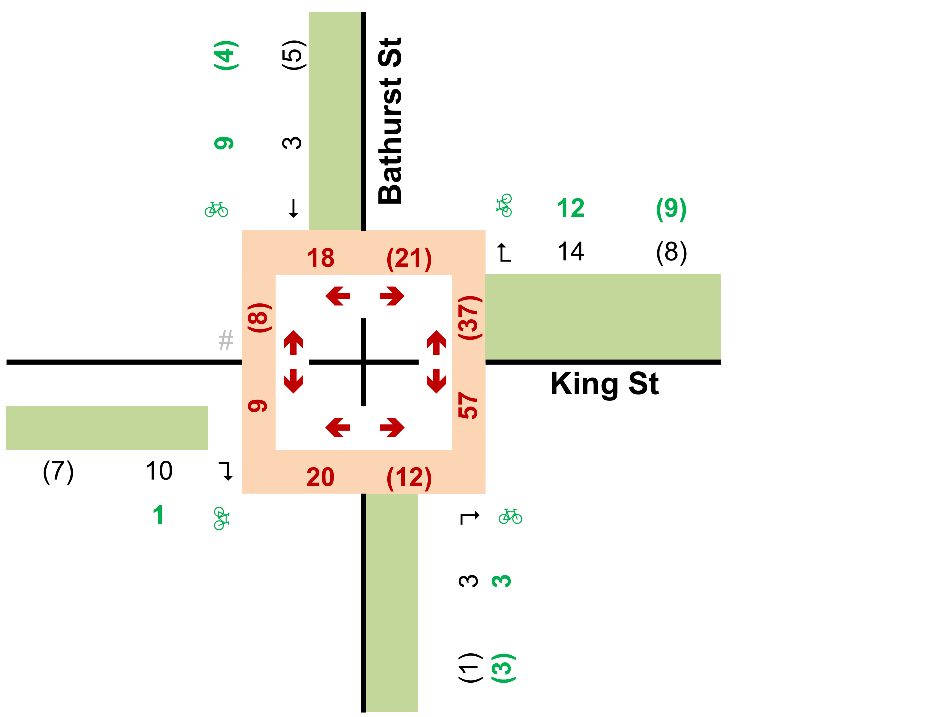
Legend

xx	A.M. Peak Hour Traffic Volumes	(xx)	P.M. Peak Hour Traffic Volumes
xx	A.M. Peak Hour Pedestrian Volumes	(xx)	P.M. Peak Hour Pedestrian Volumes
xx	A.M. Peak Hour Conflicting Bike Volumes	(xx)	P.M. Peak Hour Conflicting Bike Volumes
Transit Only Movements		← ## (##)	



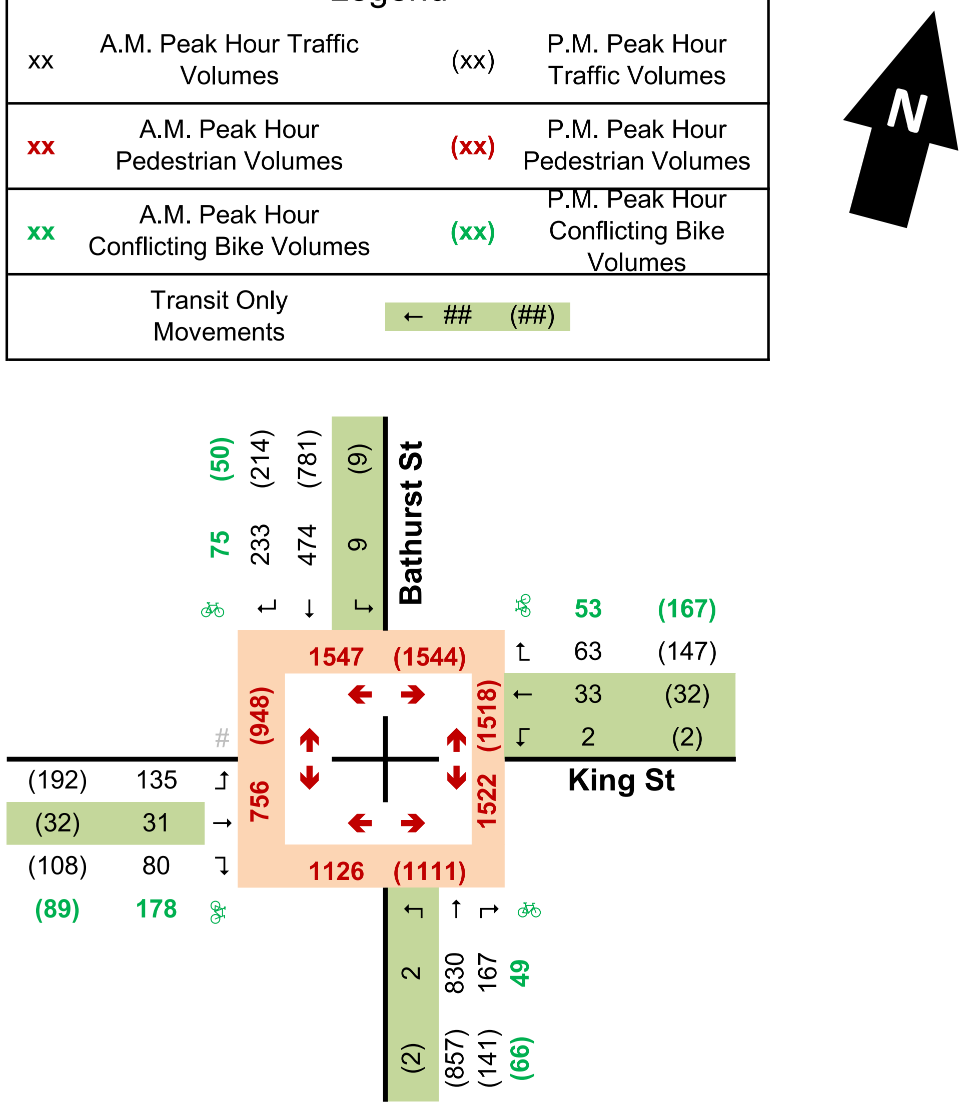
SITE TRIP VOLUMES

Legend			
xx	A.M. Peak Hour Traffic Volumes	(xx)	P.M. Peak Hour Traffic Volumes
xx	A.M. Peak Hour Pedestrian Volumes	(xx)	P.M. Peak Hour Pedestrian Volumes
xx	A.M. Peak Hour Conflicting Bike Volumes	(xx)	P.M. Peak Hour Conflicting Bike Volumes
Transit Only Movements	← ## (##)		



TOTAL TRAFFIC 2030 VOLUMES

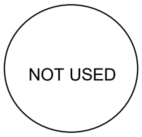
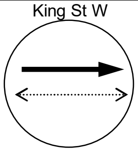
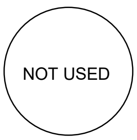
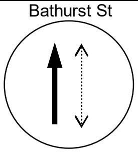
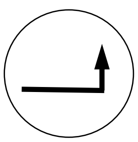
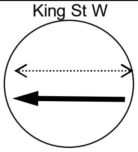
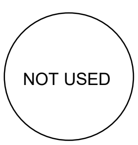
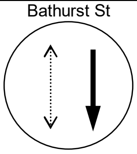
Legend			
xx	A.M. Peak Hour Traffic Volumes	(xx)	P.M. Peak Hour Traffic Volumes
xx	A.M. Peak Hour Pedestrian Volumes	(xx)	P.M. Peak Hour Pedestrian Volumes
xx	A.M. Peak Hour Conflicting Bike Volumes	(xx)	P.M. Peak Hour Conflicting Bike Volumes
Transit Only Movements		← ## (##)	



