

70 & 86 LYNN WILLIAMS STREET PROPOSED MIXED-USE DEVELOPMENT

Urban Transportation Considerations
City of Toronto



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BA Group

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TABLE OF CONTENTS

1.0	INTRODUCTION	1
1.1	The Proposed Development	1
1.2	Scope of Transportation Review	6
2.0	ACTIVE TRANSPORTATION STRATEGY	7
2.1	Existing Mobility Context	7
2.2	Future Mobility Opportunities	7
2.3	Mobility Planning Principles	7
2.4	Transportation Demand Management	8
3.0	PLANNING AND POLICY CONTEXT	10
3.1	Provincial and Regional Policies	10
3.2	Local and Site-Specific Policies	11
4.0	AREA TRANSPORTATION CONTEXT	15
4.1	Area Road Network	15
4.2	Area Transit Network	21
4.3	Area Cycling Network	31
4.4	Pedestrian Context	34
4.5	Shared Mobility Services	35
5.0	VEHICLE PARKING CONSIDERATIONS	38
5.1	Zoning By-law Parking Requirements	38
5.2	Proposed Vehicle Parking Supply	40
6.0	BICYCLE PARKING CONSIDERATIONS	41
6.1	Zoning By-law Requirements	41
6.2	Proposed Bicycle Parking Supply and Facilities	42
7.0	LOADING CONSIDERATIONS	43
7.1	Zoning By-law Requirements	43
7.2	Proposed Loading Supply	43
8.0	MULTI-MODAL TRAVEL DEMAND FORECASTING	44
8.1	Site Travel Mode Share	44
8.2	Multi-Modal Travel Demand Forecasting Methodology	47
8.3	Area Background Development Travel Demand Allowances	52
8.4	Multi-Modal Trip Distribution	55
9.0	TRANSIT CONSIDERATIONS	59
9.1	Transit Connectivity	59
9.2	Site Transit Volumes	60
10.0	VEHICULAR TRAFFIC CONSIDERATIONS	62
10.1	Traffic Analysis Scenarios and Study Periods	62
10.2	Existing Traffic Volumes	62
10.3	Future Background Traffic	64
10.4	Site Traffic Volumes	71
10.5	Future Total Traffic Volumes	71



11.0 TRAFFIC OPERATIONS ANALYSIS75

11.1 Analysis Methodology and Assumptions75

11.2 Study Area Intersections76

11.3 Analysis Summary – Local Study Area77

11.4 Analysis Summary – Wider Study Area.....79

11.5 Sensitivity Analysis – Potential Improvements85

12.0 CONCLUSIONS87



LIST OF TABLES

Table 1	Proposed Development Plan Summary.....	2
Table 2	Proposed TDM Strategies.....	9
Table 3	Summary of Existing Area Road Network	15
Table 4	Existing Area Transit Services	21
Table 5	Summary of Existing and Future Transit Service Area Travel Reaches	27
Table 6	Existing Area Cycling Infrastructure.....	31
Table 7	Site-Specific Zoning By-law 600-2005 – Minimum Parking Requirements	38
Table 8	City of Toronto Zoning By-law 569-2013, as Amended, Parking Zone ‘B’ – Parking Requirements...39	
Table 9	Former City of Toronto Zoning By-law 438-86 – Minimum Bicycle Parking Requirements	41
Table 10	City of Toronto Zoning By-law 569-2013, as Amended and TGS Version 4 (Tier 1) – Minimum Bicycle Parking Requirements	42
Table 11	Former City of Toronto Zoning By-law 438-86 – Minimum Loading Requirements	43
Table 12	Former City of Toronto Zoning By-law 438-86 – Minimum Loading Requirements	43
Table 13	Existing 2016 Area Travel Mode Share – By Land Use.....	44
Table 14	Comparison of 2016 to 2023 Residential Area Auto Travel Mode Share	44
Table 15	Future Liberty Village Area Overall Travel Mode Share	45
Table 16	Adopted Future Liberty Village Travel Mode Share	46
Table 17	Comparison of 2016 to Future Residential Area Auto Travel Mode Share	46
Table 18	Gross Person and Vehicle Residential Trip Generation Summary	48
Table 19	Gross Person and Vehicle Retail Trip Generation Summary	49
Table 20	Unconstrained Gross Person and Vehicle Trip Generation Summary	49
Table 21	Multi-Modal Person Trip Generation Summary.....	51
Table 22	Background Developments Considered	52
Table 23	Background Development Person Trip Rates	54
Table 24	Total Background Development Multi-Modal Trip Generation	55
Table 25	Residential Vehicle Trip Distribution Summary	57
Table 26	Overall Transit Trip Distribution Summary	58
Table 27	Transit Study Area – Routes and Stops	59
Table 28	Site Transit Peak Hour Trips by Route.....	60
Table 29	Site GO (Exhibition) and SmartTrack (King-Liberty) Transit Trip by Access / Egress Mode.....	61
Table 30	Existing Traffic Data Sources.....	63
Table 31	Site Vehicle Trip Generation	71
Table 32	Summary of Study Area Intersections	76
Table 33	Local Area Unsignalized Intersection & Driveway Operations	77
Table 34	Wider Area Signalized Intersection Operations	80
Table 35	Wider Area Unsignalized Intersection Operations.....	82
Table 36	Queue Lengths at Signalized Intersections	83
Table 37	Queue Lengths at Unsignalized Intersections	84
Table 38	Area Intersection Operations Summary – With Liberty New Street	86
Table 39	Existing Exhibition GO Station Access and Egress Mode Share Summary	2
Table 40	Future Exhibition Ontario Line Station Access and Egress Ridership Summary	3
Table 41	Future Exhibition Ontario Line Station Access and Egress Mode Share Summary	3
Table 42	Exhibition Ontario Line Station Access/Egress Mode Share - Riders within Liberty Village.....	4



Table 43	Future King-Liberty Station Access and Egress Mode Shares.....	4
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LIST OF FIGURES

Figure 1:	Site Location.....	3
Figure 2:	Site Context.....	4
Figure 3:	Concept Site Plan.....	5
Figure 4:	Existing and Future Area Road Network.....	18
Figure 5:	Existing Lane Configuration and Traffic Control.....	19
Figure 6:	Future Lane Configuration and Traffic Control.....	20
Figure 7:	Existing Area Transit Context.....	22
Figure 8:	Future Area Transit Context.....	24
Figure 9:	Existing Transit Reach.....	29
Figure 10:	Future Transit Reach.....	30
Figure 11:	Existing and Future Area Cycling Network.....	33
Figure 12:	Existing Area Car-Share Facilities.....	36
Figure 13:	Existing Area Bike-Share Facilities.....	37
Figure 14:	Area Background Developments.....	53
Figure 15:	StreetLight Study Area and Analysis Zones.....	56
Figure 16:	Existing Traffic Volumes.....	65
Figure 17:	Total Background Development Traffic Allowance.....	66
Figure 18:	Liberty New Street Traffic Diversion.....	68
Figure 19:	Future Background Traffic Volumes – Baseline.....	69
Figure 20:	Future Background Traffic Volumes – Sensitivity (Liberty New Street).....	70
Figure 21:	New Site Traffic Volumes.....	72
Figure 22:	Future Total Traffic Volumes – Baseline.....	73
Figure 23:	Future Total Traffic Volumes – Sensitivity (Liberty New Street).....	74

TABLE OF APPENDICES

Appendix A:	Reduced Architectural Plans
Appendix B:	TTS Queries
Appendix C:	Background Development Trip Generation
Appendix D:	StreetLight Queries
Appendix E:	General Corridor Growth Analysis
Appendix F:	Signal Timing Plans
Appendix G:	Synchro Analysis Summary Sheets
Appendix H:	Transit TTS – Transit Access / Egress Mode Share



1.0 INTRODUCTION

BA Group has been retained by Shiplake LTD. to provide transportation consulting services in relation to a Zoning By-law Amendment (ZBA) application for the proposed redevelopment of a site municipally known as 70 & 86 Lynn Williams Street, in the City of Toronto (herein referred to as the 'site'). The site is located in Liberty Village, a neighbourhood in Toronto as illustrated in **Figure 1** and **Figure 2**.

1.1 The Proposed Development

The site consists of an existing building and surface parking lot, which extends over the adjacent property and occupies a larger block. The block was previously under the same ownership and was subject to a land severance, which established the current site boundaries. The site now consists of the northern portion of the block which is generally bounded by an existing residential building to the north, Western Battery Road to the east, the remaining portion of the existing heritage building to the south, and a private driveway to the west. The development concept plan is illustrated in **Figure 3**.

The plan consists of a new building including 588 residential units and 800 m² of non-residential Gross Floor Area (GFA). A total of 110 vehicle parking spaces including 68 resident parking spaces and 42 non-resident parking spaces are proposed within two (2) underground parking levels. A total of 648 bicycle parking spaces including 530 long-term and 118 short-term spaces are proposed on the ground floor and P1 levels.

The plan illustrates a new east-west private laneway connection along the north property boundary, connecting to Western Battery Road to the east and the existing private driveway to the west. In the near term, access to the private driveway will be secured by extension of existing easements, which provide connections to Snooker Street to the west and Lynn Williams Street to the south. In the long term, the existing private driveway will be replaced by an extension of Snooker Street from its existing terminus at Hanna Avenue, southeast to Lynn Williams Street. The new east-west private laneway will provide a new and convenient connection for pedestrians and cyclists to travel between existing and proposed residential, retail, and office uses west of the site to Western Battery Road and the King-Liberty Pedestrian / Cycle Bridge. While this site configuration supports the goals of the Liberty Village Public Realm Study initiated by the City of Toronto, the design of the new east-west private laneway and site organization with respect to vehicular access to the underground parking garage, loading facilities and pick-up/drop-off areas will be reviewed in consultation with the City of Toronto as the development moves through the applications process.

The key components of the proposed development are summarized in **Table 1**. Reduced scale copies of the architectural ground floor and parking level plans are provided in **Appendix A**.



Table 1 Proposed Development Plan Summary

Development Components		Proposed Development Plan
Residential Units	Studio	56 units
	1-Bedroom	387 units
	2-Bedroom	86 units
	3-Bedroom	59 units
	Total Units	588 units
Non-Residential	Retail	800 m ² GFA
Vehicle Parking Supply	Resident	68 spaces
	Non-Resident	41 spaces
	Car-Share	1 space
	Total	110 spaces
Bicycle Parking Supply	Residential	530 long-term spaces 118 short-term spaces
	Non-Residential	0 long-term spaces 0 short-term spaces
	Total	648 spaces
Loading Supply	Total	1 Type B 1 Type G

Notes:

1. Based on site statistics provided by gh3* (October 2023).

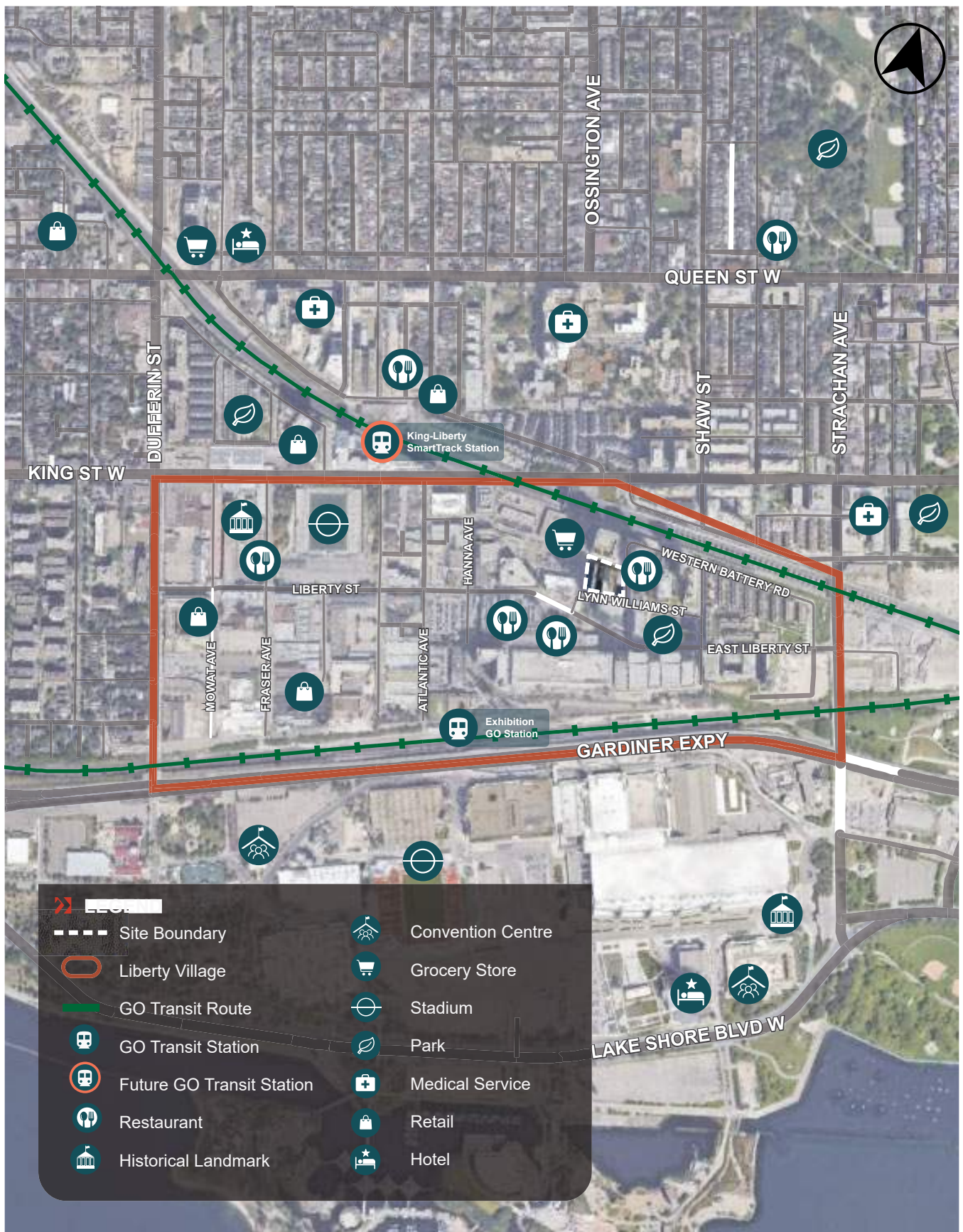




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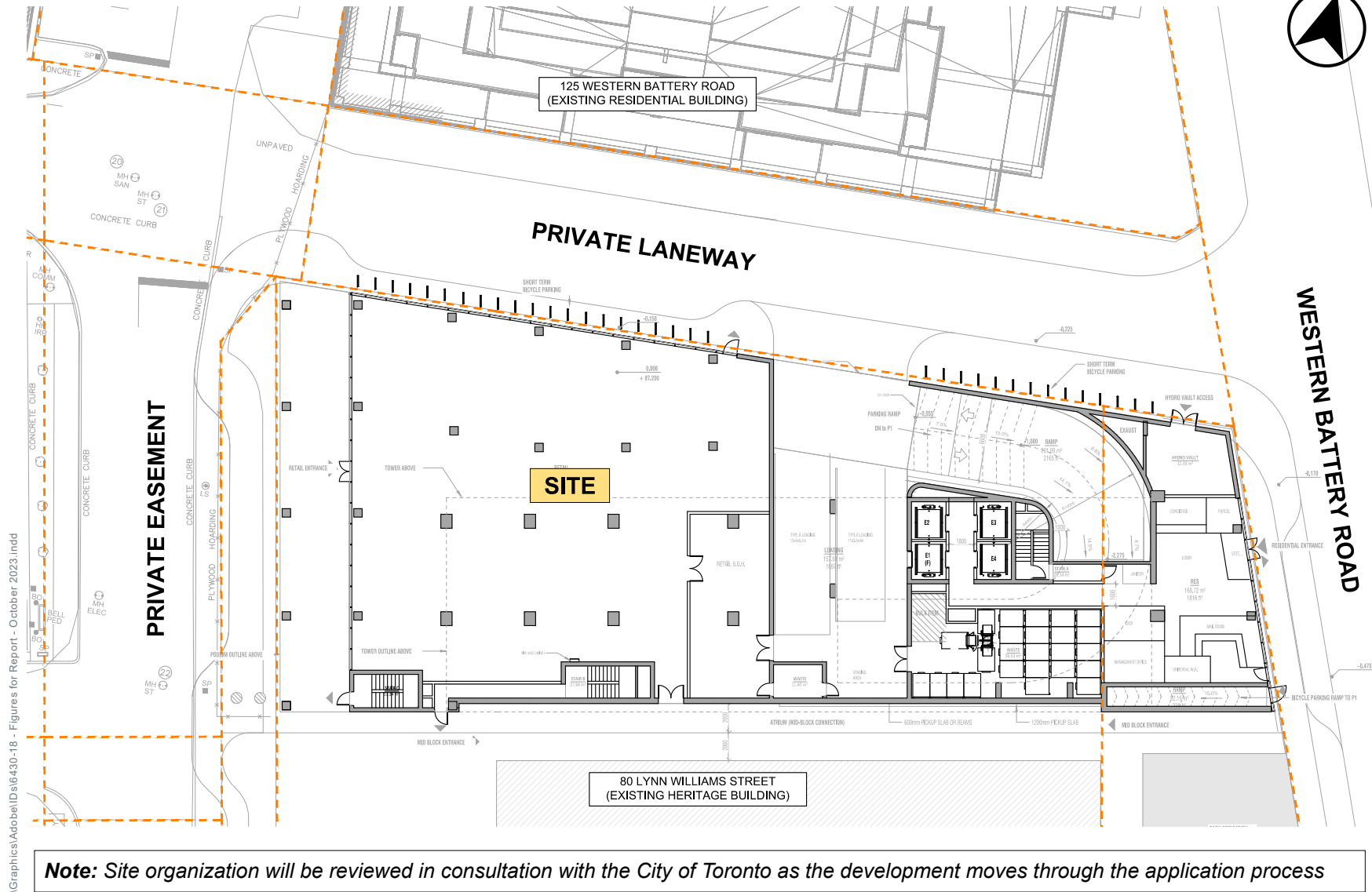
FIGURE 1 SITE LOCATION



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Aerial maps provided courtesy of Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, the GIS User Community and/or Google Earth/Maps.

FIGURE 2 SITE CONTEXT



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Aerial maps provided courtesy of: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, the GIS User Community and/or Google Earth/Maps.

FIGURE 3 CONCEPT SITE PLAN

1.2 Scope of Transportation Review

BA Group has undertaken a review of the key transportation-related aspects of the Zoning By-law Amendment application being submitted to the City of Toronto. This study summarizes the active transportation strategy, technical study methodology, Transportation Demand Management (TDM) framework, multi-modal travel forecasts, and the results of a traffic operations assessment. Key aspects of the study are described as follows:

Proposed Development Concept Plan

- A review of the proposed development programme.
- A review of the active transportation strategy and mobility planning principles.
- A review of Transportation Demand Management (TDM) measures and specific active transportation interventions, which will encourage, facilitate, and support non-automobile travel to/from the site.

Planning and Transportation Context

- A review of the planning and policy context, including provincial and regional policies, as well as local and site-specific policies.
- A review of the area transportation context including existing and future transportation road, transit, cycling and pedestrian infrastructure.

Zoning By-law Requirements

- A review of the vehicle parking, bicycle parking and loading requirements and proposed supply strategy.

Travel Demand Forecasting

- An outline of travel characteristics and travel demand projections for auto users, transit users, cyclists, and pedestrians, which will be generated by the proposed development.
- An assessment of the existing vehicular traffic activity in the study area during the key weekday morning and afternoon peak periods.
- A comprehensive review of the changes that may occur in the area in the future, including consideration for general corridor growth and the development of a number of other background sites.
- Development of traffic forecasts that reflect future vehicular traffic activity in the study area during the key weekday morning and afternoon peak periods.

Traffic Operations Review

- A review of the traffic operations at intersections in the area under existing and future traffic conditions including an assessment of the operational impacts of the proposed development.
- A review of the traffic operations under a sensitivity analysis scenario based on planned introduction of Liberty New Street between Dufferin Street and Strachan Avenue.
- A summary of proposed infrastructure improvements and mitigation measures, where required or proposed as part of the active transportation strategy.



2.0 ACTIVE TRANSPORTATION STRATEGY

2.1 Existing Mobility Context

The site is located in the Liberty Village neighbourhood area in the City of Toronto, which is historically an industrial hub for commercial, industrial and employment activity due to its location at the junction of the Canadian Pacific and Canadian National Railway lines. In addition to the higher-order rail transit infrastructure, Liberty Village is situated between key vehicular corridors (Dufferin Street, King Street West, and the Gardiner Expressway). However, the road and railway hub, which previously supported the primary transport of goods by rail resulted in an incomplete street grid. These unique challenges to the site and site vicinity provide an opportunity to improve the mobility network that recognizes the major transportation infrastructure available while creating accessible active transportation options.

In recent years, the area has seen significant growth in residential condominium development to the east of the site, along with the decline of industrial uses and the rise of office uses to the west of the site. As a result, peak hour travel to and from the site vicinity have become heavily reliant on the area multi-modal transportation network.

2.2 Future Mobility Opportunities

A fundamental principle of community building and urban intensification is the creation of an environment that encourages active modes of transportation - walking, cycling and transit, instead of vehicular use. Redevelopment of the subject site has the potential to benefit the broader mobility needs of the surrounding community through the creation of new pedestrian and cycling infrastructure. These connections create permeable links and expand the network consistent with City of Toronto policy direction to prioritize active transportation through the advancement of work that is already contemplated as part of the Liberty Village Public Realm Study.

2.3 Mobility Planning Principles

A series of mobility planning principles have been established to guide the redevelopment of Liberty Village in a manner that acknowledges and follows the vision set out for this neighbourhood and the provincial objectives for major transit station areas (MTSAs), which are areas within a 500-800 metre radius of a higher-order transit stop or station. While the focus is on the proposed development, overall connectivity to the adjacent areas and the future King-Liberty GO Station and the Ontario Line's Exhibition Station are a mobility priority.

These principles build upon the broader context of municipal and provincial planning policy direction that guides the way higher-order transit corridors evolve and respond to changing transportation needs. They recognize the initiatives and investments that prioritize the mobility and experience of people over the efficiency of car movement. Specific to the development site, these connections integrate with the existing community and augment the future urban intensification as a result of transit investments leveraged in the area (i.e. GO Transit Line and Ontario Line).

The principles are critical to the Active Transportation Strategy as they acknowledge the existing context and constraints of the development site and recognize the opportunity and role that the development can and will play in reshaping the urban fabric and mobility network of the greater community. The mobility planning principles will enable the paradigm shift in travel behavior and auto use over time.

The mobility planning principles that are achieved through the Active Transportation Strategy include:

- Leveraging Transit Investments to Meet Future Mobility Demands
- Network Building Through Pedestrian and Cycling Connections



2.3.1 Leveraging Transit Investments to Meet Future Mobility Demands

The site is located in an area that is generally defined by the Province as a Major Transit Station Area (MTSA) – King-Liberty and Exhibition. The development site is afforded a high level of transit access, specifically as it pertains to the proximity to numerous surface transit routes (i.e. TTC busses and streetcars along Liberty Street, King Street, and Strachan Avenue). Furthermore, the location of the future King-Liberty GO Station (along the Kitchener GO line) and Exhibition Station on the Ontario Line provides future higher-order transit connections across the City and to areas outside of Toronto, particularly to the west.

From a transit perspective, the strategic location of the development site presents an opportunity to create a transit-centric development that supports access to and capitalizes on the significant planned and nearly completed investments in transit.

2.3.2 Network Building Through Pedestrian and Cycling Connections

The creation of a complete network that considers pedestrian and cycling connections, transit infrastructure, road network, open spaces and first-and-last mile solutions is essential to support the development of a transit-oriented community. The proposed development is located within the area being assessed as part of the Liberty Village Public Realm Study initiated by the City of Toronto which includes a public realm strategy, an action plan and direction to undertake additional studies related to the Liberty Village Streets Plan and Liberty New Street. A key component of the Liberty Village Public Realm Study is the creation of mid-block connections.

Specific to the development site, the plan illustrates a new east-west private laneway connection along the north property boundary, connecting to Western Battery Road to the east and an existing private driveway to the west (under separate ownership). In the near term, access to the existing private driveway will be secured by extension of existing easements which provide connections to Snooker Street to the west and Lynn Williams Street to the south. In the long term, the existing private driveway will be replaced by an extension of Snooker Street from its existing terminus at Hanna Avenue, southeast to Lynn Williams Street. The new east-west private laneway will provide a new convenient connection for pedestrians and cyclists to travel between existing and proposed residential, retail, and office uses west of the site to Western Battery Road and the King-Liberty Pedestrian / Cycle Bridge.

The plan also illustrates a new walkway along the western property boundary (on the east side of the existing private driveway which will form part of the future public boulevard on the west side of the extended section of Snooker Street) and an improved sidewalk along the eastern property boundary within the public boulevard on the west side of Western Battery Road.

An atrium is illustrated on the plan along the south property boundary between the site and existing building to the south. This mid-block connection will provide site residents and visitors access to the retail uses on the site, as well as an additional mid-block crossing option between Western Battery Road to the east and an existing private driveway to the west.

The provision of these connections capitalizes on the opportunity to fill in the missing gaps, connect to existing routes and improve pedestrian and cycling connections within Liberty Village.

2.4 Transportation Demand Management

Transportation Demand Management (TDM) includes strategies to enable and encourage alternative transportation options beyond the single-occupant, private automobile. TDM measures are proposed for the development site and include the application of various site design elements and property management/operational policies that have the goal of redistributing and reducing the travel demand of developments, specifically that of single occupancy private vehicles.

Table 2 summarizes the TDM framework for the proposed development which will be refined as the project moves through the application process.



Table 2 Proposed TDM Strategies

TDM Measures	Description	Cost Estimate	Implementation Strategy	Reduction in SOV Trips
Transit Incentives				
Transit Context ⁽¹⁾	Consideration for the reduction in auto mode share, which reflects the planned transit infrastructure in close proximity to the site.	Integrated into overall development cost.	Construct as part of development.	30%-38% ⁽¹⁾
Transit Information Systems	Provision of transit information such as maps and schedules, which may be provided using phone or smart tablet applications.	Integrated into overall development cost.	Construct as part of development.	- ⁽²⁾
Transit Information Out-Reach Programming	Coordination with City staff to provide programming on-site to educate residents on available transit options in the area.	To be determined.	To be determined in consultation with the City of Toronto.	- ⁽²⁾
Presto Cards	Provision of preloaded Presto cards (one per unit) for new residents, offered at the time of occupancy.	588 units x \$50 = \$29,400	To be determined in consultation with the City of Toronto.	- ⁽²⁾
Improved Bicycle Facilities				
Access to Bicycle Facilities	Provision of a private laneway on the northern portion of the site, connecting to Western Battery Road and the existing private driveway to the west of the site.	Integrated into overall development cost.	Construct as part of development.	- ⁽²⁾
Bicycle Parking	Provision of short-term and long-term bicycle parking and a dedicated bicycle ramp allowing direct access to long-term bicycle parking on the P1 level.	Integrated into overall development cost.	Construct as part of development.	- ⁽²⁾
Bicycle Repair Station	Provision of one (1) bicycle repair station on-site.	Integrated into overall development cost.	Construct as part of development.	- ⁽²⁾
Bicycle Seminars and Tuning Days	Hosting community bicycle safety seminars and bicycle tuning days for building occupants for the first five (5) years of occupancy.	To be determined.	To be determined in consultation with the City of Toronto.	- ⁽²⁾
Bike Share Station	One (1) bike share station on-site or in close proximity to the site.	\$50,000 - \$85,000	To be determined in consultation with the City of Toronto.	- ⁽²⁾
Car-Share/Bike-Share Memberships	One annual car-share <u>or</u> bike-share membership per residential unit for the first year of occupancy.	588 units x \$100 = \$58,800	To be determined in consultation with the City of Toronto	- ⁽²⁾
Improved Pedestrian Experience				
Pedestrian Connections	Provision of a private laneway on the northern portion of the site, connecting to sidewalks on Western Battery Road and the existing private driveway to the west of the site.	Integrated into overall development cost.	Construct as part of development.	- ⁽²⁾
Reduced Vehicle Use				
Appropriate Vehicle Parking Supply	Provision of vehicle parking, which is lower than the maximum requirement based on Zoning By-law 569-2013 as Amended.	Integrated into overall development cost.	Construct as part of development.	81% ⁽³⁾

Notes:

1. Based on the comparison of Existing Auto Mode Share (TTS 2016) and Future Auto Mode Share (derived from existing proxy travel mode shares and September 2021 Ontario Line Integrated TOC Exhibition Station Draft TIA report) for the weekday peak period peak direction.
2. Unable to reasonably quantify the impact at this time.
3. Based on the comparison of 110 proposed parking spaces and 583 maximum required parking spaces based on Zoning By-law 569-2013, as Amended.



3.0 PLANNING AND POLICY CONTEXT

The following provides a summary of the key existing and emerging planning policies, applicable to the development site, that encourage more sustainable travel through the mitigation of vehicular traffic.

3.1 Provincial and Regional Policies

There are number of provincial and regional policy documents that pertain to the development site, including:

- 2020 Provincial Policy Statement;
- A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2017) and Transportation Plan (2022);
- Ministry of Transportation Transit-Supportive Guidelines (2012); and
- Metrolinx 2041 Regional Transportation Plan (2018).

3.1.1 Provincial Policy Statement

The 2020 Provincial Policy Statement (PPS) promotes efficient development patterns optimizing the use of land, resources and public investment in infrastructure and public service facilities. According to the PPS, efficient development patterns promote a mix of housing, including affordable housing, employment, recreation, parks and open spaces, and transportation choices that increase the use of active transportation and transit before other modes of travel.

Policies within the PPS promote transit-supportive development that promote greater density in proximity to existing and planned transit in order to encourage the use of transit. The policies also promote healthy, active communities through active transportation facilities and street design that provide safe pedestrian facilities. In order to maximize the use of existing and planned transportation infrastructure, the PPS policies recommend the use of TDM strategies.

3.1.2 A Place To Grow: Growth Plan for the Greater Golden Horseshoe

A Place to Grow: Growth Plan for the Greater Golden Horseshoe (Growth Plan for the GGH) outlines the importance of reducing reliance upon the automobile and promoting transit and active transportation. Planning along priority transit corridors and major transit stations shall be prioritized and planned for minimum density targets and a mix of uses in order to maximize the number of potential transit users within walking distance of the station.

Per the Growth Plan for the GGH, an MTSA is defined as “the area within an approximate 500-800 metre radius of a transit station, representing a 10-minute walk”. Furthermore, Protected Major Transit Station Areas (PMTSAs) have been identified as a subset of MTSAs. These are areas where the Province allows municipalities to implement Inclusionary Zoning, which creates mixed-income development areas.

The development site is located at an approximately 750 metre walking distance north of the planned Exhibition Station on the Ontario Line and south of the planned King-Liberty GO Station. The development is situated within both the King-Liberty PMTSA and Exhibition PMTSA boundaries, and the location of the development is consistent with the Growth Plan’s support for reduced parking standards in MTSAs, encouraging residents and visitors to use alternate modes of transportation.

In early 2022, the Ministry of Transportation and its partners developed a **Transportation Plan for the GGH** as a 30-year plan for improved mobility across the Province of Ontario. As the Greater Golden Horseshoe (“GGH”) continues to expand, the Region will require improvements to its transportation systems in order to accommodate increased demand. The Plan aims to address the impact of predicted growth through a well-connected transportation system that provides safe, efficient and convenient options for users. The 2051 vision of the Plan includes focuses on fighting gridlock and improving road performance, getting people moving on a connected transit system, supporting a more sustainable and resilient region, and efficiently moving goods.



Improving transit networks is a key focus of the Plan and is viewed as an important component towards achieving a more sustainable and resilient Region. Expanding service across the Region will allow for greater inter-regional travel and connections to destinations that might have previously been difficult to reach by transit alone. As such, the Plan aims to adopt more routes, increase service frequency, and provide more connections to enhance the network. In addition to expanding bus service, rapid transit networks across the Region are also planned or underway.

3.1.3 Ministry of Transportation Transit-supportive Guidelines

The **Transit-Supportive Guidelines** are intended to assist municipalities in implementing the policies and objectives of the **PPS** and **Growth Plan for the GGH**. The guidelines aim to create an environment that is supportive of transit, and to develop services and programs to increase transit ridership. Under the guidelines, a “node” is a settlement area of more intense density, use, and activity. It is recommended to focus urban growth within nodes, especially those with higher levels of transit service to better link land use and transit, reducing walking times to and from uses and supporting the more efficient delivery of transit services.

The guidelines also support the use of TDM strategies, especially in close proximity to transit stations. This includes the reduction of maximum and minimum parking requirements upon the adoption of TDM measures, the sharing of parking between uses, and the use of on-street parking during off-peak hours.

3.1.4 Metrolinx Regional Transportation Plan

The **Metrolinx 2041 Regional Transportation Plan (2018 RTP)** – an update to **The Big Move (2008)** – envisions sustainable and healthy communities that are developed through intensification and have low carbon footprints. A key strategy of the plan is the integration of transit and land use by focusing development at mobility hubs and MTSAs, such as the King-Liberty and Exhibition PMTSAs. Embedding TDM strategies in land use planning and development to prioritize cycling, walking and transit use is highlighted in the Plan. Furthermore, the 2018 RTP encourages best practices in parking management, such as reducing minimum parking standards, especially for developments near transit stations.

As part of its vision to promote and support the development of sustainable and healthy communities, Metrolinx is creating partnerships to facilitate the implementation of Transit Oriented Communities (TOC). TOC forms higher densities and a mix of uses, located adjacent to or within a short walking distance of higher-order transit stations. The 2018 RTP’s Strategy #4 supports TOC as Mobility Hubs, to be accomplished through public and private collaboration. The TOC program is intended to connect Metrolinx with third-party partners to promote transit ridership, reduce traffic congestion, and allocate houses and jobs near transit through transit-supportive development practices. The general principles of TOC that are supported by Metrolinx are present in proximity to the development site, with its location within two PMTSAs, approximately 750 metres of two planned higher-order rail transit lines, the provision of a reduced parking supply, and the provision of bicycle parking.

3.2 Local and Site-Specific Policies

There are a number of local area and site-specific policy documents and discussions pertaining to the site and the area in the vicinity of the site, including:

- Toronto Official Plan (2019 Office Consolidation);
- Toronto Congestion Management Plan (MoveTO, 2020);
- Our Plan Toronto: Draft Major Transit Station Area Delineations (2022);
- Toronto Vision Zero Road Safety Plan (2017);
- Toronto Green Standard Version 4 (2022); and
- Liberty Village Draft Public Realm Strategy (2022).



3.2.1 Toronto Official Plan

The **Toronto Official Plan (OP)** implements provincial direction identified in the previous section and outlines City Council's goals and visions. The OP is intended to ensure that the City evolves, improves and realizes its full potential in areas such as transit, land use development and the environment. Future growth will be steered by the OP to areas which are well served by transit and the existing road network.

The strategic location of the development site presents an opportunity to leverage the area infrastructure improvements to create a non-auto centric development. With the site being within two PMTSAs and the planned pedestrian and cycling connections in the Liberty Village area, it affords residents and visitors to the site to utilize these planned improvements effectively to connect to the greater transportation network. The new private laneway on the north side of the site presents a critical link for pedestrians and cyclists connecting between west of the site and the King-Liberty Bridge. Furthermore, adequate, but limited parking supply is encouraged to accommodate the development site needs.

3.2.2 Toronto Congestion Management Plan (MoveTO) and Vision Zero Road Safety Plan

The City launched the **Congestion Movement Plan** in 2020 to help manage and address congestion, as well as generally build a safer transportation system. The Plan focuses on a number of measures to help the City achieve a new level of resilience in terms of transportation, including actions related to smart traffic systems and transit-priority signals. It is noteworthy that the Plan also included the implementation of a Transportation Demand Management Strategy, which seeks to directly reduce and manage traffic and congestion (e.g. encourage people to make specific transportation choices that serve the overall system). Policies have been developed to improve environmental and equity benefits in conjunction with other municipal plans, such as the Vision Zero Road Safety Plan, which aims to improve safety and reduce traffic-related fatalities and conflicts for vulnerable users (e.g. most non-automobile users) in the City streets. Currently, an interim action plan (2021-2025) for MoveTO is in place with short-term actions in response to the recovery period of the pandemic.

3.2.3 Our Plan Toronto: Draft Major Transit Station Area Delineations (Council Report)

In June 2020, Toronto City Planning initiated a **Growth Plan Conformity and Municipal Comprehensive Review** to delineate 180 potential Major Transit Station Areas (MTSAs) to meet Provincial minimum intensification requirements, as a requirement to update its Official Plan. It directs the Official Plan to prioritize planning the MTSAs in a manner that implements the Growth Plan (including directing growth, protecting natural heritage and supporting Transit Oriented Development). The MTSAs are intended to be developed as high density, mixed-use, transit-supportive neighbourhoods that provide access to housing, employment and local amenities. MTSA boundaries typically include areas within an approximate 500-800 metre radius (10-minute walk) of an existing or planned transit station.

Furthermore, Protected Major Transit Station Areas (PMTSAs) have been identified as a subset of MTSAs. These are areas where the Province allows municipalities to implement Inclusionary Zoning, which creates mixed-income development areas. The proposed development is within approximately 750 metres (walking distance) of higher-order transit and is within two PMTSAs – King-Liberty GO and Exhibition PMTSAs.

3.2.4 Toronto Green Standard Version 4.0

The **Toronto Green Standard (TGS)** is Toronto's sustainable design and performance requirements for new private and city-owned developments, since 2010. The Standard consists of tiers of performance measures with supporting guidelines that promote sustainable site and building design. Tier 1 is mandatory and applied through the planning approval process.

Version 4.0 of the TGS came into effect on May 1, 2022 for new planning applications and is one of the key programs under the TransformTO Net Zero Strategy to reduce emissions, community-wide. The Standard addresses various environmental priorities in the City of Toronto, including improvements to air quality. The site is subject to performance measures pertaining to low-emissions transportation and cycling infrastructure under the Air Quality requirement of the TGS.



3.2.5 Liberty Village Public Realm Strategy

In July 2020, Toronto and East York Community Council initiated a study of the public realm within Liberty Village “to assess and identify the need and opportunity to leverage City assets to improve and expand the range of open space and community services and facilities to serve the area”.

The **Liberty Village Draft Public Realm Strategy** dated June, 2022 provides guidelines for capital projects and public and private development that recognize the ongoing changes to the area and the introduction of new transit facilities and crossings. The study includes a public realm strategy, an action plan and direction to undertake additional studies related to the Liberty Village Streets Plan and Liberty New Street.

The strategy for public realm includes the following key components:

- Priority Streetscape Improvement Areas
- Sidewalks and Boulevards
- Mid-block Connections
- Tree Planting and Landscape
- Curb Extensions (Bump-outs)
- Furnishings and Lighting
- Other Considerations

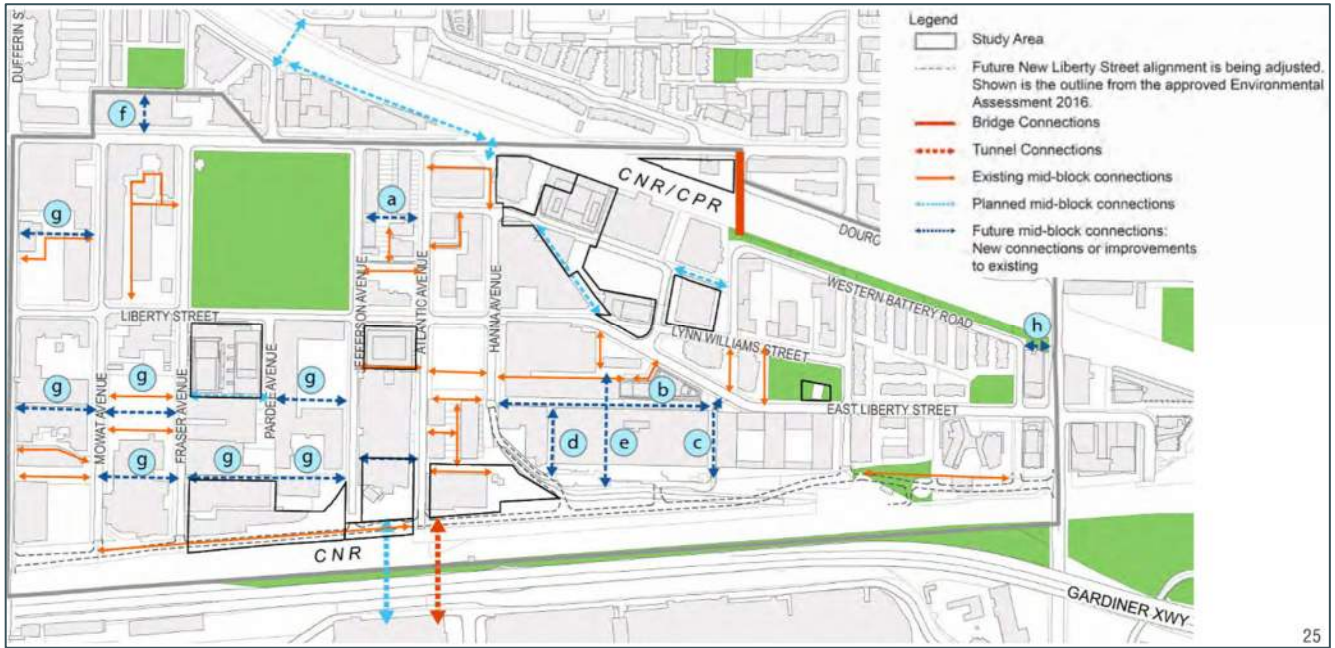
The guidelines for the study recognize mid-block connections as a fundamental character feature of Liberty Village and suggest that every development and city initiative in Liberty Village should retain, enhance and expand the mid-block connection network. New developments should secure mid-block connections with public access, wherever possible. Vehicular shared lanes should be provided with dedicated sidewalk zones where deemed appropriate. Mid-block connections adjacent to residential uses should include landscaping and be designed to address private issues. The design of these connections should ensure that the mid-block connections are high quality, usable spaces.

New connections or improvements to existing connections identified through the Public Realm Study and are illustrated in **Exhibit 1** and are summarized as follows:

- a. Improve Jefferson Avenue to Atlantic Avenue private lane/driveway;
- b. Improve West-East Driveway north of Toronto Police Services building;
- c. Improve Connection East of Toronto Police Services building;
- d. Improve Connection West of Toronto Police Services building;
- e. New North-South connection through Toronto Police Services site;
- f. New King Street to Rita Cox Parkette Connection;
- g. New West-East Connections; and
- h. Potential Connection from Strachan Avenue to Western Battery Road



Exhibit 1 – Liberty Village Public Realm Strategy (Map: Mid-Block Connections)



4.0 AREA TRANSPORTATION CONTEXT

4.1 Area Road Network

4.1.1 Existing Road Network

The existing road classification system is illustrated in **Figure 4** and a description of the road network within the immediate site area is provided in **Table 3**. The existing area lane configurations and traffic controls are illustrated in **Figure 5**.

Table 3 Summary of Existing Area Road Network

Street Name		Roadway Cross Section (Proximate to Site)	Parking / Traffic Regulations	Posted Speed	Description
Arterial Roadways	King Street West	4-lane cross-section (2 lanes in each direction) Auxiliary turn lanes at key intersections	On-street parking is permitted during the off-peak periods on both sides of King Street West	60 km/h	King Street West is an east-west major arterial road extending throughout the City between Queen Street West in the east and The Queensway in the west. In the vicinity of the site, King Street West is a two-way road that provides extensive east-west vehicle and transit mobility across the City of Toronto. Signalized intersections are located at Dufferin Street, Atlantic Avenue, and Joe Shuster Way.
	Dufferin Street	4-lane cross-section (2 lanes in each direction) Auxiliary turn lanes at key intersections	On-street parking is permitted during the off-peak periods on both sides of Dufferin Street.	50 km/h (north of Springhurst Ave) 30km/h (south of Springhurst Ave)	Dufferin Street is a north-south minor arterial road extending throughout the City between Katherine Road (where it becomes Beffort Road) in the north and Saskatchewan Road (where it becomes British Columbia Road) in the south. North of Springhurst Avenue, the corridor is classified as a minor arterial and is classified as a local road south of Springhurst Avenue. In the vicinity of the site, Dufferin Street is a two-way road that provides a north-south connection across the City of Toronto. Signalized intersections are located at King Street West and Liberty Street.
	Strachan Avenue	2-lane cross-section with (1 lane in each direction) Auxiliary turn lanes at key intersections	Parking is not permitted.	50 km/h (south of King St. W) 40 km/h (north of King St. W)	Strachan Avenue is a north-south minor arterial road extending throughout the City between Queen Street West (where it becomes Trinity Drive) in the north and Lake Shore Boulevard West (where it becomes Remembrance Drive) in the south. North of King Street West, the corridor is classified as a collector and is classified as a minor arterial south of King Street West. In the vicinity of the site, Strachan Avenue is a two-way road that provides a north-south connection across the City of Toronto. Signalized intersections are located a Douro Street and Lake Shore Boulevard West.
Continued on next page.					



Street Name		Roadway Cross Section (Proximate to Site)	Parking / Traffic Regulations	Posted Speed	Description
Collector Roadways	Atlantic Avenue	2-lane cross-section with (1 lane in each direction) Auxiliary turn lanes at key intersections	On-street parking is permitted on the east side of the street.	30 km/h	Atlantic Avenue is a north-south collector road extending between King Street West in the north and the Exhibition GO Station in the south. In the vicinity of the site, Atlantic Avenue is a two-way road that provides a north-south connection within Liberty Village. A signalized intersection is located at King Street West.
	East Liberty	2-lane cross-section with (1 lane in each direction) Auxiliary turn lanes at key intersections	On-street parking is permitted on the south side of the street.	40 km/h	East Liberty Street is an east-west collector road extending between Hanna Avenue (where it becomes Liberty Street) in the west and Strachan Avenue (where it becomes Ordnance Street) in the east. In the vicinity of the site, East Liberty Street is a two-way road that provides an east-west connection within Liberty Village. A signalized intersection is located at Strachan Avenue.
Local Roadways	Lynn Williams Street	2-lane cross-section with (1 lane in each direction)	On-street parking is permitted on the south side of the street.	30 km/h	Lynn Williams Street is an east-west local road extending between East Liberty Street in the west and Pirandello Street in the east. In the vicinity of the site, Lynn Williams Street is a two-way road that provides an east-west connection within Liberty Village.
	Western Battery Road	2-lane cross-section with (1 lane in each direction)	Paid parking is permitted on the north side of the street from Monday to Saturday from 8:00 am to 9:00 pm and on Sunday from 1:00 pm to 9:00 pm.	30 km/h	Western Battery Road is a local road extending between Lynn Williams Street in the west and East Liberty Street in the east. In the vicinity of the site, Western Battery Road is a two-way road that provides an east-west connection within Liberty Village.
	Hanna Avenue	2-lane cross-section with (1 lane in each direction)	Paid parking is permitted on the east side of the street from Monday to Saturday from 8:00 am to 9:00 pm and on Sunday from 1:00 pm to 9:00 pm.	30 km/h	Hanna Avenue is a local road extending between Snooker Street in the north and the Toronto Police Traffic Services parking lot in the south. In the vicinity of the site, Hanna Avenue is a two-way road that provides a north-south connection within Liberty Village.
	Snooker Street	2-lane cross-section with (1 lane in each direction)	Paid parking is permitted on the east side of the street from Monday to Saturday from 8:00 am to 9:00 pm and on Sunday from 1:00 pm to 9:00 pm. 30 minute commercial loading zone parking is permitted between 8:00 am to 6:00 pm.	30 km/h	Snooker Street is a local road extending between Hanna Avenue in the east and Atlantic Avenue in the west. In the vicinity of the site, Snooker Street is a two-way road that provides an east-west connection within Liberty Village.



4.1.2 Future Road Network

4.1.2.1 LIBERTY NEW STREET

Through previous city planning the City of Toronto identified the need for a two-lane local street connection within the Liberty Village neighbourhood between Strachan Avenue and Dufferin Street. In June of 2011, the City initiated the Liberty New Street Municipal Class Environmental Assessment (EA) to secure the planning approvals for the design and implementation of the new east-west road. In July of 2016, the EA study was completed and identified a number of design alternatives for the new road. The new road would be located on the north side of the GO Transit Lake Shore West rail corridor.

The preferred design identified in the EA includes the following:

- A new road with two traffic lanes (one lane in each direction);
- A multi-use path for cyclists and pedestrians on the south side of the road;
- A sidewalk on the north side of the road;
- Landscaping and civic improvements, including south-facing lookouts, where possible; and
- Two-way connections intersecting all north-south roads, except for Strachan Avenue, which would be restricted to right-in right-out movements.

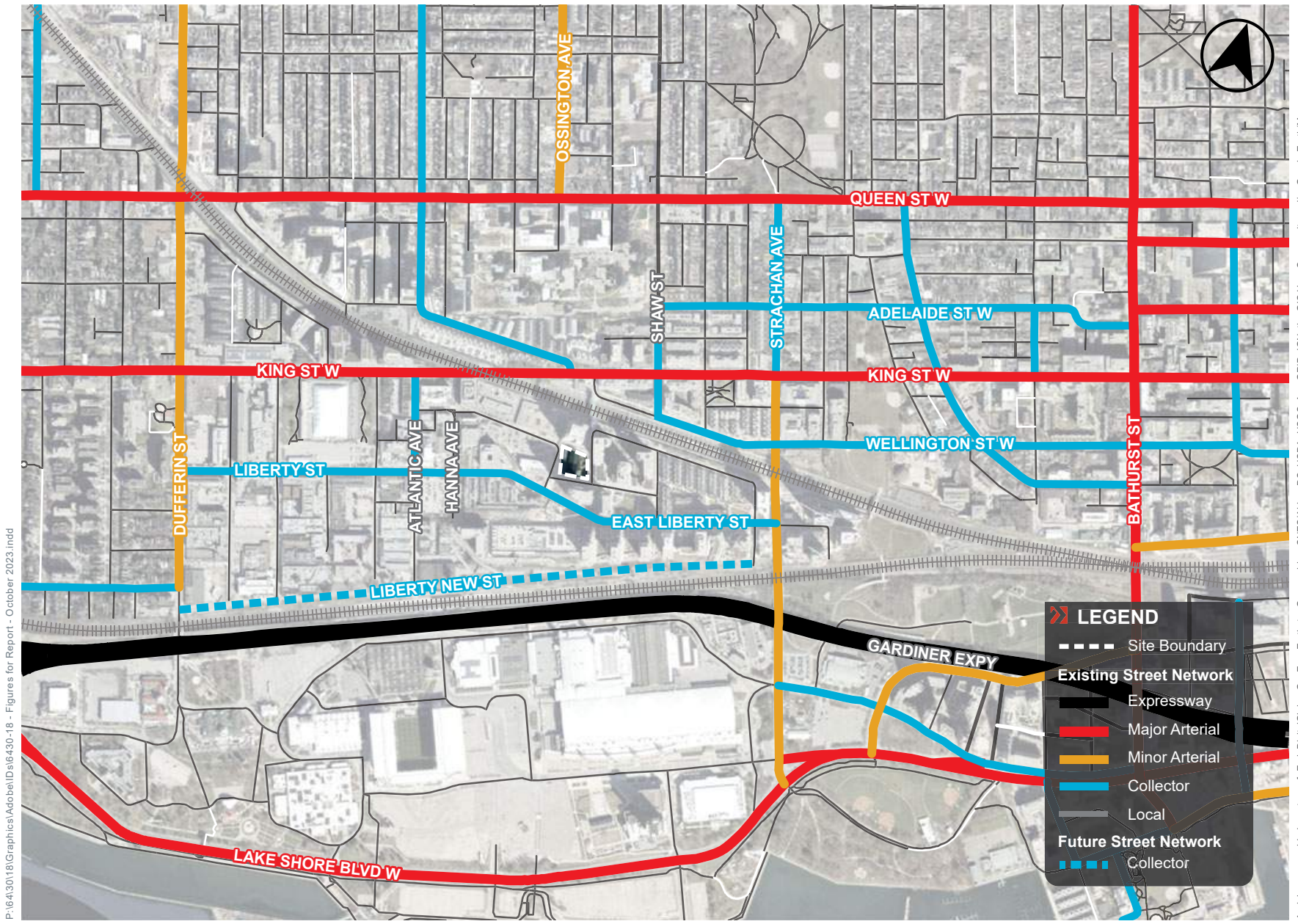
Although the preferred design has been endorsed by City Council, construction is subject to available funding and further coordination with Metrolinx is currently on the way to consider their planned improvements to the Exhibition Ontario Line Station and surrounding area. The Liberty Village Draft Public Realm Strategy dated June, 2022 includes direction to undertake additional studies related to the Liberty Village Streets Plan and Liberty New Street.

4.1.2.2 SNOOKER STREET EXTENSION

In the near term, access to the existing private driveway will be secured by extension of existing easements which provide connections to Snooker Street to the west and Lynn Williams Street to the south. In the long-term, the existing private driveway will be replaced by an extension of Snooker Street from its existing terminus at Hanna Avenue, southeast to Lynn Williams Street.

The future area road network is illustrated on **Figure 4** and the future lane configuration and traffic control is illustrated on **Figure 6**.





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Aerial maps provided courtesy of: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, the GIS User Community and/or Google Earth/Maps.

FIGURE 4 EXISTING AND FUTURE AREA ROAD NETWORK

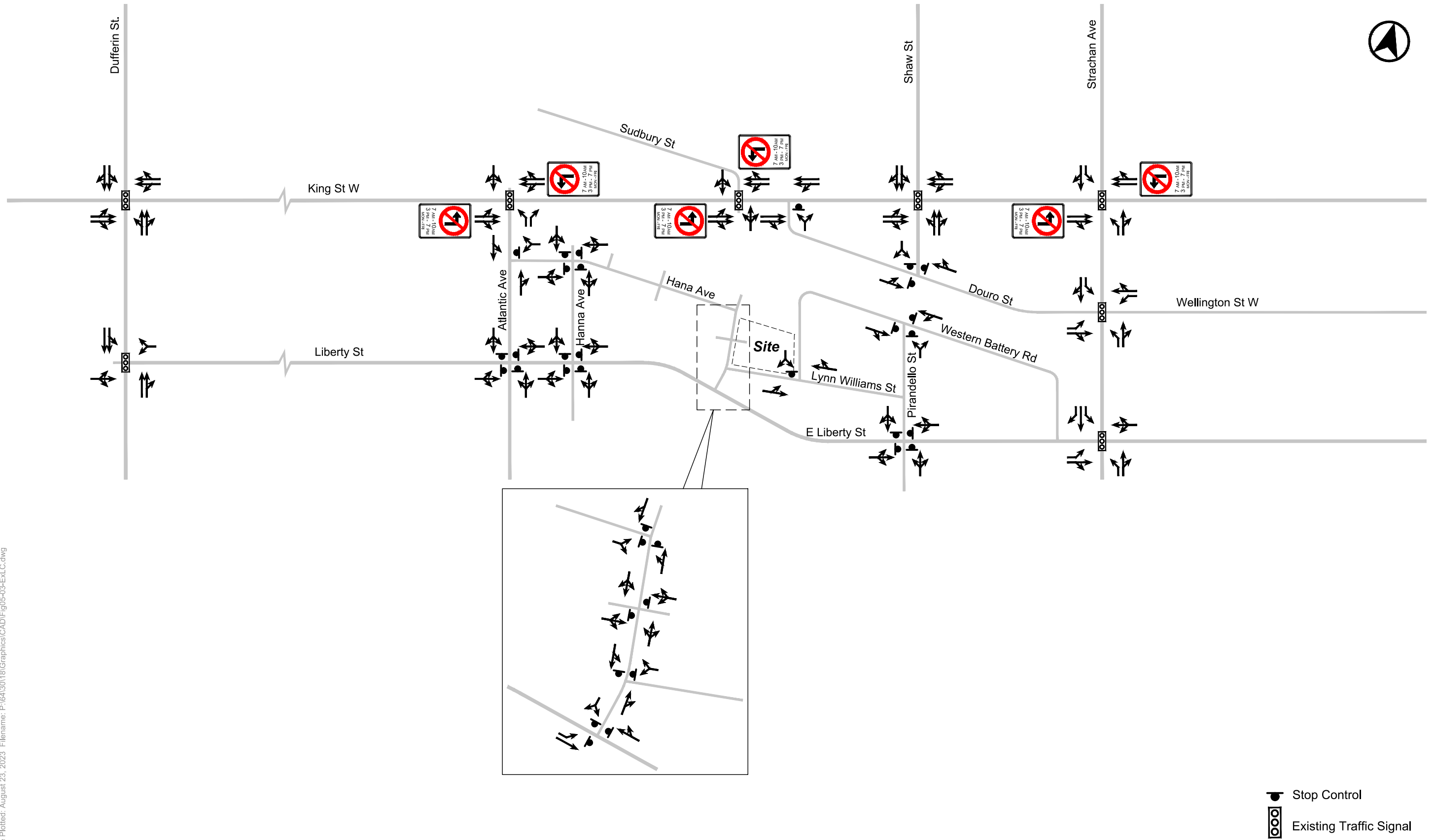
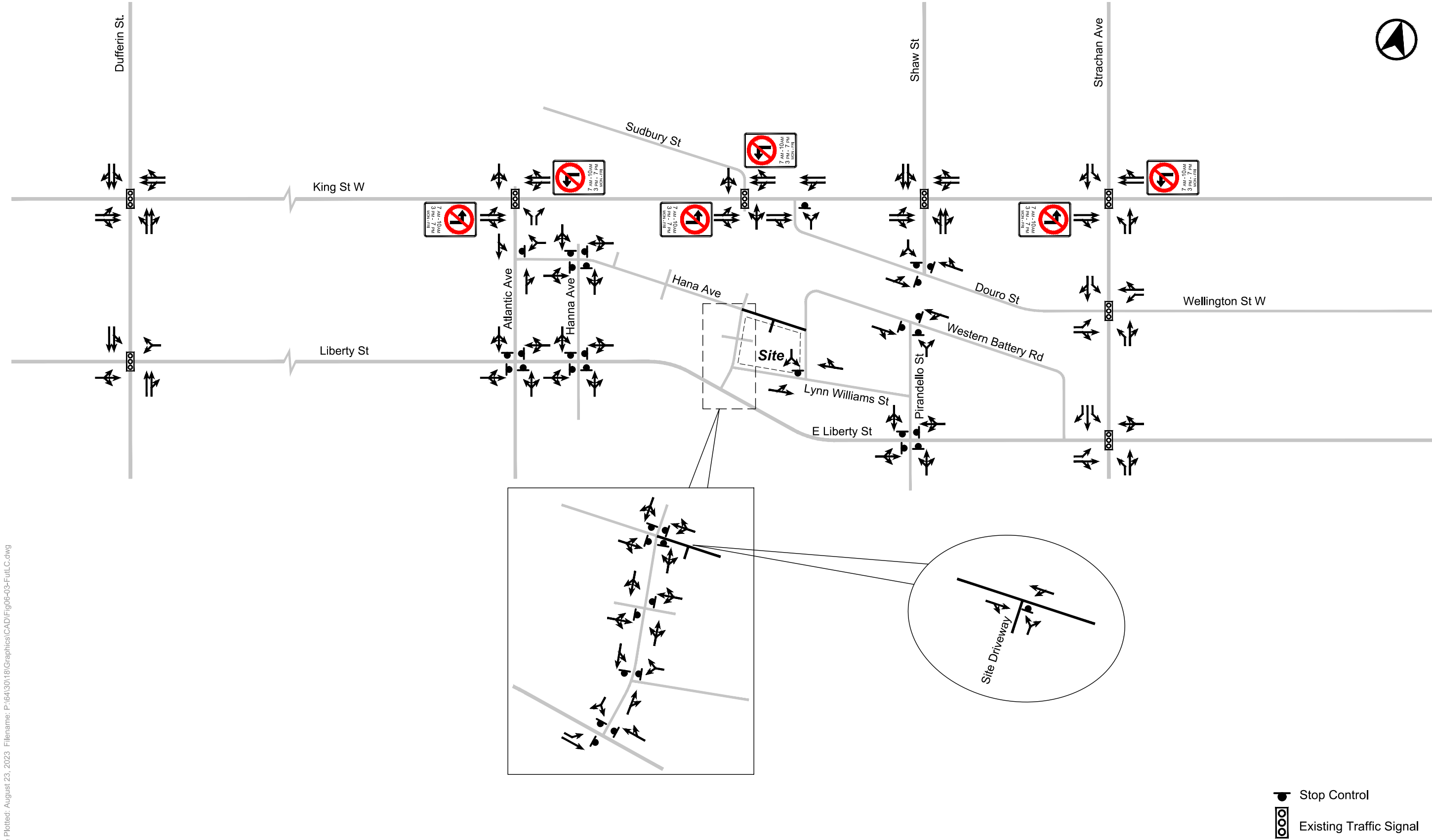


FIGURE 5 EXISTING LANE CONFIGURATION AND TRAFFIC CONTROL



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FIGURE 6 FUTURE LANE CONFIGURATION AND TRAFFIC CONTROL

4.2 Area Transit Network

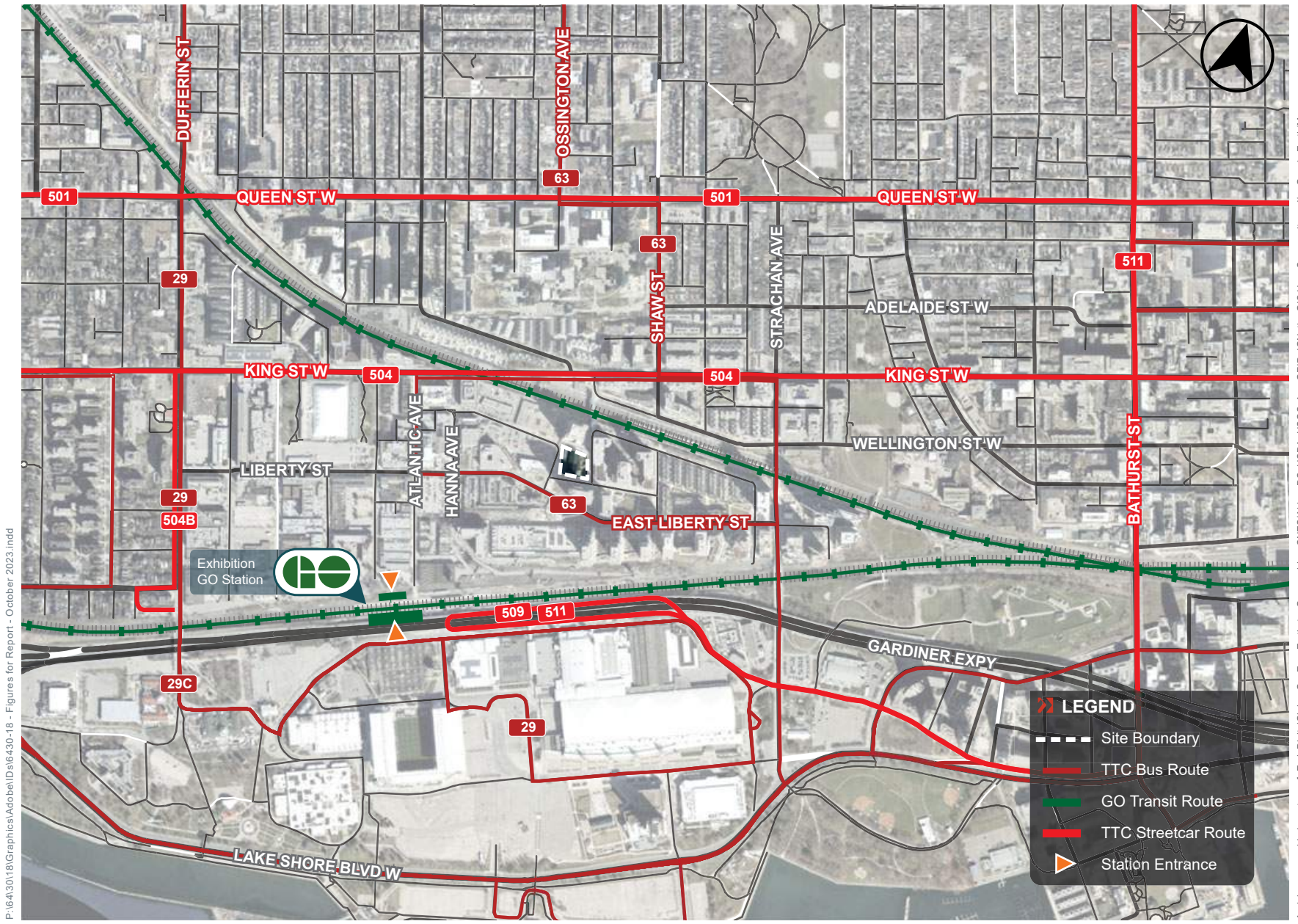
4.2.1 Existing Transit Context

The development site is well-situated relative to existing high-frequency surface transit services operated by the Toronto Transit Commission (TTC) and GO Transit. A bus stop and streetcar stop are located within an approximately 400 metre walking distance from the site, which provides access to the broader transit network and higher-order services including Line 1 (Yonge-University) and Line 2 (Bloor-Danforth). An overview of the transit services available in the vicinity of the site is provided in **Table 4** and illustrated in **Figure 7**.

Table 4 Existing Area Transit Services

	Route	Headways	Nearby Stops	Route Description
Go Transit	18 – Lakeshore West GO Train	30-minutes during peak periods 1-hour during off-peak	Exhibition Stop (~750m / 10 minute walk)	Route generally travels north-south along the Queen Elizabeth Way between Union Station in the north and Hamilton GO Centre in the south.
TTC Services	29 – Dufferin Bus	8 minutes during peak periods 10 minutes during off-peak	Dufferin Gate Loop (~1.2 km / 15 minute walk)	Route generally travels north-south between Wilson Station on Line 1 Yonge-University and Exhibition Place. It also serves Dufferin Station on Line 2 Bloor-Danforth.
	63 – Ossington Bus	6 minutes during peak periods 12 minutes during off-peak	East Liberty Street at Lynn Williams Street Stop (~400 m / 5 minute walk)	Route generally travels north-south between Eglinton West Station on Line 1 Yonge-University and King Street West and the Liberty Village. It also serves Ossington Station on Line 2 Bloor-Danforth. Both the 63A and 63B service the site.
	501 – Queen Streetcar	10 minutes during peak periods 10 minutes during off-peak	Queen Street West at Abell Street (~1.4 km / 18 minute walk)	Route generally travels east-west between Neville Park Loop and Long branch Loop. It serves Queen and Osgoode Stations on Line 1 Yonge-University. This route is part of the 10 Minute Network, which operates at 10 minutes or better every day.
	504 – King Streetcar	10 minutes during peak periods 10 minutes during off-peak	King Street West at Jefferson Avenue (400 m / 5 minute walk)	Route generally travels east-west between Dundas West Station and Broadview Station on Line 2 Bloor-Danforth. It also serves the St Andrew and King stations on Line 1 Yonge-University. This route is part of the 10 Minute Network, which operates at 10 minutes or better every day.
	509 – Harbourfront Streetcar	7 minutes during peak periods 10 minutes during off-peak	Exhibition Loop (~1.1 km / 13 minute walk)	Route generally travels east-west between Union Station on Line 1 Yonge-University and Exhibition Loop.
	511 – Bathurst Streetcar	4 minutes during peak periods 10 minutes during off-peak	Manitoba Drive at Strachan Avenue West Site (~1.0 km / 12 minute walk)	Route generally travels north-south between Bathurst Station on Line 2 Bloor-Danforth and Exhibition Loop. This route is part of the 10 Minute Network, which operates at 10 minutes or better every day.





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FIGURE 7 EXISTING AREA TRANSIT NETWORK

4.2.2 Future Transit Context

The proposed development is in a strategic location for residents and visitors to take advantage of the transit opportunities afforded to them by the planned infrastructure improvements for the Liberty Village Area. Two major transit stations – King-Liberty GO Station and Exhibition Ontario Line Station – are planned and expected to significantly improve the existing higher-order transit services and other surface transit routes (i.e. buses and streetcars) within the vicinity of the site. The future area transit network is illustrated on **Figure 8**.

4.2.2.1 DOWNTOWN RELIEF LINE / ONTARIO LINE – EXHIBITION STATION

The City of Toronto, TTC and Metrolinx are working collaboratively to plan the expansion of the downtown transit network, which includes the Downtown Relief Line South. In July 2016, the City of Toronto Council approved a preferred corridor alignment that runs from Pape / Danforth to Queen / University. The proposed Relief Line South, a 7.5 km long planned subway line with 8 stations, is proposed to connect the Yonge-University-Spadina Subway (Line 1) downtown to the Bloor-Danforth Subway (Line 2). The aim of the Relief Line South is to reduce crowding on Line 1 south of Bloor, at the Bloor-Yonge Station and on the surface transit routes to / from the downtown.

Following a Statement of Completion of the Transit Project Assessment Process (TPAP) in October 2018, further design work is currently underway for the Relief Line South. A possible north extension of the Relief Line (the “Relief Line North”) was explored in a 2016 through a six-month environmental assessment process, which advanced the preliminary design of the line. While the alignment and design are still being developed, the Relief Line North would extend north from Pape Station while the study area extends as far north as Steeles Avenue and as far west as Victoria Park Avenue.

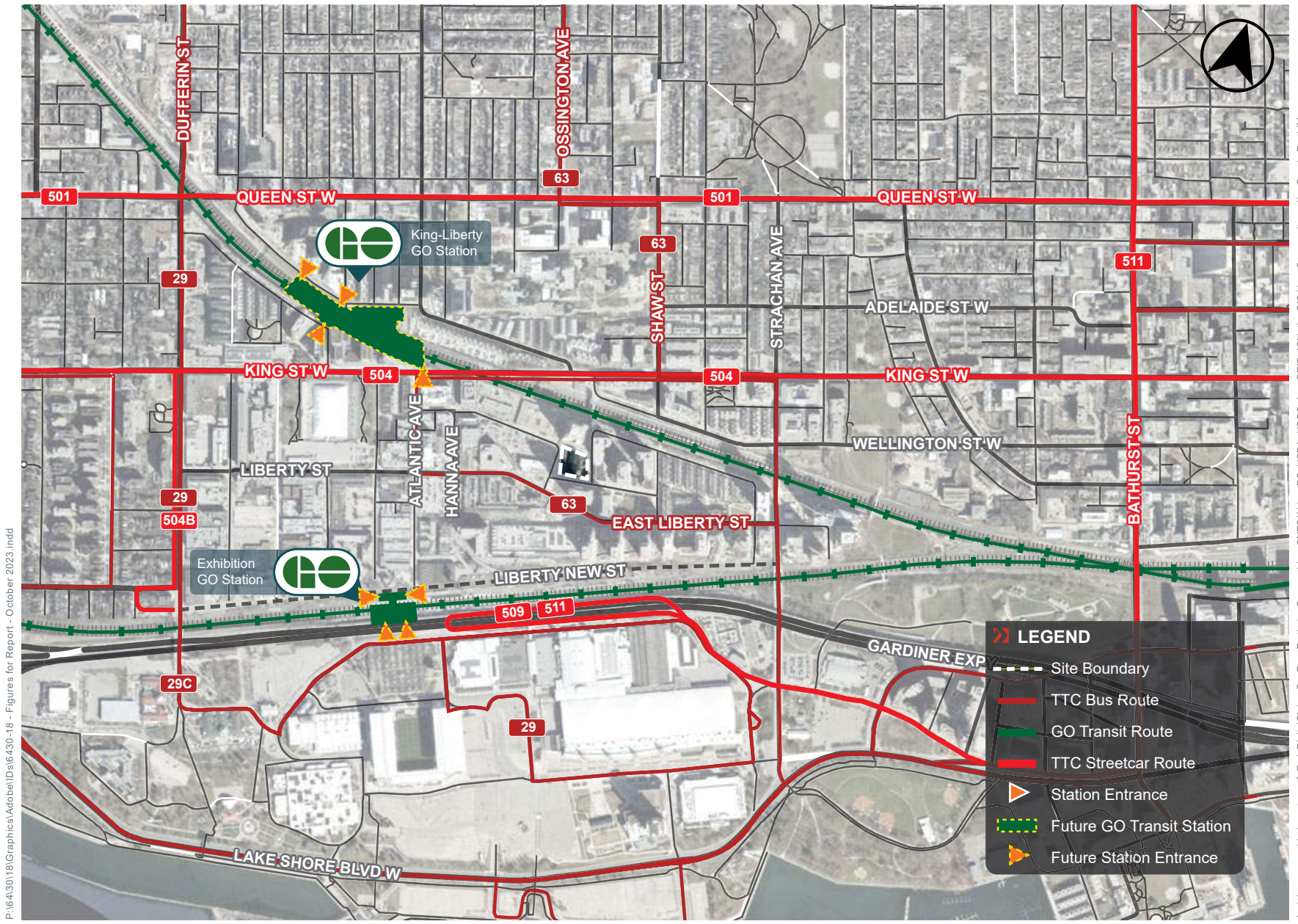
It is important to note that in April 2019, the Ford government released its transit plans for the GTHA, which included Downtown Relief Line plans called the Ontario Line. The proposed Ontario Line runs from Exhibition Station to the Ontario Science Centre Station on the Eglinton Crosstown LRT line, connecting to Osgoode, Queen and Pape Station. The Ontario Line is not proposed to extend north of Eglinton Avenue East. The proposed alignment of the Ontario Line terminates at Exhibition Station in the west, which is approximately 750 metres from the site. This line will provide the site with an additional higher-order transit service.

Early construction works for the western segment of the Ontario Line (including some tunneling work for the planned station entrance) have begun late 2021 and the Environmental Impact Assessment (EA) study is underway to be completed for public review. A draft EA report has been completed in February 2022 and is being reviewed. Start of full construction work for the new Ontario Line Exhibition Station is targeted for early 2023. As part of this process, two mixed use developments are being planned concurrent and on top for the future Exhibition Station (i.e. 1A Atlantic Avenue and 20 Atlantic Avenue) to better integrate station connectivity to the urban fabric of the surrounding lands.

Prior to the EA study for the entire western segment of the Ontario Line, a study specific to the proposed mixed-use development on top of the future Exhibition GO Station was completed in September, 2021. This study, Ontario Line: Integrated Transit Oriented Communities – Exhibition Station Draft Transportation Impact Assessment, issued for rezoning by HDR included a forecast of gross trips at the future Exhibition GO Station under 2030 conditions by access and egress mode. These trips, by mode and direction, can be expressed as a percentage of the gross directional external trips at the station to extract the forecast mode splits.

These forecast access and egress mode splits at Exhibition GO Station are summarized and discussed in greater detail in **Section A**.





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Aerial maps provided courtesy of Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, the GIS User Community and/or Google Earth/Maps.

FIGURE 8 FUTURE AREA TRANSIT NETWORK

4.2.2.2 REGIONAL EXPRESS RAIL / SMARTTRACK – KING-LIBERTY STATION

Metrolinx is working to introduce Regional Express Rail (RER) to Toronto. The key aspects of RER are frequent all-day service, electric power and strong connections to local transit systems. Through the Union Station revitalization project, Metrolinx will be improving service and capacity to support the implementation of RER. As part of this initiative, GO Transit will be introducing two-way, all-day service on its existing lines.

Electric trains can travel at higher speeds and accelerate faster, with reduced greenhouse gas emissions from the rail cars along with lower operating and maintenance costs. These factors are expected to increase the number of passenger trips which in turn would decrease automobile congestion and emissions. In addition to standard electric vehicles, Metrolinx has also been studying the feasibility of hydrogen-powered vehicles.

Metrolinx also plans to build a number of new GO Transit Stations in order to increase access to the network. New stations are planned on each of the Barrie, Kitchener, Lakeshore East and Stouffville GO rail corridors, for a total of 12 new stations in addition to those already planned for the GO network. Based on a November 2021 update, five of these stations have been planned through the combined planning efforts of Metrolinx's RER program and the City of Toronto's planned SmartTrack – a new proposed transit service between downtown Toronto, Etobicoke and Scarborough that operates along existing GO rail tracks. As of June 15, 2023, Toronto City Council voted unanimously to receive funding from the Province of Ontario to deliver the SmartTrack Stations Program. This represents the collaborative efforts of the City of Toronto, the Province of Ontario and Government of Canada to leverage existing transit infrastructure to expand transit access and improve transportation options within Toronto.

As part of the SmartTrack initiative, a new station is proposed at King-Liberty that will provide multiple transit and pedestrian connections to the site. The new GO train station will provide convenient access to higher-order transit systems including the planned SmartTrack line, UP Express and TTC transit. The development of the site and its surrounding area provides the opportunity to include multiple pedestrian connection to the future station via the planned entrances between Sudbury Street / Joe Shuster Way and at King Street West / Hanna Avenue. This will improve connectivity for active transportation with the creation of a new north-south route for future site visitors, residents and employees across the rail corridor. Metrolinx is working with adjacent landowners to further improve multi-modal connectivity into and out of the Liberty Village area via multiple pedestrian access points to and from the station.

Potential transit connections with the station include:

- 501 Queen
- 504 King
- 508 Lake Shore
- 63 Ossington
- 29 Dufferin

The Environmental Project Report for the new SmartTrack Station was completed in July 2018 by a combined effort from Parsons, Hatch and WSP. The forecast access and egress mode share at the new King-Liberty Station is outlined in Volume VI of that report in Table 4-15. These forecast mode splits are summarized and discussed in greater detail in **Section H.1.3**.

4.2.2.3 WATERFRONT TRANSIT RESET

The Waterfront Transit Reset is a multi-phase study that was implemented in 2016 (in partnership with the Toronto Transit Commission and Waterfront Toronto) to establish a vision and plan for a comprehensive transit network along the City's waterfront to the year 2041. The study area extends from the Long Branch GO Station and the Mississauga border in the west to Woodbine Avenue in the east, and south of the Queensway / Queen Street corridor to Lake Ontario.

Toronto's waterfront is undergoing significant changes with the rapid growth occurring in many precincts along the water's edge, including Humber Bay Shores, King / Spadina, Fort York, City Place, South Core, Mimico, and Liberty Village. Further



growth is planned in several other precincts along the waterfront, including Lower Yonge, Port Lands, and the emerging East Bayfront and West Don Lands neighbourhoods. Based on this growth, many key recreational and cultural destinations became increasingly prevalent along the City's waterfront.

The integrated network solution for waterfront transit is currently being coordinated with emerging and major initiatives, such as Smart Track, Relief Line, Scarborough Transit Planning, and the Metrolinx Regional Express Rail (RER) expansion program.

4.2.3 Existing and Future Transit Reach

To understand the evolving transportation context, an assessment of the transit service area for the existing and future transit network was conducted using Geographic Information Systems (GIS). This transit reach assessment reviews the transit services available to and from the site in relation to a range of travel times. This type of analysis is useful in understanding the transit accessibility and can also be used to quantify the impact of transit service changes.

The 15-, 30-, and 45-minute transit travel reach from the site during the weekday morning peak travel period was analysed for both existing and future conditions as is illustrated in **Figure 9** and **Figure 10**. Transit travel times include consideration for walking time to and from transit stops, as well as the transit schedules during the peak hour (i.e. service frequency and wait times), all of which are based upon existing transit service. The future condition reflects the impact of planned and ongoing transit improvements in the vicinity of the site (including the King-Liberty GO Station and Exhibition Station on the Ontario Line) and within a 45-minute transit service area reach of the site (including the Eglinton LRT and Waterfront East LRT).

A summary of the transit service areas reached by transit in relation to the site is provided in **Table 5**.



Table 5 Summary of Existing and Future Transit Service Area Travel Reaches

Transit Scenario	15-Minute Reach	30-Minute Rach	45-Minute Reach
<p>Existing Conditions (Travel away from site)</p>	<ul style="list-style-type: none"> • North along Ossington Ave. (north of Dundas St. W). • South along Dufferin St to Exhibition Place (access to Exhibition GO Station), and along Strachan Ave to the waterfront; • East along King St W to just past Portland St, and along Lake Shore Blvd W to Bathurst St; and • West along King St W to Springhurst Ave, and along Lake Shore Blvd W to Jameson Ave. 	<ul style="list-style-type: none"> • North along Dufferin St to just past St Clair Ave W; • South along Dufferin St to Exhibition Place (access to Exhibition GO Station), and along Strachan Ave to the waterfront; • East along King St E to just past Parliament St, along Queens Quay E to short of Lower Jarvis St, and along Bloor St W (via Line 2 Bloor–Danforth) to Spadina Station; and • West along The Queensway to the Humber River (beyond South Kingsway), and along Bloor St W (via Line 2 Bloor–Danforth) to Dundas West Station. 	<ul style="list-style-type: none"> • North along Dufferin St to short of Lawrence Ave W, and along Yonge St (via Line 1 Yonge–University) to Eglinton Station; • South along Dufferin St to Exhibition Place (access to Exhibition GO Station), and along Strachan Ave to the waterfront; • East along Queen St E to Pape Ave, along Lake Shore Blvd E to Don Roadway, and along Danforth Ave (via Line 2 Bloor–Danforth) to Greenwood Station; and • West along The Queensway to short of Islington Ave, along Lake Shore Blvd W to short of Royal York Rd, and along Bloor St W (via Line 2 Bloor–Danforth) to Kipling Station.
<p>Future Conditions ⁽¹⁾ (Travel away from site)</p>	<ul style="list-style-type: none"> • North along Ossington Ave to just before Churchill Ave (north of Dundas St W); • South along Dufferin St to Exhibition Place (access to Exhibition GO Station), and along Strachan Ave to the waterfront; • East along King St W to just past Portland St, and along Lake Shore Blvd W to Bathurst St; and • West along King St W to Springhurst Ave, and along Lake Shore Blvd W to Jameson Ave. 	<ul style="list-style-type: none"> • North along Dufferin St to just past St Clair Ave W; • South along Dufferin St to Exhibition Place (access to Exhibition GO Station), and along Strachan Ave to the waterfront; • East along the future Ontario Line to planned East Harbour Station, along the planned Waterfront East LRT to Lower Jarvis St, and along Bloor St E (via Line 2 Bloor–Danforth) to Bloor-Yonge Station; and • West along the planned Waterfront West LRT to South Kingsway, and along Bloor St W (via Line 2 Bloor–Danforth) to Dundas West Station. 	<ul style="list-style-type: none"> • North along the improved Barrie GO Line to Rutherford GO Station, and along Yonge St (via Line 1 Yonge–University) to Lawrence Station; • South along Dufferin St to Exhibition Place (access to Exhibition GO Station), and along Strachan Ave to the waterfront; • East along the future Ontario Line to planned Flemingdon Park Station, along the planned Waterfront East LRT to just before Leslie St, and along the improved Stouffville GO Line to Kennedy Station; and • West along the planned Waterfront West LRT to Royal York Rd, along the improved Lakeshore West GO Line to Port Credit GO Station, along Bloor St W (via Line 2 Bloor–Danforth) to Kipling Station, and along the Eglinton Crosstown Extension to Jane St.

Note:

1. With the addition of the Ontario Line, Waterfront East and West LRTs, GO Expansion, etc



Key findings are summarized as follows:

- Within a 15-minute reach, a modest area around the site can be accessed under existing conditions, including access to all of the Liberty Village and much of the surrounding neighbourhoods, as well as to Exhibition GO Station and Exhibition Loop on the Exhibition Place grounds. This transit reach is maintained under future conditions.
- Within a 30-minute reach, the accessible transit service area from the site expands north across western Toronto, and east-west along the waterfront between west Queen West and Harbourfront. Under existing conditions, portions of Line 1 Yonge-University and Line 2 Bloor-Danforth can now be accessed, including Union Station and Spadina Station. Under future conditions, eastbound access improves along Queen Street East to River Street, while coverage along TTC Subway Line 1 and Line 2 now encompasses Bloor-Yonge Station. The future completion of the Ontario Line also improves transit reach to beyond the Don River, with access to the planned East Harbour Station transit hub.
- Within a 45-minute reach, a majority of downtown and midtown Toronto are now accessible, with access extending further onwards into East York and Etobicoke along Danforth Avenue and Bloor Street West (via TTC Subway Line 2 Bloor-Danforth and into North York along Dufferin Street and Yonge Street (via TTC Subway Line 1 Yonge-University). Under future conditions, the completion of the planned Ontario Line will significantly expand the reach to the northeast by providing access to Flemingdon Park LRT Station and an eastern connection to Line 2, while access along the waterfront is also set to increase greatly with the completion of the planned Waterfront East and West LRTs, which provides access between Royal York Road and Leslie Street. Along the outer fringes of the transit reach, improvements from the future completion of the Eglinton Crosstown and Eglinton Crosstown West Extension will provide additional east-west access along Eglinton Avenue between Jane Street and Mount Pleasant Road. Further afield, implementation of GO Expansion will allow for access to destinations as far as Port Credit GO Station via the improved Lakeshore West GO Line, Weston GO Station via the improved Kitchener GO Line, Rutherford GO Station via the improved Barrie GO Line, Kennedy Station via the improved Stouffville GO Line, and Scarborough GO Station via the improved Lakeshore East GO Line.

In summary, the site has good access to transit under existing conditions in all time ranges analysed, with its proximity to Dufferin Street and King Street West, and to transit options at Exhibition Place. In the future, access to transit from the site is set to increase further, with the completion of several Ontario priority projects near the site, including the Ontario Line, the Waterfront Reset (Waterfront East and West LRTs) and GO Expansion, also offering onwards connections to existing TTC Subway Line 1 Yonge–University and Line 2 Bloor–Danforth and the future Eglinton Crosstown and Eglinton Crosstown West Extension.

The evolving transportation context visualized in this analysis indicates that, at either local or intercity scales, there are suitable alternatives to driving or requiring a parking space for daily travel. The site is in a prime location that enables future site users to shift away from auto use and utilize the major transit investments being afforded within the area.



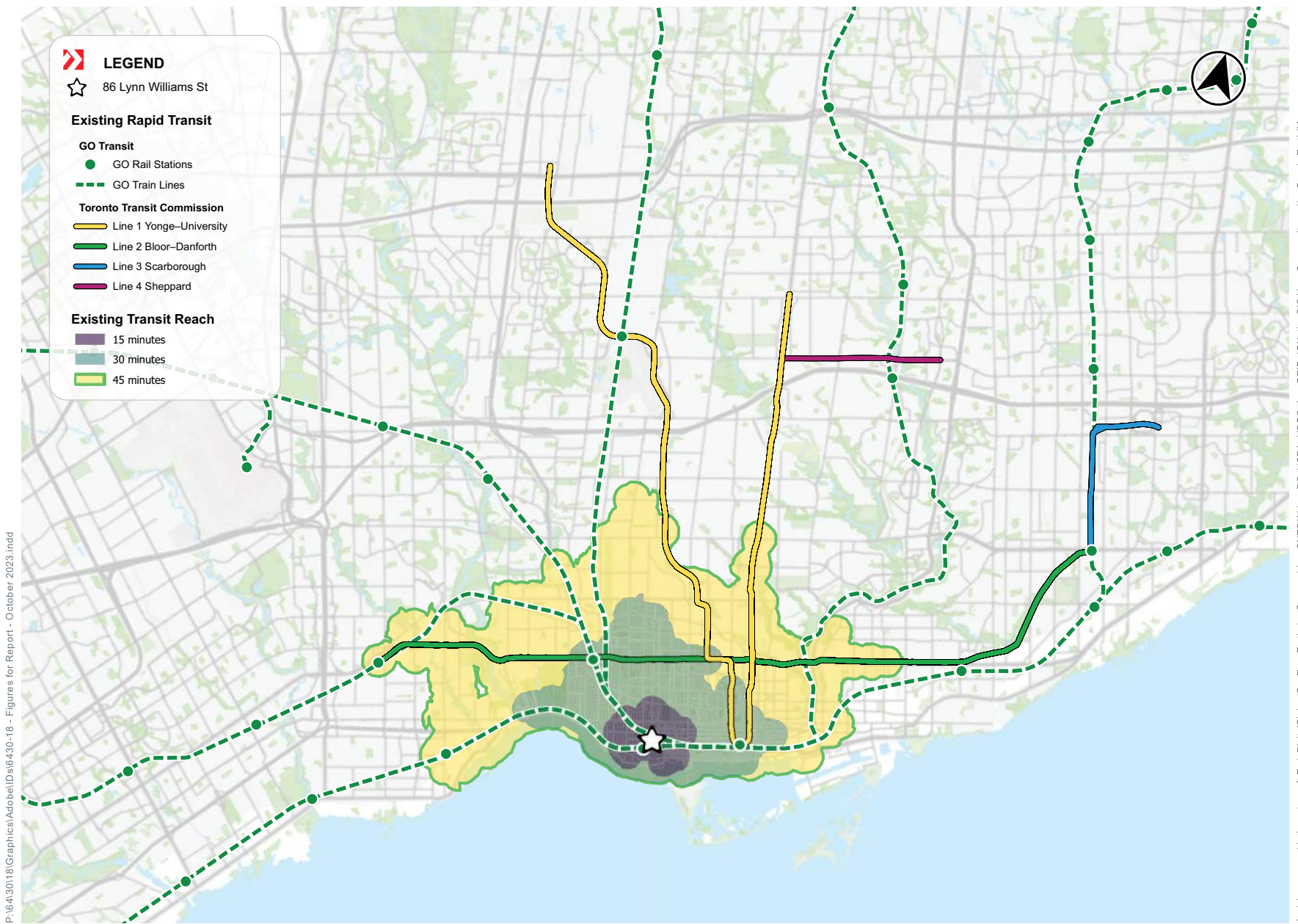
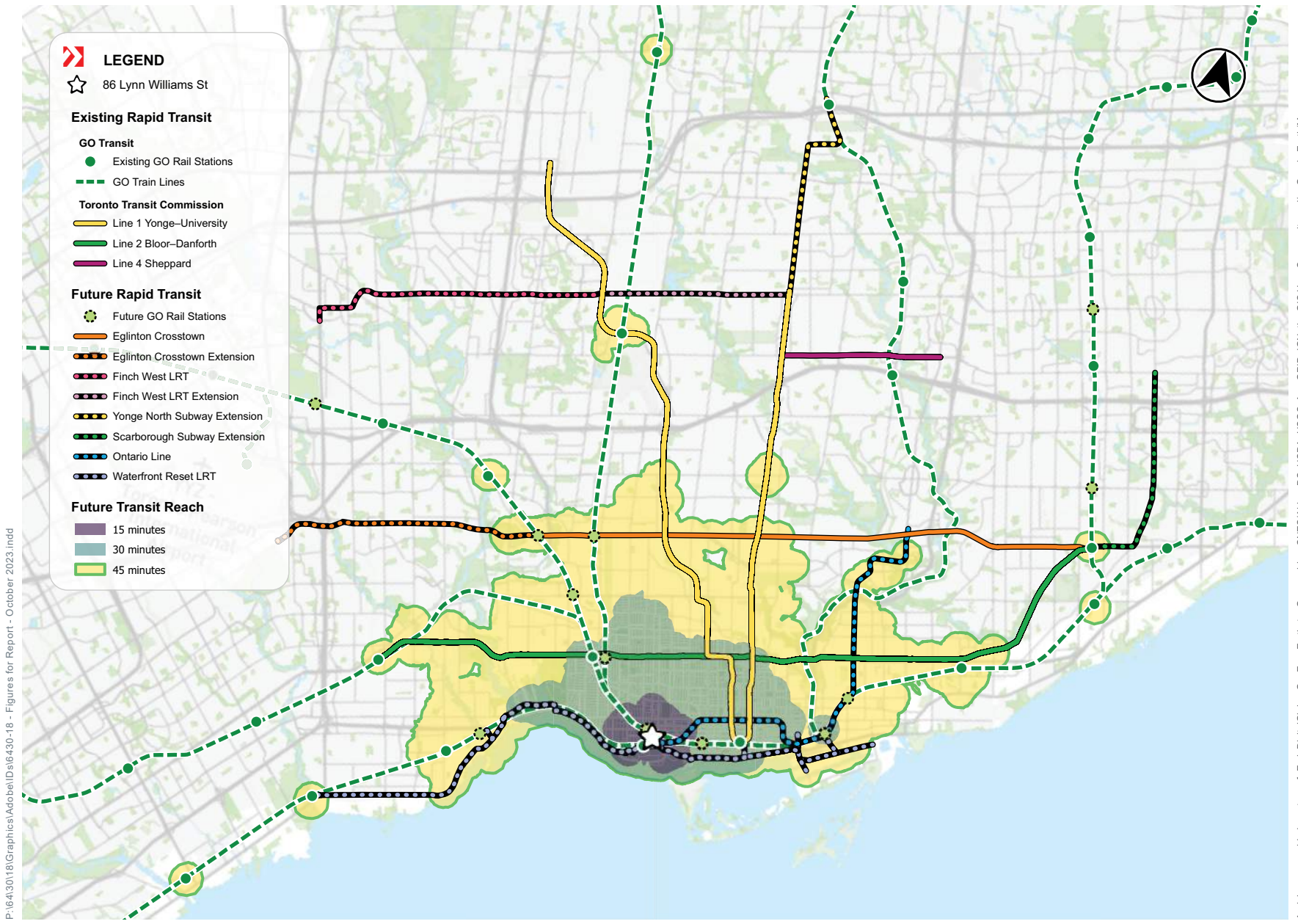


FIGURE 9 EXISTING TRANSIT REACH AWAY FROM THE SITE (MORNING PEAK PERIOD)



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Aerial maps provided courtesy of: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, the GIS User Community and/or Google Earth/Maps.

FIGURE 10 FUTURE TRANSIT REACH AWAY FROM THE SITE (MORNING PEAK PERIOD)

4.3 Area Cycling Network

4.3.1 Existing Cycling Context

The existing cycling infrastructure nearest to the site includes the Strachan Avenue bike lanes, which can be accessed via East Liberty Street. Furthermore, bike lanes on Wellington Street West, multi-use trails on Lake Shore Boulevard, various on-street shared cycling routes near the area surrounding the site, and 9 Toronto Bike share stations located within a 500-metre radius of the site provide connections to the larger cycling network.

In proximity to the site, the King-Liberty Pedestrian Cycle Bridge over the Metrolinx Kitchener / Milton Rail Corridor spans from Douro Street to the western leg of Western Battery Road. The bridge provides a convenient and more direct route for cyclists from Liberty Village to King Street West between Atlantic Avenue and Strachan Avenue.

A summary of the existing cycling infrastructure located within 1 kilometre of the site is provided in **Table 6**. The details for the cycling network were found in the City of Toronto Bike Map.

Table 6 Existing Area Cycling Infrastructure

Route		Type of Cycling Infrastructure	Description
East-West Connections	Douro Street	Cycle Tracks	Installed in 2020 and not yet included on Toronto Bike Map. The cycle track extends between Strachan Avenue and King Street West.
	Wellington Street West	Cycling Lanes	Installed in 2020 and not yet included on Toronto Bike Map. The new cycling lane extends between Strachan Avenue and Niagara Street and connects to the existing cycling lane on Wellington Street.
	Waterfront Trail	Multi-Use Trail	This multi-use trail extends from Norris Crescent in the west to Queens Quay bike lane in the east.
North-South Connections	Strachan Avenue	Bike Lane	This bike lane extends from King Street West in the north to Lake Shore Boulevard West in the south.
	Strachan Avenue	Suggested On-Street Route	This suggested on-street route extends from Queen Street in the north to King Street West in the south.
	Shaw Street	Bike Lane	This bike lane extends from King Street West in the north to Douro Street in the south.
	King-Liberty Pedestrian/Cycle Bridge	Pedestrian/Cycle Connection	This recently opened bridge (2020) provides an additional point at which bicycles can cross over the rail corridor, connecting Douro Street and Western Battery Road.

4.3.2 Future Cycling Context

The City of Toronto *Cycling Network Ten Year Plan (2016)* ('Ten Year Plan') is a policy document that outlines proposed cycling infrastructure improvements in Toronto over a ten-year period (2016 – 2025). The Ten-Year Plan intends to connect gaps within the existing cycling network, expand the network to new areas of the City, and to renew existing routes by improving their quality. An update to the Ten-Year Plan was adopted to provide the *2022 – 2024 Near-Term Implementation Program*, highlighting key improvements to be undertaken during this time period.



Within the vicinity of the Site, the *2022 – 2024 Near-Term Implementation Program* approved future implementation and studies for the following infrastructure improvements:

- New bikeway on King Street (delivered as part of a new development) between Sudbury Street and Duoro Street;
- New bikeway on Sudbury Street between Abell Street and King Street West;
- New bikeway on Ordnance Street between Strachan Avenue and 110 metres east of Strachan Avenue;
- New bikeway on Wellington Street West between Bathurst Street and Blue Jays Way;
- Extension of the West Toronto Railpath to Sudbury Street and Abell Street
- Upgrade to bi-directional cycle track on Douro Street between Strachan Avenue and King Street West; and
- State-of-good-repair markings of the bike lanes on Strachan Avenue between Queen Street West and Lake Shore Boulevard West;

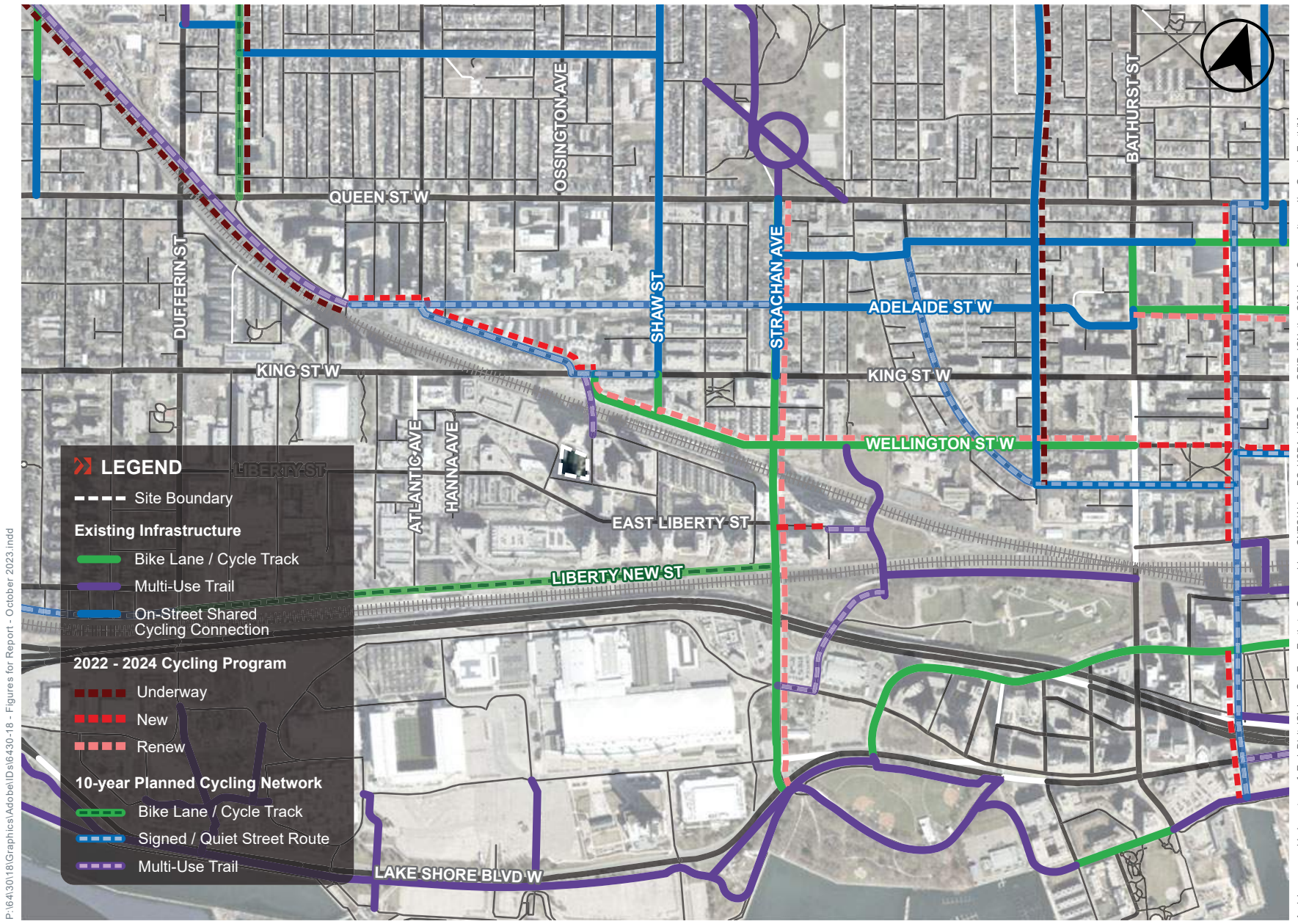
As part of the Liberty Village New Street EA study, a new multi-use path is proposed along Liberty New Street between Dufferin Street and Strachan Avenue.

Several strategic locations for proposed Bike Share stations have been identified to correspond to key gateway locations, transit destinations and open space, including the intersection of Liberty Street and Hanna Avenue in close proximity to the site. Bike share facilities are discussed in more detail in **Section 4.5**.

The future bicycle facilities in the vicinity of the site will create a robust network affording site users improved access to a variety of transit services, parks and multi-use path facilities, and key destinations near the site.

The existing and future area cycling networks that includes the planned infrastructure improvements from the City is illustrated on **Figure 11**.





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Aerial maps provided courtesy of: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, the GIS User Community and/or Google Earth/Maps.

FIGURE 11 EXISTING AND FUTURE AREA CYCLING CONNECTIONS

4.4 Pedestrian Context

4.4.1 Existing Pedestrian Network

Since the Liberty Village area was originally designed as an industrial hub, improvements are needed to connect the transportation network for all users and enhance the planning framework and built form. The site includes some walkways but there are gaps in the network that create a lack of connectivity and increased walking distances.

Existing sidewalks on Western Battery Road to the east provide connections to sidewalks on Lynn Williams Street to the south.

Existing walkways on the existing private driveway to the west (under separate ownership) provide connections to sidewalks on Snooker Street to the west and Lynn Williams Street to the south.

Beyond the site, the King-Liberty Pedestrian Cycle Bridge over the Metrolinx Kitchener / Milton Rail Corridor spans from Douro Street to the western leg of Western Battery Road. This bridge provides a convenient and a more direct route for pedestrians from Liberty Village to King Street West between Atlantic Avenue and Strachan Avenue.

4.4.2 Future Pedestrian Network

The creation of a complete network that considers pedestrian and cycling connections, transit infrastructure, road network, open spaces and first-and-last mile solutions is essential to support the development of a transit-oriented community. The proposed development is located within the area being assessed as part of the Liberty Village Public Realm Study initiated by the City of Toronto which includes a public realm strategy, an action plan and direction to undertake additional studies related to the Liberty Village Streets Plan and Liberty New Street. A key component of the Liberty Village Public Realm Study is the creation of mid-block connections. The redevelopment of the site provides an opportunity to enhance the active transportation experience and improve connectivity for the Liberty Village area and beyond.

The plan illustrates walkways on both sides of the new east-west private laneway connection along the north property boundary, connecting to existing sidewalks on Western Battery Road to the east and a walkways on the existing private driveway to the west (under separate ownership). In the near term, access to the existing private driveway will be secured by extension of existing easements which provide connections to existing sidewalks on Snooker Street to the west and Lynn Williams Street to the south. In the long term, the existing private driveway will be replaced by new sidewalks on an extension of Snooker Street from it's existing terminus at Hanna Avenue, southeast to Lynn Williams Street. The new east-west private laneway will provide a new convenient connection for pedestrians and cyclists to travel between existing and proposed residential, retail, and office uses west of the site to Western Battery Road and the King-Liberty Pedestrian / Cycle Bridge.

The plan illustrates a new walkway along the western property boundary (on the east side of the existing private driveway which will form part of the future public boulevard on the west side of the extended section of Snooker Street) and an improved sidewalk along the eastern property boundary within the public boulevard on the west side of Western Battery Road.

An atrium is illustrated on the plan along the south property boundary between the existing building to the south and the proposed development. This mid-block connection will provide site residents and visitors access to the retail uses on the site, as well as an additional mid-block crossing option between Western Battery Road to the east and an existing private driveway to the west.

The Liberty Village New Street Environmental Assessment was completed in 2016 and recommended the construction of a new east-west road extending between Dufferin Street and Strachan Avenue in Liberty Village. The new road would be located on the north side of the GO Transit Lake Shore West rail corridor and would include a multi-use path for cyclists



and pedestrians on the south side of the road and a sidewalk on the north side of the road. Although there is no confirmed schedule for construction, the detail design phase was scheduled to begin in 2018.

The future pedestrian connections will provide for efficient pedestrian routing to and from existing and planned transit services, such as the future King-Liberty GO Station, Exhibition Ontario Line Station and bus stops for the TTC 63 Ossington bus route. Through the provision of prominent access to the existing and planned transit services, there is significant support for transit use by residents and visitors.

The provision of these connections capitalizes on the opportunity to fill in the missing gaps, connect to existing routes and improve pedestrian and cycling connections within Liberty Village.

4.5 Shared Mobility Services

4.5.1 Existing and Future Services

4.5.1.1 CAR-SHARE SERVICES

Car-share programs, which were only in their infancy a decade ago, now provide convenient, non-private automobile travel opportunities for thousands of residents, employees, and visitors of the City of Toronto. Vehicles are available “on demand” without the need for car ownership. The availability of car-share vehicles near developments is strongly supportive of reduced car ownership particularly by building residents, which in turn lowers parking space demand and daily vehicle use.

The two primary car-share companies currently operating in Toronto are ZipCar and Enterprise CarShare. Zipcar is the world’s largest car-sharing program and entered the Toronto market in 2006 with approximately 100 vehicles. They have since grown the fleet to approximately 700 vehicles. Enterprise CarShare (formerly AutoShare) was founded in 1998 and currently has over 12,000 members and 400 vehicles at over 150 locations across the City of Toronto. Vehicles rented from either of these programs must be picked up and returned from the same parking space.

Within a 500-metre radius of the site, there are currently 3 Enterprise CarShare location that accommodate approximately a total of 4 car-share vehicles. The location of existing car-share stations in the area is illustrated in **Figure 12**.

4.5.1.2 TORONTO BIKE-SHARE SERVICES

The Bike-Share Toronto program provides flexible cycling options within the City of Toronto with bicycles that can be used on a short-term basis and picked up or dropped off at different stations across the City of Toronto. The system expanded in 2016 to include 1,000 bicycles and 120 stations including new stations along the Yonge and Bloor/Danforth transit corridors and as far north as St. Clair Avenue West.

In recognition of the growing demand for cycling and multi-modal travel choices, the Toronto Parking Authority (TPA) had expanded Bike Share Toronto to 6,850 bikes, 300 e-bikes and 625 stations across the City of Toronto by 2020. TPA have outlined a new Four-Year Growth Plan to further expand and strengthen the Bike Share system to up to 1,000 stations. These new stations will spread the system to all 25 wards in Toronto to increase equitable bike access to all neighbourhoods. New station locations will be selected with a focus to enable multimodal connections to new higher order transit nodes and population and/or employment density.

As part of the Phase 1 Bike Share expansion between 2016 to 2020, several new bike share stations have been installed southwesterly to Liberty Village and westerly to Bloor Street and Dufferin Street. Within a 500-metre radius of the site, there are currently 9 Bike-Share Toronto stations that accommodate approximately 154 bicycles. The location of existing bike-share stations in the area is illustrated in **Figure 13**.

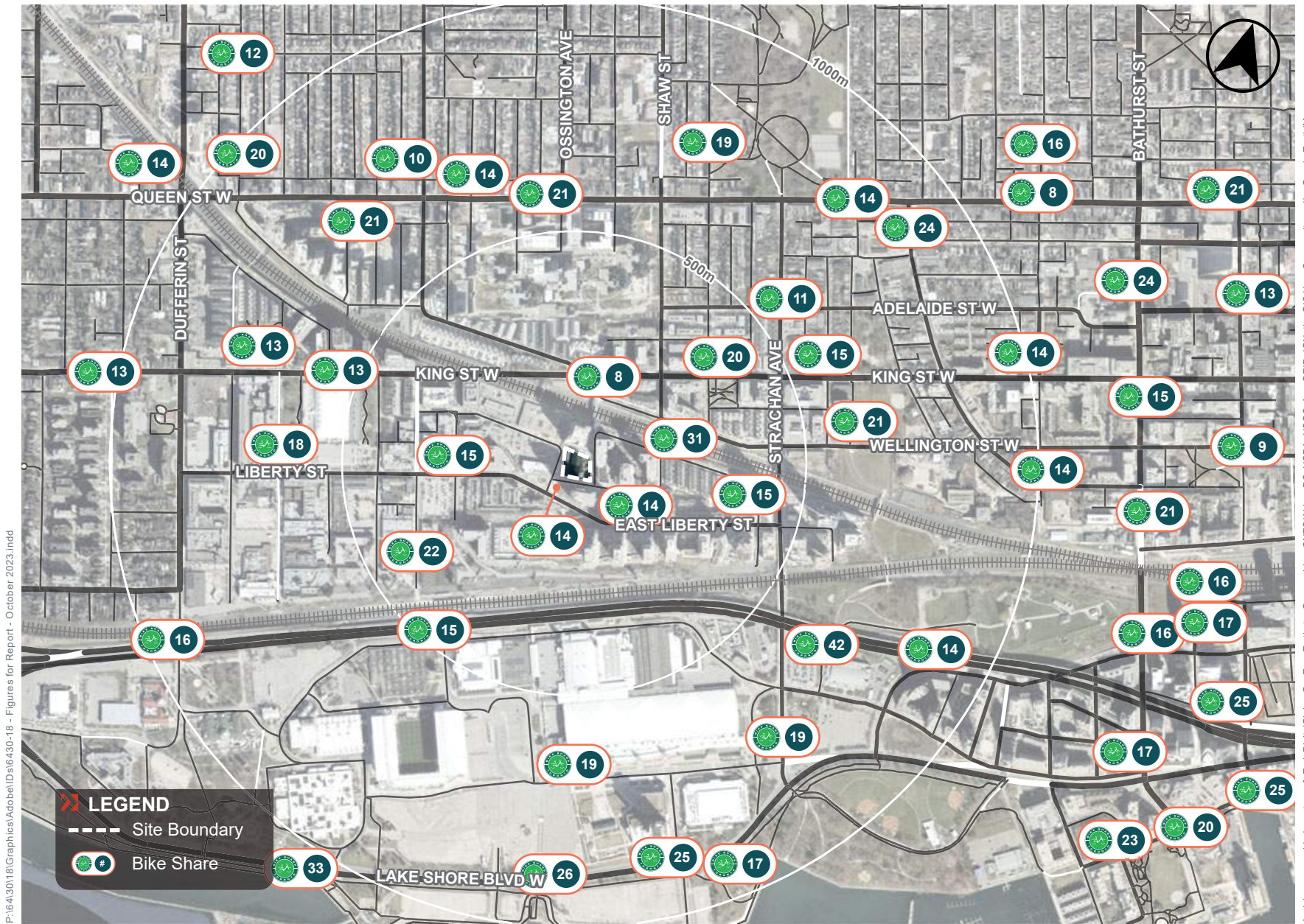




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Aerial maps provided courtesy of: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, the GIS User Community and/or Google Earth/Maps.

FIGURE 12 EXISTING CAR-SHARE STATIONS



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Aerial maps provided courtesy of: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, the GIS User Community and/or Google Earth/Maps.

FIGURE 13 EXISTING BIKE-SHARE STATIONS

5.0 VEHICLE PARKING CONSIDERATIONS

5.1 Zoning By-law Parking Requirements

5.1.1 Site-Specific Zoning By-law

The site is subject to a site-specific zoning by-law, as adopted by City of Toronto Council on June 14, 15, and 16, 2005. The parking standards in site-specific Zoning By-law 600-2005 amend the former City of Toronto By-law 438-86. **Table 7** summarizes the application of the site-specific Zoning By-law to the site statistics.

