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New Civic Development for The Ottawa Hospital

Transportation Impact Assessment and Mobility Study

July 2021

PARSONS

New Civic Development for The Ottawa Hospital

Transportation Impact Assessment and Mobility Study

Final Draft Report

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477447 - 01000

TIA Plan Reports

On 14 June 2017, the Council of the City of Ottawa adopted new Transportation Impact Assessment (TIA) Guidelines. In adopting the guidelines, Council established a requirement for those preparing and delivering transportation impact assessments and reports to sign a letter of certification.

Individuals submitting TIA reports will be responsible for all aspects of development-related transportation assessment and reporting, and undertaking such work, in accordance and compliance with the City of Ottawa's Official Plan, the Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines.

By submitting the attached TIA report (and any associated documents) and signing this document, the individual acknowledges that s/he meets the four criteria listed below.

CERTIFICATION

1. I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;
2. I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;
3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and
4. I am either a licensed[1] or registered[2] professional in good standing, whose field of expertise [check √ appropriate field(s)] is either transportation engineering ☑ or transportation planning ☐.

[1,2] **License of registration body that oversees the profession is required to have a code of conduct and ethics guidelines that will ensure appropriate conduct and representation for transportation planning and/or transportation engineering works.**

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1.0 INTRODUCTION

The Ottawa Hospital (TOH) is undertaking a Master Site Plan process for establishing a New Civic Development (NCD) and replacing the ageing Civic Campus located at 1053 Carling Avenue. The New Civic Development site is located to the southwest of the intersection of Carling Avenue and Preston Street, west of Prince of Wales Drive, and on lands to the north and east of the Central Experimental Farm. At this location, the new site will have strong ties to transit, served by Light Rail Transit (LRT) via a rapid transit station on the Trillium Line, and bus transit priority lanes with bus stops along Carling Avenue. The site is also located near the heart of the City, and as such is served with strong arterial roads and active transportation infrastructure.

The New Civic Development is intended to replace the existing 1053 Carling Avenue Civic Hospital functions and become the major referral centre for Eastern Ontario, Western Quebec, and parts of Nunavut. It will be the home of the Eastern Ontario Trauma Centre with a range of specialized services, research, and education facilities, along with related ancillary uses such as resident care stay facilities, and retail service uses. Ancillary uses are also proposed, including a mixture of uses along Carling Avenue, west of Preston Street, referred to as Carling Village.

The objective of this report is to address the requirements of the City of Ottawa's current Transportation Impact Assessment (TIA) Guidelines (2016), as well as addressing a number of important transportation issues identified by the local community. Additional detail will be provided within an update to this TIA in support of individual future Site Plan Control (SPC) applications over the years. The following report represents Step 5 – Final Report of the City's TIA process. This report also is intended to fulfill the transportation study requirements for the lifting of the "H" Holding Zone provision that has been placed on this property.

2.0 SCREENING FORM

The screening form confirmed the need for a TIA Report based on the following triggers:

1. Trip Generation triggered - the proposed development includes approximately 5.0M ft^2 GFA of new facilities with 1,250 beds anticipated at full buildout.
2. Location triggered - the development is located within a Design Priority Area (DPA), a Transit Oriented Development Zone (TOD) within 600 m of existing Carling LRT Station (renamed Dow's Lake LRT Station) and will have future driveway access to Carling Avenue which is classified as an existing bicycle spine route and future transit priority corridor.
3. Safety triggered - some proposed driveways are in the influence area of an adjacent intersections and some driveways may be located on boundary streets with horizontal or vertical curvatures.

The Screening Form has been provided in **Appendix A**.

3.0 SCOPING REPORT

3.1 Existing and Planned Conditions

3.1.1 Proposed Development

The Ottawa Hospital is planning to relocate their facilities from the existing Civic Campus at 1053 Carling Avenue to a new location at 870-930 Carling Avenue and 520 Preston Street. The proposed location is approximately 1 km east of the existing campus, as noted in **Figure 1**.

The existing Civic Campus was originally built in 1924 and has had many additions over time to the point where it has reached its capacity and faces multiple challenges such as a deteriorating structure and lack of on-site parking. The existing campus consists of approximately 2,120,000 ft^2 gross floor area (GFA), including approximately 305,000 ft^2 GFA within the University of Ottawa Heart Institute (UOHI). The new campus is intended to replace the existing 1,818,500 ft^2 portion of the Civic Campus, excluding the University of Ottawa

Heart Institute (UOHI). The UOHI is expected to remain at the existing campus for the next 10-20 years before relocating to the new Civic Development.

The new Civic Development is anticipated to be almost double the size of the existing campus, at a full buildout size of approximately 5.0M ft^2 GFA.

Table 1 provides a comparison in general statistics between the existing and new campuses. It is important to note that the future Hospital statistics are preliminary, but conservative approximations at this time.

Figure 1: Existing and Proposed Development Locations – Local Context

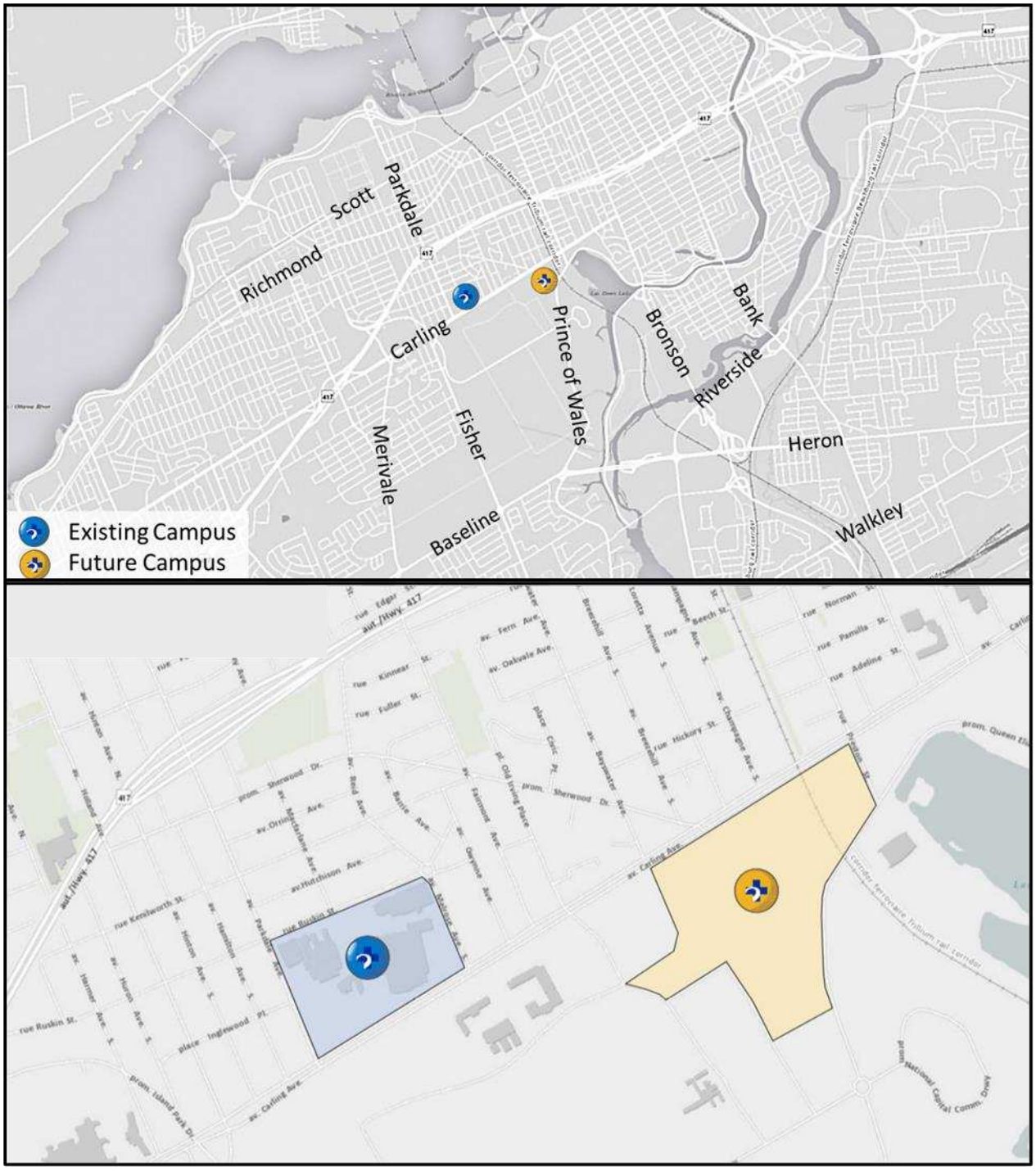


Table 1: Land Use Statistics (Existing Civic Campus)

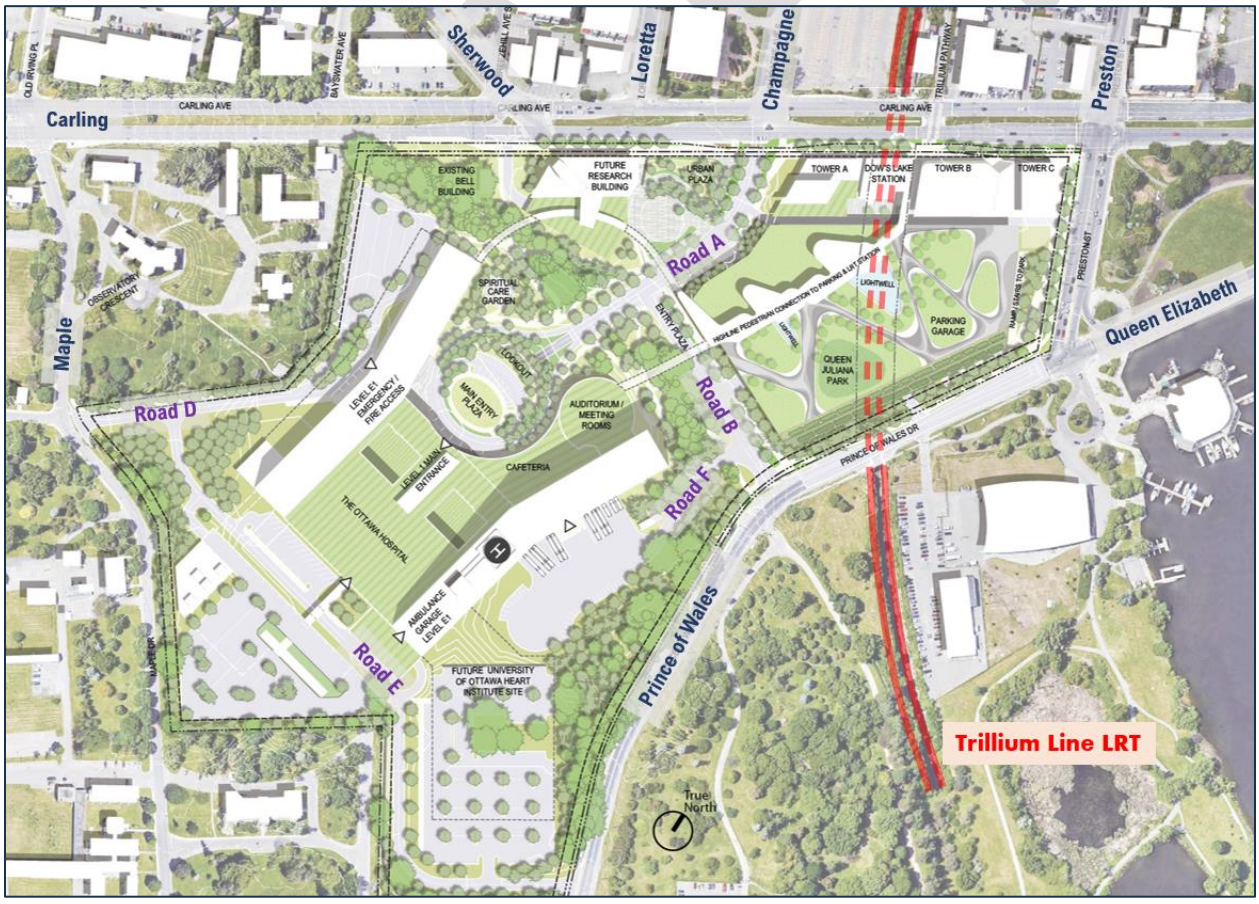
Independent Variable	Existing Civic Campus	New Civic Development
Total Number of Beds	559	1,246
Number of Employees	3,473	10,439
GFA x1,000 ft²	2,125	4,950

The proposed site is located on Federal Lands, zoned as I2 [2491]-h, which is a "major institutional zone". The site currently comprises a public park (Queen Juliana Park), the Dow's Lake parking lot, and remnants of the demolished Agriculture Canada Structure (Sir John Carling).

The latest iteration of the Master Site Plan has been provided in **Figure 2**. There are five new internal roadways (Road A to F) and various minor driveways that provide access to the adjacent road network and onsite vehicular circulation. The Dow's Lake LRT Station is located at the northeast corner of the property that will connect to the main building via an elevated covered passageway (The 'Highline'). Additional active transportation facilities will also be provided onsite to ensure the highest possible mobility and accessibility for all users.

There will be five key entrances for staff and visitors to the main building: the main 'front-door' entrance, beneath that will be a below-grade emergency drop-off entrance, two rear entrances primarily for staff, and the west 'arm' entrance. Atop the east 'arm' will be the helipad and at the lower level will be the loading bay /service entrance. Detailed discussions regarding on-site infrastructure will be provided in **Section 5.0: Strategy Report**.

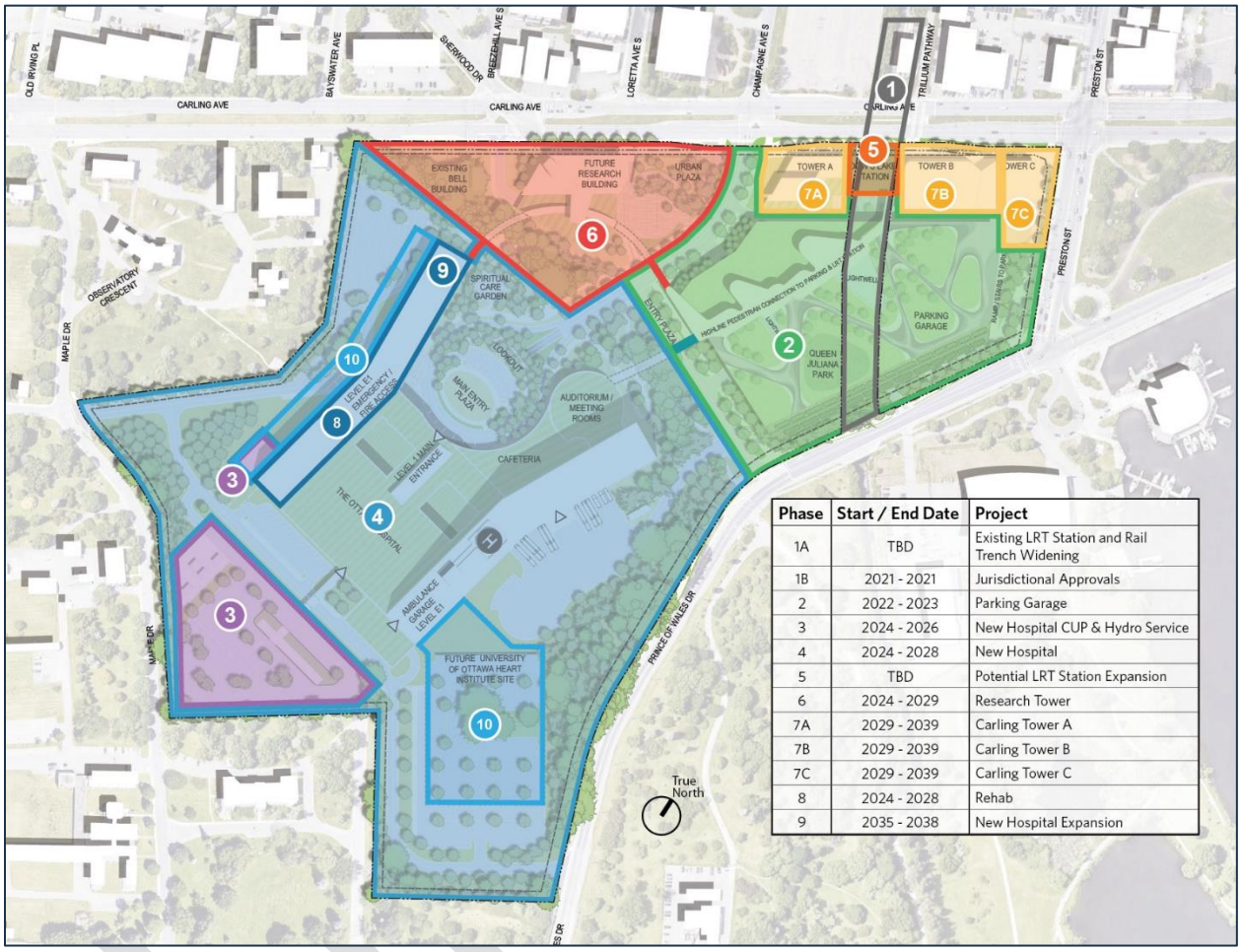
Figure 2: Proposed Master Site Plan



3.1.2 Phasing Plan

It is understood that the New Civic Development will be constructed gradually over the coming decades. The anticipated phasing plan has been summarized in **Figure 3.**

Figure 3: New Civic Development Phasing Plan



Phase	Start / End Date	Project
1A	TBD	Existing LRT Station and Rail Trench Widening
1B	2021 - 2021	Jurisdictional Approvals
2	2022 - 2023	Parking Garage
3	2024 - 2026	New Hospital CUP & Hydro Service
4	2024 - 2028	New Hospital
5	TBD	Potential LRT Station Expansion
6	2024 - 2029	Research Tower
7A	2029 - 2039	Carling Tower A
7B	2029 - 2039	Carling Tower B
7C	2029 - 2039	Carling Tower C
8	2024 - 2028	Rehab
9	2035 - 2038	New Hospital Expansion

Opening day of New Civic Development is expected by 2028, operating with approximately 6,600 (full-time equivalent) staff and approximately 770 patient beds. The gross floor area at opening day is projected to be approximately 2.4M ft^2 with a total of 3,099 parking spaces, including an approximate 2,500 space parking garage to be constructed prior to opening day. The intent of constructing the parking garage in advance of the main hospital is to accommodate the parking demand of the construction workers and as a construction staging area for the New Civic Development.

Full buildout of the New Civic Development is expected by 2048, which will include the expansion of the west 'arm' for the Rehabilitation Centre and additional programs, as well as the construction of the University of Ottawa Heart Institute (UOHI) Tower. By this time, staff projections are expected to increase to approximately 10,500 (full time equivalent) with approximately 1,250 beds.

In addition to the main hospital campus facilities, an adjoining development area referred to as Carling Village is envisioned by full buildout (situated along the south side of Carling Avenue, west of Preston Street, and serving as the active frontage of the parking garage). Carling Village is expected to consist of three towers comprised of ancillary office, commercial, and residential uses, with direct access to Dow's Lake LRT Station. The estimated gross floor area of the New Civic Development at full buildout is approximately 4.95M ft^2.

A summary of the phasing statistics by horizon year has been provided in **Table 2**.

Table 2: New Civic Development Phasing Statistics

Phase	Expected Completion By	Building Gross ft²	Description
Phases 1 - 5	2028	2.4M	Parking garage: approximate 2,500 space capacity structure will be built in advance of main hospital building. Hospital: Completion of main hospital building, including north and south "arms." The south arm will be built to its full height of 12-storeys (complete with helipad), whereas the north arm will be built to roughly 7-storeys.
Phases 6 -10	2048	2.55M	Hospital: height expansion of the north arm to meet expected needs; funded by Province University of Ottawa Heart Institute: Relocation to new campus. Carling Village and research building at Carling/Sherwood.
	TOTAL	4.95M	

3.1.3 Existing Conditions

3.1.3.1 Existing Area Road Network

The new Civic Development will be centrally located in the City of Ottawa, adjacent to the Experimental Farm, abutting three major arterial roadways: Carling Avenue, Preston Street, and Prince of Wales Drive. The road network hierarchy within the study area, based on Map 6 of the 2013 Transportation Master Plan (TMP), are illustrated in **Figure 4**. The roadway classifications descriptions from Exhibit 7.1 of the TMP are summarized in **Table 3**.

Figure 4: Existing Road Network

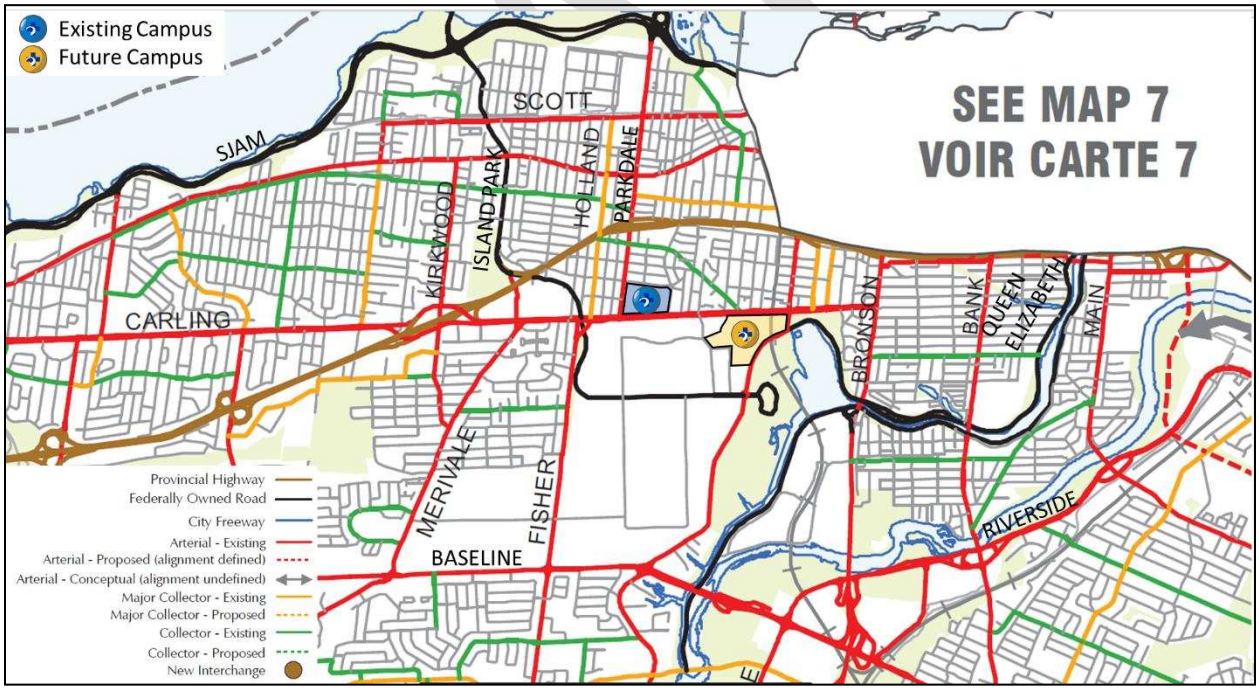


Table 3: City Road Classification Framework

Classification	Primary Function	Secondary Function
Highway	Serve "through" travel between points not accessed directly from the road itself	None – direct access to adjacent lands is prohibited
Arterial	Serve travel through the city in conjunction with other roads	Provides access to adjacent lands, subject to restrictions
Major Collector/Collector	Serve travel between arterials, major collectors, collectors, and neighbourhood travel	Provide direct access to adjacent lands
Local	Provide direct access to adjacent lands	Serve neighbourhood travel to and from collector or arterial roads
Federally Owned (NCC)	NCC Scenic Parkway system with special aesthetic treatments and design features. Different functional purposes that differ from local municipal roads	

A description of the key roadways within the study area has been provided below.

Provincial Highway:

- Highway 417 Queensway - Located approximately 700 m north of Carling Avenue where the existing site is located. Interchanges to and/or from the highway include:
  - **Kirkwood/Carling:** located approximately 1.6 km west of the existing site and 2.6 km west of the proposed site. Provides east and west on and off ramps (full access to/from highway)
  - **Parkdale:** located approximately 0.7 km north of Carling Avenue by the existing site and 1.8 km north west of the proposed site. Provides east and west on and off ramps (full access to/from highway)
  - **Rochester:** located approximately 2.0 km north east of the existing site and 1.2 km north east of the proposed site. Provides eastbound off ramp and westbound on ramp only.
  - **Bronson:** located approximately 2.4 km north east of the existing site and 1.6 km north east of the proposed site. Provides eastbound off ramp and westbound on ramp only.
  - **Metcalfe/O'Connor:** located approximately 3.7 km north east of the existing site and 2.3 km north east of the proposed site. Provides east and west on and off ramps (full access to/from highway)

Arterials:

- **Carling Avenue:** A major east-west arterial with a 6-lane urban cross section within the study area. Carling fronts the existing and proposed site and extends from Bronson Avenue to March Road in Kanata. Provides connection to Highway 417 with full movement ramps. The posted speed limit is 60km/h.
- **Parkdale Avenue:** A north-south arterial with a 2-lane urban cross section within the study area and on-street parking. Parkdale fronts the existing site and extends from Carling Avenue in the south to Sir John A. McDonald (SJAM) in the north. Provides connection to Highway 417 with full movement ramps. The posted speed limit is 50km/h.
- **Bronson Avenue:** A major north-south arterial with a 4-lane urban cross section within the study area. Extends from the Airport Parkway in the south to Albert Street in the north. Provides connection to Highway 417 with an eastbound off ramp and westbound on ramp. The posted speed limit is 50km/h.
- **Prince of Wales Drive**: A north-south arterial with a 2-lane urban/rural cross section within the study area. Prince of Wales fronts the proposed site and extends from Preston Road in the north to Fourth Line in the south. Prince of Wales is a major connector to southern neighborhoods. The posted speed limit is 60km/h.
- **Preston Street:** A north-south arterial with a 2-lane urban cross section within the study area and on-street parking. Preston Road fronts the proposed site and extends from Prince of Wales in the south to Albert Street in the north. The unposted speed limit is assumed 50km/h.

Federally Owned Roads:

- **Island Park Drive:** A north-south roadway with a 2-lane urban cross section. Extends from Carling Avenue in the south to Champlain Bridge in the north which continues on to the province of Quebec. The posted speed limit is 40km/h.
- **Queen Elizabeth Driveway:** An east-west roadway with a 2-lane urban cross section. Extends from Preston Road in the west to Laurier Avenue W in the east. The roadway borders the west side of the Rideau Canal, provides grade separation on major intersections, and offers limited access to other roadways. The posted speed limit is 40km/h.
- **NCC Scenic Driveway**: An east-west roadway with a 2-lane urban cross section. Extends from the Dominion Arboretum Park in the east to Holland Avenue in the west, where it continues as Island Park Driveway. The roadway cuts across the experimental farm of Ottawa and provides limited accesses to government, research, and farm buildings, as well as parks. The posted speed limit is 30km/h.

Collectors/Major Collectors:

- **Sherwood Drive:** An east-west collector road connecting Carling Avenue to Holland Avenue near the existing site. The posted speed limit is 40km/h.
- **Rochester Street:** A north-south collector road which provides eastbound off ramp and westbound on ramp access to Highway 417, located near to the existing site. The unposted speed limit is assumed 50km/h.
- **Booth Street**: A north-south major collector road which extends from the interprovincial Chaudière Bridge (Eddy Street on the Quebec side) to Carling Avenue in the south. The unposted speed limit is assumed 50km/h.

Local Streets of Significance:

- **Champagne Avenue:** A north-south local road which extends from Young Street in the north to Carling Avenue in the south. The posted speed limit is 40km/h.
- **Maple/Old Irving**: are both local roads and an extension of each other. North of Carling Avenue, the road is named Old Irving and extends from north to Civic Place. South of Carling, Maple Drive extends to the NCC Scenic Driveway. The posted speed limit is 30km/h south of Carling Avenue and assumed 50km/h south of Carling Avenue.

3.1.3.2 Existing Study Area Intersections

Figure 5 illustrates the study area intersections with **Table 4** providing a general description of all existing study area intersections and additional notes for major intersections. A detailed description of existing study area intersections has been provided in **Appendix B**. Existing driveways within 200m of the New Civic Development have been identified in **Figure 6.**

Figure 5: Study Area Intersections

Table 4: Existing Study Area Intersections

#	Intersection Name	Road Classification	# of Legs	Control Type	Additional Notes
1	Carling/Parkdale	Arterial to arterial	3	Signalized	
2	Carling/Civic Hospital	Arterial to local	3	Signalized	
3	Carling/Melrose	Arterial to local	3	Signalized	
4	Carling/Irving-Maple	Arterial to local	4	Signalized	
5	Carling/Sherwood	Arterial to collector	3	Signalized	Sherwood intersects Carling Ave. at a high angle
6	Carling/Champagne	Arterial to local	3	Signalized	
7	Carling/130m W of Preston	Arterial to pedestrian only	2	Signalized	Trillium Pathway crossing.
8	Carling/Preston	Arterial to arterial	4	Signalized	
9	Carling/Rochester	Arterial to major collector	3	Stop on minor	Only provides access to and from WB Carling Ave.
10	Carling/Booth	Arterial to major collector	3	Signalized	
11	Carling/Bronson	Arterial to arterial	4	Signalized	The east leg is out-flow only (one-way)
12	Parkdale/H417 WB	Arterial to provincial highway	4	Signalized	EB-WB legs are one-way only (WB flow only)
13	Parkdale/H417 EB	Arterial to provincial highway	4	Signalized	EB-WB legs are one-way only (EB flow only)
14	Parkdale/Sherwood	Arterial to collector	4	Signalized on major, stop on minor	Pedestrian actuated signals for NB-SB travel. EB-WB operates as stop-controlled
15	Parkdale/Ruskin	Arterial to local	4	Signalized	
16	Sherwood/Bayswater	Collector to local	4	4-way stop control	Angled intersection with a channelized SBR lane
17	Prince of Wales/The Driveway	Arterial to federally owned roadway	4	Roundabout	4-legged roundabout interchange
18	Prince of Wales/Navy	Arterial to local	4	Stop on minor	Navy Private provides access to 2 parking lots

#	Intersection Name	Road Classification	# of Legs	Control Type	Additional Notes
19	Prince of Wales/Preston	Arterial to arterial	3	Signalized	Channelized WBR lane
20	Rochester/Raymond 417 WB	Major collector to provincial highway	4	Signalized	EB-WB legs are one-way only (WB flow only)
21	Rochester/Orangeville 417 EB	Major collector to provincial highway	4	Signalized	EB-WB legs are one-way only (EB flow only)
22	Bronson/Catherine 417 WB	Arterial to arterial	4	Signalized	EB-WB legs are one-way only (WB flow only)
23	Bronson/417 EB	Arterial to provincial highway	4	Signalized	EB-WB legs are one-way only (EB flow only)
24	Bronson/Imperial-Plymouth	Arterial to arterial & local	4	Unsignalized	The east and west legs are out-flow only (one-way)
25	Bronson/Madawaska-Fifth	Arterial to collector	4	Signalized	

Figure 6: Adjacent Driveways within 200m of the Site

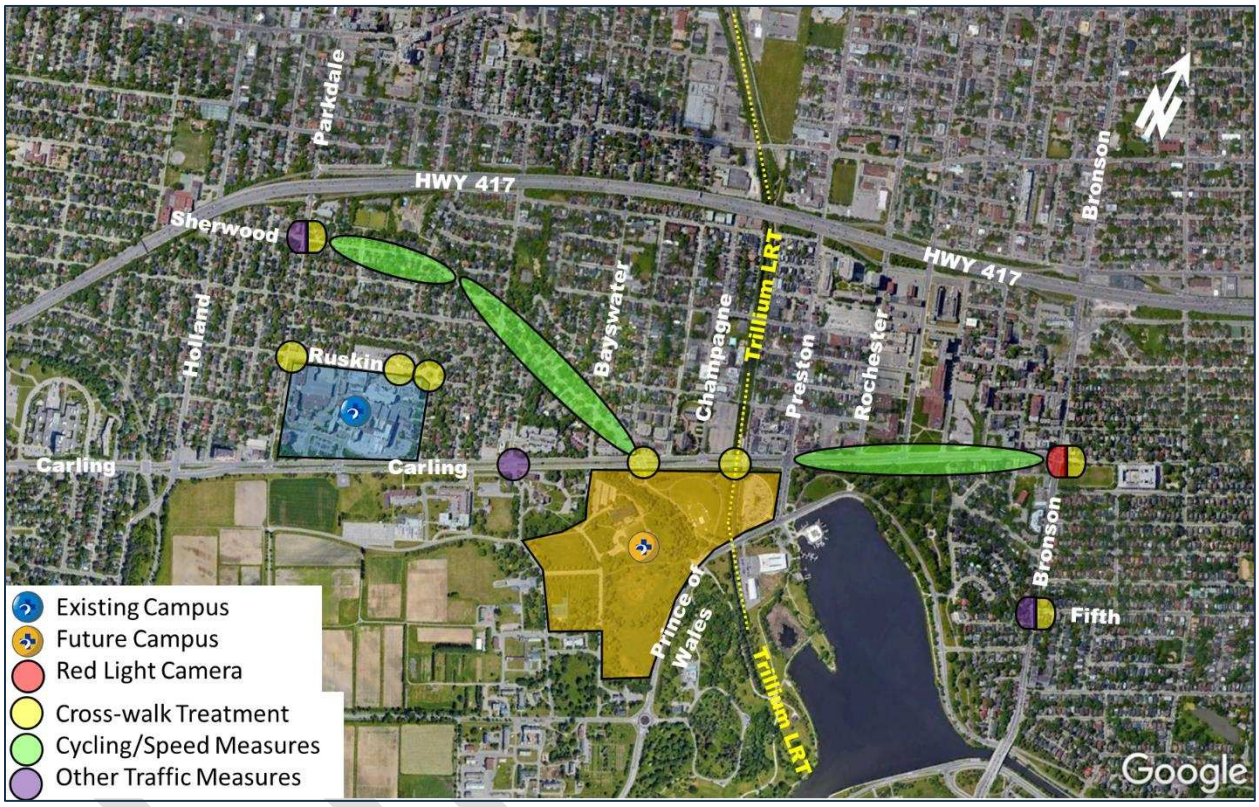
3.1.3.3 Existing Area Traffic Management Measures

Known existing area traffic management measures within the study area have been listed below, and highlighted in **Figure 7.**

- Red light cameras located at certain study area intersections, such as Carling/Bronson;
- Signalized pedestrian/cyclist only crossing at Carling Avenue on major multi-use pathway (MUP) at Trillium Pathway;
- Pedestrian actuated traffic signals at Parkdale/Sherwood;
- Maximum 40km/h with pedestrian crossing sign on road centerline on some roadways (such as Sherwood Drive);

- 'Your speed' radar indicator on some roadways (such as Sherwood Drive);
- Painted high visibility zebra-stripe treatments at some intersections (such as Carling/Bronson);
- Painted bike and bus lane symbol plus road signage;
- 'Single file' share the roads with cyclists at various locations;
- No southbound through and peak period restriction northbound on Old Irving; and,
- Channelized right-turns with refuge island at some intersections.

Figure 7: Existing Traffic Management Measures



Note: this image does not represent a comprehensive list, only those known at the time of this study. Half circles denote intersections with more than one traffic management measure.

Additionally, the City of Ottawa initiated a Sherwood Drive Traffic Calming Study in the Fall 2020 "due to concerns pertaining to speeding, elevated volumes, and non-compliance of stop signs." [1] The study is ongoing.

3.1.3.4 Existing Pedestrian/Cycling Network

All study area roadways include sidewalks on at least one side of the road. Roadways with sidewalks on only one side include Prince of Wales Drive south of Prince of Wales/Navy, Champagne Avenue, Sherwood Drive, Ruskin Street, Maple Drive, Birch Drive, Gwynne Avenue, and various other local roadways.

There are several multi-use pathways (MUPs) or grade separated/isolated pathways within the study area, including:

- **Trillium Pathway:** Extends from the Trans Canada Trail from the north which borders the Ottawa River to Prince of Wales/Queen Elizabeth Driveway where it connects to the Rideau Canal Western Pathway. This pathway cuts across the proposed site adjacent to the Trillium Line.
- **Rideau Canal Western Pathway:** Extends from Parliament Hill and along the west side of the Rideau Canal adjacent to the Queen Elizabeth Driveway. From Commissioners Park at Dow's Lake, the pathway continues

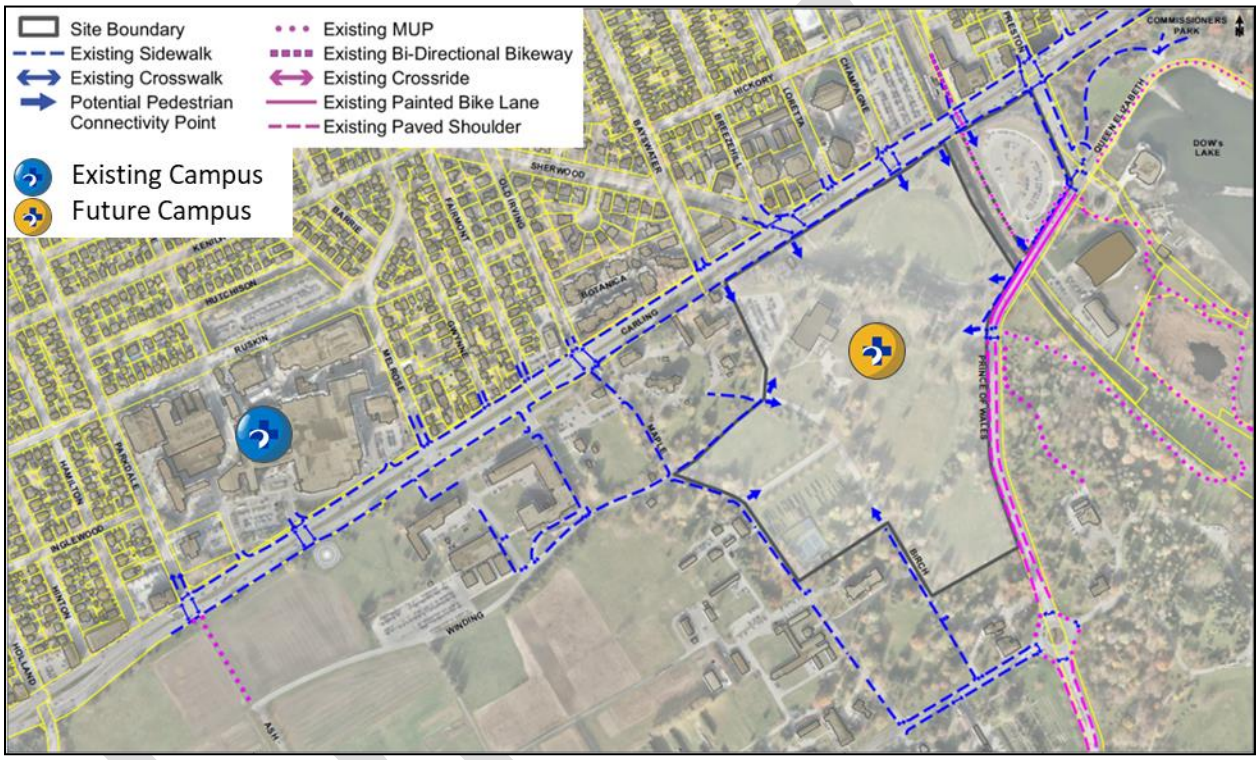
[1] City of Ottawa: Sherwood Drive Traffic Calming Study: https://ottawa.ca/en/city-hall/public-engagement/projects/sherwood-drive-traffic-calming-study. Accessed July 7, 2021.

north on the west side of the Rideau Canal and terminates at Rideau Canal Locks 9-10 where a pedestrian and cyclist bridge provides connection to the Rideau Canal Eastern Pathway. This pathway passes adjacent to the north east quadrant of the proposed site.

- **Rideau Canal Eastern Pathway:** Extends from Parliament Hill and borders the east side of the Rideau Canal and west side of Colonel By Drive. The pathway extends south to Hog's Back Road.
- **Experimental Farm Pathway:** Extends from Cow Lane in the east to Pinecrest Creek Pathway which originates near the intersection of Woodroffe/Baseline.

Figure 8 illustrates existing active transportation facilities adjacent to the existing Civic Campus and the New Civic Development and potential connection points to the City network, taken from the GeoOttawa website.

Figure 8: Existing Active Transportation Facilities



The City of Ottawa TMP outlines three main types of cycling facilities, Grade Separated/Isolated Pathways, Cross-Town Bikeways, and Spine Routes. All three types are provided within the study area as illustrated in **Figure 9**, including:

Grade Separated/Isolated Pathways:

- **Trillium Pathway:** As previously described.
- **Rideau Canal Western Pathway:** As previously described.
- **Rideau Canal Eastern Pathway:** As previously described.
- **Experimental Farm Pathway:** As previously described.

Cross-Town Bikeways:

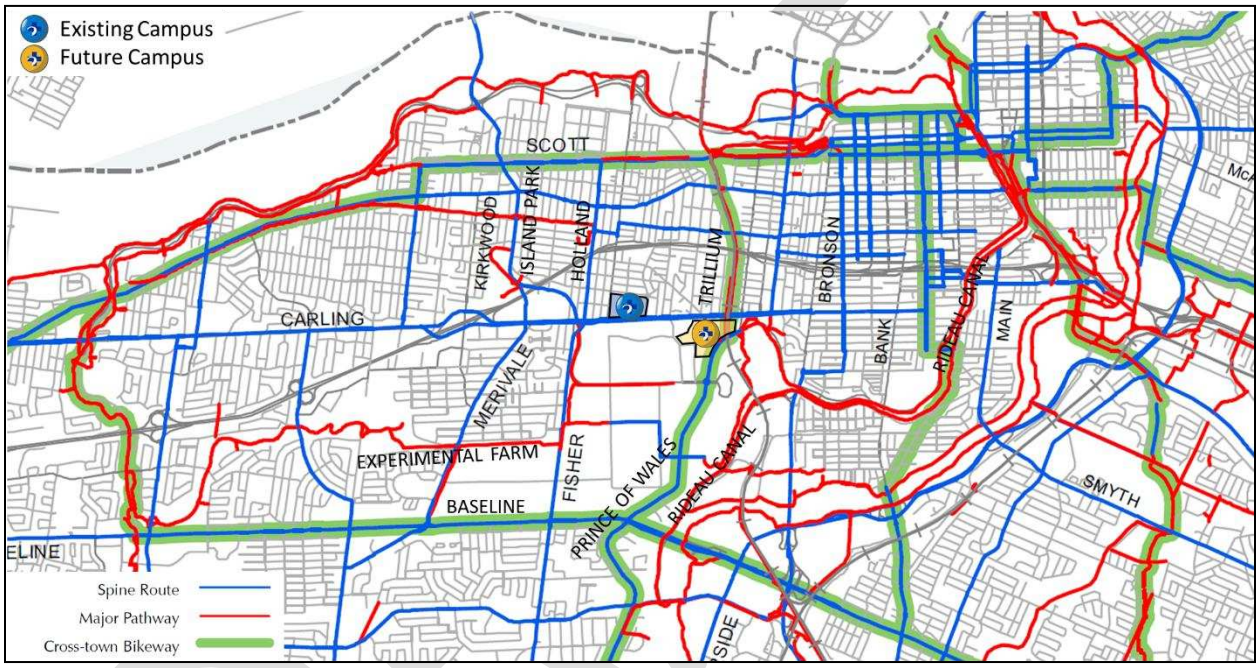
- **Prince of Wales:** Extending from the end of the Trillium Pathway in the north to Merivale Road, Prince of Wales offers a paved cycling shoulder with pocket bike lanes at major intersections.
- **Scott Street:** Extends from the Trillium Pathway in the east (where it continues as a cross-town pathway bordering the north side of Albert Street) to the Trans Canada Trail adjacent to the Ottawa River in the west near Wild Rose Garden. The pathway is located between the Transitway (LRT Line 1 and BRT) and Scott Street. At grade crossings at major intersections.