Appendix B: Existing Signal Timings

LOCATION:	**King St W & Bathurst St**	*DISTRICT:*	**Toronto & East York**
MODE/COMMENT:	**FXT with TSP**	*COMPUTER SYSTEM:*	**TransSuite**
PX:	**201**	*CONTROLLER/CABINET TYPE:*	**Peek ATC 1000 / TS2 T1**
PREPARED/CHECKED BY:	**LLC / DS**	*CONFLICT FLASH:*	**Red & Red**
PREPARATION DATE:	**November 18, 2014**	*DESIGN WALK SPEED:*	**1.0 m/s (FDW based on full crossing at 1.2 m/s)**
IMPLEMENTATION DATE:	**December 17, 2014**	*CHANNEL/DROP:*	**4026/20**

N

NEMA Phase			OFF	AM	PM	Special Events	Phase Mode	Remarks
			All Other Times	06:45-10:00 M-F	15:45-18:15 M-F	Times to be Determined	(Fixed/Demanded or Callable)	
	Local Plan		Pattern 1	Pattern 2	Pattern 3	Pattern 16		
	Split Table		Split 1	Split 2	Split 3	Split 16		
1 	WLK							Pedestrian Minimums: EWWK = 7 sec, EWFD = 19 sec NSWK = 7 sec, NSFD = 14 sec
	FDW							Left turn passage = 2 Secs
	MIN							TSP disabled - TSP activation pending new firmware testing & field validation
	MAX1							See back for TSP Instructions.
	AMB							
	ALR							
	SPLIT							
2 King St W 	WLK	7					Fixed	
	FDW	19						
	MIN	26					POZ activated by Request Loop	
	MAX1	34						
	AMB	4						
	ALR	2					(max extension of 16 secs in SDW)	
	SPLIT		44	57	49	44		
3 	WLK							
	FDW							
	MIN							
	MAX1							
	AMB							
	ALR							
	SPLIT							
4 Bathurst St 	WLK	7					Fixed	
	FDW	14					POZ activated by	
	MIN	21					Request Loop	
	MAX1	23						
	AMB	4					(max extension of 16 secs in SDW)	
	ALR	3						
	SPLIT		36	33	41	36		
5 	WLK						Fixed	
	FDW						POZ activated by	
	MIN	6					Request Loop	
	MAX1	6						
	AMB	3					(max extension of 8 secs in SDW.Extensions served only with the presence of street car within POZ during 6:45 - 10:00 M-F)	
	ALR	1						
	SPLIT		11	11	11	11		
6 King St W 	WLK	7					Fixed	
	FDW	19						
	MIN	26					POZ activated by Request Loop	
	MAX1	34						
	AMB	4						
	ALR	2					(max extension of 16 secs in SDW)	
	SPLIT		33	46	38	33		
7 	WLK							
	FDW							
	MIN							
	MAX1							
	AMB							
	ALR							
	SPLIT							
8 Bathurst St 	WLK	7					Fixed	
	FDW	14					POZ activated by	
	MIN	21					Request Loop	
	MAX1	23						
	AMB	4					(max extension of 16 secs in SDW)	
	ALR	3						
	SPLIT		36	33	41	36		
	CL		80	90	90	80		
	OF		1	20	20	1		

Notes: Picked up under TransSuite system on July 22, 2014 at approximately 13:00.

LOC: King St. W. & Bathurst St.
MODE: FXT with TSP
PX: 201 **PREPARATION DATE (TIMING CARD):** November 18, 2014

OFFSET CORRECTION PARAMETERS

2.3.4 O.C. Extend / Reduce
(Max. time added & subtracted in sec.)

From page 1

		Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8	[Cycle]	[Slop]	2.3.2.x O.C. Thres.
OFF												Pattern 1
Split 1	Ext.	--	15	--	--	--	15	--		80	10	20 s [25 %]
	Rdc.	--	2	--	8	1	1	--	8			
AM												Pattern 2
Split 2	Ext.	--	17	--	--	--	17	--	--	90	20	23 s [26 %]
	Rdc.	--	15	--	5	1	14	--	5			
PM												Pattern 3
Split 3	Ext.	--	15	--	--	--	15	--	--	80	10	20 s [25 %]
	Rdc.	--	2	--	8	1	1	--	8			
Special Events												Pattern 4
Split 16	Ext.	--	15	--	--	--	15	--	--	80	10	20 s [25 %]
	Rdc.	--	2	--	8	1	1	--	8			

T.S.P. PARAMETERS

PREPARED: LLC / DS

	TSP RUN # 2 EB Thru	TSP RUN # 4 NB Thru	TSP RUN # 5 EBLA	TSP RUN # 6 WB Thru	TSP RUN # 8 SB Thru
2.8.2 Transit Run Parameters					
ATC Green Extend Mode (Equivalent TTC Algorithm)	Mode 0 B-2	Mode 0 B-2	Mode 0 B-2	Mode 0 B-2	Mode 0 B-2
2.8.3 Transit Action Plan 1 (Used for all Other Patterns)					
Run Enable (X = Yes)	X	X		X	X
Run Config = 1 Recovery = 2 (O.C. with delay)					
2.8.3 Transit Action Plan 2 (Used for Patterns 2)					
Run Enable (X = Yes)	X	X	X	X	X
Run Config = 1 Recovery = 2 (O.C. with delay)					
2.8.3 Transit Action Plan 3 (Used for Patterns 3)					
Run Enable (X = Yes)	X	X		X	X
Run Config = 1 Recovery = 2 (O.C. with delay)					
2.8.3 Transit Action Plan 4 (Used for Patterns 16)					
Run Enable (X = Yes)					
Run Config = 1 Recovery = 2 (O.C. with delay)					