Table 7 Site-Specific Zoning By-law 600-2005 – Minimum Parking Requirements

Land Use	Units / GFA	Minimum Parking Requirement	Number of Parking Spaces Required
Resident			
Bachelor	56 units	0.3 spaces / unit	17 spaces
1-Bedroom	387 units	0.7 spaces / unit	271 spaces
2-Bedroom	86 units	1.0 spaces / unit	86 spaces
3-Bedroom	59 units	1.2 spaces / unit	71 spaces
Resident Sub-Total	588 units	--	447 spaces
Non-Resident			
Residential Visitor	588 units	0.12 spaces / unit	71 spaces
Retail	800 m ²	4.3 spaces / 100m ² GFA	34 spaces
Non-Resident Sub-Total	--	--	105 spaces
Total	--	--	552 spaces

Notes:

1. Rounding rules per Zoning By-law 438-86 Section 4(4).5(i): *Where the calculation of the number of parking spaces required to be provided and maintained by this paragraph results either in a fraction of a parking space, or in a whole number of parking spaces and a fraction of a parking space, the fraction if equal to or greater than 0.5 shall be taken to be 1.0 and added to the whole number of the parking spaces required to be provided and maintained, and if the fraction is less than 0.5 it shall be excluded from that whole number.*
2. Based on site statistics provided by gh3* (October 2023)

Application of the parking standards outlined in the site-specific zoning by-law, results in a minimum requirement of 552 vehicle parking spaces for the site, including 447 resident spaces and 105 non-resident spaces.

5.1.2 Zoning By-law 569-2013, as Amended Vehicle Parking Requirements

The City of Toronto has recently signalled a change in policy direction through the change in minimum parking requirements following the approval of Zoning By-law 89-2022, which amends the parking requirements within Zoning By-law 569-2013. Notably these amendments, which were supported by studies prepared by City staff, removed minimum resident and retail parking requirements and significantly reduced visitor requirements for new developments on a general city-wide basis – and particularly for sites located in areas well-served by transit. City Council adopted the Review of Parking Requirements for New Development (December 2021), which recommended the elimination of minimum parking requirements for most land uses, city-wide, replacing them with maximum parking standards within Zoning By-law 569-2013. This report was the culmination of approximately a year of study and consultation, where several staff reports provided rationale for the change. It acknowledged that different transportation contexts drive varying parking demand rates based upon their



proximity to transit and redefined Parking Policy Areas. It also recognized that development applications are frequently approved with reduced parking in comparison to Zoning By-law requirements.

This report shifted the public position of City of Toronto staff regarding minimum parking requirements and their enforcement. The most notable of the positions stated within the staff reports is that the minimum parking requirements in the former Zoning By-law 569-2013 do not advance the policies of the City's Official Plan to reduce auto-dependence and support non-auto modes of transportation.

City of Toronto Staff also completed a Review of Visitor Parking Requirements for New Development (June 2022). This report responded to City Council direction for staff to review the approach to minimum requirements for visitor parking in new developments, within different contexts and considering the policy areas established as part of Zoning By-law 89-2022.

On this basis, Zoning By-law 569-2013, as Amended was approved and is now in force.

The site is located in the Liberty Village neighbourhood, in the City of Toronto and falls under the Policy Parking Zone 'B' as part of the newly amended comprehensive zoning by-law (referenced in the Zoning By-law 125-2022 map). **Table 8** summarizes the application of Zoning By-law 569-2013, as Amended to the site statistics.

Table 8 City of Toronto Zoning By-law 569-2013, as Amended, Parking Zone 'B' – Parking Requirements

Land Use	Units / GFA	Min Parking Rate	Min Parking Req.	Max Parking Rate	Max Parking Req.	Effective Parking Rate	Effective Parking Req.
Resident							
Bachelor	56 units	None	0 spaces	0.7 sps / unit	39 spaces	0.7 sps / unit	39 spaces
1-Bedroom	387 units	None	0 spaces	0.8 sps / unit	309 spaces	0.8 sps / unit	309 spaces
2-Bedroom	86 units	None	0 spaces	0.9 sps / unit	77 spaces	0.9 sps / unit	77 spaces
3-Bedroom	59 units	None	0 spaces	1.1 sps / unit	64 spaces	1.1 sps / unit	64 spaces
Resident Sub-Total	588 units	--	0 spaces	--	489 spaces	--	489 spaces
Non-Resident							
Residential Visitor	588 units	2.0 + 0.05 spaces / unit	31 spaces	1.0 sps / unit (first 5 units) + 0.1 sps / unit for the 6 th and subsequent units	63 spaces	0.1 sps / unit	58 spaces
Retail	800 m ²	None	0 spaces	4.0 sps / 100 m ² GFA	31 spaces	1.0 sps / 100 m ² GFA	7 spaces
Non-Resident Sub-Total	--	--	31 spaces	--	94 spaces	--	65 spaces
Total	--	--	31 spaces		583 spaces		554 spaces
Accessible Parking Spaces		15 spaces					

Notes:

1. Based on site statistics provided by gh3* (October 2023).
2. If the number of required parking spaces results in a number with a fraction, the number is rounded down to the nearest whole number but there may not be less than one parking space.



3. Application of “Effective” Parking Rate and Requirement is a procedural requirement, stipulated by By-law 569-2013, as Amended, intended to calculate the required quantity of parking spaces (see Section 200.15.10.5).
4. Accessible parking spaces calculated per Section 200.15.10.10
 - A) “if the number of effective parking spaces is less than 13, a minimum of 1 accessible parking space must comply with all regulations for an accessible parking space in Section 200.15”
 - (B) “if the number of effective parking spaces is 13 to 100, a minimum of 1 accessible parking space for every 25 effective parking spaces or part thereof must comply with all regulations for an accessible parking space in Section 200.15”.
 - (C) “if the number of effective parking spaces is more than 100, a minimum of 5 accessible parking spaces plus 1 accessible parking space for every 50 effective parking spaces or part thereof in excess of 100 parking spaces must comply with all regulations for an accessible parking space in Section 200.15.”

Application of Zoning By-law 569-2013, as Amended results in a minimum requirement of 31 vehicle parking spaces, including 15 accessible parking spaces.

5.2 Proposed Vehicle Parking Supply

The parking strategy for the development site is consistent with the long-term vision for transit-oriented development.

The current development plans illustrate the provision of a total of 110 vehicle parking spaces – 68 resident spaces and 42 non-resident spaces, including 1 car-share space within a two-level underground parking garage. Of the total, 4 spaces are allocated as accessible spaces.

The resident parking supply exceeds the minimum requirements of the City of Toronto Zoning By-law 569-2013, as Amended. The non-resident parking supply of 42 parking spaces, including 1 car-share space, falls between the number of parking spaces required by the site-specific zoning by-law and the current City of Toronto Zoning By-law 569-2013, as Amended, and reflects more contemporary parking standards.

The number of accessible parking spaces represents a shortfall compared to the City of Toronto Zoning By-law 569-2013, as Amended, and will be reviewed through the on-going application process.

5.2.1 Proposed Toronto Green Standards (TGS) Version 4.0 Parking Provisions

The site is subject to the “Mid to High-Rise Residential & Non-Residential Version 4” standards as part of the Toronto Green Standards (TGS) Version 4.0 requirements and are outlined below.

5.2.1.1 AQ 1.2 ELECTRIC VEHICLE INFRASTRUCTURE

This standard requires parking spaces to be equipped with an energized outlet with Level 2 charging or higher (e.g. marked and identified for electric vehicle charging), in accordance with Zoning By-law 569-2013, as amended:

- All residential parking spaces, excluding visitor parking spaces; and
- 25 percent of residential visitor and non-residential parking spaces.

Based on the above, the current development plans illustrate 68 resident spaces (100% of the resident supply) and 13 non-resident spaces (approximately 30% of the non-resident supply) that will provide energized outlets with Level 2 charging or higher.



6.0 BICYCLE PARKING CONSIDERATIONS

6.1 Zoning By-law Requirements

6.1.1 Former City of Toronto Zoning By-law 438-86 Minimum Bicycle Parking Requirements

Application of the former City of Toronto Zoning By-law 438-86 to the proposed development is summarized in **Table 9** and results in a minimum requirement of 200 bicycle parking spaces (consisting of 160 long-term spaces and 40 short-term spaces).

Table 9 Former City of Toronto Zoning By-law 438-86 – Minimum Bicycle Parking Requirements

Land Use / Unit Type		Units / GFA	Minimum Rate	Minimum Requirement
Residential	Long-Term	588 units	0.75 spaces / unit to a maximum of 200 spaces 80% occupant / 20% visitor	160 spaces
	Short-Term			40 spaces
Residential Sub-Total				200 spaces ⁽¹⁾
Retail	Long-Term	800 m ² GFA	None Required ⁽²⁾	0 spaces
	Short-Term			0 spaces
Non-residential Sub-Total				0 spaces
Total Minimum Bicycle Parking Requirement				200 spaces

Notes:

1. Per former City of Toronto Zoning By-law 438-86 Section 4(13).1(a): *The bicycle parking spaces require by paragraph (a) shall be provided in the following proportion: 80 percent as bicycle parking space – occupant and 20 percent as bicycle parking spaces – visitor.*
2. If the combined non-residential floor area on the lot is less than 2,000 m², then no bicycle parking space is required.
3. Based on site statistics provided by gh3* (October 2023).

6.1.2 City of Toronto Zoning By-law 569-2013, as Amended and Toronto Green Standard Version 4.0 (Zone 1, Tier 1)

City of Toronto Zoning By-law 839-2022, which was enacted by Toronto City Council in July 2022 and is currently in-force, amends Zoning By-law 569-2013 with respect to bicycle parking. It updates the minimum bicycle parking requirements for long-term and short-term uses and is consistent with the Toronto Green Standard (TGS) Version 4, Tier 1 requirements.

The development site is designated as Bicycle Zone 1. Application of Zoning By-law 569-2013, as Amended and TGS Version 4, Tier 1 minimum bicycle parking requirements to the development site is summarized in **Table 10** and results in 648 spaces, including 530 long-term bicycle parking spaces and 118 short-term bicycle parking spaces.



Table 10 City of Toronto Zoning By-law 569-2013, as Amended and TGS Version 4 (Tier 1) – Minimum Bicycle Parking Requirements

Land Use / Unit Type		Units / GFA	Minimum Rate	Minimum Requirement
Residential	Long-Term	588 units	0.9 spaces / unit	530 spaces
	Short-Term		0.2 spaces per unit	118 spaces
Residential Sub-Total				648 spaces
Retail	Long-Term	800 m ² GFA ⁽¹⁾	None Required ⁽²⁾	0 spaces
	Short-Term			0 spaces
Non-residential Sub-Total				0 spaces
Total Minimum Bicycle Parking Requirement				648 spaces

Notes:

- Interior Floor Area (IFA) is assumed to be equal to Gross Floor Area (GFA).
- As per Zoning By-law 569-2013, as Amended Section 230.5.10.1(3): *Despite the bicycle parking space rates set out in regulations 230.5.10.1(1) and 230.5.10.1(5) and (6), 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 the lot is 2000 square metres or less, then no bicycle parking space is required.*
- Zoning By-law 569-2013, as Amended specifies that if the calculation of the number of required bicycle parking spaces results in a number with a fraction, the number is rounded up to the nearest whole number.
- Based on site statistics provided by gh3* (October 2023).

6.2 Proposed Bicycle Parking Supply and Facilities

The current development plan illustrates a total of 648 bicycle parking spaces, including 530 long-term spaces and 118 short-term spaces located on the ground floor and P1 parking levels. The proposed bicycle parking supply for the site meets the specified requirements as per City of Toronto Zoning By-law 569-2013, as Amended and TGS Version 4 (Tier 1).

Long-term spaces will be located within the underground garage in a weather-protected, secure area and will be accessible via a dedicated bicycle ramp. Short-term spaces will be located at publicly accessible areas at-grade and will be well-signed to encourage visitors and other short-term users to travel by bike to / from the development site.

6.2.1 Proposed Toronto Green Standards (TGS) Version 4.0 Bicycle Parking Provisions

6.2.1.1 AQ 2.1-2.3 BICYCLE PARKING RATES AND LOCATION

These standards require bicycle parking to be provided as per Zoning By-law 839-2022, which amends Zoning By-law 569-2013. In addition, long-term bicycle spaces must be provided in a secure controlled-access bicycle facility or purpose-built bicycle locker on a near-surface level. Short-term bicycle spaces must be highly visible at-grade or on the first parking level below-grade.

Based on the above, the proposed bicycle parking supply meets the intent of the minimum requirements outlined in Zoning By-law 569-2013, as Amended.

6.2.1.2 AQ 2.4 ELECTRIC BICYCLE INFRASTRUCTURE

This standard requires the inclusion of an Energized Outlet (120 V) adjacent to the bicycle rack or parking space for 15 percent of the required long-term bicycle parking spaces. The Energized Outlet is to be located at a maximum distance of 1100mm from the bike rack.

The current development plans illustrate 80 long-term bicycle parking spaces (15% of the long-term supply) that will provide energized outlets adjacent to the bicycle rack or parking space, which meets the requirement of TGS v4.0's AQ 2.4. standard.



7.0 LOADING CONSIDERATIONS

7.1 Zoning By-law Requirements

7.1.1 Former City of Toronto Zoning By-law 438-86 Minimum Loading Requirements

Application of the former City of Toronto Zoning By-law 438-86 to the proposed development is summarized in **Table 11** and results in a minimum requirement of one (1) Type B loading space and one (1) Type G loading space.

Table 11 Former City of Toronto Zoning By-law 438-86 – Minimum Loading Requirements

Use	Units / GFA	Type of Loading Spaces				
		Type A	Type B	Type C	Type G	Total
Resident	588 units	0 spaces	0 spaces	0 spaces	1 space	1 space
Retail	800 m ² GFA	0 spaces	1 space	0 spaces	0 spaces	1 space
Total		0 spaces	1 space	0 spaces	1 space	2 spaces

Notes:

1. Based on site statistics provided by gh3* (October 2023).

7.1.2 City of Toronto Zoning By-law 569-2013, as Amended Minimum Loading Requirements

Application of Zoning By-law 569-2013, as Amended to the proposed development is summarized in **Table 12** and results in a minimum requirement of one (1) Type B loading space and one (1) Type G loading space.

Table 12 Former City of Toronto Zoning By-law 438-86 – Minimum Loading Requirements

Use	Units / GFA	Type of Loading Spaces				
		Type A	Type B	Type C	Type G	Total
Resident	588 units	0 spaces	0 spaces	1 space	1 space	2 spaces
Retail	800 m ² GFA	0 spaces	1 space	0 spaces	0 spaces	1 space
Sub-Total without sharing		0 spaces	1 space	1 space	1 space	3 spaces
Sub-Total with sharing ⁽¹⁾		0 spaces	1 space	0 space	1 space	2 spaces
Total		0 spaces	1 space	0 spaces	1 space	2 spaces

Notes:

1. As per Zoning By-law 569-2013, as Amended Section 40.10.90.1(2): in the CR zone, if a mixed-use building has a minimum of 400 dwelling units, a Type "C" loading space required for the dwelling units is satisfied if a Type "A", Type "B" or Type "C" loading space, referred to in regulation 220.5.1.10(8), is provided for the non-residential uses in the same building.
2. Based on site statistics provided by gh3* (October 2023).

7.2 Proposed Loading Supply

The current development plans illustrate one (1) Type B loading space and one (1) Type G loading space located within the building at-grade, for the residential and retail uses on the site. The provision of two loading spaces meets the minimum loading requirements of both the former City of Toronto Zoning By-law 438-86 and the current Zoning By-law 569-2013, as Amended. The configuration of the loading area will be reviewed through the site plan application process to confirm functionality.



8.0 MULTI-MODAL TRAVEL DEMAND FORECASTING

8.1 Site Travel Mode Share

8.1.1 Existing Mode Share (2016 to 2023)

The area travel mode share in the vicinity of the site has been provided by the 2016 Transportation Tomorrow Survey (TTS) for the 2006 TTS Zones 89 and 90. These zones are generally bounded by Dufferin Street to the west, Queen Street West to the north, Bathurst Street to the east and the Gardiner Expressway to the south. The resultant area travel mode share characteristics are summarized in **Table 13** and detailed queries are provided in **Appendix B**.

Table 13 Existing 2016 Area Travel Mode Share – By Land Use

Mode	Residential – TTS ⁽¹⁾		Retail – TTS ⁽²⁾	
	Inbound	Outbound	Inbound	Outbound
Transit	18% (37%)	39% (18%)	19% (23%)	19% (22%)
(Auto) Driver	35% (35%)	36% (35%)	4% (8%)	1% (7%)
(Auto) Passenger	23% (5%)	8% (23%)	64% (36%)	51% (50%)
Walk	23% (18%)	12% (23%)	11% (17%)	19% (13%)
Cycle	2% (4%)	4% (2%)	3% (15%)	9% (7%)
Auto Subtotal	58% (40%)	44% (58%)	68% (44%)	52% (57%)
Non-Auto Subtotal	42% (60%)	56% (42%)	32% (56%)	48% (43%)
Total	100% (100%)	100% (100%)	100% (100%)	100% (100%)

Notes:

1. Based on residential trips to and from 2006 TTS Zone 89 during the 6:00-9:00 period during the AM peak period and 15:00-18:00 period during the PM peak period; Inbound mode split for AM is based on mode split for the non-peak PM direction (PM Outbound).
2. Based on the daily non-residential trips to and from 2006 TTS Zones 89 and 90 for both inbound and outbound.
3. xx (xx) – AM (PM)

On this basis, a review of 2016 travel characteristics for the TTS Zones surrounding the site confirms that a significant portion of trips, both residential and retail, in the surrounding area are undertaken using non-auto means (in the order of 50%). This is reflective of the limited extent to which area employees, residents and visitors use or need a private vehicle on a regular basis.

Table 14 Comparison of 2016 to 2023 Residential Area Auto Travel Mode Share

	2016 ⁽¹⁾		2023 ⁽²⁾		2016 to 2023 Change		% Change 2016 to 2023	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Auto ⁽³⁾	58% (40%)	44% (58%)	26% (36%)	38% (30%)	-32% (-4%)	-6% (-28%)	-55% (-10%)	-14% (-48%)
Non-Auto	42% (60%)	56% (42%)	74% (64%)	62% (70%)	+32% (+4%)	+6% (+28%)	+76% (+7%)	+11% (+67%)

Notes:

1. Based on 2016 TTS travel mode share as summarized in **Table 13**.
2. Based on multi-modal trip generation counts conducted at 125 Western Battery Road and at 69 Lynn Williams Street / 150 East Liberty Street.
3. Reflects combined driver and passenger proportions
4. xx (xx) – AM (PM)



The 2016 auto travel mode share, comprising driver and passenger, were then compared to multi-modal traffic counts conducted by BA Group at several high-rise condominiums within the Liberty Village area, as summarized in **Table 14**. This review suggests that the choice for travel via an automobile for residents in the area has declined in the order of 15-23% for peak direction travel and in the order of 50-55% for off-peak direction travel over the 2016-2023 time period.

8.1.2 Future Mode Share

Considering the significant transit infrastructure being planned in the Liberty Village area, it is expected that mode shares will shift to reflect better active transportation options. Four major factors will drive this mode shift:

1. Area residents and visitors will be able to take advantage of the planned SmartTrack corridor for more efficient travel across the City of Toronto to/from the east or two-way GO Rail service along the Kitchener Line to/from the west via the convenient location of the new King-Liberty Station;
2. The upgraded Exhibition Station and the planned Ontario Line will provide alternate means of travel to Don Valley and North York areas of the City;
3. The Ontario Line will relieve the Bloor-Danforth Line and reduce transfers at Bloor-Yonge Station, allowing greater transit ridership capacity; and
4. Planned increases in density at these new station areas will shift origin-destination patterns such that a greater number of trips will be made between these station locations (which are more likely to rely on higher order transit than private automobiles), thereby indirectly shifting mode shares.

The Draft Transportation Impact Assessment report by HDR dated September 2021 for the Ontario Line: Integrated Transit Oriented Communities – Exhibition Station documented an overall future mode share to account for improved transit services and associated modal shifts as part of their transit-oriented community trip generation (Section 4.2.1.1). These proposed overall mode shares are summarized in **Table 15**.

Table 15 Future Liberty Village Area Overall Travel Mode Share

Mode	Existing Mode Shares ⁽¹⁾		Future Mode Share ⁽¹⁾		Change	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Transit	36% (31%)	34% (33%)	40% (40%)	40% (40%)	+4% (+9%)	+6% (+7%)
(Auto) Driver	41% (30%)	30% (40%)	37% (21%)	24% (33%)	-4% (-9%)	-6% (-7%)
(Auto) Passenger	4% (5%)	3% (5%)	4% (5%)	3% (5%)	--	--
Taxi / Ride Hail	1% (3%)	3% (3%)	1% (3%)	3% (3%)	--	--
Walk	13% (24%)	22% (14%)	13% (24%)	22% (14%)	--	--
Cycle	5% (8%)	8% (6%)	5% (8%)	8% (6%)	--	--
Total	100% (100%)	100% (100%)	100% (100%)	100% (100%)	--	--

Notes:

1. Based on Table 4-2 in the September 2021 Ontario Line Integrated TOC Exhibition Station Draft TIA report.
2. xx (xx) – AM (PM)

Based on the above, the EA study anticipates a modal shift in the order of 4-9% from auto driver to higher-order commuter transit. These forecast mode shifts between auto to transit were applied to observed 2023 travel mode shares to establish the future mode share as summarized in **Table 16**.

Table 16 Adopted Future Liberty Village Travel Mode Share

Mode	Existing 2023 Mode Shares ⁽¹⁾		Change ⁽²⁾		Future Mode Share ⁽¹⁾	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Transit	31% (41%)	45% (29%)	+4% (+9%)	+6% (+7%)	35% (50%)	51% (36%)
Driver/Passenger	17% (30%)	34% (21%)	-4% (-9%)	-6% (-7%)	13% (21%)	28% (14%)
Taxi / Ride Hail	9% (6%)	3% (9%)	--	--	9% (6%)	3% (9%)
Walk	39% (20%)	14% (38%)	--	--	39% (20%)	14% (38%)
Cycle	4% (3%)	4% (3%)	--	--	4% (3%)	4% (3%)
Total	100% (100%)	100% (100%)	--	--	100% (100%)	100% (100%)

Notes:

1. Based on observations at 125 Western Battery Road, and 69 Lynn Williams and 80 & 100 Western Battery Road.
2. Change in mode share as forecast in the September 2021 HDR Ontario Line Integrated TOC Exhibition Station Draft TIA report.
3. xx (xx) – AM (PM)

A comparison between the adopted future mode shares and 2016 mode shares is provided in **Table 17** to establish the proportional change in auto travel.

Table 17 Comparison of 2016 to Future Residential Area Auto Travel Mode Share

	2016 ⁽¹⁾		Adopted Future ⁽²⁾		Change		% Change	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Auto	58% (40%)	44% (58%)	22% (27%)	31% (23%)	-36% (-13%)	-13% (-35%)	-62% (-38%)	-30% (-60%)
Non-Auto	42% (60%)	56% (42%)	78% (73%)	69% (77%)	+36% (+13%)	+13% (+35%)	+86% (+22%)	+23% (+83%)

Notes:

1. Based on 2016 TTS travel mode share as summarized in **Table 13**.
2. Based on applying the resultant change in mode share derived from Table 4-2 in the September 2021 Ontario Line Integrated TOC Exhibition Station Draft TIA report to the observed current 2023 auto and non-auto mode shares.
3. xx (xx) – AM (PM)

On this basis, as a result of the evolving transportation context in Liberty Village, auto travel mode share is expected to decrease by approximately 30%-38% for peak direction peak hour travel (i.e. outbound during the morning peak hour, and inbound during the afternoon peak hour).



8.2 Multi-Modal Travel Demand Forecasting Methodology

Multi-modal forecasts have been derived from a selection of site person and vehicle trip generation rates based on BA Group's experience of comparable developments within the City of Toronto. These residential development sites are used as proxies and are considered to be representative of the evolving transportation context (i.e. access to higher-order transit) surrounding the proposed development.

8.2.1 Site Trip Generation

The person and vehicle travel demand forecasts for the site are based on a multi-step process, which makes specific allowances for each land use. The resulting methodology formulates three (3) steps as outlined below:

- **Step 1 – Establish Person and Vehicle Trip Rates:** Establish weekday morning and afternoon peak hour person and vehicle trip rates for residential land uses. These rates are based on the average trip rates derived from prior approved proxy sites and the change in auto travel mode share between past and present (2023) at those proxy sites compared to observed trip data at nearby condominiums in the Liberty Village area.

Retail weekday morning and afternoon peak hour person and vehicle trip rates are established based on proxy sites and other approved trip rates in the vicinity, with respect to both available parking and retail floor size.
- **Step 2 – Generate Gross Person and Vehicle Trips:** Forecast gross person trip and vehicle trip estimates generated by land use (residential and retail) based on the adopted rates.
- **Step 3 – Calculate Multi-Modal Trips:** Distribute the resultant net person trips from [Step 2](#) to each travel mode by land use based on the adopted mode share information outlined in [Table 13](#) (Section [8.1.1](#)) to derive the multi-modal trip generation.

Step 1 – Establish Person and Vehicle Trip Rates

Residential Trip Generation

Person trips were derived by reviewing person trip generation counts at residential condominiums in the study area.

Vehicle trip generation rates were collected from similar residential development sites in the City of Toronto during the period from 2012 to 2019. The average trip rates from these proxy sites were adopted in other studies submitted to the City of Toronto and are now currently under review or approved.

Post-pandemic, area travel patterns have shifted due to the uptick of hybrid and work-from-home arrangements and an increased spreading of peak travel times. As such, new residential travel mode share data was collected at two condominiums in the study area. A comparison to 2016 TTS auto travel mode shares has indicated a significant decline in auto mode travel, particularly in the peak direction.

The proxy trip rates were adjusted based on the reduction in the auto travel mode to reflect current conditions, resulting in an existing two-way vehicle trip rate of 0.16 during both the weekday morning and afternoon peak hours. Similarly, the effective auto mode share reduction reflecting the forecast future mode share with the Ontario Line in place, was applied to establish a long-term two-way vehicle trip rate of 0.12 and 0.11 during the weekday morning and afternoon peak hours, respectively.

The adopted residential vehicle and person trip rates are summarized in [Table 18](#).



Table 18 Gross Person and Vehicle Residential Trip Generation Summary

	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Person Trip Rates						
69 Lynn Williams St & 150 East Liberty St (July 12, 2023)	0.09	0.28	0.37	0.22	0.18	0.40
125 Western Battery Rd (July 12, 2023)	0.13	0.35	0.48	0.24	0.15	0.39
Average	0.11	0.31	0.42	0.23	0.17	0.40
Vehicle Trip Rates						
2012-2019 Proxy Average ⁽¹⁾	0.06	0.15	0.21	0.12	0.10	0.21
2023 Reduction in Auto Mode ⁽²⁾	-55%	-14%	--	-10%	-48%	--
Adjusted 2023 Proxy Average	0.03	0.13	0.16	0.11	0.05	0.16
Near Term Trip Rate	0.03	0.13	0.16	0.11	0.05	0.16
PUDO ⁽³⁾	0.01	0.01	0.02	0.02	0.01	0.03
Primary	0.02	0.12	0.14	0.09	0.04	0.13
Reduction in Auto Mode for Future Liberty Village Area with Ontario Line ⁽⁴⁾	-62%	-30%	--	-38%	-60%	--
Long Term Trip Rate with Ontario Line	0.02	0.10	0.12	0.07	0.04	0.11
PUDO ⁽³⁾	0.01	0.01	0.02	0.01	0.01	0.02
Primary	0.01	0.09	0.10	0.06	0.03	0.09

Notes:

1. Based on the average observed trip rates from 2012 to 2019 at 55 & 59 East Liberty Street, 30 Ordnance Street and 100 Western Battery.
2. As outlined in **Table 14**, auto mode share reduction is derived by comparing 2016 auto mode shares from TTS to the observed auto mode share from 2023 traffic at 125 Western Battery Road, and 69 Lynn Williams and 80 & 100 Western Battery Road.
3. PUDO proportion based on the ratio of PUDO versus total vehicle trips observed in 2023 at 125 Western Battery Road, and 69 Lynn Williams and 80 & 100 Western Battery Road (i.e. 15% in the morning peak hour, 22% in the afternoon peak hour).
4. Reflects the auto mode share reduction between existing observed auto mode share (**Table 14**) and the future auto mode share (**Table 17**) that was calculated by application of the auto mode share change forecast within the September 2021 Ontario Line Integrated TOC Exhibition Station Draft TIA report to the current 2023 observed auto mode share.

Non-Residential Trip Generation

The small scale of the proposed retail uses suggests that it will operate as ancillary in nature to the residential uses on the site. However, given that a small number of non-residential parking spaces are proposed, an allowance for pass-by vehicle trips was made in this analysis. Vehicle trip rates are derived based on a review of unconstrained retail vehicle trips at 585 Queen Street West, which reflect a similar built form of ground floor retail use. Similarly, retail person trip rates are derived from door counts of patrons at 333 King Street East, which reflect a similar built form of ground floor retail use.

The resultant vehicle and person trip rates based on retail floor area and/or parking supply are summarized in **Table 19**.

Table 19 Gross Person and Vehicle Retail Trip Generation Summary

	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Person Trip Rates						
333 King Street East By Floor Area (trips/1,000 ft ²)	1.69	1.18	2.88	4.98	5.44	10.42
Vehicle Trip Rates						
Retail Demand ⁽¹⁾ By Floor Area (trips/1,000 ft ²)	0.18	0.05	0.23	0.26	0.41	0.67

Notes:

1. Based on the observed trip rates at 585 Queen Street West.

Step 2 – Generate Gross Person and Vehicle Trips

The application of the adopted vehicle and person trip rates for the proposed residential and retail uses are summarized in **Table 20** based on the long-term trip rates once the Ontario Line Exhibition Station is available.

Table 20 Unconstrained Gross Person and Vehicle Trip Generation Summary

	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Person Trips						
Residential (588 units)	0.11	0.31	0.42	0.23	0.17	0.40
	65	180	245	135	100	235
Retail (800m ² /8,600 ft ²)	1.69	1.18	2.88	4.98	5.44	10.42
	15	10	25	45	45	90
Site Total	80	190	270	180	145	325
Vehicle Trips						
Residential (588 units)						
Total Rates	0.02	0.10	0.12	0.07	0.04	0.11
PUDO	5	5	10	5	5	10
Primary	5	55	60	35	20	55
Subtotal	10	60	70	40	25	65
Retail (800 m²/8,600 ft²)						
Total Rates	0.18	0.05	0.23	0.26	0.41	0.67
Pass-by	0	0	0	2	2	4
Primary	2	0	2	0	2	2
Subtotal	2	0	2	2	4	6
Site Total	12	60	72	42	29	71

Notes:

1. Values rounded to the nearest 5 person and vehicle trips.



The adopted trip generation rates result in the order of 270 and 325 two-way person trips during the weekday morning and afternoon peak hours, respectively for the proposed development.

Application of the adopted trip generation rates results in the order of 72 and 71 two-way vehicle trips during the weekday morning and afternoon peak hours, respectively for the proposed development.

Step 3 – Calculate Multi-Modal Trips

The external person trips – summarized in **Table 20** – are distributed to their respective travel modes based on the future travel mode shares previously summarized in **Table 15** (Section **8.1.2**) to establish multi-modal trips for transit, pedestrian and cycling modes. The vehicle trips, which represent the combination of driver and passenger, are established based on the vehicle trip generation presented in **Table 20**. The resultant multi-modal trip generation for the proposed development is summarized in **Table 21**.

The site is forecast to generate 198 and 254 two-way non-auto person trips during the weekday morning and afternoon peak hours, respectively. Of these trips, 115 and 100 are anticipated to travel to and from the site by transit modes during the weekday morning and afternoon peak hours, respectively.

In the order of 72 and 71 two-way person trips are forecast to travel by auto modes to and from the site during the weekday morning and afternoon peak hours, respectively.



Table 21 Multi-Modal Person Trip Generation Summary

	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Adopted Mode Splits ⁽¹⁾						
Transit	35%	51%	--	50%	36%	--
Driver/Passenger	13%	28%	--	21%	14%	--
PUDO	9%	3%	--	6%	9%	--
Walk	39%	14%	--	20%	38%	--
Cycle	4%	4%	--	3%	3%	--
Total	100%	100%	--	100%	100%	--
Residential Person Trips						
Transit	25	90	115	65	35	100
Driver/Passenger	5	55	60	35	20	55
PUDO	5	5	10	5	5	10
Walk	25	25	50	25	35	60
Cycle	5	5	10	5	5	10
Total Trips	65	180	245	135	100	235
Retail Person Trips						
Transit	0	0	0	0	0	0
Driver/Passenger	2	0	2	0	2	2
PUDO	0	0	0	2	2	4
Walk	13	10	23	43	41	84
Cycle	0	0	0	0	0	0
Total Trips	15	10	25	45	45	90
Total Person Trips						
Transit	25	90	115	65	35	100
Driver/Passenger	7	55	62	35	22	57
PUDO	5	5	10	7	7	14
Walk	28	35	73	68	76	144
Cycle	5	5	10	5	5	10
Total Trips	80	190	270	180	145	325

Notes:

1. Adopted future mode shares outlined in **Table 15**.



8.3 Area Background Development Travel Demand Allowances

A comprehensive set of traffic allowances have been made for area background developments, as identified from the City of Toronto Development Application portal. Background development statistics and trip generation sources are summarized in **Table 22** and the locational context is illustrated in **Figure 14**.

Table 22 Background Developments Considered

Development Address	Development Statistics	Type of Analysis	Trip Generation Source
WITHIN STUDY AREA			
61 & 75 Hanna Ave & 120 Lynn Williams St	850 units 6,557 m ² office GFA 3,136 m ² retail GFA	Multi-modal Trip Generation	BA Group TIS, Dec 2020
25 Liberty St / 58 Atlantic Ave	22,677 m ² office GFA 2,699 m ² retail GFA	Multi-modal Trip Generation	LEA TIS Update, Apr 2017
99 Sudbury St	190 Residential Units 101 Hotel Suites	Vehicle Trip Generation Only	BA Group TIS, Mar 2014
1071 King St W	227 Residential Units 519 m ² retail GFA	Multi-modal Trip Generation	BA Group TIS Update, Dec 2019
950 King St W	217 Residential Units 588 m ² retail GFA	Multi-modal Trip Generation	NexTrans, Mar 2018
1221 King St W	307 Residential Units 1,518.3 m ² retail GFA	Vehicle Trip Generation Only	LEA TIS, Jan 2020
39 & 51 E Liberty St	791 Residential Units 376 m ² retail GFA	Vehicle Trip Generation Only	IBI Group TIS, Apr 2018
85 Hanna Avenue	9,552 m ² office GFA 129 m ² retail GFA	None	BA Group TIS, Jun 2019
OUTSIDE STUDY AREA			
1181 Queen St W	117 Residential Units 709 m ² retail GFA	Vehicle Trip Generation Only	BA Group TIS, Oct 2013
7 & 15 Fraser Ave	16,221 m ² office GFA	Multi-modal Trip Generation	BA Group TIS, Nov 2016
64-86 Bathurst St	307 Residential Units 5,100 m ² office GFA 2,394 m ² retail GFA	Vehicle Trip Generation Only	BA Group TIS, May 2018
2 Tecumseth St	680 Residential Units 31,206 m ² office GFA 6,269 m ² retail GFA	Multi-modal Trip Generation	BA Group TIS, Nov 2017
2-24 Temple Ave	273 units	Multi-modal Trip Generation	NexTrans TIS, Nov 2020
41-53 Fraser Ave	17,478 m ² office GFA 551 m ² retail GFA	Vehicle Trip Generation Only	BA Group TIS, May 2021
1A & 20 Atlantic Avenue & 1 Jefferson Avenue	568 Residential units 23,593 m ² office GFA 5,304 m ² retail GFA	Multi-modal Trip Generation	HDR TIS, Sept 2021
952 King Street W	213 units 578 m ² retail GFA	Vehicle Trip Generation Only	UrbanTrans TIS, Aug 2022
111 Strachan Ave	325 units	Vehicle Trip Generation Only	WSP TIS, Dec 2021





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Aerial maps provided courtesy of Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, the GIS User Community and/or Google Earth/Maps.

FIGURE 14 AREA BACKGROUND DEVELOPMENTS

The background developments have been divided into two groups: “within study area” and “outside study area”. Multi-modal traffic allowances have been made for background developments that belong to the former group; those closer to the site, since active transportation modes have a smaller radius of impact. Only vehicle traffic allowances have been made for background developments belonging to the latter group; those just beyond the study area, due to the larger influence area for vehicle traffic passing through the study area.

8.3.1 Background Development Multi-Modal Forecasting

Although some background development studies included multi-modal trip generation estimates, the non-automobile forecasts for the background developments “within the study area” have been generated based on the travel mode shares presented in **Table 15** and person trip rates based on those outlined in the ITE Trip Generation Manual and proxy sites in the study area. The person trip rates adopted for residential, office and retail land uses are summarized in **Table 23**.

Table 23 Background Development Person Trip Rates

	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Residential ⁽¹⁾	0.15	0.55	0.70	0.33	0.23	0.56
Retail ⁽²⁾	1.69	1.18	2.87	4.98	5.44	10.42
Office ⁽³⁾	2.01	0.31	2.32	0.24	1.51	1.75

Notes:

1. Residential trip rates based on the ITE Trip Generation Manual average rate for code LUC 222.
2. Retail trips rates based on a review of person trip rates observed at 333 King Street East and published in the ITE Trip Generation Manual for code LUC 820
3. Office trip rates based on a review of person trip rates observed at 160 John Street, 351 King Street East, 333 King Street East and published in the ITE Trip Generation Manual for code LUC 710.

The combined multi-modal background trip generation forecasts for the background developments “within the study area” are summarized in **Table 24**. Detailed trip generation analysis for each background development is provided in **Appendix C**. This multi-modal trip generation reflects the following for each background development:

- Overall person trip generation rates weighted by the proportion of trips per land use;
- Overall person trip land use interaction reduction based on the relative proportions of each land use;
- Overall travel mode share weighted by the proportion of trips per land use; and
- Vehicle trip generation as per their respective studies.



Table 24 Total Background Development Multi-Modal Trip Generation

	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Person	1972	1766	3738	1613	2306	3919
Interaction	-107	-83	-190	-221	-364	-585
Net Person	1865	1683	3548	1438	2085	3523
Transit	1088	682	1770	550	959	1509
Auto	359	421	780	347	448	795
Walk	346	283	629	340	501	841
Cycle	72	297	369	201	177	378

8.4 Multi-Modal Trip Distribution

8.4.1 StreetLight Insight Platform

The StreetLight Insight platform is a “big data” tool that converts disaggregate vehicular GPS and mobile location service data (i.e. data from smartphone apps) into detailed travel information. This information can be queried for customizable zones and TTS traffic zones. Due to the detailed nature of the data and the flexibility for defining analysis zones, it is now possible to precisely define:

- Entry and exit gateways to and from the study area where the area street network intersects the study area boundary;
- Custom zone boundaries for individual buildings within the Liberty Village area that represent a specific land use (i.e. residential, office and retail); and
- Local zones within the study boundary but outside of the immediate Liberty Village area.

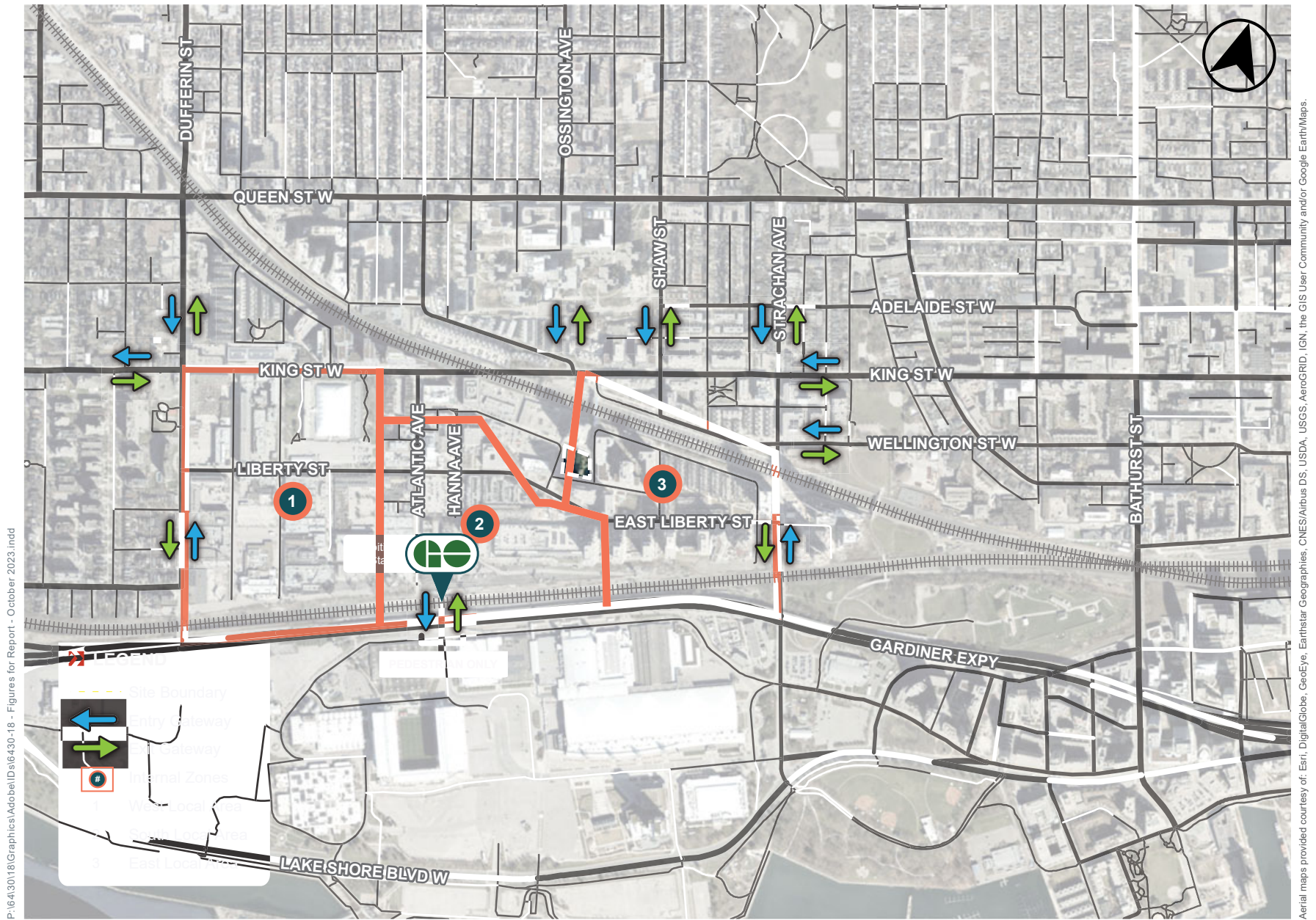
The set of entry and exit gateways, internal and site zones used as the basis for the traffic assessment are illustrated in **Figure 15**. These zone sets are defined for a series of origin-destination queries within the StreetLight Insight Platform to systematically establish vehicle and pedestrian travel distributions for residential, office (employment) and retail land uses during the weekday morning and afternoon and Saturday midday peak periods. The resultant travel distributions are presented in the following sections.

Although this travel distribution information can also be obtained through the 2016 Transportation Tomorrow Survey (TTS), the StreetLight travel distributions are adopted for this analysis because the latter:

- Allows for a more “fine grain” exploration within Liberty Village compared to the larger TTS zone which extends to Dufferin Street to the west;
- Better reflects the current travel conditions given the recent adoption of the King Street Transit Priority Corridor configuration since late 2017 which would not be captured in the 2016 TTS; and
- Generally yields greater amounts of data, especially in relation to retail uses.

Detailed StreetLight query summaries for vehicles are attached in **Appendix D**.





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Aerial maps provided courtesy of Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, the GIS User Community and/or Google Earth/Maps.

FIGURE 15 STUDY AREA AND ANALYSIS ZONES

8.4.2 Vehicle Trip Distribution

The trip distribution for residential vehicle trips was derived from StreetLight origin-destination data collected between the periods from March 1, 2019 to April 30, 2019 and September 1, 2019 to October 31, 2019. The data was aggregated for existing residential condominium towers and townhomes located immediately east of the site, in an area generally bounded by Western Battery Road to the north, Strachan Avenue to the east, East Liberty Street to the south and the site to the west.

The resultant trip distribution for the weekday morning and afternoon time periods (i.e. 6:00-10:00 and 15:00-19:00) is summarized in **Table 25**.

Table 25 Residential Vehicle Trip Distribution Summary

Route	Direction (to/from)	AM Peak		PM Peak	
		Inbound	Outbound	Inbound	Outbound
Dufferin St	North	6%	11%	9%	7%
Dufferin St	South	8%	8%	6%	11%
King St W	East	--	24%	--	12%
King St W	West	14%	3%	6%	7%
Shaw St	North	8%	5%	6%	7%
Strachan Ave	North	19%	15%	12%	14%
Strachan Ave	South	34%	23%	29%	32%
Sudbury St	North	2%	1%	1%	3%
Wellington St	East	9%	10%	31%	7%
Total		100%	100%	100%	100%

Notes:

1. Reflects left turn restriction on King Street West during weekday morning and afternoon peak periods.

The overall vehicle travel distribution pattern is influenced by:

- Limited routing opportunities to and from the south, which result in the observed reliance on Strachan Avenue and Dufferin Street;
- Left turn restrictions along King Street during the weekday peak periods, which:
 - limit inbound traffic routing options via the southbound right turn from Strachan Avenue to East Liberty Street; and
 - encourage use of Wellington Street West as a surrogate travel corridor in place of King Street inbound from the east; and
- Gateway intersections which provide connections to the arterial roads (i.e. at King Street West / Atlantic Avenue, Strachan Avenue / East Liberty Street and Dufferin Street / East Liberty Street).

As a result of the above conditions the residential trip distribution represents a significant proportion of traffic routes south of the Gardiner Expressway and Lake Shore Boulevard or eastbound to King Street West.



8.4.3 Transit Trip Distribution

As detailed in **Section 8.1.2**, it is expected that travel mode share will shift given the combination of enhanced transit services in the Liberty Village area. Furthermore, these transit improvements enhance accessibility between some origin-destination pairs over others. As such, it is expected that existing transit travel distribution to and from the study area will also shift to reflect the availability of the new services.

The September 2021 Ontario Line Integrated TOC Exhibition TIA report provided a forecast of 2041 transit distribution and assignment patterns for the Liberty Village area (Tables 3-16) based on outputs from the 2041 AM Transit OD matrix from the Metrolinx 2041 Greater Golden Horseshoe (GGH) model. This overall transit distribution is summarized in **Table 26** and has been adopted in this study for the purposes of future site transit trip distribution and assignment.

Table 26 Overall Transit Trip Distribution Summary

Route	Direction (to/from)	AM Peak		PM Peak	
		Inbound	Outbound	Inbound	Outbound
Ontario Line	East	21%	26%	26%	21%
GT01 – Lakeshore West ⁽¹⁾	East	4%	2%	2%	4%
GT03 – King-Liberty ⁽¹⁾	East	5%	2%	2%	5%
T029 – Dufferin	North	18%	18%	18%	18%
T063 – Ossington	North	5%	6%	6%	5%
T504 – King	East	11%	24%	24%	11%
T509 – Harbourfront	East	5%	4%	4%	5%
T511 – Bathurst	East	6%	5%	5%	6%
GT01 – Lakeshore West ⁽¹⁾	West	10%	3%	3%	10%
GT03 – King-Liberty ⁽¹⁾	West	3%	3%	3%	3%
T029 – Dufferin	South	5%	1%	1%	5%
T504 – King	West	6%	6%	6%	6%
T509 – Harbourfront	West	1%	0%	0%	1%
Total		100%	100%	100%	100%

Notes:

1. Reflects both local and express GO service
2. Based on 2041 Transit Route Choice To/From Liberty Village outlined in Table 3-16 in the September 2021 Ontario Line Integrated TOC Exhibition TIA report

The overall transit travel distribution pattern is influenced by:

- The improved transit service (i.e. travel time reliability) on the King streetcar due to the King Street Transit Priority Corridor configurations;
- King-Liberty Station is approximately equidistant to and from the site as Exhibition Station and so forecast GO activity is expected to be evenly split between these two lines with respect to origins-destinations from and to the east;
- To and from the west, the Kitchener line (King-Liberty Station) is expected to carry increased ridership reflecting auto trips that have shifted over to transit due to availability of two-way service and the new station location.



9.0 TRANSIT CONSIDERATIONS

Given that the area transit network will be upgraded in the future to include the new King-Liberty GO Station and Exhibition Station on the Ontario Line, a detailed area transit operations assessment will need a system-wide review of the interactions between the Kitchener GO Line, Lake Shore GO Line, and the planned stations for the Ontario Line and SmartTrack. Therefore, detailed assessment of the area transit operations is outside of the scope of this study. The transit assessment in this study is limited to a review of area transit connectivity and transit trip generation for the proposed site and assignment of those transit trips.

9.1 Transit Connectivity

With the completion of the new King-Liberty GO Station and upgraded Exhibition Station, the Liberty Village area will gain access to multiple higher-order transit routes within walking distance for longer distance (regional) trips. This can free up capacity on the numerous local bus and streetcar routes to better accommodate local transit trips just beyond the study area.

Table 27 Transit Study Area – Routes and Stops

Transit Route	Travel Direction	Stop Location	Travel Direction	Stop Location
Lake Shore West GO Line	E	Exhibition GO	W	Exhibition GO
Ontario Line	E	Exhibition Station	--	--
Kitchener GO Line	E	King-Liberty SmartTrack	W	King-Liberty SmartTrack
29 Dufferin	N	Manitoba / Nova Scotia -- Dufferin / Liberty Dufferin / King	S	Manitoba / Nova Scotia Dufferin Gate Loop Dufferin / Liberty Dufferin / King
63 Ossington (One Way)	N	Atlantic / King East Liberty / Atlantic	S / W	East Liberty / Lynn William East Liberty / Pirandello East Liberty / Strachan
501 Queen	E	Queen / Dufferin Queen / Gladstone Queen / Abell Queen / Dovercourt Queen / Ossington Queen / Shaw Queen / Strachan	W	Queen / Dufferin Queen / Gladstone Queen / Beaconsfield Queen / Dovercourt Queen / Ossington Queen / Shaw Queen / Strachan
504 King	E	King / Dufferin -- King / Atlantic King / Sudbury King / Shaw King / Strachan	W	King / Dufferin King / Joe Shuster King / Jefferson King / Sudbury King / Shaw King / Strachan
509 Harbourfront	E	Exhibition Loop Fleet / Strachan	W	Exhibition Loop Fleet / Strachan
511 Bathurst	E	Exhibition Loop Fleet / Strachan	W	Exhibition Loop Fleet / Strachan



9.2 Site Transit Volumes

9.2.1 Trip Generation

The proposed development is forecast to generate in the order of 115 and 100 new transit two-way primary trips during the weekday morning and afternoon peak hours, respectively, as discussed in **Section 8.2.1**. Pass-by transit trips are assumed to already be present on the network.

9.2.2 Trip Distribution

Future transit residential travel distributions for the Liberty Village area are outlined in **Table 26** within **Section 8.4.3**. The distributed site transit trips by route are summarized in **Table 28**. Site transit trips associated with King-Liberty Station and Exhibition GO Station (highlighted below), have been further distributed by access/egress mode in **Table 29**, which is based on the mode share information presented in **Table 41** and **Table 43**.

Table 28 Site Transit Peak Hour Trips by Route

Route	Direction (To / From)	AM Peak		PM Peak	
		Inbound	Outbound	Inbound	Outbound
Ontario Line	East	5	22	16	7
GT01 – Lakeshore West ⁽¹⁾	East	1	2	1	1
GT03 – King-Liberty ⁽¹⁾	East	1	2	1	2
T029 – Dufferin	North	4	16	12	6
T063 – Ossington	North	1	5	4	2
T504 – King	East	3	22	16	4
T509 – Harbourfront	East	1	4	3	2
T511 – Bathurst	East	2	5	3	2
GT01 – Lakeshore West ⁽¹⁾	West	3	3	2	4
GT03 – King-Liberty ⁽¹⁾	West	1	3	2	1
T029 – Dufferin	South	1	1	1	2
T504 – King	West	2	5	4	2
T509 – Harbourfront	West	0	0	0	0
Total		25	90	65	35

Notes:

1. Reflects both local and express GO service
2. Based on 2041 Transit Route Choice To/From Liberty Village outlined in Table 3-16 in the September 2021 Ontario Line Integrated TOC Exhibition TIA report



Table 29 Site GO (Exhibition) and SmartTrack (King-Liberty) Transit Trip by Access / Egress Mode

Access/Egress Mode	AM Peak		PM Peak	
	Inbound	Outbound	Inbound	Outbound
Local Transit	0	0	0	0
Park n Ride	0	0	0	0
Kiss n Ride	1	1	1	1
Walk	8	31	21	12
Cycle	2	0	0	2
Total	11	32	22	15

Based on a review of existing travel behavior for Exhibition GO Station and the forecast access and egress modes established in **Appendix H**, the last mile travel between the transit stops and the proposed building is expected to primarily be walking trips. The number of additional vehicles on the area street network generated by site transit kiss-and-ride is negligible at less than 2 two-way vehicles for both weekday peak hours.



10.0 VEHICULAR TRAFFIC CONSIDERATIONS

10.1 Traffic Analysis Scenarios and Study Periods

Traffic operations analyses have been undertaken during weekday morning and afternoon street peak hours under the following conditions:

Existing Conditions (2023)

- The existing road network and transportation context.

Future Background (2028) – Baseline

- Traffic activity in the future considering an allowance made for the area background growth in traffic in addition to the existing conditions, which includes an allowance of traffic generated by area background developments and an allowance of corridor growth.

Future Background (2028) – Sensitivity (Liberty New Street)

- The baseline future background conditions with an allowance for traffic diversion, considering the construction of Liberty New Street.

Future Total (2028) – Baseline

- Traffic activity in the future associated with the full build-out of the development site in addition to the future background condition.

Future Total (2028) – Sensitivity (Liberty New Street)

- The baseline future total conditions with an allowance for traffic diversion, considering the construction of Liberty New Street.

10.2 Existing Traffic Volumes

Existing baseline traffic volumes were established at intersections and driveways within the study area for the weekday morning and afternoon peak periods generally using traffic count information obtained from surveys undertaken by Spectrum Traffic Data Inc. A list of the count data and sources are provided in **Table 30**.

It should be noted that the traffic counts were conducted during two time periods; recently in June 2023 (for the immediate area surrounding the site) and 2016-2021 (for the wider area). Traffic volumes between intersections have been balanced to match the link volumes observed at the more recent 2023 counts. The current June 2023 vehicular traffic volumes are generally lower than the 2019 historical traffic due to a change in travel and trip making patterns given the shift to work-from-home and hybrid work arrangements that persist despite coming out of pandemic conditions. However, the decrease in vehicular volume is accompanied by an increase in pedestrian crossing volumes, especially along the eastern end of East Liberty Street. The mode shift from 2016 to 2023 is outlined in **Section 8.1.1**.



Table 30 Existing Traffic Data Sources

	Study Area Intersections	Date of Counts	Source
Local Area Network	Snooker Street / Hanna Avenue	Thursday, September 2020	Spectrum Traffic Data Inc.
	Private Street / Lynn Williams Street	Wednesday, July 28, 2021	
	East Liberty Street / Liberty Street / Hanna Avenue	Wednesday, June 28, 2023	
	East Liberty Street / Lynn Williams Street	Wednesday, July 28, 2021	
	Western Battery Road / Lynn Williams Street	Wednesday, July 28, 2021	
	East Liberty Street / Pirandello Street	Tuesday, April 16, 2019	
Wider Area Network	Dufferin Street / Liberty Street	Wednesday, June 28, 2023	
	King Street West / Dufferin Street	Tuesday, March 8, 2022	
	King Street West / Atlantic Avenue	Wednesday, June 28, 2023	
	King Street West / Sudbury Street	Tuesday, April 16, 2019	
	King Street West / Douro Street	Tuesday, April 16, 2019	
	King Street West / Shaw Street	Tuesday, April 16, 2019	
	King Street West / Strachan Avenue	Tuesday, April 16, 2019	
	Strachan Avenue / Wellington Street West / Douro Street	Tuesday, April 16, 2019	
	Strachan Avenue / East Liberty Street / Ordnance Street	Wednesday, June 28, 2023	
	Atlantic Avenue / Snooker Street	Tuesday, October 18, 2016	
	Atlantic Avenue / Liberty Street	Wednesday, June 28, 2023	

Existing turning movement counts were reviewed in detail to ensure a general consistency in the traffic volumes on roadways between intersection. Where necessary, further minor adjustments were made to balance traffic volumes between intersections to create a representative traffic volume based for the purposes of the traffic operations analyses undertaken as part of this study.

The adopted existing balanced traffic volumes during the weekday morning and afternoon peak hours are illustrated in **Figure 16**.



10.3 Future Background Traffic

Traffic growth in the vicinity of the site has been considered based upon an evaluation of traffic volume changes related to:

- General corridor growth on the major arterial roads in the area (i.e. King Street West, Dufferin Street and Strachan Avenue); and,
- Specific area development traffic (i.e. background development traffic).

10.3.1 General Corridor Growth

Weekday street peak hour traffic volume trends at the intersections of King Street West / Strachan Avenue and King Street West / Dufferin Street were reviewed based on historic traffic counts collected between 2011 to 2017 and 2007 to 2016, respectively. Traffic counts collected after fall 2017 were not considered to account for reductions in traffic volumes as a result of the King Transit Priority Corridor configuration and COVID-19. On this basis, the analysis is conservative.

The review of the historical intersection traffic data indicates that there has been minimal sustained growth in traffic levels along the King Street West, Dufferin Street and Strachan Avenue corridors over the time periods reviewed. Data sheets illustrating the corridor growth analyses are provided in **Appendix E**. In fact, taking into consideration the recent 2023 traffic counts, vehicle traffic has generally stabilized or decreased relative to traffic observed during the pandemic period. Based on the foregoing and given the extensive list of background developments that were considered, no additional general corridor growth has been applied to the arterial corridors.

10.3.2 Background Development Traffic

Traffic allowances were made for other specific proposed developments in the area, based on a review of the City of Toronto's list of current development projects as of July 2023. These sites have either active development applications, have been approved, or are currently under construction as summarized in **Table 22 (Section 8.3)** for both "within study area" and "outside study area" groups. Specific vehicle traffic allowances were made based on the traffic assignments documented in the transportation studies prepared for each background development.

10.3.2.1 BACKGROUND TRAFFIC REDISTRIBUTION

A diversion estimate for background traffic has been developed to reflect the busy operating conditions at the Wellington Street West / Strachan Avenue intersection in the northbound direction, for traffic which may currently route via the northbound right turn to instead route via the eastbound through movement. Instead of routing via East Liberty Street to Strachan Avenue northbound, background traffic would route via Atlantic Avenue to King Street West and then to Wellington Street West eastbound.

The total background development traffic allowance, with the above noted traffic redistribution is illustrated in **Figure 17**. This anticipated background traffic growth along the area street network is in the order of a 2.4% to 3.2% growth per annum with respect to existing traffic volumes along the major travel corridors (primarily King Street West and Strachan Avenue).



Date Plotted: August 23, 2023 Filename: P:\6430\18\Graphics\CAD\Fig16-03-EX.dwg

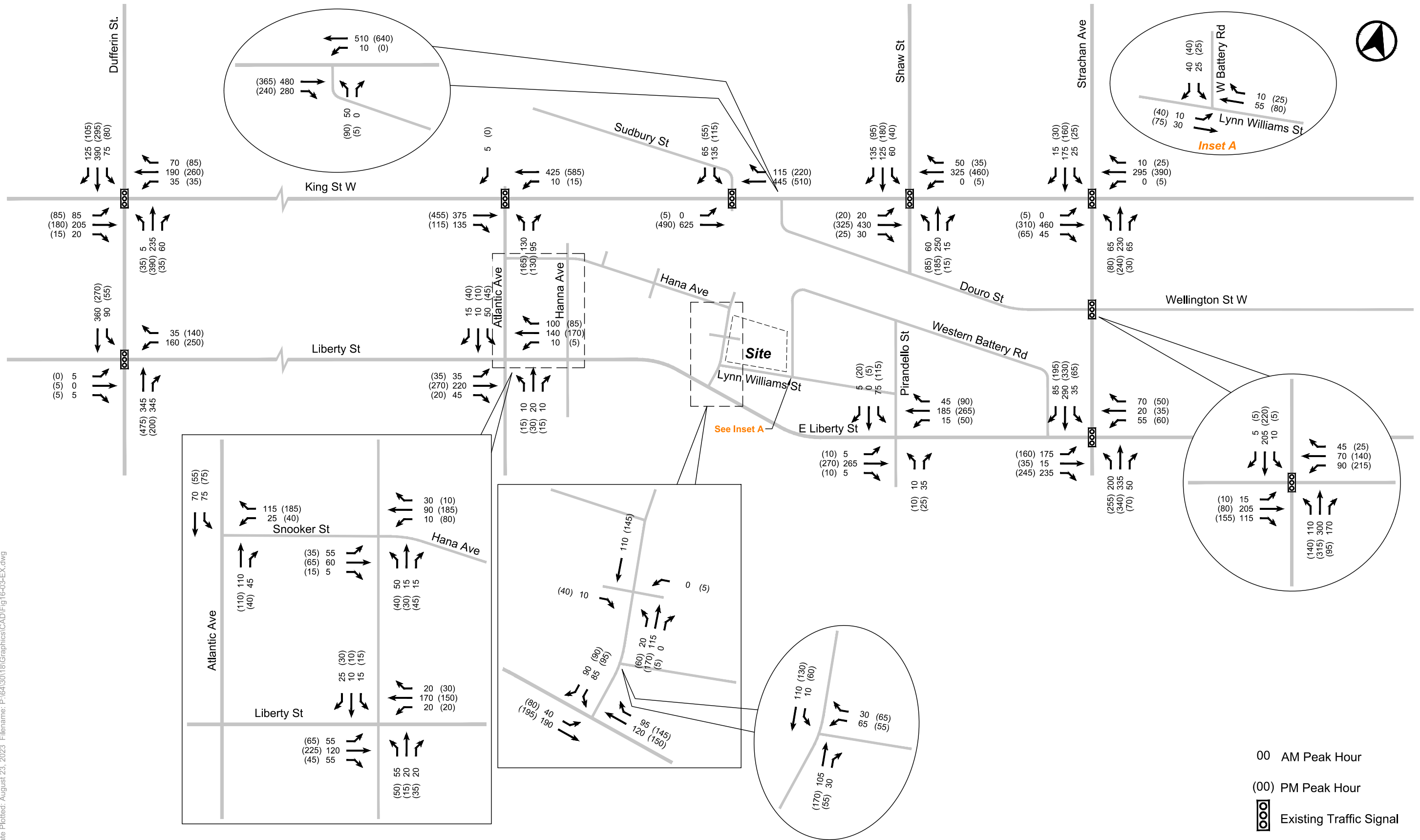


FIGURE 16 EXISTING TRAFFIC VOLUMES

Date Plotted: August 28, 2023 File name: P:\6430\18\Graphics\CAD\Fig17-03-BD.dwg

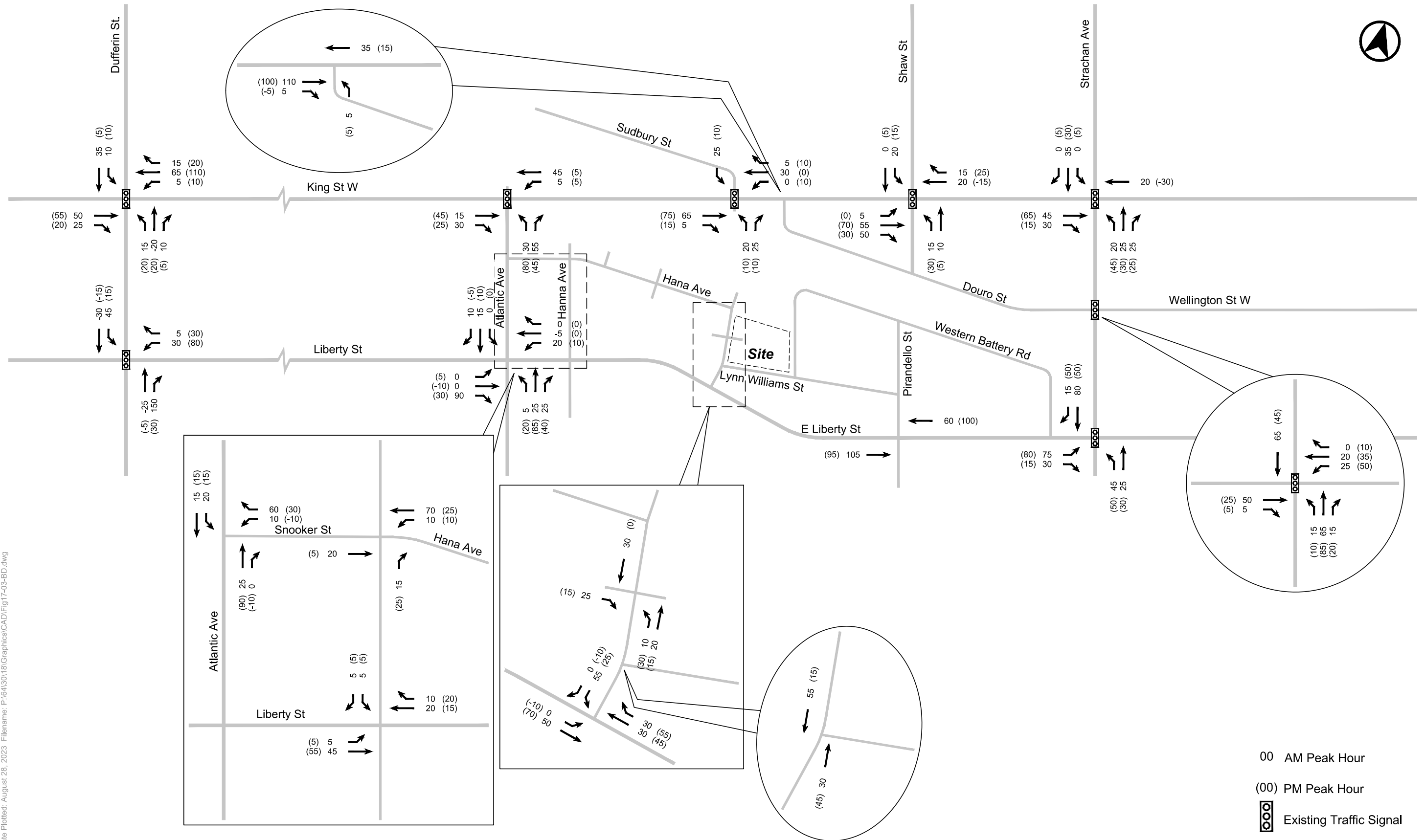


FIGURE 17 TOTAL BACKGROUND DEVELOPMENT TRAFFIC ALLOWANCE

10.3.3 Liberty New Street Traffic Diversion

The Liberty Village Draft Public Realm Strategy dated June 2022 includes a direction to undertake a separate study related to Liberty New Street. On this basis, a sensitivity analysis has been included to assess the impact of traffic redistribution afforded by this new infrastructure.

Given the proposed new connection between Strachan Avenue and Dufferin Street provided by Liberty New Street, an allowance is made for the expected traffic diversion of some of the existing and background development traffic utilizing the new street. The consideration of the diversion is necessary as the traffic network moves to a new equilibrium traffic condition in response to the relief of a new available alternate east-west route, which is especially true relative to East Liberty Street.

Appendix C4 in the September 2021 HDR TIA report for the Ontario Line TOC provides an estimate for the diversion of traffic volumes with Liberty New Street in the weekday morning and afternoon peak hours. Generally, east-west traffic (in the order of 50 to 200 vehicles) is diverted from (East) Liberty Street to Liberty New Street, varying depending on the direction of movement and time periods. These volumes are reproduced in **Figure 18**.

10.3.4 Future Background Traffic Volumes

Future background traffic volumes are the sum of the existing traffic volumes and traffic volume allowances made for area background developments after taking into consideration potential traffic redistribution reflecting future operating conditions on the area street network.

Future background traffic volumes under baseline and sensitivity scenarios are illustrated for the weekday morning and afternoon peak hours in **Figure 19** and **Figure 20**, respectively.



Date Plotted: August 23, 2023 Filename: P:\6430\18\Graphics\CAD\Fig18-03-Diversion_wLiberty.dwg

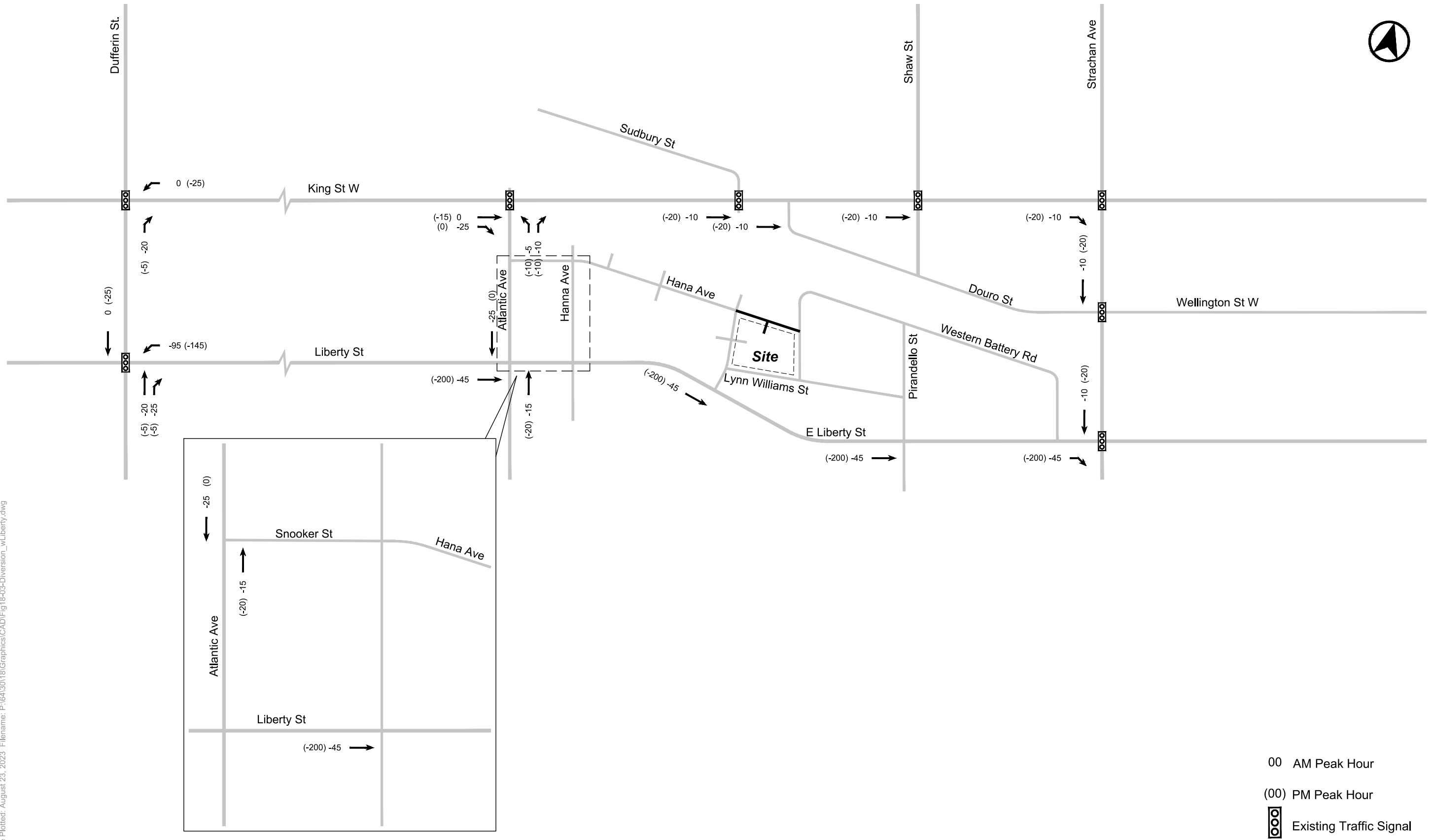


FIGURE 18 LIBERTY NEW STREET TRAFFIC DIVERSION

Date Plotted: August 23, 2023 File name: P:\6430\18\Graphics\CAD\Fig19-03-FB.dwg

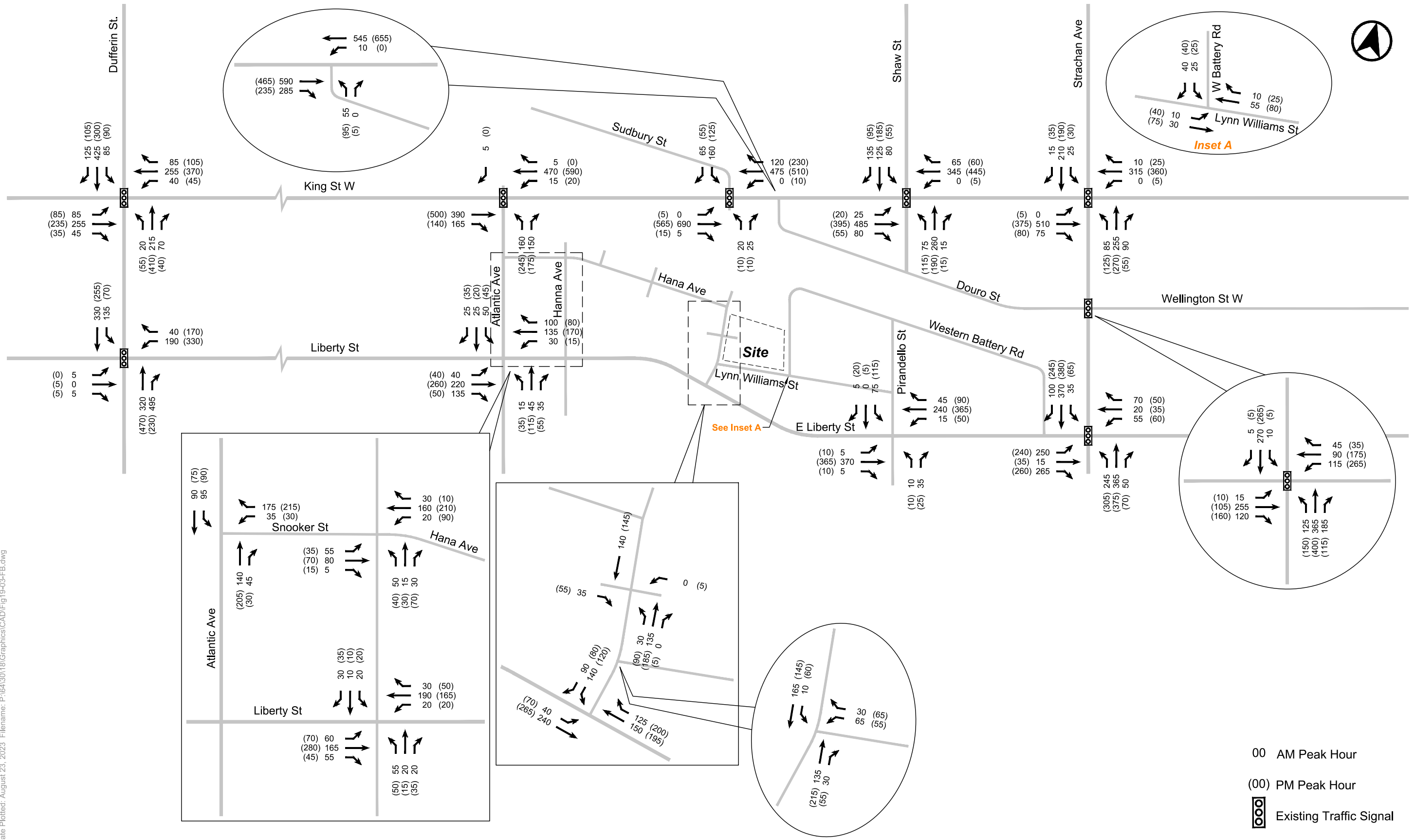


FIGURE 19 FUTURE BACKGROUND TRAFFIC VOLUMES - BASELINE

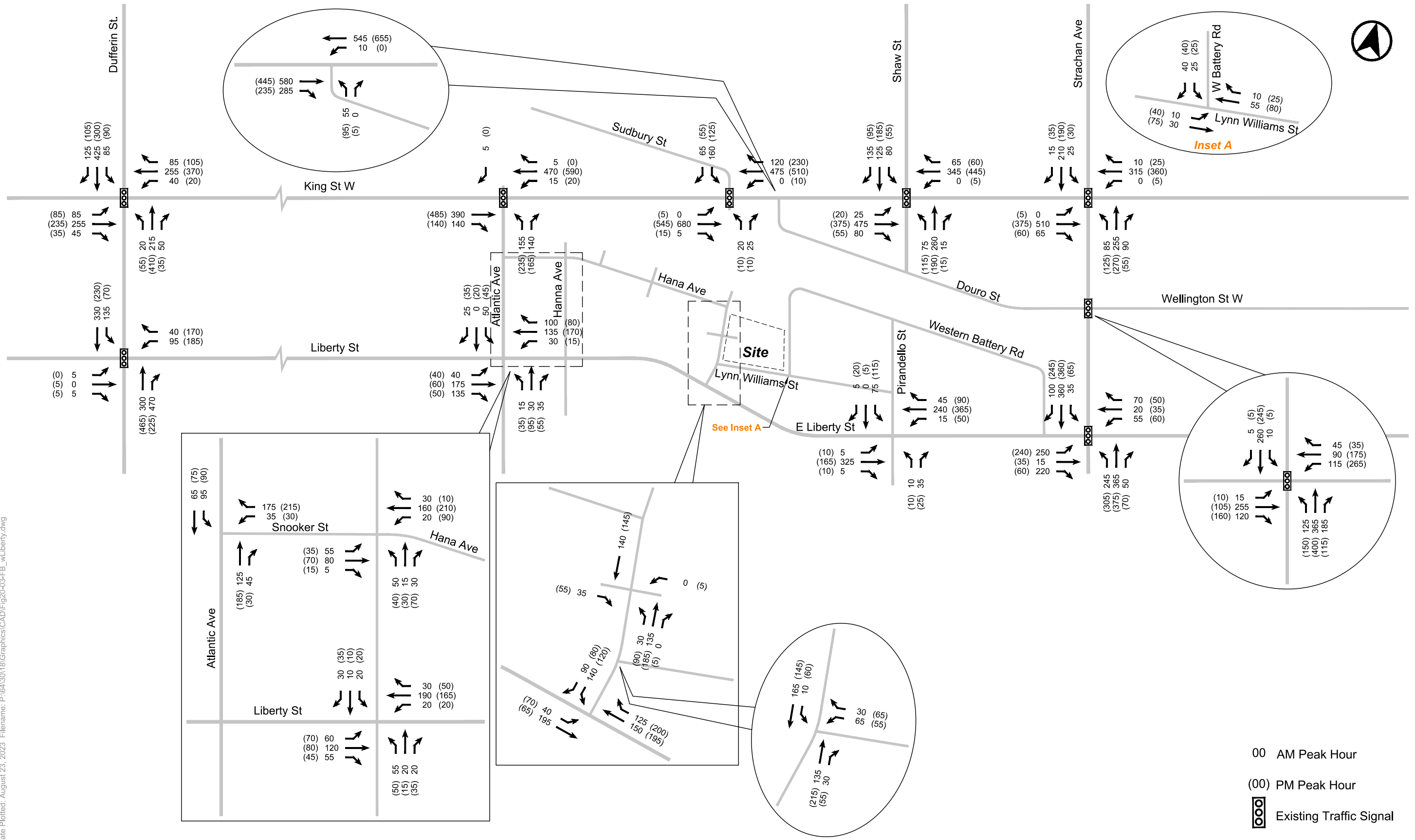


FIGURE 20 FUTURE BACKGROUND TRAFFIC VOLUMES - WITH LIBERTY NEW STREET

10.4 Site Traffic Volumes

10.4.1 Existing Site Traffic Volumes

The existing traffic activity at the site driveways serving the surface parking lot is considered negligible. Therefore, as part of this analysis, no traffic reductions were made to reflect removal of this activity.

10.4.2 Site Vehicle Trip Generation

Future site-related vehicle travel demands were forecast in **Section 8.2.1**. The resultant vehicle trip generation for the overall development site is summarized in **Table 31**.

Table 31 Site Vehicle Trip Generation

Vehicle Trips	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Primary Trips	5	55	70	35	20	55
PUDO Trips	5	5	10	5	5	10
Retail Trips	2	0	2	2	4	6
Total Trips	12	65	72	42	29	71

Based on the foregoing, the site is anticipated to generate in the order of 72 and 71 two-way vehicle trips during the weekday morning and afternoon peak hours, respectively.

10.4.3 Site Trip Distribution and Assignment

The residential travel patterns for the forecast vehicular site traffic have been derived from StreetLight origin-destination data collected between the periods from March 1, 2019 to April 30, 2019 and September 1, 2019 to October 31, 2019. The data was aggregated for existing residential condominium towers and townhomes located immediately east of the site, in an area generally bounded by Western Battery Road to the north, Strachan Avenue to the east, East Liberty Street to the south and the site to the west.

It should be noted that new site traffic assignment reflects turning restrictions on the area street network (i.e. left-turn restrictions on King Street West during weekday peak periods only).

The forecast site traffic assigned to the future road network is illustrated on **Figure 21**.

10.5 Future Total Traffic Volumes

Future total traffic volumes were established by adding site generated traffic to future background traffic volumes. **Figure 22** and **Figure 23** illustrates future total traffic volumes for the weekday morning and afternoon peak hours with and without Liberty New Street.



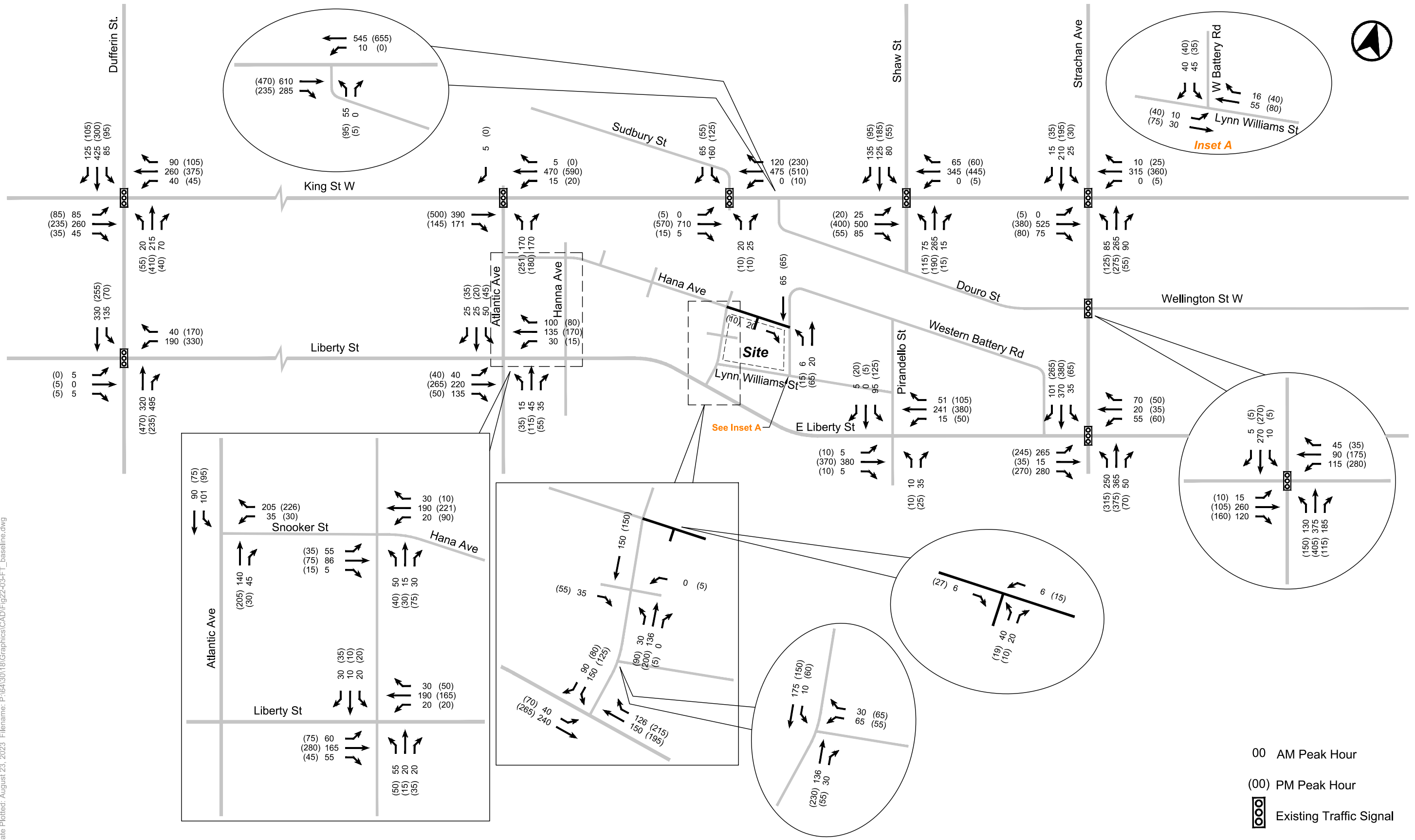


FIGURE 22 FUTURE TOTAL TRAFFIC VOLUMES - BASELINE

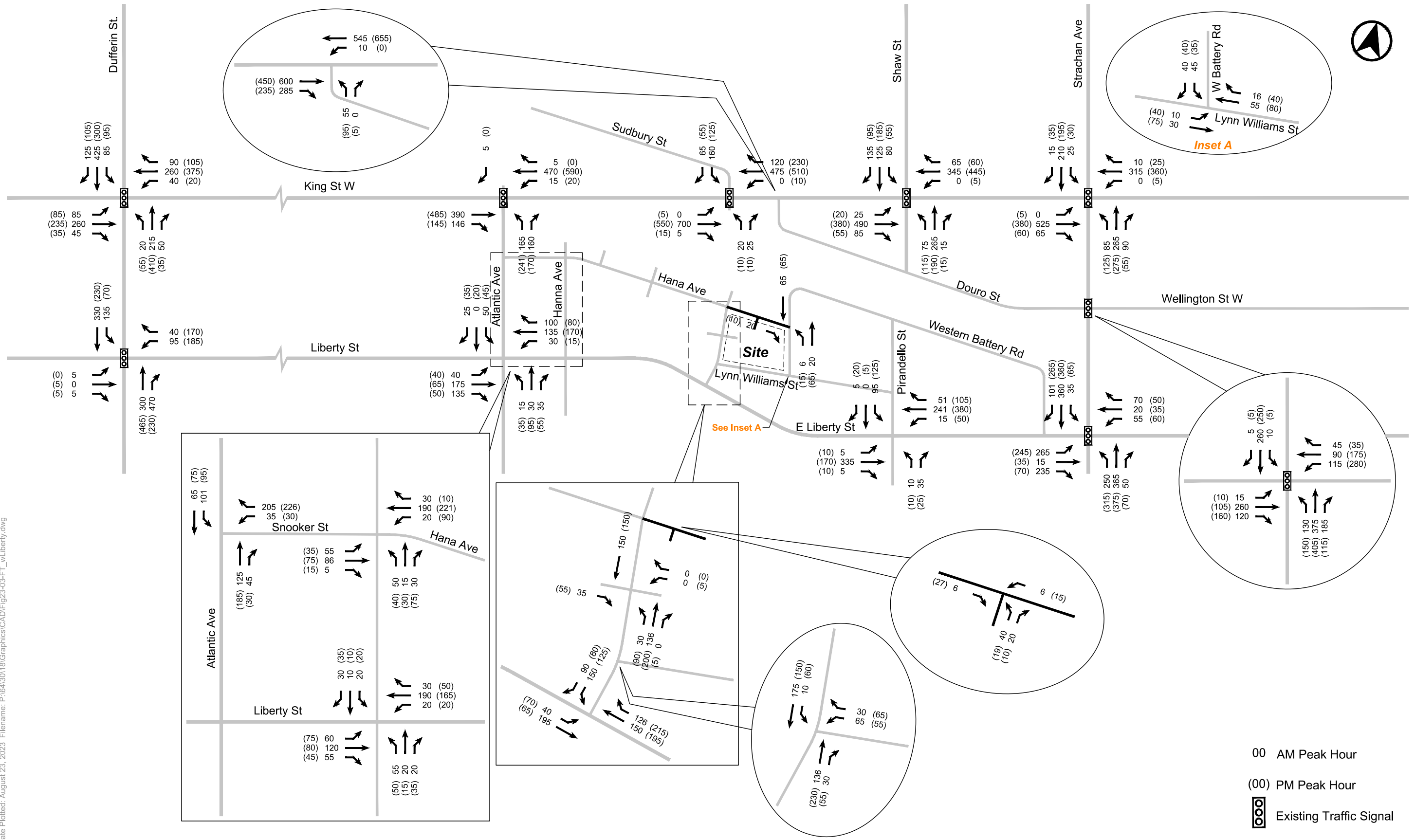


FIGURE 23 FUTURE TOTAL TRAFFIC VOLUMES - WITH LIBERTY NEW STREET

11.0 TRAFFIC OPERATIONS ANALYSIS

11.1 Analysis Methodology and Assumptions

11.1.1 Intersection Capacity Analysis Methodology

Synchro Version 11.1 and the Highway Capacity Manual (HCM) methodology were used to analyze the study area intersections and site access points. All Synchro analyses performed conform to the requirements of the City of Toronto's Guidelines for Using Synchro 11, January 15, 2021.

For signalized intersections, the volume-to-capacity ratio (v/c) is an indicator of the capacity utilization for the key movements in the intersection. A v/c of 1.00 indicates that a traffic movement through an intersection is operating at or near maximum capacity.

For unsignalized intersections, the level of service (LOS) characterizes operational conditions for key movements in terms of average delay experienced by vehicles attempting to complete a manoeuvre through the intersection. LOS 'A' represents a good level of service with short delays, while LOS 'F' represents a poor level of service with extended delays. Two-way STOP intersection analyses are based on HCM 2000 whereas All-way STOP intersection analyses are based on HCM 6 due to the lack of support HCM 2000 has for assessing all-way STOP control queuing.

The projected average and 95th percentile queues at both signalized and unsignalized intersections have been reviewed with respect to existing lane storage lengths to ensure turning lanes are not blocked regularly by adjacent lane queues and available lane storage lengths are sufficient to accommodate typical queuing potential.

11.1.2 Analysis Parameters

Heavy Vehicle Assumptions

Heavy and medium truck percentages incorporated into the analysis were based upon information provided as part of intersection turning movement counts. Where not available, a default value of 2 percent heavy vehicles was assumed.

Saturation Flow Assumptions

The City of Toronto Guidelines for using Synchro 11 (including SimTraffic 11) specifies a base saturation flow rate of 1,900 passenger cars per hour of green time per lane (pcphgpl) for signalized and unsignalized intersections. These default rates were adopted in the analysis for the proposed development.

Lost Time Adjustments

The City of Toronto Guidelines for using Synchro 11 (including SimTraffic 11) specifies a base lost time adjustment factor of -1.0 seconds (i.e. a total lost time per phase equal to the amber plus all-red time minus 1 second). This default value was adopted in the analysis.

Signal Timings

Existing signal timing plans were obtained for all the signalized intersections within the study area from the City of Toronto and included in **Appendix F**. These parameters were adopted for the analysis of existing conditions and under future conditions at all intersection, unless otherwise discussed in the following section.

Peak Hour Factor

The City of Toronto Guidelines for using Synchro 11 (including SimTraffic 11) specifies that default peak hour factors should be used except where site-specific values can be calculated from existing traffic count information. Peak hour factors were calculated based on the existing 15-minute traffic counts utilized in this study for the operations analysis.



Pedestrian Volumes

Existing pedestrian volumes observed two-way along each intersection crosswalk have been incorporated as conflicting pedestrians for the appropriate movements in the existing analysis scenarios. For intersections with extremely high pedestrian crossing volumes – such as the west leg at Strachan Avenue / East Liberty Street – pedestrians generally cross as groups. BA Group has reviewed the footage for the west leg at this intersection to establish the average group size that occurs and the southbound queuing that forms. Based on calibration to the observed 95th percentile queuing and group sizing, the pedestrian crossing volume has been reduced by a factor of 1.2 during the weekday afternoon peak hour. The adjusted pedestrian crossing volume was adopted in the Synchro models.

Additional pedestrian volumes associated with primary and transit pedestrians to and from background developments in the study area were accounted for in the future analysis scenarios. Further pedestrian volumes associated with primary and transit pedestrians generated by the site were included in the future total analysis scenarios.

11.2 Study Area Intersections

Traffic operations and new site traffic related impacts have been reviewed at the study area intersections through capacity analysis, which is summarized in **Table 32**. The study area includes the local network of roads surrounding the site and a wider area road network that reflects the available connections to and from the key arterial corridors while respecting the boundaries created by existing rail corridors to the north and south.

Table 32 Summary of Study Area Intersections

Study Area Intersections	
Local Area Network	Unsignalized
	Snooker Street / Hanna Avenue
	Proposed Private Laneway / Private Street
	Private Street / Lynn Williams Street
	East Liberty Street / Liberty Street / Hanna Avenue
	East Liberty Street / Lynn Williams Street
	Western Battery Road / Lynn Williams Street
	East Liberty Street / Pirandello Street
	Western Battery Road / Proposed Private Laneway
Wider Area Network	Signalized
	King Street West / Dufferin Street
	King Street West / Atlantic Avenue
	King Street West / Sudbury Street
	King Street West / Shaw Street
	King Street West / Strachan Avenue
	Strachan Avenue / Wellington Street West / Douro Street
	Dufferin Street / Liberty Street
Strachan Avenue / East Liberty Street / Ordnance Street	



Study Area Intersections	
Unsignalized	
King Street West / Douro Street	
Atlantic Avenue / Snooker Street	
Atlantic Avenue / Liberty Street	

11.3 Analysis Summary – Local Study Area

11.3.1 Unsignalized Intersection Operations

Analysis results for the unsignalized intersections within the local study area under the existing, future background and future total traffic conditions are summarized in **Table 33**. Detailed Synchro analysis sheets are attached in **Appendix G**.

Under existing conditions, the study area unsignalized intersections and site driveways operate under acceptable urban conditions. Under future background conditions, with the addition of area background development traffic, the study area unsignalized intersections and the site driveways will continue to operate under acceptable urban conditions. The westbound movement will become busier along East Liberty Street with only 1 lane each direction, particularly in the afternoon peak hour at its intersection with Pirandello Street (LOS D).

Under future total conditions, with the addition of site traffic, the study area unsignalized intersections will continue to operate under acceptable urban conditions with LOS C or better.

Table 33 Local Area Unsignalized Intersection & Driveway Operations

Intersection / Movement	Existing Traffic		Future Background Traffic		Future Total Traffic	
	V/C	LOS	V/C	LOS	V/C	LOS
Liberty St / E Liberty St / Hanna Ave						
EBTLR	0.30 (0.47)	A (B)	0.37 (0.57)	B (B)	0.37 (0.58)	B (B)
WBTLR	0.28 (0.30)	A (A)	0.33 (0.36)	B (B)	0.33 (0.36)	B (B)
NBTLR	0.14 (0.16)	A (A)	0.15 (0.17)	A (A)	0.15 (0.17)	A (A)
SBTLR	0.07 (0.09)	A (A)	0.09 (0.11)	A (A)	0.09 (0.11)	A (A)
E Liberty St / Lynn Williams St						
EBL	0.08 (0.14)	A (A)	0.08 (0.13)	B (B)	0.08 (0.13)	B (B)
EBT	0.34 (0.31)	A (A)	0.46 (0.44)	A (A)	0.47 (0.45)	A (A)
WBTR	0.34 (0.41)	B (B)	0.47 (0.58)	B (B)	0.47 (0.60)	B (C)
SBLR	0.29 (0.28)	B (B)	0.42 (0.34)	B (B)	0.44 (0.35)	B (B)
Pirandello St / E Liberty St						
EBTLR	0.39 (0.46)	B (B)	0.56 (0.64)	B (C)	0.59 (0.66)	B (C)
WBTLR	0.35 (0.61)	B (C)	0.45 (0.80)	B (D)	0.47 (0.87)	B (D)
NBTLR	0.07 (0.06)	A (A)	0.08 (0.07)	A (A)	0.08 (0.07)	A (B)

Intersection / Movement	Existing Traffic		Future Background Traffic		Future Total Traffic	
	V/C	LOS	V/C	LOS	V/C	LOS
SBTLR	0.14 (0.26)	A (B)	0.15 (0.28)	B (B)	0.19 (0.31)	B (B)
Lynn Williams St / Western Battery Rd						
EBTL	0.01 (0.06)	A (A)	0.01 (0.06)	A (A)	0.01 (0.06)	A (A)
WBTR	0.05 (0.08)	A (A)	0.05 (0.08)	A (A)	0.05 (0.09)	A (A)
SBLR	0.10 (0.20)	B (C)	0.10 (0.20)	B (C)	0.14 (0.25)	B (C)
Private St (Lynn Williams Extension) / Metro Driveway / Proposed Private Laneway						
EBTLR	0.11 (0.21)	A (A)	0.16 (0.17)	A (A)	0.21 (0.17)	A (A)
WBTLR	-- (--)	-- (--)	-- (--)	-- (--)	0.35 (0.42)	A (B)
NBTLR	0.20 (0.30)	A (A)	0.24 (0.26)	A (A)	0.16 (0.20)	A (A)
SBTLR	0.09 (0.11)	A (A)	0.09 (0.09)	A (A)	0.00 (0.00)	A (A)
Western Battery Rd / Proposed Private Laneway						
EBLR	-- (--)	-- (--)	-- (--)	-- (--)	0.13 (0.06)	B (B)
NBTL	-- (--)	-- (--)	-- (--)	-- (--)	0.02 (0.05)	A (A)
SBTR	-- (--)	-- (--)	-- (--)	-- (--)	0.15 (0.15)	A (A)
Site Driveway / Private Laneway						
EBTR	-- (--)	-- (--)	-- (--)	-- (--)	0.01 (0.06)	A (A)
WBTL	-- (--)	-- (--)	-- (--)	-- (--)	0.01 (0.04)	A (A)

Notes:

1. xx (xx) – AM (PM)

New site related traffic has a minor impact on area unsignalized intersections with no change to the level of service relative to future background conditions other than at the new private laneway connections. While other intersection movements will operate with LOS C, the westbound movement along East Liberty Street at Pirandello Street will be busier with LOS E.

11.3.2 Queue Considerations

A detailed summary of the 95th percentile queues for the intersections in the local study area network are attached in **Appendix G**. Based on this review, the anticipated 95th percentile queues within the local study area network can be accommodated within the available lane storage without undue queue overflow impacts to downstream intersections.



11.4 Analysis Summary – Wider Study Area

11.4.1 Signalized Intersection Operations

Traffic operations analysis results for the area signalized intersections are summarized in **Table 34** for the existing, future background and future total scenarios. Detailed Synchro worksheets are included in **Appendix G**.

Under existing conditions, all study area signalized intersections operate acceptably during the weekday morning and afternoon peak hours with overall intersection v/c ratios of 0.56 and 0.59 or better during the weekday morning and afternoon peak hours, respectively. It should be noted that with the recent completion of various background condominium buildings around the Strachan Avenue / East Liberty Street intersection, pedestrian crossing volumes have significantly increased, particularly across the west leg of the intersection.

Under future background conditions, with the addition of area background development traffic, study area signalized intersections will continue to operate acceptably with overall intersection v/c ratios of 0.73 and 0.81 or better during the weekday morning and afternoon peak hours, respectively. The southbound right and northbound left turns at Strachan Avenue / East Liberty Street will become busy relative to existing conditions given the increased activity of background traffic.

Under future total conditions, with the addition of site traffic, the study area signalized intersections will continue to operate acceptably with overall intersection v/c ratios of 0.73 and 0.92 or better during the weekday morning and afternoon peak hours, respectively. However, the high pedestrian crossing volume on the west leg of Strachan Avenue / East Liberty Street and additional traffic lead to greater impact at the intersection, particularly for the southbound right, northbound left and eastbound movements.

The baseline analysis indicates that the key intersection of Strachan Avenue / East Liberty Street / Ordnance Street will become busy but continue to operate under capacity given future conditions. The potential diversion opportunity provided by the Liberty New Street under future conditions can help alleviate operating conditions at the intersection even if no additional infrastructure improvements are made to the area street network. An additional sensitivity analysis reflecting potential improvements is further discussed in **Section 11.5**.



Table 34 Wider Area Signalized Intersection Operations

Intersection	Existing Traffic		Future Background Traffic		Future Total Traffic	
	V/C	LOS	V/C	LOS	V/C	LOS
Dufferin Street / King Street West						
EBLTR	0.25 (0.22)	A (A)	0.34 (0.29)	B (A)	0.34 (0.29)	B (A)
WBLTR	0.21 (0.25)	A (A)	0.29 (0.36)	B (B)	0.30 (0.36)	B (B)
NBLTR	0.34 (0.58)	C (D)	0.35 (0.68)	C (D)	0.35 (0.67)	C (D)
SBLTR	0.72 (0.74)	C (C)	0.75 (0.80)	C (C)	0.75 (0.80)	C (C)
Overall	0.42 (0.44)	C (C)	0.50 (0.54)	B (C)	0.50 (0.55)	B (C)
Atlantic Avenue / King Street West						
EBTR	0.33 (0.36)	A (A)	0.38 (0.41)	A (B)	0.39 (0.41)	B (B)
WBLT	0.29 (0.37)	A (A)	0.33 (0.39)	A (B)	0.33 (0.39)	A (B)
NBL	0.29 (0.33)	B (B)	0.35 (0.49)	B (C)	0.37 (0.50)	B (C)
NBR	0.09 (0.32)	B (B)	0.34 (0.48)	B (C)	0.40 (0.50)	C (C)
Overall	0.32 (0.36)	B (B)	0.37 (0.44)	B (B)	0.39 (0.45)	B (B)
Sudbury Street / King Street West						
EBLT	0.32 (0.28)	A (A)	0.36 (0.33)	A (A)	0.37 (0.33)	A (A)
WBTR	0.29 (0.40)	A (A)	0.31 (0.41)	A (A)	0.31 (0.41)	A (A)
SBLR	0.44 (0.37)	C (C)	0.50 (0.39)	C (C)	0.50 (0.39)	C (C)
Overall	0.36 (0.39)	B (B)	0.40 (0.40)	B (B)	0.41 (0.40)	B (B)
Shaw Street / King Street West						
EBLTR	0.38 (0.31)	B (B)	0.49 (0.40)	B (B)	0.51 (0.40)	B (B)
WBLTR	0.27 (0.38)	B (B)	0.29 (0.39)	B (B)	0.29 (0.39)	B (B)
NBLTR	0.51 (0.52)	C (C)	0.59 (0.63)	C (C)	0.59 (0.63)	C (C)
SBLTR	0.46 (0.45)	C (C)	0.55 (0.54)	C (C)	0.56 (0.54)	C (C)
Overall	0.37 (0.38)	B (B)	0.47 (0.42)	B (B)	0.48 (0.42)	B (B)
Strachan Avenue / King Street West						
EBLTR	0.31 (0.25)	A (A)	0.38 (0.32)	B (A)	0.39 (0.32)	B (A)
WBLTR	0.18 (0.25)	A (A)	0.20 (0.24)	A (A)	0.20 (0.24)	A (A)
NBL	0.28 (0.37)	B (D)	0.38 (0.59)	B (D)	0.37 (0.60)	B (D)
NBTR	0.63 (0.57)	C (D)	0.72 (0.66)	C (D)	0.74 (0.67)	C (D)
SBL	0.14 (0.14)	C (C)	0.16 (0.19)	C (C)	0.16 (0.20)	C (C)
SBTR	0.38 (0.41)	C (C)	0.43 (0.46)	C (C)	0.43 (0.47)	C (C)
Overall	0.42 (0.35)	B (B)	0.50 (0.43)	B (C)	0.52 (0.44)	B (C)



Intersection	Existing Traffic		Future Background Traffic		Future Total Traffic	
	V/C	LOS	V/C	LOS	V/C	LOS
Strachan Avenue / Wellington Street West						
EBL	0.05 (0.04)	B (C)	0.05 (0.04)	B (C)	0.05 (0.04)	B (C)
EBTR	0.60 (0.39)	C (C)	0.71 (0.50)	C (C)	0.72 (0.50)	C (C)
WBL	0.44 (0.55)	C (C)	0.69 (0.72)	D (C)	0.71 (0.76)	D (C)
WBTR	0.18 (0.23)	C (B)	0.23 (0.30)	C (B)	0.23 (0.30)	C (B)
NBL	0.31 (0.35)	B (B)	0.36 (0.39)	B (B)	0.37 (0.39)	B (B)
NBTR	0.54 (0.53)	B (B)	0.63 (0.67)	B (B)	0.64 (0.67)	B (B)
SBL	0.04 (0.02)	B (B)	0.04 (0.02)	B (B)	0.05 (0.02)	B (B)
SBTR	0.24 (0.43)	C (B)	0.32 (0.51)	C (C)	0.32 (0.52)	C (C)
Overall	0.56 (0.59)	B (B)	0.66 (0.75)	C (C)	0.67 (0.78)	C (C)
Dufferin Street / Liberty Street						
WBL	0.40 (0.61)	C (C)	0.47 (0.70)	C (C)	0.47 (0.70)	C (C)
WBR	0.04 (0.22)	C (C)	0.06 (0.34)	C (C)	0.06 (0.34)	C (C)
NBTR	0.33 (0.38)	A (A)	0.43 (0.43)	A (B)	0.43 (0.44)	A (B)
SBLT	0.30 (0.23)	A (A)	0.38 (0.27)	A (A)	0.38 (0.27)	A (A)
Overall	0.35 (0.45)	A (B)	0.44 (0.52)	A (B)	0.44 (0.53)	A (B)
Strachan Avenue / East Liberty Street / Ordnance Street						
EBL	0.53 (0.53)	C (C)	0.75 (0.80)	D (D)	0.80 (0.83)	D (D)
EBTR	0.56 (0.49)	C (C)	0.75 (0.56)	D (C)	0.76 (0.90)	D (E)
WBLTR	0.33 (0.41)	C (C)	0.33 (0.43)	C (C)	0.36 (0.45)	C (C)
NBL	0.47 (0.56)	B (B)	0.63 (0.71)	B (C)	0.65 (0.79)	B (C)
NBTR	0.46 (0.49)	B (B)	0.49 (0.53)	B (B)	0.49 (0.52)	B (B)
SBL	0.13 (0.31)	C (C)	0.13 (0.32)	C (C)	0.13 (0.26)	C (B)
SBT	0.43 (0.58)	C (C)	0.55 (0.67)	C (C)	0.55 (0.55)	C (C)
SBR	0.15 (0.50)	E (D)	0.17 (0.87)	D (E)	0.18 (0.97)	D (F)
Overall	0.52 (0.57)	C (C)	0.73 (0.81)	C (C)	0.73 (0.92)	C (C)

Notes:

1. xx (xx) – AM (PM)



11.4.2 Unsignalized Intersection Operations

Analysis results for the unsignalized intersections within the wider study area under existing, future background and future total traffic conditions are summarized in **Table 35**. Detailed Synchro analysis sheets are attached in **Appendix G**.

Under existing conditions, the study area unsignalized intersections operate under acceptable urban conditions.

Under future background conditions, with the addition of background development traffic, the study area unsignalized intersections will continue to operate under acceptable urban conditions with level of service LOS D or better.

Under future total conditions, with the addition of site traffic, the study area unsignalized intersections will continue to operate under acceptable urban conditions with level of service LOS D or better. The busier westbound movement at Atlantic Street / Snooker Street will operate acceptably with level of service LOS E with the addition of site traffic.

Table 35 Wider Area Unsignalized Intersection Operations

Intersection	Existing Traffic		Future Background Traffic		Future Total Traffic	
	V/C	LOS	V/C	LOS	V/C	LOS
Duoro Street / King Street West						
EBT	0.20 (0.16)	A (A)	0.25 (0.20)	A (A)	0.25 (0.21)	A (A)
EBTR	0.28 (0.24)	A (A)	0.30 (0.26)	A (A)	0.31 (0.26)	A (A)
WBTL	0.02 (0.00)	A (A)	0.02 (0.00)	A (A)	0.02 (0.00)	A (A)
WBT	0.21 (0.28)	A (A)	0.23 (0.29)	A (A)	0.23 (0.29)	A (A)
NBLR	0.22 (0.33)	C (C)	0.29 (0.40)	D (D)	0.30 (0.40)	D (D)
Atlantic Street / Snooker Street						
WBLR	0.27 (0.40)	B (C)	0.67 (0.67)	D (D)	0.76 (0.70)	E (D)
NBTR	0.10 (0.09)	A (A)	0.12 (0.15)	A (A)	0.12 (0.15)	A (A)
SBTL	0.08 (0.07)	A (A)	0.12 (0.10)	A (A)	0.12 (0.11)	A (A)
Atlantic Street / Liberty Street						
EBTLR	0.40 (0.43)	A (A)	0.55 (0.52)	A (A)	0.55 (0.52)	A (A)
WBTLR	0.33 (0.34)	A (A)	0.38 (0.40)	A (A)	0.38 (0.40)	A (A)
NBTLR	0.06 (0.09)	A (A)	0.16 (0.33)	A (A)	0.16 (0.33)	A (A)
SBTLR	0.12 (0.14)	A (A)	0.17 (0.17)	A (A)	0.17 (0.17)	A (A)

Notes:

1. xx (xx) – AM (PM)



11.4.3 Queue Considerations

A detailed summary of the 50th and 95th percentile queues for the signalized and unsignalized intersections in the study area network showing results for all movements are attached in **Appendix G**. Resultant queue lengths of busier movements, as per the capacity review in **Section 11.4** (i.e. movements with v/c greater than 0.80) or movements with a short queue storage length, are summarized for signalized intersections in **Table 36**.

Table 36 Queue Lengths at Signalized Intersections

Intersection	Storage Length (m)	Existing Traffic		Future Background Traffic		Future Total Traffic	
		50 th %tile	95 th %tile	50 th %tile	95 th %tile	50 th %tile	95 th %tile
Strachan Avenue / Wellington Street West							
EBTR	130	40.3 (16.4)	68.4 (38.2)	51.4 (25.0)	#85.5 (49.9)	52.5 (25.0)	#88.6 (49.9)
WBL	25	12.0 (22.8)	27.1 (38.6)	16.8 (29.1)	#44.4 (#50.5)	16.9 (31.0)	#45.1 (#57.3)
NBL	25	5.5 (11.4)	17.0 (20.0)	6.2 (13.6)	m16.6 (m21.3)	6.4 (14.1)	m16.4 (m20.1)
NBTR	150	18.8 (33.0)	38.6 (46.4)	23.7 (54.5)	49.5 (m89.7)	23.8 (51.3)	m45.5 (m74.1)
Strachan Avenue / East Liberty Street / Ordnance Street							
EBL	30	23.8 (21.4)	44.5 (41.8)	37.4 (35.9)	#75.7 (#76.0)	40.5 (37.2)	#82.1 (#78.9)
EBTR	230	11.0 (4.5)	#49.7 (#40.0)	19.7 (6.8)	#67.6 (#52.5)	22.2 (28.8)	#72.5 (#82.3)
NBL	45	16.2 (20.9)	27.9 (34.5)	20.5 (25.8)	34.0 (#54.6)	21.3 (26.5)	#35.5 (#59.2)
SBR	40	2.8 (4.4)	m16.0 (#38.4)	4.8 (17.0)	16.7 (#75.3)	5.0 (17.0)	16.4 (#83.0)

Notes:

1. xx (xx) – AM (PM)

Strachan Avenue / Wellington Street West

Under existing conditions, the 95th percentile queue length in the westbound left-turn lane extends beyond the storage length, for parts of the signal cycle but clears on every cycle. Under future background and future total conditions, the 95th percentile queue length will continue to extend beyond the storage length. The impact of site traffic is approximately one vehicle length.