- **Baseline Road:** Provides shared vehicle-cyclist lanes throughout.

Spine Routes:

- **Carling Avenue:** Carling Avenue currently does not provide any cycling infrastructure east of Merivale Road nor west of Highway 417/Carling overpass. The City is currently undergoing road rebalancing by converting existing general use travel lanes into exclusive bus lanes with mixed bus-cycling lanes and intermittent cycling facilities as proposed for the Carling Avenue Transit Priority Corridor. The Carling Avenue Transit Priority Corridor design has been provided in **Appendix C.**
- **Holland Avenue:** Holland Avenue provides a variety of cycling facilities, from shared vehicle-cyclist space, shared bus-cyclist only space, paved shoulders, and pocket bike lanes.

Figure 9: Existing Cycling Network



Source: City of Ottawa TMP (2013), Map 1.

3.1.3.5 Existing Transit Network

There are different levels of transit service available in proximity to the New Civic Development, as illustrated in **Figure 10**.

Rapid Transit: Operates 7 days/week in all time periods with fewer stops located only at major stations. Line 1 and 2 LRT provide grade separated travel as well as routes that operate on the Transitway BRT.

- O-Train Line 2 (Trillium Line) LRT: Carling Station (to be renamed Dow's Lake Station) is located at the northeast quadrant of the New Civic Development as illustrated in **Figure 11**. The Trillium Line travels north/south, connecting to the O-Train Line 1 (Confederation Line) further north, which runs east-west through the City. The Trillium Line also connects the BRT Transitway that continues to operate within the City.

Figure 10: Current OC-Transpo Routes

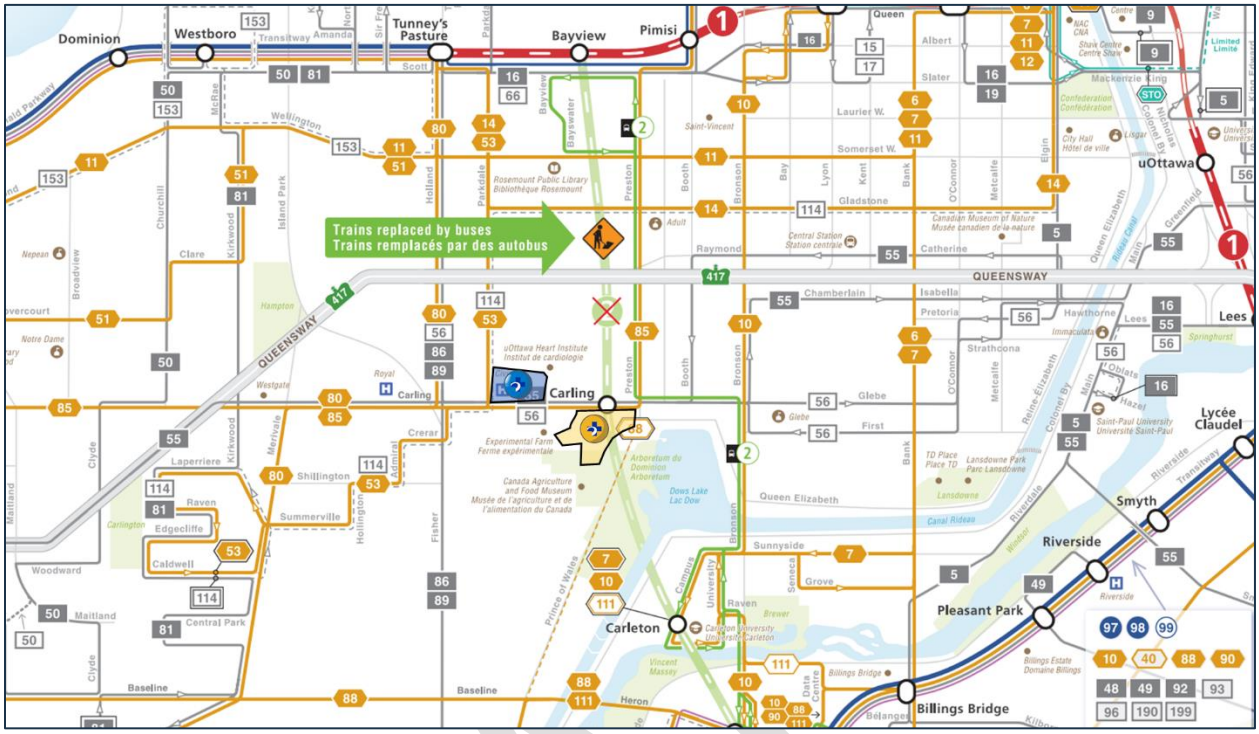
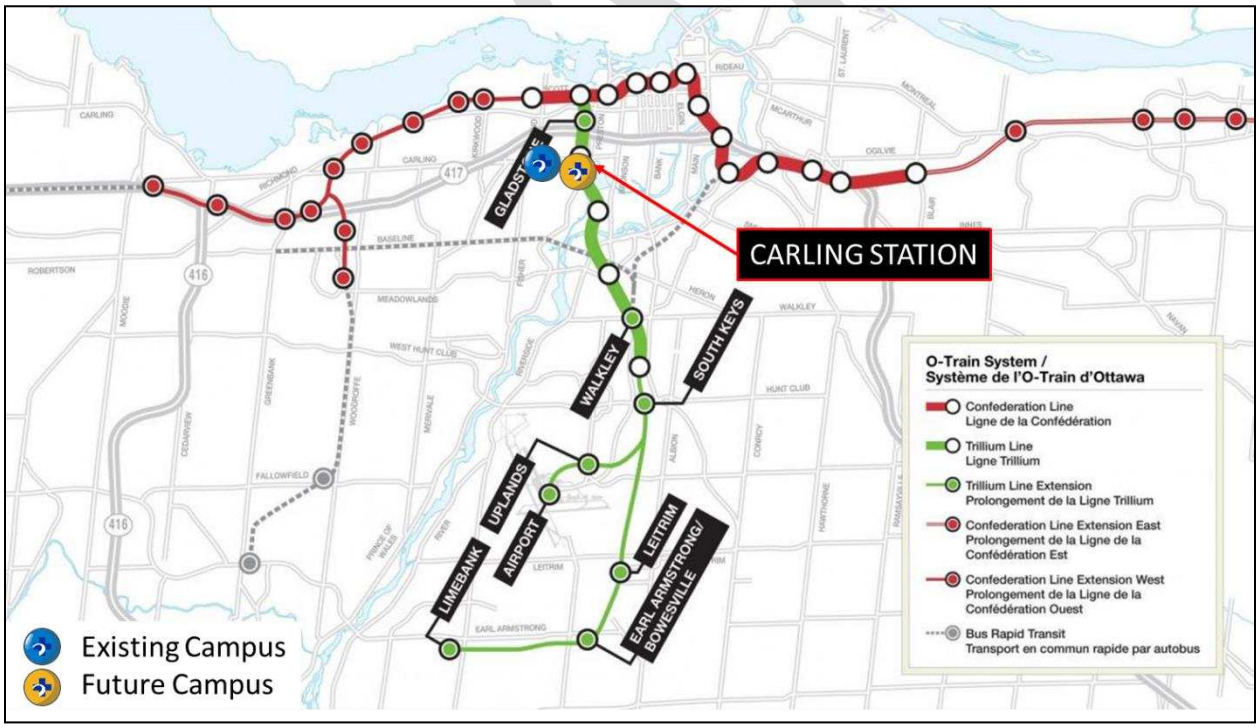


Figure 11: Stage 2 Rapid Transit Network



Frequent Transit: Operates 7 days/week in all time periods with service every 15 minutes or less and provides connections to 'rapid transit'.

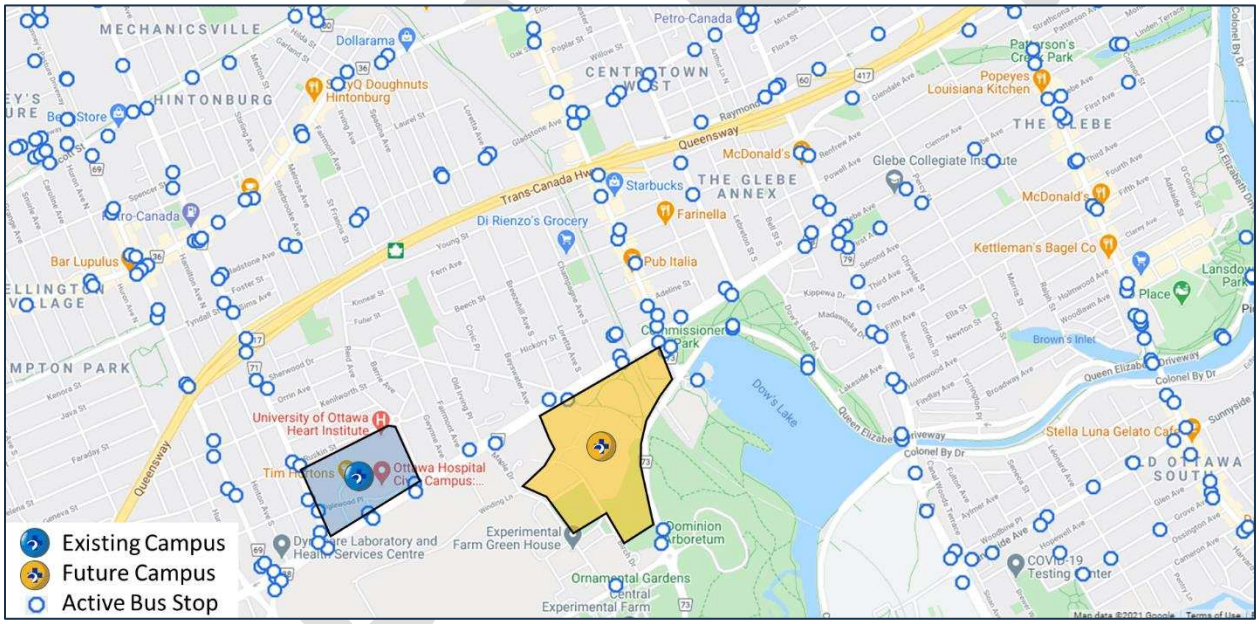
- Route #85: provides service between Terrasses de la Chaudiere in Gatineau and Bayshore Shopping Center, with connections to LRT at Pimisi and Dow's Lake Stations. Route #85 has stops located on Carling Avenue, located adjacent to the future site.
- Route #88: provides service between Hurdman and Terry Fox, with connections to LRT at Hurdman and Mooney's Bay Stations. Route #88 has stops located on Prince of Wales during Sunday service only, located adjacent to the future site.

Local Route Transit: Provides custom routing to local destinations. Normally has closely spaced stops and provides connection to larger stations for transfer.

- Route #55: provides service between Elmvale and Bayshore, with connections to LRT at Lees Station and Dow's Lake Station. Route #55 has stops located on Carling Avenue, located adjacent to the future site.
- Route #56: provides service between Union Station and Tunney's Pasture Station, with connections to LRT at the University of Ottawa, Lees, Tunney's Pasture and Dow's Lake Stations. Route #56 has stops located on Carling Avenue, located adjacent to the future site.

Nearby bus stops are shown in **Figure 12**.

Figure 12: Existing Transit Stops



Source: Travel Planner (octranspo.com)

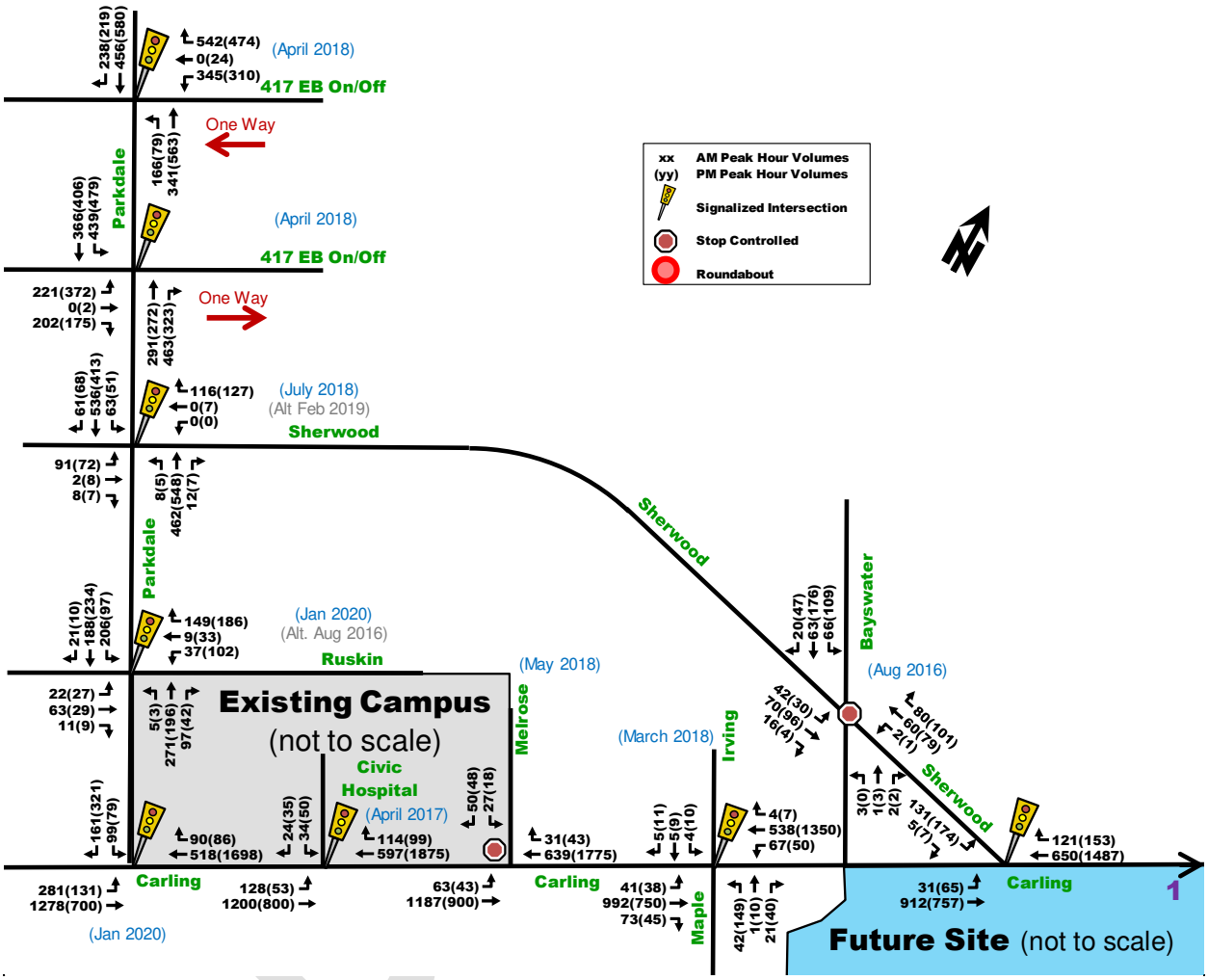
There are about roughly the same number of bus routes and stops in the vicinity of the new Civic Development compared to the existing Civic Campus. However, the stark contrast between the two locations is the proximity to the Dow's Lake LRT station, which provides access to the Trillium LRT Line and rapid transit corridor.

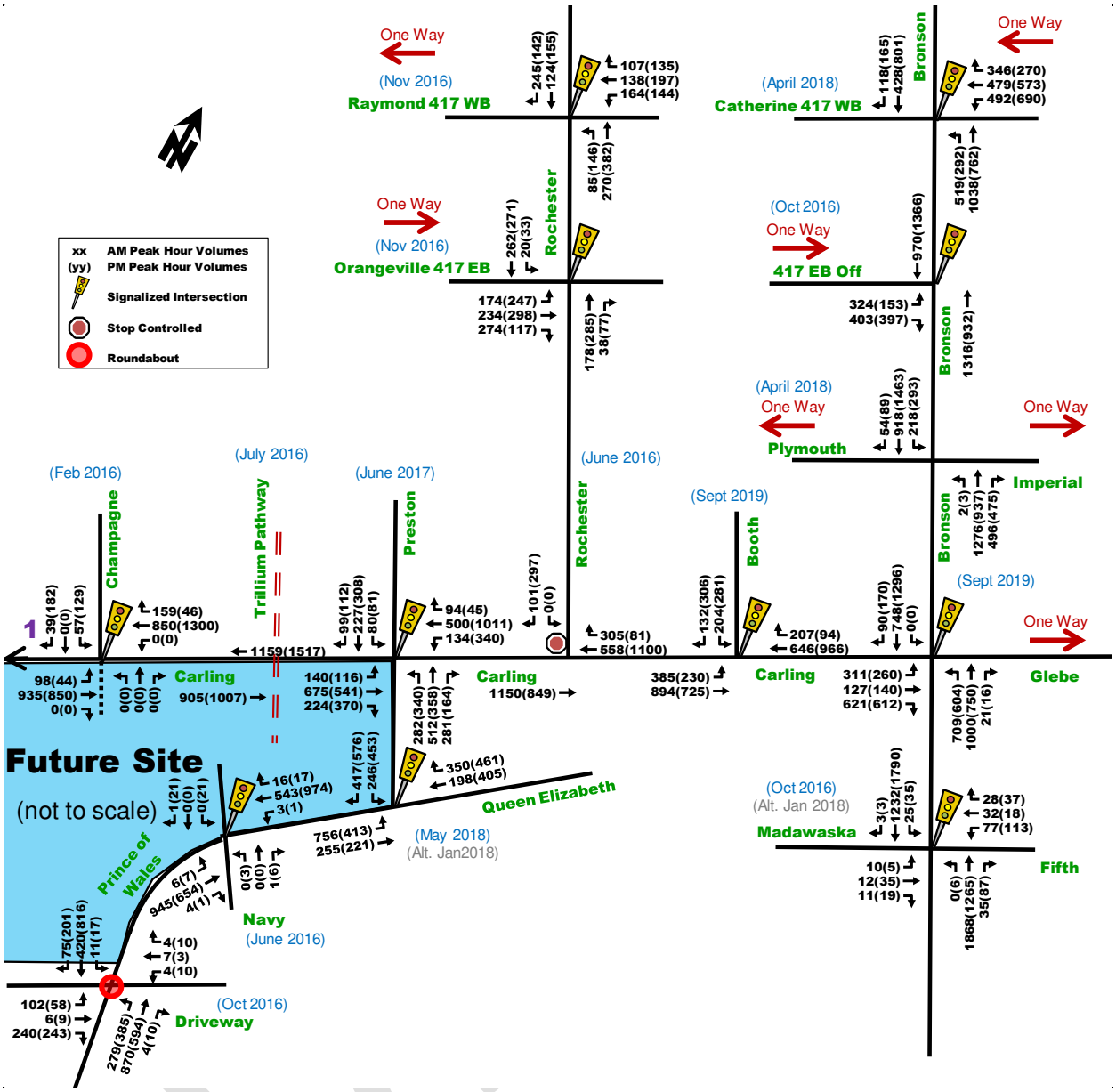
As of May 2020, the Trillium Line has been closed to facilitate the construction of the City's Stage 2 LRT expansion, which is discussed further in **Section 3.1.4: Planned Conditions**. The construction period is expected to extend through 2022, and the City has implemented temporary bus routes, R2, operating at 10-minute headway during peak hour periods to accommodate transit demands.

3.1.3.6 Existing Peak Hour Travel Demand

The existing peak hour traffic volumes within the study area were obtained from the City of Ottawa (supplemented as necessary through field collection by Parsons staff), and subsequently adjusted where necessary to address significant traffic volume discrepancies between intersections. The existing peak hour volume traffic volumes are illustrated in **Figure 13**, and the original intersection turning movement counts have been provided in **Appendix D**.

Figure 13: Existing Peak Hour Traffic Volumes (Balanced)





3.1.3.7 Existing Road Safety Conditions

The 5-year collision history for study area intersections (2014 to 2018, inclusive) was obtained from the City of Ottawa and includes 25 intersections with a total of 587 recorded collisions: most collisions (78% or 457 collisions) involved only property damage, indicating low impact speeds or lower risk type of collision such as rear end vehicle to vehicle; 22% or 127 collisions involved personal injuries; and 1% or 3 collisions were "non-reportable". The primary causes of collisions cited by police include rear end (35% or 203 collisions), turning movement (24% or 141 collisions), sideswipe (18% or 105 collisions), angle (17% or 99 collisions) and all other type collisions (6% or 39 collisions).

To help quantify the relative safety risk at intersections within the study area, an industry standard unit of measure for assessing collisions at an intersection was used based on the number of collisions per million entering vehicles (MEV). An MEV value greater than 1.00 indicates a relatively high frequency of collisions; however, it does not explain the type or severity of collision. A secondary analysis is done to determine the severity of collision by representing the number of personal injuries as a percentage of the total number of collisions at a given intersection.

A high propensity (MEV > 1.00 or %PIR > 30%) would signal a potential intersection design deficiency or other contributing factor, such as poor intersection geometry, blind spots, poor lighting, excessive speeds, high amount of entry/exit driveways etc.

At intersections within the study area, reported collisions with an MEV higher than 0.75/MEV (considered medium), higher than 1.0/MEV (high percentage of collisions), higher than 30% PIR (considered high likeliness of injury) and have at least 10 registered collisions have been flagged and include:

- 1.16/MEV and 13% PIR (based on 83 collisions) at the Bronson/Catherine intersection;
- 0.86/MEV and 31% PIR (based on 58 collisions) at the Bronson/Fifth-Madawaska intersection;
- 0.83/MEV and 13% PIR (based on 54 collisions) at the Bronson/Imperial intersection;
- 0.75/MEV and 37% PIR (based on 49 collisions) at the Carling/Preston intersection;
- 0.60/MEV and 35% PIR (based on 26 collisions) at the Parkdale/HWY-417 EB intersection;
- 0.55/MEV and 32% PIR (based on 25 collisions) at the Carling/Civic Hospital intersection;
- 0.38/MEV and 30% PIR (based on 10 collisions) at the Parkdale/Ruskin intersection;
- 0.31/MEV and 41% PIR (based on 17 collisions) at the Carling/Booth intersection;

The collision data summary has been provided in **Appendix E**.

It is noteworthy that all of the intersections highlighted with medium to high MEV are arterial to arterial roadways, which translates to a high number of vehicles during the peak periods leading to congestion and higher risks of collisions. The fast stop and go pattern at these intersections as congestion builds is the likely cause for the higher MEV index. There were no intersections with a high MEV and PIR; however, there were 2 intersections which had a medium MEV and high PIR which include Bronson/Fifth-Madawaska and Carling/Preston.

Bronson/Fifth-Madawaska recorded 58 collisions, with 18 collisions (31%) resulting in personal injury. Of the 18 collisions causing injury, 3 (5%) involved pedestrians, 2 (3%) involved cyclists and 9 (50%) involved rear end collisions.

Carling/Preston recorded 49 collisions, with 18 collisions (37%) resulting in personal injury. Of the 18 collisions causing injury, 1 (5%) involved pedestrians and 7 (39%) involved cyclists. It is noteworthy that an additional 2 cyclist collisions were record at this intersection, although they did not result in injury.

Within the five-years of recorded collision data, there were 13 collisions involving pedestrians and 26 involving cyclists.

Of the pedestrian collisions, none resulted in fatal injuries, 8 (62%) occurred during dry driving conditions, and 9 (69%) during clear weather. There were 9 (69%) pedestrian collisions that involved a vehicle making a left turning movement, 2 (15%) a right turning movement and the remaining 2 (15%) involving through movements. It is noteworthy that of the 25 intersections analyzed, Bronson Ave intersections (5 total) had 9 (69%) of all 13 collisions involving pedestrians, meaning that pedestrian collisions occur at a much higher frequency along Bronson Avenue than any other road.

This outcome was likely caused by the interaction of high traffic volumes, direct frontage along a 4-lane urban arterial, and high pedestrian activity triggered by local residential communities and Carleton University further south on Bronson.

Of the cyclist collisions, 22 (85%) resulted in non-fatal injuries and the remainder 4 (15%) resulted in property damage only. There were 14 (54%) cyclist collisions that involved a vehicle making a turning movement, 9 (35%) angle movement, 2 (8%) sideswipe and the remaining 1 (4%) involving a rear end movement. It is noteworthy that of the 25 intersections analyzed, Preston Street intersections (3 total), had 14 (54%) of all 26 collisions involving cyclists, meaning that cyclist collisions occur at a much higher frequency throughout Preston Street than any other road. There were 9 (35%) cyclist related collisions at the intersection of Carling/Preston, making it a high-risk intersection for cyclists.

Overall, Preston Street at Carling Avenue demonstrated higher risks for active transportation related collisions. This outcome may have been caused by the lack of segregated cycling facilities on Preston and Carling. The City recently addressed this with the completion of the Trillium Line Pathway connection across Carling in 2016, enabling cyclists to avoid sharing travel lanes with vehicles on Preston Street. The City is also planning additional active transportation infrastructure as part of the Carling Avenue Transit Priority Corridor design that will further enhance the active transportation experience at this location.

It is expected that future access intersections to the new Civic Development will incorporate additional safety considerations, such as pedestrian and cyclist priority signal timing phases, and prohibiting right-turns on red. Further discussion on future intersection operations will be discussed in **Section 5.0: Strategy Report**.

3.1.4 Planned Conditions

City of Ottawa New Official Plan (NOP)

The City of Ottawa is in the process of adopting "The New Official Plan," which is a legal document under the authority of the Ontario Planning Act.[2] It contains the City's goals, objectives, and policies to guide growth and manage physical change to 2046. It also implements the priorities identified in City's Strategic Plan as they relate to land use, which ultimately impacts Ottawa's health, economy, environment, and sense of community. This Plan provides direction to other important city plans such as the Transportation Master Plan and the Parks and Greenspace Master Plan. The strategic directions of the NOP include Intensification, Sustainable Transportation, and Environment/Climate/Health/Energy resiliency. These themes will be emphasized in this document and the ultimate design of the New Civic Development.

City of Ottawa Transportation Master Plan Update

Of note, the City is also in the process of updating the Transportation Master Plan, which is currently anticipated to be completed by Fall 2023. The Transportation Master Plan, together with the accompanying Ottawa Cycling Plan and Ottawa Pedestrian Plan, is the City's blueprint for transportation growth management policies, and the planning, funding, and implementation of its walking, cycling, transit and road networks over the next several decades. This document will build off the strategic directions and themes in the NOP.

3.1.4.1 Planned Study Area Transportation Network Changes

Within the study area, notable transportation network changes are described as follows.

2013 Transportation Master Plan

There are notable transportation network changes within the study area included in the City's 2013 Transportation Master Plan. Identified as part of the 2031 Affordable Network is a Transit Priority Corridor (continuous lanes) along Carling Avenue between the Carling (now Dow's Lake) LRT Station and the Lincoln Fields LRT Station to the west. City staff confirmed the section from Lincoln Fields to Sherwood are expected to be completed by 2022, with the remaining sections to be operational by 2026.

Transit Priority (isolated measures) are planned along Bronson Avenue from Heron Road to Carling Avenue and along Carling Avenue between Bronson Avenue and Dow's Lake Station. There are existing transit priority lanes along Carling Avenue between Bronson Avenue and Booth Street for westbound travel and Sherwood Drive to Bronson Avenue for eastbound travel.

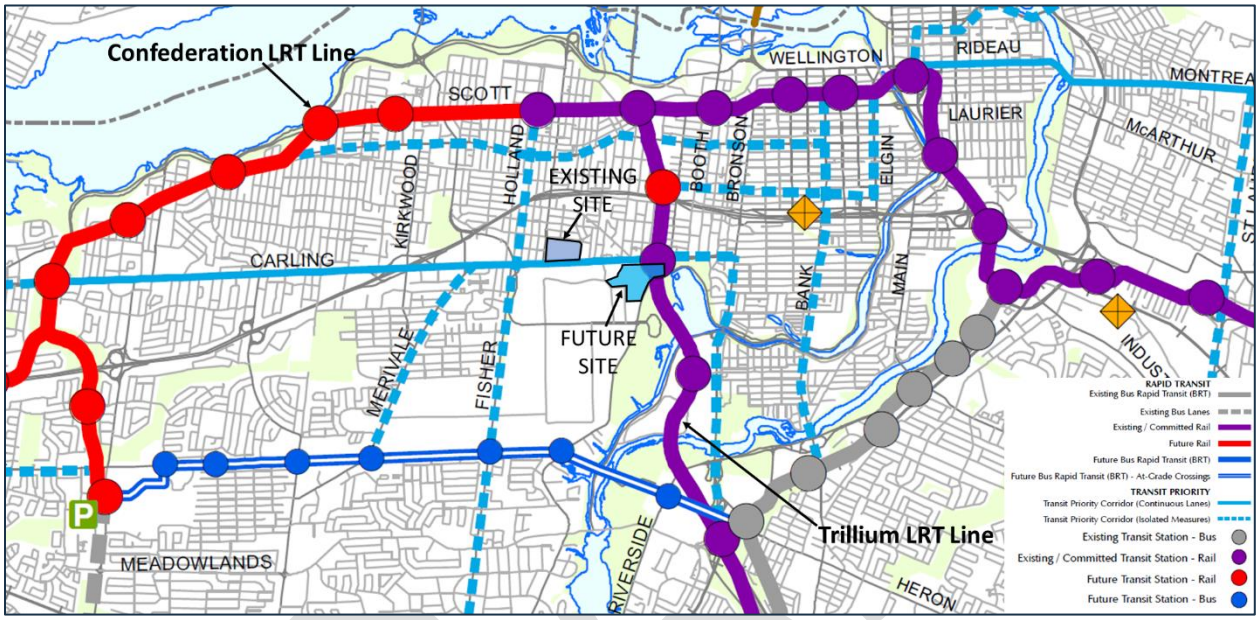
The City is in the process of expanding its LRT system, termed the Stage 2 LRT project. The Trillium Line is currently undergoing modifications at existing stations, including Carling Station which will be renamed to Dow's

[2] City Of Ottawa: New Official Plan – November 2020 Draft

Lake Station and is located on the subject site, the construction of new stations, and extension of the line south adding 16 km of rail track. The Trillium Line modifications are expected to be completed by 2022.

The Confederation Line is also being expanded in both east and west directions, to include 15 km of additional rail and 11 new stations to the west and 12 km of additional rail and 5 new stations to the east, anticipated to be operational by the year 2025 and 2024 respectively. The TMP's Affordable Network Plan is outlined in **Figure 14** below.

Figure 14: Affordable Network Plan - TMP

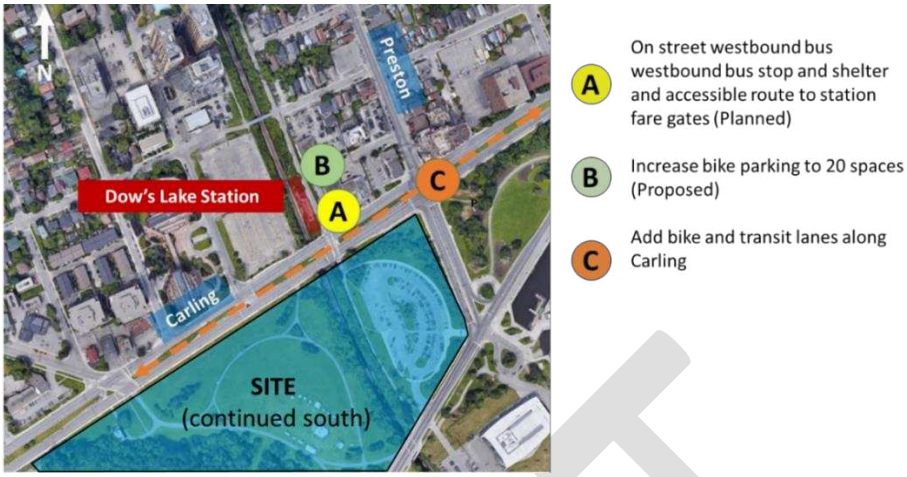


Source: City of Ottawa TMP (2013), Map 5.

Dow's Lake Station (former Carling Station) is located on the north side of Carling Avenue, west of Preston Street. Within the Stage 2 expansion of the Trillium Line, a new elevator will be provided for redundancy, the existing elevator will be refurbished, and the existing platform will be extended. As seen in **Figure 15**, there are currently no plans to integrate the Dow's Lake LRT Station with the future hospital and no dramatic changes are envisioned for the near future or until the track is twinned, which may be decades away.

The integration of Dow's Lake LRT Station to the future Civic Campus would highly improve pedestrian and cyclist safety by eliminating an at-grade crossing at Carling Avenue, a major arterial roadway. An integrated LRT Station to the hospital would also incentivize taking public transit and would create a more seamless link connection between the hospital and transit services.

Figure 15: Carling LRT Station Connectivity Study

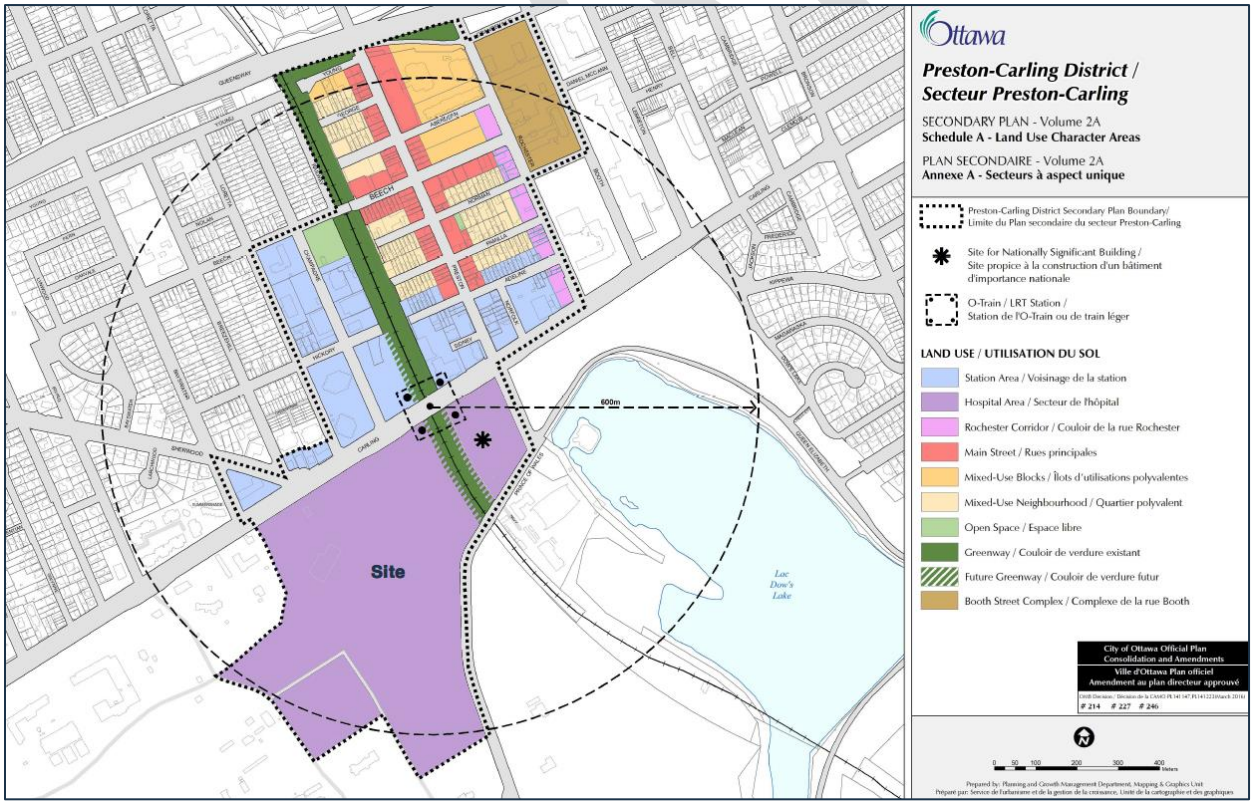


Source :https://ottawa.ca/en/city-hall/public-engagement/projects/stage-2-lrt-station-connectivity-enhancement-study#stage-2-trillium-line-south-extension-connectivity-review. Accessed Jan 10, 2021.

Preston-Carling District Secondary Plan (2016)

The Preston-Carling District Secondary Plan, prepared by the City of Ottawa in 2016 and updated in 2018 to include the Hospital Area, provides policy guidelines for public and private development within the Preston-Carling-District. The district includes the lands bounded by Beech Street and Hwy 417 to the north, Rochester Street to the east, Carling Avenue and Prince of Wales Drive to the south and Loretta Avenue and the Trillium LRT Line to the west, as shown in **Figure 16**.

Figure 16: Preston Carling District Secondary Plan



Source: City of Ottawa: Preston-Carling District Secondary Plan – Schedule A

An important part of the Preston-Carling District Secondary Plan was a focus on mobility and quality facilities for active travel modes, public spaces, and proximity to transit. The Public Realm and Mobility Plan of the Preston-

Carling District Secondary Plan has been provided in **Appendix F**, which highlighted the following transportation-related strategies:

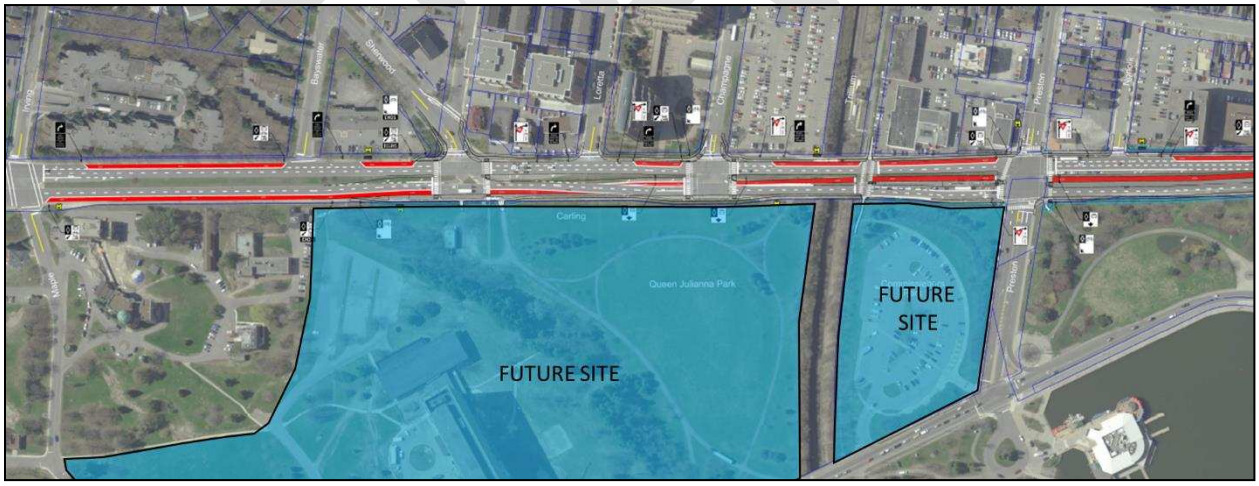
- Bicycle lanes/track planned along both sides of Rochester Street with wide sidewalks and on-street parking;
- Improvements to the existing multi-use pathway (MUP) along the east side of the Trillium LRT Line corridor and plans to extend MUP across Carling Avenue [COMPLETED];
- A planned MUP along the east side of the Trillium LRT Line corridor between Beech Street, Carling Avenue and Prince of Wales Drive [COMPLETED]; and,
- Bicycle lanes/tracks planned along both sides of Carling Avenue.

The Secondary Plan promotes a "pedestrian-first" development with accessible sidewalks and pedestrian paths connecting neighbourhood amenities. Cycling will be promoted by the implementation of the City's Cycling Plan and some additional east-west connections as well as the Rochester Street bike lanes/tracks. Improving connections to the Carling LRT Station and focusing on a quality transit station area will help promote transit ridership in the area. The Secondary Plan aims to reduce passenger vehicle dependency while maintaining appropriate vehicle connections for businesses and residential uses. It aims to provide the appropriate amount of on-street/public parking spaces to serve the area's local commercial businesses while deterring a car-oriented neighbourhood.

Carling Transit Priority Study

The Carling Avenue Transit Priority Study functional design is complete, and the detailed design has been paused. The current plan within the vicinity of the site is shown as **Figure 17**. The functional design includes transit priority (continuous lanes) with future plans to ultimately expand to an at-grade LRT to Baseline Station. The timing of the planned near-term modifications is expected in the 2026 to 2028 timeframe, which coincides with opening day of the new Civic Campus.

Figure 17: Carling Avenue Transit Priority Plan (excerpt)



Source: https://ottawa.ca/en/carling-avenue-transit-priority-measures. Accessed Jan 20, 2021.

The Carling Avenue Transit Priority Corridor functional design for the entire corridor has been included in **Appendix C.**

3.1.4.2 Other Area Developments

A 600m radius from all corners of the future site represents the catchment area from which known developments of relevance are highlighted, as shown in **Figure 18**. The trips generated from these future area developments were layered on to background traffic volumes to estimate future traffic volumes within the study area. A brief description of the noted developments has been provided below.

Figure 18: Other Area Developments

1 - 90 Champagne

The proposed development is a 14-storey residential building. A total of 336 units are proposed. The Transportation Brief (prepared by Novatech) projects an increase in two-way traffic volumes of approximately 25 veh/h during peak hours.

2 - 93-105 Norman

The proposed development is a residential building with an approximately 117 units proposed. The Transportation Brief (prepared by Delcan) projects an increase in two-way traffic volumes of approximately 70 to 80 veh/h during peak hours.

3 - 101-105 Champagne

The proposed development is a 25-storey residential building with at grade commercial. A total of 352 units are proposed. No Transportation Brief was found for this development.

4 - 17 Aberdeen / 300 Preston

The proposed development is a 30-storey residential building. A total of 254 units are proposed. The Transportation Brief (prepared by IBI Group) projects an increase in two-way traffic volumes of approximately 40 to 50 veh/h during peak hours.

5 - 552 Booth

The proposed development consists of approximately 1,000 dwelling units in five buildings and 142,200 square feet of retail and office. The Transportation Brief (prepared by Parsons) projects an increase in two-way traffic volumes of approximately 175 veh/h during peak hours.