2.8.4 Transit Run Configuration 1

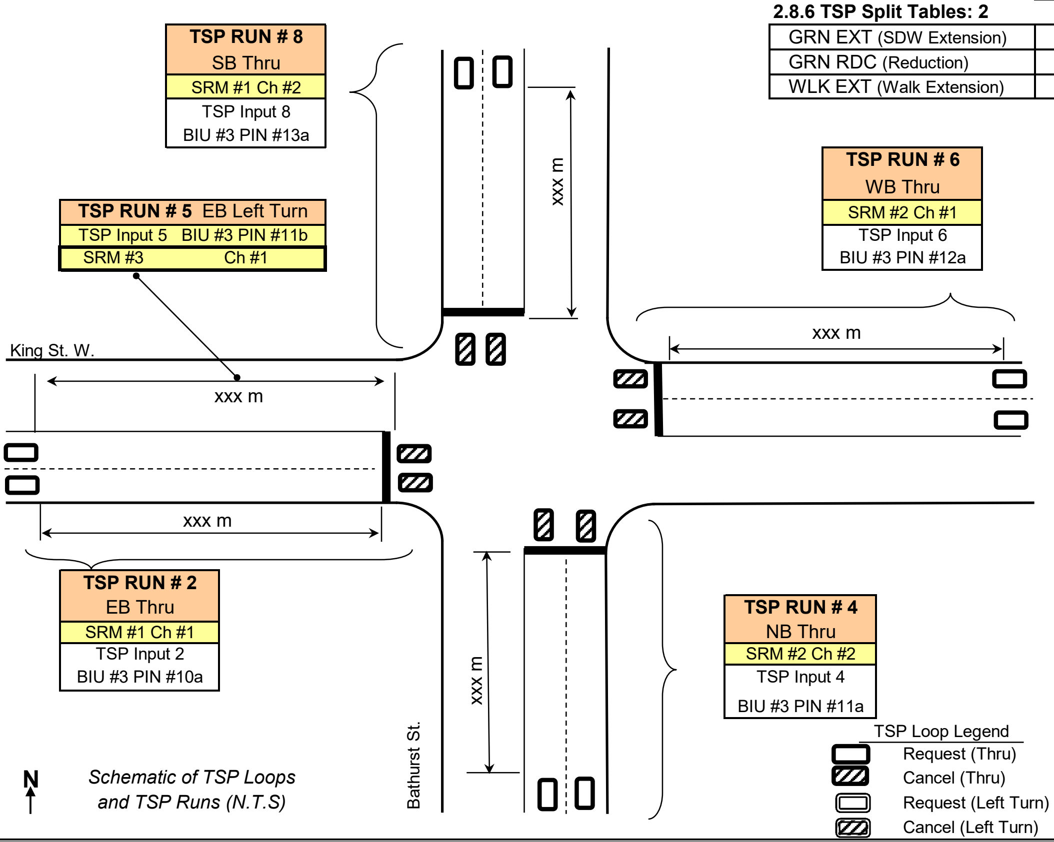
Delay / Extend / Fail	-- / -- / 235	-- / -- / 235	-- / -- / 235	-- / -- / 235	-- / -- / 235
CALLS (and Extends)	**Ø 2/6**	**Ø 4/8**	**Ø 5**	**Ø 2/6**	**Ø 4/8**
Skips	--	--	--	--	--
Reduces (Truncates)	--	--	--	--	--

2.8.6 TSP Split Tables: 1, 3 & 16

	Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8
GRN EXT (SDW Extension)	--	16	--	16		16	--	16
GRN RDC (Reduction)	--	--	--	--	--	--	--	--
WLK EXT (Walk Extension)	--	--	--	--	--	--	--	--

2.8.6 TSP Split Tables: 2

	Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8
GRN EXT (SDW Extension)	--	16	--	16	8	16	--	16
GRN RDC (Reduction)	--	--	--	--	--	--	--	--
WLK EXT (Walk Extension)	--	--	--	--	--	--	--	--



Notes:

ATC Mode	0	2	3	4
TTC Algor'm	B-2	A	C	D
Extensions	SDW	Walk	W/SDW	W/SDW

TSP SUMMARY

Maximum Green Extensions:
EWG: 16 s SDW
NSG: 16 s SDW
EBLA: 8 s SDW

Appendix C: Synchro Reports

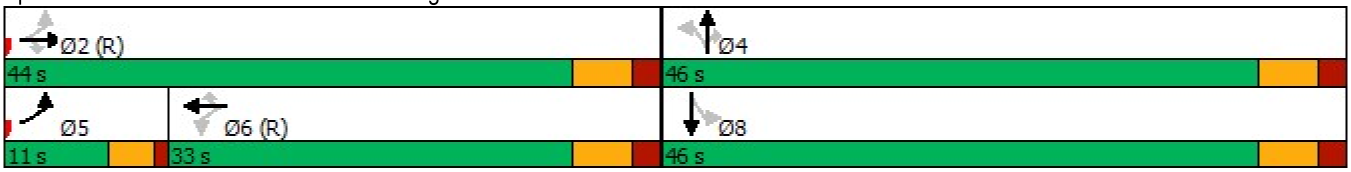
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	127	30	63	2	32	45	2	789	157	8	445
Future Volume (vph)	127	30	63	2	32	45	2	789	157	8	445
Lane Group Flow (vph)	0	161	64	0	35	46	0	807	160	0	691
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA
Protected Phases	5	2			6			4			8
Permitted Phases	2		2	6		6	4		4	8	
Detector Phase	5	2	2	6	6	6	4	4	4	8	8
Switch Phase											
Minimum Initial (s)	7.0	27.0	27.0	27.0	27.0	27.0	22.0	22.0	22.0	22.0	22.0
Minimum Split (s)	11.0	33.0	33.0	33.0	33.0	33.0	28.0	28.0	28.0	28.0	28.0
Total Split (s)	11.0	44.0	44.0	33.0	33.0	33.0	46.0	46.0	46.0	46.0	46.0
Total Split (%)	12.2%	48.9%	48.9%	36.7%	36.7%	36.7%	51.1%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-1.0		-2.0	-1.0		-1.0	-1.0		-1.0
Total Lost Time (s)		4.0	5.0		4.0	5.0		5.0	5.0		5.0
Lead/Lag	Lead			Lag	Lag	Lag					
Lead-Lag Optimize?											
Recall Mode	Max	C-Max	C-Max	C-Max	C-Max	C-Max	Max	Max	Max	Max	Max
Act Effct Green (s)		40.0	39.0		29.0	28.0		41.0	41.0		41.0
Actuated g/C Ratio		0.44	0.43		0.32	0.31		0.46	0.46		0.46
v/c Ratio		0.76	0.20		0.22	0.16		0.95	0.44		0.99
Control Delay		45.6	7.9		26.8	2.7		48.3	20.0		52.5
Queue Delay		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Total Delay		45.6	7.9		26.8	2.7		48.3	20.0		52.5
LOS		D	A		C	A		D	B		D
Approach Delay		34.9			13.1			43.6			52.5
Approach LOS		C			B			D			D
Queue Length 50th (m)		19.2	1.2		4.4	0.0		48.3	9.6		52.1
Queue Length 95th (m)		#52.0	8.7		12.3	2.4		#106.3	m30.8		#92.8
Internal Link Dist (m)		272.4			268.6			204.8			124.4
Turn Bay Length (m)											
Base Capacity (vph)		211	313		159	282		850	361		701
Starvation Cap Reductn		0	0		0	0		0	0		0
Spillback Cap Reductn		0	0		0	0		0	0		0
Storage Cap Reductn		0	0		0	0		0	0		0
Reduced v/c Ratio		0.76	0.20		0.22	0.16		0.95	0.44		0.99

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 28 (31%), Referenced to phase 2:EBTL and 6:WBTL, Start of 1st Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.99
Intersection Signal Delay: 44.5 Intersection LOS: D
Intersection Capacity Utilization 93.6% 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: 201: Bathurst St & King St