Strachan Avenue / East Liberty Street

Under existing conditions, the 95th percentile queue length in the eastbound left-turn lane extends beyond the storage length, for parts of the signal cycle but clears on every cycle. Under future background and future total conditions, the 95th percentile queue length will continue to extend beyond the storage length. The impact of site traffic is approximately one vehicle length.

Under existing conditions, the 95th percentile queue lengths in the northbound left-turn lane and southbound right-turn lane do not extend beyond the storage length. However, with the addition of area background traffic allowances under future background conditions, the 95th percentile queue length will extend beyond the storage length, for parts of the signal cycle, but will clear on every cycle. Under future total conditions, the 95th percentile queue length will continue to extend beyond the storage length. The impact of site traffic is approximately one vehicle length.

Unsignalized Intersections

Resultant queues for unsignalized intersections in the study area are summarized in **Table 37**. All anticipated queues at area unsignalized intersections can be accommodated by the available existing storage lengths on the road network.



Table 37 Queue Lengths at Unsignalized Intersections

Intersection	Storage Length (m)	Existing Traffic	Future Background Traffic	Future Total Traffic
Private Road / Proposed Private Laneway^{1,2}				
EBLTR	20	2.8 (4.2)	4.2 (4.2)	4.2 (4.9)
WBLTR	30	-- (--)	-- (--)	1.4 (0.7)
NBLTR	30	4.9 (6.3)	6.3 (7.0)	7.0 (7.7)
SBLTR	25	2.1 (2.1)	2.1 (2.1)	2.1 (2.1)
East Liberty Street / Private Road^{1,2}				
EBL	45	1.4 (3.5)	2.1 (2.8)	2.1 (2.8)
SBLR	15	8.4 (8.4)	14.7 (10.5)	15.4 (9.1)
Lynn Williams Street / Western Battery Road				
EBTL	70	0.2 (1.4)	0.2 (1.4)	0.2 (1.4)
SBLR	45	2.8 (5.9)	2.8 (5.9)	3.9 (7.6)
Duoro Street / King Street West				
NBLR	25	6.6 (11.4)	9.3 (14.7)	9.6 (14.9)
Atlantic Street / Snooker Street				
WBLR	65	8.9 (15.5)	36.8 (37.3)	48.1 (41.2)
SBTL	60	2.0 (1.8)	3.2 (2.7)	3.2 (2.8)
Atlantic Street / Liberty Street^{1,2}				
EBTLR	60	13.3 (14.7)	24.5 (20.3)	24.5 (21.0)
WBTLR	60	9.8 (10.5)	12.6 (12.6)	12.6 (13.3)
NBTLR	80	1.4 (2.1)	4.2 (9.8)	4.2 (9.8)
SBTLR	105	2.8 (3.5)	4.2 (4.2)	4.2 (4.2)
Hanna Avenue / East Liberty Street^{1,2}				
EBTLR	25	8.4 (17.5)	11.9 (24.5)	11.9 (25.2)
WBTLR	45	7.7 (8.4)	9.8 (10.5)	9.8 (11.2)
NBTLR	80	3.5 (4.2)	3.5 (4.2)	3.5 (4.2)
SBTLR	105	1.4 (2.1)	2.1 (2.8)	2.1 (2.8)
Western Battery Road / Proposed Private Laneway				
EBLR	30	--	--	3.5 (1.6)
NBTL	50	--	--	0.5 (1.4)
Private Road / Proposed Private Laneway				
WBTL	30	--	--	0.4 (1.0)

Note:

1. Based on HCM6 methodology outputs for all-way STOP control intersections
2. Queue values reflect a vehicle plus buffer length of 7.0 metres
3. xx (xx) – AM (PM)



11.5 Sensitivity Analysis – Potential Improvements

Several potential road network improvements have been considered to address capacity constraints which emerge under future background conditions.

11.5.1 Improvements at Strachan Avenue and East Liberty Street / Ordnance Street

At the intersection of Strachan Avenue and East Liberty Street/ Ordnance Street, the northbound left-turn and southbound right-turn movements will be capacity constrained under future background conditions, if background traffic volume projections are realized. Potential mitigation measures for these movements are as follows:

- During the weekday morning peak hour, optimize the traffic signal phasing (+4.0 sec northbound left-turn phase, -5.0 sec southbound through, +1.0 sec east-west main phase) while maintaining existing cycle lengths.
- During the weekday afternoon peak hour, optimize the traffic signal phasing (+2.5 sec northbound left-turn phase, -2.5 sec southbound through) while maintaining existing cycle lengths and reduce “Flash Don’t Walk” time to meet minimum requirements based on pedestrian crossing distances.
- Review potential for two westbound receiving lanes along East Liberty Street (by removing on-street parking) to allow simultaneous southbound right turns during the northbound protected left-turn phase.

Although these potential improvements address the capacity constraints in the short-term, they should be considered in the context of the evolving transportation system in the Liberty Village area in relation to future improvements to transit service, active transportation, and the road network. With the planned construction of Liberty New Street, the road network is expected to become more balanced with alternate routing options provided via Dufferin Street and Strachan Avenue such that the potential intersection improvements may not be required.

11.5.2 Sensitivity Analysis – Liberty New Street

The resultant intersection operations analysis for the (East) Liberty Street corridor with the above noted optimization and with the traffic diversions offered by Liberty New Street are summarized in **Table 38**. Detailed Synchro analysis sheets under sensitivity conditions, are attached in **Appendix G**.

It is important to consider the potential improvements in the context of the evolving transportation system in the Liberty Village area in relation to future improvements to transit service, active transportation, and the road network. With the planned construction of Liberty New Street, the road network is expected to become more balanced with alternate routing options provided via Dufferin Street and Strachan Avenue such that the intersection improvements may not be required.

Enhanced connectivity in the Liberty Village area and beyond, through significant planned improvements to the transit system and active transportation network, may further eliminate the requirement for these potential improvements. Some of the future projects that will encourage non-auto trips in the Liberty Village area include the planned construction of Liberty New Street with facilities for active transportation, a proposed new King-Liberty SmartTrack train station and a new subway station at Exhibition as part of the proposed Ontario Line.

Although the site is currently well-served by several Toronto Transit Commission (TTC) and GO Transit surface transit routes, as development occurs in the area, there is an opportunity to facilitate sustainable multi-modal travel options. New developments are being designed with Transportation Demand Management (TDM) as a key principle to prioritize transit and active transportation, while also accommodating the use of the automobile in order to foster multi-modal travel with a range of options. The availability of existing and future active transportation facilities along with existing and planned transit services, will offer a wide variety of travel mode choices to future residents and visitors.



Table 38 Area Intersection Operations Summary – With Liberty New Street

Intersection	Future Background Traffic		Future Total Traffic	
	V/C	LOS	V/C	LOS
Strachan Ave / East Liberty St / Ordnance St				
EBL	0.75 (0.80)	D (D)	0.80 (0.83)	D (D)
EBTR	0.54 (0.17)	C (C)	0.57 (0.18)	C (C)
WBTLR	0.33 (0.38)	C (C)	0.33 (0.39)	C (C)
NBL	0.62 (0.69)	B (C)	0.64 (0.77)	B (C)
NBTR	0.49 (0.53)	B (B)	0.49 (0.52)	B (B)
SBL	0.13 (0.32)	C (C)	0.13 (0.26)	C (B)
SBT	0.54 (0.63)	C (C)	0.54 (0.52)	C (B)
SBR	0.17 (0.86)	E (E)	0.18 (0.96)	E (F)
Overall	0.72 (0.80)	C (C)	0.73 (0.88)	C (C)
East Liberty St / Pirandello St				
EBTLR	0.49 (0.30)	B (B)	0.52 (0.31)	B (B)
WBTLR	0.44 (0.74)	B (C)	0.46 (0.79)	B (D)
NBTLR	0.07 (0.06)	A (A)	0.08 (0.06)	A (A)
SBTLR	0.15 (0.26)	B (B)	0.19 (0.28)	B (B)
East Liberty St / Lynn Williams St				
EBL	0.08 (0.13)	B (A)	0.08 (0.13)	B (A)
EBT	0.37 (0.11)	A (A)	0.38 (0.11)	A (A)
WBTR	0.46 (0.54)	B (B)	0.46 (0.56)	B (B)
SBLR	0.41 (0.31)	B (B)	0.43 (0.32)	B (B)
Liberty St / Atlantic St				
EBTLR	0.46 (0.21)	A (A)	0.46 (0.21)	A (A)
WBTLR	0.36 (0.36)	A (A)	0.36 (0.36)	A (A)
NBTLR	0.13 (0.26)	A (A)	0.13 (0.26)	A (A)
SBTLR	0.12 (0.14)	A (A)	0.12 (0.15)	A (A)
Liberty St / Dufferin St				
WBL	0.29 (0.49)	C (C)	0.29 (0.49)	C (C)
WBR	0.03 (0.40)	C (C)	0.03 (0.40)	C (C)
NBTR	0.39 (0.39)	A (A)	0.39 (0.39)	A (A)
SBTL	0.34 (0.22)	A (A)	0.34 (0.23)	A (A)
Overall	0.37 (0.42)	A (B)	0.37 (0.42)	A (B)



12.0 CONCLUSIONS

BA Group has been retained by Shiplake LTD. to provide transportation consulting services in relation to a Zoning By-law Amendment (ZBA) application for the proposed redevelopment of a site municipally known as 70 & 86 Lynn Williams Street (herein referred to as the 'site'), in the City of Toronto. The site is located in Liberty Village, a neighbourhood in Toronto.

The Proposed Development

1. The site consists of an existing building and surface parking lot, which extends over the adjacent property and occupies a larger block. The block was previously under the same ownership and was subject to a land severance, which established the current site boundaries. The site now consists of the northern portion of the block which is generally bounded by an existing residential building to the north, Western Battery Road to the east, the remaining portion of the existing heritage building to the south, and a private driveway to the west.
2. The plan consists of a new building including 588 residential units and 800 m² of non-residential Gross Floor Area (GFA). A total of 110 vehicle parking spaces including 68 resident parking spaces and 42 non-resident parking spaces are proposed within two (2) underground parking levels. A total of 648 bicycle parking spaces including 530 long-term and 118 short-term spaces are proposed on the ground floor and P1 levels.
3. The plan illustrates a new east-west private laneway connection along the north property boundary, connecting to Western Battery Road to the east and the existing private driveway to the west. In the near term, access to the private driveway will be secured by extension of existing easements, which provide connections to Snooker Street to the west and Lynn Williams Street to the south. The new east-west private laneway will provide a new and convenient connection for pedestrians and cyclists to travel between existing and proposed residential, retail, and office uses west of the site to Western Battery Road and the King-Liberty Pedestrian / Cycle Bridge.
4. While this site configuration supports the goals of the Liberty Village Public Realm Study initiated by the City of Toronto, the design of the new east-west private laneway and site organization with respect to vehicular access to the underground parking garage, loading facilities and pick-up/drop-off areas will be reviewed in consultation with the City of Toronto as the development moves through the applications process.

Active Transportation Strategy

5. A series of mobility planning principles have been established to guide the redevelopment of Liberty Village in a manner that acknowledges and follows the vision set out for this neighbourhood and the provincial objectives for major transit station areas (MTSAs), which are areas within a 500-800 metre radius of a higher-order transit stop or station. While the focus is on the proposed development, overall connectivity to the adjacent areas and the future King-Liberty GO Station and the Ontario Line's Exhibition Station are a mobility priority. The mobility planning principles that are achieved through the Active Transportation Strategy are as follows:
 - i. Leveraging Transit Investments to Meet Future Mobility Demands
 - From a transit perspective, the strategic location of the development site presents an opportunity to create a transit-centric development that supports access to and capitalizes on the significant planned and nearly completed investments in transit.
 - ii. Network Building Through Pedestrian and Cycling Connections
 - The creation of a complete network that considers pedestrian and cycling connections, transit infrastructure, road network, open spaces and first-and-last mile solutions is essential to support the development of a transit-oriented community. A key component of the Liberty Village Public Realm Study is the creation of mid-block connections. The provision of these connections



capitalizes on the opportunity to fill in the missing gaps, connect to existing routes and improve pedestrian and cycling connections within Liberty Village.

6. Transportation Demand Management (TDM) includes strategies to enable and encourage alternative transportation options beyond the single-occupant, private automobile. TDM measures are proposed for the development site and include the application of various site design elements and property management/operational policies that have the goal of redistributing and reducing the travel demand of developments, specifically that of single occupancy private vehicles. Proposed TDM measures include:
 - Transit Context
 - Provision of Transit Information Systems
 - Provision of Transit Information Out-Reach Programming
 - Provision of Presto Cards
 - Access to Bicycle Facilities
 - Provision of Bicycle Parking
 - Provision of a Bicycle Repair Station
 - Organising Bicycle Seminars and Tuning Days
 - Provision of a Bike Share Station
 - Provision of Car-Share / Bike-Share Memberships
 - Provision of Pedestrian Connections
 - Provision of Appropriate Vehicle Parking Supply

Vehicle Parking Considerations

7. Application of the parking standards outlined in the site-specific zoning by-laws, results in a minimum vehicle parking requirement of 552 total parking spaces for the site, including 447 resident spaces and 105 non-resident spaces. Application of Zoning By-law 569-2013, as Amended results in a minimum requirement of 31 vehicle parking spaces, including 15 accessible parking spaces.
8. The parking strategy for the development site is consistent with the long-term vision for transit-oriented development. The current development plans illustrate the provision of a total of 110 vehicle parking spaces – 68 resident spaces and 42 non-resident spaces, including 1 car-share space within a two-level underground parking garage. Of the total, 4 spaces are allocated as accessible spaces.
9. The resident parking supply exceeds the minimum requirements of the City of Toronto Zoning By-law 569-2013, as Amended. The non-resident parking supply of 42 parking spaces, including 1 car-share space, falls between the number of parking spaces required by the site-specific zoning by-law and the current City of Toronto Zoning By-law 569-2013, as Amended, and reflects more contemporary parking standards.
10. The number of accessible parking spaces represents a shortfall compared to the City of Toronto Zoning By-law 569-2013, as Amended, and will be reviewed through the on-going application process.
11. Based on the parking supply of 68 resident spaces and 42 non-resident spaces, the current development plans illustrate 68 resident spaces (100% of the resident supply) and 13 non-resident spaces (approximately 30% of the non-resident supply) that will provide energized outlets with Level 2 charging or higher, which meets and exceeds the TGS V4.0's AQ1.2 standard.



Bicycle Parking Considerations

12. Application of the former City of Toronto Zoning By-law 438-86 to the proposed development results in a minimum requirement of 200 bicycle parking spaces (consisting of 160 long-term spaces and 40 short-term spaces). The development site is designated as Bicycle Zone 1. Application of Zoning By-law 569-2013, as Amended and TGS Version 4, Tier 1 minimum bicycle parking requirements to the development site results in 648 spaces (including 530 long-term bicycle parking spaces and 118 short-term bicycle parking spaces).
13. The current development plan illustrates a total of 648 bicycle parking spaces, including 530 long-term spaces and 118 short-term spaces located on the ground floor and P1 parking levels. The proposed bicycle parking supply for the site meets the specified requirements as per City of Toronto Zoning By-law 569-2013, as Amended and TGS Version 4 (Tier 1).
14. Long-term spaces will be located within the underground garage in a weather-protected, secure area and will be accessible via a dedicated bicycle ramp. Short-term spaces will be located at publicly accessible areas at-grade and will be well-signed to encourage visitors and other short-term users to travel by bike to / from the development site.
15. The current development plans illustrate 80 long-term bicycle parking spaces (15% of the long-term supply) that will provide energized outlets adjacent to the bicycle rack or parking space, which meets the requirement of TGS v4.0's AQ 2.4. standard.

Loading Considerations

16. Application of the former City of Toronto Zoning By-law 438-86 to the proposed development results in a minimum requirement of one (1) Type B loading space and one (1) Type G loading space. Application of Zoning By-law 569-2013, as Amended to the proposed development results in a minimum requirement of one (1) Type B loading space and one (1) Type G loading space.
17. The current development plans illustrate one (1) Type B loading space and one (1) Type G loading space located within the building at-grade, for the residential and retail uses on the site. The provision of two loading spaces meets the minimum loading requirements of both the former City of Toronto Zoning By-law 438-86 and the current Zoning By-law 569-2013, as Amended. The configuration of the loading area will be reviewed through the site plan application process to confirm functionality.

Multi-Modal Travel Demand Forecasting

18. Existing travel mode shares are derived from a review of the 2016 Transportation Tomorrow Survey (TTS) and the current (2023) mode shares derived from multi-modal travel studies conducted by BA Group at several proxy locations within the Liberty Village area was conducted and compared to the TTS data.
19. A comparison of the 2016 and 2023 auto travel mode share between the two data sets suggests that the choice for travel via an automobile for residents in the area has declined in the order of 15-23% for peak direction travel and in the order of 50-55% for off-peak direction travel.
20. Considering the significant transit infrastructure being planned in the Liberty Village area, it is expected that mode shares will shift to reflect greater active transportation. The EA study by HDR anticipates a modal shift in the order of 4%-9% from auto driver to higher-order commuter transit.
21. The adopted future mode share for the auto and non-auto travel modes is derived from applying the resultant change in mode share derived from *Table 4-2 in the September 2021 Ontario Line Integrated TOC Exhibition Station Draft TIA* report to the observed current 2023 auto and non-auto mode shares.



22. As a result of the evolving transportation context in Liberty Village, auto travel mode share is expected to decrease by approximately 30%-38% for peak direction peak hour travel (i.e. outbound during the morning peak hour, and inbound during the afternoon peak hour).
23. Multi-modal forecasts have been derived from a selection of site person and vehicle trip generation rates based on BA Group's experience of comparable developments within the City of Toronto. These residential development sites are used as proxies and are considered to be representative of the evolving transportation context (i.e. access to higher-order transit) surrounding the proposed development.
24. The multi-modal travel demand forecasting methodology is outlined in three steps:
 - i. **Step 1** – Establish Person and Vehicle Trip Rates
 - ii. **Step 2** – Generate Gross Person and Vehicle Trips
 - iii. **Step 3** – Calculate Multi-Modal Trips
25. The site will generate in the order of 270 and 325 two-way person trips during the weekday morning and afternoon peak hours, respectively.
26. The site is forecast to generate 198 and 254 two-way non-auto person trips during the weekday morning and afternoon peak hours, respectively. Of these trips, 115 and 100 are anticipated to travel to and from the site by transit modes during the weekday morning and afternoon peak hours, respectively.
27. The proposed site will generate in the order of 73 and 144 two-way walking trips during the weekday morning and afternoon peak hours, respectively.
28. The proposed site will generate in the order of 10 two-way cycling trips during both the weekday morning and afternoon peak hours.
29. In the order of 72 and 71 two-way person trips are forecast to travel by auto modes to and from the site during the weekday morning and afternoon peak hours, respectively.
30. Vehicle trips have been assigned to the area street network based on observed travel distributions to and from residential uses to the east of the site derived from StreetLight data. Transit trips have been assigned to the area transit stops in the area network based on observed travel distributions to and from the Liberty Village area derived from 2016 Transportation Tomorrow Survey data with adjustments to reflect the new King-Liberty SmartTrack Station and Exhibition Ontario Line Station.

Area Background Growth

31. The background developments have been divided into two groups: "within study area" and "outside study area". Multi-modal traffic allowances have been made for background developments that belong to the former group; those closer to the site, since active transportation modes have a smaller radius of impact. Only vehicle traffic allowances have been made for background developments belonging to the latter group; those just beyond the study area, due to the larger influence area for vehicle traffic passing through the study area.

Vehicular Traffic Considerations

32. Existing baseline traffic volumes were established at intersections and driveways within the study area for the weekday morning and afternoon peak periods generally using traffic count information obtained from surveys undertaken by Spectrum Traffic Data Inc. It should be noted that the traffic counts were conducted during two time periods; recently in June 2023 (for the immediate area surrounding the site) and 2016-2021 (for the wider area).



33. The review of the historical intersection traffic data indicates that there has been minimal sustained growth in traffic levels along the King Street West, Dufferin Street and Strachan Avenue corridors over the time periods reviewed. Based on the foregoing and given the extensive list of background developments that were considered, no additional general corridor growth has been applied to the arterial corridors.
34. Traffic allowances were made for other specific proposed developments in the area, based on a review of the City of Toronto's list of current development projects as of July 2023. These sites have either active development applications, have been approved, or are currently under construction.
35. The residential travel patterns for the forecast vehicular site traffic have been derived from StreetLight origin-destination data collected between the periods from March 1, 2019 to April 30, 2019 and September 1, 2019 to October 31, 2019. New site traffic assignment reflects turning restrictions on the area street network (i.e. left-turn restrictions on King Street West during weekday peak periods only).
36. Future total traffic volumes were established by adding site generated traffic to future background traffic volumes.
37. The Liberty Village Draft Public Realm Strategy dated June 2022 includes a direction to undertake a separate study related to Liberty New Street. On this basis, a sensitivity analysis has been included to assess the impact of traffic redistribution afforded by this new infrastructure. *Appendix C4 in the September 2021 HDR TIA report for the Ontario Line TOC* provides an estimate for the diversion of traffic volumes with Liberty New Street in the weekday morning and afternoon peak hours which have been adopted for this sensitivity analysis.

Traffic Operations Analysis

Local Study Area Unsignalized Intersections

38. Under existing conditions, the study area unsignalized intersections and site driveways operate under acceptable urban conditions. Under future background conditions, with the addition of area background development traffic, the study area unsignalized intersections and the site driveways will continue to operate under acceptable urban conditions. The westbound movement will become busier along East Liberty Street with only 1 lane each direction, particularly in the afternoon peak hour at its intersection with Pirandello Street (LOS D).
39. Under future total conditions, with the addition of site traffic, the study area unsignalized intersections will continue to operate under acceptable urban conditions with LOS C or better.
40. New site related traffic has a minor impact on area unsignalized intersections with no change to the level of service relative to future background conditions other than at the new private laneway connections. While other intersection movements will operate with LOS C, the westbound movement along East Liberty Street at Pirandello Street will be busier with LOS E.
41. The anticipated 95th percentile queues within the local study area network can be accommodated within the available lane storage without undue queue overflow impacts to downstream intersections.

Wider Study Area Signalized Intersections

42. Under existing conditions, all study area signalized intersections operate acceptably during the weekday morning and afternoon peak hours with overall intersection v/c ratios of 0.56 and 0.59 or better during the weekday morning and afternoon peak hours, respectively. It should be noted that with the recent completion of various background condominium buildings around the Strachan Avenue / East Liberty Street intersection, pedestrian crossing volumes have significantly increased, particularly across the west leg of the intersection.



43. Under future background conditions, with the addition of area background development traffic, study area signalized intersections will continue to operate acceptably with overall intersection v/c ratios of 0.73 and 0.81 or better during the weekday morning and afternoon peak hours, respectively. The southbound right and northbound left turns at Strachan Avenue / East Liberty Street will become busy relative to existing conditions given the increased activity of background traffic.
44. Under future total conditions, with the addition of site traffic, the study area signalized intersections will continue to operate acceptably with overall intersection v/c ratios of 0.73 and 0.92 or better during the weekday morning and afternoon peak hours, respectively. However, the high pedestrian crossing volume on the west leg of Strachan Avenue / East Liberty Street and additional traffic lead to greater impact at the intersection, particularly for the southbound right, northbound left and eastbound movements.
45. The baseline analysis indicates that the key intersection of Strachan Avenue / East Liberty Street / Ordnance Street will become busy but continue to operate under capacity given future conditions. The potential diversion opportunity provided by the Liberty New Street under future conditions can help alleviate operating conditions at the intersection even if no additional infrastructure improvements are made to the area street network.

Wider Study Area Unsignalized Intersections

46. Under existing conditions, the study area unsignalized intersections operate under acceptable urban conditions.
47. Under future background conditions, with the addition of background development traffic, the study area unsignalized intersections will continue to operate under acceptable urban conditions with level of service LOS D or better.
48. Under future total conditions, with the addition of site traffic, the study area unsignalized intersections will continue to operate under acceptable urban conditions with level of service LOS D or better. The busier westbound movement at Atlantic Street / Snooker Street will operate acceptably with level of service LOS E with the addition of site traffic.

Queue Considerations

Strachan Avenue / Wellington Street West

49. Under existing conditions, the 95th percentile queue length in the westbound left-turn lane extends beyond the storage length, for parts of the signal cycle but clears on every cycle. Under future background and future total conditions, the 95th percentile queue length will continue to extend beyond the storage length. The impact of site traffic is approximately one vehicle length.

Strachan Avenue / East Liberty Street

50. Under existing conditions, the 95th percentile queue length in the eastbound left-turn lane extends beyond the storage length, for parts of the signal cycle but clears on every cycle. Under future background and future total conditions, the 95th percentile queue length will continue to extend beyond the storage length. The impact of site traffic is approximately one vehicle length.

Under existing conditions, the 95th percentile queue lengths in the northbound left-turn lane and southbound right-turn lane do not extend beyond the storage length. However, with the addition of area background traffic allowances under future background conditions, the 95th percentile queue length will extend beyond the storage length, for parts of the signal cycle, but will clear on every cycle. Under future total conditions, the 95th percentile queue length will continue to extend beyond the storage length. The impact of site traffic is approximately one vehicle length.



Unsignalized Intersections

51. All anticipated queues at area unsignalized intersections can be accommodated by the available existing storage lengths on the road network.

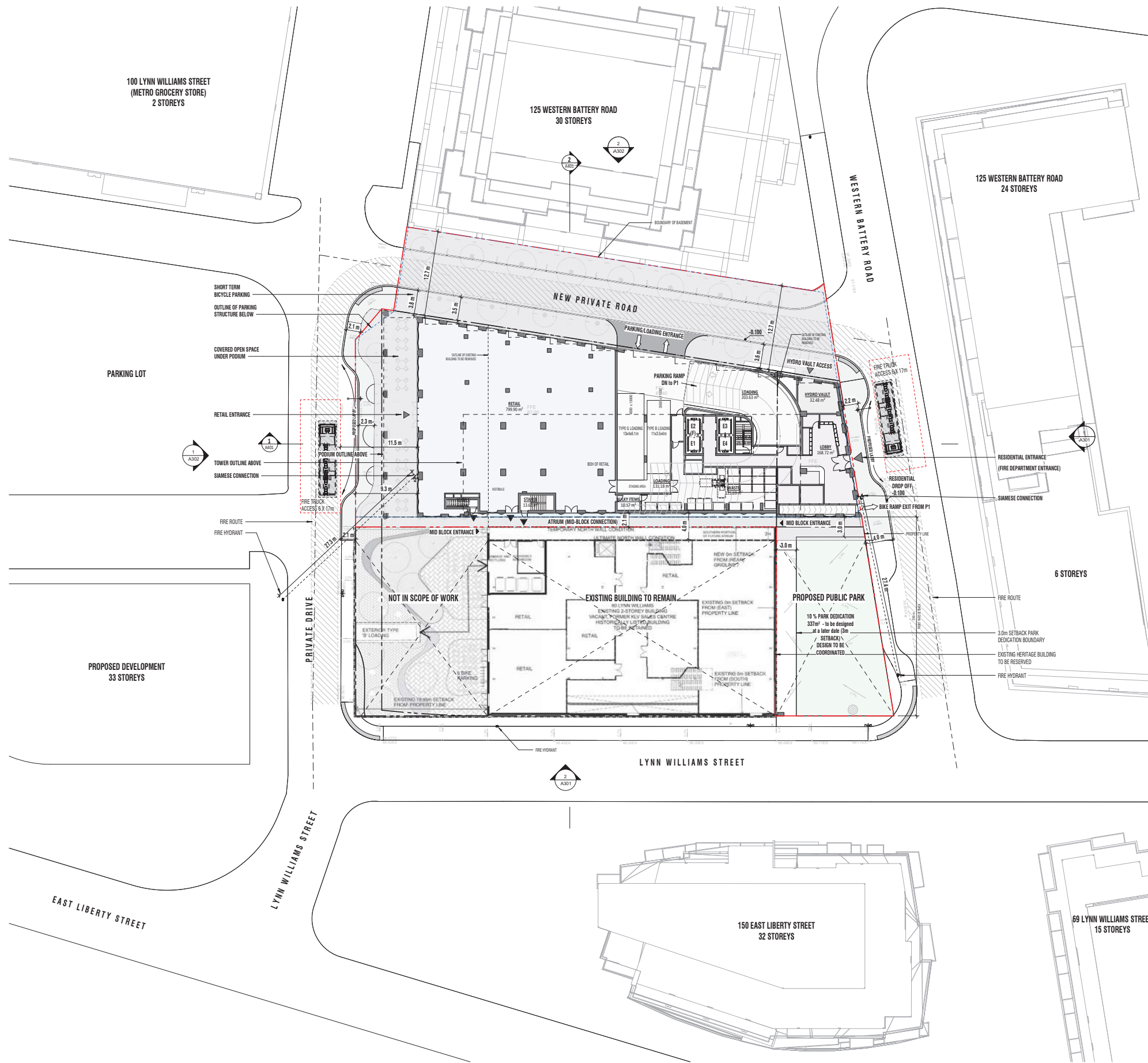
Sensitivity Analysis

52. Several potential road network improvements have been considered to address capacity constraints which emerge under future background conditions. Although these potential improvements address the capacity constraints in the short-term, they should be considered in the context of the evolving transportation system in the Liberty Village area in relation to future improvements to transit service, active transportation, and the road network.
53. With the planned construction of Liberty New Street, the road network is expected to become more balanced with alternate routing options provided via Dufferin Street and Strachan Avenue such that the potential intersection improvements may not be required.
54. Sensitivity analysis was conducted on the East Liberty Street / Liberty Street corridor with the considered optimizations and improvements, including the consideration of the traffic diversions offered by Liberty New Street. The resultant analysis shows improved area intersection operations along the East Liberty / Liberty corridor.



Appendix A: Reduced Architectural Plans





SITE PLAN LEGEND

- XXX.XX PROPOSED ELEVATION
- XXX.XX EX EXISTING ELEVATION
- XXX.XX AD AREA DRAINAGE
- XXX.XX SW STORM WATER
- XXX.XX CB CATCH BASIN
- PROPERTY LINE - SUBJECT SITE BOUNDARY
- PREVIOUS LOT BOUNDARIES
- PROPERTY LINE EASEMENT
- FIRE TRUCK ROUTE
- PARKING STRUCTURE BELOW
- LOBBY
- WOOD AMENITY
- WASTE
- RETAIL
- HYDRO VAULT
- LOADING / MOVING / RAMP
- ▲ MAIN RES ENTRANCE
- ▲ RES ENTRANCE
- ▲ NON-RES ENTRANCE
- ▲ EXIT
- ▲ VEHICULAR ENTRANCE/EXIT
- ▲ FIRE HYDRANT
- ▲ SIAMENSE CONNECTION
- STREET LIGHT
- PEDESTRIAN LIGHT
- BOLLARD LIGHT
- BOLLARDS
- BICYCLE SHARING STATION
- BIKE RING
- PROPOSED CANOPY TREE
- EXISTING TREE
- EXISTING TREE TO BE PROTECTED
- PROPOSED UNDERSTOREY TREE
- GRASSES AND SHRUBS
- HIGH ALBEDO PAVEMENT
- CONCRETE PAVING
- CONCRETE PAVING
- REFER TO LANDSCAPE PLAN FOR HARDSCAPE AND PLANTING DETAILS

SITE PLAN LEG

- PROPE
- SETBA
- FIRE T
- PARKS
- ▲ MAIN F
- ▲ RES E1
- ▲ NON-F
- ▲ EXIT
- ▲ VENC
- PROP

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GENERAL NOTES:

- Drawings are not to be scaled. Contractor will verify all existing conditions and dimensions required to perform the Work and will report any discrepancies with the Contract Documents to the Architect before commencing work.
- The Architectural Drawings are to be used in conjunction with all other Contract Documents including the Project Manual and the Structural, Mechanical and Electrical Drawings. In cases of difference between the Contract Documents with respect to the quality, time or scope of work, the greater shall apply.
- Portions of Report or Schematic Mechanical or Electrical Drawings, Notes and Tables are indicated on the Architectural Drawings. Locations shown on the Architectural Drawings shall govern over Mechanical and Electrical Drawings. Mechanical and Electrical Notes not clearly located will be located as directed by the Architect.
- Dimensions indicated on these sheets shall be taken from the faces of finished surfaces unless otherwise noted.
- The Architect has not been retained for supervision of construction and assumes no responsibility for means, methods and techniques of construction.
- These documents are not to be used for construction unless specifically noted for each purpose.

NOTES

- A TRAINED ON-SITE STAFF MEMBER MUST BE AVAILABLE TO MANEUVER BINS FOR THE COLLECTION VEHICLE AND TO ACT AS A FLAGMAN WHEN THE TRUCK IS REVERSEING. IN THE EVENT THE ON-SITE STAFF MEMBER IS UNAVAILABLE AT THE TIME THE CITY COLLECTION VEHICLE ARRIVES AT THE SITE, THE COLLECTION VEHICLE WILL LEAVE THE SITE AND NOT RETURN UNTIL THE NEXT SCHEDULED COLLECTION DAY.
- TYPE G LOADING IS TO MINIMIZE VERTICAL CLEARANCE. MINIMUM 200mm THICK REINFORCED CONCRETE SLAB IN LOADING SPACE AND STAGING AREA. FLOOR GRADE NOT TO EXCEED +0.75.
- THE OVERHEAD DOOR ADJACENT TO THE TYPE G LOADING AREA WILL BE OPEN UPON THE ARRIVAL OF THE TRUCK TO ALLOW IT TO REVERSE FROM THE TYPE G LOADING AREA ENOUGH TO EXIT THE SITE IN A FORWARD MOTION.
- A WARNING SYSTEM IS TO BE PROVIDED TO CAUTION MOTORISTS LEAVING THE PARKING GARAGE OF HEAVY VEHICLES WHEN LOADING SYSTEM TO INCLUDE LIGHTS AND SIGNS.
- ALL ACCESS DRIVEWAYS TO BE USED BY THE COLLECTION VEHICLE TO HAVE A MAXIMUM GRADIENT OF 8%, HAVE A MINIMUM VERTICAL CLEARANCE OF 4.6 METERS THROUGHOUT, A MINIMUM WIDTH OF 4.3 METERS THROUGHOUT AND BE 6 METERS WIDE AT POINT OF ADDRESS AND EXPRESS.
- PROPOSED ACCESS ROUTE FOR WASTE COLLECTION VEHICLE TO HAVE MINIMUM 4.6 VERTICAL CLEARANCE THROUGHOUT AND DESIGNED TO SAFELY SUPPORT 20000kg.
- STRUCTURAL ENGINEER TO DESIGN AREA TO CONFORM AS FOLLOWS: (A) DESIGN CODE - ONTARIO BUILDING CODE (B) DESIGN LOAD - CITY TRUCK LEFT VEHICLE IN ADDITION TO BUILDING CODE REQUIREMENTS (C) IMPACT FACTOR - 8% FOR MAX. VEHICULAR SPEEDS TO 35KM/H AND 30% FOR HIGHWAY SPEEDS.
- NON-RESIDENTIAL COMPONENT WILL ONLY SCHEDULE USE OF THE TYPE G LOADING SPACE ON SPHERENT DAYS FROM THE COLLECTION DAYS OF THE RESIDENTIAL COMPONENT TO INSURE THAT THE TYPE G LOADING SPACE WILL BE VACANT FOR CITY WASTE COLLECTION.
- 4 FIRE ACCESS ROUTE MIN. 6m WIDE WITH 5m HEIGHT CLEARANCE. CHANGE IN GRADIENT NOT MORE THAN 1% IN 5m. LOAD SUPPORT SUFFICIENT FOR EQUIPMENT SURFACE TO BE ACCESSIBLE IN ALL CLIMATIC CONDITIONS FOR ALL TRUCK DIMENSION MOVEMENT REFER TO TRAFFIC CONSULTANT REPORT - PATH SHOWN FOR CONTEXT.
- FIRE ACCESS ROUTE MIN. 6m WIDE WITH 5m HEIGHT CLEARANCE. CHANGE IN GRADIENT NOT MORE THAN 1% IN 5m. LOAD SUPPORT SUFFICIENT FOR EQUIPMENT SURFACE TO BE ACCESSIBLE IN ALL CLIMATIC CONDITIONS FOR ALL TRUCK DIMENSION MOVEMENT REFER TO TRAFFIC CONSULTANT REPORT - PATH SHOWN FOR CONTEXT.
- BE ADVISED THAT SHOULD ANY PARTY INCLUDING THE OWNER OR ANY SUBSEQUENT OWNER, APPLY FOR MORE THAN ONE CONDOMINIUM CORPORATION COMPROMISING ANY OR ALL OF THIS DEVELOPMENT OR MAKE AN APPLICATION THAT RESULTS IN A LAND DIVISION, THAT ANY REQUIRED LEGAL ASSURANCES, INCLUDING BUT NOT LIMITED TO EASEMENTS, WITH RESPECT TO THE APPOINTED SERVICES, SUCH ASSURANCES WILL BE DETERMINED AT THE TIME OF APPLICATION FOR CONDOMINIUM APPROVAL.
- VENTILATION GRATING TO HAVE A POROSITY OF LESS THAN 20mm x 20mm OR 40mm x 10mm.

BICYCLE PARKING			
LEVEL	BIKE PARKING		TOTAL
	LONG-TERM	SHORT-TERM	
P1	500	0	500
Level 1	0	118	118
	500	118	618

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55 SSSINGTON AVE. SUITE 100
Toronto, ON, Canada M5J 2Y9
416 915 1791

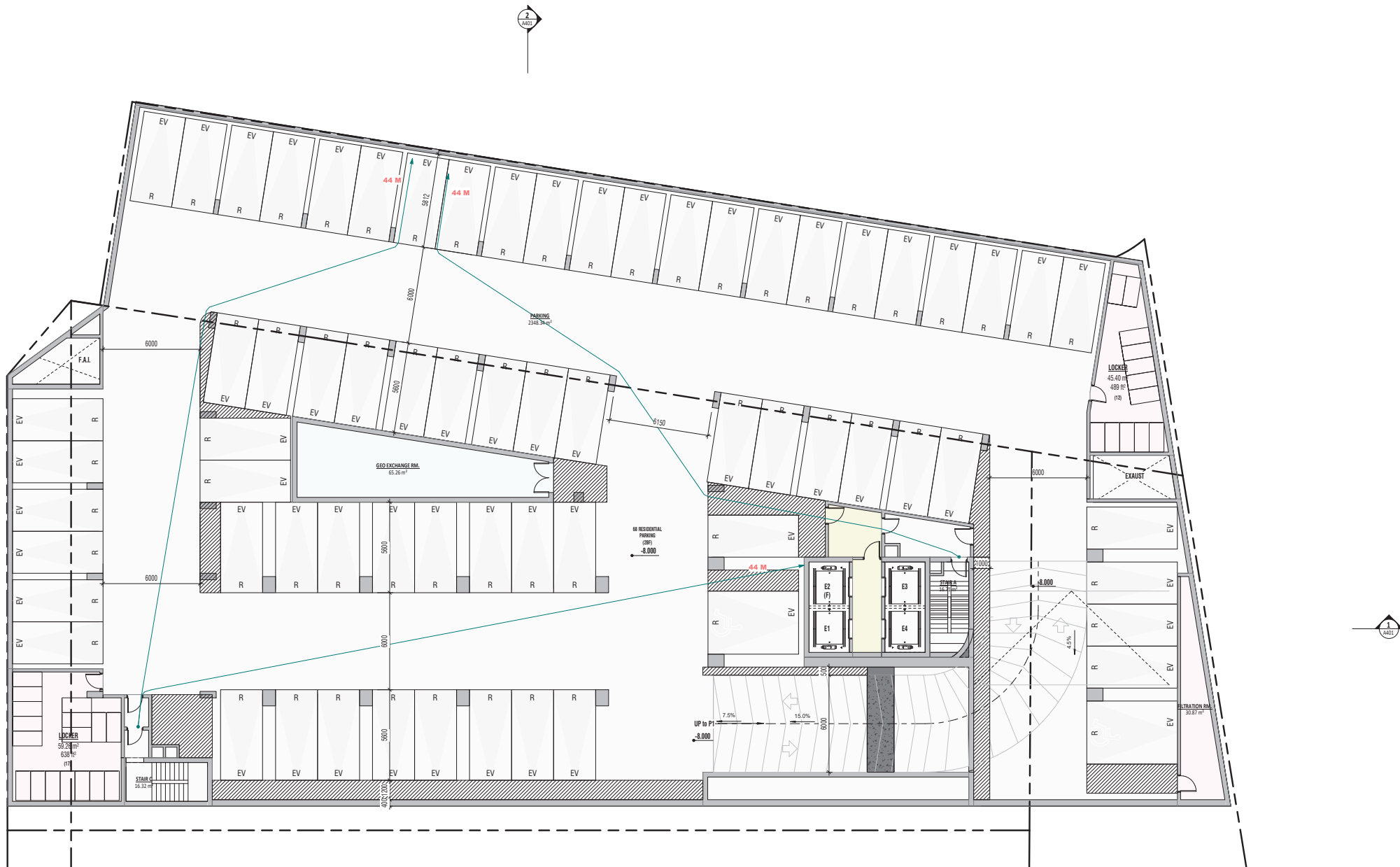
86 LYNN WILLIAMS STREET

TORONTO



SCALE As indicated
PROJECT NO. 201803
ISSUE DATE 12/22/22

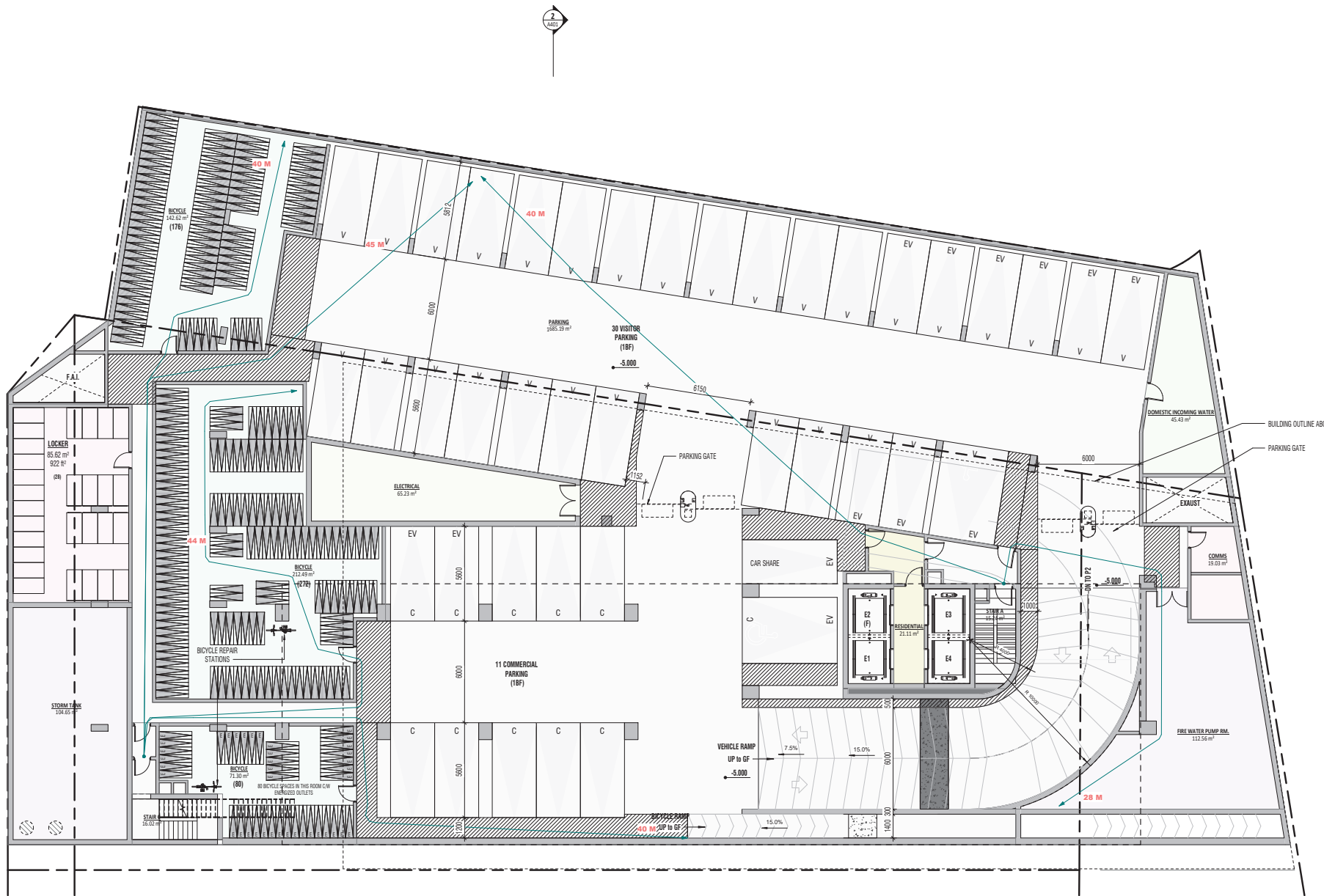
**GROUND FLOOR
SITE PLAN**



- PARKING PLAN NOTES**
- All residential parking spaces provided for dwelling units located in an apartment building, mixed use building, multiple dwelling unit building, excluding visitor parking spaces, will include an energized outlet capable of providing Level 2 charging or higher to the parking space. Specialty which strategy is used: a dedicated electrical outlet, microblock, or EVSE supplied by a separate branch circuit or using Electric Vehicle Energy Management Systems (EVEMS) load sharing technologies.
 - 25% of all visitor residential spaces and non-residential parking spaces in a building must include an energized outlet capable of providing Level 2 charging or higher.
 - Level 2 Charging means a Level 2 electric vehicle charging level as defined by SAE International's J1772 standard, as amended (208V to 240V single-phase power, with maximum current of 80A).
 - Energized Outlet means a connected point in an electrical wiring installation at which current is taken to supply utilization equipment for electric vehicle charging.

Level	S.1 CAR PARKING												Total Car Parking	
	Residential Car Parking			Visitor Car Parking			Retail Car Parking			Car Share Parking	Total			
	Regular	Barrier-Free	Total	EVSE (100%)	Regular	Barrier-Free	Total	EVSE (25%)	Regular			Barrier-Free		Total
P1	0	0	0	0	29	1	30	9	10	1	11	3	11	42
P2	66	2	68	68	0	0	0	0	0	0	0	0	0	68
TOTAL	66	2	68	68	29	1	30	9	10	1	11	3	11	110

LEVEL	BICYCLE PARKING	
	LONG-TERM	SHORT-TERM
	P1	0
P2	0	118
TOTAL	0	118



- PARKING PLAN NOTES**
- All residential parking spaces provided for dwelling units located in an apartment building, mixed use building, multiple dwelling unit building, excluding visitor parking spaces, will include an energized outlet capable of providing Level 2 charging or higher to the parking space. Specify which strategy is used: a dedicated electrical outlet, microblock, or EVSE supplied by a separate branch circuit or using Electric Vehicle Energy Management Systems (EVEMS) load sharing technologies.
 - 25% of all visitor residential spaces and non-residential parking spaces in a building must include an energized outlet capable of providing Level 2 charging or higher.
 - Level 2 charging means a Level 2 electric vehicle charging level as defined by SAE International's J1772 standard, as amended (208V to 240V single-phase power, with maximum current of 60A).
 - Energized Outlet means a connected point in an electrical wiring installation at which current is taken to supply utilization equipment for electric vehicle charging.

Level	S.1 CAR PARKING												Total Car Parking	
	Residential Car Parking			Visitor Car Parking			Retail Car Parking			Car Share Parking	Total			
	Regular	Barrier-Free	Total	Regular	Barrier-Free	Total	Regular	Barrier-Free	Total					
P1	0	0	0	0	29	1	30	9	10	1	11	3	11	42
P2	66	2	68	68	0	0	0	0	0	0	0	0	0	68
TOTAL	66	2	68	68	29	1	30	9	10	1	11	3	11	110

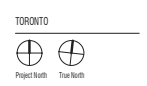
LEVEL	BICYCLE PARKING	
	LONG-TERM	SHORT-TERM
P1	100	6
P2	0	119
TOTAL	100	119

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55 OSSINGTON AVE. SUITE 100
Toronto, ON, Canada M5J 2Y9
416 915 1791

86 LYNN WILLIAMS STREET



SCALE: As indicated
PROJECT NO. 201803
ISSUE DATE: 12/22/22

**LEVEL P1
FLOOR PLAN**

1.0 SUMMARY

SITE AREA	TOTAL	3315.2 m ²
(BLOCK 11 - PART 1)	1790.3 m ²	
(BLOCK 11 - EXTENSION)	352.8 m ²	
(BLOCK 2 - PART 2)	834.8 m ²	
PARK DEDICATION (10%)	337.3 m ²	

TOTAL GFA - 34,192 m²
FSI - 10.31
NEW RESIDENTIAL UNITS - 588

3.0 FLOOR AREA

2.2 FLOOR AREA									
Level	GCA/Level (m ²)	Total GCA (m ²)	GFA Deductions (m ²)	Total GFA (m ²)	Residential GFA (m ²)	Retail GFA (m ²)	Leasable (m ²)	Indoor Amenity (m ²)	Outdoor Amenity (m ²)
P2	2,731	2,731	2,708	22	22	0	0	0	0
P1	2,691	2,691	2,670	21	21	0	0	0	0
	5,422	5,422	5,378	43	43	0	0	0	0

ABOVE-GRADE									
Level	1,593	1,593	624	969	169	800	800	0	0
Level 2	1,774	1,703	454	1,250	1,250	0	1,093	293	0
Level 3-4	1,774	3,549	740	2,808	2,808	0	2,376	586	0
Level 5-6	1,774	3,549	154	3,394	3,394	0	2,825	0	0
Level 7	780	925	298	717	717	0	498	127	919
Level 8-16	794	7,143	698	6,445	6,445	0	5,774	0	0
Level 17-42	794	20,636	2,084	18,551	18,551	0	16,679	0	0
Level 43	414	414	400	14	14	0	0	179	366
MPH	324	324	324	0	0	0	0	0	0
	10,021	39,835	5,687	34,148	33,349	800	29,845	1,188	1,285

GRAND TOTAL	Total GCA (m ²)	GFA Deductions (m ²)	Total GFA (m ²)	Residential GFA (m ²)	Retail GFA (m ²)	Leasable (m ²)	Indoor Amenity (m ²)	Outdoor Amenity (m ²)
	45,257	11,865	34,192	33,392	800	29,845	1,188	1,285

3.2 RESIDENTIAL UNITS

Level	New Residential				Total Units
	Studio	1B	1B+D	2B	
P2	0	0	0	0	0
P1	0	0	0	0	0
Level 1	0	0	0	0	0
Level 2	4	5	1	0	10
Level 3-4	8	12	0	2	22
Level 5-6	8	12	0	2	22
Level 7	1	6	1	3	11
Level 8-16	9	81	9	27	126
Level 17-42	26	280	0	52	358
Level 43	0	0	0	0	0
MPH	0	0	0	0	0

Unit Type	Studio	1B	1B+D	2B	3B	TOTAL
No. Units	56	376	11	86	50	588
Unit Mix	9%	64%	2%	15%	10%	100%
Total Area (m ²)	2118.81 m ²	16690.32 m ²	511.82 m ²	4823.00 m ²	4718.14 m ²	22872.10 m ²
Total Area (SF)	22807 SF	179790 SF	5509 SF	52091 SF	50796 SF	311853 SF
Average Size	401 SF	468 SF	493 SF	607 SF	857 SF	521 SF

3.3 BF UNITS - BREAKDOWN

Level	1B+D (BF)	2B (BF)	3B (BF)
Level 2	1	0	0
Level 3-4	2	2	0
Level 5-6	2	4	0
Level 7	1	0	0
Level 8-16	2	1	0
Level 17-42	26	27	0
Grand total	33	26	0

4.0 AMENITY

4.1 AMENITY				
Total Units	Amenity			
588	Outdoor	Outdoor / Unit	Indoor	Indoor / Unit
	1285.14 m ²	2m ² /Unit	1185.94 m ²	2m ² /Unit

5.0 PARKING

5.1 CAR PARKING														
Level	Residential Car Parking			Visitor Car Parking			Retail Car Parking			Car Share Parking	Total Car Parking			
	Regular	Barrier-Free	Total	Regular	Barrier-Free	Total	Regular	Barrier-Free	Total					
P1	0	0	0	0	29	1	30	9	10	1	11	3	1	42
P2	66	2	68	68	0	0	0	0	0	0	0	0	0	68
TOTAL	66	2	68	68	29	1	30	9	10	1	11	3	1	110

Car Parking Rates

- 0.05 Visitor Parking Spaces
- 0.28 Resident Parking Spaces per Unit
- All parking spaces marked with an 'EV' to be supplied with an energized outlet capable of providing Level 2 charging or higher

6.0 STORAGE

6.1 LOCKERS	
LEVEL 2	28
LEVEL 3	28
LEVEL 4	28
LEVEL 5	80
LEVEL 6	80
P1	28
P2	29
	301

2.0 BUILDING HEIGHTS

Tower: 135.8 m (43 Storeys)
Mechanical Penthouse: 7.7 m
TOTAL: 143.5 m

7.0 LOADING

7.1 LOADING		
Level	Count	Type
Level 1	1	LOADING - TYPE 'G'
Level 1	1	LOADING - TYPE 'G'

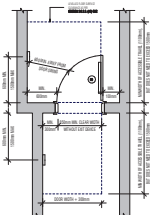
8.0 WASTE

8.1 WASTE STORAGE AREA		
Level	Area Type	Area
Level 1	WASTE	125.69 m ²

BARREER FREE DOORS

GENERAL NOTES:

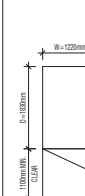
- ALL DOORS IN BARREER FREE PATH OF TRAVEL MAINTAIN THE MINIMUM CLEARANCES NOTED IN THE DIAGRAMS AS PER DOC. SEC. 3.8.3.3 UNLESS EQUIPPED WITH AUTOMATIC DOOR OPENERS.
- COORDINATE ALL DOOR THRESHOLD AND DOOR THICKNESS TO MAINTAIN A MINIMUM BARREER FREE PATH OF TRAVEL AS NOTED IN THE DIAGRAMS AS PER DOC. SEC. 3.8.3.3.
- ALL DOORS THAT OCCUR IN A BARREER FREE PATH OF TRAVEL ARE TO BESESS A LOWER TYPE DOOR HANDLES THAT MEET THE REQUIREMENTS OF THE DOC.
- THRESHOLD IN A BARREER FREE PATH OF TRAVEL TO BE MAXIMUM 13MM HIGH.



STORAGE LOCKERS

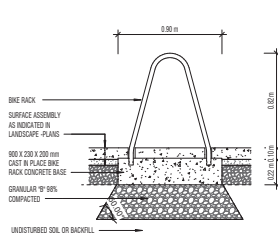
*TYPICAL STORAGE LOCKER

1830MM X 1200MM UNLESS OTHERWISE NOTED

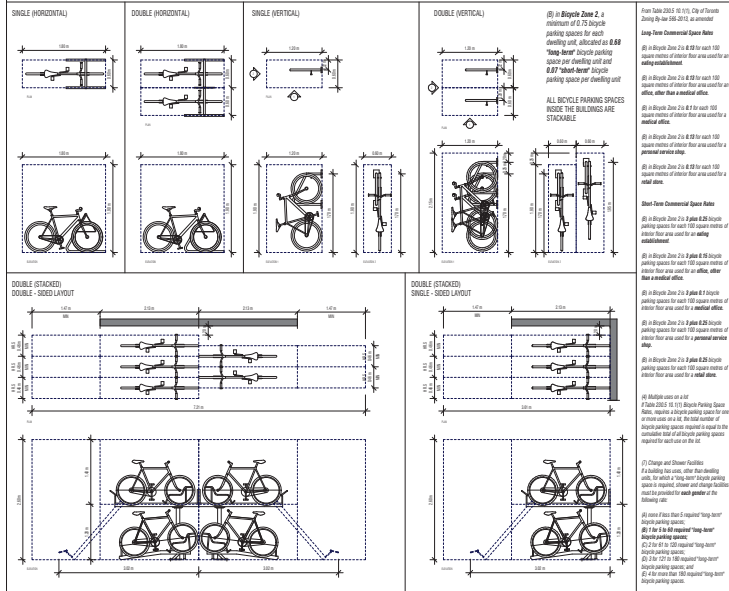


SHORT-TERM BICYCLE PARKING: TYPICAL BICYCLE RING AT GRADE

BICYCLE PARKING LAYOUTS ARE DESIGNED TO COMPLY WITH CITY OF TORONTO REGULATIONS FOR THE DESIGN AND MANAGEMENT OF BICYCLE PARKING FACILITIES



BICYCLE STORAGE



PARKING LEGEND & NOTES

NOTE: ALL PARKING LEVELS MUST COMPLY WITH THE REQUIREMENTS OF THE TORONTO MUNICIPAL CODE CHAPTELRON PROPERTY CHARGES

GENERAL MAINTENANCE: THE WALLS, FLOOR, CEILING AND COLUMNS SHALL BE MAINTAINED FREE OF MOULDS, SPILLS, OR CRACKS, AND KEPT CLEAN BY PERIODIC BRUSHING, MOPPING AND WAXING. ALL EXTERIOR WALLS AND COLUMNS SHALL BE PAINTED WHITE FROM A LEVEL OF 20 INCHES ABOVE THE FLOOR TO THE CEILING AND EVERY OTHER WALL SHALL BE PAINTED WHITE. WALLS FROM SLAB LEVEL TO 24 INCHES SHALL BE PAINTED BLACK.

LIGHTING STANDARDS: PROVIDE ILLUMINATION BY ARTIFICIAL MEANS AT A MINIMUM MAINTENANCE LEVEL OF ILLUMINATION OF FIVE FOOT CANDLES (54 LUX) AT LEVELS OF ILLUMINATION IN WHICH THE UNIFORMITY RATIO DOES NOT EXCEED 4:1.

PROTECTION AND CLEANING OF LIGHTING FIXTURES: ALL LIGHTING FIXTURES SHALL BE PROTECTED FROM DAMAGE BY THE PRESENCE OF REQUIRED WAREHOUSES OR OTHER SUITABLE MEANS OF PROTECTION AND SHALL BE MAINTAINED IN A CLEAN CONDITION.

FIREWORKS ON REQUIRED EXIT DOORS: EVERY EXIT DOOR SHALL OPEN IN THE DIRECTION OF EGRESS FROM THE GARAGE WITHOUT THE USE OF A KEY OR OTHER DEVICE AND EQUIPPED WITH A LATCHING DEVICE THAT WILL RELEASE THE DOOR AND ALLOW THE DOOR TO OPEN FULLY WHEN A FORCE OF NOT MORE THAN 20 POUNDS IS APPLIED TO THE DEVICE IN THE DIRECTION OF EXIT TRAVEL.

FIREWORKS ON ENTRANCE DOORS: EVERY ACCESS DOOR SHALL BE EQUIPPED WITH A LATCH THAT WILL PREVENT ENTRY TO THE GARAGE EXCEPT BY THE USE OF A KEY, COORD CARD OR SIMILAR DEVICE AND A SELF-CLOSING DEVICE DESIGNED TO WITHDRAW THE DOOR TO THE CLOSED AND LATCHED POSITION AFTER EACH USE.

NOTES: LARGE GATE EXIT ARRANGING USE DRAWING SHALL BE DISPLAYED ON SAFE-EXIT DOOR 1.500 MILLIMETER ABOVE THE FLOOR, MEASURED FROM THE CENTER OF THE DOOR TO THE CENTER WITH THE ARROW POINTING DOWN.

SMALL GATE EXIT ARRANGING USE DRAWING: SHALL BE PROMINENTLY DISPLAYED ON COLUMNS OR WALLS 1.500 MILLIMETER ABOVE THE FLOOR, MEASURED FROM THE TOP OF THE SIGN TO THE FLOOR, ON THE BASIS OF ONE ALLEY 1500 MM HIGH IS PROVIDED ABOVE THE FLOOR, WITH THE BEST SIGNS BEING ONLY DISTRIBUTED IN THE GARAGE AND IN ANY EVENT BEING NO CLOSER THAN 20 METRES APART FROM EACH OTHER.

SMALL GATE EXIT ARRANGING USE DRAWING: SHALL BE PROMINENTLY DISPLAYED ON COLUMNS OR WALLS 1.500 MILLIMETER ABOVE THE FLOOR, MEASURED FROM THE TOP OF THE SIGN TO THE FLOOR, ON THE BASIS OF ONE ALLEY 1500 MM HIGH IS PROVIDED ABOVE THE FLOOR, WITH THE BEST SIGNS BEING ONLY DISTRIBUTED IN THE GARAGE AND IN ANY EVENT BEING NO CLOSER THAN 20 METRES APART FROM EACH OTHER.

CONCRETE NUMBER

- CONCRETE NUMBER: IN ADDITION TO THOSE SHOWN ON PLANS, ARE TO BE INSTALLED AND MAINTAINED BY THE OWNER AT ALL RIGHT-ANGLED TURNS AND PROVIDED IN EACH DIRECTION TO PROVIDE MOTORISTS WITH CLEAR VIEWS OF OCCURRING TRAFFIC.
- SLOPED AROUND BASE OF COLUMNS AT PARKING LEVELS

ALERT SIGN

LARGE SAFE-EXIT SIGN

SMALL SAFE-EXIT SIGN

LEGEND

- GREY - CANADIAN GOVERNMENT SPEC. BOARD STANDARD PAINT COLOR NO. 501-210
- YELLOW - CANADIAN GOVERNMENT SPEC. BOARD STANDARD PAINT COLOR NO. 505-201
- WHITE - STANDARD PAINT COLOURS 1 - GP - 100
- BLACK - STANDARD PAINT COLOURS 1 - GP - 100
- GREEN - CANADIAN GOVERNMENT SPEC. BOARD STANDARD PAINT COLOR NO. 505-228
- HELVETICA BOLD CONDENSED

NOTE: PROVIDE AN ADDITIONAL SIGN ON EACH PARKING SPACE WITH AN OBSTRUCTION OCCUR BETWEEN THE FRONT AND REAR TIREM

ABBREVIATIONS:

- R - RESIDENTIAL PARKING STALL
- V - VISITOR PARKING STALL
- C - NON-RESIDENTIAL PARKING STALL
- EV - ELECTRIC VEHICLE SUPPLY EQUIPPED PARKING STALL

LOCAL SLOPE OF 2% IN THE SLAB AT THE BASE OF ALL INTERIOR WALLS TO BE PROVIDED WITH MIN. RISE OF 30MM AT THE BASE AS SHOWN HERE

Toronto Green Standard Version 4.0 Mid to High Rise Residential and All Non-Residential Development

General Project Description	Proposed
TOTAL GROSS FLOOR AREA	34,192 m ²
BREAKDOWN OF PROJECT COMPONENTS (m ²)	33,349 m ²
RESIDENTIAL	33,349 m ²
RETAIL	800 m ²
COMMERCIAL	N/A
INDUSTRIAL	N/A
INSTITUTIONAL / OTHER	N/A
TOTAL NUMBER OF RESIDENTIAL UNITS	588

Section 1: For Stand Alone Zoning Bylaw Amendment Applications and Site Plan Control Applications

Low Emissions Transportation	Required	Proposed	Proposed %
NUMBER OF PARKING SPACES	-	110	-
NUMBER OF PARKING SPACES WITH EVSE (RESIDENTIAL)	68 + 30 Visitor	68 + 30 Visitor	100%
NUMBER OF PARKING SPACES WITH EVSE (NON-RESIDENTIAL)	3	3 + 1 Car Share	33%
Cycle Infrastructure	Required	Proposed	Proposed %
NUMBER OF LONG-TERM BICYCLE PARKING SPACES (ALL-USES)	530	530	100%
NUMBER OF LONG-TERM BICYCLE PARKING (RESIDENTIAL AND ALL OTHER USES) LOCATED ON:			
A) FIRST STOREY OF BUILDING		0	0%
B) SECOND STOREY OF BUILDING		0	0%
C) FIRST LEVEL BELOW-GROUND		530	100%
D) SECOND LEVEL BELOW-GROUND		0	0%
E) OTHER LEVELS BELOW-GROUND		0	0%
NUMBER OF SHORT-TERM BICYCLE PARKING SPACES	118	118	100%
NUMBER OF SHOWER AND CHANGE FACILITIES	N/A	N/A	N/A
Tree Canopy	Required	Proposed	Proposed %
TOTAL SOIL VOLUME (40% OF THE SITE AREA + 66m ² X 30m ³)	523 m ³	648.8 m ³	>100%
SOIL VOLUME PROVIDED WITHIN THE SITE AREA (m ³)		648.8 m ³	
SOIL VOLUME PROVIDED WITHIN THE PUBLIC BOULEVARD (m ³)		0	

Section 2: For Site Plan Control Applications

Cycle Infrastructure	Required	Proposed	Proposed %
NUMBER OF SHORT-TERM BICYCLE PARKING SPACES (ALL USES) AT-GRADE OR ON FIRST LEVEL BELOW-GRADE	118	118	100%
NUMBER OF PUBLICLY ACCESSIBLE BICYCLE PARKING SPACES	118	118	100%
NUMBER OF ENERGIZED OUTLETS FOR ELECTRIC BICYCLES	80	80	100%
Tree Canopy	Required	Proposed	Proposed %
TOTAL SITE AREA (M2)		2,880 m ²	
TOTAL SOIL VOLUME (40% OF THE SITE AREA + 66 m ² X 30 m ³)	523 m ³	648.8 m ³	>100%
TOTAL NUMBER OF TREES PLANTED		19	
NUMBER OF SURFACE PARKING SPACES (IF APPLICABLE)		N/A	
NUMBER OF SHADE TREES LOCATED IN SURFACE PARKING AREA		N/A	
Landscaping & Biodiversity	Required	Proposed	Proposed %
TOTAL NON-ROOF HARDCAPE AREA (m ²)		1,541.8 m ²	
TOTAL NON-ROOF HARDCAPE AREA TREATED FOR URBAN HEAT ISLAND (MINIMUM RESIDENTIAL 75% OR NON-RESIDENTIAL 50%) (M ²)	1,156.35 m ²	1,349 m ²	>100%
AREA OF NON-ROOF HARDCAPE TREATED WITH: (INDICATE M ²)			
A) HIGH-ALBEDO SURFACE MATERIAL		1,349 m ²	100%
B) OPEN-GRID PAVEMENT		0 m ²	0%
C) SHADE FROM TREE CANOPY		0 m ²	0%
D) SHADE FROM HIGH-ALBEDO STRUCTURES		0 m ²	0%
E) SHADE FROM ENERGY GENERATION STRUCTURES		0 m ²	0%
PERCENTAGE OF LOT AREA AS SOFT LANDSCAPING (NON-RESIDENTIAL ONLY)		N/A	
TOTAL NUMBER OF PLANTS		19,445	
TOTAL NUMBER OF NATIVE PLANTS AND % OF TOTAL PLANTS	50%	100%	100%
AVAILABLE ROOF SPACE (M ²)		1,581.1 m ²	
AVAILABLE ROOF SPACE PROVIDED AS GREEN ROOF (M ²)	1,024.7 m ²	691.25 m ²	38.9%
AVAILABLE ROOF SPACE PROVIDED AS COOL ROOF (M ²)		N/A	
AVAILABLE ROOF SPACE PROVIDED AS SOLAR PANELS (M ²)		N/A	
Bird Collision Deterrence	Required	Proposed	Proposed %
TOTAL AREA OF GLAZING OF ALL ELEVATIONS WITHIN 15M ABOVE GRADE		1154 m ²	
TOTAL AREA OF TREATED GLAZING (MINIMUM 85% OF TOTAL AREA OF GLAZING WITHIN 15M ABOVE GRADE) (M ²)	981 m ²	1154 m ²	100%
PERCENTAGE OF GLAZING WITHIN 15M ABOVE GRADE TREATED WITH:			
A) VISUAL MARKERS		1154 m ²	100%
B) NON-REFLECTIVE GLASS		0 m ²	0%
C) BUILDING INTEGRATED STRUCTURES		0 m ²	0%

GREEN ROOF STATISTICS	REQUIRED	PROPOSED
GROSS FLOOR AREA, AS DEFINED IN GREEN ROOF BYLAW (m ²)		33,570 m ²
TOTAL ROOF AREA (m ²)		1,775 m ²
AREA OF RESIDENTIAL PRIVATE TERRACES (m ²)		76.2m ²
ROOFTOP OUTDOOR AMENITY SPACE, IF IN A RESIDENTIAL BUILDING (m ²)		0 m ²
AREA OF RENEWABLE ENERGY DEVICES (m ²)		0 m ²
TOWER(S) ROOF AREA WITH FLOOR PLATE LESS THAN 750 m ² (m ²)		0 m ²
TOTAL AVAILABLE ROOF SPACE (m ²)		1,775 m ²
GREEN ROOF COVERAGE	REQUIRED	PROPOSED
COVERAGE OF AVAILABLE ROOF SPACE (m ²)	1,024 m ²	691.25 m ²
COVERAGE OF AVAILABLE ROOF SPACE (%)	60%	38.9%

NOTE: Gross Floor Area, as defined in the Green Roof Bylaw (November 9, 2017) refers to the total area of each floor level of a building, above and below average grade, measured from the exterior of the main wall of each floor level, including voids at the level of each floor, such as an atrium, mezzanine, stairwell, elevator, ventilation duct or utility shaft, but excluding areas used for the purpose of parking or loading.

Appendix B: TTS Queries



Residential - Mode Split

AM Outbound

Wed Sep 30 2020 16:52:26 GMT-0400 (Eastern Daylight Time)

Frequency Distribution Query Form - Trip - 2016 v1.1

Field: Primary travel mode of trip - mode_prime

Filters:

Start time of trip - start_time In 600-859
and
Trip purpose of origin - purp_orig In H
and
2006 GTA zone of origin - gla06_orig In 89
and
Type of dwelling unit - dwell_type In 2

Table: Trip 2016

Row:	Count:	Expanded:			
Transit exc	97	2188	Transit	2295	39%
Cycle	9	241	Driver	2108	36%
Auto driver	85	2088	Passenger	473	8%
GO rail onl	7	93	Walk	708	12%
Joint GO r	1	14	Cycle	241	4%
Motorcycle	1	20			
Other	1	23			
Auto pass	8	219			
Taxi passe	4	88			
Paid ridest	8	166			
Walk	32	708			
Total:	253	5848			

PM Outbound

Wed Sep 30 2020 16:54:52 GMT-0400 (Eastern Daylight Time)

Frequency Distribution Query Form - Trip - 2016 v1.1

Field: Primary travel mode of trip - mode_prime

Filters:

Start time of trip - start_time In 1500-1759
and
Trip purpose of origin - purp_orig In H
and
2006 GTA zone of origin - gla06_orig In 89
and
Type of dwelling unit - dwell_type In 2

Table: Trip 2016

Row:	Count:	Expanded:			
Transit exc	7	129	Transit	141	18%
Cycle	1	18	Driver	281	35%
Auto driver	10	281	Passenger	182	23%
GO rail onl	1	12	Walk	183	23%
Auto pass	3	59	Cycle	18	2%
Taxi passe	3	62			
Paid ridest	3	61			
Walk	6	183			
Total:	34	806			

PM Inbound

Wed Sep 30 2020 16:56:21 GMT-0400 (Eastern Daylight Time)

Frequency Distribution Query Form - Trip - 2016 v1.1

Field: Primary travel mode of trip - mode_prime

Filters:

Start time of trip - start_time In 1500-1759
and
Trip purpose of destination - purp_dest In H
and
2006 GTA zone of destination - gla06_dest In 89
and
Type of dwelling unit - dwell_type In 2

Table: Trip 2016

Row:	Count:	Expanded:			
Transit exc	64	1451	Transit	1546	37%
Cycle	6	152	Driver	1460	35%
Auto driver	60	1460	Passenger	222	5%
GO rail onl	6	81	Walk	754	18%
Joint GO r	1	14	Cycle	152	4%
Motorcycle	3	97			
Auto pass	3	97			
Taxi passe	5	83			
Paid ridest	2	42			
Walk	33	754			
Total:	180	4135			

Employment - Mode Split

AM Inbound

Wed Sep 30 2020 16:59:00 GMT-0400 (Eastern Daylight Time)

Frequency Distribution Query Form - Trip - 2016 v1.1

Field: Primary travel mode of trip - mode_prime

Filters:

Start time of trip - start_time In 600-859
and
Trip purpose of destination - purp_dest In W
and
2006 GTA zone of destination - gla06_dest In 89
and
Occupation type - occupation In G,P

Table: Trip 2016

Row:	Count:	Expanded:			
Transit exc	77	1786	Transit	2547	44%
Cycle	17	320	Driver	2211	38%
Auto driver	100	2188	Passenger	239	4%
GO rail onl	30	602	Walk	517	9%
Joint GO r	8	159	Cycle	320	5%
Motorcycle	1	23			
Auto pass	10	193			
Paid ridest	2	46			
Walk	24	517			
Total:	269	5833			

PM Outbound

Wed Sep 30 2020 17:00:45 GMT-0400 (Eastern Daylight Time)

Frequency Distribution Query Form - Trip - 2016 v1.1

Field: Primary travel mode of trip - mode_prime

Filters:

Start time of trip - start_time In 1500-1759
and
Trip purpose of origin - purp_orig In W
and
2006 GTA zone of origin - gla06_orig In 89
and
Occupation type - occupation In G,P

Table: Trip 2016

Row:	Count:	Expanded:			
Transit exc	49	1019	Transit	1622	36%
Cycle	13	223	Driver	1880	42%
Auto driver	88	1857	Passenger	275	6%
GO rail onl	21	462	Walk	515	11%
Joint GO r	7	141	Cycle	223	5%
Motorcycle	1	23			
Auto pass	6	156			
Taxi passe	2	45			
Paid ridest	4	74			
Walk	23	515			
Total:	214	4514			

Retail - Mode Split

Daily Inbound

Wed Sep 30 2020 17:07:01 GMT-0400 (Eastern Daylight Time)

Frequency Distribution Query Form - Trip - 2016 v1.1

Field: Primary travel mode of trip - mode_prime

Filters:

Trip purpose of destination - purp_dest In M
and
2006 GTA zone of destination - gla06_dest In 89,90

Table: Trip 2016

Row:	Count:	Expanded:			
Transit exc	13	216	Transit	264	14%
Cycle	9	163	Driver	702	38%
Auto driver	39	683	Passenger	286	16%
GO rail onl	2	48	Walk	416	23%
Motorcycle	2	19	Cycle	163	9%
Auto pass	11	286			
Walk	20	416			
Total:	96	1830			

Daily Outbound

Wed Sep 30 2020 17:04:53 GMT-0400 (Eastern Daylight Time)

Frequency Distribution Query Form - Trip - 2016 v1.1

Field: Primary travel mode of trip - mode_prime

Filters:

Trip purpose of origin - purp_orig In M
and
2006 GTA zone of origin - gla06_orig In 89,90

Table: Trip 2016

Row:	Count:	Expanded:			
Transit exc	12	250	Transit	278	15%
Cycle	9	163	Driver	702	38%
Auto driver	39	683	Passenger	308	17%
GO rail onl	1	28	Walk	380	21%
Motorcycle	2	19	Cycle	163	9%
Auto pass	12	297			
Taxi passe	1	11			
Walk	20	380			
Total:	96	1830			

Wed Sep 30 2020 17:06:14 GMT-0400 (Eastern Daylight Time)

Frequency Distribution Query Form - Trip - 2016 v1.1

Field: Primary travel mode of trip - mode_prime

Filters:

Trip purpose of destination - purp_dest In M
and
2006 GTA zone of destination - gla06_dest In 89,90
and
Start time of trip - start_time In 1500-1859

Table: Trip 2016

Row:	Count:	Expanded:			
Transit exc	7	114	Transit	114	13%
Cycle	4	58	Driver	333	39%
Auto driver	17	319	Passenger	207	24%
Motorcycle	1	14	Walk	149	17%
Auto pass	7	207	Cycle	58	7%
Walk	6	149			
Total:	42	861			

Wed Sep 30 2020 17:05:44 GMT-0400 (Eastern Daylight Time)

Frequency Distribution Query Form - Trip - 2016 v1.1

Field: Primary travel mode of trip - mode_prime

Filters:

Trip purpose of origin - purp_orig In M
and
2006 GTA zone of origin - gla06_orig In 89,90
and
Start time of trip - start_time In 1500-1859

Table: Trip 2016

Row:	Count:	Expanded:			
Transit exc	7	157	Transit	157	29%
Cycle	2	25	Driver	197	37%
Auto driver	14	183	Passenger	68	13%
Motorcycle	1	14	Walk	87	16%
Auto pass	6	68	Cycle	25	5%
Walk	4	87			
Total:	34	535			

Transit DOA - Outbound

AM Residential Outbound

Tue Oct 20 2020 19:58:55 GMT-0400 (Eastern Daylight Time) - Run Time: 899ms

AM Office / Retail Outbound

Note: TTS has no data on these uses in the site area in the AM Peak Period

Cross Tabulation Query Form - Transit - 2016 v1.1

Row: Route used on link #1 - route_1
 Column: 2006 GTA zone of destination - gta06_dest
 Table: Primary travel mode of trip - mode_prime

Filters:
 Start time of trip - start_time In 600-859
 and
 Trip purpose of origin - purp_orig In H
 and
 2006 GTA zone of origin - gta06_orig In 89-90
 and
 Primary travel mode of trip - mode_prime In B,J,G

Tran 2016
 Table: Transit excluding GO rail

ns ew	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E		
		6	15	16	17	21	25	32	35	36	37	38	41	42	43	45	46	47	48	49	50	51	52	53	54	55	56	57	59
GB71		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T029		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T063		0	0	0	0	89	0	0	0	0	0	33	20	45	41	77	20	0	0	17	4	18	5	0	37	22	0	52	0
T501		37	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	22	20	0	0	24	0	0	0
T504		0	14	58	0	20	46	0	106	135	20	33	0	22	20	23	37	14	0	93	46	66	57	27	77	226	117	189	35
T509		0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
T510		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T511		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	0	0	19	0	0	0	0	0	0	0
T514		0	0	0	0	0	23	0	0	6	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	0	64	0
T593		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	20	0	0	0	0	0	0
T596		0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Private Bu:		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Tran 2016
 Table: GO rail only

ns ew	N E	N E	N E	N E	N E	S W	S W	S W	S W	
		36	56	57	60	63	4024	4052	4145	5198
GT01		14	12	27	27	14	11	13	14	25

SUMMARY

AM Residential Outbound

GT01	Orientation	TTS Trips					%	TTS Trips				
		N	S	E	W	N		S	E	W		
	EW	0	0	94	63	4%	0%	0%	60%	40%		
T029	NS	104	0	0	0	3%	100%	0%	0%	0%		
T063	NS	1018	18	0	0	26%	98%	2%	0%	0%		
T501	EW	0	0	202	34	6%	0%	0%	86%	14%		
T504	EW	0	0	2203	125	59%	0%	0%	95%	5%		
T509	EW	0	0	84	0	2%	0%	0%	100%	0%		
T511	NS	16	0	0	0	0%	100%	0%	0%	0%		
		1138	18	2583	222							

3 links used

Tue Oct 20 2020 20:09:54 GMT-0400 (Eastern Daylight Time) - Run Time: 1298ms

Cross Tabulation Query Form - Transit - 2016 v1.1

Row: Route used on link #3 - route_3
Column: 2006 GTA zone of origin - gta06_orig
Table: Primary travel mode of trip - mode_prime

Filters:

Start time of trip - start_time In 1500-1759
and
Trip purpose of destination - purp_dest In H
and
2006 GTA zone of destination - gta06_dest In 89-90
and
Primary travel mode of trip - mode_prime In B,J,G
and
Number of transit links used - n_route In 3

Tran 2016

Table: Transit excluding GO rail

	6	21	68	69	118	189	202	204	205	218	228	301	345	366	415	442	454	481	2141
T029	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
T063	0	0	20	9	19	17	18	53	10	0	4	23	17	7	27	20	0	0	0
T504	17	20	0	0	0	0	0	0	0	11	0	0	0	0	0	11	20	0	0

Tran 2016

Table: Joint GO rail and local transit

	3709
T504	20

4 links used

Tue Oct 20 2020 20:10:51 GMT-0400 (Eastern Daylight Time) - Run Time: 13906ms

Cross Tabulation Query Form - Transit - 2016 v1.1

Row: Route used on link #4 - route_4
Column: 2006 GTA zone of origin - gta06_orig
Table: Primary travel mode of trip - mode_prime

Filters:

Start time of trip - start_time In 1500-1759
and
Trip purpose of destination - purp_dest In H
and
2006 GTA zone of destination - gta06_dest In 89-90
and
Primary travel mode of trip - mode_prime In B,J,G
and
Number of transit links used - n_route In 4

Tran 2016

Table: Transit excluding GO rail

	189	216	391	415
T063	0	0	27	27
T504	0	17	0	0
T511	18	0	0	0

5 links used

Tue Oct 20 2020 20:11:27 GMT-0400 (Eastern Daylight Time) - Run Time: 8852ms

Cross Tabulation Query Form - Transit - 2016 v1.1

Row: Route used on link #5 - route_5
Column: 2006 GTA zone of origin - gta06_orig
Table: Primary travel mode of trip - mode_prime

Filters:

Start time of trip - start_time In 1500-1759
and
Trip purpose of destination - purp_dest In H
and
2006 GTA zone of destination - gta06_dest In 89-90
and
Primary travel mode of trip - mode_prime In B,J,G
and
Number of transit links used - n_route In 5

Tran 2016

Table: Transit excluding GO rail

	2272
T504	17

N W	S W	N W	N W	N W	N W	N W	N W	N W	N W	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E	N E	S W	S W	S W	N W	N W	N W	N W	N W	N W	N E	N E	N E	N W	N E	N E	
107	110	114	118	124	170	171	179	182	189	195	202	204	205	209	211	216	218	228	263	272	279	290	299	301	313	345	366	391	415	420	442	454	481	2141	2272	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41	0
0	0	6	19	0	7	0	0	0	17	0	21	53	10	0	0	0	4	0	0	0	0	0	27	0	17	7	27	54	0	20	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	24	0	0	0	0	0	0	4	0	0	0	0	0	0	
4	29	0	0	0	0	39	0	0	0	11	0	0	18	55	17	11	0	20	12	0	0	0	10	0	0	0	0	0	0	0	11	20	0	0	17	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	20	0	0	0	20	18	0	0	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	91	0	0	0	0	0	0	0	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	



Appendix C: Background Development Trip Generation

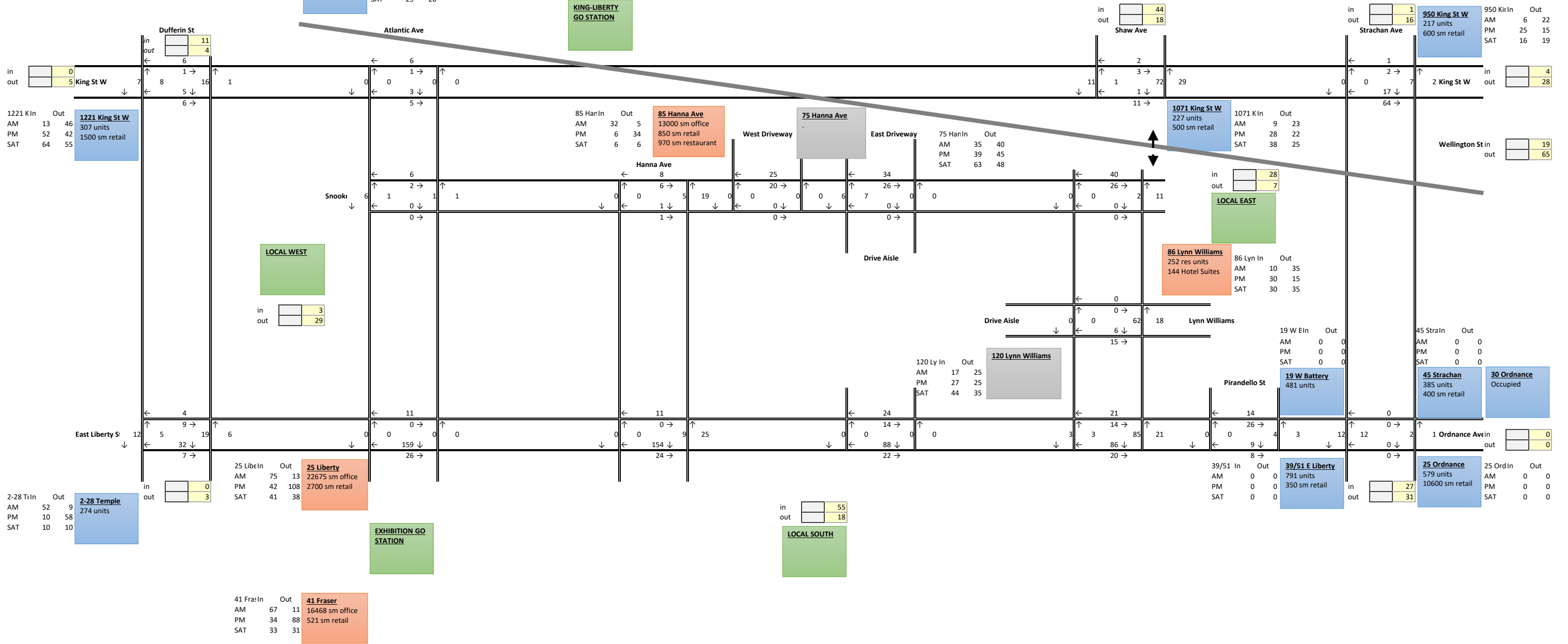


Background Development Multi-Modal Trip Generation

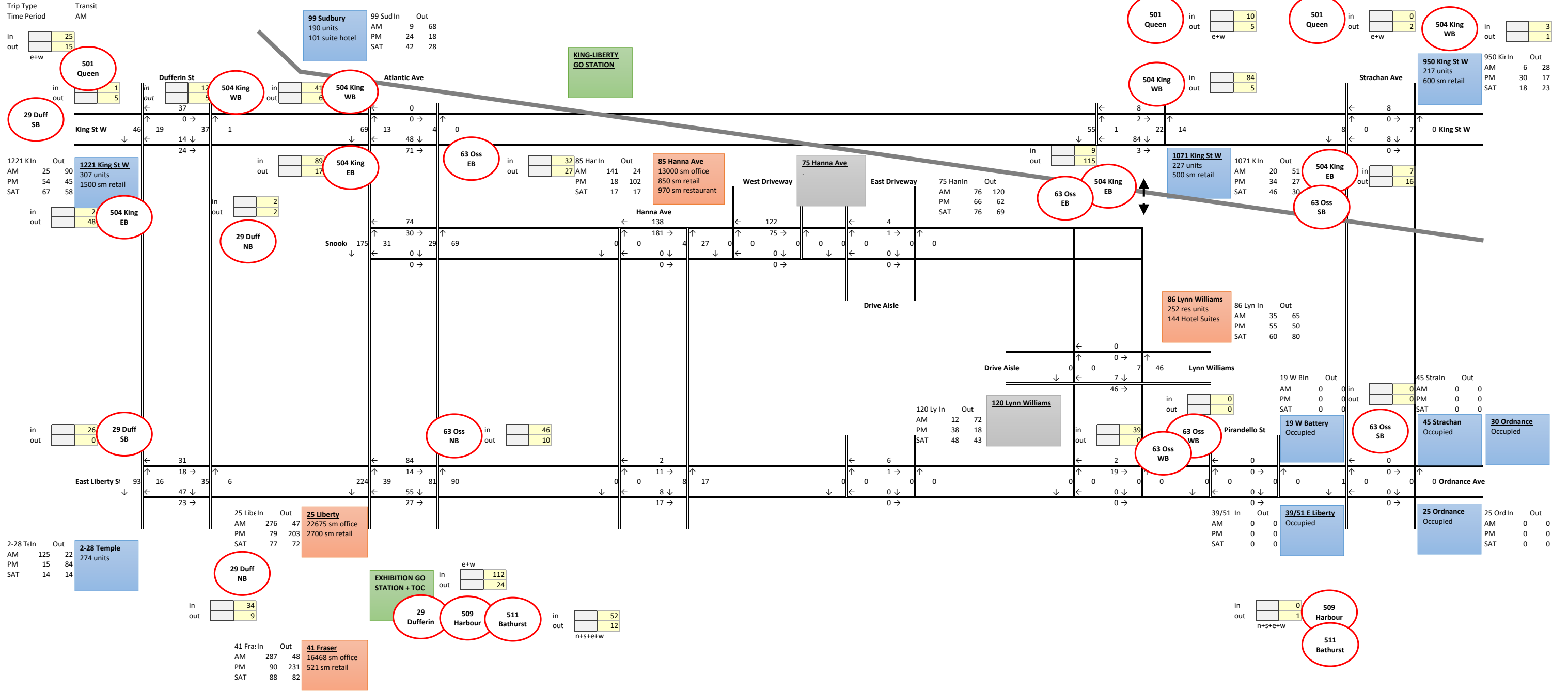
Development	Type	AM		PM		SAT		Overall AM Mode Split				Overall PM Mode Split				Overall SAT Mode Split							
		In	Out	In	Out	In	Out	Transit	Driver	Passenger	Walk	Cycle	Transit	Driver	Passenger	Walk	Cycle	Transit	Driver	Passenger	Walk	Cycle	
75 Hanna Ave - Res	Transit	14	112	55	19	61	53																
75 Hanna Ave - Office	Transit	59	6	4	36	5	5																
75 Hanna Ave - Retail	Transit	3	2	7	7	10	11	33%	23%	13%		21%	23%	14%			23%	23%	18%				
120 Lynn Williams - Res	Transit	8	69	30	11	37	32																
1221 King St W - Retail	Transit	4	9	8	7	11	11	30%	24%	15%		15%	17%	14%			20%	14%	18%				
1221 King St W	Transit	25	90	54	45	67	58	31%	26%	12%	16%	5%	22%	37%	14%	21%	6%						
99 Sudbury	Transit	9	68	24	18	42	28	35%	36%	11%	14%	4%	29%	35%	12%	20%	3%						
1071 King St W	Transit	20	51	34	27	46	30	33%	36%	12%	15%	4%	25%	36%	14%	21%	5%						
950 King St W	Transit	6	28	30	17	18	23	35%	36%	11%	14%	4%	29%	35%	12%	20%	3%						
25 Liberty	Transit	276	47	79	203	77	72	39%	38%	6%	11%	6%	28%	40%	10%	15%	7%						
85 Hanna Ave	Transit	141	24	18	102	17	17	42%	38%	5%	9%	5%	35%	41%	7%	12%	5%						
41 Fraser	Transit	287	48	90	231	88	82	42%	38%	5%	10%	6%	33%	41%	7%	13%	6%						
2-28 Temple	Transit	125	22	15	84	14	14	35%	36%	11%	14%	4%	29%	35%	12%	20%	3%						
86 Lynn Williams	Transit	35	65	55	50	60	80	40%	22%	12%	20%	6%	40%	16%	17%	8%							
Exhibition TOC	Transit	111	112	102	152	107	132																
75 Hanna Ave - Res	Ped	18	35	27	25	46	32																
75 Hanna Ave - Office	Ped	12	2	1	11	1	1																
75 Hanna Ave - Retail	Ped	5	3	11	9	16	15																
120 Lynn Williams - Res	Ped	11	21	15	15	27	20																
120 Lynn Williams - Retail	Ped	6	4	12	10	17	15																
1221 King St W	Ped	13	46	52	42	64	55																
99 Sudbury	Ped	4	28	16	13	29	20																
1071 King St W	Ped	9	23	28	22	38	25																
950 King St W	Ped	6	22	25	15	16	19																
25 Liberty	Ped	75	13	42	108	41	38																
85 Hanna Ave	Ped	32	5	6	34	6	6																
41 Fraser	Ped	67	11	34	88	33	31																
2-28 Temple	Ped	52	9	10	58	10	10																
86 Lynn Williams	Ped	10	35	30	15	30	35																
Exhibition TOC	Ped	36	61	61	51	49	56																
75 Hanna Ave	Veh	50	85	71	67	72	70																
120 Lynn Williams	Veh	17	49	38	26	32	32																
1221 King St W	Veh	25	27	33	36	37	40	1.28															
99 Sudbury	Veh	25	50	45	30	40	45	1.13															
1071 King St W	Veh	10	45	25	20	20	37	1.14															
950 King St W	Veh	7	27	26	14	17	21	1.00															
25 Liberty	Veh	98	28	34	106	35	36	0.53															
85 Hanna Ave	Veh	10	0	5	10	0	0	0.00															
41 Fraser	Veh	0	0	0	0	0	0																
2-28 Temple	Veh	10	36	8	6	0	0																
86 Lynn Williams	Veh	30	55	50	40	45	45	1.40															
Exhibition TOC	Veh	107	74	62	133	85	104																
75 Hanna Ave	Person	254	335	279	325	331	295																
120 Lynn Williams	Person	79	198	196	172	233	212																
1221 King St W	Person	72	182	178	156	213	193																
99 Sudbury	Person	44	160	96	67	122	102																
1071 King St W	Person	44	133	103	82	126	110																
950 King St W	Person	20	82	87	49	68	68																
25 Liberty	Person	515	102	180	490	176	178																
85 Hanna Ave	Person	209	34	32	163	25	26																
41 Fraser	Person	366	62	70	298	61	63																
2-28 Temple	Person	41	150	90	63	115	96																
86 Lynn Williams	Person	90	170	145	115	145	175																
Exhibition TOC	Person	328	328	302	441	315	385																
75 Hanna Ave	Net Person	233	314	229	275	331	295																
120 Lynn Williams	Net Person	76	195	162	138	233	212																
1221 King St W	Net Person	71	180	160	140	192	174																
99 Sudbury	Net Person	44	160	96	67	122	102																
1071 King St W	Net Person	44	132	97	77	118	103																
950 King St W	Net Person	20	82	87	49	68	68																
25 Liberty	Net Person	494	98	176	480	176	178																
85 Hanna Ave	Net Person	201	33	32	163	25	26																
41 Fraser	Net Person	362	61	62	265	54	56																
2-28 Temple	Net Person	41	149	80	56	102	85																
86 Lynn Williams	Net Person	90	170	145	115	145	175																
Exhibition TOC	Net Person	279	279	257	375																		
75 Hanna Ave	NonAuto	122	174	125	128	165	141																
120 Lynn Williams	NonAuto	32	106	99	74	128	114																
1221 King St W	NonAuto	42	149	121	99	149	128																
99 Sudbury	NonAuto	14	103	43	33	75	51																
1071 King St W	NonAuto	32	81	68	54	94	61																
950 King St W	NonAuto	42	51	56	33	48	44																
25 Liberty	NonAuto	392	66	139	358	136	127																
85 Hanna Ave	NonAuto	191	33	27	151	25	26																
41 Fraser	NonAuto	362	61	62	265	54	56																
2-28 Temple	NonAuto	29	108	71	49	102	85																
86 Lynn Williams	NonAuto	6																					

Total Peak Hour Primary Pedestrians

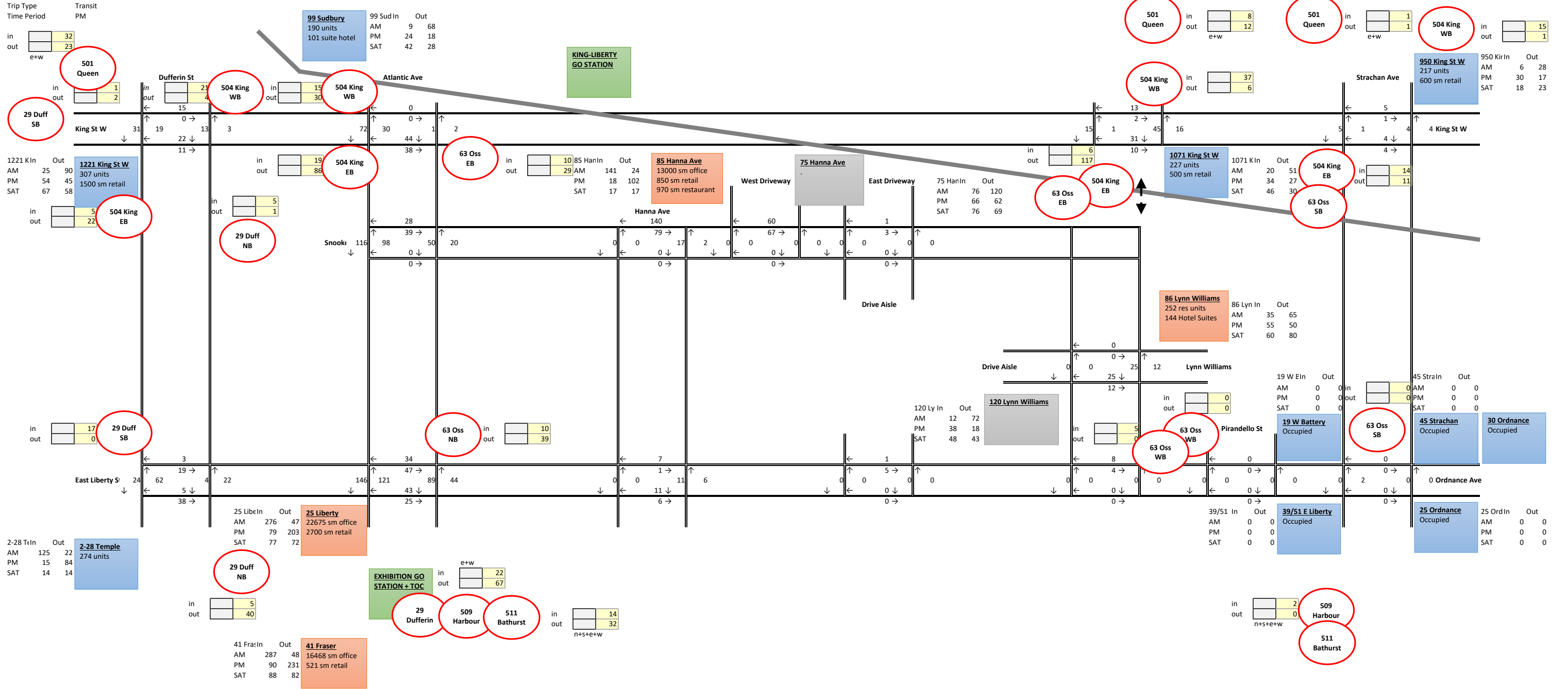
Trip Type Pedestrian
Time Period AM



Background Development Peak Hour Transit Activity



Background Development Peak Hour Transit Activity



Appendix D: StreetLight Queries



StreetLight Query Settings Summary

Res PED	Res VEH
<p>Analysis ID: 158300 Analysis: Site Traffic Res OD - Inbound Ped v2 Created by: lorion@bagroup.com Created on: 2020-10-15 Organization: BA Consulting Group - Consultant Subscription Study: Liberty Village - METRO Folder: Origin-Destination Patterns</p> <p>Analysis Setup Details: Analysis Type: O-D Analysis (LBS Trip Data) Type of Travel: Personal Mode of Travel: Pedestrian Data Source: Location-Based Services with Pass-through Output Type: StreetLight Index</p> <p>Analysis Options: Data Period: 2019:[4, 5, 6, 9, 10, 11]</p> <p>Day Type: 0: All Days (M-Su) 1: Weekday (M-Th) 2: Weekend Day (Sa-Su)</p> <p>Day Part: 0: All Day (12am-12am) 1: Early AM (12am-6am) 2: Peak AM (6am-10am) 3: Mid-Day (10am-3pm) 4: Peak PM (3pm-7pm) 5: Late PM (7pm-12am)</p> <p>Country: Canada Metrics Version: R80-M93</p> <p>Copyright © 2011 - 2020, StreetLight Data, Inc. All rights reserved.</p>	<p>Analysis ID: 158298 Analysis: Site Traffic Res OD - Inbound Vehicle v2 Created by: lorion@bagroup.com Created on: 2020-10-15 Organization: BA Consulting Group - Consultant Subscription Study: Liberty Village - METRO Folder: Origin-Destination Patterns</p> <p>Analysis Setup Details: Analysis Type: O-D Analysis (LBS Trip Data) Type of Travel: Personal Mode of Travel: All Modes Data Source: Location-Based Services with Pass-through Output Type: StreetLight Volume</p> <p>Analysis Options: Date Range: 03/01/2019-04/30/2019, 09/01/2019-10/31/2019</p> <p>Day Type: 0: All Days (M-Su) 1: Weekday (M-Th) 2: Weekend Day (Sa-Su)</p> <p>Day Part: 0: All Day (12am-12am) 1: Early AM (12am-6am) 2: Peak AM (6am-10am) 3: Mid-Day (10am-3pm) 4: Peak PM (3pm-7pm) 5: Late PM (7pm-12am)</p> <p>Country: Canada Metrics Version: R82-M93 Any data used for Sep 1-15, 2020 is preliminary.</p> <p>Copyright © 2011 - 2020, StreetLight Data, Inc. All rights reserved.</p>

Non-Res PED	Non-Res VEH
<p>Analysis ID: 158759 Analysis: Site Traffic OD - Inbound Ped v3 Created by: lorion@bagroup.com Created on: 2020-10-16 Organization: BA Consulting Group - Consultant Subscription Study: Liberty Village - METRO</p> <p>Analysis Setup Details: Analysis Type: O-D Analysis (LBS Trip Data) Type of Travel: Personal Mode of Travel: Pedestrian Data Source: Location-Based Services with Pass-through Output Type: StreetLight Index</p> <p>Analysis Options: Data Period: 2019:[4, 5, 6, 9, 10, 11]</p> <p>Day Type: 0: All Days (M-Su) 1: Weekday (M-Th) 2: Weekend Day (Sa-Su)</p> <p>Day Part: 0: All Day (12am-12am) 1: Early AM (12am-6am) 2: Peak AM (6am-10am) 3: Mid-Day (10am-3pm) 4: Peak PM (3pm-7pm) 5: Late PM (7pm-12am)</p> <p>Country: Canada Metrics Version: R82-M93 Any data used for Sep 1-15, 2020 is preliminary.</p> <p>Copyright © 2011 - 2020, StreetLight Data, Inc. All rights reserved.</p>	<p>Analysis ID: 106105 Analysis: Site Traffic OD - Inbound Vehicle v2 Created by: lorion@bagroup.com Created on: 2020-03-05 Organization: BA Consulting Group - Consultant Subscription Study: Liberty Village - METRO</p> <p>Analysis Setup Details: Analysis Type: O-D Analysis (LBS Trip Data) Type of Travel: Personal Mode of Travel: All Modes Data Source: Location-Based Services with Pass-through Output Type: StreetLight Index</p> <p>Analysis Options: Date Range: 03/01/2019-04/30/2019, 09/01/2019-10/31/2019</p> <p>Day Type: 0: All Days (M-Su) 1: Weekday (M-Th) 2: Weekend Day (Sa-Su)</p> <p>Day Part: 0: All Day (12am-12am) 1: Early AM (12am-6am) 2: Peak AM (6am-10am) 3: Mid-Day (10am-3pm) 4: Peak PM (3pm-7pm) 5: Late PM (7pm-12am)</p> <p>Country: Canada Metrics Version: R66-M81</p> <p>Copyright © 2011 - 2020, StreetLight Data, Inc. All rights reserved.</p>

StreetLight Liberty Village - Vehicle and Pedestrian OD Patterns

PEDESTRIAN DOA

Origin/Destination	Weekday Pedestrians Inbound									Weekday Pedestrians Outbound								
	AM			Midday			PM			AM			Midday			PM		
	Residential	Metro	Office	Residential	Metro	Office	Residential	Metro	Office	Residential	Metro	Office	Residential	Metro	Office	Residential	Metro	Office
On Site	10%	0%	6%	14%	9%	5%	19%	1%	2%	6%	14%	4%	10%	8%	15%	18%	3%	8%
Net Trips	90%	100%	94%	86%	91%	95%	81%	99%	98%	94%	86%	96%	90%	92%	85%	82%	97%	92%
Local																		
Local - East Side	0%	17%	23%	0%	12%	8%	0%	24%	13%	0%	17%	23%	0%	19%	16%	0%	50%	42%
Local - South Side	16%	57%	29%	12%	21%	5%	12%	18%	20%	8%	17%	0%	17%	16%	13%	20%	7%	10%
Local - West Side	2%	0%	3%	15%	39%	27%	14%	19%	29%	14%	17%	9%	16%	31%	20%	9%	9%	8%
External																		
Dufferin - to/from N	0%	9%	0%	1%	0%	6%	1%	0%	2%	2%	0%	0%	0%	0%	1%	0%	2%	2%
Dufferin - to/from S	1%	0%	0%	1%	3%	5%	1%	2%	3%	0%	17%	0%	1%	0%	1%	1%	4%	3%
Joe Shuster - to/from N	0%	9%	6%	2%	4%	7%	2%	6%	7%	1%	0%	0%	2%	3%	7%	2%	7%	2%
King - to/from E	3%	9%	0%	6%	1%	7%	13%	10%	5%	13%	0%	0%	8%	2%	8%	5%	2%	2%
King - to/from W	1%	0%	0%	2%	3%	7%	0%	5%	10%	1%	17%	5%	1%	3%	4%	2%	5%	13%
Shaw - to/from N	2%	0%	19%	2%	0%	1%	2%	1%	2%	0%	0%	0%	3%	1%	1%	2%	1%	2%
Strachan - to/from N	4%	0%	0%	4%	2%	0%	9%	2%	2%	9%	0%	0%	5%	0%	1%	12%	1%	2%
Strachan - to/from S	37%	0%	3%	26%	6%	7%	14%	5%	3%	16%	0%	9%	25%	14%	5%	22%	8%	2%
Sudbury - to/from N	6%	0%	16%	5%	3%	18%	1%	2%	3%	1%	17%	50%	3%	2%	21%	4%	2%	10%
Wellington - to/from E	25%	0%	0%	18%	5%	1%	29%	5%	0%	32%	0%	5%	16%	6%	1%	17%	3%	0%
Exhibition GO Connection	3%	0%	0%	7%	1%	1%	2%	1%	0%	3%	0%	0%	3%	1%	1%	4%	0%	3%
100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Trip Gen Interaction % 75 Hanna (transit + ped)	3%	30%	7%				15%	18%	41%	2%	38%	27%				11%	28%	8%

VEHICLE DOA

Origin/Destination	Weekday Vehicles Inbound									Weekday Vehicle Outbound												
	AM			Midday			PM			AM			Midday			PM						
	Residential	Metro	Office	Residential	Metro	Office	Residential	Metro	Office	Residential	Metro	Office	Residential	Metro	Office	Residential	Metro	Office				
External																						
Dufferin - to/from N	5%	8%	8%	6%	11%	11%	6%	6%	9%	8%	7%	13%	15%	14%	4%	9%	8%	4%	8%	5%	6%	
Dufferin - to/from S	8%	8%	13%	7%	10%	17%	6%	6%	8%	7%	8%	25%	4%	5%	9%	5%	7%	10%	12%	10%	11%	
Joe Shuster - to/from N	1%	0%	12%	2%	10%	6%	3%	4%	4%	4%	4%	50%	2%	6%	3%	18%	9%	3%	10%	5%	7%	
King - to/from E	4%	4%	27%	10%	11%	12%	22%	26%	26%	26%	24%	0%	53%	49%	12%	11%	20%	12%	4%	25%	16%	
King - to/from W	13%	8%	30%	7%	11%	16%	6%	14%	16%	15%	3%	0%	9%	8%	5%	17%	24%	7%	12%	33%	24%	
Shaw - to/from N	8%	31%	2%	9%	0%	9%	6%	3%	10%	7%	5%	0%	2%	2%	10%	13%	5%	7%	20%	4%	11%	
Strachan - to/from N	19%	16%	2%	14%	8%	5%	12%	4%	3%	4%	15%	0%	0%	0%	14%	6%	5%	14%	4%	1%	2%	
Strachan - to/from S	34%	18%	5%	36%	28%	16%	28%	25%	11%	17%	24%	13%	11%	11%	33%	15%	14%	32%	23%	12%	17%	
Sudbury - to/from N	2%	0%	1%	2%	3%	4%	1%	4%	6%	5%	1%	0%	0%	0%	2%	0%	5%	3%	3%	3%	3%	
Wellington - to/from E	5%	6%	1%	7%	9%	2%	9%	9%	7%	8%	10%	0%	5%	5%	8%	6%	1%	7%	4%	1%	2%	
Exhibition GO Connection	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
75 Hanna		2	23					6	8				1	6					14	18		

Note:

Office consist of trips to/from 108 Atlantic & 85 Snooker

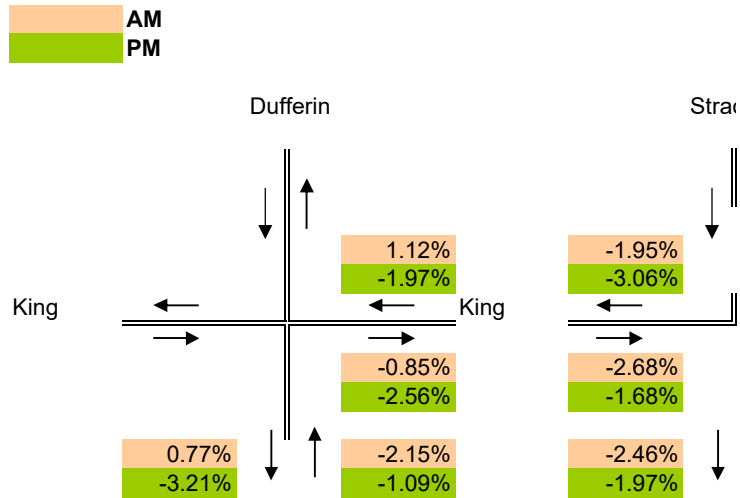
Metro = Retail

Blended Non-Res label

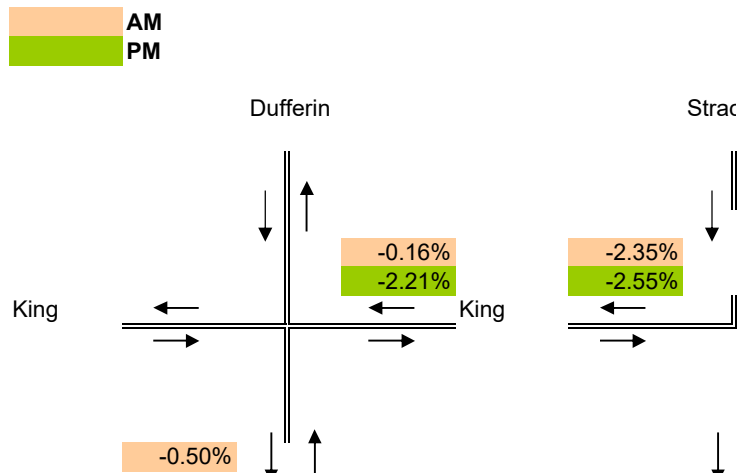
Appendix E: General Corridor Growth Analysis



Background Traffic Growth Rates



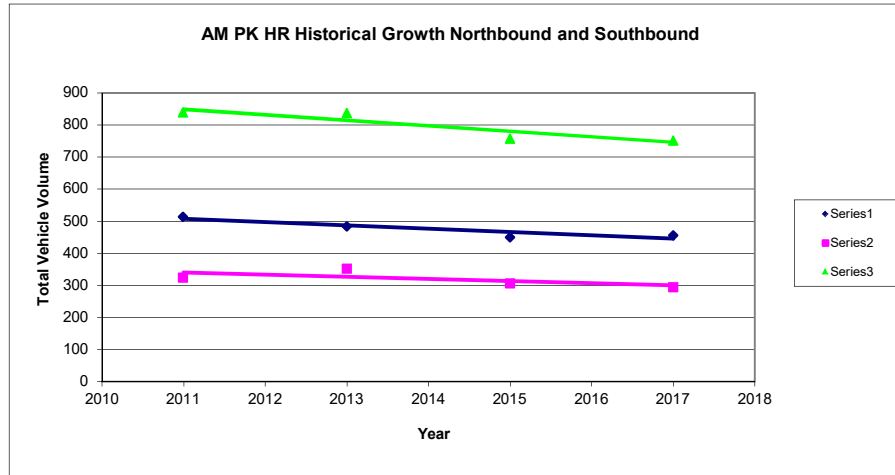
Background Traffic Growth Rates (2-way)



Project: Liberty Village
 Project ID: 7036-25
 Intersection: King/Strachan
 Peak Hour: PM

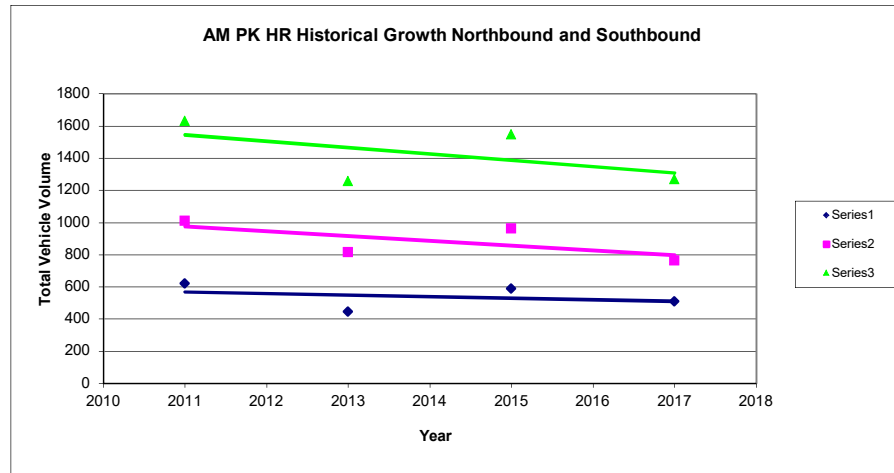
**Note: Growth is counted until 2017, all graphs still display all counts

Count Information		South of King/Strachan		
Date	Year	Northbound	Southbound	2-way
Wed, Oct 19	2005	408	324	732
Thurs, Aug 13	2009	396	270	666
Thurs, Sept 15	2011	515	325	840
Thurs, Dec 05	2013	485	354	839
Tues, Jun 16	2015	451	307	758
Thurs, May 18	2017	457	296	753
Tues, Apr 16	2019	432	253	685
Trend Point		508.20	340.60	848.80
Slope		-10.40	-6.70	-17.10
Growth		-2.05%	-1.97%	-2.01%



King Street Pilot started on Nov 12, 2017

Count Information		West of King/Strachan		
Date	Year	Eastbound	Westbound	2-way
Wed, Oct 19	2005	558	826	1384
Thurs, Aug 13	2009	644	1032	1676
Thurs, Sept 15	2011	618	1011	1629
Thurs, Dec 05	2013	445	813	1258
Tues, Jun 16	2015	587	962	1549
Thurs, May 18	2017	507	762	1269
Tues, Apr 16	2019	362	518	880
Trend Point		567.90	976.70	1544.60
Slope		-9.55	-29.90	-39.45
Growth		-1.68%	-3.06%	-2.55%



7218-03 2001-2013 -1.05% 0.91% -0.01% West of Bathurst/King
 LEA 25 Liberty St 2006 and 2015 1.20% 2.00% King St Corridor

Appendix F: Signal Timing Plans



LOCATION:		Dufferin St & Liberty St / Private Access						DISTRICT:		Toronto & East York	
MODE/COMMENT:		SAP with PR & TSP						COMPUTER SYSTEM:		TransSuite	
TCS:		1449						CONTROLLER/CABINET TYPE:		Peek ATC-1000 / TS2T1	
PREPARED/CHECKED BY:		BF						CONFLICT FLASH:		Red & Red	
PREPARATION DATE:		August 6, 2019						DESIGN WALK SPEED:		1.0 m/s (FDW based on full crossing at 1.2 m/s)	
IMPLEMENTATION DATE:		August 6, 2019						CHANNEL/DROP:		4007/19	
								CONTROLLER/FIRMWARE:		3.018.1.2976	
NEMA Phase	Local Plan Split Table	OFF	AM	PM	NGHT	WKND	Event	Phase Mode (Fixed/Demanded or Callable)	Remarks		
		All Other Times	06:30-09:30 M-F	15:00-19:00 M-F	23:00-06:30 Daily	10:00-19:00 Sat/Sun	TBD				
		Pattern 1 Split 1	Pattern 2 Split 2	Pattern 3 Split 3	Pattern 4 Split 4	Pattern 5 Split 5	Pattern 6 Split 6				
1		WLK FDW MIN MAX1 AMB ALR SPLIT								Pedestrian Minimums: NSWK = 7 sec, NSFD = 11 sec EWWK = 7 sec, EWFD = 11 sec EW phase is callable by vehicle and/or pedestrian actuation. If a vehicle and/or pedestrian call is received, the maximum EWG is served. The EWWK & EWFD are displayed on the pedestrian signal heads if a vehicle and/or pedestrian call is received.	
2		WLK 7 FDW 11 MIN 18 MAX1 47 AMB 4 ALR 2 SPLIT						Fixed POZ activated by Request Loop (Max extension of 30 secs in Green/WLK)		Side Street Passage Time = 3 sec See back for TSP instructions TSP enabled on May 22, 2015 Script #2 is used to mitigate issues with TSP operation in ATC-1000 firmware version 3.018.1.2976 Script #1 is revised to eliminate the extended Walk on Phase 4 and 8 for all times.	
3		WLK FDW MIN MAX1 AMB ALR SPLIT									
4		WLK 7 FDW 11 MIN 18 MAX1 18 AMB 3 ALR 2 SPLIT						Callable by Trafficam & pushbutton. Extendable by Trafficam. (Truncations allowed to pedestrian minimum)			
5		WLK FDW MIN MAX1 AMB ALR SPLIT									
6		WLK 7 FDW 11 MIN 18 MAX1 47 AMB 4 ALR 2 SPLIT						Fixed POZ activated by Request Loop (Max extension of 30 secs in Green/WLK)			
7		WLK FDW MIN MAX1 AMB ALR SPLIT									
8		WLK 7 FDW 11 MIN 18 MAX1 18 AMB 3 ALR 2 SPLIT						Callable by Trafficam & pushbutton. Extendable by Trafficam. (Truncations allowed to pedestrian minimum)			
		CL OF	76 39	80 74	80 79	64 16	80 1	70 1			

Notes:

LOC: Dufferin St & Liberty St
 MODE: SAP with WRM & TSP
 TCS: 1449 PREPARATION DATE (TIMING CARD): March 28, 2018

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)	O.C. Thres.
OFF												
Split 1	Ext.	--	23	--	--	--	23	--	--	76	28	30 s [39 %]
	Rdc.	--	28	--	--	--	28	--	--			
AM												
Split 2	Ext.	--	25	--	--	--	25	--	--	80	28	30 s [38 %]
	Rdc.	--	28	--	--	--	28	--	--			
PM												
Split 3	Ext.	--	5	--	--	25	--	5	--	80	18	20 s [25 %]
	Rdc.	--	18	--	--	--	18	--	--			
NGT												
Split 4	Ext.	--	17	--	--	--	17	--	--	64	16	30 s [47 %]
	Rdc.	--	16	--	--	--	16	--	--			
WKND												
Split 5	Ext.	--	25	--	--	--	25	--	--	80	29	30 s [38 %]
	Rdc.	--	29	--	--	--	29	--	--			
Event												
Split 6	Ext.	--	20	--	--	--	20	--	--	70	18	30 s [43 %]
	Rdc.	--	18	--	--	--	18	--	--			

Per TTC's request, extension times for PM plan are changed.
 Note: In response to observation, Phase 4/8 OC Rdc. not permitted and OC Ext added to phase 4/8 during pattern 3.
 OC Thresholds have been increased to mitigated side street impacts. OC Ext values have been adjusted accordingly.