6 - 450 Rochester

The proposed development consists of a 9 and 15-storey residential buildings with 59,182 ft^2 of commercial space. A total of 540 units are proposed. The Transportation Brief (prepared by Parsons) projects an increase in two-way traffic volumes of approximately 80 to 75 veh/h during peak hours

7 - 70 Beech

The proposed development is a 6-storey residential building with at grade commercial. A total of 40 units are proposed. No Transportation Brief was found for this development.

8 - 530 Rochester

The proposed development is a 20-storey residential building. A total of 117 units are proposed. The Transportation Brief (prepared by Delcan) projects no net change in two-way traffic volumes compared to trips generated from the existing development.

9 - 500 Preston

The proposed development is a 30-storey residential building with at grade commercial. A total of 224 units are proposed. The Transportation Brief (prepared by Delcan) projects an increase in two-way traffic volumes of approximately 25 veh/h during peak hours.

10 - 855 Carling

The proposed development consists of approximately 400 apartment dwelling units in four buildings (19, 15 and two 5 storeys). The Transportation Brief (prepared by Delcan) projects an increase in two-way traffic volumes of approximately 90 to 105 veh/h during peak hours with a reduction of approximately 20 veh/h from existing site.

11 - 845 Carling

The proposed development consists of approximately 1,123 dwelling units in three buildings (55, 48 and 18 storeys) and a large public plaza. The Transportation Brief (prepared by Delcan) projects an increase in two-way traffic volumes of approximately 150 to 175 veh/h during peak hours.

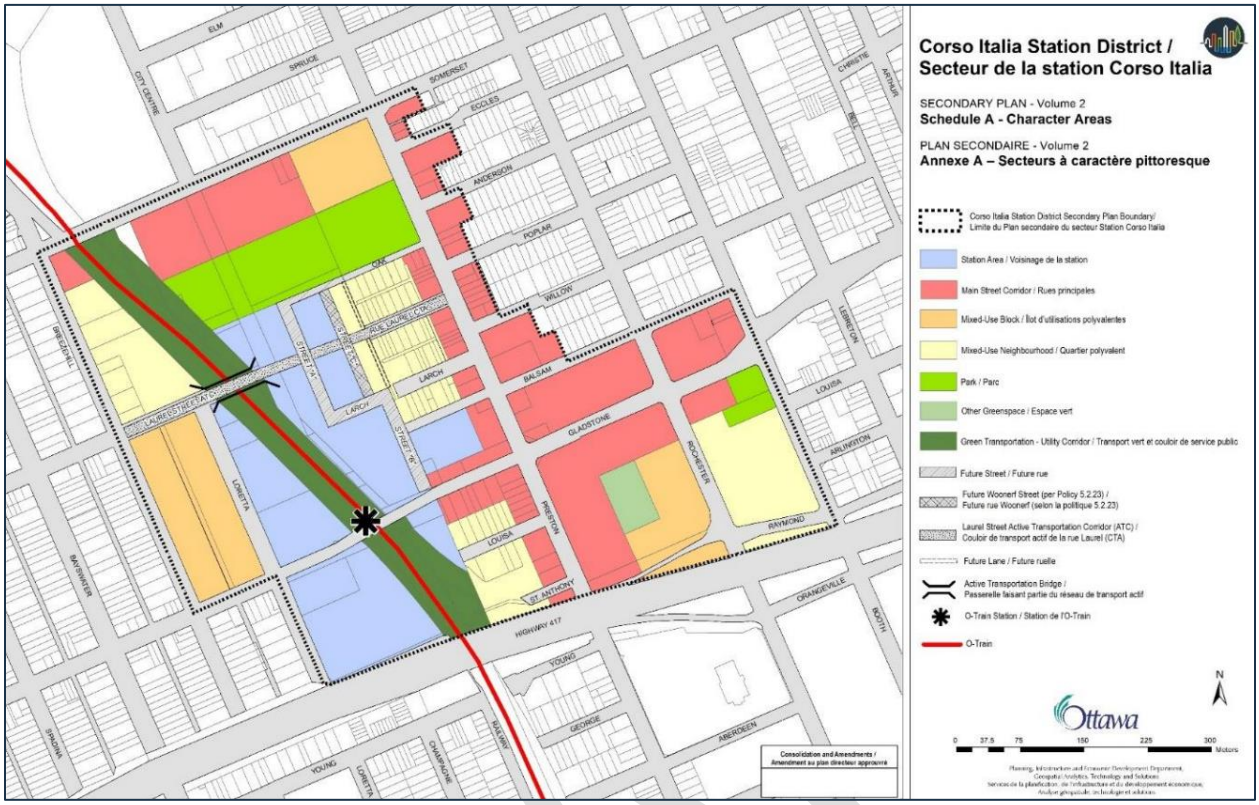
12 - 505 Preston

The proposed development is a 45-storey mixed-use building. A total of 262 units are proposed. The Transportation Brief (prepared by IBI) projects an increase in two-way traffic volumes of approximately 60 to 70 veh/h during peak hours.

Anticipated developments near the future Corso Italia (former Gladstone) LRT Station have been identified for information. Given the overall size and location outside of the 600m development radius, it has been removed from consideration in the following analysis. These developments constitute the recently approved Corso Italia Station District Secondary Plan, and include Gladstone Village, Trinity's proposal at 951 Gladstone Avenue and 145 Loretta Avenue, 1040 and 1050 Somerset Street among others. These developments include mixed-income housing, office, retail, and institutional uses.

The Gladstone Village development, which is bound by Gladstone Avenue, Preston Street, Somerset Street, and the Trillium Line, proposes approximately 1,050 residential units. Trinity's development, bounded by Gladstone Avenue, Loretta Avenue, Laurel Street, and the Trillium Line, an approximate 930 residential units, over 140,000 square feet of office space, and over 21,000 square feet of retail space are proposed. Other nearby developments noted but not included in the analysis include a 38-storey building with 338 proposed condominium units at 1040 Somerset Street, and a 23-storey building with 195 proposed residential units at 1050 Somerset Street.

Figure 19: Corso Italia Station District CDP



Source: https://documents.ottawa.ca/sites/documents/files/corsoitalia_sp_en.pdf. Accessed March 10, 2021.

In addition, there is a notable residential tower being contemplated at 829 Carling, in the northwest quadrant of the Carling/Preston intersection, but a formal development application has yet to be initiated.

3.2 Study Area and Time Periods

The weekday AM and PM peak hours will be analyzed in two future horizons: the Opening Day 2028 and Full Buildout 2048.

While the New Civic Development is expected to be open 24-hours a day, seven days a week, the current estimate of the full-time day-shift employee schedule at the New Civic Development is between 7:00am and 3:00pm on weekdays, which is similar to the current Civic Campus day-shift schedule, but not completely aligned with the typical commuter peak hours. The implications of this specific day-shift schedule, as it relates to intersection capacity analysis during the peak hour will be discussed in **Section 5.9.8**.

The proposed study area intersections, noted below, have been illustrated in **Figure 5**.

1. Carling/Parkdale
2. Carling/Civic Hospital
3. Carling/Melrose
4. Carling/Irvine-Maple
5. Carling/Sherwood
6. Carling/Champagne
7. Carling/Trillium Pathway
8. Carling/Preston
9. Carling/Rochester
10. Carling/Booth
11. Carling/Bronson
12. Parkdale/Westmount HWY-417
13. Parkdale/HWY-417 EB
14. Parkdale/Sherwood
15. Parkdale/Ruskin
16. Sherwood/Bayswater
17. Prince of Wales/Driveway
18. Prince of Wales/Navy
19. Prince of Wales/Preston
20. Rochester/Raymond HWY-417
21. Rochester/Orangeville HWY-417
22. Bronson/Catherine HWY-417
23. Bronson/HWY-417 EB Off
24. Bronson/Imperial-Plymouth
25. Bronson/Madawaska-Fifth

In addition to the above list, all new access intersections or driveways were also included in the analysis.

3.3 Exemption Review

According to the City's TIA guidelines, the following modules/elements of the TIA process would normally be exempt in the subsequent steps of the TIA process, based on the type of application being submitted. However, we understand there is a strong public and stakeholder interest in the on-site details and potential impacts of the subject development, thus all elements will be included in this report.

Table 5: Exemption Review Summary

Module	Element	Exemption Consideration
4.1 Development Design	4.1.2 Circulation and Access	Only required for site plans.
	4.1.3 New Streets Networks	Only required for plans of subdivision.
4.2 Parking	4.2.1 Parking Supply	Only required for site plans.
	4.2.2 Spillover Parking	The parking is expected to meet By-Law requirements; to be confirmed at Site Plan.

4.0 FORECASTING REPORT

4.1 Development-Generated Travel Demand

4.1.1 Land Use Assumptions

The first step to estimating site generated trips for the new Civic Development was to define anticipated land uses on site and the appropriate variables.

TOH has proposed a Main Hospital building located in the upper escarpment of the subject site, with an ancillary research building located on the southeast corner of the Sherwood/Carling intersection. A new high density mixed-use development has also been proposed on the south side of Carling Avenue on the northeast quadrant of the site, closest to Dow's Lake LRT Station. This site will be known as Carling Village, and includes offices for hospital use, ground floor retail, and residential units.

The following discussion will focus on the new Civic Development specifically and choosing the appropriate land use variables to estimate hospital specific person trips. Modern hospitals are very complex institutions that can have a wide variety of uses and characteristics, and can easily lead to a high degree of variability in trip generation estimates if only a single land use variable is considered. Therefore, the land use variables chosen for comparison were:

- Number of Beds
- Number of Employees
- Gross Floor Area Size

TOH provided site statistics at the existing Carling Campus, and future estimates of the above land use variables for this study.

For completeness, the future estimates included Carling Village, which comprises three high-rise towers connected by a podium. The towers compose of approximately 750,000 building gross floor area (BGSF), of which it has been assumed that 550,000 ft^2 will be hospital related uses (e.g. research and office use), which would already be accounted for in the Main Hospital statistics. The remainder 200,000 ft^2 was divided into 100,000 ft^2 of ground floor and 2nd floor retail, and 100,000 ft^2 of residential use, as shown in **Table 6.**

Table 6: Existing Civic Campus vs Future Civic Development Statistics

Independent Variable	2018 Existing	2028 – Opening Day	2048 – Full Buildout
Main Hospital Buildings			
Total Number of Beds	559	764	1,246
Number of Employees	3,473	6,631	10,439
GFA x1,000 ft²	2,125	2,400	4,750
Carling Village			
Retail x1,000 ft²	0	0	100
Residential Units [1]	0	0	150

1.) 150 units based on 100,000 ft² and average unit size of approximately 665 ft² each, considering shared spaces and building utilities

The anticipated growth trends for the Main Hospital uses among these three land use variables have been summarized below:

- The number of beds is expected to increase approximately 125% by 2048
- The number of employees is expected to increase approximately 200% by 2048
- The gross floor area is expected to increase approximately 125% by 2048
- The Carling Village ground floor retail and residential components are new proposed land uses

The future Hospital projections show a significant increase in overall size and programming compared to the existing Civic Campus. How these trends translated to estimated site generated person trips will be discussed and evaluated in the following section.

4.1.2 Trip Generation Rates

The following section will discuss the person-trip generation process, specifically how the preferred person trip generation rate was selected/developed and to document the estimated site generated person trips based on the land use variables established in the previous section.

4.1.2.1 Research on Other Hospitals

The City of Ottawa TIA Guidelines, Section 3.1.1, states that supported sources for base trip generation rates, in order of preference, are:

- 2009 TRANS Trip Generation Study for residential uses;
- Trip generation surveys of similar developments in the City (i.e. local rates);
- ITE trip generation rates for adjacent street traffic; and,
- First principles.

In our research of other hospital sites in North America, we found that most studies cited ITE Trip Generation rates to estimate future traffic volumes and used general assumptions to account for alternative modes of travel. In rare cases were local rates developed and used.

As part of this process, both person trip generation methodologies (ITE and local rates) were considered and compared to determine an appropriate approach to the person trip generation.

4.1.2.2 Method 1: ITE Trip Generation Manual 10th Ed

The ITE Trip Generation Manual is an industry standard resource that is widely used to estimate future development generated travel demands. The trip generation rates were derived empirically from travel surveys completed by ITE. The main benefit of the ITE Manual is that no data collection is required by the user, which is cost-effective. However, there are important cautionary considerations when relying on the ITE Manual:

- The majority of ITE studies only recorded vehicle trips and do not provide mode share statistics for the surveyed site. Therefore, assumptions have to be made to estimate person trips, which increases the margin for error.
- ITE surveys were mainly conducted in the United States, which has a significant number of private hospitals that tend to be smaller in size compared to public hospitals in Canada.
- ITE surveys were completed in the 1980s, 90s and early 2000s. Transportation systems have evolved significantly in Canada over the last three decades.

The latter two points bring into question the validity/appropriateness of the survey data, which must be accounted for if the ITE rates are to be used.

Table 7 outlines the average and fitted vehicle trip generation rates from ITE for a hospital during the peak hour of adjacent street traffic, based on the same three land use variables outlined in Table 6 using the existing Civic Campus statistics. ITE references have been provided in Appendix G.

Table 7: Hospital ITE Average Vehicle Rate Projected for Independent Variables

Independent Variable	Quantity [1]	Peak Hour	ITE Rates	
			Fitted	Average
Number of Beds	559	AM	1.84	1.84
		PM	1.89	1.89
Number of Employees	3,473	AM	0.26	0.27
		PM	0.27	0.28
GFA x1,000 ft²	2,125	AM	0.80	0.89
		PM	0.89	0.97

1. Based on 2018 Existing statistics for Fitted Rate calculation

Generally, the fitted rate is preferred when the variable of the subject site falls within the 'cluster' of data samples (where sample points are most dense). Average rates are best used when the variable of the subject site is an outlier, to avoid over/under estimation.

In this case, the new Civic Development was shown to be much larger than the average hospital surveyed by ITE based on size, number of employees and number of beds, as per Table 8 below. Additionally, the average rate was higher than the fitted rate, which represents the worse-case scenario. Therefore, the average rate was considered most appropriate for comparison purposes.

Table 8: Typical Hospital Sizes from ITE Surveys

Independent Variable	2048 – Full Buildout	Average ITE Size	ITE Size Range
Number of Beds	1,246	516	91 – 1,699
Number of Employees	10,439	2,450	70 – 14,297
GFA x1,000 ft²	4,750	820	69 - 3,842

ITE also provided weekday peak hour person-trip rates for hospitals, but these rates were not considered reliable due to low sample sizes and high degree of variability in the scatter plots. All afternoon peak hour rates sources (beds, employees and GFA) were based on a single data point, the morning rates were all based on 3 data points.

4.1.2.3 Method 2: Local Hospital Rates

While the ITE Manual is suitable when data is lacking, if local data exists, it is the City of Ottawa's preferred approach to developing a trip generation rate. The reason is that there is no need to calibrate the ITE rates to local conditions, such as different shift schedules or quality of nearby non-auto mode infrastructure. Any of these local factors would be embedded within the data and could be used immediately rather than factoring ITE data based on other hospitals.

However, the cautionary considerations for local data are as follows:

- In many cases the cost of data collection is prohibitive, leading to reduced quality and potential gaps in the data.
- Typically, the number of data points will always be fewer than ITE, again due to costs. In many cases, traffic studies rely on a single count or data point to support the analysis, which limits insight and validation.

These factors may increase the variability of results. It is important to ensure the data collection is comprehensive enough to avoid incorrect assumptions. The general approach to deriving the hospital person trip generation rate was as follows:

1. Collect all intersection turning movement counts at all intersections to the hospital.
2. Identify all the inbound and outbound vehicular movements and calculate the total vehicle demand during the AM and PM peak hours for adjacent street traffic.
3. Calculate the vehicle trip rate using existing land use variable statistics from **Table 6.**
4. Estimate the existing mode share for the existing Carling Campus.
5. Calculate the total person trips for each land use variable.
6. Assign a factor to account for satellite parking (30% - representing the influence of offsite parking that were not captured in the turning movement counts)

The key factor for this derivation was the assumed existing mode share, which were based on existing intersection turning movement counts and transit ridership at nearby stops provided by the City of Ottawa. In this case, the assumed existing mode shares at the Ottawa Hospital are summarized in **Table 9**.

Table 9: Assumed Existing Civic Campus Mode Shares

Mode	Mode Share
Auto-Driver	85%
Non-Auto-Driver	15%

In discussions with TOH staff, existing walk and bike mode shares were expected to be negligible at the existing Civic Campus, with transit and passengers making up the 15% non-auto-driver mode share.

Based on the above mode share assumptions, the local trip rates during the AM and PM peak hour periods for adjacent street traffic were developed, as shown in **Table 10**.

Table 10: Local Hospital Rates Projected for Independent Variables

Independent Variable	Quantity [1]	Peak Hour	Local Rate (vehicle trips)
Number of Beds	559	AM	2.40
		PM	2.04
Number of Employees	3,743	AM	0.39
		PM	0.33
GFA x1,000 ft2	2,125	AM	0.63
		PM	0.54

1. Based on 2018 Existing statistics for Local Rate calculation

It is noteworthy that the PM peak hour rates were lower than the AM peak hour rate, which is unlike the ITE results. This could be explained by the shift schedule set by TOH; the majority of staff work the day shift and the hours typically fall between 7:00am and 3:00pm. This schedule coincides with the morning peak hour for adjacent street traffic, but ends before the typical afternoon peak hour for adjacent street traffic. Detailed calculations for the entire process have also been provided in **Appendix G**.

4.1.2.4 Comparison of Method 1 and 2

A comparison of the ITE and Local Trip Generation Rates during the AM and PM peak hours for adjacent street traffic have been summarized in **Table 11**.

Table 11: Hospital ITE vs Local Vehicle Trip Generation Rate Comparison

Independent Variable	Peak Hour	ITE Average Rate	Local Rate
Number of Beds	AM	1.84	2.40
	PM	1.89	2.04
Number of Employees	AM	0.27	0.39
	PM	0.28	0.33
GFA x1,000 ft²	AM	0.89	0.63
	PM	0.97	0.54

The results show local rates based on the number of beds and employees were higher than the ITE rates, while the GFA calculations were much lower. In this case, all three variables were incorporated into the trip generation rate, whereby an average of all three was taken. This approach reduced the reliance on any one variable, to limit the potential for over- or under-estimation.

Therefore, the local AM and PM peak hour (for adjacent street traffic) trip generation rates based on the number of beds, employees and total gross floor area were used to develop future trip generation estimates. The corresponding local person trip generation rates, based on existing mode shares in **Table 9**, have been summarized in **Table 12**.

Table 12: Hospital Person Trip Generation Rates

Independent Variable	Peak Hour	Local Rate
Number of Beds	AM	2.82
	PM	2.40
Number of Employees	AM	0.46
	PM	0.39
GFA x1,000 ft²	AM	0.74
	PM	0.64

With the person trip rates developed, the next step in the forecasting process is to estimate future mode shares at the new Civic Development.

4.1.3 Mode Shares

The mode share assumptions at the new Civic Development play a critical role in estimating future site generated trips. Many factors were considered in the mode share analysis, such as proximity to transit, maturity of the surrounding transportation network and population density within the development capture area. For complex sites like a hospital, we recognized there would be different types of people with differing travel choices, and a single mode share assumption for all future hospital trips must account for all these different users. The following trip types were defined for TOH:

- Emergency Trips
  - Patient/Visitor heading to emergency entrance
  - Emergency vehicles
- Non-emergency Trips
  - Scheduled patient appointments
  - Visiting someone at the hospital
- Employees Trips
  - Works at the hospital

A set of mode share assumptions was defined for each group, then aggregated into a single mode share set. This process is defined in greater detail in **Section 5.2: Parking**, where this approach was used to determine the

adequacy of the future parking supply. This way, the final mode share assumptions reflected the anticipated broad range of travelers to this facility.

The first step in this process was to look at City of Ottawa targets and at other institutions for representative mode share assumptions.

4.1.3.1 Research within City of Ottawa and Other Institutions

The following section outlines mode share research that led to the chosen mode share assumptions for the future Hospital. A variety of sources were reviewed, including City of Ottawa targets and TRANS survey results, private institutions located in the City of Ottawa, and hospitals located in Canada and the United States. A summary of all the mode share results from these sources has been compiled in **Table 13**, followed by a brief discussion of the notable trends.

City of Ottawa Mode Shares:

The City of Ottawa, in partnership with the TRANS Committee, completed comprehensive surveys in 2011 on travel behaviour in the National Capital Region, including mode choice. The survey results were published in various studies, including the City TMP, as noted in **Table 13**. The results demonstrated a common trend of lower auto-driver (30%) closer to the Core Area of the City (i.e. downtown). As you proceed outward towards suburban regions, the trend reverses (50%).

In the districts adjacent to the future hospital site, i.e. Merivale Ward and Inner Area Ward, this trend was also found as the Inner Area had lower auto-driver use compared to the adjacent Merivale Ward that is further removed from downtown (35% vs 55%). The one exception to the noted trends was near rapid transit stations. Whether in the suburbs or downtown, the City of Ottawa targeted aggressive transit and active travel mode shares near rapid transit stations, which greatly reduced auto-driver use (15% target). The corresponding TRANS OD Survey results have been provided in **Appendix H.**

Table 13: Mode Share Research Summary

	Location	Source	Auto Driver	Auto Passenger	Transit	Walk	Bike
City of Ottawa Mode Shares	Inner Area	Ottawa TMP [1]	[30%]	[8%]	[22%]	[33%]	[7%]
	Inner Suburbs	Ottawa TMP [1]	[49%]	[13%]	[25%]	[10%]	[3%]
	All Types – Core Area	TRANS [2]	32% (34%)	6% (7%)	24% (21%)	38% (38%)	
	All Types – Urban Area	TRANS [2]	47% (53%)	11% (11%)	31% (24%)	11% (12%)	
	All Types – All Areas	TRANS [2]	51% (59%)	11% (11%)	27% (20%)	11% (10%)	
	Inner Area Ward	TRANS [3]	36% (38%)	8% (10%)	30% (24%)	19% (22%)	6% (6%)
	Merivale Ward	TRANS [3]	55% (60%)	12% (14%)	21% (16%)	10% (8%)	3% (2%)
	City of Ottawa TOD Targets	TOD Report [4]	15%	5%	65%	10%	5%
Other Institutions in Ottawa	OHH	TIA [5]	68%	15%	15%	1%	1%
	U. Ottawa	TRANS SG Survey [6]	17%	5%	56%	19%	2%
	Carleton U.	TRANS SG Survey [6]	22%	7%	61%	8%	2%
	Algonquin College	TRANS SG Survey [6]	32%	5%	51%	12%	0%
Other Hospitals (Toronto)	Toronto General Staff	UHN Study [7]	15%	7%	65%	10%	3%
	Toronto Western Staff		25%	15%	45%	11%	4%
	Princess Margaret Staff		10%	6%	70%	10%	4%
	Toronto Rehab UC Staff		10%	3%	70%	10%	7%
	Toronto General Visitors		21%	31%	40%	7%	1%
	Toronto Western Visitors		30%	33%	29%	7%	1%
	Princess Margaret Visitors		28%	42%	25%	5%	0%
	Toronto Rehab UC Visitors		9%	49%	30%	7%	5%
Other Hospitals (USA)	OHSU Hospital	TIA [8]	38%	9%	30%	6%	17%
	SCH Hospital	TIA [9]	38%	19%	19%	15%	9%
	BNMC Hospital	TIA [10]	88%	5%	4%	2%	1%

Notes:
xx = Daily; xx (yy) = AM (PM); [xx] = AM only
The Ottawa Hospital will be located on the boundary between Merivale District and Ottawa Inner Area District.
The Ottawa Hospital will be located on the boundary between Core Area and Urban Area.

1. Based on Exhibit 2.6 of the Ottawa TMP https://documents.ottawa.ca/sites/documents/files/documents/tmp_en.pdf
2. Active travel does not differentiate bike/walk trips. Auto passengers is the remainder of the mode shares to reach 100%. From table 3.13 http://www.ncr-trans-rcn.ca/wp-content/uploads/2016/10/Trip_Generation_Study_Report_FINAL_2009.pdf
3. Extracts from the TRANS OD 2011 Report, pages 89 and 99 http://www.ncr-trans-rcn.ca/wp-content/uploads/2013/04/TRANS-2011-OD-Survey-Final-Report-January-2013.pdf
4. Page 29 Section 9.5 of the report https://documents.ottawa.ca/sites/documents/files/documents/tod2_plan_main_en.pdf
5. Based on 2225 Mer Bleue Road – Orleans Health Hub (OHH) TIS (HDR, 2018) http://webcast.ottawa.ca/plan/All_Image%20Referencing_Site%20Plan%20Application_Image%20Reference_2018-04-12%20-%20Traffic%20Study%20-%20D07-12-18-0053.PDF
6. The student populations are as follows: U.Ottawa 40,000, Carleton U. 28,000, Algonquin College 20,000. From table 1, https://carleton.ca/transportationplan/wp-content/uploads/Carleton-University-Transportation-Strategy-2019.pdf
7. Based on correspondence with UHN master planning manager Stephen Black (stephen.black@uhn.ca) via email, November 17, 2020
8. Based on 21,990 staff surveyed. From page 10 within the Ohio Health and Science University Report https://www.ohsu.edu/sites/default/files/2019-07/OHSU_TDM_Plan_web.pdf
9. Based on 3,500 staff surveyed. From scattered mentions within Seattle Children's Hospital Report http://www.seattle.gov/Documents/Departments/Neighborhoods/MajorInstitutions/SeattleChildrens/Compiled%20Final%20Master%20Plan%20-%20Approved%2005-12-10.pdf
10. Based on 717 staff surveyed. From table 1 within Buffalo Niagara Medical Campus Report https://rosap.ntl.bts.gov/view/dot/40541

In the case of the future Ottawa Hospital, it will be located on the boundary between the Core Area and the Urban Area, and the boundary of the Merivale Ward and the Inner Area Ward. Most importantly, it will be located directly adjacent to the Carling Avenue LRT station. Therefore, there is reason to expect a lower auto-driver mode share than other hospitals in the City located outside the Core Area and not in close proximity to a rapid transit station

City of Ottawa Institutions:

While the City-wide mode shares provided insight into overall population travel choices, the results may be considered too aggregated to apply specifically to hospital trips. To lend further precision to our mode share assumptions, it was important to look deeper into travel behaviour for similar land uses, i.e. private institutional campuses.

The only recent transportation study completed for a health institution in the City of Ottawa was the Orleans Health Hub (OHH), in 2018. The OHH is located in Orleans, a suburb of the City, and has limited transit accessibility. Therefore, the mode share assumptions greatly favoured the auto-driver mode (over 65%), which was not a reasonable comparable to TOH.

Alternatively, other similar large institutions in Ottawa located within 600 meters walking distance to an LRT station were investigated. In this case, the City's post-secondary institutions provided a better comparison. A TRANS Special Generators Survey was conducted in 2013/2014 for all post-secondary institutions, which documented very low auto-driver mode shares among the student population. Select results from Carleton University (~15%), University of Ottawa (~20%) and Algonquin College (~30%) demonstrate this trend.

Carleton University was considered an acceptable comparable based on geography and transportation infrastructure. The University is centrally located, and the campus is bounded by two major roadways, a City arterial road (Bronson Avenue), and an NCC driveway (Colonel By Drive). An LRT Station is located on site that is integrated with the campus transportation network. The Ottawa Hospital is also centrally located and is bounded by a major City arterial road (Carling Avenue) and a scenic driveway (Prince of Wales Drive). The Carling LRT station is located on site that will be integrated with the hospital transportation network. Therefore, a 15% auto-driver mode share showed some merit.

However, the Special Generator Survey only captured the student population, not staff. This demographic typically has lower auto ownership and thereby, less access to a vehicle. These factors would not fully represent the users of a modern hospital campus. As a result, the mode share results were considered the "ideal" outcome if appropriate supportive measures and policies were in place.

Toronto Hospitals:

The study team reached out to the University Health Network (UHN) for information regarding their hospital travel trends and characteristics. UHN encompasses the Toronto General and Toronto Western Hospitals, the Princess Margaret Cancer Centre, Toronto Rehabilitation Institute, and The Michener Institute of Education. Survey results from the first four locations were provided, which included staff and visitor/patient mode choices. The General, Cancer Centre and Rehab Institute are all located in downtown Toronto, within 400m of two subway stations, Queen's Park and St. Patrick, and reasonable walking distance to extremely high population density. Therefore, it is unsurprising to find very low auto-driver mode shares among staff (15% or less), and extremely high transit modal shares (65% to 70%). Visitor/patient mode shares are also low for auto-drivers, staying below 30%. The difference lies in the number of passengers, which increases substantially (31% to 50%) at the expense of transit usage. It would appear that this group favours shuttles, carpooling and drop-offs, which is reasonable given these trips include emergencies and group visits.

It is worth noting that the above results exceed even the "ideal" mode shares found among students at Carleton University. Therefore, these mode shares may be too aggressive for The Ottawa Hospital, considering the area context.

The Western Hospital is located further west of the previous facilities. There is streetcar service on two adjacent streets to the hospital, but the nearest subway station is over 1km away. The surrounding area is primarily low-density commercial and residential uses. As a result, there is a notable increase in the auto-driver mode share (25%) and decrease in transit mode share (45%) among staff. Visitors/patients have similar preferences choosing equally between auto-driver, passenger, and transit (roughly 30% each).

The Western Hospital mode shares appear more reasonable a comparison to The Ottawa Hospital given its location and context. Excerpts of the data received from UHN, among other hospital research has been provided in **Appendix I.**

Other Hospitals:

Broadening our search for hospital travel trends outside of Canada revealed case studies in the United States including Oregon Health and Science University (OHSU), Seattle Children's Hospital (SCH), and Buffalo Niagara Medical Center (BNMC). These studies provided additional insights based on their location near LRT but may differ in general commuter patterns and socio-economic context as they are located in US cities.

Although all three hospitals are located near LRT, there were sizeable differences in staff mode share results. OHSU and SCH both have extensive TDM policy measures to promote non-auto modes and incentivize alternate modes of transportation, which resulted in an auto-driver mode share of roughly 40% for both. The non-auto-driver mode shares varied between the two, which highlights differences in quality of nearby active mode infrastructure.

BNMC was considered an outlier. Despite being located near an LRT station, "were indeed accessible to a large number of employees", nearly 90% of staff drove. The corresponding TDM policy report outlines that "this was not a major surprise due to the longstanding car culture of Western New York", referring to the large proportion of staff driving to work[3]. The City of Ottawa is far more accepting and progressive with alternate modes of transportation, as demonstrated in the aggressive targets set in the TMP.

[3] Page 12 https://rosap.ntl.bts.gov/view/dot/40541

The results for OHSU and SCH were considered "conservative" targets for TOH.

4.1.3.2 Future Mode Share Assumptions

The future mode share assumptions were developed based on all the background research from the previous section. The review of other institutions in similar geographical contexts helped us develop a "target" auto driver mode share for the two future buildout horizons: 2028 Opening Day and 2048 Full Buildout. In 2028, a "high" auto driver mode share was also developed that represents a worst-case scenario where the mode share "target" is not achieved. By 2048, it was expected that the target mode shares would be achieved.

Table 14 summarizes the mode share assumptions by horizon year, as well as site comparisons from the research summary in **Table 13.**

Table 14: Hospital Auto vs Non-Auto Target Mode Shares in 2028 and 2048

Year	Scenario	Auto Driver	Non-Auto Driver
2028	Target	50%	50%
	High	65%	35%
2048	Target	35%	65%
City of Ottawa TOD		15%	85%
Carleton U (Students)		22%	78%
Toronto Western Hospital (Staff)		25%	75%
Toronto Western Hospital (Visitor/Patient)		30%	70%
OHSU & SCH		38%	62%

Considering the mix of staff and anticipated average daily visitors, a blended set of mode share assumptions were developed for all trip types (staff, patients, and visitors) at the new Civic Development at Opening Day (2028) and Full Buildout (2048), which are shown in **Table 15**.

Table 15: Estimated Hospital Mode Shares in 2028 and 2048

Year	Auto Driver	Auto Passenger	Transit	Walk	Bike
2028	50%	15%	30%	3%	2%
2048	35%	12%	45%	5%	3%

4.1.4 Trip Generation Results

4.1.4.1 Hospital Uses

The estimated site generated trips were developed by multiplying the local person trip rates from **Table 12** by the established independent variables for the new Civic Development in **Table 6**. This process resulted in total person trips that were then converted into different trip types by multiplying the person trip total by future mode share values from **Table 15**. This process was completed separately based on the number of employees, beds, and total gross floor area, and subsequently averaged to estimate vehicle trips shown in **Table 16.** Note that the final estimates include all hospital trip generation sources, including emergency vehicles, staff, visitors, maintenance vehicles, truck deliveries, etc.

Table 16: Hospital Person to Vehicle Trip Conversion

Independent Variable	Peak Hour	Person Trips 2028	Vehicle Trips 2028	Average Vehicle. Trips 2028	Person Trips 2048	Vehicle Trips 2048	Average Vehicle. Trips 2048
Number of Beds	AM	2,158	1,079		3,519	1,232	
	PM	1,836	918		2,995	1,048	
Number of Employees	AM	2,797	1,399	AM = 1,123	4,403	1,541	AM = 1,336
	PM	2,565	1,283	PM = 986	4,038	1,413	PM = 1,171
GFA x1,000 ft²	AM	1,783	892		3,529	1,235	
	PM	1,517	759		3,003	1,051	

The estimated trips for all modes based on mode shares noted in **Table 15** have been summarized in **Table 17** and **Table 18** for the 2028 and 2048 horizon years.

Table 17: Estimated Hospital Trip Generation 2028 with Target Auto Driver Mode Share

	Travel Mode	Modal Share	Total	IN	OUT
AM	Auto Driver	50%	1,123	764	359
	Passenger	15%	337	229	108
	Transit	30%	674	458	215
	Walk	3%	67	46	22
	Bike	2%	45	31	14
	Total Person Trips	100%	2,246	1,528	718
PM	Auto Driver	50%	986	456	530
	Passenger	15%	296	137	159
	Transit	30%	592	274	318
	Walk	3%	59	27	32
	Bike	2%	39	18	21
	Total Person Trips	100%	1,973	912	1,061

Table 18: Estimated Hospital Trip Generation 2048 with Target Auto Driver Mode Share

	Travel Mode	Modal Share	Total	IN	OUT
AM	Auto Driver	35%	1,336	909	427
	Passenger	12%	458	312	146
	Transit	45%	1,718	1,169	549
	Walk	5%	191	130	61
	Bike	3%	115	78	37
	Total Person Trips	100%	3,817	2,597	1,220
PM	Auto Driver	35%	1,171	541	630
	Passenger	12%	401	186	216
	Transit	45%	1,505	696	809
	Walk	5%	167	77	90
	Bike	3%	100	46	54
	Total Person Trips	100%	3,345	1,547	1,799

As shown in **Table 17** and **Table 18**, the total person trips are expected to increase between 2028 and 2048 as the hospital expands its programs resulting in more staff and patients travelling to/from the hospital. However, the auto driver mode share was expected to decrease between 2028 and 2048 as long-term travel behaviour changes in favour of alternate modes. A large portion of new trips in the 2048 horizon were expected to use transit, specifically the Trillium Line accessed from Dow's Lake Station, increasing the peak hour transit trips from approximately 650 to 1,700 two-way trips. Walk and bike mode shares were expected to slightly rise from 2028 to 2048 as well, coinciding with increased residential planned in the surrounding community in accordance with City TOD policies.

In the event that the target transit, cycling and walking mode shares are not met by 2028, a "high" auto driver mode share scenario results were developed, as shown in **Table 19**.

Table 19: Estimated Hospital Trip Generation 2028 with "High" Auto Driver Mode Share

	Travel Mode	Modal Share	Total	IN	OUT
AM	Auto Driver	65%	1,373	934	439
	Passenger	18%	380	259	122
	Transit	14%	296	201	95
	Walk	2%	42	29	14
	Bike	1%	21	14	7
	Total Person Trips	100%	2,113	1,437	675
PM	Auto Driver	65%	1,199	554	644
	Passenger	18%	332	153	178
	Transit	14%	258	119	139
	Walk	2%	37	17	20
	Bike	1%	18	9	10
	Total Person Trips	100%	1,844	853	992

The local rate developed for the prior analysis was only reliable in predicting future hospital uses similar to those found at the existing Civic Campus. Any new uses must be accounted for separately, which is the purpose of the following section.

4.1.4.2 Carling Village Ancillary Uses

As discussed in **Section 4.1.1: Land Use Assumptions**, TOH is planning to construct three towers with a podium expanding adjacent to Dow's Lake Station, above the Trillium Line tracks. Carling Village is projected to accommodate approximately 550,000 ft² of hospital related uses, 100,000 ft² of residential units for patients and families and hospital residents/researchers, and approximately 100,000 ft² of commercial uses on the first two floors. The proposed residence and commercial land uses were not comparable to any land uses that currently exist at the existing Civic Campus. Therefore, these trips were added separately in the trip generation analysis. The proposed office and research spaces were considered hospital related uses, and would be captured within the derived local rate.

The vehicle trip generation rates for residential and commercial have been summarized in **Table 20**; the ITE Manual for the commercial uses and from the TRANS Study for the City of Ottawa for the residential uses.

It is important to note that the TRANS Study only provided rates based on traditional residential apartment that generate traditional commuter trips. In this case the residence is primarily a supporting facility to the Hospital that may not have a work trip purpose. Therefore, the use of this rate should be considered conservative.

Table 20: Carling Village Trip Generation Rates

Land Use Carling Village	Size	Reference	Peak Hour	Trip Generation Rate
Ground Floor Commercial (Shopping Center)	100,000 ft²	ITE 820	AM	0.94 (x)
			PM	3.81 (x)
Residence (High-Rise Use)	150 units[1]	TRANS 222	AM	0.24 (u)
			PM	0.27 (u)

(x) = per 1,000 ft²; (u) = per unit
1.) 150 units based on 350,000 ft² and average unit size of approximately 665 ft² each, considering shared spaces and building utilities

The proposed ground-floor commercial and residence land uses were not expected to generate a high degree of auto driver trips. The proposed commercial space is relatively small and is intended to cater to LRT related pedestrian traffic and local community. The residential aspect is assumed to be catered to temporary staff working at the hospital or for patient's family for long- or short-term stay. Therefore, the City's typical TOD mode share targets were applied to these uses, as shown in **Table 21**.

Table 21: Projected Mode Shares for Carling Village

Year	Auto Driver	Passenger	Transit	Walk	Bike
Ground Floor Commercial	15%	5%	20%	50%	10%
Residential	15%	5%	65%	10%	5%

For the commercial uses, vehicle trip generation rates from **Table 20** were converted to modified person trips by multiplying them by 1.28 to account for typical North American auto occupancy, transit use and non-motorized mode. This modified person trip was then multiplied by the respective land use size to obtain a person trip as seen in **Table 20.** The mode shares assumptions were applied to the total person trip, to estimate future commercial vehicle trips as seen in **Table 23**.

A similar process was applied to the residential uses. Vehicle trip generation rates from **Table 20** were multiplied by the respective land use size to obtain modified vehicle trips. The modified vehicle trips were then divided by the mode shares from the TRANS Survey. The obtained person trips were then multiplied by the mode shares from **Table 21** to obtain the future residential vehicle trips as seen in **Table 24.**

Table 22: Carling Village Person Trips to Vehicle Trips Conversion

Independent Variable	Peak Hour	Vehicle Trips	Person Trips [1]	Vehicle Trips to/from Site
Commercial	AM	94	120	19
	PM	381	488	75
Residential	AM	36	97	15
	PM	41	103	15

1.) Person trips for residential derived from drive mode share of 37% as determined by TRANS Model

The Carling Village ancillary land use trip generation results, include commercial and residential uses, have been summarized in **Table 23.** Detailed calculations can be found in **Appendix J**.

Table 23: Estimated Carling Village Commercial Trip Generation

	Travel Mode	Modal Share	Total	IN	OUT
AM	Auto Driver	15%	19	12	7
	Passenger	5%	7	4	3
	Transit	20%	23	14	9
	Walk	50%	60	37	23
	Bike	10%	11	7	4
	Total Person Trips	100%	120	74	46
PM	Auto Driver	15%	75	36	39
	Passenger	5%	25	12	13
	Transit	20%	96	46	50
	Walk	50%	244	117	127
	Bike	10%	48	23	25
	Total Person Trips	100%	488	234	254

Table 24: Estimated Carling Village Residential Trip Generation

	Travel Mode	Modal Share	Total	IN	OUT
AM	Auto Driver	15%	15	3	12
	Passenger	5%	4	1	3
	Transit	55%	53	12	41
	Walk	15%	15	4	11
	Bike	10%	10	2	8
	Total Person Trips	100%	97	22	75
PM	Auto Driver	15%	15	9	6
	Passenger	5%	5	3	2
	Transit	55%	57	35	22
	Walk	15%	16	10	6
	Bike	10%	10	6	4
	Total Person Trips	100%	103	63	40

Table 25: Estimated Carling Village Combined Trip Generation

	Travel Mode	Total	IN	OUT
AM	Auto Driver	34	15	19
	Passenger	11	5	6
	Transit	76	26	50
	Walk	75	41	34
	Bike	21	10	12
	Total Person Trips	217	96	121
PM	Auto Driver	90	45	45
	Passenger	30	15	15
	Transit	153	81	72
	Walk	260	127	133
	Bike	58	30	29
	Total Person Trips	591	297	294

The different land uses within Carling Village and their proximity to the new Civic Development were expected to generate internal trips between each other, without accessing the external/adjacent transportation network, e.g. a visitor travels to the hospital and walks to the commercial stores at Carling Village. Therefore, an internal reduction factor was applied to reduce double counting. It was assumed 65% of all person trips generated from Carling Village would be an internal trip. The combined residential and commercial trips as seen in **Table 25** were adjusted by the internal reduction factor, resulting in the projected trips as shown in **Table 26**.

Table 26: Estimated Carling Village Combined Trip Generation with Internal Reductions

	Travel Mode	Total	IN	OUT
AM	Auto Driver	12	5	7
	Passenger	4	2	2
	Transit	27	10	17
	Walk	26	14	12
	Bike	7	3	4
	Total Person Trips	76	34	42
PM	Auto Driver	32	16	16
	Passenger	11	6	5
	Transit	53	28	25
	Walk	91	44	47
	Bike	20	10	10
	Total Person Trips	207	104	103

The Carling Village site was not expected to be constructed by 2028 but has been assumed by the 2048 horizon.

4.1.4.3 Projected Total TOH Site Trip Generation

The total projected site generated volumes for the future Hospital campus and Carling Village, have been summarized in **Table 27** and **Table 28** for the 2028 and 2048 horizon years respectively.