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	127	30	63	2	32	45	2	789	157	8	445	224
Future Volume (vph)	127	30	63	2	32	45	2	789	157	8	445	224
Ideal Flow (vphpl)	1900	1250	1900	1900	1250	1900	1900	1250	1900	1900	1250	1900
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)		4.0	5.0		4.0	5.0		5.0	5.0		5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00		0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.64		1.00	0.61		1.00	0.56		0.80	
Flpb, ped/bikes		0.80	1.00		0.98	1.00		1.00	1.00		1.00	
Frt		1.00	0.85		1.00	0.85		1.00	0.85		0.95	
Flt Protected		0.96	1.00		1.00	1.00		1.00	1.00		1.00	
Satd. Flow (prot)		583	655		498	719		1956	693		1470	
Flt Permitted		0.76	1.00		0.99	1.00		0.95	1.00		0.94	
Satd. Flow (perm)		462	655		494	719		1866	693		1390	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	130	31	64	2	33	46	2	805	160	8	454	229
RTOR Reduction (vph)	0	0	29	0	0	32	0	0	46	0	68	0
Lane Group Flow (vph)	0	161	35	0	35	14	0	807	114	0	623	0
Confl. Peds. (#/hr)	645		541	541		645	284		201	201		284
Confl. Bikes (#/hr)	61		43	42		63	163		39	38		168
Heavy Vehicles (%)	7%	100%	13%	5%	100%	2%	0%	5%	8%	0%	9%	2%
Bus Blockages (#/hr)	0	36	36	0	28	28	0	14	3	0	14	3
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	5	2			6			4			8	
Permitted Phases	2		2	6		6	4		4	8		
Actuated Green, G (s)		38.0	38.0		27.0	27.0		40.0	40.0		40.0	
Effective Green, g (s)		40.0	39.0		29.0	28.0		41.0	41.0		41.0	
Actuated g/C Ratio		0.44	0.43		0.32	0.31		0.46	0.46		0.46	
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	
Lane Grp Cap (vph)		217	283		159	223		850	315		633	
v/s Ratio Prot		c0.07										
v/s Ratio Perm		0.26	0.05		0.07	0.02		0.43	0.16		c0.45	
v/c Ratio		0.74	0.12		0.22	0.06		0.95	0.36		0.98	
Uniform Delay, d1		20.7	15.3		22.3	21.8		23.5	16.0		24.2	
Progression Factor		1.00	1.00		1.00	1.00		1.29	1.98		1.00	
Incremental Delay, d2		20.3	0.9		3.2	0.6		16.9	2.4		32.1	
Delay (s)		41.0	16.1		25.4	22.3		47.2	34.0		56.3	
Level of Service		D	B		C	C		D	C		E	
Approach Delay (s)		33.9			23.7			45.1			56.3	
Approach LOS		C			C			D			E	

Intersection Summary			
HCM 2000 Control Delay	46.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	93.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

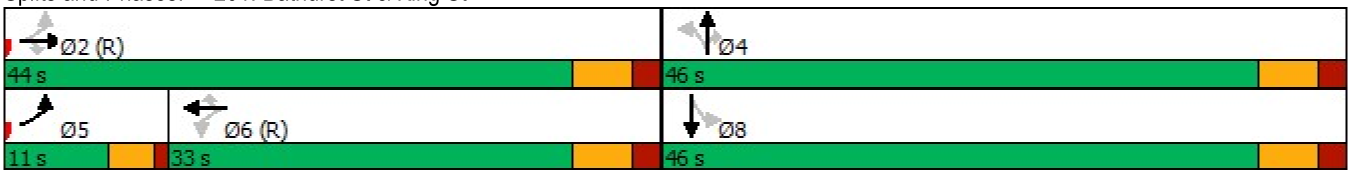
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	183	31	93	2	33	133	2	815	133	8	735
Future Volume (vph)	183	31	93	2	33	133	2	815	133	8	735
Lane Group Flow (vph)	0	227	99	0	37	141	0	869	141	0	1006
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA
Protected Phases	5	2			6			4			8
Permitted Phases	2		2	6		6	4		4	8	
Detector Phase	5	2	2	6	6	6	4	4	4	8	8
Switch Phase											
Minimum Initial (s)	7.0	27.0	27.0	27.0	27.0	27.0	22.0	22.0	22.0	22.0	22.0
Minimum Split (s)	11.0	33.0	33.0	33.0	33.0	33.0	28.0	28.0	28.0	28.0	28.0
Total Split (s)	11.0	44.0	44.0	33.0	33.0	33.0	46.0	46.0	46.0	46.0	46.0
Total Split (%)	12.2%	48.9%	48.9%	36.7%	36.7%	36.7%	51.1%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-1.0		-2.0	-1.0		-1.0	-1.0		-1.0
Total Lost Time (s)		4.0	5.0		4.0	5.0		5.0	5.0		5.0
Lead/Lag	Lead			Lag	Lag	Lag					
Lead-Lag Optimize?											
Recall Mode	Max	C-Max	C-Max	C-Max	C-Max	C-Max	Max	Max	Max	Max	Max
Act Effct Green (s)		40.0	39.0		29.0	28.0		41.0	41.0		41.0
Actuated g/C Ratio		0.44	0.43		0.32	0.31		0.46	0.46		0.46
v/c Ratio		1.07	0.31		0.23	0.50		1.06	0.46		1.38
Control Delay		106.9	14.1		27.0	18.0		75.9	12.8		205.1
Queue Delay		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Total Delay		106.9	14.1		27.0	18.0		75.9	12.8		205.1
LOS		F	B		C	B		E	B		F
Approach Delay		78.7			19.9			67.1			205.1
Approach LOS		E			B			E			F
Queue Length 50th (m)		~32.4	6.6		4.7	7.2		~88.0	5.6		~121.2
Queue Length 95th (m)		#86.9	18.4		12.7	25.7		#124.1	22.2		#159.6
Internal Link Dist (m)		272.4			268.6			204.8			124.4
Turn Bay Length (m)											
Base Capacity (vph)		213	321		161	282		817	307		727
Starvation Cap Reductn		0	0		0	0		0	0		0
Spillback Cap Reductn		0	0		0	0		0	0		0
Storage Cap Reductn		0	0		0	0		0	0		0
Reduced v/c Ratio		1.07	0.31		0.23	0.50		1.06	0.46		1.38

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of 1st Green	
Natural Cycle: 110	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.38	
Intersection Signal Delay: 120.4	Intersection LOS: F
Intersection Capacity Utilization 104.3%	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.

Splits and Phases: 201: Bathurst St & King St



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	183	31	93	2	33	133	2	815	133	8	735	202
Future Volume (vph)	183	31	93	2	33	133	2	815	133	8	735	202
Ideal Flow (vphpl)	1900	1250	1900	1900	1250	1900	1900	1250	1900	1900	1250	1900
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)		4.0	5.0		4.0	5.0		5.0	5.0		5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00		0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.63		1.00	0.62		1.00	0.48		0.87	
Flpb, ped/bikes		0.81	1.00		0.99	1.00		1.00	1.00		1.00	
Frt		1.00	0.85		1.00	0.85		1.00	0.85		0.97	
Flt Protected		0.96	1.00		1.00	1.00		1.00	1.00		1.00	
Satd. Flow (prot)		655	695		507	719		1883	573		1625	
Flt Permitted		0.68	1.00		0.99	1.00		0.95	1.00		0.95	
Satd. Flow (perm)		467	695		502	719		1795	573		1537	
Peak-hour factor, PHF	0.94	0.96	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	195	32	99	2	35	141	2	867	141	9	782	215
RTOR Reduction (vph)	0	0	20	0	0	59	0	0	46	0	27	0
Lane Group Flow (vph)	0	227	79	0	37	82	0	869	95	0	979	0
Confl. Peds. (#/hr)	640		535	535		640	469		216	216		469
Confl. Bikes (#/hr)	42		60	58		43	82		150	146		84
Heavy Vehicles (%)	3%	100%	10%	10%	100%	5%	40%	9%	12%	13%	6%	5%
Bus Blockages (#/hr)	0	28	28	0	24	24	0	14	3	0	14	3
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	5	2			6			4			8	
Permitted Phases	2		2	6		6	4		4	8		
Actuated Green, G (s)		38.0	38.0		27.0	27.0		40.0	40.0		40.0	
Effective Green, g (s)		40.0	39.0		29.0	28.0		41.0	41.0		41.0	
Actuated g/C Ratio		0.44	0.43		0.32	0.31		0.46	0.46		0.46	
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	
Lane Grp Cap (vph)		226	301		161	223		817	261		700	
v/s Ratio Prot		c0.10										
v/s Ratio Perm		0.35	0.11		0.07	0.11		0.48	0.17		c0.64	
v/c Ratio		1.00	0.26		0.23	0.37		1.06	0.36		1.40	
Uniform Delay, d1		25.0	16.3		22.3	24.1		24.5	16.0		24.5	
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	
Incremental Delay, d2		61.0	2.1		3.3	4.7		49.8	3.9		187.8	
Delay (s)		86.0	18.4		25.6	28.8		74.3	19.9		212.3	
Level of Service		F	B		C	C		E	B		F	
Approach Delay (s)		65.5			28.1			66.7			212.3	
Approach LOS		E			C			E			F	