2.1.9.2 Advanced I/O Scripts
 Input Script 2 "TCS1449TSPFilter"
 Blocks TSP inputs 2 & 6 during phase 4/8 Amb & AllR, and during unused time served in phase 2/6 late in the cycle, to mitigate firmware issues with ATC-1000 Build 3.018.1.2976. The script also applies a 40 seconds delay to TSP input 2 during Pattern 3 (PM).

T.S.P. PARAMETERS

PREPARED: BF

TSP RUN # 2	TSP RUN # 6
NB Thru	SB Thru

2.8.2 Transit Run Parameters

ATC Green Extend Mode (Equivalent TTC Algorithm)	Mode 2	Mode 2
	A	A

2.8.3 Transit Action Plan 1 (Used for Patterns 1, 4, 5 & 6)

Run Enable (X = Yes)	X	X
Run Config = 1	Recovery = 2 (O.C. with delay)	

2.8.3 Transit Action Plan 2 (Used for Pattern 2)

Run Enable (X = Yes)	X	X
Run Config = 2	Recovery = 2 (O.C. with delay)	

2.8.3 Transit Action Plan 3 (Used for Pattern 3)

Run Enable (X = Yes)	X	X
Run Config = 3	Recovery = 2 (O.C. with delay)	

2.8.4 Transit Run Configuration 1

Delay / Extend / Fail	3 / -- / 235	1 / -- / 235
CALLS (and Extends)	Ø 2/6	Ø 2/6
Skips	--	--
Reduces (Truncates)	Ø 4/8	Ø 4/8

2.8.4 Transit Run Configuration 2

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

2.8.4 Transit Run Configuration 3

Delay / Extend / Fail	* / -- / 235	1 / -- / 235
CALLS (and Extends)	Ø 2/6	Ø 2/6
Skips	--	--
Reduces (Truncates)	Ø 4/8	Ø 4/8

*40 seconds NB delay provided by script 2 Elapsed time

	Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8
--	-----	-----	-----	-----	-----	-----	-----	-----

2.8.6 TSP Split Tables: 1 & 4

GRN EXT (SDW Extension)	--	--	--	--	--	--	--	--
GRN RDC (Reduction)	--	--	--	-1	--	--	--	-1
WLK EXT (Walk Extension)	--	+30	--	--	--	+30	--	--

2.8.6 TSP Split Tables: 2 & 6

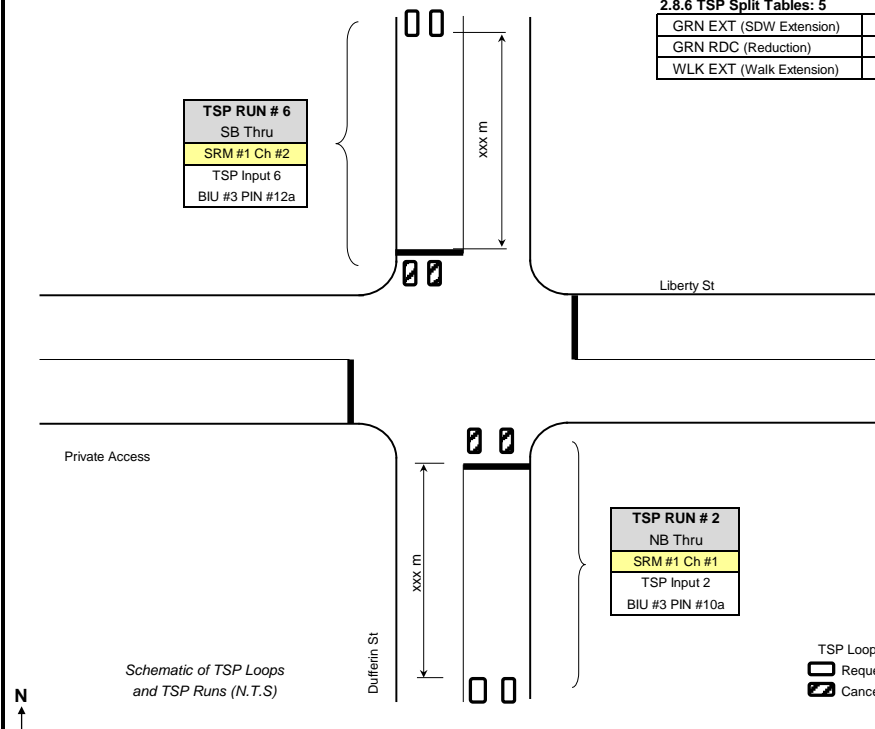
GRN EXT (SDW Extension)	--	--	--	--	--	--	--	--
GRN RDC (Reduction)	--	--	--	-5	--	--	--	-5
WLK EXT (Walk Extension)	--	+30	--	--	--	+30	--	--

2.8.6 TSP Split Tables: 3

GRN EXT (SDW Extension)	--	--	--	--	--	--	--	--
GRN RDC (Reduction)	--	--	--	-15	--	--	--	-15
WLK EXT (Walk Extension)	--	+30	--	--	--	+30	--	--

2.8.6 TSP Split Tables: 5

GRN EXT (SDW Extension)	--	--	--	--	--	--	--	--
GRN RDC (Reduction)	--	--	--	-4	--	--	--	-4
WLK EXT (Walk Extension)	--	+30	--	--	--	+30	--	--



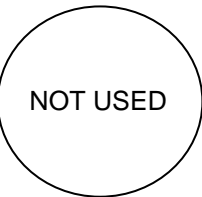
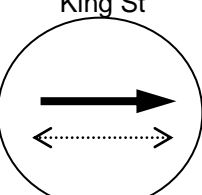
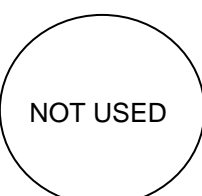
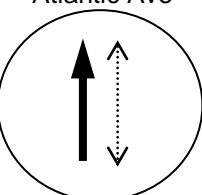
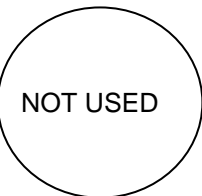
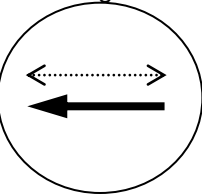
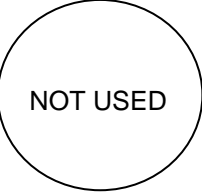
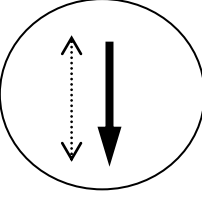
Notes:
 Script #2 blocks TSP inputs 2 and 6 late in the cycle, to mitigate firmware issues with ATC-1000 Build 3.018.1.2976.

TSP inputs can be checked on screen 1.2.4 at all times.

ATC Mo	0	2	3	4
TTC Alg	B-2	A	C	D
Extensic	SDW	Walk	W/SDW	W/SDW

TSP SUMMARY
 Maximum Green Extensions:
 NSG: 30s Green/WLK
 Phase 4 & 8 truncation to ped min

LOCATION:	King St & Atlantic Ave	DISTRICT:	Toronto & East York
MODE/COMMENT:	SAP with PR, TSP, 2 Wire- Polara APS* & LBO Signs	COMPUTER SYSTEM:	TransSuite
TCS:	1912	CONTROLLER/CABINET TYPE:	PEEK ATC-1000 / TS2 T1
PREPARED BY / DATE:	Ranajamil Iftikhar / January 18, 2021	CONFLICT FLASH:	Red & Red
CHECKED BY / DATE:		DESIGN WALK SPEED:	1.0 m/s (FDW based on full crossing at 1.2 m/s)
IMPLEMENTATION DATE:	January 18, 2021	CHANNEL/DROP:	4026/12
		FIRMWARE VERSION:	3.018.1.2976

NEMA Phase	Local Plan Split Table	OFF	AM	PM	Caribana	Phase Mode (Fixed/Demanded or Callable)	Remarks
		All Other Times	07:00-09:30 M-F	16:00-18:30 M-F	To be determined		
		Pattern 1 Split 1	Pattern 2 Split 2	Pattern 3 Split 3	Pattern 4 Split 4		
1 	WLK FDW MIN MAX1 AMB ALR SPLIT						Pedestrian Minimums: EWWK = 7 sec. EWFD = 14 sec. NSWK = 7 sec. NSFD = 13 sec. NB phase is callable by vehicle or pedestrian actuation. If a vehicle and/or pedestrian call is received, the maximum NBG is served. The NSWK & NSFD are displayed on the pedestrian signal heads if a vehicle and/or pedestrian call is received.
2 	WLK 7 FDW 14 MIN 21 MAX1 27 AMB 4 ALR 3 SPLIT					Fixed POZ activated by Request Loop (max extension of 30 secs in Green/Walk)	See back for TSP Instructions. APS is on during 7 secs of EWWK and NSWK when activated by pushbuttons Extended Push Activation = 3 secs TSP EB & WB disabled on November 29, 2018.
3 	WLK FDW MIN MAX1 AMB ALR SPLIT						Phase 8 can only be activated by pushbutton to avoid being constantly actuated if a construction vehicle sits on or close to the stopbar loop for construction purpose Script 4 blocks TSP requests from streetcars less than 90 seconds behind the previous streetcar in the same direction. Additional 1 second above the pedestrian minimum provided to the Phase 4/8 SPLIT is to be served in Phase 4/8.
4 	WLK 7 FDW 13 MIN 20 MAX1 20 AMB 4 ALR 2 SPLIT					Callable by Leddar O/H Detection and/or Pushbutton; (truncations allowable to pedestrian minimum)	Script 1 is used for driving LBO signs during the weekday NLT periods for WB. Load switch 16 is used to drive LBO signs. TSP temporarily disabled on January 18, 2021 during bus replacement for 504 King routes.
5 	WLK FDW MIN MAX1 AMB ALR SPLIT						
6 	WLK 7 FDW 14 MIN 21 MAX1 27 AMB 4 ALR 3 SPLIT					Fixed POZ activated by Request Loop (max extension of 30 secs in Green/Walk)	
7 	WLK FDW MIN MAX1 AMB ALR SPLIT						
8 	WLK 7 FDW 13 MIN 20 MAX1 20 AMB 4 ALR 2 SPLIT					Callable by Pushbutton (truncations allowable to pedestrian minimum)	
	CL OF	60 6	70 6	70 6	80 29		

Notes: APS ready but not activated*

LOC: King St & Atlantic Ave
MODE: SAP with PR, TSP, 2 Wire- Polara APS* & LBO Signs
TCS: 1912 **PREPARATION DATE (TIMING CARD):** February 5, 2020

OFFSET CORRECTION PARAMETERS

2.3.4 O.C. Extend / Reduce (Max. time added & subtracted in sec.)										From page 1		2.3.2.x O.C. Thres.	
		Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8	[Cycle]	[Slop]	Pattern 1	Pattern 2
OFF													
Split 1	Ext.	--	21	--	--	--	21	--	--	60	6	18 s [30 %]	18 s [25 %]
	Rdc.	--	5	--	1	--	5	--	1				
AM,PM													
Split 2,3,4	Ext.	--	26	--	--	--	26	--	--	70	16	18 s [25 %]	20 s [25 %]
	Rdc.	--	15	--	1	--	15	--	1				
Caribana													
Split 2,3,4	Ext.	--	30	--	--	--	30	--	--	80	26	18 s [25 %]	20 s [25 %]
	Rdc.	--	25	--	1	--	25	--	1				

Pattern 1 OC Threshold set to 3x OC Rdc due to limited slop. Controller could take up to three cycles to get back in sync from -TSP Recovery.

2.1.9.2 Advanced I/O Scripts

Input Script 4 'TSP26Timer'
 Blocks TSP 2 and TSP 6 calls from vehicles with a headway less than 90 sec
 To view current status of TSP inputs, go to screen 2.1.9.2 page 01 and press [C].

T.S.P. PARAMETERS

PREPARED: AL

TSP RUN # 2	TSP RUN # 6
EB Thru	WB Thru

2.8.2 Transit Run Parameters

ATC Green Extend Mode (Equivalent TTC Algorithm)	Mode 2	Mode 2
	A	A

2.8.3 Transit Action Plan 1 (Used for Patterns 1 & 4)

Run Enable (X = Yes)	X	X
Run Config = 1	Recovery = 2 (o.c.)	

2.8.3 Transit Action Plan 2 (Used for Pattern 2)

Run Enable (X = Yes)	X	X
Run Config = 2	Recovery = 2 (o.c.)	

2.8.3 Transit Action Plan 3 (Used for Pattern 3)

Run Enable (X = Yes)	X	X
Run Config = 3	Recovery = 2 (o.c.)	

2.8.4 Transit Run Configuration 1

Delay / Extend / Fail	-- / -- / 235	7 / -- / 235
CALLS (and Extends)	Ø 2/6	Ø 2/6
Skips	--	--
Reduces (Truncates)	Ø 4/8	Ø 4/8

2.8.4 Transit Run Configuration 2

Delay / Extend / Fail	13 / -- / 235	7 / -- / 235
CALLS (and Extends)	Ø 2/6	Ø 2/6
Skips	--	--
Reduces (Truncates)	Ø 4/8	Ø 4/8

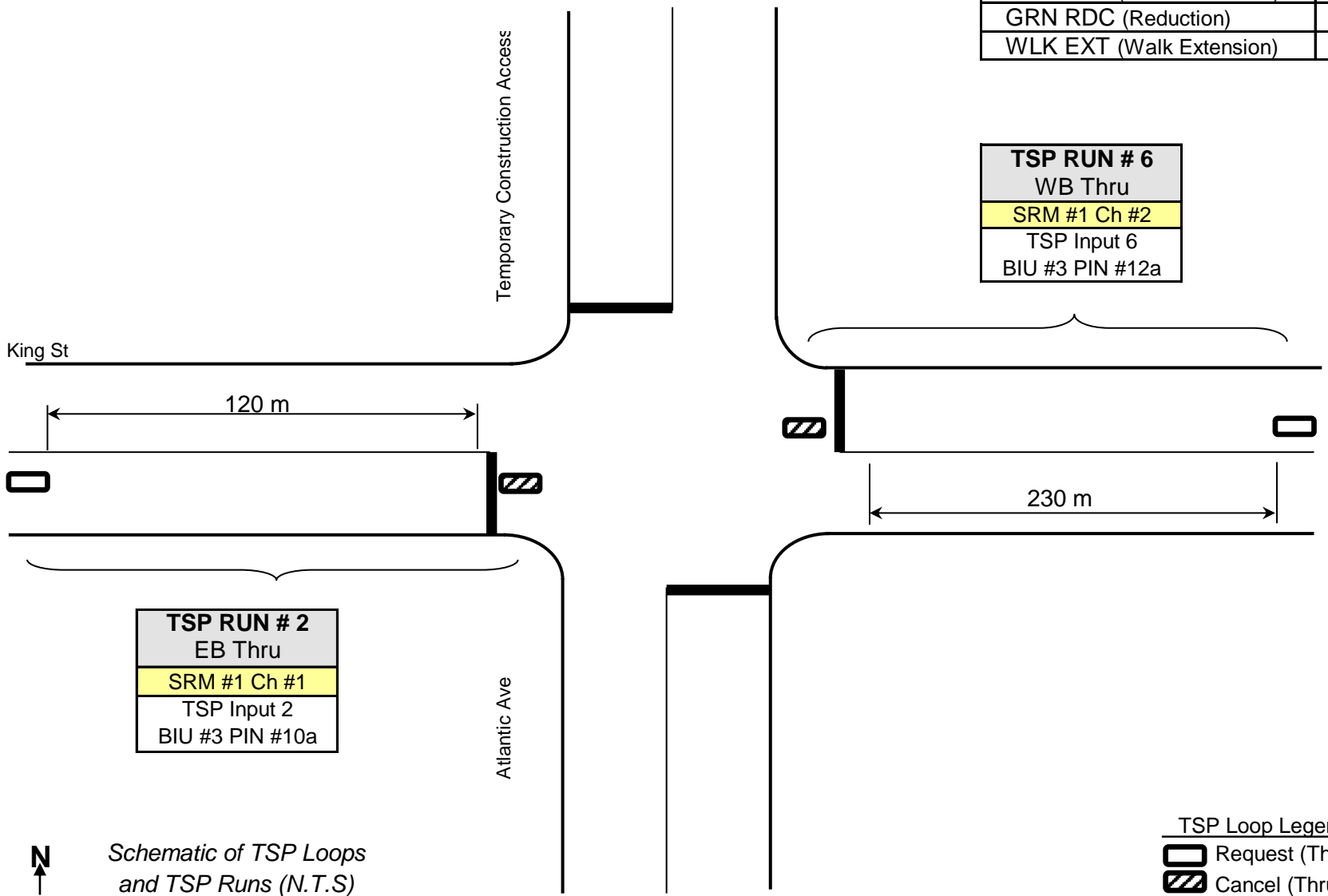
2.8.4 Transit Run Configuration 3

Delay / Extend / Fail	5 / -- / 235	7 / -- / 235
CALLS (and Extends)	Ø 2/6	Ø 2/6
Skips	--	--
Reduces (Truncates)	Ø 4/8	Ø 4/8

	Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8
--	-----	-----	-----	-----	-----	-----	-----	-----

2.8.6 TSP Split Tables: 1, 2, 3 & 4

GRN EXT (SDW Extension)	--	--	--	--	--	--	--	--
GRN RDC (Reduction)	--	--	--	-1	--	--	--	-1
WLK EXT (Walk Extension)	--	30	--	--	--	30	--	--



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: 30 s Green/Walk
 NSG Truncation to ped minimum

LOCATION: King St & Dufferin St
 MODE/COMMENT: SA1 with TSP
 TCS: 539
 PREPARED BY / DATE: RanaJamil Iftikhar / January 13, 2021
 CHECKED BY / DATE:
 IMPLEMENTATION DATE: January 13, 2021

ATO / DISTRICT / WARD: Area 1 / Toronto & East York / Ward 4 & 10
 COMPUTER SYSTEM: TransSuite
 CONTROLLER/CABINET TYPE: Peek ATC-1000 / TS2T1
 CONFLICT FLASH: Red & Red
 DESIGN WALK SPEED: 0.9 m/s (FDW based on full crossing at 1.1 m/s)
 CHANNEL/DROP: 4026/18
 CONTROLLER/FIRMWARE: 3.018.1.2976



NEMA Phase	Local Plan Split Table	OFF	AM	PM	NGHT	WKND	Caribana	Phase Mode (Fixed/Demanded or Callable)	Remarks
		All Other Times	06:30-09:30 M-F	15:00-19:00 M-F	23:00-06:30 Daily	10:00-19:00 Sat/Sun	TBD		
		Pattern 1 Split 1	Pattern 2 Split 2	Pattern 3 Split 3	Pattern 4 Split 4	Pattern 5 Split 5	Pattern 6 Split 6		
1 	WLK FDW MIN 10 MAX1 10 AMB 3 ALR 6 SPLIT	0	0	0	0	0	0	Protected/Permissive WBLTGA Callable by WBLT streetcars via interrogator (Max extension of 10 secs in WBLA)	Pedestrian Minimums: EWWK = 8 sec, EWFD = 15 sec NSWK = 8 sec, NSFD = 15 sec Left Turn Passage Time = 2 sec See back for TSP instructions. TSP enabled on June 23, 2015 Due to restrictions in ATC-1000 firmware version 3.18.2976, phase 2 & 6 splits must be programmed as at least 30 during all patterns at this intersection.
2 King St 	WLK 8 FDW 15 MIN 23 MAX1 26 AMB 3.3 ALR 2.2 SPLIT	32	41	35	33	33	35	Fixed POZ activated by Request Loop (Max extension of 16 secs in Green/SDW)	TSP temporarily disabled on January 13, 2021 during bus replacement for 504 King routes.
3 	WLK FDW MIN MAX1 AMB ALR SPLIT								
4 Dufferin St 	WLK 8 FDW 15 MIN 23 MAX1 40 AMB 3.3 ALR 2.2 SPLIT	46	39	45	31	47	45	Fixed POZ activated by Request Loop (Max extension of 16 secs in Green/SDW)	
5 	WLK FDW MIN 6 MAX1 6 AMB 3.3 ALR 4.0 SPLIT							Demanded (In Shared Thru-Left Lane) Reserved for Future Use Times to be Determined	
6 King St 	WLK 8 FDW 15 MIN 23 MAX1 26 AMB 3.3 ALR 2.2 SPLIT	32	41	35	33	33	35	Fixed POZ activated by Request Loop (Max extension of 16 secs in Green/SDW)	
7 	WLK FDW MIN 6 MAX1 6 AMB 3.3 ALR 3.9 SPLIT	14		14		14	14	Demanded (In Shared Thru-Left Lane)	
8 Dufferin St 	WLK 8 FDW 15 MIN 23 MAX1 26 AMB 3.3 ALR 2.2 SPLIT	32	39	31	31	33	31	Fixed POZ activated by Request Loop (Max extension of 16 secs in Green/SDW)	
	CL OF	78 53	80 24	80 29	64 29	80 45	80 46		

Note:

LOC: King St & Dufferin St
 MODE: SA1 with TSP
 TCS: 539

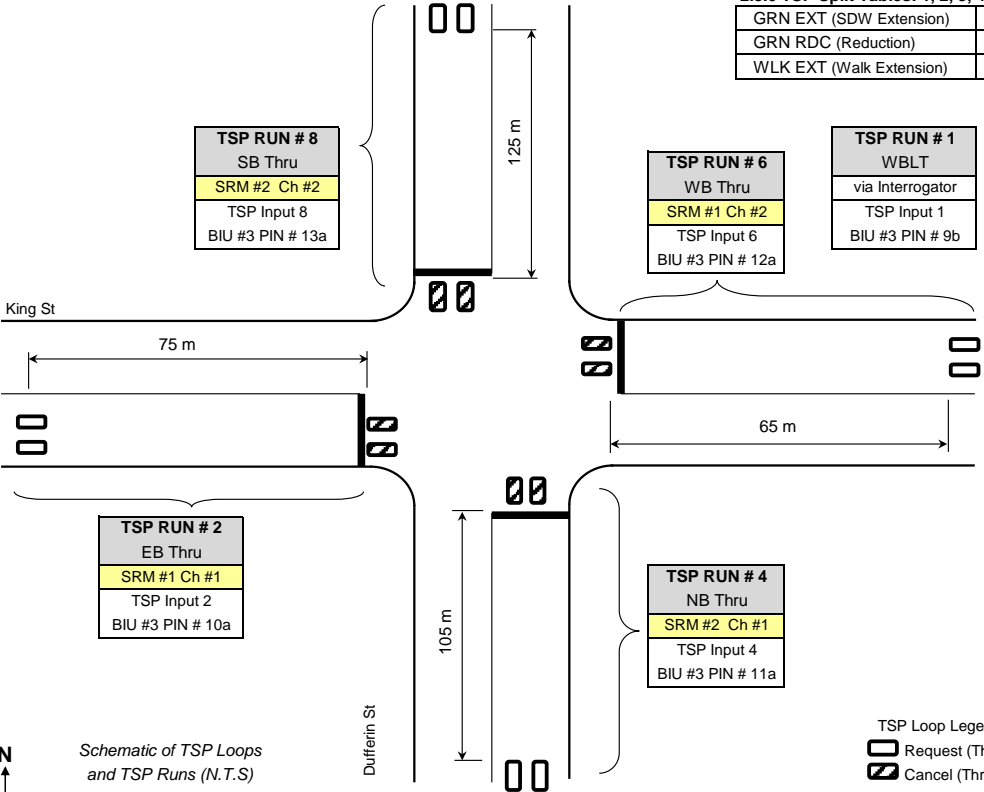
OFFSET CORRECTION PARAMETERS

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]	Thres.
OFF													
Split 1	Ext.	--	18	--	19	--	18	--	19		78	5	5 [6%]
	Rdc.	--	3	--	2	--	3	1	1				
AM													
Split 2	Ext.	--	15	--	15	--	15	--	15		80	10	20 [25%]
	Rdc.	--	5	--	5	--	5	--	5				
PM													
Split 3	Ext.	--	17	--	18	--	17	--	18		80	8	11 [14%]
	Rdc.	--	7	--	1	--	7	1	--				
NGT													
Split 4	Ext.	--	15	--	15	--	15	--	15		64	6	5 [8%]
	Rdc.	--	4	--	2	--	4	--	2				
WKND													
Split 5	Ext.	--	17	--	18	--	17	--	18		80	8	11 [14%]
	Rdc.	--	5	--	3	--	5	1	2				
Caribana													
Split 6	Ext.	--	17	--	18	--	17	--	18		80	8	11 [14%]
	Rdc.	--	7	--	1	--	7	1	--				

OC Rdc for Phase 8 is set assuming the reductions need to be limited based on longer Phase 7 clearances applied to the through phases due to a firmware issue.
 Pattern 1, 3, 4, 5 & 6 OC Thres set to 3x available slop (adjusted for long LT clearance).
 Controller could take up to 3 cycles to get back in sync from -TSP Recovery.

2.1.9.2 Advanced I/O Scripts
 Input Script 1: "TSPFilter539"
 Blocks TSP 2/6 calls during phase 2/6 Amb/AIR and blocks TSP 4/8 calls during phase 4/8 Amb/AIR to mitigate firmware issues with ATC-1000 version 3.018.2976



T.S.P. PARAMETERS

TSP RUN # 1	TSP RUN # 2	TSP RUN # 4	TSP RUN # 6	TSP RUN # 8
WBLT	EB Thru	NB Thru	WB Thru	SB Thru

2.8.2 Transit Run Parameters

ATC Green Extend Mode (Equivalent TTC Algorithm)	Mode 0	Mode 0	Mode 0	Mode 0	Mode 0
	B-2	B-2	B-2	B-2	B-2

2.8.3 Transit Action Plan 1 (Used for Patterns 1, 4, 5 & 6)

Run Enable (X = Yes)		X	X	X	X	X
Run Config = 1	Recovery = 1 (o.c.)					

2.8.3 Transit Action Plan 2 (Used for Pattern 2)

Run Enable (X = Yes)	X	X	X	X	X
Run Config = 2	Recovery = 1 (o.c.)				

2.8.3 Transit Action Plan 3 (Used for Pattern 3)

Run Enable (X = Yes)	X	X	X	X	X
Run Config = 3	Recovery = 1 (o.c.)				

2.8.4 Transit Run Configuration 1

Delay / Extend / Fail	-- / -- / 235	23 / 4 / 235	28 / -- / 235	22 / 4 / 235	21 / -- / 235
Max Req During Offset Corr	1	1	1	1	1
CALLS (and Extends)	Ø 1	Ø 2/6	Ø 4/8	Ø 2/6	Ø 4/8
Skips	--	--	--	--	--
Reduces (Truncates)	--	--	--	--	--

2.8.4 Transit Run Configuration 2

Delay / Extend / Fail	-- / -- / 235	26 / 4 / 235	38 / -- / 235	21 / 4 / 235	17 / -- / 235
Max Req During Offset Corr	1	1	1	1	1
CALLS (and Extends)	Ø 1	Ø 2/6	Ø 4/8	Ø 2/6	Ø 4/8
Skips	--	--	--	--	--
Reduces (Truncates)	--	--	--	--	--

2.8.4 Transit Run Configuration 3

Delay / Extend / Fail	-- / -- / 235	23 / 4 / 235	42 / -- / 235	31 / 4 / 235	18 / -- / 235
Max Req During Offset Corr	1	1	1	1	1
CALLS (and Extends)	Ø 1	Ø 2/6	Ø 4/8	Ø 2/6	Ø 4/8
Skips	--	--	--	--	--
Reduces (Truncates)	--	--	--	--	--

	Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8
--	-----	-----	-----	-----	-----	-----	-----	-----

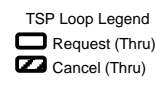
2.8.6 TSP Split Tables: 1, 2, 3, 4, 5 & 6

GRN EXT (SDW Extension)	+10	+16	--	+16	--	+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: 16s Green/SDW
 NSG: 16s Green/SDW
 WBLTA: 10s Green



LOCATION:	King St & Shaw St	DISTRICT:	Toronto & East York
MODE/COMMENT:	SAP with PR, 2-Wire Polara APS & LPI & TSP	COMPUTER SYSTEM:	TransSuite
TCS:	1628	CONTROLLER/CABINET TYPE:	Peek ATC 1000 / TS2 T1
PREPARED BY / DATE:	Alvin Luk / June 8, 2020	CONFLICT FLASH:	Red & Red
CHECKED BY / DATE:	Tony Zhao / Ameneh Dialameh / June 18, 2020	DESIGN WALK SPEED:	1.0 m/s (FDW based on full crossing at 1.2 m/s)
IMPLEMENTATION DATE:	July 30, 2020	CHANNEL/DROP:	4026/14
		FIRMWARE VERSION:	3.018.1.2976



NEMA Phase	Local Plan Split Table	OFF	AM	PM	Gardiner Clsr	Phase Mode (Fixed/Demanded/Callable)	Remarks
		All Other Times	06:45-09:30 M-F	15:45-18:15 M-F	Times to be determined		
		Pattern 1 Split 1	Pattern 2 Split 2	Pattern 3 Split 3	Pattern 4 Split 4		
1 	WLK FDW MIN MAX1 AMB ALR SPLIT						Pedestrian Minimums: EWWK = 7 secs; EWFD = 17 secs NSWK = 7 secs; NSFD = 14 secs NS phase is callable by vehicle or pedestrian actuation. If a vehicle and/or pedestrian call is received, the maximum NSG is served. The NSWK & NSFD are displayed on the pedestrian signal heads if a pedestrian or vehicle call is received.
2 	King St WLK DLY 5 WLK 7 FDW 17 MIN 19 MAX1 26 AMB 3.0 ALR 2.7 SPLIT					Fixed POZ activated by Request Loop (max extension of 30 secs in Green/Walk) Split shown includes 5 sec of EW LPI	APS on for 7 secs of EWWK and NSWK when activated by the push buttons. Extended Push Activation = 3 secs See back for TSP Instructions. TSP re-enabled for both directions on February 2, 2018 Script 5 blocks TSP requests from streetcars less than 90 seconds behind the previous streetcar in the same direction.
3 	WLK FDW MIN MAX1 AMB ALR SPLIT						NS Leading Pedestrian Interval - NSWK comes up 5 seconds before NS vehicle green. EW Leading Pedestrian Interval - EWWK comes up 5 seconds before EW vehicle green. Extra 0.5s in Phase 4/8 to always be served when phase is called.
4 	Shaw St WLK DLY 5 WLK 7 FDW 14 MIN 16 MAX1 16 AMB 3.0 ALR 3.5 SPLIT					Callable by Wavetronix detector and/or Push Button Split shown includes 5 sec of NS LPI	
5 	WLK FDW MIN MAX1 AMB ALR SPLIT						
6 	King St WLK DLY 5 WLK 7 FDW 17 MIN 19 MAX1 26 AMB 3.0 ALR 2.7 SPLIT					Fixed POZ activated by Request Loop (max extension of 30 secs in Green/Walk) Split shown includes 5 sec of EW LPI	
7 	WLK FDW MIN MAX1 AMB ALR SPLIT						
8 	Shaw St WLK DLY 5 WLK 7 FDW 14 MIN 16 MAX1 16 AMB 3.0 ALR 3.5 SPLIT					Callable by Wavetronix detector and/or Push Button Split shown includes 5 sec of NS LPI	
	CL OF	65 1	70 1	70 1	80 42		

NOTES: No EWLT from 7:00AM-10:00AM, M-F; 3:00PM-7:00PM, M-F; public holidays excepted; bicycles excepted; TTC vehicles excepted on EB.

LOC: King St & Shaw St
 MODE: SAP with PR, 2-Wire Polara APS & LPI & TSP
 TCS: 1628 PREPARATION DATE (TIMING CARD): June 8, 2020

OFFSET CORRECTION PARAMETERS

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

		Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8	[Cycle]	[Slop]	Thres.
From page 1												
OFF												
Split 1	Ext.	--	30	--	--	--	30	--	--	65	2	6 s [9 %]
	Rdc.	--	2	--	--	--	2	--	--			
AM												
Split 2	Ext.	--	26	--	--	--	26	--	--	70	7	18 s [25 %]
	Rdc.	--	7	--	--	--	7	--	--			
PM												
Split 3	Ext.	--	26	--	--	--	26	--	--	70	7	18 s [25 %]
	Rdc.	--	7	--	--	--	7	--	--			
GARDINER												
Split 4	Ext.	--	30	--	--	--	30	--	--	80	17	20 s [25 %]
	Rdc.	--	17	--	--	--	17	--	--			

2.1.9.2 Advanced I/O Scripts

Input Script 5 'TSP26Timer'

Blocks TSP 2 and TSP 6 calls from vehicles with a headway less than 90 sec
 To view current status of TSP inputs, go to screen 2.1.9.2 page 01 and press [C].

T.S.P. PARAMETERS

PREPARED: AL

TSP RUN # 2	TSP RUN # 6
EB Thru	WB Thru

2.8.2 Transit Run Parameters

ATC Green Extend Mode (Equivalent TTC Algorithm)	Mode 2 A (walk)	Mode 2 A (walk)

2.8.3 Transit Action Plan 1 (Used for Pattern 1 & 4)

Run Enable (X = Yes)	X	X
Run Config = 1	Recovery = 2 (O.C. with delay)	

2.8.3 Transit Action Plan 2 (Used for Pattern 2)

Run Enable (X = Yes)	X	X
Run Config = 2	Recovery = 2 (O.C. with delay)	

2.8.3 Transit Action Plan 3 (Used for Pattern 3)

Run Enable (X = Yes)	X	X
Run Config = 3	Recovery = 2 (O.C. with delay)	

2.8.4 Transit Run Configuration 1

Delay / Extend / Fail	-- / -- / 235	-- / -- / 235
Max Req During Offset Corr	1	1
CALLS (and Extends)	Ø 2/6	Ø 2/6
Skips	--	--
Reduces (Truncates)	--	--

2.8.4 Transit Run Configuration 2

Delay / Extend / Fail	10 / -- / 235	-- / -- / 235
Max Req During Offset Corr	1	1
CALLS (and Extends)	Ø 2/6	Ø 2/6
Skips	--	--
Reduces (Truncates)	--	--

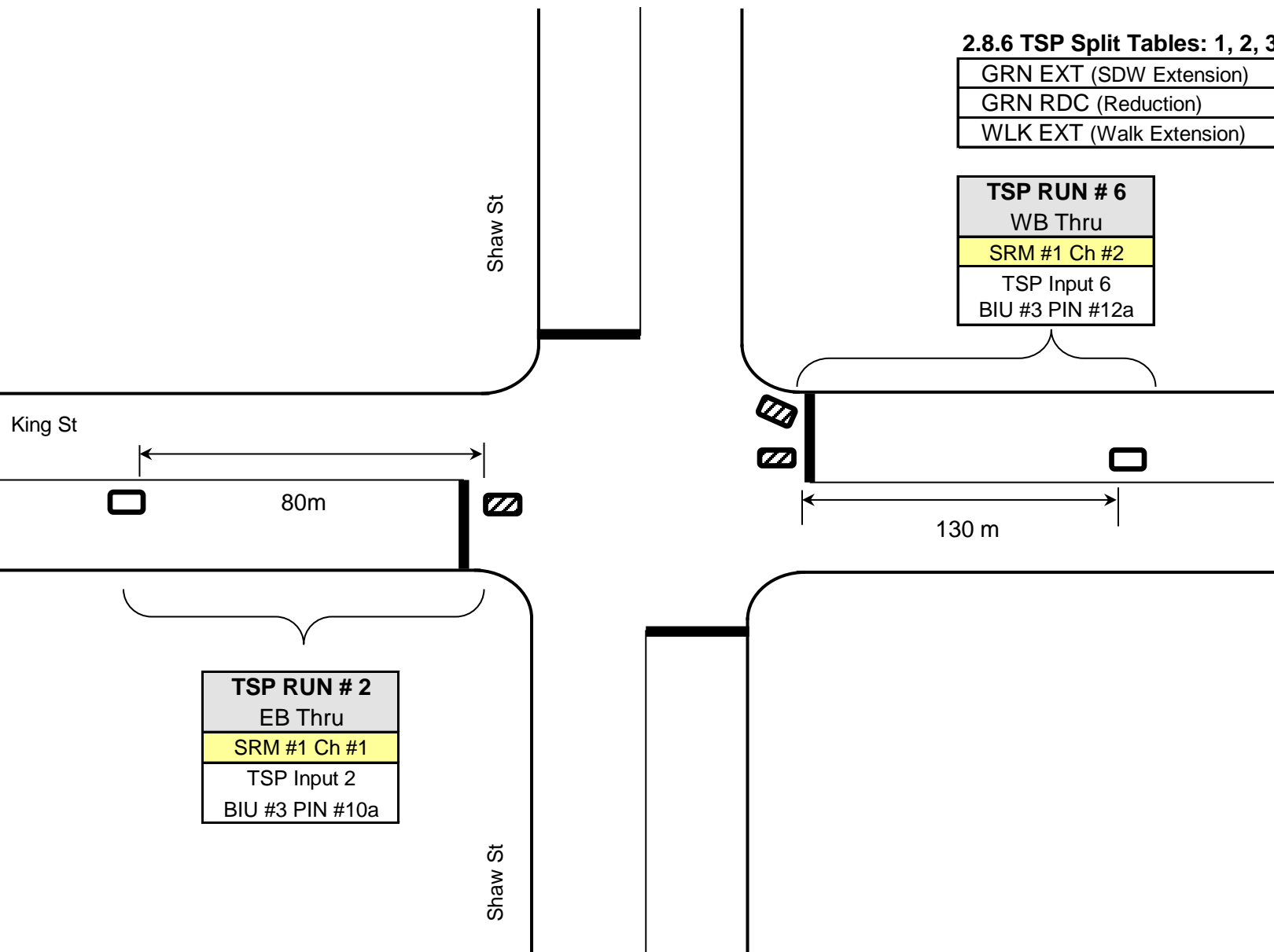
2.8.4 Transit Run Configuration 3

Delay / Extend / Fail	-- / -- / 235	7 / -- / 235
Max Req During Offset Corr	1	1
CALLS (and Extends)	Ø 2/6	Ø 2/6
Skips	--	--
Reduces (Truncates)	--	--

Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8
-----	-----	-----	-----	-----	-----	-----	-----

2.8.6 TSP Split Tables: 1, 2, 3 & 4

GRN EXT (SDW Extension)	--	--	--	--	--	--	--
GRN RDC (Reduction)	--	--	--	--	--	--	--
WLK EXT (Walk Extension)	--	30	--	--	--	30	--



Notes:

*Truncation of Phase 4/8 to the minimum is approved for the future, but it is not used due to a firmware issue with 3.18.2976 and LPIs.

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: 30 s Green/WLK

TSP Loop Legend

LOCATION:	King St W & Strachan Ave	DISTRICT:	Toronto & East York
MODE/COMMENT:	FXT with TSP*	COMPUTER SYSTEM:	TransSuite
TCS:	538	CONTROLLER/CABINET TYPE:	Peek ATC-1000 / TS2 T1
PREPARED BY / DATE:	Ranajamil Iftikhar / November 19, 2018	CONFLICT FLASH:	Red & Red
CHECKED BY / DATE:	Carmen Lam / November 21, 2108	DESIGN WALK SPEED:	1.0 m/s (FDW based on full crossing at 1.2 m/s)
IMPLEMENTATION DATE:	November 29, 2018	CHANNEL/DROP:	4026/11
		CONTROLLER FIRMWARE:	3.018.1.2976



NEMA Phase	Local Plan Split Table	OFF	AM	PM	NGHT	WKND	SPEC EVENT	Phase Mode (Fixed/Demanded or Callable)	Remarks
		All Other Times	06:45-09:30 M-F	15:45-18:15 M-F	22:00-06:45 Daily	09:00-19:00 Sat & Sun	Times to be determined		
		Pattern 1 Split 1	Pattern 2 Split 2	Pattern 3 Split 3	Pattern 4 Split 4	Pattern 5 Split 5	Pattern 16 Split 16		
1 	WLK FDW MIN 6 MAX1 7 AMB 3 ALR 1 SPLIT							Demanded (Phase not currently in use - only implemented for during Dufferin St bridge rehab)	Pedestrian Minimums: EWWK = 7 sec, EWFD = 13 sec NSWK = 7 sec, NSFD = 14 sec *See back for TSP Instructions. WB & EB TSP enabled on Feb 3, 2014. Script 1 blocks TSP requests from streetcars less than 90 seconds behind the previous streetcar in the same direction.
2 King St 	WLK 7 FDW 13 MIN 20 MAX1 32 AMB 3 ALR 3 SPLIT							Fixed POZ activated by Request Loop (max extension of 30 secs in EBG/Walk)	
3 	WLK FDW MIN MAX1 AMB ALR SPLIT								
4 Strachan Av 	WLK 7 FDW 14 MIN 21 MAX1 22 AMB 4 ALR 2 SPLIT							Fixed (truncations allowable to pedestrian minimum)	
5 	WLK FDW MIN MAX1 AMB ALR SPLIT								
6 King St 	WLK 7 FDW 13 MIN 20 MAX1 32 AMB 3 ALR 3 SPLIT							Fixed POZ activated by Request Loop (max extension of 30 secs in WBG/Walk)	
7 	WLK FDW MIN MAX1 AMB ALR SPLIT								
8 Strachan Av 	WLK 7 FDW 14 MIN 21 MAX1 22 AMB 4 ALR 2 SPLIT							Fixed (truncations allowable to pedestrian minimum)	
	CL OF	70 14	80 42	80 50	70 59	75 47	70 14		

Notes:

LOC: King St & Strachan Av
 MODE: FXT with TSP
 TCS: 538 PREPARATION DATE (TIMING CARD): November 20, 2018

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)
OFF											
Split 1	Ext.	--	13	--	13	--	13	--	13	70	9
	Rdc.	--	5	--	4	--	5	--	4		
AM											
Split 2	Ext.	--	15	--	15	--	15	--	15	80	10
	Rdc.	--	6	--	4	--	6	--	4		
PM											
Split 3	Ext.	--	15	--	15	--	15	--	15	80	10
	Rdc.	--	6	--	4	--	6	--	4		
NIGHT											
Split 4	Ext.	--	13	--	13	--	13	--	13	70	9
	Rdc.	--	5	--	4	--	5	--	4		
WKND											
Split 5	Ext.	--	14	--	14	--	14	--	14	75	10
	Rdc.	--	6	--	4	--	6	--	4		
SPECIAL EVENT											
Split 16	Ext.	--	13	--	13	--	13	--	13	70	9
	Rdc.	--	8	--	1	--	8	--	1		

2.3.2.x O.C.

Thres.	Pattern	Time	Slop
17	Pattern 1	17 s	[24 %]
20	Pattern 2	20 s	[25 %]
20	Pattern 3	20 s	[25 %]
18	Pattern 4	18 s	[26 %]
19	Pattern 5	19 s	[25 %]
18	Pattern 16	18 s	[26 %]

T.S.P. PARAMETERS

PREPARED: RI

TSP RUN # 2	TSP RUN # 6
EB Thru	WB Thru

2.8.2 Transit Run Parameters

ATC Green Extend Mode (Equivalent TTC Algorithm)	Mode 2	Mode 2
	A	A

2.8.3 Transit Action Plan 1 (Used for Patterns 1, 4, 5, 16)

Run Enable (X = Yes)	X	X
Run Config = 1	Recovery = 2 (O.C. with delay)	

2.8.3 Transit Action Plan 2 (Used for Pattern 2)

Run Enable (X = Yes)	X	X
Run Config = 2	Recovery = 2 (O.C. with delay)	

2.8.3 Transit Action Plan 3 (Used for Pattern 3)

Run Enable (X = Yes)	X	X
Run Config = 3	Recovery = 2 (O.C. with delay)	

2.8.4 Transit Run Configuration 1

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

2.8.4 Transit Run Configuration 2

Delay / Extend / Fail	15 / -- / 235	4 / -- / 235
CALLS (and Extends)	Ø 2/6	Ø 2/6
Skips	--	--
Reduces (Truncates)	Ø 4/8	Ø 4/8

2.8.4 Transit Run Configuration 3

Delay / Extend / Fail	4 / -- / 235	9 / -- / 235
CALLS (and Extends)	Ø 2/6	Ø 2/6
Skips	--	--
Reduces (Truncates)	Ø 4/8	Ø 4/8

2.8.6 TSP Split Tables: 1 & 4

	Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8
GRN EXT (SDW Extension)	--	--	--	--	--	--	--	--
GRN RDC (Reduction)	--	--	--	-5	--	--	--	-5
WLK EXT (Walk Extension)	--	30	--	--	--	30	--	--

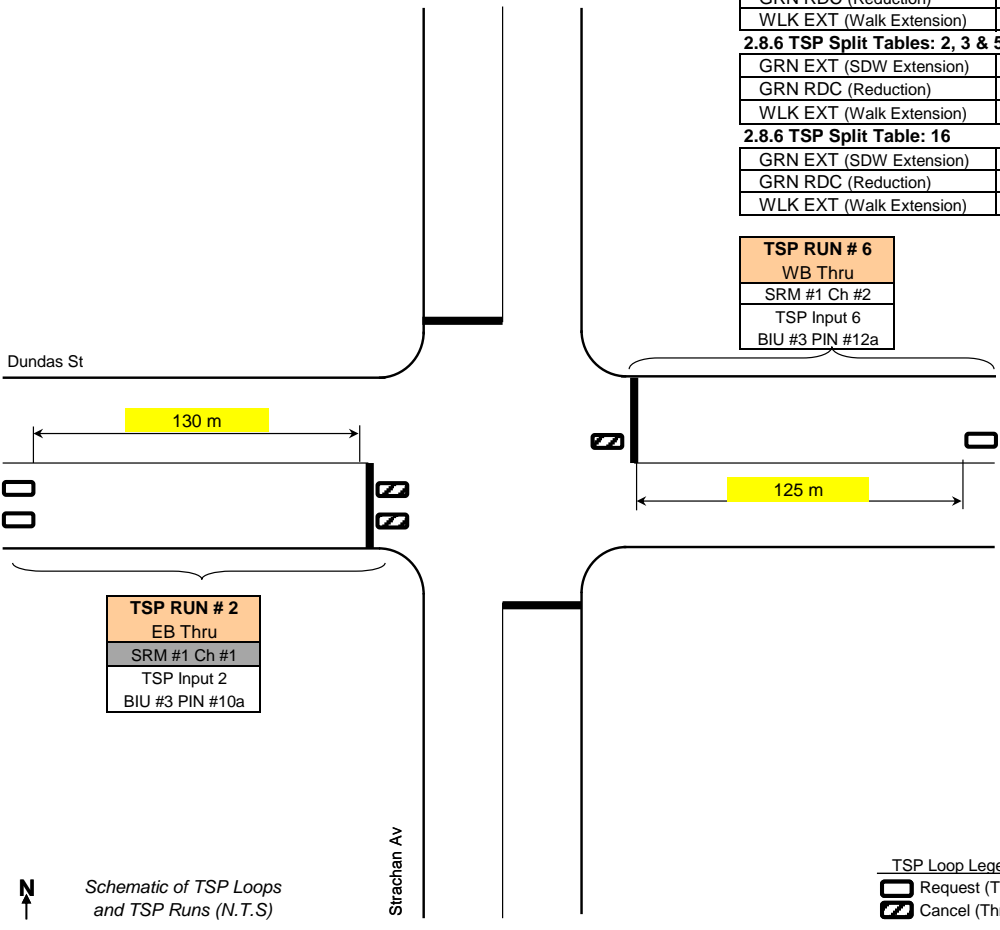
2.8.6 TSP Split Tables: 2, 3 & 5

GRN EXT (SDW Extension)	--	--	--	--	--	--	--	--
GRN RDC (Reduction)	--	--	--	-7	--	--	--	-7
WLK EXT (Walk Extension)	--	30	--	--	--	30	--	--

2.8.6 TSP Split Table: 16

GRN EXT (SDW Extension)	--	--	--	--	--	--	--	--
GRN RDC (Reduction)	--	--	--	-1	--	--	--	-1
WLK EXT (Walk Extension)	--	30	--	--	--	30	--	--

TSP RUN # 6
WB Thru
SRM #1 Ch #2
TSP Input 6
BIU #3 PIN #12a




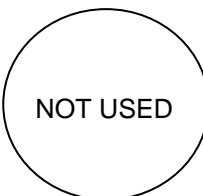
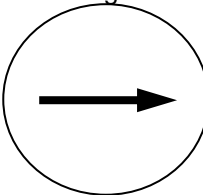
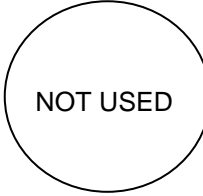
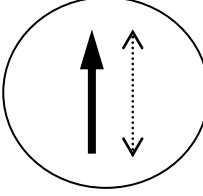
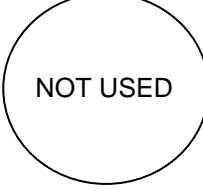
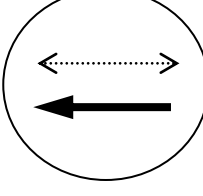
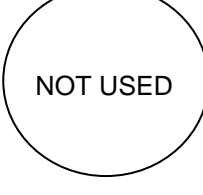
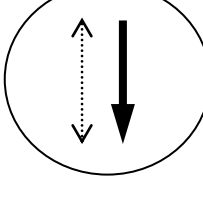
ATC Mode	0	2	3	4
TTC Algor'm	B-2	A	C	D
Extensions	SDW	Walk	W/SDW	W/SDW

TSP SUMMARY

Maximum Green Extensions:
 EWG: 30 s Green/Walk
 Truncation of phases 4 and 8 to ped min

TSP Loop Legend
 [Symbol] Request (Thru)
 [Symbol] Cancel (Thru)

LOCATION:	King St & Sudbury St / Private Access	DISTRICT:	Toronto & East York	N 
MODE/COMMENT:	SAP with PR & TSP	COMPUTER SYSTEM:	TransSuite	
TCS:	1851	CONTROLLER/CABINET TYPE:	Peek ATC 1000 / TS2 T1	
PREPARED BY / DATE:	Ranajamil Iftikhar / January 18, 2021	CONFLICT FLASH:	Red & Red	
CHECKED BY / DATE:		DESIGN WALK SPEED:	1.0 m/s (FDW based on full crossing at 1.2 m/s)	
IMPLEMENTATION DATE:	January 18, 2021	CHANNEL/DROP:	4026/15	
		CONTROLLER FIRMWARE:	3.018.1.2976	

NEMA Phase	Local Plan Split Table	OFF	AM	PM	CARIBANA	Phase Mode (Fixed/Demanded or Callable)	Remarks
		All Other Times	06:45-09:30 M-F	15:45-18:15 M-F	Times to be Determined		
		Pattern 1 Split 1	Pattern 2 Split 2	Pattern 3 Split 3	Pattern 4 Split 4		
1 	WLK FDW MIN MAX1 AMB ALR SPLIT						Pedestrian Minimums: NSWK = 7 sec, NSFD = 14 sec EWWK = 7 sec, EWFD = 17 sec NS phase is callable by vehicle or pedestrian actuation. If a vehicle call and/or a pedestrian call is received, the pedestrian minimums will be served. The NSWK & NSFD are only displayed on the pedestrian signal heads if a vehicle and/or pedestrian call is received.
2 King St 	WLK 7 FDW 17 MIN 24 MAX1 43 AMB 4 ALR 2 SPLIT					Fixed POZ activated by Request Loop (max extension of 30 secs in Green/Walk)	See back for TSP Instructions. EB & WB TSP enabled on Feb 3, 2014 Additional 1 second above the pedestrian minimum provided to the Phase 4/8 SPLIT is to be served in Phase 4/8.
3 	WLK FDW MIN MAX1 AMB ALR SPLIT						Script 1 blocks TSP requests from streetcars less than 90 seconds behind the previous streetcar in the same direction. TSP temporarily disabled on January 18, 2021 during bus replacement for 504 King routes.
4 Private Access 	WLK 7 FDW 14 MIN 21 MAX1 21 AMB 3 ALR 2 SPLIT					Callable by Stopbar loop and/or Pushbutton; Truncations allowable to pedestrian minimum	
5 	WLK FDW MIN MAX1 AMB ALR SPLIT						
6 King St 	WLK 7 FDW 17 MIN 24 MAX1 43 AMB 4 ALR 2 SPLIT					Fixed POZ activated by Request Loop (max extension of 30 secs in Green/Walk)	
7 	WLK FDW MIN MAX1 AMB ALR SPLIT						
8 Sudbury St 	WLK 7 FDW 14 MIN 21 MAX1 21 AMB 3 ALR 2 SPLIT					Callable by Traficam detector and/or Pushbutton; Truncations allowable to pedestrian minimum	
	CL OF	75 1	80 1	80 1	80 52		

Notes:

LOC: King St & Sudbury St / Private Access
 MODE: SAP with PR & TSP
 TCS: 1851 PREPARATION DATE: November 19, 201

OFFSET CORRECTION PARAMETERS

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

		Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8	[Cycle]	[Slop]
From page 1											
OFF											
Split 1	Ext.	--	28	--	--	--	28	--	--	75	19
	Rdc.	--	18	--	1	--	18	--	1		
AM											
Split 2	Ext.	--	30	--	--	--	30	--	--	80	24
	Rdc.	--	23	--	1	--	23	--	1		
PM											
Split 3	Ext.	--	30	--	--	--	30	--	--	80	24
	Rdc.	--	23	--	1	--	23	--	1		
CARIBANA											
Split 4	Ext.	--	30	--	--	--	30	--	--	80	24
	Rdc.	--	23	--	1	--	23	--	1		

2.3.2.x O.C. Thres.

Pattern 1	19 s [25 %]
Pattern 2	20 s [25 %]
Pattern 3	20 s [25 %]
Pattern 3	20 s [25 %]

T.S.P. PARAMETERS

PREPARED: RI

TSP RUN # 2	TSP RUN # 6
EB Thru	WB Thru

2.8.2 Transit Run Parameters

ATC Green Extend Mode (Equivalent TTC Algorithm)	Mode 2 A (walk)	Mode 2 A (walk)
--	-----------------	-----------------

2.8.3 Transit Action Plan 1 (Used for Patterns 1,3 & 4)

Run Enable (X = Yes)	X	X
Run Config = 1	Recovery = 2 (O.C. with delay)	

2.8.3 Transit Action Plan 2 (Used for Pattern 2)

Run Enable (X = Yes)	X	X
Run Config = 2	Recovery = 2 (O.C. with delay)	

2.8.4 Transit Run Configuration 1

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

2.8.4 Transit Run Configuration 2

Delay / Extend / Fail	13 / -- / 235	-- / -- / 235
CALLS (and Extends)	Ø 2/6	Ø 2/6
Skips	--	--
Reduces (Truncates)	Ø 4/8	Ø 4/8

Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8
-----	-----	-----	-----	-----	-----	-----	-----

2.8.6 TSP Split Tables: 1, 2, 3 & 4

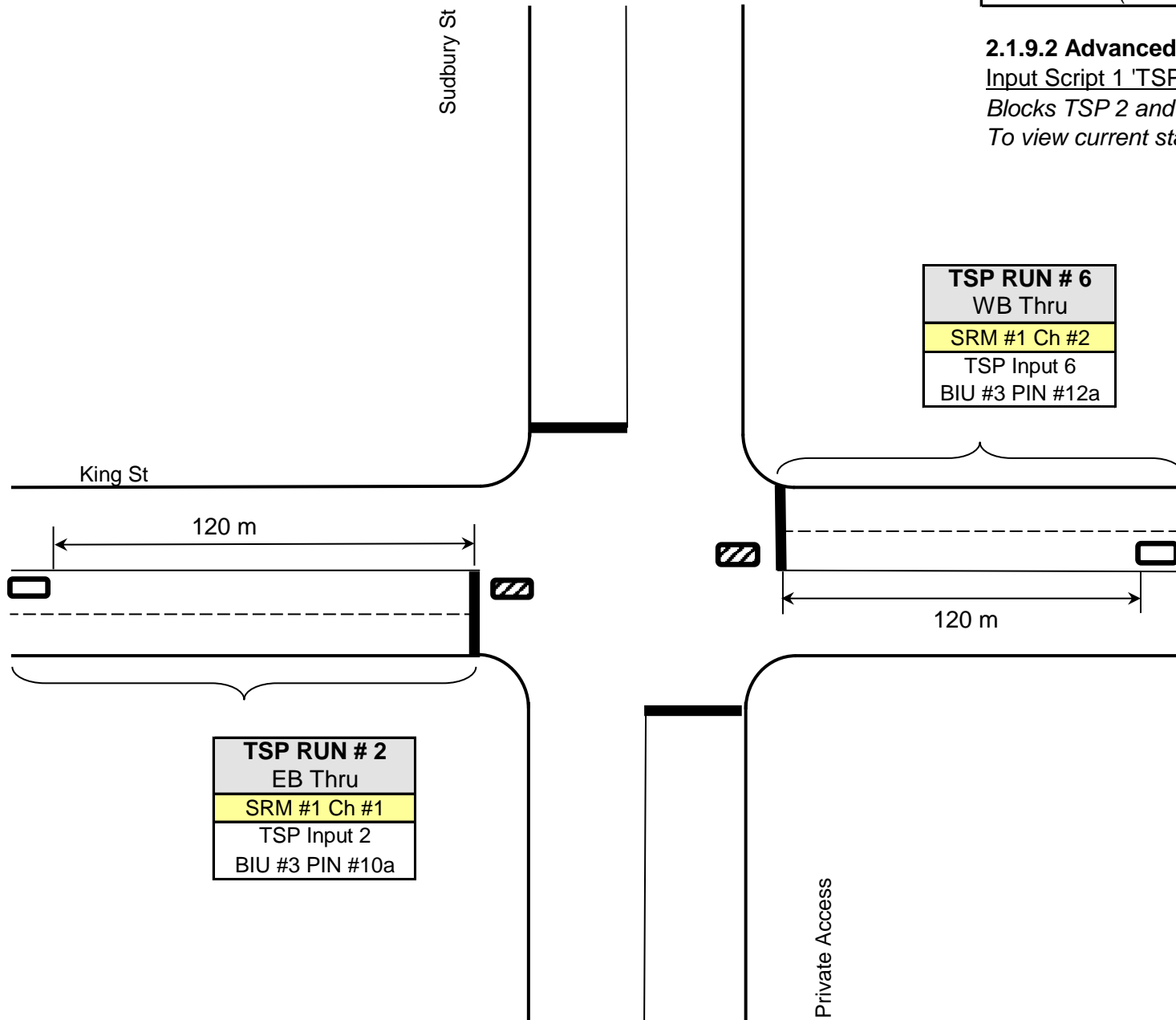
GRN EXT (SDW Extension)	--	--	--	--	--	--	--
GRN RDC (Reduction)	--	--	--	-1	--	--	-1
WLK EXT (Walk Extension)	--	30	--	--	--	30	--

2.1.9.2 Advanced I/O Scripts

Input Script 1 'TSP26Timer'

Blocks TSP 2 and TSP 6 calls from vehicles with a headway less than 90 sec

To view current status of TSP inputs, go to screen 2.1.9.2 page 01 and press [C].



Schematic of TSP Loops and TSP Runs (N.T.S)

TSP Loop Legend
 □ Request (Thru)
 ▨ Cancel (Thru)

Notes:

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

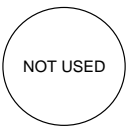
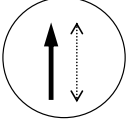
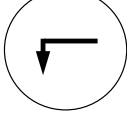
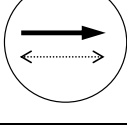

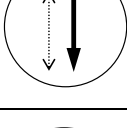
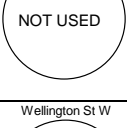
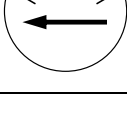
TSP SUMMARY

Maximum Green Extensions:
 EWG: 30 s Green/Walk
 NS truncation to ped min

LOCATION: MODE/COMMENT: TCS: PREPARED BY / DATE CHECKED BY / DATE IMPLEMENTATION DATE:		Strachan Ave & East Liberty St / Ordnance St FXT with 2 Wire Polara APS* 2180 WSP / February 25, 2020 Ameneh Dialameh / March 4, 2020 March 13, 2020				DISTRICT: COMPUTER SYSTEM: CONTROLLER/CABINET TYPE: CONFLICT FLASH: DESIGN WALK SPEED: CHANNEL/DROP: CONTROLLER FIRMWARE:		Toronto & East York TransSuite Peek ATC-1000 / TS2 T1 Red & Red 1.0 m/s (FDW based on full crossing at 1.2 m/s) 4026/10 3.018.1.2976	
NEMA Phase	Local Plan Split Table	OFF	AM	PM	SPEC EVENT	Phase Mode (Fixed/Demanded or Callable)	Remarks		
		All Other Times	06:45-9:30 M-F	15:45-18:15 M-F	Times to be determined				
		Pattern 1	Pattern 2	Pattern 3	Pattern 4				
1		WLK FDW MIN MAX1 AMB ALR SPLIT						Pedestrian Minimums: NSWK = 7 sec, NSFD = 14 sec EWWK = 7 sec, EWFD = 18 sec Activated APS on during FULL EW & NS Walk periods when no arrow is displayed. Extended Push Activation= 3 seconds	
2		WLK 7 FDW 14 MIN 21 MAX1 35 AMB 3.0 ALR 3.3 SPLIT				Fixed			
3		WLK FDW MIN MAX1 AMB ALR SPLIT							
4		WLK 7 FDW 18 MIN 25 MAX1 25 AMB 3.0 ALR 4.6 SPLIT				Fixed			
5		WLK FDW MIN 6 MAX1 7 AMB 3 ALR 1 SPLIT				Fixed			
6		WLK 7 FDW 14 MIN 21 MAX1 24 AMB 3.0 ALR 3.3 SPLIT				Fixed			
7		WLK FDW MIN MAX1 AMB ALR SPLIT							
8		WLK 7 FDW 18 MIN 25 MAX1 25 AMB 3.0 ALR 4.6 SPLIT				Fixed			
		CL OF	75 1	80 49	80 44	80 19			

Notes: The AM, PM and Special Event Plan favour progression for NB traffic.

LOCATION:	Strachan Ave & Wellington St W/ Douro St	ATO (DISTRICT) / WARD:	1 (Toronto & East York) / 10
MODE/COMMENT:	FT with 2-wire Polara APS & RLC (WB)	COMPUTER SYSTEM:	TransSuite
TCS:	2403	CONTROLLER/CABINET TYPE:	PEEK ATC-1000 / TS2T1
PREPARED BY/ DATE:	Dinesh Wagle / April 29, 2021	CONFLICT FLASH:	Red & Red
CHECKED BY/ DATE:	Hao Le / April 30, 2021	DESIGN WALK SPEED:	1.0m/s (FDW based on full crossing @ 1.2m/s)
IMPLEMENTATION DATE:	July 21, 2021	CHANNEL/DROP:	4026/30
		FIRMWARE VERSION:	3.018.2976

NEMA Phase	Local Plan Split Table	OFF	AM	PM	SPEC EVENT	Phase Mode (Fixed/Demanded or Callable)	Remarks
		All Other Times	06:45-09:30 M-F	15:45-18:15 M-F	Times to be determined		
		Pattern 1 Split 1	Pattern 2 Split 2	Pattern 3 Split 3	Pattern 4 Split 4		
1 	WLK FDW MIN MAX 1 AMB ALR SPLIT						Pedestrian Minimums: NSWK = 7 sec, NSFD = 13 sec EWWK = 7 sec, EWFD = 16 sec Left-Turn Passage Time = 2 secs Extended APS Push Activation = 3 secs When activated, actuated APS on during EW & NS walk periods when no arrows are displayed.
2 Strachan Ave 	WLK 7 FDW 13 MIN 20 MAX 1 33 AMB 3.0 ALR 2.9 SPLIT	39	49	43	49	Fixed	
3 	WLK FDW MIN 6 MAX 1 6 AMB 3.3 ALR 4.2 SPLIT			14		Callable and extendable by 9m setback loop	
4 Douro St 	WLK 7 FDW 16 MIN 23 MAX 1 23 AMB 3.0 ALR 4.1 SPLIT	31	31	31	31	Fixed	
5 	WLK FDW MIN 6 MAX 1 6 AMB 3.3 ALR 4.2 SPLIT			14		NBLA Fixed	
6 Strachan Ave 	WLK 7 FDW 13 MIN 20 MAX 1 33 AMB 3.0 ALR 2.9 SPLIT	39	49	29	49	Fixed	
7 	WLK FDW MIN MAX 1 AMB ALR SPLIT						
8 Wellington St W 	WLK 7 FDW 16 MIN 23 MAX 1 23 AMB 3.0 ALR 4.1 SPLIT	31	31	45	31	Fixed	
	CL OF	70 27	80 48	88 46	80 27		

NOTES:

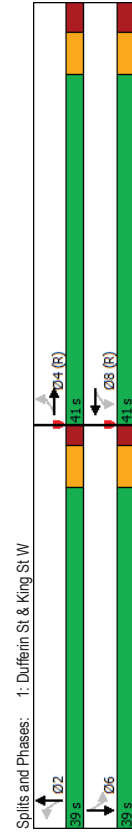
Appendix G: Synchro Analysis Summary Sheets



Queues Existing (AM)

1: Dufferin St & King St W

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	4	4	8	8	2	2	6	6
Traffic Volume (vph)	85	205	35	190	5	235	75	390
Future Volume (vph)	85	205	35	190	5	235	75	390
Ideal Flow (vphpl)	0	337	0	321	0	325	0	642
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4	4	8	8	2	2	6	6
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	21.0	21.0	21.0	21.0	20.0	20.0	20.0	20.0
Minimum Split (s)	28.0	28.0	28.0	27.0	27.0	27.0	27.0	27.0
Total Split (s)	41.0	41.0	41.0	39.0	39.0	39.0	39.0	39.0
Total Split (%)	51.3%	51.3%	51.3%	48.8%	48.8%	48.8%	48.8%	48.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	C-Min	C-Min	C-Min	C-Min	Min	Min	Min	Min
v/c Ratio	0.26	0.22	0.22	0.22	0.36	0.36	0.73	0.73
Control Delay	10.7	8.6	8.6	8.6	24.7	24.7	27.3	27.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.7	8.6	8.6	8.6	24.7	24.7	27.3	27.3
Queue Length 50th (m)	13.0	9.7	9.7	9.7	22.1	22.1	44.4	44.4
Queue Length 95th (m)	25.3	20.4	20.4	20.4	28.9	28.9	55.6	55.6
Internal Link Dist (m)	163.4	383.3	383.3	383.3	189.0	189.0	183.0	183.0
Turn Bay Length (m)								
Base Capacity (vph)	1310	1427	1427	1427	1200	1200	1164	1164
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.22	0.22	0.22	0.27	0.27	0.55	0.55
Intersection Summary								
Cycle Length: 80								
Actuated Cycle Length: 80								
Offset: 28 (35%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green								
Natural Cycle: 55								
Control Type: Actuated-Coordinated								



HCM Signalized Intersection Capacity Analysis Existing (AM)

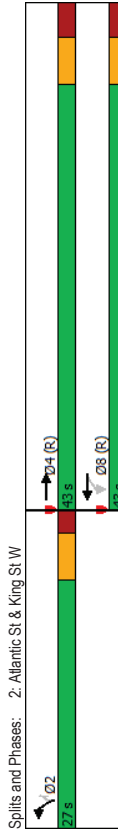
1: Dufferin St & King St W

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Movement	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	4	4	8	8	2	2	6	6
Traffic Volume (vph)	85	205	35	190	5	235	75	390
Future Volume (vph)	85	205	35	190	5	235	75	390
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Fpb. ped/bikes	0.98	0.98	0.98	0.98	1.00	1.00	0.98	0.98
Fpb. ped/bikes	0.97	0.97	0.98	0.98	1.00	1.00	0.97	0.97
Frt	0.99	0.99	0.96	0.96	0.97	0.97	0.99	0.99
Flt Protected	0.99	0.99	0.99	0.99	1.00	1.00	0.99	0.99
Satd. Flow (prot)	3042	3042	2883	2883	2922	2922	3136	3136
Flt Permitted	0.77	0.77	0.88	0.88	0.94	0.94	0.85	0.85
Satd. Flow (perm)	2384	2384	2555	2555	2761	2761	2669	2669
Peak-Hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	223	22	38	207	76	5	265
RTOR Reduction (vph)	0	5	0	0	29	0	0	33
Lane Group Flow (vph)	0	332	0	0	292	0	0	606
Conf. Peds. (#/hr)	136	256	256	136	78	189	189	78
Heavy Vehicles (%)	10%	8%	17%	42%	8%	11%	20%	3%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4	4	8	8	2	2	6	6
Permitted Phases	4	4	8	8	2	2	6	6
Actuated Green, G (s)	42.8	42.8	42.8	42.8	24.2	24.2	24.2	24.2
Effective Green, g (s)	43.8	43.8	43.8	43.8	25.2	25.2	25.2	25.2
Actuated g/C Ratio	0.55	0.55	0.55	0.55	0.31	0.31	0.31	0.31
Clearance Time (s)	7.0	7.0	7.0	7.0	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	3.0
Lane Grp Cap (vph)	1305	1305	1388	1388	869	869	840	840
v/s Ratio Prot								
v/s Ratio Perm	c0.14	0.14	0.11	0.11	0.11	0.11	c0.23	0.23
v/c Ratio	0.25	0.21	0.21	0.21	0.34	0.34	0.72	0.72
Uniform Delay, d1	9.5	9.2	9.2	9.2	21.0	21.0	24.3	24.3
Progression Factor	1.00	1.00	1.00	1.00	1.38	1.38	1.00	1.00
Incremental Delay, d2	0.5	0.5	0.3	0.3	0.2	0.2	3.1	3.1
Delay (s)	10.0	9.6	9.6	9.6	29.1	29.1	27.4	27.4
Level of Service	A	A	A	A	C	C	C	C
Approach Delay (s)	10.0	9.6	9.6	9.6	29.1	29.1	27.4	27.4
Approach LOS	A	A	A	A	C	C	C	C
Intersection Summary								
HCM 2000 Control Delay	20.6	20.6	20.6	20.6	11.0	11.0	11.0	11.0
HCM 2000 Volume to Capacity ratio	0.42	0.42	0.42	0.42	0.31	0.31	0.31	0.31
Actuated Cycle Length (s)	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
Intersection Capacity Utilization	88.9%	88.9%	88.9%	88.9%	88.9%	88.9%	88.9%	88.9%
Analysis Period (min)	15	15	15	15	15	15	15	15
Critical Lane Group								

Queues Existing (AM)

2: Atlantic St & King St W

	EBT	WBL	WBT	NBL	NBR
Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑↑	↑↑	↑↑	↑↑
Traffic Volume (vph)	375	10	425	130	95
Future Volume (vph)	375	10	425	130	95
Lane Group Flow (vph)	586	0	500	149	109
Turn Type	NA	Perm	NA	Prot	Perm
Protected Phases	4	8	2	2	2
Permitted Phases	4	8	8	2	2
Detector Phase					
Switch Phase					
Minimum Initial (s)	21.0	21.0	21.0	20.0	20.0
Minimum Split (s)	28.0	28.0	26.0	26.0	26.0
Total Split (s)	43.0	43.0	43.0	27.0	27.0
Total Split (%)	61.4%	61.4%	61.4%	38.6%	38.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.0	6.0	6.0	5.0	5.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	C-Max	C-Max	C-Max	None	None
v/c Ratio	0.35	0.29	0.29	0.29	0.25
Control Delay	7.9	9.3	20.6	5.9	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	7.9	9.3	20.6	5.9	5.9
Queue Length 50th (m)	17.2	18.1	15.6	0.0	0.0
Queue Length 95th (m)	25.4	25.6	28.6	9.6	9.6
Internal Link Dist (m)	55.1	301.6	50.4		
Turn Bay Length (m)					
Base Capacity (vph)	1666	1699	544	459	
Station Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.35	0.29	0.27	0.24	
Intersection Summary					
Cycle Length: 70					
Actuated Cycle Length: 70					
Offset: 26 (37%), Referenced to phase 4:EBT and 8:WBT.L, Start of Green					
Natural Cycle: 55					
Control Type: Actuated-Coordinated					



HCM Signalized Intersection Capacity Analysis Existing (AM)

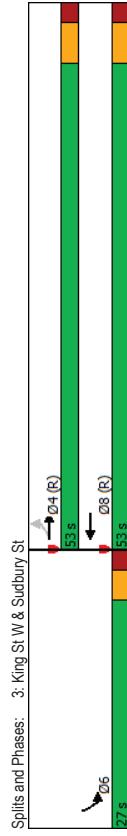
2: Atlantic St & King St W

	EBT	EBR	WBL	WBT	NBL	NBR
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑↑	↑↑	↑↑	↑↑	↑↑
Traffic Volume (vph)	375	135	10	425	130	95
Future Volume (vph)	375	135	10	425	130	95
Ideal Flow (vphpb)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00
Fpb. ped/bikes	0.91	1.00	1.00	0.86		
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.96	1.00	1.00	0.85		
Flt Protected	1.00	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	2977	3328	1733	1224		
Flt Permitted	1.00	0.94	0.95	1.00		
Satd. Flow (perm)	2977	3131	1733	1224		
Peak-Hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	431	155	11	489	149	109
RTOR Reduction (vph)	61	0	0	0	0	76
Lane Group Flow (vph)	535	0	0	500	149	33
Confl. Peds. (#/hr)	186	186	223	123		
Confl. Bikes (#/hr)	5					
Heavy Vehicles (%)	6%	3%	0%	7%	3%	12%
Turn Type	NA	Perm	NA	Prot	Perm	Perm
Protected Phases	4		8	2	2	
Permitted Phases	4	8				2
Actuated Green, G (s)	37.0		37.0	20.0	20.0	
Effective Green, g (s)	38.0		38.0	21.0	21.0	
Actuated g/C Ratio	0.54		0.54	0.30	0.30	
Clearance Time (s)	7.0		7.0	6.0	6.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1616		1699	519	367	
v/s Ratio Prot	c0.18			c0.09		
v/s Ratio Perm			0.16		0.03	
v/c Ratio	0.33		0.29	0.29	0.09	
Uniform Delay, d1	8.9		8.7	18.8	17.6	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	0.6		0.4	0.3	0.1	
Delay (s)	9.5		9.1	19.1	17.7	
Level of Service	A		A	B	B	
Approach Delay (s)	9.5		9.1	18.5		
Approach LOS	A		A	B		
Intersection Summary						
HCM 2000 Control Delay			11.1		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.32			
Actuated Cycle Length (s)			70.0		Sum of lost time (s)	11.0
Intersection Capacity Utilization			44.7%		ICU Level of Service	A
Analysis Period (min)			15			
c. Critical Lane Group						

Existing (AM)

3: King St W & Sudbury St

	EBT	WBT	SBL
Lane Group	EBT	WBT	SBL
Lane Configurations	4↑↑	4↑↑	W
Traffic Volume (vph)	625	445	135
Future Volume (vph)	625	445	135
Lane Group Flow (vph)	644	578	206
Turn Type	NA	NA	Prot
Protected Phases	4	8	6
Permitted Phases	4	8	6
Detector Phase	4	8	6
Switch Phase	4	8	6
Minimum Initial (s)	24.0	24.0	21.0
Minimum Split (s)	30.0	30.0	26.0
Total Split (s)	53.0	53.0	27.0
Total Split (%)	66.3%	66.3%	33.6%
Yellow Time (s)	4.0	4.0	3.0
All-Red Time (s)	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	4.0
Lead/Lag			
Lead-Lag Optimize?			
Recall Mode	C-Max	C-Max	None
v/c Ratio	0.32	0.30	0.47
Control Delay	8.0	6.8	24.6
Queue Delay	0.0	0.0	0.0
Total Delay	8.0	6.8	24.6
Queue Length 50th (m)	23.4	17.6	23.1
Queue Length 95th (m)	32.7	25.9	43.4
Internal Link Dist (m)	301.6	26.9	138.9
Turn Bay Length (m)			
Base Capacity (vph)	1987	1940	460
Station Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.32	0.30	0.45
Intersection Summary			
Cycle Length: 80			
Actuated Cycle Length: 80			
Offset: 28 (35%), Referenced to phase 4:EBTL and 8:WBT, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			



Existing (AM)

3: King St W & Sudbury St

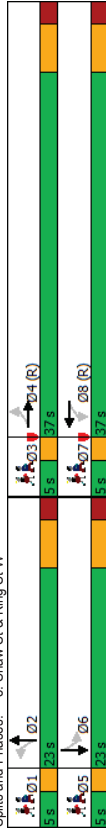
	EBL	EBT	WBT	WBR	SBL	SBR
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		4↑	4↑	4↑	W	W
Traffic Volume (vph)	0	625	445	115	135	65
Future Volume (vph)	0	625	445	115	135	65
Ideal Flow (vphpb)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	4.0		
Lane Util. Factor		0.95	0.95	1.00		
Fpb. ped/bikes		1.00	0.96	0.90		
Fpb. ped/bikes		1.00	1.00	1.00		
Frt		1.00	0.97	0.96		
Flt Protected		1.00	1.00	0.97		
Satd. Flow (prot)		3245	3124	1529		
Flt Permitted		1.00	1.00	0.97		
Satd. Flow (perm)		3245	3124	1529		
Peak-Hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	644	459	119	139	67
RTOR Reduction (vph)	0	0	28	0	22	0
Lane Group Flow (vph)	0	644	550	0	184	0
Confl. Peds. (#/hr)	100		100	60	300	
Confl. Bikes (#/hr)			35			
Heavy Vehicles (%)	50%	10%	7%	3%	3%	0%
Turn Type	NA	NA	NA	Prot	Prot	Prot
Protected Phases		4	8	6		
Permitted Phases	4					
Actuated Green, G (s)		48.0	48.0	21.0		
Effective Green, g (s)		49.0	49.0	22.0		
Actuated g/C Ratio		0.61	0.61	0.28		
Clearance Time (s)		6.0	6.0	5.0		
Vehicle Extension (s)		3.0	3.0	3.0		
Lane Grp Cap (vph)		1987	1913	420		
v/s Ratio Prot		c0.20	0.18	c0.12		
v/c Ratio		0.32	0.29	0.44		
Uniform Delay, d1		7.5	7.3	23.9		
Progression Factor		1.00	1.00	1.00		
Incremental Delay, d2		0.4	0.4	0.7		
Delay (s)		7.9	7.7	24.6		
Level of Service		A	A	C		
Approach Delay (s)		7.9	7.7	24.6		
Approach LOS		A	A	C		
Intersection Summary						
HCM 2000 Control Delay		10.2				HCM 2000 Level of Service B
HCM 2000 Volume to Capacity ratio		0.36				
Actuated Cycle Length (s)		80.0				Sum of lost time (s) 9.0
Intersection Capacity Utilization		45.0%				ICU Level of Service A
Analysis Period (min)		15				
c. Critical Lane Group						

Existing (AM)
 HCM Unsynchronized Intersection Capacity Analysis
 4: Duoro St & King St W

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	4P	4P	4P	4P	W	W
Traffic Volume (veh/h)	480	280	10	510	50	0
Future Volume (Veh/h)	480	280	10	510	50	0
Sign Control	Free	Free	0%	Stop	0%	0%
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	511	298	11	543	53	0
Pedestrians					5	175
Lane Width (m)			3.5	3.5		
Walking Speed (m/s)			1.2	1.2		
Percent Blockage			0	14		
Right turn flare (veh)			None	None		
Median type						
Median storage (veh)						
Upstream signal (m)	51		130			
pX platoon unblocked	0.91		0.92		0.91	
vC, conflicting volume	984		1128		584	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vO, unblocked vol	783		829		344	
IC, single (s)	4.1		6.9		6.9	
IC, 2 stage (s)						
p0 queue free %	2.2		3.5		3.3	
CM capacity (veh/h)	98		78		100	
	659		239		511	
Direction_Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	341	468	192	362	53	
Volume Left	0	0	11	0	53	
Volume Right	0	298	0	0	0	
cSH	1700	1700	659	1700	239	
Volume to Capacity	0.20	0.28	0.02	0.21	0.22	
Queue Length 95th (m)	0.0	0.0	0.4	0.0	6.6	
Control Delay (s)	0.0	0.0	0.8	0.0	24.3	
Lane LOS	A	A	C	C	C	
Approach Delay (s)	0.0	0.3	24.3			
Approach LOS			C			
Intersection Summary						
Average Delay	1.0					
Intersection Capacity Utilization	36.5%					
ICU Level of Service	A					
Analysis Period (min)	15					

Existing (AM)
 Queues
 5: Shaw St & King St W

EBL	EBT	WBT	NBL	NBT	SBL	SBT	Ø1	Ø3	Ø5	Ø7
4P	4P	4P	4P	4P	4P	4P				
20	430	325	60	250	60	125				
20	430	325	60	250	60	125				
Perm	NA	NA	Perm	NA	Perm	NA				
4	4	8	2	2	6	1	3	5	7	
4	4	8	2	2	6	6				
19.0	19.0	19.0	16.0	16.0	16.0	3.0	3.0	3.0	3.0	
28.0	28.0	28.0	22.0	22.0	22.0	5.0	5.0	5.0	5.0	
37.0	37.0	37.0	23.0	23.0	23.0	5.0	5.0	5.0	5.0	
52.9%	52.9%	52.9%	32.9%	32.9%	32.9%	7%	7%	7%	7%	
4.0	4.0	4.0	4.0	4.0	4.0	2.0	2.0	2.0	2.0	
2.0	2.0	2.0	2.0	2.0	2.0	0.0	0.0	0.0	0.0	
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0					
5.0	5.0	5.0	5.0	5.0	5.0					
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
None	None	None	None	None	None	None	None	None	None	
0.39	0.27	0.51	0.51	0.51	0.55					
13.3	11.4	25.4	16.8	16.8	16.8					
0.0	0.0	0.0	0.0	0.0	0.0					
13.3	11.4	25.4	16.8	16.8	16.8					
22.3	15.3	21.0	11.8	11.8	11.8					
33.5	24.1	32.7	24.1	24.1	24.1					
105.5	222.7	65.9	127.6	127.6	127.6					
1311	1443	701	634	634	634					
0	0	0	0	0	0					
0	0	0	0	0	0					
0	0	0	0	0	0					
0.39	0.27	0.49	0.53	0.53	0.53					
Intersection Summary										
Cycle Length: 70										
Actuated Cycle Length: 70										
Offset: 1 (1%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green										
Natural Cycle: 60										
Control Type: Actuated-Coordinated										

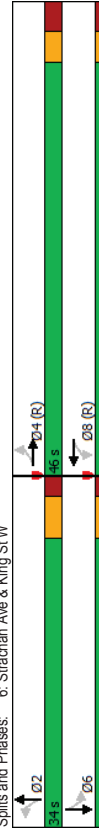


5. Shaw St & King St W Existing (AM)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	4TB	4TB	4TB	4TB	4TB	4TB	4TB	4TB	4TB	4TB	4TB
Traffic Volume (vph)	20	430	30	0	325	50	60	250	15	60	125
Future Volume (vph)	20	430	30	0	325	50	60	250	15	60	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Frbp. ped/bikes	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Frbp. ped/bikes	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Frt	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Flt Protected	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	3060	3118	3118	3290	3290	2510	2510	2510	2510	2510	2510
Flt Permitted	0.93	1.00	1.00	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Satd. Flow (perm)	2651	3118	3118	2706	2706	2057	2057	2057	2057	2057	2057
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	453	32	0	342	53	63	263	16	63	132
RTOR Reduction (vph)	0	7	0	0	17	0	0	5	0	0	107
Lane Group Flow (vph)	0	499	0	0	378	0	0	337	0	0	230
Conf. Ped. (#/hr)	230	470	470	230	290	165	165	165	10	10	15
Conf. Bikes (#/hr)	60	120	120	60	80	40	40	40	10	10	15
Heavy Vehicles (%)	86%	7%	3%	0%	8%	6%	1%	2%	0%	41%	4%
Turn Type	Perm	NA	NA	NA	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	4	8	8	8	2	2	2	2	6	6	6
Permitted Phases	4	8	8	8	2	2	2	2	6	6	6
Actuated Green, G (s)	31.0	31.0	31.0	31.0	16.2	16.2	16.2	16.2	16.2	16.2	16.2
Effective Green, g (s)	32.0	32.0	32.0	32.0	17.2	17.2	17.2	17.2	17.2	17.2	17.2
Actuated G/C Ratio	0.46	0.46	0.46	0.46	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Clearance Time (s)	6.0	6.0	6.0	6.0	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	3.0	3.0	3.0	3.0
Lane Grp Cap. (vph)	1303	1425	1425	1425	664	664	664	664	664	664	664
v/s Ratio Prot	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
v/s Ratio Perm	0.38	0.27	0.27	0.27	0.51	0.51	0.51	0.51	0.51	0.51	0.51
Uniform Delay, d1	12.5	11.7	11.7	11.7	22.7	22.7	22.7	22.7	22.4	22.4	22.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7
Delay (s)	13.4	12.2	12.2	12.2	23.4	23.4	23.4	23.4	23.1	23.1	23.1
Level of Service	B	B	B	B	C	C	C	C	C	C	C
Approach Delay (s)	13.4	12.2	12.2	12.2	23.4	23.4	23.4	23.4	23.1	23.1	23.1
Approach LOS	B	B	B	B	C	C	C	C	C	C	C
Intersection Summary											
HCM 2000 Control Delay	17.3 HCM 2000 Level of Service B										
HCM 2000 Volume to Capacity ratio	0.37										
Actuated Cycle Length (s)	70.0 Sum of lost time (s) 14.0										
Intersection Capacity Utilization	67.4% ICU Level of Service C										
Analysis Period (min)	15										
Critical Lane Group	c										

6. Strachan Ave & King St W Existing (AM)

Lane Group	EBT	WBT	NBT	SBT
Lane Configurations	4TB	4TB	4TB	4TB
Traffic Volume (vph)	460	295	65	230
Future Volume (vph)	460	295	65	230
Lane Group Flow (vph)	549	332	71	321
Turn Type	NA	Perm	NA	Perm
Protected Phases	4	8	2	2
Permitted Phases	4	8	2	2
Detector Phase	4	8	2	2
Switch Phase	4	8	2	2
Minimum Initial (s)	20.0	20.0	21.0	21.0
Minimum Split (s)	26.0	26.0	27.0	27.0
Total Split (s)	46.0	46.0	34.0	34.0
Total Split (%)	57.5%	57.5%	42.5%	42.5%
Yellow Time (s)	3.0	3.0	4.0	4.0
All-Red Time (s)	3.0	3.0	2.0	2.0
Last Time Adjust (s)	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	C-Max	C-Max	Min	Min
v/c Ratio	0.31	0.18	0.28	0.64
Control Delay	9.2	8.5	19.0	23.1
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	9.2	8.5	19.0	23.1
Queue Length 50th (m)	19.5	11.1	7.9	33.1
Queue Length 95th (m)	34.7	21.0	15.8	66.6
Internal Link Dist (m)	222.7	138.4	121.3	128.6
Turn Bay Length (m)	177.5	180.8	310	230
Base Capacity (vph)	1775	1808	310	230
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.31	0.18	0.23	0.53
Intersection Summary				
Cycle Length: 80				
Actuated Cycle Length: 80				
Offset: 42 (53%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green				
Natural Cycle: 55				
Control Type: Actuated-Coordinated				
m. Volume for 95th percentile queue is metered by upstream signal.				