Table 27: Estimated Trip Generation 2028 Site Generated Traffic

	Travel Mode	Total	IN	OUT
AM	Auto Driver	1,123	764	359
	Passenger	337	229	108
	Transit	674	458	215
	Walk	67	46	22
	Bike	45	31	14
	Total Person Trips	2,246	1,528	718
PM	Auto Driver	986	456	530
	Passenger	296	137	159
	Transit	592	274	318
	Walk	59	27	32
	Bike	39	18	21
	Total Person Trips	1,973	912	1,061

Table 28: Projected Trip Generation 2048 Site Generated Traffic

	Travel Mode	Total	IN	OUT
AM	Auto Driver	1,348	914	434
	Passenger	462	314	148
	Transit	1,745	1,179	566
	Walk	217	144	73
	Bike	122	81	41
	Total Person Trips	3,893	2,631	1,262
PM	Auto Driver	1,203	557	646
	Passenger	412	192	221
	Transit	1,558	724	834
	Walk	258	121	137
	Bike	120	56	64
	Total Person Trips	3,552	1,651	1,902

4.1.4.4 Estimate of Future Daily Traffic

The estimated 2048 daily traffic volumes at the future Ottawa Hospital campus (not including the Carling Village ancillary uses) have been summarized in **Table 29**.

Table 29: Estimated 2048 Daily Trips at New TOH Campus by Mode

	Travel Mode	Daily Trips
Daily	Auto Driver	15,000
	Auto Passenger	3,850
	Transit	14,500
	Walk	1,450
	Bike	600
	TOTAL	35,400

Note: Values rounded to nearest 50

Peak hour to daily traffic volume factors were calculated using rates in the ITE Trip Generation Manual for the Hospital land use. The conversion factor in this case was 6 times the sum of the AM and PM peak hour volumes for adjacent street traffic. This provided the daily vehicular traffic volume result, but other modes would not necessarily have a similar 6 times conversion factor. Therefore, different approaches were taken to estimate passenger, transit, pedestrian, and cyclist daily traffic volumes.

In this case, the City's intersection turning movement counts at the two nearby intersections to the future Ottawa Hospital: Preston/Carling and Champagne/Carling, were used to develop a pedestrian and cyclist peak hour to daily conversion factors. In this case, the conversion factor for pedestrians was 4.0, and for 2.8 cyclists.

Finally, transit and passenger peak hour to daily conversion factors were assigned to be 75% of the auto-driver factor, which equated to 4.5. This conversion was developed in the absence of representative data, but it was considered reasonable to assume there would be less off-peak activity for these modes compared to auto-drivers, but more than pedestrian and cyclists. The details of this process have been provided in **Appendix K.**

The above daily trips encompass all travelers to the new Civic Development. Beyond employees and visitors, they include ambulances, corporate transports, emergency visits and deliveries.

Trucks and Ambulances

Based on the information provided by TOH, the existing Civic Campus currently averages approximately 70 ambulance transports a day and approximately 650 non-urgent transports per month, which averages to roughly 100 emergency and non-urgent transports per weekday. The New Civic Development was estimated to have a similar order of magnitude of transports per day at full buildout.

The number of emergency visits was estimated to be in the order of 350 to 450 per day by 2048. The number of deliveries to the loading area could not be confirmed at the time of this study due to uncertainty in future

programming, but there will be 11 loading docks proposed at the future building. Existing delivery schedules suggest an order of magnitude estimate of at least 15 deliveries per weekday.

4.1.5 Trip Distribution

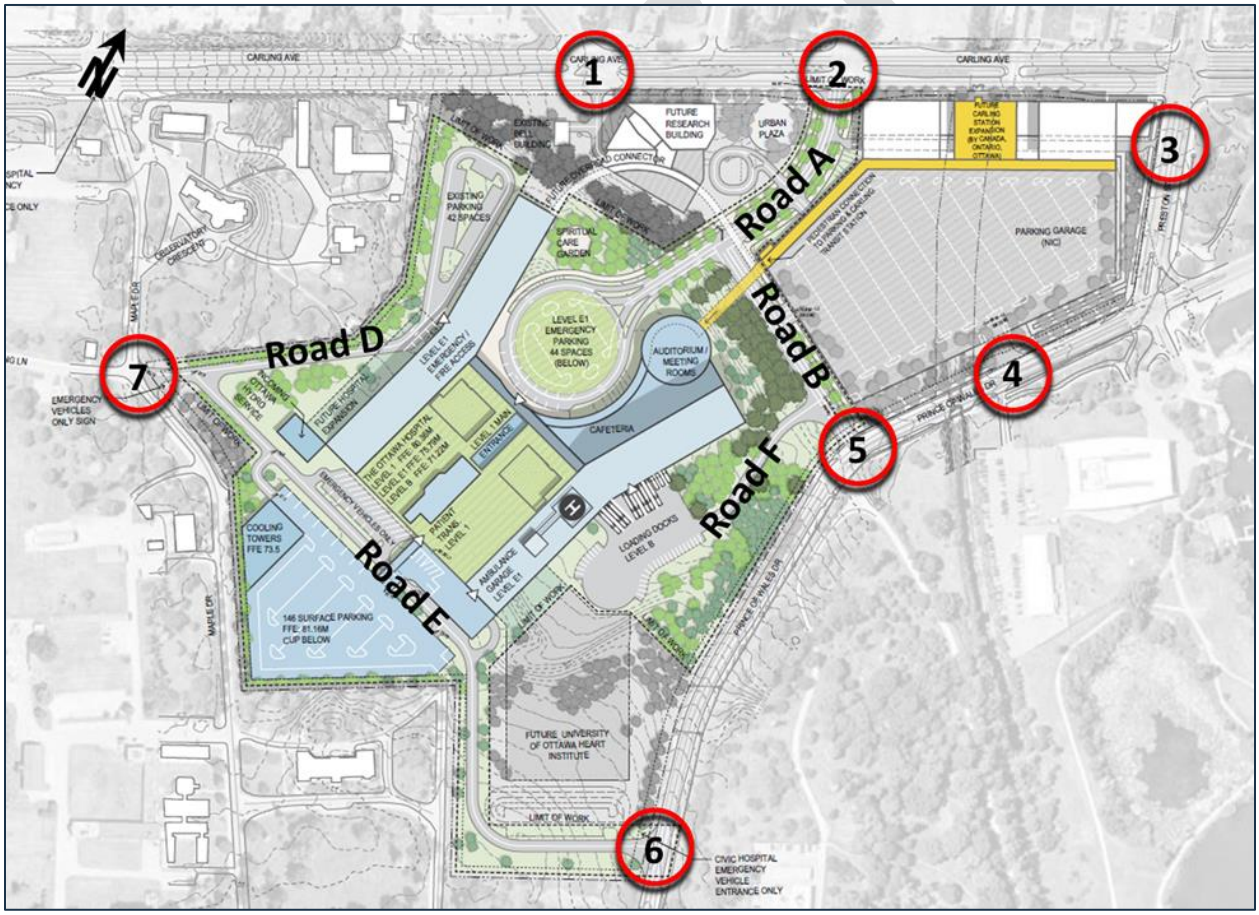
Site Access

There are seven (7) proposed access intersections at the New Civic Development, as shown in **Figure 20**. The four (4) full movement intersections that will be the main access points to the future Hospital campus include:

- Road A/Champagne/Carling (Location 2)
- Road B/Prince of Wales (Location 5)
- Road E/Prince of Wales (Location 6)
- Maple/Old Irving/Carling (Location 7)

The remaining three accesses are secondary points of entry that have partially restricted movements.

Figure 20: Future Proposed Site Accesses



Vehicle Access by User Type

Generally speaking, visitors will be directed to the 'front' of the main Hospital building via Carling and Prince of Wales, using primarily Roads A and B. Staff access is more dispersed due to the location of staff parking; the majority will be destined to the parking garage (via Roads A, B, and the Parking Garage Access) while a small number will use the reserved staff parking areas behind the main Hospital Building (Road E). Ambulances and non-urgent transports will be focused to the rear of the main Hospital building (Roads D and E), segregating them from visitor and staff traffic as much as possible. TOH will implement the appropriate signage and wayfinding to

ensure this information is clear to drivers. Additional details regarding the internal roads and access intersections have been provided in **Section 5.1.3.** and **Section 5.4.**

Based on the general access plan noted above, origin and destinations within the Hospital site were established from which traffic distributions could be estimated.

Site Access Distribution

The trip distribution assumptions were also based on the 2011 OD Survey, TRANS model select link analysis, and existing traffic volume counts. The estimated distribution of site-generated traffic is as follow:

Champagne Access at Carling

- 29%/28% to/from west on Carling
- 30%/30% to/from east on Carling

Prince of Wales Accesses

- 24%/25% to/from north on PoW
- 14%/13% to/from south on PoW

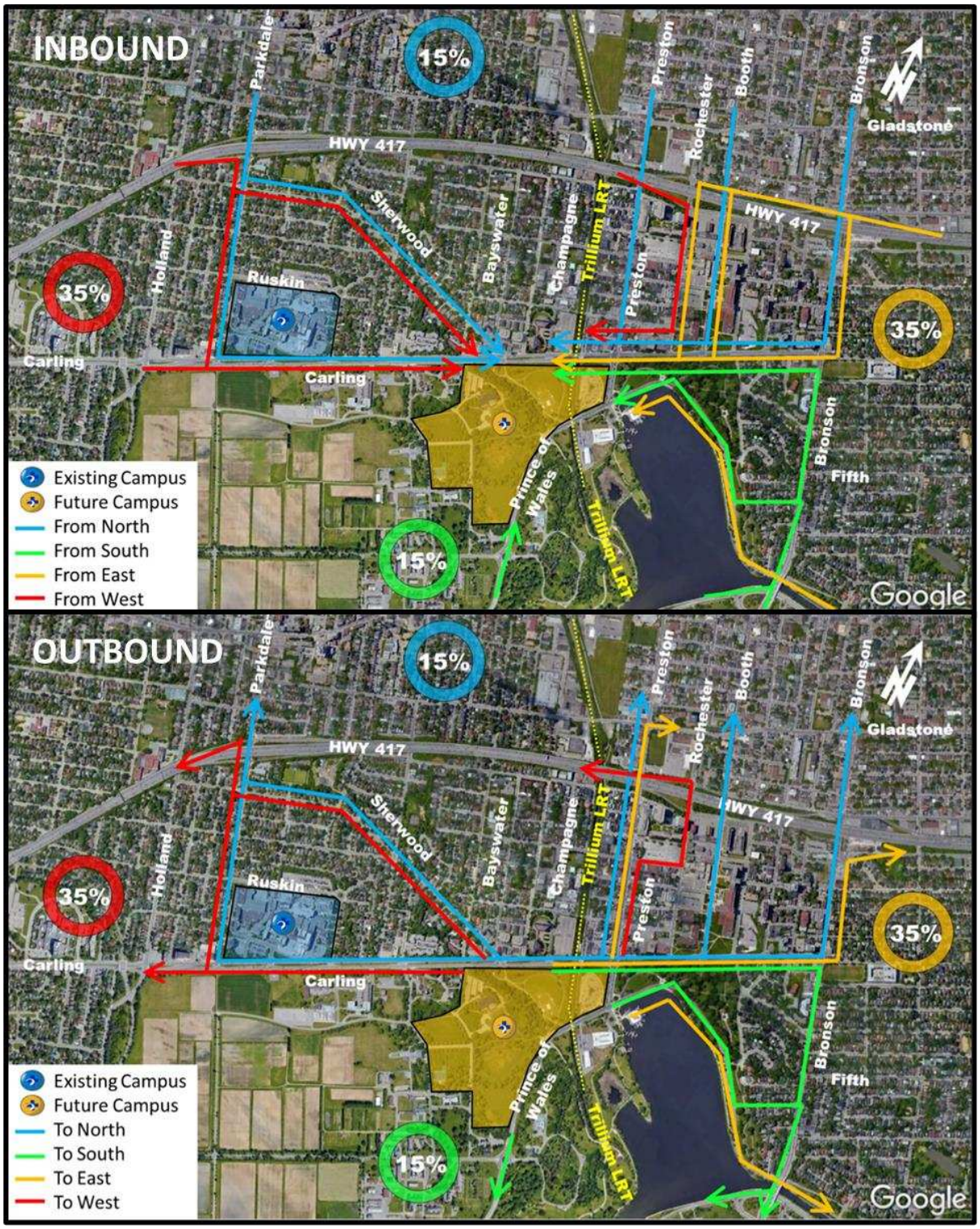
Maple Access

- 3%/4% of all traffic to/from this access (all emergency only)

Figure 21 describes the potential inbound and outbound routes from the adjacent road network. Although there are various vehicular routes available to and from the hospital, it was assumed that the majority of trips would take the shortest path to their destination while staying on the collector and arterial roadways as long as possible.

Considerations for short-cutting, community traffic infiltration and emergency routes will be discussed in greater detail in **Section 5.5: Neighbourhood Traffic Management.**

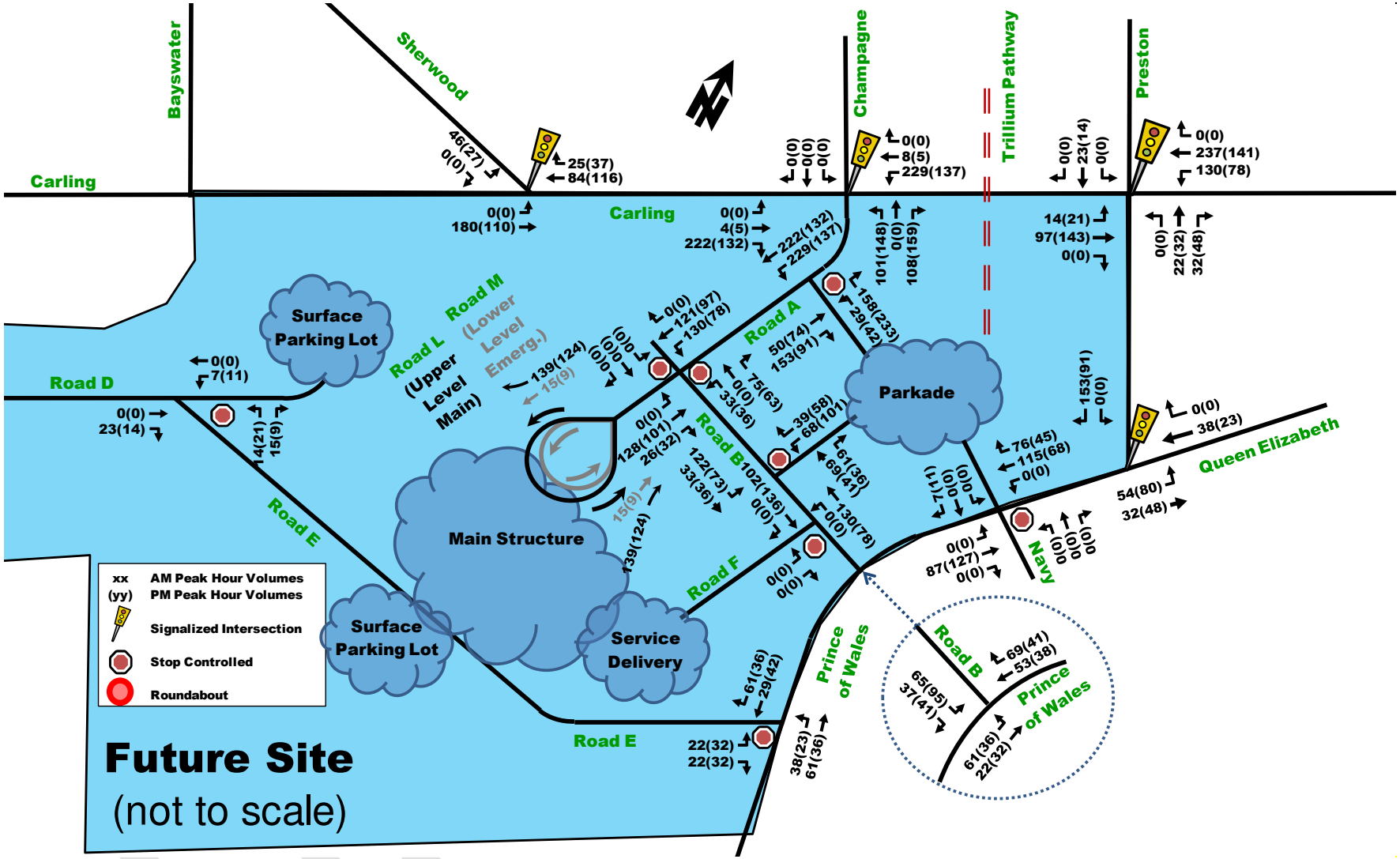
Figure 21: Inbound & Outbound Vehicle Candidate Routes to the New Civic Development

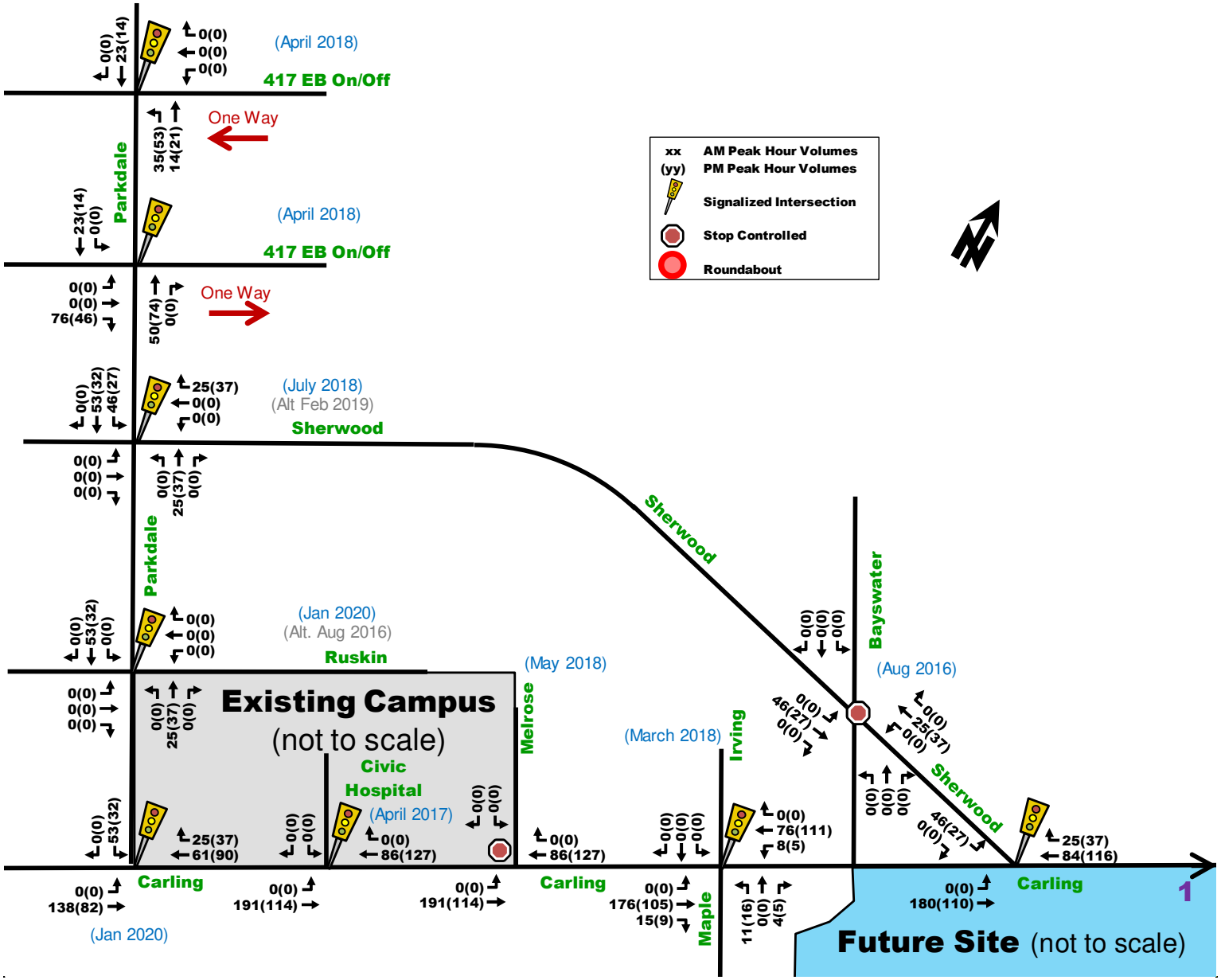


4.1.6 Trip Assignment

The new site-generated vehicle trips in the 2028 and 2048 horizon years were assigned to the study area network, as shown in **Figure 22** and **Figure 23** respectively.

Figure 22: 'New' Site Generated Traffic 2028




xx AM Peak Hour Volumes
(yy) PM Peak Hour Volumes
Signalized Intersection
Stop Controlled
Roundabout
(April 2018)
417 EB On/Off
One Way
Parkdale
(April 2018)
417 EB On/Off
One Way
(July 2018)
(Alt Feb 2019)
Sherwood
Parkdale
(Jan 2020)
(Alt. Aug 2016)
Ruskin
Existing Campus
(not to scale)
Civic
Hospital
(April 2017)
Melrose
(May 2018)
(March 2018)
Irving
Sherwood
Bayswater
(Aug 2016)
Sherwood
Carling
Carling
Carling
Maple
(Jan 2020)
Future Site (not to scale)
1

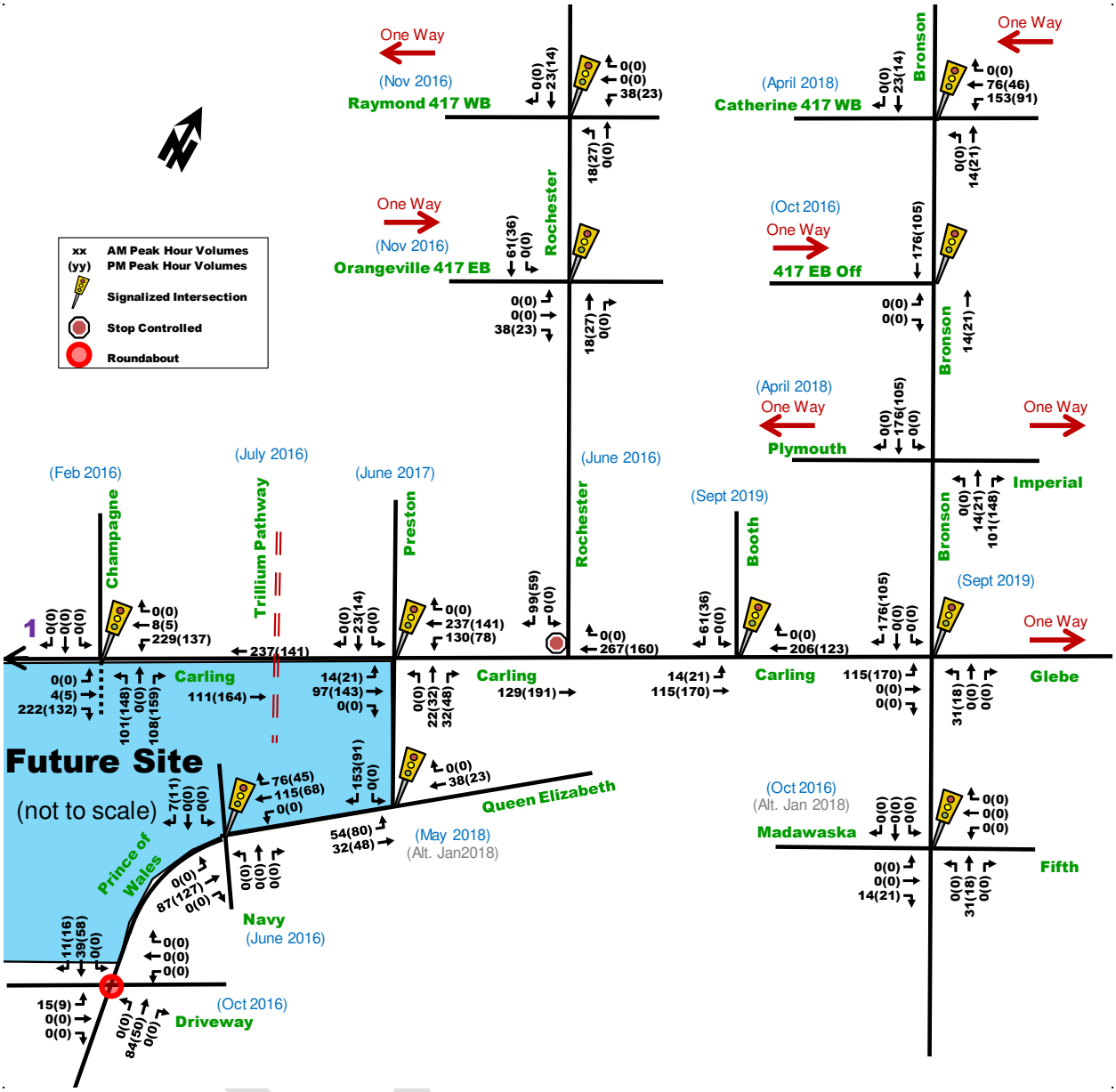
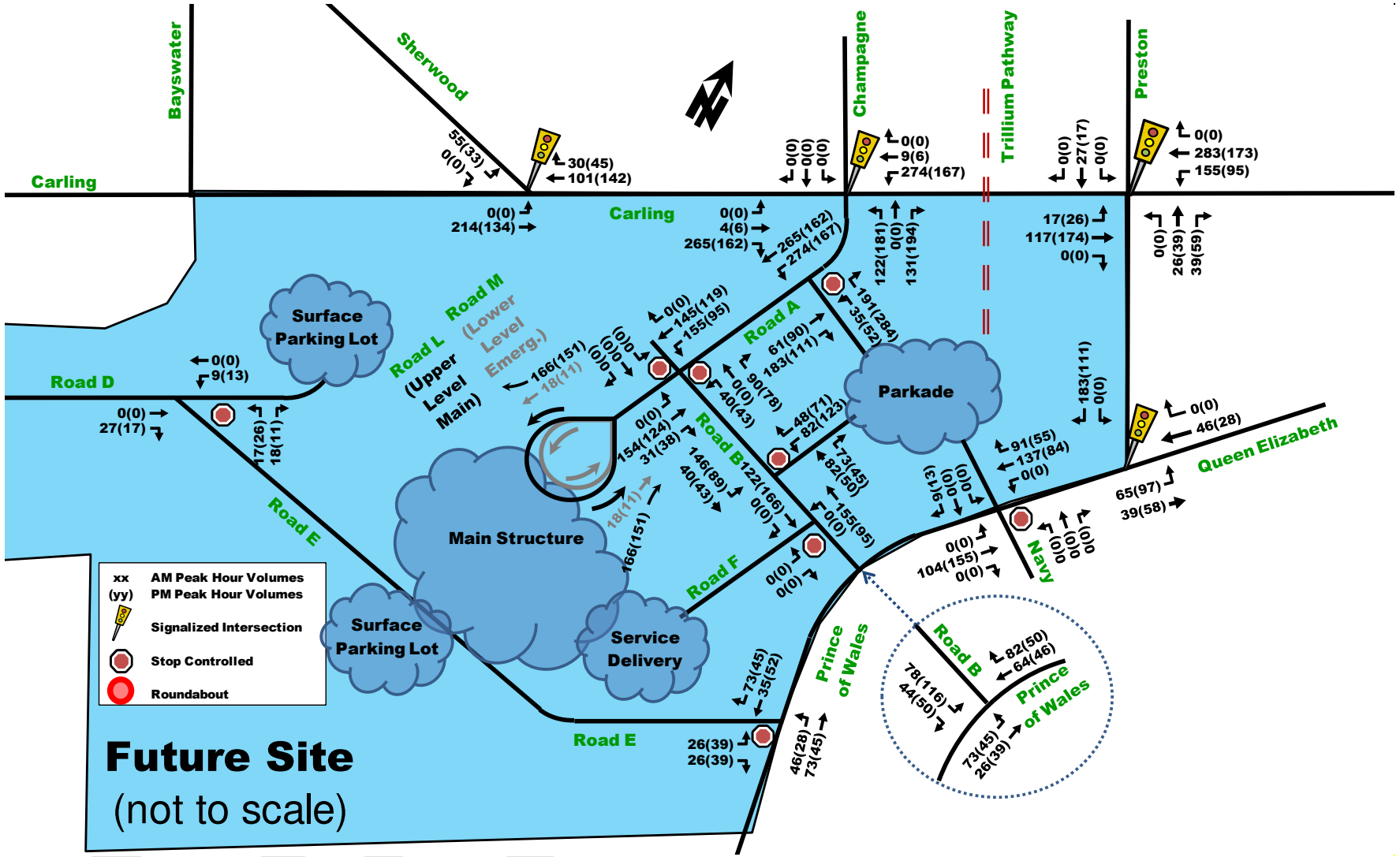
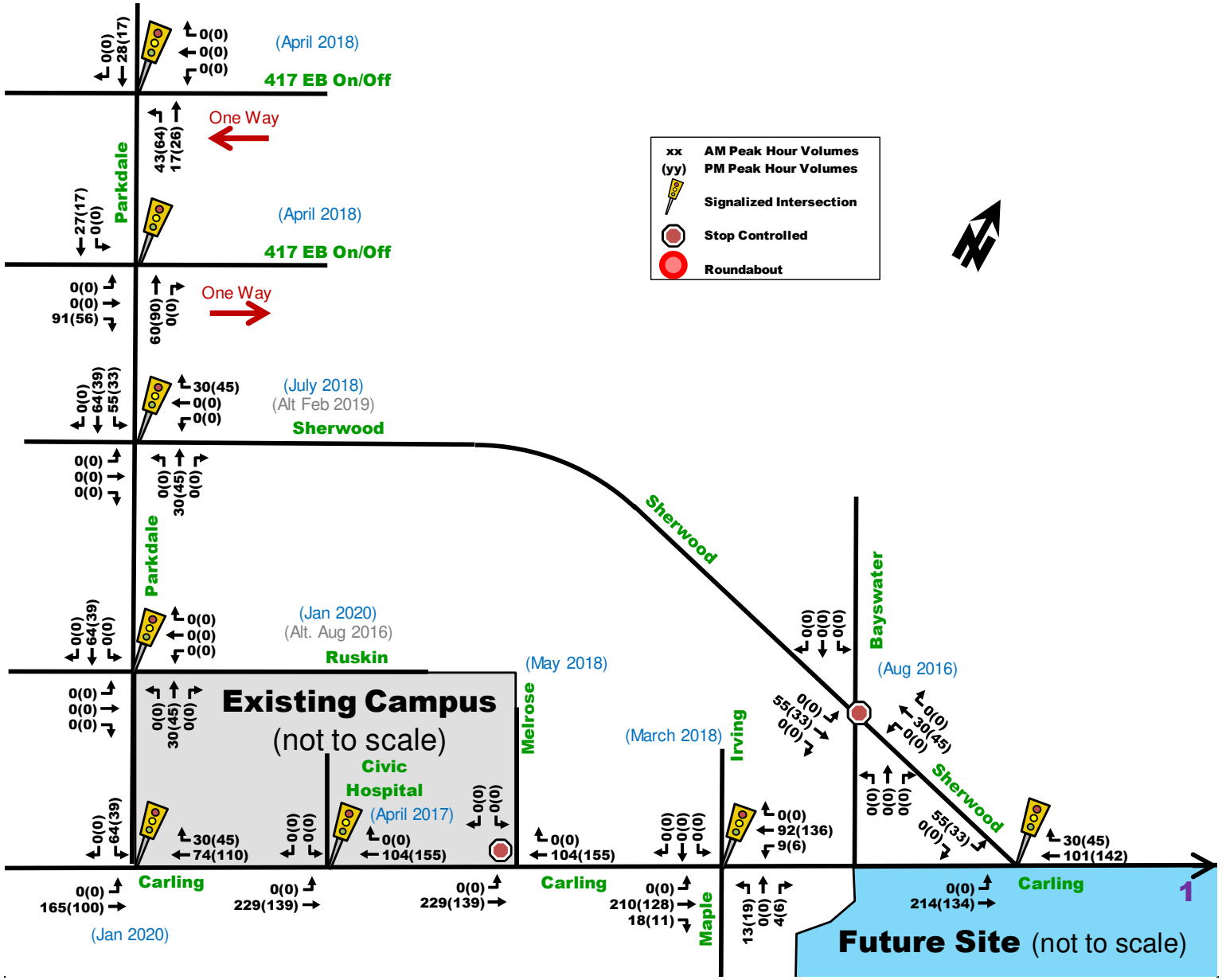

xx AM Peak Hour Volumes
(yy) PM Peak Hour Volumes
Signalized Intersection
Stop Controlled
Roundabout
Future Site
(not to scale)
One Way
(Nov 2016)
Raymond 417 WB
(April 2018)
Catherine 417 WB
Bronson
One Way
(Nov 2016)
Orangeville 417 EB
Rochester
(Oct 2016)
One Way
417 EB Off
Bronson
(April 2018)
One Way
Plymouth
One Way
Imperial
(Feb 2016)
Champagne
(July 2016)
Trillium Pathway
(June 2017)
Preston
(June 2016)
Rochester
(Sept 2019)
Booth
Bronson
(Sept 2019)
One Way
Glebe
Carling
Carling
Carling
Queen Elizabeth
(May 2018)
(Alt. Jan2018)
Prince of Wales
Navy
(June 2016)
(Oct 2016)
Driveway
(Oct 2016)
(Alt. Jan 2018)
Madawaska
Fifth

Figure 23: 'New' Site Generated Traffic 2048




xx AM Peak Hour Volumes
(yy) PM Peak Hour Volumes
Signalized Intersection
Stop Controlled
Roundabout
(April 2018)
417 EB On/Off
One Way
Parkdale
(April 2018)
417 EB On/Off
One Way
(July 2018)
(Alt Feb 2019)
Sherwood
Parkdale
(Jan 2020)
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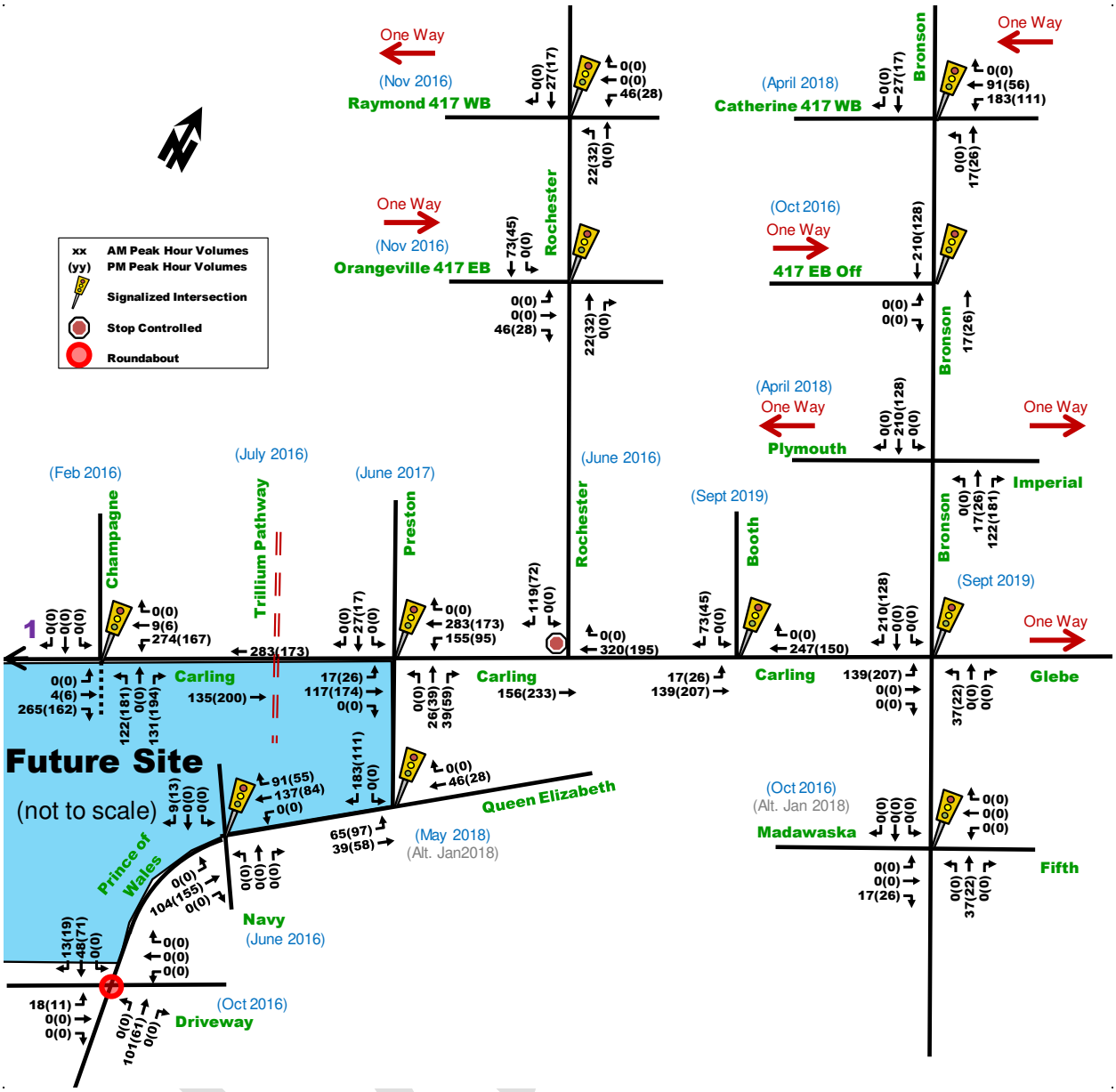
Ruskin
Existing Campus
(not to scale)
Civic
Hospital
(April 2017)
Melrose
(May 2018)
(March 2018)
Irving
Sherwood
Bayswater
(Aug 2016)
Sherwood
Carling
Carling
Carling
Maple
(Jan 2020)
Future Site (not to scale)
1


xx AM Peak Hour Volumes
(yy) PM Peak Hour Volumes
Signalized Intersection
Stop Controlled
Roundabout
One Way
(Nov 2016)
Raymond 417 WB
(April 2018)
Catherine 417 WB
Bronson
Rochester
(Nov 2016)
Orangeville 417 EB
(Oct 2016)
417 EB Off
(April 2018)
Plymouth
(June 2016)
(Feb 2016)
Champagne
(July 2016)
Trillium Pathway
(June 2017)
Preston
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Booth
Imperial
Carling
Glebe
Future Site
(not to scale)
Queen Elizabeth
(May 2018)
(Alt. Jan2018)
Prince of Wales
Navy
(June 2016)
(Oct 2016)
Driveway
(Oct 2016)
(Alt. Jan 2018)
Madawaska
Fifth

4.1.7 'H' Sign on Hwy 417

As part of the planning and implementation of the New Civic Development decisions will have to be made on the blue 'H' marker along the approaches to the Hospital including Hwy 417. These decisions will be made independent of this Mobility Study; however, the study can provide useful information to inform the decision. Specifically, the study has concluded that for eastbound travelers on Hwy 417, the faster travel time for visitors to the main entrance of the Hospital would exit the highway at the eastbound Rochester St interchange. These travelers would then follow Rochester to Carling to Road A route. For westbound travelers on Hwy 417, the faster travel time for visitors would exit the highway at the westbound Bronson St interchange, and follow the Catherine, Bronson, Carling to Road A route.

If selected, these potential routes would follow the City's arterial and major collector road system, and corresponding decisions would need approval by the Ontario Ministry of Transportation (MTO) via an application for Hospital Markers and the City of Ottawa for the installation of all required trailblazing on municipal roads.

4.2 Background Network Travel Demands

4.2.1 Transportation Network Plans

4.2.1.1 Carling Transit Priority and Stage 2 LRT

As discussed in **Section 3.1.4: Planned Conditions**, Carling Avenue is identified in the 2031 Affordable Network as a Transit Priority Corridor (continuous lanes) along Carling Avenue between Dow's Lake Station, located in the northeast quadrant of the subject site, and the Lincoln Fields Station to the west. Transit Priority (isolated measures) are planned along Bronson Avenue from Heron Road to Carling Avenue and along Carling Avenue between Bronson Avenue and Dow's Lake Station.

Ottawa's LRT system is currently undergoing expansion as part of the Stage 2 project. The Trillium Line, which connects with Confederation Line at Bayview Station to the north of the subject site, is currently being extended to include 16 additional kilometers of rail and 8 new stations. The Confederation Line is also being extended to include 15km of additional rail and 11 new stations to the west and 12km of additional rail and 5 new stations to the east. The Trillium Line extension is scheduled for completion by 2022, the Confederation Line East extension is scheduled for completion by 2024, and the Confederation Line West extension is scheduled for completion by 2025.

Dow's Lake Station is located within 600m walking distance to the main entrance of the future hospital building. While the Stage 2 modifications include only minor upgrades to Dow's Lake Station, such as an additional elevator, there are ongoing discussions between TOH, the Light Rail Office and the City of Ottawa to expand Dow's Lake Station underneath Carling Avenue to create a southern portal with direct access to the Carling Village, and closer to the new Civic Development.

The benefits of expanding this station further south to provide more convenient and grade separated direct access to the hospital is discussed in **Section 5.1.1.2**.

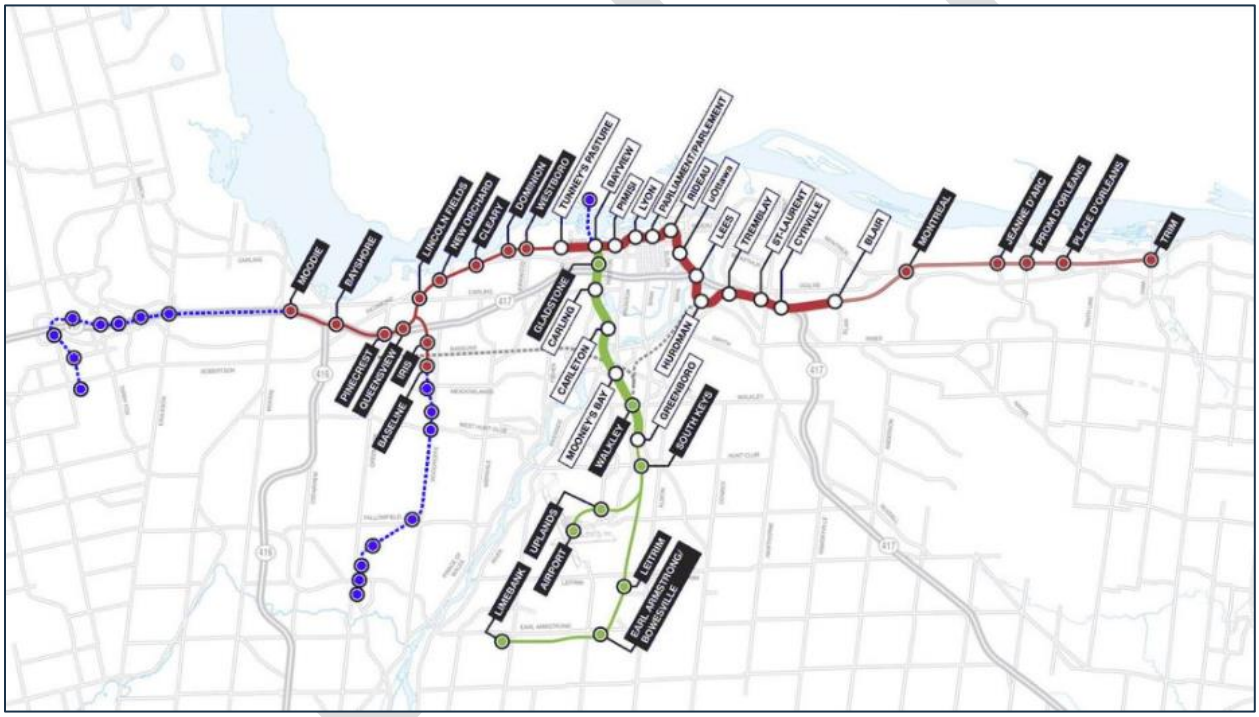
4.2.1.2 Stage 3 LRT

The City's Stage 3 LRT expansion was only conceptual at the time of this study with no funding being guaranteed and the final design has yet to be completed. Stage 3, as shown in **Figure 24**, will extend the Confederation Line West line further west and south. The current plan suggests 8 new stations potentially extending from Moodie Station to Hazeldean Station in Kanata/Stittsville, 8 new stations extending from Baseline Station to Barrhaven Towncenter in Barrhaven, and the potential for an interprovincial connection to Gatineau's proposed LRT/Tram system.