Intersection Summary			
HCM 2000 Control Delay	122.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	104.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	135	31	70	2	33	49	2	830	165	9	471
Future Volume (vph)	135	31	70	2	33	49	2	830	165	9	471
Lane Group Flow (vph)	0	170	71	0	36	50	0	849	168	0	728
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA
Protected Phases	5	2			6			4			8
Permitted Phases	2		2	6		6	4		4	8	
Detector Phase	5	2	2	6	6	6	4	4	4	8	8
Switch Phase											
Minimum Initial (s)	7.0	27.0	27.0	27.0	27.0	27.0	22.0	22.0	22.0	22.0	22.0
Minimum Split (s)	11.0	33.0	33.0	33.0	33.0	33.0	28.0	28.0	28.0	28.0	28.0
Total Split (s)	11.0	44.0	44.0	33.0	33.0	33.0	46.0	46.0	46.0	46.0	46.0
Total Split (%)	12.2%	48.9%	48.9%	36.7%	36.7%	36.7%	51.1%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-1.0		-2.0	-1.0		-1.0	-1.0		-1.0
Total Lost Time (s)		4.0	5.0		4.0	5.0		5.0	5.0		5.0
Lead/Lag	Lead			Lag	Lag	Lag					
Lead-Lag Optimize?											
Recall Mode	Max	C-Max	C-Max	C-Max	C-Max	C-Max	Max	Max	Max	Max	Max
Act Effct Green (s)		40.0	39.0		29.0	28.0		41.0	41.0		41.0
Actuated g/C Ratio		0.44	0.43		0.32	0.31		0.46	0.46		0.46
v/c Ratio		0.93	0.28		0.23	0.22		1.00	1.70		1.11
Control Delay		76.2	12.7		27.0	4.2		58.5	364.5		91.0
Queue Delay		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Total Delay		76.2	12.7		27.0	4.2		58.5	364.5		91.0
LOS		E	B		C	A		E	F		F
Approach Delay		57.5			13.7			109.0			91.0
Approach LOS		E			B			F			F
Queue Length 50th (m)		20.6	3.6		4.5	0.0		50.8	~35.1		~70.0
Queue Length 95th (m)		#66.6	13.2		12.5	3.4		#114.6	m#64.2		#105.2
Internal Link Dist (m)		272.4			268.6			204.8			124.4
Turn Bay Length (m)											
Base Capacity (vph)		183	256		158	225		850	99		657
Starvation Cap Reductn		0	0		0	0		0	0		0
Spillback Cap Reductn		0	0		0	0		0	0		0
Storage Cap Reductn		0	0		0	0		0	0		0
Reduced v/c Ratio		0.93	0.28		0.23	0.22		1.00	1.70		1.11

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 28 (31%), Referenced to phase 2:EBTL and 6:WBTL, Start of 1st Green

Natural Cycle: 120

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.70

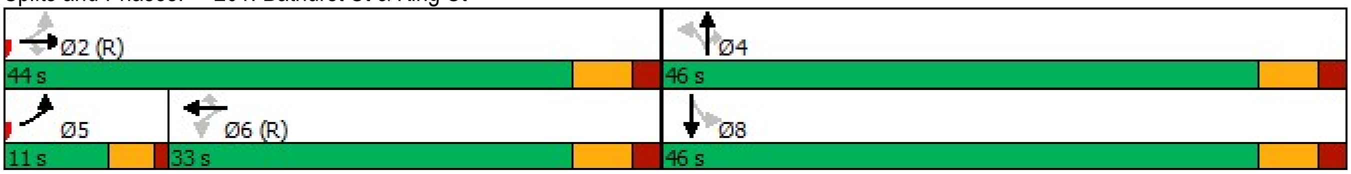
Intersection Signal Delay: 92.8 Intersection LOS: F

Intersection Capacity Utilization 98.3% 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.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 201: Bathurst St & King St



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	135	31	70	2	33	49	2	830	165	9	471	233
Future Volume (vph)	135	31	70	2	33	49	2	830	165	9	471	233
Ideal Flow (vphpl)	1900	1250	1900	1900	1250	1900	1900	1250	1900	1900	1250	1900
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)		4.0	5.0		4.0	5.0		5.0	5.0		5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00		0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.53		1.00	0.45		1.00	0.09		0.75	
Flpb, ped/bikes		0.70	1.00		0.98	1.00		1.00	1.00		1.00	
Frt		1.00	0.85		1.00	0.85		1.00	0.85		0.95	
Flt Protected		0.96	1.00		1.00	1.00		1.00	1.00		1.00	
Satd. Flow (prot)		517	545		496	536		1956	117		1377	
Flt Permitted		0.75	1.00		0.99	1.00		0.95	1.00		0.94	
Satd. Flow (perm)		405	545		492	536		1866	117		1299	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	138	32	71	2	34	50	2	847	168	9	481	238
RTOR Reduction (vph)	0	0	20	0	0	34	0	0	46	0	66	0
Lane Group Flow (vph)	0	170	51	0	36	16	0	849	122	0	662	0
Confl. Peds. (#/hr)	1529		1106	1106		1529	747		1465	1465		747
Confl. Bikes (#/hr)	61		45	42		66	163		41	38		177
Heavy Vehicles (%)	7%	100%	13%	5%	100%	2%	0%	5%	8%	0%	9%	2%
Bus Blockages (#/hr)	0	36	36	0	28	28	0	14	3	0	14	3
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	5	2			6			4			8	
Permitted Phases	2		2	6		6	4		4	8		
Actuated Green, G (s)		38.0	38.0		27.0	27.0		40.0	40.0		40.0	
Effective Green, g (s)		40.0	39.0		29.0	28.0		41.0	41.0		41.0	
Actuated g/C Ratio		0.44	0.43		0.32	0.31		0.46	0.46		0.46	
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	
Lane Grp Cap (vph)		191	236		158	166		850	53		591	
v/s Ratio Prot		c0.09										
v/s Ratio Perm		0.31	0.09		0.07	0.03		0.46	c1.04		0.51	
v/c Ratio		0.89	0.21		0.23	0.09		1.00	2.30		1.12	
Uniform Delay, d1		23.0	15.9		22.3	22.0		24.5	24.5		24.5	
Progression Factor		1.00	1.00		1.00	1.00		1.28	5.20		1.00	
Incremental Delay, d2		41.5	2.1		3.3	1.1		26.3	625.2		74.7	
Delay (s)		64.5	18.0		25.6	23.1		57.6	752.5		99.2	
Level of Service		E	B		C	C		E	F		F	
Approach Delay (s)		50.8			24.2			172.4			99.2	
Approach LOS		D			C			F			F	