6: Strachan Ave & King St W

7: Atlantic St & Snooker St

Existing (AM)

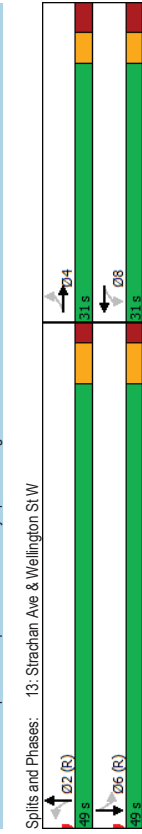
Existing (AM)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations											
Traffic Volume (vph)	0	460	45	0	295	10	65	230	65	25	175
Future Volume (vph)	0	460	45	0	295	10	65	230	65	25	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	0.99	1.00	1.00	0.99	1.00	0.94	1.00	0.98	1.00	0.98
Frt	0.99	1.00	1.00	1.00	0.97	1.00	0.97	1.00	0.99	1.00	0.99
Flt Protected	3049	3117	1438	1648	1553	1792					
Satd. Flow (perm)	3049	3117	859	1648	641	1792					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	500	49	0	321	11	71	250	71	27	190
RTOR Reduction (vph)	0	8	0	0	3	0	0	14	0	0	4
Lane Group Flow (vph)	0	541	0	0	329	0	71	307	0	27	202
Conf. Ped. (#/hr)	210	390	390	210	170	215	215	215	215	215	170
Conf. Bikes (#/hr)	60	60	60	60	60	60	60	60	60	60	60
Heavy Vehicles (%)	0%	7%	35%	0%	12%	22%	7%	2%	10%	0%	2%
Turn Type	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Protected Phases	4	8	2	2	2	6					
Permitted Phases	4	8	2	2	2	6					
Actuated Green, G (s)	45.4	45.4	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6
Effective Green, g (s)	46.4	46.4	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6
Actuated g/C Ratio	0.58	0.58	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Clearance Time (s)	6.0	6.0	6.0	6.0	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	3.0	3.0	3.0	3.0
Lane Grp Cap. (vph)	1768	1807	253	486	189	528					
v/s Ratio Prot	c0.18	0.11	0.08	c0.19	0.11	0.04					
v/s Ratio Perm	0.31	0.18	0.28	0.63	0.14	0.38					
Uniform Delay, d1	8.6	7.9	21.7	24.4	20.8	22.4					
Progression Factor	1.00	1.00	0.77	0.77	1.00	1.00					
Incremental Delay, d2	0.4	0.2	0.5	2.4	0.3	0.5					
Delay (s)	9.0	8.1	17.2	21.1	21.1	22.9					
Level of Service	A	A	B	C	C	C					
Approach Delay (s)	9.0	8.1	20.4	22.7	22.7	22.7					
Approach LOS	A	A	C	C	C	C					
Intersection Summary											
HCM 2000 Control Delay	13.9 HCM 2000 Level of Service B										
HCM 2000 Volume to Capacity ratio	0.42										
Actuated Cycle Length (s)	80.0 Sum of lost time (s) 10.0										
Intersection Capacity Utilization	64.5% ICU Level of Service C										
Analysis Period (min)	15										
c Critical Lane Group											

Movement	WBL	WBR	NBT	NBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	25	115	110	45	75	70
Future Volume (Veh/h)	25	115	110	45	75	70
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	28	129	124	51	84	79
Pedestrians	125	20	20	45	45	45
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Walking Speed (m/s)	1.2	1.2	1.2	1.2	1.2	1.2
Percent Blockage	10	2	2	4	4	4
Right turn flare (veh)						
Median type	None	None	None	None	None	None
Median storage (veh)						
Upstream signal (m)					74	
pX, platoon unblocked						
vC, conflicting volume	542	320		300		
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	542	320		300		
IC, single (s)	6.4	6.2		4.2		
IC, 2 stage (s)						
IF (s)	3.5	3.3		2.3		
p0 queue free %	93	79		92		
d0 capacity (veh/h)	413	625		1113		
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	157	175	163			
Volume Left	28	0	84			
Volume Right	129	51	0			
cSH	572	1700	1113			
Volume to Capacity	0.27	0.10	0.08			
Queue Length 95th (m)	8.9	0.0	2.0			
Control Delay (s)	13.7	0.0	4.7			
Lane LOS	B	A	A			
Approach Delay (s)	13.7	0.0	4.7			
Approach LOS	B	A	A			
Intersection Summary						
Average Delay	5.9					
Intersection Capacity Utilization	44.0%					
Analysis Period (min)	15					
ICU Level of Service	A					

Existing (AM)
13: Strachan Ave & Wellington St W

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	15	205	90	70	110	300	10	205
Traffic Volume (vph)	15	205	90	70	110	300	10	205
Future Volume (vph)	15	205	90	70	110	300	10	205
Ideal Flow (vphpl)	16	340	96	122	117	500	11	223
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4							
Permitted Phases	8							
Minimum Split (s)	27.0	27.0	26.0	26.0	29.0	29.0	29.0	29.0
Total Split (%)	31.0	31.0	31.0	31.0	49.0	49.0	49.0	49.0
Total Split (%)	38.8%	38.8%	38.8%	38.8%	61.3%	61.3%	61.3%	61.3%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.05	0.62	0.44	0.23	0.31	0.55	0.04	0.24
Control Delay	19.3	26.0	29.1	14.4	10.6	10.7	19.5	23.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.3	26.0	29.1	14.4	10.6	10.7	19.5	23.1
Queue Length 50th (m)	1.8	40.3	12.0	8.9	5.5	18.8	1.5	34.6
Queue Length 95th (m)	6.1	68.4	27.1	21.3	17.0	38.6	m4.9	52.2
Internal Link Dist (m)	64.0		134.1		143.3		121.3	
Turn Bay Length (m)	15.0		25.0		15.0		15.0	
Base Capacity (vph)	317	550	218	535	382	907	295	919
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.62	0.44	0.23	0.31	0.55	0.04	0.24



Existing (AM)
13: Strachan Ave & Wellington St W

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	15	205	115	90	70	45	110	300	170
Traffic Volume (vph)	15	205	115	90	70	45	110	300	170
Future Volume (vph)	15	205	115	90	70	45	110	300	170
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	0.94	1.00	0.93	1.00	0.92	1.00	0.99	1.00
Fibb. ped/bikes	0.86	1.00	0.93	1.00	0.62	1.00	0.83	1.00	1.00
Frt	1.00	0.95	1.00	0.94	1.00	0.95	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1365	1617	1619	1558	1069	1604	1328	1670	1670
Flt Permitted	0.68	1.00	0.39	1.00	0.62	1.00	0.38	1.00	1.00
Satd. Flow (perm)	975	1617	672	1558	695	1604	536	1670	1670
Peak-Hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	16	218	122	96	74	48	117	319	181
RTOR Reduction (vph)	0	25	0	0	29	0	0	26	0
Lane Group Flow (vph)	16	315	0	96	93	0	117	474	0
Conf. Peds. (#/hr)	85	65	65	65	85	355	100	100	355
Conf. Bikes (#/hr)	20				40				35
Heavy Vehicles (%)	12%	3%	4%	3%	2%	3%	3%	1%	25%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases	4								
Permitted Phases	8								
Actuated Green, G (s)	25.0	25.0	25.0	25.0	43.0	43.0	43.0	43.0	43.0
Effective Green, g (s)	26.0	26.0	26.0	26.0	44.0	44.0	44.0	44.0	44.0
Actuated g/C Ratio	0.32	0.32	0.32	0.32	0.55	0.55	0.55	0.55	0.55
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Grp Cap (vph)	316	525	218	506	382	882	294	918	918
v/s Ratio Prot	c0.19								
v/s Ratio Perm	0.02	0.14	0.14	0.17	0.17	0.17	0.02	0.13	0.13
v/c Ratio	0.05	0.60	0.44	0.18	0.31	0.54	0.04	0.24	0.24
Uniform Delay, d1	18.5	22.6	21.3	19.4	9.7	11.5	8.3	9.3	9.3
Progression Factor	1.00	1.00	1.00	1.00	0.84	0.81	2.24	2.37	2.37
Incremental Delay, d2	0.3	5.0	6.3	0.8	1.9	2.1	0.2	0.6	0.6
Delay (s)	18.8	27.6	27.6	20.2	10.0	11.4	18.8	22.7	22.7
Level of Service	B	C	C	C	B	B	B	C	C
Approach Delay (s)	27.2								
Approach LOS	C								
Intersection Summary	Intersection Summary								
HCM 2000 Control Delay	18.9								
HCM 2000 Volume to Capacity ratio	0.56								
Actuated Cycle Length (s)	80.0								
Intersection Capacity Utilization	100.3%								
Analysis Period (min)	15								
c. Critical Lane Group	15								

Existing (AM)
15: Dufferin St & Liberty St

Queue	WBL	WBR	NBT	SBL	SBT
Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Configurations	160	35	345	90	360
Traffic Volume (vph)	160	35	345	90	360
Future Volume (vph)	160	35	345	90	360
Ideal Flow (vphpl)	167	36	718	0	489
Turn Type	Prot	Perm	NA	Perm	NA
Protected Phases	8	2	2	6	6
Permitted Phases	8	8	2	6	6
Detector Phase	8	8	2	6	6
Switch Phase	8	8	2	6	6
Minimum Initial (s)	18.0	18.0	18.0	18.0	18.0
Minimum Split (s)	23.0	23.0	24.0	24.0	24.0
Total Split (s)	28.0	28.0	52.0	52.0	52.0
Total Split (%)	35.0%	35.0%	65.0%	65.0%	65.0%
Yellow Time (s)	3.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0	5.0	5.0	5.0
Lead/Lag					
Lead-Lag Optimize?	None	None	C-Max	C-Max	C-Max
Recall Mode	0.40	0.10	0.37	0.30	0.30
v/c Ratio	29.2	11.4	3.5	1.4	1.4
Control Delay	0.0	0.0	0.0	0.0	0.0
Queue Delay	29.2	11.4	3.5	1.4	1.4
Total Delay	22.6	0.6	10.6	2.4	2.4
Queue Length 50th (m)	40.6	7.8	17.8	3.0	3.0
Queue Length 95th (m)	382.8	162.3	186.7	186.7	186.7
Internal Link Dist (m)	10.0				
Turn Bay Length (m)	525	442	1928	1541	1541
Base Capacity (vph)	0	0	0	0	0
Station Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reducth	0	0	0	0	0
Reduced v/c Ratio	0.32	0.08	0.37	0.30	0.30

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 74 (93%), Referenced to phase 2:NBT and 6:SBTL - Start of Green
 Natural Cycle: 50
 Control Type: Actuated-Coordinated



Existing (AM)
15: Dufferin St & Liberty St

Queue	WBL	WBR	NBT	SBL	SBT
Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Configurations	160	35	345	90	360
Traffic Volume (vph)	160	35	345	90	360
Future Volume (vph)	160	35	345	90	360
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95
Fpb. ped/bikes	1.00	0.89	0.88	1.00	1.00
Fibb. ped/bikes	1.00	1.00	1.00	0.98	0.98
Frt	1.00	0.85	0.93	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.99	0.99
Satd. Flow (prot)	1750	1401	2775	3264	3264
Flt Permitted	0.95	1.00	1.00	0.72	0.72
Satd. Flow (perm)	1750	1401	2775	2369	2369
Peak-Hour factor, PHF	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	167	36	359	94	375
RTOR Reduction (vph)	0	24	126	0	0
Lane Group Flow (vph)	167	12	592	0	469
Confl. Peds. (#/hr)	112	70	102	102	102
Confl. Bikes (#/hr)	2			4	
Heavy Vehicles (%)	2%	2%	7%	2%	7%
Turn Type	Prot	Perm	NA	Perm	NA
Protected Phases	8	2	2	6	6
Permitted Phases	8	8	2	6	6
Actuated Green, G (s)	18.0	18.0	51.0	51.0	51.0
Effective Green, g (s)	19.0	19.0	52.0	52.0	52.0
Actuated G/C Ratio	0.24	0.24	0.65	0.65	0.65
Clearance Time (s)	5.0	5.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	415	332	1803	1539	1539
v/s Ratio Prot	c0.10		c0.21		
v/s Ratio Perm	0.40	0.04	0.33	0.30	0.20
v/c Ratio	25.7	23.5	6.2	6.1	6.1
Uniform Delay, d1	1.00	1.00	1.00	0.16	0.16
Progression Factor	0.6	0.0	0.5	0.4	0.4
Incremental Delay, d2	26.4	23.5	6.7	1.4	1.4
Delay (s)	C	C	A	A	A
Level of Service	C	C	A	A	A
Approach Delay (s)	25.9	6.7	1.4	1.4	1.4
Approach LOS	C	A	A	A	A

Intersection Summary

HCM 2000 Control Delay: 7.7
 HCM 2000 Level of Service: A
 HCM 2000 Volume to Capacity ratio: 0.35
 Actuated Cycle Length (s): 80.0
 Sum of lost time (s): 9.0
 Intersection Capacity Utilization: 65.3%
 ICU Level of Service: C
 Analysis Period (min): 15
 Critical Lane Group: c

HCM Unsignalized Intersection Capacity Analysis
 16: Atlantic St & Liberty St

Existing (AM)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		Stop	Stop		Stop			Stop			Stop	
Traffic Volume (vph)	35	220	45	10	140	100	10	20	10	50	10	15
Future Volume (vph)	35	220	45	10	140	100	10	20	10	50	10	15
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	37	232	47	11	147	105	11	21	11	53	11	16
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	316	263	43	80								
Volume Left (vph)	37	11	11	53								
Volume Right (vph)	47	105	11	16								
Head (s)	-0.03	-0.13	-0.01	0.08								
Departure Headway (s)	4.5	4.5	5.3	5.4								
Degree Utilization, x	0.40	0.33	0.06	0.12								
Capacity (veh/h)	772	769	584	598								
Control Delay (s)	10.4	9.6	8.7	9.1								
Approach Delay (s)	10.4	9.6	8.7	9.1								
Approach LOS	B	A	A	A								
Intersection Summary												
Delay	9.9											
Level of Service	A											
Intersection Capacity Utilization	49.7%											
Analysis Period (min)	15											
	ICU Level of Service											
	A											

Synchro 11 Report

HCM 6th AWSC
 16: Atlantic St & Liberty St

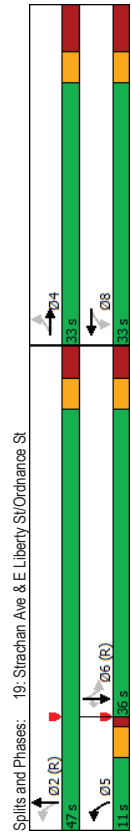
Existing (AM)

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	9.9											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	35	220	45	10	140	100	10	20	10	50	10	15
Traffic Vol, veh/h	35	220	45	10	140	100	10	20	10	50	10	15
Future Vol, veh/h	35	220	45	10	140	100	10	20	10	50	10	15
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	8	1	4	0	1	14	22	0	0	6	0	0
Mvmt Flow	37	232	47	11	147	105	11	21	11	53	11	16
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	EB	WB	EB	WB	NB	NB	SB	SB	EB	NB
Opposing Approach	WB	EB	WB	EB	WB	EB	SB	SB	NB	NB	WB	WB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	SB	NB	NB	EB	EB	EB	WB	WB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	NB	SB	SB	WB	WB	WB	EB	EB	EB	EB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	10.7	9.4	8.7	9.1	9.4	9.4	9	9	9	9.1	9.1	9.1
HCM LOS	B	A	A	A	A	A	A	A	A	A	A	A
Lane	NBLn1 EBLn1 WBLn1 SBLn1											
Vol Left, %	25% 12% 4% 67%											
Vol Thru, %	50% 73% 56% 13%											
Vol Right, %	25% 15% 40% 20%											
Sign Control	Stop Stop Stop Stop											
Traffic Vol by Lane	40	300	250	75								
LT Vol	10	35	10	50								
Through Vol	20	220	140	10								
RT Vol	10	45	100	15								
Lane Flow Rate	42	316	263	79								
Geometry Grp	1 1 1 1											
Degree of Utl (X)	0.065 0.401 0.318 0.117											
Departure Headway (Ht)	5.579 4.575 4.349 5.357											
Convergence, Y/N	Yes Yes Yes Yes											
Cap	638 786 824 666											
Service Time	3.647 2.614 2.386 3.421											
HCM Lane V/C Ratio	0.066 0.402 0.319 0.119											
HCM Control Delay	9 10.7 9.4 9.1											
HCM Lane LOS	A B A A											
HCM 95th-ile Q	0.2 1.9 1.4 0.4											

Synchro 11 Report

Queues
19: Strachan Ave & E Liberty St/Ordinance St

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	175	15	55	20	200	335	35	290	85
Traffic Volume (vph)	175	15	55	20	200	335	35	290	85
Future Volume (vph)	186	266	0	154	213	409	37	309	90
Lane Group Flow (vph)	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm
Turn Type	4	8	5	2	2	6	6	6	6
Protected Phases	32.6	32.6	32.6	10.0	27.3	27.3	27.3	27.3	27.3
Permitted Phases	33.0	33.0	33.0	33.0	11.0	47.0	36.0	36.0	36.0
Minimum Split (s)	41.3%	41.3%	41.3%	13.8%	58.8%	45.0%	45.0%	45.0%	45.0%
Total Split (%)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Yellow Time (s)	4.6	4.6	4.6	4.6	1.0	3.3	3.3	3.3	3.3
All-Red Time (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Lost Time Adjust (s)	6.6	6.6	6.6	3.0	5.3	5.3	5.3	5.3	5.3
Total Lost Time (s)	0.53	0.69	0.40	0.49	0.46	0.13	0.43	0.29	0.29
Lead/Lag	28.2	19.5	16.2	13.4	13.8	27.9	31.4	12.8	12.8
Lead-Lag Optimizer?	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
v/c Ratio	28.2	19.5	16.2	13.4	13.8	27.9	31.4	12.8	12.8
Control Delay	23.8	11.0	10.7	16.2	37.2	5.8	49.8	2.8	2.8
Queue Delay	44.5	#49.7	27.2	27.9	59.9	m13.5	76.2	m16.0	143.3
Total Delay	45.8	123.7	152.3	152.3	152.3	152.3	152.3	152.3	152.3
Queue Length 50th (m)	50.0	50.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Queue Length 95th (m)	354	385	384	433	885	288	713	310	310
Internal Link Dist (m)	0	0	0	0	0	0	0	0	0
Base Capacity (vph)	0	0	0	0	0	0	0	0	0
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.69	0.40	0.49	0.46	0.13	0.43	0.29	0.29



HCM Signalized Intersection Capacity Analysis
19: Strachan Ave & E Liberty St/Ordinance St

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	175	15	235	55	20	200	335	50	35
Traffic Volume (vph)	175	15	235	55	20	200	335	50	35
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	6.6	6.6	6.6	6.6	3.0	5.3	5.3	5.3	5.3
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	1.00	0.51	0.88	0.88	1.00	0.95	1.00	1.00	1.00
Fpb. ped/bikes	0.84	1.00	0.87	0.87	1.00	0.98	1.00	1.00	1.00
Fibb. ped/bikes	1.00	0.86	0.94	0.94	1.00	0.98	1.00	1.00	1.00
Frt	0.95	1.00	0.98	0.98	1.00	0.95	1.00	1.00	1.00
Flt Protected	1477	816	1305	1305	1544	1684	1368	1860	621
Satd. Flow (prot)	0.69	1.00	0.78	0.78	0.44	1.00	0.62	1.00	1.00
Flt Permitted	1074	816	1038	1038	712	1684	762	1860	621
Satd. Flow (perm)	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Peak-Hour factor, PHF	186	16	250	59	21	74	213	356	53
Adj. Flow (vph)	0	117	0	0	42	0	7	0	0
RTOR Reduction (vph)	186	149	0	0	112	0	213	402	0
Lane Group Flow (vph)	125	335	335	335	125	380	202	202	380
Conf. Peds. (#/hr)	2%	0%	1%	1%	5%	2%	4%	2%	2%
Heavy Vehicles (%)	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm
Turn Type	4	8	5	2	2	6	6	6	6
Protected Phases	25.4	25.4	25.4	25.4	40.7	40.7	29.7	29.7	29.7
Permitted Phases	26.4	26.4	26.4	26.4	41.7	41.7	30.7	30.7	30.7
Actuated Green, G (s)	0.33	0.33	0.33	0.33	0.52	0.52	0.38	0.38	0.38
Effective Green, g (s)	7.6	7.6	7.6	7.6	4.0	6.3	6.3	6.3	6.3
Actuated g/C Ratio	354	269	342	342	454	877	288	713	238
Clearance Time (s)	c0.18	0.17	0.11	0.11	c0.20	0.05	c0.24	0.05	0.17
Lane Grp Cap (vph)	0.53	0.56	0.33	0.33	0.47	0.46	0.13	0.43	0.43
v/s Ratio Prot	21.7	22.0	20.1	20.1	11.1	12.0	16.0	18.2	16.1
v/s Ratio Perm	1.00	1.00	1.00	1.00	1.00	1.00	1.63	1.59	4.64
Uniform Delay, d1	5.5	8.0	2.6	2.6	3.5	1.7	0.9	1.8	1.2
Progression Delay, d2	27.2	30.0	22.7	22.7	14.6	13.8	26.8	30.7	75.9
Incremental Delay, d2	C	C	C	C	B	B	C	C	C
Delay (s)	28.9	39.7	22.7	22.7	14.1	14.1	39.7	39.7	39.7
Level of Service	C	C	C	C	B	B	C	C	C
Approach Delay (s)	C	C	C	C	B	B	C	C	C
Approach LOS	C	C	C	C	B	B	C	C	C

Intersection Summary	
HCM 2000 Control Delay	25.6
HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.52
Actuated Cycle Length (s)	80.0
Sum of lost time (s)	14.9
Intersection Capacity Utilization	97.7%
ICU Level of Service	F
Analysis Period (min)	15
c. Critical Lane Group	

HCM Unsignalized Intersection Capacity Analysis
 8: Hanna Ave/75 Hanna Ave & Snooker St/Private St

HCM 6th AWSC
 8: Hanna Ave/75 Hanna Ave & Snooker St/Private St

Existing (AM)

Existing (AM)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	Stop											
Sign Control	Stop											
Traffic Volume (vph)	55	60	5	10	90	30	50	15	15	0	0	0
Future Volume (vph)	55	60	5	10	90	30	50	15	15	0	0	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	65	71	6	12	107	36	60	18	18	0	0	0
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	142	155	96	0								
Volume Left (vph)	65	12	60	0								
Volume Right (vph)	6	36	18	0								
Head (s)	0.10	-0.10	0.12	0.00								
Departure Headway (s)	4.4	4.2	4.7	4.7								
Degree Utilization, x	0.17	0.18	0.12	0.00								
Capacity (veh/h)	792	833	722	725								
Control Delay (s)	8.3	8.1	8.3	7.7								
Approach Delay (s)	8.3	8.1	8.3	0.0								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay	8.3											
Level of Service	A											
Intersection Capacity Utilization	31.4%											
Analysis Period (min)	15											
	ICU Level of Service											
	A											

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	8.3											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	55	60	5	10	90	30	50	15	15	0	0	0
Traffic Vol, veh/h	55	60	5	10	90	30	50	15	15	0	0	0
Future Vol, veh/h	55	60	5	10	90	30	50	15	15	0	0	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	0	3	14	9	1	0	8	0	7	0	0	0
Mvmt Flow	65	71	6	12	107	36	60	18	18	0	0	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	WB	EB	NB	NB	SB	SB	SB	NB	NB	SB
Opposing Approach	WB	EB	EB	WB	EB	WB	WB	WB	WB	EB	EB	WB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	SB	NB	NB	EB	EB	EB	EB	WB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	WB	WB	WB	WB	WB	EB	EB	EB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	8.3	8.3	8.3	8.3	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
HCM LOS	A	A	A	A	A	A	A	A	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	62%	46%	8%	0%
Vol Thru, %	19%	50%	69%	100%
Vol Right, %	19%	4%	23%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	80	120	130	0
LT Vol	50	55	10	0
Through Vol	15	60	90	0
RT Vol	15	5	30	0
Lane Flow Rate	95	143	155	0
Geometry Grp	1	1	1	1
Degree of Utl (X)	0.125	0.173	0.186	0
Departure Headway (Hd)	4.712	4.366	4.318	4.688
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	763	824	834	0
Service Time	2.729	2.378	2.33	2.709
HCM Lane V/C Ratio	0.125	0.174	0.186	0
HCM Control Delay	8.4	8.3	8.3	7.7
HCM Lane LOS	A	A	A	N
HCM 95th-ile Q	0.4	0.6	0.7	0

HCM Unsignalized Intersection Capacity Analysis
 11: Private St & Existing Metro Driveway

Existing (AM)

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W	W	Stop	Stop	Stop	Stop
Sign Control						
Traffic Volume (vph)	0	75	90	25	35	20
Future Volume (vph)	0	75	90	25	35	20
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72
Hourly flow rate (vph)	0	104	125	35	49	28
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total (vph)	104	160	77			
Volume Left (vph)	0	125	0			
Volume Right (vph)	104	0	28			
Head (s)	-0.53	0.21	-0.22			
Departure Headway (s)	3.9	4.4	4.1			
Degree Utilization, x	0.11	0.20	0.09			
Capacity (veh/h)	871	791	854			
Control Delay (s)	7.4	8.5	7.5			
Approach Delay (s)	7.4	8.5	7.5			
Approach LOS	A	A	A			
Intersection Summary						
Delay			7.9			
Level of Service			A			
Intersection Capacity Utilization			26.1%		ICU Level of Service	A
Analysis Period (min)			15			

Synchro 11 Report

HCM 6th AWSC
 11: Private St & Existing Metro Driveway

Existing (AM)

Intersection	EBL	EBR	NBL	NBT	SBT	SBR
Intersection Delay, s/veh						7.9
Intersection LOS						A
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W	W	Stop	Stop	Stop	Stop
Traffic Vol, veh/h	0	75	90	25	35	20
Future Vol, veh/h	0	75	90	25	35	20
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72
Heavy Vehicles, %	0	4	4	0	0	0
Mount Flow	0	104	125	35	49	28
Number of Lanes	1	0	0	1	1	0
Approach	EB	NB	SB	SB	SB	SB
Opposing Approach		SB	NB			
Opposing Lanes	0	1	1	1	1	
Conflicting Approach Left	SB	EB	EB	EB	EB	
Conflicting Lanes Left	1	1	1	0	0	
Conflicting Approach Right	NB			EB	EB	
Conflicting Lanes Right	1	0	0	1	1	
HCM Control Delay	7.3	8.5	7.4	7.4	7.4	
HCM LOS	A	A	A	A	A	
Lane	NBLn1	EBLn1	SBLn1	SBLn1	SBLn1	
Vol Left, %	78%	0%	0%	0%	0%	
Vol Thru, %	22%	0%	64%	64%	64%	
Vol Right, %	0%	100%	36%	36%	36%	
Sign Control	Stop	Stop	Stop	Stop	Stop	
Traffic Vol by Lane	115	75	55	55	55	
LT Vol	90	0	0	0	0	
Through Vol	25	0	35	35	35	
RT Vol	0	75	20	20	20	
Lane Flow Rate	160	104	76	76	76	
Geometry Grp	1	1	1	1	1	
Degree of Utl (X)	0.194	0.111	0.085	0.085	0.085	
Departure Headway (Hd)	4.368	3.831	3.988	3.988	3.988	
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	
Cap	818	942	885	885	885	
Service Time	2.419	1.831	2.071	2.071	2.071	
HCM Lane V/C Ratio	0.196	0.11	0.086	0.086	0.086	
HCM Control Delay	8.5	7.3	7.4	7.4	7.4	
HCM Lane LOS	A	A	A	A	A	
HCM 95th-ile Q	0.7	0.4	0.3	0.3	0.3	

Synchro 11 Report

12: Private St & 120 Lynn Williams Driveway

Existing (AM)

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W					
Traffic Volume (veh/h)	0	10	20	115	110	0
Future Volume (Veh/h)	0	10	20	115	110	0
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	0	13	27	153	147	0
Pedestrians	80			20	75	
Lane Width (m)	3.5			3.5	3.5	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	6			2	6	
Right turn flare (veh)				None	None	
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
VC, conflicting volume	509	247	227			
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol	509	247	227			
IC, single (s)	6.4	6.2	4.1			
IC, 2 stage (s)						
IF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	98			
CM capacity (veh/h)	454	733	1266			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	13	180	147			
Volume Left	0	27	0			
Volume Right	13	0	0			
cSH	733	1266	1700			
Volume to Capacity	0.02	0.02	0.09			
Queue Length 95th (m)	0.4	0.5	0.0			
Control Delay (s)	10.0	1.3	0.0			
Lane LOS	B	A	A			
Approach Delay (s)	10.0	1.3	0.0			
Approach LOS	B	A	A			
Intersection Summary						
Average Delay		1.1				
Intersection Capacity Utilization		28.7%				ICU Level of Service A
Analysis Period (min)		15				

14: Lynn Williams St & Private St

Existing (AM)

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W					
Traffic Volume (veh/h)	65	30	105	30	10	110
Future Volume (Veh/h)	65	30	105	30	10	110
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	81	38	131	38	12	138
Pedestrians	25		15			75
Lane Width (m)	3.5		3.5			3.5
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	2		1			6
Right turn flare (veh)			None			None
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
VC, conflicting volume	352	250			194	
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol	352	250			194	
IC, single (s)	6.5	6.2			4.1	
IC, 2 stage (s)						
IF (s)	3.6	3.3			2.2	
p0 queue free %	87	95			99	
CM capacity (veh/h)	608	724			1363	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	119	169	150			
Volume Left	81	0	12			
Volume Right	38	38	0			
cSH	641	1700	1363			
Volume to Capacity	0.19	0.10	0.01			
Queue Length 95th (m)	5.4	0.0	0.2			
Control Delay (s)	11.9	0.0	0.7			
Lane LOS	B	A	A			
Approach Delay (s)	11.9	0.0	0.7			
Approach LOS	B	A	A			
Intersection Summary						
Average Delay			3.5			
Intersection Capacity Utilization			33.6%			ICU Level of Service A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 17: Liberty St/E Liberty St & Hanna Ave

Existing (AM)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop											
Traffic Volume (vph)	55	120	55	20	170	20	55	20	20	20	15	10
Future Volume (vph)	55	120	55	20	170	20	55	20	20	20	15	10
Peak Hour Factor	0.97											
Hourly flow rate (vph)	57	124	57	21	175	21	57	21	21	21	15	10
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	238	217	99	51								
Volume Left (vph)	57	21	57	15								
Volume Right (vph)	57	21	21	26								
Head (s)	-0.06	0.08	0.01	-0.21								
Departure Headway (s)	4.5	4.6	5.0	4.9								
Degree Utilization, x	0.30	0.28	0.14	0.07								
Capacity (veh/h)	770	739	651	654								
Control Delay (s)	9.4	9.4	8.9	8.3								
Approach Delay (s)	9.4	9.4	8.9	8.3								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay	9.2											
Level of Service	A											
Intersection Capacity Utilization	46.3%											
Analysis Period (min)	15											
	ICU Level of Service											
	A											

Synchro 11 Report

HCM 6th AWSC
 17: Liberty St/E Liberty St & Hanna Ave

Existing (AM)

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	9.1											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	55	120	55	20	170	20	55	20	20	15	10	25
Traffic Vol, veh/h	55	120	55	20	170	20	55	20	20	15	10	25
Future Vol, veh/h	55	120	55	20	170	20	55	20	20	15	10	25
Peak Hour Factor	0.97											
Heavy Vehicles, %	0											
Mvmt Flow	57	124	57	21	175	21	57	21	21	15	10	26
Number of Lanes	0											
Approach	EB	WB	WB									
Opposing Approach	WB	EB	SB									
Opposing Lanes	1	1	1									
Conflicting Approach Left	SB	NB	EB									
Conflicting Lanes Left	1	1	1									
Conflicting Approach Right	NB	SB	WB									
Conflicting Lanes Right	1	1	1									
HCM Control Delay	9.3											
HCM LOS	A											
	NBLn1	EBLn1	WBLn1	SBLn1								
Lane	58%	24%	10%	30%								
Vol Left, %	21%	52%	81%	20%								
Vol Thru, %	21%	24%	10%	50%								
Vol Right, %	Stop	Stop	Stop	Stop								
Sign Control	95	230	210	50								
Traffic Vol by Lane	55	55	20	15								
LT Vol	20	120	170	10								
Through Vol	20	55	20	25								
RT Vol	98	237	216	52								
Lane Flow Rate	1	1	1	1								
Geometry Grp	0.135	0.291	0.27	0.071								
Degree of Utl (X)	4.969	4.418	4.494	4.928								
Departure Headway (Ht)	Yes	Yes	Yes	Yes								
Convergence, Y/N	719	813	799	724								
Cap	3.017	2.452	2.53	2.979								
Service Time	0.136	0.292	0.27	0.072								
HCM Lane V/C Ratio	8.8	9.3	9.2	8.4								
HCM Control Delay	A	A	A	A								
HCM Lane LOS	0.5	1.2	1.1	0.2								
HCM 95th-ile Q												

Synchro 11 Report

HCM Unsignalized Intersection Capacity Analysis
18: E Liberty St & Lynn Williams St

Existing (AM)

Movement	EBL	EBT	EB2	WBT	WBR	SBL	SBR
Lane Configurations	W	W	W	W	W	W	W
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	40	190	120	95	85	85	90
Future Volume (vph)	40	190	120	95	85	85	90
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	48	226	143	113	101	101	107
Direction, Lane #	EB 1	EB 2	WB 1	WB 1	SB 1		
Volume Total (vph)	48	226	256	208			
Volume Left (vph)	48	0	0	0	101		
Volume Right (vph)	0	0	113	107			
Head (s)	0.55	0.09	-0.19	-0.16			
Departure Headway (s)	5.9	5.4	4.7	5.0			
Degree Utilization, x	0.08	0.34	0.34	0.29			
Capacity (veh/h)	583	640	723	666			
Control Delay (s)	8.2	9.9	10.1	10.0			
Approach Delay (s)	9.6		10.1	10.0			
Approach LOS	A		B	B			
Intersection Summary							
Delay	9.9						
Level of Service	A						
Intersection Capacity Utilization	42.3%						
Analysis Period (min)	15						
	ICU Level of Service			A			

Synchro 11 Report

HCM 6th AWSC
18: E Liberty St & Lynn Williams St

Existing (AM)

Intersection	EBL	EBT	EB2	WBT	WBR	SBL	SBR
Intersection Delay, s/veh							10.3
Intersection LOS							B
Movement	EBL	EBT	WB2	WBR	SBL	SBR	
Lane Configurations	W	W	W	W	W	W	
Traffic Vol, veh/h	40	190	120	95	85	85	90
Future Vol, veh/h	40	190	120	95	85	85	90
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	3	5	8	0	2	4	
Mvmt Flow	48	226	143	113	101	107	
Number of Lanes	1	1	1	0	1	0	
Approach	EB	WB	WB	WB	SB	SB	
Opposing Approach	WB	EB					
Opposing Lanes	1	2			0		
Conflicting Approach Left	SB				WB		
Conflicting Lanes Left	1	0			1		
Conflicting Approach Right		SB			EB		
Conflicting Lanes Right	0	1			2		
HCM Control Delay	10.5	10.2	10.2	10.1			
HCM LOS	B	B	B	B	B	B	
Lane	EBLn1	EBLn2	WBLn1	SBLn1	SBLn1		
Vol Left, %	100%	0%	0%	0%	49%		
Vol Thru, %	0%	100%	56%	0%	0%		
Vol Right, %	0%	0%	44%	51%	51%		
Sign Control	Stop	Stop	Stop	Stop	Stop		
Traffic Vol by Lane	40	190	215	175			
LT Vol	40	0	0	85			
Through Vol	0	190	120	0			
RT Vol	0	0	95	90			
Lane Flow Rate	48	226	256	208			
Geometry Grp	7	7	5	2			
Degree of Utl (X)	0.077	0.336	0.337	0.288			
Departure Headway (Ht)	5.812	5.342	4.745	4.972			
Convergence, Y/N	Yes	Yes	Yes	Yes			
Cap	613	670	753	719			
Service Time	3.579	3.109	2.809	3.035			
HCM Lane V/C Ratio	0.078	0.337	0.34	0.289			
HCM Control Delay	9.1	10.8	10.2	10.1			
HCM Lane LOS	A	B	B	B			
HCM 95th-ile Q	0.2	1.5	1.5	1.2			

Synchro 11 Report

HCM Unsignalized Intersection Capacity Analysis
 20: Pirandello St & E Liberty St

Existing (AM)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	EB 1	WB 1	NB 1	SB 1								
Sign Control	Stop	Stop	Stop	Stop								
Traffic Volume (vph)	5	265	5	15	185	45	10	0	35	75	0	5
Future Volume (vph)	5	265	5	15	185	45	10	0	35	75	0	5
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	5	291	5	16	203	49	11	0	38	82	0	5
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	301	268	49	87								
Volume Left (vph)	5	16	11	82								
Volume Right (vph)	5	49	38	5								
Head (s)	0.09	0.07	-0.35	0.40								
Departure Headway (s)	4.7	4.7	5.1	5.7								
Degree Utilization, x	0.39	0.35	0.07	0.14								
Capacity (veh/h)	731	731	615	564								
Control Delay (s)	10.7	10.2	8.4	9.6								
Approach Delay (s)	10.7	10.2	8.4	9.6								
Approach LOS	B	B	A	A								
Intersection Summary												
Delay	10.2											
Level of Service	B											
Intersection Capacity Utilization	41.9%											
Analysis Period (min)	15											
ICU Level of Service	A											

HCM 6th AWSC
 20: Pirandello St & E Liberty St

Existing (AM)

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	10.6											
Intersection LOS	B											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	5	265	5	15	185	45	10	0	35	75	0	5
Traffic Vol, veh/h	5	265	5	15	185	45	10	0	35	75	0	5
Future Vol, veh/h	5	265	5	15	185	45	10	0	35	75	0	5
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	25	5	14	6	10	9	0	0	5	14	0	20
Mvmt Flow	5	291	5	16	203	49	11	0	38	82	0	5
Number of Lanes	0	1	0	0	1	0	1	0	1	0	1	0
Approach	EB	WB	WB	WB	WB	NB	NB	SB	SB	SB	SB	SB
Opposing Approach	WB	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	NB	NB	NB	EB	EB	WB	WB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	SB	SB	WB	WB	WB	EB	EB	EB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	11.6											
HCM LOS	B											
NBLn1	22%											
EBLn1	2%											
WBLn1	6%											
SBLn1	94%											
Vol Left, %	0%											
Vol Thru, %	96%											
Vol Right, %	76%											
Stop	18%											
Stop	6%											
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	45	275	245	80								
LT Vol	10	5	15	75								
Through Vol	0	265	185	0								
RT Vol	35	5	45	5								
Lane Flow Rate	49	302	269	88								
Geometry Grp	1											
Degree of Utl (X)	0.068											
0.347	0.139											
Departure Headway (Ht)	4.973											
4.992	5.709											
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	713	719	770	624								
Service Time	3.054											
3.043	3.783											
HCM Lane V/C Ratio	0.069											
0.42	0.349											
HCM Control Delay	8.4											
11.6	10.2											
HCM Lane LOS	A											
B	B											
A	A											
HCM 95th-tile Q	0.2	2.1	1.6	0.5								

Existing (AM)
 HCM Unsynchronized Intersection Capacity Analysis
 21: Lynn Williams St & Western Battery Road

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	30	55	10	25	40
Future Volume (Veh/h)	10	30	55	10	25	40
Sign Control	Free	Free	Free	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	12	36	66	12	30	48
Pedestrians	9	22			88	
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Walking Speed (m/s)	1.2	1.2	1.2	1.2	1.2	1.2
Percent Blockage	1	2			7	
Right turn flare (veh)	None	None				
Median type						
Median storage (veh)						
Upstream signal (m)						
pX platoon unblocked						
vC, conflicting volume	166				242	169
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCv, unblocked vol	166				242	169
IC, single (s)	4.1				6.4	6.2
IC, 2 stage (s)	2.2				3.5	3.3
p0 queue free %	99				96	94
CM capacity (veh/h)	1323				679	812
Direction_Lane #	EB 1	WB 1	SB 1			
Volume Total	48	78	78			
Volume Left	12	0	30			
Volume Right	0	12	48			
cSH	1323	1700	755			
Volume to Capacity	0.01	0.05	0.10			
Queue Length 95th (m)	0.2	0.0	2.8			
Control Delay (s)	2.0	0.0	10.3			
Lane LOS	A		B			
Approach Delay (s)	2.0	0.0	10.3			
Approach LOS			B			
Intersection Summary						
Average Delay			4.4			
Intersection Capacity Utilization			26.3%			
Analysis Period (min)			15			
ICU Level of Service			A			

Existing (PM)
 1: Dufferin St & King St W

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	85	180	35	260	35	390	80	295
Future Volume (vph)	85	180	35	260	35	390	80	295
Lane Group Flow (vph)	0	301	0	409	0	495	0	516
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases	4	4	8	8	5	2	6	6
Permitted Phases	4	4	8	8	5	2	6	6
Detector Phase								
Switch Phase								
Minimum Initial (s)	21.0	21.0	21.0	21.0	6.0	20.0	20.0	20.0
Minimum Split (s)	28.0	28.0	28.0	28.0	10.0	27.0	27.0	27.0
Total Split (s)	35.0	35.0	35.0	35.0	14.0	45.0	31.0	31.0
Total Split (%)	43.8%	43.8%	43.8%	43.8%	17.5%	56.3%	38.8%	38.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	5.0	-1.0	-1.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	5.0	6.0	6.0	6.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode								
v/c Ratio	0.22	0.22	0.26	0.26	0.59	0.76	0.76	0.76
Control Delay	9.1	9.1	8.3	8.3	38.2	31.0	31.0	31.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.1	9.1	8.3	8.3	38.2	31.0	31.0	31.0
Queue Length 50th (m)	10.3	10.3	12.7	12.7	40.7	37.0	37.0	37.0
Queue Length 95th (m)	20.5	20.5	24.6	24.6	57.3	49.5	49.5	49.5
Internal Link Dist (m)	163.4	163.4	383.3	383.3	189.0	183.0	183.0	183.0
Turn Bay Length (m)								
Base Capacity (vph)	1357	1357	1579	1579	1456	773	773	773
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.22	0.26	0.26	0.34	0.67	0.67	0.67
Intersection Summary								
Cycle Length: 80								
Actuated Cycle Length: 80								
Offset: 29 (36%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green								
Natural Cycle: 65								
Control Type: Actuated-Coordinated								



HCM Signalized Intersection Capacity Analysis

1: Dufferin St & King St W

Existing (PM)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4T		4T			4T			4T		
Traffic Volume (vph)	85	180	15	35	260	85	35	390	35	80	295	105
Future Volume (vph)	85	180	15	35	260	85	35	390	35	80	295	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0			6.0			5.0			5.0		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Fpb. ped/bikes	0.99	0.93		0.93	0.98		1.00	0.98		0.98		0.97
Fpb. ped/bikes	0.95	0.98		0.98	1.00		1.00	0.98		0.98		0.97
Ft	0.99	0.97		0.97	0.99		1.00	0.99		0.99		0.99
Flt Protected	0.99	1.00		1.00	1.00		1.00	0.99		0.99		0.99
Satd. Flow (prot)	3141	3004		3004	3295		3295	3161		3161		3161
Flt Permitted	0.74	0.90		0.90	0.88		0.88	0.71		0.71		0.71
Satd. Flow (perm)	2357	2714		2714	2898		2898	2558		2558		2558
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	91	194	16	38	280	91	38	419	38	86	317	113
RTOR Reduction (vph)	0	3	0	0	22	0	0	11	0	0	33	0
Lane Group Flow (vph)	0	298	0	0	387	0	0	484	0	0	483	0
Confl. Peds. (#/hr)	245	232	232	245	113		219	219		219		113
Confl. Bikes (#/hr)	15			30			10			10		5
Heavy Vehicles (%)	2%	4%	14%	25%	3%	2%	0%	3%	20%	1%	4%	1%
Turn Type	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	4		8		8		5		2		6	
Permitted Phases	4		8		8		2		6		6	
Actuated Green, G (s)	44.9		44.9		44.9		22.1		22.1		22.1	
Effective Green, g (s)	45.9		45.9		45.9		23.1		23.1		23.1	
Actuated G/C Ratio	0.57		0.57		0.57		0.29		0.29		0.29	
Clearance Time (s)	7.0		7.0		7.0		6.0		6.0		6.0	
Vehicle Extension (s)	3.0		3.0		3.0		3.0		3.0		3.0	
Lane Grp Cap. (vph)	1352		1557		1557		836		836		651	
v/s Ratio Prot	0.13		c0.14		c0.14		0.17		0.17		c0.21	
v/s Ratio Perm	0.22		0.25		0.25		0.58		0.58		0.74	
Uniform Delay, d1	8.3		8.5		8.5		24.3		24.3		25.7	
Progression Factor	1.00		1.00		1.00		1.51		1.51		1.00	
Incremental Delay, d2	0.4		0.4		0.4		0.9		0.9		4.5	
Delay (s)	8.7		8.9		8.9		37.6		37.6		30.3	
Level of Service	A		A		A		D		D		C	
Approach Delay (s)	8.7		8.9		8.9		37.6		37.6		30.3	
Approach LOS	A		A		A		D		D		C	
Intersection Summary												
HCM 2000 Control Delay	23.5 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.44											
Actuated Cycle Length (s)	80.0 Sum of lost time (s) 15.0											
Intersection Capacity Utilization	87.5% ICU Level of Service E											
Analysis Period (min)	15											
c Critical Lane Group												

08-24-2023 BA Group

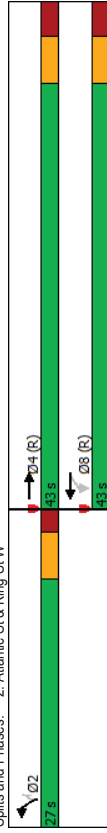
Synchro 11 Report

Queues

2: Atlantic St & King St W

Existing (PM)

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations	4T	4T	4T	4T	4T
Traffic Volume (vph)	455	15	585	165	130
Future Volume (vph)	455	15	585	165	130
Lane Group Flow (vph)	613	0	645	177	140
Turn Type	NA	Perm	NA	Perm	Perm
Protected Phases	4		8		2
Permitted Phases	4		8		2
Detector Phase	4		8		2
Switch Phase					
Minimum Initial (s)	21.0	21.0	21.0	20.0	20.0
Minimum Split (s)	28.0	28.0	28.0	26.0	26.0
Total Split (s)	43.0	43.0	43.0	27.0	27.0
Total Split (%)	61.4%	61.4%	61.4%	36.6%	36.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.0	6.0	6.0	5.0	5.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	C-Max	C-Max	C-Max	None	None
v/c Ratio	0.37	0.37	0.37	0.33	0.36
Control Delay	8.8	10.0	21.2	17.2	17.2
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	8.8	10.0	21.2	17.2	17.2
Queue Length 50th (m)	20.2	24.6	18.8	10.6	10.6
Queue Length 95th (m)	30.5	35.3	34.6	25.2	25.2
Internal Link Dist (m)	55.1	301.6	50.4		
Turn Bay Length (m)					
Base Capacity (vph)	1664	1732	561	401	401
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.37	0.37	0.32	0.35	0.35
Intersection Summary					
Cycle Length: 70					
Actuated Cycle Length: 70					
Offset: 26 (37%), Referenced to phase 4:EBT and 8:WBT.L, Start of Green					
Natural Cycle: 55					
Control Type: Actuated-Coordinated					



08-24-2023 BA Group

Synchro 11 Report

HCM Signalized Intersection Capacity Analysis

2: Atlantic St & King St W

Existing (PM)

Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	↑↑	↑↑	↑↑	↑↑	↑↑	↑↑	
Traffic Volume (vph)	455	115	15	585	165	130	
Future Volume (vph)	455	115	15	585	165	130	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	
Fpb. ped/bikes	0.89	1.00	1.00	0.81	1.00	1.00	
Fpb. ped/bikes	1.00	0.99	1.00	1.00	1.00	1.00	
Ft	0.97	1.00	1.00	0.85	1.00	1.00	
Flt Protected	1.00	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	3007	3413	1785	1192	1192	1192	
Flt Permitted	1.00	0.93	0.95	1.00	1.00	1.00	
Satd. Flow (perm)	3007	3192	1785	1192	1192	1192	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	
Adj. Flow (vph)	480	124	16	629	177	140	
RTOR Reduction (vph)	31	0	0	0	0	27	
Lane Group Flow (vph)	582	0	0	645	177	113	
Confl. Peds. (#/hr)	13	400	400	322	172	10	
Confl. Bikes (#/hr)	13	400	400	322	172	10	
Heavy Vehicles (%)	3%	0%	0%	4%	0%	8%	
Turn Type	NA	Perm	NA	Prot	Perm	Perm	
Protected Phases	4	8	2	2	2	2	
Permitted Phases	8	8	2	2	2	2	
Actuated Green, G (s)	37.0	37.0	20.0	20.0	20.0	20.0	
Effective Green, g (s)	36.0	36.0	21.0	21.0	21.0	21.0	
Actuated G/C Ratio	0.54	0.54	0.30	0.30	0.30	0.30	
Clearance Time (s)	7.0	7.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap. (vph)	1632	1732	535	357	357	357	
v/s Ratio Prot	0.19	0.19	c0.10	c0.10	c0.10	c0.10	
v/s Ratio Perm	0.36	0.37	0.33	0.32	0.32	0.32	
Uniform Delay, d1	9.1	9.2	19.0	18.9	18.9	18.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.6	0.6	0.4	0.5	0.5	0.5	
Delay (s)	9.7	9.8	19.4	19.5	19.5	19.5	
Level of Service	A	A	B	B	B	B	
Approach Delay (s)	9.7	9.8	19.4	19.4	19.4	19.4	
Approach LOS	A	A	B	B	B	B	
Intersection Summary							
HCM 2000 Control Delay	11.7					HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.36						
Actuated Cycle Length (s)	70.0					Sum of lost time (s)	11.0
Intersection Capacity Utilization	52.8%					ICU Level of Service	A
Analysis Period (min)	15						
c Critical Lane Group							

06-24-2023 BA Group

Synchro 11 Report

Queues

3: King St W & Sudbury St

Existing (PM)

Lane Group	EBL	EBT	WBT	SBL
Lane Configurations	←	←	←	←
Traffic Volume (vph)	5	490	510	115
Future Volume (vph)	5	490	510	115
Lane Group Flow (vph)	0	550	811	189
Turn Type	Perm	NA	NA	Prot
Protected Phases	4	8	8	6
Permitted Phases	4	8	8	6
Detector Phase	4	4	8	6
Switch Phase	4	4	8	6
Minimum Initial (s)	24.0	24.0	24.0	21.0
Minimum Split (s)	30.0	30.0	30.0	26.0
Total Split (s)	53.0	53.0	53.0	27.0
Total Split (%)	66.3%	66.3%	66.3%	33.8%
Yellow Time (s)	4.0	4.0	4.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	4.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	C-Max	C-Max	C-Max	None
v/c Ratio	0.28	0.42	0.42	0.40
Control Delay	7.7	7.1	22.6	22.6
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	7.7	7.1	22.6	22.6
Queue Length 50th (m)	19.5	24.8	20.3	20.3
Queue Length 95th (m)	27.6	36.2	38.8	38.8
Internal Link Dist (m)	301.6	26.9	138.9	138.9
Turn Bay Length (m)				
Base Capacity (vph)	1834	1934	498	498
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.28	0.42	0.38	0.38
Intersection Summary				
Cycle Length: 80				
Actuated Cycle Length: 80				
Offset: 1 (1%), Referenced to phase 4:EBTL and 8:WBT, Start of Green				
Natural Cycle: 60				
Control Type: Actuated-Coordinated				
Splits and Phases: 3: King St W & Sudbury St				

06-24-2023 BA Group

Synchro 11 Report

HCM Signalized Intersection Capacity Analysis Existing (PM)
3: King St W & Sudbury St

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		←	←	←	←	←
Traffic Volume (vph)	5	490	510	220	115	55
Future Volume (vph)	5	490	510	220	115	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0		
Lane Util. Factor	0.95	0.95	0.95	1.00		
Fpb. ped/bikes	1.00	1.00	0.95	1.00		
Fpb. ped/bikes	1.00	1.00	0.95	1.00		
Flt Protected	1.00	1.00	1.00	0.97		
Satd. Flow (prot)	3334	3063	1659	1659		
Flt Permitted	0.95	1.00	0.97			
Satd. Flow (perm)	3161	3063	1659			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	6	544	567	244	128	61
RTOR Reduction (vph)	0	0	68	0	22	0
Lane Group Flow (vph)	0	550	753	0	167	0
Confl. Peds. (#/hr)	140	140	60	115		
Confl. Bikes (#/hr)		55				
Heavy Vehicles (%)	0%	7%	3%	0%	0%	0%
Turn Type	Perm	NA	NA	Prot		
Protected Phases	4	8		6		
Permitted Phases	4					
Actuated Green, G (s)	48.0	48.0	21.0			
Effective Green, g (s)	49.0	48.0	22.0			
Actuated G/C Ratio	0.61	0.61	0.28			
Clearance Time (s)	6.0	6.0	5.0			
Vehicle Extension (s)	3.0	3.0	3.0			
Lane Grp Cap. (vph)	1936	1876	456			
v/s Ratio Prot		c0.25		c0.10		
v/s Ratio Perm	0.17					
v/s Ratio	0.28	0.40	0.37			
Uniform Delay, d1	7.3	8.0	23.4			
Progression Factor	1.00	1.00	1.00			
Incremental Delay, d2	0.4	0.6	0.5			
Delay (s)	7.6	8.6	23.9			
Level of Service	A	A	C			
Approach Delay (s)	7.6	8.6	23.9			
Approach LOS	A	A	C			
Intersection Summary						
HCM 2000 Control Delay	10.1 HCM 2000 Level of Service B					
HCM 2000 Volume to Capacity ratio	0.39					
Actuated Cycle Length (s)	80.0 Sum of lost time (s) 9.0					
Intersection Capacity Utilization	48.2% ICU Level of Service A					
Analysis Period (min)	15					
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis Existing (PM)
4: Duoro St & King St W

Movement	EBT	EBR	WBT	WBR	NBT	NBR
Lane Configurations	←	←	←	←	←	←
Traffic Volume (veh/h)	365	240	0	640	90	5
Future Volume (Veh/h)	365	240	0	640	90	5
Sign Control	Free	Free	Stop	Free	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	410	270	0	719	101	6
Pedestrians					200	
Lane Width (m)					3.5	
Walking Speed (m/s)					1.2	
Percent Blockage					16	
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (m)	51		130			
pX, platoon unblocked			0.93		0.95	0.93
vC, conflicting volume			880		1104	540
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			718		672	352
IC, single (s)			4.1		6.8	6.9
IC, 2 stage (s)						
p0 queue free %			2.2		3.5	3.3
q0 capacity (veh/h)			685		314	506
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	273	407	240	479	107	107
Volume Left	0	0	0	0	0	6
Volume Right	0	270	0	0	0	101
cSH	1700	1700	695	1700	321	321
Volume to Capacity	0.16	0.24	0.00	0.28	0.33	0.33
Queue Length 95th (m)	0.0	0.0	0.0	0.0	11.4	11.4
Control Delay (s)	0.0	0.0	0.0	0.0	21.7	21.7
Lane LOS					C	C
Approach Delay (s)	0.0	0.0	0.0	21.7		
Approach LOS				C		
Intersection Summary						
Average Delay	1.5					
Intersection Capacity Utilization	32.8% ICU Level of Service A					
Analysis Period (min)	15					

Queues Existing (PM)

5: Shaw St & King St W

EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	Ø1	Ø3	Ø5	Ø7
Lane Group											
Lane Configurations											
Traffic Volume (vph)	20	325	5	460	85	185	40	180			
Future Volume (vph)	20	325	5	460	85	185	40	180			
Lane Group Flow (vph)	0	411	0	556	0	317	0	350			
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases	4	4	8	8	2	2	6	1	3	5	7
Permitted Phases	4	4	8	8	2	2	6	6			
Detector Phase	4	4	8	8	2	2	6	6			
Switch Phase											
Minimum Initial (s)	19.0	19.0	19.0	19.0	16.0	16.0	16.0	3.0	3.0	3.0	3.0
Minimum Split (s)	28.0	28.0	28.0	22.0	22.0	22.0	22.0	5.0	5.0	5.0	5.0
Total Split (s)	37.0	37.0	37.0	37.0	23.0	23.0	23.0	5.0	5.0	5.0	5.0
Total Split (%)	52.9%	52.9%	52.9%	32.9%	32.9%	32.9%	32.9%	7%	7%	7%	7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0	2.0	2.0	2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	0.0	0.0	0.0
Last Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0				
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Lead/Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None	None	Ped	Ped	Ped
v/c Ratio	0.31	0.38	0.38	0.53	0.38	0.51	0.51				
Control Delay	12.4	13.1	13.1	26.0	13.1	19.4	19.4				
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Queue Length	12.4	13.1	13.1	26.0	13.1	19.4	19.4				
Queue Length 50th (m)	17.2	24.4	24.4	19.5	15.7	15.7	15.7				
Queue Length 95th (m)	26.7	36.0	36.0	31.1	27.6	27.6	27.6				
Internal Link Dist (m)	105.5	222.7	222.7	65.9	127.6	127.6	127.6				
Turn Bay Length (m)	13.0	1445	1445	626	712	712	712				
Station 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	0.31	0.38	0.38	0.51	0.49	0.49	0.49				
Intersection Summary											
Cycle Length: 70											
Actuated Cycle Length: 70											
Offset: 1 (1%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green											
Natural Cycle: 60											
Control Type: Actuated-Coordinated											

Splits and Phases: 5: Shaw St & King St W



HCM Signalized Intersection Capacity Analysis Existing (PM)

5: Shaw St & King St W

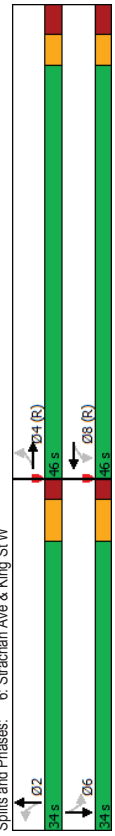
EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Movement							
Lane Configurations							
Traffic Volume (vph)	20	325	25	5	460	35	85
Future Volume (vph)	20	325	25	5	460	35	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Fpb. ped/bikes	0.97	0.98	0.98	0.98	0.98	0.98	0.98
Fibb. ped/bikes	0.99	0.99	1.00	0.99	0.99	0.99	0.98
Frt	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Flt Protected	1.00	1.00	1.00	1.00	0.99	0.99	0.99
Satd. Flow (prot)	3116	3306	3306	3288	2872	2872	2872
Flt Permitted	0.91	0.95	0.95	0.73	0.87	0.87	0.87
Satd. Flow (perm)	2851	3145	3145	2414	2500	2500	2500
Peak-Hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	22	361	28	6	511	39	94
RTOR Reduction (vph)	0	8	0	0	8	0	0
Lane Group Flow (vph)	0	403	0	0	548	0	0
Confl. Peds. (#/hr)	270	195	195	270	205	170	170
Confl. Bikes (#/hr)	15	45	45	15	10	10	10
Heavy Vehicles (%)	71%	6%	0%	0%	4%	6%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases	4	8	8	2	2	6	6
Permitted Phases	4	8	8	2	2	6	6
Actuated Green, G (s)	31.0	31.0	32.0	16.2	17.2	17.2	16.2
Effective Green, g (s)	32.0	32.0	32.0	17.2	17.2	17.2	17.2
Actuated g/C Ratio	0.46	0.46	0.46	0.25	0.25	0.25	0.25
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)	1303	1437	1437	593	614	614	614
v/s Ratio Prot	0.14	c0.17	c0.17	c0.13	0.11	0.11	0.11
v/s Ratio Perm	0.31	0.38	0.38	0.52	0.45	0.45	0.45
Uniform Delay, d1	12.0	12.5	12.5	22.9	22.4	22.4	22.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.8	0.8	0.8	0.5	0.5	0.5
Delay (s)	12.6	13.3	13.3	23.7	23.0	23.0	23.0
Level of Service	B	B	B	C	C	C	C
Approach Delay (s)	12.6	13.3	13.3	23.7	23.0	23.0	23.0
Approach LOS	B	B	B	C	C	C	C
Intersection Summary							
HCM 2000 Control Delay	17.2	HCM 2000 Level of Service					
HCM 2000 Volume to Capacity ratio	0.38	B					
Actuated Cycle Length (s)	70.0	Sum of lost time (s)					
Intersection Capacity Utilization	64.5%	ICU Level of Service					
Analysis Period (min)	15	C					
c Critical Lane Group							

Queues Existing (PM)

6: Strachan Ave & King St W

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	4TB	4TB	4TB	4TB	4TB	4TB	4TB	4TB
Traffic Volume (vph)	5	310	5	390	80	240	25	160
Future Volume (vph)	5	310	5	390	80	240	25	160
Lane Group Flow (vph)	0	413	0	456	87	294	27	207
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4	8	8	2	2	2	6	6
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	20.0	20.0	20.0	20.0	21.0	21.0	21.0	21.0
Minimum Split (s)	26.0	26.0	26.0	27.0	27.0	27.0	27.0	27.0
Total Split (s)	46.0	46.0	46.0	46.0	34.0	34.0	34.0	34.0
Total Split (%)	57.5%	57.5%	57.5%	57.5%	42.5%	42.5%	42.5%	42.5%
Yellow Time (s)	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0				-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0				5.0	5.0	5.0	5.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	C-Max	C-Max	C-Max	C-Max	Min	Min	Min	Min
v/c Ratio	0.26	0.25	0.37	0.57	0.14	0.14	0.42	0.42
Control Delay	7.7	8.2	43.2	44.0	23.0	24.6	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.7	8.2	43.2	44.0	23.0	24.6	0.0	0.0
Queue Length 50th (m)	13.0	15.7	14.5	49.5	3.3	25.4	0.0	0.0
Queue Length 95th (m)	22.8	26.4	m28.3	74.5	9.2	42.0	0.0	0.0
Internal Link Dist (m)	222.7	138.4		121.3		128.6		
Turn Bay Length (m)				20.0		25.0		
Base Capacity (vph)	1595	1824	299	653	246	624		
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.25	0.29	0.45	0.11	0.33		

Intersection Summary



HCM Signalized Intersection Capacity Analysis Existing (PM)

6: Strachan Ave & King St W

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Movement	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	4TB	4TB	4TB	4TB	4TB	4TB	4TB	4TB
Traffic Volume (vph)	5	310	5	390	80	240	25	160
Future Volume (vph)	5	310	5	390	80	240	25	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0				5.0	5.0	5.0	5.0
Lane Util. Factor	0.95	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Fpb. ped/bikes	0.89				1.00	0.97	1.00	0.95
Fpb. ped/bikes	1.00				0.79	1.00	0.86	1.00
Frt	0.97				1.00	0.98	1.00	0.98
Flt Protected	1.00				0.95	1.00	0.95	1.00
Satd. Flow (prot)	2806				1410	1787	1536	1698
Flt Permitted	0.95				0.56	1.00	0.42	1.00
Satd. Flow (perm)	2669				832	1787	663	1698
Peak-Hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	337	71	5	424	27	87	261
RTOR Reduction (vph)	0	18	0	0	5	0	6	0
Lane Group Flow (vph)	0	395	0	0	451	0	87	288
Conf. Peds. (#/hr)	470				65		215	215
Conf. Bikes (#/hr)	15				35		35	35
Heavy Vehicles (%)	0%	7%	27%	0%	5%	4%	0%	3%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4	8	8	2	2	2	6	6
Permitted Phases	4	46.3	47.3	46.3	21.7	21.7	21.7	21.7
Actuated Green, G (s)	46.3	47.3	47.3	46.3	22.7	22.7	22.7	22.7
Effective Green, g (s)	0.59	0.59	0.59	0.28	0.28	0.28	0.28	0.28
Actuated G/C Ratio	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Clearance Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Vehicle Extension (s)	1578				236	507	193	481
Lane Grp Cap (vph)	c0.15	0.15	0.15	0.10	0.10	0.12	0.04	0.12
v/s Ratio Perm	0.25	0.25	0.25	0.37	0.57	0.14	0.41	0.41
Uniform Delay, d1	7.8	7.8	7.8	22.9	24.5	21.4	23.2	23.2
Progression Factor	1.00	1.00	1.00	1.67	1.67	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.3	0.3	0.9	1.3	0.3	0.6	0.6
Delay (s)	8.2	8.2	8.2	39.1	42.1	21.7	23.8	23.8
Level of Service	A	A	A	D	D	C	C	C
Approach Delay (s)	8.2	8.2	8.2	41.4	41.4	23.6	23.6	23.6
Approach LOS	A	A	A	D	D	C	C	C

Intersection Summary

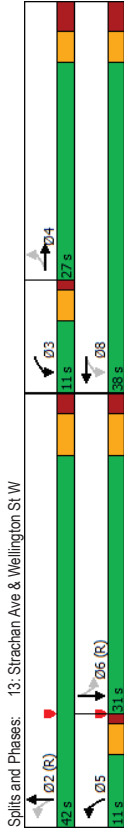
HCM 2000 Control Delay	19.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		
Critical Lane Group			

Existing (PM)
 HCM Unsignalized Intersection Capacity Analysis
 7: Atlantic St & Snooker St

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W					R
Traffic Volume (veh/h)	40	185	110	40	75	55
Future Volume (Veh/h)	40	185	110	40	75	55
Sign Control	Stop		Free		Free	Free
Grade	0%		0%		0%	0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	42	195	116	42	79	58
Pedestrians	125		40		40	40
Lane Width (m)	3.5		3.5		3.5	3.5
Walking Speed (m/s)	1.2		1.2		1.2	1.2
Percent Blockage			3			3
Right turn flare (veh)			None			None
Median type			None			None
Median storage (veh)						74
Upstream signal (m)						
pX platoon unblocked						283
vC, conflicting volume	518	302				
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vC, unblocked vol	518	302				283
IC, single (s)	6.4	6.2				4.1
IC, 2 stage (s)						
IF (s)	3.5	3.3				2.2
p0 queue free %	90	70				93
CM capacity (veh/h)	422	644				1160
Direction_Lane #	WB 1	NB 1	SB 1			
Volume Total	237	158	137			
Volume Left	42	0	79			
Volume Right	195	42	0			
cSH	589	1700	1160			
Volume to Capacity	0.40	0.09	0.07			
Queue Length 95th (m)	15.5	0.0	1.8			
Control Delay (s)	15.2	0.0	5.1			
Lane LOS	C		A			
Approach Delay (s)	15.2	0.0	5.1			
Approach LOS	C		A			
Intersection Summary						
Average Delay			8.1			
Intersection Capacity Utilization			46.7%			ICU Level of Service
Analysis Period (min)			15			A

Existing (PM)
 13: Strachan Ave & Wellington St W

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	W	W	W	W	W	W	W	R
Traffic Volume (vph)	10	80	215	140	140	315	5	220
Future Volume (vph)	10	80	215	140	140	315	5	220
Lane Group Flow (vph)	11	250	229	176	149	436	5	239
Turn Type	Perm	NA	pm+pt	NA	pm+pt	NA	Perm	NA
Protected Phases	4	3	8	5	2		6	
Permitted Phases	4	8		2			6	
Minimum Split (s)	27.0	27.0	10.0	26.0	10.0	29.0	29.0	29.0
Total Split (s)	27.0	27.0	11.0	38.0	11.0	42.0	31.0	31.0
Total Split (%)	33.8%	33.8%	13.8%	47.5%	13.8%	52.5%	38.8%	38.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	1.0	3.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	3.0	5.0	3.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead	Lead	Lead	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio	0.04	0.49	0.53	0.24	0.36	0.54	0.02	0.43
Control Delay	21.9	16.2	19.7	15.1	12.3	14.4	14.0	20.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.9	16.2	19.7	15.1	12.3	14.4	14.0	20.3
Queue Length 50th (m)	1.3	16.4	22.8	16.3	11.4	33.0	0.6	34.1
Queue Length 95th (m)	5.2	38.2	38.6	29.8	20.0	46.4	1.8	53.1
Internal Link Dist (m)		64.0	134.1		143.3			121.3
Turn Bay Length (m)		15.0		25.0		15.0		
Base Capacity (vph)	292	507	431	738	414	813	290	561
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.49	0.53	0.24	0.36	0.54	0.02	0.43
Intersection Summary								
Cycle Length: 80								
Actuated Cycle Length: 80								
Offset: 46 (58%), Referenced to phase 2-NBTL and 6-SBTL, Start of Green								
Natural Cycle: 80								
Control Type: Pretimed								
m Volume for 95th percentile queue is metered by upstream signal.								



HCM Signalized Intersection Capacity Analysis
13: Strachan Ave & Wellington St W

Existing (PM)

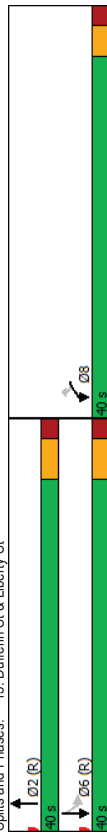
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1	1	1	1	1	1	1	1	1	1	1	1
Traffic Volume (vph)	10	80	155	215	140	25	140	315	95	5	220	5
Future Volume (vph)	10	80	155	215	140	25	140	315	95	5	220	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	0.91	1.00	0.97	1.00	0.97	1.00	0.96	1.00	0.99	1.00	0.99
Fpb. ped/bikes	0.87	1.00	0.97	1.00	0.85	1.00	0.85	1.00	0.83	1.00	1.00	1.00
Ft	1.00	0.90	1.00	0.98	1.00	0.98	1.00	0.97	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1561	1528	1740	1771	1525	1730	1666	1726	1666	1726	1726	1726
Flt Permitted	0.65	1.00	0.43	1.00	0.48	1.00	0.51	1.00	0.51	1.00	1.00	1.00
Satd. Flow (perm)	1062	1528	781	1771	768	1730	893	1726	893	1726	1726	1726
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	11	85	165	229	149	27	149	335	101	5	234	5
RTOR Reduction (vph)	0	87	0	0	8	0	0	13	0	0	1	0
Lane Group Flow (vph)	11	163	0	229	188	0	149	423	0	5	238	0
Conf. Peds. (#/hr)	80	55	55	80	350	70	70	350	40	40	350	35
Conf. Bikes (#/hr)	5	5	5	5	20	20	20	20	20	20	20	20
Heavy Vehicles (%)	0%	1%	1%	0%	0%	4%	0%	1%	0%	0%	7%	20%
Turn Types	Perm	NA	NA	pm+pt	NA	NA	pm+pt	NA	NA	Perm	NA	NA
Protected Phases	4	3	8	5	2	5	2	6	6	6	6	6
Permitted Phases	4	8	8	2	2	2	2	6	6	6	6	6
Actuated Green, G (s)	21.0	21.0	32.0	32.0	36.0	36.0	36.0	36.0	25.0	25.0	25.0	25.0
Effective Green, g (s)	22.0	22.0	33.0	33.0	37.0	37.0	37.0	37.0	26.0	26.0	26.0	26.0
Actuated G/C Ratio	0.28	0.28	0.41	0.41	0.46	0.46	0.46	0.46	0.32	0.32	0.32	0.32
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Grp Cap (vph)	292	420	418	730	430	800	290	560	290	560	560	560
v/s Ratio Prot	0.11	c0.05	0.09	0.13	c0.24	0.13	0.13	0.14	0.01	0.01	0.14	0.14
v/s Ratio Perm	0.04	0.39	0.55	0.23	0.35	0.53	0.02	0.43	0.02	0.43	0.43	0.43
Uniform Delay, d1	21.2	23.5	16.3	15.3	13.1	15.3	18.3	21.2	18.3	21.2	21.2	21.2
Progression Factor	1.00	1.00	1.00	1.00	0.86	0.82	0.74	0.83	0.74	0.83	0.83	0.83
Incremental Delay, d2	2.0	2.7	5.1	0.7	2.0	2.2	0.1	2.3	0.1	2.3	2.3	2.3
Level of Service	C	C	C	B	B	B	B	B	B	B	B	B
Approach Delay (s)	26.0	19.1	19.1	14.3	14.3	14.3	19.7	19.7	19.7	19.7	19.7	19.7
Approach LOS	C	B	B	B	B	B	B	B	B	B	B	B
Intersection Summary												
HCM 2000 Control Delay	18.5 HCM 2000 Level of Service B											
HCM 2000 Volume to Capacity ratio	0.59											
Actuated Cycle Length (s)	80.0 Sum of lost time (s) 16.0											
Intersection Capacity Utilization	92.7% ICU Level of Service F											
Analysis Period (min)	15											
c Critical Lane Group												

Synchro 11 Report

Queues
15: Dufferin St & Liberty St

Existing (PM)

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Configurations	1	1	1	1	1
Traffic Volume (vph)	250	140	475	55	270
Future Volume (vph)	250	140	475	55	270
Lane Group Flow (vph)	281	157	759	0	365
Turn Type	Prot	Perm	NA	Perm	NA
Protected Phases	8	2	2	6	6
Permitted Phases	8	8	2	6	6
Detector Phase	8	8	2	6	6
Switch Phase	18.0	18.0	18.0	18.0	18.0
Minimum Initial (s)	23.0	23.0	24.0	24.0	24.0
Minimum Split (s)	40.0	40.0	40.0	40.0	40.0
Total Split (s)	50.0%	50.0%	50.0%	50.0%	50.0%
Total Split (%)	3.0	3.0	4.0	4.0	4.0
Yellow Time (s)	2.0	2.0	2.0	2.0	2.0
All-Red Time (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Lost Time Adjust (s)	4.0	4.0	5.0	5.0	5.0
Total Lost Time (s)	4.0	4.0	5.0	5.0	5.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	C-Max	C-Max	C-Max
v/c Ratio	0.61	0.36	0.39	0.23	0.23
Control Delay	31.6	11.3	7.4	1.7	1.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	31.6	11.3	7.4	1.7	1.7
Queue Length 50th (m)	40.9	6.9	21.5	2.1	2.1
Queue Length 95th (m)	57.7	19.2	40.8	3.9	3.9
Internal Link Dist (m)	382.8	162.3	186.7	186.7	186.7
Turn Bay Length (m)	10.0	10.0	10.0	10.0	10.0
Base Capacity (vph)	787	681	1945	1584	1584
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.36	0.23	0.39	0.23	0.23
Intersection Summary					
Cycle Length: 80					
Actuated Cycle Length: 80					
Offset: 79 (99%), Referenced to phase 2:NBT and 6:SBTL, Start of Green					
Natural Cycle: 50					
Control Type: Actuated-Coordinated					



Synchro 11 Report

HCM Signalized Intersection Capacity Analysis
15: Dufferin St & Liberty St

Existing (PM)

Movement	WBL	WBR	NBT	NBR	SBL	SBR	
Lane Configurations	↔	↔	↔	↔	↔	↔	
Traffic Volume (vph)	250	140	475	200	55	270	
Future Volume (vph)	250	140	475	200	55	270	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95	
Fpb. ped/bikes	1.00	0.89	0.92	1.00	0.99	1.00	
Fibp. ped/bikes	1.00	0.85	0.96	1.00	0.99	1.00	
Flt Protected	0.95	1.00	1.00	0.99	0.99	0.99	
Satd. Flow (prot)	1750	1385	3054	3297	3297	3297	
Flt Permitted	0.95	1.00	1.00	0.76	0.76	0.76	
Satd. Flow (perm)	1750	1385	3054	2535	2535	2535	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	
Adj. Flow (vph)	281	157	534	225	62	303	
RTOR Reduction (vph)	0	76	39	0	0	0	
Lane Group Flow (vph)	281	81	720	0	0	365	
Confl. Peds. (#/hr)	87	69	108	108	108	108	
Confl. Bikes (#/hr)	6	6	8	8	8	8	
Heavy Vehicles (%)	2%	3%	4%	1%	1%	7%	
Turn Type	Prot	Perm	NA	Perm	NA	NA	
Protected Phases	8	2	2	6	6	6	
Permitted Phases	8	2	2	6	6	6	
Actuated Green, G (s)	20.1	20.1	48.9	48.9	48.9	48.9	
Effective Green, g (s)	21.1	21.1	49.9	49.9	49.9	49.9	
Actuated g/C Ratio	0.26	0.26	0.62	0.62	0.62	0.62	
Clearance Time (s)	5.0	5.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap. (vph)	461	365	1904	1581	1581	1581	
v/s Ratio Prot	c0.16		c0.24				
v/s Ratio Perm	0.06		0.14				
v/s Ratio	0.61	0.22	0.38	0.23	0.23	0.23	
Uniform Delay, d1	25.8	23.0	7.4	6.6	6.6	6.6	
Progression Factor	1.00	1.00	1.00	0.19	0.19	0.19	
Incremental Delay, d2	2.3	0.3	0.6	0.3	0.3	0.3	
Delay (s)	28.1	23.3	8.0	1.6	1.6	1.6	
Level of Service	C	C	A	A	A	A	
Approach Delay (s)	28.4	8.0	1.6	1.6	1.6	1.6	
Approach LOS	C	A	A	A	A	A	
Intersection Summary							
HCM 2000 Control Delay	11.7					HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45						
Actuated Cycle Length (s)	80.0						
Sum of lost time (s)	9.0						
Intersection Capacity Utilization	63.0%					ICU Level of Service	B
Analysis Period (min)	15						
c Critical Lane Group							

HCM Unsignalized Intersection Capacity Analysis
16: Atlantic St & Liberty St

Existing (PM)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	35	270	20	5	170	85	15	30	15	45	10
Future Volume (vph)	35	270	20	5	170	85	15	30	15	45	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	36	276	20	5	173	87	15	31	15	46	10
Direction, Lane #	EB 1	WB 1	NB 1	SB 1							
Volume Total (vph)	332	265	61	97							
Volume Left (vph)	36	5	15	46							
Volume Right (vph)	20	87	15	41							
Head (s)	0.00	-0.09	-0.08	-0.14							
Departure Headway (s)	4.7	4.6	5.4	5.3							
Degree Utilization, x	0.43	0.34	0.09	0.14							
Capacity (veh/h)	738	738	578	606							
Control Delay (s)	11.1	10.0	8.9	9.1							
Approach Delay (s)	B	B	A	A							
Approach LOS	B	B	A	A							
Intersection Summary											
Delay	10.3										
Level of Service	B										
Intersection Capacity Utilization	55.3%										
ICU Level of Service	B										
Analysis Period (min)	15										

Existing (PM)
 HCM 6th AWSC
 16: Atlantic St & Liberty St

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	35	270	20	5	170	85	15	30	15	45	10	40
Intersection LOS	B											
Future Vol, veh/h	35	270	20	5	170	85	15	30	15	45	10	40
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles, %	0	1	0	0	1	16	5	0	0	0	0	2
Mvmt Flow	36	276	20	5	173	87	15	31	15	46	10	41
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

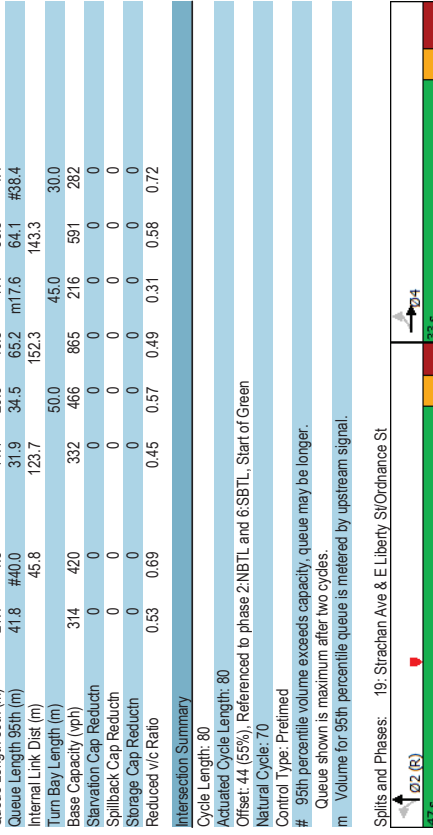
Approach	EB	WB	EB	WB	NB	SB
Opposing Approach	1	1	1	1	1	1
Opposing Lanes	WB	EB	WB	EB	NB	NB
Conflicting Approach Left	SB	NB	EB	WB	EB	WB
Conflicting Lanes Left	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB	EB	EB
Conflicting Lanes Right	1	1	1	1	1	1
HCM Control Delay	11	9.8	9.8	9	9	9.1
HCM LOS	B	A	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	25%	11%	2%	47%
Vol Thru, %	50%	83%	65%	11%
Vol Right, %	25%	6%	33%	42%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	60	325	260	95
LT Vol	15	35	5	45
Through Vol	30	270	170	10
RT Vol	15	20	85	40
Lane Flow Rate	61	332	265	97
Geometry Grp	1	1	1	1
Degree of Uhl (X)	0.091	0.423	0.331	0.139
Departure Headway (Hd)	5.363	4.589	4.495	5.162
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	662	783	796	688
Service Time	3.446	2.639	2.548	3.239
HCM Lane V/C Ratio	0.092	0.424	0.333	0.141
HCM Control Delay	9	11	9.8	9.1
HCM Lane LOS	A	B	A	A
HCM 95th-ile Q	0.3	2.1	1.5	0.5

Existing (PM)
 19: Strachan Ave & E Liberty St/Ordinance St

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	EB	EB	WB	WB	NB	NB	SB	SB	SB
Traffic Volume (vph)	160	35	60	35	255	340	65	330	195
Future Volume (vph)	160	35	60	35	255	340	65	330	195
Lane Group Flow (vph)	167	291	0	151	266	427	68	344	203
Turn Type	Perm	NA	Perm	NA	pm-pt	NA	Perm	NA	Perm
Protected Phases	4		8		5	2	6		6
Permitted Phases	4		8		2		6		6
Minimum Split (s)	32.6	32.6	32.6	32.6	10.0	27.3	27.3	27.3	27.3
Total Split (s)	33.0	33.0	33.0	33.0	16.0	47.0	31.0	31.0	31.0
Total Split (%)	41.3%	41.3%	41.3%	41.3%	20.0%	58.8%	38.8%	38.8%	38.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	4.6	4.6	4.6	4.6	1.0	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	3.0	5.3	5.3	5.3	5.3
Lead/Lag					Lead	Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio	0.53	0.69	0.45	0.57	0.49	0.31	0.58	0.72	0.72
Control Delay	29.3	15.0	21.3	14.8	14.6	23.5	24.3	22.9	22.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.3	15.0	21.3	14.8	14.6	23.5	24.3	22.9	22.9
Queue Length 50th (m)	21.4	4.5	14.1	20.9	40.8	7.4	38.3	4.4	4.4
Queue Length 95th (m)	41.8	#40.0	31.9	34.5	65.2	m17/6	64.1	#38.4	#38.4
Internal Link Dist (m)		45.8		123.7		152.3		143.3	
Turn Bay Length (m)			50.0		45.0		30.0		30.0
Base Capacity (vph)	314	420	332	466	865	216	591	282	282
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.69	0.45	0.57	0.49	0.31	0.58	0.72	0.72

Intersection Summary	Cycle Length: 80
Actuated Cycle Length: 80	
Offset: 44 (55%), Referenced to phase 2-NBTL and 6-SBTL, Start of Green	
Natural Cycle: 70	
Control Type: Pre-timed	
# 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.	



HCM Signalized Intersection Capacity Analysis
 19: Strachan Ave & E Liberty St/Ordnance St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	→	→	→	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	160	35	245	60	35	50	255	340	70	65	330	195
Future Volume (vph)	160	35	245	60	35	50	255	340	70	65	330	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	3.0	5.3	5.3	5.3	5.3	5.3
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp_psd/bikes	1.00	0.47	0.87	0.87	1.00	0.90	1.00	0.90	1.00	1.00	0.32	1.00
Frbp_psd/bikes	0.74	1.00	0.85	0.85	1.00	0.90	1.00	0.97	1.00	1.00	0.85	1.00
Frt	1.00	0.87	0.95	0.95	1.00	0.98	1.00	0.95	1.00	1.00	0.85	1.00
Flt Protected	1303	765	1286	1286	1609	1656	1247	1842	485	485	1842	485
Flt Permitted	0.69	1.00	0.71	0.71	0.35	1.00	0.51	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	932	765	936	936	594	1656	674	1842	485	485	1842	485
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	167	36	255	62	36	52	266	354	73	68	344	203
RTOR Reduction (vph)	0	168	0	0	23	0	0	2	0	0	0	126
Lane Group Flow (vph)	167	123	0	0	128	0	266	425	0	68	344	77
Conf. Peds. (#/hr)	209	600	600	209	705	382	382	382	15	15	8	8
Conf. Bikes (#/hr)	13	49	49	13	49	15	15	15	8	8	8	8
Heavy Vehicles (%)	1%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	2%
Turn Types	Perm	NA	Perm	NA	NA	pm+pt	NA	NA	Perm	NA	Perm	NA
Protected Phases	4	8	5	2	2	5	2	2	6	6	6	6
Permitted Phases	4	8	5	2	2	5	2	2	6	6	6	6
Actuated Green, G (s)	25.4	25.4	25.4	25.4	40.7	40.7	40.7	40.7	24.7	24.7	24.7	24.7
Effective Green, g (s)	26.4	26.4	26.4	26.4	41.7	41.7	41.7	41.7	25.7	25.7	25.7	25.7
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.52	0.52	0.32	0.32	0.32	0.32	0.32	0.32
Clearance Time (s)	7.6	7.6	7.6	7.6	4.0	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Lane Grp Cap (vph)	314	252	308	308	474	863	216	591	155	155	155	155
v/s Ratio Prot	0.16	0.16	0.16	0.16	0.09	0.26	0.10	0.19	0.10	0.10	0.16	0.16
v/s Ratio Perm	0.18	0.18	0.18	0.18	0.20	0.26	0.10	0.19	0.10	0.10	0.16	0.16
v/c Ratio	0.53	0.49	0.41	0.41	0.56	0.49	0.31	0.50	0.31	0.31	0.58	0.50
Uniform Delay, d1	21.8	21.4	20.8	20.8	12.0	12.3	20.5	22.7	21.9	21.9	21.9	21.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.93	0.88	1.60	1.60	1.60	1.60
Incremental Delay, d2	6.3	6.6	4.1	4.1	4.7	2.0	3.4	3.7	9.7	9.7	9.7	9.7
Delay (s)	28.1	28.0	24.9	24.9	16.7	14.3	22.4	23.7	44.7	44.7	44.7	44.7
Level of Service	C	C	C	C	B	B	C	C	C	C	C	D
Approach Delay (s)	28.0	28.0	24.9	24.9	15.2	15.2	30.5	30.5	30.5	30.5	30.5	30.5
Approach LOS	C	C	C	C	B	B	C	C	C	C	C	C
Intersection Summary												
HCM 2000 Control Delay	24.0 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.57											
Actuated Cycle Length (s)	80.0 Sum of lost time (s)											
Intersection Capacity Utilization	102.2% ICU Level of Service G											
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
 8: Hanna Ave/75 Hanna Ave & Snooker St/Private St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	→	→	→	←	←	←	←	←	←	←	←	←
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	35	65	15	80	185	10	40	30	45	0	0	0
Future Volume (vph)	35	65	15	80	185	10	40	30	45	0	0	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	37	68	16	84	195	11	42	32	47	0	0	0
Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 1							
Volume Total (vph)	121	290	121	0	0	0	0	0	0	0	0	0
Volume Left (vph)	37	84	42	0	0	0	0	0	0	0	0	0
Volume Right (vph)	16	11	47	0	0	0	0	0	0	0	0	0
Head (s)	-0.02	0.04	-0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Departure Headway (s)	4.5	4.4	4.7	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Degree Utilization, x	0.15	0.35	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Capacity (veh/h)	766	793	711	655	655	655	655	655	655	655	655	655
Control Delay (s)	8.3	9.7	8.5	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Approach Delay (s)	8.3	9.7	8.5	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Approach LOS	A	A	A	A	A	A	A	A	A	A	A	A
Intersection Summary												
Delay	9.1											
Level of Service	A											
Intersection Capacity Utilization	38.3%											
Analysis Period (min)	15											
ICU Level of Service	A											

HCM 6th AWSC
8: Hanna Ave/75 Hanna Ave & Snooker St/Private St

HCM 6th AWSC
11: Private St & Existing Metro Driveway

Existing (PM)

Existing (PM)

Intersection	Delay, s/veh	9.1										
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	35	65	15	80	185	10	40	30	45	0	0	0
Traffic Vol, veh/h	35	65	15	80	185	10	40	30	45	0	0	0
Future Vol, veh/h	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Peak Hour Factor	0	0	0	0	0	0	2	0	0	0	0	0
Heavy Vehicles, %	37	68	16	84	195	11	42	32	47	0	0	0
Mgmt Flow	0	1	0	0	1	0	0	1	0	0	1	0
Number of Lanes												
Approach	EB	WB	WB	EB	WB	NB	NB	SB	SB	SB	SB	SB
Opposing Approach	WB	EB	EB	WB	WB	NB	SB	SB	NB	NB	NB	NB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	NB	EB	EB	EB	EB	WB	WB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	WB	WB	WB	WB	EB	EB	EB	EB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	8.3	EB	9.7	EB	9.7	8.6	8.6	8.6	8.6	8.6	8.6	8.6
HCM LOS	A	A	A	A	A	A	A	A	A	A	A	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W	W	Stop	Stop	Stop	Stop
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	25	105	120	50	40	25
Future Volume (vph)	25	105	120	50	40	25
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	28	118	135	56	45	28
Direction, Lane #	EB 1	NB 1	SB 1	SB 1	SB 1	SB 1
Volume Total (vph)	146	191	73			
Volume Left (vph)	28	135	0			
Volume Right (vph)	118	0	28			
Head (s)	-0.45	0.14	-0.23			
Departure Headway (s)	4.1	4.4	4.2			
Degree Utilization, x	0.16	0.24	0.09			
Capacity (veh/h)	888	782	809			
Control Delay (s)	7.8	8.8	7.6			
Approach Delay (s)	7.8	8.8	7.6			
Approach LOS	A	A	A			
Intersection Summary						
Delay	8.2					
Level of Service	A					
Intersection Capacity Utilization	31.7%					
ICU Level of Service	A					
Analysis Period (min)	15					

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	35%	30%	29%	0%
Vol Thru, %	26%	57%	67%	100%
Vol Right, %	39%	13%	4%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	115	115	275	0
LT Vol	40	35	80	0
Through Vol	30	65	185	0
RT Vol	45	15	10	0
Lane Flow Rate	121	121	289	0
Geometry Grp	1	1	1	1
Degree of Uhl (X)	0.157	0.151	0.351	0
Departure Headway (Hd)	4.683	4.484	4.362	4.982
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	766	800	825	0
Service Time	2.712	2.508	2.382	3.02
HCM Lane V/C Ratio	0.158	0.151	0.35	0
HCM Control Delay	8.6	8.3	9.7	8
HCM Lane LOS	A	A	A	N
HCM 95th-tile Q	0.6	0.5	1.6	0

HCM 6th AWSC
11: Private St & Existing Metro Driveway

Existing (PM)

Intersection	EBL	EBR	NBL	NBT	SBT	SBR
Intersection Delay, s/veh	8.2					
Intersection LOS	A					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			4	4	
Traffic Vol, veh/h	25	105	120	50	40	25
Future Vol, veh/h	25	105	120	50	40	25
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles, %	0	0	0	0	0	0
Mgmt Flow	28	118	135	56	45	28
Number of Lanes	1	0	0	1	1	0
Approach	EB	NB	SB	SB	SB	NB
Opposing Approach		SB	NB			
Opposing Lanes	0	1	1			1
Conflicting Approach Left	SB	EB				
Conflicting Lanes Left	1	1				0
Conflicting Approach Right	NB			EB		
Conflicting Lanes Right	1			1		
HCM Control Delay	7.8	8.8	8.8	7.6	7.6	
HCM LOS	A	A	A	A	A	
Lane	NBLn1	EBLn1	NBLn1	SBLn1	SBLn1	
Vol Left, %	71%	19%	0%	0%		
Vol Thru, %	29%	0%	62%			
Vol Right, %	0%	81%	38%			
Sign Control	Stop	Stop	Stop	Stop		
Traffic Vol by Lane	170	130	65			
LT Vol	120	25	0			
Through Vol	50	0	40			
RT Vol	0	105	25			
Lane Flow Rate	191	146	73			
Geometry Grp	1	1	1			
Degree of Uhl (X)	0.231	0.164	0.085			
Departure Headway (Hd)	4.356	4.052	4.187			
Convergence, Y/N	Yes	Yes	Yes			
Cap	814	890	858			
Service Time	2.442	2.055	2.2			
HCM Lane V/C Ratio	0.235	0.164	0.085			
HCM Control Delay	8.8	7.8	7.6			
HCM Lane LOS	A	A	A			
HCM 95th-ile Q	0.9	0.6	0.3			

HCM Unsignalized Intersection Capacity Analysis
12: Private St & 120 Lynn Williams Driveway

Existing (PM)

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			4	4	
Traffic Volume (veh/h)	0	40	60	170	145	0
Future Volume (Veh/h)	0	40	60	170	145	0
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	43	64	181	154	0
Pedestrians	160			50	160	
Lane Width (m)	3.5			3.5	3.5	
Walking Speed (mis)	1.2			1.2	1.2	
Percent Blockage	13			4	13	
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
px, platoon unblocked						
vC, conflicting volume	783	364	314			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	783	364	314			
IC, single (s)	6.4	6.2	4.1			
IC, 2 stage (s)						
IF (s)	3.5	3.3	2.2			
p0 queue free %	100	92	94			
dm capacity (veh/h)	261	572	1085			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	43	245	154			
Volume Left	0	64	0			
Volume Right	43	0	0			
vSH	572	1095	1700			
Volume to Capacity	0.08	0.06	0.09			
Queue Length 95th (m)	1.9	1.5	0.0			
Control Delay (s)	11.8	2.6	0.0			
Lane LOS	B	A	A			
Approach Delay (s)	11.8	2.6	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			2.6			
Intersection Capacity Utilization			47.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 14: Lynn Williams St & Private St

HCM Unsignalized Intersection Capacity Analysis
 17: Liberty St/E Liberty St & Hanna Ave

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Volume (veh/h)	55	65	170	55	60	130
Future Volume (Veh/h)	55	65	170	55	60	130
Sign Control	Stop	Stop	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	58	68	179	58	63	137
Pedestrians	55		25			170
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Walking Speed (m/s)	1.2	1.2	1.2	1.2	1.2	1.2
Percent Blockage	4		2			14
Right turn flare (veh)			None			None
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
pX platoon unblocked						
VC, conflicting volume	551	433				292
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol	551	433				292
IC, single (s)	6.4	6.2				4.1
IC, 2 stage (s)	3.5	3.3				2.2
p0 queue free %	87	87				95
ICF (s)	443	517				1224
CM capacity (veh/h)						
Direction_Lane #	WB 1	NB 1	SB 1			
Volume Total	126	237	200			
Volume Left	58	0	63			
Volume Right	68	58	0			
cSH	480	1700	1224			
Volume to Capacity	0.26	0.14	0.05			
Queue Length 95th (m)	8.3	0.0	1.3			
Control Delay (s)	15.2	0.0	2.9			
Lane LOS	C	A	A			
Approach Delay (s)	15.2	0.0	2.9			
Approach LOS	C					
Intersection Summary						
Average Delay			4.4			
Intersection Capacity Utilization			46.8%		ICU Level of Service	A
Analysis Period (min)			15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					Stop	Stop		Stop				Stop
Sign Control					Stop	Stop		Stop				Stop
Traffic Volume (vph)	65	225	45	20	150	30	50	15	35	15	10	30
Future Volume (vph)	65	225	45	20	150	30	50	15	35	15	10	30
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	71	247	49	22	165	33	55	16	38	16	11	33
Direction_Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	367	220	109	60								
Volume Left (vph)	71	22	55	16								
Volume Right (vph)	49	33	38	33								
Head (s)	-0.04	0.04	-0.06	-0.25								
Departure Headway (s)	4.6	4.9	5.3	5.2								
Degree Utilization, x	0.47	0.30	0.16	0.09								
Capacity (veh/h)	747	703	595	597								
Control Delay (s)	11.6	9.9	9.4	8.7								
Approach Delay (s)	11.6	9.9	9.4	8.7								
Approach LOS	B	A	A	A								
Intersection Summary												
Delay				10.5								
Level of Service				B								
Intersection Capacity Utilization				52.0%								A
Analysis Period (min)				15								

HCM 6th AWSC
17: Liberty St/E Liberty St & Hanna Ave

Existing (PM)

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	10.5											
Intersection LOS	B											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	65	225	45	20	150	30	50	15	35	15	10	30
Traffic Vol, veh/h	65	225	45	20	150	30	50	15	35	15	10	30
Future Vol, veh/h	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Peak Hour Factor	0	0	0	0	9	0	6	0	0	6	0	0
Heavy Vehicles, %	71	247	49	22	165	33	55	16	38	16	11	33
Mgmt Flow	0	1	0	0	1	0	0	1	0	0	1	0
Number of Lanes												
Approach	EB	WB	WB	EB	WB	WB	NB	NB	SB	SB	SB	SB
Opposing Approach	WB	EB	WB	EB	WB	WB	SB	SB	NB	NB	NB	NB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	NB	EB	EB	EB	WB	WB	WB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	WB	WB	WB	EB	EB	EB	EB	EB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	11.6	9.7	9.7	9.4	9.4	9.4	8.8	8.8	8.8	8.8	8.8	8.8
HCM LOS	B											

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	50%	19%	10%	27%
Vol Thru, %	15%	67%	75%	18%
Vol Right, %	35%	13%	15%	55%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	100	335	200	55
LT Vol	50	65	20	15
Through Vol	15	225	150	10
RT Vol	35	45	30	30
Lane Flow Rate	110	368	220	60
Geometry Grp	1	1	1	1
Degree of Uhl (X)	0.162	0.466	0.287	0.088
Departure Headway (Hd)	5.309	4.559	4.695	5.232
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	669	788	760	678
Service Time	3.389	2.612	2.755	3.319
HCM Lane V/C Ratio	0.164	0.467	0.289	0.088
HCM Control Delay	9.4	11.6	9.7	8.8
HCM Lane LOS	A	B	A	A
HCM 95th-ile Q	0.6	2.5	1.2	0.3

HCM Unsignalized Intersection Capacity Analysis
18: E Liberty St & Lynn Williams St

Existing (PM)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	W	W	W	W	W	W	W	W	W	W	W	W
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	80	195	150	145	145	95	90	90	90	90	90	90
Future Volume (vph)	80	195	150	145	145	95	90	90	90	90	90	90
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	86	210	161	156	102	97	97	97	97	97	97	97
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 1	SB 1	SB 1	SB 1	SB 1	SB 1	SB 1	SB 1
Volume Total (vph)	86	210	317	199	199	199	199	199	199	199	199	199
Volume Left (vph)	86	0	0	0	0	0	0	0	0	0	0	0
Volume Right (vph)	0	0	156	97	97	97	97	97	97	97	97	97
Head (s)	0.52	0.00	-0.24	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19
Departure Headway (s)	5.9	5.4	4.7	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
Degree Utilization, x	0.14	0.31	0.41	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
Capacity (veh/h)	582	645	735	636	636	636	636	636	636	636	636	636
Control Delay (s)	8.6	9.6	10.9	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
Approach Delay (s)	9.3	10.9	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
Approach LOS	A	B	B	B	B	B	B	B	B	B	B	B
Intersection Summary												
Delay	10.2											
Level of Service	B											
Intersection Capacity Utilization	48.8%											
ICU Level of Service	A											
Analysis Period (min)	15											

HCM 6th AWSC
18: E Liberty St & Lynn Williams St

Existing (PM)

Intersection	Delay, s/veh	Existing (PM)							
Intersection LOS	10.5	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations	80	195	150	145	95	90			
Traffic Vol, veh/h	80	195	150	145	95	90			
Future Vol, veh/h	0.93	0.93	0.93	0.93	0.93	0.93			
Peak Hour Factor	1	0	6	0	0	0			
Heavy Vehicles, %	86	210	161	156	102	97			
Mount Flow	1	1	1	0	1	0			
Number of Lanes									
Approach	EB	WB	WB	EB	SB	SB			
Opposing Approach	WB	EB							
Opposing Lanes	1	2			0				
Conflicting Approach Left	SB				WB				
Conflicting Lanes Left	1	0			1				
Conflicting Approach Right	SB	EB			EB				
Conflicting Lanes Right	0	1	2		2				
HCM Control Delay	10.1	11	11	10.2					
HCM LOS	B	B	B	B	B	B			
Lane	EBLn1	EBLn2	WBLn1	SBLn1	SBLn1	SBLn1			
Vol Left, %	100%	0%	0%	0%	51%	51%			
Vol Thru, %	0%	100%	51%	0%	0%	0%			
Vol Right, %	0%	0%	49%	49%	49%	49%			
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop			
Traffic Vol by Lane	80	195	295	185	185	185			
LT Vol	80	0	0	0	95	0			
Through Vol	0	195	150	0	0	0			
RT Vol	0	0	145	90	0	0			
Lane Flow Rate	86	210	317	199					
Geometry Grp	7	7	5	2					
Degree of Upl (X)	0.139	0.308	0.413	0.282					
Departure Headway (Hd)	5.816	5.284	4.682	5.105					
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes			
Cap	612	673	764	698					
Service Time	3.588	3.066	2.748	3.179					
HCM Lane V/C Ratio	0.141	0.312	0.415	0.285					
HCM Control Delay	9.5	10.4	11	10.2					
HCM Lane LOS	A	B	B	B	B	B			
HCM 95th-ile Q	0.5	1.3	2	1.2					

HCM Unsignalized Intersection Capacity Analysis
20: Pirandello St & E Liberty St

Existing (PM)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	10	270	10	50	265	90	10	0	25	115	5	20
Future Volume (vph)	10	270	10	50	265	90	10	0	25	115	5	20
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	11	300	11	56	294	100	11	0	28	128	6	22
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	322	450	39	156								
Volume Left (vph)	11	56	11	128								
Volume Right (vph)	11	100	28	22								
Head (s)	-0.01	-0.07	-0.37	0.08								
Departure Headway (s)	5.1	4.9	5.8	6.0								
Degree Utilization, x	0.46	0.61	0.06	0.26								
Capacity (veh/h)	670	715	506	538								
Control Delay (s)	12.3	15.2	9.2	11.0								
Approach Delay (s)	12.3	15.2	9.2	11.0								
Approach LOS	B	C	A	B								
Intersection Summary												
Delay	13.3											
Level of Service	B											
Intersection Capacity Utilization	64.9%											
ICU Level of Service	C											
Analysis Period (min)	15											

HCM 6th AWSC
20: Pirandello St & E Liberty St

Existing (PM)

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	13.7											
Intersection LOS	B											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	270	10	50	265	90	10	0	25	115	5	20
Traffic Vol, veh/h	10	270	10	50	265	90	10	0	25	115	5	20
Future Vol, veh/h	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Peak Hour Factor	12	0	0	2	3	0	0	0	0	0	0	0
Heavy Vehicles, %	11	300	11	56	294	100	11	0	28	128	6	22
Mgmt Flow	0	1	0	0	1	0	0	1	0	0	1	0
Number of Lanes												
Approach	EB	WB	WB	EB	SB	NB	SB	NB	SB	NB	SB	NB
Opposing Approach	1	1	1	1	1	1	1	1	1	1	1	1
Oposing Lanes	SB	NB	EB	WB	WB	EB	SB	NB	WB	WB	SB	NB
Conflicting Approach Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Lanes Left	NB	SB	WB	WB	EB	SB	NB	SB	EB	WB	SB	NB
Conflicting Approach Right	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Lanes Right	13	15.4	C	15.4	C	9.3	11.1	11.1	11.1	11.1	11.1	11.1
HCM Control Delay												
HCM LOS	B											

Lane	NBLn1	EBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	23%	3%	12%	82%	
Vol Thru, %	0%	93%	65%	4%	
Vol Right, %	71%	3%	22%	14%	
Sign Control	Stop	Stop	Stop	Stop	
Traffic Vol by Lane	35	290	405	140	
LT Vol	10	10	50	115	
Through Vol	0	270	265	5	
RT Vol	25	10	90	20	
Lane Flow Rate	39	322	450	156	
Geometry Grp	1	1	1	1	
Degree of UHl (X)	0.063	0.473	0.614	0.258	
Departure Headway (Hd)	5.802	5.284	4.91	5.964	
Convergence, Y/N	Yes	Yes	Yes	Yes	
Cap	615	683	738	602	
Service Time	3.86	3.317	2.91	4.01	
HCM Lane V/C Ratio	0.063	0.471	0.61	0.259	
HCM Control Delay	9.3	13	15.4	11.1	
HCM Lane LOS	A	B	C	B	
HCM 95th-ile Q	0.2	2.5	4.3	1	

Synchro 11 Report

HCM Unsignalized Intersection Capacity Analysis
21: Lynn Williams St & Western Battery Road

Existing (PM)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	40	75	80	25	25	40						
Traffic Volume (veh/h)	40	75	80	25	25	40						
Future Volume (Veh/h)	40	75	80	25	25	40						
Sign Control	Free	Free	Free	Free	Free	Stop						
Grade	0%	0%	0%	0%	0%	0%						
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75						
Hourly flow rate (vph)	53	100	107	33	33	53						
Pedestrians	16	56	56	239	239	239						
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5						
Walking Speed (m/s)	1.2	1.2	1.2	1.2	1.2	1.2						
Percent Blockage	1	5	5	19	19	19						
Right turn flare (veh)	None											
Median type	None											
Median storage (veh)	None											
Upstream signal (m)	None											
Px platoon unblocked	379											
Vc, conflicting volume	624											
VC1, stage 1 conf vol	378											
VC2, stage 2 conf vol	378											
Vcu, unblocked vol	4.1											
IC, single (s)	2.2											
IC, 2 stage (s)	94											
IF (s)	951											
p0 queue free %	153											
q0 capacity (veh/h)	53											
q1 capacity (veh/h)	0											
q2 capacity (veh/h)	33											
Direction, Lane #	EB 1	WB 1	SB 1									
Volume Total	153	140	86									
Volume Left	53	0	33									
Volume Right	0	33	53									
CSH	951	1700	430									
Volume to Capacity	0.06	0.08	0.20									
Queue Length 95th (m)	1.4	0.0	5.9									
Control Delay (s)	3.5	0.0	15.5									
Lane LOS	A	C	C									
Approach Delay (s)	3.5	0.0	15.5									
Approach LOS	C	C	C									
Intersection Summary												
Average Delay	4.9											
Intersection Capacity Utilization	28.3%											
ICU Level of Service	A											
Analysis Period (min)	15											

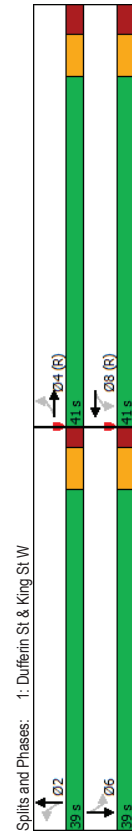
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	40	75	80	25	25	40						
Traffic Volume (veh/h)	40	75	80	25	25	40						
Future Volume (Veh/h)	40	75	80	25	25	40						
Sign Control	Free	Free	Free	Free	Free	Stop						
Grade	0%	0%	0%	0%	0%	0%						
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75						
Hourly flow rate (vph)	53	100	107	33	33	53						
Pedestrians	16	56	56	239	239	239						
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5						
Walking Speed (m/s)	1.2	1.2	1.2	1.2	1.2	1.2						
Percent Blockage	1	5	5	19	19	19						
Right turn flare (veh)	None											
Median type	None											
Median storage (veh)	None											
Upstream signal (m)	None											
Px platoon unblocked	379											
Vc, conflicting volume	624											
VC1, stage 1 conf vol	378											
VC2, stage 2 conf vol	378											
Vcu, unblocked vol	4.1											
IC, single (s)	2.2											
IC, 2 stage (s)	94											
IF (s)	951											
p0 queue free %	153											
q0 capacity (veh/h)	53											
q1 capacity (veh/h)	0											
q2 capacity (veh/h)	33											
Direction, Lane #	EB 1	WB 1	SB 1									
Volume Total	153	140	86									
Volume Left	53	0	33									
Volume Right	0	33	53									
CSH	951	1700	430									
Volume to Capacity	0.06	0.08	0.20									
Queue Length 95th (m)	1.4	0.0	5.9									
Control Delay (s)	3.5	0.0	15.5									
Lane LOS	A	C	C									
Approach Delay (s)	3.5	0.0	15.5									
Approach LOS	C	C	C									
Intersection Summary												
Average Delay	4.9											
Intersection Capacity Utilization	28.3%											
ICU Level of Service	A											
Analysis Period (min)	15											

Synchro 11 Report

Queues
1: Dufferin St & King St W

Future Background (AM)
Base Scenario

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	4	4	8	8	2	2	6	6
Traffic Volume (vph)	85	255	40	255	20	215	85	425
Future Volume (vph)	85	255	40	255	20	215	85	425
Ideal Flow (vph)	0	418	0	412	0	332	0	690
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4	4	8	8	2	2	6	6
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	21.0	21.0	21.0	21.0	20.0	20.0	20.0	20.0
Minimum Split (s)	28.0	28.0	28.0	28.0	27.0	27.0	27.0	27.0
Total Split (s)	41.0	41.0	41.0	41.0	39.0	39.0	39.0	39.0
Total Split (%)	51.3%	51.3%	51.3%	51.3%	48.8%	48.8%	48.8%	48.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode								
v/c Ratio	0.34	0.31	0.31	0.31	0.37	0.37	0.76	0.76
Control Delay	12.5	10.9	10.9	10.9	21.0	21.0	27.2	27.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.5	10.9	10.9	10.9	21.0	21.0	27.2	27.2
Queue Length 50th (m)	18.1	15.6	15.6	15.6	20.1	20.1	47.2	47.2
Queue Length 95th (m)	33.3	29.4	29.4	29.4	27.1	27.1	59.4	59.4
Internal Link Dist (m)	163.4	383.3	383.3	383.3	189.0	189.0	183.0	183.0
Turn Bay Length (m)								
Base Capacity (vph)	1217	1350	1350	1350	1094	1094	1126	1126
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.31	0.31	0.31	0.30	0.30	0.61	0.61
Intersection Summary								
Cycle Length: 80								
Actuated Cycle Length: 80								
Offset: 28 (35%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green								
Natural Cycle: 55								
Control Type: Actuated-Coordinated								



HCM Signalized Intersection Capacity Analysis
1: Dufferin St & King St W

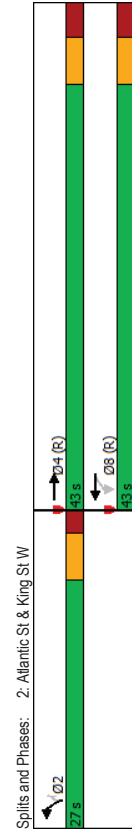
Future Background (AM)
Base Scenario

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Movement	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	4	4	8	8	2	2	6	6
Traffic Volume (vph)	85	255	40	255	20	215	85	425
Future Volume (vph)	85	255	40	255	20	215	85	425
Ideal Flow (vph)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Fpb. ped/bikes	0.96	0.96	0.95	0.95	0.93	0.93	0.96	0.96
Fpb. ped/bikes	0.97	0.97	0.98	0.98	1.00	1.00	0.98	0.98
Frt	0.98	0.98	0.97	0.97	0.97	0.97	0.97	0.97
Flt Protected	0.99	0.99	0.99	0.99	1.00	1.00	0.99	0.99
Satd. Flow (prot)	2966	2966	2885	2885	2804	2804	3070	3070
Flt Permitted	0.77	0.77	0.87	0.87	0.89	0.89	0.84	0.84
Satd. Flow (perm)	2310	2310	2530	2530	2493	2493	2688	2688
Peak-Hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	277	49	277	92	22	234	76
RTOR Reduction (vph)	0	11	0	28	0	40	0	31
Lane Group Flow (vph)	0	407	0	384	0	292	0	659
Conf. Peds. (#/hr)	180	305	305	180	158	244	244	158
Conf. Bikes (#/hr)	40	40	15	15	5	5	5	5
Heavy Vehicles (%)	10%	8%	17%	42%	8%	11%	20%	3%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4	4	8	8	2	2	6	6
Permitted Phases	4	4	8	8	2	2	6	6
Actuated Green, G (s)	40.8	40.8	40.8	40.8	26.2	26.2	26.2	26.2
Effective Green, g (s)	41.8	41.8	41.8	41.8	27.2	27.2	27.2	27.2
Actuated G/C Ratio	0.52	0.52	0.52	0.52	0.34	0.34	0.34	0.34
Clearance Time (s)	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1206	1206	1321	1321	847	847	879	879
v/s Ratio Prot								
v/s Ratio Perm	c0.18	0.15	0.15	0.15	0.12	0.12	c0.25	c0.25
v/c Ratio	0.34	0.29	0.29	0.29	0.35	0.35	0.75	0.75
Uniform Delay, d1	11.1	10.8	10.8	10.8	19.7	19.7	23.4	23.4
Progression Factor	1.00	1.00	1.00	1.00	1.30	1.30	1.00	1.00
Incremental Delay, d2	0.8	0.6	0.6	0.6	0.2	0.2	3.5	3.5
Delay (s)	11.8	11.3	11.3	11.3	25.9	25.9	26.9	26.9
Level of Service	B	B	B	B	C	C	C	C
Approach Delay (s)	11.8	11.3	11.3	11.3	25.9	25.9	26.9	26.9
Approach LOS	B	B	B	B	C	C	C	C
Intersection Summary								
HCM 2000 Control Delay	19.9	19.9	19.9	19.9	11.0	11.0	11.0	11.0
HCM 2000 Volume to Capacity ratio	0.50	0.50	0.50	0.50	0.35	0.35	0.75	0.75
Actuated Cycle Length (s)	80.0	80.0	80.0	80.0	11.0	11.0	11.0	11.0
Intersection Capacity Utilization	90.5%	90.5%	90.5%	90.5%	E	E	E	E
Analysis Period (min)	15	15	15	15	15	15	15	15
c Critical Lane Group								

Queues
2: Atlantic St & King St W

Future Background (AM)
Base Scenario

	EBT	WBL	WBT	NBL	NBR
Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑↑	↑↑	↑↑	↑↑
Traffic Volume (vph)	390	15	470	160	150
Future Volume (vph)	390	15	470	160	150
Lane Group Flow (vph)	638	0	557	184	172
Turn Type	NA	Perm	NA	Prot	Perm
Protected Phases	4	8	2	2	2
Permitted Phases	4	8	8	2	2
Detector Phase					
Switch Phase					
Minimum Initial (s)	21.0	21.0	21.0	20.0	20.0
Minimum Split (s)	28.0	28.0	28.0	26.0	26.0
Total Split (s)	43.0	43.0	43.0	27.0	27.0
Total Split (%)	61.4%	61.4%	61.4%	38.6%	38.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.0	6.0	6.0	5.0	5.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	C-Max	C-Max	C-Max	None	None
v/c Ratio	0.41	0.33	0.35	0.42	0.42
Control Delay	8.0	9.6	21.6	15.5	15.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	8.0	9.6	21.6	15.5	15.5
Queue Length 50th (m)	18.4	20.6	19.7	10.8	10.8
Queue Length 95th (m)	27.6	28.8	34.6	25.6	25.6
Internal Link Dist (m)	55.1	301.6	50.4		
Turn Bay Length (m)					
Base Capacity (vph)	1555	1673	544	430	430
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.41	0.33	0.34	0.40	0.40
Intersection Summary					
Cycle Length: 70					
Actuated Cycle Length: 70					
Offset: 26 (37%), Referenced to phase 4:EBT and 8:WBT.L, Start of Green					
Natural Cycle: 55					
Control Type: Actuated-Coordinated					



HCM Signalized Intersection Capacity Analysis
2: Atlantic St & King St W

Future Background (AM)
Base Scenario

	EBT	EBR	WBL	WBT	NBL	NBR
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑↑	↑↑	↑↑	↑↑	↑↑
Traffic Volume (vph)	390	165	15	470	160	150
Future Volume (vph)	390	165	15	470	160	150
Ideal Flow (vphpb)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00
Fpb. ped/bikes	0.85	1.00	1.00	0.85		
Fpb. ped/bikes	1.00	0.99	1.00	1.00	1.00	1.00
Frt	0.96	1.00	1.00	0.85		
Flt Protected	1.00	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	2746	3317	1733	1218		
Flt Permitted	1.00	0.93	0.95	1.00		
Satd. Flow (perm)	2746	3084	1733	1218		
Peak-Hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	448	190	17	540	184	172
RTOR Reduction (vph)	65	0	0	0	0	48
Lane Group Flow (vph)	573	0	0	557	184	124
Confl. Peds. (#/hr)	5	313	313	305	127	5
Confl. Bikes (#/hr)	5					
Heavy Vehicles (%)	6%	3%	0%	7%	3%	12%
Turn Type	NA	Perm	NA	Prot	Perm	Perm
Protected Phases	4	8	8	2	2	2
Permitted Phases	4	8	8	2	2	2
Actuated Green, G (s)	37.0	37.0	20.0	20.0	20.0	20.0
Effective Green, g (s)	38.0	38.0	21.0	21.0	21.0	21.0
Actuated g/C Ratio	0.54	0.54	0.30	0.30	0.30	0.30
Clearance Time (s)	7.0	7.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1490	1674	519	365		
v/s Ratio Prot	c0.21			c0.11		
v/s Ratio Perm		0.18		0.10		
v/c Ratio	0.38	0.33	0.35	0.34		
Uniform Delay, d1	9.2	8.9	19.2	19.1		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.8	0.5	0.4	0.6		
Delay (s)	10.0	9.5	19.6	19.6		
Level of Service	A	A	B	B		
Approach Delay (s)	10.0	9.5	19.6	19.6		
Approach LOS	A	A	B	B		
Intersection Summary						
HCM 2000 Control Delay		12.0			HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio		0.37				
Actuated Cycle Length (s)		70.0			Sum of lost time (s)	11.0
Intersection Capacity Utilization		49.7%			ICU Level of Service	A
Analysis Period (min)		15				
c. Critical Lane Group						

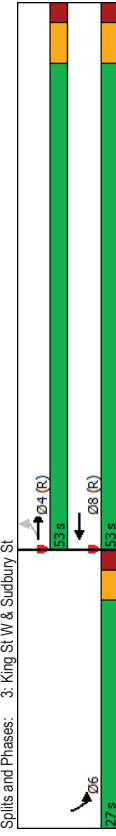


Queues
3: King St W & Sudbury St

Future Background (AM)
Base Scenario

	EBT	WBT	SBL
Lane Group	EBT	WBT	SBL
Lane Configurations	4↑	4↑	W
Traffic Volume (vph)	690	475	160
Future Volume (vph)	690	475	160
Lane Group Flow (vph)	711	614	232
Turn Type	NA	NA	Prot
Protected Phases	4	8	6
Permitted Phases	4	8	6
Detector Phase	4	8	6
Switch Phase	4	8	6
Minimum Initial (s)	24.0	24.0	21.0
Minimum Split (s)	30.0	30.0	26.0
Total Split (s)	53.0	53.0	27.0
Total Split (%)	66.3%	66.3%	33.6%
Yellow Time (s)	4.0	4.0	3.0
All-Red Time (s)	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	4.0
Lead/Lag			
Lead-Lag Optimize?			
Recall Mode	C-Max	C-Max	None
v/c Ratio	0.36	0.32	0.62
Control Delay	8.5	7.1	26.2
Queue Delay	0.0	0.0	0.0
Total Delay	8.5	7.1	26.2
Queue Length 50th (m)	26.6	19.3	27.6
Queue Length 95th (m)	38.1	29.0	48.8
Internal Link Dist (m)	301.6	26.9	138.9
Turn Bay Length (m)			
Base Capacity (vph)	1979	1935	465
Station Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.36	0.32	0.50

Intersection Summary
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 28 (35%), Referenced to phase 4:EBTL and 8:WBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated



HCM Signalized Intersection Capacity Analysis
3: King St W & Sudbury St

Future Background (AM)
Base Scenario

	EBL	EBT	WBT	WBR	SBL	SBR
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		4↑	4↑	W	W	
Traffic Volume (vph)	0	690	475	120	160	65
Future Volume (vph)	0	690	475	120	160	65
Ideal Flow (vphpb)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0		
Lane Util. Factor	0.95	0.95	0.95	1.00		
Fpb, ped/bikes	1.00	0.96	0.91			
Fpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	1.00	0.97	0.96			
Flt Protected	1.00	1.00	0.97			
Satd. Flow (prot)	3245	3128	1552			
Flt Permitted	1.00	1.00	0.97			
Satd. Flow (perm)	3245	3128	1552			
Peak-Hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	711	490	124	165	67
RTOR Reduction (vph)	0	0	27	0	19	0
Lane Group Flow (vph)	0	711	587	0	213	0
Conf. Peds. (#/hr)	100			100	60	300
Conf. Bikes (#/hr)				35		
Heavy Vehicles (%)	50%	10%	7%	3%	3%	0%
Turn Type	NA	NA	NA	Prot	Prot	Prot
Protected Phases		4	8	6		
Permitted Phases		4	8	6		
Actuated Green, G (s)		47.8	47.8	21.2		
Effective Green, g (s)		48.8	48.8	22.2		
Actuated G/C Ratio		0.61	0.61	0.28		
Clearance Time (s)		6.0	6.0	5.0		
Vehicle Extension (s)		3.0	3.0	3.0		
Lane Grp Cap (vph)		1979	1908	430		
v/s Ratio Prot		c0.22	0.19	c0.14		
v/c Ratio		0.36	0.31	0.50		
Uniform Delay, d1		7.8	7.5	24.2		
Progression Factor		1.00	1.00	1.00		
Incremental Delay, d2		0.5	0.4	0.9		
Delay (s)		8.3	7.9	25.1		
Level of Service		A	A	C		
Approach Delay (s)		8.3	7.9	25.1		
Approach LOS		A	A	C		

Intersection Summary
HCM 2000 Control Delay
HCM 2000 Volume to Capacity ratio
Actuated Cycle Length (s)
Intersection Capacity Utilization
Analysis Period (min)
Critical Lane Group

HCM Unsynchronized Intersection Capacity Analysis
4: Duoro St & King St W

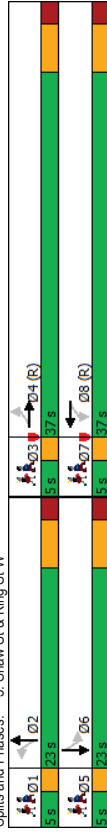
Future Background (AM)
Base Scenario

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	4T	4T	4T	4T	W	
Traffic Volume (veh/h)	590	285	10	545	55	0
Future Volume (Veh/h)	590	285	10	545	55	0
Sign Control	Free	Free	Free	Stop	Stop	
Grade	0%	0%	0%	0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	628	303	11	580	59	0
Pedestrians					5	175
Lane Width (m)			3.5	3.5		
Walking Speed (m/s)			1.2	1.2		
Percent Blockage			0	14		
Right turn flare (veh)			None			
Median type						
Median storage (veh)						
Upstream signal (m)	51		130			
pX platoon unblocked						
vC, conflicting volume	1106			1266	646	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCn, unblocked vol	885		932	371		
IC, single (s)	4.1		6.9	6.9		
IC, 2 stage (s)						
p0 queue free %	2.2		3.5	3.3		
CM capacity (veh/h)	98		71	100		
CM capacity (veh/h)	594		203	484		
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	419	512	204	387	59	
Volume Left	0	0	11	0	59	
Volume Right	0	303	0	0	0	
cSH	1700	1700	594	1700	203	
Volume to Capacity	0.25	0.30	0.02	0.23	0.29	
Queue Length 95th (m)	0.0	0.0	0.5	0.0	9.3	
Control Delay (s)	0.0	0.0	0.8	0.0	29.9	
Lane LOS	A	A	A	D	D	
Approach Delay (s)	0.0	0.3		29.9		
Approach LOS				D		
Intersection Summary						
Average Delay	1.2					
Intersection Capacity Utilization	39.4%					
Analysis Period (min)	15					
ICU Level of Service	A					

Queues
5: Shaw St & King St W

Future Background (AM)
Base Scenario

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT	Ø1	Ø3	Ø5	Ø7
Lane Configurations	4T	4T	4T	4T	4T	4T	4T				
Traffic Volume (vph)	25	485	345	75	260	80	125				
Future Volume (vph)	25	485	345	75	260	80	125				
Lane Group Flow (vph)	0	621	431	0	369	0	358				
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA				
Protected Phases	4	4	8	2	2	6	1				
Permitted Phases	4	4	8	2	2	6	6				
Detector Phase											
Switch Phase											
Minimum Initial (s)	19.0	19.0	19.0	16.0	16.0	16.0	3.0				
Minimum Split (s)	28.0	28.0	28.0	22.0	22.0	22.0	5.0				
Total Split (s)	37.0	37.0	37.0	23.0	23.0	23.0	5.0				
Total Split (%)	52.9%	52.9%	52.9%	32.9%	32.9%	32.9%	7%				
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	2.0				
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	0.0				
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	0.0				
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	0.0				
Lead/Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lead				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes				
Recall Mode	C-Max	C-Max	C-Max	None	None	None	None				
v/c Ratio	0.50	0.30	0.59	0.59	0.59	0.64	0.62				
Control Delay	14.3	11.4	27.2	19.7	19.7	19.7	0.0				
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Delay	14.3	11.4	27.2	19.7	19.7	19.7	0.0				
Queue Length 50th (m)	28.4	16.7	23.3	13.5	13.5	13.5	0.0				
Queue Length 95th (m)	42.6	26.1	36.2	27.3	27.3	27.3	0.0				
Internal Link Dist (m)	105.5	222.7	65.9	127.6	127.6	127.6	0.0				
Turn Bay Length (m)											
Base Capacity (vph)	1237	1428	646	575	575	575	0				
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	0.50	0.30	0.57	0.62	0.62	0.62	0.62				
Intersection Summary											
Cycle Length: 70											
Actuated Cycle Length: 70											
Offset: 1 (1%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green											
Natural Cycle: 60											
Control Type: Actuated-Coordinated											



5. Shaw St & King St W

Future Background (AM)

Base Scenario

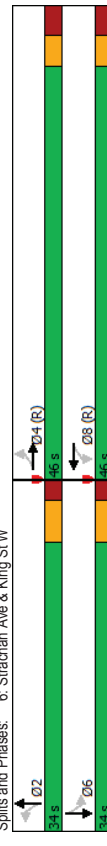
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	4TB	4TB	4TB	4TB	4TB	4TB	4TB	4TB	4TB	4TB	4TB	4TB
Traffic Volume (vph)	25	485	80	0	345	65	75	260	15	80	125	135
Future Volume (vph)	25	485	80	0	345	65	75	260	15	80	125	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Fpb. ped/bikes	0.91	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Fpb. ped/bikes	0.99	1.00	1.00	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Ft	0.98	0.98	0.98	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Flt Protected	1.00	1.00	1.00	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Satd. Flow (prot)	2876	3078	3078	3256	3256	3256	3256	3256	3256	3256	3256	3256
Flt Permitted	0.93	1.00	1.00	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Satd. Flow (perm)	2667	3078	3078	2498	2498	2498	2498	2498	2498	2498	2498	2498
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	26	511	84	0	363	68	79	274	16	84	132	142
RTOR Reduction (vph)	0	18	0	0	22	0	0	5	0	0	107	0
Lane Group Flow (vph)	0	603	0	0	409	0	0	364	0	0	251	0
Confl. Peds. (#/hr)	245	569	569	245	358	297	297	358	297	297	358	358
Confl. Bikes (#/hr)	60	20	20	60	10	10	10	60	10	10	60	60
Heavy Vehicles (%)	86%	7%	3%	0%	8%	6%	1%	2%	0%	41%	4%	3%
Turn Type	Perm	NA	NA	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4	8	8	2	2	2	2	2	2	2	2	2
Permitted Phases	4	8	8	2	2	2	2	2	2	2	2	2
Actuated Green, G (s)	31.0	31.0	31.0	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4
Effective Green, g (s)	32.0	32.0	32.0	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4
Actuated G/C Ratio	0.46	0.46	0.46	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	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	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap. (vph)	1219	1407	1407	620	620	620	620	620	620	620	620	620
v/s Ratio Prot	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
v/s Ratio Perm	0.49	0.29	0.29	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Uniform Delay, d1	13.3	11.9	11.9	23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4	0.5	0.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Delay (s)	14.8	12.4	12.4	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6
Level of Service	B	B	B	C	C	C	C	C	C	C	C	C
Approach Delay (s)	14.8	12.4	12.4	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6	24.6
Approach LOS	B	B	B	C	C	C	C	C	C	C	C	C
Intersection Summary												
HCM 2000 Control Delay	18.2 HCM 2000 Level of Service B											
HCM 2000 Volume to Capacity ratio	0.47											
Actuated Cycle Length (s)	70.0 Sum of lost time (s) 14.0											
Intersection Capacity Utilization	75.6% ICU Level of Service D											
Analysis Period (min)	15											
c Critical Lane Group												

6. Strachan Ave & King St W

Future Background (AM)

Base Scenario

Lane Group	EBT	WBT	NBT	SBT
Lane Configurations	4TB	4TB	4TB	4TB
Traffic Volume (vph)	510	315	85	255
Future Volume (vph)	510	315	85	255
Lane Group Flow (vph)	636	353	92	375
Turn Type	NA	Perm	NA	Perm
Protected Phases	4	8	2	6
Permitted Phases	4	8	2	6
Detector Phase	4	8	2	6
Switch Phase	4	8	2	6
Minimum Initial (s)	20.0	20.0	21.0	21.0
Minimum Split (s)	26.0	26.0	27.0	27.0
Total Split (s)	46.0	46.0	34.0	34.0
Total Split (%)	57.5%	57.5%	42.5%	42.5%
Yellow Time (s)	3.0	3.0	4.0	4.0
All-Red Time (s)	3.0	3.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode				
v/c Ratio	0.38	0.20	0.38	0.16
Control Delay	10.5	9.3	20.4	21.2
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	10.5	9.3	20.4	21.2
Queue Length 50th (m)	25.1	12.8	10.7	46.4
Queue Length 95th (m)	42.3	22.8	19.5	81.3
Internal Link Dist (m)	222.7	138.4	121.3	128.6
Turn Bay Length (m)				
Base Capacity (vph)	1658	1761	286	595
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.38	0.20	0.32	0.14
Intersection Summary				
Cycle Length: 80				
Actuated Cycle Length: 80				
Offset: 42 (53%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green				
Natural Cycle: 55				
Control Type: Actuated-Coordinated				
m Volume for 95th percentile queue is metered by upstream signal.				