The latest plans show a connection to Gatineau's rapid transit system via potential connection to the Portage Bridge or possible Prince of Wales Bridge which could provide connection to the Trillium LRT Line at Bayview Station, however, this connection is many years away. As of July 5th, 2021, the City of Ottawa has approved an interim (and possibly permanent) use for the Prince of Wales Bridge as a multi-use pathway which would connect to the Trillium MUP[4]. In both alternatives, as LRT or MUP connection, it provides a more efficient connection to the New Civic Development for active transportation. As of November 26, 2020, the City of Ottawa council has approved budget for Stage 3 expansion to Barrhaven if the upper levels of government invest in the $3-billion-dollar project[5].

Source: https://teamtwentyone.ca/news/2021/2/26/have-your-say-prince-of-wales-bridge-multi-use-pathway. Accessed July 27, 2021.

Figure 24: Stage 3 Concept Plan



Source: https://web.archive.org/web/20190224213445/https://www.stage2lrt.ca/wp-content/uploads/2019/02/Stage-2-Light-Rail-Transit-Project_Tech-Briefing_20190222_EN.pdf. Accessed Feb 16, 2021.

4.2.2 Background Growth

Estimated background growth rates within the study area were estimated using the City's TRANS model for the following scenarios:

- Base 2011; and,
- 2031 land uses and affordable network scenario.

[4] https://ottawa.ctvnews.ca/turning-the-prince-of-wales-bridge-into-a-multi-use-pathway-to-cost-22-6m-city-1.5497395
[5] https://ottawa.ca/en/news/council-approves-design-barrhaven-lrt#:~:text=Light%2Drail%20transit%20will%20extend,Station%20to%20Barrhaven%20Town%20Centre

A summary of the results has been provided in **Table 30**. The background growth projections have been outlined in further detail in **Appendix L**.

Table 30: Linear Background Growth Rate Assumptions for 2028

Location	Carling	Parkdale	Sherwood	Preston	Rochester	Booth	Bronson	Prince of Wales
Annual Growth Rate	1%	2%	1%	0.5%	0.5%	0%	1%	1%

The above growth rates were used to estimate background peak hour traffic volumes at the Opening Day 2028 horizon year.

The TRANS model was limited in providing reliable projections to the 2048 horizon year, which led to unexpected and unrealistic results in certain locations of the network. These areas were fine-tuned/calibrated using existing traffic counts and engineering judgement to more accurately reflect the local context. The communities surrounding the New Civic Development are relatively mature neighborhoods with limited greenfield space for significant development, with the exception of TOD areas along the Trillium Line.

The New Official Plan is promoting more sustainable transportation initiatives to improve the environment, community health and quality of life. Therefore, over the next 30 years vehicular traffic demand is expected to decrease through continued investment in intensification and alternate modes of transportation.

Additionally, known adjacent developments described in **Section 4.2.3: Other Developments** were added to existing traffic volumes to account for growth beyond 2028.

Therefore, background traffic growth was assumed to be flat/null between years 2028 and 2048.

A significant portion of existing Civic Campus traffic was also removed from the study area network before applying the traffic growth rate. Note, it was unclear at the time of this study of the future use of the existing Civic Campus after the relocation of the main building in 2028. It is understood that the site is currently zoned for medical uses only and a zoning bylaw amendment would be triggered to change uses. Therefore, for the purposes of this study, it was assumed that any medical expansion on the existing Civic Campus site would be captured within the growth rate assumptions.

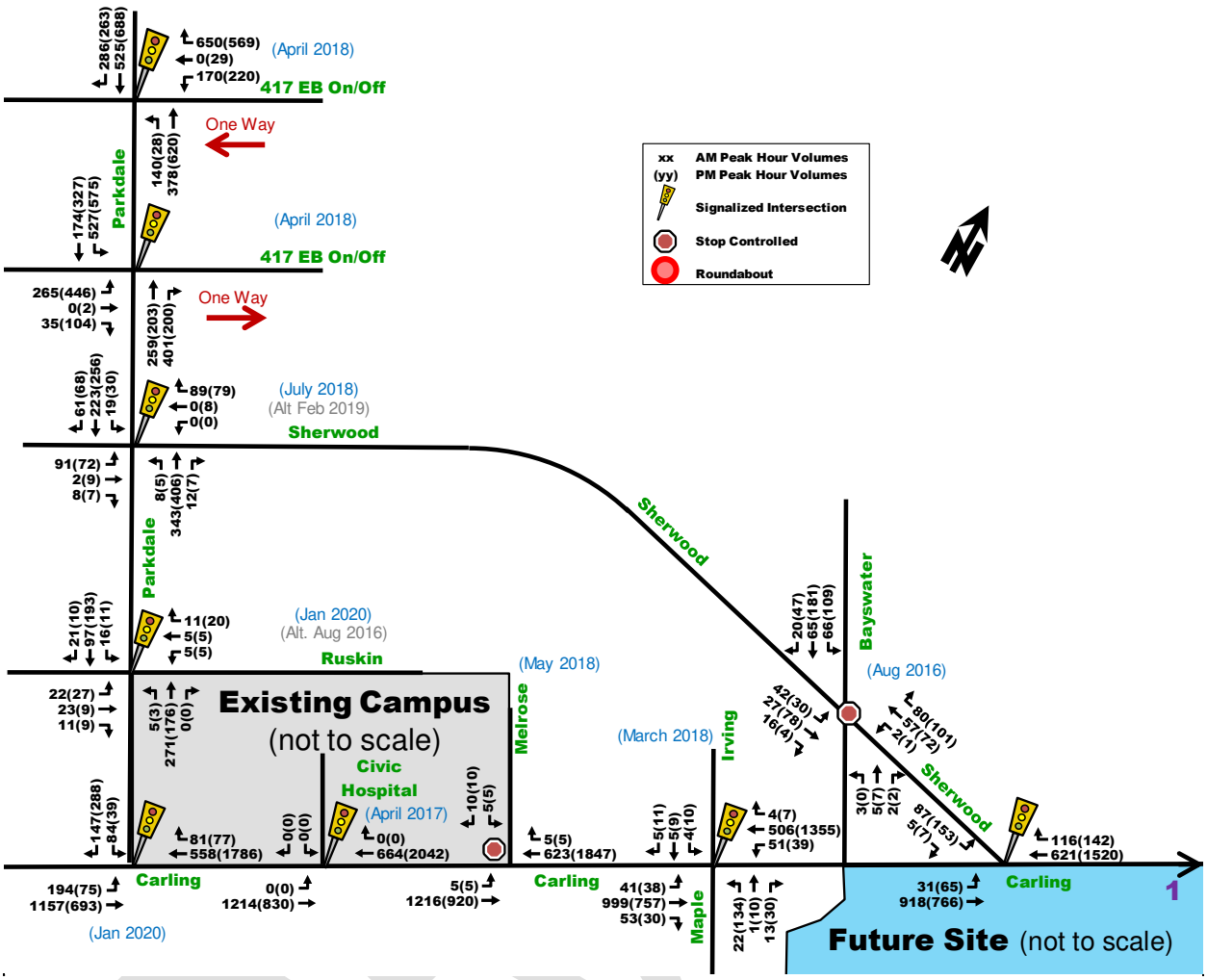
4.2.3 Other Developments

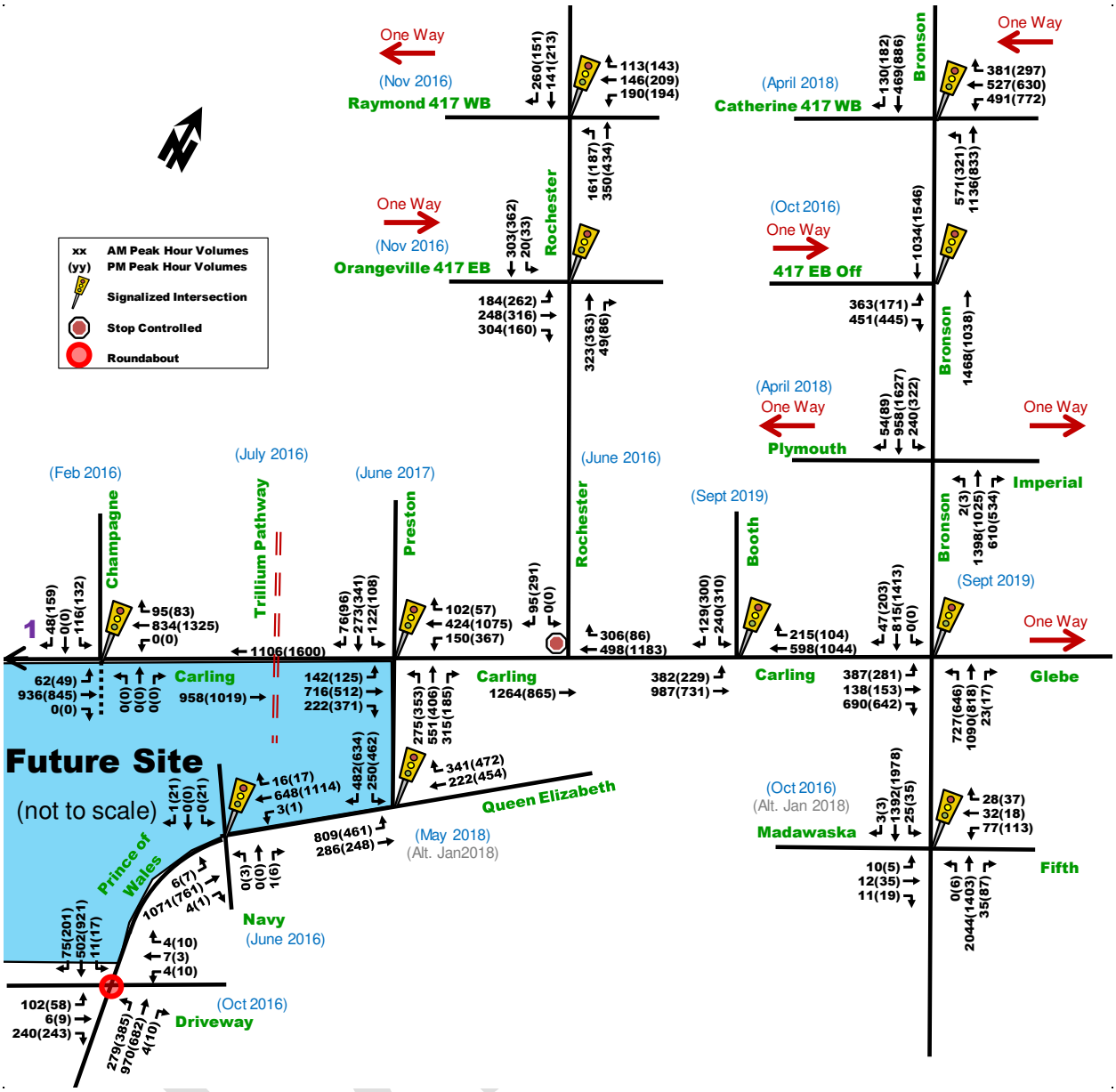
The volumes from the other area development mentioned in **Section 3.1.4: Planned Conditions** were layered onto the existing traffic volumes for the future analysis volumes. **Appendix M** shows detailed trip generation volumes added per each 'other development.'

4.2.4 Total Background Volumes

The resulting total background vehicle trips including background growth rate from and all 'other developments' from **Section 4.2.3: Other Developments**, have been provided in **Figure 25.**

Figure 25: Total Background Traffic Volumes




xx AM Peak Hour Volumes
(yy) PM Peak Hour Volumes
Signalized Intersection
Stop Controlled
Roundabout
Future Site
(not to scale)
Raymond 417 WB
(Nov 2016)
One Way
Orangeville 417 EB
(Nov 2016)
One Way
Rochester
Catherine 417 WB
(April 2018)
Bronson
One Way
417 EB Off
(Oct 2016)
One Way
Plymouth
(April 2018)
One Way
Imperial
Glebe
(Sept 2019)
One Way
Booth
(Sept 2019)
Carling
Champagne
(Feb 2016)
Trillium Pathway
(July 2016)
Preston
(June 2017)
Rochester
(June 2016)
Queen Elizabeth
(May 2018)
(Alt. Jan2018)
Prince of Wales
Navy
(June 2016)
Driveway
(Oct 2016)
Madawaska
(Oct 2016)
(Alt. Jan 2018)
Fifth

4.3 Demand Rationalization

The following section will provide rationalizations for reductions in background or site generated traffic that may be justified in the forthcoming analysis. The approach for this study was to proceed with road network evaluations without these reductions in the future horizons, as a worst-case scenario.

These reductions would then be applied and analyzed to determine the future road network performance under 'planned' conditions (i.e. where the City's long-range planning goals and strategic directions are achieved).

Carling Avenue Transit Priority

The main capacity constraint in the study area road network is expected to be Carling Avenue. Carling Avenue currently has a 6-lane urban cross-section, which can comfortably accommodate existing traffic volumes that can reach 2,000 vehicles per hour in the peak direction (at isolated locations) in the morning and afternoon peak hours. The City's plan to implement bus rapid transit (BRT) along Carling Avenue will have significant vehicular capacity implications resulting from the removal of two travel lanes (one in each direction) to improve transit and active transportation priority and performance.

The Carling Avenue Transit Priority Study (WSP, 2017) estimated that BRT implementation would contribute to a 20% reduction in peak direction background traffic, and up to 15% reduction in the off-peak direction along certain sections. However, even with this reduction, the WSP study noted that certain intersections (mainly arterial-to-arterial) were still expected to experience periods of congestion due to signal timing constraints with the introduction of transit priority timings, and increased pedestrian and cycling accommodations. This result was balanced by greatly improved transit service with median transit lanes, and safety for cyclists, who would have segregated cycling facilities throughout the corridor.

Therefore, TOH will ensure active transportation and transit accommodations are maintained at all access intersections along Carling Avenue to support the planned BRT implementation, with the understanding that major intersections will continue to show higher levels of congestion in the future.

City-wide AT and Transit Initiatives

In keeping with the vision and strategic directions outlined in the current Official Plan and further reinforced in the upcoming New Official Plan, the City has been adopting aggressive policies within transit-oriented development (TOD) areas in hopes of reducing personal vehicle use, such as the Preston-Carling Secondary Plan. In addition to the noted Carling Avenue Transit Priority measures, the ongoing Stage 2 LRT construction that will bring approximately 43 kilometers of new rail and 24 new stations by 2025, further expansion as part of the Stage 3 LRT extension, and a new multi-use pathway (MUP) on Rochester Street or Booth Street are all expected to have an impact on background traffic mode share assumptions within the study area.

The Carling Avenue Transit Priority Study also highlighted the City's longer term intensification goals and the achievement of TOD and stating "transit service along the corridor is expected to increase by approximately 2% per year, for a total increase of 30% by 2031."

For the purpose of this analysis, it has been assumed that up to 5% of additional background traffic (two-way) would be removed from all arterial and collector roadways by 2028 and 10% by 2048 to account for long-term implementation of City-wide sustainable transportation initiatives.

TOH Mode Share Targets

The new Civic Development will be located in a significantly better transit catchment area, directly adjacent to the Dow's lake LRT Station and the aforementioned Carling Avenue Transit Priority Corridor with continuous transit lanes. The new campus will also be located at a hub of various multi-use pathways (MUPs), including the Trillium Pathway and the Rideau Canal Western Pathway, which provide regional connectivity to other major pathways such as the Albert Street MUP, Ottawa River Pathway, and the Experimental Farm Pathway. The combined synergy of these facilities combined provide an excellent incentive for future staff and visitors to take

alternate modes of transportation. Therefore, the anticipated target non-auto mode shares at opening day 2028, and 2048 were considered acceptable.

However, more aggressive non-auto mode share targets may ultimately be needed to reduce potential congestion at major intersections near the future campus and to mitigate potential on-site parking implications. These goals may be achieved through the implementation of a robust and comprehensive TDM Plan, which is discussed in further detail in **Section 5.5: TDM**.

Summary

The demand rationalization assumptions at Opening Day (2028) and Full Buildout (2048) are:

2028:

- 15% reduction in background traffic for EBT and WBT movements at Carling Avenue local or collector intersections
- 15% reduction in background traffic on all movements at Carling Avenue major collector/arterial intersections
- 5% reduction in background traffic on all movements at collector or arterial intersections not on Carling Avenue

2048:

- 20% reduction in background traffic for EBT and WBT movements at Carling Avenue local or collector intersections
- 20% reduction in background traffic on all movements at Carling Avenue major collector/arterial intersections
- 10% reduction in background traffic on all movements at collector or arterial intersections not on Carling Avenue

The demand rationalization peak hour traffic volumes in 2028 and 2048 have been provided in **Appendix N.**

5.0 STRATEGY REPORT

5.1 Development Design

5.1.1 Design for Sustainable Modes

5.1.1.1 Pedestrian/Cycling Routes and Facilities

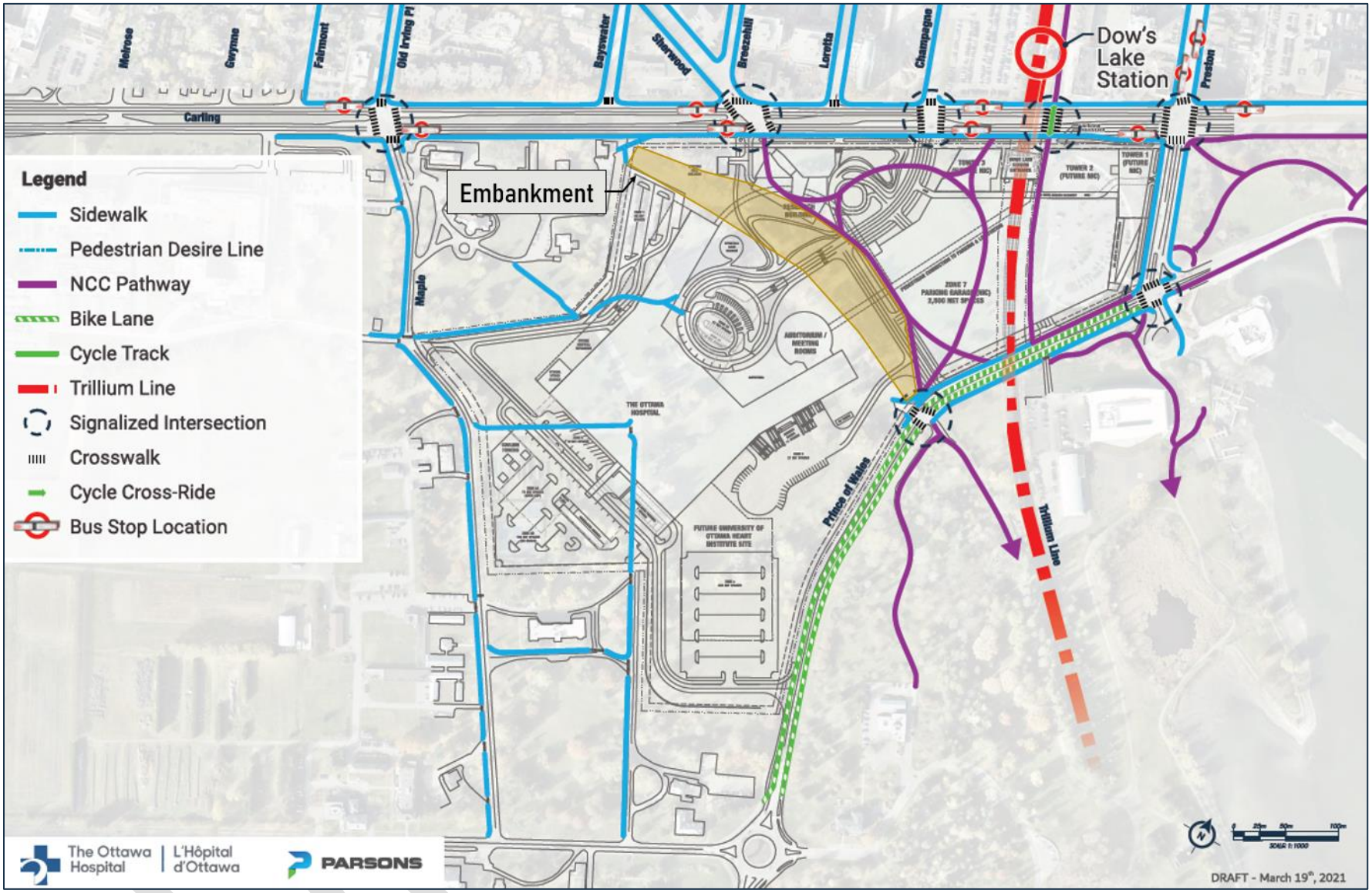
Surrounding Network

The New Civic Development will be located at a hub of converging pathways and offers far superior pedestrian and cycling infrastructure than the existing Civic Campus, as described in **Section 3.1.3.4**.

To the north of the New Civic Development lies the Trillium Pathway, which offers a predominantly grade separated pathway extending to Albert Street and the Ottawa River Pathway, both major active transportation connections in the City. To the southeast is the Rideau Canal Western Pathway, which provides grade separated connection to Downtown Ottawa and to the Rideau Canal Eastern Pathway at Rideau Canal locks 9 and 10. The latter provides connectivity to Ottawa South. To the southwest, is the Experimental Farm Multi-use Pathway.

In the future, cycle tracks are planned on Carling Avenue as part of the Carling Avenue Transit Priority design, cycling facilities are proposed on Prince of Wales and Preston Street associated with the New Civic Development, and potential City cycling facilities have been identified on Rochester Street and Booth Street. The combined synergy of these initiatives provides excellent opportunities and incentives for New Civic Development staff and visitors to use more sustainable modes of transportation.

Figure 26: Existing Active Transportation Facilities at the New Civic Development



Existing Site

At this time, the subject site is primarily park land with recreational amenities on and surrounding the site, such as the Queen Juliana Park, the Central Experimental Farm to the west and south, and Dow's Lake to the east. Various active travel connections currently permeate the site, as shown in **Figure 26**.

Existing on-site active transportation connections will be maintained where possible, while new or enhanced connections will be provided. One of the key constraints within the subject site is the terrain; there is a steep embankment that begins at Carling (near Bayswater) and proceeds east along the south limit of Queen Juliana Park to Prince of Wales, effectively bisecting the site. The grade differential between the top and bottom of the embankment is roughly 15m at its peak. **Figure 27** shows two perspectives of this embankment today.

The main Hospital building will be located on the upper embankment, which creates challenges in connecting active transportation facilities to the lower embankment area while meeting accessibility and appropriate design standards. Despite these challenges the majority of existing connections were successfully maintained, though some may have been re-routed or diverted to accommodate new buildings or structures on-site.

Figure 27: Existing Elevations at New Civic Development

Source: Google. Top - Image from 2009, prior to the demolition of the Sir John Carling Building. Bottom – View from Carling/Bayswater looking south.

New Civic Development Active Transportation Plan

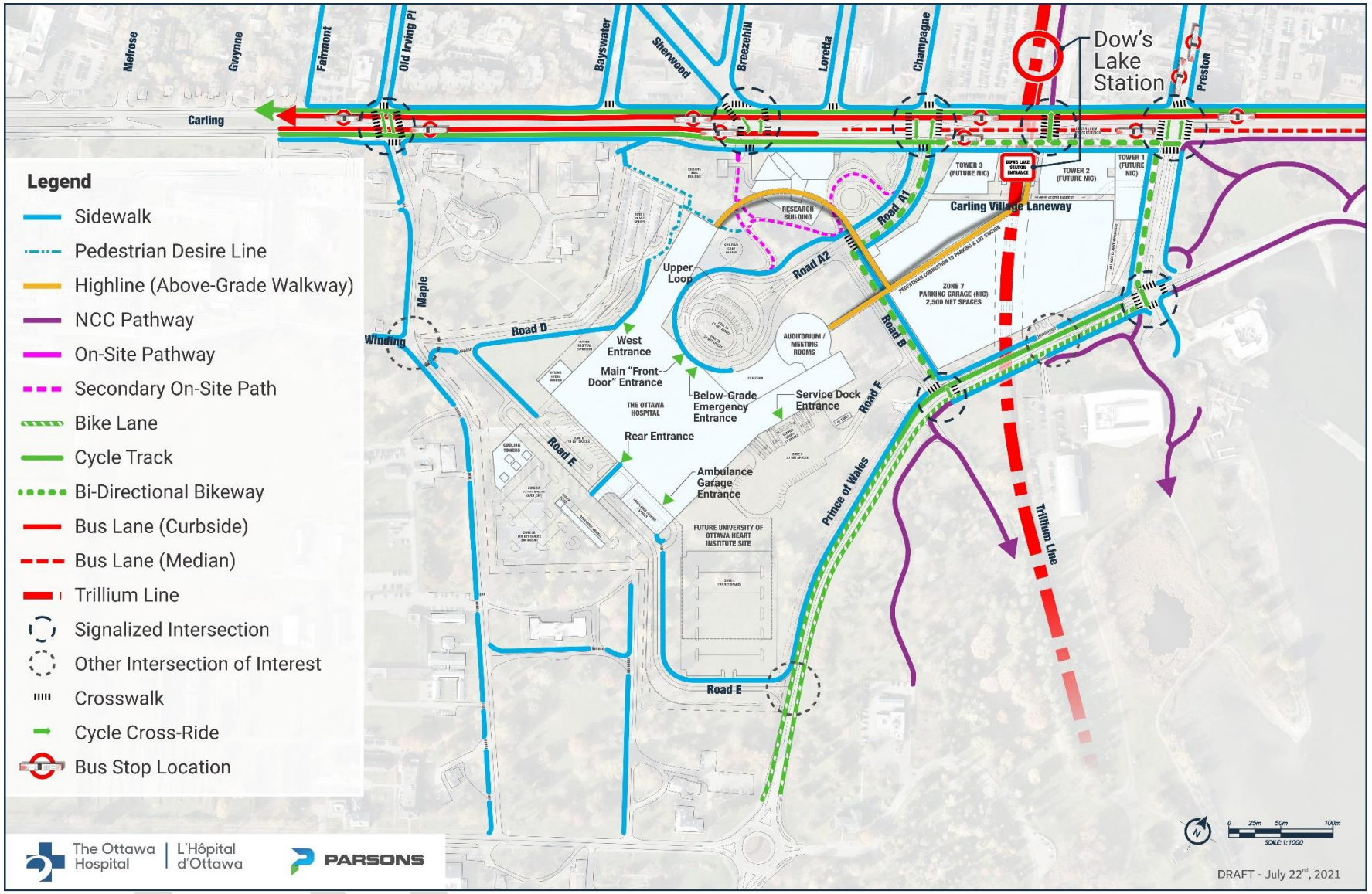
In developing the Active Transportation Plan (ATP), the primary goal was to ensure a quality experience for all employees and visitors of the new campus, creating a sense of place. Essential National Capital Commission (NCC) policies have been adopted as part of the new Civic Development design, including:

1. Encourage active mobility and the use of transit by providing a pleasant pedestrian and cycling experience and adequate facilities for users.
2. Locate the main pedestrian accesses to provide a pleasant walking experience. Design a direct connection to transit at the Trillium Line (Dow's Lake) Station.
3. Locate and organize access, lay-bys, and drop-offs to improve wayfinding and to minimize conflicts between vehicles, cyclists, and pedestrians.
4. Demonstrate best practices for universal accessibility, meeting (an, where possible, exceeding) nationally accepted standards and guidelines.

Figure 28 illustrates the current iteration of the New Civic Development ATP including proposed pathways, sidewalks, and bikeways or cycle tracks, based on anticipated on-site building and facility locations, and anticipated active transportation desire lines. Some of the key elements of the ATP, relating back to the NCC policies have been highlighted below. Note, the specific treatments and on-site design details have yet to be defined and will be confirmed during the Site Plan Control approvals for future development phases.

- **The Highline:** A new grade separated pedestrian connection has been proposed within the New Civic Development. This connection will be elevated and sheltered, providing an attractive route between Dow's Lake Station and Carling Village (including the future parking garage), the research building off Carling, and the main Hospital building (both the East and West arms). This connection will provide a high-quality and pleasant experience for active transportation and transit users that is free of conflicts with vehicular traffic.
- **Main Building Access**: In addition to the Highline, multiple pedestrian connections have been proposed on-site to access the main Hospital building. A sidewalk will be provided on the north side of Road A and the east side of Road B that will connect pedestrians to the main building entrance from Carling/Road A and Prince of Wales/Road B. Sidewalk connections have also been proposed in the rear of the building Roads D and E that provide access to the west and south emergency entrances. Therefore, all viable access points to the subject site will have pedestrian accommodations that will meet AODA standards.
- **Other Pedestrian Desire Lines**: An existing staircase just west of Sherwood Drive off Carling Avenue provides access over the embankment to parking facilities adjacent to the Sir John Carling Cafeteria. While no formal connection to this stairway has been noted in the ATP, it does present a potential opportunity to provide another access to the main Hospital building.
- **Pick-up/Drop-offs**: Pick-up and drop-off areas have been provided within 50m of the main Hospital building entrance and the Research building entrance. All proposed parking areas will be accessible by either sidewalk or pathway.
- **Queen Juliana Park Pathway:** The current asphalt pathway begins at Carling/Sherwood and proceeds south, parallel to the embankment, to Prince of Wales. The New Civic Development will remove this pathway and replace it with a secondary on-site path to enable pedestrians to navigate from Carling/Sherwood to the north crosswalk at Road A/Road B. Upon crossing, a sidewalk on the east side of Road B will enable pedestrians to reach Prince of Wales. Cyclists will be able to travel on Carling between Sherwood and Road A1 on City planned cycle tracks, then use the proposed bi-directional bikeway onsite to travel to/from Prince of Wales.

Figure 28: Proposed AT Plan and Future Transit Network at the New Civic Development



It is important to note that the secondary on-site paths were designated as such due to potential challenges to adhere to AODA standards. Ideally AODA standards will be achieved, however the design is constrained by the steep grades approaching the embankment, which may trigger additional accommodations and mitigation measures. These details will be evaluated further and confirmed during the Site Plan Application (SPA).

- **Prince of Wales**: The existing active transportation facilities along Prince of Wales, between Preston and Road B will be enhanced with a cycle track and sidewalk on the north side, which replaces the multi-use pathway and on-road bike lane.
- **Trillium Pathway**: The Trillium Pathway, south of Carling to Prince of Wales, will be discontinued by the future parking garage structure. As a result, two new routes are proposed to accommodate this popular desire line.
  Firstly, a new bi-directional cycling facility and sidewalk will be provided on the south side of Carling, between Champagne and Preston, then on the west side of Preston down to Prince of Wales that will accommodate active users to the Rideau Canal Western Pathway at Dow's Lake. This proposal represents a direct replacement of the current Trillium Line pathway.
  Secondly, the same facilities (sidewalk and bi-directional cycling facility) have been provided within the New Civic Development on the east side Road A1 and the north side of Road B, abutting the future parking garage that will connect to Prince of Wales/Road B intersection. A new signalized intersection with a cross-ride on the north crossing will be provided. This secondary link may also accommodate existing Trillium Pathway or Queen Juliana Pathway users destined south on Prince of Wales or to the NCC Scenic Driveway.

Proposed cross sections of adjacent and internal roads have been provided in **Appendix O**, which highlight how active transportation facilities will be integrated into the right-of-way and internal network.

The anticipated desire lines for active transportation modes at the new Civic Development have been identified in **Figure 29.** The most prominent desire line was expected to be directed northeast of the main building, which leads to the Dow's Lake Station, the Trillium Pathway, the main parking structure and Little Italy. This understanding lead to the development of the Highline, potentially carrying over 1,500 active transportation users during the peak hour periods. The secondary desire line was directed north to the Sherwood/Carling intersection, the location of the nearest bus stops. Minor desire lines were also shown, which reflect the various destinations that can be accommodated by active transportation facilities at the new Civic Development.

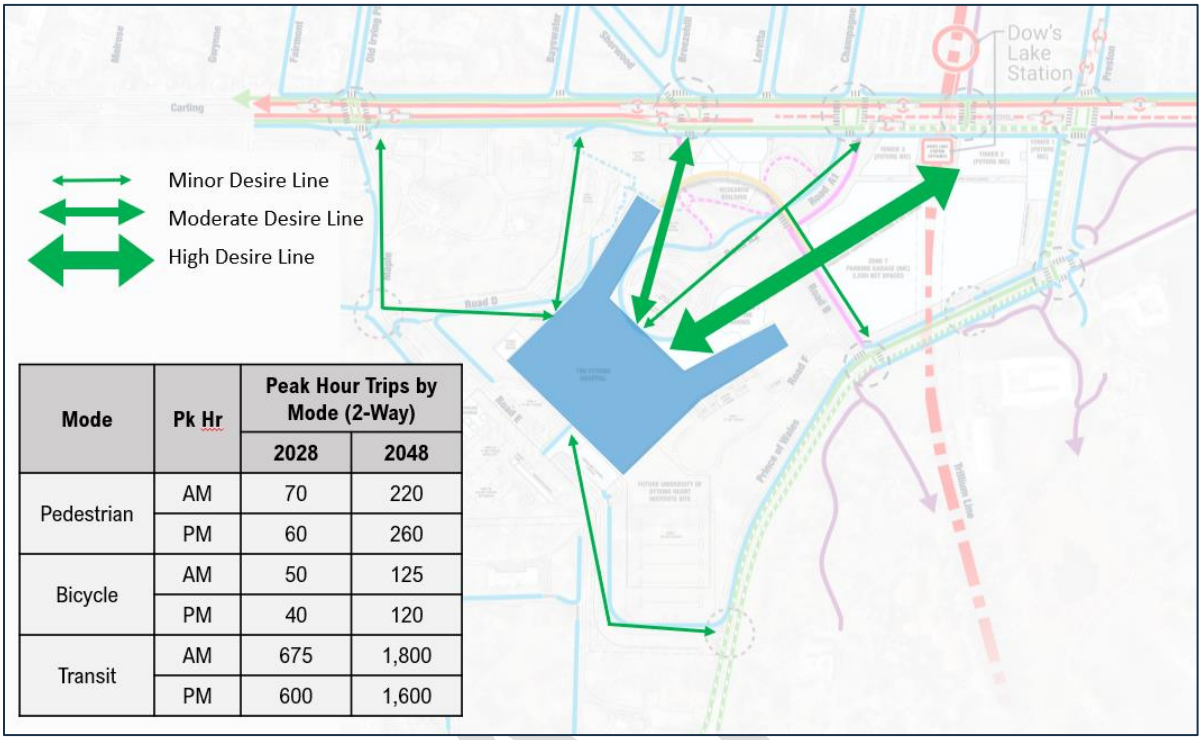
Of note, TOH made the design choice to limit direct access to the front entrance of the main Hospital building for cyclists, to reduce potential vehicle/cycling conflicts on Road A2. However, secured bike parking will be provided in the parking garage where cyclists may then transition to pedestrians. Additionally, cyclist may still access the rear of the main Hospital building via Carling to Maple to Road D, and Prince of Wales to Road E.

5.1.1.2 Location of Transit Facilities

There are no plans at this time to extend transit service into the New Civic Development. Transit service will remain on the adjacent road network, but the previously discussed ATP will ensure high-quality connections to City transit service are provided.

The previous **Figure 28** also noted proposed transit infrastructure. All-day bus service operations will remain on Carling Avenue, and the Dow's Lake LRT Station is located directly across the subject site. The straight-line distance between the main Hospital entrance and the existing Dow's Lake Station platform is roughly 400m.

Figure 29: Active Transportation Desire Lines



Mode	Pk Hr	Peak Hour Trips by Mode (2-Way)	
		2028	2048
Pedestrian	AM	70	220
	PM	60	260
Bicycle	AM	50	125
	PM	40	120
Transit	AM	675	1,800
	PM	600	1,600

There are on-going discussions between TOH, the LRT Office, and City of Ottawa on extending Dow's Lake Station south of Carling, to provide direct access within Carling Village below-grade. Providing the southern portal removes the need for pedestrians to cross Carling Avenue at-grade, effectively avoiding a mix of vehicles and pedestrians and improving the quality of experience for transit and active transportation users. A southern portal ensures the entire journey between the main Hospital building to Dow's Lake Station is sheltered and without conflict, beginning in the Highline and ending with the below-grade portal that leads directly to the LRT platforms.

The Carling Avenue Transit Priority Study functional design generally maintained bus stops at their existing locations, but incorporated transit lanes (both curb side and median) and a multi-use pathway on both sides of Carling. The ATP includes various routes to access bus stops on Carling Avenue, either by via sidewalk or pathway. The straight-line distance from the main Hospital entrance and the nearby bus stops at Sherwood and Champagne are roughly 200m and 300m, respectively.

5.1.2 Circulation and Access

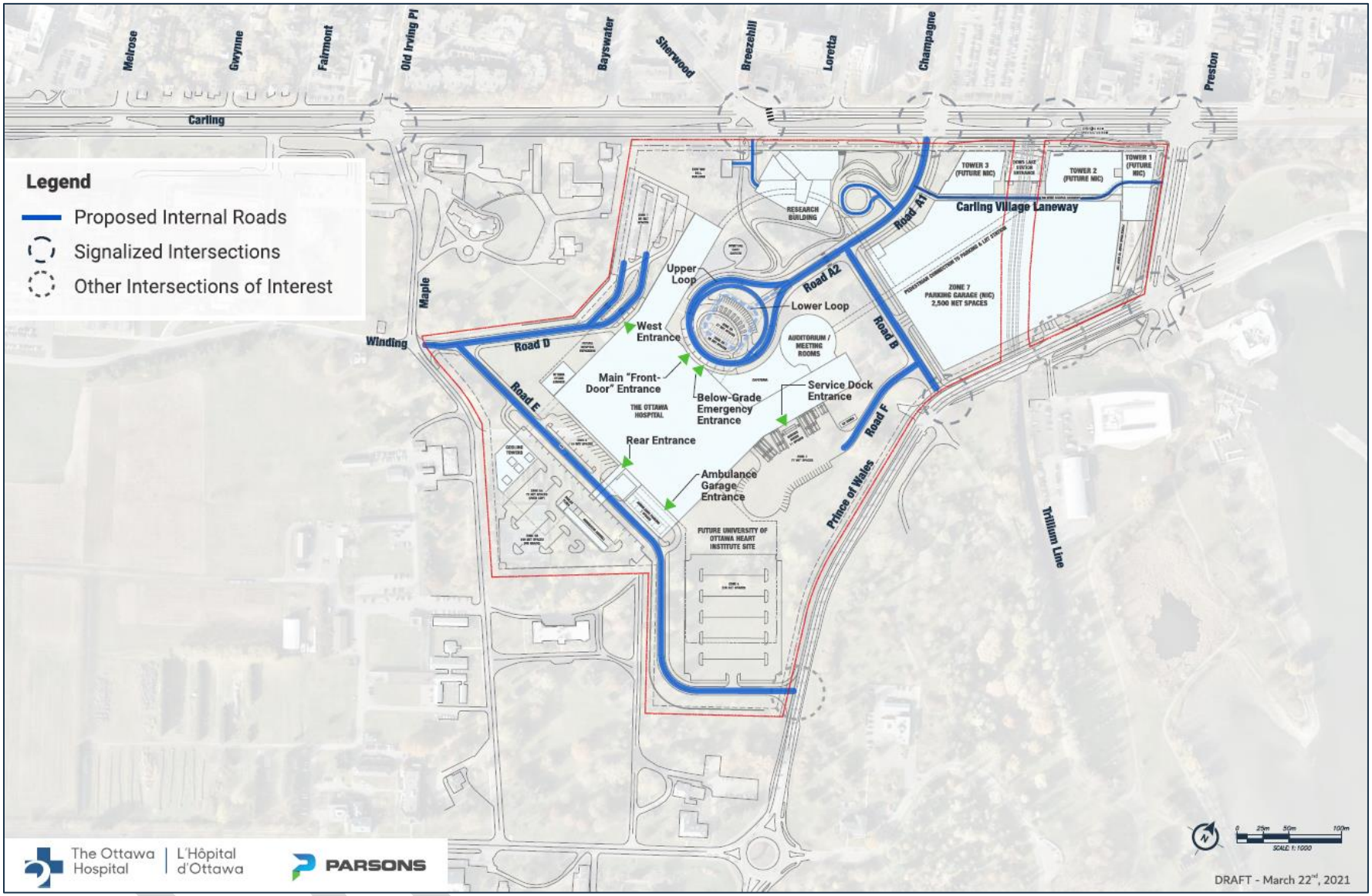
The future Hospital campus circulation and access will be described in **Section 5.1.3: New Streets Network**, which introduces the new internal road network layout.

5.1.3 New Streets Network

Figure 30 shows the proposed internal road network layout with key entrance locations to the future Hospital campus. Cross-sections of the key internal roadways have been provided in **Appendix O.** There are six key internal roadways proposed, including:

- **Road A**: The primary access road for staff and visitors off Carling Avenue. Ambulances and non-urgent transports are not intended to use this roadway. Road A will become the southern leg of the existing Champagne/Carling intersection. Road A will have a 4-lane cross-section to provide optimum capacity for vehicles headed to the emergency drop-off area below the main Hospital building entrance. An all-way stop sign is proposed at the intersection of Road A/Road B. A sidewalk and bi-directional cycling facility are

Figure 30: Proposed Internal Road Network at the New Civic Development



proposed on the east side between Carling and Road B (labeled Road A1). A sidewalk is proposed on the west side of Road A from Champagne to the main entrance.

South of the Road A/Road B intersection, Road A will diverge, with two lanes heading upwards to the upper-level front-door entrance loop and Zone 2 parking area (refer to **Figure 33** for zone designations), and a single lane proceeds to a below-grade emergency drop-off area loop beneath the main Hospital entrance.

TOH emphasized the importance of efficient vehicle circulation leading to the emergency drop-off area below the main Hospital entrance, which was a critical consideration when designing 4-travel lanes along the entirety of Road A rather than two-lanes with auxiliary turn lanes.