Intersection Summary			
HCM 2000 Control Delay	126.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.58		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	98.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

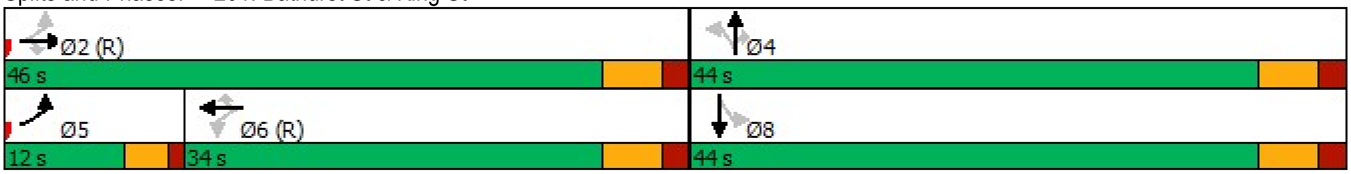
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	192	32	101	2	32	140	2	857	140	9	776
Future Volume (vph)	192	32	101	2	32	140	2	857	140	9	776
Lane Group Flow (vph)	0	237	107	0	36	149	0	914	149	0	1064
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA
Protected Phases	5	2			6			4			8
Permitted Phases	2		2	6		6	4		4	8	
Detector Phase	5	2	2	6	6	6	4	4	4	8	8
Switch Phase											
Minimum Initial (s)	7.0	27.0	27.0	27.0	27.0	27.0	22.0	22.0	22.0	22.0	22.0
Minimum Split (s)	11.0	33.0	33.0	33.0	33.0	33.0	28.0	28.0	28.0	28.0	28.0
Total Split (s)	12.0	46.0	46.0	34.0	34.0	34.0	44.0	44.0	44.0	44.0	44.0
Total Split (%)	13.3%	51.1%	51.1%	37.8%	37.8%	37.8%	48.9%	48.9%	48.9%	48.9%	48.9%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-1.0		-2.0	-1.0		-1.0	-1.0		-1.0
Total Lost Time (s)		4.0	5.0		4.0	5.0		5.0	5.0		5.0
Lead/Lag	Lead			Lag	Lag	Lag					
Lead-Lag Optimize?											
Recall Mode	Max	C-Max	C-Max	C-Max	C-Max	C-Max	Max	Max	Max	Max	Max
Act Effct Green (s)		42.0	41.0		30.0	29.0		39.0	39.0		39.0
Actuated g/C Ratio		0.47	0.46		0.33	0.32		0.43	0.43		0.43
v/c Ratio		1.20	0.38		0.22	0.65		1.18	1.64		1.61
Control Delay		151.7	15.4		25.8	27.4		119.0	347.6		303.5
Queue Delay		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Total Delay		151.7	15.4		25.8	27.4		119.0	347.6		303.5
LOS		F	B		C	C		F	F		F
Approach Delay		109.3			27.1			151.1			303.5
Approach LOS		F			C			F			F
Queue Length 50th (m)		~38.7	7.4		4.4	8.8		~100.4	~21.3		~139.2
Queue Length 95th (m)		#93.7	20.9		12.2	#37.7		#137.1	#58.1		#178.1
Internal Link Dist (m)		272.4			268.6			204.8			124.4
Turn Bay Length (m)											
Base Capacity (vph)		198	284		166	229		777	91		662
Starvation Cap Reductn		0	0		0	0		0	0		0
Spillback Cap Reductn		0	0		0	0		0	0		0
Storage Cap Reductn		0	0		0	0		0	0		0
Reduced v/c Ratio		1.20	0.38		0.22	0.65		1.18	1.64		1.61

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of 1st Green	
Natural Cycle: 140	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.64	
Intersection Signal Delay: 198.1	Intersection LOS: F
Intersection Capacity Utilization 108.7%	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.

Splits and Phases: 201: Bathurst St & King St



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	192	32	101	2	32	140	2	857	140	9	776	214
Future Volume (vph)	192	32	101	2	32	140	2	857	140	9	776	214
Ideal Flow (vphpl)	1900	1250	1900	1900	1250	1900	1900	1250	1900	1900	1250	1900
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)		4.0	5.0		4.0	5.0		5.0	5.0		5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00		0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.53		1.00	0.46		1.00	0.08		0.83	
Flpb, ped/bikes		0.72	1.00		0.98	1.00		1.00	1.00		1.00	
Frt		1.00	0.85		1.00	0.85		1.00	0.85		0.97	
Flt Protected		0.96	1.00		1.00	1.00		1.00	1.00		1.00	
Satd. Flow (prot)		582	581		505	532		1883	101		1551	
Flt Permitted		0.68	1.00		0.99	1.00		0.95	1.00		0.94	
Satd. Flow (perm)		415	581		500	532		1795	101		1465	
Peak-hour factor, PHF	0.94	0.96	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	204	33	107	2	34	149	2	912	149	10	826	228
RTOR Reduction (vph)	0	0	20	0	0	58	0	0	48	0	27	0
Lane Group Flow (vph)	0	237	87	0	36	91	0	914	101	0	1037	0
Confl. Peds. (#/hr)	1523		1099	1099		1523	940		1481	1481		940
Confl. Bikes (#/hr)	42		63	58		45	82		158	146		89
Heavy Vehicles (%)	3%	100%	10%	10%	100%	5%	40%	9%	12%	13%	6%	5%
Bus Blockages (#/hr)	0	28	28	0	24	24	0	14	3	0	14	3
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	5	2			6			4			8	
Permitted Phases	2		2	6		6	4		4	8		
Actuated Green, G (s)		40.0	40.0		28.0	28.0		38.0	38.0		38.0	
Effective Green, g (s)		42.0	41.0		30.0	29.0		39.0	39.0		39.0	
Actuated g/C Ratio		0.47	0.46		0.33	0.32		0.43	0.43		0.43	
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	
Lane Grp Cap (vph)		212	264		166	171		777	43		634	
v/s Ratio Prot		c0.12										
v/s Ratio Perm		0.40	0.15		0.07	0.17		0.51	c1.00		0.71	
v/c Ratio		1.12	0.33		0.22	0.53		1.18	2.34		1.64	
Uniform Delay, d1		24.0	15.7		21.6	25.0		25.5	25.5		25.5	
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	
Incremental Delay, d2		97.1	3.3		3.0	11.5		92.6	671.1		293.0	
Delay (s)		121.1	19.0		24.5	36.4		118.1	696.6		318.5	
Level of Service		F	B		C	D		F	F		F	
Approach Delay (s)		89.3			34.1			199.2			318.5	
Approach LOS		F			C			F			F	