HCM Signalized Intersection Capacity Analysis
 6: Strachan Ave & King St W

HCM Unsignalized Intersection Capacity Analysis
 7: Atlantic St & Snooker St

Future Background (AM)
 Base Scenario

Future Background (AM)
 Base Scenario

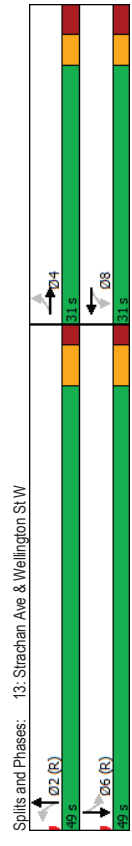
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	0	510	75	0	315	10	85	255	90	25	210	15	
Future Volume (vph)	0	510	75	0	315	10	85	255	90	25	210	15	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Fpb. ped/bikes	0.92	0.99	1.00	0.93	1.00	0.93	1.00	0.99	1.00	0.99	1.00	0.99	
Fpb. ped/bikes	1.00	1.00	1.00	0.87	1.00	0.87	1.00	0.88	1.00	0.88	1.00	0.99	
Ft	0.98	1.00	1.00	1.00	0.96	1.00	0.96	1.00	0.99	1.00	0.99	1.00	
Ft Protected	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	2917	3119	1447	1607	1568	1799	1568	1799	1568	1799	1568	1799	
Ft Permitted	1.00	1.00	0.52	1.00	0.33	1.00	0.33	1.00	0.33	1.00	0.33	1.00	
Satd. Flow (perm)	2917	3119	790	1607	550	1799	550	1799	550	1799	550	1799	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	0	554	82	0	342	11	92	277	98	27	228	16	
RTOR Reduction (vph)	0	13	0	0	3	0	0	14	0	0	3	0	
Lane Group Flow (vph)	0	623	0	0	350	0	92	361	0	27	241	0	
Conf. Peds. (#/hr)	221	460	460	221	178	231	231	231	231	231	231	178	
Conf. Bikes (#/hr)	60	60	60	60	60	60	60	60	60	60	60	60	
Heavy Vehicles (%)	0%	7%	35%	0%	12%	22%	7%	2%	10%	0%	2%	0%	
Turn Types	NA	NA	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	NA	
Protected Phases	4	8	8	2	2	2	2	2	2	2	2	6	
Permitted Phases	4	8	8	2	2	2	2	2	2	2	2	6	
Actuated Green, G (s)	44.1	44.1	44.1	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	
Effective Green, g (s)	45.1	45.1	45.1	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	
Actuated g/C Ratio	0.56	0.56	0.56	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	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	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap. (vph)	1644	1758	1758	245	500	171	559	171	559	171	559	171	
v/s Ratio Prot	c0.21	0.11	0.11	c0.22	0.13	0.05	0.13	0.05	0.13	0.05	0.13	0.05	
v/s Ratio Perm	0.38	0.20	0.20	0.38	0.72	0.16	0.43	0.16	0.43	0.16	0.43	0.16	
Uniform Delay, d1	9.7	8.6	8.6	21.5	24.5	20.0	21.9	20.0	21.9	20.0	21.9	21.9	
Progression Factor	1.00	1.00	1.00	0.78	0.79	1.00	1.00	0.78	0.79	1.00	1.00	0.78	
Incremental Delay, d2	0.7	0.3	0.3	0.8	4.3	0.4	0.5	0.4	0.5	0.4	0.5	0.4	
Delay (s)	10.3	8.8	8.8	17.7	23.7	20.4	22.4	20.4	22.4	20.4	22.4	22.4	
Level of Service	B	A	A	B	C	C	C	B	C	C	C	C	
Approach Delay (s)	10.3	8.8	8.8	22.5	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2	
Approach LOS	B	A	A	C	C	C	C	C	C	C	C	C	
Intersection Summary													
HCM 2000 Control Delay	15.2											HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50												
Actuated Cycle Length (s)	80.0											Sum of lost time (s)	10.0
Intersection Capacity Utilization	68.7%											ICU Level of Service	C
Analysis Period (min)	15												
c Critical Lane Group													

Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (veh/h)	35	175	140	45	95	90	
Future Volume (Veh/h)	35	175	140	45	95	90	
Sign Control	Stop	Free	Free	Free	Free	Free	
Grade	0%	0%	0%	0%	0%	0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	
Hourly flow rate (vph)	39	197	157	51	107	101	
Pedestrians	25	20	20	20	157	157	
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	
Walking Speed (m/s)	1.2	1.2	1.2	1.2	1.2	1.2	
Percent Blockage	18	2	2	2	13	13	
Right turn flare (veh)	None	None	None	None	None	None	
Median type	None	None	None	None	None	None	
Median storage (veh)	None	None	None	None	None	None	
Upstream signal (m)	None	None	None	None	None	74	
pX, platoon unblocked	None	None	None	None	None	None	
vC, conflicting volume	742	564	564	433	433	433	
vC1, stage 1 conf vol	None	None	None	None	None	None	
vC2, stage 2 conf vol	None	None	None	None	None	None	
vC3, unblocked vol	742	564	564	433	433	433	
IC, single (s)	6.4	6.2	6.2	4.2	4.2	4.2	
IC, 2 stage (s)	None	None	None	None	None	None	
IF (s)	3.5	3.3	3.3	2.3	2.3	2.3	
p0 queue free %	86	47	47	88	88	88	
d0 capacity (veh/h)	274	374	374	904	904	904	
Direction, Lane #	WB 1	NB 1	SB 1				
Volume Total	236	208	208	208	208	208	
Volume Left	39	0	107	0	0	0	
Volume Right	197	51	0	0	0	0	
cSH	353	1700	904	904	904	904	
Volume to Capacity	0.67	0.12	0.12	0.12	0.12	0.12	
Queue Length 95th (m)	36.8	0.0	3.2	3.2	3.2	3.2	
Control Delay (s)	33.5	0.0	5.5	5.5	5.5	5.5	
Lane LOS	D	A	A	A	A	A	
Approach Delay (s)	33.5	0.0	5.5	5.5	5.5	5.5	
Approach LOS	D	A	A	A	A	A	
Intersection Summary							
Average Delay	13.9					ICU Level of Service	A
Intersection Capacity Utilization	52.1%						
Analysis Period (min)	15						

Queues
13: Strachan Ave & Wellington St W

Future Background (AM)
Base Scenario

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	15	255	115	90	125	365	10	270
Traffic Volume (vph)	15	255	115	90	125	365	10	270
Future Volume (vph)	15	255	115	90	125	365	10	270
Lane Group Flow (vph)	16	399	122	144	133	585	11	292
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6	
Permitted Phases	4		8		2		6	
Minimum Split (s)	27.0	27.0	26.0	26.0	29.0	29.0	29.0	29.0
Total Split (s)	31.0	31.0	31.0	31.0	49.0	49.0	49.0	49.0
Total Split (%)	38.8%	38.8%	38.8%	38.8%	61.3%	61.3%	61.3%	61.3%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag								
Lead-Lag Optimizer?								
v/c Ratio	0.05	0.72	0.69	0.27	0.36	0.64	0.04	0.32
Control Delay	19.3	30.8	46.8	16.8	10.9	17.9	22.2	22.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
Total Delay	19.3	30.8	46.8	16.8	10.9	12.0	17.9	22.2
Queue Length 50th (m)	1.8	51.4	16.8	12.7	6.2	23.7	1.4	42.9
Queue Length 95th (m)	6.1	#85.5	#44.4	26.6	m16.6	49.5	m3.9	62.5
Internal Link Dist (m)	64.0		134.1		143.3		121.3	
Turn Bay Length (m)	15.0		25.0		15.0		15.0	
Base Capacity (vph)	312	553	177	541	370	912	248	922
Starvation Cap Reductn	0	0	0	0	0	34	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.72	0.69	0.27	0.36	0.67	0.04	0.32



HCM Signalized Intersection Capacity Analysis
13: Strachan Ave & Wellington St W

Future Background (AM)
Base Scenario

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Movement	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	15	255	120	115	90	45	125	365	185
Traffic Volume (vph)	15	255	120	115	90	45	125	365	185
Future Volume (vph)	15	255	120	115	90	45	125	365	185
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	0.95	1.00	0.94	1.00	0.93	1.00	0.99	1.00
Fibb. ped/bikes	0.86	1.00	0.94	1.00	0.67	1.00	0.84	1.00	1.00
Frt	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1372	1638	1637	1599	1154	1619	1347	1675	1675
Flt Permitted	0.67	1.00	0.32	1.00	0.56	1.00	0.32	1.00	1.00
Satd. Flow (perm)	961	1638	546	1599	675	1619	453	1675	1675
Peak-Hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	16	271	128	122	96	48	133	388	197
RTOR Reduction (vph)	0	21	0	0	22	0	0	23	0
Lane Group Flow (vph)	16	378	0	122	122	0	133	562	0
Confl. Peds. (#/hr)	85	65	65	65	85	355	100	100	355
Confl. Bikes (#/hr)	20				40				35
Heavy Vehicles (%)	12%	3%	4%	3%	2%	3%	3%	1%	25%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases	4		8		2		6		6
Permitted Phases	4		8		2		6		6
Actuated Green, G (s)	25.0	25.0	25.0	25.0	43.0	43.0	43.0	43.0	43.0
Effective Green, g (s)	26.0	26.0	26.0	26.0	44.0	44.0	44.0	44.0	44.0
Actuated g/C Ratio	0.32	0.32	0.32	0.32	0.55	0.55	0.55	0.55	0.55
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Grp Cap (vph)	312	532	177	519	371	890	249	921	921
v/s Ratio Prot	c0.23		0.08		c0.35		0.17		0.17
v/s Ratio Perm	0.02		0.22		0.20		0.02		0.02
v/c Ratio	0.05	0.71	0.69	0.23	0.36	0.63	0.04	0.32	0.32
Uniform Delay, d1	18.5	23.7	23.5	19.7	10.1	12.4	8.3	9.8	9.8
Progression Delay	1.00	1.00	1.00	1.00	0.80	0.76	2.02	2.13	2.13
Incremental Delay, d2	0.3	7.8	19.8	1.1	2.2	2.8	0.3	0.9	0.9
Delay (s)	18.8	31.5	43.3	20.8	10.3	12.3	17.1	21.8	21.8
Level of Service	B	C	D	C	B	B	B	C	C
Approach Delay (s)	31.0		31.1		11.9		21.6		21.6
Approach LOS	C		C		B		C		C

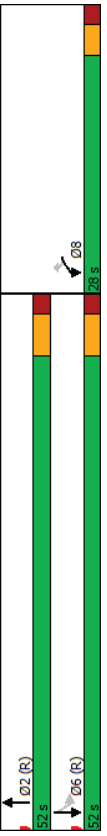
Intersection Summary	
HCM 2000 Control Delay	21.3
HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66
Actuated Cycle Length (s)	80.0
Sum of lost time (s)	10.0
Intersection Capacity Utilization	107.2%
ICU Level of Service	G
Analysis Period (min)	15
Critical Lane Group	

Queues
15: Dufferin St & Liberty St
Base Scenario

HCM Signalized Intersection Capacity Analysis
15: Dufferin St & Liberty St
Future Background (AM)
Base Scenario

	WBL	WBR	NBT	SBL	SBT
Lane Group					
Lane Configurations	↔	↔	↔	↔	↔
Traffic Volume (vph)	190	40	320	135	330
Future Volume (vph)	190	40	320	135	330
Lane Group Flow (vph)	198	42	849	0	485
Turn Type	Prot	Perm	NA	Perm	NA
Protected Phases	8	2	2	6	6
Permitted Phases	8	8	2	6	6
Detector Phase					
Switch Phase					
Minimum Initial (s)	18.0	18.0	18.0	18.0	18.0
Minimum Split (s)	23.0	23.0	24.0	24.0	24.0
Total Split (s)	28.0	28.0	52.0	52.0	52.0
Total Split (%)	35.0%	35.0%	65.0%	65.0%	65.0%
Yellow Time (s)	3.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0	5.0	5.0	5.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	C-Max	C-Max	C-Max
v/c Ratio	0.47	0.13	0.49	0.38	0.38
Control Delay	30.1	12.5	3.6	2.1	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	30.1	12.5	3.6	2.1	2.1
Queue Length 50th (m)	27.3	1.4	9.9	3.0	3.0
Queue Length 95th (m)	46.0	9.1	20.2	5.0	5.0
Internal Link Dist (m)	382.8		162.3	186.7	
Turn Bay Length (m)	10.0				
Base Capacity (vph)	525	404	1723	1274	
Starvation Cap Reductn	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	
Storage Cap Reductn	0	0	0	0	
Reduced v/c Ratio	0.38	0.10	0.49	0.38	

Intersection Summary	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 74 (93%), Referenced to phase 2:NBT and 6:SBLT - Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	



HCM Unsignalized Intersection Capacity Analysis
 16: Atlantic St & Liberty St

HCM 6th AWSC
 16: Atlantic St & Liberty St

Future Background (AM)
 Base Scenario

Future Background (AM)
 Base Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		Stop	Stop		Stop			Stop			Stop	
Traffic Volume (vph)	40	220	135	30	135	100	15	45	35	50	25	25
Future Volume (vph)	40	220	135	30	135	100	15	45	35	50	25	25
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	42	232	142	32	142	105	16	47	37	53	26	26
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	416	279	100	105								
Volume Left (vph)	42	32	16	53								
Volume Right (vph)	142	105	37	26								
Head (s)	-0.14	-0.10	-0.13	0.00								
Departure Headway (s)	4.8	5.0	5.7	5.8								
Degree Utilization, x	0.55	0.38	0.16	0.17								
Capacity (veh/h)	726	688	546	542								
Control Delay (s)	13.4	11.0	9.7	10.0								
Approach Delay (s)	B	B	A	A								
Approach LOS	B	B	A	A								
Intersection Summary												
Delay	11.8											
Level of Service	B											
Intersection Capacity Utilization	52.8%											
Analysis Period (min)	15											
	ICU Level of Service											
	A											

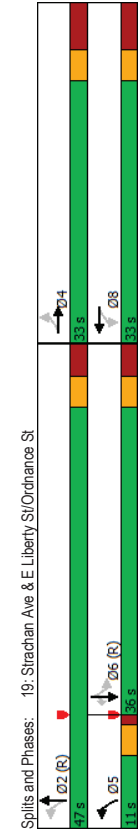
Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh												
Intersection LOS												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	40	220	135	30	135	100	15	45	35	50	25	25
Traffic Vol, veh/h	40	220	135	30	135	100	15	45	35	50	25	25
Future Vol, veh/h	40	220	135	30	135	100	15	45	35	50	25	25
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	8	1	4	0	1	14	22	0	0	6	0	0
Minor Flow	42	232	142	32	142	105	16	47	37	53	26	26
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	WB	EB	NB	NB	SB	SB	SB	NB	NB	SB
Opposing Approach	WB	EB	EB	WB	WB	WB	WB	WB	WB	WB	WB	WB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	SB	NB	NB	EB	EB	EB	EB	WB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	NB	SB	SB	WB	WB	WB	WB	EB	EB	EB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	13.9	10.9	10.9	10.2	10.2	10.2	10.1	10.1	10.1	10.1	10.1	10.1
HCM LOS	B	B	B	B	B	B	B	B	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	16%	10%	11%	50%
Vol Thru, %	47%	56%	51%	25%
Vol Right, %	37%	34%	38%	25%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	95	395	265	100
LT Vol	15	40	30	50
Through Vol	45	220	135	25
RT Vol	35	135	100	25
Lane Flow Rate	100	416	279	105
Geometry Grp	1	1	1	1
Degree of Utl (X)	0.166	0.562	0.379	0.171
Departure Headway (Hd)	5.989	4.864	4.889	5.847
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	698	744	739	613
Service Time	4.033	2.873	2.901	3.891
HCM Lane V/C Ratio	0.167	0.559	0.378	0.171
HCM Control Delay	10.2	13.9	10.9	10.1
HCM Lane LOS	B	B	B	B
HCM 95th-ile Q	0.6	3.5	1.8	0.6

Queues
19: Strachan Ave & E Liberty St/Ordinance St

Future Background (AM)
Base Scenario

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group									
Lane Configurations	EB	EB	WB	WB	NB	NB	SB	SB	SB
Traffic Volume (vph)	250	15	55	20	245	365	35	370	100
Future Volume (vph)	250	15	55	20	245	365	35	370	100
Lane Group Flow (vph)	266	298	0	154	261	441	37	394	106
Turn Type	Perm	NA	Perm	NA	pm-pt	NA	Perm	NA	Perm
Protected Phases	4		8	5	2		6		6
Permitted Phases	4		8	5	2		6		6
Minimum Split (s)	32.6	32.6	32.6	32.6	10.0	27.3	27.3	27.3	27.3
Total Split (s)	33.0	33.0	33.0	33.0	11.0	47.0	36.0	36.0	36.0
Total Split (%)	41.3%	41.3%	41.3%	41.3%	13.8%	58.8%	45.0%	45.0%	45.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	4.6	4.6	4.6	4.6	1.0	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	-1.0	1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.6	8.6	6.6	6.6	3.0	5.3	5.3	5.3	5.3
Lead/Lag									
Lead-Lag Optimizer?					Yes	Yes	Yes	Yes	Yes
v/c Ratio	0.75	0.83	0.40	0.66	0.50	0.13	0.55	0.35	0.35
Control Delay	39.6	32.9	16.2	18.8	14.4	26.0	33.0	13.7	13.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.6	32.9	16.2	18.8	14.4	26.0	33.0	13.7	13.7
Queue Length 50th (m)	37.4	19.7	10.7	20.5	41.4	5.9	65.0	4.8	4.8
Queue Length 95th (m)	#75.7	#67.6	27.3	34.0	66.2	m12.1	m93.5	m16.7	143.3
Internal Link Dist (m)	45.8		123.7		152.3				
Turn Bay Length (m)			50.0		45.0		30.0		
Base Capacity (vph)	354	361	382	396	888	282	713	305	305
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.83	0.40	0.66	0.50	0.13	0.55	0.35	0.35



06-24-2023
BA Group

HCM Signalized Intersection Capacity Analysis
19: Strachan Ave & E Liberty St/Ordinance St

Future Background (AM)
Base Scenario

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	EB	EB	WB	WB	NB	NB	SB	SB	SB
Traffic Volume (vph)	250	15	265	55	20	70	245	365	50
Future Volume (vph)	250	15	265	55	20	70	245	365	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	8.6	6.6	6.6	3.0	5.3	5.3	5.3	5.3
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	0.51	0.88	0.88	1.00	0.95	1.00	1.00	0.43
Fibb. ped/bikes	0.84	1.00	0.88	0.88	0.93	1.00	1.00	0.79	1.00
Frt	1.00	0.86	0.94	0.94	1.00	0.98	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.98	0.98	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1477	809	1312	1312	1622	1691	1380	1860	608
Flt Permitted	0.69	1.00	0.77	0.77	0.35	1.00	0.51	1.00	1.00
Satd. Flow (perm)	1074	809	1033	1033	595	1691	736	1860	608
Peak-Hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	266	16	282	59	21	74	261	388	53
RTOR Reduction (vph)	0	115	0	0	42	0	0	0	0
Lane Group Flow (vph)	266	183	0	0	112	0	261	435	0
Conf. Peds. (#/hr)	125	335	335	27	27		205	205	405
Conf. Bikes (#/hr)									
Heavy Vehicles (%)	2%	0%	1%	1%	5%	2%	2%	2%	1%
Turn Type	Perm	NA	Perm	NA	pm-pt	NA	Perm	NA	Perm
Protected Phases	4		8	5	2		6		6
Permitted Phases	4		8	5	2		6		6
Actuated Green, G (s)	25.4	25.4	25.4	25.4	40.7	40.7	29.7	29.7	29.7
Effective Green, g (s)	26.4	24.4	26.4	26.4	41.7	41.7	30.7	30.7	30.7
Actuated g/C Ratio	0.33	0.30	0.33	0.33	0.52	0.52	0.38	0.38	0.38
Clearance Time (s)	7.6	7.6	7.6	7.6	4.0	6.3	6.3	6.3	6.3
Lane Grp Cap (vph)	354	246	340	340	412	881	282	713	233
v/s Ratio Prot	0.23				c0.06	0.26			0.21
v/s Ratio Perm	c0.25				c0.27		0.05		0.07
v/c Ratio	0.75	0.75	0.33	0.33	0.63	0.49	0.13	0.55	0.17
Uniform Delay, d1	23.9	25.0	20.2	20.2	12.1	12.3	16.0	19.3	16.3
Progression Delay, d2	1.00	1.00	1.00	1.00	1.00	1.00	1.51	1.52	3.20
Incremental Delay, d2	13.7	18.4	2.6	2.6	7.2	2.0	0.8	2.7	1.4
Delay (s)	37.6	43.4	22.8	22.8	19.3	14.3	25.0	32.1	53.5
Level of Service	D	D	C	C	B	B	C	C	D
Approach Delay (s)	40.7		22.8		16.2		35.8		D
Approach LOS	D		C		B		D		D
Intersection Summary									
HCM 2000 Control Delay	29.1 HCM 2000 Level of Service C								
HCM 2000 Volume to Capacity ratio	0.73								
Actuated Cycle Length (s)	80.0								
Intersection Capacity Utilization	102.8% ICU Level of Service G								
Analysis Period (min)	15								
c. Critical Lane Group									

06-24-2023
BA Group

HCM Unsignalized Intersection Capacity Analysis
 8: Hanna Ave/75 Hanna Ave & Snooker St/Private St

HCM 6th AWSC
 8: Hanna Ave/75 Hanna Ave & Snooker St/Private St

Future Background (AM)
 Base Scenario

Future Background (AM)
 Base Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		Stop		Stop				Stop			Stop	
Traffic Volume (vph)	55	80	5	20	160	30	50	15	30	0	0	0
Future Volume (vph)	55	80	5	20	160	30	50	15	30	0	0	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	65	95	6	24	190	36	60	18	36	0	0	0
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	166	250	114	0								
Volume Left (vph)	65	24	60	0								
Volume Right (vph)	6	36	36	0								
Head (s)	0.09	-0.04	0.02	0.00								
Departure Headway (s)	4.6	4.3	4.9	5.0								
Degree Utilization, x	0.21	0.30	0.15	0.00								
Capacity (veh/h)	761	796	685	653								
Control Delay (s)	8.8	9.2	8.7	8.0								
Approach Delay (s)	8.8	9.2	8.7	8.0								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay	9.0											
Level of Service	A											
Intersection Capacity Utilization	40.5%											
Analysis Period (min)	15											
	ICU Level of Service											
	A											

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	9.1											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	55	80	5	20	160	30	50	15	30	0	0	0
Traffic Vol, veh/h	55	80	5	20	160	30	50	15	30	0	0	0
Future Vol, veh/h	55	80	5	20	160	30	50	15	30	0	0	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	0	3	14	9	1	0	8	0	7	0	0	0
Mvmt Flow	65	95	6	24	190	36	60	18	36	0	0	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	WB	WB	WB	NB	NB	SB	SB	SB	SB	NB
Opposing Approach	WB	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB	WB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	SB	NB	NB	NB	EB	EB	EB	EB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	NB	SB	SB	SB	WB	WB	WB	WB	EB	EB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	8.7	9.5	8.7	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8
HCM LOS	A	A	A	A	A	A	A	A	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	53%	39%	10%	0%
Vol Thru, %	16%	57%	76%	100%
Vol Right, %	32%	4%	14%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	95	140	210	0
LT Vol	50	55	20	0
Through Vol	15	80	160	0
RT Vol	30	5	30	0
Lane Flow Rate	113	167	250	0
Geometry Grp	1	1	1	1
Degree of Uln (X)	0.154	0.209	0.309	0
Departure Headway (Ht)	4.889	4.514	4.455	5.002
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	733	795	808	0
Service Time	2.92	2.539	2.478	3.043
HCM Lane V/C Ratio	0.154	0.21	0.309	0
HCM Control Delay	8.8	8.7	9.5	8
HCM Lane LOS	A	A	A	N
HCM 95th-ile Q	0.5	0.8	1.3	0

HCM Unsignalized Intersection Capacity Analysis
 11: Private St & Existing Metro Driveway

Future Background (AM)
 Base Scenario

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W	Stop	Stop	Stop	Stop	Stop
Sign Control						
Traffic Volume (vph)	0	105	110	25	35	20
Future Volume (vph)	0	105	110	25	35	20
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72
Hourly flow rate (vph)	0	146	153	35	49	28
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total (vph)	146	188	77			
Volume Left (vph)	0	153	0			
Volume Right (vph)	146	0	28			
Head (s)	-0.53	0.22	-0.22			
Departure Headway (s)	4.0	4.5	4.2			
Degree Utilization, x	0.16	0.24	0.09			
Capacity (veh/h)	853	769	808			
Control Delay (s)	7.7	8.9	7.6			
Approach Delay (s)	7.7	8.9	7.6			
Approach LOS	A	A	A			
Intersection Summary						
Delay			8.2			
Level of Service			A			
Intersection Capacity Utilization			28.7%		ICU Level of Service	A
Analysis Period (min)			15			

HCM 6th AWSC
 11: Private St & Existing Metro Driveway

Future Background (AM)
 Base Scenario

Intersection	EBL	EBR	NBL	NBT	SBT	SBR
Intersection Delay, s/veh						8.2
Intersection LOS						A
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W	Stop	Stop	Stop	Stop	Stop
Traffic Vd, veh/h	0	105	110	25	35	20
Future Vd, veh/h	0	105	110	25	35	20
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72
Heavy Vehicles, %	0	4	4	0	0	0
Mvmt Flow	0	146	153	35	49	28
Number of Lanes	1	0	0	1	1	0
Approach	EB	NB	NB	SB	SB	SB
Opposing Approach		SB	SB	NB	NB	
Opposing Lanes	0	1	1	1	1	
Conflicting Approach Left	SB	EB	EB			
Conflicting Lanes Left	1	1	1	0	0	
Conflicting Approach Right	NB			EB	EB	
Conflicting Lanes Right	1	0	0	1	1	
HCM Control Delay	7.6	8.9	7.6	7.6	7.6	
HCM LOS	A	A	A	A	A	
Lane	NBLn1	EBLn1	SBLn1			
Vd Left, %	81%	0%	0%	0%		
Vd Thru, %	19%	0%	64%			
Vd Right, %	0%	100%	36%			
Sign Control	Stop	Stop	Stop			
Traffic Vd by Lane	135	105	55			
LT Vd	110	0	0			
Through Vd	25	0	35			
RT Vd	0	105	20			
Lane Flow Rate	188	146	76			
Geometry Grp	1	1	1			
Degree of Utl (X)	0.232	0.158	0.089			
Departure Headway (Hd)	4.448	3.906	4.189			
Convergence, Y/N	Yes	Yes	Yes			
Cap	799	923	858			
Service Time	2.524	1.91	2.201			
HCM Lane V/C Ratio	0.235	0.158	0.089			
HCM Control Delay	8.9	7.6	7.6			
HCM Lane LOS	A	A	A			
HCM 95th-ile Q	0.9	0.6	0.3			

HCM Unsignalized Intersection Capacity Analysis
 12: Private St & 120 Lynn Williams Driveway

HCM Unsignalized Intersection Capacity Analysis
 14: Lynn Williams St & Private St

Future Background (AM)
 Base Scenario

Future Background (AM)
 Base Scenario

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W					
Traffic Volume (veh/h)	0	35	30	135	140	0
Future Volume (Veh/h)	0	35	30	135	140	0
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	0	47	40	180	187	0
Pedestrians	80			20	75	
Lane Width (m)	3.5			3.5	3.5	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	6			2	6	
Right turn flare (veh)				None	None	
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
VC, conflicting volume	602	287	267			
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol	602	287	267			
IC, single (s)	6.4	6.2	4.1			
IC, 2 stage (s)						
IF (s)	3.5	3.3	2.2			
p0 queue free %	100	93	97			
CM capacity (veh/h)	396	696	1224			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	47	220	187			
Volume Left	0	40	0			
Volume Right	47	0	0			
cSH	696	1224	1700			
Volume to Capacity	0.07	0.03	0.11			
Queue Length 95th (m)	1.7	0.8	0.0			
Control Delay (s)	10.5	1.7	0.0			
Lane LOS	B	A	A			
Approach Delay (s)	10.5	1.7	0.0			
Approach LOS	B	A	A			
Intersection Summary						
Average Delay		1.9				
Intersection Capacity Utilization		40.3%				
Analysis Period (min)		15				
						ICU Level of Service
						A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W					
Traffic Volume (veh/h)	65	30	135	30	10	165
Future Volume (Veh/h)	65	30	135	30	10	165
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	81	38	169	38	12	206
Pedestrians	85			36		75
Lane Width (m)	3.5			3.5		3.5
Walking Speed (m/s)	1.2			1.2		1.2
Percent Blockage	7			3		6
Right turn flare (veh)				None		None
Median type				None		None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
VC, conflicting volume	539	348			292	
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol	539	348			292	
IC, single (s)	6.5	6.2			4.1	
IC, 2 stage (s)						
IF (s)	3.6	3.3			2.2	
p0 queue free %	82	94			99	
CM capacity (veh/h)	441	606			1193	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	119	207	218			
Volume Left	81	0	12			
Volume Right	38	38	0			
cSH	483	1700	1193			
Volume to Capacity	0.25	0.12	0.01			
Queue Length 95th (m)	7.7	0.0	0.2			
Control Delay (s)	14.9	0.0	0.5			
Lane LOS	B	A	A			
Approach Delay (s)	14.9	0.0	0.5			
Approach LOS	B	A	A			
Intersection Summary						
Average Delay			3.5			
Intersection Capacity Utilization			36.4%			
Analysis Period (min)			15			
						ICU Level of Service
						A

HCM Unsignalized Intersection Capacity Analysis
 17: Liberty St/E Liberty St & Hanna Ave

HCM 6th AWSC
 17: Liberty St/E Liberty St & Hanna Ave

Future Background (AM)
 Base Scenario

Future Background (AM)
 Base Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		Stop	Stop		Stop			Stop			Stop	
Traffic Volume (vph)	60	165	55	20	190	30	55	20	20	20	10	30
Future Volume (vph)	60	165	55	20	190	30	55	20	20	20	10	30
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	62	170	57	21	196	31	57	21	21	21	10	31
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	289	248	99	62								
Volume Left (vph)	62	21	57	21								
Volume Right (vph)	57	31	21	31								
Head (s)	-0.03	0.06	0.01	-0.19								
Departure Headway (s)	4.6	4.7	5.3	5.1								
Degree Utilization, x	0.37	0.33	0.15	0.09								
Capacity (veh/h)	742	723	614	616								
Control Delay (s)	10.3	10.0	9.2	8.6								
Approach Delay (s)	10.3	10.0	9.2	8.6								
Approach LOS	B	B	A	A								
Intersection Summary												
Delay	9.9											
Level of Service	A											
Intersection Capacity Utilization	51.3%											
Analysis Period (min)	15											
	ICU Level of Service											
	A											

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	9.7											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	60	165	55	20	190	30	55	20	20	20	10	30
Traffic Vol, veh/h	60	165	55	20	190	30	55	20	20	20	10	30
Future Vol, veh/h	60	165	55	20	190	30	55	20	20	20	10	30
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles, %	0	4	1	0	8	4	0	0	5	7	0	0
Mvmt Flow	62	170	57	21	196	31	57	21	21	21	10	31
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	WB	WB	WB	NB	NB	SB	SB	SB	SB	SB
Opposing Approach	WB	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB	WB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	SB	NB	NB	EB	EB	EB	WB	WB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	WB	WB	EB	EB	WB	WB	WB	WB	WB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	10.1	9.7	9.7	9.1	9.1	8.7	8.7	8.7	8.7	8.7	8.7	8.7
HCM LOS	B	A	A	A	A	A	A	A	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	58%	21%	8%	33%
Vol Thru, %	21%	59%	79%	17%
Vol Right, %	21%	20%	12%	50%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	95	280	240	60
LT Vol	55	60	20	20
Through Vol	20	165	190	10
RT Vol	20	55	30	30
Lane Flow Rate	98	289	247	62
Geometry Grp	1	1	1	1
Degree of Utl (X)	0.141	0.362	0.315	0.088
Departure Headway (Ht)	5.18	4.516	4.576	5.135
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	688	794	782	692
Service Time	3.246	2.562	2.623	3.207
HCM Lane V/C Ratio	0.142	0.364	0.316	0.09
HCM Control Delay	9.1	10.1	9.7	8.7
HCM Lane LOS	A	B	A	A
HCM 95th-tile Q	0.5	1.7	1.4	0.3

HCM Unsignalized Intersection Capacity Analysis
 18: E Liberty St & Lynn Williams St

Future Background (AM)
 Base Scenario

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	40	240	150	125	140	90
Future Volume (vph)	40	240	150	125	140	90
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	48	286	179	149	167	107
Direction, Lane #	EB 1	EB 2	WB 1	WB 1	SB 1	SB 1
Volume Total (vph)	48	286	328	274		
Volume Left (vph)	48	0	0	0	167	
Volume Right (vph)	0	0	149	107		
Head (s)	0.55	0.09	-0.20	-0.07		
Departure Headway (s)	6.3	5.8	5.1	5.5		
Degree Utilization, x	0.08	0.46	0.47	0.42		
Capacity (veh/h)	546	597	671	601		
Control Delay (s)	8.6	12.5	12.6	12.5		
Approach Delay (s)	11.9		12.6	12.5		
Approach LOS	B		B	B		
Intersection Summary						
Delay	12.3					
Level of Service	B					
Intersection Capacity Utilization	48.1%					
Analysis Period (min)	15					
						ICU Level of Service
						A

HCM 6th AWSC
 18: E Liberty St & Lynn Williams St

Future Background (AM)
 Base Scenario

Intersection	EBL	EBT	WBT	WBR	SBL	SBR
Intersection Delay, s/veh						12.7
Intersection LOS						B
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Vol, veh/h	40	240	150	125	140	90
Future Vol, veh/h	40	240	150	125	140	90
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	3	5	8	0	2	4
Mvmt Flow	48	286	179	149	167	107
Number of Lanes	1	1	1	0	1	0
Approach	EB	WB	WB	SB	SB	SB
Opposing Approach	WB	EB				
Opposing Lanes	1	2			0	
Conflicting Approach Left	SB				WB	WB
Conflicting Lanes Left	1	0			1	1
Conflicting Approach Right		SB			EB	EB
Conflicting Lanes Right	0	1			2	2
HCM Control Delay	12.9		12.7		12.5	
HCM LOS	B		B		B	
Lane	EBLn1	EBLn2	WBLn1	SBLn1		
Vol Left, %	100%	0%	0%	61%		
Vol Thru, %	0%	100%	55%	0%		
Vol Right, %	0%	0%	45%	39%		
Sign Control	Stop	Stop	Stop	Stop		
Traffic Vol by Lane	40	240	275	230		
LT Vol	40	0	0	140		
Through Vol	0	240	150	0		
RT Vol	0	0	125	90		
Lane Flow Rate	48	286	327	274		
Geometry Grp	7	7	5	2		
Degree of Utl (X)	0.083	0.459	0.471	0.419		
Departure Headway (Ht)	6.259	5.787	5.174	5.515		
Convergence, Y/N	Yes	Yes	Yes	Yes		
Cap	573	623	697	652		
Service Time	3.987	3.514	3.202	3.55		
HCM Lane V/C Ratio	0.084	0.459	0.469	0.42		
HCM Control Delay	9.6	13.4	12.7	12.5		
HCM Lane LOS	A	B	B	B		
HCM 95th-ile Q	0.3	2.4	2.5	2.1		

HCM Unsynchronized Intersection Capacity Analysis
 20: Pirandello St & E Liberty St

Future Background (AM)
 Base Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	5	370	5	15	240	45	10	0	35	75	0	5
Future Volume (vph)	5	370	5	15	240	45	10	0	35	75	0	5
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	5	407	5	16	264	49	11	0	38	82	0	5
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	417	329	49	87								
Volume Left (vph)	5	16	11	82								
Volume Right (vph)	5	49	38	5								
Head (s)	0.09	0.08	-0.35	0.40								
Departure Headway (s)	4.8	4.9	5.6	6.2								
Degree Utilization, x	0.56	0.45	0.08	0.15								
Capacity (veh/h)	718	703	546	511								
Control Delay (s)	13.8	11.9	9.0	10.3								
Approach Delay (s)	13.8	11.9	9.0	10.3								
Approach LOS	B	B	A	B								
Intersection Summary												
Delay	12.5											
Level of Service	B											
Intersection Capacity Utilization	45.4%											
Analysis Period (min)	15											
ICU Level of Service	A											

HCM 6th AWSC
 20: Pirandello St & E Liberty St

Future Background (AM)
 Base Scenario

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	13.2											
Intersection LOS	B											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	5	370	5	15	240	45	10	0	35	75	0	5
Future Vol, veh/h	5	370	5	15	240	45	10	0	35	75	0	5
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	25	5	14	6	10	9	0	0	5	14	0	20
Mvmt Flow	5	407	5	16	264	49	11	0	38	82	0	5
Number of Lanes	0	1	0	0	1	0	1	0	1	0	0	1
Approach	EB	WB	WB	WB	NB	NB	SB	SB	SB	WB	WB	SB
Opposing Approach	WB	EB	EB	EB	WB	WB	WB	WB	WB	WB	WB	NB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	NB	NB	EB	EB	EB	EB	WB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	SB	WB	WB	WB	WB	WB	WB	WB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	15.4											
HCM LOS	C											
NBLn1	22%											
EBLn1	1%											
WBLn1	5%											
SBLn1	94%											
Vol Thru, %	0%											
Vol Right, %	78%											
Sign Control	Stop											
Traffic Vol by Lane	45											
Through Vol	10											
RT Vol	0											
Lane Flow Rate	35											
Geometry Grp	1											
Degree of Utl (X)	0.076											
Departure Headway (Ht)	5.544											
Convergence, Y/N	Yes											
Cap	649											
Service Time	3.549											
HCM Lane V/C Ratio	0.076											
HCM Control Delay	9											
HCM Lane LOS	A											
HCM 95th-tile Q	0.2											

HCM Unsignalized Intersection Capacity Analysis
 21: Lynn Williams St & Western Battery Road

Future Background (AM)
 Base Scenario

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	30	55	10	25	40
Future Volume (Veh/h)	10	30	55	10	25	40
Sign Control	Free	Free	Free	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	12	36	66	12	30	48
Pedestrians	9	22			88	
Lane Width (m)	3.5	3.5	3.5		3.5	
Walking Speed (m/s)	1.2	1.2	1.2		1.2	
Percent Blockage	1	2			7	
Right turn flare (veh)	None	None				
Median type						
Median storage (veh)						
Upstream signal (m)						
pX platoon unblocked						
VC, conflicting volume	166				242	169
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol	166				242	169
IC, single (s)	4.1				6.4	6.2
IC, 2 stage (s)	2.2				3.5	3.3
p0 queue free %	99				96	94
CM capacity (veh/h)	1323				679	812
Direction_Lane #	EB 1	WB 1	SB 1			
Volume Total	48	78	78			
Volume Left	12	0	30			
Volume Right	0	12	48			
cSH	1323	1700	755			
Volume to Capacity	0.01	0.05	0.10			
Queue Length 95th (m)	0.2	0.0	2.8			
Control Delay (s)	2.0	0.0	10.3			
Lane LOS	A		B			
Approach Delay (s)	2.0	0.0	10.3			
Approach LOS			B			
Intersection Summary						
Average Delay			4.4			
Intersection Capacity Utilization			26.3%		ICU Level of Service	A
Analysis Period (min)			15			

Queues
 1: Dufferin St & King St W

Future Background (PM)
 Base Scenario

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	85	235	45	370	55	410	90	300
Future Volume (vph)	85	235	45	370	55	410	90	300
Lane Group Flow (vph)	0	382	0	559	0	543	0	533
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases	4	4	8	8	5	2	6	6
Permitted Phases	4	4	8	8	5	2	6	6
Detector Phase								
Switch Phase								
Minimum Initial (s)	21.0	21.0	21.0	21.0	6.0	20.0	20.0	20.0
Minimum Split (s)	28.0	28.0	28.0	28.0	10.0	27.0	27.0	27.0
Total Split (s)	35.0	35.0	35.0	35.0	14.0	45.0	31.0	31.0
Total Split (%)	43.8%	43.8%	43.8%	43.8%	17.5%	56.3%	38.8%	38.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode								
v/c Ratio	0.29	0.29	0.36	0.36	0.69	0.69	0.81	0.81
Control Delay	10.2	10.2	10.2	10.2	39.1	33.9	33.9	33.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.2	10.2	10.2	10.2	39.1	33.9	33.9	33.9
Queue Length 50th (m)	14.3	20.9	20.9	20.9	46.5	38.6	38.6	38.6
Queue Length 95th (m)	27.4	38.2	38.2	38.2	62.5	51.9	51.9	51.9
Internal Link Dist (m)	163.4		383.3		189.0		183.0	
Turn Bay Length (m)								
Base Capacity (vph)	1298		1538		1304		725	
Starvation Cap Reductn	0		0		0		0	
Spillback Cap Reductn	0		0		0		0	
Storage Cap Reductn	0		0		0		0	
Reduced v/c Ratio	0.29	0.29	0.36	0.36	0.42	0.42	0.74	0.74
Intersection Summary								
Cycle Length: 80								
Actuated Cycle Length: 80								
Offset: 29 (36%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green								
Natural Cycle: 65								
Control Type: Actuated-Coordinated								



HCM Signalized Intersection Capacity Analysis
 1: Dufferin St & King St W

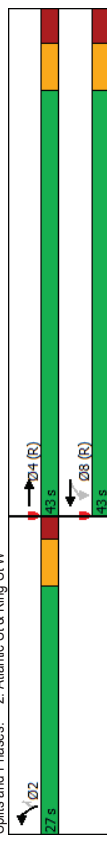
Future Background (PM)
 Base Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	85	235	35	45	370	105	55	410	40	90	300	105
Traffic Volume (vph)	85	235	35	45	370	105	55	410	40	90	300	105
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	6.0			6.0			5.0			5.0		
Total Lost time (s)												
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Fpb. ped/bikes	0.97	0.97	0.98	0.98	0.98	0.99	0.99	0.99	0.99	0.98	0.98	0.98
Frt	0.99	0.99	0.97	0.97	0.99	0.99	0.99	0.99	0.99	0.97	0.97	0.97
Flt Protected	3117	3035	3261	3105								
Satd. Flow (prot)	0.73	0.89	0.79	0.67								
Flt Permitted	2292	2702	2892									
Satd. Flow (perm)	0.93	0.93	0.83	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Peak-hour factor, PHF	91	253	38	48	398	113	59	441	43	97	323	113
Adj. Flow (vph)	0	7	0	0	19	0	0	11	0	0	32	0
RTOR Reduction (vph)	0	375	0	0	540	0	0	532	0	0	502	0
Lane Group Flow (vph)	267	277	277	267	178	253	253	178				
Confl. Peds. (#/hr)	15			30			10				5	
Confl. Bikes (#/hr)	2%	4%	14%	25%	3%	2%	0%	3%	20%	1%	4%	1%
Heavy Vehicles (%)	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm	NA
Turn Type	4			8			5		2		6	
Protected Phases	4			8			2		2		6	
Permitted Phases	4			8			2		2		6	
Actuated Green, G (s)	44.0			44.0			23.0		23.0		23.0	
Effective Green, g (s)	45.0			45.0			24.0		24.0		24.0	
Actuated g/C Ratio	0.56			0.56			0.30		0.30		0.30	
Clearance Time (s)	7.0			7.0			6.0		6.0		6.0	
Vehicle Extension (s)	3.0			3.0			3.0		3.0		3.0	
Lane Grp Cap. (vph)	1289			1519			777		777		626	
v/s Ratio Prot	0.16			c0.20			0.21		0.21		c0.24	
v/s Ratio Perm	0.29			0.36			0.68		0.68		0.80	
Uniform Delay, d1	9.2			9.6			24.7		24.7		25.8	
Progression Factor	1.00			1.00			1.47		1.47		1.00	
Incremental Delay, d2	0.6			0.7			2.3		2.3		7.3	
Delay (s)	9.7			10.2			38.5		38.5		33.1	
Level of Service	A			B			D		D		C	
Approach Delay (s)	9.7			10.2			38.5		38.5		33.1	
Approach LOS	A			B			D		D		C	
Intersection Summary												
HCM 2000 Control Delay	23.8 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.54											
Actuated Cycle Length (s)	80.0 Sum of lost time (s) 15.0											
Intersection Capacity Utilization	87.5% ICU Level of Service E											
Analysis Period (min)	15											
Critical Lane Group	c											

Queues
 2: Atlantic St & King St W

Future Background (PM)
 Base Scenario

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations	4	8	8	2	2
Traffic Volume (vph)	500	20	590	245	175
Future Volume (vph)	500	20	590	245	175
Lane Group Flow (vph)	688	0	656	263	188
Turn Type	NA	Perm	NA	Prot	Perm
Protected Phases	4		8	2	2
Permitted Phases	4		8	2	2
Detector Phase	4		8	2	2
Switch Phase	4		8	2	2
Minimum Initial (s)	21.0	21.0	21.0	20.0	20.0
Minimum Split (s)	28.0	28.0	28.0	26.0	26.0
Total Split (s)	43.0	43.0	43.0	27.0	27.0
Total Split (%)	61.4%	61.4%	61.4%	36.6%	36.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.0	6.0	6.0	5.0	5.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	C-Max	C-Max	C-Max	None	None
v/c Ratio	0.42	0.39	0.49	0.49	0.50
Control Delay	9.4	10.3	23.6	23.3	23.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	9.4	10.3	23.6	23.3	23.3
Queue Length 50th (m)	23.5	25.2	29.5	18.8	18.8
Queue Length 95th (m)	36.5	37.5	49.5	37.2	37.2
Internal Link Dist (m)	55.1	301.6	50.4		
Turn Bay Length (m)					
Base Capacity (vph)	1627	1695	561	386	386
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.42	0.39	0.47	0.49	0.49
Intersection Summary					
Cycle Length: 70					
Actuated Cycle Length: 70					
Offset: 26 (37%), Referenced to phase 4:EBT and 8:WBT.L, Start of Green					
Natural Cycle: 55					
Control Type: Actuated-Coordinated					



HCM Signalized Intersection Capacity Analysis
 2: Atlantic St & King St W

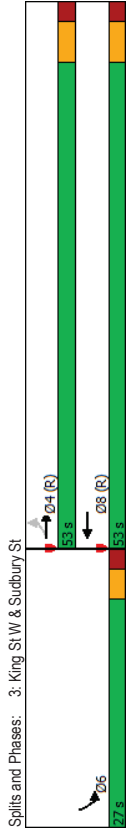
Future Background (PM)
 Base Scenario

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑↑	↑↑	↑↑	↑↑	↑↑
Traffic Volume (vph)	500	140	20	590	245	175
Future Volume (vph)	500	140	20	590	245	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	0.99	1.00	1.00	1.00	1.00
Flt	0.97	1.00	1.00	0.85	1.00	1.00
Flt Protected	1.00	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	2947	3408	1785	1187	1785	1187
Flt Permitted	1.00	0.92	0.95	1.00	1.00	1.00
Satd. Flow (perm)	2947	3139	1785	1187	1785	1187
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	538	151	22	634	263	188
RTOR Reduction (vph)	36	0	0	0	0	14
Lane Group Flow (vph)	653	0	0	656	263	174
Conf. Peds. (#/hr)	13	492	492	424	175	10
Conf. Bikes (#/hr)	13	492	492	424	175	10
Heavy Vehicles (%)	3%	0%	0%	4%	0%	8%
Turn Type	NA	Perm	NA	Prot	Perm	Perm
Protected Phases	4		8	2	2	
Permitted Phases	8		8	2	2	
Actuated Green, G (s)	36.8	20.2	20.2	20.2	20.2	20.2
Effective Green, g (s)	37.8	21.2	21.2	21.2	21.2	21.2
Actuated G/C Ratio	0.54	0.30	0.30	0.30	0.30	0.30
Clearance Time (s)	7.0	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
Lane Grp Cap. (vph)	1591	1695	540	359	540	359
v/s Ratio Prot	c0.22			c0.15		
v/s Ratio Perm		0.21		0.15		0.15
v/c Ratio	0.41	0.39	0.49	0.48	0.48	0.48
Uniform Delay, d1	9.5	9.4	20.0	19.9	19.9	19.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	0.7	0.7	1.0	1.0	1.0
Delay (s)	10.3	10.0	20.6	21.0	21.0	21.0
Level of Service	B	B	C	C	C	C
Approach Delay (s)	10.3	10.0	20.8	20.8	20.8	20.8
Approach LOS	B	B	C	C	C	C
Intersection Summary						
HCM 2000 Control Delay		12.8				HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio		0.44				B
Actuated Cycle Length (s)		70.0				Sum of lost time (s)
Intersection Capacity Utilization		58.7%				11.0
Analysis Period (min)		15				B
c Critical Lane Group						

Queues
 3: King St W & Sudbury St

Future Background (PM)
 Base Scenario

Lane Group	EBL	EBT	WBT	SBL
Lane Configurations	↑↑	↑↑	↑↑	↑↑
Traffic Volume (vph)	5	565	510	125
Future Volume (vph)	5	565	510	125
Lane Group Flow (vph)	0	634	823	200
Turn Type	Perm	NA	NA	Prot
Protected Phases	4	8	8	6
Permitted Phases	4	8	8	6
Detector Phase	4	4	8	6
Switch Phase	4	4	8	6
Minimum Initial (s)	24.0	24.0	24.0	21.0
Minimum Split (s)	30.0	30.0	30.0	26.0
Total Split (s)	53.0	53.0	53.0	27.0
Total Split (%)	66.3%	66.3%	66.3%	33.8%
Yellow Time (s)	4.0	4.0	4.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	4.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	C-Max	C-Max	C-Max	None
v/c Ratio	0.33	0.43	0.42	0.42
Control Delay	8.1	7.1	23.5	23.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	8.1	7.1	23.5	23.5
Queue Length 50th (m)	23.1	24.8	22.2	22.2
Queue Length 95th (m)	32.4	36.3	41.3	41.3
Internal Link Dist (m)	301.6	26.9	138.9	138.9
Turn Bay Length (m)				
Base Capacity (vph)	1837	1930	498	498
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.33	0.43	0.40	0.40
Intersection Summary				
Cycle Length: 80				
Actuated Cycle Length: 80				
Offset: 1 (1%), Referenced to phase 4:EBTL and 8:WBT, Start of Green				
Natural Cycle: 60				
Control Type: Actuated-Coordinated				



HCM Signalized Intersection Capacity Analysis
 3: King St W & Sudbury St
 Future Background (PM)
 Base Scenario

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		4A	4A		W	W
Traffic Volume (vph)	5	565	510	230	125	55
Future Volume (vph)	5	565	510	230	125	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0			
Lane Util. Factor	0.95	0.95	1.00	1.00		
Fpb. ped/bikes	1.00	1.00	0.96	1.00		
Fpb. ped/bikes	1.00	1.00	0.96	1.00		
Flt Protected	1.00	1.00	0.97			
Satd. Flow (prot)	3335	3050	1666			
Flt Permitted	0.95	1.00	0.97			
Satd. Flow (perm)	3164	3050	1666			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	6	628	567	256	139	61
RTOR Reduction (vph)	0	0	63	0	20	0
Lane Group Flow (vph)	0	634	760	0	180	0
Confl. Peds. (#/hr)	140		140	60	115	
Confl. Bikes (#/hr)			55			
Heavy Vehicles (%)	0%	7%	3%	0%	0%	0%
Turn Type	Perm	NA	NA	NA	Prot	Prot
Protected Phases	4	8	8	6		
Permitted Phases	4					
Actuated Green, G (s)	48.0	48.0	21.0	21.0		
Effective Green, g (s)	49.0	49.0	22.0	22.0		
Actuated G/C Ratio	0.61	0.61	0.28	0.28		
Clearance Time (s)	6.0	6.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap. (vph)	1937	1868	488	488		
v/s Ratio Prot		c0.25		c0.11		
v/s Ratio Perm	0.20					
v/s Ratio	0.33	0.41	0.39	0.39		
Uniform Delay, d1	7.5	8.0	23.6	23.6		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.5	0.7	0.6	0.6		
Delay (s)	8.0	8.7	24.1	24.1		
Level of Service	A	A	C	C		
Approach Delay (s)	8.0	8.7	24.1	24.1		
Approach LOS	A	A	C	C		
Intersection Summary						
HCM 2000 Control Delay		10.3			HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio		0.40				
Actuated Cycle Length (s)		80.0			Sum of lost time (s)	9.0
Intersection Capacity Utilization		48.6%			ICU Level of Service	A
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
 4: Duoro St & King St W
 Future Background (PM)
 Base Scenario

Movement	EBT	EBR	WBT	WBR	NBT	NBR
Lane Configurations	4A	4A	4A	4A	W	W
Traffic Volume (veh/h)	465	235	0	655	95	5
Future Volume (Veh/h)	465	235	0	655	95	5
Sign Control	Free	Free	0%	Free	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	522	264	0	736	107	6
Pedestrians					200	
Lane Width (m)					3.5	
Walking Speed (m/s)					1.2	
Percent Blockage					16	
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (m)	51		130			
pX, platoon unblocked		0.91		0.95	0.91	
vC, conflicting volume		986		1222	593	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol		796		761	366	
IC, single (s)		4.1		6.8	6.9	
IC, 2 stage (s)						
IF (s)		2.2		3.5	3.3	
p0 queue free %		100		61	99	
dM capacity (veh/h)		639		276	488	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	348	438	245	491	113	
Volume Left	0	0	0	0	107	
Volume Right	0	264	0	0	6	
cSH	1700	1700	639	1700	283	
Volume to Capacity	0.20	0.26	0.00	0.29	0.40	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	14.7	
Control Delay (s)	0.0	0.0	0.0	0.0	26.0	
Lane LOS					D	
Approach Delay (s)	0.0	0.0	0.0	26.0		
Approach LOS				D		
Intersection Summary						
Average Delay			1.8			
Intersection Capacity Utilization			35.2%		ICU Level of Service	A
Analysis Period (min)			15			

Queues
5: Shaw St & King St W

HCM Signalized Intersection Capacity Analysis
5: Shaw St & King St W

Future Background (PM)
Base Scenario

EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	Ø1	Ø3	Ø5	Ø7
Lane Group											
Lane Configurations											
Traffic Volume (vph)	20	395	5	445	115	190	55	185			
Future Volume (vph)	20	395	5	445	115	190	55	185			
Ideal Flow (vphpl)	0	522	0	567	0	356	0	373			
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA			
Protected Phases	4	4	8	8	2	2	6	1	3	5	7
Permitted Phases	4	4	8	8	2	2	6	6			
Detector Phase	4	4	8	8	2	2	6	6			
Switch Phase											
Minimum Initial (s)	19.0	19.0	19.0	19.0	16.0	16.0	16.0	3.0	3.0	3.0	3.0
Minimum Split (s)	28.0	28.0	28.0	28.0	22.0	22.0	22.0	5.0	5.0	5.0	5.0
Total Split (s)	37.0	37.0	37.0	37.0	23.0	23.0	23.0	5.0	5.0	5.0	5.0
Total Split (%)	52.9%	52.9%	52.9%	52.9%	32.9%	32.9%	32.9%	7%	7%	7%	7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0	2.0	2.0	2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	0.0	0.0	0.0
Last Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0				
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Lead/Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None	Ped	Ped
v/c Ratio	0.40	0.40	0.40	0.40	0.63	0.63	0.58				
Control Delay	13.1	13.0	28.6	28.6	22.0	22.0					
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0					
Total Delay	13.1	13.0	28.6	28.6	22.0	22.0					
Queue Length 50th (m)	22.5	24.5	22.7	22.7	18.4	18.4					
Queue Length 95th (m)	34.3	36.4	35.8	35.8	31.4	31.4					
Internal Link Dist (m)	105.5	222.7	65.9	65.9	127.6	127.6					
Turn Bay Length (m)											
Base Capacity (vph)	1289	1415	586	586	657	657					
Starvation Cap Reductn	0	0	0	0	0	0					
Spillback Cap Reductn	0	0	0	0	0	0					
Storage Cap Reductn	0	0	0	0	0	0					
Reduced v/c Ratio	0.40	0.40	0.61	0.61	0.57	0.57					
Intersection Summary											
Cycle Length: 70											
Actuated Cycle Length: 70											
Offset: 1 (1%), Referenced to phase 4EBTL and 8:WBTL, Start of Green											
Natural Cycle: 60											
Control Type: Actuated-Coordinated											



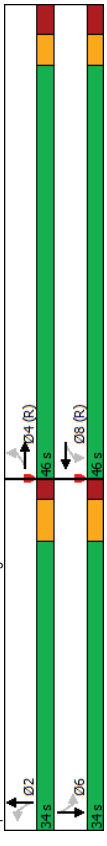
Future Background (PM)
Base Scenario

EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	NBR	SBR
Lane Configurations									
Traffic Volume (vph)	20	395	5	445	60	115	190	15	55
Future Volume (vph)	20	395	5	445	60	115	190	15	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Fpb. ped/bikes	0.94	0.94	0.96	0.96	0.98	0.98	0.91		
Fibb. ped/bikes	0.99	0.99	1.00	1.00	0.94	0.94	0.97		
Frt	0.98	0.98	0.98	0.98	0.99	0.99	0.96		
Flt Protected	1.00	1.00	1.00	1.00	0.98	0.98	0.99		
Satd. Flow (prot)	3027	3225	3225	3212	2799	2799	2799		
Flt Permitted	0.92	0.92	0.95	0.95	0.69	0.69	0.82		
Satd. Flow (perm)	2789	3065	3065	2260	2321	2321	2321		
Peak-Hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	22	439	61	6	494	67	128	211	17
RTOR Reduction (vph)	0	15	0	0	15	0	0	5	0
Lane Group Flow (vph)	0	507	0	0	552	0	0	351	0
Confl. Peds. (#/hr)	290	248	248	290	233	233	323	323	233
Confl. Bikes (#/hr)	15	15	15	45	45	10	10	10	5
Heavy Vehicles (%)	71%	6%	0%	0%	4%	6%	0%	0%	40%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases	4	4	8	8	2	2	6		
Permitted Phases	4	4	8	8	2	2	6		
Actuated Green, G (s)	31.0	31.0	31.0	31.0	16.4	16.4	16.4		
Effective Green, g (s)	32.0	32.0	32.0	32.0	17.4	17.4	17.4		
Actuated g/C Ratio	0.46	0.46	0.46	0.46	0.25	0.25	0.25		
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)	1274	1401	1401	561	576	576	576		
v/s Ratio Prot									
v/s Ratio Perm	c0.18	0.18	0.18	c0.16	0.13	0.13	0.13		
v/c Ratio	0.40	0.39	0.39	0.63	0.54	0.54	0.54		
Uniform Delay, d1	12.6	12.6	12.6	23.4	22.8	22.8	22.8		
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.9	0.8	0.8	2.2	2.2	2.2	2.2		
Delay (s)	13.5	13.4	13.4	25.6	23.9	23.9	23.9		
Level of Service	B	B	B	C	C	C	C		
Approach Delay (s)	13.5	13.4	13.4	25.6	23.9	23.9	23.9		
Approach LOS	B	B	B	C	C	C	C		
Intersection Summary									
HCM 2000 Control Delay	18.0	18.0	18.0	HCM 2000 Level of Service	B	B	B		
HCM 2000 Volume to Capacity ratio	0.42	0.42	0.42						
Actuated Cycle Length (s)	70.0	70.0	70.0	Sum of lost time (s)	14.0	14.0	14.0		
Intersection Capacity Utilization	67.8%	67.8%	67.8%	ICU Level of Service	C	C	C		
Analysis Period (min)	15	15	15						
c. Critical Lane Group									

Queues
6: Strachan Ave & King St W

EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
5	375	5	360	125	270	30	190
5	375	5	360	125	270	30	190
0	500	0	423	136	353	33	245
Perm	NA	Perm	NA	Perm	NA	Perm	NA
4	4	8	8	2	2	6	6
4	4	8	8	2	2	6	6
20.0	20.0	20.0	20.0	21.0	21.0	21.0	21.0
26.0	26.0	26.0	27.0	27.0	27.0	27.0	27.0
46.0	46.0	46.0	46.0	34.0	34.0	34.0	34.0
57.5%	57.5%	57.5%	57.5%	42.5%	42.5%	42.5%	42.5%
3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0
3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
C-Max	C-Max	C-Max	C-Max	Min	Min	Min	Min
0.32	0.24	0.59	0.66	0.19	0.19	0.47	0.47
9.1	9.0	49.0	44.7	22.8	24.4	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.1	9.0	49.0	44.7	22.8	24.4	0.0	0.0
16.7	14.4	23.5	59.5	4.1	31.1	0.0	0.0
27.1	m35.9	86.1	102	46.4	128.6	0.0	0.0
222.7	138.4	121.3	128.6	0.0	0.0	0.0	0.0
1546	1767	278	638	206	625	0.0	0.0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0.32	0.24	0.49	0.55	0.16	0.39	0.0	0.0

Intersection Summary
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 50 (63%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.



HCM Signalized Intersection Capacity Analysis
6: Strachan Ave & King St W

EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
5	375	5	360	125	270	55	30
5	375	5	360	125	270	55	30
1900	1900	1900	1900	1900	1900	1900	1900
5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
0.89	0.96	1.00	0.95	1.00	0.95	1.00	0.95
1.00	1.00	0.81	1.00	0.97	1.00	0.87	1.00
0.97	0.99	1.00	0.97	1.00	0.97	1.00	0.98
1.00	1.00	1.00	0.95	1.00	0.95	1.00	1.00
2787	3225	1438	1736	1555	1701	1555	1701
0.95	0.95	0.51	1.00	0.95	1.00	0.95	1.00
2653	3066	772	1736	575	1701	575	1701
0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
5	408	87	5	391	27	136	293
0	20	0	0	6	0	10	0
0	480	0	0	417	0	136	343
479	574	574	479	266	232	232	266
15	15	65	65	35	35	35	35
0%	7%	27%	0%	5%	4%	0%	0%
Perm	NA	Perm	NA	Perm	NA	Perm	NA
4	4	8	8	2	2	6	6
4	45.0	45.0	23.0	23.0	23.0	23.0	23.0
46.0	46.0	24.0	24.0	24.0	24.0	24.0	24.0
0.58	0.58	0.30	0.30	0.30	0.30	0.30	0.30
6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
1525	1762	231	520	172	510	172	510
c0.18	0.14	0.18	0.18	0.06	0.06	0.06	0.06
0.32	0.24	0.59	0.66	0.19	0.46	0.19	0.46
8.8	8.4	23.8	24.4	20.8	22.8	20.8	22.8
1.00	1.00	1.67	1.69	1.00	1.00	1.00	1.00
0.5	0.3	3.0	2.5	0.5	0.7	0.5	0.7
9.4	8.7	42.9	43.8	21.3	23.4	21.3	23.4
A	A	D	D	C	C	C	C
9.4	8.7	43.5	43.5	23.2	23.2	23.2	23.2
A	A	A	D	C	C	C	C

Intersection Summary
HCM 2000 Control Delay: 21.3
HCM 2000 Level of Service: C
HCM 2000 Volume to Capacity Ratio: 0.43
Actuated Cycle Length (s): 80.0
Sum of lost time (s): 10.0
Intersection Capacity Utilization: 67.2%
ICU Level of Service: C
Analysis Period (min): 15
Critical Lane Group: c

7: Atlantic St & Snooker St

Future Background (PM)

Base Scenario

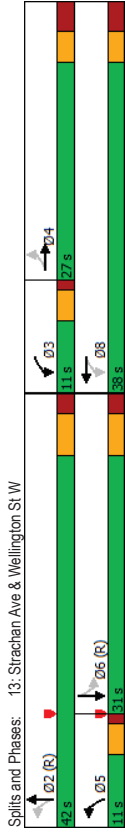
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W					R
Traffic Volume (veh/h)	30	215	205	30	90	75
Future Volume (Veh/h)	30	215	205	30	90	75
Sign Control	Stop		Free		Free	Free
Grade	0%		0%		0%	0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	32	226	216	32	95	79
Pedestrians	198		40			119
Lane Width (m)	3.5		3.5			3.5
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage						
Right turn flare (veh)	16		3			10
Median type			None			None
Median storage (veh)						
Upstream signal (m)						74
pX platoon unblocked						
vC, conflicting volume	739	549				446
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCn, unblocked vol	739	549				446
IC, single (s)	6.4	6.2				4.1
IC, 2 stage (s)						
IF (s)	3.5	3.3				2.2
p0 queue free %	89	45				90
CI capacity (veh/h)	283	408				944
Direction_Lane #	WB 1	NB 1	SB 1			
Volume Total	258	248	174			
Volume Left	32	0	95			
Volume Right	226	32	0			
cSH	387	1700	944			
Volume to Capacity	0.67	0.15	0.10			
Queue Length 95th (m)	37.3	0.0	2.7			
Control Delay (s)	31.1	0.0	5.5			
Lane LOS	D		A			
Approach Delay (s)	31.1	0.0	5.5			
Approach LOS	D		A			
Intersection Summary						
Average Delay			13.2			
Intersection Capacity Utilization			53.1%			ICU Level of Service
Analysis Period (min)			15			A

13: Strachan Ave & Wellington St W

Future Background (PM)

Base Scenario

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	h	h	h	h	h	h	h	h
Traffic Volume (vph)	10	105	265	175	150	400	5	265
Future Volume (vph)	10	105	265	175	150	400	5	265
Lane Group Flow (vph)	11	282	282	223	160	548	5	287
Turn Type	Perm	NA	pm+pt	NA	pm+pt	NA	Perm	NA
Protected Phases	4	3	8	5	2	2	6	
Permitted Phases	4	8						
Minimum Split (s)	27.0	27.0	10.0	26.0	10.0	29.0	29.0	29.0
Total Split (s)	27.0	27.0	11.0	38.0	11.0	42.0	31.0	31.0
Total Split (%)	33.8%	33.8%	13.8%	47.5%	13.8%	52.5%	38.8%	38.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	1.0	3.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	3.0	5.0	3.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead	Lead	Lead	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio	0.04	0.57	0.70	0.30	0.41	0.67	0.02	0.51
Control Delay	21.9	21.5	26.4	16.1	12.8	18.2	13.8	21.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay	21.9	21.5	26.4	16.1	12.8	18.3	13.8	21.4
Queue Length 50th (m)	1.3	25.0	29.1	21.5	13.6	54.5	0.6	41.2
Queue Length 95th (m)	5.2	49.9	#50.5	37.7	m21.3	m89.7	m1.6	62.3
Internal Link Dist (m)		64.0	134.1		143.3		121.3	
Turn Bay Length (m)	15.0		25.0		15.0		15.0	
Base Capacity (vph)	282	496	405	735	395	815	236	562
Starvation Cap Reductn	0	0	0	0	0	13	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.57	0.70	0.30	0.41	0.68	0.02	0.51
Intersection Summary								
Cycle Length: 80								
Actuated Cycle Length: 80								
Offset: 46 (58%), Referenced to phase 2-NBTL and 6-SBTL, Start of Green								
Natural Cycle: 80								
Control Type: Pretimed								
# 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.								



HCM Signalized Intersection Capacity Analysis
13: Strachan Ave & Wellington St W

Future Background (PM)
Base Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	10	105	160	265	175	35	150	400	115	5	265	5	
Traffic Volume (vph)	10	105	160	265	175	35	150	400	115	5	265	5	
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Ideal Flow (vphpl)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Lane Util. Factor	1.00	0.92	1.00	0.97	1.00	0.96	1.00	0.96	1.00	0.99	1.00	0.99	
Fpb. ped/bikes	0.88	1.00	0.98	1.00	0.89	1.00	0.89	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.91	1.00	0.98	1.00	0.97	1.00	0.97	1.00	1.00	1.00	0.95	
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00	0.95	
Satd. Flow (prot)	1575	1556	1749	1762	1566	1735	1690	1731	1690	1731	1731	1690	
Flt Permitted	0.62	1.00	0.38	1.00	0.42	1.00	0.41	1.00	0.41	1.00	1.00	0.41	
Satd. Flow (perm)	1027	1556	701	1762	698	1735	728	1731	728	1731	1731	728	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	
Adj. Flow (vph)	11	112	170	282	186	37	160	426	122	5	282	5	
RTOR Reduction (vph)	0	68	0	9	0	0	13	0	0	0	1	0	
Lane Group Flow (vph)	11	214	0	282	214	0	160	535	0	5	286	0	
Confl. Peds. (#/hr)	80	55	55	80	350	70	70	350	70	70	350	70	
Confl. Bikes (#/hr)	5	20	20	5	40	40	40	20	40	20	40	20	
Heavy Vehicles (%)	0%	1%	1%	0%	0%	4%	0%	1%	0%	0%	7%	20%	
Turn Types	Perm	NA	NA	pm+pt	NA	NA	pm+pt	NA	NA	Perm	NA	NA	
Protected Phases	4	3	8	5	2	2	5	2	2	6	6	6	
Permitted Phases	4	8	8	8	2	2	8	2	2	6	6	6	
Actuated Green, G (s)	21.0	21.0	32.0	32.0	36.0	36.0	36.0	36.0	36.0	25.0	25.0	25.0	
Effective Green, g (s)	22.0	22.0	33.0	33.0	37.0	37.0	37.0	37.0	37.0	26.0	26.0	26.0	
Actuated G/C Ratio	0.28	0.28	0.41	0.41	0.46	0.46	0.46	0.46	0.46	0.32	0.32	0.32	
Clearance Time (s)	6.0	6.0	4.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lane Grp Cap (vph)	282	427	393	726	411	802	411	802	236	562	562	562	
v/s Ratio Prot	0.14	0.14	c0.07	0.12	0.04	c0.31	0.04	c0.31	0.01	0.17	0.17	0.17	
v/s Ratio Perm	0.01	0.04	0.50	0.22	0.30	0.39	0.39	0.67	0.02	0.51	0.51	0.51	
Uniform Delay, d1	21.3	24.4	17.9	15.7	13.4	16.7	13.4	16.7	18.4	21.8	21.8	21.8	
Progression Factor	1.00	1.00	1.00	1.00	0.88	0.88	0.88	0.88	0.73	0.82	0.82	0.82	
Incremental Delay, d2	0.3	4.2	10.7	1.0	2.2	3.5	2.2	3.5	0.2	3.1	3.1	3.1	
Level of Service	C	C	C	B	B	B	B	B	B	B	C	C	
Approach Delay (s)	28.3	28.3	28.3	23.4	23.4	17.3	17.3	17.3	20.8	20.8	20.8	20.8	
Approach LOS	C	C	C	C	C	B	B	B	C	C	C	C	
Intersection Summary													
HCM 2000 Control Delay	21.4											HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75												
Actuated Cycle Length (s)	80.0											Sum of lost time (s)	16.0
Intersection Capacity Utilization	98.3%											ICU Level of Service	F
Analysis Period (min)	15												
c Critical Lane Group													

08-24-2023
BA Group

Synchro 11 Report

Queues
15: Dufferin St & Liberty St

Future Background (PM)
Base Scenario

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Configurations	1	1	1	1	1
Traffic Volume (vph)	330	170	470	70	255
Future Volume (vph)	330	170	470	70	255
Lane Group Flow (vph)	371	191	786	0	366
Turn Type	Prot	Perm	NA	Perm	NA
Protected Phases	8	2	2	6	6
Permitted Phases	8	8	2	6	6
Detector Phase	8	8	2	6	6
Switch Phase	18.0	18.0	18.0	18.0	18.0
Minimum Initial (s)	23.0	23.0	24.0	24.0	24.0
Minimum Split (s)	40.0	40.0	40.0	40.0	40.0
Total Split (s)	50.0%	50.0%	50.0%	50.0%	50.0%
Total Split (%)	3.0	3.0	4.0	4.0	4.0
Yellow Time (s)	2.0	2.0	2.0	2.0	2.0
All-Red Time (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Last Time Adjust (s)	4.0	4.0	5.0	5.0	5.0
Total Lost Time (s)					
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	C-Max	C-Max	C-Max
v/c Ratio	0.70	0.42	0.45	0.27	0.27
Control Delay	31.5	14.4	9.4	3.4	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	31.5	14.4	9.4	3.4	3.4
Queue Length 50th (m)	52.6	13.3	26.7	3.3	3.3
Queue Length 95th (m)	69.4	25.9	50.3	m8.6	m8.6
Internal Link Dist (m)	382.8	162.3	186.7		
Turn Bay Length (m)	10.0				
Base Capacity (vph)	787	638	1747	1372	1372
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.47	0.30	0.45	0.27	0.27
Intersection Summary					
Cycle Length: 80					
Actuated Cycle Length: 80					
Offset: 79 (99%), Referenced to phase 2:NBT and 6:SBTL, Start of Green					
Natural Cycle: 50					
Control Type: Actuated-Coordinated					
m Volume for 95th percentile queue is metered by upstream signal.					
Splits and Phases: 15: Dufferin St & Liberty St					

08-24-2023
BA Group

Synchro 11 Report

HCM Signalized Intersection Capacity Analysis
 15: Dufferin St & Liberty St

Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations	W	R	T	T	T	T	
Traffic Volume (vph)	330	170	470	230	70	255	
Future Volume (vph)	330	170	470	230	70	255	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95	
Fpb. ped/bikes	1.00	0.85	0.88	1.00	1.00	0.98	
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.99	1.00	0.99	
Satd. Flow (prot)	1750	1316	2900	3268	1750	1316	
Flt Permitted	0.95	1.00	1.00	0.71	1.00	0.71	
Satd. Flow (perm)	1750	1316	2900	2345	1750	1316	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	
Adj. Flow (vph)	371	191	528	258	79	287	
RTOR Reduction (vph)	0	57	55	0	0	0	
Lane Group Flow (vph)	371	134	731	0	0	366	
Conf. Peds. (#/hr)	169	104	157	157	157	157	
Conf. Bikes (#/hr)	6	6	8	8	8	8	
Heavy Vehicles (%)	2%	3%	4%	1%	1%	7%	
Turn Type	Prot	Perm	NA	Perm	NA	NA	
Protected Phases	8	2	2	6	6	6	
Permitted Phases	8	2	2	6	6	6	
Actuated Green, G (s)	23.3	23.3	45.7	45.7	45.7	45.7	
Effective Green, g (s)	24.3	24.3	46.7	46.7	46.7	46.7	
Actuated g/C Ratio	0.30	0.30	0.88	0.58	0.58	0.58	
Clearance Time (s)	5.0	5.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap. (vph)	531	399	1692	1368	531	399	
v/s Ratio Prot	0.21	0.25	0.25	0.16	0.16	0.16	
v/s Ratio Perm	0.70	0.34	0.43	0.27	0.27	0.27	
v/c Ratio	24.6	21.6	9.3	8.2	8.2	8.2	
Uniform Delay, d1	1.00	1.00	1.00	0.32	0.32	0.32	
Progression Factor	4.0	0.5	0.8	0.4	0.4	0.4	
Incremental Delay, d2	28.6	22.1	10.1	3.0	3.0	3.0	
Delay (s)	C	C	B	A	A	A	
Level of Service	C	C	B	A	A	A	
Approach Delay (s)	28.4	10.1	3.0	3.0	3.0	3.0	
Approach LOS	C	B	A	A	A	A	
Intersection Summary							
HCM 2000 Control Delay	13.9					HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52						
Actuated Cycle Length (s)	80.0					Sum of lost time (s)	9.0
Intersection Capacity Utilization	67.7%					ICU Level of Service	C
Analysis Period (min)	15						
c Critical Lane Group							

HCM Unsignalized Intersection Capacity Analysis
 16: Atlantic St & Liberty St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	40	260	50	15	170	80	35	115	55	45	20	35
Future Volume (vph)	40	260	50	15	170	80	35	115	55	45	20	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	41	265	51	15	173	82	36	117	56	46	20	36
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	357	270	209	102								
Volume Left (vph)	41	15	36	46								
Volume Right (vph)	51	82	56	36								
Head (s)	-0.05	-0.08	-0.11	-0.11								
Departure Headway (s)	5.2	5.3	5.6	5.9								
Degree Utilization, x	0.52	0.40	0.33	0.17								
Capacity (veh/h)	685	634	570	513								
Control Delay (s)	13.6	11.7	11.4	10.0								
Approach Delay (s)	13.6	11.7	11.4	10.0								
Approach LOS	B	B	B	B								
Intersection Summary												
Delay	12.2											
Level of Service	B											
Intersection Capacity Utilization	54.0%											
Analysis Period (min)	15											
ICU Level of Service	A											

16: Atlantic St & Liberty St
 Future Background (PM)
 Base Scenario

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, shveh	12.1											
Intersection LOS	B											
Movement												
Lane Configurations	40	260	50	15	170	80	35	115	55	45	20	35
Traffic Vol, veh/h	40	260	50	15	170	80	35	115	55	45	20	35
Future Vol, veh/h	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Peak Hour Factor	0	1	0	0	1	16	5	0	0	0	0	2
Heavy Vehicles, %	41	265	51	15	173	82	36	117	56	46	20	36
Mvmt Flow	0	1	0	0	1	0	0	1	0	0	1	0
Number of Lanes												
Approach	EB	WB	WB	EB	WB	WB	NB	NB	SB	SB	NB	SB
Opposing Approach	WB	EB	WB	EB	WB	WB	SB	SB	NB	NB	WB	WB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	NB	EB	EB	EB	WB	WB	WB	WB	EB	EB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	WB	WB	WB	EB	EB	EB	EB	WB	WB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	13.5	11.5	11.5	11.5	11.5	11.5	10	10	10	10	10	10
HCM LOS	B	B	B	B	B	B	A	A	A	A	A	A

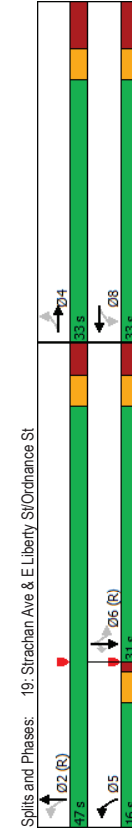
Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	17%	11%	6%	45%
Vol Thru, %	56%	74%	64%	20%
Vol Right, %	27%	14%	30%	35%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	205	350	265	100
LT Vol	35	40	15	45
Through Vol	115	260	170	20
RT Vol	55	80	80	35
Lane Flow Rate	209	357	270	102
Geometry Grp	1	1	1	1
Degree of Uhl (X)	0.329	0.511	0.389	0.165
Departure Headway (Hd)	5.666	5.162	5.175	5.811
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	632	700	692	615
Service Time	3.718	3.195	3.221	3.87
HCM Lane V/C Ratio	0.331	0.51	0.39	0.166
HCM Control Delay	11.5	13.5	11.5	10
HCM Lane LOS	B	B	B	A
HCM 95th-ile Q	1.4	2.9	1.8	0.6

19: Strachan Ave & E Liberty St/Ordinance St
 Future Background (PM)
 Base Scenario



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	4	4	4	4	4	4	4	4	4
Traffic Volume (vph)	240	35	60	35	305	375	65	380	245
Future Volume (vph)	240	35	60	35	305	375	65	380	245
Lane Group Flow (vph)	250	307	0	151	318	464	68	396	255
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm
Protected Phases	4	8	5	2	6	6	6	6	6
Permitted Phases	4	8	5	2	6	6	6	6	6
Minimum Split (s)	32.6	32.6	32.6	10.0	27.3	27.3	27.3	27.3	27.3
Total Split (s)	33.0	33.0	33.0	16.0	47.0	31.0	31.0	31.0	31.0
Total Split (%)	41.3%	41.3%	41.3%	20.0%	58.8%	38.8%	38.8%	38.8%	38.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	4.6	4.6	4.6	1.0	3.3	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.6	6.6	6.6	3.0	5.3	5.3	5.3	5.3	5.3
Lead/Lag									
Lead/Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio	0.80	0.74	0.47	0.72	0.53	0.32	0.67	0.93	0.93
Control Delay	45.5	18.3	21.7	21.3	15.3	24.6	27.1	49.2	49.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.5	18.3	21.7	21.3	15.3	24.6	27.1	49.2	49.2
Queue Length 50th (m)	35.9	6.8	14.2	25.8	45.5	7.6	45.3	17.0	17.0
Queue Length 95th (m)	#76.0	#52.5	32.3	#54.6	72.3	m15.9	75.5	m#75.3	143.3
Internal Link Dist (m)	45.8		123.7		152.3				
Turn Bay Length (m)	314	416	324	443	873	213	591	274	274
Base Capacity (vph)	0	0	0	0	0	0	0	0	0
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.74	0.47	0.72	0.53	0.32	0.67	0.93	0.93

Intersection Summary
 Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 44 (55%), Referenced to phase 2-NBTL and 6-SBTL, Start of Green
 Natural Cycle: 75
 Control Type: Pre-timed
 # 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.



HCM Signalized Intersection Capacity Analysis
 19: Strachan Ave & E Liberty St/Ordnance St

HCM Unsignalized Intersection Capacity Analysis
 8: Hanna Ave/75 Hanna Ave & Snooker St/Private St

Movement	Future Background (PM)											SBR	
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT		
Lane Configurations	→	→	→	←	←	←	←	←	←	←	←	↔	
Traffic Volume (vph)	240	35	260	60	35	50	305	375	70	65	380	245	
Future Volume (vph)	240	35	260	60	35	50	305	375	70	65	380	245	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	3.0	5.3	5.3	5.3	5.3	5.3	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Fpb. ped/bikes	1.00	0.46	1.00	0.87	1.00	0.91	1.00	0.91	1.00	1.00	1.00	0.31	
Fpb. ped/bikes	0.74	1.00	1.00	0.85	1.00	0.93	1.00	0.93	1.00	0.71	1.00	1.00	
Ft	1.00	0.87	1.00	0.95	1.00	0.98	1.00	0.98	1.00	1.00	1.00	0.85	
Ft Protected	0.95	1.00	1.00	0.98	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1303	758	1294	1664	1673	1673	1664	1673	1273	1842	1842	474	
Ft Permitted	0.69	1.00	1.00	0.69	1.00	0.29	1.00	0.29	1.00	0.60	1.00	1.00	
Satd. Flow (perm)	952	758	910	910	506	1673	506	1673	665	1842	1842	474	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	
Adj. Flow (vph)	250	36	271	62	36	52	318	391	73	68	396	255	
RTOR Reduction (vph)	0	166	0	0	23	0	0	2	0	0	0	122	
Lane Group Flow (vph)	250	141	0	0	128	0	318	462	0	68	396	133	
Conf. Peds. (#/hr)	209	600	600	209	725	49	385	385	15	15	8	8	
Conf. Bikes (#/hr)	13	0	0	0	0	0	0	0	0	0	0	0	
Heavy Vehicles (%)	1%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	2%	
Turn Types	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm	NA	
Protected Phases	4	8	5	2	2	2	5	2	6	6	6	6	
Permitted Phases	4	8	5	2	2	2	5	2	6	6	6	6	
Actuated Green, G (s)	25.4	25.4	25.4	25.4	40.7	40.7	40.7	40.7	24.7	24.7	24.7	24.7	
Effective Green, g (s)	26.4	26.4	26.4	26.4	41.7	41.7	41.7	41.7	25.7	25.7	25.7	25.7	
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.52	0.52	0.52	0.52	0.32	0.32	0.32	0.32	
Clearance Time (s)	7.6	7.6	7.6	7.6	4.0	6.3	6.3	6.3	6.3	6.3	6.3	6.3	
Lane Grp Cap (vph)	314	250	300	300	451	872	213	591	152	152	152	152	
v/s Ratio Prot	0.19	0.19	0.19	0.19	0.11	0.28	0.11	0.28	0.10	0.21	0.21	0.21	
v/s Ratio Perm	0.26	0.26	0.26	0.26	0.14	0.25	0.14	0.25	0.10	0.28	0.28	0.28	
v/c Ratio	0.80	0.56	0.43	0.43	0.71	0.53	0.71	0.53	0.32	0.67	0.87	0.87	
Uniform Delay, d1	24.4	22.1	20.9	20.9	12.9	12.7	12.7	12.7	20.5	23.5	25.6	25.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.92	1.36	1.36	
Incremental Delay, d2	18.6	8.9	4.4	4.4	8.9	2.3	2.3	2.3	3.2	4.8	39.2	39.2	
Delay (s)	43.0	30.9	25.3	25.3	21.9	15.0	15.0	15.0	23.3	26.5	74.1	74.1	
Level of Service	D	C	C	C	C	B	B	B	C	C	C	E	
Approach Delay (s)	36.3	36.3	36.3	36.3	25.3	17.8	17.8	17.8	43.1	43.1	43.1	43.1	
Approach LOS	D	D	D	D	C	B	B	B	D	D	D	D	
Intersection Summary													
HCM 2000 Control Delay	31.2											HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81												
Actuated Cycle Length (s)	80.0											Sum of lost time (s)	14.9
Intersection Capacity Utilization	104.9%											ICU Level of Service	G
Analysis Period (min)	15												
c Critical Lane Group													

HCM 6th AWSC
8: Hanna Ave/75 Hanna Ave & Snooker St/Private St

HCM Unsignalized Intersection Capacity Analysis
11: Private St & Existing Metro Driveway

Future Background (PM)
Base Scenario

Future Background (PM)
Base Scenario

Intersection	9.6											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	35	70	15	90	210	10	40	30	70	0	0	0
Traffic Vol, veh/h	35	70	15	90	210	10	40	30	70	0	0	0
Future Vol, veh/h	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Peak Hour Factor	0	0	0	0	0	0	2	0	0	0	0	0
Heavy Vehicles, %	37	74	16	95	221	11	42	32	74	0	0	0
Mgmt Flow	0	1	0	0	1	0	0	1	0	0	1	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	WB	EB	WB	NB	NB	SB	SB	SB	SB	SB
Opposing Approach	WB	EB	WB	EB	WB	NB	SB	SB	NB	NB	NB	NB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	NB	EB	EB	EB	EB	WB	WB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	WB	WB	WB	WB	EB	EB	EB	EB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	8.5	10.4	10.4	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9
HCM LOS	A	B	B	A	A	A	A	A	A	A	A	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W	W	Stop	Stop	Stop	Stop
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	25	105	135	50	40	25
Future Volume (vph)	25	105	135	50	40	25
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	28	118	152	56	45	28
Direction, Lane #	EB 1	NB 1	SB 1	SB 1	SB 1	SB 1
Volume Total (vph)	146	208	73			
Volume Left (vph)	28	152	0			
Volume Right (vph)	118	0	28			
Head (s)	-0.45	0.15	-0.23			
Departure Headway (s)	4.1	4.4	4.2			
Degree Utilization, x	0.17	0.26	0.09			
Capacity (veh/h)	818	781	804			
Control Delay (s)	7.9	9.0	7.6			
Approach Delay (s)	7.9	9.0	7.6			
Approach LOS	A	A	A			
Intersection Summary	8.4					
Delay	8.4					
Level of Service	A					
Intersection Capacity Utilization	32.5%					
Analysis Period (min)	15					
ICU Level of Service	A					

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	23%	29%	29%	0%
Vol Thru, %	21%	56%	68%	100%
Vol Right, %	50%	12%	3%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	140	120	310	0
LT Vol	40	35	90	0
Through Vol	30	70	210	0
RT Vol	70	15	10	0
Lane Flow Rate	147	126	326	0
Geometry Grp	1	1	1	1
Degree of Uhl (X)	0.193	0.161	0.402	0
Departure Headway (Hd)	4.709	4.586	4.438	5.128
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	760	779	809	0
Service Time	2.745	2.632	2.467	3.179
HCM Lane V/C Ratio	0.193	0.162	0.403	0
HCM Control Delay	8.9	8.5	10.4	8.2
HCM Lane LOS	A	A	B	N
HCM 95th-ile Q	0.7	0.6	2	0

HCM 6th AWSC
11: Private St & Existing Metro Driveway

HCM Unsignalized Intersection Capacity Analysis
12: Private St & 120 Lynn Williams Driveway

Future Background (PM)
Base Scenario

Future Background (PM)
Base Scenario

Intersection	EBL	EBR	NBL	NBT	SBR
Intersection Delay, s/veh	8.3				
Intersection LOS	A				
Movement	EBL	EBR	NBL	NBT	SBR
Lane Configurations	W			4	1
Traffic Vol, veh/h	25	105	135	50	40
Future Vol, veh/h	25	105	135	50	40
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles, %	0	0	0	0	0
Mgmt Flow	28	118	152	56	45
Number of Lanes	1	0	0	1	1
Approach	EB	NB	SB	SB	SB
Opposing Approach		SB	NB		
Opposing Lanes	0	1	1		
Conflicting Approach Left	SB	EB			
Conflicting Lanes Left	1	1			
Conflicting Approach Right	NB		EB		
Conflicting Lanes Right	1		1		
HCM Control Delay	7.9	8.9	7.6		
HCM LOS	A	A	A		
Lane	NBLn1	EBLn1	SBLn1	SBLn1	
Vol Left, %	73%	19%	0%		
Vol Thru, %	27%	0%	62%		
Vol Right, %	0%	81%	38%		
Sign Control	Stop	Stop	Stop		
Traffic Vol by Lane	185	130	65		
LT Vol	135	25	0		
Through Vol	50	0	40		
RT Vol	0	105	25		
Lane Flow Rate	208	146	73		
Geometry Grp	1	1	1		
Degree of U/I (X)	0.252	0.166	0.085		
Departure Headway (Hd)	4.361	4.092	4.21		
Convergence, Y/N	Yes	Yes	Yes		
Cap	813	881	854		
Service Time	2.451	2.095	2.223		
HCM Lane V/C Ratio	0.256	0.166	0.085		
HCM Control Delay	8.9	7.9	7.6		
HCM Lane LOS	A	A	A		
HCM 95th-ile Q	1	0.6	0.3		

Movement	EBL	EBR	NBL	NBT	SBR
Lane Configurations	W			4	1
Traffic Volume (veh/h)	0	55	90	185	145
Future Volume (Veh/h)	0	55	90	185	145
Sign Control	Stop	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	59	96	197	154
Pedestrians	160			50	160
Lane Width (m)	3.5			3.5	3.5
Walking Speed (mis)	1.2			1.2	1.2
Percent Blockage	13			4	13
Right turn flare (veh)					
Median type				None	None
Median storage (veh)					
Upstream signal (m)					
PX, platoon unblocked					
VC, conflicting volume	863	364	314		
VC1, stage 1 conf vol					
VC2, stage 2 conf vol					
VCu, unblocked vol	863	364	314		
IC, single (s)	6.4	6.2	4.1		
IC, 2 stage (s)					
IF (s)	3.5	3.3	2.2		
p0 queue free %	100	90	91		
dm capacity (veh/h)	226	572	1095		
Direction, Lane #	EB 1	NB 1	SB 1		
Volume Total	59	293	154		
Volume Left	0	96	0		
Volume Right	59	0	0		
ESH	572	1095	1700		
Volume to Capacity	0.10	0.09	0.09		
Queue Length 95th (m)	2.7	2.3	0.0		
Control Delay (s)	12.0	3.4	0.0		
Lane LOS	B	A	A		
Approach Delay (s)	12.0	3.4	0.0		
Approach LOS	B				
Intersection Summary					
Average Delay			3.4		
Intersection Capacity Utilization			50.2%		ICU Level of Service
Analysis Period (min)			15		A

HCM Unsignalized Intersection Capacity Analysis
 14: Lynn Williams St & Private St

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W					4
Traffic Volume (veh/h)	55	65	215	55	60	145
Future Volume (Veh/h)	55	65	215	55	60	145
Sign Control	Stop	Stop	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	58	68	226	58	63	153
Pedestrians	115		49			170
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Walking Speed (m/s)	1.2	1.2	1.2	1.2	1.2	1.2
Percent Blockage	9		4			14
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
pX platoon unblocked						
VC, conflicting volume	698	540				399
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol	698	540				399
IC, single (s)	6.4	6.2				4.1
IC, 2 stage (s)	3.5	3.3				2.2
p0 queue free %	83	84				94
CM capacity (veh/h)	336	427				1062
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	126	284	216			
Volume Left	58	0	63			
Volume Right	68	58	0			
cSH	379	1700	1062			
Volume to Capacity	0.33	0.17	0.06			
Queue Length 95th (m)	11.4	0.0	1.5			
Control Delay (s)	19.1	0.0	2.9			
Lane LOS	C	A	A			
Approach Delay (s)	19.1	0.0	2.9			
Approach LOS	C					
Intersection Summary						
Average Delay			4.9			
Intersection Capacity Utilization			50.2%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 17: Liberty St/E Liberty St & Hanna Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		Stop	Stop		Stop	Stop		Stop	Stop		Stop	Stop
Traffic Volume (vph)	70	280	45	20	165	50	50	15	35	20	10	35
Future Volume (vph)	70	280	45	20	165	50	50	15	35	20	10	35
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	77	308	49	22	181	55	55	16	38	22	11	38
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	434	258	109	71								
Volume Left (vph)	77	22	55	22								
Volume Right (vph)	49	55	38	38								
Head (s)	-0.03	0.00	-0.06	-0.23								
Departure Headway (s)	4.7	5.0	5.7	5.6								
Degree Utilization, x	0.57	0.36	0.17	0.11								
Capacity (veh/h)	731	688	554	555								
Control Delay (s)	13.9	10.7	9.8	9.3								
Approach Delay (s)	13.9	10.7	9.8	9.3								
Approach LOS	B	B	A	A								
Intersection Summary												
Delay				12.1								
Level of Service				B								B
Intersection Capacity Utilization				57.9%								
Analysis Period (min)				15								

HCM 6th AWSC
17: Liberty St/E Liberty St & Hanna Ave

HCM Unsignalized Intersection Capacity Analysis
18: E Liberty St & Lynn Williams St

Future Background (PM)
Base Scenario

Future Background (PM)
Base Scenario

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	11.9											
Intersection LOS	B											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	70	280	45	20	165	50	50	15	35	20	10	35
Traffic Vol, veh/h	70	280	45	20	165	50	50	15	35	20	10	35
Future Vol, veh/h	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Peak Hour Factor	0	0	0	0	9	0	6	0	0	6	0	0
Heavy Vehicles, %	77	308	49	22	181	55	55	16	38	22	11	38
Mvmt Flow	0	1	0	0	1	0	0	1	0	0	1	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	WB	WB	EB	SB	NB	NB	SB	SB	SB	SB
Opposing Approach	WB	EB	SB	SB	WB	EB	WB	WB	NB	NB	NB	NB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	NB	EB	EB	WB	WB	WB	WB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	WB	WB	EB	EB	EB	EB	EB	EB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	13.7	10.4	10.4	9.9	9.9	9.3	9.3	9.3	9.3	9.3	9.3	9.3
HCM LOS	B	B	B	A	A	A	A	A	A	A	A	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR
Lane Configurations	70	285	195	200	120	80	120	80
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	70	285	195	200	120	80	120	80
Future Volume (vph)	70	285	195	200	120	80	120	80
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	75	285	210	215	129	86	129	86
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 1	SB 1	SB 1	SB 1
Volume Total (vph)	75	285	425	215	215	215	215	215
Volume Left (vph)	75	0	0	0	129	86	129	86
Volume Right (vph)	0	0	215	86	86	86	86	86
Head (s)	0.52	0.00	-0.25	-0.12	-0.12	-0.12	-0.12	-0.12
Departure Headway (s)	6.1	5.6	4.9	5.7	5.7	5.7	5.7	5.7
Degree Utilization, x	0.13	0.44	0.58	0.34	0.34	0.34	0.34	0.34
Capacity (veh/h)	589	619	711	576	576	576	576	576
Control Delay (s)	8.8	11.8	14.4	11.5	11.5	11.5	11.5	11.5
Approach Delay (s)	11.2	14.4	11.5	11.5	11.5	11.5	11.5	11.5
Approach LOS	B	B	B	B	B	B	B	B
Intersection Summary								
Delay	12.6							
Level of Service	B							
Intersection Capacity Utilization	55.4%							
ICU Level of Service	B							
Analysis Period (min)	15							

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	50%	18%	9%	31%
Vol Thru, %	15%	71%	70%	15%
Vol Right, %	35%	11%	21%	54%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	100	395	235	65
LT Vol	50	70	20	20
Through Vol	15	280	165	10
RT Vol	35	45	50	35
Lane Flow Rate	110	434	258	71
Geometry Grp	1	1	1	1
Degree of Uhl (X)	0.174	0.562	0.343	0.111
Departure Headway (Hd)	5.687	4.662	4.785	5.619
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	634	764	741	641
Service Time	3.689	2.747	2.882	3.624
HCM Lane V/C Ratio	0.174	0.568	0.348	0.111
HCM Control Delay	9.9	13.7	10.4	9.3
HCM Lane LOS	A	B	B	A
HCM 95th-ile Q	0.6	3.5	1.5	0.4

HCM 6th AWSC
18: E Liberty St & Lynn Williams St

HCM 20: Pirandello St & E Liberty St

Future Background (PM)
Base Scenario

Future Background (PM)
Base Scenario

Intersection	EBL	EBT	WBT	WBR	SBL	SBR
Intersection Delay, s/veh	13.2					
Intersection LOS	B					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	70	265	195	200	120	80
Traffic Vol, veh/h	70	265	195	200	120	80
Future Vol, veh/h	0.93	0.93	0.93	0.93	0.93	0.93
Peak Hour Factor	1	0	6	0	0	0
Heavy Vehicles, %	75	285	210	215	129	86
Mgmt Flow	1	1	1	0	1	0
Number of Lanes	EB	WB	WB	WB	SB	SB
Approach	WB	EB				
Opposing Approach	1	2			0	
Conflicting Lanes	SB				WB	WB
Conflicting Approach Left	1	0			1	
Conflicting Lanes Left	SB	SB	EB		EB	
Conflicting Approach Right	0	1	2		2	
Conflicting Lanes Right	12.2	14.8	11.6		11.6	
HCM Control Delay	B	B	B	B	B	B
HCM LOS						
Lane	EBLn1	EBLn2	WBLn1	SBLn1		
Vol Left, %	100%	0%	0%	60%		
Vol Thru, %	0%	100%	49%	0%		
Vol Right, %	0%	0%	51%	40%		
Sign Control	Stop	Stop	Stop	Stop		
Traffic Vol by Lane	70	265	395	200		
LT Vol	70	0	0	120		
Through Vol	0	265	195	0		
RT Vol	0	0	200	80		
Lane Flow Rate	75	285	425	215		
Geometry Grp	7	7	5	2		
Degree of UHl (X)	0.128	0.444	0.586	0.339		
Departure Headway (Hd)	6.128	5.605	4.97	5.674		
Convergence, Y/N	Yes	Yes	Yes	Yes		
Cap	586	644	731	634		
Service Time	3.856	3.332	2.97	3.711		
HCM Lane V/C Ratio	0.128	0.443	0.581	0.339		
HCM Control Delay	9.8	12.8	14.8	11.6		
HCM Lane LOS	A	B	B	B		
HCM 95th-ile Q	0.4	2.3	3.9	1.5		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	365	10	50	365	90	10	0	25	115	5	20
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	10	365	10	50	365	90	10	0	25	115	5	20
Future Volume (vph)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Peak Hour Factor	11	406	11	56	406	100	11	0	28	128	6	22
Hourly flow rate (vph)	EB 1	WB 1	NB 1	SB 1								
Direction, Lane #	428	562	39	156								
Volume Total (vph)	11	56	11	128								
Volume Left (vph)	11	100	28	22								
Volume Right (vph)	-0.01	-0.05	-0.37	0.08								
Head (s)	5.4	5.2	6.5	6.6								
Departure Headway (s)	0.64	0.80	0.07	0.28								
Degree Utilization, x	645	685	467	498								
Capacity (veh/h)	17.3	25.8	10.0	12.1								
Control Delay (s)	C	D	A	B								
Approach Delay (s)												
Approach LOS												
Intersection Summary												
Delay			20.4									
Level of Service			C									
Intersection Capacity Utilization			73.2%									
Analysis Period (min)			15									

HCM 6th AWSC
20: Pirandello St & E Liberty St

HCM Unsynchronized Intersection Capacity Analysis
21: Lynn Williams St & Western Battery Road

Future Background (PM)
Base Scenario

Future Background (PM)
Base Scenario

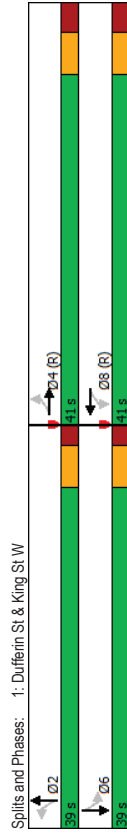
Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	20.8											
Intersection LOS	C											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	365	10	50	365	90	10	0	25	115	5	20
Traffic Vol, veh/h	10	365	10	50	365	90	10	0	25	115	5	20
Future Vol, veh/h	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Peak Hour Factor	12	0	2	3	0	0	0	0	0	0	0	0
Heavy Vehicles, %	11	406	11	56	406	100	11	0	28	128	6	22
Mgmt Flow	0	1	0	0	1	0	0	1	0	0	1	0
Number of Lanes												
Approach	EB	WB	EB	WB	WB	NB	NB	SB	SB	SB	NB	NB
Opposing Approach	1	1	1	1	1	1	1	1	1	1	1	1
Opposing Lanes	SB	NB	EB	WB	WB	EB	WB	WB	WB	WB	WB	WB
Conflicting Approach Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Lanes Left	NB	SB	SB	WB	WB	EB	WB	WB	WB	WB	WB	WB
Conflicting Approach Right	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Lanes Right	18.6	25.6	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
HCM Control Delay												
HCM LOS	C	D	D	B	B	B	B	B	B	B	B	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR
Lane Configurations	40	75	80	25	25	40	40	40
Traffic Volume (veh/h)	40	75	80	25	25	40	40	40
Future Volume (Veh/h)	Free	Free	Free	Free	Free	Stop	Stop	Stop
Sign Control	0%	0%	0%	0%	0%	0%	0%	0%
Grade	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Peak Hour Factor	53	100	107	33	33	53	53	53
Hourly flow rate (vph)	16	56	56	3.5	3.5	3.5	3.5	3.5
Pedestrians	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Lane Width (m)	1	5	5	19	19	19	19	19
Walking Speed (m/s)	None	None	None	None	None	None	None	None
Percent Blockage	None	None	None	None	None	None	None	None
Right turn flare (veh)	None	None	None	None	None	None	None	None
Median type	None	None	None	None	None	None	None	None
Median storage (veh)	None	None	None	None	None	None	None	None
Upstream signal (m)	379	624	378	624	378	378	378	378
px, platoon unblocked	VC, conflicting volume	VC1, stage 1 conf vol	VC2, stage 2 conf vol	VCu, unblocked vol	IC, single (s)	IC, 2 stage (s)	IF (s)	p0 queue free %
VC, conflicting volume	379	624	378	624	378	624	378	378
VC1, stage 1 conf vol	4.1	2.2	2.2	94	94	94	90	90
VC2, stage 2 conf vol	2.2	94	94	94	94	94	90	90
VCu, unblocked vol	951	329	329	532	532	532	532	532
IC, single (s)	2.2	94	94	94	94	94	90	90
IC, 2 stage (s)	951	329	329	532	532	532	532	532
IF (s)	2.2	94	94	94	94	94	90	90
p0 queue free %	951	329	329	532	532	532	532	532
dm capacity (veh/h)	EB 1	WB 1	SB 1	EB 1	WB 1	SB 1	EB 1	WB 1
Direction, Lane #	153	140	86	53	0	33	0	33
Volume Total	Volume Left	Volume Right	gSH	961	1700	430	0.06	0.08
Volume Left	0	33	53	0.06	0.08	0.20	1.4	0.0
Volume Right	961	1700	430	0.06	0.08	0.20	1.4	0.0
gSH	0.06	0.08	0.20	1.4	0.0	5.9	3.5	0.0
Volume to Capacity	1.4	0.0	5.9	3.5	0.0	15.5	A	C
Queue Length 95th (m)	A	C	C	3.5	0.0	15.5	3.5	0.0
Control Delay (s)	3.5	0.0	15.5	3.5	0.0	15.5	C	C
Lane LOS	Approach Delay (s)	Approach LOS	Intersection Summary	Average Delay	Intersection Capacity Utilization	ICU Level of Service	Analysis Period (min)	A
Approach Delay (s)	3.5	0.0	15.5	4.9	28.3%	A	15	A
Approach LOS	C	C	C	4.9	28.3%	A	15	A

Queues
1: Dufferin St & King St W

Future Total (AM)
Base Scenario

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	4	4	8	8	2	2	6	6
Traffic Volume (vph)	85	255	40	260	20	215	85	425
Future Volume (vph)	85	255	40	260	20	215	85	425
Ideal Flow (vphpl)	0	418	0	424	0	332	0	690
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4	4	8	8	2	2	6	6
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	21.0	21.0	21.0	21.0	20.0	20.0	20.0	20.0
Minimum Split (s)	28.0	28.0	28.0	28.0	27.0	27.0	27.0	27.0
Total Split (s)	41.0	41.0	41.0	41.0	39.0	39.0	39.0	39.0
Total Split (%)	51.3%	51.3%	51.3%	51.3%	48.8%	48.8%	48.8%	48.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	C-Min	C-Min	C-Min	C-Min	Min	Min	Min	Min
v/c Ratio	0.34	0.31	0.34	0.31	0.37	0.37	0.76	0.76
Control Delay	12.5	10.9	12.5	10.9	21.0	21.0	27.2	27.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.5	10.9	12.5	10.9	21.0	21.0	27.2	27.2
Queue Length 50th (m)	18.1	16.0	18.1	16.0	20.1	20.1	47.2	47.2
Queue Length 95th (m)	33.4	30.1	33.4	30.1	27.0	27.0	59.4	59.4
Internal Link Dist (m)	163.4	383.3	163.4	383.3	189.0	189.0	183.0	183.0
Turn Bay Length (m)								
Base Capacity (vph)	1213	1352	1213	1352	1094	1094	1126	1126
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.31	0.34	0.31	0.30	0.30	0.61	0.61
Intersection Summary								
Cycle Length: 80								
Actuated Cycle Length: 80								
Offset: 28 (35%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green								
Natural Cycle: 55								
Control Type: Actuated-Coordinated								



HCM Signalized Intersection Capacity Analysis
1: Dufferin St & King St W

Future Total (AM)
Base Scenario

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBT	SBT
Movement	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBT	SBT
Lane Configurations	4	4	8	8	2	2	6	6	6	6
Traffic Volume (vph)	85	255	40	260	20	215	85	425	425	425
Future Volume (vph)	85	255	40	260	20	215	85	425	425	425
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Fpb. ped/bikes	0.96	0.96	0.96	0.96	0.93	0.93	0.96	0.96	0.96	0.96
Fibb. ped/bikes	0.97	0.97	0.97	0.97	1.00	1.00	0.98	0.98	0.98	0.98
Frt	0.98	0.98	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Flt Protected	0.99	0.99	0.99	0.99	1.00	1.00	0.99	0.99	0.99	0.99
Satd. Flow (prot)	2967	2967	2881	2881	2804	2804	3070	3070	3070	3070
Flt Permitted	0.77	0.77	0.87	0.87	0.89	0.89	0.84	0.84	0.84	0.84
Satd. Flow (perm)	2302	2302	2532	2532	2493	2493	2688	2688	2688	2688
Peak-Hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	277	49	43	283	98	22	234	76	92
RTOR Reduction (vph)	0	11	0	0	30	0	0	40	0	0
Lane Group Flow (vph)	0	407	0	0	394	0	0	292	0	0
Conf. Peds. (#/hr)	180	305	305	180	158	244	244	158	158	158
Heavy Vehicles (%)	10%	8%	17%	42%	8%	11%	20%	3%	6%	4%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4	4	8	8	2	2	6	6	6	6
Permitted Phases	4	4	8	8	2	2	6	6	6	6
Actuated Green, G (s)	40.8	40.8	40.8	40.8	26.2	26.2	26.2	26.2	26.2	26.2
Effective Green, g (s)	41.8	41.8	41.8	41.8	27.2	27.2	27.2	27.2	27.2	27.2
Actuated g/C Ratio	0.52	0.52	0.52	0.52	0.34	0.34	0.34	0.34	0.34	0.34
Clearance Time (s)	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1202	1322	1202	1322	847	847	879	879	879	879
v/s Ratio Prot										
v/s Ratio Perm	0.18	0.16	0.30	0.30	0.12	0.12	0.25	0.25	0.25	0.25
v/c Ratio	0.34	0.30	0.34	0.30	0.35	0.35	0.75	0.75	0.75	0.75
Uniform Delay, d1	11.1	10.8	11.1	10.8	19.7	19.7	23.4	23.4	23.4	23.4
Progression Factor	1.00	1.00	1.00	1.00	1.30	1.30	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	0.6	0.8	0.6	0.2	0.2	3.5	3.5	3.5	3.5
Delay (s)	11.8	11.4	11.4	11.4	25.9	25.9	26.9	26.9	26.9	26.9
Level of Service	B	B	B	B	C	C	C	C	C	C
Approach Delay (s)	11.8	11.4	11.4	11.4	25.9	25.9	26.9	26.9	26.9	26.9
Approach LOS	B	B	B	B	C	C	C	C	C	C
Intersection Summary										
HCM 2000 Control Delay	19.8	19.8	19.8	19.8	11.0	11.0	11.0	11.0	11.0	11.0
HCM 2000 Volume to Capacity ratio	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Actuated Cycle Length (s)	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
Intersection Capacity Utilization	90.5%	90.5%	90.5%	90.5%	90.5%	90.5%	90.5%	90.5%	90.5%	90.5%
Analysis Period (min)	15	15	15	15	15	15	15	15	15	15
c Critical Lane Group										