The short distances between internal accesses would have resulted in auxiliary lanes near the full length of road, resulting in short weaving sections, while a fully twinned road allows for indecisive drivers to continue through to the next access without having to merge back to a through lane if they had been in a former auxiliary lane.

Furthermore, a 4-lane cross-section compared to a 2-lane cross section with auxiliary turn lanes and receiving lanes does not increase the footprint of the road and provides similar to the same landscaping availability and cyclist safety (as they will be located on their own bi-directional cycle facility separated by a physical boulevard).

Lastly, a 4-lane cross-section is required on the split (south of Road B) where one lane continues to the upper-level main entrance and lower-level emergency; on the merge where the upper-level main entrance and lower-level emergency lanes meet to form Road A. Wayfinding signs will be provided to facilitate efficiency and fluidity within the site, to ensure vehicles in the correct lanes based on their destination.

- **Road B**: The primary access road for staff, visitors, and deliveries/trucks off Prince of Wales Drive. Similar to Road A, ambulance vehicles and non-urgent transports are not intended to use this road. Road B begins near the former driveway to the south parking lot for the Sir John Carling Building, and ends at an all-way stop intersection with Road A.

  Road B consists of a 4-lane cross-section up to the parking garage entrance, which accommodates truck turns from Road B to/from Road F (approximately 30m west of Prince of Wales), which leads to the service dock for service vehicles and trucks. Beyond the parking garage entrance, Road B continues as a 3-lane cross-section with a layby on the east side of the roadway, up to the intersection of Road A/Road B. A sidewalk and bi-directional cycling facility are proposed on the east side of Road B between Prince of Wales and Road A.
- **Road C**: Does not exist.
- **Road D**: An internal road that provides access to the west entrance of the main Hospital building and the Zone 1 staff parking area. It also connects Maple Drive to Road E. TOH intends to regulate access across this connection, permitting only ambulances and non-urgent transports. Public and staff destined to the main Hospital building will be forced to use an alternative access. Professional staff will only be permitted if responding to an emergency event. Therefore, less vehicular traffic will use Maple. Road D will have a 2-lane cross-section with sidewalk facilities on the south side between Maple and the Zone 1 parking area.
- **Road E**: A secondary access off Prince of Wales that is intended for ambulance, non-urgent transports, limited staff, and visitors. Road E provides access to ambulance garage (Zone 6) and staff parking (Zone 5) at the rear of the hospital, as well as staff and visitors to the future University of Ottawa Heart Institute (Zone 4) location near Prince of Wales. Road E/Prince of Wales will be an unsignalized intersection, stop controlled on the eastbound approach. Road E will have a 2-lane cross-section with a sidewalk on the north/east side of the road.
- **Road F**: Is a minor roadway, extending south from Road B, providing access to the service and truck loading area (Zone 3). Road F will have a 2-lane cross-section with no active transportation facilities. A bulb-out cul-de-sac is proposed so that trucks can perform turnaround operations.
- **Carling Village Laneway**: TOH is proposing a one-way (westbound) roadway with a right-in only access at both Preston Street and Road A. The proposed width will be 6m, predominantly designed for commercial truck delivery drop offs, with a Woonerf design to give priority for pedestrians.

Road F was assessed using truck turning templates for a WB-20 sized design vehicle, to ensure adequate space has been provided. This assessment and other truck turning templates have been provided in **Appendix P**. The precise design of the trucking, emergency, and pick-up/drop-off areas have yet to be finalized, therefore turning templates have not been completed for these locations. Likewise, the internal parking garage design has not been completed. These requirements will be confirmed during the Site Plan Control process.

The proposed layout also ensures efficient operations for ambulance and non-urgent transports, as their operations are located at the rear of the building that are accessed by Roads D and E, which have been segregated from the primary access roads (Road A and B) meant primarily for staff and visitors.

5.2 Parking

5.2.1 Parking Supply

5.2.1.1 Existing Civic Campus Parking Supply

There are approximately 2,500 parking spaces currently provided for the Civic Campus, located both on- and off-site for staff, visitors, patients, and all hospital related services. A summary of all existing parking locations associated with the Civic campus has been provided in **Table 31**, and illustrated in **Figure 31** and **Figure 32**.

Table 31: Existing TOH Parking Locations

Campus	Parking Lot Designation	Structure	User Type
Civic	P1	Parking Garage	Public / Staff
Civic	P1 Outdoor Lot (CSB Lot)	Surface	Staff Only
UOHI	P2 Ruskin	Surface	Public Only
Civic	P3 Indoor	Underground Garage	Staff Only
Civic	P3 Courtyard	Surface	Staff Only
Civic	P4	Surface	Public Only
Civic	P5 (855 Carling Avenue)	Surface	Staff Only
Civic	P6	Surface	Staff Only
Civic	P7	Surface	Public Only
Civic	Experimental Farm 110	Surface	Staff Only
Civic	Experimental Farm 40	Surface	Staff Only
Civic	Fairmont Church	Surface	Staff Only
Civic	Dow's Lake Location	Underground Garage	Staff Only
Civic	1095 Carling	Underground Garage	Staff Only
Civic	*NEW* On-street meters (pay-per-car-plate)	Surface	Public Only

Satellite parking areas are leased with transport to/from the Civic campus provided via a private shuttle service beginning at 5:30am to 9:00pm. There are also intercampus shuttles (between The Civic and other Ottawa Hospital campuses) that operate at 15- to 20-min headway between 6am and 6pm daily.

The estimated ratio of parking space supply to estimated daily personal vehicle trips (of all types, staff, visitors and emergency) at the Civic Campus (including satellite parking) is approximately 0.70, which characterizes the current parking conditions.

In discussions with TOH staff, it was confirmed that the current campus parking demand is high, exceeding the available parking supply. Typical weekday parking is overcapacity from Monday through Thursday, and the staff wait list varies close to 260 names, with an average wait time of approximately 12-16 months.

Figure 31: Existing On-site Parking Locations

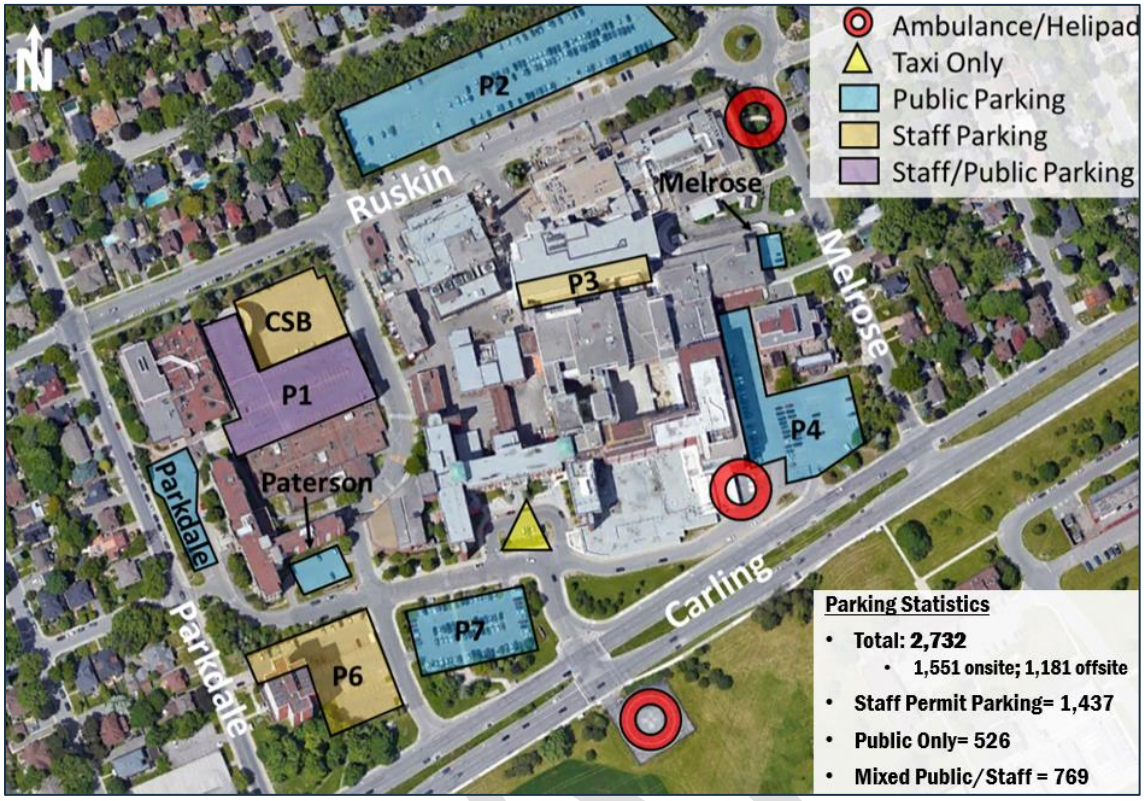
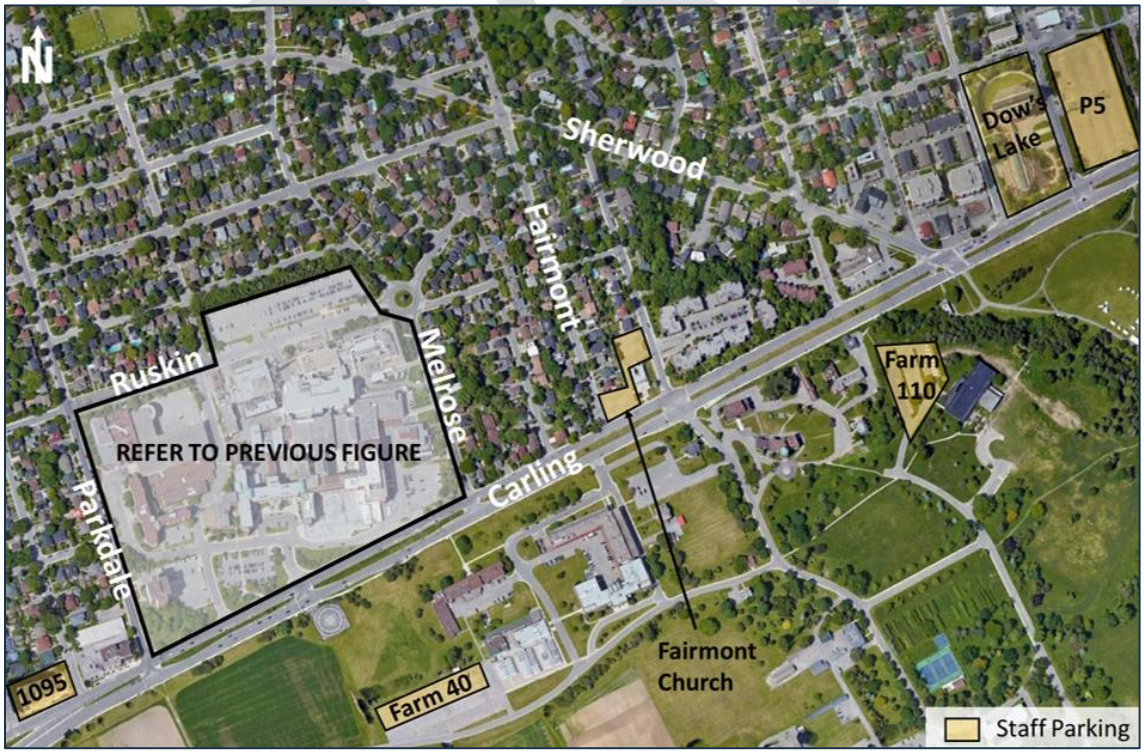
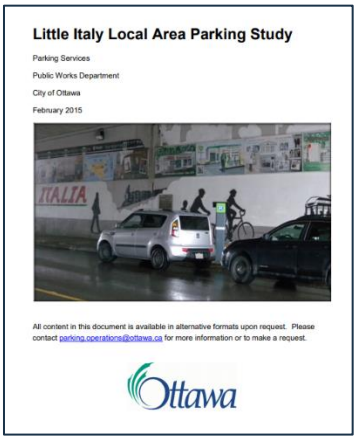


Figure 32: Existing Off-Site (Satellite) Parking Locations



5.2.1.2 Little Italy Local Area Parking Study



The City of Ottawa completed a parking study for the Little Italy Community in February 2015. The study area was bounded by Albert Street in the north, Carling Avenue in the south, Booth Street in the east and the Trillium Line in the west.

A summary of the key findings is as follows:

- South of Hwy 417, between Rochester and the Trillium Pathway to Carling, there are 178 on-street parking, 1,770 off-street parking.
- Within the study on the area south of Hwy 417, it was noted that on-street parking frequently surpassed 85% parking occupancy[6] and occasionally reached +100%, while off-street parking was not being utilized enough, frequently below 75%.
- Off-street lots were observed approaching practical capacity on weekdays in the morning until mid-afternoon.
- On weekday evenings and weekends, when on-street parking is unpaid, the off-street lots in these sections were underutilized.
- Planned intensification is expected to increase local population by 63% over 20 years
- Some of the potential strategies to influence availability of parking included: promoting transit, bike parking, car sharing, off-street parking through improved signage, reduction in driveways to make space for more on-street parking, on-street parking permits for residents, priced parking to meet demands, increased parking enforcement, zoning provisions to unbundle parking (TDM), development agreement to get public parking in new developments.

The underutilized off-street parking supply may present an opportunity for TOH to leverage leasing partnerships if the future onsite parking supply is insufficient to accommodate parking demand at the New Civic Development.

5.2.1.3 Parking By-Law Requirements

According to the City of Ottawa Zoning By-law, the proposed on-site vehicle parking supply at full buildout (2048) is acceptable. Table 32 summarizes the minimum vehicle parking by-law requirements.

Table 32: City Parking Bylaw Minimum

	Gross Floor Area s.m.	Min Parking Rate (Area X, Schedule 1A)	Min Parking Required	Max Parking Rate (Area B, Schedule 1)	Max Parking Permitted
Hospital	330,000 m²	0.7/100 m²	2310	1.6/100 m²	5,280
Retail	7,000 m²	1.25/100 m²	88	3.6/100 m²	252
Office	23,500 m²	1/100 m²	235	2.2/100 m²	517
Research and Development	6,000 m²	0.4/100 m²	24	1/100 m²	60
Medical Facility	22,000 m²	2/100 m²	440	5/100 m²	1,100
		Total Required	**3,097**	**Max Permitted**	**7,209**
		Total Provided	**3,099**		
		Blended Rate	**0.80/100 m²**		

The bylaw minimum bicycle parking requirements have been summarized in Table 33.

[6] 'Parking occupancy' is a measure of how many vehicles are parked divided by the number of spaces. A ratio between 75% to 85% is considered ideal.

Table 33: Minimum Bicycle Parking Requirements

Land Use	Size	Rate	Minimum Bike Parking Required
Hospital Uses			
Hospital	330,000 m²	1 per 1,000 m²	330
Office/R&D/Medical Facility	51,500 m²	1 per 250 m²	206
		Sub Total	**536**
Private Uses			
Retail	0.1M ft² (9,290 m²)	1 per 500 m²	19
Residence	150 units	0.5 per unit	75
		Sub Total	**94**
		Total Combined	**630**

5.2.1.4 Location and Quantity

Vehicle Parking

The location of on-site parking is shown in **Figure 33** with a summary of each location provided in **Table 33**.

Table 34: Estimated On-Site Parking Summary

Parking Zone	Likely Target User	Estimated Parking Supply	Description	Access Road
1	Staff	88	Existing surface lot, former parking for Sir John Carling	Road E
2	Public	55	27 surface spaces at main access and 28 underground for emergency access	Road A - Upper/Lower Travel Loops
3	Trucks / Service / Staff	27	27 surface spaces likely for service staff with 11 loading docks	Road F
4	Public / Staff	238	Proposed surface parking; may become underground once UOHI is built	Road E
5	Staff	172	100 located at grade, 72 over CUP structure	Road E
6	Emergency Vehicle	19	Emergency/Ambulance parking area	Road D and E
7	Public / Staff	2,500	Main parking garage structure	Road A, B and Prince of Wales Parking garage RIRO
	TOTAL	**3,099**		

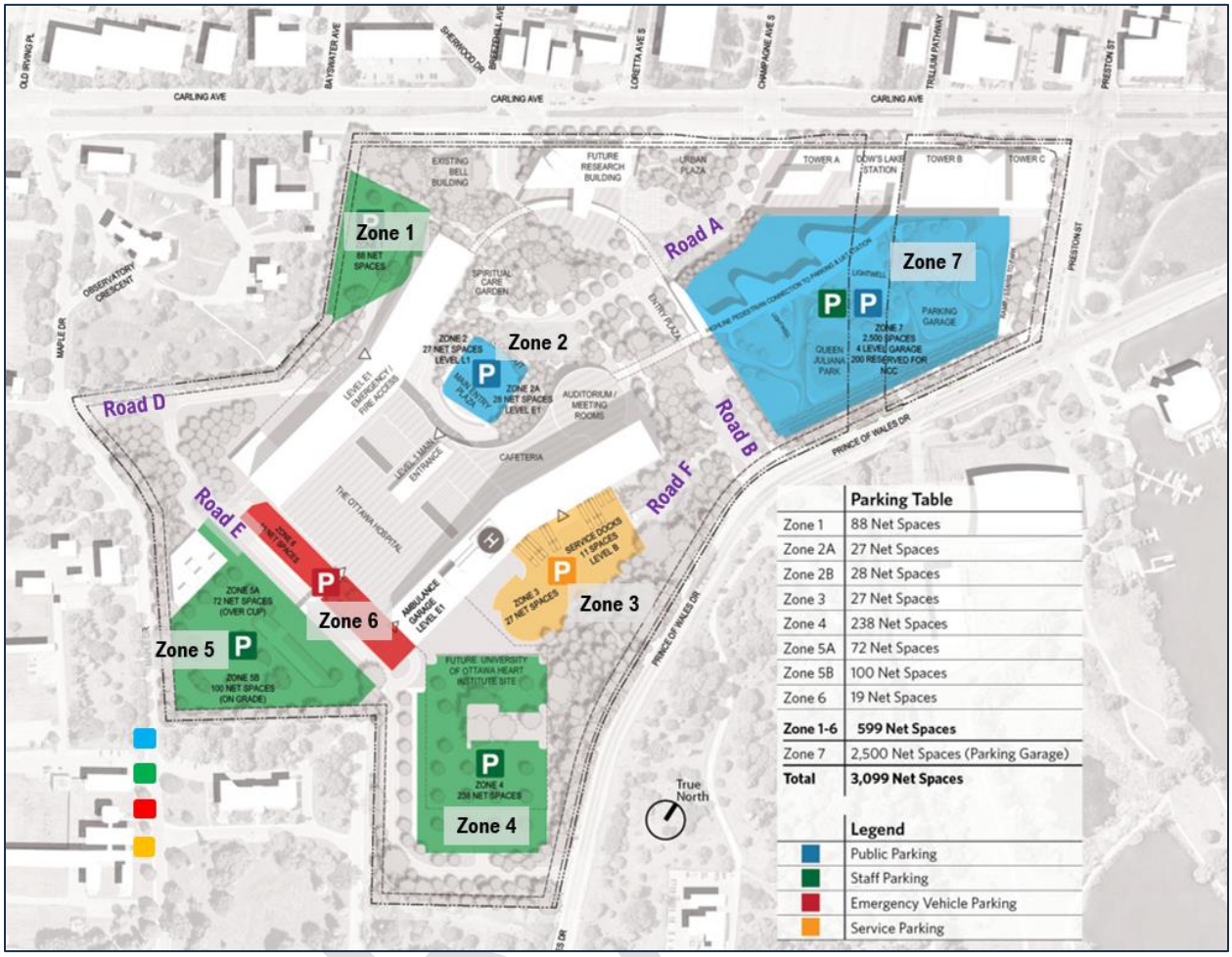
The primary source of on-site parking will be provided by a new parking garage structure located above the Trillium Line, immediately south of the proposed Carling Village area (the northeast quadrant of the site). The parking garage will be a 4-storey structure partially underground, housing approximately 2,500 parking spaces. Ultimately, there will be three access points to the parking garage:

1. All turns access via Road A – inbound restricted to public only, no restrictions outbound
2. All turns access via Road B – no restrictions between public and staff
3. Right-in Right-out (RIRO) via Prince of Wales – no restrictions between public and staff

The remaining parking spaces will be distributed throughout the campus to accommodate the variety of facilities and services needed for the future Hospital.

TOH confirmed their plan to discontinue all existing off-site (satellite) parking leases and parking shuttle services once the parking garage structure is constructed. The existing Civic Campus parking areas, including the parking garage, during the transition to the new campus. It is expected the intercampus shuttle service will remain in operation.

Figure 33: TOH On-Site Parking Plan

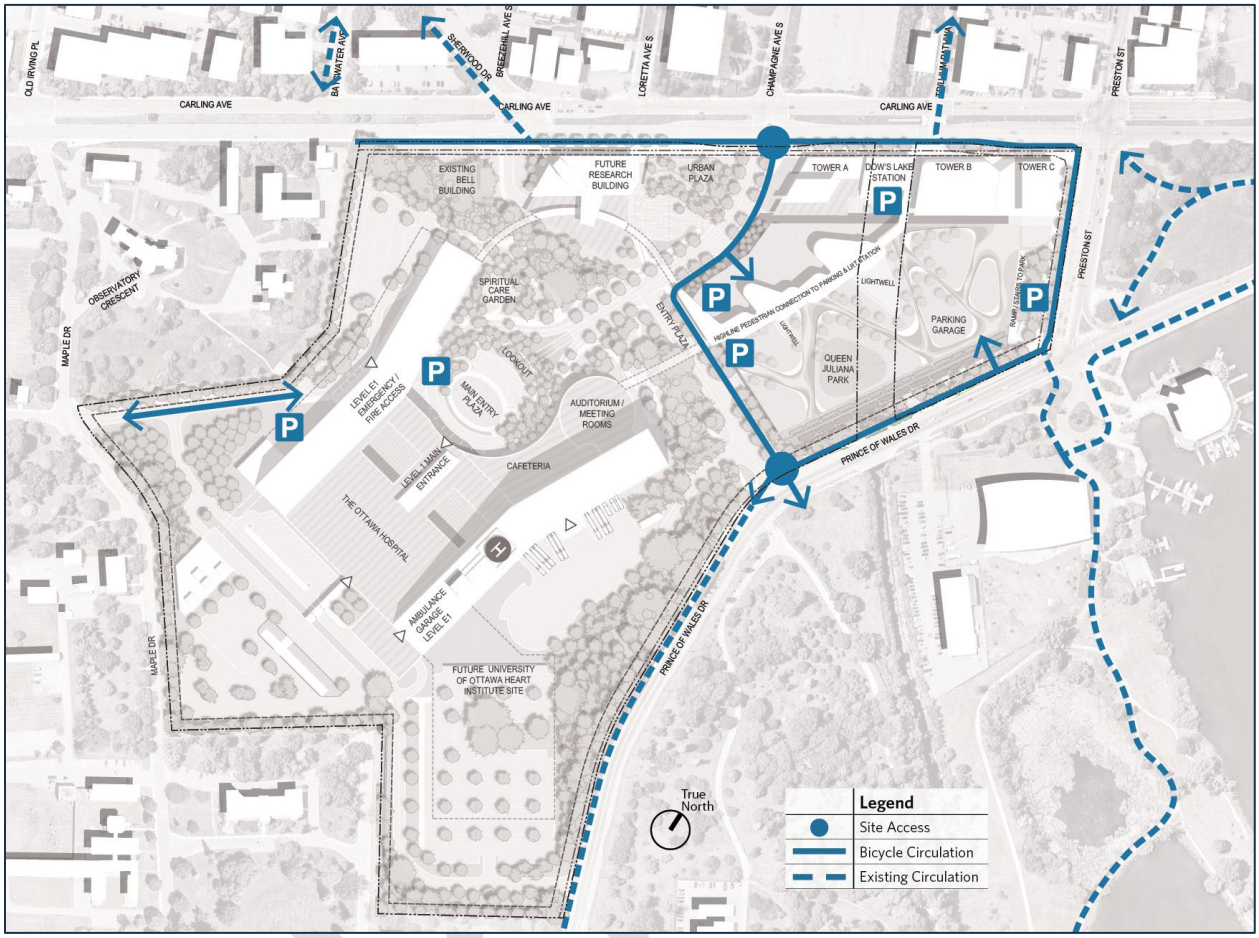


It is important to note that there is a requirement from the National Capital Commission (NCC) to provide approximately 200 public parking spaces within TOH lands to offset the loss of parking across from Dow's Lake Pavilion. This requirement is not expected to greatly affect the available parking supply during the anticipated peak demand period (7:00am to 3:00pm), which does not coincide with the peak recreational periods. There is expected to be ample supply within the parking garage to meet this requirement in evenings and weekends. TOH and the NCC are in the process of coming to an agreement as to how the tour bus parking and visitor parking requirements will be provided.

Bicycle Parking

The location and distribution of bicycle parking spaces will be confirmed at the Site Plan Control stage for the various development phases. Decisions on the location should have regard for: proximity to Dow's Lake Station, the main building and research building entrances that are served by cycling, and within the parking garage itself. There can be an emphasis for bicycle parking at the main building west entrance off of Road D where shower facilities for staff are anticipated. Of note, TOH has made a design decision that cyclists are not to be accommodated at the main entrance at the end of Road A in an effort to minimize potential bicycle/vehicle conflicts, as shown in **Figure 34**. Additionally, where feasible, opportunities for indoor and/or covered parking can be explored.

Figure 34: Bicycle Circulation and Parking Locations



5.2.2 Future Parking Demand

The estimated future vehicular parking demand at the New Civic Development was based on historic trends and future projections provided by TOH for daily vehicle arrivals among three key user groups: staff, patients/visitors, and emergency visitors. The derivation process has been provided in **Appendix Q**.

Current estimates indicate the proposed 3,099 on-site parking spaces will likely be insufficient to accommodate the anticipated parking demand in both the 2028 and 2048 horizon years unless aggressive non-auto mode share targets are achieved. A summary of the parking demand analysis has been provided below.

At Opening Day, 2028:

- If 100% of vehicle trips parked at the hospital at once, assuming 50% of employees, 60% of planned visits and 80% of emergency visits used a personal vehicle, roughly 4,350 spaces would be needed.
- The auto-driver mode share targets needed to accommodate the theoretical maximum with the planned 3,099 parking space supply would be approximately: 35% Employees, 45% Planned Visits, and 60% Emergency Visits.
- If the existing 0.70 parking ratio was assumed (reflecting current parking conditions at the Civic Campus), approximately 3,050 spaces would be needed.
- In this case, the planned 3,099 parking space supply would be adequate, but does not substantially improve the current parking conditions.

At Full Buildout, 2048:

- If 100% of vehicle trips parked at the hospital at once, assuming 35% of employees, 45% of planned visits and 80% of emergency visits used a personal vehicle, roughly 4,700 spaces would be needed.
- The auto-driver mode share targets needed to accommodate the theoretical maximum with the planned 3,099 parking space supply would be approximately: 25% Employees, 30% Planned Visits, and 55% Emergency Visits.
- If the existing 0.70 parking ratio was assumed (reflecting current parking conditions at the Civic Campus), approximately 3,260 spaces would be needed.
- In this case, the planned 3,099 parking space supply would generally be adequate, with periods of overflow (approximately 5%), which does not improve the current parking conditions.

The key finding from the parking demand analysis was that 3,099 parking spaces would only be considered adequate if TOH was accepting of the 0.70 parking space to vehicle trip ratio currently exhibited at the Civic Campus. However, this outcome may not be desirable considering the parking shortfall being experienced at the existing campus, and concerns with long waitlists for staff and inadequate on-site parking for the public.

Therefore, it is expected that more aggressive mode share targets for alternate modes (e.g. transit, walking and cycling) will be required. This goal is achievable based on research of other institutions, but requires the implementation of a robust and comprehensive Transportation Demand Management (TDM) Plan to increase the probability of success.

Ultimately, if the required mode share targets are not met, the largest implication is potential parking spillover into the surrounding neighbourhood streets. To confront this issue proactively, TOH will develop a Parking Management Strategy prior to implementation of Phases 2 and 3 of the New Civic Development to identify potential parking implications and provide mitigation options. TOH will then be prepared to respond to parking supply shortages if they arise. Potential mitigation measures have been outlined in the following section.

5.2.3 Parking Spillover Mitigation

The following section will outline potential responses if sustained parking supply shortages were to occur in the future. Note, this section will not discuss preventative measures, which will be covered in **Section 5.5: TDM**. These and other interventions will be discussed in further detail in the future Parking Management Strategy.

The potential parking spillover mitigation options for consideration at the appropriate time include:

- Collaborate with the City Area Traffic Management group to identify vulnerable streets and to consider appropriate parking restrictions to reduce potential overflow infiltration.
- Increase TDM budget and implement more aggressive TDM measures to encourage use of alternate modes.
- Utilize the existing parking supply at the Civic Campus, and implement a parking shuttle service to the New Civic Development.
- Temporarily reinstate satellite parking leases and shuttle service.
- Investigate off-street parking partnerships/leases in Little Italy, where the 2015 City Parking Study identified underutilized capacity in the off-street supply.
- Offer staff and/or visitor incentives to park offsite, such as at nearby off-street public parking areas in Little Italy, e.g. Preston Square parking garage.
- Construct a temporary overflow parking area to provide a short-term increase in on-site parking supply within the Master Site Plan, providing time to implement longer-term measures, such as identifying spaces within the Master Site Plan that could be utilized for the construction of a second parking garage.

5.3 Boundary Street Design

The multi-modal level of service (MMLOS) is a tool used to grade alternate modes of transportation that are not personal vehicle related (i.e. pedestrian, cyclists, transit, and commercial trucks). MMLOS uses measures of exposure to grade pedestrian and cyclist safety while transit and truck uses delay and road geometries to grade performance.

5.3.1 Existing Conditions

The boundary streets for the development include Carling Avenue, Preston Street, Prince of Wales, and Maple Drive frontage for existing conditions. The typical cross-sections for each roadway fronting the site consist of:

- Carling Avenue consists of 3 vehicle lanes per direction with more than 3,000 vehicles per day, 1.8m sidewalks without boulevard treatment, posted speed of 60km/h with no on-road parking, and classified as a truck route
- Preston Street consists of 2-3 vehicle lanes per direction with more than 3,000 vehicles per day, 1.5m sidewalks without boulevard treatment, posted speed of 50km/h with no on-road parking, and classified as a truck route
- Prince of Wales Drive consists of 1 vehicle lane per direction with more than 3,000 vehicles per day, 1.8m sidewalks without boulevard treatment, posted speed of 60km/h with no on-road parking, and classified as a truck route and a paved bike shoulder
- Maple Drive consists of 1 vehicle lane per direction with less than 3,000 vehicles per day, 1.5m sidewalk on the west side only without boulevard treatment and posted speed of 30km/h with no on-road parking

The proposed site is located within 600m of a rapid LRT station at Carling Station (future Dow's Lake Station). Multi-modal Level of Service analysis for the subject road segments adjacent to the site are summarized in

Table 35 with detail analysis provided in **Appendix R.**

Table 35: Existing Adjacent Road Network MMLOS

Road Segment	Multi-Modal Level of Service (MMLOS)							
	Pedestrian		Bicycle		Transit		Truck	
	PLoS	Target	BLoS	Target	TLoS	Target	TkLoS	Target
Carling Ave.	F	A	F	D	E	D	A	D
Preston St.	E	A	E	D	-	n/a	A	D
Prince of Wales Dr.	F	A	C	D	-	n/a	C	D
Maple Dr. east side	F	A	A	D	-	n/a	-	n/a
Maple Dr. west side	D	A	A	D	-	n/a	-	n/a

Pedestrian

- No pedestrian PLoS targets were met given the aggressive desired targets for locations within 600 meters of rapid transit. The major factors causing poor PLoS includes high vehicular volumes on most road segments, lack of boulevard separation on all segments and fast operating speeds on most segments.

Bicycle

- The bike BLoS targets were met at Prince of Wales Drive and Maple Drive. Carling Avenue and Preston Street did not meet the BLoS desired target due to lack of cycling facilities and high quantity of travel lanes on both roadways.

Transit

- Only Carling Avenue has transit facilities and as such, is the only road segment to be considered for TLoS. Carling Avenue did not meet the TLoS targets mainly due to congestion on Carling Avenue.

Truck

- All truck routes met the TkLoS targets.

5.3.2 Future Conditions

The future boundary streets for the development include Carling Avenue, Preston Street, Prince of Wales and Maple Drive frontage. The typical cross-sections proposed for each roadway fronting the site consist of:

- Carling Avenue is proposed as 2 vehicle lanes per direction with an additional bus only lane, with more than 3,000 vehicles per day, 3.5-meter sidewalks with more than 2-meter boulevard, posted speed of 60km/h with no on-road parking, and classified as a truck route, spine bike route and transit priority corridor with continuous lanes
- Preston Street is proposed as 2-3 vehicle lanes per direction with more than 3,000 vehicles per day, 3-meter sidewalks with more than 2-meter boulevard, posted speed of 50km/h with no on-road parking, and classified as a truck route and a local bike route
- Prince of Wales Drive is proposed as 1-2 vehicle lanes per direction with more than 3,000 vehicles per day, 2-meter sidewalks with more than 2-meter boulevard, posted speed of 60km/h with no on-road parking, and classified as a truck route and spine bike route
- Maple Drive, no anticipated changes from existing and thus, will not be included

The proposed site is located within 600m of a rapid LRT station at Carling Station (future Dow's Lake Station). Multi-modal Level of Service analysis for the subject road segments adjacent to the site are summarized in **Table 36** with detail analysis provided in **Appendix S**.

Table 36: Existing Adjacent Road Network MMLOS

Road Segment	Multi-Modal Level of Service (MMLOS)							
	Pedestrian		Bicycle		Transit		Truck	
	PLoS	Target	BLoS	Target	TLoS	Target	TkLoS	Target
Carling Ave.	C	A	A	C	C	C	A	D
Preston St.	C	A	A	B	-	n/a	A	D
Prince of Wales Dr.	C	A	A	C	-	n/a	C	D

Pedestrian

- No pedestrian PLoS targets were met given the aggressive desired targets for locations within 600 meters of rapid transit. Although there is a large improvement from existing conditions (F to C), it is not sufficient to meet the desired target. The major factors preventing a PLoS of A include high vehicular volumes on all the segments and fast operating speeds.

Bicycle

- The bike BLoS targets were met at all future locations due to physically separated bike lanes.

Transit

- Carling Avenue met the TLoS targets.

Truck

- All truck routes met the TkLoS targets.

5.4 Access Intersection Design

5.4.1 Location and Design of Access

Public or Staff Access

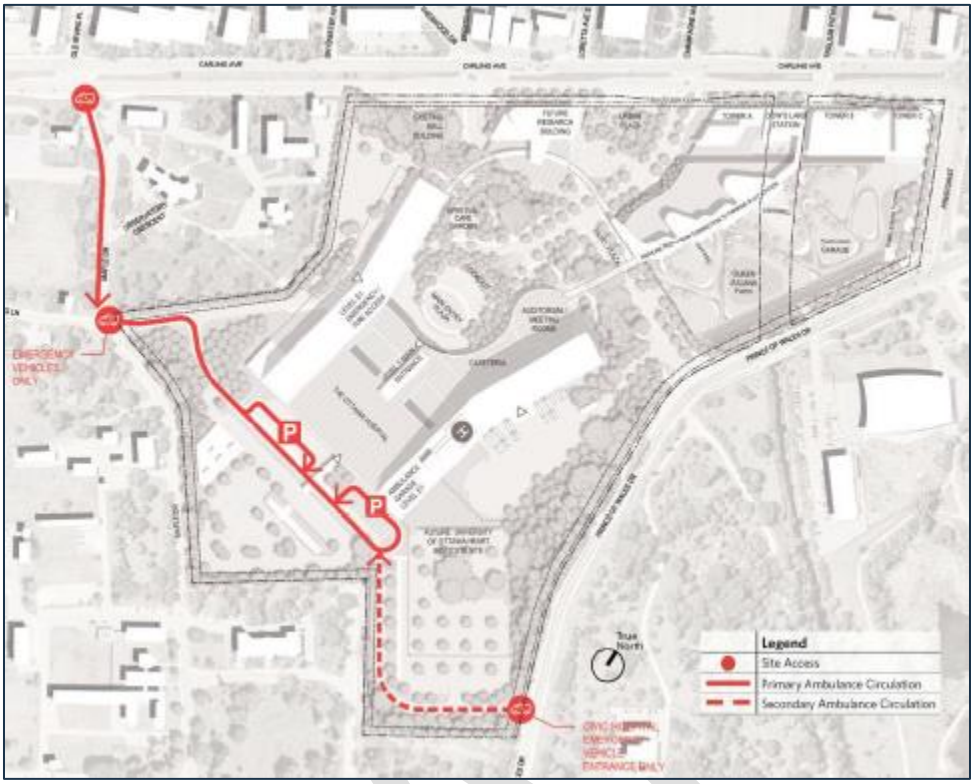
The description of proposed local roads has been provided in **Section 5.1.3: New Street Network.** The following summary describes the corresponding access intersections to the New Civic Development.

- **Road A/Carling** will be the main access off Carling Avenue, located at the existing Champagne/Carling intersection. The primary function of this intersection is to provide direct access to the main Hospital building front door on the upper-level, the lower-level emergency drop-off, and the Road A parking garage access.
- **Road B/Prince of Wales** will be located approximately 200m west of Preston. It will be the primary access intersection to the Road B parking garage access and for Prince of Wales traffic destined for the main Hospital building upper- and lower-level areas. This is also the main entrance for trucks and service vehicles destined to the loading dock via Road F.
- **Parking Garage RIRO/Prince of Wales** will be a right-in right-out (RIRO) access to the proposed parking garage has been proposed on the north approach, located opposite Navy Private (approximately 100m west of Preston). The RIRO restriction will be enforced by a raised island within TOH property. A median enforcement was not permitted since all-movement access to Navy must be maintained.
- **Road D/Maple** is located at the existing Winding/Maple intersection. It will provide access to Road E, leading to the rear of the main Hospital building for ambulances and non-urgent transports.
- **Road E/Prince of Wales** will be located over 100m north of the NCC Scenic Driveway. It will provide access from Prince of Wales to the rear of the main Hospital building for ambulances and non-urgent transports, reserved staff parking, and a small number of visitors to the future University of Ottawa Heart Institute (UOHI).
- **Carling Village Laneway/Preston** will be a one-way westbound right-in only access from Preston, approximately 30m south of Carling, providing access for commercial deliveries serving Carling Village.
- **Driveway/Carling** is an existing driveway access limited to RIRO only at the intersection of Carling/Sherwood. The future design will incorporate a raised island to reinforce the turn restrictions. This driveway will continue to provide access to the existing Bell utility building, and in the future the proposed Research Building will use the access for receiving and shipping, recycling, composting and garbage pickup.

Emergency Accesses

Wayfinding will direct ambulances and non-urgent transports on Carling to Maple to Road D and finally Road E, while emergency vehicles on Prince of Wales will be directed to Road E. Road E provides access to the ambulance/emergency receiving areas at the rear of the main Hospital building. The helipad will be located atop the east 'arm' of the main Hospital building. The proposed ambulance and emergency transport circulation plan is shown in **Figure 35**.

Figure 35: Ambulance Circulation



5.4.2 Intersection Control

Intersection warrants, including roundabout screening forms, were completed where applicable and have been included in **Appendix S**. The recommended control for key access intersections have been outlined below.

- **Champagne/Carling:** This intersection will be maintained as a signalized intersection.
- **Road B/Prince of Wales:** The traffic signal warrant for this intersection was not triggered. A roundabout screening form deemed this intersection a plausible candidate for a roundabout design. Both signal and roundabout options were evaluated operationally.
- **Navy/Prince of Wales:** The current stop control on the minor approach should be maintained.
- **Road D/Winding/Maple:** The existing all-way stop control will be adequate for operations, but consideration of a roundabout may be preferable to maintain traffic flow for emergency vehicles and as a gateway feature. A roundabout screening form confirmed deemed this intersection a plausible candidate for a roundabout design. TOH is expected to regulate traffic on Road D between Maple and Road E to ambulances and non-urgent transports only.
- **Road E/Prince of Wales**: The traffic signal warrant for this intersection was not triggered. Stop control on the side street was considered adequate.
- **Carling/Sherwood/Driveway:** This intersection will be maintained as a signalized intersection.

5.4.3 Intersection Design

The following summary highlights any specific intersection treatments needed to satisfy private approach by-laws and/or performance requirements. The proposed access intersection designs, which were based on the Carling Avenue Transit Priority Study functional designs can be found in **Appendix C**. Note, auxiliary lane storage length requirements will be confirmed in the queueing analysis in **Section 5.9.7**.

Road A/Champagne/Carling: The proposed intersection design will add a south leg (Road A) to the existing intersection; however the northbound approach will prohibit the through movement to deter short-cutting through the local community to the north. This design maximizes storage capacity for the northbound left and northbound right-turn movements. The recommended spacing to the nearest intersection is 60m, which is met.

A new westbound left-turn lane and eastbound right-turn lane will be added to accommodate anticipated New Civic Development traffic. The westbound left-turn lane length will be limited to approximately 60m due to the proximity of the existing Trillium Line bridge.

- **Road B/Prince of Wales:** Although a roundabout design was initially considered, it was ultimately ruled out due to potential right-of-way implications and grading constraints. Therefore, a traffic signal design was developed. An eastbound left-turn lane will be required. A westbound lane was added to Prince of Wales to increase through capacity and provide appropriate space for truck turning movements. The minimum 60m intersection spacing was met.
- **Parking Garage RIRO/Prince of Wales:** The RIRO to the proposed parking garage will be enforced by a raised island within TOH property. Appropriate signage will also be provided reinforce this restriction. The minimum intersection spacing requirement was met.
- **Road E/Prince of Wales:** No special treatments were recommended at this intersection.
- **Carling Village/Preston:** This intersection is proposed as a right-in only. While the corner clearance standard for arterial roads is not met, general traffic will be prohibited from use. Therefore, there is no expectation for capacity issues at this location.

5.5 Transportation Demand Management

5.5.1 Context for TDM

Transportation Demand Management (TDM) refers to an approach to transportation planning and design that focuses on creating a more sustainable transportation system. TDM influences whether, why, when, where, and how people travel, thereby motivating important changes in travel behaviour including: modal shift, trip reductions, driving reductions, and time and route shifting.[7]

The new Civic Development will be a state-of-the-art facility employing over 10,000 workers and providing essential healthcare to a large portion of the City of Ottawa. Once operational, the Hospital will create a sizable shift in transportation impacts in the immediate area, and a proactive approach to managing and mitigating these impacts is essential.

5.5.2 Needs and Opportunities

At full buildout, the new Civic Development will consist of approximately twice the number of patient beds, twice the gross floor area, and approximately three times the number of staff currently working at the existing Civic Campus. This growth will trigger a significant increase in person trips that must be accommodated within the adjacent transportation system at the new location.