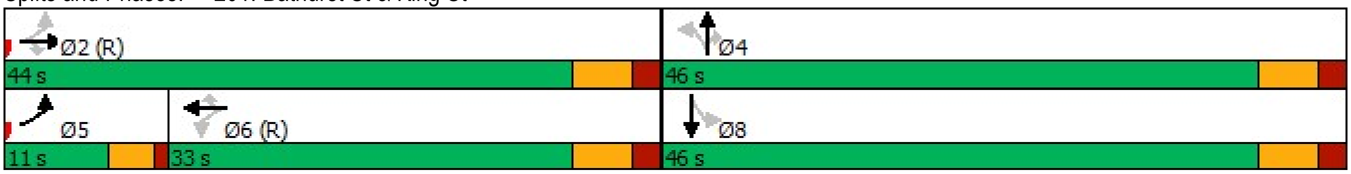
Intersection Summary			
HCM 2000 Control Delay	221.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.62		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	108.7%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	135	31	80	2	33	63	2	830	167	9	474
Future Volume (vph)	135	31	80	2	33	63	2	830	167	9	474
Lane Group Flow (vph)	0	170	82	0	36	64	0	849	170	0	731
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA
Protected Phases	5	2			6			4			8
Permitted Phases	2		2	6		6	4		4	8	
Detector Phase	5	2	2	6	6	6	4	4	4	8	8
Switch Phase											
Minimum Initial (s)	7.0	27.0	27.0	27.0	27.0	27.0	22.0	22.0	22.0	22.0	22.0
Minimum Split (s)	11.0	33.0	33.0	33.0	33.0	33.0	28.0	28.0	28.0	28.0	28.0
Total Split (s)	11.0	44.0	44.0	33.0	33.0	33.0	46.0	46.0	46.0	46.0	46.0
Total Split (%)	12.2%	48.9%	48.9%	36.7%	36.7%	36.7%	51.1%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-1.0		-2.0	-1.0		-1.0	-1.0		-1.0
Total Lost Time (s)		4.0	5.0		4.0	5.0		5.0	5.0		5.0
Lead/Lag	Lead			Lag	Lag	Lag					
Lead-Lag Optimize?											
Recall Mode	Max	C-Max	C-Max	C-Max	C-Max	C-Max	Max	Max	Max	Max	Max
Act Effct Green (s)		40.0	39.0		29.0	28.0		41.0	41.0		41.0
Actuated g/C Ratio		0.44	0.43		0.32	0.31		0.46	0.46		0.46
v/c Ratio		0.93	0.32		0.23	0.28		1.00	1.72		1.11
Control Delay		76.2	14.3		27.0	6.8		58.5	373.1		93.4
Queue Delay		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Total Delay		76.2	14.3		27.0	6.8		58.5	373.1		93.4
LOS		E	B		C	A		E	F		F
Approach Delay		56.1			14.1			111.0			93.4
Approach LOS		E			B			F			F
Queue Length 50th (m)		20.6	4.8		4.5	0.0		50.8	~36.0		~70.8
Queue Length 95th (m)		#66.6	15.8		12.5	6.1		#114.6	m#65.5		#106.0
Internal Link Dist (m)		272.4			268.6			204.8			124.4
Turn Bay Length (m)											
Base Capacity (vph)		183	254		158	225		850	99		656
Starvation Cap Reductn		0	0		0	0		0	0		0
Spillback Cap Reductn		0	0		0	0		0	0		0
Storage Cap Reductn		0	0		0	0		0	0		0
Reduced v/c Ratio		0.93	0.32		0.23	0.28		1.00	1.72		1.11

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 28 (31%), Referenced to phase 2:EBTL and 6:WBTL, Start of 1st Green	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.72	
Intersection Signal Delay: 93.7	Intersection LOS: F
Intersection Capacity Utilization 98.8%	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.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 201: Bathurst St & King St



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	135	31	80	2	33	63	2	830	167	9	474	233
Future Volume (vph)	135	31	80	2	33	63	2	830	167	9	474	233
Ideal Flow (vphpl)	1900	1250	1900	1900	1250	1900	1900	1250	1900	1900	1250	1900
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)		4.0	5.0		4.0	5.0		5.0	5.0		5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00		0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.53		1.00	0.45		1.00	0.09		0.75	
Flpb, ped/bikes		0.70	1.00		0.98	1.00		1.00	1.00		1.00	
Frt		1.00	0.85		1.00	0.85		1.00	0.85		0.95	
Flt Protected		0.96	1.00		1.00	1.00		1.00	1.00		1.00	
Satd. Flow (prot)		517	541		496	536		1956	116		1377	
Flt Permitted		0.75	1.00		0.99	1.00		0.95	1.00		0.94	
Satd. Flow (perm)		405	541		491	536		1866	116		1299	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	138	32	82	2	34	64	2	847	170	9	484	238
RTOR Reduction (vph)	0	0	20	0	0	44	0	0	46	0	65	0
Lane Group Flow (vph)	0	170	62	0	36	20	0	849	124	0	666	0
Confl. Peds. (#/hr)	1547		1126	1126		1547	756		1522	1522		756
Confl. Bikes (#/hr)	61		49	42		75	163		53	38		178
Heavy Vehicles (%)	7%	100%	13%	5%	100%	2%	0%	5%	8%	0%	9%	2%
Bus Blockages (#/hr)	0	36	36	0	28	28	0	14	3	0	14	3
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	5	2			6			4			8	
Permitted Phases	2		2	6		6	4		4	8		
Actuated Green, G (s)		38.0	38.0		27.0	27.0		40.0	40.0		40.0	
Effective Green, g (s)		40.0	39.0		29.0	28.0		41.0	41.0		41.0	
Actuated g/C Ratio		0.44	0.43		0.32	0.31		0.46	0.46		0.46	
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	
Lane Grp Cap (vph)		191	234		158	166		850	52		591	
v/s Ratio Prot		c0.09										
v/s Ratio Perm		0.31	0.11		0.07	0.04		0.46	c1.06		0.51	
v/c Ratio		0.89	0.26		0.23	0.12		1.00	2.38		1.13	
Uniform Delay, d1		23.0	16.3		22.3	22.2		24.5	24.5		24.5	
Progression Factor		1.00	1.00		1.00	1.00		1.28	5.12		1.00	
Incremental Delay, d2		41.5	2.7		3.3	1.5		26.3	662.2		77.3	
Delay (s)		64.5	19.0		25.6	23.7		57.6	787.8		101.8	
Level of Service		E	B		C	C		E	F		F	
Approach Delay (s)		49.7			24.4			179.4			101.8	
Approach LOS		D			C			F			F	