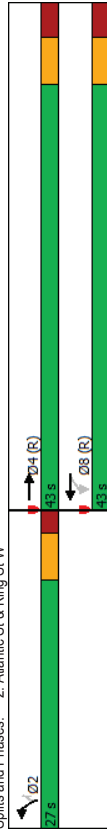
Queues
2: Atlantic St & King St W

HCM Signalized Intersection Capacity Analysis
2: Atlantic St & King St W

Future Total (AM)
Base Scenario

Movement	EBT	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑↑	↑↑	↑↑	↑↑
Traffic Volume (vph)	390	15	470	170	170
Future Volume (vph)	390	15	470	170	170
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00
Fpb. ped/bikes	0.85	1.00	1.00	0.85	0.85
Fpb. ped/bikes	1.00	0.99	1.00	1.00	1.00
Frt	0.96	1.00	1.00	0.85	0.85
Flt Protected	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	2744	3317	1733	1218	1218
Flt Permitted	1.00	0.93	0.95	1.00	1.00
Satd. Flow (perm)	2744	3084	1733	1218	1218
Peak-Hour factor, PHF	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	448	191	540	195	195
RTOR Reduction (vph)	66	0	0	0	48
Lane Group Flow (vph)	573	0	557	195	147
Confl. Peds. (#/hr)	5	313	313	305	127
Confl. Bikes (#/hr)	5				
Heavy Vehicles (%)	6%	3%	0%	7%	12%
Turn Type	NA	Perm	NA	Prot	Perm
Protected Phases	4		8	2	
Permitted Phases		8			2
Actuated Green, G (s)	36.9		36.9	20.1	20.1
Effective Green, g (s)	37.9		37.9	21.1	21.1
Actuated G/C Ratio	0.54		0.54	0.30	0.30
Clearance Time (s)	7.0		7.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	1485		1669	522	367
v/s Ratio Prot	c0.21		0.18		c0.12
v/s Ratio Perm		0.39	0.33	0.37	0.40
Uniform Delay, d1	9.3		9.0	19.2	19.4
Progression Factor	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.8		0.5	0.5	0.7
Delay (s)	10.1		9.5	19.7	20.1
Level of Service	B		A	B	C
Approach Delay (s)	10.1		9.5	19.9	
Approach LOS	B		A	B	
Intersection Summary					
HCM 2000 Control Delay			12.3		HCM 2000 Level of Service B
HCM 2000 Volume to Capacity ratio			0.39		
Actuated Cycle Length (s)			70.0		Sum of lost time (s) 11.0
Intersection Capacity Utilization			49.7%		ICU Level of Service A
Analysis Period (min)			15		
c. Critical Lane Group					

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑↑	↑↑	↑↑	↑↑
Traffic Volume (vph)	390	15	470	170	170
Future Volume (vph)	390	15	470	170	170
Lane Group Flow (vph)	639	0	557	195	195
Turn Type	NA	Perm	NA	Prot	Perm
Protected Phases	4		8	2	
Permitted Phases		8			2
Detector Phase	4	8	8	2	2
Switch Phase					
Minimum Initial (s)	21.0	21.0	21.0	20.0	20.0
Minimum Split (s)	28.0	28.0	26.0	26.0	26.0
Total Split (s)	43.0	43.0	43.0	27.0	27.0
Total Split (%)	61.4%	61.4%	61.4%	38.6%	38.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.0	6.0	6.0	5.0	5.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	C-Max	C-Max	C-Max	None	None
v/c Ratio	0.41	0.33	0.37	0.47	0.47
Control Delay	8.1	9.7	21.8	17.0	17.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	8.1	9.7	21.8	17.0	17.0
Queue Length 50th (m)	18.3	20.6	21.1	13.4	13.4
Queue Length 95th (m)	28.0	29.2	36.3	30.0	30.0
Internal Link Dist (m)	55.1	301.6	50.4		
Turn Bay Length (m)					
Base Capacity (vph)	1552	1670	544	430	430
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.41	0.33	0.36	0.45	0.45
Intersection Summary					
Cycle Length: 70					
Actuated Cycle Length: 70					
Offset: 26 (37%), Referenced to phase 4EBT and 8WBTL, Start of Green					
Natural Cycle: 55					
Control Type: Actuated-Coordinated					



Queues
3: King St W & Sudbury St

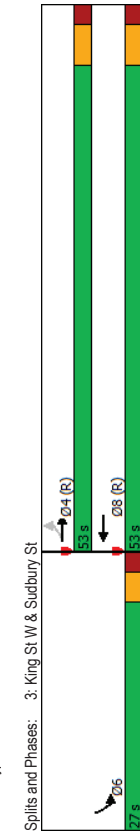
HCM Signalized Intersection Capacity Analysis
3: King St W & Sudbury St

Future Total (AM)
Base Scenario

Future Total (AM)
Base Scenario

	EBT	WBT	SBL
Lane Group	EBT	WBT	SBL
Lane Configurations	4	8	6
Traffic Volume (vph)	710	475	160
Future Volume (vph)	710	475	160
Lane Group Flow (vph)	732	614	232
Turn Type	NA	NA	Prot
Protected Phases	4	8	6
Detector Phase	4	8	6
Switch Phase			
Minimum Initial (s)	24.0	24.0	21.0
Minimum Split (s)	30.0	30.0	26.0
Total Split (s)	53.0	53.0	27.0
Total Split (%)	66.3%	66.3%	33.6%
Yellow Time (s)	4.0	4.0	3.0
All-Red Time (s)	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	4.0
Lead/Lag			
Lead-Lag Optimize?			
Recall Mode	C-Max	C-Max	None
v/c Ratio	0.37	0.32	0.52
Control Delay	8.6	7.1	26.2
Queue Delay	0.0	0.0	0.0
Total Delay	8.6	7.1	26.2
Queue Length 50th (m)	27.6	19.3	27.6
Queue Length 95th (m)	39.5	29.0	48.8
Internal Link Dist (m)	301.6	26.9	138.9
Turn Bay Length (m)			
Base Capacity (vph)	1979	1935	465
Station Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.37	0.32	0.50

Intersection Summary
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 28 (35%), Referenced to phase 4:EBTL and 8:WBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated



	EBL	EBT	WBT	WBR	SBL	SBR
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		4	4	4	W	W
Traffic Volume (vph)	0	710	475	120	160	65
Future Volume (vph)	0	710	475	120	160	65
Ideal Flow (vphpb)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0		
Lane Util. Factor	0.95	0.95	1.00	1.00		
Fpb, ped/bikes	1.00	0.96	1.00	0.91		
Fpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	1.00	0.97	1.00	0.96		
Flt Protected	1.00	1.00	1.00	0.97		
Satd. Flow (prot)	3245	3128	1552	1552		
Flt Permitted	1.00	1.00	1.00	0.97		
Satd. Flow (perm)	3245	3128	1552	1552		
Peak-Hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	732	490	124	165	67
RTOR Reduction (vph)	0	0	27	0	19	0
Lane Group Flow (vph)	0	732	587	0	213	0
Conf. Peds. (#/hr)	100			100	60	300
Conf. Bikes (#/hr)				35		
Heavy Vehicles (%)	50%	10%	7%	3%	3%	0%
Turn Type	NA	NA	NA	Prot	Prot	Prot
Protected Phases	4	8	8	6		
Permitted Phases	4					
Actuated Green, G (s)	47.8	47.8	47.8	21.2		
Effective Green, g (s)	48.8	48.8	48.8	22.2		
Actuated G/C Ratio	0.61	0.61	0.61	0.28		
Clearance Time (s)	6.0	6.0	6.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	1979	1908		430		
v/s Ratio Prot	c0.23	0.19		c0.14		
v/c Ratio	0.37	0.31		0.50		
Uniform Delay, d1	7.9	7.5		24.2		
Progression Factor	1.00	1.00		1.00		
Incremental Delay, d2	0.5	0.4		0.9		
Delay (s)	8.4	7.9		25.1		
Level of Service	A	A		C		
Approach Delay (s)	8.4	7.9		25.1		
Approach LOS	A	A		C		
Intersection Summary						
HCM 2000 Control Delay		10.7				B
HCM 2000 Volume to Capacity ratio		0.41				
Actuated Cycle Length (s)		80.0				9.0
Intersection Capacity Utilization		45.0%				A
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Duoro St & King St W

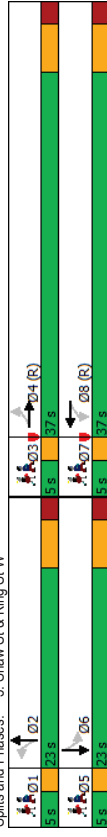
Future Total (AM)
Base Scenario

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	4P	4P	4P	4P	W	
Traffic Volume (veh/h)	610	285	10	545	55	0
Future Volume (Veh/h)	610	285	10	545	55	0
Sign Control	Free	Free	Free	Stop	Stop	
Grade	0%	0%	0%	0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	649	303	11	580	59	0
Pedestrians					5	175
Lane Width (m)			3.5	3.5		
Walking Speed (m/s)			1.2	1.2		
Percent Blockage			0	14		
Right turn flare (veh)			None			
Median type						
Median storage (veh)						
pX platoon unblocked	51		0.89	130	0.91	0.89
vC, conflicting volume			1127	1288	656	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vO, unblocked vol			898	945	370	
IC, single (s)			4.1	6.9	6.9	
IC, 2 stage (s)						
p0 queue free %			2.2	3.5	3.3	
CM capacity (veh/h)			98	70	100	
			585	198	482	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	433	519	204	387	59	
Volume Left	0	0	11	0	59	
Volume Right	0	303	0	0	0	
cSH	1700	1700	585	1700	198	
Volume to Capacity	0.25	0.31	0.02	0.23	0.30	
Queue Length 95th (m)	0.0	0.0	0.5	0.0	9.6	
Control Delay (s)	0.0	0.0	0.8	0.0	30.8	
Lane LOS	A	A	A	D	D	
Approach Delay (s)	0.0	0.3		30.8		
Approach LOS				D		
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			39.9%			
Analysis Period (min)			15			
				ICU Level of Service		A

Queues
5: Shaw St & King St W

Future Total (AM)
Base Scenario

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Configurations	4P	4P	4P	4P	4P	4P	4P
Traffic Volume (vph)	25	500	345	75	265	80	125
Future Volume (vph)	25	500	345	75	265	80	125
Lane Group Flow (vph)	Perm	NA	NA	Perm	NA	Perm	NA
Turn Type	4	8	8	2	2	6	1
Protected Phases	4	4	4	8	8	2	6
Permitted Phases	4	4	4	8	8	2	6
Detector Phase							
Switch Phase							
Minimum Initial (s)	19.0	19.0	19.0	16.0	16.0	16.0	3.0
Minimum Split (s)	28.0	28.0	28.0	22.0	22.0	22.0	5.0
Total Split (s)	37.0	37.0	37.0	23.0	23.0	23.0	5.0
Total Split (%)	52.9%	52.9%	52.9%	32.9%	32.9%	32.9%	7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	0.0
Lead/Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	C-Max	C-Max	C-Max	None	None	None	Ped
v/c Ratio	0.52	0.30	0.60	0.60	0.64	0.64	19.9
Control Delay	14.6	11.4	27.3	19.9	19.9	19.9	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.6	11.4	27.3	19.9	19.9	19.9	0.0
Queue Length 50th (m)	29.6	16.7	23.7	13.5	13.5	13.5	0.0
Queue Length 95th (m)	44.2	26.1	36.8	27.4	27.4	27.4	0.0
Internal Link Dist (m)	105.5	222.7	65.9	127.6	127.6	127.6	0.0
Turn Bay Length (m)							
Base Capacity (vph)	1234	1428	647	572	572	572	0
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	0.52	0.30	0.58	0.63	0.63	0.63	0.63
Intersection Summary							
Cycle Length: 70							
Actuated Cycle Length: 70							
Offset: 1 (1%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green							
Natural Cycle: 60							
Control Type: Actuated-Coordinated							



5. Shaw St & King St W

Future Total (AM)
Base Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	4TB	4TB	4TB	4TB	4TB	4TB	4TB	4TB	4TB	4TB	4TB
Traffic Volume (vph)	25	500	85	0	345	65	75	265	15	80	125
Future Volume (vph)	25	500	85	0	345	65	75	265	15	80	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Fpb. ped/bikes	0.91	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Fpb. ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ft	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Flt Protected	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	2867	3078	3078	3256	3256	2427					
Flt Permitted	0.93	1.00	1.00	0.76	0.76	0.74					
Satd. Flow (perm)	2660	3078	3078	2502	2502	1813					
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	26	526	89	0	363	68	79	279	16	84	132
RTOR Reduction (vph)	0	18	0	0	22	0	0	5	0	0	107
Lane Group Flow (vph)	0	623	0	0	409	0	0	369	0	0	251
Confl. Peds. (#/hr)	245	595	595	245	358	379	379	358	10	10	15
Confl. Bikes (#/hr)	60	20	20	60	20	20	20	20	10	10	15
Heavy Vehicles (%)	86%	7%	3%	0%	8%	6%	1%	2%	0%	41%	4%
Turn Type	Perm	NA	NA	NA	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	4	8	8	2	2	2	2	2	2	6	6
Permitted Phases	4	8	8	2	2	2	2	2	2	6	6
Actuated Green, G (s)	31.0	31.0	32.0	32.0	16.4	17.4	17.4	16.4	16.4	16.4	16.4
Effective Green, g (s)	32.0	32.0	32.0	32.0	17.4	17.4	17.4	16.4	16.4	16.4	16.4
Actuated G/C Ratio	0.46	0.46	0.46	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Clearance Time (s)	6.0	6.0	6.0	6.0	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	3.0	3.0	3.0	3.0
Lane Grp Cap. (vph)	1216	1407	1407	621	621	621	621	621	621	621	450
v/s Ratio Prot	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.14
v/s Ratio Perm	0.51	0.29	0.29	0.59	0.59	0.56	0.56	0.56	0.56	0.56	0.56
Uniform Delay, d1	13.5	11.9	11.9	23.2	23.2	22.9	22.9	22.9	22.9	22.9	22.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.5	0.5	0.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Delay (s)	15.0	12.4	12.4	24.7	24.7	24.5	24.5	24.5	24.5	24.5	24.5
Level of Service	B	B	B	C	C	C	C	C	C	C	C
Approach Delay (s)	15.0	12.4	12.4	24.7	24.7	24.5	24.5	24.5	24.5	24.5	24.5
Approach LOS	B	B	B	C	C	C	C	C	C	C	C
Intersection Summary											
HCM 2000 Control Delay	18.3	HCM 2000 Level of Service									
HCM 2000 Volume to Capacity ratio	0.48	B									
Actuated Cycle Length (s)	70.0	Sum of lost time (s)									
Intersection Capacity Utilization	76.2%	ICU Level of Service									
Analysis Period (min)	15	D									
c Critical Lane Group											

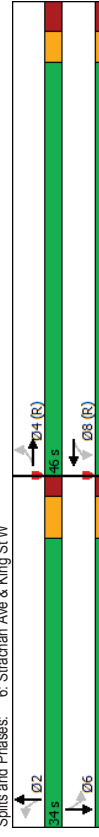
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BA Group

Synchro 11 Report

6. Strachan Ave & King St W

Future Total (AM)
Base Scenario

Lane Group	EBT	WBT	NBT	SBT
Lane Configurations	4TB	4TB	4TB	4TB
Traffic Volume (vph)	525	315	85	265
Future Volume (vph)	525	315	85	265
Lane Group Flow (vph)	653	353	92	386
Turn Type	NA	NA	Perm	NA
Protected Phases	4	8	2	6
Permitted Phases	4	8	2	6
Detector Phase	4	8	2	6
Switch Phase	4	8	2	6
Minimum Initial (s)	20.0	20.0	21.0	21.0
Minimum Split (s)	26.0	26.0	27.0	27.0
Total Split (s)	46.0	46.0	34.0	34.0
Total Split (%)	57.5%	57.5%	42.5%	42.5%
Yellow Time (s)	3.0	3.0	4.0	4.0
All-Red Time (s)	3.0	3.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	C-Max	C-Max	Min	Min
v/c Ratio	0.40	0.20	0.37	0.75
Control Delay	10.8	9.4	20.1	26.7
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	10.8	9.4	20.1	26.7
Queue Length 50th (m)	26.7	13.1	10.7	50.0
Queue Length 95th (m)	43.8	22.8	19.6	84.1
Internal Link Dist (m)	222.7	138.4	121.3	128.6
Turn Bay Length (m)	1653	1752	286	595
Storage Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.40	0.20	0.32	0.65
Intersection Summary				
Cycle Length: 80				
Actuated Cycle Length: 80				
Offset: 42 (53%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green				
Natural Cycle: 55				
Control Type: Actuated-Coordinated				
m Volume for 95th percentile queue is metered by upstream signal.				



08-24-2023
BA Group

Synchro 11 Report

6: Strachan Ave & King St W

7: Atlantic St & Snooker St

Future Total (AM)

Future Total (AM)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations											
Traffic Volume (vph)	0	525	75	0	315	10	85	265	90	25	210
Future Volume (vph)	0	525	75	0	315	10	85	265	90	25	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	0.92	0.99	1.00	0.93	1.00	0.99	1.00	0.99	1.00	0.99	1.00
Fpb. ped/bikes	1.00	1.00	0.87	1.00	0.87	1.00	0.88	1.00	0.88	1.00	0.99
Flt Protected	0.98	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	2924	3119	1447	1614	1575	1799					
Flt Permitted	1.00	1.00	0.52	1.00	0.32	1.00					
Satd. Flow (perm)	2924	3119	792	1614	532	1799					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	571	82	0	342	11	92	288	98	27	228
RTOR Reduction (vph)	0	13	0	0	3	0	0	12	0	0	3
Lane Group Flow (vph)	0	640	0	0	350	0	92	374	0	27	241
Conf. Ped. (#/hr)	221	479	479	221	178	231	231	231	231	178	178
Conf. Bikes (#/hr)	60	60	10	60	25	25	25	25	25	35	35
Heavy Vehicles (%)	0%	7%	35%	0%	12%	22%	7%	2%	10%	0%	2%
Turn Types	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Protected Phases	4	8	2	2	2	6					
Permitted Phases	4	8	2	2	2	6					
Actuated Green, G (s)	43.9	44.9	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1
Effective Green, g (s)	44.9	44.9	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1
Actuated g/C Ratio	0.56	0.56	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
Clearance Time (s)	6.0	6.0	6.0	6.0	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	3.0	3.0	3.0	3.0
Lane Grp Cap. (vph)	1641	1750	248	506	166	564					
v/s Ratio Prot	c0.22	0.11		c0.23	0.05	0.13					
v/s Ratio Perm	0.39	0.20	0.37	0.74	0.16	0.43					
Uniform Delay, d1	9.9	8.7	21.3	24.5	19.9	21.7					
Progression Factor	1.00	1.00	0.79	0.80	1.00	1.00					
Incremental Delay, d2	0.7	0.3	0.8	4.7	0.5	0.5					
Delay (s)	10.6	8.9	17.6	24.3	20.3	22.3					
Level of Service	B	A	B	C	C	C					
Approach Delay (s)	10.6	8.9	23.0	22.1	22.1	22.1					
Approach LOS	B	A	C	C	C	C					
Intersection Summary											
HCM 2000 Control Delay	15.4 HCM 2000 Level of Service B										
HCM 2000 Volume to Capacity ratio	0.52										
Actuated Cycle Length (s)	80.0 Sum of lost time (s) 10.0										
Intersection Capacity Utilization	69.6% ICU Level of Service C										
Analysis Period (min)	15										
c Critical Lane Group											

Future Total (AM)

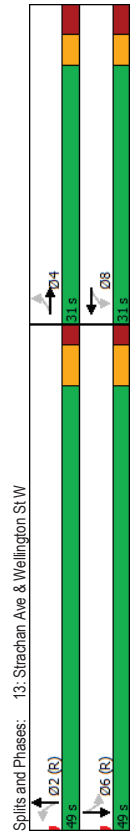
Future Total (AM)

Movement	WBL	WBR	NBT	NBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	35	205	140	45	96	90
Future Volume (Veh/h)	35	205	140	45	96	90
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	39	230	157	51	108	101
Pedestrians	295	20	20	157	157	157
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Walking Speed (m/s)	1.2	1.2	1.2	1.2	1.2	1.2
Percent Blockage	18	2	2	13	13	13
Right turn flare (veh)			None	None	None	None
Median type			None	None	None	None
Median storage (veh)						
Upstream signal (m)					74	74
pX platoon unblocked						
vC, conflicting volume	744	564			433	433
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	744	564			433	433
IC, single (s)	6.4	6.2			4.2	4.2
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.3	2.3
p0 queue free %	86	39			88	88
q0 capacity (veh/h)	273	374			904	904
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	269	208	209			
Volume Left	39	0	108			
Volume Right	230	51	0			
eSH	365	1700	904			
Volume to Capacity	0.76	0.12	0.12			
Queue Length 95th (m)	48.1	0.0	3.2			
Control Delay (s)	40.7	0.0	5.5			
Lane LOS	E	A	A			
Approach Delay (s)	40.7	0.0	5.5			
Approach LOS	E	E	E			
Intersection Summary						
Average Delay	17.7					
Intersection Capacity Utilization	54.1%					
Analysis Period (min)	15					
ICU Level of Service	A					

Queues
13: Strachan Ave & Wellington St W

Future Total (AM)
Base Scenario

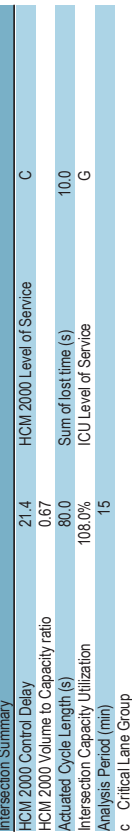
	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	15	260	115	90	130	375	10	270
Traffic Volume (vph)	15	260	115	90	130	375	10	270
Future Volume (vph)	15	260	115	90	130	375	10	270
Lane Group Flow (vph)	16	405	122	144	138	596	11	292
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4							
Permitted Phases	8							
Minimum Split (s)	27.0	27.0	26.0	26.0	29.0	29.0	29.0	29.0
Total Split (%)	31.0	31.0	31.0	31.0	49.0	49.0	49.0	49.0
Total Split (%)	38.8%	38.8%	38.8%	38.8%	61.3%	61.3%	61.3%	61.3%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag								
Lead-Lag Optimizer?								
v/c Ratio	0.05	0.73	0.71	0.27	0.37	0.65	0.05	0.32
Control Delay	19.3	31.3	48.8	16.8	10.9	11.8	17.9	22.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
Total Delay	19.3	31.3	48.8	16.8	10.9	12.0	17.9	22.1
Queue Length 50th (m)	1.8	52.5	16.9	12.7	6.4	23.8	1.4	42.1
Queue Length 95th (m)	6.1	#88.6	#45.1	26.6	m16.4	m45.5	m3.7	62.3
Internal Link Dist (m)	64.0	134.1						
Turn Bay Length (m)	15.0	25.0						
Base Capacity (vph)	312	554	173	541	370	914	243	922
Starvation Cap Reductn	0	0	0	0	0	35	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.73	0.71	0.27	0.37	0.68	0.05	0.32



HCM Signalized Intersection Capacity Analysis
13: Strachan Ave & Wellington St W

Future Total (AM)
Base Scenario

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Movement	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	15	260	120	115	90	45	130	375	185
Traffic Volume (vph)	15	260	120	115	90	45	130	375	185
Future Volume (vph)	15	260	120	115	90	45	130	375	185
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	0.95	1.00	0.94	1.00	0.93	1.00	0.99	1.00
Fibb. ped/bikes	0.86	1.00	0.95	1.00	0.67	1.00	0.85	1.00	1.00
Frt	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1372	1641	1639	1599	1154	1622	1350	1675	1675
Flt Permitted	0.67	1.00	0.31	1.00	0.56	1.00	0.31	1.00	1.00
Satd. Flow (perm)	961	1641	533	1599	675	1622	442	1675	1675
Peak-Hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	16	277	128	122	96	48	138	399	197
RTOR Reduction (vph)	0	21	0	0	22	0	0	22	0
Lane Group Flow (vph)	16	384	0	122	122	0	138	574	0
Confl. Peds. (#/hr)	85	65	65	85	355	100	100	355	35
Confl. Bikes (#/hr)	20								
Heavy Vehicles (%)	12%	3%	4%	3%	2%	3%	3%	1%	25%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases	4								
Permitted Phases	8								
Actuated Green, G (s)	25.0	25.0	25.0	25.0	43.0	43.0	43.0	43.0	43.0
Effective Green, g (s)	26.0	26.0	26.0	26.0	44.0	44.0	44.0	44.0	44.0
Actuated g/C Ratio	0.32	0.32	0.32	0.32	0.55	0.55	0.55	0.55	0.55
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Grp Cap (vph)	312	533	173	519	371	892	243	921	921
v/s Ratio Prot	c0.23								
v/s Ratio Perm	0.02	0.23	0.20	0.20	0.20	0.35	0.02	0.17	0.17
v/c Ratio	0.05	0.72	0.71	0.23	0.37	0.64	0.05	0.32	0.32
Uniform Delay, d1	18.5	23.8	23.6	19.7	10.2	12.5	8.3	9.8	9.8
Progression Factor	1.00	1.00	1.00	1.00	0.78	0.74	2.02	2.12	2.12
Incremental Delay, d2	0.3	8.2	21.4	1.1	2.3	2.9	0.3	0.8	0.8
Delay (s)	18.8	32.0	45.1	20.8	10.2	12.1	17.1	21.7	21.7
Level of Service	B	C	D	C	B	B	B	C	C
Approach Delay (s)	31.5								
Approach LOS	C								
Intersection Summary									
HCM 2000 Control Delay	21.4								
HCM 2000 Level of Service	C								
HCM 2000 Volume to Capacity ratio	0.67								
Actuated Cycle Length (s)	80.0								
Sum of lost time (s)	10.0								
Intersection Capacity Utilization	108.0%								
ICU Level of Service	G								
Analysis Period (min)	15								
c. Critical Lane Group									



Queues
15: Dufferin St & Liberty St

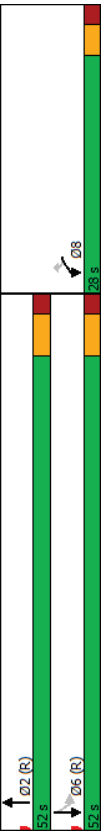
HCM Signalized Intersection Capacity Analysis
15: Dufferin St & Liberty St

Future Total (AM)
Base Scenario

Future Total (AM)
Base Scenario

	WBL	WBR	NBT	SBL	SBT
Lane Group					
Lane Configurations	↔	↔	↔	↔	↔
Traffic Volume (vph)	190	40	320	135	330
Future Volume (vph)	190	40	320	135	330
Lane Group Flow (vph)	198	42	849	0	485
Turn Type	Prot	Perm	NA	Perm	NA
Protected Phases	8	2	2	6	6
Permitted Phases	8	8	2	6	6
Detector Phase					
Switch Phase					
Minimum Initial (s)	18.0	18.0	18.0	18.0	18.0
Minimum Split (s)	23.0	23.0	24.0	24.0	24.0
Total Split (s)	28.0	28.0	52.0	52.0	52.0
Total Split (%)	35.0%	35.0%	65.0%	65.0%	65.0%
Yellow Time (s)	3.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0	5.0	5.0	5.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	C-Max	C-Max	C-Max
v/c Ratio	0.47	0.13	0.49	0.38	0.38
Control Delay	30.1	12.5	3.6	2.1	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	30.1	12.5	3.6	2.1	2.1
Queue Length 50th (m)	27.3	1.4	9.9	3.0	3.0
Queue Length 95th (m)	46.0	9.1	20.2	5.1	5.1
Internal Link Dist (m)	382.8		162.3	186.7	
Turn Bay Length (m)	10.0				
Base Capacity (vph)	525	401	1723	1274	
Station Cap Reductn	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	
Storage Cap Reductn	0	0	0	0	
Reduced v/c Ratio	0.38	0.10	0.49	0.38	

Intersection Summary	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 74 (93%), Referenced to phase 2:NBT and 6:SBTL - Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	



Splits and Phases: 15: Dufferin St & Liberty St

06-24-2023
BA Group

Synchro 11 Report

	WBL	WBR	NBT	SBL	SBT
Movement					
Lane Configurations	↔	↔	↔	↔	↔
Traffic Volume (vph)	190	40	320	495	135
Future Volume (vph)	190	40	320	495	135
Ideal Flow (vphpb)	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95
Fpb. ped/bikes	1.00	0.81	0.76	1.00	1.00
Fibb. ped/bikes	1.00	1.00	1.00	0.97	0.97
Frt	1.00	0.85	0.91	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.99	0.99
Satd. Flow (prot)	1750	1265	2386	3209	3209
Flt Permitted	0.95	1.00	1.00	0.61	0.61
Satd. Flow (perm)	1750	1265	2386	1971	1971
Peak-Hour factor, PHF	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	198	42	333	516	141
RTOR Reduction (vph)	0	24	183	0	0
Lane Group Flow (vph)	198	18	666	0	485
Conf. Peds. (#/hr)	221	137	168	168	
Conf. Bikes (#/hr)	2		4		
Heavy Vehicles (%)	2%	2%	7%	2%	5%
Turn Type	Prot	Perm	NA	Perm	NA
Protected Phases	8	2	2	6	6
Permitted Phases	8	8	2	6	6
Actuated Green, G (s)	18.3	18.3	50.7	50.7	50.7
Effective Green, g (s)	19.3	19.3	51.7	51.7	51.7
Actuated G/C Ratio	0.24	0.24	0.65	0.65	0.65
Clearance Time (s)	5.0	5.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	422	305	1541	1273	
v/s Ratio Prot	c0.11		c0.28		
v/s Ratio Perm	0.01				0.25
v/c Ratio	0.47	0.06	0.43	0.38	0.38
Uniform Delay, d1	26.0	23.4	6.9	6.6	6.6
Progression Factor	1.00	1.00	1.00	0.20	0.20
Incremental Delay, d2	0.8	0.1	0.9	0.7	0.7
Delay (s)	26.8	23.5	7.8	2.0	2.0
Level of Service	C	C	A	A	A
Approach Delay (s)	26.2	7.8	2.0	2.0	2.0
Approach LOS	C	A	A	A	A

Intersection Summary	
HCM 2000 Control Delay	8.8
HCM 2000 Volume to Capacity ratio	0.44
Actuated Cycle Length (s)	80.0
Sum of lost time (s)	9.0
Intersection Capacity Utilization	70.9%
ICU Level of Service	C
Analysis Period (min)	15
Critical Lane Group	

06-24-2023
BA Group

Synchro 11 Report

HCM Unsignalized Intersection Capacity Analysis
 16: Atlantic St & Liberty St

HCM 6th AWSC
 17: Liberty St/E Liberty St & Hanna Ave

Future Total (AM)
 Base Scenario

Future Total (AM)
 Base Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		Stop	Stop		Stop			Stop			Stop	
Traffic Volume (vph)	40	220	135	30	135	100	15	45	35	50	25	25
Future Volume (vph)	40	220	135	30	135	100	15	45	35	50	25	25
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	42	232	142	32	142	105	16	47	37	53	26	26
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	416	279	100	105								
Volume Left (vph)	42	32	16	53								
Volume Right (vph)	142	105	37	26								
Head (s)	-0.14	-0.10	-0.13	0.00								
Departure Headway (s)	4.8	5.0	5.7	5.8								
Degree Utilization, x	0.55	0.38	0.16	0.17								
Capacity (veh/h)	726	688	546	542								
Control Delay (s)	13.4	11.0	9.7	10.0								
Approach Delay (s)	13.4	11.0	9.7	10.0								
Approach LOS	B	B	A	A								
Intersection Summary												
Delay	11.8											
Level of Service	B											
Intersection Capacity Utilization	52.8%											
Analysis Period (min)	15											
	ICU Level of Service											
	A											

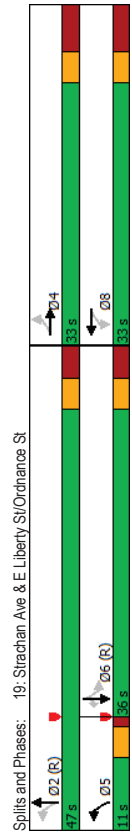
Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	9.7											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	60	165	55	20	190	30	55	20	20	20	10	30
Traffic Vol, veh/h	60	165	55	20	190	30	55	20	20	20	10	30
Future Vol, veh/h	60	165	55	20	190	30	55	20	20	20	10	30
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles, %	0	4	1	0	8	4	0	0	0	5	7	0
Mvmt Flow	62	170	57	21	196	31	57	21	21	21	10	31
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB	SB	SB
Opposing Approach	WB	EB			SB	SB	SB	WB	WB	WB	WB	WB
Opposing Lanes	1	1			1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	NB	EB	EB	EB	EB	WB	WB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	WB	WB	WB	WB	EB	EB	EB	EB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	10.1	9.7	9.7	9.1	9.1	9.1	8.7	8.7	8.7	8.7	8.7	8.7
HCM LOS	B	A	A	A	A	A	A	A	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	58%	21%	8%	33%
Vol Thru, %	21%	59%	79%	17%
Vol Right, %	21%	20%	12%	50%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	95	280	240	60
LT Vol	55	60	20	20
Through Vol	20	165	190	10
RT Vol	20	55	30	30
Lane Flow Rate	98	289	247	62
Geometry Grp	1	1	1	1
Degree of Utl (X)	0.141	0.362	0.315	0.088
Departure Headway (Hd)	5.18	4.516	4.576	5.135
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	688	794	782	692
Service Time	3.246	2.562	2.623	3.207
HCM Lane V/C Ratio	0.142	0.364	0.316	0.09
HCM Control Delay	9.1	10.1	9.7	8.7
HCM Lane LOS	A	B	A	A
HCM 95th-ile Q	0.5	1.7	1.4	0.3

Queues
19: Strachan Ave & E Liberty St/Ordinance St

Future Total (AM)
Base Scenario

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group									
Lane Configurations	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Traffic Volume (vph)	265	15	55	20	250	365	35	370	101
Future Volume (vph)	265	15	55	20	250	365	35	370	101
Lane Group Flow (vph)	282	314	0	154	266	441	37	394	107
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm
Protected Phases	4		8	5	2		6		6
Permitted Phases	4		8	5	2		6		6
Minimum Split (s)	32.6	32.6	32.6	10.0	27.3	27.3	27.3	27.3	27.3
Total Split (s)	33.0	33.0	33.0	11.0	47.0	47.0	36.0	36.0	36.0
Total Split (%)	41.3%	41.3%	41.3%	13.8%	58.8%	45.0%	45.0%	45.0%	45.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	4.6	4.6	4.6	4.6	1.0	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.6	6.6	6.6	3.0	5.3	5.3	5.3	5.3	5.3
Lead/Lag									
Lead/Lag Optimizer?				Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio	0.80	0.84	0.43	0.67	0.50	0.13	0.55	0.35	0.35
Control Delay	43.4	33.2	17.1	19.5	14.4	26.1	32.9	13.8	13.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.4	33.2	17.1	19.5	14.4	26.1	32.9	13.8	13.8
Queue Length 50th (m)	40.5	22.2	10.8	21.0	41.4	5.9	65.1	5.0	5.0
Queue Length 95th (m)	#82.1	#72.5	28.0	#35.5	66.2	m12.1	m16.4	143.3	143.3
Internal Link Dist (m)	45.8		123.7	152.3					
Turn Bay Length (m)			50.0		45.0		30.0		30.0
Base Capacity (vph)	354	376	356	396	888	282	713	305	305
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.84	0.43	0.67	0.50	0.13	0.55	0.35	0.35



HCM Signalized Intersection Capacity Analysis
19: Strachan Ave & E Liberty St/Ordinance St

Future Total (AM)
Base Scenario

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Traffic Volume (vph)	265	15	280	55	20	250	365	50	370
Future Volume (vph)	265	15	280	55	20	250	365	50	370
Ideal Flow (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	6.6	3.0	5.3	5.3	5.3	5.3
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	0.51	0.88	0.88	1.00	0.95	1.00	1.00	1.00
Fibb. ped/bikes	0.84	1.00	0.89	0.89	0.93	1.00	0.79	1.00	1.00
Frt	1.00	0.86	0.94	0.94	1.00	0.98	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.98	0.98	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1477	807	1325	1325	1622	1691	1380	1860	608
Flt Permitted	0.69	1.00	0.71	0.71	0.35	1.00	0.51	1.00	1.00
Satd. Flow (perm)	1074	807	953	953	595	1691	736	1860	608
Peak-Hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	282	16	298	59	21	74	266	388	53
RTOR Reduction (vph)	0	111	0	0	42	0	6	0	0
Lane Group Flow (vph)	282	203	0	0	112	0	266	435	0
Conf. Peds. (#/hr)	125	335	335	335	125	405	205	205	405
Conf. Bikes (#/hr)	7		7		27		7		7
Heavy Vehicles (%)	2%	0%	1%	1%	5%	2%	4%	2%	2%
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm
Protected Phases	4		8	5	2		6		6
Permitted Phases	4		8	5	2		6		6
Actuated Green, G (s)	25.4	25.4	25.4	25.4	40.7	40.7	29.7	29.7	29.7
Effective Green, g (s)	26.4	26.4	26.4	26.4	41.7	41.7	30.7	30.7	30.7
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.52	0.52	0.38	0.38	0.38
Clearance Time (s)	7.6	7.6	7.6	7.6	4.0	6.3	6.3	6.3	6.3
Lane Grp Cap (vph)	354	266	314	314	412	881	282	713	233
v/s Ratio Prot	0.25		0.12		c0.06	0.26		0.05	0.21
v/s Ratio Perm	c0.26		0.12		c0.27			0.13	0.55
v/c Ratio	0.80	0.76	0.36	0.36	0.65	0.49	0.13	0.55	0.18
Uniform Delay, d1	24.4	24.0	20.4	20.4	12.1	12.3	16.0	19.3	16.3
Progression Delay, d2	1.00	1.00	1.00	1.00	1.00	1.00	1.52	1.52	3.18
Incremental Delay, d2	16.8	18.7	3.2	3.2	7.6	2.0	0.8	2.7	1.4
Delay (s)	41.2	42.7	23.5	23.5	19.7	14.3	25.1	32.1	53.3
Level of Service	D	D	C	C	B	B	C	C	D
Approach Delay (s)	42.0		23.5		16.4		35.8		
Approach LOS	D		C		B		D		
Intersection Summary									
HCM 2000 Control Delay	29.8						C		
HCM 2000 Volume to Capacity ratio	0.73								
Actuated Cycle Length (s)	80.0						14.9		
Intersection Capacity Utilization	102.1%						G		
Analysis Period (min)	15								
c. Critical Lane Group									

HCM Unsignalized Intersection Capacity Analysis
 8: Hanna Ave/75 Hanna Ave & Snooker St/Private St

HCM 6th AWSC
 8: Hanna Ave/75 Hanna Ave & Snooker St/Private St

Future Total (AM)
 Base Scenario

Future Total (AM)
 Base Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	Stop Stop Stop Stop											
Traffic Volume (vph)	55	81	5	20	190	30	50	15	30	0	0	0
Future Volume (vph)	55	81	5	20	190	30	50	15	30	0	0	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	65	96	6	24	226	36	60	18	36	0	0	0
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	167	286	114	0								
Volume Left (vph)	65	24	60	0								
Volume Right (vph)	6	36	36	0								
Head (s)	0.09	-0.03	0.02	0.00								
Departure Headway (s)	4.6	4.4	4.9	5.1								
Degree Utilization, x	0.21	0.35	0.16	0.00								
Capacity (veh/h)	752	795	669	637								
Control Delay (s)	8.9	9.7	8.9	8.1								
Approach Delay (s)	8.9	9.7	8.9	0.0								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay	9.3											
Level of Service	A											
Intersection Capacity Utilization	42.0%											
Analysis Period (min)	15											
ICU Level of Service	A											

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	9.4											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	55	81	5	20	190	30	50	15	30	0	0	0
Traffic VdL, veh/h	55	81	5	20	190	30	50	15	30	0	0	0
Future Vol, veh/h	55	81	5	20	190	30	50	15	30	0	0	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	0	3	14	9	1	0	8	0	7	0	0	0
Mvmt Flow	65	96	6	24	226	36	60	18	36	0	0	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB	NB	NB
Opposing Approach	WB	EB	EB	EB	WB	WB	WB	WB	WB	WB	WB	WB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	NB	NB	EB	EB	EB	EB	EB	EB	EB	EB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	SB	WB	WB	WB	WB	WB	WB	WB	WB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	8.8	9.9	9.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9
HCM LOS	A	A	A	A	A	A	A	A	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	53%	39%	8%	0%
Vol Thru, %	16%	57%	79%	100%
Vol Right, %	32%	4%	12%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	95	141	240	0
LT Vol	50	55	20	0
Through Vol	15	81	190	0
RT Vol	30	5	30	0
Lane Flow Rate	113	168	286	0
Geometry Grp	1	1	1	1
Degree of Utl (X)	0.156	0.212	0.355	0
Departure Headway (Ht)	4.973	4.556	4.47	5.092
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	720	787	806	0
Service Time	3.008	2.584	2.493	3.139
HCM Lane V/C Ratio	0.157	0.213	0.355	0
HCM Control Delay	8.9	8.8	9.9	8.1
HCM Lane LOS	A	A	A	N
HCM 95th-ile Q	0.6	0.8	1.6	0

HCM Unsignalized Intersection Capacity Analysis
 11: Private St & Proposed Private Laneway & Existing Metro Driveway

HCM 6th AWSC
 11: Private St & Proposed Private Laneway & Existing Metro Driveway

Future Total (AM)
 Base Scenario

Future Total (AM)
 Base Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		Stop	Stop		Stop			Stop			Stop	
Traffic Volume (vph)	0	6	105	10	30	0	110	25	1	0	35	20
Future Volume (vph)	0	6	105	10	30	0	110	25	1	0	35	20
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Hourly flow rate (vph)	0	8	146	14	42	0	153	35	1	0	49	28
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	154	56	189	77								
Volume Left (vph)	0	14	153	0								
Volume Right (vph)	146	0	1	28								
Head (s)	-0.50	0.05	0.21	-0.22								
Departure Headway (s)	4.1	4.8	4.7	4.4								
Degree Utilization, x	0.18	0.07	0.25	0.09								
Capacity (veh/h)	814	699	735	765								
Control Delay (s)	8.0	8.1	9.2	7.8								
Approach Delay (s)	8.0	8.1	9.2	7.8								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay	8.5											
Level of Service	A											
Intersection Capacity Utilization	34.1%											
Analysis Period (min)	15											
ICU Level of Service	A											

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	8.4											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	0	6	105	10	30	0	110	25	1	0	35	20
Traffic Vd, veh/h	0	6	105	10	30	0	110	25	1	0	35	20
Future Vol, veh/h	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Peak Hour Factor	0	0	4	0	0	0	4	0	0	0	0	0
Heavy Vehicles, %	0	8	146	14	42	0	153	35	1	0	49	28
Mvmt Flow	0	1	0	0	1	0	0	1	0	0	1	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	EB	WB	WB	EB	NB	NB	SB	SB	WB	WB	SB
Opposing Approach	WB	EB	EB	WB	WB	EB	EB	WB	WB	WB	WB	NB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	NB	EB	EB	EB	EB	WB	WB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	WB	WB	WB	WB	EB	EB	EB	EB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	7.9	8.1	9.2	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8
HCM LOS	A	A	A	A	A	A	A	A	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	81%	0%	25%	0%
Vol Thru, %	18%	5%	75%	64%
Vol Right, %	1%	95%	0%	36%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	136	111	40	55
LT Vol	110	0	10	0
Through Vol	25	6	30	35
RT Vol	1	105	0	20
Lane Flow Rate	189	154	56	76
Geometry Grp	1	1	1	1
Degree of Utl (X)	0.245	0.172	0.073	0.092
Departure Headway (Hd)	4.661	4.027	4.742	4.357
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	771	893	756	822
Service Time	2.686	2.047	2.768	2.385
HCM Lane V/C Ratio	0.245	0.172	0.074	0.092
HCM Control Delay	9.2	7.9	8.1	7.8
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	1	0.6	0.2	0.3

HCM Unsignalized Intersection Capacity Analysis
 12: Private St & 120 Lynn Williams Driveway

HCM Unsignalized Intersection Capacity Analysis
 14: Lynn Williams St & Private St

Future Total (AM)
 Base Scenario

Future Total (AM)
 Base Scenario

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W					
Traffic Volume (veh/h)	0	35	30	136	150	0
Future Volume (Veh/h)	0	35	30	136	150	0
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	0	47	40	181	200	0
Pedestrians	80					
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Walking Speed (m/s)	1.2	1.2	1.2	1.2	1.2	1.2
Percent Blockage	6					
Right turn flare (veh)						
Median type			None	None	None	None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
VC, conflicting volume	617	300	280			
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol	617	300	280			
IC, single (s)	6.4	6.2	4.1			
IC, 2 stage (s)						
IF (s)	3.5	3.3	2.2			
p0 queue free %	100	93	97			
CM capacity (veh/h)	388	685	1210			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	47	221	200			
Volume Left	0	40	0			
Volume Right	47	0	0			
cSH	685	1210	1700			
Volume to Capacity	0.07	0.03	0.12			
Queue Length 95th (m)	1.8	0.8	0.0			
Control Delay (s)	10.6	1.7	0.0			
Lane LOS	B	A	A			
Approach Delay (s)	10.6	1.7	0.0			
Approach LOS	B	A	A			
Intersection Summary						
Average Delay		1.9				
Intersection Capacity Utilization		40.4%				ICU Level of Service A
Analysis Period (min)		15				

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W					
Traffic Volume (veh/h)	65	30	136	30	10	175
Future Volume (Veh/h)	65	30	136	30	10	175
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	81	38	170	38	12	219
Pedestrians	160					
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Walking Speed (m/s)	1.2	1.2	1.2	1.2	1.2	1.2
Percent Blockage						
Right turn flare (veh)	13					
Median type			None	None	None	None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
VC, conflicting volume	628	424				368
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol	628	424				368
IC, single (s)	6.5	6.2				4.1
IC, 2 stage (s)						
IF (s)	3.6	3.3				2.2
p0 queue free %	78	93				99
CM capacity (veh/h)	365	513				1046
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	119	208	231			
Volume Left	81	0	12			
Volume Right	38	38	0			
cSH	402	1700	1046			
Volume to Capacity	0.30	0.12	0.01			
Queue Length 95th (m)	9.7	0.0	0.3			
Control Delay (s)	17.7	0.0	0.5			
Lane LOS	C	A	A			
Approach Delay (s)	17.7	0.0	0.5			
Approach LOS	C	A	A			
Intersection Summary						
Average Delay			4.0			
Intersection Capacity Utilization			36.9%			ICU Level of Service A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 17: Liberty St/E Liberty St & Hanna Ave

HCM 6th AWSC
 17: Liberty St/E Liberty St & Hanna Ave

Future Total (AM)
 Base Scenario

Future Total (AM)
 Base Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		Stop	Stop		Stop			Stop			Stop	
Traffic Volume (vph)	60	165	55	20	190	30	55	20	20	20	10	30
Future Volume (vph)	60	165	55	20	190	30	55	20	20	20	10	30
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	62	170	57	21	196	31	57	21	21	21	10	31
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	289	248	99	62								
Volume Left (vph)	62	21	57	21								
Volume Right (vph)	57	31	21	31								
Head (s)	-0.03	0.06	0.01	-0.19								
Departure Headway (s)	4.6	4.7	5.3	5.1								
Degree Utilization, x	0.37	0.33	0.15	0.09								
Capacity (veh/h)	742	723	614	616								
Control Delay (s)	10.3	10.0	9.2	8.6								
Approach Delay (s)	10.3	10.0	9.2	8.6								
Approach LOS	B	B	A	A								
Intersection Summary												
Delay	9.9											
Level of Service	A											
Intersection Capacity Utilization	51.3%											
Analysis Period (min)	15											
	ICU Level of Service											
	A											

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	9.7											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	60	165	55	20	190	30	55	20	20	20	10	30
Traffic Vol, veh/h	60	165	55	20	190	30	55	20	20	20	10	30
Future Vol, veh/h	60	165	55	20	190	30	55	20	20	20	10	30
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles, %	0	4	1	0	8	4	0	0	5	7	0	0
Mvmt Flow	62	170	57	21	196	31	57	21	21	21	10	31
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB	SB	NB
Opposing Approach	WB	EB	EB	EB	WB	WB	WB	WB	WB	WB	WB	WB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	SB	NB	NB	EB	EB	EB	WB	WB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	WB	WB	WB	WB	EB	EB	EB	EB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	10.1	9.7	9.7	9.1	9.1	8.7	8.7	8.7	8.7	8.7	8.7	8.7
HCM LOS	B	A	A	A	A	A	A	A	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	58%	21%	8%	33%
Vol Thru, %	21%	59%	79%	17%
Vol Right, %	21%	20%	12%	50%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	95	280	240	60
LT Vol	55	60	20	20
Through Vol	20	165	190	10
RT Vol	20	55	30	30
Lane Flow Rate	98	289	247	62
Geometry Grp	1	1	1	1
Degree of Utl (X)	0.141	0.362	0.315	0.088
Departure Headway (Hd)	5.18	4.516	4.576	5.135
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	688	794	782	692
Service Time	3.246	2.562	2.623	3.207
HCM Lane V/C Ratio	0.142	0.364	0.316	0.09
HCM Control Delay	9.1	10.1	9.7	8.7
HCM Lane LOS	A	B	A	A
HCM 95th-tile Q	0.5	1.7	1.4	0.3

HCM Unsignalized Intersection Capacity Analysis
 18: E Liberty St & Lynn Williams St

Future Total (AM)
 Base Scenario

Movement	EBL	EBT	EB2	WBT	WBR	SBL	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	40	240	150	126	150	150	90
Future Volume (vph)	40	240	150	126	150	150	90
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	48	286	179	150	179	107	107
Direction, Lane #	EB 1	EB 2	WB 1	WB 1	SB 1		
Volume Total (vph)	48	286	329	286			
Volume Left (vph)	48	0	0	179			
Volume Right (vph)	0	0	150	107			
Head (s)	0.55	0.09	-0.20	-0.05			
Departure Headway (s)	6.3	5.9	5.2	5.5			
Degree Utilization, x	0.08	0.47	0.47	0.44			
Capacity (veh/h)	541	591	664	600			
Control Delay (s)	8.7	12.6	12.8	12.8			
Approach Delay (s)	12.1		12.8	12.8			
Approach LOS	B		B	B			
Intersection Summary							
Delay	12.5						
Level of Service	B						
Intersection Capacity Utilization	48.7%						
Analysis Period (min)	15						
				ICU Level of Service			
				A			

HCM 6th AWSC
 18: E Liberty St & Lynn Williams St

Future Total (AM)
 Base Scenario

Intersection	EBL	EBT	EB2	WBT	WBR	SBL	SBR
Intersection Delay, s/veh							
Intersection LOS							
Movement	EBL	EBT	WB1	WBR	SBL	SBR	
Lane Configurations	↔	↔	↔	↔	↔	↔	
Traffic Vol, veh/h	40	240	150	126	150	150	90
Future Vol, veh/h	40	240	150	126	150	150	90
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	3	5	8	0	2	4	
Mvmt Flow	48	286	179	150	179	107	
Number of Lanes	1	1	1	0	1	0	
Approach	EB	WB	WB	WB	SB	SB	
Opposing Approach	WB	EB					
Opposing Lanes	1	2			0		
Conflicting Approach Left	SB				WB	WB	
Conflicting Lanes Left	1	0			1	1	
Conflicting Approach Right		SB			EB	EB	
Conflicting Lanes Right	0	1			2	2	
HCM Control Delay	12.9		12.9		12.9		
HCM LOS	B		B		B		
Lane	EBLn1	EBLn2	WBLn1	SBLn1			
Vol Left, %	100%	0%	0%	0%	62%		
Vol Thru, %	0%	100%	54%	0%	0%		
Vol Right, %	0%	0%	46%	38%			
Sign Control	Stop	Stop	Stop	Stop	Stop		
Traffic Vol by Lane	40	240	276	240			
LT Vol	40	0	0	150			
Through Vol	0	240	150	0			
RT Vol	0	0	126	90			
Lane Flow Rate	48	286	329	286			
Geometry Grp	7	7	5	2			
Degree of Uln (X)	0.083	0.463	0.476	0.44			
Departure Headway (Ht)	6.307	5.835	5.219	5.544			
Convergence, Y/N	Yes	Yes	Yes	Yes			
Cap	569	617	690	649			
Service Time	4.04	3.568	3.251	3.577			
HCM Lane V/C Ratio	0.084	0.464	0.477	0.441			
HCM Control Delay	9.6	13.5	12.9	12.9			
HCM Lane LOS	A	B	B	B			
HCM 95th-ile Q	0.3	2.4	2.6	2.2			

HCM Unsignalized Intersection Capacity Analysis
 20: Pirandello St & E Liberty St

HCM 6th AWSC
 20: Pirandello St & E Liberty St

Future Total (AM)
 Base Scenario

Future Total (AM)
 Base Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop											
Traffic Volume (vph)	5	380	5	15	241	51	10	0	35	95	0	5
Future Volume (vph)	5	380	5	15	241	51	10	0	35	95	0	5
Peak Hour Factor	0.91											
Hourly flow rate (vph)	5	418	5	16	265	56	11	0	38	104	0	5
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	428	337	49	109								
Volume Left (vph)	5	16	11	104								
Volume Right (vph)	5	56	38	5								
Head (s)	0.09	0.07	-0.35	0.41								
Departure Headway (s)	4.9	5.0	5.7	6.3								
Degree Utilization, x	0.59	0.47	0.08	0.19								
Capacity (veh/h)	702	687	525	505								
Control Delay (s)	14.8	12.5	9.2	10.8								
Approach Delay (s)	14.8	12.5	9.2	10.8								
Approach LOS	B	B	A	B								
Intersection Summary	Delay: 13.2 Level of Service: B Intersection Capacity Utilization: 46.1% Analysis Period (min): 15 ICU Level of Service: A											

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	14.2											
Intersection LOS	B											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	380	5	15	241	51	10	0	35	95	0	5
Future Vol, veh/h	5	380	5	15	241	51	10	0	35	95	0	5
Peak Hour Factor	0.91											
Heavy Vehicles, %	25											
Mvmt Flow	5	418	5	16	265	56	11	0	38	104	0	5
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	NB	SB								
Opposing Approach	WB	EB	SB	NB								
Opposing Lanes	1	1	1	1								
Conflicting Approach Left	SB	NB	EB	WB								
Conflicting Lanes Left	1	1	1	1								
Conflicting Approach Right	NB	SB	WB	EB								
Conflicting Lanes Right	1	1	1	1								
HCM Control Delay	16.9											
HCM LOS	C											

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	22%	1%	5%	95%
Vol Thru, %	0%	97%	79%	0%
Vol Right, %	78%	1%	17%	5%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	45	390	307	100
LT Vol	10	5	15	95
Through Vol	0	380	241	0
RT Vol	35	5	51	5
Lane Flow Rate	49	429	337	110
Geometry Grp	1	1	1	1
Degree of Utl (X)	0.078	0.63	0.471	0.194
Departure Headway (Hd)	5.683	5.292	5.031	6.342
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	629	686	719	566
Service Time	3.732	3.301	3.043	4.384
HCM Lane V/C Ratio	0.078	0.625	0.469	0.194
HCM Control Delay	9.2	16.9	12.5	10.9
HCM Lane LOS	A	C	B	B
HCM 95th-tile Q	0.3	4.5	2.5	0.7

HCM Unsignalized Intersection Capacity Analysis
 21: Lynn Williams St & Western Battery Road

HCM Unsignalized Intersection Capacity Analysis
 22: Western Battery Road & Proposed Private Laneway

Future Total (AM)
 Base Scenario

Future Total (AM)
 Base Scenario

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		4	4		4	4
Traffic Volume (veh/h)	10	30	55	16	45	40
Future Volume (Veh/h)	10	30	55	16	45	40
Sign Control	Free	Free	Free	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	12	36	66	19	54	48
Pedestrians	9	22			88	
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Walking Speed (m/s)	1.2	1.2	1.2	1.2	1.2	1.2
Percent Blockage	1	2			7	
Right turn flare (veh)						
Median type	None	None	None	None	None	None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
VC, conflicting volume	173				246	172
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol	173				246	172
IC, single (s)	4.1				6.4	6.2
IC, 2 stage (s)	2.2				3.5	3.3
p0 queue free %	99				92	94
CM capacity (veh/h)	1315				675	808
Direction_Lane #	EB 1	WB 1	SB 1			
Volume Total	48	85	102			
Volume Left	12	0	54			
Volume Right	0	19	48			
cSH	1315	1700	732			
Volume to Capacity	0.01	0.05	0.14			
Queue Length 95th (m)	0.2	0.0	3.9			
Control Delay (s)	2.0	0.0	10.7			
Lane LOS	A	B	B			
Approach Delay (s)	2.0	0.0	10.7			
Approach LOS	B	B	B			
Intersection Summary						
Average Delay			5.1			
Intersection Capacity Utilization			27.0%			ICU Level of Service
Analysis Period (min)			15			A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			4	4	4
Traffic Volume (veh/h)	0	20	6	20	65	0
Future Volume (Veh/h)	0	20	6	20	65	0
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.25	0.25	0.25	0.25	0.25	0.25
Hourly flow rate (vph)	0	80	24	80	260	0
Pedestrians	108					
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Walking Speed (m/s)	1.2	1.2	1.2	1.2	1.2	1.2
Percent Blockage	9					
Right turn flare (veh)						
Median type	None	None	None	None	None	None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
VC, conflicting volume	496	368	368			
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol	496	368	368			
IC, single (s)	6.4	6.2	4.1			
IC, 2 stage (s)	3.5	3.3	2.2			
p0 queue free %	100	87	98			
CM capacity (veh/h)	479	622	1087			
Direction_Lane #	EB 1	NB 1	SB 1			
Volume Total	80	104	260			
Volume Left	0	24	0			
Volume Right	80	0	0			
cSH	622	1097	1700			
Volume to Capacity	0.13	0.02	0.15			
Queue Length 95th (m)	3.5	0.5	0.0			
Control Delay (s)	11.6	2.1	0.0			
Lane LOS	B	A	A			
Approach Delay (s)	11.6	2.1	0.0			
Approach LOS	B	B	A			
Intersection Summary						
Average Delay			2.6			
Intersection Capacity Utilization			23.1%			ICU Level of Service
Analysis Period (min)			15			A

HCM Unsignalized Intersection Capacity Analysis
 23: Site Driveway & Proposed Private Laneway

Future Total (AM)
 Base Scenario

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	EB	EB	WB	WB	NB	NB
Traffic Volume (veh/h)	0	6	6	0	40	20
Future Volume (Veh/h)	0	6	6	0	40	20
Sign Control	Free	Free	Free	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.25	0.25	0.25	0.25	0.25	0.25
Hourly flow rate (vph)	0	24	24	0	160	80
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (m)						
pX platoon unblocked						
VC conflicting volume		24			60	12
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCu, unblocked vol						
IC, single (s)		4.1			6.4	6.2
IC, 2 stage (s)		2.2			3.5	3.3
p0 queue free %		99			83	93
CM capacity (veh/h)		1604			937	1074
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	24	24	240			
Volume Left	0	24	160			
Volume Right	24	0	80			
cSH	1700	1604	979			
Volume to Capacity	0.01	0.01	0.25			
Queue Length 95th (m)	0.0	0.4	7.7			
Control Delay (s)	0.0	7.3	9.9			
Lane LOS	A	A	A			
Approach Delay (s)	0.0	7.3	9.9			
Approach LOS	A	A	A			
Intersection Summary						
Average Delay			8.8			
Intersection Capacity Utilization			15.1%		ICU Level of Service	A
Analysis Period (min)			15			

Queues
 1: Dufferin St & King St W

Future Total (PM)
 Base Scenario

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Configurations	EB	EB	WB	WB	NB	NB	SB
Traffic Volume (vph)	85	235	45	375	55	410	95
Future Volume (vph)	85	235	45	375	55	410	95
Lane Group Flow (vph)	0	382	0	564	0	543	0
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm
Protected Phases	4	4	8	8	5	2	6
Permitted Phases	4	4	8	8	5	2	6
Detector Phase	4	4	8	8	5	2	6
Switch Phase							
Minimum Initial (s)	21.0	21.0	21.0	21.0	6.0	20.0	20.0
Minimum Split (s)	28.0	28.0	28.0	28.0	10.0	27.0	27.0
Total Split (s)	35.0	35.0	35.0	35.0	14.0	45.0	31.0
Total Split (%)	43.8%	43.8%	43.8%	43.8%	17.5%	56.3%	38.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	1.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	5.0	5.0	5.0
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode							
v/c Ratio	0.30	0.30	0.37	0.37	0.68	0.82	0.82
Control Delay	10.4	10.4	10.4	10.4	38.8	34.1	34.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.4	10.4	10.4	10.4	38.8	34.1	34.1
Queue Length 50th (m)	14.5	14.5	21.5	21.5	46.4	38.9	38.9
Queue Length 95th (m)	27.6	27.6	38.9	38.9	62.4	52.5	52.5
Internal Link Dist (m)	163.4		383.3		189.0		183.0
Turn Bay Length (m)							
Base Capacity (vph)	1289		1531		1306		723
Starvation Cap Reductn	0		0		0		0
Spillback Cap Reductn	0		0		0		0
Storage Cap Reductn	0		0		0		0
Reduced v/c Ratio	0.30		0.37		0.42		0.74
Intersection Summary							
Cycle Length: 80							
Actuated Cycle Length: 80							
Offset: 29 (36%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green							
Natural Cycle: 65							
Control Type: Actuated-Coordinated							



HCM Signalized Intersection Capacity Analysis
 1: Duferin St & King St W

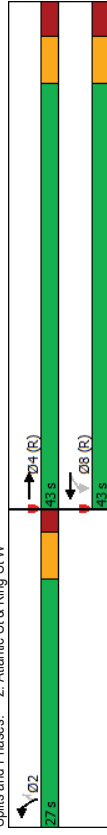
Future Total (PM)
 Base Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	85	235	35	45	375	105	55	410	40	95	300	105
Traffic Volume (vph)	85	235	35	45	375	105	55	410	40	95	300	105
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Total Lost time (s)	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Lane Util. Factor	0.97	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Fpb. ped/bikes	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Flt Protected	3118	3039	3262	3104								
Satd. Flow (prot)	0.73	0.89	0.79	0.66								
Flt Permitted	2288	2707	2895	2081								
Satd. Flow (perm)	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Peak-hour factor, PHF	91	253	38	48	403	113	59	441	43	102	323	113
Adj. Flow (vph)	0	7	0	0	19	0	0	11	0	0	31	0
RTOR Reduction (vph)	0	375	0	0	545	0	0	532	0	0	507	0
Lane Group Flow (vph)	267	277	277	267	178	253	253	178	10	10	178	10
Conf. Peds. (#/hr)	15	15	15	30	30	30	30	30	30	30	30	30
Conf. Bikes (#/hr)	2%	4%	14%	25%	3%	2%	0%	3%	20%	1%	4%	1%
Heavy Vehicles (%)	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm	NA
Turn Type	4	4	8	8	5	2	2	6	6	6	6	6
Protected Phases	4	4	8	8	5	2	2	6	6	6	6	6
Permitted Phases	4	4	8	8	5	2	2	6	6	6	6	6
Actuated Green, G (s)	43.7	43.7	44.7	44.7	24.3	24.3	24.3	24.3	24.3	24.3	24.3	24.3
Effective Green, g (s)	44.7	44.7	44.7	44.7	24.3	24.3	24.3	24.3	24.3	24.3	24.3	24.3
Actuated G/C Ratio	0.56	0.56	0.56	0.56	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Clearance Time (s)	7.0	7.0	7.0	7.0	6.0	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	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap. (vph)	1278	1512	1512	1512	788	788	788	788	788	788	788	788
v/s Ratio Prot	0.16	0.16	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
v/s Ratio Perm	0.29	0.29	0.36	0.36	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
v/c Ratio	9.3	9.8	9.8	9.8	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4
Uniform Delay, d1	1.00	1.00	1.00	1.00	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48
Progression Factor	0.6	0.6	0.7	0.7	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Incremental Delay, d2	9.9	10.4	10.4	10.4	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2
Delay (s)	A	B	B	B	D	D	D	D	D	D	D	D
Level of Service	A	B	B	B	D	D	D	D	D	D	D	D
Approach Delay (s)	9.9	10.4	10.4	10.4	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2
Approach LOS	A	B	B	B	D	D	D	D	D	D	D	D
Intersection Summary												
HCM 2000 Control Delay	23.7 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.65											
Actuated Cycle Length (s)	80.0 Sum of lost time (s) 15.0											
Intersection Capacity Utilization	87.5% ICU Level of Service E											
Analysis Period (min)	15											
Critical Lane Group	c											

Queues
 2: Atlantic St & King St W

Future Total (PM)
 Base Scenario

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations	4	8	8	2	2
Traffic Volume (vph)	500	20	590	251	180
Future Volume (vph)	500	20	590	251	180
Lane Group Flow (vph)	694	0	656	270	194
Turn Type	NA	Perm	NA	Prot	Perm
Protected Phases	4	8	8	2	2
Permitted Phases	4	8	8	2	2
Detector Phase	4	8	8	2	2
Switch Phase	21.0	21.0	21.0	20.0	20.0
Minimum Initial (s)	28.0	28.0	28.0	26.0	26.0
Minimum Split (s)	43.0	43.0	43.0	27.0	27.0
Total Split (%)	61.4%	61.4%	61.4%	36.6%	36.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.0	6.0	6.0	5.0	5.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	C-Max	C-Max	C-Max	None	None
v/c Ratio	0.43	0.39	0.50	0.52	0.52
Control Delay	9.4	10.3	23.8	23.8	23.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	9.4	10.3	23.8	23.8	23.8
Queue Length 50th (m)	23.7	25.2	30.4	19.6	19.6
Queue Length 95th (m)	36.8	37.6	51.0	38.3	38.3
Internal Link Dist (m)	55.1	301.6	50.4		
Turn Bay Length (m)	1621	1683	561	386	
Storage Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.43	0.39	0.48	0.50	0.50
Intersection Summary					
Cycle Length: 70					
Actuated Cycle Length: 70					
Offset: 26 (37%), Referenced to phase 4:EBT and 8:WBT.L, Start of Green					
Natural Cycle: 55					
Control Type: Actuated-Coordinated					

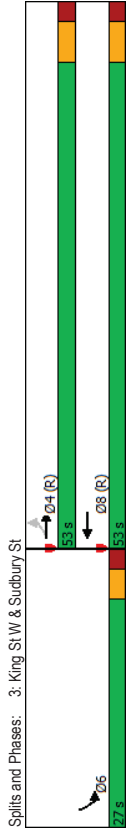


2: Atlantic St & King St W
 HCM Signalized Intersection Capacity Analysis
 Future Total (PM)
 Base Scenario

Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	↑↑	↑↑	←	←	←	←	
Traffic Volume (vph)	500	145	20	590	251	180	
Future Volume (vph)	500	145	20	590	251	180	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	
Frbp. ped/bikes	0.87	1.00	1.00	0.80	1.00	1.00	
Frbp. ped/bikes	1.00	0.99	1.00	1.00	1.00	1.00	
Frt	0.97	1.00	1.00	0.85	1.00	1.00	
Flt Protected	1.00	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	2934	3408	1785	1187	1187	1187	
Flt Permitted	1.00	0.92	0.95	1.00	1.00	1.00	
Satd. Flow (perm)	2934	3138	1785	1187	1187	1187	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	
Adj. Flow (vph)	538	156	22	634	270	194	
RTOR Reduction (vph)	37	0	0	0	0	14	
Lane Group Flow (vph)	657	0	0	656	270	180	
Conf. Peds. (#/hr)	13	492	492	424	175	10	
Conf. Bikes (#/hr)	13	492	492	424	175	10	
Heavy Vehicles (%)	3%	0%	0%	4%	0%	8%	
Turn Type	NA	Perm	NA	Prot	Perm	Perm	
Protected Phases	4		8	2	2		
Permitted Phases	8		8	2	2		
Actuated Green, G (s)	36.8	36.8	20.2	20.2	20.2	20.2	
Effective Green, g (s)	37.8	37.8	21.2	21.2	21.2	21.2	
Actuated G/C Ratio	0.54	0.54	0.30	0.30	0.30	0.30	
Clearance Time (s)	7.0	7.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap. (vph)	1584	1694	540	359	359	359	
v/s Ratio Prot	c0.22		0.15				
v/s Ratio Perm		0.21		c0.15			
v/c Ratio	0.41	0.39	0.50	0.50	0.50	0.50	
Uniform Delay, d1	9.5	9.4	20.0	20.1	20.1	20.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.8	0.7	0.7	1.1	1.1	1.1	
Delay (s)	10.3	10.0	20.8	21.2	21.2	21.2	
Level of Service	B	B	C	C	C	C	
Approach Delay (s)	10.3	10.0	20.9				
Approach LOS	B	B	C				
Intersection Summary							
HCM 2000 Control Delay	12.9	HCM 2000 Level of Service					B
HCM 2000 Volume to Capacity ratio	0.45						
Actuated Cycle Length (s)	70.0	Sum of lost time (s)					11.0
Intersection Capacity Utilization	58.7%	ICU Level of Service					B
Analysis Period (min)	15						
c Critical Lane Group							

3: King St W & Sudbury St
 Queues
 Future Total (PM)
 Base Scenario

Lane Group	EBL	EBT	WBT	SBL
Lane Configurations	←	←	←	←
Traffic Volume (vph)	5	570	510	125
Future Volume (vph)	5	570	510	125
Lane Group Flow (vph)	0	639	823	200
Turn Type	Perm	NA	NA	Prot
Protected Phases	4	8	8	6
Permitted Phases	4		8	6
Detector Phase	4	4	8	6
Switch Phase				
Minimum Initial (s)	24.0	24.0	24.0	21.0
Minimum Split (s)	30.0	30.0	30.0	26.0
Total Split (s)	53.0	53.0	53.0	27.0
Total Split (%)	66.3%	66.3%	66.3%	33.8%
Yellow Time (s)	4.0	4.0	4.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	4.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	C-Max	C-Max	C-Max	None
v/c Ratio	0.33	0.43	0.42	
Control Delay	8.1	7.1	23.5	
Queue Delay	0.0	0.0	0.0	
Total Delay	8.1	7.1	23.5	
Queue Length 50th (m)	23.4	24.8	22.2	
Queue Length 95th (m)	32.7	36.3	41.3	
Internal Link Dist (m)	301.6	26.9	138.9	
Turn Bay Length (m)				
Base Capacity (vph)	1837	1930	498	
Starvation Cap Reductn	0	0	0	
Spillback Cap Reductn	0	0	0	
Storage Cap Reductn	0	0	0	
Reduced v/c Ratio	0.33	0.43	0.40	
Intersection Summary				
Cycle Length: 80				
Actuated Cycle Length: 80				
Offset: 1 (1%), Referenced to phase 4:EBTL and 8:WBT, Start of Green				
Natural Cycle: 60				
Control Type: Actuated-Coordinated				



HCM Signalized Intersection Capacity Analysis
 3: King St W & Sudbury St

HCM Unsignalized Intersection Capacity Analysis
 4: Duoro St & King St W

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		4A	1A		W	
Traffic Volume (vph)	5	570	510	230	125	55
Future Volume (vph)	5	570	510	230	125	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0			
Lane Util. Factor	0.95	0.95	1.00			
Fpb. ped/bikes	1.00	0.91	0.96			
Fpb. ped/bikes	1.00	1.00	1.00			
Ft	1.00	0.95	0.96			
Flt Protected	1.00	1.00	0.97			
Satd. Flow (prot)	3335	3050	1666			
Flt Permitted	0.95	1.00	0.97			
Satd. Flow (perm)	3164	3050	1666			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	6	633	567	256	139	61
RTOR Reduction (vph)	0	0	63	0	20	0
Lane Group Flow (vph)	0	639	760	0	180	0
Confl. Peds. (#/hr)	140		140	60	115	
Confl. Bikes (#/hr)			55			
Heavy Vehicles (%)	0%	7%	3%	0%	0%	0%
Turn Type	Perm	NA	NA	NA	Prot	Prot
Protected Phases	4	8	8	6		
Permitted Phases	4					
Actuated Green, G (s)	48.0	48.0	21.0	21.0		
Effective Green, g (s)	49.0	49.0	22.0	22.0		
Actuated G/C Ratio	0.61	0.61	0.28	0.28		
Clearance Time (s)	6.0	6.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap. (vph)	1937	1868	488	488		
v/s Ratio Prot		c0.25		c0.11		
v/s Ratio Perm	0.20					
v/s Ratio	0.33	0.41	0.39	0.39		
Uniform Delay, d1	7.5	8.0	23.6	23.6		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.5	0.7	0.6	0.6		
Delay (s)	8.0	8.7	24.1	24.1		
Level of Service	A	A	C	C		
Approach Delay (s)	8.0	8.7	24.1	24.1		
Approach LOS	A	A	C	C		
Intersection Summary						
HCM 2000 Control Delay		10.3			HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio		0.40				
Actuated Cycle Length (s)		80.0			Sum of lost time (s)	9.0
Intersection Capacity Utilization		48.6%			ICU Level of Service	A
Analysis Period (min)		15				
c Critical Lane Group						

Movement	EBT	EBR	WBT	WBR	NBL	NBR
Lane Configurations	4A		4A		W	
Traffic Volume (veh/h)	470	235	0	655	95	5
Future Volume (Veh/h)	470	235	0	655	95	5
Sign Control	Free	Free	0%	Free	Stop	
Grade	0%	0%	0%	0%	0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	528	264	0	736	107	6
Pedestrians					200	
Lane Width (m)					3.5	
Walking Speed (m/s)					1.2	
Percent Blockage					16	
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (m)	51		130			
pX, platoon unblocked			0.91		0.95	0.91
vC, conflicting volume			992		1228	596
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			800		765	367
IC, single (s)			4.1		6.8	6.9
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			100		61	99
qM capacity (veh/h)			636		274	487
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	362	440	245	491	113	113
Volume Left	0	0	0	0	0	6
Volume Right	0	264	0	0	0	6
cSH	1700	1700	636	1700	281	
Volume to Capacity	0.21	0.26	0.00	0.29	0.40	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	14.9	
Control Delay (s)	0.0	0.0	0.0	0.0	26.2	
Lane LOS					D	
Approach Delay (s)	0.0	0.0	0.0	26.2		
Approach LOS				D		
Intersection Summary						
Average Delay			1.8			
Intersection Capacity Utilization			35.3%		ICU Level of Service	A
Analysis Period (min)			15			

Queues HCM Signalized Intersection Capacity Analysis 5: Shaw St & King St W Future Total (PM) Base Scenario

EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	Ø1	Ø3	Ø5	Ø7
Lane Group											
Lane Configurations											
Traffic Volume (vph)	20	400	5	445	115	190	55	185			
Future Volume (vph)	20	400	5	445	115	190	55	185			
Lane Group Flow (vph)	0	527	0	567	0	356	0	373			
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA			
Protected Phases											
Permitted Phases	4	4	8	8	2	2	6	1	3	5	7
Detector Phase											
Switch Phase	4	4	8	8	2	2	6	6			
Minimum Initial (s)											
Minimum Initial (s)	19.0	19.0	19.0	19.0	16.0	16.0	16.0	3.0	3.0	3.0	3.0
Minimum Split (s)											
Minimum Split (s)	28.0	28.0	28.0	28.0	22.0	22.0	22.0	5.0	5.0	5.0	5.0
Total Split (s)											
Total Split (s)	37.0	37.0	37.0	37.0	23.0	23.0	23.0	5.0	5.0	5.0	5.0
Total Split (%)											
Total Split (%)	52.9%	52.9%	52.9%	52.9%	32.9%	32.9%	32.9%	7%	7%	7%	7%
Yellow Time (s)											
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0	2.0	2.0	2.0
All-Red Time (s)											
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	0.0	0.0	0.0
Last Time Adjust (s)											
Last Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0				
Total Lost Time (s)											
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Lead/Lag											
Lead/Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None	None	Ped	Ped	Ped
v/c Ratio	0.41	0.40	0.40	0.63	0.40	0.63	0.59				
Control Delay											
Control Delay	13.2	13.0	13.0	28.6	13.0	28.6	22.0				
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Delay											
Total Delay	13.2	13.0	13.0	28.6	13.0	28.6	22.0				
Queue Length 50th (m)											
Queue Length 50th (m)	22.8	24.5	24.5	22.7	18.4	18.4					
Queue Length 95th (m)											
Queue Length 95th (m)	34.6	36.4	36.4	35.8	31.4	31.4					
Internal Link Dist (m)											
Internal Link Dist (m)	105.5	222.7	222.7	65.9	127.6	127.6					
Turn Bay Length (m)											
Turn Bay Length (m)	1286	1415	1415	586	656	656					
Station Cap Reductn											
Station Cap Reductn	0	0	0	0	0	0					
Spillback Cap Reductn											
Spillback Cap Reductn	0	0	0	0	0	0					
Storage Cap Reductn											
Storage Cap Reductn	0	0	0	0	0	0					
Reduced v/c Ratio											
Reduced v/c Ratio	0.41	0.40	0.40	0.61	0.57	0.57					
Intersection Summary											
Cycle Length: 70											
Actuated Cycle Length: 70											
Offset: 1 (1%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green											
Natural Cycle: 60											
Control Type: Actuated-Coordinated											



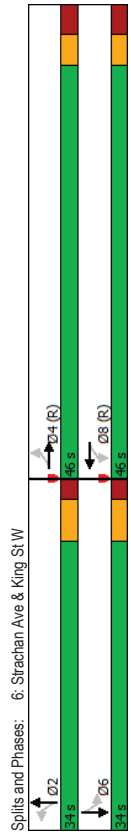
HCM Signalized Intersection Capacity Analysis 5: Shaw St & King St W Future Total (PM) Base Scenario

EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	NBR	SBR
Movement									
Lane Configurations									
Traffic Volume (vph)	20	400	5	445	60	115	190	15	55
Future Volume (vph)	20	400	5	445	60	115	190	15	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor									
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Fpb. ped/bikes									
Fpb. ped/bikes	0.94	0.96	0.96	0.98	0.98	0.94	0.97	0.97	0.91
Fibb. ped/bikes									
Fibb. ped/bikes	0.99	1.00	1.00	0.99	0.99	0.99	0.96	0.96	0.99
Frt									
Frt	0.98	0.98	0.98	0.98	0.98	0.98	0.99	0.99	0.99
Flt Protected									
Flt Protected	1.00	1.00	1.00	1.00	0.98	0.98	0.96	0.96	0.99
Satd. Flow (prot)									
Satd. Flow (prot)	3017	3225	3225	3211	2797	2797	2797	347	347
Flt Permitted									
Flt Permitted	0.92	0.95	0.95	0.69	0.69	0.69	0.82	0.82	0.82
Satd. Flow (perm)									
Satd. Flow (perm)	2781	3064	3064	2260	2260	2260	2319	2319	2319
Peak-Hour factor, PHF									
Peak-Hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)									
Adj. Flow (vph)	22	444	61	6	494	67	128	211	17
RTOR Reduction (vph)									
RTOR Reduction (vph)	0	15	0	0	15	0	0	5	0
Lane Group Flow (vph)									
Lane Group Flow (vph)	0	512	0	0	552	0	0	351	0
Confl. Peds. (#/hr)									
Confl. Peds. (#/hr)	290	332	332	290	233	347	347	10	5
Confl. Bikes (#/hr)									
Confl. Bikes (#/hr)	15	45	45	15	45	10	10	5	5
Heavy Vehicles (%)									
Heavy Vehicles (%)	71%	6%	0%	0%	4%	6%	0%	0%	40%
Turn Type									
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases									
Protected Phases	4	4	8	8	2	2	6		
Permitted Phases									
Permitted Phases	4	4	8	8	2	2	6		
Actuated Green, G (s)									
Actuated Green, G (s)	31.0	31.0	31.0	31.0	16.4	16.4	16.4		
Effective Green, g (s)									
Effective Green, g (s)	32.0	32.0	32.0	32.0	17.4	17.4	17.4		
Actuated G/C Ratio									
Actuated G/C Ratio	0.46	0.46	0.46	0.46	0.25	0.25	0.25		
Clearance Time (s)									
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0		
Vehicle Extension (s)									
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)									
Lane Grp Cap (vph)	1271	1400	1400	561	561	561	576		
v/s Ratio Prot									
v/s Ratio Prot	c0.18	0.18	0.18	c0.16	c0.16	c0.16	0.13		
v/c Ratio Perm									
v/c Ratio Perm	0.40	0.39	0.39	0.63	0.63	0.63	0.54		
Uniform Delay, d1									
Uniform Delay, d1	12.6	12.6	12.6	23.4	23.4	23.4	22.8		
Progression Factor									
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Incremental Delay, d2									
Incremental Delay, d2	1.0	0.8	0.8	2.2	2.2	2.2	1.0		
Delay (s)									
Delay (s)	13.6	13.4	13.4	25.6	25.6	25.6	23.9		
Level of Service									
Level of Service	B	B	B	C	C	C	C		
Approach Delay (s)									
Approach Delay (s)	13.6	13.4	13.4	25.6	25.6	25.6	23.9		
Approach LOS									
Approach LOS	B	B	B	C	C	C	C		
Intersection Summary									
HCM 2000 Control Delay									
HCM 2000 Control Delay	18.0	18.0	18.0	HCM 2000 Level of Service	B	B	B		
HCM 2000 Volume to Capacity ratio									
HCM 2000 Volume to Capacity ratio	0.42	0.42	0.42	0.42	0.42	0.42	0.42		
Actuated Cycle Length (s)									
Actuated Cycle Length (s)	70.0	70.0	70.0	Sum of lost time (s)	14.0	14.0	14.0		
Intersection Capacity Utilization									
Intersection Capacity Utilization	68.0%	68.0%	68.0%	ICU Level of Service	C	C	C		
Analysis Period (min)									
Analysis Period (min)	15	15	15	15	15	15	15		
Critical Lane Group									
Critical Lane Group									



Queues
6: Strachan Ave & King St W

		Future Total (PM)								Base Scenario	
		EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT		
Lane Group											
Lane Configurations											
Traffic Volume (vph)		5	380	5	360	125	275	30	195		
Future Volume (vph)		5	380	5	360	125	275	30	195		
Lane Group Flow (vph)		0	505	0	423	136	359	33	250		
Turn Type		Perm	NA	Perm	NA	Perm	NA	Perm	NA		
Protected Phases		4		8		2		2	6		
Permitted Phases		4		8		2		2	6		
Switch Phase											
Minimum Initial (s)		20.0	20.0	20.0	20.0	21.0	21.0	21.0	21.0		
Minimum Split (s)		26.0	26.0	26.0	27.0	27.0	27.0	27.0	27.0		
Total Split (s)		46.0	46.0	46.0	46.0	34.0	34.0	34.0	34.0		
Total Split (%)		57.5%	57.5%	57.5%	57.5%	42.5%	42.5%	42.5%	42.5%		
Yellow Time (s)		3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0		
All-Red Time (s)		3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0		
Lost Time Adjust (s)		-1.0		-1.0		-1.0		-1.0			
Total Lost Time (s)		5.0		5.0		5.0		5.0			
Lead/Lag											
Lead-Lag Optimize?											
Recall Mode		C-Max	C-Max	C-Max	C-Max	Min	Min	Min	Min		
v/c Ratio		0.33	0.24	0.60	0.67	0.20	0.20	0.48			
Control Delay		9.2	9.0	49.1	44.8	22.9	24.5				
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0				
Total Delay		9.2	9.0	49.1	44.8	22.9	24.5				
Queue Length 50th (m)		16.9	14.4	23.4	60.5	4.1	31.9				
Queue Length 95th (m)		32.4	27.1	m35.9	87.8	10.2	47.4				
Internal Link Dist (m)		222.7	138.4		121.3		128.6				
Turn Bay Length (m)				20.0		25.0					
Base Capacity (vph)		1544	1765	275	639	203	625				
Starvation Cap Reductn		0	0	0	0	0	0				
Spillback Cap Reductn		0	0	0	0	0	0				
Storage Cap Reducth		0	0	0	0	0	0				
Reduced v/c Ratio		0.33	0.24	0.49	0.56	0.16	0.40				
Intersection Summary											
Cycle Length: 80											
Actuated Cycle Length: 80											
Offset: 50 (63%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green											
Natural Cycle: 55											
Control Type: Actuated-Coordinated											
m: Volume for 95th percentile queue is metered by upstream signal.											



HCM Signalized Intersection Capacity Analysis
6: Strachan Ave & King St W

		Future Total (PM)								Base Scenario	
		EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT		
Movement											
Lane Configurations											
Traffic Volume (vph)		5	380	80	5	360	25	125	275	55	30
Future Volume (vph)		5	380	80	5	360	25	125	275	55	30
Ideal Flow (vphpl)		1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0		5.0		5.0		5.0	5.0
Lane Util. Factor		0.95		0.95		1.00		1.00		1.00	1.00
Fpb. ped/bikes		0.89		0.96		1.00		0.95		1.00	0.95
Fpb. ped/bikes		1.00		1.00		0.81		1.00		0.87	1.00
Frt		0.97		0.99		1.00		0.97		1.00	0.98
Flt Protected		1.00		1.00		0.95		1.00		0.95	1.00
Satd. Flow (prot)		2789		3225		1442		1738		1559	1703
Flt Permitted		0.95		0.95		0.60		1.00		0.34	1.00
Satd. Flow (perm)		2655		3066		763		1738		562	1703
Peak-Hour factor, PHF		0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)		5	413	87	5	391	27	136	299	60	33
RTOR Reduction (vph)		0	19	0	0	6	0	0	10	0	0
Lane Group Flow (vph)		0	486	0	0	417	0	136	349	0	33
Conf. Peds. (#/hr)		479		593		479		266		232	232
Conf. Bikes (#/hr)		15		65		65		35		35	35
Heavy Vehicles (%)		0%	7%	27%	0%	5%	4%	0%	0%	2%	0%
Turn Type		Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		2		6	
Permitted Phases		4		8		2		2		6	
Actuated Green, G (s)		45.0		45.0		23.0		23.0		23.0	23.0
Effective Green, g (s)		46.0		46.0		24.0		24.0		24.0	24.0
Actuated G/C Ratio		0.58		0.58		0.30		0.30		0.30	0.30
Clearance Time (s)		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
Lane Grp Cap (vph)		1526		1762		228		521		168	510
v/s Ratio Prot						cd20					0.14
v/s Ratio Perm		c0.18		0.14		0.18		0.06		0.06	
v/c Ratio		0.32		0.24		0.60		0.67		0.20	0.47
Uniform Delay, d1		8.8		8.4		23.9		24.5		20.8	22.8
Progression Factor		1.00		1.00		1.67		1.68		1.00	1.00
Incremental Delay, d2		0.6		0.3		3.3		2.7		0.6	0.7
Delay (s)		9.4		8.7		43.1		43.9		21.4	23.5
Level of Service		A		A		D		D		C	C
Approach Delay (s)		9.4		8.7		43.7		43.7		23.3	23.3
Approach LOS		A		A		D		D		C	C
Intersection Summary											
HCM 2000 Control Delay		21.5		21.5		HCM 2000 Level of Service		C			
HCM 2000 Volume to Capacity ratio		0.44		0.44						10.0	
Actuated Cycle Length (s)		80.0		80.0		Sum of lost time (s)					
Intersection Capacity Utilization		67.6%		67.6%		ICU Level of Service		C			
Analysis Period (min)		15		15							
c: Critical Lane Group											

7: Atlantic St & Snooker St

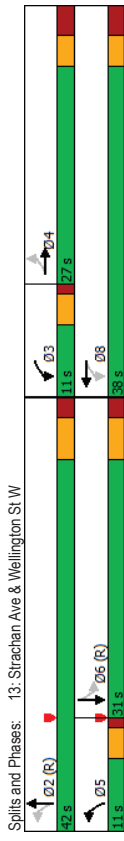
Future Total (PM)
Base Scenario

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W					R
Traffic Volume (veh/h)	30	226	205	30	95	75
Future Volume (Veh/h)	30	226	205	30	95	75
Sign Control	Stop		Free		Free	Free
Grade	0%		0%		0%	0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	32	238	216	32	100	79
Pedestrians	198		40			119
Lane Width (m)	3.5		3.5			3.5
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage						10
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						74
pX platoon unblocked						
VC, conflicting volume	749	549				446
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol	749	549				446
IC, single (s)	6.4	6.2				4.1
IC, 2 stage (s)						
IF (s)	3.5	3.3				2.2
p0 queue free %	88	42				89
CM capacity (veh/h)	278	408				944
Direction_Lane #	WB 1	NB 1	SB 1			
Volume Total	270	248	179			
Volume Left	32	0	100			
Volume Right	238	32	0			
cSH	386	1700	944			
Volume to Capacity	0.70	0.15	0.11			
Queue Length 95th (m)	41.2	0.0	2.8			
Control Delay (s)	33.3	0.0	5.6			
Lane LOS	D		A			
Approach Delay (s)	33.3	0.0	5.6			
Approach LOS	D		D			
Intersection Summary						
Average Delay			14.3			
Intersection Capacity Utilization			54.1%			ICU Level of Service
Analysis Period (min)			15			A

13: Strachan Ave & Wellington St W

Future Total (PM)
Base Scenario

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	h	h	h	h	h	h	h	h
Traffic Volume (vph)	10	105	280	175	150	405	5	270
Future Volume (vph)	10	105	280	175	150	405	5	270
Lane Group Flow (vph)	11	282	298	223	160	553	5	292
Turn Type	Perm	NA	pm-pt	NA	pm-pt	NA	Perm	NA
Protected Phases	4	3	8	5	2	6		
Permitted Phases	4	8			2		6	
Minimum Split (s)	27.0	27.0	10.0	26.0	10.0	29.0	29.0	29.0
Total Split (s)	27.0	27.0	11.0	38.0	11.0	42.0	31.0	31.0
Total Split (%)	33.8%	33.8%	13.8%	47.5%	13.8%	52.5%	38.8%	38.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	1.0	3.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	3.0	5.0	3.0	5.0	5.0	5.0
Lead/Lag	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio	0.04	0.57	0.74	0.30	0.41	0.68	0.02	0.52
Control Delay	21.9	21.5	28.9	16.1	11.9	16.6	14.2	21.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay	21.9	21.5	28.9	16.1	11.9	16.7	14.2	21.6
Queue Length 50th (m)	1.3	25.0	31.0	21.5	14.1	51.3	0.6	41.9
Queue Length 95th (m)	5.2	49.9	#57.3	37.7	m/4.1	m1.6	63.7	121.3
Internal Link Dist (m)		64.0	134.1		143.3			
Turn Bay Length (m)	15.0		25.0		15.0			
Base Capacity (vph)	282	496	405	735	393	815	233	563
Starvation Cap Reductn	0	0	0	0	0	13	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.57	0.74	0.30	0.41	0.69	0.02	0.52
Intersection Summary								
Cycle Length: 80								
Actuated Cycle Length: 80								
Offset: 46 (58%), Referenced to phase 2-NBTL and 6-SBTL, Start of Green								
Natural Cycle: 80								
Control Type: Pretimed								
# 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.								



13: Strachan Ave & Wellington St W

HCM Signalized Intersection Capacity Analysis

Future Total (PM)
Base Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	10	105	160	280	175	35	150	405	115	5	270	5	
Traffic Volume (vph)	10	105	160	280	175	35	150	405	115	5	270	5	
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Ideal Flow (vphpl)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Lane Util. Factor	1.00	0.92	1.00	0.97	1.00	0.97	1.00	0.96	1.00	0.99	1.00	0.99	
Fpb. ped/bikes	0.88	1.00	0.98	1.00	0.89	1.00	0.89	1.00	0.85	1.00	1.00	0.95	
Frt	1.00	0.91	1.00	0.98	1.00	0.98	1.00	0.97	1.00	1.00	1.00	0.95	
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00	0.95	
Satd. Flow (prot)	1575	1556	1749	1762	1592	1736	1691	1731	1691	1731	1731	1691	
Flt Permitted	0.62	1.00	0.38	1.00	0.41	1.00	0.40	1.00	0.40	1.00	1.00	0.40	
Satd. Flow (perm)	1027	1556	701	1762	690	1736	718	1731	718	1731	1731	718	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	
Adj. Flow (vph)	11	112	170	298	186	37	160	431	122	5	287	5	
RTOR Reduction (vph)	0	68	0	9	0	0	13	0	0	0	1	0	
Lane Group Flow (vph)	11	214	0	298	214	0	160	540	0	5	291	0	
Confl. Peds. (#/hr)	80	55	55	80	350	70	350	70	70	350	70	350	
Confl. Bikes (#/hr)	5	20	20	5	40	40	40	40	40	40	40	40	
Heavy Vehicles (%)	0%	1%	1%	0%	0%	4%	0%	1%	0%	0%	7%	20%	
Turn Types	Perm	NA	NA	pm+pt	NA	NA	pm+pt	NA	NA	Perm	NA	NA	
Protected Phases	4	3	8	5	2	5	2	6	6	6	6	6	
Permitted Phases	4	8	8	2	2	2	2	6	6	6	6	6	
Actuated Green, G (s)	21.0	21.0	32.0	32.0	36.0	36.0	36.0	36.0	25.0	25.0	25.0	25.0	
Effective Green, g (s)	22.0	22.0	33.0	33.0	37.0	37.0	37.0	37.0	26.0	26.0	26.0	26.0	
Actuated G/C Ratio	0.28	0.28	0.41	0.41	0.46	0.46	0.46	0.46	0.32	0.32	0.32	0.32	
Clearance Time (s)	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lane Grp Cap (vph)	282	427	393	726	409	802	233	562	233	562	562	562	
v/s Ratio Prot	0.14	c0.08	0.12	0.04	c0.31	0.14	0.17	0.17	0.17	0.17	0.17	0.17	
v/s Ratio Perm	0.01	c0.24	0.14	0.14	0.14	0.14	0.14	0.14	0.01	0.01	0.01	0.01	
v/c Ratio	0.04	0.50	0.76	0.30	0.39	0.67	0.02	0.52	0.02	0.52	0.52	0.52	
Uniform Delay, d1	21.3	24.4	18.6	15.7	13.4	16.8	18.4	21.9	16.8	18.4	21.9	21.9	
Progression Factor	1.00	1.00	1.00	1.00	0.80	0.78	0.75	0.82	0.75	0.82	0.82	0.82	
Incremental Delay, d2	0.3	4.2	12.8	1.0	2.2	3.5	0.2	3.2	0.2	3.2	3.2	3.2	
Level of Service	C	C	C	B	B	B	B	B	B	B	C	C	
Approach Delay (s)	28.3	C	C	25.2	C	15.8	B	21.0	15.8	B	21.0	21.0	
Approach LOS	C	C	C	B	C	B	B	C	B	C	C	C	
Intersection Summary													
HCM 2000 Control Delay	21.3											HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78												
Actuated Cycle Length (s)	80.0											Sum of lost time (s)	16.0
Intersection Capacity Utilization	98.6%											ICU Level of Service	F
Analysis Period (min)	15												
c Critical Lane Group													

15: Dufferin St & Liberty St

Future Total (PM)
Base Scenario

Movement	WBL	WBR	NBT	SBL	SBT
Lane Configurations	330	170	470	70	255
Traffic Volume (vph)	330	170	470	70	255
Future Volume (vph)	371	191	792	0	366
Lane Group Flow (vph)	371	191	792	0	366
Turn Type	Prot	Perm	NA	Perm	NA
Protected Phases	8	2	2	6	6
Permitted Phases	8	8	2	6	6
Detector Phase	8	8	2	6	6
Switch Phase	18.0	18.0	18.0	18.0	18.0
Minimum Initial (s)	23.0	23.0	24.0	24.0	24.0
Minimum Split (s)	40.0	40.0	40.0	40.0	40.0
Total Split (s)	50.0%	50.0%	50.0%	50.0%	50.0%
Total Split (%)	3.0	3.0	4.0	4.0	4.0
Yellow Time (s)	2.0	2.0	2.0	2.0	2.0
All-Red Time (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Last Time Adjust (s)	4.0	4.0	5.0	5.0	5.0
Total Lost Time (s)	4.0	4.0	5.0	5.0	5.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	C-Max	C-Max	C-Max
v/c Ratio	0.70	0.42	0.45	0.27	0.27
Control Delay	31.5	14.4	9.4	3.4	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	31.5	14.4	9.4	3.4	3.4
Queue Length 50th (m)	52.6	13.3	26.8	3.3	3.3
Queue Length 95th (m)	69.4	25.9	50.6	m8.8	m8.8
Internal Link Dist (m)	382.8	162.3	186.7	186.7	186.7
Turn Bay Length (m)	10.0	10.0	10.0	10.0	10.0
Base Capacity (vph)	787	637	1745	1371	1371
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.47	0.30	0.45	0.27	0.27
Intersection Summary					
Cycle Length: 80					
Actuated Cycle Length: 80					
Offset: 79 (99%), Referenced to phase 2:NBT and 6:SBTL, Start of Green					
Natural Cycle: 50					
Control Type: Actuated-Coordinated					
m Volume for 95th percentile queue is metered by upstream signal.					



HCM Signalized Intersection Capacity Analysis
 15: Dufferin St & Liberty St

Movement	WBL	WBR	NBT	NBR	SBL	SBT	Future Total (PM)	
Lane Configurations								
Traffic Volume (vph)	330	170	470	235	70	255		
Future Volume (vph)	330	170	470	235	70	255		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0		
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95		
Fpb. ped/bikes	1.00	0.85	0.88	1.00	1.00	0.98		
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	0.98		
Flt Protected	0.95	1.00	1.00	0.99	1.00	0.99		
Satd. Flow (prot)	1750	1314	2892	3269	3269	3269		
Flt Permitted	0.95	1.00	1.00	0.71	1.00	0.71		
Satd. Flow (perm)	1750	1314	2892	2342	2342	2342		
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89		
Adj. Flow (vph)	371	191	528	264	79	287		
RTOR Reduction (vph)	0	57	57	0	0	0		
Lane Group Flow (vph)	371	134	735	0	0	366		
Conf. Peds. (#/hr)	169	105	157	157	157	157		
Conf. Bikes (#/hr)	6	6	8	8	8	8		
Heavy Vehicles (%)	2%	3%	4%	1%	1%	7%		
Turn Type	Prot	Perm	NA	Perm	NA	NA		
Protected Phases	8	2	2	6	6	6		
Permitted Phases	8	2	2	6	6	6		
Actuated Green, G (s)	23.3	23.3	45.7	45.7	45.7	45.7		
Effective Green, g (s)	24.3	24.3	46.7	46.7	46.7	46.7		
Actuated g/C Ratio	0.30	0.30	0.58	0.58	0.58	0.58		
Clearance Time (s)	5.0	5.0	6.0	6.0	6.0	6.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		
Lane Grp Cap. (vph)	531	399	1688	1367	1367	1367		
v/s Ratio Prot	0.21	0.21	0.25	0.25	0.25	0.25		
v/s Ratio Perm	0.10	0.10	0.10	0.16	0.16	0.16		
v/s Ratio	0.70	0.34	0.44	0.27	0.27	0.27		
Uniform Delay, d1	24.6	21.6	9.3	8.2	8.2	8.2		
Progression Factor	1.00	1.00	1.00	0.33	0.33	0.33		
Incremental Delay, d2	4.0	0.5	0.8	0.4	0.4	0.4		
Delay (s)	28.6	22.1	10.1	3.0	3.0	3.0		
Level of Service	C	C	B	A	A	A		
Approach Delay (s)	28.4	10.1	3.0	3.0	3.0	3.0		
Approach LOS	C	B	A	A	A	A		
Intersection Summary								
HCM 2000 Control Delay	13.9						HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53							
Actuated Cycle Length (s)	80.0						Sum of lost time (s)	9.0
Intersection Capacity Utilization	67.9%						ICU Level of Service	C
Analysis Period (min)	15							
c Critical Lane Group								

HCM Unsignalized Intersection Capacity Analysis
 16: Atlantic St & Liberty St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Sign Control	Stop												
Traffic Volume (vph)	40	265	50	15	170	80	35	115	55	45	20	35	
Future Volume (vph)	40	265	50	15	170	80	35	115	55	45	20	35	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	
Hourly flow rate (vph)	41	270	51	15	173	82	36	117	56	46	20	36	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1									
Volume Total (vph)	362	270	209	102									
Volume Left (vph)	41	15	36	46									
Volume Right (vph)	51	82	56	36									
Head (s)	-0.05	-0.08	-0.11	-0.11									
Departure Headway (s)	5.2	5.3	5.7	5.9									
Degree Utilization, x	0.52	0.40	0.33	0.17									
Capacity (veh/h)	655	633	568	511									
Control Delay (s)	13.8	11.8	11.4	10.1									
Approach Delay (s)	13.8	11.8	11.4	10.1									
Approach LOS	B	B	B	B									
Intersection Summary													
Delay	12.3												
Level of Service	B												
Intersection Capacity Utilization	54.3%						ICU Level of Service						A
Analysis Period (min)	15												

HCAM 6th AWSC
16: Atlantic St & Liberty St

Future Total (PM)
Base Scenario

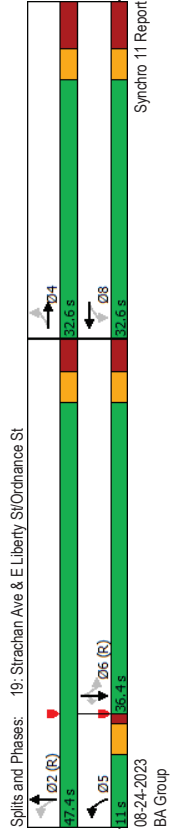
Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	12.2											
Intersection LOS	B											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	4	4	4	4	4	4	4	4	4	4	4	4
Traffic Vol, veh/h	40	265	50	15	170	80	35	115	55	45	20	35
Future Vol, veh/h	40	265	50	15	170	80	35	115	55	45	20	35
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles, %	0	1	0	0	1	16	5	0	0	0	0	2
Mvmt Flow	41	270	51	15	173	82	36	117	56	46	20	36
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	WB	EB	WB	WB	NB	NB	SB	SB	NB	NB
Opposing Approach	WB	EB	WB	EB	WB	WB	NB	NB	SB	SB	NB	NB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	NB	EB	WB	WB	EB	WB	WB	WB	EB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	WB	WB	WB	EB	WB	WB	WB	EB	WB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	13.7	11.5	11.5	11.5	11.5	11.5	10	10	10	10	10	10
HCM LOS	B	B	B	B	B	B	A	A	A	A	A	A
Lane	NBLn1	EBLn1	EBLn1	WBLn1	WBLn1	WBLn1	SBLn1	SBLn1	SBLn1	SBLn1	SBLn1	SBLn1
Vol Left, %	17%	11%	6%	45%								
Vol Thru, %	56%	75%	64%	20%								
Vol Right, %	27%	14%	30%	35%								
Sign Control	Stop	Stop	Stop	Stop								
Traffic Vol by Lane	205	355	265	100								
LT Vol	35	40	15	45								
Through Vol	115	265	170	20								
RT Vol	55	80	80	35								
Lane Flow Rate	209	362	270	102								
Geometry Grp	1	1	1	1								
Degree of Upl (X)	0.33	0.519	0.39	0.165								
Departure Headway (Hd)	5.682	5.168	5.186	5.828								
Convergence, Y/N	Yes	Yes	Yes	Yes								
Cap	632	699	692	613								
Service Time	3.734	3.199	3.232	3.889								
HCM Lane V/C Ratio	0.331	0.518	0.39	0.166								
HCM Control Delay	11.5	13.7	11.5	10								
HCM Lane LOS	B	B	B	A								
HCM 95th-ile Q	1.4	3	1.9	0.6								

08-24-2023
BA Group
Synchro 11 Report

19: Strachan Ave & E Liberty St/Ordnance St

Future Total (PM)
Base Scenario

Queue	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	4	4	4	4	4	4	4	4	4
Traffic Volume (vph)	245	35	60	35	315	375	65	380	265
Future Volume (vph)	245	35	60	35	315	375	65	380	265
Future Group Flow (vph)	255	317	0	151	328	464	68	396	276
Turn Type	Perm	NA	Perm	NA	pm-pt	NA	Perm	NA	Perm
Protected Phases	4	8	8	5	2	6	6	6	6
Permitted Phases	4	4	8	8	5	2	6	6	6
Detector Phase	4	4	8	8	5	2	6	6	6
Switch Phase	25.0	25.0	25.0	25.0	6.0	21.0	14.0	14.0	14.0
Minimum Initial (s)	32.6	32.6	32.6	32.6	10.0	27.3	27.3	27.3	27.3
Minimum Split (s)	32.6	32.6	32.6	32.6	11.0	47.4	36.4	36.4	36.4
Total Split (s)	40.8%	40.8%	40.8%	40.8%	13.8%	59.3%	45.5%	45.5%	45.5%
Total Split (%)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Yellow Time (s)	4.6	4.6	4.6	4.6	1.0	3.3	3.3	3.3	3.3
All-Red Time (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Lost Time Adjust (s)	6.6	6.6	6.6	6.6	3.0	5.3	5.3	5.3	5.3
Total Lost Time (s)	Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lag	Lag
Recall Mode	Min	Min	None	None	C-Min	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.83	0.93	0.49	0.84	0.53	0.26	0.55	0.98	0.98
Control Delay	49.1	51.4	22.8	32.0	15.0	18.9	20.6	60.1	60.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.1	51.4	22.8	32.0	15.0	18.9	20.6	60.1	60.1
Queue Length 50th (m)	37.2	28.8	14.4	26.5	45.0	7.2	43.1	17.0	17.0
Queue Length 95th (m)	#78.9	#82.3	33.0	#59.2	71.4	m#13.5	m#65.1	m#63.0	m#63.0
Internal Link Dist (m)	45.8	123.7	152.3	143.3					
Turn Bay Length (m)	309	341	310	392	882	258	716	282	282
Base Capacity (vph)	0	0	0	0	0	0	0	0	0
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.83	0.93	0.49	0.84	0.53	0.26	0.55	0.98	0.98
Intersection Summary									
Cycle Length: 80									
Actuated Cycle Length: 80									
Offset: 44 (55%), Referenced to phase 2:NBLT and 6:SBTL, Start of Green									
Natural Cycle: 75									
Control Type: Actuated-Coordinated									
# 95th percentile volume exceeds capacity, queue may be longer.									
Queue shown is maximum after two cycles.									
m Volume for 95th percentile queue is metered by upstream signal.									