Our understanding of the area road network from discussions with City staff, public stakeholders, and a review of local traffic studies have confirmed that the two adjacent arterial roadways to the new Civic Development, Carling Avenue and Prince of Wales Drive are both heavily utilized corridors particularly during the peak periods. Reducing the number trips by personal vehicle will be critical to maintain reasonable operation of the adjacent road network.

[7] Transportation Demand Management Strategy, Noxon Associates Ltd., May 2012, pg.1

Current parking demand projections suggest that while the proposed 3,099 parking space supply may be adequate, it would not provide an opportunity to address the parking availability pressures experienced by existing hospital employees and visitors. Therefore, TOH should endeavor to reduce personal vehicle use by staff and visitors as much as possible to avoid this outcome.

As discussed in **Sections 4.1** and **4.2**, the new Civic Development will be located above of the Trillium LRT Line, adjacent to Dow's Lake Station, and at a crossing point of two City cross-town bikeways (Trillium Line Pathway and Prince of Wales), a major pathway (Rideau Canal Western Pathway), and a City spine route (Carling Avenue). Carling Avenue is also slated to be converted to a BRT corridor within the next 10 years, further increasing the quality of transit service in the area. This proximity to high-quality transit and active transportation facilities presents an excellent opportunity to increase the use of alternate modes at the new Civic Development.

Additionally, the City has been adopting aggressive policies in transit-oriented development (TOD) in hopes of reducing personal vehicle use. This is highlighted by the recently approved Corso Italia Station District Secondary Plan and Preston-Carling District Secondary Plan (last amended in 2018). The latter governs the subject site, and is a policy based approach that aims to find a balance between vehicular parking in the area and the type of parking; to reduce incentives for employees to commute by car, but still offer parking for short term visitors; increasing density and creating local neighborhoods by providing a variety of land uses to encourage local shopping, working and recreation accessible by walking and biking; by improving alternate mode of transportation infrastructure. The timing of the TOH relocation is a tremendous opportunity to be ambitious with the TDM Strategy and push the boundaries of these policies to increase sustainable modes and reduce dependency on the personal vehicle.

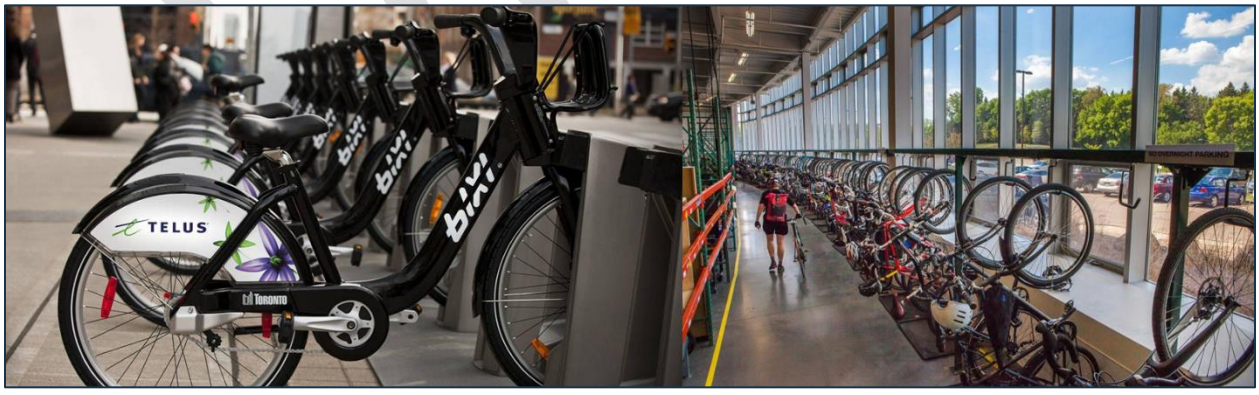
5.5.3 TDM Framework

The following section will identify a general TDM framework with the understanding that a comprehensive TDM Plan will be undertaken by TOH as a separate assignment prior to Site Plan Control Approval for each phase of development.

5.5.3.1 Research of TDM Implementation

A study from Transportation Research Part D: Transport and Environment[8] found that employees are approximately five times likelier to bike to work if they had access to showers, lockers, and secure bike parking spaces. Additionally, he found that 62% of millennials want to live in walkable cities with access to bike lanes and other infrastructure for alternative modes of transportation.

Figure 36: Bike Storage and Bike Sharing Platforms



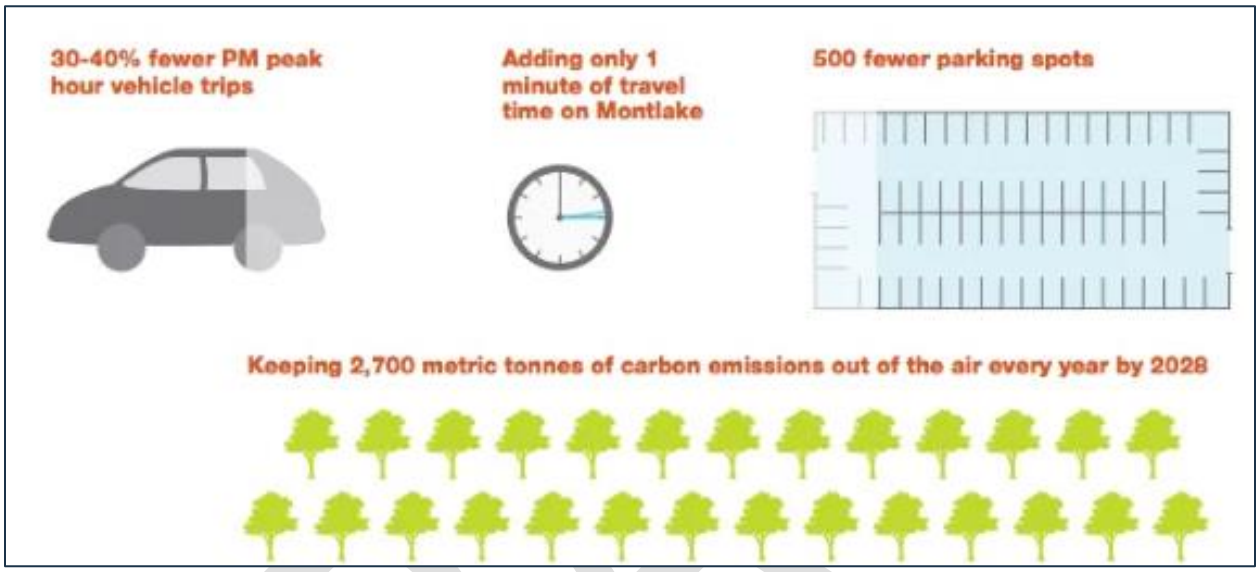
Source: http://hamiltonbikeshare.org/

[8] Transportation Research Part D: Transport and Environment, Vol 17 Issue 7, Oct 2012, Pg. 525-531

Some TDM measures can include policy-based incentives, such as pre-loaded monthly transit passes given to all staff, monetary bonuses for not driving to work or variable parking rates that are higher during the higher demand hours.

The Seattle's Children Hospital implemented all of the policy-based incentives mentioned above as well as eliminated monthly parking passes (daily only) and created a specialized vanpool and carpool program. These policy-based incentives resulted in 30-40% fewer PM peak staff vehicle trips which resulted in 500 fewer parking space being required (staff population of approximately 3,500 at the time of the study)[9].

Figure 37: Policy-Based Incentive Results for Seattle's Children Hospital [5]



Similar to policies and infrastructure, providing a team to study trends such as internal coordinators, frequent surveys and transportation studies can play a large role in determining habits and adjusting TDM measures as necessary. The Oregon Health and Science University (OHSU) is an excellent example of how a health institute has used frequent studies and surveys to help implement policies which align with travel demands. They've found solutions to linking commuters from similar areas and plan to achieve 44% increase in carpooling, 63% increase in ridesharing along with increases in active travel patterns while reducing single drivers[10].

In Ottawa, similar large developments have taken specific monitoring approaches, such as ZIBI which plans to use cameras at the entry points to determine travel patterns and behaviors within the site. The new Civic Development has ample potential to harness information from staff surveys, big-data sources, parking utilization studies, pedestrian and cyclist usage, camera technology and proposing innovative ideas to increase use of alternate modes of transportation.

5.5.3.2 Potential TDM Framework

The TDM checklists provided by the City of Ottawa have been completed and included in **Appendix T**. At this early stage of the Master Site Plan, the checklists highlight recommended TDM measures for TOH to consider, which will be confirmed as part of each phase that goes through Site Plan Control Approval. The following list highlights some of the key site-specific measures and policies that should be considered as part of the future TDM Plan for The Ottawa Hospital:

<u>Programming</u>

- Establish a full-time equivalent (FTE) staff position for a TDM coordinator.

[9] https://usa.streetsblog.org/2015/05/08/how-seattle-childrens-hospital-took-the-lead-on-healthy-transportation/
[10] https://www.ohsu.edu/sites/default/files/2019-07/OHSU_TDM_Plan_web.pdf

- Develop a TDM specific capital budget.

Communication and Promotion

- Develop a communication strategy.
- Incorporate event coordination and success recognition to increase participation (e.g. awareness campaigns, awards etc.).
- Provide travel tools and information (e.g. web portal, trip planning tools, social media, mobile applications etc.)

Partnerships

- Community outreach, particularly among the local neighbourhoods/community associations.
- Engage City of Ottawa partnerships, e.g. OC Transpo, Parks, Recreation & Culture, etc. to coordinate efforts and resources to increase transit and active transportation use.

Policy and Infrastructure

- Develop an aggressive parking pricing structure.
- Incentivize transit through monthly pass subsidies.
- Incentivize carpooling/carsharing/bikesharing through discounts and priority parking spaces.
- Install real-time transit information signage at key locations, e.g. the main lobby
- Provide cycling supportive facilities, e.g. showers, change rooms, secured storage etc.
- Develop an emergency ride home program (ERH)
- Design pick-up and drop-off areas to recognize future travel trends, including the use of emerging transportation solutions including ride-sharing, ride-hailing, and autonomous vehicle technologies.

Monitoring

- Complete regular staff and patient surveys to track travel choices over time
- Implement a parking utilization monitoring program so that TOH can proactively track trends in parking supply and demand over time and be in a position to make timely decisions over the years.

5.6 Neighborhood Traffic Management

5.6.1 Adjacent Neighbourhoods

The New Civic Development is expected to increase vehicular traffic on the adjacent road network. It is important to acknowledge local neighborhoods and find solutions to keep the majority of hospital related vehicle trips on the arterial and major collector road network, and protect local roads for use by the local community.

Shortcutting:

A significant concern heard early in the public consultation process was 'shortcutting' through the adjacent communities. Shortcutting is the phenomenon of vehicles using local roads to by-pass congestion on major roadways (arterials or collectors), contrary to the intended function of the respective roadway. It is important to strive for a balance between functionality and safety, while lessening the impact on neighbourhood roadways that are designed for fewer vehicles. Careful consideration has been given to multiple areas of concern raised by the public and stakeholders, which helped direct Master Site Plan development process. A summary of key neighbourhood traffic management considerations within the Master Site Plan have been provided below.

Sherwood Drive is classified by the City as a collector road. The New Official Plan states:

"The collector roads connect communities and distribute traffic between the arterial system and the local road system. These roads tend to be shorter and carry lower volumes of traffic than do the arterials. Direct access to collector roads from adjacent properties will be permitted where such access will not introduce traffic safety or capacity concerns. The design and construction of collector roads will accommodate the

safe and efficient operation of transit services. In general, a major collector is a roadway that acts as a connection between an arterial road and collector roads."

The local community has raised concerns with increased vehicular traffic and speeding along Sherwood, and is understandably concerned about the potential implications of the location of the New Civic Development.

Response: For this reason, the Sherwood/Carling intersection was ruled out as a primary access point to the New Civic Development. Rather, the intersection was aligned with Champagne to disincentivize TOH traffic from using Sherwood, which otherwise may have created an undesired direct travel route between the Parkdale interchange and the main Hospital access (Road A). Also of note, the City of Ottawa is currently updating the Sherwood Traffic Calming Study, and this may lead to other speed management measures along Sherwood.

- **Champagne Avenue** is classified as a local road. The intersection of Carling and Champagne will also serve as the intersection of Road A at Carling for the new Civic Development, there may be concerns about additional traffic and shortcutting on this local road north of Carling. Specifically, there is a risk of short-cutting between the Rochester St interchange and the New Civic Development using Rochester, Beech and Champagne.

  Response: There is an existing traffic signal at this Carling/Champagne intersection, which provides one of the few limited choices to serve The New Civic Development. The design of the future Champagne/Carling intersection will prohibit the northbound through movement from Road A to Champagne (across Carling) by incorporating right-turn island. This design will mitigate higher levels of northbound traffic on Champagne.

  In regard to southbound traffic on Champagne, the design team believes it important to provide this additional inbound route to access the main emergency entrance for visitors to the hospital at this intersection. However, significant additional traffic volumes on Champagne are not anticipated. This is because there are preferred routes that follow the collector and arterial road network, including: Bronson, Rochester, Booth and Carling.

  However, traffic volumes along the Rochester/Beech/Champagne route should be monitored to identify if notable cut-through traffic materializes. If so, options are available to mitigate the inbound/southbound shortcut on Champagne, such as:
  - Prohibit southbound vehicle travel at Hickory Street (permit active travel modes only)
  - Implement traffic calming measures (such as speed humps, raised intersections, signage etc.) along Champagne Avenue to reduce speeds and increase travel time to help curtail the shortcut benefit.

- **Maple Drive** is a road owned by the federal government that plays a local road function. With an intersection on Carling, it will be the future secondary access for the Hospital to the arterial road network. Maple will continue its function in serving the federal government lands and will also serve as the means of connecting the main Hospital building to Carling via Roads D and 'E.' There are concerns with increased vehicular traffic on Maple associated with the New Civic Development.

  Response: Road D provides access to the west entrance of the main Hospital building and the Zone 1 staff parking area (refer to **Figure 33** for zone designations). It also connects Maple Drive to Road E. TOH intends to regulate access across this connection, permitting only ambulances and non-urgent transports, public and staff destined to the main Hospital building will be forced to use an alternative access. Professional staff will only be permitted if responding to an emergency event. Therefore, less vehicular traffic will use Maple.

- **Old Irving Place, Bayswater Avenue and Fairmont Avenue**: Old Irving Place is a local road located on the north leg of the Carling/Maple intersection. It is approximately 300m in length, connecting Sherwood and Carling. This road already has travel restrictions in place to prevent shortcutting through the neighbourhood

including a full southbound vehicular restriction set approximately 60m north of Carling, and a northbound prohibition between the hours of 7:00 – 9:00 AM and 3:30 – 5:30 PM at Carling.

Bayswater is a short local road (only 120m in length) located approximately 120m west of Sherwood. It forms a T-intersection with Carling Avenue. This intersection only permits right-in right-out movements.

Fairmont is a local road located approximately 80m west of Maple, and forms a T-intersection with Carling Avenue to the south and connects across the Hwy 417 via an underpass to the north. This intersection only permits right-in right-out movements.

The local community raised concerns about potential implications related to the location of the New Civic Development.

Response: The existing travel prohibitions on Old Irving will remain in place and will continue to effectively mitigate potential shortcutting. As previously noted, TOH intends to regulate access to Road 'D,' permitting only ambulances and non-urgent transports under normal conditions. Right-in right-out restrictions will help limit the opportunities to shortcut on Fairmount and Bayswater. Additionally, the Carling corridor between Champagne and Parkdale is expected to operate well, which reduces the likelihood of traffic wanting to deviate and shortcut through a local community.

- **Dow's Lake Community:** Members of the Dow's Lake Community, bounded by Bronson to the east, Carling to the North and Queen Elizabeth Driveway to the west/south, have raised concerns with possible cut-through traffic implications caused by the location of The New Civic Development.

  Response: The results of the traffic analysis does not suggest vehicular traffic volumes will significantly increase in the Dows Lake Community under normal conditions. However, it is acknowledged that Lakeside Avenue provides direct access for eastbound traffic from Queen Elizabeth Driveway to Bronson and may experience slightly higher traffic volumes at times during peak commuter periods when the adjacent arterial network is most likely to be congested.

  For the remaining local streets, existing area traffic management measures (such as turn prohibitions and time of day restrictions) will still be enforced that will help limit traffic infiltration. The Bronson/Carling intersection was also modified in recent years to provide double northbound left-turn lanes, which improves traffic operations and will help reduce travel times to the New Civic Development from Bronson/Carling. If persistent traffic infiltration is observed post-opening day of the New Civic Development, the City area traffic management group can assess and implement appropriate mitigation measures to address these concerns.

Road Classifications

The City of Ottawa TIA Guidelines provide the following general guidelines on vehicle traffic volume thresholds based on road classification:

- Local roads: 120 vehicles per direction per hour.
- Collectors roads: 300 vehicles per direction per hour.
- Major collectors roads: 600 vehicles per direction per hour.

The following roadways were assessed to determine if a reclassification was warranted.

- **Champagne Avenue**, a local road, currently exceeds its 120 peak hour vehicles per direction north of Carling. A road classification may be warranted, but was not considered necessary based on the local context. Future traffic growth is limited to the local community since the road does not cross Hwy 417 to the north (it ends approximately 700m north of Carling) and The New Civic Development intends to prohibit northbound travel from Road A effectively reducing traffic volumes on Champagne.

- **Maple Drive**, a federal government road, experiences vehicular traffic volumes that exceed the local road threshold south of Carling. However, the road is designed and functions similar to a collector

roadway, with a wider ROW approach Carling and few driveway accesses. Additionally, TOH intends to regulate traffic entering Road D to ambulances and non-urgent transports only, which will reduce future traffic volumes associated with the New Civic Development.

- **Sherwood Drive**, a collector road, is not expected to experience vehicular traffic volumes in excess of 300-vehicle per hour per direction in future horizons. Therefore, a road reclassification is not needed.

Parking Infiltration

Parking infiltration was another identified public concern that was previously discussed in **Section 5.2: Parking** and **Section 5.5: TDM**. TOH will be developing a TDM Plan aimed to prevent the downstream impacts of high personal vehicle use, such as parking infiltration, by identifying measures and policies to achieve the mode share targets set for the 2028 and 2048 horizon years. In this scenario, the onsite parking supply at the New Civic Development is expected to accommodate future parking demand. However, if the mode share targets are not achieved, TOH will also have a parking mitigation plan identifying intervention to mitigate potential parking demand overflow, such as reinstating off-site satellite parking areas.

If additional area traffic management concerns are identified post-buildout of the New Civic Development, the City's established traffic management protocol will be available to review and assess the concerns, and lead the discussion on appropriate mitigation. TOH would be expected to participate as an active stakeholder in the area.

5.7 Transit

5.7.1 Route Capacity

There are no plans to create new or extend bus service into the new Civic Development. Therefore, the Trillium Line and future Carling Avenue Transit Priority (interim BRT) represent the two main transit service providers within the study area. Both services are anticipated to be operational by the 2028 (opening day) horizon year.

The Trillium LRT line is currently a single lane track with sidings for trains to pass, and operates on a fully grade separated network. It was confirmed that twinning of the tracks is not anticipated in the near future. The timing for twinning the tracks was expected to be well beyond the 2031 horizon year of the current TMP.

Service plans for the Carling Avenue BRT corridor have yet to be defined, but is expected to exceed the current route capacity. Segregated bus lanes, including some segments with median bus lanes, are expected to improve transit rider experience by increasing the capacity, reliability, and performance of buses by reducing vehicle conflicts such as right-turning vehicles[11].

The study team reached out to OC-Transpo requesting future ridership projections and route capacities of these two main services, but have not received the required information in time for this submission.

While a notable increase in transit ridership will be triggered by the new Civic Development, it is expected that this demand can be accommodated by the two main transit services noted in the Opening Day (2028) and the 2048 horizon years. By the latter year, there is the possibility the Trillium Line tracks may already be twinned. If additional capacity is required along the Carling Avenue BRT corridor, discussions with OC Transpo may be initiated to increase service frequency accordingly.

5.7.2 Transit Priority

The Carling Avenue Transit Priority study outlined the required measures to improve transit performance, which have been incorporated into the intersection designs included in this report. All signal timing adjustments required for protected intersections and transit priority have been accounted for in the operational analysis to follow. Further review of potential transit service impacts may be reviewed at the SPA, once OC Transpo data for the future BRT and LRT have been provided.

[11] https://betterbrt.growingeastcounty.com/portfolio/median-stations/. Accessed July 7, 2021.

5.8 Review of Network Concept

This section is only triggered if more than 200 new people trips will be generated over the existing allowable zoning. In this case, the existing zoning is not changing, rather the lifting of the holding provision is being applied for. For the purpose of this report, this section will still be analyzed given the size and scale of this development.

The key rationalizations that support the New Civic Development within the area transportation network have been discussed in **Section 4.3: Demand Rationalizations** and **Section 5.1.1: Design for Sustainable Modes**.

The purpose of this section is to determine whether changes to the current TMP concepts for auto or transit networks are required to accommodate the development-generated travel demands. The following list summarizes planned "affordable" network concepts in the TMP, with anticipated modifications triggered by the proposed Hospital campus.

Relevant TMP Affordable Network concept proposals:

- Carling Transit Priority Corridor
- Stage 2 LRT and Trillium Line Extension

Proposed modifications:

- New south portal for access to Dow's Lake Station within the campus, to further improve access and quality of experience for transit users
- Augment the Carling BRT design to incorporate cycle tracks over MUPs along Carling Avenue, to improve the quality of experience and safety among pedestrians and cyclists.
- Redirection of the Trillium Pathway to current Dow's Lake terminus due to location of future parking garage

Strategies to reduce TOH vehicular demand on the adjacent road network:

- Leverage the proximity of transit and active transportation facilities in the area transportation network through innovative design of the New Civic Development, focusing on mobility and accessibility for users of all ages and physical abilities.
- Be forward thinking; incorporate flexibility to integrate emerging travel choices, such as autonomous vehicles, Uber/Taxi, shuttles, etc., within future site plan designs.
- TOH will develop a comprehensive TDM Plan to promote a sustainable approach to transportation at future Hospital campus.

5.9 Intersection Design

5.9.1 Intersection Control

Please refer to **Section 5.4.2: Intersection Control**.

5.9.2 Intersection Design

Similar to **Section 4.3: Boundary Street Design**, which analyzed a multi-modal level of service (MMLOS) for road segments, an MMLOS for signalized intersections was also completed. Only adjacent intersections along the site frontage were analyzed.

The future intersection designs on Carling, Preston, and Prince of Wales all incorporated segregated cycling facilities. The Carling Transit Priority functional designs for BRT required all Carling intersections to have fully protected eastbound and westbound left-turn signal phasing. The north-south pedestrian crossings were given pedestrian and cyclist advances as required for protected intersection designs, and, in some cases, all crossings were given these advances. Where a bi-directional cycle track was proposed, conflicting right turns on red were prohibited.

The proposed site is located within 600m of a rapid LRT station (Dow's Lake Station). Multi-modal Level of Service analysis for the subject signalized intersections adjacent to the site are summarized in **Table 37** with detail analysis provided in **Appendix R.**

Table 37: MMLOS Analysis for Signalized Intersections

Intersection	Multi-Modal Level of Service (MMLOS)							
	Pedestrian		Bicycle		Transit		Truck	
	PLoS	Target	BLoS	Target	TLoS	Target	TkLoS	Target
Existing Intersections								
Maple/Carling	F	C	F	D	C	D	-	n/a
Sherwood/Carling	F	A	F	D	C	D	-	n/a
Champagne/Carling	F	A	F	D	C	D	-	n/a
Trillium MUP/Carling	F	A	D	D	B	D	-	n/a
Preston/Carling	F	A	F	D	F	D	D	D
Preston/P. of Wales	F	A	F	D	-	n/a	D	D
Future Intersections								
Maple/Carling	F	A	D	C	D	C	-	n/a
Sherwood/Carling	F	A	C	B	F	C	-	n/a
Champagne/Carling	F	A	C	C	F	C	-	n/a
Trillium MUP/Carling	F	A	D	C	C	C	-	n/a
Preston/Carling	F	A	C	B	F	C	D	D
Preston/P. of Wales	F	A	C	C	-	n/a	D	D
Road B/P. of Wales	E	A	D	C	-	n/a	B	D

Pedestrian

- No pedestrian PLoS targets were met given the aggressive desired targets for locations within 600 meters of rapid transit. The main factor causing poor PLoS includes how many lanes are required to be crossed (calculated as distance crossed divided by 3.5 meters). Reducing the number of lanes of most of these intersections would result in extremely poor vehicular performance

Bicycle

- The bike BLoS targets were only met at the Trillium MUP/Carling intersection due to the absence of turning movements and mixed bike/car traffic. In the future, BLoS performance improves given the cycle tracks proposed on major arterials such as Carling Avenue, Preston Street and Prince of Wales Drive, however, with the cycle track improvements and cycle route classification given, the new MMLOS targets are more aggressive and not all intersections meet the desired future target despite many improvements to cycling facilities

Transit

- The majority of existing intersections meet the TLoS target due to modest delays on Carling Avenue. Although bus facilities will be incorporated into Carling Avenue, the overall increase in traffic and delays causes most of the future intersections with transit routes to fall short of the TLoS desired target

Truck

- All truck routes met their TkLoS targets for existing and future

5.9.3 Existing Conditions

5.9.3.1 Intersection Performance Criteria

In the City of Ottawa, the performance of an intersection is described with a level of service (LoS) with a grade rating from A to F with A having ample vehicular capacity and F representing heavy congestion. The LoS can be seen for intersections as a whole (overall) as well as the critical individual movement. Generally, the City targets an overall LoS E or better for an intersection to be considered acceptable.

For signalized intersections, the LoS is defined by a vehicle to capacity rating (v/c ratio), while roundabouts and unsignalized intersections rely on time delay in seconds (s). The LoS criteria for each type of intersection is shown in Table 38.

Table 38: Level of Service Criteria

Level of Service	Traffic Signal (v/c ratio)	Roundabout (s)	STOP/Yield Sign (s)
A	≤0.6	≤10	≤10
B	>0.6 and ≤0.7	>10 and ≤20	>10 and ≤15
C	>0.7 and ≤0.8	>20 and ≤35	>15 and ≤25
D	>0.8 and ≤0.9	>35 and ≤50	>25 and ≤35
E	>0.9 and ≤1.0	>50 and ≤70	>35 and ≤50
F	>1.0	>70	>50

Intersections within the study area were evaluated using Synchro V10 software for signalized and unsignalized intersections, while SIDRA V8 software will be used for roundabout intersections. Any queue length analysis was based on the 95th percentile queue result.

5.9.3.2 Existing Intersection Performance

Table 39 summarizes the Existing network performance results. The Synchro and SIDRA outputs for existing conditions have been provided in Appendix T.

Table 39: Existing Study Area Intersection Performance

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'As a Whole'		
	LoS	Max Delay (s) or v/c	Movement	Delay (s)	LoS	Max v/c
Signalized Intersections						
Parkdale/Carling	D(E)	0.82(0.93)	SBL(SBL)	25.6(35.0)	A(D)	0.56(0.83)
Civic/Carling	A(A)	0.39(0.60)	SBL(WBT)	3.8(9.6)	A(A)	0.32(0.59)
Maple-Old Irvine/Carling	A(C)	0.31(0.79)	EBT(NBT)	11.0(13.8)	A(A)	0.30(0.48)
Sherwood/Carling	A(A)	0.38(0.58)	EBT(WBT)	9.8(17.8)	A(A)	0.38(0.58)
Champagne/Carling	A(C)	0.46(0.71)	SBL(SBL)	5.8(15.4)	A(A)	0.40(0.58)
Trillium MUP/Carling	A(A)	0.41(0.35)	EBT(WBT)	7.2(0.2)	A(A)	0.41(0.35)
Preston/Carling	D(F)	0.90(1.40)	NBL(NBL)	43.1(80.8)	D(F)	0.82(1.05)
Booth/Carling	D(C)	0.81(0.77)	EBL(SBL)	27.0(24.7)	B(B)	0.61(0.66)
Bronson/Carling	E(F)	1.00(1.30)	NBT(NBL)	53.0(89.7)	E(F)	0.99(1.12)
Hwy 417 WB on-off/Parkdale	E(E)	0.94(0.98)	SBT(WBT)	49.0(51.8)	D(E)	0.87(0.92)
Hwy 417 EB on-off/Parkdale	C(E)	0.78(1.00)	SBL(SBL)	36.1(42.7)	C(C)	0.72(0.80)
Sherwood/Parkdale	B(B)	0.65(0.65)	SBT(SBT)	11.8(11.8)	A(B)	0.56(0.61)
Ruskin/Parkdale	A(B)	0.57(0.62)	SBT(WBT)	11.5(15.4)	A(A)	0.46(0.40)
Preston/Prince of Wales	F(F)	1.12(1.19)	EBL(SBT)	47.8(58.3)	E(F)	0.97(1.03)
Hwy 417 on Raymond/Rochester	B(C)	0.65(0.76)	WBT(WBT)	13.1(20.1)	A(A)	0.51(0.58)
Hwy 417 off Orangeville/Rochester	C(C)	0.73(0.76)	EBT(EBT)	11.7(18.3)	A(A)	0.57(0.49)
Hwy 417 on-off Catherine/Bronson	F(F)	1.12(1.27)	NBL(WBL)	46.4(70.4)	D(F)	0.89(1.03)
Hwy 417 EB off/Bronson	D(D)	0.89(0.88)	EBR(EBR)	23.3(43.1)	C(D)	0.77(0.81)
Unsignalized Intersections						
Melrose/Carling	C(F)	25(244)	SB(SB)	1(7)	A(A)	-
Rochester/Carling	C(F)	17(111)	SB(SB)	1(14)	A(B)	-
Navy/Prince of Wales	C(F)	18(80)	NB(SB)	1(2)	A(A)	-
Bayswater/Sherwood	A(B)	9(12)	SB(SB)	9(11)	A(B)	-
Roundabout Intersections						
NCC Scenic Driveway/Prince of Wales	B(C)	14(26)	WB(EB)	7(11)	A(B)	-

Note: Analysis of intersections assumes a PHF of 0.90 and a saturation flow rate of 1800 veh/h/lane

As seen in **Table 39**, the majority of study area intersections operate an acceptable LoS overall, with the exception of the following major arterial to arterial intersections in the PM peak:

- Preston/Carling,
- Bronson/Carling,
- Preston/Prince of Wales, and
- Catherine/Bronson.

Three unsignalized intersections showed LoS F on the minor approaches, but the overall intersection performance, which takes a weighted average of delay time per total vehicles processed, was a LoS B or better.

5.9.4 Future Background Conditions

5.9.4.1 Background Intersection Performance (2028 and 2048)

The Opening Day (2028) background traffic volumes, as developed in **Section 4.2: Background Network Travel Demands**, was developed by applying a linear annual growth rate to existing traffic volumes up to 2028, with known adjacent development traffic added separately. The Full Buildout (2048) background traffic volumes were assumed to be the same due to flat/null traffic growth assumption between 2028 and 2048, also as described in **Section 4.2.**

The 2028 study area road network was adjusted based on planned modifications by the City, as outlined in the TMP. A summary of the key network model assumptions has been provided below:

- The Carling corridor was modified to reflect the Carling Transit Priority functional design, which included median bus lanes and a reduction in 1 to 2 general traffic travel lanes along the entire corridor.
- All eastbound and westbound permissive left turns on Carling have been converted to fully protected.
- All north-south crossings on Carling will have a 5 second pedestrian and cyclist advance timing, and Preston/Carling will have a 5 second advance timing on all legs. This added protected phase advance will take effective green time from general traffic.
- All intersections along Carling Avenue had their cycle length adjusted to 120 seconds in the AM peak and 140 seconds in the PM peak to match neighboring intersections and to allow enough time for the added pedestrian/cyclist advances.
- In locations where a bi-directional cycle track is proposed, such as the south leg of Preston/Carling, and south leg of Bronson/Carling , right turns on red were prohibited on conflicting movements and a 10 second advance was added to the bi-directional crossing leg.
- Peak hour pedestrian and cyclist volumes were increased to reflect anticipated growth in AT mode travels.
- A peak hour factor of 1.0 was used for future conditions as per the TIA Guidelines.

Table 40 summarizes the intersection performance results in the future Background Condition with the network assumptions noted above. The Synchro and SIDRA outputs have been provided in **Appendix U**. For reference, the traffic volumes used in this analysis are available in **Appendix N**.

Table 40: Background Intersection Performance

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'As a Whole'		
	LoS	Max Delay (s) or v/c	Movement	Delay (s)	LoS	Max v/c
Signalized Intersections						
Parkdale/Carling	C(D)	0.77(0.89)	SBL(WBT)	26.9(26.3)	A(D)	0.52(0.88)
Civic/Carling	A(A)	0.36(0.60)	EBT(WBT)	0.2(2.2)	A(A)	0.36(0.60)
Maple-Old Irvine/Carling	A(B)	0.46(0.66)	EBT(NBT)	16.1(23.4)	A(B)	0.44(0.63)
Sherwood/Carling	A(C)	0.49(0.72)	SBL(SBL)	11.5(10.9)	A(B)	0.34(0.64)
Champagne/Carling	B(D)	0.63(0.86)	SBL(SBL)	13.4(36.4)	A(B)	0.43(0.67)
Trillium MUP/Carling	A(C)	0.45(0.72)	WBT(WBT)	8.9(18.0)	A(C)	0.45(0.72)
Preston/Carling	F(F)	1.17(1.60)	NBL(WBL)	58.1(123.8)	E(F)	0.91(1.18)
Booth/Carling	E(F)	0.96(1.13)	EBL(WBT)	29.9(63.1)	D(F)	0.87(1.06)
Bronson/Carling	E(F)	1.00(1.16)	NBT(SBT)	52.8(84.7)	E(F)	0.98(1.10)
Hwy 417 WB on-off/Parkdale	E(F)	0.95(1.04)	WBT(SBT)	50.8(52.7)	E(E)	0.91(1.00)
Hwy 417 EB on-off/Parkdale	C(E)	0.78(0.99)	SBL(SBL)	42.1(46.6)	B(C)	0.68(0.78)
Sherwood/Parkdale	A(A)	0.55(0.41)	EBT(NBT)	9.4(8.5)	A(A)	0.30(0.38)
Ruskin/Parkdale	A(A)	0.24(0.24)	EBT(EBT)	7.8(7.7)	A(A)	0.18(0.15)
Preston/Prince of Wales	F(F)	1.03(1.12)	EBL(SBT)	34.1(54.6)	D(F)	0.90(1.00)
Hwy 417 on Raymond/Rochester	B(C)	0.63(0.75)	WBT(WBT)	12.5(19.4)	A(A)	0.49(0.57)
Hwy 417 off Orangeville/Rochester	C(C)	0.72(0.76)	EBT(EBT)	11.6(17.8)	A(A)	0.46(0.49)
Hwy 417 on-off Catherine/Bronson	F(F)	1.05(1.27)	NBL(WBL)	43.2(70.1)	D(F)	0.85(1.03)
Hwy 417 EB off/Bronson	D(D)	0.89(0.89)	EBR(EBR)	23.3(44.0)	C(D)	0.76(0.83)
Unsignalized Intersections						
Melrose/Carling	C(F)	18(77)	SB(SB)	1(1)	A(A)	-
Rochester/Carling	B(F)	13(291)	SB(SB)	1(35)	A(D)	-
Navy/Prince of Wales	C(F)	19(86)	NB(SB)	1(2)	A(A)	-
Bayswater/Sherwood	A(B)	9(11)	SB(SB)	8(10)	A(B)	-
Roundabout Intersections						
NCC Scenic Driveway/Prince of Wales	B(E)	15(56)	WB(EB)	7(17)	A(B)	-

Note: Analysis of intersections assumes a PHF of 1.0 and a saturation flow rate of 1800 veh/h/lane

The results in Table 40 show the segment of Carling Avenue between Preston Street and Bronson Avenue is expected to experience reduced intersection performance, predominantly as a response from the reduction of travel lanes from 4 or 5 lane cross-sections to a 3-lane cross-section, as a result of implementing transit priority lanes. The reduction in number of lanes on Carling Avenue reduces the overall vehicular capacity of the corridor.

5.9.5 Future Conditions with the New Civic – Opening Day 2028

5.9.5.1 Opening Day 2028 Intersection Performance

Opening Day (2028) of the New Civic Development will have a completed parking garage containing 2,500 parking spaces, a central utility plant with associated staff parking, and the main Hospital building. The proposed AT Plan and access intersections designs were also included in the road network analysis. The following key adjustments and assumptions were incorporate in the 2028 background network model:

- Addition of a south leg at Champagne, with new EBR and WBL auxiliary lanes;
- Addition of Road D (east leg) at Maple/Winding;
- Addition of Road B and Road E intersections off Prince of Wales;
- Addition of a WBT lane on Prince of Wales through Road B as a shared through-right;
- Addition of a RIRO parking garage access at Navy/Prince of Wales and removal of WBL turn-lane;
- Addition of 2nd EBL plus a 2nd receiving lane at Preston/Prince of Wales
- Addition of new internal intersections;

- New bi-directional cycle track crossings at the east leg of Road B/Prince of Wales intersection and west leg of Preston/Prince of Wales. A 10 second advance was added on the bi-directional crossing along with no right on red at conflicting movements;
- Champagne/Carling south leg has a 10 second advance for pedestrians/cyclists with no-rights on red for conflicting movements given the uni-directional cycle facility and heavy EBR turning movement;
- The majority of existing Civic Campus site generated traffic volumes were removed from the network to reflect the transition to the new Civic Development, and opening day volumes to the new site were layered on top; and
- Addition of more pedestrian and cyclist within the network to account for hospital generated active trips.

Table 41 summarizes the Opening Day (2028) the intersection performance results, without background traffic reductions discussed in **Section 4.3: Demand Rationalizations**. The Synchro and SIDRA outputs for Opening Day conditions have been provided in **Appendix U**. For reference, the traffic volumes used in this analysis are available in **Appendix N**.

Table 41: Opening Day 2028 Intersection Performance

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'As a Whole'		
	LoS	Max Delay (s) or v/c	Movement	Delay (s)	LoS	Max v/c
Signalized Intersections						
Parkdale/Carling	C(E)	0.80(0.95)	SBL(WBT)	29.2(39.1)	A(E)	0.57(0.93)
Civic/Carling	A(B)	0.41(0.64)	EBT(WBT)	0.3(3.5)	A(B)	0.41(0.64)
Maple/Old Irving/Carling	A(C)	0.57(0.72)	EBT(NBT)	16.7(27.1)	A(B)	0.54(0.69)
Sherwood/Carling	B(C)	0.63(0.74)	SBL(SBL)	11.3(22.5)	A(C)	0.44(0.71)
Road A/Champagne/Carling	C(C)	0.76(0.74)	WBL(NBL)	32.1(31.9)	B(A)	0.63(0.50)
Trillium MUP/Carling	A(C)	0.54(0.78)	WBT(WBT)	7.7(20.2)	A(C)	0.54(0.78)
Preston/Carling	F(F)	1.46(1.85)	WBL(WBL)	78.0(157.6)	F(F)	1.09(1.33)
Booth/Carling	F(F)	1.26(1.27)	WBT(WBT)	60.5(83.2)	F(F)	1.07(1.18)
Bronson/Carling	F(F)	1.11(1.21)	SBT(EBR)	77.1(108.4)	F(F)	1.03(1.19)
Hwy 417 WB on-off/Parkdale	E(F)	0.98(1.05)	SBT(SBT)	53.0(59.2)	E(F)	0.94(1.01)
Hwy 417 EB on-off/Parkdale	C(F)	0.79(1.03)	SBL(SBL)	41.8(46.5)	C(D)	0.71(0.81)
Sherwood/Parkdale	A(A)	0.56(0.46)	EBT(SBT)	9.4(9.0)	A(A)	0.36(0.44)
Ruskin/Parkdale	A(A)	0.24(0.24)	EBT(EBT)	7.4(7.3)	A(A)	0.19(0.17)
Preston/Prince of Wales	D(F)	0.85(1.08)	EBL(SBR)	32.4(68.8)	C(F)	0.80(1.03)
Hwy 417 on Raymond/Rochester	B(C)	0.62(0.74)	WBT(WBT)	13.2(19.3)	A(A)	0.50(0.57)
Hwy 417 off Orangeville/Rochester	C(C)	0.74(0.77)	EBT(EBT)	11.9(17.8)	A(A)	0.57(0.49)
Hwy 417 on-off Catherine/Bronson	F(F)	1.44(1.42)	NBL(WBL)	64.8(82.9)	E(F)	0.97(1.10)
Hwy 417 EB off/Bronson	D(E)	0.88(0.97)	EBR(EBR)	26.1(46.8)	C(D)	0.80(0.86)
Road B/Prince of Wales	B(A)	0.70(0.54)	EBT(EBT)	12.1(12.5)	B(A)	0.68(0.54)
Unsignalized Intersections						
Melrose/Carling	C(F)	21(103)	SB(SB)	1(1)	A(A)	-
Rochester/Carling	C(F)	25(627)	SB(SB)	2(77)	A(F)	-
Navy/Prince of Wales	C(F)	20(59)	NB(NB)	1(1)	A(A)	-
Bayswater/Sherwood	A(B)	9(12)	SB(SB)	8(11)	A(B)	-
Road E/Prince of Wales	E(F)	42(71)	EB(EB)	1(3)	A(A)	-
Road A/Parking garage	B(B)	13(12)	WB(SB)	5(6)	A(A)	-
Road B/Parking garage	B(B)	11(11)	WB(WB)	5(7)	A(A)	-
Road B/Road F	B(B)	10(10)	EB(EB)	1(1)	A(A)	-
Road E/Road D	A(A)	9(9)	NB(SB)	5(6)	A(A)	-
Maple/Road D	A(A)	8(8)	SB(EB)	8(8)	A(A)	-
Road A/Road B	A(A)	9(9)	WB(WB)	9(8)	A(B)	-
Roundabout Intersections						
NCC Scenic Driveway/Prince of Wales	B(F)	17(125)	WB(EB)	7(31)	A(C)	-

Note: Analysis of intersections assumes a PHF of 1.0 and a saturation flow rate of 1800 veh/h/lane

Overall, the Opening Day (2028) intersection performance results were similar to Background conditions. The same major signalized intersections experienced higher levels of congestion. Despite the loss in roadway capacity associated with the removal of two travel lanes (one in each direction) in support of the Carling Transit Priority modifications, no additional intersections on Carling Avenue operated below City recommended thresholds. This result confirms the study area network can generally accommodate traffic from the new Civic Development at Opening Day.

As for unsignalized intersections, the results did not indicate severe operational issues. Rochester/Carling was shown to operates poorly at times in the afternoon peak hour due to the lost travel lane on Carling Avenue combined with a heavy southbound right-turn. However, the addition of the proposed development traffic had minimal influence on this result.