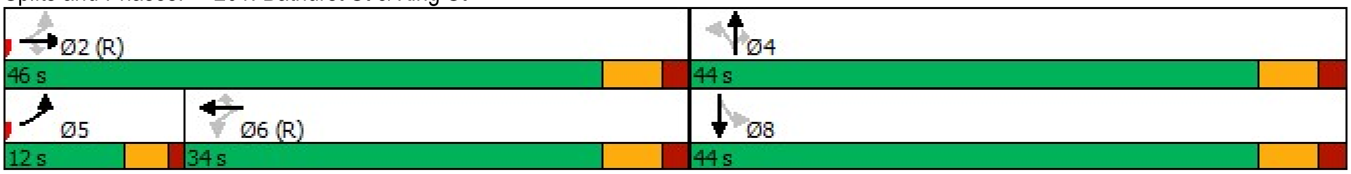
Intersection Summary			
HCM 2000 Control Delay	129.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.61		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	98.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	192	32	108	2	32	147	2	857	141	9	781
Future Volume (vph)	192	32	108	2	32	147	2	857	141	9	781
Lane Group Flow (vph)	0	237	115	0	36	156	0	914	150	0	1069
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA
Protected Phases	5	2			6			4			8
Permitted Phases	2		2	6		6	4		4	8	
Detector Phase	5	2	2	6	6	6	4	4	4	8	8
Switch Phase											
Minimum Initial (s)	7.0	27.0	27.0	27.0	27.0	27.0	22.0	22.0	22.0	22.0	22.0
Minimum Split (s)	11.0	33.0	33.0	33.0	33.0	33.0	28.0	28.0	28.0	28.0	28.0
Total Split (s)	12.0	46.0	46.0	34.0	34.0	34.0	44.0	44.0	44.0	44.0	44.0
Total Split (%)	13.3%	51.1%	51.1%	37.8%	37.8%	37.8%	48.9%	48.9%	48.9%	48.9%	48.9%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-1.0		-2.0	-1.0		-1.0	-1.0		-1.0
Total Lost Time (s)		4.0	5.0		4.0	5.0		5.0	5.0		5.0
Lead/Lag	Lead			Lag	Lag	Lag					
Lead-Lag Optimize?											
Recall Mode	Max	C-Max	C-Max	C-Max	C-Max	C-Max	Max	Max	Max	Max	Max
Act Effct Green (s)		42.0	41.0		30.0	29.0		39.0	39.0		39.0
Actuated g/C Ratio		0.47	0.46		0.33	0.32		0.43	0.43		0.43
v/c Ratio		1.20	0.41		0.22	0.68		1.18	1.65		1.61
Control Delay		151.7	16.5		25.8	30.0		119.0	352.2		306.8
Queue Delay		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Total Delay		151.7	16.5		25.8	30.0		119.0	352.2		306.8
LOS		F	B		C	C		F	F		F
Approach Delay		107.5			29.2			151.9			306.8
Approach LOS		F			C			F			F
Queue Length 50th (m)		~38.7	8.4		4.4	10.2		~100.4	~21.8		~140.1
Queue Length 95th (m)		#93.7	22.9		12.2	#41.1		#137.1	#58.6		#179.0
Internal Link Dist (m)		272.4			268.6			204.8			124.4
Turn Bay Length (m)											
Base Capacity (vph)		198	282		166	229		777	91		662
Starvation Cap Reductn		0	0		0	0		0	0		0
Spillback Cap Reductn		0	0		0	0		0	0		0
Storage Cap Reductn		0	0		0	0		0	0		0
Reduced v/c Ratio		1.20	0.41		0.22	0.68		1.18	1.65		1.61

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of 1st Green	
Natural Cycle: 140	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.65	
Intersection Signal Delay: 199.1	Intersection LOS: F
Intersection Capacity Utilization 109.2%	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: 201: Bathurst St & King St



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	192	32	108	2	32	147	2	857	141	9	781	214
Future Volume (vph)	192	32	108	2	32	147	2	857	141	9	781	214
Ideal Flow (vphpl)	1900	1250	1900	1900	1250	1900	1900	1250	1900	1900	1250	1900
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)		4.0	5.0		4.0	5.0		5.0	5.0		5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00		0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.53		1.00	0.46		1.00	0.08		0.83	
Flpb, ped/bikes		0.72	1.00		0.98	1.00		1.00	1.00		1.00	
Frt		1.00	0.85		1.00	0.85		1.00	0.85		0.97	
Flt Protected		0.96	1.00		1.00	1.00		1.00	1.00		1.00	
Satd. Flow (prot)		582	578		505	532		1883	100		1552	
Flt Permitted		0.68	1.00		0.99	1.00		0.95	1.00		0.94	
Satd. Flow (perm)		415	578		500	532		1795	100		1466	
Peak-hour factor, PHF	0.94	0.96	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	204	33	115	2	34	156	2	912	150	10	831	228
RTOR Reduction (vph)	0	0	20	0	0	58	0	0	48	0	27	0
Lane Group Flow (vph)	0	237	95	0	36	98	0	914	102	0	1042	0
Confl. Peds. (#/hr)	1544		1111	1111		1544	948		1518	1518		948
Confl. Bikes (#/hr)	42		66	58		50	82		167	146		89
Heavy Vehicles (%)	3%	100%	10%	10%	100%	5%	40%	9%	12%	13%	6%	5%
Bus Blockages (#/hr)	0	28	28	0	24	24	0	14	3	0	14	3
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	5	2			6			4			8	
Permitted Phases	2		2	6		6	4		4	8		
Actuated Green, G (s)		40.0	40.0		28.0	28.0		38.0	38.0		38.0	
Effective Green, g (s)		42.0	41.0		30.0	29.0		39.0	39.0		39.0	
Actuated g/C Ratio		0.47	0.46		0.33	0.32		0.43	0.43		0.43	
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	
Lane Grp Cap (vph)		212	263		166	171		777	43		635	
v/s Ratio Prot		c0.12										
v/s Ratio Perm		0.40	0.17		0.07	0.18		0.51	c1.02		0.71	
v/c Ratio		1.12	0.36		0.22	0.58		1.18	2.37		1.64	
Uniform Delay, d1		24.0	16.0		21.6	25.4		25.5	25.5		25.5	
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	
Incremental Delay, d2		97.1	3.8		3.0	13.3		92.6	681.2		295.4	
Delay (s)		121.1	19.8		24.5	38.7		118.1	706.7		320.9	
Level of Service		F	B		C	D		F	F		F	
Approach Delay (s)		88.0			36.1			201.1			320.9	
Approach LOS		F			D			F			F	

Intersection Summary			
HCM 2000 Control Delay	222.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	109.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Appendix D: Transfer Trip Matrix

Peak AM Surface Transfer Matrix

From/To	OL EB/NB	OL WB/SB	OL walk egress	LT EB	LT WB	LT SB	LT NB	LT Walk Egress / Transfer	Total
OL EB/NB	-	-	269	358	-	90	90	-	806
OL WB/SB	-	-	358	-	179	179	269	-	985
OL walk access	1,522	269	-	-	-	-	-	-	1,791
LT EB	358	-	-	-	-	-	-	90	448
LT WB	-	90	-	-	-	-	-	269	358
LT SB	269	-	-	-	-	-	-	179	448
LT NB	269	-	-	-	-	-	-	179	448
LT Walk Access / Transfer	-	-	-	537	-	-	-	-	537
Total	2,417	358	627	895	179	269	358	716	5,820

Peak PM Surface Transfer Matrix

From/To	OL EB/NB	OL WB/SB	OL walk egress	LT EB	LT WB	LT SB	LT NB	LT Walk Egress / Transfer	Total
OL EB/NB	-	-	1,522	358	-	269	269	-	2,417
OL WB/SB	-	-	269	-	90	-	-	-	358
OL walk access	269	358	-	-	-	-	-	-	627
LT EB	358	-	-	-	-	-	-	537	895
LT WB	-	179	-	-	-	-	-	-	179
LT SB	90	179	-	-	-	-	-	-	269
LT NB	90	269	-	-	-	-	-	-	358
LT Walk Access / Transfer	-	-	-	90	269	179	179	-	716
Total	806	985	1,791	448	358	448	448	537	5,820