08-24-2023
BA Group
Synchro 11 Report

HCM Signalized Intersection Capacity Analysis
 19: Strachan Ave & E Liberty St/Ordnance St

Movement	Base Scenario											Future Total (PM)		
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations														
Traffic Volume (vph)	245	35	270	60	35	50	315	375	70	65	380	265		
Future Volume (vph)	245	35	270	60	35	50	315	375	70	65	380	265		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	3.0	5.3	5.3	5.3	5.3	5.3		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Frbp_ped/bikes	1.00	0.46		0.87	1.00	0.91	1.00	0.91	1.00	1.00	0.85	0.31		
Frbp_ped/bikes	0.74	1.00		0.86	0.91	1.00	0.91	1.00	0.71	1.00	1.00	1.00		
Frt	1.00	0.87		0.95	1.00	0.98	1.00	0.98	1.00	1.00	0.85	0.85		
Flt Protected	0.95	1.00		0.98	1.00	0.95	1.00	0.95	1.00	1.00	0.85	0.85		
Satd. Flow (prot)	1303	754		1300	1625	1673	1625	1673	1273	1842	474	474		
Flt Permitted	0.69	1.00		0.66	0.35	1.00	0.35	1.00	0.60	1.00	1.00	1.00		
Satd. Flow (perm)	952	754		882	589	1673	589	1673	665	1842	474	474		
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96		
Adj. Flow (vph)	255	36	281	62	36	52	328	391	73	68	396	276		
RTOR Reduction (vph)	0	97	0	0	24	0	0	2	0	0	0	98		
Lane Group Flow (vph)	255	220	0	0	127	0	328	462	0	68	396	178		
Conf. Ped. (#/hr)	209	600	600	209	725	385	385	725	15	15	725	725		
Conf. Bikes (#/hr)	13			49								8		
Heavy Vehicles (%)	1%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	2%		
Turn Types	Perm	NA	Perm	NA	NA	pm+pt	NA	NA	Perm	NA	Perm	NA		
Protected Phases	4			8		5	2		6			6		
Permitted Phases	4			8		2			6			6		
Actuated Green, G (s)	25.0	25.0		25.0	41.1	41.1	41.1	41.1	30.1	30.1	30.1	30.1		
Effective Green, g (s)	26.0	26.0		26.0	42.1	42.1	42.1	42.1	31.1	31.1	31.1	31.1		
Actuated g/C Ratio	0.32	0.32		0.32	0.53	0.53	0.53	0.53	0.39	0.39	0.39	0.39		
Clearance Time (s)	7.6	7.6		7.6	4.0	6.3	6.3	6.3	6.3	6.3	6.3	6.3		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
Lane Grp Cap. (vph)	309	245		286	417	880	286	880	258	716	184	184		
v/s Ratio Prot	c0.29			0.14	0.33	0.28		0.28	0.10		c0.38			
v/s Ratio Perm	0.27			0.14	0.33	0.28		0.28	0.10		c0.38			
v/c Ratio	0.83	0.90		0.45	0.79	0.52	0.79	0.52	0.26	0.55	0.97			
Uniform Delay, d1	24.9	25.8		21.3	14.0	12.4	14.0	12.4	16.7	19.0	24.0			
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.96	0.93	1.31			
Incremental Delay, d2	16.2	31.9		1.1	9.4	2.2	9.4	2.2	2.0	2.4	51.3			
Delay (s)	41.1	57.6		22.4	23.5	14.6	23.5	14.6	17.9	20.1	82.8			
Level of Service	D	E		C	C	B	C	B	B	C	F			
Approach Delay (s)	50.3			22.4		18.3		18.3	43.3		D			
Approach LOS	D			C		B		B	D		D			
Intersection Summary														
HCM 2000 Control Delay												34.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio												0.92		
Actuated Cycle Length (s)												80.0	Sum of lost time (s)	14.9
Intersection Capacity Utilization												105.5%	ICU Level of Service	G
Analysis Period (min)												15		
c Critical Lane Group														

HCM Unsignalized Intersection Capacity Analysis
 8: Hanna Ave/75 Hanna Ave & Snooker St/Private St

Movement	Base Scenario											Future Total (PM)		
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations														
Sign Control	Stop											Stop		
Traffic Volume (vph)	35	75	15	90	221	10	40	30	75	0	0	0		
Future Volume (vph)	35	75	15	90	221	10	40	30	75	0	0	0		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95		
Hourly flow rate (vph)	37	79	16	95	233	11	42	32	79	0	0	0		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1										
Volume Total (vph)	132	339	153	0										
Volume Left (vph)	37	95	42	0										
Volume Right (vph)	16	11	79	0										
Head (s)	-0.02	0.04	-0.25	0.00										
Departure Headway (s)	4.7	4.5	4.7	5.2										
Degree Utilization, x	0.17	0.42	0.20	0.00										
Capacity (veh/h)	736	773	687	618										
Control Delay (s)	8.6	10.7	8.9	8.2										
Approach Delay (s)	8.6	10.7	8.9	8.2										
Approach LOS	A	B	A	A										
Intersection Summary														
Delay												9.8		
Level of Service												A	ICU Level of Service	
Intersection Capacity Utilization												43.2%		
Analysis Period (min)												15	A	

HCM 6th AWSC
8: Hanna Ave/75 Hanna Ave & Snooker St/Private St

HCM Unsignalized Intersection Capacity Analysis
11: Private St & Proposed Private Laneway & Existing Metro Driveway

Intersection	Future Total (PM)											
	Base Scenario											
Intersection Delay, s/veh	9.8											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	35	75	15	90	221	10	40	30	75	0	0	0
Traffic Vol, veh/h	35	75	15	90	221	10	40	30	75	0	0	0
Future Vol, veh/h	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Peak Hour Factor	0	0	0	0	0	0	2	0	0	0	0	0
Heavy Vehicles, %	37	79	16	95	233	11	42	32	79	0	0	0
Mgmt Flow	0	1	0	0	1	0	0	1	0	0	1	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	WB	WB	EB	NB	NB	NB	SB	SB	SB	SB
Opposing Approach	1	1	1	1	1	1	1	1	1	1	1	1
Opposing Lanes	SB	NB	NB	EB	EB	WB	WB	WB	WB	WB	WB	WB
Conflicting Approach Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	8.6	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7
HCM LOS	A	B	B	B	B	B	B	B	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	28%	28%	28%	0%
Vol Thru, %	21%	60%	69%	100%
Vol Right, %	52%	12%	3%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	145	125	321	0
LT Vol	40	35	90	0
Through Vol	30	75	221	0
RT Vol	75	15	10	0
Lane Flow Rate	153	132	338	0
Geometry Grp	1	1	1	1
Degree of UHl (X)	0.201	0.169	0.418	0
Departure Headway (Hd)	4.739	4.626	4.458	5.182
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	756	774	808	0
Service Time	2.775	2.664	2.489	3.234
HCM Lane V/C Ratio	0.202	0.171	0.418	0
HCM Control Delay	9	8.6	10.7	8.2
HCM Lane LOS	A	A	B	N
HCM 95th-tile Q	0.7	0.6	2.1	0

HCM 6th AWSC
 11: Private St & Proposed Private Laneway & Existing Metro Driveway

HCM Unsignalized Intersection Capacity Analysis
 12: Private St & 120 Lynn Williams Driveway

Future Total (PM)
 Base Scenario

Future Total (PM)
 Base Scenario

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	8.6											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	25	10	105	5	13	0	133	50	17	0	40	25
Traffic Vol, veh/h	25	10	105	5	13	0	133	50	17	0	40	25
Future Vol, veh/h	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Peak Hour Factor	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Vehicles, %	28	11	118	6	15	0	149	56	19	0	45	28
Mvmt Flow	0	1	0	0	1	0	0	1	0	0	1	0
Number of Lanes												
Approach	EB	WB	EB	WB	EB	WB	NB	NB	SB	SB	SB	SB
Opposing Approach	WB	EB	WB	EB	WB	EB	SB	SB	NB	NB	WB	WB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB	EB	WB	SB	SB	WB	WB	EB	EB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB	WB	EB	SB	SB	WB	WB	EB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	8.1	8	8	8	8	8	9.2	7.7	7.7	7.7	7.7	7.7
HCM LOS	A	A	A	A	A	A	A	A	A	A	A	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W					
Traffic Volume (veh/h)	0	55	90	200	150	0
Future Volume (Veh/h)	0	55	90	200	150	0
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	59	96	213	160	0
Pedestrians	160			50	161	
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Walking Speed (m/s)	1.2	1.2	1.2	1.2	1.2	1.2
Percent Blockage	13			4	13	
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
Px, platoon unblocked	886	370	320			
Vc, conflicting volume						
Vc1, stage 1 conf vol						
Vc2, stage 2 conf vol						
Vcu, unblocked vol	886	370	320			
IC, single (s)	6.4	6.2	4.1			
IC, 2 stage (s)						
IF (s)	3.5	3.3	2.2			
p0 queue free %	100	90	91			
pm capacity (veh/h)	219	568	1089			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	59	309	160			
Volume Left	0	96	0			
Volume Right	59	0	0			
CSH	568	1089	1700			
Volume to Capacity	0.10	0.09	0.09			
Queue Length 95th (m)	2.8	2.3	0.0			
Control Delay (s)	12.1	3.3	0.0			
Lane LOS	B	A	A			
Approach Delay (s)	12.1	3.3	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			3.3			
Intersection Capacity Utilization			51.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 14: Lynn Williams St & Private St

Movement	WBL	WBR	NBT	NBR	SBL	SBT	Future Total (PM)
Lane Configurations	W						Base Scenario
Traffic Volume (veh/h)	55	65	230	55	60	150	
Future Volume (Veh/h)	55	65	230	55	60	150	
Sign Control	Stop	Stop	Free	Free	Free	Free	
Grade	0%	0%	0%	0%	0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	
Hourly flow rate (vph)	58	68	242	58	63	158	
Pedestrians	162		49			170	
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	
Walking Speed (m/s)	1.2	1.2	1.2	1.2	1.2	1.2	
Percent Blockage	12		4			14	
Right turn flare (veh)			None			None	
Median type			None			None	
Median storage (veh)							
Upstream signal (m)							
pX platoon unblocked							
VC, conflicting volume	756	593			452		
VC1, stage 1 conf vol							
VC2, stage 2 conf vol							
VCU, unblocked vol	756	593			452		
IC, single (s)	6.4	6.2			4.1		
IC, 2 stage (s)	3.5	3.3			2.2		
p0 queue free %	81	82			94		
CM capacity (veh/h)	298	385			981		
Direction_Lane #	WB 1	NB 1	SB 1				
Volume Total	126	300	221				
Volume Left	58	0	63				
Volume Right	68	58	0				
cSH	340	1700	981				
Volume to Capacity	0.37	0.18	0.06				
Queue Length 95th (m)	13.3	0.0	1.6				
Control Delay (s)	21.7	0.0	3.0				
Lane LOS	C	A	A				
Approach Delay (s)	21.7	0.0	3.0				
Approach LOS	C						
Intersection Summary							
Average Delay			5.3				
Intersection Capacity Utilization			51.4%			ICU Level of Service	A
Analysis Period (min)			15				

HCM Unsignalized Intersection Capacity Analysis
 17: Liberty St/E Liberty St & Hanna Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	75	280	45	20	165	50	50	15	35	20	10	35
Future Volume (vph)	75	280	45	20	165	50	50	15	35	20	10	35
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	82	308	49	22	181	55	55	16	38	22	11	38
Direction_Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	439	258	109	71								
Volume Left (vph)	82	22	55	22								
Volume Right (vph)	49	55	38	38								
Head (s)	-0.03	0.00	-0.06	-0.23								
Departure Headway (s)	4.7	5.0	5.7	5.6								
Degree Utilization, x	0.58	0.36	0.17	0.11								
Capacity (veh/h)	730	686	553	553								
Control Delay (s)	14.1	10.7	9.8	9.3								
Approach Delay (s)	14.1	10.7	9.8	9.3								
Approach LOS	B	B	A	A								
Intersection Summary												
Delay			12.2									
Level of Service			B									
Intersection Capacity Utilization			58.5%									B
Analysis Period (min)			15									

HCM 6th AWSC
17: Liberty St/E Liberty St & Hanna Ave

HCM Unsignalized Intersection Capacity Analysis
18: E Liberty St & Lynn Williams St

Future Total (PM)
Base Scenario

Future Total (PM)
Base Scenario

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	12											
Intersection LOS	B											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	75	280	45	20	165	50	50	15	35	20	10	35
Traffic Vol, veh/h	75	280	45	20	165	50	50	15	35	20	10	35
Future Vol, veh/h	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Peak Hour Factor	0	0	0	0	9	0	6	0	0	6	0	0
Heavy Vehicles, %	82	308	49	22	181	55	55	16	38	22	11	38
Mvmt Flow	0	1	0	0	1	0	0	1	0	0	1	0
Number of Lanes												
Approach	EB	WB	WB	WB	WB	NB	NB	SB	SB	SB	SB	SB
Opposing Approach	1	1	1	1	1	1	1	1	1	1	1	1
Opposing Lanes	SB	NB	NB	EB	EB	WB	WB	WB	WB	WB	WB	WB
Conflicting Approach Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Lanes Left	NB	SB	SB	WB	WB	EB	EB	EB	EB	EB	EB	EB
Conflicting Approach Right	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Lanes Right	13.9	10.5	10.5	9.9	9.9	9.4	9.4	9.4	9.4	9.4	9.4	9.4
HCM Control Delay												
HCM LOS	B	B	B	A	A	A	A	A	A	A	A	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR
Lane Configurations	75	285	195	215	125	80	125	80
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	70	265	195	215	125	80	125	80
Future Volume (vph)	70	265	195	215	125	80	125	80
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	75	285	210	231	134	86	134	86
Direction, Lane #	EB 1	EB 2	WB 1	WB 1	SB 1			
Volume Total (vph)	75	285	441	220				
Volume Left (vph)	75	0	0	134				
Volume Right (vph)	0	0	231	86				
Head (s)	0.52	0.00	-0.27	-0.11				
Departure Headway (s)	6.2	5.7	4.9	5.7				
Degree Utilization, x	0.13	0.45	0.60	0.35				
Capacity (veh/h)	555	614	710	572				
Control Delay (s)	8.9	12.0	15.1	11.7				
Approach Delay (s)	11.3	15.1	11.7					
Approach LOS	B	C	B					
Intersection Summary								
Delay	13.0							
Level of Service	B							
Intersection Capacity Utilization	56.7%							
ICU Level of Service	B							
Analysis Period (min)	15							

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	50%	19%	9%	31%
Vol Thru, %	15%	70%	70%	15%
Vol Right, %	35%	11%	21%	54%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	100	400	235	65
LT Vol	50	75	20	20
Through Vol	15	280	165	10
RT Vol	35	45	50	35
Lane Flow Rate	110	440	258	71
Geometry Grp	1	1	1	1
Degree of Uhl (X)	0.174	0.57	0.351	0.112
Departure Headway (Hd)	5.703	4.666	4.892	5.636
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	631	765	739	638
Service Time	3.719	2.759	2.892	3.653
HCM Lane V/C Ratio	0.174	0.575	0.349	0.111
HCM Control Delay	9.9	13.9	10.5	9.4
HCM Lane LOS	A	B	B	A
HCM 95th-ile Q	0.6	3.6	1.6	0.4

HCM 6th AWSC
18: E Liberty St & Lynn Williams St

HCM Unsignalized Intersection Capacity Analysis
20: Pirandello St & E Liberty St

Future Total (PM)
Base Scenario

Future Total (PM)
Base Scenario

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Intersection Delay, s/veh	13.5					
Intersection LOS	B					
Lane Configurations	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	70	265	195	215	125	80
Future Vol, veh/h	70	265	195	215	125	80
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles, %	1	0	6	0	0	0
Mgmt Flow	75	285	210	231	134	86
Number of Lanes	1	1	1	0	1	0
Approach	EB	WB	WB	EB	SB	SB
Opposing Approach	WB	EB				
Opposing Lanes	1	2			0	
Conflicting Approach Left	SB				WB	
Conflicting Lanes Left	1	0			1	
Conflicting Approach Right	SB	EB			EB	
Conflicting Lanes Right	0	1	2		2	
HCM Control Delay	12.3	15.4	11.8		11.8	
HCM LOS	B	C	C		B	
Lane	EBLn1	EBLn2	WBLn1	SBLn1		
Vol Left, %	100%	0%	0%	61%		
Vol Thru, %	0%	100%	48%	0%		
Vol Right, %	0%	0%	52%	39%		
Sign Control	Stop	Stop	Stop	Stop		
Traffic Vol by Lane	70	265	410	205		
LT Vol	70	0	0	125		
Through Vol	0	265	195	0		
RT Vol	0	0	215	80		
Lane Flow Rate	75	285	441	220		
Geometry Grp	7	7	5	2		
Degree of Uhl (X)	0.129	0.447	0.608	0.35		
Departure Headway (Hd)	6.173	5.649	4.963	5.724		
Convergence, Y/N	Yes	Yes	Yes	Yes		
Cap	582	638	727	628		
Service Time	3.9	3.376	2.987	3.759		
HCM Lane V/C Ratio	0.129	0.447	0.607	0.35		
HCM Control Delay	9.8	12.9	15.4	11.8		
HCM Lane LOS	A	B	C	B		
HCM 95th-ile Q	0.4	2.3	4.2	1.6		

Movement	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	10	370	10	50	380	105	10	0	25	125	5
Future Volume (vph)	10	370	10	50	380	105	10	0	25	125	5
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	11	411	11	56	422	117	11	0	28	139	6
Direction, Lane #	EB 1	WB 1	NB 1	SB 1							
Volume Total (vph)	433	695	39	167							
Volume Left (vph)	11	56	11	139							
Volume Right (vph)	11	117	28	22							
Head (s)	0.00	-0.06	-0.37	0.09							
Departure Headway (s)	5.5	5.2	6.7	6.7							
Degree Utilization, x	0.66	0.87	0.07	0.31							
Capacity (veh/h)	631	670	459	497							
Control Delay (s)	18.6	32.4	10.3	12.7							
Approach Delay (s)	C	D	B	B							
Approach LOS	C	D	B	B							
Intersection Summary											
Delay	24.2										
Level of Service	C										
Intersection Capacity Utilization	75.6%										
ICU Level of Service	D										
Analysis Period (min)	15										

HCM 6th AWSC
20: Pirandello St & E Liberty St

HCM Unsignalized Intersection Capacity Analysis
21: Lynn Williams St & Western Battery Road

Future Total (PM)
Base Scenario

Future Total (PM)
Base Scenario

Intersection	Delay, s/veh											
Intersection LOS	24.3	C										
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	370	10	50	380	105	10	0	25	125	5	20
Traffic Vol, veh/h	10	370	10	50	380	105	10	0	25	125	5	20
Future Vol, veh/h	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Peak Hour Factor	12	0	0	2	3	0	0	0	0	0	0	0
Heavy Vehicles, %	11	411	11	56	422	117	11	0	28	139	6	22
Mvmt Flow	0	1	0	0	1	0	0	1	0	0	1	0
Number of Lanes												
Approach	EB	WB	WB	EB	NB	NB	SB	SB	SB	NB	NB	SB
Opposing Approach	1	1	1	1	1	1	1	1	1	1	1	1
Opposing Lanes	SB	NB	NB	EB	EB	EB	WB	WB	WB	WB	WB	WB
Conflicting Approach Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Lanes Left	NB	SB	SB	WB	WB	WB	EB	EB	EB	EB	EB	EB
Conflicting Approach Right	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Lanes Right	19.9	31.7	10.3	12.7								
HCM Control Delay	C	D	D	B	B	B	B	B	B	B	B	B
HCM LOS												
Lane	NBLn1	EBLn1	EBLn1	WBLn1	SBLn1	SBLn1						
Vol Left, %	29%	3%	9%	83%								
Vol Thru, %	0%	95%	71%	3%								
Vol Right, %	71%	3%	20%	13%								
Sign Control	Stop	Stop	Stop	Stop								
Traffic Vol by Lane	35	390	535	150								
LT Vol	10	10	50	125								
Through Vol	0	370	380	5								
RT Vol	25	10	105	20								
Lane Flow Rate	39	433	594	167								
Geometry Grp	1	1	1	1								
Degree of U/I (X)	0.073	0.679	0.659	0.309								
Departure Headway (Hd)	6.767	5.64	5.2	6.667								
Convergence, Y/N	Yes	Yes	Yes	Yes								
Cap	532	637	696	535								
Service Time	4.767	3.707	3.26	4.752								
HCM Lane V/C Ratio	0.073	0.68	0.653	0.312								
HCM Control Delay	10.3	19.9	31.7	12.7								
HCM Lane LOS	B	C	D	B								
HCM 95th-ile Q	0.2	5.3	10	1.3								

06-24-2023
BA Group

06-24-2023
BA Group

Synchro 11 Report

Synchro 11 Report

HCM Unsignalized Intersection Capacity Analysis
 22: Western Battery Road & Proposed Private Laneway

HCM Unsignalized Intersection Capacity Analysis
 23: Site Driveway & Proposed Private Laneway

Future Total (PM)
 Base Scenario

Future Total (PM)
 Base Scenario

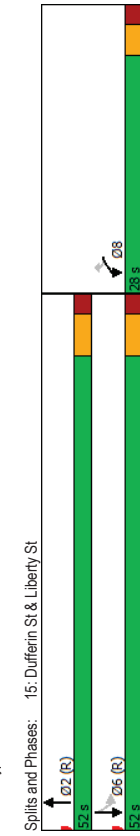
Movement	EBL	EBR	NBL	NBT	SBT	SBR	Diagram
Lane Configurations	W						↖ ↗
Traffic Volume (veh/h)	0	10	15	65	65	0	
Future Volume (Veh/h)	0	10	15	65	65	0	
Sign Control	Stop	Free	Free	Free	Free	Stop	
Grade	0%	0%	0%	0%	0%	0%	
Peak Hour Factor	0.25	0.25	0.25	0.25	0.25	0.25	
Hourly flow rate (vph)	0	40	60	260	260	0	
Pedestrians	108						
Lane Width (m)	3.5						
Walking Speed (m/s)	1.2						
Percent Blockage	9						
Right turn flare (veh)				None	None		
Median type							
Median storage (veh)							
Upstream signal (m)							
pX, platoon unblocked							
VC, conflicting volume	748	368	368				
VC1, stage 1 conf vol							
VC2, stage 2 conf vol							
VCU, unblocked vol	748	368	368				
IC, single (s)	6.4	6.2	4.1				
IC, 2 stage (s)							
IF (s)	3.5	3.3	2.2				
p0 queue free %	100	94	95				
CM capacity (veh/h)	330	622	1097				
Direction, Lane #	EB 1	NB 1	SB 1				
Volume Total	40	320	260				
Volume Left	0	60	0				
Volume Right	40	0	0				
cSH	622	1097	1700				
Volume to Capacity	0.06	0.05	0.15				
Queue Length 95th (m)	1.6	1.4	0.0				
Control Delay (s)	11.2	2.0	0.0				
Lane LOS	B	A	A				
Approach Delay (s)	11.2	2.0	0.0				
Approach LOS	B	A	A				
Intersection Summary							
Average Delay			1.8				
Intersection Capacity Utilization			23.1%			ICU Level of Service	A
Analysis Period (min)			15				

Movement	EBT	EBR	WBL	WBT	NBL	NBR	Diagram
Lane Configurations	W						↖ ↗
Traffic Volume (veh/h)	0	27	15	0	19	10	
Future Volume (Veh/h)	0	27	15	0	19	10	
Sign Control	Free	Free	Free	Free	Stop	Stop	
Grade	0%	0%	0%	0%	0%	0%	
Peak Hour Factor	0.25	0.25	0.25	0.25	0.25	0.25	
Hourly flow rate (vph)	0	108	60	0	76	40	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)				None	None		
Median type							
Median storage (veh)							
Upstream signal (m)							
pX, platoon unblocked							
VC, conflicting volume		108			174	54	
VC1, stage 1 conf vol							
VC2, stage 2 conf vol							
VCU, unblocked vol		108			174	54	
IC, single (s)		4.1			6.4	6.2	
IC, 2 stage (s)							
IF (s)		2.2			3.5	3.3	
p0 queue free %		96			90	96	
CM capacity (veh/h)		1495			788	1019	
Direction, Lane #	EB 1	WB 1	NB 1				
Volume Total	108	60	116				
Volume Left	0	60	76				
Volume Right	108	0	40				
cSH	1700	1495	854				
Volume to Capacity	0.06	0.04	0.14				
Queue Length 95th (m)	0.0	1.0	3.8				
Control Delay (s)	0.0	7.5	9.9				
Lane LOS	A	A	A				
Approach Delay (s)	0.0	7.5	9.9				
Approach LOS	A	A	A				
Intersection Summary							
Average Delay			5.6				
Intersection Capacity Utilization			17.5%			ICU Level of Service	A
Analysis Period (min)			15				

Queues
15: Dufferin St & Liberty St

Future Background (AM)
Sensitivity Scenario

	WBL	WBR	NBT	SBL	SBT
Lane Group					
Lane Configurations	↔	↔	↔	↔	↔
Traffic Volume (vph)	95	40	300	135	330
Future Volume (vph)	95	40	300	135	330
Lane Group Flow (vph)	99	42	803	0	485
Turn Type	Prot	Perm	NA	Perm	NA
Protected Phases	8	2	2	6	6
Permitted Phases	8	8	2	6	6
Detector Phase					
Switch Phase					
Minimum Initial (s)	18.0	18.0	18.0	18.0	18.0
Minimum Split (s)	23.0	23.0	24.0	24.0	24.0
Total Split (s)	28.0	28.0	52.0	52.0	52.0
Total Split (%)	35.0%	35.0%	65.0%	65.0%	65.0%
Yellow Time (s)	3.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0	5.0	5.0	5.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	C-Max	C-Max	C-Max
v/c Ratio	0.24	0.13	0.43	0.33	0.33
Control Delay	26.5	9.3	3.1	1.6	1.6
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	26.5	9.3	3.1	1.6	1.6
Queue Length 50th (m)	12.9	0.0	9.2	2.9	2.9
Queue Length 95th (m)	25.8	7.8	17.0	4.7	4.7
Internal Link Dist (m)	382.8		162.3	186.7	186.7
Turn Bay Length (m)	10.0				
Base Capacity (vph)	525	411	1851	1465	1465
Station Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.19	0.10	0.43	0.33	0.33



08-24-2023
BA Group

HCM Signalized Intersection Capacity Analysis
15: Dufferin St & Liberty St

Future Background (AM)
Sensitivity Scenario

	WBL	WBR	NBT	SBL	SBT
Movement					
Lane Configurations	↔	↔	↔	↔	↔
Traffic Volume (vph)	95	40	300	135	330
Future Volume (vph)	95	40	300	135	330
Ideal Flow (vphpb)	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95
Fpb. ped/bikes	1.00	0.81	0.76	1.00	1.00
Fpb. ped/bikes	1.00	1.00	1.00	0.97	0.97
Frt	1.00	0.85	0.91	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.99	0.99
Satd. Flow (prot)	1750	1274	2383	3197	3197
Flt Permitted	0.95	1.00	1.00	0.63	0.63
Satd. Flow (perm)	1750	1274	2383	2030	2030
Peak-Hour factor, PHF	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	99	42	312	141	344
RTOR Reduction (vph)	0	34	149	0	0
Lane Group Flow (vph)	99	8	654	0	485
Conf. Peds. (#/hr)	221	132	168	168	168
Conf. Bikes (#/hr)	2		4		
Heavy Vehicles (%)	2%	2%	7%	2%	7%
Turn Type	Prot	Perm	NA	Perm	NA
Protected Phases	8	8	2	6	6
Permitted Phases	8	8	2	6	6
Actuated Green, G (s)	14.4	14.4	54.6	54.6	54.6
Effective Green, g (s)	15.4	15.4	55.6	55.6	55.6
Actuated G/C Ratio	0.19	0.19	0.70	0.70	0.70
Clearance Time (s)	5.0	5.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	336	245	1656	1410	1410
v/s Ratio Prot	c0.06		c0.27		
v/s Ratio Perm	0.01		0.24		
v/c Ratio	0.29	0.03	0.39	0.34	0.34
Uniform Delay, d1	27.7	26.2	5.1	4.9	4.9
Progression Factor	1.00	1.00	1.00	0.19	0.19
Incremental Delay, d2	0.5	0.1	0.7	0.6	0.6
Delay (s)	28.1	26.3	5.8	5.5	5.5
Level of Service	C	C	A	A	A
Approach Delay (s)	27.6	5.8	1.5	1.5	1.5
Approach LOS	C	A	A	A	A

Intersection Summary	
HCM 2000 Control Delay	6.5
HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37
Actuated Cycle Length (s)	80.0
Sum of lost time (s)	9.0
Intersection Capacity Utilization	69.6%
ICU Level of Service	C
Analysis Period (min)	15
Critical Lane Group	

08-24-2023
BA Group

HCM Unsignalized Intersection Capacity Analysis
 16: Atlantic St & Liberty St

HCM 6th AWSC
 16: Atlantic St & Liberty St

Future Background (AM)
 Sensitivity Scenario

Future Background (AM)
 Sensitivity Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		Stop	Stop		Stop			Stop			Stop	
Traffic Volume (vph)	40	175	135	30	135	100	15	30	35	50	0	25
Future Volume (vph)	40	175	135	30	135	100	15	30	35	50	0	25
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	42	184	142	32	142	105	16	32	37	53	0	26
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	368	279	85	79								
Volume Left (vph)	42	32	16	53								
Volume Right (vph)	142	105	37	26								
Head (s)	-0.16	-0.10	-0.15	0.01								
Departure Headway (s)	4.5	4.7	5.4	5.6								
Degree Utilization, x	0.46	0.36	0.13	0.12								
Capacity (veh/h)	755	729	579	566								
Control Delay (s)	11.4	10.4	9.2	9.3								
Approach Delay (s)	11.4	10.4	9.2	9.3								
Approach LOS	B	B	A	A								
Intersection Summary												
Delay	10.6											
Level of Service	B											
Intersection Capacity Utilization	50.5%											
Analysis Period (min)	15											
	ICU Level of Service											
	A											

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	10.7											
Intersection LOS	B											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	40	175	135	30	135	100	15	30	35	50	0	25
Traffic VdL, veh/h	40	175	135	30	135	100	15	30	35	50	0	25
Future Vol, veh/h	40	175	135	30	135	100	15	30	35	50	0	25
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	8	1	4	0	1	14	22	0	0	6	0	0
Mutual Flow	42	184	142	32	142	105	16	32	37	53	0	26
Number of Lanes	0	1	0	0	1	0	0	1	0	1	0	1
Approach	EB	WB	WB	WB	NB	NB	SB	SB	NB	WB	NB	NB
Opposing Approach	WB	EB	EB	EB	WB	WB	WB	WB	WB	WB	WB	WB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	SB	NB	NB	EB	EB	EB	EB	WB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	NB	SB	SB	WB	WB	WB	WB	WB	WB	WB	WB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	11.7	10.2	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.4	9.4	9.4
HCM LOS	B	B	A	A	A	A	A	A	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	19%	11%	11%	67%
Vol Thru, %	38%	50%	51%	0%
Vol Right, %	44%	39%	38%	33%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	80	350	265	75
LT Vol	15	40	30	50
Through Vol	30	175	135	0
RT Vol	35	135	100	25
Lane Flow Rate	84	368	279	79
Geometry Grp	1	1	1	1
Degree of Uln (X)	0.134	0.47	0.354	0.123
Departure Headway (Hd)	5.715	4.59	4.564	5.613
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	631	777	781	642
Service Time	3.718	2.659	2.638	3.617
HCM Lane V/C Ratio	0.133	0.474	0.357	0.123
HCM Control Delay	9.6	11.7	10.2	9.4
HCM Lane LOS	A	B	B	A
HCM 95th-ile Q	0.5	2.5	1.6	0.4

Queues
19: Strachan Ave & E Liberty St/Ordnance St

Future Background (AM)
Sensitivity Scenario

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group									
Lane Configurations	EB	EB	WB	WB	NB	NB	SB	SB	SB
Traffic Volume (vph)	250	15	55	20	245	365	35	360	100
Future Volume (vph)	250	15	55	20	245	365	35	360	100
Lane Group Flow (vph)	266	250	0	154	261	441	37	383	106
Turn Type	Perm	NA	Perm	NA	pm-pt	NA	Perm	NA	Perm
Protected Phases	4		8	5	2	6		6	
Permitted Phases	4		8	5	2	6		6	
Minimum Split (s)	32.6	32.6	32.6	10.0	27.3	27.3	27.3	27.3	27.3
Total Split (s)	33.0	33.0	33.0	11.0	47.0	36.0	36.0	36.0	36.0
Total Split (%)	41.3%	41.3%	41.3%	13.8%	58.8%	45.0%	45.0%	45.0%	45.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	4.6	4.6	4.6	4.6	1.0	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	-1.0	1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.6	8.6	6.6	3.0	5.3	5.3	5.3	5.3	5.3
Lead/Lag									
Lead-Lag Optimizer?				Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio	0.75	0.68	0.40	0.65	0.50	0.13	0.54	0.35	0.35
Control Delay	39.6	19.8	16.1	18.3	14.4	26.5	33.0	14.0	14.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.6	19.8	16.1	18.3	14.4	26.5	33.0	14.0	14.0
Queue Length 50th (m)	37.4	10.1	10.7	20.5	41.4	6.0	63.3	5.0	5.0
Queue Length 95th (m)	#75.7	#46.5	27.2	34.0	66.2	m12.1	m91.2	m16.8	143.3
Internal Link Dist (m)	45.8		123.7		152.3				
Turn Bay Length (m)			50.0		45.0		30.0		
Base Capacity (vph)	354	366	385	401	888	282	713	305	305
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.68	0.40	0.65	0.50	0.13	0.54	0.35	0.35

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 0 (0%), Referenced to phase 2:NBLT and 6:SBTL, Start of Green	
Natural Cycle: 70	
Control Type: Pretimed	
# 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.	



HCM Signalized Intersection Capacity Analysis
19: Strachan Ave & E Liberty St/Ordnance St

Future Background (AM)
Sensitivity Scenario

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	EB	EB	WB	WB	NB	NB	SB	SB	SB
Traffic Volume (vph)	250	15	220	55	20	245	365	50	360
Future Volume (vph)	250	15	220	55	20	245	365	50	360
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	8.6	6.6	6.6	3.0	5.3	5.3	5.3	5.3
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	0.51	0.88	0.88	1.00	0.95	1.00	1.00	0.43
Fibb. ped/bikes	0.84	1.00	0.86	0.86	0.92	1.00	0.79	1.00	1.00
Frt	1.00	0.86	0.94	0.94	1.00	0.98	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.98	0.98	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1477	819	1291	1291	1613	1691	1380	1860	608
Flt Permitted	0.69	1.00	0.79	0.79	0.36	1.00	0.51	1.00	1.00
Satd. Flow (perm)	1074	819	1040	1040	611	1691	736	1860	608
Peak-Hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	266	16	234	59	21	74	261	388	53
RTOR Reduction (vph)	0	117	0	0	42	0	0	0	0
Lane Group Flow (vph)	266	133	0	0	112	0	261	435	0
Conf. Bikes (#/hr)	125	335	335	27	27	27	205	205	405
Heavy Vehicles (%)	2%	0%	1%	1%	5%	2%	2%	2%	1%
Turn Type	Perm	NA	Perm	NA	pm-pt	NA	Perm	NA	Perm
Protected Phases	4		8	5	2	6		6	
Permitted Phases	4		8	5	2	6		6	
Actuated Green, G (s)	25.4	25.4	25.4	25.4	40.7	40.7	29.7	29.7	29.7
Effective Green, g (s)	26.4	24.4	26.4	26.4	41.7	41.7	30.7	30.7	30.7
Actuated g/C Ratio	0.33	0.30	0.33	0.33	0.52	0.52	0.38	0.38	0.38
Clearance Time (s)	7.6	7.6	7.6	7.6	4.0	6.3	6.3	6.3	6.3
Lane Grp Cap (vph)	354	249	343	343	418	881	282	713	233
v/s Ratio Prot	0.16				c0.06	0.26			0.21
v/s Ratio Perm	c0.25		0.11		c0.26		0.05		0.07
v/c Ratio	0.75	0.54	0.33	0.33	0.62	0.49	0.13	0.54	0.17
Uniform Delay, d1	23.9	23.1	20.1	20.1	12.0	12.3	16.0	19.1	16.3
Progression Delay, d2	1.00	1.00	1.00	1.00	1.00	1.00	1.54	1.54	3.30
Incremental Delay, d2	13.7	8.0	2.5	2.5	6.9	2.0	0.8	2.6	1.4
Delay (s)	37.6	31.1	22.7	22.7	18.9	14.3	25.4	32.1	55.2
Level of Service	D	C	C	C	B	B	C	C	E
Approach Delay (s)	34.4		22.7		16.0		36.3		36.3
Approach LOS	C		C		B		D		D

Intersection Summary

HCM 2000 Control Delay	27.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.9
Intersection Capacity Utilization	99.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 17: Liberty St/E Liberty St & Hanna Ave

HCM 6th AWSC
 17: Liberty St/E Liberty St & Hanna Ave

Future Background (AM)
 Sensitivity Scenario

Future Background (AM)
 Sensitivity Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		Stop	Stop		Stop			Stop			Stop	
Traffic Volume (vph)	60	120	55	20	190	30	55	20	20	20	10	30
Future Volume (vph)	60	120	55	20	190	30	55	20	20	20	10	30
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	62	124	57	21	196	31	57	21	21	21	10	31
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	243	248	99	62								
Volume Left (vph)	62	21	57	21								
Volume Right (vph)	57	31	21	31								
Head (s)	-0.05	0.06	0.01	-0.19								
Departure Headway (s)	4.6	4.7	5.2	5.0								
Degree Utilization, x	0.31	0.32	0.14	0.09								
Capacity (veh/h)	754	734	632	636								
Control Delay (s)	9.6	9.9	9.0	8.5								
Approach Delay (s)	9.6	9.9	9.0	8.5								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay	9.5											
Level of Service	A											
Intersection Capacity Utilization	49.9%											
Analysis Period (min)	15											
	ICU Level of Service											
	A											

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	9.4											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	60	120	55	20	190	30	55	20	20	20	10	30
Traffic Vol, veh/h	60	120	55	20	190	30	55	20	20	20	10	30
Future Vol, veh/h	60	120	55	20	190	30	55	20	20	20	10	30
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles, %	0	4	1	0	8	4	0	0	5	7	0	0
Mvmt Flow	62	124	57	21	196	31	57	21	21	21	10	31
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	WB	EB	WB	WB	NB	NB	SB	SB	SB	SB
Opposing Approach	WB	EB	EB	WB	WB	WB	SB	SB	SB	SB	NB	NB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	NB	EB	EB	EB	WB	WB	WB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	WB	WB	WB	EB	EB	EB	EB	EB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	9.5	9.6	9.6	8.9	8.9	8.9	8.6	8.6	8.6	8.6	8.6	8.6
HCM LOS	A	A	A	A	A	A	A	A	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	58%	26%	8%	33%
Vol Thru, %	21%	51%	79%	17%
Vol Right, %	21%	23%	12%	50%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	95	235	240	60
LT Vol	55	60	20	20
Through Vol	20	120	190	10
RT Vol	20	55	30	30
Lane Flow Rate	98	242	247	62
Geometry Grp	1	1	1	1
Degree of Utl (X)	0.138	0.302	0.31	0.086
Departure Headway (Ht)	5.07	4.493	4.517	5.022
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	703	797	794	709
Service Time	3.127	2.533	2.556	3.083
HCM Lane V/C Ratio	0.139	0.304	0.311	0.087
HCM Control Delay	8.9	9.5	9.6	8.6
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.5	1.3	1.3	0.3

HCM Unsignalized Intersection Capacity Analysis
 18: E Liberty St & Lynn Williams St

HCM 6th AWSC
 18: E Liberty St & Lynn Williams St

Future Background (AM)
 Sensitivity Scenario

Future Background (AM)
 Sensitivity Scenario

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	40	195	150	125	140	90
Future Volume (vph)	40	195	150	125	140	90
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	48	232	179	149	167	107
Direction, Lane #	EB 1	EB 2	WB 1	WB 1	SB 1	
Volume Total (vph)	48	232	328	274		
Volume Left (vph)	48	0	0	167		
Volume Right (vph)	0	0	149	107		
Head (s)	0.55	0.08	-0.20	-0.07		
Departure Headway (s)	6.2	5.8	5.0	5.4		
Degree Utilization, x	0.08	0.37	0.46	0.41		
Capacity (veh/h)	546	596	684	618		
Control Delay (s)	8.6	10.9	12.2	12.0		
Approach Delay (s)	10.5		12.2	12.0		
Approach LOS	B		B	B		
Intersection Summary						
Delay	11.6					
Level of Service	B					
Intersection Capacity Utilization	48.1%					
Analysis Period (min)	15					
					ICU Level of Service	
					A	

Intersection	EBL	EBT	WBT	WBR	SBL	SBR
Intersection Delay, s/veh						
Intersection LOS						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Vol, veh/h	40	195	150	125	140	90
Future Vol, veh/h	40	195	150	125	140	90
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	3	5	8	0	2	4
Mvmt Flow	48	232	179	149	167	107
Number of Lanes	1	1	1	0	1	0
Approach	EB	WB	WB	SB	SB	SB
Opposing Approach	WB	EB				
Opposing Lanes	1	2			0	
Conflicting Approach Left	SB				WB	WB
Conflicting Lanes Left	1	0			1	1
Conflicting Approach Right		SB			EB	EB
Conflicting Lanes Right	0	1			2	2
HCM Control Delay	11.5	12.4			12.1	
HCM LOS	B	B			B	B

Lane	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	0%	61%
Vol Thru, %	0%	100%	55%	0%
Vol Right, %	0%	0%	45%	39%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	40	195	275	230
LT Vol	40	0	0	140
Through Vol	0	195	150	0
RT Vol	0	0	125	90
Lane Flow Rate	48	232	327	274
Geometry Grp	7	7	5	2
Degree of Uln (X)	0.082	0.371	0.461	0.409
Departure Headway (Ht)	6.229	5.757	5.074	5.374
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	576	627	710	671
Service Time	3.955	3.463	3.098	3.401
HCM Lane V/C Ratio	0.083	0.37	0.461	0.408
HCM Control Delay	9.5	11.9	12.4	12.1
HCM Lane LOS	A	B	B	B
HCM 95th-ile Q	0.3	1.7	2.4	2

HCM Unsynchronized Intersection Capacity Analysis
 20: Pirandello St & E Liberty St

Future Background (AM)
 Sensitivity Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	Stop											
Sign Control	Stop											
Traffic Volume (vph)	5	325	5	15	240	45	10	0	35	75	0	5
Future Volume (vph)	5	325	5	15	240	45	10	0	35	75	0	5
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	5	357	5	16	264	49	11	0	38	82	0	5
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	367	329	49	87								
Volume Left (vph)	5	16	11	82								
Volume Right (vph)	5	49	38	5								
Head (s)	0.09	0.08	-0.35	0.40								
Departure Headway (s)	4.8	4.9	5.4	6.1								
Degree Utilization, x	0.49	0.44	0.07	0.15								
Capacity (veh/h)	717	714	564	524								
Control Delay (s)	12.4	11.7	8.8	10.1								
Approach Delay (s)	12.4	11.7	8.8	10.1								
Approach LOS	B	B	A	B								
Intersection Summary	11.7											
Delay	B											
Level of Service	B											
Intersection Capacity Utilization	45.1%											
Analysis Period (min)	15											
ICU Level of Service	A											

HCM 6th AWSC
 20: Pirandello St & E Liberty St

Future Background (AM)
 Sensitivity Scenario

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	12.1											
Intersection LOS	B											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	5	325	5	15	240	45	10	0	35	75	0	5
Traffic Vol, veh/h	5	325	5	15	240	45	10	0	35	75	0	5
Future Vol, veh/h	5	325	5	15	240	45	10	0	35	75	0	5
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	25	5	14	6	10	9	0	0	5	14	0	20
Mvmt Flow	5	357	5	16	264	49	11	0	38	82	0	5
Number of Lanes	0	1	0	0	1	0	1	0	1	0	0	1
Approach	EB	WB	WB	EB	NB	NB	SB	SB	NB	SB	NB	SB
Opposing Approach	WB	EB	EB	WB	SB	SB	EB	EB	WB	WB	SB	NB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	NB	EB	EB	EB	WB	WB	SB	SB	EB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	WB	WB	WB	EB	EB	SB	SB	NB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	13.6											
HCM LOS	B											
NBLn1	22%											
EBLn1	1%											
WBLn1	5%											
SBLn1	94%											
Vol Left, %	0%											
Vol Thru, %	97%											
Vol Right, %	80%											
Vol Right, %	78%											
Stop	1%											
Stop	15%											
Stop	6%											
Sign Control	Stop											
Traffic Vol by Lane	45	335	300	80								
LT Vol	10	5	15	75								
Through Vol	0	325	240	0								
RT Vol	35	5	45	5								
Lane Flow Rate	49	368	330	88								
Geometry Grp	1											
Degree of Utl (X)	0.074											
Departure Headway (Hd)	5.403											
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	667	703	748	590								
Service Time	3.406	3.162	2.841	4.12								
HCM Lane V/C Ratio	0.073	0.523	0.441	0.149								
HCM Control Delay	8.8	13.6	11.5	10.2								
HCM Lane LOS	A	B	B	B								
HCM 95th-ile Q	0.2	3	2.2	0.5								

Queues
15: Dufferin St & Liberty St

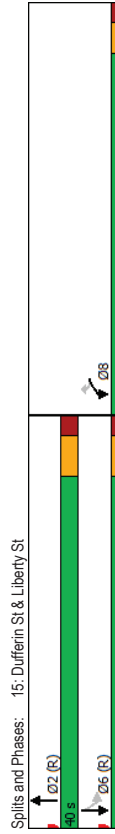
HCM Signalized Intersection Capacity Analysis
15: Dufferin St & Liberty St

Future Background (PM)
Sensitivity Scenario

Future Background (PM)
Sensitivity Scenario

Movement	WBL	WBR	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔
Traffic Volume (vph)	185	170	465	70	230
Future Volume (vph)	185	170	465	70	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95
Fpb. ped/bikes	1.00	0.85	0.88	1.00	1.00
Frt	1.00	0.85	0.95	0.97	1.00
Flt Protected	0.95	1.00	1.00	0.99	0.99
Satd. Flow (prot)	1750	1315	2903	3257	3257
Flt Permitted	0.95	1.00	1.00	0.71	0.71
Satd. Flow (perm)	1750	1315	2903	2328	2328
Peak-Hour factor, PHF	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	208	191	522	253	258
RTOR Reduction (vph)	0	64	47	0	0
Lane Group Flow (vph)	208	127	728	0	337
Conf. Peds. (#/hr)	169	104	157	157	157
Conf. Bikes (#/hr)	6			8	
Heavy Vehicles (%)	2%	3%	4%	1%	7%
Turn Type	Prot	Perm	NA	Perm	NA
Protected Phases	8		2		6
Permitted Phases		8		6	
Actuated Green, G (s)	18.5	18.5	50.5	50.5	50.5
Effective Green, g (s)	19.5	19.5	51.5	51.5	51.5
Actuated G/C Ratio	0.24	0.24	0.64	0.64	0.64
Clearance Time (s)	5.0	5.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	426	320	1868	1498	1498
v/s Ratio Prot	c0.12		c0.25		
v/s Ratio Perm	0.10		0.10		0.14
v/s Ratio	0.49	0.40	0.39	0.22	0.22
Uniform Delay, d1	26.0	25.3	6.8	5.9	5.9
Progression Factor	1.00	1.00	1.00	0.24	0.24
Incremental Delay, d2	0.9	0.8	0.6	0.3	0.3
Delay (s)	26.9	26.2	7.4	1.7	1.7
Level of Service	C	C	A	A	A
Approach Delay (s)	26.5		7.4	1.7	1.7
Approach LOS	C		A	A	A
Intersection Summary					
HCM 2000 Control Delay			11.2	HCM 2000 Level of Service	
HCM 2000 Volume to Capacity ratio			0.42	B	
Actuated Cycle Length (s)			80.0	Sum of lost time (s)	
Intersection Capacity Utilization			64.1%	ICU Level of Service	
Analysis Period (min)			15	C	
c Critical Lane Group					

Movement	WBL	WBR	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔
Traffic Volume (vph)	185	170	465	70	230
Future Volume (vph)	185	170	465	70	230
Lane Group Flow (vph)	208	191	775	0	337
Turn Type	Prot	Perm	NA	Perm	NA
Protected Phases	8		2		6
Permitted Phases		8		6	
Detector Phase	8	8	2	6	6
Switch Phase					
Minimum Initial (s)	18.0	18.0	18.0	18.0	18.0
Minimum Split (s)	23.0	23.0	24.0	24.0	24.0
Total Split (s)	40.0	40.0	40.0	40.0	40.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0	5.0	5.0	5.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	C-Max	C-Max	C-Max
v/c Ratio	0.49	0.50	0.41	0.22	0.22
Control Delay	30.2	19.4	6.4	1.8	1.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	30.2	19.4	6.4	1.8	1.8
Queue Length 50th (m)	28.9	14.2	21.4	2.0	2.0
Queue Length 95th (m)	48.8	32.2	34.4	m4.4	m4.4
Internal Link Dist (m)	382.8		162.3	186.7	
Turn Bay Length (m)	10.0				
Base Capacity (vph)	787	639	1913	1505	1505
Station Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.26	0.30	0.41	0.22	0.22
Intersection Summary					
Cycle Length, 80					
Actuated Cycle Length: 80					
Offset: 79 (99%), Referenced to phase 2:NBT and 6:SBTL - Start of Green					
Natural Cycle: 50					
Control Type: Actuated-Coordinated					
m Volume for 95th percentile queue is metered by upstream signal.					



HCM Unsignalized Intersection Capacity Analysis
 16: Atlantic St & Liberty St

HCM 6th AWSC
 16: Atlantic St & Liberty St

Future Background (PM)
 Sensitivity Scenario

Future Background (PM)
 Sensitivity Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	40	60	50	15	170	80	35	95	55	45	20	35
Future Volume (vph)	40	60	50	15	170	80	35	95	55	45	20	35
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	41	61	51	15	173	82	36	97	56	46	20	36
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	153	270	189	102								
Volume Left (vph)	41	15	36	46								
Volume Right (vph)	51	82	56	36								
Head (s)	-0.14	-0.08	-0.12	-0.11								
Departure Headway (s)	4.9	4.8	5.0	5.1								
Degree Utilization, x	0.21	0.36	0.26	0.14								
Capacity (veh/h)	676	707	666	630								
Control Delay (s)	9.1	10.4	9.7	9.0								
Approach Delay (s)	9.1	10.4	9.7	9.0								
Approach LOS	A	B	A	A								
Intersection Summary												
Delay	9.8											
Level of Service	A											
Intersection Capacity Utilization	46.6%											
Analysis Period (min)	15											
	ICU Level of Service											
	A											

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	9.7											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	40	60	50	15	170	80	35	95	55	45	20	35
Traffic Vol, veh/h	40	60	50	15	170	80	35	95	55	45	20	35
Future Vol, veh/h	40	60	50	15	170	80	35	95	55	45	20	35
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles, %	0	1	0	0	1	16	5	0	0	0	0	2
Mvmt Flow	41	61	51	15	173	82	36	97	56	46	20	36
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	WB	EB	NB	NB	SB	SB	SB	NB	NB	SB
Opposing Approach	WB	EB	EB	WB	WB	WB	EB	EB	EB	WB	WB	EB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	NB	EB	EB	EB	WB	WB	WB	EB	EB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	WB	WB	WB	EB	EB	EB	WB	WB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	9.1	10.2	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
HCM LOS	A	B	A	A	A	A	A	A	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	19%	27%	6%	45%
Vol Thru, %	51%	40%	64%	20%
Vol Right, %	30%	33%	30%	35%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	185	150	265	100
LT Vol	35	40	15	45
Through Vol	95	60	170	20
RT Vol	55	50	80	35
Lane Flow Rate	189	153	270	102
Geometry Grp	1	1	1	1
Degree of Uln (X)	0.26	0.204	0.348	0.142
Departure Headway (Ht)	4.962	4.803	4.639	5.022
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	717	741	771	706
Service Time	3.039	2.877	2.704	3.108
HCM Lane V/C Ratio	0.264	0.206	0.35	0.144
HCM Control Delay	9.8	9.1	10.2	9
HCM Lane LOS	A	A	B	A
HCM 95th-ile Q	1	0.8	1.6	0.5

Queues
19: Strachan Ave & E Liberty St/Ordinance St

Future Background (PM)
Sensitivity Scenario

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Traffic Volume (vph)	240	35	60	35	305	375	65	360	245
Future Volume (vph)	240	35	60	35	305	375	65	360	245
Future Group Flow (vph)	250	99	0	151	318	464	68	375	255
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm
Protected Phases	4		8	5	2		6		
Permitted Phases	4		8	5	2		6		
Minimum Split (s)	32.6	32.6	32.6	10.0	27.3	27.3	27.3	27.3	27.3
Total Split (s)	33.0	33.0	33.0	33.0	41.3%	41.3%	20.0%	58.8%	38.8%
Total Split (%)	41.3%	41.3%	41.3%	20.0%	58.8%	38.8%	38.8%	38.8%	38.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	4.6	4.6	4.6	4.6	1.0	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.6	6.6	6.6	3.0	5.3	5.3	5.3	5.3	5.3
Lead/Lag									
Lead-Lag Optimizer?					Yes	Yes	Yes	Yes	Yes
v/c Ratio	0.80	0.26	0.42	0.70	0.53	0.32	0.63	0.93	0.93
Control Delay	45.5	10.8	20.2	19.9	15.3	24.0	25.8	49.0	49.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.5	10.8	20.2	19.9	15.3	24.0	25.8	49.0	49.0
Queue Length 50th (m)	35.9	3.9	13.9	25.8	45.5	7.6	43.1	17.8	17.8
Queue Length 95th (m)	#76.0	15.1	31.1	#48.5	72.3	m16.2	71.9	m#67.8	143.3
Internal Link Dist (m)	45.8		123.7		152.3				
Turn Bay Length (m)	314	387	358	453	873	213	591	275	275
Base Capacity (vph)	0	0	0	0	0	0	0	0	0
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.26	0.42	0.70	0.53	0.32	0.63	0.93	0.93

Intersection Summary

Cycle Length: 80	Actuated Cycle Length: 80
Offset: 44 (55%). Referenced to phase 2:NBLT and 6:SBTL. Start of Green	Natural Cycle: 75
Control Type: Pretimed	# 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.



08-24-2023
BA Group

HCM Signalized Intersection Capacity Analysis
19: Strachan Ave & E Liberty St/Ordinance St

Future Background (PM)
Sensitivity Scenario

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Movement	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Traffic Volume (vph)	240	35	60	35	305	375	70	65	360
Future Volume (vph)	240	35	60	35	305	375	70	65	360
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	6.6	3.0	5.3	5.3	5.3	5.3
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	0.61	0.87	0.87	1.00	0.91	1.00	1.00	0.31
Fibb. ped/bikes	0.74	1.00	0.78	0.78	0.92	1.00	1.00	0.71	1.00
Frt	1.00	0.90	0.95	0.95	1.00	0.98	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.98	0.98	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1303	1044	1191	1191	1643	1673	1273	1842	474
Flt Permitted	0.69	1.00	0.83	0.83	0.31	1.00	0.50	1.00	1.00
Satd. Flow (perm)	952	1044	1014	1014	542	1673	665	1842	474
Peak-Hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	250	36	62	36	318	391	73	68	375
RTOR Reduction (vph)	0	42	0	0	0	0	0	0	0
Lane Group Flow (vph)	250	57	0	0	128	0	318	462	0
Confl. Peds. (#/hr)	209	600	600	209	725	385	385	725	15
Confl. Bikes (#/hr)	13		49						
Heavy Vehicles (%)	1%	0%	0%	0%	1%	0%	0%	0%	2%
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm
Protected Phases	4		8		5	2			
Permitted Phases	4		8		2		6		
Actuated Green, G (s)	25.4	25.4	25.4	25.4	40.7	40.7	24.7	24.7	24.7
Effective Green, g (s)	26.4	26.4	26.4	26.4	41.7	41.7	25.7	25.7	25.7
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.52	0.52	0.32	0.32	0.32
Clearance Time (s)	7.6	7.6	7.6	7.6	4.0	6.3	6.3	6.3	6.3
Lane Grp Cap (vph)	314	344	334	334	461	872	213	591	152
v/s Ratio Prot	0.05				c0.11	0.28			0.20
v/s Ratio Perm	c0.26		0.13		0.25		0.10		c0.28
v/c Ratio	0.80	0.17	0.38	0.69	0.53	0.32	0.63	0.63	0.86
Uniform Delay, d1	24.4	19.0	20.5	12.7	12.7	12.7	20.5	23.1	25.5
Progression Delay, d2	1.00	1.00	1.00	1.00	1.00	1.00	0.96	0.91	1.45
Incremental Delay, d2	18.6	1.0	3.3	8.2	2.3	2.3	3.2	4.2	38.1
Delay (s)	43.0	20.0	23.8	23.8	20.9	15.0	22.8	25.2	75.2
Level of Service	D	C	C	C	B	B	C	C	E
Approach Delay (s)	36.5		23.8		17.4		43.2		
Approach LOS	D		C		B		D		

Intersection Summary

HCM 2000 Control Delay	30.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	14.9
Intersection Capacity Utilization	77.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

08-24-2023
BA Group

HCM Unsignalized Intersection Capacity Analysis
 17: Liberty St/E Liberty St & Hanna Ave

HCM 6th AWSC
 17: Liberty St/E Liberty St & Hanna Ave

Future Background (PM)
 Sensitivity Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	70	80	45	20	165	50	50	15	35	20	10	35
Future Volume (vph)	70	80	45	20	165	50	50	15	35	20	10	35
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	77	88	49	22	181	55	55	16	38	22	11	38
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	214	258	109	71								
Volume Left (vph)	77	22	55	22								
Volume Right (vph)	49	55	38	38								
Head (s)	-0.07	0.00	-0.06	-0.23								
Departure Headway (s)	4.6	4.6	5.1	5.0								
Degree Utilization, x	0.27	0.33	0.15	0.10								
Capacity (veh/h)	734	741	645	647								
Control Delay (s)	9.4	9.9	9.0	8.5								
Approach Delay (s)	9.4	9.9	9.0	8.5								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay	9.4											
Level of Service	A											
Intersection Capacity Utilization	51.3%											
Analysis Period (min)	15											
ICU Level of Service	A											

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	9.4											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	70	80	45	20	165	50	50	15	35	20	10	35
Traffic Vol, veh/h	70	80	45	20	165	50	50	15	35	20	10	35
Future Vol, veh/h	70	80	45	20	165	50	50	15	35	20	10	35
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Flow	77	88	49	22	181	55	55	16	38	22	11	38
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	WB	WB	WB	NB	NB	SB	SB	SB	NB	NB
Opposing Approach	WB	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB	WB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	NB	NB	NB	EB	EB	EB	EB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	SB	SB	WB	WB	WB	WB	EB	EB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	9.4	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
HCM LOS	A	A	A	A	A	A	A	A	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	50%	36%	9%	31%
Vol Thru, %	15%	41%	70%	15%
Vol Right, %	35%	23%	21%	54%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	100	195	235	65
LT Vol	50	70	20	20
Through Vol	15	80	165	10
RT Vol	35	45	50	35
Lane Flow Rate	110	214	258	71
Geometry Grp	1	1	1	1
Degree of Uln (X)	0.154	0.273	0.322	0.098
Departure Headway (Hd)	5.053	4.579	4.49	4.961
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	705	782	798	717
Service Time	3.113	2.624	2.533	3.025
HCM Lane V/C Ratio	0.156	0.274	0.323	0.099
HCM Control Delay	9	9.4	9.7	8.6
HCM Lane LOS	A	A	A	A
HCM 95th-ile Q	0.5	1.1	1.4	0.3

HCM Unsignalized Intersection Capacity Analysis
 18: E Liberty St & Lynn Williams St

HCM 6th AWSC
 18: E Liberty St & Lynn Williams St

Future Background (PM)
 Sensitivity Scenario

Future Background (PM)
 Sensitivity Scenario

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	70	65	195	200	120	80
Future Volume (vph)	70	65	185	200	120	80
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	75	70	210	215	129	86
Direction, Lane #	EB 1	EB 2	WB 1	WB 1	SB 1	
Volume Total (vph)	75	70	425	215		
Volume Left (vph)	75	0	0	129		
Volume Right (vph)	0	0	215	86		
Head (s)	0.52	0.00	-0.25	-0.12		
Departure Headway (s)	6.0	5.5	4.5	5.1		
Degree Utilization, x	0.13	0.11	0.54	0.31		
Capacity (veh/h)	561	617	762	641		
Control Delay (s)	8.7	8.0	12.7	10.3		
Approach Delay (s)	8.3		12.7	10.3		
Approach LOS	A		B	B		
Intersection Summary						
Delay	11.2					
Level of Service	B					
Intersection Capacity Utilization	55.4%					
Analysis Period (min)	15					
ICU Level of Service	B					

Intersection	EBL	EBT	WBT	WBR	SBL	SBR
Intersection Delay, s/veh	↔	↔	↔	↔	↔	↔
Intersection LOS	B					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Vol, veh/h	70	65	195	200	120	80
Future Vol, veh/h	70	65	195	200	120	80
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles, %	1	0	6	0	0	0
Mvmt Flow	75	70	210	215	129	86
Number of Lanes	1	1	1	0	1	0
Approach	EB	WB	WB	SB	SB	SB
Opposing Approach	WB	EB				
Opposing Lanes	1	2			0	
Conflicting Approach Left	SB			WB	WB	
Conflicting Lanes Left	1	0		1	1	
Conflicting Approach Right		SB		EB	EB	
Conflicting Lanes Right	0	1		2	2	
HCM Control Delay	9.3	12.8		10.4		
HCM LOS	A	B		B		

Lane	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	0%	60%
Vol Thru, %	0%	100%	49%	0%
Vol Right, %	0%	0%	51%	40%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	70	65	395	200
LT Vol	70	0	0	120
Through Vol	0	65	195	0
RT Vol	0	0	200	80
Lane Flow Rate	75	70	425	215
Geometry Grp	7	7	5	2
Degree of Uln (X)	0.125	0.106	0.537	0.304
Departure Headway (Ht)	5.958	5.436	4.552	5.086
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	698	654	786	701
Service Time	3.734	3.211	2.609	3.16
HCM Lane V/C Ratio	0.125	0.107	0.541	0.307
HCM Control Delay	9.6	8.9	12.8	10.4
HCM Lane LOS	A	A	B	B
HCM 95th-ile Q	0.4	0.4	3.2	1.3

HCM Unsynchronized Intersection Capacity Analysis
 20: Pirandello St & E Liberty St

HCM 6th AWSC
 20: Pirandello St & E Liberty St

Future Background (PM)
 Sensitivity Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	EB 1	WB 1	NB 1	SB 1								
Sign Control	Stop	Stop	Stop	Stop								
Traffic Volume (vph)	10	165	10	50	365	90	10	0	25	115	5	20
Future Volume (vph)	10	165	10	50	365	90	10	0	25	115	5	20
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	11	183	11	56	406	100	11	0	28	128	6	22
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	205	562	39	156								
Volume Left (vph)	11	56	11	128								
Volume Right (vph)	11	100	28	22								
Head (s)	-0.01	-0.05	-0.37	0.08								
Departure Headway (s)	5.2	4.7	5.8	5.9								
Degree Utilization, x	0.30	0.74	0.06	0.26								
Capacity (veh/h)	644	742	544	551								
Control Delay (s)	10.4	20.1	9.1	11.0								
Approach Delay (s)	10.4	20.1	9.1	11.0								
Approach LOS	B	C	A	B								
Intersection Summary												
Delay	16.1											
Level of Service	C											
Intersection Capacity Utilization	65.5%											
Analysis Period (min)	15											
ICU Level of Service	C											

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	16.2											
Intersection LOS	C											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	165	10	50	365	90	10	0	25	115	5	20
Traffic Vol, veh/h	10	165	10	50	365	90	10	0	25	115	5	20
Future Vol, veh/h	10	165	10	50	365	90	10	0	25	115	5	20
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	12	0	0	2	3	0	0	0	0	0	0	0
Hourly Flow	11	183	11	56	406	100	11	0	28	128	6	22
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	WB	EB	WB	WB	NB	NB	SB	SB	NB	NB
Opposing Approach	WB	EB	EB	WB	WB	WB	SB	SB	WB	WB	WB	WB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	SB	NB	NB	NB	EB	EB	EB	WB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	WB	WB	EB	EB	EB	WB	WB	WB	WB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	10.8	20.1	9.2	11.0	11.0	9.2	11.0	11.0	9.2	11.0	11.0	11.0
HCM LOS	B	C	A	B	C	A	B	C	A	B	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	29%	5%	10%	82%
Vol Thru, %	0%	89%	72%	4%
Vol Right, %	71%	5%	18%	14%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	35	185	505	140
LT Vol	10	10	50	115
Through Vol	0	165	365	5
RT Vol	25	10	90	20
Lane Flow Rate	39	206	561	156
Geometry Grp	1	1	1	1
Degree of Utl (X)	0.062	0.308	0.742	0.256
Departure Headway (Hd)	5.761	5.398	4.763	5.935
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	621	666	763	605
Service Time	3.807	3.429	2.763	3.974
HCM Lane V/C Ratio	0.063	0.309	0.735	0.258
HCM Control Delay	9.2	10.8	20.1	11
HCM Lane LOS	A	B	C	B
HCM 95th-ile Q	0.2	1.3	6.8	1

Queues
15: Dufferin St & Liberty St

HCM Signalized Intersection Capacity Analysis
15: Dufferin St & Liberty St

Future Total (AM)
Sensitivity Scenario

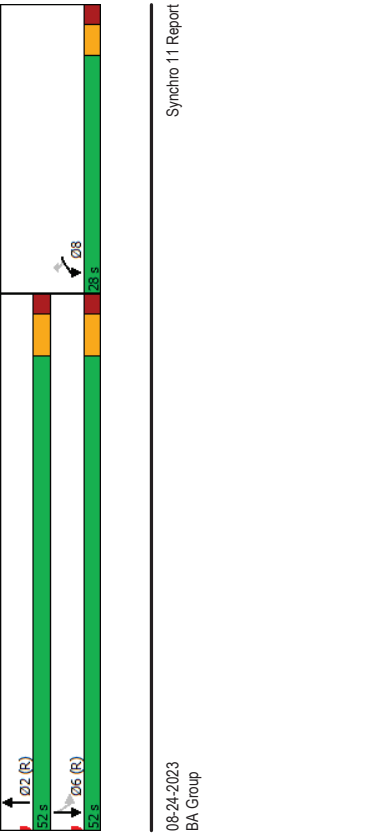
Future Total (AM)
Sensitivity Scenario

Movement	WBL	WBR	NBT	SBL	SBT
Lane Configurations	5	5	4	4	4
Traffic Volume (vph)	95	40	300	135	330
Future Volume (vph)	95	40	300	135	330
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95
Frb. ped/bikes	1.00	0.81	0.76	1.00	1.00
Frb. ped/bikes	1.00	1.00	1.00	0.97	0.97
Frt	1.00	0.85	0.91	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.99	0.99
Satd. Flow (prot)	1750	1264	2383	3197	3197
Flt Permitted	0.95	1.00	1.00	0.63	0.63
Satd. Flow (perm)	1750	1264	2383	2030	2030
Peak-Hour factor, PHF	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	99	42	312	141	344
RTOR Reduction (vph)	0	34	149	0	0
Lane Group Flow (vph)	99	8	654	0	485
Conf. Peds. (#/hr)	221	137	168	168	168
Conf. Bikes (#/hr)	2	2	4	4	4
Heavy Vehicles (%)	2%	2%	7%	5%	7%
Turn Type	Prot	Perm	NA	Perm	NA
Protected Phases	8	2	2	6	6
Permitted Phases	8	8	8	6	6
Actuated Green, G (s)	14.4	14.4	54.6	54.6	54.6
Effective Green, g (s)	15.4	15.4	55.6	55.6	55.6
Actuated G/C Ratio	0.19	0.19	0.70	0.70	0.70
Clearance Time (s)	5.0	5.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	336	243	1656	1410	1410
v/s Ratio Prot	c0.06		c0.27		
v/s Ratio Perm	0.01		0.01		0.24
v/s Ratio	0.29	0.03	0.39	0.34	0.34
Uniform Delay, d1	27.7	26.3	5.1	4.9	4.9
Progression Factor	1.00	1.00	1.00	0.19	0.19
Incremental Delay, d2	0.5	0.1	0.7	0.6	0.6
Delay (s)	28.1	26.3	5.8	1.5	1.5
Level of Service	C	C	A	A	A
Approach Delay (s)	27.6	5.8	1.5	1.5	1.5
Approach LOS	C	A	A	A	A

Movement	WBL	WBR	NBT	SBL	SBT
Lane Configurations	5	5	4	4	4
Traffic Volume (vph)	95	40	300	135	330
Future Volume (vph)	95	40	300	135	330
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95
Frb. ped/bikes	1.00	0.81	0.76	1.00	1.00
Frb. ped/bikes	1.00	1.00	1.00	0.97	0.97
Frt	1.00	0.85	0.91	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.99	0.99
Satd. Flow (prot)	1750	1264	2383	3197	3197
Flt Permitted	0.95	1.00	1.00	0.63	0.63
Satd. Flow (perm)	1750	1264	2383	2030	2030
Peak-Hour factor, PHF	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	99	42	312	141	344
RTOR Reduction (vph)	0	34	149	0	0
Lane Group Flow (vph)	99	8	654	0	485
Conf. Peds. (#/hr)	221	137	168	168	168
Conf. Bikes (#/hr)	2	2	4	4	4
Heavy Vehicles (%)	2%	2%	7%	5%	7%
Turn Type	Prot	Perm	NA	Perm	NA
Protected Phases	8	2	2	6	6
Permitted Phases	8	8	8	6	6
Actuated Green, G (s)	14.4	14.4	54.6	54.6	54.6
Effective Green, g (s)	15.4	15.4	55.6	55.6	55.6
Actuated G/C Ratio	0.19	0.19	0.70	0.70	0.70
Clearance Time (s)	5.0	5.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	336	243	1656	1410	1410
v/s Ratio Prot	c0.06		c0.27		
v/s Ratio Perm	0.01		0.01		0.24
v/s Ratio	0.29	0.03	0.39	0.34	0.34
Uniform Delay, d1	27.7	26.3	5.1	4.9	4.9
Progression Factor	1.00	1.00	1.00	0.19	0.19
Incremental Delay, d2	0.5	0.1	0.7	0.6	0.6
Delay (s)	28.1	26.3	5.8	1.5	1.5
Level of Service	C	C	A	A	A
Approach Delay (s)	27.6	5.8	1.5	1.5	1.5
Approach LOS	C	A	A	A	A

Intersection Summary	WBL	WBR	NBT	SBL	SBT
Cycle Length, 80					
Actuated Cycle Length: 80					
Offset: 74 (93%), Referenced to phase 2:NBT and 6:SBTL - Start of Green					
Natural Cycle: 50					
Control Type: Actuated-Coordinated					

Intersection Summary	WBL	WBR	NBT	SBL	SBT
Cycle Length, 80					
Actuated Cycle Length: 80					
Offset: 74 (93%), Referenced to phase 2:NBT and 6:SBTL - Start of Green					
Natural Cycle: 50					
Control Type: Actuated-Coordinated					



Intersection Summary	WBL	WBR	NBT	SBL	SBT
HCM 2000 Control Delay	6.5				
HCM 2000 Volume to Capacity ratio	0.37				
Actuated Cycle Length (s)	80.0				
Intersection Capacity Utilization	69.6%				
Analysis Period (min)	15				
Critical Lane Group					

HCM Unsignalized Intersection Capacity Analysis
 16: Atlantic St & Liberty St

HCM 6th AWSC
 16: Atlantic St & Liberty St

Future Total (AM)
 Sensitivity Scenario

Future Total (AM)
 Sensitivity Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		Stop	Stop		Stop			Stop			Stop	
Traffic Volume (vph)	40	175	135	30	135	100	15	30	35	50	0	25
Future Volume (vph)	40	175	135	30	135	100	15	30	35	50	0	25
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	42	184	142	32	142	105	16	32	37	53	0	26
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	368	279	85	79								
Volume Left (vph)	42	32	16	53								
Volume Right (vph)	142	105	37	26								
Head (s)	-0.16	-0.10	-0.15	0.01								
Departure Headway (s)	4.5	4.7	5.4	5.6								
Degree Utilization, x	0.46	0.36	0.13	0.12								
Capacity (veh/h)	755	729	579	566								
Control Delay (s)	11.4	10.4	9.2	9.3								
Approach Delay (s)	11.4	10.4	9.2	9.3								
Approach LOS	B	B	A	A								
Intersection Summary												
Delay	10.6											
Level of Service	B											
Intersection Capacity Utilization	50.5%											
Analysis Period (min)	15											
ICU Level of Service	A											

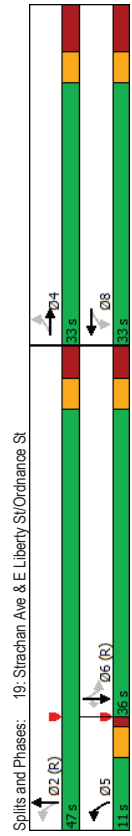
Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	10.7											
Intersection LOS	B											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	40	175	135	30	135	100	15	30	35	50	0	25
Traffic VdL, veh/h	40	175	135	30	135	100	15	30	35	50	0	25
Future Vol, veh/h	40	175	135	30	135	100	15	30	35	50	0	25
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	8	1	4	0	1	14	22	0	0	6	0	0
Minor Flow	42	184	142	32	142	105	16	32	37	53	0	26
Number of Lanes	0	1	0	0	1	0	0	1	0	1	0	1
Approach	EB	WB	WB	WB	NB	NB	SB	SB	NB	NB	SB	NB
Opposing Approach	WB	EB	EB	EB	WB	WB	SB	SB	WB	WB	SB	NB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	SB	NB	NB	EB	EB	WB	WB	WB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	SB	WB	WB	EB	EB	EB	EB	EB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	11.7	10.2	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
HCM LOS	B	B	A	A	A	A	A	A	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	19%	11%	11%	67%
Vol Thru, %	38%	50%	51%	0%
Vol Right, %	44%	39%	38%	33%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	80	350	265	75
LT Vol	15	40	30	50
Through Vol	30	175	135	0
RT Vol	35	135	100	25
Lane Flow Rate	84	368	279	79
Geometry Grp	1	1	1	1
Degree of Uln (X)	0.134	0.47	0.354	0.123
Departure Headway (Hd)	5.715	4.59	4.564	5.613
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	631	777	781	642
Service Time	3.718	2.659	2.638	3.617
HCM Lane V/C Ratio	0.133	0.474	0.357	0.123
HCM Control Delay	9.6	11.7	10.2	9.4
HCM Lane LOS	A	B	B	A
HCM 95th-tile Q	0.5	2.5	1.6	0.4

Queues
19: Strachan Ave & E Liberty St/Ordinance St

Future Total (AM)
Sensitivity Scenario

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group									
Lane Configurations	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Traffic Volume (vph)	265	15	55	20	250	365	35	360	101
Future Volume (vph)	265	15	55	20	250	365	35	360	101
Lane Group Flow (vph)	282	266	0	154	266	441	37	383	107
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm
Protected Phases	4		8		5		2		6
Permitted Phases	4		8		5		2		6
Minimum Split (s)	32.6	32.6	32.6	32.6	10.0	27.3	27.3	27.3	27.3
Total Split (s)	33.0	33.0	33.0	33.0	11.0	47.0	36.0	36.0	36.0
Total Split (%)	41.3%	41.3%	41.3%	41.3%	13.8%	58.8%	45.0%	45.0%	45.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	4.6	4.6	4.6	4.6	1.0	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	3.0	5.3	5.3	5.3	5.3
Lead/Lag					Lead	Lag	Lag	Lag	Lag
Lead-Lag Optimizer?					Yes	Yes	Yes	Yes	Yes
v/c Ratio	0.80	0.70	0.40	0.66	0.50	0.13	0.54	0.35	0.35
Control Delay	43.4	20.6	16.2	18.9	14.4	26.5	33.0	14.1	14.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.4	20.6	16.2	18.9	14.4	26.5	33.0	14.1	14.1
Queue Length 50th (m)	40.5	12.2	10.7	21.0	41.4	6.0	63.4	5.2	5.2
Queue Length 95th (m)	#82.1	#51.4	27.2	34.7	66.2	m12.1	m90.9	m16.8	m16.8
Internal Link Dist (m)	45.8		123.7		152.3			143.3	
Turn Bay Length (m)			50.0		45.0		30.0		
Base Capacity (vph)	354	381	384	401	888	282	713	305	305
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.70	0.40	0.66	0.50	0.13	0.54	0.35	0.35



HCM Signalized Intersection Capacity Analysis
19: Strachan Ave & E Liberty St/Ordinance St

Future Total (AM)
Sensitivity Scenario

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Traffic Volume (vph)	265	15	235	55	20	250	365	50	35
Future Volume (vph)	265	15	235	55	20	250	365	50	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	6.6	3.0	5.3	5.3	5.3	5.3
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	0.51	0.88	0.88	1.00	0.95	1.00	1.00	0.43
Fibb. ped/bikes	0.84	1.00	0.87	0.87	0.92	1.00	0.79	1.00	1.00
Frt	1.00	0.86	0.94	0.94	1.00	0.98	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.98	0.98	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1477	816	1305	1305	1613	1691	1380	1860	608
Flt Permitted	0.69	1.00	0.78	0.78	0.36	1.00	0.51	1.00	1.00
Satd. Flow (perm)	1074	816	1038	1038	611	1691	736	1860	608
Peak-Hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	282	16	250	59	21	74	266	388	53
RTOR Reduction (vph)	0	112	0	0	42	0	6	0	0
Lane Group Flow (vph)	282	154	0	0	112	0	266	435	0
Conf. Ped. (#/hr)	125	335	335	335	125	405	205	205	405
Conf. Bikes (#/hr)	7		7		27		7		7
Heavy Vehicles (%)	2%	0%	1%	1%	5%	2%	4%	2%	2%
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm
Protected Phases	4		8		5		2		6
Permitted Phases	4		8		5		2		6
Actuated Green, G (s)	25.4	25.4	25.4	25.4	40.7	40.7	29.7	29.7	29.7
Effective Green, g (s)	26.4	26.4	26.4	26.4	41.7	41.7	30.7	30.7	30.7
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.52	0.52	0.38	0.38	0.38
Clearance Time (s)	7.6	7.6	7.6	7.6	4.0	6.3	6.3	6.3	6.3
Lane Grp Cap (vph)	354	269	342	342	418	881	282	713	233
v/s Ratio Prot	0.19				c0.06	0.26			0.21
v/s Ratio Perm	c0.26		0.11		c0.27		0.05		0.07
v/c Ratio	0.80	0.57	0.33	0.33	0.64	0.49	0.13	0.54	0.18
Uniform Delay, d1	24.4	22.1	20.1	20.1	12.1	12.3	16.0	19.1	16.3
Progression Delay, d2	1.00	1.00	1.00	1.00	1.00	1.00	1.54	1.55	3.29
Incremental Delay, d2	16.8	8.6	2.6	2.6	7.2	2.0	0.8	2.5	1.4
Delay (s)	41.2	30.7	22.7	22.7	19.3	14.3	25.5	32.1	55.1
Level of Service	D	C	C	C	B	B	C	C	E
Approach Delay (s)	36.1		22.7		16.2		36.3		36.3
Approach LOS	D		C		B		D		D
Intersection Summary									
HCM 2000 Control Delay	27.8				HCM 2000 Level of Service				C
HCM 2000 Volume to Capacity ratio	0.73								
Actuated Cycle Length (s)	80.0								
Intersection Capacity Utilization	99.2%				ICU Level of Service				F
Analysis Period (min)	15								
c. Critical Lane Group									

HCM Unsignalized Intersection Capacity Analysis
 17: Liberty St/E Liberty St & Hanna Ave

HCM 6th AWSC
 17: Liberty St/E Liberty St & Hanna Ave

Future Total (AM)
 Sensitivity Scenario

Future Total (AM)
 Sensitivity Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		Stop	Stop		Stop			Stop			Stop	
Traffic Volume (vph)	60	120	55	20	190	30	55	20	20	20	20	30
Future Volume (vph)	60	120	55	20	190	30	55	20	20	20	20	30
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	62	124	57	21	196	31	57	21	21	21	21	31
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	243	248	99	62								
Volume Left (vph)	62	21	57	21								
Volume Right (vph)	57	31	21	31								
Head (s)	-0.05	0.06	0.01	-0.19								
Departure Headway (s)	4.6	4.7	5.2	5.0								
Degree Utilization, x	0.31	0.32	0.14	0.09								
Capacity (veh/h)	754	734	632	636								
Control Delay (s)	9.6	9.9	9.0	8.5								
Approach Delay (s)	9.6	9.9	9.0	8.5								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay	9.5											
Level of Service	A											
Intersection Capacity Utilization	49.9%											
Analysis Period (min)	15											
	ICU Level of Service											
	A											

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	9.4											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	60	120	55	20	190	30	55	20	20	20	20	30
Traffic VdL, veh/h	60	120	55	20	190	30	55	20	20	20	20	30
Future Vol, veh/h	60	120	55	20	190	30	55	20	20	20	20	30
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles, %	0	4	1	0	8	4	0	0	0	5	7	0
Mvmt Flow	62	124	57	21	196	31	57	21	21	21	21	31
Number of Lanes	0	1	0	0	1	0	0	1	0	0	0	1
Approach	EB	WB	WB	EB	NB	NB	SB	SB	WB	WB	EB	SB
Opposing Approach	WB	EB	EB	WB	WB	WB	SB	SB	WB	WB	EB	NB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	NB	EB	EB	EB	WB	WB	WB	WB	EB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	WB	WB	WB	EB	EB	EB	EB	EB	WB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	9.5	9.6	9.6	8.9	8.9	8.6	8.6	8.6	8.6	8.6	8.6	8.6
HCM LOS	A	A	A	A	A	A	A	A	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	58%	26%	8%	33%
Vol Thru, %	21%	51%	79%	17%
Vol Right, %	21%	23%	12%	50%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	95	235	240	60
LT Vol	55	60	20	20
Through Vol	20	120	190	10
RT Vol	20	55	30	30
Lane Flow Rate	98	242	247	62
Geometry Grp	1	1	1	1
Degree of Utl (X)	0.138	0.302	0.31	0.086
Departure Headway (Hd)	5.07	4.493	4.517	5.022
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	703	797	794	709
Service Time	3.127	2.533	2.556	3.083
HCM Lane V/C Ratio	0.139	0.304	0.311	0.087
HCM Control Delay	8.9	9.5	9.6	8.6
HCM Lane LOS	A	A	A	A
HCM 95th-tilt Q	0.5	1.3	1.3	0.3

HCM Unsignalized Intersection Capacity Analysis
 18: E Liberty St & Lynn Williams St

HCM 6th AWSC
 18: E Liberty St & Lynn Williams St

Future Total (AM)
 Sensitivity Scenario

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	40	195	150	126	150	90
Future Volume (vph)	40	195	150	126	150	90
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	48	232	179	150	179	107
Direction, Lane #	EB 1	EB 2	WB 1	WB 1	SB 1	
Volume Total (vph)	48	232	329	286		
Volume Left (vph)	48	0	0	179		
Volume Right (vph)	0	0	150	107		
Head (s)	0.55	0.08	-0.20	-0.05		
Departure Headway (s)	6.3	5.8	5.1	5.4		
Degree Utilization, x	0.08	0.38	0.46	0.43		
Capacity (veh/h)	541	591	678	617		
Control Delay (s)	8.7	11.1	12.4	12.4		
Approach Delay (s)	10.7		12.4	12.4		
Approach LOS	B		B	B		
Intersection Summary						
Delay	11.8					
Level of Service	B					
Intersection Capacity Utilization	48.7%					
Analysis Period (min)	15					
					ICU Level of Service	A

Intersection	EBL	EBT	WBT	WBR	SBL	SBR
Intersection Delay, s/veh	↔	↔	↔	↔	↔	↔
Intersection LOS	B				B	
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Vol, veh/h	40	195	150	126	150	90
Future Vol, veh/h	40	195	150	126	150	90
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	3	5	8	0	2	4
Mvmt Flow	48	232	179	150	179	107
Number of Lanes	1	1	1	0	1	0
Approach	EB	WB	WB	SB	SB	SB
Opposing Approach	WB	EB				
Opposing Lanes	1	2			0	
Conflicting Approach Left	SB				WB	WB
Conflicting Lanes Left	1	0			1	1
Conflicting Approach Right		SB			EB	EB
Conflicting Lanes Right	0	1			2	2
HCM Control Delay	11.6		12.6		12.4	
HCM LOS	B		B		B	

Lane	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	0%	62%
Vol Thru, %	0%	100%	54%	0%
Vol Right, %	0%	0%	46%	38%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	40	195	276	240
LT Vol	40	0	0	150
Through Vol	0	195	150	0
RT Vol	0	0	126	90
Lane Flow Rate	48	232	329	286
Geometry Grp	7	7	5	2
Degree of Uln (X)	0.083	0.374	0.467	0.429
Departure Headway (Hd)	6.277	5.805	5.117	5.4
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	571	620	703	669
Service Time	4.007	3.534	3.144	3.429
HCM Lane V/C Ratio	0.084	0.374	0.468	0.428
HCM Control Delay	9.6	12	12.6	12.4
HCM Lane LOS	A	B	B	B
HCM 95th-ile Q	0.3	1.7	2.5	2.2

HCM Unsynchronized Intersection Capacity Analysis
 20: Pirandello St & E Liberty St

HCM 6th AWSC
 20: Pirandello St & E Liberty St

Future Total (AM)
 Sensitivity Scenario

Future Total (AM)
 Sensitivity Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	Stop											
Sign Control	Stop											
Traffic Volume (vph)	5	335	5	15	241	51	10	0	35	95	0	5
Future Volume (vph)	5	335	5	15	241	51	10	0	35	95	0	5
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	5	368	5	16	265	56	11	0	38	104	0	5
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	378	337	49	109								
Volume Left (vph)	5	16	11	104								
Volume Right (vph)	5	56	38	5								
Head (s)	0.09	0.07	-0.35	0.41								
Departure Headway (s)	4.9	5.0	5.6	6.2								
Degree Utilization, x	0.52	0.46	0.08	0.19								
Capacity (veh/h)	702	698	545	519								
Control Delay (s)	13.1	12.2	9.0	10.6								
Approach Delay (s)	B	B	A	B								
Approach LOS	B	B	A	B								
Intersection Summary												
Delay	12.2											
Level of Service	B											
Intersection Capacity Utilization	45.8%											
Analysis Period (min)	15											
ICU Level of Service	A											

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	12.7											
Intersection LOS	B											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	5	335	5	15	241	51	10	0	35	95	0	5
Traffic Vol, veh/h	5	335	5	15	241	51	10	0	35	95	0	5
Future Vol, veh/h	5	335	5	15	241	51	10	0	35	95	0	5
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	25	5	14	6	10	9	0	0	5	14	0	20
Mvmt Flow	5	368	5	16	265	56	11	0	38	104	0	5
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	WB	EB	NB	NB	SB	SB	NB	EB	SB	NB
Opposing Approach	WB	EB	EB	WB	SB	SB	EB	EB	WB	WB	WB	WB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	NB	EB	EB	EB	WB	WB	WB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	WB	WB	WB	EB	EB	EB	EB	EB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	14.4	12	12	12	9	9	10.6	10.6	10.6	10.6	10.6	10.6
HCM LOS	B	B	B	B	A	A	B	B	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	22%	1%	5%	95%
Vol Thru, %	0%	97%	79%	0%
Vol Right, %	78%	1%	17%	5%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	45	345	307	100
LT Vol	10	5	15	95
Through Vol	0	335	241	0
RT Vol	35	5	51	5
Lane Flow Rate	49	379	337	110
Geometry Grp	1	1	1	1
Degree of Uln (X)	0.076	0.545	0.454	0.189
Departure Headway (Hd)	5.537	5.174	4.849	6.204
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	650	690	732	581
Service Time	3.541	3.269	2.946	4.207
HCM Lane V/C Ratio	0.075	0.549	0.46	0.189
HCM Control Delay	9	14.4	12	10.6
HCM Lane LOS	A	B	B	B
HCM 95th-ile Q	0.2	3.3	2.4	0.7

Queues
15: Dufferin St & Liberty St

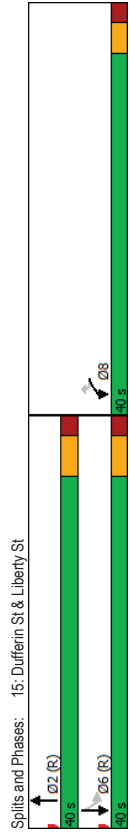
HCM Signalized Intersection Capacity Analysis
15: Dufferin St & Liberty St

Future Total (PM)
Sensitivity Scenario

Future Total (PM)
Sensitivity Scenario

Movement	WBL	WBR	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔
Traffic Volume (vph)	185	170	465	70	230
Future Volume (vph)	185	170	465	70	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95
Fpb. ped/bikes	1.00	0.85	0.88	1.00	1.00
Frt	1.00	0.85	0.95	0.97	1.00
Flt Protected	0.95	1.00	1.00	0.99	0.99
Satd. Flow (prot)	1750	1313	2896	3258	3258
Flt Permitted	0.95	1.00	1.00	0.71	0.71
Satd. Flow (perm)	1750	1313	2896	2326	2326
Peak-Hour factor, PHF	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	208	191	522	258	258
RTOR Reduction (vph)	0	64	48	0	0
Lane Group Flow (vph)	208	127	732	0	337
Confl. Peds. (#/hr)	169	105	157	157	157
Confl. Bikes (#/hr)	6			8	
Heavy Vehicles (%)	2%	3%	4%	1%	7%
Turn Type	Prot	Perm	NA	Perm	NA
Protected Phases	8		2		6
Permitted Phases	8		2		6
Actuated Green, G (s)	18.5	18.5	50.5		50.5
Effective Green, g (s)	19.5	19.5	51.5		51.5
Actuated G/C Ratio	0.24	0.24	0.64		0.64
Clearance Time (s)	5.0	5.0	6.0		6.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	426	320	1864		1497
v/s Ratio Prot	c0.12		c0.25		
v/s Ratio Perm	0.10		0.10		0.14
v/s Ratio	0.49	0.40	0.39		0.23
Uniform Delay, d1	26.0	25.3	6.8		5.9
Progression Factor	1.00	1.00	1.00		0.25
Incremental Delay, d2	0.9	0.8	0.6		0.3
Delay (s)	26.9	26.2	7.4		1.7
Level of Service	C	C	A		A
Approach Delay (s)	26.5		7.4		1.7
Approach LOS	C		A		A
Intersection Summary					
HCM 2000 Control Delay			11.2	HCM 2000 Level of Service	
HCM 2000 Volume to Capacity ratio			0.42	B	
Actuated Cycle Length (s)			80.0	Sum of lost time (s)	
Intersection Capacity Utilization			64.3%	ICU Level of Service	
Analysis Period (min)			15	C	
c Critical Lane Group					

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔
Traffic Volume (vph)	185	170	465	70	230
Future Volume (vph)	185	170	465	70	230
Lane Group Flow (vph)	208	191	780	0	337
Turn Type	Prot	Perm	NA	Perm	NA
Protected Phases	8		2		6
Permitted Phases	8		2		6
Detector Phase	8		2		6
Switch Phase	8		2		6
Minimum Initial (s)	18.0	18.0	18.0	18.0	18.0
Minimum Split (s)	23.0	23.0	24.0	24.0	24.0
Total Split (s)	40.0	40.0	40.0	40.0	40.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0	5.0	5.0	5.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	C-Max	C-Max	C-Max
v/c Ratio	0.49	0.50	0.41	0.22	0.22
Control Delay	30.2	19.4	6.4	1.8	1.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	30.2	19.4	6.4	1.8	1.8
Queue Length 50th (m)	28.9	14.3	21.4	2.0	2.0
Queue Length 95th (m)	48.8	32.2	34.6	m4.5	m4.5
Internal Link Dist (m)	382.8		162.3	186.7	
Turn Bay Length (m)	10.0				
Base Capacity (vph)	787	638	1909	1503	
Starvation Cap Reductn	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	
Storage Cap Reductn	0	0	0	0	
Reduced v/c Ratio	0.26	0.30	0.41	0.22	0.22
Intersection Summary					
Cycle Length, 80					
Actuated Cycle Length: 80					
Offset: 79 (99%), Referenced to phase 2:NBT and 6:SBTL - Start of Green					
Natural Cycle: 50					
Control Type: Actuated-Coordinated					
m Volume for 95th percentile queue is metered by upstream signal.					



HCM Unsignalized Intersection Capacity Analysis
 16: Atlantic St & Liberty St

HCM 6th AWSC
 16: Atlantic St & Liberty St

Future Total (PM)
 Sensitivity Scenario

Future Total (PM)
 Sensitivity Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	40	65	50	15	170	80	35	95	55	45	20	35
Future Volume (vph)	40	65	50	15	170	80	35	95	55	45	20	35
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	41	66	51	15	173	82	36	97	56	46	20	36
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	158	270	189	102								
Volume Left (vph)	41	15	36	46								
Volume Right (vph)	51	82	56	36								
Head (s)	-0.13	-0.08	-0.12	-0.11								
Departure Headway (s)	4.9	4.8	5.0	5.1								
Degree Utilization, x	0.21	0.36	0.26	0.15								
Capacity (veh/h)	675	706	663	628								
Control Delay (s)	9.2	10.5	9.7	9.0								
Approach Delay (s)	9.2	10.5	9.7	9.0								
Approach LOS	A	B	A	A								
Intersection Summary												
Delay	9.8											
Level of Service	A											
Intersection Capacity Utilization	46.7%											
Analysis Period (min)	15											
	ICU Level of Service											
	A											

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	9.7											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	40	65	50	15	170	80	35	95	55	45	20	35
Traffic Vol, veh/h	40	65	50	15	170	80	35	95	55	45	20	35
Future Vol, veh/h	40	65	50	15	170	80	35	95	55	45	20	35
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles, %	0	1	0	0	1	16	5	0	0	0	0	2
Mvmt Flow	41	66	51	15	173	82	36	97	56	46	20	36
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	WB	EB	NB	NB	SB	SB	SB	NB	NB	SB
Opposing Approach	WB	EB	EB	WB	WB	WB	EB	EB	EB	WB	WB	EB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	NB	EB	EB	EB	WB	WB	WB	EB	EB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	WB	WB	WB	EB	EB	EB	WB	WB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	9.2	10.2	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
HCM LOS	A	B	A	A	A	A	A	A	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	19%	26%	6%	45%
Vol Thru, %	51%	42%	64%	20%
Vol Right, %	30%	32%	30%	35%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	185	155	265	100
LT Vol	35	40	15	45
Through Vol	95	65	170	20
RT Vol	55	50	80	35
Lane Flow Rate	189	158	270	102
Geometry Grp	1	1	1	1
Degree of Uln (X)	0.261	0.211	0.349	0.143
Departure Headway (Ht)	4.978	4.81	4.648	5.037
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	715	739	768	704
Service Time	3.055	2.887	2.715	3.125
HCM Lane V/C Ratio	0.264	0.214	0.352	0.145
HCM Control Delay	9.8	9.2	10.2	9
HCM Lane LOS	A	A	B	A
HCM 95th-ile Q	1	0.8	1.6	0.5

Queues
19: Strachan Ave & E Liberty St/Ordinance St

Future Total (PM)
Sensitivity Scenario

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group									
Lane Configurations	EB	EB	WB	WB	NB	NB	SB	SB	SB
Traffic Volume (vph)	245	35	60	35	315	375	65	360	265
Future Volume (vph)	245	35	60	35	315	375	65	360	265
Lane Group Flow (vph)	255	109	0	151	328	464	68	375	276
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm
Protected Phases	4		8		5		2		6
Permitted Phases	4		8		5		2		6
Minimum Split (s)	32.6	32.6	32.6	32.6	10.0	27.3	27.3	27.3	27.3
Total Split (s)	32.6	32.6	32.6	32.6	11.0	47.4	36.4	36.4	36.4
Total Split (%)	40.8%	40.8%	40.8%	40.8%	13.8%	59.3%	45.5%	45.5%	45.5%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	4.6	4.6	4.6	4.6	1.0	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	3.0	5.3	5.3	5.3	5.3
Lead/Lag					Lead	Lag	Lag	Lag	Lag
Lead-Lag Optimizer?					Yes	Yes	Yes	Yes	Yes
v/c Ratio	0.83	0.29	0.43	0.82	0.53	0.53	0.26	0.52	0.98
Control Delay	49.1	10.7	20.6	30.0	15.0	18.8	20.2	60.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	49.1	10.7	20.6	30.0	15.0	18.8	20.2	60.1	
Queue Length 50th (m)	37.2	4.0	14.0	26.5	45.0	7.4	41.7	17.7	
Queue Length 95th (m)	#78.9	16.0	31.3	#57.6	71.4	m13.8	m62.0	m#83.3	
Internal Link Dist (m)	45.8		123.7		152.3		143.3		
Turn Bay Length (m)			50.0		45.0		30.0		
Base Capacity (vph)	309	375	352	400	882	258	716	283	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.83	0.29	0.43	0.82	0.53	0.26	0.52	0.98	

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 44 (55%). Referenced to phase 2:NBLT and 6:SBTL. Start of Green	
Natural Cycle: 75	
Control Type: Pretimed	
# 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.	



06-24-2023
BA Group

HCM Signalized Intersection Capacity Analysis
19: Strachan Ave & E Liberty St/Ordinance St

Future Total (PM)
Sensitivity Scenario

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	EB	EB	WB	WB	NB	NB	SB	SB	SB
Traffic Volume (vph)	245	35	70	60	315	375	70	65	360
Future Volume (vph)	245	35	70	60	315	375	70	65	360
Ideal Flow (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	6.6	3.0	5.3	5.3	5.3	5.3
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	0.59	1.00	0.87	1.00	0.91	1.00	1.00	0.31
Fibb. ped/bikes	0.74	1.00	0.79	0.79	0.90	1.00	0.71	1.00	1.00
Frt	1.00	0.90	0.95	0.95	1.00	0.98	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.98	0.98	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1303	1004	1195	1195	1603	1673	1273	1842	474
Flt Permitted	0.69	1.00	0.83	0.83	0.37	1.00	0.50	1.00	1.00
Satd. Flow (perm)	952	1004	1012	1012	627	1673	665	1842	474
Peak-Hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	255	36	73	62	36	52	328	391	73
RTOR Reduction (vph)	0	49	0	0	24	0	2	0	0
Lane Group Flow (vph)	255	60	0	0	127	0	328	462	0
Conf. Peds. (#/hr)	209	600	600	209	725	385	385	725	15
Conf. Bikes (#/hr)	13		49						
Heavy Vehicles (%)	1%	0%	0%	0%	0%	0%	0%	0%	2%
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm
Protected Phases	4		8		5		2		6
Permitted Phases	4		8		5		2		6
Actuated Green, G (s)	25.0	25.0	25.0	25.0	41.1	41.1	30.1	30.1	30.1
Effective Green, g (s)	26.0	26.0	26.0	26.0	42.1	42.1	31.1	31.1	31.1
Actuated g/C Ratio	0.32	0.32	0.32	0.32	0.53	0.53	0.39	0.39	0.39
Clearance Time (s)	7.6	7.6	7.6	7.6	4.0	6.3	6.3	6.3	6.3
Lane Grp Cap (vph)	309	326	328	328	880	258	716	283	184
v/s Ratio Prot	0.06				c0.08	0.28			0.20
v/s Ratio Perm	c0.27		0.13		0.33		0.10		c0.37
v/c Ratio	0.83	0.18	0.39	0.77	0.52	0.26	0.52	0.96	0.96
Uniform Delay, d1	24.9	19.4	20.9	13.9	12.4	16.7	18.8	23.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	0.95	0.94	1.43	
Incremental Delay, d2	21.6	1.2	3.4	12.5	2.2	2.0	2.2	50.2	
Delay (s)	46.5	20.6	24.3	26.3	14.6	17.8	19.7	84.2	
Level of Service	D	C	C	C	B	B	B	F	
Approach Delay (s)	38.7		24.3		19.5		44.3		
Approach LOS	D		C		B		D		

Intersection Summary

HCM 2000 Control Delay	32.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	14.9
Intersection Capacity Utilization	79.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

06-24-2023
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HCM Unsignalized Intersection Capacity Analysis
 17: Liberty St/E Liberty St & Hanna Ave

HCM 6th AWSC
 17: Liberty St/E Liberty St & Hanna Ave

Future Total (PM)
 Sensitivity Scenario

Future Total (PM)
 Sensitivity Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Sign Control		Stop		Stop								
Traffic Volume (vph)	75	80	45	20	165	50	50	15	35	20	10	35
Future Volume (vph)	75	80	45	20	165	50	50	15	35	20	10	35
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	82	88	49	22	181	55	55	16	38	22	11	38
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	219	258	109	71								
Volume Left (vph)	82	22	55	22								
Volume Right (vph)	49	55	38	38								
Head (s)	-0.06	0.00	-0.06	-0.23								
Departure Headway (s)	4.6	4.6	5.1	5.0								
Degree Utilization, x	0.28	0.33	0.15	0.10								
Capacity (veh/h)	733	739	643	644								
Control Delay (s)	9.4	9.9	9.0	8.5								
Approach Delay (s)	9.4	9.9	9.0	8.5								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay	9.4											
Level of Service	A											
Intersection Capacity Utilization	51.3%											
Analysis Period (min)	15											
	ICU Level of Service											
	A											

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	9.4											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	75	80	45	20	165	50	50	15	35	20	10	35
Traffic Vol, veh/h	75	80	45	20	165	50	50	15	35	20	10	35
Future Vol, veh/h	75	80	45	20	165	50	50	15	35	20	10	35
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	82	88	49	22	181	55	55	16	38	22	11	38
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	WB	EB	WB	WB	NB	NB	SB	SB	SB	SB
Opposing Approach	WB	EB	EB	WB	WB	WB	SB	SB	SB	NB	NB	NB
Opposing Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Left	SB	NB	NB	EB	EB	EB	WB	WB	WB	WB	WB	WB
Conflicting Lanes Left	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting Approach Right	NB	SB	SB	WB	WB	WB	EB	EB	EB	EB	EB	EB
Conflicting Lanes Right	1	1	1	1	1	1	1	1	1	1	1	1
HCM Control Delay	9.4	9.7	9.7	9.1	9.1	9.1	8.6	8.6	8.6	8.6	8.6	8.6
HCM LOS	A	A	A	A	A	A	A	A	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	50%	38%	9%	31%
Vol Thru, %	15%	40%	70%	15%
Vol Right, %	35%	23%	21%	54%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	100	200	235	65
LT Vol	50	75	20	20
Through Vol	15	80	165	10
RT Vol	35	45	50	35
Lane Flow Rate	110	220	258	71
Geometry Grp	1	1	1	1
Degree of Uln (X)	0.155	0.28	0.323	0.099
Departure Headway (Ht)	5.065	4.586	4.496	4.974
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	703	780	795	715
Service Time	3.128	2.636	2.544	3.041
HCM Lane V/C Ratio	0.156	0.282	0.325	0.099
HCM Control Delay	9.1	9.4	9.7	8.6
HCM Lane LOS	A	A	A	A
HCM 95th-ile Q	0.5	1.1	1.4	0.3

HCM Unsignalized Intersection Capacity Analysis
 18: E Liberty St & Lynn Williams St

HCM 6th AWSC
 18: E Liberty St & Lynn Williams St

Future Total (PM)
 Sensitivity Scenario

Future Total (PM)
 Sensitivity Scenario

Movement	EBL	EBT	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume (vph)	70	65	195	215	215	125	80
Future Volume (vph)	70	65	185	215	215	125	80
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	75	70	210	231	231	134	86
Direction, Lane #	EB 1	EB 2	WB 1	WB 1	SB 1		
Volume Total (vph)	75	70	441	220			
Volume Left (vph)	75	0	0	134			
Volume Right (vph)	0	0	231	86			
Head (s)	0.52	0.00	-0.27	-0.11			
Departure Headway (s)	6.1	5.5	4.6	5.2			
Degree Utilization, x	0.13	0.11	0.56	0.32			
Capacity (veh/h)	557	611	762	634			
Control Delay (s)	8.7	8.0	13.2	10.5			
Approach Delay (s)	8.4		13.2	10.5			
Approach LOS	A		B	B			
Intersection Summary							
Delay	11.6						
Level of Service	B						
Intersection Capacity Utilization	56.7%						
Analysis Period (min)	15						
	ICU Level of Service			B			

Intersection	EBL	EBT	EBT	WBT	WBR	SBL	SBR
Intersection Delay, s/veh	11.8						
Intersection LOS	B						
Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	↔	↔	↔	↔	↔	↔	
Traffic Vol, veh/h	70	65	195	215	215	125	80
Future Vol, veh/h	70	65	195	215	215	125	80
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles, %	1	0	6	0	0	0	0
Mvmt Flow	75	70	210	231	134	86	
Number of Lanes	1	1	1	0	1	0	
Approach	EB	WB	WB	SB	SB		
Opposing Approach	WB	EB					
Opposing Lanes	1	2			0		
Conflicting Approach Left	SB				WB		
Conflicting Lanes Left	1	0			1		
Conflicting Approach Right		SB			EB		
Conflicting Lanes Right	0	1			2		
HCM Control Delay	9.3	13.3	10.6				
HCM LOS	A	B	B				

Lane	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	0%	61%
Vol Thru, %	0%	100%	48%	0%
Vol Right, %	0%	0%	52%	39%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	70	65	410	205
LT Vol	70	0	0	125
Through Vol	0	65	195	0
RT Vol	0	0	215	80
Lane Flow Rate	75	70	441	220
Geometry Grp	7	7	5	2
Degree of Utl (X)	0.125	0.106	0.559	0.314
Departure Headway (Hd)	5.994	5.471	4.561	5.13
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	694	649	785	694
Service Time	3.775	3.251	2.619	3.208
HCM Lane V/C Ratio	0.126	0.108	0.562	0.317
HCM Control Delay	9.6	8.9	13.3	10.6
HCM Lane LOS	A	A	B	B
HCM 95th-ile Q	0.4	0.4	3.5	1.3

HCM Unsynchronized Intersection Capacity Analysis
 20: Pirandello St & E Liberty St

HCM 6th AWSC
 20: Pirandello St & E Liberty St

Future Total (PM)
 Sensitivity Scenario

Future Total (PM)
 Sensitivity Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection Delay, s/veh	18.6											
Intersection LOS	C											
Lane Configurations	Stop											
Traffic Volume (vph)	10	170	10	50	380	105	10	0	25	125	5	20
Future Volume (vph)	10	170	10	50	380	105	10	0	25	125	5	20
Peak Hour Factor	0.90											
Hourly flow rate (vph)	11	189	11	56	422	117	11	0	28	139	6	22
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	211	595	39	167								
Volume Left (vph)	11	56	11	139								
Volume Right (vph)	11	117	28	22								
Head (s)	-0.01	-0.06	-0.37	0.09								
Departure Headway (s)	5.3	4.8	5.9	6.1								
Degree Utilization, x	0.31	0.79	0.06	0.28								
Capacity (veh/h)	630	736	537	544								
Control Delay (s)	10.7	23.6	9.3	11.4								
Approach Delay (s)	10.7	23.6	9.3	11.4								
Approach LOS	B	C	A	B								
Intersection Summary	18.3											
Delay	18.3											
Level of Service	C											
Intersection Capacity Utilization	68.0%											
Analysis Period (min)	15											
ICU Level of Service	C											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	Stop											
Traffic VdL, veh/h	10	170	10	50	380	105	10	0	25	125	5	20
Future VdL, veh/h	10	170	10	50	380	105	10	0	25	125	5	20
Peak Hour Factor	0.90											
Heavy Vehicles, %	0											
Mvmt Flow	11	189	11	56	422	117	11	0	28	139	6	22
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB	WB	NB	SB								
Opposing Approach	WB	EB	SB	NB								
Opposing Lanes	1	1	1	1								
Conflicting Approach Left	SB	NB	EB	WB								
Conflicting Lanes Left	1	1	1	1								
Conflicting Approach Right	NB	SB	WB	EB								
Conflicting Lanes Right	1	1	1	1								
HCM Control Delay	11.2											
HCM LOS	B											

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	29%	5%	9%	83%
Vol Thru, %	0%	89%	71%	3%
Vol Right, %	71%	5%	20%	13%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	35	190	535	150
LT Vol	10	10	50	125
Through Vol	0	170	380	5
RT Vol	25	10	105	20
Lane Flow Rate	39	211	594	167
Geometry Grp	1	1	1	1
Degree of Utl (X)	0.064	0.323	0.796	0.28
Departure Headway (Hd)	5.911	5.503	4.819	6.054
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	603	652	755	592
Service Time	3.975	3.543	2.819	4.104
HCM Lane V/C Ratio	0.065	0.324	0.787	0.282
HCM Control Delay	9.4	11.2	23.8	11.5
HCM Lane LOS	A	B	C	B
HCM 95th-tilt Q	0.2	1.4	8.2	1.1

Appendix H: Transit TTS – Transit Access / Egress Mode Share



H TRANSIT DEMAND REVIEW

H.1 Exhibition Station Access and Egress Mode Shares

H.1.1 Existing Conditions – Exhibition GO Station

BA Group had constructed a review of the 2016 Transportation Tomorrow Survey (TTS) database to establish the existing usage patterns for the Exhibition GO Station in regards to:

- Origin and destination patterns for 2006 TTS Zones in the Greater Toronto and Hamilton Area (GTHA) to / from the Exhibition GO Station;
- The distribution of ingress and egress mode to / from the Exhibition GO Station; and
- The distribution of connecting local transit routes to / from the Exhibition GO Station.

Detailed queries are provided in **Appendix B**. Based on this information, the overall and area specific existing peak period access and egress mode shares are summarized in **Table 39**.

Table 39 Existing Exhibition GO Station Access and Egress Mode Share Summary

Mode	Overall King-Liberty Area ⁽¹⁾				Liberty Village Specific Area ⁽²⁾			
	Morning Peak Hour		Afternoon Peak Hour		Morning Peak Hour		Afternoon Peak Hour	
	Access	Egress	Access	Egress	Access	Egress	Access	Egress
Local Transit	24%	3%	2%	20%	0%	0%	0%	0%
Park n Ride	5%	0%	0%	3%	9%	0%	0%	10%
Kiss n Ride	0%	0%	2%	7%	0%	0%	0%	0%
Walk	51%	94%	96%	60%	76%	99%	99%	82%
Cycle	20%	3%	0%	10%	15%	1%	1%	8%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Notes:

1. Based on 2016 TTS trips to/from Exhibition GO Station that originate or destined anywhere.
2. Based on 2016 TTS trips to/from Exhibition GO Station that originate or destined to 2006 TTS Zones 89 and 90.
3. Off peak directional mode share dataset is small.

In the peak direction of travel, the existing mode share for auto-based access and egress to/from the Exhibition GO Station is in the order of 10% in the study area. There is negligible difference in auto mode share for access and egress between all Exhibition GO ridership versus ridership only associated with the study area. The only difference between these subsets is that ridership to/from the study area will generally walk instead of relying on transit or being a passenger.

H.1.2 Future Conditions – Exhibition Station

The future Exhibition Ontario Line Station access and egress mode shares under future conditions were adopted from the 2030 ingress and egress mode split mode split estimates of the combined GO and Ontario Line trips outlined in the December 2021 *HDR Ontario Line Integrated TOC – Exhibition Station Draft TIA report* (Section 3.3.4 Table 3-6 & 3-10).

The overall future access and egress ridership estimates at Exhibition Station are summarized in **Table 40** for the weekday morning and afternoon peak hours.



Table 40 Future Exhibition Ontario Line Station Access and Egress Ridership Summary

Mode	GO Related Trips ⁽¹⁾				Ontario Line-Related Trips ⁽²⁾				Total Trips ⁽³⁾			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	Access	Egress	Access	Egress	Access	Egress	Access	Egress	Access	Egress	Access	Egress
Local Transit	118	1041	1041	118	733	380	380	733	851	1421	1421	851
Park n Ride	--	--	--	--	--	--	--	--	--	--	--	--
Kiss n Ride	64	107	107	64	89	53	53	89	153	160	160	153
Walk	198	332	332	198	883	1689	1689	883	1081	2021	2021	1081
Cycle	19	32	32	19	349	14	14	349	368	46	46	368
Total	399	1512	1512	399	2054	2136	2136	2054	2453	3648	3648	2453

Notes:

1. Reflects 2030 Exhibition GO Station gross external trip generation (no non-local transit transfers) in Table 3-6 in the December 2021 *HDR Ontario Line Integrated TOC – Exhibition Station Draft TIA* report.
2. Reflects 2030 Exhibition Ontario Line Station gross external trip generation (no non-local transit transfers) in Table 3-10 in the December 2021 *HDR Ontario Line Integrated TOC – Exhibition Station Draft TIA* report.
3. Reflects the sum of future ridership for GO and Ontario Line at Exhibition Station.

The above total trips across access and egress modes are used to derive the forecast overall access and egress mode share at Exhibition Station. Resultant mode shares are summarized in **Table 41**.

Table 41 Future Exhibition Ontario Line Station Access and Egress Mode Share Summary

Mode	Future Access/Egress Mode Shares ⁽¹⁾			
	Morning Peak Hour		Afternoon Peak Hour	
	Access	Egress	Access	Egress
Local Transit	35%	39%	39%	35%
Park n Ride	--	--	--	--
Kiss n Ride	5%	4%	4%	5%
Walk	45%	56%	56%	45%
Cycle	15%	1%	1%	15%
Total	100%	100%	100%	100%

Notes:

1. Mode share reflects the total future ridership for GO and Ontario Line at Exhibition Station.

Based on a comparison of existing (**Table 40**) versus the overall forecast (**Table 41**) access/egress mode share for all Exhibition Station ridership, there is a much higher proportion of local transit transfers (approximately 40% versus 20% or less) and a lower proportion of walking under future conditions – especially in the off-peak direction. However, this is reflective of the overall Exhibition Station ridership that may be arriving/depart from/to beyond the Liberty Village area. Based on a review of existing access and egress modes at Exhibition GO Station for riders to/from within the Liberty Village area, the overall access/egress mode share has a much higher proportion of walking instead of use of connecting transit as shown in **Table 42**.



Table 42 Exhibition Ontario Line Station Access/Egress Mode Share - Riders within Liberty Village

Mode	Morning Peak Hour		Afternoon Peak Hour	
	Access	Egress	Access	Egress
Local Transit	~0%	~0%	~0%	~0%
Park n Ride	~0%	~0%	~0%	~0%
Kiss n Ride	5%	4%	4%	5%
Walk	80%	95%	95%	80%
Cycle	15%	1%	1%	15%

Given the proximity of the site to Exhibition Station, it is expected that site-related transit trips to and from the station will primarily walk the short distance between the station and the proposed development, rather than using other modes.

H.1.3 King-Liberty Station Access and Egress Mode Shares

King-Liberty SmartTrack Station access and egress mode shares under future conditions were adopted from the mode splits outlined in the 2018 Metrolinx New SmartTrack Stations Environmental Project Report Volume VI (Section 4.9.1 Table 4-15). These overall future access and egress mode shares are summarized in **Table 43** and were adopted for this study.

Table 43 Future King-Liberty Station Access and Egress Mode Shares

Mode	Morning Peak Hour		Afternoon Peak Hour	
	Access	Egress	Access	Egress
Transit	18%	22%	22%	18%
Park n Ride	--	--	--	--
Kiss n Ride	18%	0%	0%	18%
Walk	58%	71%	71%	58%
Cycle	6%	7%	7%	6%
Total	100%	100%	100%	100%

Notes:

1. Based on mode shares presented in Section 4.9.1 Table 4-15 in the 2018 Metrolinx New SmartTrack Stations Environmental Project Report Volume VI.

Given the proximity of the site to King-Liberty Station, it is expected that site-related transit trips to and from the station will primarily walk the short distance between the station and the proposed development, rather than travelling through other modes.