5.9.5.2 Opening Day 2028 Intersection Performance with Demand Rationalization Reductions

Table 42 summarizes intersection performance results at Opening Day (2028) with applicable Background traffic reductions outlined in Section 4.3: Demand Rationalizations. The Synchro and SIDRA outputs can be found in Appendix U. For reference, the traffic volumes used in this analysis are available in Appendix N.

Table 42: Opening Day 2028 Intersection Performance with Reduced Volumes

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'As a Whole'		
	LoS	Max Delay (s) or v/c	Movement	Delay (s)	LoS	Max v/c
Signalized Intersections						
Parkdale/Carling	C(D)	0.75(0.82)	SBL(SBL)	23.3(24.4)	A(B)	0.46(0.70)
Civic/Carling	A(A)	0.33(0.50)	EBT(WBT)	0.2(1.2)	A(A)	0.33(0.50)
Maple-Old Irvine/Carling	A(C)	0.46(0.72)	EBT(NBT)	17.9(25.9)	A(A)	0.44(0.56)
Sherwood/Carling	B(C)	0.63(0.74)	SBL(SBL)	12.2(17.8)	A(A)	0.37(0.57)
Champagne/Carling	C(C)	0.76(0.74)	WBL(NBL)	30.0(28.5)	A(A)	0.52(0.44)
Trillium MUP/Carling	A(B)	0.43(0.61)	WBT(WBT)	7.9(16.5)	A(B)	0.43(0.61)
Preston/Carling[1]	F(F)	1.08(1.21)	WBL(WBL)	48.6(93.0)	D(F)	0.85(1.03)
	D(E)	*0.87(0.96)*	*NBL(NBL)*	*50.4(77.1)*	*C(D)*	*0.72(0.85)*
Booth/Carling	E(F)	0.97(1.03)	WBT(WBT)	32.1(43.0)	D(E)	0.87(0.97)
Bronson/Carling	D(E)	0.89(0.95)	EBL(EBR)	44.1(55.4)	D(E)	0.81(0.94)
Hwy 417 WB on-off/Parkdale	C(D)	0.80(0.87)	WBT(WBT)	17.0(20.3)	B(C)	0.68(0.75)
Hwy 417 EB on-off/Parkdale	B(C)	0.70(0.78)	EBT(EBT)	33.6(28.3)	A(A)	0.53(0.60)
Sherwood/Parkdale	A(A)	0.56(0.39)	EBT(SBT)	9.9(8.3)	A(A)	0.31(0.36)
Ruskin/Parkdale	A(A)	0.24(0.24)	EBT(EBT)	7.7(7.7)	A(A)	0.17(0.15)
Preston/Prince of Wales	D(E)	0.82(0.98)	SBT(EBL)	28.1(49.7)	B(E)	0.69(0.93)
Hwy 417 on Raymond/Rochester	A(C)	0.57(0.72)	WBL(WBT)	12.5(18.7)	A(A)	0.44(0.53)
Hwy 417 off Orangeville/Rochester	C(C)	0.71(0.74)	EBT(EBT)	10.9(16.9)	A(A)	0.54(0.46)
Hwy 417 on-off Catherine/Bronson	F(F)	1.01(1.14)	NBL(WBL)	38.4(44.5)	C(E)	0.80(0.93)
Hwy 417 EB off/Bronson	D(D)	0.84(0.86)	EBR(EBR)	17.3(19.4)	B(C)	0.65(0.73)
Road B/Prince of Wales	B(A)	0.67(0.54)	EBT(SBL)	11.4(12.3)	B(A)	0.65(0.51)
Unsignalized Intersections						
Melrose/Carling	C(E)	16(44)	SB(SB)	1(1)	A(A)	-
Rochester/Carling	C(F)	19(239)	SB(SB)	2(31)	A(D)	-
Navy/Prince of Wales	C(E)	18(39)	NB(NB)	1(1)	A(A)	-
Bayswater/Sherwood	A(B)	9(12)	SB(SB)	8(10)	A(B)	-
Road E/Prince of Wales	E(F)	36(59)	EB(EB)	1(2)	A(A)	-
Road A/Parking Garage	B(B)	13(12)	WB(SB)	5(6)	A(A)	-
Road B/Parking Garage	B(B)	11(11)	WB(WB)	5(7)	A(A)	-
Road B/Road F	B(B)	10(10)	EB(EB)	1(1)	A(A)	-
Road E/Road D	A(A)	9(9)	NB(SB)	5(6)	A(A)	-
Maple/Road D	A(A)	8(9)	SB(EB)	8(8)	A(A)	-
Road A/Road B	A(A)	9(9)	WB(WB)	9(8)	A(B)	-
Roundabout Intersections						
NCC Scenic Driveway/Prince of Wales	B(C)	15(30)	WB(EB)	7(12)	A(B)	-

Note: Analysis of intersections assumes a PHF of 1.0 and a saturation flow rate of 1800 veh/h/lane

1.) Preston/Carling modelled as envisioned within the Stantec Carling Transit Priority Study and below with the addition of an EBR turn lane. Further discussion below.

The results of the sensitivity analysis at Opening Day (2028) with noted Background traffic reductions showed significant improvement in operational performance along the Carling Avenue corridor. While major intersections (arterial to arterial) continued to operate near or at capacity, all intersections with the exception of Preston/Carling were shown to operate 'as a whole' within City recommended thresholds at Opening Day (2028) with estimated New Civic Development traffic. Additional findings have been summarized below:

Preston/Carling

The intersection of Preston/Carling was modelled as envisioned within the Stantec Carling Transit Priority Study, which proposed a left-turn lane, a through lane and a shared through-right lane for the eastbound approach. Sensitivity analysis determined that the addition of a separate eastbound right-turn lane and converting the shared through-right to a through only lane would improve intersection operations to City standards.

The addition of a separate EBR lane also allows for a fully time separated phase for pedestrians and cyclists crossing the south leg of the intersection, that is envisioned with a bi-directional cycle facility. However, the addition of this extra lane does have implications to the New Civic Development right of way, it would compress the available landscaping separation between Carling Avenue and the active transportation facilities, and it would also increase the distance for pedestrians and cyclists along the west crosswalk, which is already overlong due to the proposed median bus lanes.

Additional sensitivity was conducted to determine what demand modifications (reductions in volumes) would be required to improve performance at Preston/Carling with the proposed Stantec design. A reduction in overall volumes (without demand rationalized reductions) by 15% in the AM and 25% in the PM results in overall acceptable performance.

Prince of Wales/Road E

Left-turning vehicles exiting from Road E onto Prince of Wales was shown to be congested in the afternoon peak hour. However, this result can be mitigated by diverting traffic south (performing a right-turn instead of left-turn out of Road E, a less critical movement) to the nearby NCC Driveway roundabout and performing a U-turn to proceed north.

5.9.5.3 Opening Day 2028 Intersection Performance with 'High' MS Target and DR Reductions

Table 43 summarizes intersection performance results at Opening Day (2028) with applicable Background traffic reductions outlined in **Section 4.3: Demand Rationalizations**, but target mode shares were not achieved at the New Civic Development. This scenario reflects the high auto-driver mode share noted in **Table 19**. The Synchro and SIDRA outputs can be found in **Appendix U.** For reference, the traffic volumes used in this analysis are available in **Appendix N**.

Table 43: Opening Day 2028 Intersection Performance with Reduced Volumes and High AD Mode Share

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'As a Whole'		
	LoS	Max Delay (s) or v/c	Movement	Delay (s)	LoS	Max v/c
Signalized Intersections						
Parkdale/Carling	C(D)	0.76(0.83)	SBL(SBL)	24.1(25.9)	A(C)	0.47(0.71)
Civic/Carling	A(A)	0.34(0.51)	EBT(WBT)	0.2(1.2)	A(A)	0.34(0.51)
Maple-Old Irvine/Carling	A(C)	0.47(0.73)	EBT(NBT)	17.8(26.2)	A(A)	0.45(0.58)
Sherwood/Carling	B(C)	0.65(0.75)	SBL(SBL)	12.8(18.1)	A(A)	0.39(0.58)
Champagne/Carling	D(D)	0.82(0.83)	WBL(NBL)	32.6(31.6)	A(A)	0.56(0.49)
Trillium MUP/Carling	A(B)	0.45(0.62)	WBT(WBT)	8.0(17.4)	A(B)	0.45(0.62)
Preston/Carling	F(F)	1.21(1.27)	WBL(WBL)	53.3(99.3)	D(F)	0.90(1.05)
Booth/Carling	F(F)	1.04(1.06)	WBT(WBT)	37.7(46.0)	E(E)	0.92(0.99)
Bronson/Carling	E(E)	0.91(1.00)	EBL(EBL)	44.8(58.4)	D(E)	0.85(0.97)
Hwy 417 WB on-off/Parkdale	C(D)	0.80(0.87)	WBT(WBT)	18.3(21.7)	B(C)	0.69(0.75)
Hwy 417 EB on-off/Parkdale	B(C)	0.70(0.78)	EBT(EBT)	35.1(30.4)	A(A)	0.53(0.60)
Sherwood/Parkdale	A(A)	0.58(0.41)	EBT(SBT)	9.9(8.4)	A(A)	0.33(0.36)
Ruskin/Parkdale	A(A)	0.24(0.24)	EBT(EBT)	7.6(7.6)	A(A)	0.18(0.16)
Preston/Prince of Wales	D(F)	0.82(1.02)	SBT(EBL)	29.0(53.4)	B(E)	0.70(0.96)
Hwy 417 on Raymond/Rochester	A(C)	0.58(0.72)	WBL(WBT)	12.6(18.7)	A(A)	0.45(0.53)
Hwy 417 off Orangeville/Rochester	C(C)	0.71(0.75)	EBT(EBT)	10.9(16.9)	A(A)	0.54(0.47)
Hwy 417 on-off Catherine/Bronson	F(F)	1.06(1.19)	NBL(WBL)	38.7(47.3)	D(E)	0.84(0.96)
Hwy 417 EB off/Bronson	D(D)	0.85(0.86)	EBR(EBR)	17.7(20.8)	B(C)	0.65(0.73)
Road B/Prince of Wales	B(A)	0.67(0.60)	EBT(SBL)	11.9(13.8)	B(A)	0.65(0.54)
Unsignalized Intersections						
Melrose/Carling	C(E)	17(46)	SB(SB)	1(1)	A(A)	-
Rochester/Carling	C(F)	23(293)	SB(SB)	2(39)	A(D)	-
Navy/Prince of Wales	C(E)	18(42)	NB(NB)	1(1)	A(A)	-
Bayswater/Sherwood	A(B)	9(12)	SB(SB)	8(11)	A(B)	-
Road E/Prince of Wales	E(F)	43(77)	EB(EB)	2(3)	A(A)	-
Road A/Parking Garage	C(B)	15(14)	WB(SB)	6(7)	A(A)	-
Road B/Parking Garage	B(B)	13(12)	WB(WB)	6(7)	A(A)	-
Road B/Road F	B(B)	10(10)	EB(EB)	1(1)	A(A)	-
Road E/Road D	A(A)	9(9)	NB(SB)	5(6)	A(A)	-
Maple/Road D	A(A)	8(8)	SB(EB)	8(8)	A(A)	-
Road A/Road B	B(A)	10(9)	WB(WB)	9(9)	A(B)	-
Roundabout Intersections						
NCC Scenic Driveway/Prince of Wales	B(C)	15(34)	WB(EB)	7(12)	A(B)	-

Note: Analysis of intersections assumes a PHF of 1.0 and a saturation flow rate of 1800 veh/h/lane

As shown in **Table 43**, if the New Civic Development does not meet its target mode shares and a higher driver mode share occurs, the intersections are expected to operate similarly to the reduced demand rationalized network, meaning that the majority of the congestion caused to the network is not linked to the hospital but rather the background volume growth.

It is important to note the above conclusion does not account for potential parking implications resulting from the high auto-driver mode share at the New Civic Development, but it does highlight the significant benefits to and resiliency of the adjacent road network capacity if the City's sustainable targets are achieved.

5.9.6 Future Conditions with the New Civic – Full Buildout 2048

5.9.6.1 Full Buildout Intersection Performance

At Full Buildout (2048), the New Civic Development will include the UOHI, Carling Village, and full expansion of the main Hospital building with ancillary facilities.

It is important to reiterate a key assumption from **Section 4.2.2: Background Growth**: background traffic growth was flat/null between 2028 and 2048. Additional traffic in this scenario originates from other adjacent developments and growth at the New Civic Development.

Table 44 summarizes the Full Buildout (2048) network performance results, without background traffic reductions discussed in **Section 4.3: Demand Rationalizations**. The operational outputs have been provided in **Appendix U**. For reference, the traffic volumes used in this analysis are available in **Appendix N**.

Table 44: Full Buildout 2048 Intersection Performance

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'As a Whole'		
	LoS	Max Delay (s) or v/c	Movement	Delay (s)	LoS	Max v/c
Signalized Intersections						
Parkdale/Carling	D(E)	0.81(0.97)	SBL(WBT)	32.5(41.9)	A(E)	0.59(0.95)
Civic/Carling	A(B)	0.43(0.65)	EBT(WBT)	0.3(3.7)	A(B)	0.43(0.65)
Maple-Old Irvine/Carling	B(C)	0.67(0.79)	EBT(WBT)	21.8(32.9)	B(C)	0.63(0.76)
Sherwood/Carling	A(C)	0.59(0.77)	SBL(WBT)	14.1(51.3)	A(C)	0.47(0.76)
Champagne/Carling	D(D)	0.81(0.83)	WBL(NBL)	34.0(37.8)	B(A)	0.66(0.55)
Trillium MUP/Carling	A(C)	0.56(0.80)	WBT(WBT)	7.8(19.7)	A(C)	0.56(0.80)
Preston/Carling	F(F)	1.61(2.37)	WBL(NBL)	130.8(196.3)	F(F)	1.29(1.54)
Booth/Carling	F(F)	1.33(1.30)	WBT(WBT)	67.1(88.6)	F(F)	1.11(1.20)
Bronson/Carling	F(F)	1.09(1.24)	NBT(NBL)	84.1(117.5)	F(F)	1.08(1.23)
Hwy 417 WB on-off/Parkdale	E(F)	0.99(1.05)	SBT(SBT)	53.7(59.8)	E(F)	0.95(1.01)
Hwy 417 EB on-off/Parkdale	C(F)	0.79(1.04)	SBL(SBL)	42.0(46.6)	C(D)	0.72(0.82)
Sherwood/Parkdale	A(A)	0.57(0.48)	EBT(SBT)	9.5(9.2)	A(A)	0.37(0.43)
Ruskin/Parkdale	A(A)	0.24(0.24)	EBT(EBT)	7.3(7.2)	A(A)	0.20(0.18)
Preston/Prince of Wales	E(F)	0.96(1.17)	EBL(SBT)	43.5(80.5)	D(F)	0.90(1.03)
Hwy 417 on Raymond/Rochester	B(C)	0.61(0.74)	WBL(WBT)	13.3(19.3)	A(A)	0.49(0.57)
Hwy 417 off Orangeville/Rochester	C(C)	0.74(0.77)	EBT(EBT)	12.2(17.8)	A(A)	0.57(0.50)
Hwy 417 on-off Catherine/Bronson	F(F)	1.48(1.45)	NBL(WBL)	67.2(86.4)	E(F)	0.99(1.11)
Hwy 417 EB off/Bronson	D(E)	0.88(0.99)	EBR(EBR)	27.8(47.4)	C(D)	0.80(0.86)
Road B/Prince of Wales	B(A)	0.70(0.60)	EBT(SBL)	12.1(14.1)	B(A)	0.68(0.56)
Unsignalized Intersections						
Melrose/Carling	C(F)	22(111)	SB(SB)	1(1)	A(A)	-
Rochester/Carling	D(F)	31(714)	SB(SB)	2(89)	A(F)	-
Navy/Prince of Wales	C(F)	21(65)	NB(NB)	1(1)	A(A)	-
Bayswater/Sherwood	A(B)	9(12)	SB(SB)	9(11)	A(B)	-
Road E/Prince of Wales	E(F)	51(101)	EB(EB)	2(4)	A(A)	-
Road A/Parking Garage	C(C)	16(15)	WB(SB)	6(7)	A(A)	-
Road B/Parking Garage	B(B)	13(12)	WB(WB)	6(7)	A(A)	-
Road B/Road F	B(B)	10(10)	EB(EB)	1(1)	A(A)	-
Road E/Road D	A(A)	9(9)	NB(NB)	5(6)	A(A)	-
Maple/Road D	A(A)	8(8)	SB(EB)	8(8)	A(A)	-
Road A/Road B	B(A)	10(9)	WB(WB)	9(9)	A(B)	-
Roundabout Intersections						
NCC Scenic Driveway/Prince of Wales	B(F)	17(141)	WB(EB)	7(35)	A(D)	-

Note: Analysis of intersections assumes a PHF of 1.0 and a saturation flow rate of 1800 veh/h/lane

The Full Buildout (2048) intersection performance results showed the access intersections adjacent to the site and internal roadways are expected to operate similarly as at Opening Day (2028).

The same major signalized intersections along Carling continued to experience congestion, as did the same critical movements at minor unsignalized intersections along Prince of Wales.

In the unlikely event the Background traffic reductions associated with the Carling Avenue Transit Priority modifications and others outlined in **Section 4.3. Demand Rationalization** do not occur by the 2048 horizon year, the Carling Avenue corridor will continue to experience significant congestion between Bronson and Preston, as well as at Preston/Prince of Wales.

Long-term, these issues cannot be resolved by increasing vehicular capacity, particularly with City's current direction to remove general purpose travel lanes in favour of exclusive bus lanes along Carling Avenue. It is important to recognize the accepted trade-off from losing vehicular capacity is the significant improvement in the quality of services and the user experience for transit, pedestrians, and cyclists through the corridor, which TOH have attempted to enhance with the proposed access intersection designs and throughout the Master Site Plan and Active Transportation Plan.

Beyond continuing to implement the City's long-term sustainable transportation strategy, the critical aspect moving forward is for TOH to invest in and successfully implement a long-term TDM Plan to reduce personal vehicle use, and fully leverage the enhanced active transportation and transit facilities available to them in the adjacent network.

5.9.6.2 2048 Full Buildout Intersection Performance with Demand Rationalization Reductions

Table 45 summarizes intersection performance results at Full Buildout (2048) with applicable Background traffic reductions outlined in **Section 4.3: Demand Rationalizations**. The operational outputs can be found in **Appendix U**. For reference, the traffic volumes used in this analysis are available in **Appendix N**.

Table 45: Full Buildout 2048 Performance with Background Volume Reductions

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'As a Whole'		
	LoS	Max Delay (s) or v/c	Movement	Delay (s)	LoS	Max v/c
Signalized Intersections						
Parkdale/Carling	C(D)	0.75(0.81)	SBL(SBL)	25.5(20.1)	A(B)	0.45(0.67)
Civic/Carling	A(A)	0.32(0.48)	EBT(WBT)	0.2(1.1)	A(A)	0.32(0.48)
Maple-Old Irvine/Carling	A(B)	0.52(0.67)	EBT(NBT)	22.8(30.1)	A(A)	0.49(0.58)
Sherwood/Carling	A(C)	0.59(0.74)	SBL(SBL)	15.1(20.3)	A(A)	0.38(0.58)
Champagne/Carling	D(D)	0.81(0.83)	WBL(NBL)	32.4(32.4)	A(A)	0.54(0.48)
Trillium MUP/Carling	A(A)	0.42(0.59)	WBT(WBT)	7.7(14.7)	A(A)	0.42(0.59)
Preston/Carling[1]	F(F)	1.22(1.30)	WBL(NBL)	72.4(92.3)	E(F)	0.97(1.09)
	D(E)	*0.85(0.97)*	*WBL(NBL)*	*50.4(72.4)*	*C(D)*	*0.71(0.83)*
Booth/Carling	E(E)	0.97(0.99)	WBT(WBT)	32.2(39.1)	D(E)	0.87(0.93)
Bronson/Carling	D(E)	0.89(0.93)	EBL(EBL)	44.2(53.1)	D(E)	0.81(0.92)
Hwy 417 WB on-off/Parkdale	C(D)	0.76(0.82)	WBT(WBT)	14.4(17.1)	B(B)	0.64(0.70)
Hwy 417 EB on-off/Parkdale	B(C)	0.69(0.78)	EBT(EBT)	21.7(23.8)	A(A)	0.49(0.57)
Sherwood/Parkdale	A(A)	0.57(0.39)	EBT(SBT)	10.0(8.2)	A(A)	0.31(0.34)
Ruskin/Parkdale	A(A)	0.24(0.24)	EBT(EBT)	7.7(7.8)	A(A)	0.17(0.15)
Preston/Prince of Wales	E(E)	0.91(0.98)	SBR(SBT)	43.6(51.7)	D(D)	0.83(0.87)
Hwy 417 on Raymond/Rochester	A(B)	0.57(0.70)	WBL(WBT)	12.3(18.4)	A(A)	0.44(0.51)
Hwy 417 off Orangeville/Rochester	B(C)	0.70(0.74)	EBT(EBT)	10.7(16.6)	A(A)	0.44(0.45)
Hwy 417 on-off Catherine/Bronson	E(F)	0.97(1.07)	NBL(WBL)	35.8(40.5)	C(D)	0.77(0.89)
Hwy 417 EB off/Bronson	D(D)	0.82(0.86)	EBR(EBR)	15.7(16.5)	B(B)	0.61(0.69)
Road B/Prince of Wales	B(A)	0.64(0.60)	EBT(SBL)	11.1(13.7)	B(A)	0.62(0.52)
Unsignalized Intersections						
Melrose/Carling	C(E)	16(40)	SB(SB)	1(1)	A(A)	-
Rochester/Carling	C(F)	21(221)	SB(SB)	2(29)	A(C)	-
Navy/Prince of Wales	C(E)	17(37)	NB(NB)	1(1)	A(A)	-
Bayswater/Sherwood	A(B)	9(12)	SB(SB)	8(11)	A(B)	-
Road E/Prince of Wales	E(F)	38(66)	EB(EB)	1(3)	A(A)	-
Road A/Parking Garage	C(C)	16(15)	WB(SB)	6(7)	A(A)	-
Road B/Parking Garage	B(B)	13(12)	WB(WB)	6(7)	A(A)	-
Road B/Road F	B(B)	10(10)	EB(EB)	1(1)	A(A)	-
Road E/Road D	A(A)	9(9)	NB(NB)	5(6)	A(A)	-
Maple/Road D	A(A)	8(8)	SB(EB)	8(8)	A(A)	-
Road A/Road B	B(A)	10(9)	WB(WB)	9(9)	A(B)	-
Roundabout Intersections						
NCC Scenic Driveway/Prince of Wales	B(C)	15(24)	WB(EB)	7(10)	A(B)	-

Note: Analysis of intersections assumes a PHF of 1.0 and a saturation flow rate of 1800 veh/h/lane

1.) Preston/Carling modelled as envisioned within the Stantec Carling Transit Priority Study and below with the addition of an EBR turn lane. Further discussion below.

The results of the sensitivity analysis at Full Buildout (2048) with New Civic Development traffic and noted Background traffic reductions showed similar improvements as observed in the Opening Day (2028) results. Additional findings have been summarized below:

Preston/Carling:

Similar to the corresponding Opening Day (2028) sensitivity analysis, there would be notable benefits to intersection performance and signal timing benefits to cyclists with the implementation of an auxiliary eastbound right-turn lane. However, the same implications would also apply, encroaching on already limited landscape space and increased crossing distance on an already overlong west crosswalk.

Additional sensitivity was conducted to determine what demand modifications (reductions in volumes) would be required to improve performance at Preston/Carling with the proposed Stantec design. A reduction in overall volumes (without demand rationalized reductions) by 35% in the AM and PM peaks results in overall acceptable performance.

5.9.7 Queue Length Analysis

Available storage capacity for notable movements were assessed at Full Buildout (2048) with applicable Background traffic reductions outlined in **Section 4.3: Demand Rationalizations**.

The locations identified as potential candidates for queue spillback were:

- **Champagne/Carling**: The westbound left-turn has a maximum storage length of approximately 60m, based on the Carling Transit Priority design. Twinning the left turn was not possible due to the proposed median bus lane.
- **Preston/Carling:** The westbound left-turn has a proposed storage length of approximately 120m, based on the Carling Transit Priority design. Twinning the left turn was not possible due to the proposed median bus lane. The implications of adding an eastbound right-turn lane were also assessed.
- **Preston/Prince of Wales:** The effectiveness of an additional eastbound left-turn lane has been shown.
- **Road B/Prince of Wales:** The westbound approach was observed with extended queues.
- **Road A/Parking garage:** The westbound left-turn queue into the parking garage was assessed to avoid spillback to Carling.
- **Maple/Carling**: The need for an auxiliary northbound left-turn was assessed.

Table 46: Queue Length Summary

Intersection		Weekday AM Peak (PM Peak)			
		Queue Length (m)			Notes
		Capacity	50th %	95th %	
Champagne/Carling	WBL	60	45(44)	85(73)	95th percentile Q may be exceeded
	EBR	75	54(21)	114(58)	95th percentile Q may be exceeded in AM
Preston/Carling no EBR	EBTR	70	119(138)	149(143)	The addition of an EBR turn-lane would reduce extent of queue spillback
Preston/Carling with EBR	EBR	70	40(82)	64(126)	
Preston/Carling no EBR	WBL	120	98(143)	126(169)	The addition of an EBR turn-lane would reduce queueing
Preston/Carling with EBR		120	72(109)	114(133)	
Preston/Prince of Wales Single EBL	EBL	80	252(180)	324(247)	A double EBL is highly recommended
Preston/Prince of Wales Double EBL		80	85(66)	108(85)	
Road B/PoW Single Through Lane	WB	220	48(135)	114(296)	A double WB through is highly recommended
Road B/PoW Two Through Lane		220	24(49)	53(99)	
Road A/Parking Garage	WBL	65	7(4)	23(15)	No concerns.
Maple-Old Irvine/Carling	NB	180	6(47)	16(74)	Northbound left not required.

Overall, there is sufficient storage to accommodate queues at the noted locations of interest.

The westbound left-turn at Champagne/Carling may at times experience queue spillback, but only during the critical peak hours. On average, the available storage capacity will be sufficient.

As part of the Carling Transit Priority, Preston/Carling westbound left-turn will be extended from its existing length, but queue spillback is expected to persist during the critical peak hours. The addition of an EBR turn-lane

reduces queues for both the EBR and WBL turn movements, however, some spillback may still occur during the critical peak hours.

The proposed implementation of dual eastbound left-turn lanes at Preston/Prince of Wales greatly reduced the potential for queue spillback. The critical period was the morning peak hour, where 95th percentile queues were approximately 110m.

The westbound approach to Road B/Prince of Wales was experiencing notable queueing with a single through lane. The addition of a through-right lane with two receiving lanes was effective in mitigating this issue. The additional lanes would also provide more comfortable truck turning movements to/from Road B, enabling wider turns and an acceleration lane for exiting vehicles heading south on Prince of Wales.

These requirements will be confirmed in more detail during the Site Plan Control process for future phases of development.

5.9.8 Peak Hour of Generator Considerations

The following section will attempt to confirm that the working hours assumed for the existing Civic Campus and the future Hospital campus are generally similar to the peak hour of adjacent street traffic.

The following table shows the peak hour traffic volumes at adjacent intersections to the existing Civic Campus, which was used to capture the existing campus vehicular demand. The inbound/outbound turning movements during the peak hour of adjacent street traffic was shown to be generally similar to the peak hour of movement themselves (replicating the peak hour of the generator). This result suggests the use of the former to derive the local trip generation rates was reasonable and a separate analysis was not necessary.

Table 47: Adjacent Street Peak Hour vs Peak of Generator Hour

Intersection	Peak Hour of the Adjacent Street			Peak Hour for Civic Campus Traffic		
	Beginning of Peak Hour	Inbound Volumes (vph)	Outbound Volumes (vph)	Beginning of Peak Hour	Inbound Volumes (vph)	Outbound Volumes (vph)
AM Peak Hour						
Parkdale/Carling[1]	8:00	371	260	9:00	400	284
Parkdale/Ruskin	7:15	366	195	7:15	366	195
Civic/Carling	8:00	242	58	9:00	267	94
Melrose/Carling	8:00	94	77	9:00	78	90
PM Peak Hour						
Parkdale/Carling[1]	16:00	217	400	16:00	217	400
Parkdale/Ruskin	15:00	168	321	15:00	168	321
Civic/Carling	16:15	152	85	15:00	194	107
Melrose/Carling	16:30	86	66	16:30	86	66

1. *There are no direct ins/out at Parkdale/Carling, but the movements WBR and EBL were considered for ins and SB as outs*

The shift schedule for staff at the future hospital was confirmed by TOH, with the majority of staff arriving at the beginning of 7:00am and leaving at 3:00pm. These arrival and departure hours were compared to the peak hour of the generator at the future access intersection locations to the new Civic Development. A summary has been provided in Table 48.

Table 48: Comparison of Adjacent Road Peak Hour Volumes and Future Site Generator Peak Hour

Intersection	Peak Hour of Adjacent Street			Peak Hour of Future Campus		
	Beginning of Peak Hour	Major Road 2-Way Volumes (vph)	Minor Road 2-Way Volumes (vph)	Beginning of Peak Hour	Major Road 2-Way Volumes (vph)	Minor Road 2-Way Volumes (vph)
AM Peak Hour						
Maple/Carling	8:00	1,718	78	7:00	1,279	179
Champagne/Carling	8:00	1,820	96	7:00	1,432	59
Preston/Carling	8:00	1,583	1,481	7:00	1,211	1,199
Navy/P. of Wales	8:00	1,517	2	7:00	1,243	4
PM Peak Hour						
Maple/Carling	15:30	1,912	229	15:00	1,762	209
Champagne/Carling	16:15	1,978	311	15:00	1,680	308
Preston/Carling	16:15	2,430	1,363	15:00	2,001	1,374
Navy/P. of Wales	15:45	1,654	51	15:00	1,494	44

1. *Minor roadways with movements less than 200 veh/h were not considered.*

As seen in **Table 48**, the background traffic volumes during the peak hour of the adjacent street were typically higher by a 15% to 20% over the peak hour of the generator (following the anticipated shift schedule), suggesting the analysis is conservative and represents a worse-case scenario. Therefore, no adjustments to the background traffic volumes were made to reflect this result.

6.0 FINDINGS AND RECOMMENDATIONS

The follow discussion outlines key findings and recommendations of this TIA for the New Civic Development.

Existing & Future Background Conditions

- The Ottawa Hospital (TOH) is replacing the aging Civic Campus located at 1053 Carling Avenue with a New Civic Development. The future site is located to the southwest of the intersection of Carling Avenue and Preston Street, west of Prince of Wales Drive, and on lands to the north and east of the Central Experimental Farm. At this location, the new site will have strong ties to transit, served by Light Rail Transit (LRT) via a rapid transit station on the Trillium Line, and bus transit priority lanes with bus stops along Carling Avenue. The site is also located near the heart of the City, and as such is served with strong arterial roads and active transportation infrastructure
- The estimated mode shares at the existing Civic Campus are: 85% auto-driver and 15% non-auto driver (e.g. transit, walk and cycling), which reflects the lack of high-quality active transportation and transit facilities in the surrounding network.
- The future site is located directly adjacent to the Dow's Lake LRT Station, which is currently being upgraded as part of the City's Stage 2 LRT expansion initiative. The Trillium Line expansion is expected to be completed by 2022. There is an opportunity to provide connectivity between the hospital project and Dow's Lake Station, and in turn connect to the City's overall rapid transit system.
- Carling Avenue adjacent to both the existing and future hospital sites is anticipated to be upgraded into a transit priority corridor by the Opening Day (2028) horizon year. The modifications include the conversion of two general purpose travel lanes to bus lanes and the addition of bus stops and cycle tracks that will serve the hospital site and the surrounding community.
- The Carling Avenue Transit Priority design includes additional active transportation infrastructure that will further enhance the active transportation experience. The Trillium Pathway, opened in 2016, also provides an important connection to the site. Of note, there was a notable cyclist and pedestrian collision pattern at the Preston/Carling intersection from 2014 to 2018.

- Existing MMLOS analysis for road segments and intersections shows poor pedestrian and cyclist performance, and in the case of the pedestrian scores, this is largely due to the length of the crossings of major roads.
- Overall, the majority of study area intersections in existing conditions operated within City recommended guideline (LOS E or better), with the exception of the following major arterial to arterial intersections:
    - Preston/Carling
    - Bronson/Carling,
    - Preston/Prince of Wales, and
    - Catherine/Bronson.
- Overall, the majority of study area intersections in 2028 and 2048 background conditions operated within City recommended guideline (LOS E or better), with the exception of the following major arterial to arterial intersections:
    - Preston/Carling,
    - Booth/Carling,
    - Bronson/Carling,
    - Preston/Prince of Wales, and
    - Catherine/Bronson

Proposed Development

- The assumed phasing of the New Civic Development is:
    1. Opening Day 2028, which anticipates approximately 2.4M ft2 of hospital use, 6,600 FTE employees and 765 beds; and,
    2. Full Buildout 2048, which includes the full hospital expansion and all ancillary facilities, including the Carling Village development site and the UOHI building (totaling approximately 5.0M ft^2), 10,500 FTE employees, and 1,250 beds.
- A total of approximately 3,100 parking spaces (number is subject to change) will be provided on-site. All existing off-site (satellite) parking leases will be discontinued by Opening Day (2028).
- The target mode shares for the New Civic Development are:
    - Opening Day: 50% auto-driver, 15% auto-passenger, 30% transit, 5% active transportation
    - Full Buildout: 35% auto-driver, 12% auto-passenger, 45% transit, 8% active transportation

  These targets represent all campus users (staff, visitors etc.), but it is recognized there will be variability in the mode shares between each user group (e.g. employees will have a lower auto-driver component, while patients/visitors will have a higher auto-driver component).
- At Opening Day (2028), the New Civic Development is estimated to generate approximately:
    - 110 to 100 active transportation trips during the commuter peak hours;
    - 600 to 700 transit trips during the commuter peak hours; and
    - 1,000 to 1,100 personal vehicle trips during the commuter peak hours.
- At Full Buildout (2048), the New Civic Development is estimated to generate approximately:
    - 250 to 300 active transportation trips during the commuter peak hours;
    - 1,600 to 1,800 transit trips during the commuter peak hours; and
    - 1,200 to 1,350 personal vehicle trips during the commuter peak hours.

Future Combined Network Conditions

- TOH is proposing high quality active transportation connections throughout the campus that connect to existing and planned pedestrian, cycling and transit networks. However, future MMLOS for road segments and intersections will have difficulty meeting minimum targets for pedestrian and cyclist performance.
- The implementation of the Carling Avenue Transit Priority measures will diminish existing vehicular capacity within the Carling Avenue corridor in favour of a more balanced transportation system that includes higher-performing active transportation and transit facilities.

The evaluation of the road network performance showed that the addition of New Civic Development traffic at Opening Day 2028 and Full Buildout 2048, did not increase the number of poorly performing intersections compared to the future Background conditions with the exception of Parkdale/ WB 417.

- Preston/Carling,
- Booth/Carling,
- Bronson/Carling,
- Preston/Prince of Wales, and
- Catherine/Bronson

Parkdale/ WB 417 was on the edge of the acceptable intersection performance threshold in Background conditions, and the addition of New Civic Development traffic reduced performance by only 1%. Overall, the change in overall congestion would be negligible.

The New Civic Development access intersections were all shown to operate well in both future horizons.

- If City-wide sustainable policies and initiatives as outlined in the New Official Plan and supporting transit infrastructure such as the Carling Avenue Transit Priority Corridor are taken into consideration (by applying Background traffic volume reductions), the number of poorly performing intersections would be reduced to:
  - Preston/Carling
- It is acknowledged that the addition of an eastbound right turn-lane at Preston/Carling would resolve the suboptimal intersection performance and enable a time separated phase for cyclists across the south crossride. However, this modification would increase the pedestrian crossing distance at an already excessively long crosswalk (due to the planned median bus lanes), and also would have landscaping and property implications on the south side of Carling Avenue.
- The future New Civic Development access intersections have been designed to accommodate projected vehicular queues where possible considering the locational constraints, but some spillback may occur at times during the critical peak hour when the adjacent arterial network is at its most congested state. These intersection design requirements will be confirmed during the Site Plan Control process for subsequent phases.
- The above results are contingent on TOH achieving ambitious target mode shares for employees and visitors: approximately 50% auto-drivers at Opening Day 2028, and approximately 35% auto-drivers at Full Buildout 2048.

Supporting Strategies

- To help achieve the target mode shares at the Opening Day and Full Buildout horizons, TOH has an opportunity to prioritize the development of a comprehensive Transportation Demand Management (TDM) Strategy/Plan (separate to this document and following the approval of the Master Site Plan) to reduce the project's long-term reliance on the automobile, and in turn reduce parking requirements. TDM Checklists highlight recommended TDM measures for TOH to consider, which will be confirmed incrementally during the development approval process. A preliminary TDM framework is included in this report, and key elements of this framework include:
  - Programming: provide a team and budget for TDM coordination
  - Community and Promotion: inform, engage through campaigns, provide tools and award
  - Partnerships: engage with local associations, OC Transpo, car/bike/van pooling, etc.
  - Policy and Infrastructure: measures to incentivize active transportation such as monthly transit pass discounts, aggressively priced staff parking passes, shower and storage facilities for cyclists, real-time transit information and key locations, emergency ride home program, etc.
  - Monitoring: complete regular surveys and studies to continually upgrade and retrofit TDM strategies
- TOH intends to invest heavily in active transportation infrastructure at the New Civic Development, based on the proposed AT Plan, to leverage the proximity of the future site to high-quality facilities in the surrounding network. A list of the prominent elements of the AT Plan include: "The Highline", which is an elevated and sheltered pedestrian connection between Dow's Lake Station and the main Hospital building,

Bi-directional cycling facilities around and through the site, ample bicycle parking, secondary pathway connections, and sidewalks that permeate throughout the site.

- TOH acknowledges the impact the New Civic Development will have on existing AT facilities, such as the pathway across the Queen Juliana Park and the Trillium Pathway.
    - To replace the Queen Juliana Park pathway, cycle tracks have been proposed on both sides of Carling Avenue west of Champagne. The internal roads around the parking garage will also have a bi-directional cycling facility connecting Carling to Prince of Wales.
    - The Trillium Pathway will be redirected to a bi-directional cycle facility on the south side of Carling and the west side of Preston back to its current destination in the form of a bi-directional crossride at the Preston/Prince of Wales intersection
- To support these AT infrastructure initiatives, the signal timing plans at signalized intersections along the New Civic Development frontage will be enhanced to improve pedestrian and cycling operations.
- TOH will meet the require bylaw requirements for bicycle parking. The location and distribution of bicycle parking spaces will be confirmed at the Site Plan Control stage for the various development phases. Of note, TOH has made a design decision that cyclists are not to be accommodated at the main hospital front-door entrance in an effort to minimize potential bicycle/vehicle conflicts. Where feasible, opportunities for indoor and/or covered parking can be explored.
- The hospital site's location within 600-meter walk to high frequency LRT Trillium Line and Dow's Lake Station makes it a prime candidate for a transit-oriented development. The additional proposed Carling BRT lanes functions as a supplementary transit service. It is expected the capacity of both services will accommodate future transit ridership at the New Civic Development. The transit demand and capacity will be reassessed during the Site Plan Control process for subsequent phases.
- To leverage transit use, the New Civic Development is proposing an AT Plan that provides direct connections to surrounding transit service. A featured element is the Highline connection to Dow's Lake station. TOH is also pursuing a potential extension of the Dow's Lake Station platform to the south side of Carling Avenue, and discussion are ongoing. Additionally, the transit incentives/strategies within the TDM Plan will be a critical element to leverage the proximity of future infrastructure and service, to maximize its use.
- TOH understands the importance of identifying the most appropriate locations for the blue 'H' marker along the approaches to the Hospital including Hwy 417. These decisions will be made independent of this study; however, this study has identified the Rochester EB off ramp and the Bronson WB off ramp as possible locations for these markers. If selected, these potential routes would follow the City's arterial and major collector road system, and corresponding decisions would need approval by the Ontario Ministry of Transportation (MTO) on Hwy 417 and the City of Ottawa for the installation of all required trailblazing markers on municipal roads.
- The access and circulation needs for ambulances and emergency transports have been considered in the Master Site Plan. As a result, the access points for ambulances and emergency transports were segregated from public and staff access points where possible, to minimize potential conflicts and operational impacts of these essential vehicles.
- TOH recognizes that the New Civic Development may have traffic implications to nearby communities and neighbourhoods. Therefore, considerable effort was taken to identify vulnerable streets during the design process to help mitigate potential traffic infiltration.
    - **Sherwood Drive:** The Sherwood/Carling intersection is ruled out as a primary Carling Avenue access point to the New Civic Development. This will help disincentivize traffic infiltration along Sherwood. Of note, the City of Ottawa is currently updating the Sherwood Traffic Calming Study, and this may lead to other speed management measures along this street.
    - **Champagne Avenue:** The northbound through movements exiting the future New Civic Development at Carling/Champagne will be prohibited and physical measures such as the inclusion of a channelized turn island departing the site are proposed. Vehicles must turn left or right on to Carling Avenue when exiting the campus.

  - **Maple Drive**: The New Civic Development intends to regulate access to Maple Drive from the internal site access to discourage/prohibit public and staff movements. This will greatly reduce the traffic volumes on Maple Drive from the New Civic Development and help maximize the travel time and reliability of ambulance movements along the emergency route.
  - **Dow's Lake Community**: It is acknowledged that Lakeside Avenue provides direct access for eastbound traffic from Queen Elizabeth Driveway to Bronson and may experience slightly higher traffic volumes at times during peak commuter periods when the adjacent arterial network is most likely to be congested. For the remaining local streets, existing area traffic management measures (such as turn prohibitions and time of day restrictions) will still be enforced that will help limit traffic infiltration. Additional measures may be explored in consultation with the City Area Traffic Management group if traffic infiltration is observed in the future.
- Current parking demand projections suggest the proposed approximately 3,100 parking space supply is appropriate to the context, but parking availability pressures could be experienced if historic travel trends exhibited at the exiting Civic Hospital persist into the future. To address this healthy tension between parking supply and demand, TOH should endeavor through its TDM Plan, to reduce personal vehicle use by staff and visitors as much as possible to avoid this outcome. Leveraging the proximity to the area's existing and proposed rapid transit system, the bus transit infrastructure, and the active transportation networks will be important aspects of this strategy.
- TOH will also develop a comprehensive Parking Management Strategy (separate to this report) prior to implementation of Phases 2 and 3 of the New Civic Development to identify potential parking implications and provide mitigation options, building off the preliminary ideas described in this report. TOH will then be prepared to respond quickly to parking supply shortages and the implications if they arise.
- TOH acknowledges the requirement from the National Capital Commission (NCC) to provide approximately 200 public parking spaces within the New Civic Development to offset the loss of parking across from Dow's Lake Pavilion. There is expected to be ample supply within the parking garage to meet this requirement in evenings and weekends. TOH and the NCC are in the process of coming to an agreement as to how these visitor parking requirements and tour bus parking will be provided.